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Memorandum To: Douglas DeMaster, Director, Alaska Fisheries Science Center
 John Bengtson, Director, Marine Mammal Laboratory (MML)
 James Balsiger, Director, Alaska Region
 Jon Kurland and Lisa Rotterman, Alaska Region Protected Resources

From: Lowell Fritz, Kathryn Sweeney, Rod Towell and Thomas Gelatt
 Marine Mammal Laboratory, Alaska Ecosystem Program

Subject: Results of Steller Sea Lion Surveys in Alaska, June-July 2015

Aerial, ship, and land-based surveys to count Steller sea lion (*Eumetopias jubatus*) pups (~1 mo old) and non-pups (adults and juveniles ≥ 1 year old) on terrestrial rookery and haulout sites in Alaska were conducted by the MML in June-July 2015. The manned aerial survey was conducted from 24 June to 8 July in southeast Alaska north of Dixon Entrance through the Semidi Islands in the central Gulf of Alaska (between 132°W and 158°W), as well as in northern Bristol Bay (eastern Bering Sea). Ship-based surveys, which included the use of an unmanned aircraft system (UAS), were conducted from 20 June to 1 July in the Aleutian Islands between 172°E and 165°W, and from 13-18 July in the Pribilof Islands (eastern Bering Sea). In addition, Steller sea lions were counted on Round Island in Bristol Bay by Alaska Department of Fish and Game (ADFG) scientists studying Pacific walrus (*Odobenus rosmarus divergens*) and on St. George (Pribilof) Island by MML scientists studying northern fur seals (*Callorhinus ursinus*).

Methods

Aerial surveys to count Steller sea lions are conducted in late June through mid-July starting ~10 days after the mean birth dates of pups in the survey area (4-14 June; Pitcher et al. 2001). The objectives in 2015 were to survey all terrestrial rookeries and haulouts in the eastern half of southern Alaska, northern Bristol Bay, the Pribilof Islands, and sites in the Aleutian Islands that were missed in 2014. The 2015 survey area includes segments recognized by NMFS as being within the breeding ranges of the eastern and the western distinct population segments (DPSs) of Steller sea lion. Steller sea lions born on rookeries east of 144°W longitude, which includes areas in southeast Alaska and Yakutat surveyed in 2015, are recognized as part of the eastern DPS; those born on rookeries west of 144°W, which includes areas from Prince William Sound through the Kodiak and Semidi archipelagos, and parts of the Aleutian Islands and eastern Bering Sea that were surveyed in 2015 are recognized as part of the western DPS (Figure 1).

In 2015, 173 sites in the eastern half of southern Alaska and in northern Bristol Bay were surveyed using a NOAA twin Otter manned aircraft equipped with three high resolution digital cameras (as in 2009-

2014; see Fritz et al. 2013); the Otter missed only 6 sites in its survey area, each of which had 0 sea lions in recent years (Figure 1). The US Fish and Wildlife Service (FWS) RV *Tiglâx* was used to survey 16 sites in the Aleutian and Pribilof Islands: 9 were counted by observers from either land-based overlooks, inflatable skiffs offshore, or from the research vessel (mean counts of 2-3 observers are reported, except for Attu/Cape Wrangell which is the mean of 3 counts from a single observer and Chagulak which is a mean of two counts from a single observer), while the UAS (UAS hexacopter) was used to photograph 7 sites, including Walrus, Otter, and St. Paul Islands in the Pribilof archipelago. On Round Island, Steller sea lions were counted on the same day that the Otter flew other haulouts in northern Bristol Bay (personal communication from E. Weiss, Lands and Refuge Manager, Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK 99518). On St. George Island, MML staff counted Steller sea lions during the northern fur seal bull count. Aerial photographs taken by the UAS and occupied aircraft surveys were analyzed as in previous years (see Fritz et al. 2013).

agTrend modeling—Pup and non-pup count data (including the 2015 counts reported in this memorandum) were modeled using agTrend in order to estimate regional counts and abundance trends (Johnson and Fritz 2014). The agTrend model augments missing count information (sites we did not survey and collect counts from in 2015) in order to produce estimates of total counts and population abundance trends for larger aggregations like regions and rookery cluster areas (RCAs).

Results

Steller sea lion pup counts

In 2015, a total of 11,920 live pups were counted by observers or from aerial images on 50 sites that had at least one pup within the optimal time window for conducting pup counts (Tables 1 and 2). For regions in which all rookeries and major haulouts were surveyed, 7,599 pups were counted in southeast Alaska (eastern DPS), 1,194 and 2,707, respectively, in the eastern and central Gulf of Alaska (western DPS), and 48 in the eastern Bering Sea (western DPS).

agTrend modeling—For the western DPS in Alaska overall, pup counts increased at 1.87% y^{-1} between 2000 and 2015 (95% credible interval of 1.30-2.40% y^{-1} ; Table 3 and Figure 2), up slightly from the 1.76% y^{-1} estimated for the 2000-2014 period (Fritz et al. 2015). The total estimated pup count for the western DPS in Alaska in 2015 is 12,492 (95% credible interval of 11,480 – 13,612), which is also up slightly from the 2013 (12,316; DeMaster 2014) and 2014 estimates (12,189; Fritz et al. 2015). The regional pattern of western DPS pup count trends is also similar to previous years' assessments, with generally increasing counts east of Samalga Pass and decreasing counts to the west (Figure 3). To the east, overall pup counts increased at >3% y^{-1} between 2000 and 2015, while pup counts in each of the four regions increased at >2.8% y^{-1} . The only area east of Samalga Pass where western DPS pup counts did not increase at a statistically significant rate between 2000 and 2015 was in RCA 8, which is the combined Chowiet and Chirikof rookeries (Table 3). To the west of Samalga Pass, pup counts decreased overall at -1.62% y^{-1} between 2000 and 2015 and continued their steep decline in the western Aleutian Islands (RCA 1; -8.88% y^{-1}). In the central Aleutian Islands, pup counts west of Tanaga Pass decreased significantly between 2000 and 2015 (-5.11% y^{-1} in RCA 2 and -2.11% y^{-1} in RCA 3) while between Tanaga and Samalga Passes (in RCAs 4 and 5), pup counts were statistically stable (though increasing slowly). In southeast Alaska (eastern DPS), pup counts totaled 7,599 in 2015 and have increased at a rate of 3.20% y^{-1} between 2000 and 2015.

