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23 October 2007 F/AKC3:lwf

Memorandum For: The Record

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Subject: Survey of Adult and Juvenile Steller Sea Lions, June-July 2007

An aerial survey to assess trends in numbers of western stock (wDPS) adult and juvenile (non-pup) Steller sea lions in Alaska was conducted by NMFS from 9 June to 6 July 2007. As in 2004 (Fritz and Stinchcomb 2005) and 2006, the 2007 survey was conducted using medium format (5-inch film), vertically-oriented photography with forward motion compensation. The 2007 survey also employed simultaneous digital, vertically-oriented photography (with forward motion compensation); both cameras were mounted side-by-side in a single belly port of a NOAA Twin Otter aircraft (NOAA, Aircraft Operations Center, Tampa FL). The 2007 survey was the first test of a digital camera (Canon EOS-1DS Mark II) with forward motion compensation in the aerial survey for adult and juvenile Steller sea lions.

Methods

Aerial surveys for non-pups are conducted in mid-late June, when the greatest proportion of adults is onshore to give birth and breed. The primary objective in 2007 was to survey all terrestrial rookery and haul-out sites within the Alaskan range of the wDPS from Cape St. Elias (145°W) to Attu Island (172°E). However, due to lost survey days caused by weather and maintenance requirements of the aircraft, the 2007 survey did not result in a complete assessment of numbers at trend sites across the Alaskan range of the wDPS of Steller sea lion (Tables 1, 2, and 3). Trend sites are those that have been consistently surveyed since the mid-1970s (1970s trend sites) or 1991 (1990s trend sites).

In 2007, we were able to survey 65 of the 87 trend sites from the 1970s, and 124 of the 161 trend sites from the 1990s. Between 2000 and 2004, counts of non-pups at wDPS trend sites in Alaska increased 11-12%, and this was the first increase observed across 3 surveys (2000, 2002, and 2004) since the late 1970s. Because of the incomplete nature of the 2006 and 2007 aerial surveys, there is limited information to update the non-pup abundance trend for the entire western stock of Steller sea lions in Alaska.

While it was not possible to survey the entire range of the wDPS in Alaska in 2007, all or all but one of the 1990s trend sites were surveyed in four of the six Alaskan sub-areas:

- All in the eastern Gulf of Alaska (E GULF: 145°-150°W; N=13)
- Missing one (Long Island) in the central Gulf of Alaska (C GULF: 150°-157°W; N=32 of 33)
- Missing one (Kak Island) in the western Gulf of Alaska (W GULF: 157°-163°W; N=19 of 20) and
- Missing one (Umnak/Cape Aslik) in the eastern Aleutian Islands (E ALEU: 163°-169°W; N=26 of 27) (Tables 1 and 3).

There was no survey effort in the western Aleutian Islands (W ALEU: 172°-177°E) in 2007, while in the central Aleutian Islands (C ALEU: 169°W – 177°E), survey effort was limited to the eastern portion between Yunaska and Tanaga Islands (170.5°-178°W), with very little effort occurring west of Amchitka Pass. This enabled the creation of an eastern portion of the C ALEU sub-area for comparison of 2004 and 2007 counts at all 1990s trend sites except Chagulak. In addition, trends within eastern and western portions of the C ALEU were compared.

Two researchers working independently counted all adult and juvenile Steller sea lions at each terrestrial site photographed during the 2007 survey. Each researcher counted all sea lions on both the digital and medium format film images. Each of the following series of paired counts was statistically compared using paired sample *t*-tests (Snedecor 1946):

- Counter 1 digital vs. film: N = 45; *t* = 0.16; P = 0.88
- Counter 2 digital vs. film: N = 45; *t* = 0.97 ; P = 0.35
- Digital Counter 1 vs. Counter 2: N = 95; *t* = 1.50; P = 0.14
- Film Counter 1 vs. Counter 2: N = 62; *t* = 1.61; P = 0.12.

None of the paired counts were statistically different (all $P > 0.1$), indicating that counts by either counter using either media were independent estimates of the true count.

Consequently, counts listed in Table 1 are the means of all available counts for each site (N=2 if images from only one media type were available, otherwise N=4). Values of the *t*-statistic indicate that differences between counters for a single media type were larger than differences between media for a single counter. This suggests that individual counter differences in recognizing sea lions in photographic images were greater than any differences in resolution between the two media types, though none of the differences were statistically significant.

