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Memorandum To: Douglas DeMaster, Director, Alaska Fisheries Science Center
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 Jon Kurland and Lisa Rotterman, Alaska Region Protected Resources

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Subject: Results of Steller Sea Lion Surveys in Alaska, June-July 2014

Aerial and ship-based surveys to count Steller sea lion (*Eumetopias jubatus*) pups (~1 mo old) and non-pups (adults and juveniles) on land in Alaska were conducted by the National Marine Mammal Laboratory in June-July 2014. The manned aircraft photographic survey was conducted from 23 June to 9 July, and targeted all known rookeries and haulout sites in the range of the western distinct population segment (DPS) between the Delarof Islands in the Aleutian Islands and the Shumagin Islands in the western Gulf of Alaska (between 179°W and 158°W). Ship-based survey effort, which included the first use of a small unmanned aircraft to survey Steller sea lions, was conducted from 19 June to 3 July in the western portion of the Aleutian Islands from Attu Island eastward to the Delarof Islands (between 172°E and 179°W).

Methods

Aerial surveys to count Steller sea lions are conducted in late June through mid-July starting at least 10 days after the mean birth dates of pups in the survey area (~10 June; Pitcher et al. 2001). The primary objective in 2014 was to survey all terrestrial rookeries and haul-out sites along the Aleutian Island chain (western DPS) of Alaska (Figure 1). A NOAA twin Otter aircraft equipped with three high resolution digital cameras (as in 2009-2013; Fritz et al. 2013) surveyed portions of the central Aleutian Islands, and the eastern Aleutian Islands and western Gulf of Alaska. Ship-based effort on board the USFWS RV *Tiglax* was concentrated in the western and part of the central Aleutian Islands, and included the use of an unoccupied aircraft system (UAS; APH-22 hexacopter).

In 2014, 151 of the 178 targeted sites in the Aleutian Island regions were successfully surveyed, as well as 36 sites in the western Gulf of Alaska region (Figure 2). The twin Otter crew surveyed 165 sites, missing (due to fog) only 3 sites in the central Aleutians and 7 sites in the western Gulf of Alaska. The research vessel crew (including UAS) surveyed 23 sites: 12 sites were counted by observers from either land-based overlooks, inflatable skiffs offshore, or from the research vessel (mean counts of 2 observers are reported), while the UAS was used to survey 11 sites (10 of which were used for trend analysis and are reported here). Of the 21 sites that were not surveyed by the vessel, 20 were skipped as they had no

recent (within the last 10 years) history of sea lion presence during the summer breeding season, while Shemya Island was not surveyed due to vessel time constraints. The rookery at Billings Head on Akun Island was surveyed by taking only oblique images from the occupied aircraft; pup counts are not considered to be reliable from oblique images, thus only non-pups were counted.

Aerial photographs taken by the UAS and occupied aircraft surveys were analyzed as in previous years (see Fritz et al. 2013). Trends in pup and non-pup counts were estimated using agTrend (Johnson and Fritz 2014).

Results

Steller sea lion pups

In 2014, we counted a total of 7,366 live pups on 57 sites (34 rookeries and 23 haul-outs) that had at least one pup (Tables 1 and 2). This included 2,457 pups in the western Gulf of Alaska, 2,581 pups in the eastern Aleutian Islands, 2,153 pups in the central Aleutian Islands, and only 175 pups in the western Aleutian Islands.

Updated trends (Johnson and Fritz 2014) in pup counts in each region and for the western DPS in Alaska as a whole are listed in Table 3 and shown in Figure 3. Pup counts increased at $1.76\% \text{ y}^{-1}$ in the western DPS in Alaska overall between 2000 and 2014, essentially unchanged from the $1.75\% \text{ y}^{-1}$ estimated for the 2000-2013 period (DeMaster 2014). Trends were different east and west of Samalga Pass: to the east, pup counts increased at $>3\% \text{ y}^{-1}$, while to the west, counts decreased at $-1.66\% \text{ y}^{-1}$ with a continued steep decline in the western Aleutian Islands ($-8.92\% \text{ y}^{-1}$). The estimate for the total pup count in the western DPS in Alaska in 2014 is 12,189 (90% credible interval of 11,318 – 13,064), which is essentially unchanged from the 2013 estimate of 12,316 (DeMaster 2014).

Steller sea lion non-pups

In 2014, we counted a total of 20,984 live non-pups on 187 sites (59 rookeries and 63 haul-outs) (Tables 1 and 2). This included 7,244 non-pups in the western Gulf of Alaska, 7,575 non-pups in the eastern Aleutian Islands, 5,568 non-pups in the central Aleutian Islands, and only 597 non-pups in the western Aleutian Islands.