Steller sea lion non-pup counts

In 2015, a total of 37,727 live non-pups were counted on 109 sites that had at least one non-pup (Tables 1 and 2). For completely surveyed regions, this included 21,268 non-pups in southeast Alaska (eastern DPS), 6,234 and 7,836, respectively, in the eastern and central Gulf of Alaska (western DPS), and 604 in the eastern Bering Sea (western DPS).

agTrend modeling—For the western DPS in Alaska overall, non-pup counts increased at 1.94% y^{-1} between 2000 and 2015 (1.35-2.58% y^{-1} ; Table 3 and Figure 4), slightly lower than the 2.17% y^{-1} estimated for the 2000-2014 period (Fritz et al. 2015). The total estimated non-pup count for the western DPS in Alaska in 2015 is 38,491 (34,377 – 42,634), which is slightly greater than both the 2013 (36,360; DeMaster 2014) and 2014 estimates (37,308; Fritz et al. 2015). The regional pattern of western DPS non-pup count trends is similar to that described for pups: increasing counts east of Samalga Pass and decreasing counts to the west (Figure 5). To the east, non-pup counts overall increased at >3% y^{-1} between 2000 and 2015, and at >2% y^{-1} in each of the four regions and five RCAs. To the west of Samalga Pass, non-pup counts decreased overall at -1.82% y^{-1} between 2000 and 2015 and continued their steep decline in the western Aleutian Islands (RCA 1; -8.71% y^{-1}). In the central Aleutian Islands, non-pup counts west of Tanaga Pass decreased significantly between 2000 and 2015 (at -4.12% y^{-1} in RCA 2 and -3.80% y^{-1} in RCA 3), while between Tanaga and Samalga Passes, non-pup counts were either statistically stable (though declining slowly at -0.28% y^{-1} in RCA 4) or increasing (2.12% y^{-1} in RCA 5). In southeast Alaska (eastern DPS), non-pup counts totaled 21,268 in 2015, and have increased at a rate of 2.30% y^{-1} between 2000 and 2015.

Acknowledgments

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Literature Cited

- DeMaster, D. 2014. Results of Steller sea lion surveys in Alaska, June-July 2013. Memorandum to J. Balsiger, J. Kurland, B. Gerke, and L. Rotterman, January 30, 2014. Available AFSC, Marine Mammal Laboratory, NOAA, NMFS 7600 Sand Point Way NE, Seattle WA 98115.
- Fritz, L. W., K. Sweeney, D. Johnson, and T. Gelatt. 2015. Results of Steller sea lion surveys in Alaska, June-July 2014. Memorandum to D. DeMaster, J. Bengtson, J. Balsiger, J. Kurland, and L. Rotterman, January 28, 2015. Available AFSC, Marine Mammal Laboratory, NOAA, NMFS 7600 Sand Point Way NE, Seattle WA 98115.

- Fritz, L. W., K. Sweeney, D. Johnson, M. Lynn, T. Gelatt, and J. Gilpatrick. 2013. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) conducted in Alaska in June-July 2008 through 2012, and an update on the status and trend of the western Distinct Population Segment in Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-251, 91 p.
- Johnson, D. S., and L. W. Fritz. 2014. agTrend: A Bayesian approach for estimating trends of aggregated abundance. *Methods in Ecology and Evolution* 5(10):1110-1115.
- Pitcher, K. W., V. N. Burkanov, D. G. Calkins, B. J. LeBoeuf, E. G. Mamaev, R. L. Merrick, and G. W. Pendleton. 2001. Spatial and temporal variation in the timing of births of Steller sea lions. *J. Mammalogy* 82(4): 1047-1053.

Table 1. Counts of live Steller sea lion non-pups and pups (mean of 2 independent counters) on sites surveyed by the twin Otter aircraft in 2015. See Figure 1 for Region and RCA (rookery cluster area) locations. Rookeries are noted with a '1' (≥ 50 pups in any year since 1970) and haulouts with a '0'.

