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Memorandum For: James Balsiger, Director, Alaska Region  
Kaja Brix, Lisa Rotterman and Dana Seagars, Alaska Region Protected Resources

From: Douglas DeMaster, Director, Alaska Fisheries Science Center

Subject: Results of Steller Sea Lion Surveys in Alaska, June-July 2011

### Summary and Introduction

An aerial survey to assess Steller sea lion (*Eumetopias jubatus*) pup production in the range of the western distinct population segment (DPS) in Alaska was conducted by the Alaska Fisheries Science Center (AFSC) from 27 June to 16 July 2011 (Figure 1). A secondary objective was to survey adult and juvenile (non-pup) sea lions in areas missed during the 2010 survey, particularly in the central and western Aleutian Islands. We successfully surveyed 135 of the 179 targeted terrestrial rookeries and haul-outs in 2011. All 73 sites in the eastern, central, and western Gulf of Alaska and in the eastern Aleutian Islands between 144°-170°W were successfully surveyed, as were all 52 sites in the eastern half of the central Aleutian Islands between 170°-178°W and 10 of 13 sites in the western Aleutian Islands between 172°-177°E. However, we were unable to survey any of the 40 sites (including 7 rookeries) in the western half of the central Aleutian Islands between 177°E-178°W, 1 site (a nearly extinct rookery on Buldir) in the western Aleutian Islands, and 1 site (a small rookery on Walrus Island in the Pribilof Islands, eastern Bering Sea) because of persistent fog and bad weather. In addition, we could not survey 2 haul-outs (Alaid and Nizki) in the western Aleutian Islands due to airspace restrictions near Shemya Island.

Pup survey results: We counted a total of 10,604 live pups on 60 sites (29 rookeries and 31 major haul-outs) that had at least one pup (Table 1). In order to estimate total pup production in the western DPS in Alaska in 2011, trends from 1998-2010 were used to estimate 2011 pup production for the sites we were unable to survey in parts of the central Aleutian Islands and eastern Bering Sea, and this total (943 pups) was added to the survey count. This yielded a total western DPS Steller sea lion production estimate of 11,547 pups, an increase of 427 from the 2009 estimate of 11,120 pups (Figures 2-4). Total pup production in all four sub-areas east of Samalga Pass (169°W) increased by 724 between 2009 and 2011: 74 in the eastern Gulf of Alaska, 316 in the central Gulf of Alaska, 187 in the western Gulf of Alaska, and 147 in the eastern Aleutian Islands. By contrast, total pup production in the two sub-areas west of Samalga Pass and in the eastern Bering Sea decreased by 297 between 2009 and 2011: -176 in the central Aleutian Islands, -103 in the western Aleutian Islands, and -18 in the eastern Bering Sea.

At the 31 major western DPS rookeries used to estimate trend, pup production totaled 10,091 in 2011, and since 2001/02, has increased at an average rate of 1.8%  $y^{-1}$  ( $P=0.02$ ;  $N=4$  counts; Table 2). This is nearly identical to the annual rate estimated for the period 2001/02-2009, but

with an additional count, the probability that it is significantly  $> 0$  has increased. However, there are strong regional differences in rookery pup production, which declined in the western ( $-9.2\% \text{ y}^{-1}$ ;  $P<0.01$ ) and central Aleutian Islands ( $-1.5\% \text{ y}^{-1}$ ;  $P=0.05$ ) between 2001/02 and 2011, but is increasing in the eastern Aleutian Islands ( $4.8\% \text{ y}^{-1}$ ;  $P<0.01$ ), and in the western ( $3.5\% \text{ y}^{-1}$ ;  $P=0.02$ ), central ( $2.2\% \text{ y}^{-1}$ ;  $P=0.08$ ), and eastern Gulf of Alaska ( $4.7\% \text{ y}^{-1}$ ;  $P<0.01$ ; Figure 3).

Non-pup survey results: While an overall adult and juvenile (non-pup) trend count for the western DPS in Alaska cannot be obtained for 2011, there is trend information available for portions of the range, specifically rookery cluster areas (RCAs) 4 and 5 in the eastern half of the central Aleutian Islands (between  $170^{\circ}\text{W}$  and  $178^{\circ}\text{W}$ ), the eastern Aleutian Islands sub-area, and the western and eastern Gulf of Alaska sub-areas (Table 3; Figure 5). The non-pup count on all trend sites in RCA 4 was 2% lower (-52) in 2011 than in 2010, while the trend site non-pup count in RCA 5 was 20% greater (+341). In the eastern Aleutian Islands, non-pup counts on 19 of 27 trend sites were essentially no different (only 1% greater) in 2011 than in 2008; these 19 sites had the vast majority (91%) of all non-pups counted in the eastern Aleutian subarea in 2008. By contrast, in the western Gulf of Alaska, non-pup counts on 14 of 20 trend sites were 1,205 (21%) greater in 2011 than in 2008; these 14 sites had the vast majority (99%) of all non-pups counted in the western Gulf subarea in 2008. Similarly, in the eastern Gulf of Alaska, non-pup counts on 10 of 19 trend sites were 530 (12%) greater in 2011 than in 2008; these 10 sites also had the vast majority (97%) of all non-pups counted in the eastern Gulf subarea in 2008.

## Methods

Aerial surveys to assess Steller sea lion (SSL) pup production in Alaska are conducted in late June through mid-July, starting at least 10 days after the mean birth dates of pups in the survey area (4-14 June; Pitcher et al. 2001). The primary objective in 2011 was to survey all terrestrial rookery and major haul-out sites within the range of the western DPS in Alaska. A secondary objective was to survey adult and juvenile (non-pup) sea lions in the central and western Aleutian Islands.

We successfully surveyed 135 of the 179 targeted terrestrial rookeries and haul-outs in 2011 (Figure 1). All 73 sites in the eastern, central, and western Gulf of Alaska and in the eastern Aleutian Islands between  $144^{\circ}$ - $170^{\circ}\text{W}$  were successfully surveyed, as were all 52 sites in the eastern half of the central Aleutian Islands between  $170^{\circ}$ - $178^{\circ}\text{W}$  and 10 of 13 sites in the western Aleutian Islands between  $172^{\circ}$ - $177^{\circ}\text{E}$ . However, we were unable to survey any of the 40 sites (including 7 rookeries) in the western half of the central Aleutian Islands between  $177^{\circ}\text{E}$ - $178^{\circ}\text{W}$ , 1 site (a nearly extinct rookery on Buldir) in the western Aleutian Islands, and 1 site (a small rookery on Walrus Island) in the Pribilof Islands, eastern Bering Sea, because of persistent fog and bad weather. In addition, we could not survey 2 haul-outs (Alaid and Nizki) in the western Aleutian Islands due to airspace restrictions near Shemya Island.

We used a NOAA Twin Otter aircraft to conduct the survey. Sites with ten or more non-pups hauled out were photographed using three Canon EOS-1Ds Mark III digital cameras equipped with 85 mm telephoto lenses mounted in the belly of the plane. The center camera was mounted vertically while the port and starboard cameras were mounted obliquely at a  $21^{\circ}$  angle, pointing inward towards the center camera. The cameras were mounted in a forward motion compensator (FMC) to minimize blur. The desired survey altitude was 750 ft (which provided an approximate 1000 ft swath width), but ranged between 600-1300 ft due to low ceilings, wind speeds, and

topography at some sites. The desired ground speed was 90 kts, but ranged from 85-110 kts depending on wind speed and direction. Cameras were set to aperture priority (f5.6) and ISO to 800. Lenses were focused manually and set to near infinity.

