

# Closing the Loop on Research Impact Monitoring: Potential Research Mortality Risk to Steller Sea Lion Populations in Alaska Greatly Overestimated Actual Exposure

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## Background

- In 2007 the National Marine Fisheries Service implemented a mortality risk analysis to assess potential impacts of scientific research activities on Steller sea lion populations (NMFS 2007).
- That analysis was based on the types of activities and numbers of associated takes requested in permit applications, and produces an estimate of the cumulative potential mortality risk for all authorized research.
- Risk is quantified as potential mortalities that could be expected to be observed by researchers or go unobserved should the requested activities be permitted, and the total compared to benchmarks in the Marine Mammal Protection Act for limited anthropogenic impacts.
- Permits for research are subsequently approved based on that analysis, but no formal process exists to review annual research activities to determine the magnitude of actual impact and thus no way to determine whether research activities should be further limited or could be safely increased.
- To evaluate the actual Steller sea lion population exposure risk authorized takes were compared with actual takes to calculate the subsequent real mortality risk.

## Methods

- The actual mortality risk was calculated based on activities and takes presented in annual reports of 18 researchers during the first two reporting periods after receiving permits, and applying the analytical framework NMFS (2007) used to evaluate permit applications.
- The core of this analysis uses an accounting process that stratifies take activities and numbers into potential exposure levels (e.g. researcher presence in-view of animals is less of a potential effect than being among animals, or than capturing animals) with associated risks of serious injury or mortality expressed as rates per animal. These rates are either estimated (in the case of the potential for injuries or mortalities to occur but go unobserved) or determined from researcher reports (if available to estimate potential observed mortality rates).

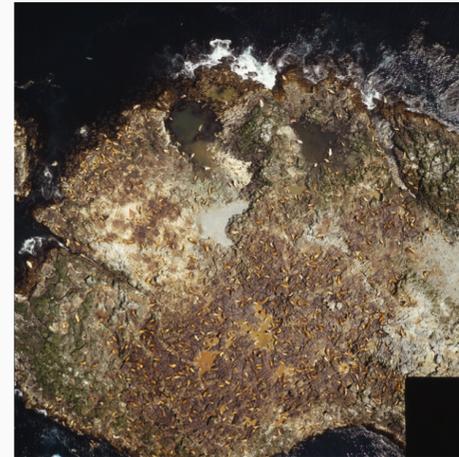


Image from an aerial survey conducted "in-view" of animals (NOAA photo by NMML-AEP).



Researchers in-view of and among animals during the breeding season (NOAA photo by Jeremy Sterling).



Sea lion captures in-view of animals. Risk assessments of research activities must include multiple exposure levels (ADF&G photo).

### Actual research takes of Steller sea lions were far lower than requested in permit applications.

Authorized and reported research and incidental harassment takes by research activity and age class of Steller sea lions during reporting periods 1 (June 26, 2007 – August 1, 2007) and 2 (August 2, 2007 – August 1, 2008).

Activity	Age class <sup>1</sup>	Authorized takes per year	Reported takes <sup>2</sup>	
			Period 1	Period 2
<b>Western stock</b>				
Aerial survey	Pup	16,664	4,174	7,954
	Non-pup	82,336	11,262	46,326
	Subtotal	99,000	15,436	54,280
Incidental disturbance	Pup	7,137	379	859
	Non-pup	22,213	3,571	10,944
	Any <sup>3</sup>	77,110		
	Subtotal	106,460	3,950	11,803
Capture	Pup	1,412	590	540
	Non-pup	2,705	0	71
Capture/temporary captivity	Non-pup	30	0	11
	Subtotal	4,147	590	622
Accidental mortality	Any	32	0	1
<b>Eastern stock</b>				
Aerial survey	Pup	6,500	0	3,293
	Non-pup	41,000	0	17,183
	Any	39,000	0	0
	Subtotal	86,500	0	20,476
Incidental disturbance	Pup	13,000	800	500
	Non-pup	16,650	3,583	4,299
	Any <sup>3</sup>	61,800		
	Subtotal	91,450	4,383	4,799
Capture	Pup	1,248	193	0
	Non-pup	139	0	0
	Subtotal	1,387	193	0
Accidental mortality	Any	29 <sup>4</sup>	0	0

<sup>1</sup>Age class definitions: pups: animals up to 2 months old on a rookery during June-July; non-pups: any animal >2 months old; any: includes pups and non-pups.

<sup>2</sup>Requested potential takes for aerial surveys are based on counts of animals expected to be present. Some permit holders reported the number of animals counted during the survey (not the same as actually may have reacted to the activity), and others reported the numbers of animals reacting to the activity.