Site name	Region	RCA	Rook	Date	Photos	Non-Pups	Pups
WEST ROCK	SE AK	11		27-Jun	Y	769	1
NOSE POINT	SE AK	11		27-Jun	N	0	
EASTERLY	SE AK	11		27-Jun	Y	280	0
GRINDALL	SE AK	11		27-Jun	Y	186	0
POINT MARSH	SE AK	11		27-Jun	Y	19	0
LISENOI	SE AK	11		27-Jun	N	0	
ETOLIN	SE AK	11		27-Jun	N	0	
POINT ISLET (POINT ROCK)	SE AK	11		27-Jun	N	0	
HORN CLIFF	SE AK	11		27-Jun	N	0	
SUKOI ISLETS	SE AK	11		27-Jun	N	0	
SAKIE POINT	SE AK	11		27-Jun	N	0	
WALTER (PORT HOUGHTON)	SE AK	11		27-Jun	N	0	
WOLF ROCK	SE AK	11		27-Jun	Y	504	0
FORRESTER/FORRESTER I	SE AK	11	1	27-Jun	Y	35	0
SUNSET POINT	SE AK	11		27-Jun	N	0	
FORRESTER/EAST RK	SE AK	11	1	27-Jun	Y	268	208
FORRESTER/SEA LION RK	SE AK	11	1	27-Jun	Y	708	631
FORRESTER/LOWRIE	SE AK	11	1	27-Jun	Y	1870	1552
FORRESTER/C HORN RK	SE AK	11	1	27-Jun	Y	428	420
FORRESTER/NORTH RK	SE AK	11	1	27-Jun	Y	1084	1143
SUNSET	SE AK	11		27-Jun	Y	560	2
CAPE BARTOLOME	SE AK	11		27-Jun	Y	61	0
POINT LEAGUE (STEVENS PASS)	SE AK	11		27-Jun	N	0	
SAIL	SE AK	11		27-Jun	Y	518	0
TIMBERED	SE AK	11		27-Jun	Y	514	5
CAPE ADDINGTON	SE AK	11		27-Jun	Y	972	1
THE BROTHERS/W+E	SE AK	11		27-Jun	N	0	
FALSE POINT PYBUS	SE AK	11		27-Jun	N	0	
THE BROTHERS/SW	SE AK	11		27-Jun	Y	691	0
ROUND ROCK	SE AK	11		27-Jun	N	0	
TURNABOUT	SE AK	11		27-Jun	N	0	
PINTA ROCKS	SE AK	11		27-Jun	N	0	
CORONATION	SE AK	11		27-Jun	Y	132	1
YASHA	SE AK	11		27-Jun	Y	680	9
HAZY	SE AK	11	1	27-Jun	Y	2636	1994
CAPE OMMANEY	SE AK	11		27-Jun	Y	472	0
LARCH BAY	SE AK	11		27-Jun	N	0	

Table 1 (continued) Site name	Region	RCA	Rook	Date	Photos	Non-Pups	Pups
POINT LULL	SE AK	11		27-Jun	N	0	
POINT MARSDEN	SE AK	11		24-Jun	N	0	
SEA LION ROCK (PUFFIN BAY)	SE AK	11		27-Jun	Y	136	0
BENJAMIN	SE AK	11		24-Jun	Y	106	0
FUNTER BAY	SE AK	11		24-Jun	N	0	
BERNERS BAY	SE AK	11		24-Jun	N	0	
LITTLE ISLAND	SE AK	11		24-Jun	N	0	
ROCKY ISLAND	SE AK	11		24-Jun	N	0	
TENAKEE CANNERY POINT	SE AK	11		24-Jun	N	0	
MET POINT	SE AK	11		24-Jun	N	0	
ELDRED ROCK	SE AK	11		24-Jun	N	0	
GRAN (LEDGE) POINT	SE AK	11		24-Jun	Y	536	2
THE SISTERS	SE AK	11		24-Jun	N	0	
BIALI ROCK	SE AK	11	1	27-Jun	Y	896	204
JACOB ROCK	SE AK	11		27-Jun	Y	257	1
KAIUCHALI (BIORKA)	SE AK	11		27-Jun	Y	76	1
ST. LAZARIA	SE AK	11		24-Jun	N	0	
SEA LION ISLANDS	SE AK	11		24-Jun	Y	556	4
POINT CAROLUS	SE AK	11		24-Jun	N	30	
SOUTH MARBLE	SE AK	11		24-Jun	Y	1952	7
CASE (TLINGIT) POINT	SE AK	11		24-Jun	N	0	
WHITE SISTERS	SE AK	11	1	24-Jun	Y	1446	910
MIDDLE PASS ROCK	SE AK	11		24-Jun	Y	207	0
INIAN	SE AK	11		24-Jun	Y	158	1
GAFF ROCK	SE AK	11		24-Jun	N	1	
GLOOMY KNOB	SE AK	11		24-Jun	N	0	
CAPE BINGHAM	SE AK	11		24-Jun	N	0	
CAPE CROSS	SE AK	11		24-Jun	Y	38	0
BLACK ROCK	SE AK	11		24-Jun	N	0	
GRAVES ROCK	SE AK	11	1	24-Jun	Y	1486	502
VENISA	SE AK	11		24-Jun	N	0	
TARR INLET	SE AK	11		24-Jun	N	0	
HARBOR POINT	SE AK	11		28-Jun	N	0	
CAPE FAIRWEATHER	SE AK	11		28-Jun	N	0	
ALSEK	SE AK	11		28-Jun	N	0	
AKWE	SE AK	11		28-Jun	N	0	
SITKAGI BLUFFS	SE AK	11		28-Jun	N	0	
CAPE ST. ELIAS	E GULF	10		1-Jul	Y	1114	28
HOOK POINT	E GULF	10		1-Jul	Y	19	0
MIDDLETON	E GULF	10		1-Jul	N	0	
CAPE HINCHINBROOK	E GULF	10		1-Jul	Y	17	0
SEAL ROCKS	E GULF	10	1	1-Jul	Y	1058	674