Results from the 2007 digital vs. medium format film count comparison are different than the comparison of counts from oblique 35 mm and vertical medium format images, where medium format image counts were significantly higher than those from 35 mm slides (Fritz and Stinchcomb 2005). Differences in resolution between 35 mm and medium format film required an adjustment factor of -3.64% be applied to all vertical medium format counts in order to properly analyze sub-area time series trends that include counts from 35 mm oblique images; this adjustment factor is applied to all vertical digital counts from 2007 as well (Figures 1 and 2).

Results and Discussion

Counts of non-pup sea lions in the C GULF and W GULF increased by 540 (13%) and 431 (8%) between 2004 and 2007, and by 163 (3%) in the E ALEU (Table 3). The 2007 count in the C GULF is the first showing an increase since the beginning of the time series, and is similar in magnitude to the 2000 and 2002 counts (Figure 1). Increases

in both the W GULF and E ALEU continue the increasing trends observed in both sub-areas between 2000 and 2004, though at lower rates (Figure 1).

The 2007 count of non-pups in the E GULF was 264 lower (-8%) than the 2004 count, which is opposite of the increasing trend observed here between 2000 and 2006 (Table 3, Figure 1). In the eastern portion of the C ALEU, the 2007 non-pup count was 858 lower (-20%) than the 2004 count. Counts in the eastern C ALEU had increased 49% between 1996 and 2004 (Figure 2). Because counts in the western portion of the C ALEU declined steadily between 1991 and 2002, increasing counts in the eastern C ALEU were responsible for the relatively stable counts observed in the C ALEU as a whole since the mid-1990s (Figures 1 and 2). Counts in 2004 and 2006 in the western C ALEU and the W ALEU suggest that the western Steller sea lion population between Amchitka Pass and Attu Island continues to decline.

Although counts at some trend sites are missing for both 2006 and 2007, available data indicate that the size of the adult and juvenile portion of the western Steller sea lion population throughout much of its range (Cape St. Elias to Tanaga Island, 145°-178° W) in Alaska has remained largely unchanged between 2004 (N=23,107) and 2007 (N=23,118; Table 3). This conclusion was also reached following the incomplete survey of 2006. However, there are significant regional differences in recent trends: increases between 2004 and 2007 in the E ALEU, W GULF and C GULF have largely been offset by decreases in the eastern C ALEU and E GULF. Recent trends (through 2004 and 2006) in the western C ALEU and W ALEU have been negative, suggesting that the overall trend for the wDPS in Alaska (through 2007) is either stable or declining slightly.

Acknowledgments

We thank Mark Nelson and Nick Toth (pilots), Kevin Roteveel (mechanic), and the entire NOAA Aircraft Operations Center for their efforts to conduct this, their first, aerial survey of Steller sea lions in Alaska. We look forward to a continuing productive relationship with NOAA AOC. We also thank Don LeRoi (Aerial Imaging Solutions, Old Lyme, CN) whose enthusiasm and skills are making our transition from film to digital photography possible.

Literature Cited

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Table 1. Counts of adult and juvenile (non-pup Steller sea lions) at TREND ROOKERIES AND HAUL-OUTS from medium-format aerial photographs taken in June 2004 and June 2006, and medium format or digital aerial photographs taken in June-July 2007. Trend Sites surveyed regularly since the 1970s, 1990s, and those that are rookeries are noted. Rookeries labeled Y* are 'new' rookeries, which were not included as rookeries in the designation of critical habitat (CH) in 1993 but have produced at least 50 pups since 1975. Rookeries labeled N* are listed CH rookeries, but have not record of at least 50 pups since 1975. Counts are unadjusted.