Three researchers working independently counted all SSLs at each terrestrial site photographed during the 2011 survey. One researcher analyzed all photographs, while the other two divided the sites to ensure two independent counts per site. Sea lions were counted off digital photographs using high resolution monitors and Adobe Photoshop software (mention of specific products does not serve as an endorsement). A script within the software tallied the number of pups, juveniles, adult females, sub-adult males and adult males that were marked on the image. Initial total counts of pups and non-pups (juveniles, adult females, sub-adult males and adult males) at each site by each researcher were compared. If the difference in total pup or non-pup counts at a site was greater than 5% or greater than 20, then the photographs (with counted animals) were compared to reconcile the discrepancies. If sea lions were disturbed into the water by the survey aircraft, then every effort was made to count them (N=1,033, 3.4% of all non-pups counted), but animals that were in the water away from shore near undisturbed sites were not counted. Total counts of pups and non-pups at all photographed sites differed between counters by 72 (0.7%) and 163 (0.5%), respectively. Counts reported here are means of the replicate counts for the photographed sites or the visual count of non-pups recorded by the observer for the sites with few or no sea lions. At one site, Akun/Billings Head, pups were counted by researchers (N=2) on the ground and their mean count is reported here.

Pup production in 2011 at twelve sites that we were unable to survey in RCAs 1-3 and the eastern Bering Sea was estimated based on recent trends in local pup production. For RCA 1 (western Aleutian sub-area), pup production at Alaid and Buldir (a total of only 11 pups counted in 2010) was estimated in 2011 based on the regression of  $\ln(\text{pup count})$  on year for the period 1997-2011 at the three rookeries in RCA 1 ( $-8.9\% \text{ y}^{-1}$ ;  $P<0.001$ ). For RCA 2, pup production at six sites (rookeries on Amchitka/Column Rocks, Ayugadak, Kiska/Lief Cove, and Kiska/Cape St. Stephen; major haul-outs on Amchitka/East Cape and Semisopochnoi/Pochnoi) was estimated in 2011 based on the regression of  $\ln(\text{pup count})$  on year for the period 1998-2009 at the four RCA 2 rookeries ( $-3.9\% \text{ y}^{-1}$ ;  $P=0.033$ ). For RCA 3, pup production at Gramp Rock, Tag and Ulak/Hasgox Point was estimated in 2011 based on the regression of  $\ln(\text{pup count})$  on year for the period 1998-2010 at these rookeries ( $-4.1\% \text{ y}^{-1}$ ;  $P=0.002$ ). Pup production at Walrus Island in the eastern Bering Sea in 2011 was estimated based on the regression of  $\ln(\text{pup count})$  on year for the period 1960-2010 at this rookery ( $-10.1\% \text{ y}^{-1}$ ;  $P<0.001$ ).

## Results and Discussion

### Pup production in the western DPS in AK

Steller sea lion pup production within the range of the western DPS in AK is estimated at 11,547 on all rookeries and major haulouts in 2011. Pup production increased by 427 between 2009 and 2011 (Table 1; Figure 2), with 60% of this increase (260) occurring at rookeries. Between 2001/02 and 2011, pup production at the 31 trend rookeries increased at a rate of  $1.8\% \text{ y}^{-1}$  ( $P=0.02$ ; Table 3; Figure 3), which is similar to the rate observed between 2001/02 and 2009, and is significantly different from 0 with the addition of the 2011 count.

Analysis of recent regional and overall trends (Tables 2-3; Figures 1-4) within the western DPS in AK indicates that pup production:

- Increased between 2009 and 2011 in all four sub-areas east of Samalga Pass (169°W):
  - eastern Aleutian Islands: increase of 147 (6%) with the largest increase occurring at Ugamak (N=60)
  - western Gulf of Alaska: increase of 187 (8%) with the largest increase occurring at Clubbing Rocks (N=50)
  - central Gulf of Alaska: increase of 316 (16%) with the largest increases occurring at Sugarloaf (N=154) and Chowiet (N=93): these were the largest absolute increases observed at any site between 2009 and 2011
  - eastern Gulf of Alaska: increase of 74 (7%) with the largest increase occurring at Wooded (Fish) (N=47);
- Decreased between 2009 and 2011 in both sub-areas west of Samalga Pass:
  - central Aleutian Islands: decrease of 176 (-7%) with the greatest decrease estimated at Gramp Rock (N=45)
  - western Aleutian Islands: decrease of 103 (-34%) with the greatest decrease occurring at Agattu/Gillon Point (N=59).

East of Samalga Pass, pup counts increased at over 75% of the major haul-outs and rookeries surveyed in both 2009 and 2011 (Table 1; Figure 2). By contrast, west of Samalga Pass, pup counts decreased or remained the same at all 11 major haul-outs and rookeries surveyed in both 2009 and 2011. At an additional 11 sites west of Samalga Pass, pup production was estimated to decline through 2011 based on local 1998-2010 trends.

There are 9 rookeries within the western DPS in Alaska where >400 pups were produced in 2011; 8 are located east of Samalga Pass and only 1 (Seguam/Saddleridge) is located west of Samalga Pass (Table 1). Over 25% of all pups produced within the western DPS in Alaska in 2011 were born at the four rookeries closest to Unimak Pass (Akutan/Cape Morgan and Ugamak in the eastern Aleutians and Clubbing Rocks and Pinnacle Rock in the western Gulf of Alaska). In addition, pup production in 2011 at two sites (South Rocks and The Whaleback) in the western Gulf surpassed the 50 pup threshold traditionally used for rookery designation. Pup production in the central Gulf of Alaska increased the most of any sub-area in the western DPS in AK between 2009 and 2011, but since 2001/02, the annual rate of increase ( $2.2\% \text{ y}^{-1}$ ;  $P=0.08$ ) is not significantly different from 0. Pup production at the major haul-out on Twoheaded Island near the south end of Kodiak Island exceeded 50 for the first time in 2011.

Pup production continues to decline in the western Aleutian Islands and in the eastern Bering Sea, and now appears to be declining throughout the entire central Aleutian Islands as well. These three sub-areas, where 17 of the 37 rookeries in the western DPS in AK are located, accounted for only 24% of the western DPS AK pup production in 2011, down from 35% in 2001/02. In the western Aleutians, rookery pup production has declined at  $-9.2\% \text{ y}^{-1}$  ( $P<0.01$ ) since 1997, and has shown no sign of stabilizing (Figure 4). Buldir produced only 1 pup in 2010 and is now no longer a rookery. Meanwhile, pup production at the largest rookery in the western Aleutians, Agattu/Gillon Point, has dropped over 50% in the last 7 years. Pup production on Walrus Island in the eastern Bering Sea has declined at a rate  $\sim 10\% \text{ y}^{-1}$  since 1960, and was last assessed in 2010 (14 pups); Walrus may also no longer be a rookery.