Table 1 (continued) Site name	Region	RCA	Rook	Date	Photos	Non-Pups	Pups
GLACIER	E GULF	10		1-Jul	Y	1366	14
WOODED (FISH)	E GULF	10	1	1-Jul	Y	830	340
POINT ELEANOR	E GULF	10		1-Jul	N	0	
THE NEEDLE	E GULF	10		1-Jul	Y	143	30
DUTCH GROUP	E GULF	10		1-Jul	Y	328	0
PERRY	E GULF	10		1-Jul	N	0	
PLEIADES	E GULF	10		1-Jul	N	0	
POINT LaTOUCHE	E GULF	10		1-Jul	N	0	
DANGER	E GULF	10		1-Jul	Y	24	0
POINT ELRINGTON	E GULF	10		1-Jul	Y	178	0
PROCESSION ROCKS	E GULF	10		1-Jul	Y	183	4
CAPE PUGET	E GULF	10		1-Jul	Y	47	0
CAPE JUNKEN	E GULF	10		1-Jul	N	0	
CAPE FAIRFIELD	E GULF	10		1-Jul	N	0	
CAPE RESURRECTION	E GULF	10		1-Jul	Y	146	1
RUGGED	E GULF	10		1-Jul	Y	48	0
NO NAME	E GULF	10		1-Jul	Y	182	0
AIALIK CAPE	E GULF	10		1-Jul	N	0	
CHISWELL ISLANDS	E GULF	10	1	1-Jul	Y	204	102
NATOA (GROTTO)	E GULF	10		1-Jul	Y	64	1
SEAL ROCKS (KENAI)	E GULF	10		1-Jul	Y	51	0
GRANITE CAPE	E GULF	10		1-Jul	Y	99	0
STEEP POINT	E GULF	10		30-Jun	N	1	
RAGGED/HOOF POINT	E GULF	10		30-Jun	Y	132	0
RABBIT	E GULF	10		30-Jun	N	0	
OUTER (PYE)	C GULF	10	1	30-Jun	Y	278	148
NUKA POINT	C GULF	10		30-Jun	N	0	
GORE POINT	C GULF	10		30-Jun	N	0	
EAST CHUGACH	C GULF	10		30-Jun	N	0	
PERL	C GULF	10		30-Jun	Y	44	0
PERL ROCKS	C GULF	10		30-Jun	N	0	
NAGAHUT ROCKS	C GULF	10		30-Jun	Y	22	0
SEA LION ROCKS (MARMOT)	C GULF	9		2-Jul	Y	12	0
MARMOT	C GULF	9	1	3-Jul	Y	1450	624
ELIZABETH/CAPE ELIZABETH	C GULF	10		30-Jun	N	0	
AFOGNAK/TONKI CAPE	C GULF	9		2-Jul	N	0	
FLAT	C GULF	10		30-Jun	N	0	
WEST AMATULI	C GULF	9		30-Jun	N	0	
SUGARLOAF	C GULF	9	1	30-Jun	Y	975	902
KODIAK/CAPE CHINIAK	C GULF	9		2-Jul	Y	132	2
SEA OTTER/RK NEAR	C GULF	9		2-Jul	N	0	
SUD	C GULF	9		30-Jun	N	0	

Table 1 (continued) Site name	Region	RCA	Rook	Date	Photos	Non-Pups	Pups
LONG ISLAND	C GULF	9		2-Jul	Y	64	0
SEA OTTER	C GULF	9		2-Jul	Y	119	2
AFOGNAK/IZHUT BAY	C GULF	9		2-Jul	N	0	
UGAK	C GULF	9		2-Jul	N	0	
USHAGAT/NW	C GULF	9		30-Jun	Y	2	0
USHAGAT/ROCKS SOUTH	C GULF	9		30-Jun	Y	62	0
AFOGNAK/CAPE IZHUT	C GULF	9		2-Jul	N	0	
USHAGAT/SW	C GULF	9	1	30-Jun	Y	220	126
SPRUCE/NORTH CAPE	C GULF	9		2-Jul	N	0	
LATAK ROCKS	C GULF	9		2-Jul	Y	394	16
KODIAK/GULL POINT	C GULF	9		2-Jul	Y	44	0
AFOGNAK BAY	C GULF	9		2-Jul	N	0	
KODIAK/CAPE BARNABAS	C GULF	9		2-Jul	N	0	
KODIAK/CAPE PARAMANOF	C GULF	9		2-Jul	N	0	
KODIAK/STEEP CAPE	C GULF	9		2-Jul	Y	38	0
CAPE DOUGLAS	C GULF	9		30-Jun	N	0	
KODIAK/MALINA POINT	C GULF	9		2-Jul	N	0	
SHAW	C GULF	9		30-Jun	N	0	
TWOHEADED	C GULF	9	1	2-Jul	Y	540	45
NOISY	C GULF	9		2-Jul	N	0	
SHAKUN ROCKS	C GULF	9		3-Jul	Y	98	7
KODIAK/CAPE UGAT	C GULF	9		2-Jul	Y	150	1
SITKINAK/CAPE SITKINAK	C GULF	9		2-Jul	Y	186	1
KODIAK/BIRD ROCK	C GULF	9		2-Jul	N	0	
KODIAK/CAPE KULIUK	C GULF	9		2-Jul	N	0	
CAPE NUKSHAK	C GULF	9		3-Jul	N	0	
CAPE UGYAK	C GULF	8		3-Jul	N	0	
KODIAK/SUNDSTROM	C GULF	8		2-Jul	N	0	
CAPE GULL	C GULF	8		3-Jul	Y	87	0
CAPE KULIAK	C GULF	8		3-Jul	N	0	
KODIAK/CAPE ALITAK	C GULF	8		2-Jul	N	0	
KODIAK/CAPE UYAK	C GULF	8		2-Jul	N	0	
TAKLI	C GULF	8		3-Jul	Y	24	0
KODIAK/STURGEON HEAD	C GULF	8		2-Jul	N	0	
KODIAK/CAPE IKOLIK	C GULF	8		2-Jul	Y	210	0
KODIAK/TOMBSTONE ROCKS	C GULF	8		2-Jul	N	0	
PUALE BAY	C GULF	8		3-Jul	Y	124	0
CHIRIKOF	C GULF	8	1	8-Jul	Y	781	250
NAGAI ROCKS	C GULF	8		8-Jul	Y	251	5
KILOKAK ROCKS	C GULF	8		8-Jul	Y	200	0
AIUGNAK COLUMNS	C GULF	8		8-Jul	N	1	
CHOWIET	C GULF	8	1	8-Jul	Y	1014	542