SITENAME	REGION	70s	90s	Rookery	2004	2006	2007
		TREND	TREND				
CAPE ST. ELIAS	E GULF	X	X		318	414	728
CAPE HINCHINBROOK	E GULF		X		496	237	95
SEAL ROCKS	E GULF	X	X	Y	841	1,119	803
WOODED (FISH)	E GULF	X	X	Y	523	619	282
GLACIER	E GULF	X	X		620	466	531
THE NEEDLE	E GULF	X	X		123	127	145
POINT ELRINGTON	E GULF	X	X		132	58	37
CAPE PUGET	E GULF		X		0	0	0
CAPE FAIRFIELD	E GULF		X		0	0	10
RUGGED	E GULF	X	X		0	0	0
AIALIK CAPE	E GULF		X		1	103	161
CHISWELL ISLANDS	E GULF	X	X	Y*	72	71	74
SEAL ROCKS (KENAI)	E GULF	X	X		3	4	2
OUTER (PYE)	C GULF		X	Y	222	251	268
GORE POINT	C GULF		X		0	0	0
EAST CHUGACH	C GULF		X		0		0
PERL	C GULF		X		49		241
NAGAHUT ROCKS	C GULF		X		1		2
ELIZABETH/CAPE ELIZABETH	C GULF		X		28		0
SUGARLOAF	C GULF	X	X	Y	667	733	662
USHAGAT/NW	C GULF	X	X		3	0	0
USHAGAT/SW	C GULF	X	X	Y*	101	141	74
USHAGAT/ROCKS SOUTH	C GULF	X	X		8	9	0
LATAK ROCKS	C GULF	X	X		56		115
SEA OTTER	C GULF		X		127		100
RK NEAR SEA OTTER	C GULF		X		10		0
AFOGNAK/TONKI CAPE	C GULF		X		0		0
SEA LION ROCKS (MARMOT)	C GULF	X	X		2		1
MARMOT	C GULF	X	X	Y	703	686	551
LONG ISLAND	C GULF	X	X		32		
KODIAK/CAPE CHINIAK	C GULF	X	X		87		241
UGAK	C GULF		X		0		0
KODIAK/GULL POINT	C GULF		X		109		148
KODIAK/CAPE BARNABAS	C GULF	X	X		0		140
TWOHEADED	C GULF	X	X		266		228
SITKINAK/CAPE SITKINAK	C GULF	X	X		80		104
KODIAK/CAPE UGAT	C GULF		X		2	167	248
KODIAK/STEEP CAPE	C GULF		X		0	14	61
SHAKUN ROCKS	C GULF		X		104	67	113

Table 1 (continued)

SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006	2007
TAKLI	C GULF		X		85	157	92
PUALE BAY	C GULF		X		58	2	1
UGAIUSHAK	C GULF	X	X		0	0	2
SUTWIK	C GULF	X	X		206	114	127
CHOWIET	C GULF	X	X	Y	541		424
CHIRIKOF	C GULF	X	X	Y	303		300
NAGAI ROCKS	C GULF		X		330		449
CHERNABURA	W GULF	X	X	Y	828		1,228
LIGHTHOUSE ROCKS	W GULF		X	Y*	111	153	152
KAK	W GULF		X		17	24	
MITROFANIA	W GULF		X		182	103	116
SPITZ	W GULF	X	X		1	0	11
KUPREANOF POINT	W GULF		X		53	116	53
CASTLE ROCK	W GULF	X	X		70	15	38
ATKINS	W GULF	X	X	Y	651	663	585
THE HAYSTACKS	W GULF		X		38	1	41
THE WHALEBACK	W GULF		X		102	99	83
NAGAI/MOUNTAIN POINT	W GULF	X	X		80	56	148
SEA LION ROCKS (SHUMAGINS)	W GULF	X	X		36	142	44
UNGA/ACHEREDIN POINT	W GULF		X		264	152	229
JUDE	W GULF		X	Y*	474	338	445
PINNACLE ROCK	W GULF	X	X	Y	1,011	1,167	1,057
CLUBBING ROCKS	W GULF	X	X	Y	911	1,037	1,063
CHERNI	W GULF		X		0	0	0
SOUTH ROCKS	W GULF		X		528	320	457
BIRD ROCK	W GULF	X	X		57	62	97
	W GULF		X		17	0	0
UNIMAK/CAPE SARICHEF	E ALEU		X		250	6	0
AMAK+ROCKS	E ALEU	X	X		733	410	220
SEA LION ROCK (AMAK)	E ALEU	X	X	Y	456	447	385
UGAMAK COMPLEX	E ALEU	X	X	Y	1,304	1,319	1,493
AIKTAK	E ALEU		X		101	111	43
TIGALDA/ROCKS NE	E ALEU		X		141	202	236
TIGALDA/SOUTH SIDE	E ALEU		X		46	83	105
ROOTOK	E ALEU		X		96	96	141
TANGINAK	E ALEU		X		4	6	4
AKUN/BILLINGS HEAD	E ALEU	X	X	Y	307	338	523
AKUTAN/REEF-LAVA	E ALEU	X	X		119	103	57
AKUTAN/CAPE MORGAN	E ALEU	X	X	Y	1,021	1,249	1,172
OLD MAN ROCKS	E ALEU		X		71	112	81
EGG	E ALEU		X		5	0	0
OUTER SIGNAL	E ALEU		X		0	0	0
UNALASKA/CAPE SEDANKA	E ALEU		X		0	0	0
UNALASKA/BISHOP POINT	E ALEU		X		265	285	186
UNALASKA/MAKUSHIN BAY	E ALEU		X		20	88	154
UNALASKA/SPRAY CAPE	E ALEU		X		0	0	0