In the central Aleutian Island sub-area, pup production trends generally decline from east to west (from RCAs 5 through 2; Figures 1 and 4). In the eastern half of the central Aleutians (RCAs 4

and 5), pup production increased through the early and mid 2000s. Furthermore, the three rookeries in RCA 4 (Kasatochi, Adak, and Kanaga) were the only ones in the entire western and central Aleutian Islands that had increasing pup production in the 1990s (Figure 4). However, pup counts in 2010 and 2011 in RCAs 4 and 5 suggest that the recent increasing trend here may have ceased. Because we were able to survey only 2 haul-out sites in RCAs 2 and 3 from the air in 2011, we have no 2011 pup count from these areas and the numbers that appear in Table 1 in bold italics for 2011 are estimates based on pup production trends between 1998 and 2010. If the most recent count at each site in RCAs 2 and 3 (in 2009 or 2010) is used instead of an estimate based on pup production trends, the total central Aleutian subarea count for 2011 would be 2,307, greater by only 49 pups from the estimate in Table 2 (2,258) and still down 5% from the 2009 count. The 2011 RCA 2 and 3 pup estimates in Table 1, however, may be optimistic. NMML researchers based on the RV *Tiglax* counted pups from a cliff above the rookery at Kiska/Cape St. Stephen in RCA 2 (N=39 on 26 June 2011), as well as at Agattu/Cape Sabak (N=62 on 22 June 2011) and Attu/Cape Wrangell (N=21 on 24 June 2011) in RCA 1, western Aleutians. Cliff counts were ~80% of the aerial survey counts at the two sites where both occurred: at Agattu/Cape Sabak, the aerial survey found 76 pups (on 16 July), while the cliff count was 62 (82% of the aerial survey count); at Attu/Cape Wrangell, the aerial survey found 27 pups (on 16 July), while the cliff count was 21 (78%). Cliff counts could have been lower than aerial survey counts due to lower pup sightability (e.g., pups hidden at the base of the cliff or behind rocks), and because they were conducted over two weeks earlier than the aerial survey; some of the additional pups counted on the aerial photos may have been born after the cliff count was conducted. At Kiska/Cape St Stephen (the only rookery with a cliff count in RCAs 2 and 3), the cliff count was 39, and accounting for the lower counts from the cliff yields an estimate of 49 pups ( $=39/0.8$ ). This is considerably lower than the estimated pup production at this site based on recent trends (N=84; Table 1). Thus, pup production estimates for RCAs 2 and 3 in Table 1 may be high. If this is the case, then the trend in pup production for the entire central Aleutian sub-area (Table 2) may also be over-estimated. However, because of the small number of cliff-aerial count pairs in 2011, it was not appropriate to apply this technique to estimate RCA 2 and 3 pup production; instead, extrapolation based on recent local trends was used with the understanding that RCA 2 and 3 pup production may be over-estimated. Surveys in subsequent years will provide data to confirm pup production trends in these areas.

#### Non-pup counts at trend sites in the western DPS in AK

While an overall adult and juvenile (non-pup) trend count for the western DPS in Alaska cannot be obtained for 2011, updated trend information through 2011 is available for portions of its range, specifically the western Aleutian Islands, RCAs 4 and 5, the eastern Aleutian Islands, and the western and eastern Gulf of Alaska (Table 3; Figure 5). In the western Aleutian Islands, non-pup counts on 8 of 10 trend sites were 39 (5%) lower in 2011 than in 2008; these 8 sites had most (86%) of all non-pup counted in the western Aleutians in 2008. Total non-pup counts in RCAs 4 and 5 were 7% greater in 2011 than in 2010. This increase was due entirely to greater counts (+341) in RCA 5 since counts in RCA 4 were lower (-52). In the eastern Aleutian Islands, non-pup counts on 19 of 27 trend sites were essentially no different (only 1% greater) in 2011 than in 2008; these 19 sites had the vast majority (91%) of all non-pups counted in the eastern Aleutian subarea in 2008. By contrast, in the western Gulf of Alaska, non-pup counts on 14 of 20 trend sites were 1,205 (21%) greater in 2011 than in 2008; these 14 sites had the vast majority (99%) of all non-pups counted in the western Gulf subarea in 2008. Similarly, in the eastern Gulf of Alaska, non-pup counts on 10 of 19 trend sites were 530 (12%) greater in 2011

than in 2008; these 10 sites also had the vast majority (97%) of all non-pups counted in the eastern Gulf subarea in 2008. Data collected through 2011 indicate the following regional trends in non-pup counts:

- Continued significant decline in the western Aleutians, 1991-2011:  $-8.5\% \text{ y}^{-1}$  ( $P < 0.001$ )
- Improvement in trend from west to east in the central Aleutians, with counts declining west of Tanaga Pass (Kiska through the Delarof Islands) and either stable or increasing between Tanaga and Samalga Passes:
  - Significant decline in RCA 2, 1991-2008:  $-5.5\% \text{ y}^{-1}$  ( $P < 0.001$ )
  - Significant decline in RCA 3, 1991-2010:  $-3.1\% \text{ y}^{-1}$  ( $P < 0.001$ )
  - Stable in RCA 4, 2000-2011:  $-0.4\% \text{ y}^{-1}$  ( $P = 0.756$ )
  - Significant increase in RCA 5, 2000-2011:  $2.2\% \text{ y}^{-1}$  ( $P = 0.027$ )
- Significant increase in both the eastern Aleutians ( $2.6\% \text{ y}^{-1}$ ,  $P = 0.005$ ) and the western Gulf of Alaska ( $4.8\% \text{ y}^{-1}$ ,  $P < 0.001$ ), 2000-2011
- Stable in the central Gulf of Alaska, 2000-2010:  $0.0\% \text{ y}^{-1}$  ( $P = 0.98$ ), and
- Significant increase in the eastern Gulf of Alaska, 2000-2011:  $5.8\% \text{ y}^{-1}$  ( $P = 0.002$ ).

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Table 1. Counts of Steller sea lion pups (live) in 2005, 2009, 2010, and 2011 (except where indicated). All counts are from high-resolution aerial photographs except AKUN/BILLINGS HEAD, which are ground counts. Rookeries are listed in **bold**. See footnotes for information on individual counts/estimates listed in bold italics. See Figure 1 for Region and RCA (rookery cluster area) locations.