<sup>3</sup>Many permits specified the age class for incidental disturbance as "any" or "all" for 61,800 takes annually in addition to those specifically authorized for pups or non-pups. However, actual takes were separable into pup or non-pup age classes based on permit reports.

<sup>4</sup>A total of 29 accidental mortalities were authorized for 2008, while 28 were authorized for 2007.

### Mortality risk of research activities was much lower than initial estimates

Estimated potential mortality risk to Steller sea lions based on type and amount of research activities requested in permit applications (Applications) and subsequently conducted and reported (Reports). The mortality risk was 90-96% less for the western and 92-98% less for eastern stock.

Permit	Period 1 <sup>1</sup>		Period 2	
	Applications	Reports	Applications	Reports
<b>Western stock</b>				
358-1888	2.3	0.0	2.3	0.5
715-1884	0.0	0.0	0.0	0.0
715-1885	2.2	0.0	2.2	0.0
782-1889	8.7	1.0	8.3	1.8
881-1890	12.0	0.3	12.0	0.7
1034-1887	3.1	0.0	3.1	0.0
1049-1886	1.2	0.0	2.7	0.2
1118-1881	0.0	0.0	0.0	0.0
1119-1882	0.0	0.0	0.0	0.0
Western stock predicted	29.5	1.3	30.6	3.1
<b>Eastern stock</b>				
358-1888	15.8	0.0	15.8	0.0
434-1892	7.4	2.1	7.4	0.3
715-1885	0.8	0.1	1.5	0.1
782-1702	0.1	0.0	0.1	0.0
782-1889	1.0	0.0	1.0	0.2
1034-1887	1.3	0.0	1.3	0.0
Eastern stock predicted	26.4	2.2	27.0	0.6

<sup>1</sup>Reporting period does not include an entire calendar year, but the estimated mortality rate based on permit applications encompasses an entire year.

### Actual research-related mortality rate was less than expected

For the two reporting periods 20 potential western stock observed mortalities were expected based on activities requested, but based on reported activities the exposure risk could have resulted in 0.6 observed mortalities, and 1 mortality was observed. In the eastern stock 16 potential observed mortalities were expected, but the exposure based on reports could have resulted in 1.4 observed mortalities and none were observed.

	Period 1		Period 2	
	Applications	Reports	Applications	Reports
<b>Western DPS</b>				
Predicted total	29.5	1.3	30.6	3.1
Predicted unobserved	19.6	1.2	20.7	2.7
Predicted observed	9.9	0.1	9.9	0.5
Actual observed		0.0		1.0
<b>Eastern DPS</b>				
Predicted total	26.4	2.2	27.0	0.6
Predicted unobserved	18.6	0.9	19.3	0.6
Predicted observed	7.7	1.4	7.7	0.0
Actual observed		0.0		0.0

## Are research activities likely to impact Steller sea lion populations?

**No** The analytical matrix instituted by NMFS (2007) provides a framework to quantitatively compare potential impacts of proposed research activities with sea lion population status.

The estimated risk to Steller sea lion populations by research proposed in permit applications was far greater than actually existed, or that occurred as a result of real research activity.

## Is there a disparity of estimated impact between permitted and actual research activities?

**Yes** Many factors may lead to a difference between permitted and reported takes and estimated impact:

The MMPA and Endangered Species Act (ESA) definitions of take are too broad for detailed impact assessment, and include the "potential" for a take to occur. Thus for many research activities (e.g., aerial or vessel surveys) the number of takes requested must thus equal the maximum number of animals that could be present during the activity, and the number of animals actually present must be reported. However with appropriate skill and mitigation measures to reduce disturbance, in most cases the number of animals that noticeably react to an activity (let alone experience an injury or death) has been observed to be much less than the number likely to be present.

Steller sea lion permits were issued for multiple years but modifications that would change the number or types of takes were prohibited (and are now limited). These limitations may result in inflated take requests, as applicants must ensure numbers are adequate to cover efforts that could be undertaken with new funds and/or to respond to new research priorities or directions. Without such a buffer important opportunities to address recovery concerns are lost.

It is also possible that take requests are inflated to ensure actual takes remain less than authorized takes to prevent non-compliance with issued permit conditions.

## Is this important for marine mammal research?

**Yes** Because it is critical to conduct research on marine mammal species at risk, especially in Alaska and Arctic regions, retrospective review analyses as used in this study should be integrated into permitting processes to avoid unnecessary restrictions on research activity and to responsibly monitor and mitigate potential research impacts.

## Literature Cited

NMFS. 2007. Steller sea lion and northern fur seal research final programmatic environmental impact statement. DOC-NOAA-NMFS-OPR-PD Silver Spring, MD.