Updated trends (Johnson and Fritz 2014) in non-pup counts in each region and for the western DPS in Alaska as a whole are listed in Table 3 and shown in Figure 4. Non-pup counts increased at $2.17\% \text{ y}^{-1}$ in the western DPS in Alaska overall between 2000 and 2014, up slightly but not significantly different from the $1.87\% \text{ y}^{-1}$ estimated for the 2000-2013 period (DeMaster 2014). Trends were different east and west of Samalga Pass: to the east, non-pup counts increased at $3.41\% \text{ y}^{-1}$, while to the west, counts decreased at $-1.22\% \text{ y}^{-1}$, with a continued steep decline in the western Aleutian Islands ($-7.10\% \text{ y}^{-1}$). The estimate for the total non-pup count in the western DPS in Alaska is 37,308 (90% credible interval of 34,373 – 40,314), which is essentially unchanged from the 2013 estimate of 36,360 (DeMaster 2014).

Walrus

A group of ~250 walrus was photographed at a known Steller sea lion haulout north of Cape Sarichef Unimak Island (54.59 N, 164.93 W) on 23 June @ 7 PM. No Steller sea lions were observed at the north haulout, though 2 were seen at the Cape Sarichef haulout.

Acknowledgments

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Literature Cited

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Table 1. Counts of Steller sea lion non-pups and live pups (mean of 2 independent counters) on sites surveyed by the twin Otter aircraft in 2014. 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 haulout sites with a '0'.

SITENAME	REGION	RCA	ROOKERY	DATE	NON-PUP	PUP
ATKINS	W GULF	7	1	23-Jun	671	315
BIG KONIUJI	W GULF	7	0	23-Jun	0	0
BIRD	W GULF	7	0	23-Jun	214	4
BIRD (SHUMAGINS)	W GULF	7	0	23-Jun	66	0
CASTLE ROCK	W GULF	7	0	23-Jun	129	4
CATON	W GULF	7	0	23-Jun	410	1
CHERNABURA	W GULF	7	1	23-Jun	798	266
CHERNI	W GULF	7	0	23-Jun	0	0
CLUBBING ROCKS NORTH	W GULF	7	1	23-Jun	426	232
CLUBBING ROCKS SOUTH	W GULF	7	1	23-Jun	907	487
EGG (SAND POINT)	W GULF	7	0	23-Jun	0	0
HAGUE ROCK	W GULF	7	0	23-Jun	0	0
HUNT	W GULF	7	0	23-Jun	0	0
JUDE	W GULF	7	1	23-Jun	572	304
KUPREANOF POINT	W GULF	7	0	23-Jun	212	0
MITROFANIA	W GULF	8	0	23-Jun	288	4
NAGAI/MOUNTAIN POINT	W GULF	7	0	23-Jun	3	0
NAGAI/RK W OF CAPE WEDGE	W GULF	7	0	23-Jun	0	0
OLGA ROCKS NE	W GULF	7	0	23-Jun	94	0
OLGA ROCKS SW	W GULF	7	0	23-Jun	238	5
OMEGA	W GULF	7	0	23-Jun	0	0
PAUL	W GULF	7	0	23-Jun	0	0
PINNACLE ROCK	W GULF	7	1	23-Jun	1152	714
SANAK	W GULF	7	0	23-Jun	0	0
SEA LION ROCKS (SHUMAGINS)	W GULF	7	0	23-Jun	97	0
SIMEONOF	W GULF	7	0	23-Jun	1	0
SOZAVARIKA	W GULF	7	0	23-Jun	0	0
SPITZ	W GULF	8	0	23-Jun	90	0
SUSHILNOI ROCKS	W GULF	7	1	23-Jun	341	62
THE HAYSTACKS	W GULF	7	0	23-Jun	136	1
THE WHALEBACK	W GULF	7	1	23-Jun	190	58
TWINS	W GULF	7	0	23-Jun	0	0
UMGA	W GULF	7	0	23-Jun	0	0
UNGA/ACHEREDIN POINT	W GULF	7	0	23-Jun	107	0
UNGA/CAPE UNGA	W GULF	7	0	23-Jun	0	0
WOSNESENSKI	W GULF	7	0	23-Jun	102	0

Table 1. (continued)