<b>SITE NAME</b>	<b>Region</b>	<b>RCA</b>	<b>2005</b>	<b>2009<sup>3</sup></b>	<b>2010</b>	<b>2011<sup>4</sup></b>
<b>FORRESTER COMPLEX</b>	SEAK	11	3,429	4,036		
<b>HAZY</b>	SEAK	11	1,286	1,976		
<b>BIALI ROCK</b>	SEAK	11	100	144		
<b>WHITE SISTERS</b>	SEAK	11	520	847		
<b>GRAVES ROCK</b>	SEAK	11	175	441		
WEST ROCK	SEAK	11		2		
SUNSET	SEAK	11		1		
JACOB ROCK	SEAK	11		2		
YASHA	SEAK	11		10		
THE BROTHERS/SW	SEAK	11		2		
CAPE ADDINGTON	SEAK	11				
TIMBERED	SEAK	11				
CAPE OMMANEY	SEAK	11		1		
EASTERLY	SEAK	11		1		
<b>SEAL ROCKS</b>	E GULF	10	556	740	634	728
<b>WOODED (FISH)</b>	E GULF	10	159	178	224	225
<b>CHISWELL ISLANDS</b>	E GULF	10	44	64	64	84
CAPE ST. ELIAS	E GULF	10		18	15	26
THE NEEDLE	E GULF	10		20	22	30
GLACIER	E GULF	10		4		5
POINT ELRINGTON	E GULF	10		1	4	2
CAPE RESURRECTION	E GULF	10		1		1
NO NAME	E GULF	10		1		
<b>OUTER (PYE)</b>	C GULF	10	104	122	122	145
<b>SUGARLOAF</b>	C GULF	9	559	613		767
<b>USHAGAT</b>	C GULF	9	55	71		84
<b>MARMOT</b>	C GULF	9	433	509		524
<b>CHIRIKOF</b>	C GULF	8	123	216		186
<b>CHOWIET</b>	C GULF	8	432	360		453
LATAK ROCKS	C GULF	9	1	12		18
SEA OTTER	C GULF	9	1			
SHAKUN ROCKS	C GULF	9				1
KODIAK/CAPE UGAT	C GULF	9		1		
TWOHEADED	C GULF	9	16	14		52
NAGAI ROCKS	C GULF	8	31	18		8
KILOKAK ROCKS	C GULF	8				2
SUTWIK	C GULF	8		12		24

Table 1 (continued).

<b>SITE NAME</b>	<b>Region</b>	<b>RCA</b>	<b>2005</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>ATKINS</b>	W GULF	7	328	338		380
<b>CHERNABURA</b>	W GULF	7	153	244		250
<b>PINNACLE ROCK</b>	W GULF	7	643	702		748
<b>CLUBBING ROCKS</b>	W GULF	7	583	778		828
LIGHTHOUSE ROCKS	W GULF	8	11	16		9
MITROFANIA	W GULF	7				2
THE WHALEBACK	W GULF	7	24	40		52
<b>JUDE</b>	W GULF	7	206	270		300
OLGA ROCKS SW	W GULF	7				1
SUSHILNOI ROCKS	W GULF	7	12	34		27
SOUTH ROCKS	W GULF	7	44	60		70
BIRD	W GULF	7				2
<b>SEA LION ROCK (AMAK)</b>	E ALEU	6	158	185		200
<b>UGAMAK COMPLEX</b>	E ALEU	6	769	909		969
<b>AKUN/BILLINGS HEAD<sup>1</sup></b>	E ALEU	6	<b>85</b>	144		136
<b>AKUTAN/CAPE MORGAN</b>	E ALEU	6	657	688	730	734
<b>BOGOSLOF</b>	E ALEU	6	225	282		323
<b>OGCHUL</b>	E ALEU	6	78	90	116	109
<b>ADUGAK</b>	E ALEU	6	185	276		250
AMAK+ROCKS	E ALEU	6		1		1
UNIMAK/OKSENOF POINT	E ALEU	6		6		0
AIKTAK	E ALEU	6	8	2		2
AKUTAN/REEF-LAVA	E ALEU	6		22		21
UNALASKA/BISHOP POINT	E ALEU	6				1
UNALASKA/CAPE IZIGAN	E ALEU	6	21	29	41	34
THE PILLARS	E ALEU	6			1	1
<b>YUNASKA<sup>2</sup></b>	C ALEU	5	<b>145</b>	170	185	166
<b>SEGUAM/SADDLERIDGE</b>	C ALEU	5	530	540	518	504
SEGUAM/TURF POINT	C ALEU	5	7			0
AGLIGADAK	C ALEU	5	0	0	1	0
AMLIA/SVIECH. HARBOR	C ALEU	5	28	34	30	35
AMLIA/EAST CAPE	C ALEU	5			2	0
HERBERT	C ALEU	5				3
<b>KASATOCHI/NORTH POINT</b>	C ALEU	4	372	394	354	373
<b>ADAK/LAKE POINT</b>	C ALEU	4	311	338	320	310
<b>KANAGA/SHIP ROCK</b>	C ALEU	4	221	214	214	208
KANAGA/CAPE CHUNU	C ALEU	4			3	0
OGLODAK	C ALEU	4		4	3	0
SILAK	C ALEU	4			1	0
TAGALAK	C ALEU	4			1	2
<b>GRAMP ROCK</b>	C ALEU	3	387	332	299	<b>287</b>
<b>TAG</b>	C ALEU	3	144	130	135	<b>130</b>
<b>ULAK/HASGOX POINT</b>	C ALEU	3	338	272	264	<b>254</b>
TANAGA/CAPE SASMIK	C ALEU	3			3	2



Table 1 (continued).

<b>SITE NAME</b>	<b>Region</b>	<b>RCA</b>	<b>2005</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>AMCHITKA/COLUMN ROCKS</b>	C ALEU	2	44	40		<b>37</b>
<b>AYUGADAK</b>	C ALEU	2	83	44		<b>40</b>
<b>KISKA/LIEF COVE</b>	C ALEU	2	115	80		<b>74</b>
<b>KISKA/CAPE ST STEPHEN</b>	C ALEU	2	82	91		<b>84</b>
SEMISOPOCHNOI/POCHNOI	C ALEU	2	16	5		<b>5</b>
AMCHITKA/EAST CAPE	C ALEU	2	24	13		<b>12</b>
<b>BULDIR</b>	W ALEU	1	26	<b>7</b>	1	<b>1</b>
ALCID	W ALEU	1	27	<b>20</b>	10	<b>9</b>
<b>AGATTU/CAPE SABAK</b>	W ALEU	1	113	<b>83</b>	84	76
<b>AGATTU/GILLON POINT</b>	W ALEU	1	157	<b>142</b>	106	83
<b>ATTU/CAPE WRANGELL</b>	W ALEU	1	47	<b>47</b>	33	27
<b>WALRUS</b>	BERING		29	<b>29</b>	14	<b>11</b>
<b>TOTAL SE ALASKA</b>			5,510	7,461		
<b>TOTAL WESTERN DPS IN AK</b>			9,950	11,120		11,547

<sup>1</sup> Count recorded for Akun/Billings Head in 2005 is from 2004.

<sup>2</sup> Count recorded for Yunaska in 2005 is from 2004.

<sup>3</sup> Counts recorded for Buldir, Alcid, Agattu/Cape Sabak and Agattu/Gillon Point in 2009 are from 2008. Counts recorded for Attu/Cape Wrangell and Walrus in 2009 are from 2005.

<sup>4</sup> Counts recorded for Gramp Rock, Tag and Ulak/Hasgox Point in 2011 are estimates based on 1998-2010 trend in pup production in RCA 3; counts recorded for Amchitka/Column Rocks, Ayugadak, Kiska/Lief Cove, Kiska/Cape St. Stephen, Semisopochnoi/Pochnoi, and Amchitka/East in 2011 are estimates based on 1998-2009 trend in pup production in RCA 2; count recorded for Buldir in 2011 is from 2010; count recorded for Alcid in 2011 is an estimate based on 1998-2011 trend in pup production in the western Aleutian sub-area; count recorded for Walrus in 2011 is an estimate based on 1960-2010 trend in pup production at this site.