Table 1 (continued) Site name	Region	RCA	Rook	Date	Photos	Non-Pups	Pups
AGHIYUK	C GULF	8		8-Jul	Y	47	0
UGAIUSHAK	C GULF	8		8-Jul	Y	5	0
SUTWIK	C GULF	8		8-Jul	Y	262	36
LIGHTHOUSE ROCKS	W GULF	8	1	8-Jul	Y	178	24
ATKULIK	W GULF	8		8-Jul	N	0	
KAK	W GULF	8		8-Jul	Y	194	0
SEAL CAPE	W GULF	8		8-Jul	N	0	
SUMMIT	BERING			3-Jul	N	0	
THE TWINS	BERING			3-Jul	N	0	
CAPE NEWENHAM	BERING			3-Jul	Y	194	0

Table 2. Counts of live Steller sea lion non-pups and pups on sites surveyed during 2015 ship- and ground-based effort. Counts conducted from cliff tops, inflatable skiffs offshore, or from the research vessel are indicated as a “ground” source and sites surveyed with the unmanned aircraft are labeled “UAS”, Rookeries are noted with a ‘1’ (≥ 50 pups in any year since 1970) and haulouts left blank in the ‘Rook’ column. Survey dates at Kiska/Cape St Stephen, Alaid, and Attu/Cape Wrangell were too early for complete pup counts.

Site name	Region	RCA	Rook	Date	Mode	Non-Pups	Pups
AKUN/BILLINGS HEAD	E ALEU	6	1	1-Jul	UAS	562	138
YUNASKA	C ALEU	5	1	29-Jun	UAS	348	167
CHAGULAK	C ALEU	5		29-Jun	GROUND	66	
AMUKTA + ROCKS	C ALEU	5		29-Jun	UAS	36	0
KISKA/CAPE ST STEPHEN	C ALEU	2	1	20-Jun	GROUND	82	
BULDIR/EAST CAPE	W ALEU	1		25-Jun	GROUND	21	
BULDIR/NW ROCKS	W ALEU	1		25-Jun	GROUND	5	
AGATTU/CAPE SABAK	W ALEU	1	1	23-Jun	GROUND	95	43
AL Aid	W ALEU	1		22-Jun	GROUND	59	
ATTU/CHIRIKOF POINT	W ALEU	1		22-Jun	GROUND	1	
ATTU/CHICHAGOF POINT	W ALEU	1		21-Jun	GROUND	51	
ATTU/CAPE WRANGELL	W ALEU	1	1	21-Jun	GROUND	88	
OTTER ISLAND	BERING			18-Jul	UAS	13	0
ST. PAUL/SEA LION ROCK	BERING			15-Jul	UAS	12	0
ST. PAUL/NE POINT	BERING			13-Jul	UAS	29	0
WALRUS	BERING		1	18-Jul	UAS	260	48
ST. GEORGE	BERING			14-Jul	GROUND	23	
ROUND (WALRUS IS)	BERING			3-Jul	GROUND	73	

Table 3. Annual rates of change (% y^{-1} with \pm 95% credible intervals) in counts of Steller sea lion pups and non-pups by (A) region and (B) rookery cluster area (RCA) for the period 2000-2015 modeled using agTrend. DPS = distinct population segment of Steller sea lion. The Bering region only includes Walrus Island in the Pribilof Islands for pups only; these data are not included in the RCA analysis.

A. Region	DPS	Rate	Pups		Non-Pups		
			-95% CI	+95% CI	Rate	-95% CI	+95% CI
SE AK	E	3.20	2.58	3.83	2.30	1.58	3.05
E Gulf of AK	W	4.31	2.54	6.00	5.07	2.35	7.87
C Gulf of AK	W	2.82	1.39	4.24	2.68	1.53	3.73
W Gulf of AK	W	3.28	1.86	4.61	3.95	2.75	5.11
Eastern Aleutians	W	3.35	2.29	4.37	2.08	0.69	3.44
E of Samalga Pass	W	3.30	2.61	3.98	3.28	2.55	4.10
Central Aleutians.	W	-0.68	-1.58	0.23	-0.84	-1.69	0.05
Western Aleutians	W	-8.88	-10.00	-7.73	-8.71	-10.65	-6.83
W of Samalga Pass	W	-1.62	-2.45	-0.82	-1.82	-2.62	-0.97
Bering	W	-2.92	-9.73	3.45			
Alaska	W	1.87	1.30	2.40	1.94	1.35	2.58
B. RCA	DPS						
11	E	3.20	2.58	3.83	2.30	1.58	3.05
10	W	4.18	2.50	5.70	4.30	1.88	6.79
9	W	3.37	2.33	4.44	3.11	1.52	4.60
8	W	1.78	-1.88	5.58	3.18	1.64	4.73
7	W	3.26	1.84	4.60	3.96	2.73	5.18
6	W	3.35	2.29	4.37	2.08	0.72	3.34
5	W	0.92	-0.60	2.37	2.12	0.18	4.08
4	W	1.73	-0.45	3.97	-0.28	-1.88	1.32
3	W	-2.11	-3.49	-0.74	-3.80	-4.94	-2.50
2	W	-5.11	-7.21	-3.02	-4.12	-5.98	-2.21
1	W	-8.88	-10.00	-7.73	-8.71	-10.65	-6.83

Figure 1. Steller sea lion terrestrial rookeries and haulouts surveyed in June-July 2015. Survey regions, rookery cluster areas (RCAs) and boundary of the eastern and western distinct population segments (DPSs) in Alaska are also shown.