Table 1 (continued)

SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006	2007
UNALASKA/CAPE IZIGAN	E ALEU		X		238	329	304
BOGOSLOF/FIRE ISLAND	E ALEU	X	X	Y	380	358	405
UMNAK/CAPE ASLIK	E ALEU	X	X		119	73	
POLIVNOI ROCK	E ALEU		X		91	42	96
THE PILLARS	E ALEU		X		4	0	0
OGCHUL	E ALEU	X	X	Y	139	132	152
VSEVIDOF	E ALEU	X	X		48	41	35
ADUGAK	E ALEU	X	X	Y	259	429	473
ULIAGA	C ALEU		X		0	99	
KAGAMIL	C ALEU	X	X		1	0	
CHUGINADAK	C ALEU	X	X		129	79	
CARLISLE	C ALEU	X	X		0	0	
HERBERT	C ALEU	X	X		38	66	
YUNASKA	C ALEU	X	X	Y	260	255	279
CHAGULAK	C ALEU	X	X		0	13	
AMUKTA+ROCKS	C ALEU	X	X		2	18	56
SEGUAM/FINCH POINT	C ALEU	X	X		2		0
SEGUAM/SW RIP	C ALEU	X	X		40		31
SEGUAM/SADDLERIDGE	C ALEU	X	X	Y	923		668
SEGUAM/TURF POINT	C ALEU	X	X		58		8
SEGUAM/LAVA COVE	C ALEU	X	X		0		0
SEGUAM/LAVA POINT	C ALEU	X	X		5		0
SEGUAM/WHARF POINT	C ALEU	X	X		90		121
AGLIGADAK	C ALEU	X	X	N*	61		15
AMLIA/EAST CAPE	C ALEU	X	X		34		55
AMLIA/SVIECH. HARBOR	C ALEU		X		144		113
TANADAK (AMLIA)	C ALEU	X	X		1		0
SAGIGIK	C ALEU	X	X		30		10
ATKA/NORTH CAPE	C ALEU	X	X		383	279	140
ATKA/CAPE KOROVIN	C ALEU	X	X		4	0	30
SALT	C ALEU	X	X		0		0
KASATOCHI/NORTH POINT	C ALEU	X	X	Y	667	610	613
OGLODAK	C ALEU		X		86	111	58
IKIGINAK	C ALEU	X	X		0	8	16
FENIMORE	C ALEU		X		30	10	9
ANAGAKSIK	C ALEU	X	X		2	52	14
GREAT SITKIN	C ALEU		X		0	0	0
LITTLE TANAGA STRAIT	C ALEU	X	X		49		15
KAGALASKA	C ALEU		X		48	0	3
ADAK	C ALEU	X	X	Y	1,008		779
KANAGA/N CAPE	C ALEU		X		7	13	2
KANAGA/CAPE MIGA	C ALEU		X		0	0	0
KANAGA/SHIP ROCK	C ALEU		X	Y*	229		331
TANAGA/BUMPY POINT	C ALEU		X		33		33
TANAGA/CAPE SASMIK	C ALEU		X		122		63
GRAMP ROCK	C ALEU	X	X	Y	679		
UGIDAK	C ALEU	X	X		25		