Table 2. Summary of Steller sea lion pup production at trend rookeries in the ranges of the western and eastern distinct population segments (DPSs) in Alaska. Kenai to Kiska includes the central and western Gulf of Alaska, and the eastern and central Aleutian Islands sub-areas. Counts in 2011 include estimates at 7 rookeries in the central Aleutian Islands based on 1998-2010 trends (in italics).

# of Rookeries Year	Western DPS							Eastern DPS	
	Gulf of Alaska			Aleutian Islands			Kenai to Kiska	Total	SE AK
	Eastern 2	Central 5	Western 4	Eastern 5	Central 11*	Western 4	25	31	5
1978-1979	574	18,893	9,351						2,219
1984-1989		10,254	5,879	4,778	9,382		30,293		
1990-1992		4,904	1,923	2,115	3,568		12,510		4,164
1994	903	2,831	1,662	1,756	3,109		9,358		3,770
1997	611					979			
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	343	7,830	8,888	5,510
2009	918	1,820	2,062	2,299	2,431	279	8,612	9,809	7,444
2011	953	2,075	2,206	2,412	2,258	187	8,944	<i>10,091</i>	

\* 1984-89 CAI count does not include Amchitka/Column Rocks (n=10; in italics);  
2011 CAI count includes estimates for 7 rookeries based on 1998-2010 trends (in italics).  
2011 Total western DPS count includes the 2011 CAI estimate (in italics).

Table 3. Counts<sup>1</sup> of adult and juvenile (non-pup) Steller sea lions at trend rookeries and haul-outs in the range of the western DPS in Alaska from high resolution vertical aerial photographs taken in June-July 2004-2011. Rookeries are in **bold**. See Figure 1 for region and rookery cluster area (RCA) locations. For 2010, results from both the ‘early’ (2010E; 8-9 June) and ‘late’ (2010L; 10-11 July) survey results are shown for RCA 10.

<b>SITE NAME</b>	<b>REGION</b>	<b>RCA</b>	<b>2004</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010E</b>	<b>2010L</b>	<b>2011</b>
CAPE ST. ELIAS	E GULF	10	318	414	728	1,400	714	558	1,490	1,480
CAPE HINCHINBROOK	E GULF	10	496	237	95	229	102	161	0	76
<b>SEAL ROCKS</b>	E GULF	10	841	1,119	803	1,024	1,007	1,042	1,036	1,310
<b>WOODED (FISH)</b>	E GULF	10	523	619	282	603	663	634	886	564
GLACIER	E GULF	10	620	466	531	509	724	564	1,127	862
THE NEEDLE	E GULF	10	123	127	145	88	112	111	66	102
POINT ELRINGTON	E GULF	10	132	58	37	169	162	81	38	42
CAPE PUGET	E GULF	10	0	0	0	0	10	1	0	
CAPE FAIRFIELD	E GULF	10	0	0	10	47	32	27	11	
RUGGED	E GULF	10	0	0	0	8	2	0	7	
AIALIK CAPE	E GULF	10	1	103	161	77	88	74	100	
<b>CHISWELL ISLANDS</b>	E GULF	10	72	71	74	68	94	68	186	126
SEAL ROCKS (KENAI)	E GULF	10	3	4	2	0	13	4	58	
<b>OUTER (PYE)</b>	C GULF	10	222	251	268	249	231	269	435	308
GORE POINT	C GULF	10	0	0	0	0	0	0	0	
EAST CHUGACH	C GULF	10	0		0	0	0	0	0	
PERL	C GULF	10	49		241	144	151	217	74	140
NAGAHUT ROCKS	C GULF	10	1		2	21	0	0	0	
ELIZABETH/CAPE ELIZABETH	C GULF	10	28		0	0	0	0	0	
<b>SUGARLOAF</b>	C GULF	9	667	733	662	849	844	788		1,018
USHAGAT/NW	C GULF	9	3	0	0	0	0	0		
<b>USHAGAT/SW</b>	C GULF	9	101	141	74	96	88	86		166
USHAGAT/ROCKS SOUTH	C GULF	9	8	9	0	45	29	28		
LATAX ROCKS	C GULF	9	56		115	108	334	128		228
SEA OTTER	C GULF	9	127		100	1	7	6		
RK NEAR SEA OTTER	C GULF	9	10		0	47	20	0		
AFOGNAK/TONKI CAPE	C GULF	9	0		0	16	2	0		
SEA LION ROCKS (MARMOT)	C GULF	9	2		1	13	2	0		
<b>MARMOT</b>	C GULF	9	703	686	551	644	749	576		829
LONG ISLAND	C GULF	9	32			59	39	0		
KODIAK/CAPE CHINIAK	C GULF	9	87		241	130	117	110		234
UGAK	C GULF	9	0		0	0	0	0		
KODIAK/GULL POINT	C GULF	9	109		148	109	89	72		
KODIAK/CAPE BARNABAS	C GULF	9	0		140	84	130	194		
TWOHEADED	C GULF	9	266		228	204	251	244		353
SITKINAK/CAPE SITKINAK	C GULF	9	80		104	115	63	76		
KODIAK/CAPE UGAT	C GULF	9	2	167	248	285	270	140		212
KODIAK/STEEP CAPE	C GULF	9	0	14	61	38		24		
SHAKUN ROCKS	C GULF	9	104	67	113	81		117		125
TAKLI	C GULF	8	85	157	92	67		74		
PUALE BAY	C GULF	8	58	2	1	2		84		0
UGAIUSHAK	C GULF	8	0	0	2	0				

Table 3 (continued)