SITENAME	REGION	RCA	ROOKERY	DATE	NON-PUP	PUP
ADUGAK	E ALEU	6	1	28-Jun	510	294
AIKTAK	E ALEU	6	0	23-Jun	62	7
AKUN/AKUN BAY	E ALEU	6	0	28-Jun	0	0
AKUN/AKUN HEAD	E ALEU	6	0	28-Jun	0	0
AKUN/BILLINGS HEAD*	E ALEU	6	1	28-Jun	558	
AKUN/JACKASS POINT	E ALEU	6	0	28-Jun	0	0
AKUTAN/BATTERY POINT	E ALEU	6	0	23-Jun	0	0
AKUTAN/CAPE MORGAN	E ALEU	6	1	23-Jun	1127	748
AKUTAN/NORTH HEAD	E ALEU	6	0	28-Jun	0	0
AKUTAN/REEF-LAVA	E ALEU	6	0	28-Jun	352	21
AMAK+ROCKS	E ALEU	6	0	23-Jun	592	4
AVATANAK/NE	E ALEU	6	0	28-Jun	0	0
AVATANAK/S	E ALEU	6	0	23-Jun	15	0
AVATANAK/SE	E ALEU	6	0	28-Jun	16	0
BABY	E ALEU	6	0	28-Jun	0	0
BASALT ROCK	E ALEU	6	0	28-Jun	0	0
BOGOSLOF/FIRE ISLAND	E ALEU	6	1	28-Jun	347	337
EGG	E ALEU	6	0	28-Jun	0	0
EGG/SE Tip	E ALEU	6	0	28-Jun	10	0
EGG/West	E ALEU	6	0	28-Jun	0	0
EMERALD	E ALEU	6	0	28-Jun	0	0
INNER SIGNAL	E ALEU	6	0	28-Jun	49	0
KALIGAGAN	E ALEU	6	0	23-Jun	1	0
OGCHUL	E ALEU	6	1	28-Jun	272	130
OLD MAN ROCKS	E ALEU	6	0	28-Jun	15	0
OUTER SIGNAL	E ALEU	6	0	28-Jun	1	0
POLIVNOI ROCK	E ALEU	6	0	28-Jun	126	0
ROCK	E ALEU	7	0	23-Jun	0	0
ROOTOK/EAST	E ALEU	6	0	23-Jun	24	0
ROOTOK/NORTH	E ALEU	6	0	23-Jun	6	0
SAMALGA	E ALEU	6	0	28-Jun	0	0
SEA LION ROCK (AMAK)	E ALEU	6	1	23-Jun	504	185
TANGINAK	E ALEU	6	0	28-Jun	2	0
THE PILLARS	E ALEU	6	0	28-Jun	26	1
TIGALDA/ROCKS NE	E ALEU	6	0	23-Jun	114	0
TIGALDA/SOUTH SIDE	E ALEU	6	0	23-Jun	93	1
UGAMAK/NORTH	E ALEU	6	1	23-Jun	580	402
UGAMAK/ROUND	E ALEU	6	1	23-Jun	244	160
UGAMAK/SW	E ALEU	6	0	23-Jun	0	0
UGAMAK/UGAMAK BAY	E ALEU	6	1	23-Jun	392	242

* Akun/Billingshead NP count conducted from oblique images. No accurate pup count available.

Table 1. (continued)