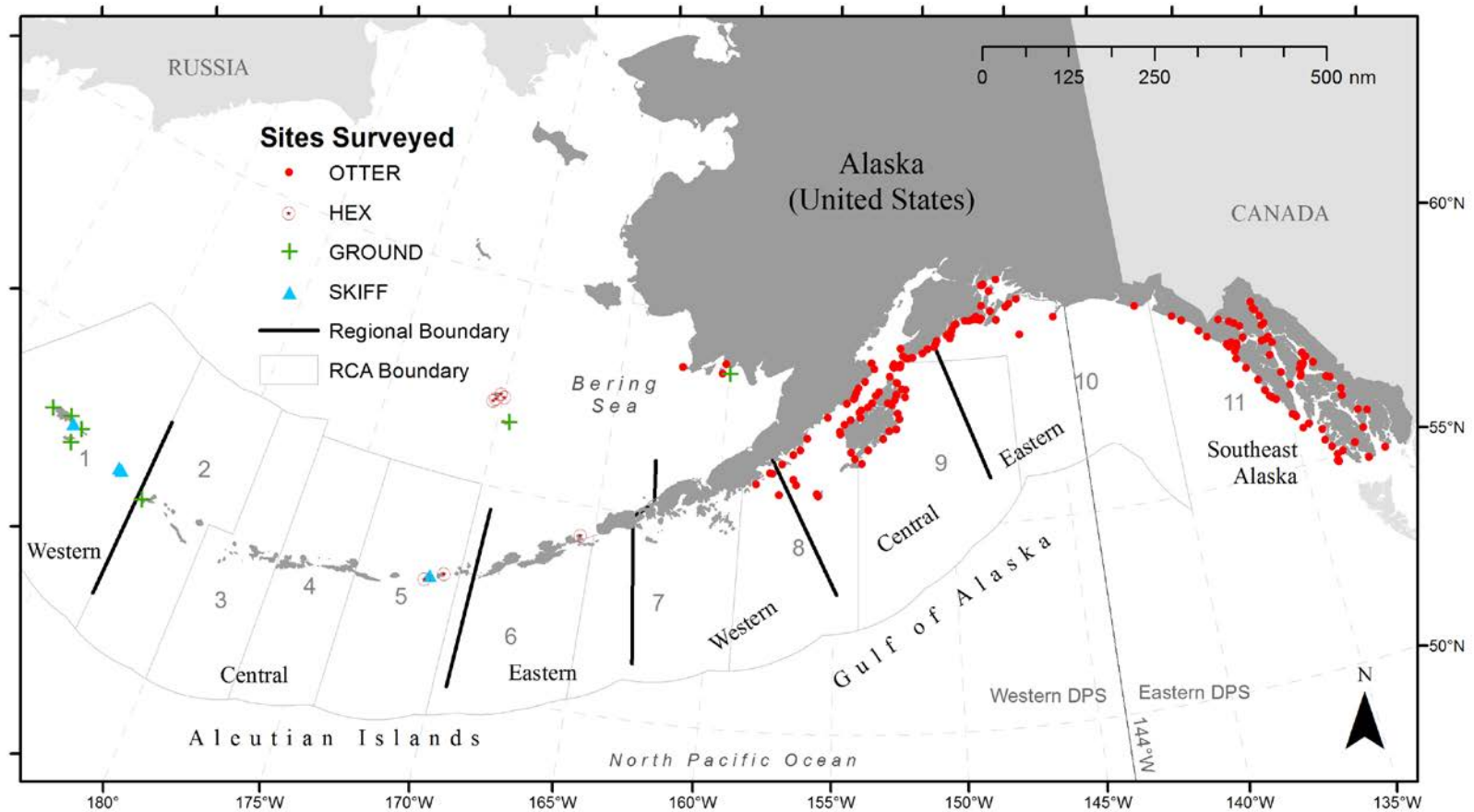


Figure 2. Estimated (using agTrend) and actual counts (points) of western Steller sea lion pups in Alaska, 1989-2015. Green line = average trend for the 2000-2015 period. Blue zone = 95% credible interval of estimated realized count (black line). Vertical black lines = 95% credible interval on estimated actual count.

