Overview of Recent Steller Sea Lion Telemetry Work in Alaska

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Steller sea lions in the endangered western stock of Alaska have declined by more than 80% since the 1970s (Loughlin et al. 1992, Sease and Loughlin 1999). Nutritional stress has been the leading hypothesis for the decline of the Steller sea lion population. The reproductive success of adult females and survival of juveniles to maturity are important factors in the population dynamics of Steller sea lions (York 1994). To gain a better understanding of movements, foraging behavior, dive ontogeny, and resource selection, location-, haulout-, and dive-reporting satellite data recorders (SDRs) and location-only Argos platform transmitter terminals (PTTs) have been deployed on adult females with dependent young and juvenile (<3 years-of-age) Steller sea lions. Between 1989 and 2001, 179 instruments were deployed on Steller sea lions in Alaska by the Alaska Department of Fish and Game (ADFG) and National Marine Mammal Laboratory (NMML) (Table 1, Fig. 1). Of those, 94 instruments were deployed in the western stock and 85 instruments were deployed in the eastern stock.

Initial satellite telemetry efforts focused on adult female foraging capabilities and the movements of adult females with dependent pups on the rookery. Adult females were captured on the haulout by darting with Telazol, and instruments attached to the pelage using fast-setting epoxy and nylon mesh. Fifty-four instruments were deployed on adult females from 1990 to 1993. Results from these studies have been previously reported by Merrick et al. (1994) and Merrick and Loughlin (1997). An analysis of the foraging ecology of adult females with dependent pups is in preparation (R. Andrews, University of British Columbia, Vancouver, pers. comm.)

Table 1. Stock (Western and Eastern divided at Cape Suckling), region, capture period, sex, approximate age class, and number of satellite data recorders (SDRs) deployed on Steller sea lions in Alaska, with mean deployment duration and range of SDRs.

Stock/region	Capture period	Age class: Pups/Juveniles M	Age class: Pups/Juveniles F	Age class: Adults F	Total no. SDRs deployed	Mean deployment duration/range (days)
Western stock						
NMML						
Central Aleutians	Jul 90, Feb 00	1	3	5	9	43(0-104)
Eastern Aleutians	Jun 90, Jul/Nov 91	4	3	8	15	38(1-67)
GOA-W	Jul 91,93; Mar 96	1	1	6	8	28(0-52)
GOA-C (Kodiak region)[b]	Jun/Dec 90, Jun 91, Feb/Jul 92, Feb 93, Dec 94, Jan 96	7	3	21	31	45(0-174)[a]
Total		13	10	40	63	
ADFG						
GOA-C (Kodiak)	Mar 01	10	3		13	[a]
GOA-E	Jan 93		1	1		114
GOA-E	Jan 95		1	1		129(113-145)
GOA-E	Jun 95		1	0	1	11
PWS	Apr 00	4	4		8	42.5(10-78)
PWS	Apr 00	0	2		2	64(54-74)
PWS	Aug 00	1	3		4	67.8(51-103)
Total		17	13	1	31	
Eastern stock						
SE-N	Nov 98	5	5		10	44.6(12-119)
SE-N	Jan 00	2	5		7	81.6(60-138)
SE-N	Jan 00	2	1		3	146.7(120-181)
SE-N	May 01	2	2		4	[a]
SE-N	May 01	1	1		2	[a]
SE-C	Mar 98	7	5		12	81.7(30-143)
SE-C	Aug 99	4	6		10	5.6(3-13)
SE-C	Sept 00	3	2		5	106(82-114)
SE-C	May 01	5	3		8	[a]
SE-S	May/Jul 92	0	1	5	6	40(28-84)
SE-S	Jun/Jul 93			7	7	28(21-36)[c]
SE-S	July 98	3	7		10	21.1(11-34)[c]
SE-S (NMML)	Jul 91			1	1	<1
Total		34	38	13	85	

[a]Data collection still in progress as of 31 May 2001.

[b]10 instruments deployed by NMML in Unimak Pass during March 2001 are not included in this table.

[c]Feeding trips for summer-captured adult females with pups are being analyzed for Andrews et al. (in prep). Locations outside feeding trips not used.

PWS = Prince William Sound, GOA-C = Central Gulf of Alaska, GOA-E = Eastern Gulf of Alaska, SE = Southeast Alaska, N = North, C = Central, S = south. Pups/Juveniles are <36 months of age.