SITE NAME	REGION	RCA	2004	2006	2007	2008	2009	2010E	2010L	2011
SUTWIK	C GULF	8	206	114	127	93	106	148		286
CHOWIET	C GULF	8	541		424	559	644	653		686
CHIRIKOF	C GULF	8	303		300	300	430	262		461
NAGAI ROCKS	C GULF	8	330		449	234	218	201		254
<b>LIGHTHOUSE ROCKS</b>	W GULF	8	111	153	152	164	123			182
KAK	W GULF	8	17	24		1		27		
MITROFANIA	W GULF	8	182	103	116	129				183
SPITZ	W GULF	8	1	0	11	1				
<b>CHERNABURA</b>	W GULF	7	828		1,228	1,281	1,162			1,494
KUPREANOF POINT	W GULF	7	53	116	53	72				175
CASTLE ROCK	W GULF	7	70	15	38	28				
<b>ATKINS</b>	W GULF	7	651	663	585	558	631			892
THE HAYSTACKS	W GULF	7	38	1	41	3				
THE WHALEBACK	W GULF	7	102	99	83	102	103			122
NAGAI/MOUNTAIN POINT	W GULF	7	80	56	148	60				10
SEA LION ROCKS (SHUMAGINS)	W GULF	7	36	142	44	54				168
UNGA/ACHEREDIN POINT	W GULF	7	264	152	229	202				103
<b>JUDE</b>	W GULF	7	474	338	445	465	512			698
<b>PINNACLE ROCK</b>	W GULF	7	1,011	1,167	1,057	1,094	1,132			1,126
<b>CLUBBING ROCKS</b>	W GULF	7	911	1,037	1,063	952	1,023			1,068
CHERNI	W GULF	7	0	0	0	0				
SOUTH ROCKS	W GULF	7	528	320	457	451	434			484
BIRD ROCK	W GULF	7	57	62	97	155				234
	W GULF	7	17	0	0	0				
UNIMAK/CAPE SARICHEF	E ALEU	6	250	6	0	167	1			0
AMAK+ROCKS	E ALEU	6	733	410	220	265	324	366		358
<b>SEA LION ROCK (AMAK)</b>	E ALEU	6	456	447	385	360	314	436		552
<b>UGAMAK COMPLEX</b>	E ALEU	6	1,304	1,319	1,493	1,619	1,874			1,219
AIKTAK	E ALEU	6	101	111	43	42	61			78
TIGALDA/ROCKS NE	E ALEU	6	141	202	236	359	229			135
TIGALDA/SOUTH SIDE	E ALEU	6	46	83	105	91				61
ROOTOK	E ALEU	6	96	96	141	60				
TANGINAK	E ALEU	6	4	6	4	1				
<b>AKUN/BILLINGS HEAD</b>	E ALEU	6	307	338	523	386				
AKUTAN/REEF-LAVA	E ALEU	6	119	103	57	128	166	98		352
<b>AKUTAN/CAPE MORGAN</b>	E ALEU	6	1,021	1,249	1,172	1,135	905	1,298		1,358
OLD MAN ROCKS	E ALEU	6	71	112	81	89		196		126
EGG	E ALEU	6	5	0	0	0		84		
OUTER SIGNAL	E ALEU	6	0	0	0	10		52		
UNALASKA/CAPE SEDANKA	E ALEU	6	0	0	0	0		0		
UNALASKA/BISHOP POINT	E ALEU	6	265	285	196	204	195	240		214
UNALASKA/MAKUSHIN BAY	E ALEU	6	20	88	154	115		56		
UNALASKA/SPRAY CAPE	E ALEU	6	0	0	0	0		0		
UNALASKA/CAPE IZIGAN	E ALEU	6	238	329	304	188	456	435		460
<b>BOGOSLOF/FIRE ISLAND</b>	E ALEU	6	380	358	405	390	399	434		314
UMNAK/CAPE ASLIK	E ALEU	6	119	73		63		78		20

Table 3 (continued)

SITE NAME	REGION	RCA	2004	2006	2007	2008	2009	2010E	2010L	2011
<b>OGCHUL</b>	E ALEU	6	139	132	152	200	224	268		210
VSEVIDOF	E ALEU	6	48	41	35	50		75		82
<b>ADUGAK</b>	E ALEU	6	259	429	473	636	620	564		492
ULIAGA	C ALEU	6	0	99		66		216		182
KAGAMIL	C ALEU	6	1	0		0		51		41
CHUGINADAK	C ALEU	6	129	79		53		173		68
CARLISLE	C ALEU	5	0	0		27		10		42
HERBERT	C ALEU	5	38	66		105		67		92
<b>YUNASKA</b>	C ALEU	5	260	255	279	282	298	403		526
CHAGULAK	C ALEU	5	0	13		59		54		49
AMUKTA+ROCKS	C ALEU	5	2	18	56	35		72		54
SEGUAM/FINCH POINT	C ALEU	5	2		0	0		0		2
SEGUAM/SW RIP	C ALEU	5	40		31	39		30		0
<b>SEGUAM/SADDLERIDGE</b>	C ALEU	5	923		668	835	857	756		944
SEGUAM/TURF POINT	C ALEU	5	58		8	3	13	7		25
SEGUAM/LAVA COVE	C ALEU	5	0		0	0		0		0
SEGUAM/LAVA POINT	C ALEU	5	5		0	0		0		0
SEGUAM/WHARF POINT	C ALEU	5	90		121	49		69		71
AGLIGADAK	C ALEU	5	61		15	14	11	38		12
AMLIA/EAST CAPE	C ALEU	5	34		55	117		63		26
AMLIA/SVIECH. HARBOR	C ALEU	5	144		113	100	192	120		191
TANADAK (AMLIA)	C ALEU	5	1		0	30		12		34
SAGIGIK	C ALEU	5	30		10	14		40		14
ATKA/NORTH CAPE	C ALEU	4	383	279	140	32		206		94
ATKA/CAPE KOROVIN	C ALEU	4	4	0	30	39		6		0
SALT	C ALEU	4	0		0	4		7		1
<b>KASATOCHI/NORTH POINT</b>	C ALEU	4	667	610	613	550	609	732		716
OGLODAK	C ALEU	4	86	111	58	99	86	86		44
IKIGINAK	C ALEU	4	0	8	16	0		0		4
FENIMORE	C ALEU	4	30	10	9	4		29		96
ANAGAKSIK	C ALEU	4	2	52	14	20		30		21
GREAT SITKIN	C ALEU	4	0	0	0	0		0		76
LITTLE TANAGA STRAIT	C ALEU	4	49		15	36		26		60
KAGALASKA	C ALEU	4	48	0	3	42		52		0
<b>ADAK</b>	C ALEU	4	1,008		779	621	596	715		764
KANAGA/N CAPE	C ALEU	4	7	13	2	14		0		0
KANAGA/CAPE MIGA	C ALEU	4	0	0	0	0		27		2
<b>KANAGA/SHIP ROCK</b>	C ALEU	4	229		331	322	420	372		358
TANAGA/BUMPY POINT	C ALEU	3	33		33	22		46		22
TANAGA/CAPE SASMIK	C ALEU	3	122		63	95		96		19
<b>GRAMP ROCK</b>	C ALEU	3	679			593	442	504		
UGIDAK	C ALEU	3	25			16		4		
<b>TAG</b>	C ALEU	3	242			255	235	212		
KAVALGA	C ALEU	3	56			63		4		
UNALGA+DINKUM ROCKS	C ALEU	3	19			0		0		
ULAK/HASGOX POINT	C ALEU	3	531			537	515	470		
AMATIGNAK/KNOB POINT	C ALEU	3	1		0	3		0		

Table 3 (continued)

SITE NAME	REGION	RCA	2004	2006	2007	2008	2009	2010E	2010L	2011
AMCHITKA/CAPE IVAKIN	C ALEU	2	0	0	0	0				
AMCHITKA/EAST CAPE	C ALEU	2	178	103		103	71			
AMCHITKA/ST. MAKARIUS	C ALEU	2	0	0	0	0				
<b>AMCHITKA/COLUMN ROCK</b>	C ALEU	2	85			71	69			
<b>AYUGADAK</b>	C ALEU	2	152			152	113			
RAT	C ALEU	2	45			0				
SEA LION ROCK (KISKA)	C ALEU	2	0			0				
TANADAK (KISKA)	C ALEU	2	34			1				
KISKA/SOBAKA-VEGA	C ALEU	2	101			52				
<b>KISKA/CAPE ST STEPHEN</b>	C ALEU	2	210			229	205			
<b>KISKA/LIEF COVE</b>	C ALEU	2	170			162	152			
KISKA/PILLAR ROCK	C ALEU	2	0			0				
<b>BULDIR</b>	W ALEU	1	108			43		25		
SHEMYA	W ALEU	1	17	18		4				3
AL Aid	W ALEU	1	125	86		86		95		
<b>AGATTU/CAPE SABAK</b>	W ALEU	1	325	282		202		178		302
<b>AGATTU/GILLON POINT</b>	W ALEU	1	374	308		281		237		174
ATTU/MASSACRE BAY	W ALEU	1	0	0		0				0
ATTU/CHIRIKOF POINT	W ALEU	1	75	30		42				22
ATTU/CHICHAGOF POINT	W ALEU	1	54	13		25				16
ATTU/KRESTA POINT	W ALEU	1	0	0		0				0
<b>ATTU/CAPE WRANGELL</b>	W ALEU	1	257	260		247		190		244

<sup>1</sup> Counts are unadjusted for resolution differences with 35 mm oblique photographs taken prior to 2004 (Fritz and Stinchcomb 2005).