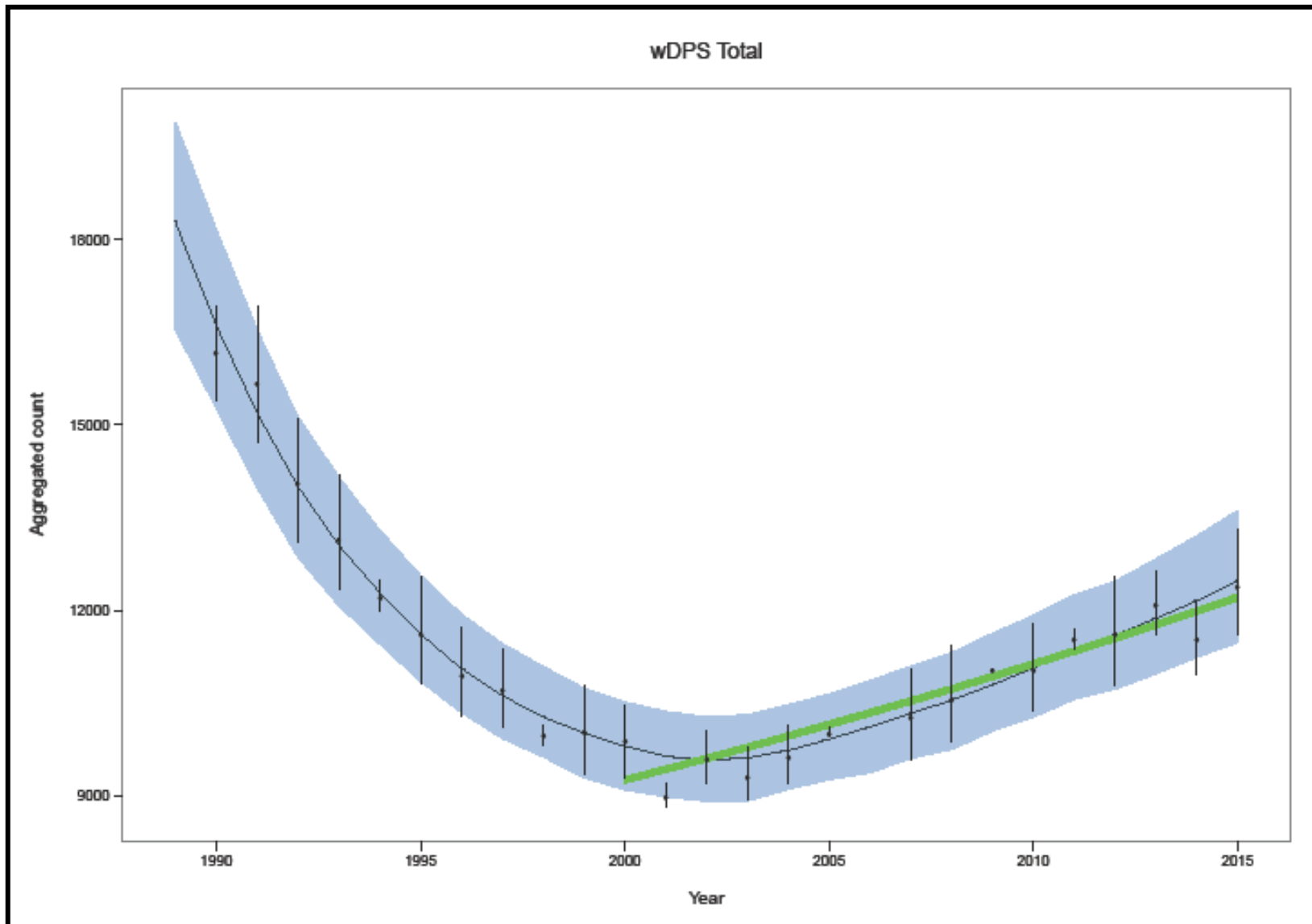


Figure 3. Estimated (using agTrend) and actual counts (points) of western Steller sea lion pups in Alaska east and west of Samalga Pass (~170°W in the Aleutian Islands), 1989-2015. Display is identical to Figure 2.