SITENAME	REGION	RCA	ROOKERY	DATE	NON-PUP	PUP
UMNAK/AGULIUK POINT	E ALEU	6	0	28-Jun	0	0
UMNAK/CAPE ASLIK	E ALEU	6	0	28-Jun	181	2
UMNAK/CAPE CHAGAK	E ALEU	6	0	28-Jun	0	0
UMNAK/CAPE IDAK	E ALEU	6	0	28-Jun	0	0
UMNAK/CAPE UDAK	E ALEU	6	0	28-Jun	6	0
UMNAK/REINDEER POINT	E ALEU	6	0	28-Jun	0	0
UNALASKA/BISHOP POINT	E ALEU	6	0	28-Jun	208	3
UNALASKA/BRUNDAGE HEAD	E ALEU	6	0	28-Jun	0	0
UNALASKA/CAPE IZIGAN	E ALEU	6	0	28-Jun	197	42
UNALASKA/CAPE SEDANKA	E ALEU	6	0	28-Jun	0	0
UNALASKA/CAPE STARICHKOF	E ALEU	6	0	28-Jun	0	0
UNALASKA/CAPE WISLOW	E ALEU	6	0	28-Jun	0	0
UNALASKA/KOVRIZHKA	E ALEU	6	0	28-Jun	0	0
UNALASKA/MAKUSHIN BAY	E ALEU	6	0	28-Jun	47	0
UNALASKA/PRIEST ROCK	E ALEU	6	0	23-Jun	105	0
UNALASKA/SPRAY CAPE	E ALEU	6	0	28-Jun	78	1
UNALASKA/WHALEBONE CAPE	E ALEU	6	0	28-Jun	6	0
UNIMAK/CAPE LAZAREF	E ALEU	6	0	23-Jun	0	0
UNIMAK/CAPE LUTKE	E ALEU	6	0	23-Jun	0	0
UNIMAK/CAPE SARICHEF	E ALEU	6	0	23-Jun	2	0
UNIMAK/CAVE POINT	E ALEU	6	0	23-Jun	0	0
UNIMAK/OKSENOF POINT	E ALEU	6	0	23-Jun	594	1
UNIMAK/SCOTCH CAP	E ALEU	6	0	23-Jun	0	0
UNIMAK/SENNETT POINT	E ALEU	6	0	23-Jun	0	0
VSEVIDOF	E ALEU	6	0	28-Jun	113	0
ADAK/ARGONNE POINT	C ALEU	4	0	30-Jun	0	0
ADAK/CAPE KAGIGIKAK	C ALEU	4	0	30-Jun	36	4
ADAK/CAPE MOFFET	C ALEU	4	0	30-Jun	0	0
ADAK/CAPE YAKAK	C ALEU	4	0	30-Jun	62	0
ADAK/CRONE ISLAND	C ALEU	4	0	30-Jun	21	0
ADAK/HEAD ROCK (KULUK BAY)	C ALEU	4	0	30-Jun	0	0
ADAK/LAKE POINT	C ALEU	4	1	30-Jun	466	250
AGLIGADAK	C ALEU	5	0	9-Jul	45	0
AMATIGNAK/KNOB POINT	C ALEU	3	0	9-Jul	4	0
AMATIGNAK/NITROF POINT	C ALEU	3	0	9-Jul	29	0
AMATIGNAK/WEST	C ALEU	3	0	9-Jul	0	0
AMLIA/CAPE MISTY	C ALEU	5	0	9-Jul	32	0
AMLIA/EAST CAPE	C ALEU	5	0	9-Jul	19	2
AMLIA/SVIECH. HARBOR	C ALEU	5	0	9-Jul	147	34
AMTAGIS	C ALEU	4	0	9-Jul	0	0

Table 1. (continued)

SITENAME	REGION	RCA	ROOKERY	DATE	NON-PUP	PUP
ANAGAKSIK	C ALEU	4	0	9-Jul	29	0
ATKA/CAPE KOROVIN	C ALEU	4	0	9-Jul	7	0
ATKA/NORTH CAPE	C ALEU	4	0	9-Jul	113	0
BOBROF	C ALEU	3	0	30-Jun	0	0
CARLISLE	C ALEU	5	0	28-Jun	20	0
CHUGINADAK	C ALEU	6	0	28-Jun	112	1
CHUGUL	C ALEU	4	0	9-Jul	29	0
FENIMORE	C ALEU	4	0	9-Jul	58	0
GARELOI	C ALEU	3	0	30-Jun	0	0
GRAMP ROCK	C ALEU	3	1	9-Jul	448	236
GREAT SITKIN	C ALEU	4	0	9-Jul	0	0
HERBERT	C ALEU	5	0	28-Jun	114	0
IGITKIN/SW POINT	C ALEU	4	0	9-Jul	0	0
IKIGINAK	C ALEU	4	0	9-Jul	0	0
ILAK	C ALEU	3	0	9-Jul	8	0
KAGALASKA	C ALEU	4	0	30-Jun	15	0
KAGAMIL	C ALEU	6	0	28-Jun	13	0
KANAGA/CAPE CHUNU	C ALEU	3	0	30-Jun	0	0
KANAGA/CAPE MIGA	C ALEU	3	0	30-Jun	0	0
KANAGA/N CAPE	C ALEU	3	0	30-Jun	0	0
KANAGA/SHIP ROCK	C ALEU	3	1	30-Jun	350	207
KASATOCHI/NORTH POINT	C ALEU	4	1	9-Jul	587	376
KAVALGA	C ALEU	3	0	30-Jun	9	0
KONIUJI/NORTH POINT	C ALEU	4	0	9-Jul	0	0
LITTLE TANAGA STRAIT	C ALEU	4	0	30-Jun	5	0
OGLIUGA	C ALEU	3	0	30-Jun	22	0
OGLODAK	C ALEU	4	0	9-Jul	65	0
SAGCHUDAK	C ALEU	4	0	9-Jul	0	0
SAGIGIK	C ALEU	5	0	9-Jul	52	0
SALT	C ALEU	4	0	9-Jul	14	0
SEGUAM/FINCH POINT	C ALEU	5	0	9-Jul	112	2
SEGUAM/LAVA COVE	C ALEU	5	0	9-Jul	20	0
SEGUAM/LAVA POINT	C ALEU	5	0	9-Jul	0	0
SEGUAM/MOUNDHILL POINT	C ALEU	5	0	9-Jul	33	0
SEGUAM/SADDLERIDGE	C ALEU	5	1	9-Jul	694	530
SEGUAM/SW RIP	C ALEU	5	0	9-Jul	64	0
SEGUAM/TURF POINT	C ALEU	5	0	9-Jul	32	0
SEGUAM/WHARF POINT	C ALEU	5	0	9-Jul	2	0
SILAK	C ALEU	4	0	30-Jun	44	0
SKAGUL/S. POINT	C ALEU	3	0	30-Jun	9	0
TAG	C ALEU	3	1	9-Jul	174	104