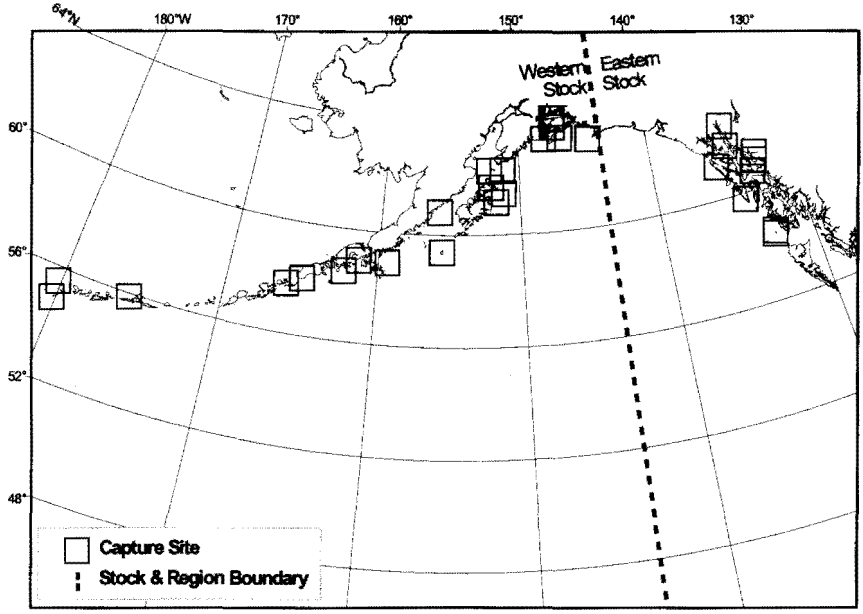

Figure 1. Steller sea lion haulouts and rookeries at which SDRs and PTTs have been deployed by ADFG and NMML.

Reduced juvenile survivorship is believed to be one of the primary factors contributing to the decline of the Steller sea lion (York 1994). After emphasis shifted from adult to juvenile survival, we deployed SDRs on juveniles to better describe the early life history of Steller sea lions. This information will yield a more complete picture of the diving capabilities of juveniles and how they compare to adult female sea lions. With this information, we may better understand the limitations in dive behavior of juveniles, describe their usage of at-sea habitat near haulouts, identify the transition between the behavior of nutritionally dependent pups to independently foraging juveniles, and understand how diving ability may affect their ability to obtain prey.

We used two different methods to capture juvenile Steller sea lions: capturing animals on land, and capturing animals using the underwater technique developed by D. McAllister and W. Cunningham (ADFG unpubl. data). As of May 2001, 125 SDRs have been deployed on juvenile animals (Table 1, Fig. 1). Of those, 53 (30 on males, 23 on females) were deployed in the western stock and 72 (34 on males, 38 on females) were deployed in the eastern stock. SDR deployment duration ranged from 0 to 181 days. Earlier juvenile telemetry results have been reported by Merrick and Loughlin (1997). Results of more recent studies are in preparation (dive

development, M. Rehberg; movement and resource selection, K. Raum-Suryan; and integrated movement and diving behavior, T. Loughlin, NMFS NMML, Seattle, Washington, pers. comm.).

SDR instrumentation of juveniles continues, and the future goals of juvenile satellite telemetry work are to integrate the dive and location information with concurrent studies by other researchers, such as forage fish distribution and biomass studies (Gulf Apex Predator-Prey study and Southeast Alaska Predator-Prey study, K. Wynne (University of Alaska Fairbanks) and M. Sigler, National Marine Fisheries Service, Juneau, Alaska, pers. comm., forage information from scat collections, and nutritional status (M. Rehberg, unpubl. data).

ADFG and NMML had slightly different goals for pre-2001 juvenile deployments. ADFG, studying diving ontogeny during the first 2 years of life, programmed its instruments with a day-on/day-off duty cycle to extend SDR life as long as possible. NMML, studying the use of habitat near western stock haulouts, did not use a daily duty cycle, which resulted in a more continuous set of location data. Since January 2000 ADFG and NMML have programmed their SDRs to collect dive and haulout data in a compatible fashion, which will permit better comparisons between the eastern and western Steller sea lion stocks.

The most recently deployed SDRs (since March 2001) have increased battery capacity at least double that of earlier units, allowing longer, non-duty-cycled deployments and greater data transmission rates. Programming changes devised by NMML have increased the quantity and diurnal spread of location and dive data reported (although data completeness continues to vary by individual). Attachment techniques developed by ADFG have increased the duration of instrument attachment to 8 months (although antenna durability remains an issue). Our future goals include testing improved instrumentation and instrument placement locations on sea lions, which should allow collection of more detailed location, dive, and haulout information.

References

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STELLER SEA LION DECLINE: IS IT FOOD II

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