Table 1 (continued)		70s	90s				
SITENAME	REGION	TREND	TREND	Rookery	2004	2006	2007
TAG	C ALEU	X	X	Y	242		
KAVALGA	C ALEU	X	X		56		
UNALGA+DINKUM ROCKS	C ALEU	X	X		19		
ULAK/HASGOX POINT	C ALEU	X	X	Y	531		
AMATIGNAK/KNOB POINT	C ALEU		X		1		0
AMATIGNAK/NITROF POINT	C ALEU	X	X		76	38	
SEMISOPOCHNOI/POCHNOI	C ALEU		X	N*	55	41	
AMCHITKA/CAPE IVAKIN	C ALEU	X	X		0	0	0
AMCHITKA/EAST CAPE	C ALEU	X	X	N*	178	103	
AMCHITKA/ST. MAKARIUS	C ALEU		X		0	0	0
AMCHITKA/COLUMN ROCK	C ALEU		X	Y	85		
AYUGADAK	C ALEU	X	X	Y	152		
RAT	C ALEU		X		45		
SEA LION ROCK (KISKA)	C ALEU		X		0		
TANADAK (KISKA)	C ALEU		X		34		
KISKA/SOBAKA-VEGA	C ALEU		X		101		
KISKA/CAPE ST STEPHEN	C ALEU	X	X	Y	210		
KISKA/LIEF COVE	C ALEU	X	X	Y	170		
KISKA/PILLAR ROCK	C ALEU		X		0		
BULDIR	W ALEU	X	X	Y	108		
SHEMYA	W ALEU		X		17	18	
ALCID	W ALEU	X	X		125	86	
AGATTU/CAPE SABAK	W ALEU	X	X	Y	325	282	
AGATTU/GILLON POINT	W ALEU	X	X	Y	374	308	
ATTU/MASSACRE BAY	W ALEU		X		0	0	
ATTU/CHIRIKOF POINT	W ALEU		X		75	30	
ATTU/CHICHAGOF POINT	W ALEU		X		54	13	
ATTU/KRESTA POINT	W ALEU		X		0	0	
ATTU/CAPE WRANGELL	W ALEU		X	Y	257	260	
1990s Trend Site Counts					27,437	19,058	23,118
Other Site Counts (Table 2)					1,600	2,231	3,018
Total Count					29,037	21,289	26,136

Table 2. Counts of adult and juvenile (non-pup) Steller sea lions at NON-TREND HAUL-OUTS from medium-format aerial photographs taken in June 2004 and June 2006, and medium format or digital aerial photographs taken in June-July 2007. Counts are unadjusted.

SITENAME	REGION	2004	2006	2007	Comment
HOOK POINT	E GULF	96	101	132	
STEEP POINT	E GULF	1	11	0	
MIDDLETON	E GULF	4	0	0	
POINT ELEANOR	E GULF		0	0	
PERRY	E GULF		218	437	
PLEIADES	E GULF		0	0	
POINT LaTOUCHE	E GULF	0	0	0	
DANGER	E GULF	12	10	119	
PROCESSION ROCKS	E GULF	36	67	77	
CAPE JUNKEN	E GULF	0	0	0	
CAPE RESURRECTION	E GULF	3	0	12	
GRANITE CAPE	E GULF	1	89	25	
Rocks b/n Steep and Rabbit	E GULF			90	
RABBIT	E GULF	0	0	0	
					2006 count of 103 and 2007 count of 161 applied to Aialik Cape
NEAR AIALIK CAPE	E GULF				
HOOF POINT	E GULF		52		
FLAT	C GULF	4		44	
SHAW	C GULF	81	162	1	
NUKA POINT	C GULF	0	0	0	
PERL ROCKS	C GULF	0		0	
WEST AMATULI	C GULF	0	0	0	
SUD	C GULF	0	0	0	
KODIAK/CAPE PARAMANOF	C GULF	0	0	0	
CAPE DOUGLAS	C GULF	0	0	0	
KODIAK/MALINA POINT	C GULF	0	0	0	
NOISY	C GULF	0	0	0	
KODIAK/CAPE KULIUK	C GULF	0	0	0	
CAPE NUKSHAK	C GULF	0	0	0	
CAPE UGYAK	C GULF	0	0	0	
KODIAK/SUNDSTROM	C GULF	0		0	
CAPE GULL	C GULF	0	0	0	
CAPE KULIAK	C GULF		0	4	
KODIAK/CAPE ALITAK	C GULF	0		0	
KODIAK/CAPE UYAK	C GULF		0	0	
KODIAK/STURGEON HEAD	C GULF		0	0	
KODIAK/CAPE IKOLIK	C GULF	108	52	33	
KODIAK/TOMBSTONE ROCKS	C GULF	0	0	0	
KILOKAK ROCKS	C GULF	85	144	198	
AIUGNAK COLUMNS	C GULF	1	24	7	
AGHIYUK	C GULF	27	5	9	