Table 1. (continued)

SITENAME	REGION	RCA	ROOKERY	DATE	NON-PUP	PUP
TAGALAK	C ALEU	4	0	9-Jul	183	12
TANADAK (AMLIA)	C ALEU	5	0	9-Jul	0	0
TANAGA/BUMPY POINT	C ALEU	3	0	30-Jun	0	0
TANAGA/CAPE SASMIK	C ALEU	3	0	30-Jun	6	0
UGIDAK	C ALEU	3	0	9-Jul	4	0
ULAK/HASGOX POINT	C ALEU	3	1	9-Jul	409	173
ULIAGA	C ALEU	6	0	28-Jun	164	1
UNALGA+DINKUM ROCKS	C ALEU	3	0	30-Jun	0	0

Table 2. Counts of Steller sea lion non-pups (NP) and pups collected during 2014 ship-based surveys of rookeries and haul-out sites. Counts conducted from cliff tops, inflatable skiffs offshore, or from the research vessel are indicated as a “ground” source and sites surveyed with the UAS are labeled as “APH-22.” Rookeries are noted with a ‘1’ (≥ 50 pups in any year since 1970) and haulout sites with a ‘0’.

SITENAME	Region	RCA	Rookery	DATE	SOURCE	NP	Pup
AMCHITKA/COLUMN ROCK	C ALEU	2	1	28-Jun	GROUND	37	7
AMCHITKA/EAST CAPE	C ALEU	2	0	28-Jun	APH-22	146	9
AYUGADAK	C ALEU	2	1	28-Jun	APH-22	102	42
KISKA/CAPE ST STEPHEN	C ALEU	2	1	27-Jun	APH-22	182	71
KISKA/GERTRUDE-BUKHTI	C ALEU	2	0	27-Jun	GROUND	6	0
KISKA/LIEF COVE	C ALEU	2	1	26-Jun	APH-22	128	84
KISKA/SIRIUS POINT	C ALEU	2	0	21-Jun	GROUND	0	0
KISKA/SOBAKA-VEGA	C ALEU	2	0	27-Jun	GROUND	30	0
KISKA/WOLF POINT	C ALEU	2	0	21-Jun	GROUND	4	0
SEMISOPOCHNOI/PETREL	C ALEU	2	0	21-Jun	GROUND	3	0
SEMISOPOCHNOI/POCHNOI	C ALEU	2	0	21-Jun	APH-22	49	8
SEMISOPOCHNOI/SW KNOB	C ALEU	2	0	21-Jun	GROUND	0	0
SEMISOPOCHNOI/TUMAN POINT	C ALEU	2	0	21-Jun	GROUND	0	0
AGATTU/CAPE SABAK	W ALEU	1	1	25-Jun	APH-22	137	44
AGATTU/GILLON POINT	W ALEU	1	1	24-Jun	APH-22	158	80
AL Aid	W ALEU	1	0	22-Jun	APH-22	91	16
ATTU/CAPE WRANGELL	W ALEU	1	1	23-Jun	APH-22	141	34
ATTU/CHICHAGOF POINT	W ALEU	1	0	25-Jun	APH-22	64	0
ATTU/CHIRIKOF POINT	W ALEU	1	0	25-Jun	GROUND	2	1
BULDIR/NW ROCKS	W ALEU	1	1	22-Jun	GROUND	4	0
BULDIR/ROOKERY	W ALEU	1	1	22-Jun	GROUND	0	0
INGENSTREM ROCKS	W ALEU	1	0	22-Jun	GROUND	0	0

Table 3. Annual rates of change (% y^{-1} with $\pm 95\%$ credible intervals) in counts of Steller sea lion pups and non-pups by region, 2000-2014.