Figure 1. Terrestrial rookery and haul-out sites surveyed in 2011 in the range of western distinct population segment (DPS) of Steller sea lion in Alaska and used in the analysis of population trends. Boundaries of the eastern, central, and western sub-areas of the Gulf of Alaska and Aleutian Islands are solid bold lines. Numbered regions (1-10) from west to east are Rookery Cluster Areas (RCAs), whose borders are shown by dashed lines.

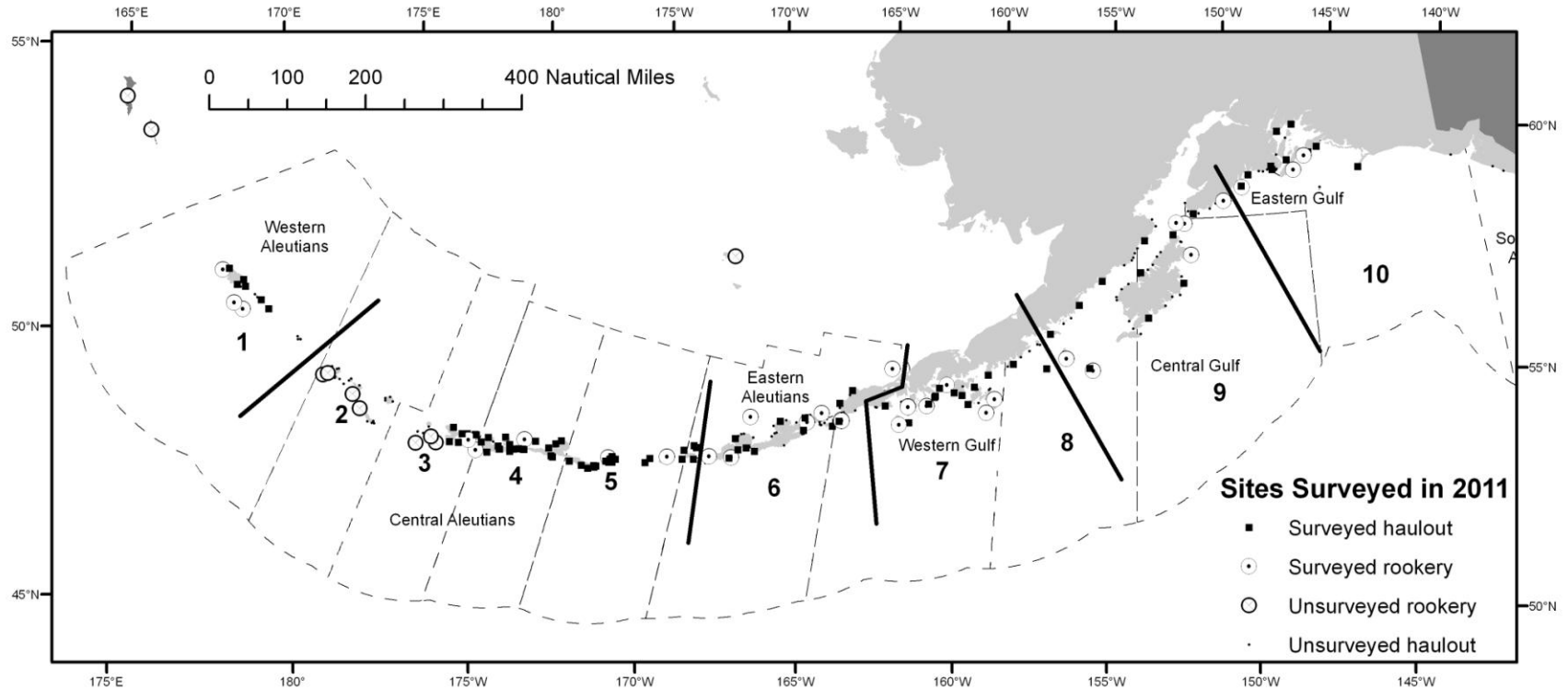


Figure 2. Change in the number of Steller sea lion pups counted (or estimated for 7 sites in the western part of the central Aleutian Islands) at major haul-out and rookery sites between 2009 and 2011 in the western DPS in Alaska. Sites are displayed from west (left) to east (right) in AK, and are grouped into the sub-areas noted in Figure 1. ALEU=Aleutian Island; GULF = Gulf of Alaska; W=western; C=central; E=eastern.

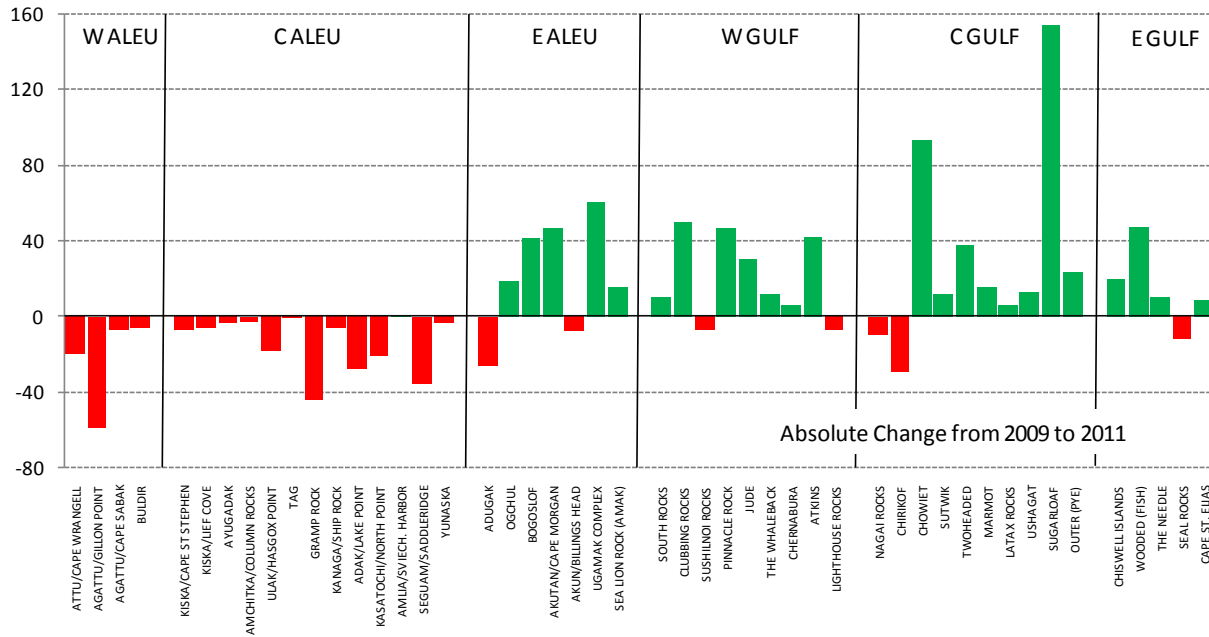


Figure 3. Annual rate of change in total Steller sea lion pup counts at trend rookeries within each sub-area of the western DPS in Alaska between 2001/02 to 2011. DPS = distinct population segment. Sub-areas shown in Figure 1. Red=declining significantly ( $P \leq 0.05$ ); Green=increasing significantly ( $P \leq 0.05$ ); Black=rate of change not significantly different from 0 ( $P > 0.05$ ).