Table 2 (continued)

SITENAME	REGION	2004	2006	2007	Comment
OLGA ROCKS NE	W GULF	11	28	36	
OLGA ROCKS SW	W GULF	117	102	95	
SUSHILNOI ROCKS	W GULF	290	327	289	
CATON	W GULF	109	368	416	
ATKULIK	W GULF	0	0		
CHANKLIUT	W GULF	0	0		
SEAL CAPE	W GULF	0	0		
BIG KONIUJI	W GULF	0	0	0	
TWINS	W GULF	0	0	0	
NAGAI/RK W OF CAPE WEDGE	W GULF	0	0	0	
EGG (SAND POINT)	W GULF	0	0	0	
UNGA/CAPE UNGA	W GULF	0	0	0	
OMEGA	W GULF	0	1	0	
WOSNESENSKI	W GULF	166	113	110	
HUNT	W GULF	0	0	0	
HAGUE ROCK	W GULF	0	0	0	
SOZAVARIKA	W GULF	0	0		
SANAK	W GULF	0	0	0	
UMGA	W GULF	0	0	0	
UNIMAK/CAPE LAZAREF	E ALEU	0		0	
UNIMAK/OKSENOF POINT	E ALEU			269	
UNIMAK/CAPE LUTKE	E ALEU	0	0	0	
UNIMAK/SCOTCH CAP	E ALEU	0	0	0	
Rock b/n Unimak/Sennett Point and Unimak/Cape Sarichef	E ALEU		19	6	
KALIGAGAN	E ALEU	1	0	6	
UNIMAK/SENNETT POINT	E ALEU	0	1	0	
BASALT ROCK	E ALEU	1	4	0	
AKUN/AKUN BAY	E ALEU	0	0	18	
AKUN/JACKASS POINT	E ALEU	0	0	0	
AKUN/AKUN HEAD	E ALEU	0	0	0	
AKUTAN/BATTERY POINT	E ALEU	0	0	0	
AVATANAK	E ALEU		15	42	
BABY	E ALEU	0	4	0	
INNER SIGNAL	E ALEU	38	0	47	
UNALASKA/PRIEST ROCK	E ALEU	0	1	3	
UNALASKA/WHALEBONE CAPE	E ALEU	0	0	0	
UNALASKA/CAPE WISLOW	E ALEU	0	0	0	
UNALASKA/CAPE STARICHKOF	E ALEU	0	0	0	
Unlisted Rock b/n Bishop and Kovrizhka	E ALEU			10	
UNALASKA/KOVRIZHKA	E ALEU	0	0	0	
UNALASKA/RK NEAR MAKUSHIN	E ALEU				2006 count of 60 applied to Unalaska/Makushin Bay
UMNAK/CAPE IDAK	E ALEU		0	0	
EMERALD	E ALEU	0		0	
UMNAK/REINDEER POINT	E ALEU		0		

Table 2 (continued)