Region	Pups			Non-Pups		
	Rate	-95% CI	+95% CI	Rate	-95% CI	+95% CI
Eastern Gulf of Alaska	4.44	2.36	6.42	5.22	2.48	8.06
Central Gulf of Alaska	2.14	0.45	3.61	2.61	1.46	3.76
E/C Gulf combined	2.83	1.58	4.07	3.67	2.36	5.08
Western Gulf of Alaska	3.27	1.86	4.72	4.09	2.77	5.33
Eastern Aleutian Is.	3.55	2.43	4.62	2.30	0.98	3.67
East of Samalga Pass	3.18	2.44	3.91	3.41	2.59	4.15
Central Aleutian Is.	-0.64	-1.56	0.23	-0.27	-1.17	0.61
Western Aleutian Is.	-8.92	-10.14	-7.53	-7.10	-8.66	-5.57
W of Samalga Pass	-1.66	-2.46	-0.86	-1.22	-2.02	-0.4
Bering Sea (Walrus I.)	-7.17	-10.89	-3.00			
Western DPS in AK	1.76	1.16	2.31	2.17	1.54	2.76

Figure 1. Terrestrial rookeries and haul-out sites in the survey area of the Aleutian Islands and western Gulf of Alaska in the range of the western distinct population segment (DPS) of Steller sea lion in Alaska. Survey regions and rookery cluster areas (RCAs) are depicted.