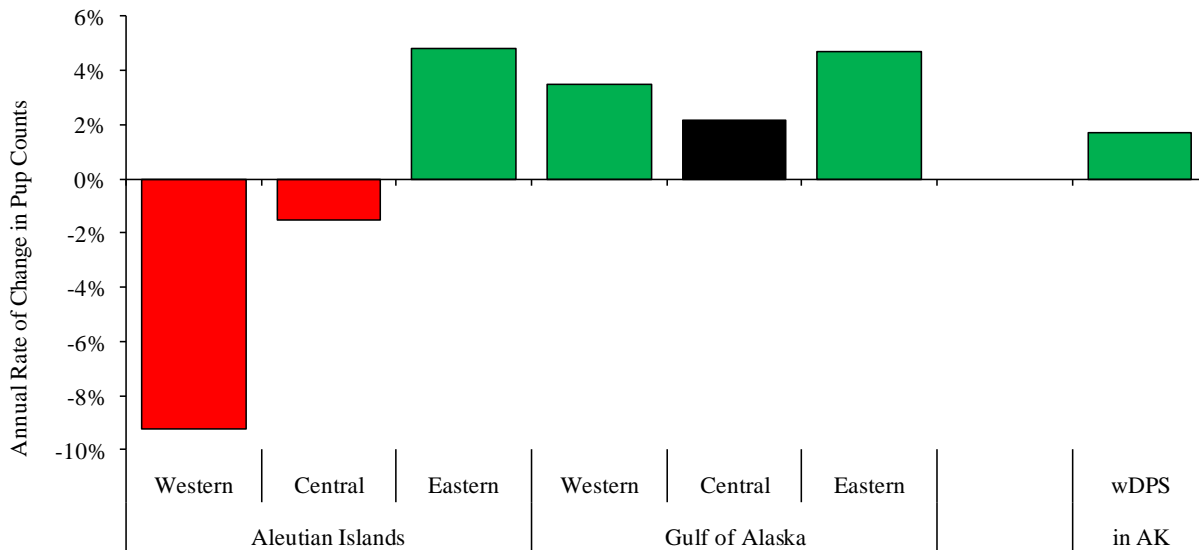




Figure 4. Steller sea lion pup counts at major rookeries within each sub-area of Alaska, 1990-2011 in Alaska (Figure 1). A. Western Aleutians and RCAs 2 & 3 in the Central Aleutians; B. RCAs 4 & 5 in the Central Aleutians; C. Eastern Aleutians and Western Gulf of Alaska; D. Central Gulf of Alaska; E. Eastern Gulf of Alaska; F. SE Alaska. 2011 data available for all areas except RCAs 2 & 3 and SE Alaska.

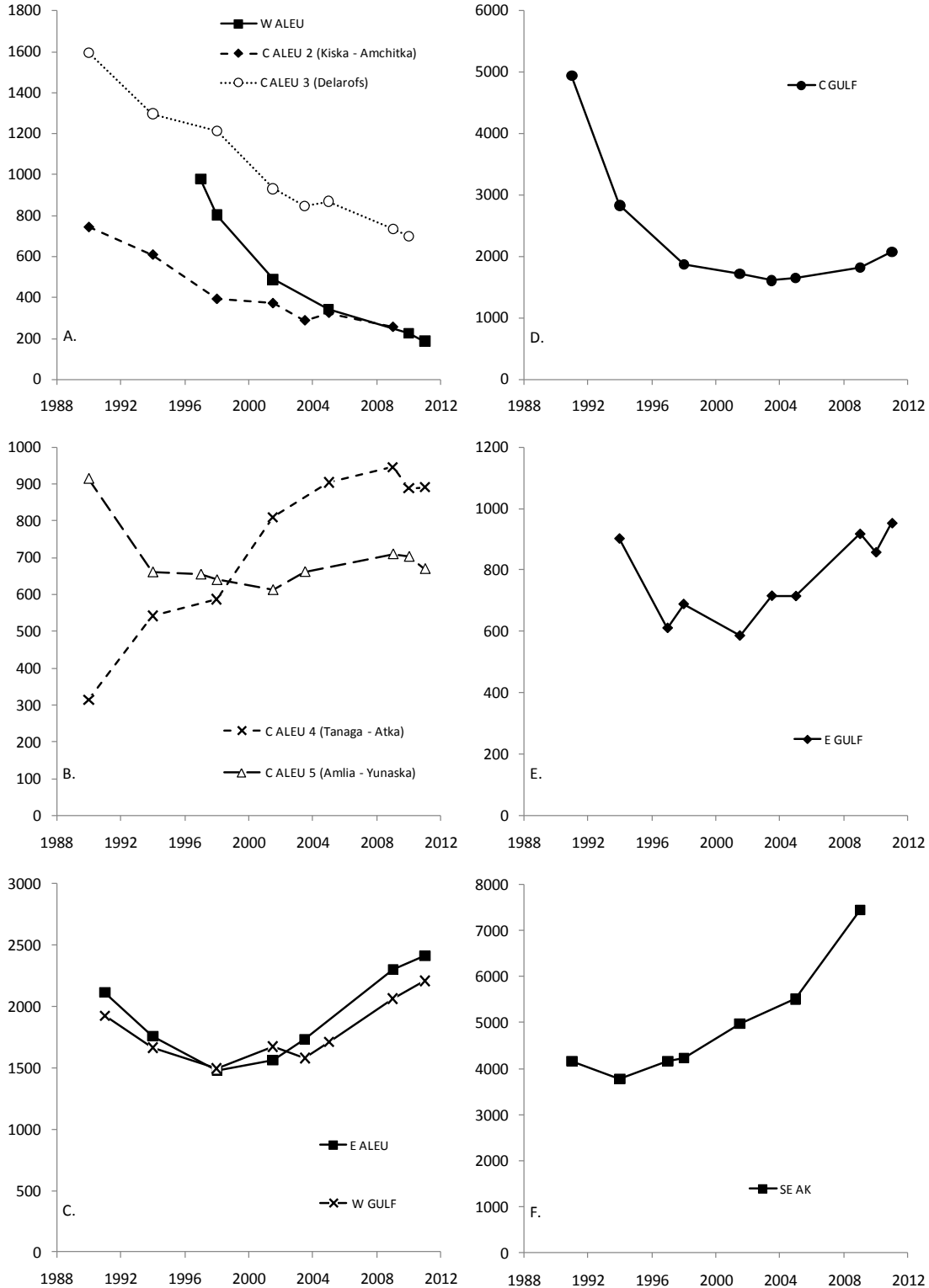


Figure 5. Counts of adult and juvenile (non-pup) Steller sea lions at groups of trend sites in sub-areas of the western DPS in AK, 1990-2011. Labels refer to RCAs and sub-areas shown in Figure 1.