SITENAME	REGION	2004	2006	2007	Comment
UMNAK/CAPE CHAGAK	E ALEU		0		
UMNAK/AGULIUK POINT	E ALEU		0		
SAMALGA	E ALEU	1	0	0	
TAGALAK	C ALEU	91	134	162	
SILAK	C ALEU	38	32	88	
ADAK/CAPE MOFFET	C ALEU	0	0	0	
ADAK/ARGONNE POINT	C ALEU	35	12	10	
BOBROF	C ALEU	49	21		
SEMISOPOCHNOI/PETREL	C ALEU	0	43		
SEMISOPOCHNOI/SW KNOB	C ALEU	17	0		
SEMISOPOCHNOI/TUMAN POINT	C ALEU	0	0		
SEGULA/GULA POINT	C ALEU		1		
AMLIA/CAPE MISTY	C ALEU	21		72	
KONIUJI/NORTH POINT	C ALEU	0	0	0	
CHUGUL	C ALEU	39	69	73	
IGITKIN/SW POINT	C ALEU	0	0	0	
ADAK/CRONE ISLAND	C ALEU	0			
KANAGA/CAPE CHUNU	C ALEU	9		82	
ILAK	C ALEU	45			
SKAGUL/S. POINT	C ALEU	1			
OGLIUGA	C ALEU	49			
AMCHITKA/OMEGA POINT	C ALEU	0	0	0	
AMCHITKA/CHITKA POINT	C ALEU	0		0	
AMCHITKA/BIRD	C ALEU	0		0	
TWIN ROCKS (KISKA)	C ALEU	13			
KISKA/SOUTH HEAD	C ALEU	0	0		
KISKA/WITCHCRAFT POINT	C ALEU	0			
KISKA/GERTRUDE-BUKHTI	C ALEU	0	0		
INGENSTREM ROCKS	W ALEU	0	1		
NIZKI	W ALEU	0	0		
DAN'S ROCKS	W ALEU	0	0		
TOTAL OTHER SITES		1,600	2,231	3,018	

Table 3. Summary of trend sites surveyed (A& B) and counts of adult and juvenile (non-pup) Steller sea lions at 1990s Trend Sites (C & D) within the range of the western stock from medium-format aerial photos taken in June 2004 and June 2006, and medium format or digital photos taken in June-July 2007. Counts are unadjusted.

A. Number of 1970s Trend Sites Surveyed

Sub-Area	2004	2006	2007
E GULF	9	9	9
C GULF	16	7	15
W GULF	9	8	9
E ALEU	11	11	10
C ALEU	38	15	22
W ALEU	4	3	0
Total	87	53	65

C. Counts of Non-Pup Steller Sea Lions at 1990s Trend Sites

Only Completely Surveyed Sub-Areas

Sub-Area	2004	2006	2007
E GULF	3,129	3,218	2,865
C GULF	4,180		
W GULF	5,431		
E ALEU	6,217	6,259	
C ALEU	7,145		
W ALEU	1,335		
Total	27,437		

B. Number of 1990s Trend Sites Surveyed

Sub-Area	2004	2006	2007
E GULF	13	13	13
C GULF	33	14	32
W GULF	20	19	19
E ALEU	27	27	26
C ALEU	58	24	34
W ALEU	10	9	0
Total	161	106	124

D. Counts of Non-Pup Steller Sea Lions at 1990s Trend Sites

Includes sub-areas missing 1 or more trend sites (removed from all years)

Sub-Area	2004	2006	2007	Comments
E GULF	3,129	3,218	2,865	No missing sites
C GULF	4,148		4,688	Missing Long
W GULF	5,414		5,845	Missing Kak
E ALEU	6,098	6,186	6,261	Missing Umnak/Cape Aslik
C ALEU-E	4,318		3,460	Yunaska-Tanaga; missing Chagulak
Total	23,107		23,118	
W ALEU	1,227	997		Missing Buldir

Figure 1. Counts of adult and juvenile (non-pup) Steller sea lions at 1990s Trend Sites (Table 1) by sub-area in the range of the western stock in Alaska, 1991-2007. Sea lions in 2004, 2006, and 2007 were counted on medium format or digital photographs taken vertically over trend sites; sea lions in all other years were counted on 35 mm slides shot obliquely from side windows of aircraft. Region totals for 2004, 2006, and 2007 reflect a reduction of 3.64% from the actual medium format count to reflect the higher resolution and higher counts obtained on vertical medium format-digital vs. oblique 35 mm photographs (Fritz and Stinchcomb 2005).

- A. In the Gulf of Alaska, only the E GULF has a complete time-series of trend sites counts (1991-2007); in the C GULF, counts at Long Island are omitted, while in the W GULF, counts at Kak Island are omitted (2006 counts are not plotted for both sub-areas).
- B. In the Aleutian Islands, the C ALEU has a complete time series of trend site counts only through 2004; in the E ALEU counts at Umnak/Cape Aslik are omitted; in the W ALEU, counts at Buldir Island are omitted and there are no counts for 2007.

