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# Steller sea lion ecology and status

Steller sea lion population status, life history, ecology,  
behavior, distribution, etc.

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Marine Mammal Laboratory

May 12, 2020

# Steller sea lion

- First described by Georg Steller in 1741
- *Eumetopias jubatus* - “broad forehead” “mane”
- The largest Otariid



# Steller sea lions and California sea lions



***Eumetopias jubatus***

Max size: 2.9 m (F) – 3.25 m (M)

Weight: 350 kg (F) – 1120 kg (M)



***Zalophus californianus***

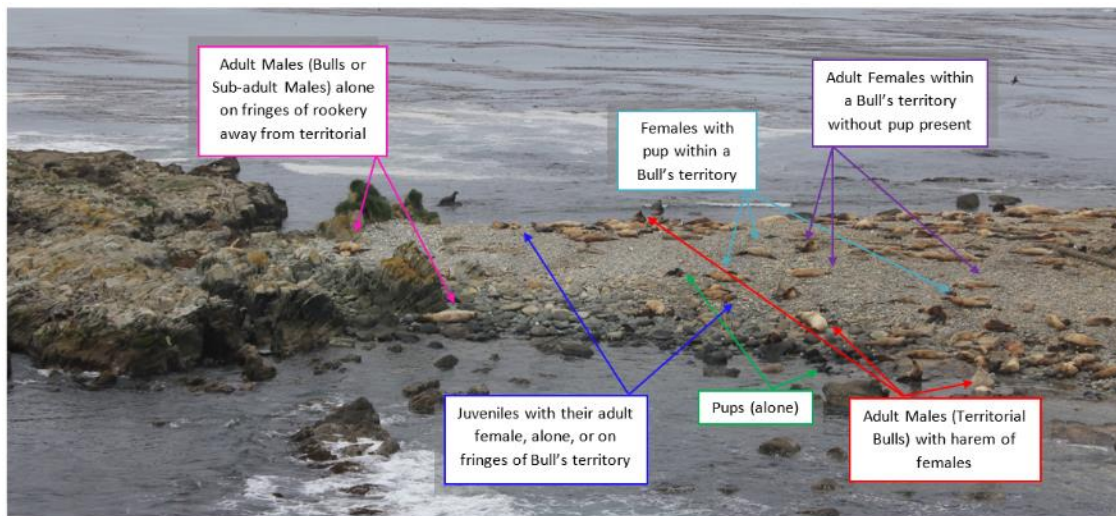
Max size: 1.8 m (F) – 2.4 m (M)

Weight: 100 kg (F) – 350 kg (M)  
(> 600 kg at Bonneville dam)



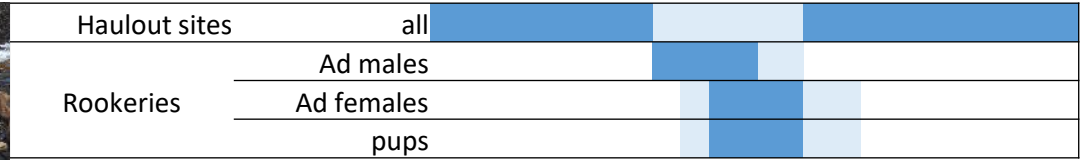
# Rookery Structure

## Harem males guard and defend females and pups

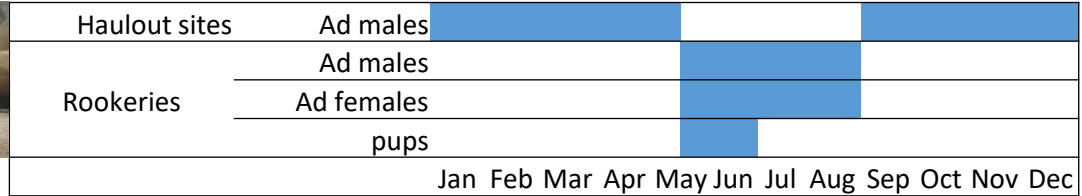


# Seasonal cycle

Steller sea lion



California sea lion



Images: NMFS/Jeff Harris, Tony Orr

# Weaning and independence

Steller pups stay with their mother for a longer period

## Steller sea lion

- Perinatal period ~10 days (1-17 days)
- Maternal foraging trip cycles from rookery for 2-3 months
- Mother pup-pairs may remain at rookeries or relocate as pup swim ability increases; adult females leave rookeries with ~2 month-old pups and move as far north as BC (Wright et al. 2017)
- Weaning: 9 months – 3 years (60-80% in first year)