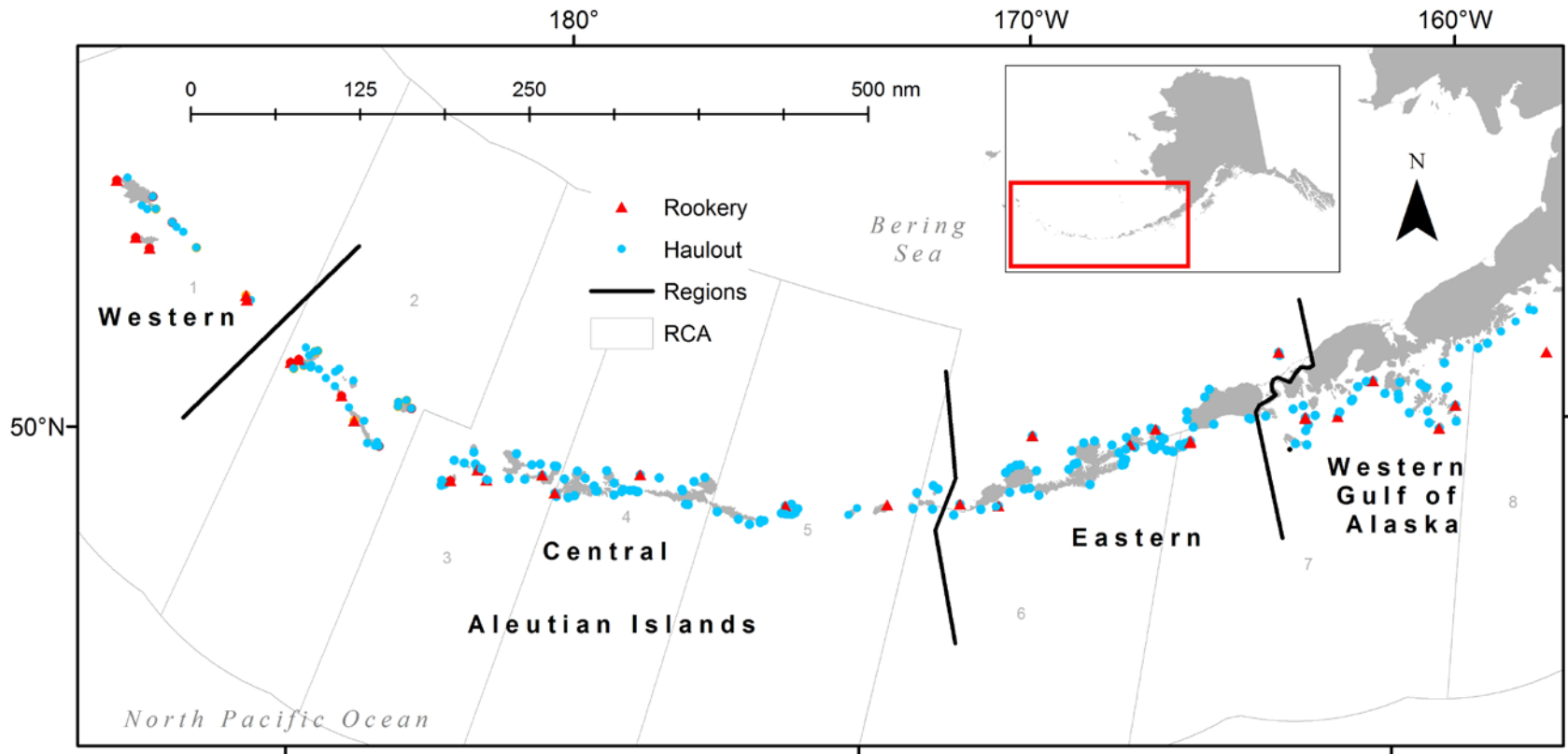


Figure 2. Steller sea lion terrestrial sites where pup and non-pup were counted during 2014 ship-based and aerial surveys in the eastern, central, and western Aleutian Islands, and western Gulf of Alaska regions.

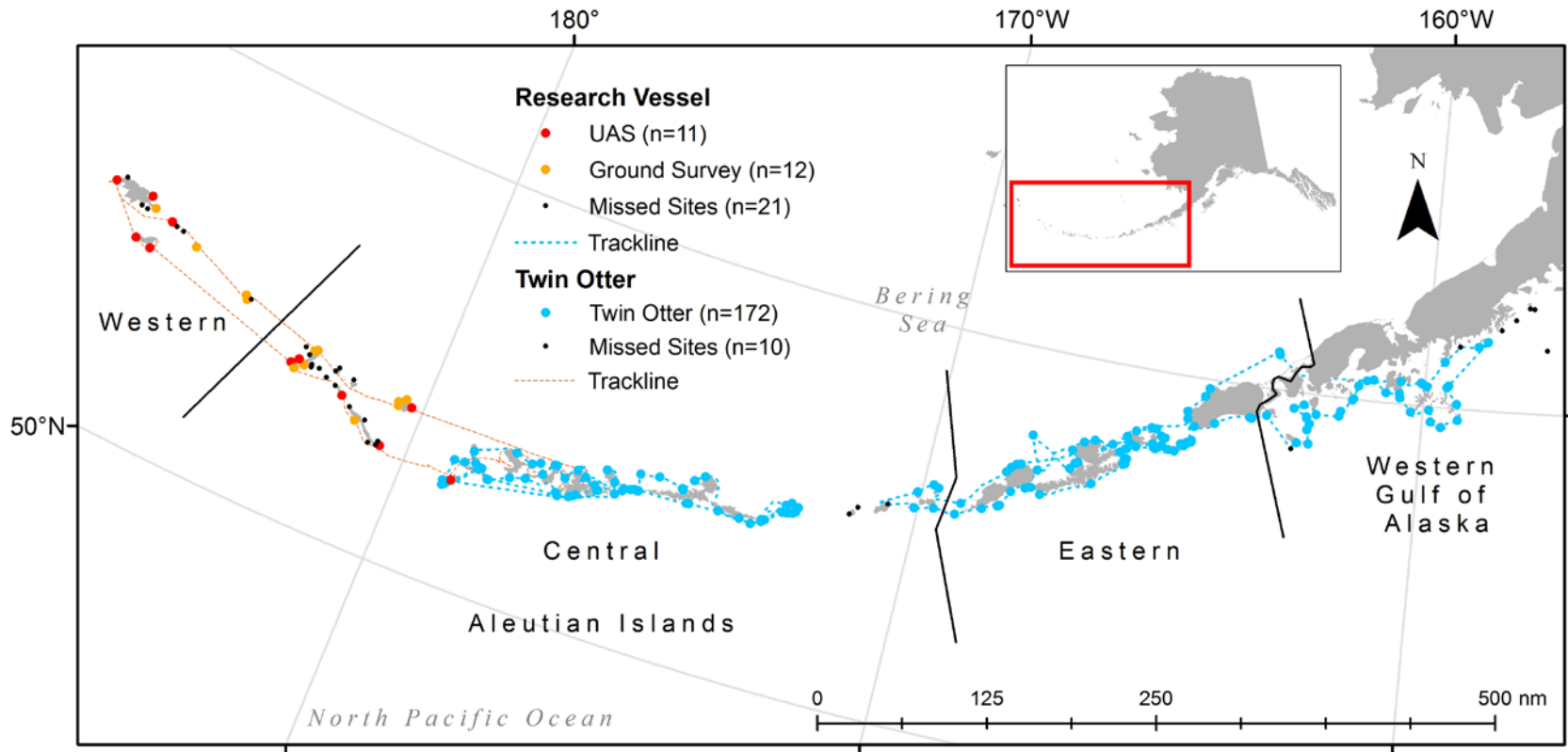


Figure 3. Estimated counts of western Steller sea lion pups by region in Alaska using agTrend (Johnson and Fritz 2014), 1990-2014. ALEU=Aleutian Islands; GULF=Gulf of Alaska; BERING=Walrus Is (Pribilofs). Blue line=average trend 2000-2014. Grey zone=90% credible interval of estimated realized count. Vertical black lines=90% credible interval on estimated actual count.