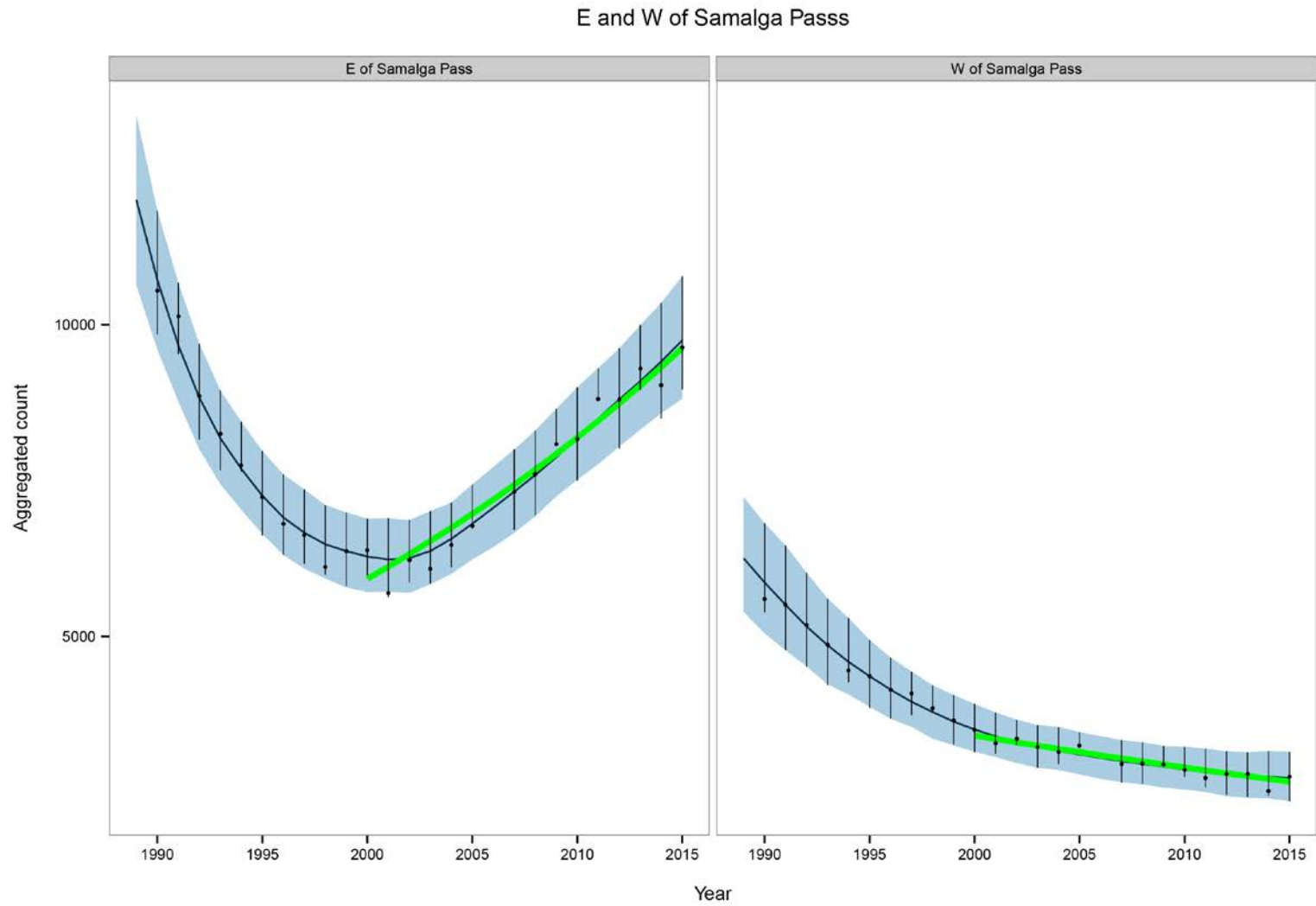


Figure 4. Estimated (using agTrend) and actual counts (points) of western Steller sea lion non-pups in Alaska, 1989-2015. Display is identical to Figure 2.

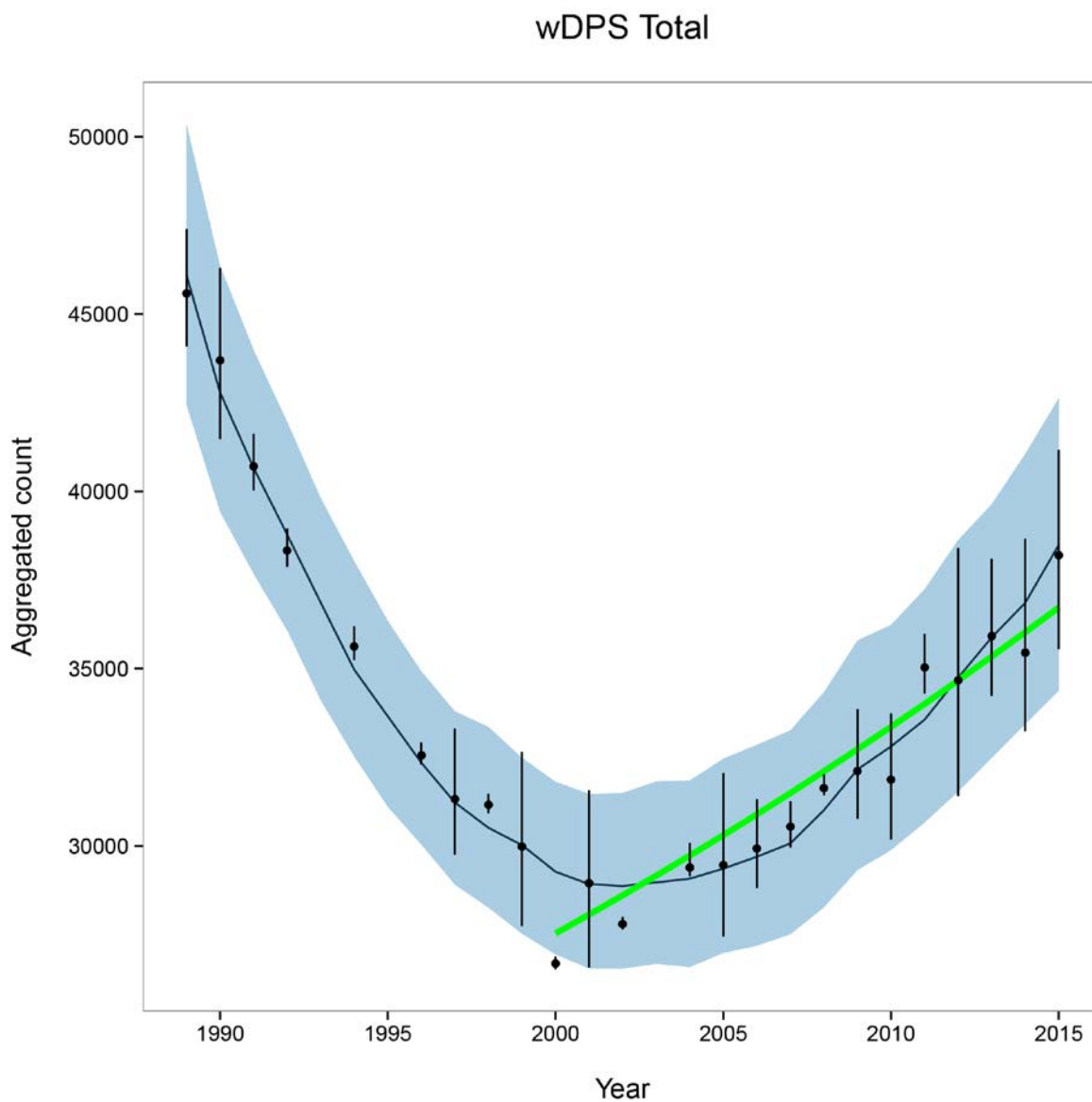


Figure 5. Estimated (using agTrend) and actual counts (points) of western Steller sea lion non-pups in Alaska east and west of Samalga Pass (~170°W in the Aleutian Islands), 1989-2015. Display is identical to Figure 2.