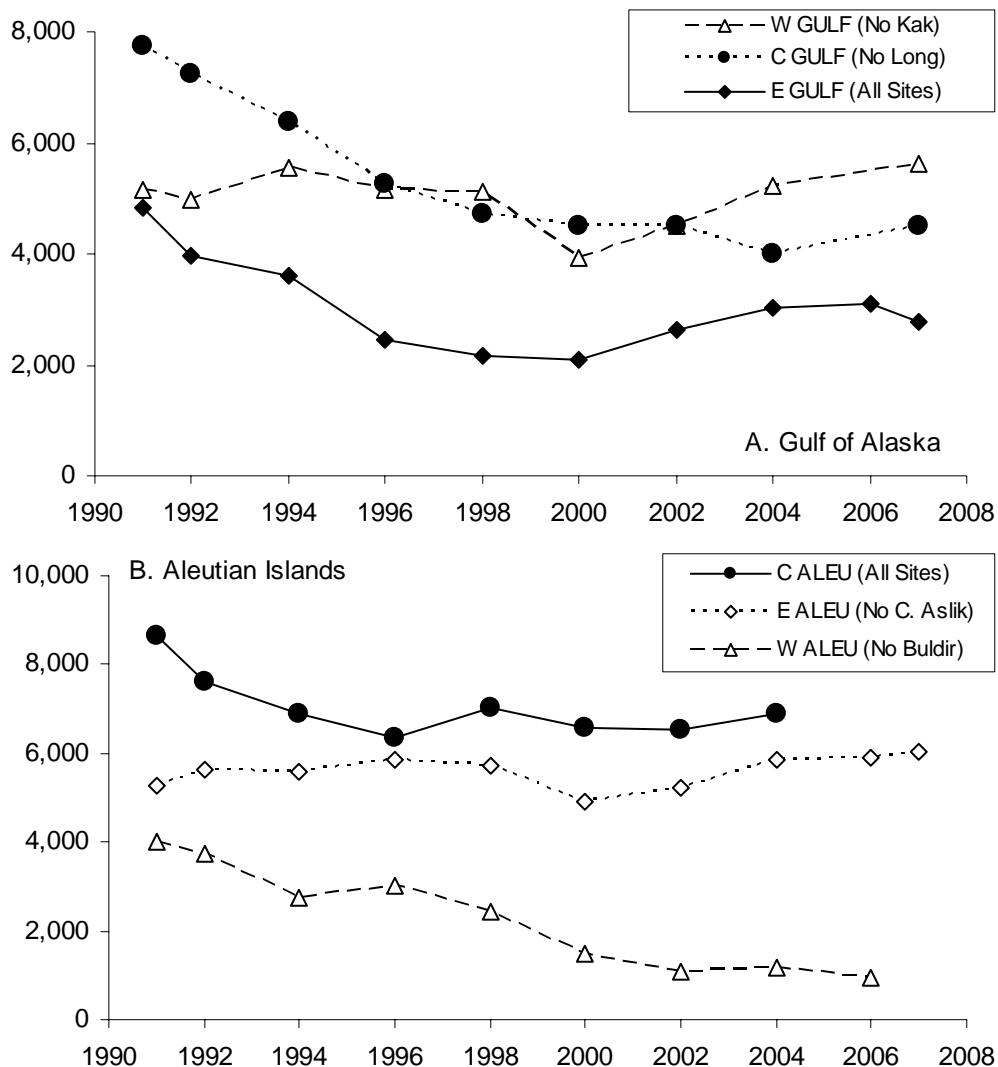


Figure 2. Counts of adult and juvenile (non-pup) Steller sea lions at 1990s Trend Sites (Table 1) in the eastern and western portions of the C ALEU sub-area, 1991-2007. Sea lions in 2004, 2006, and 2007 were counted on medium format or digital photographs taken vertically over trend sites; sea lions in all other years were counted on 35 mm slides shot obliquely from side windows of aircraft. Region totals for 2004, 2006, and 2007 reflect a reduction of 3.64% from the actual medium format count to reflect the higher resolution and higher counts obtained on vertical medium format-digital vs. oblique 35 mm photographs. Eastern C ALEU includes all trend site counts between 169°-178°W (Islands of Four Mountains through Tanaga Island); counts for 2006 and 2007 were pooled by averaging and plotted at year = 2006.5. Western C ALEU includes all trend site counts between 177°E and 178°W (Kiska Island through the Delarof Islands).