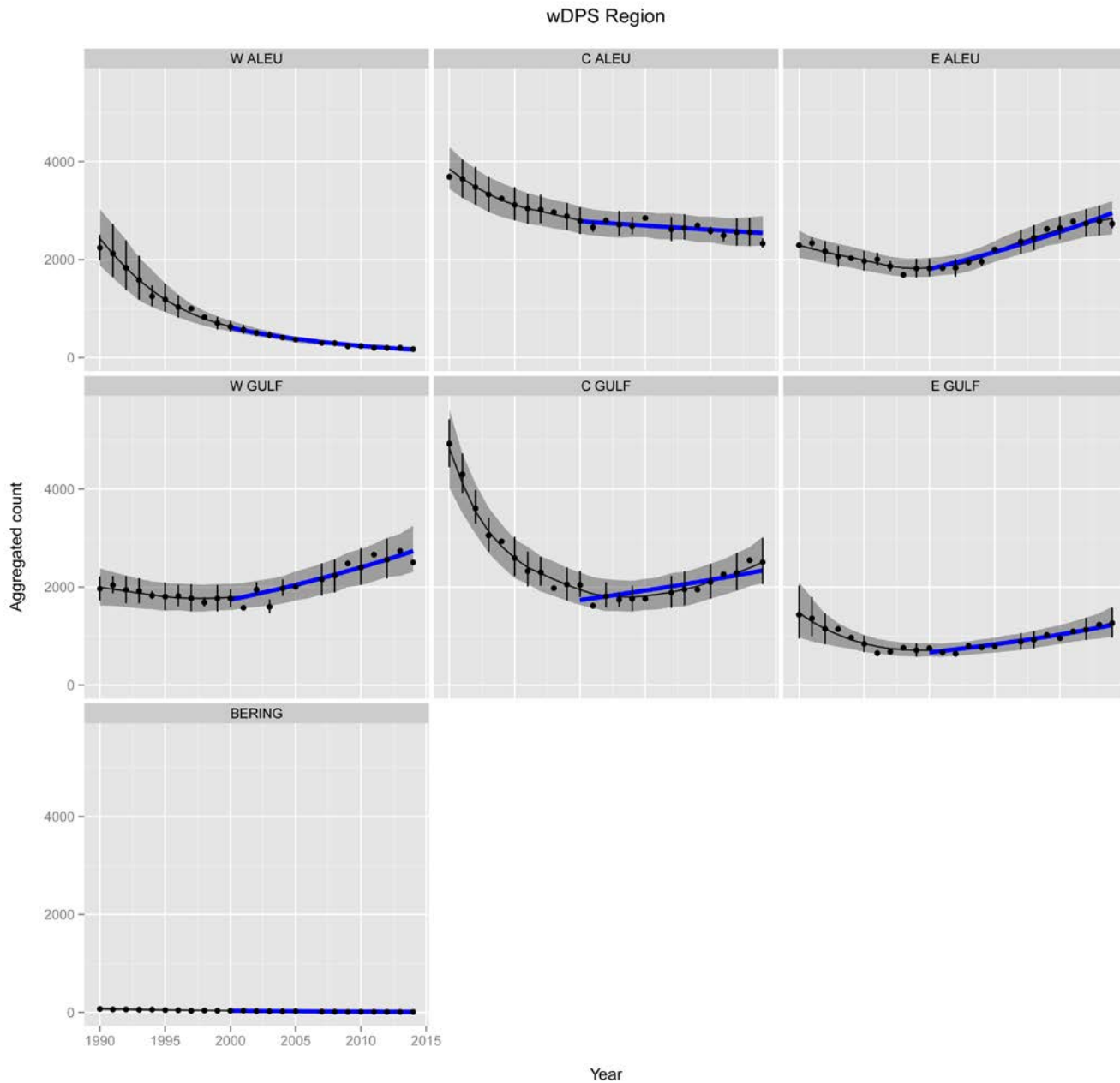


Figure 4. Estimated counts of western Steller sea lion non-pups by region in Alaska using agTrend (Johnson and Fritz 2014), 1990-2014. ALEU=Aleutian Islands; GULF=Gulf of Alaska. Blue line=average trend 2000-2014. Grey zone=90% credible interval of estimated realized count. Vertical black lines=90% credible interval on estimated actual count.