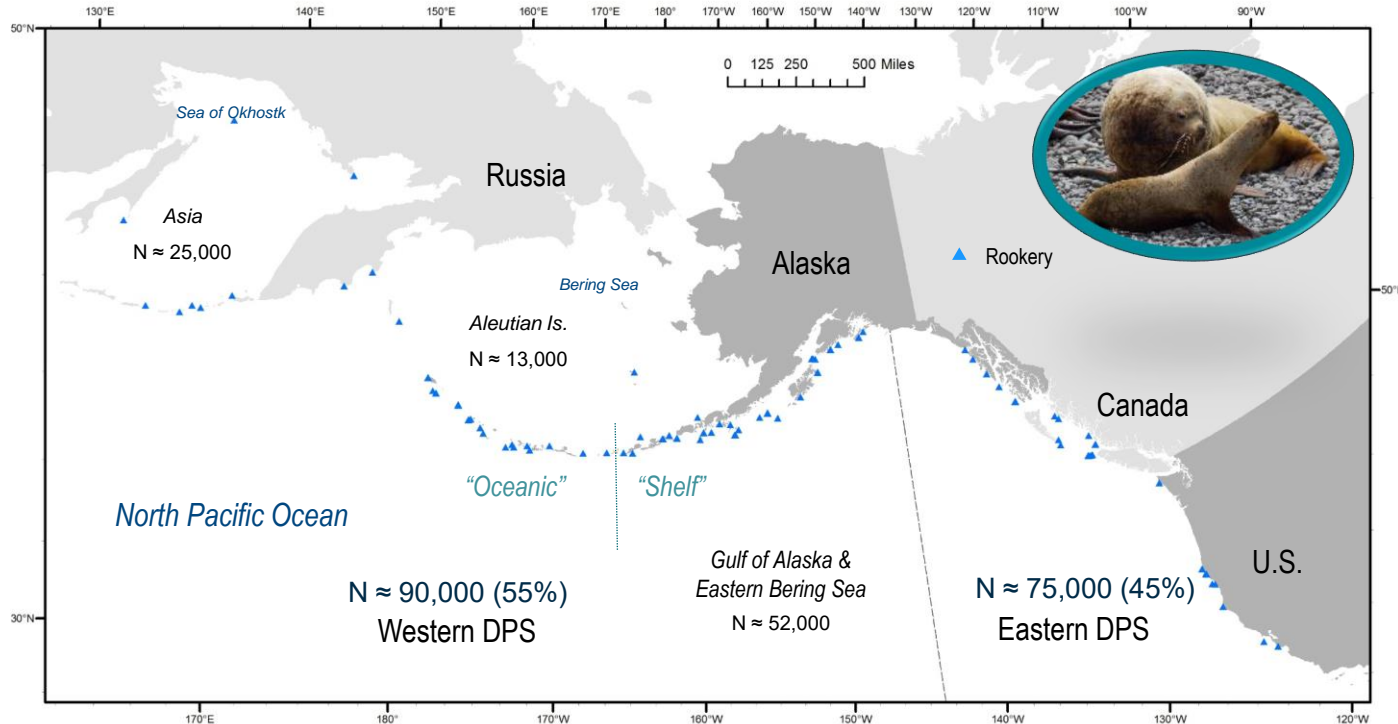


## California sea lion

- Perinatal period 5-8 days
- Maternal foraging trip cycles from rookery for 8-11 months
- Mother pup-pairs remain at (or close to) rookeries
- Weaning: 10-11 months (as young as 6 months if poor foraging conditions)

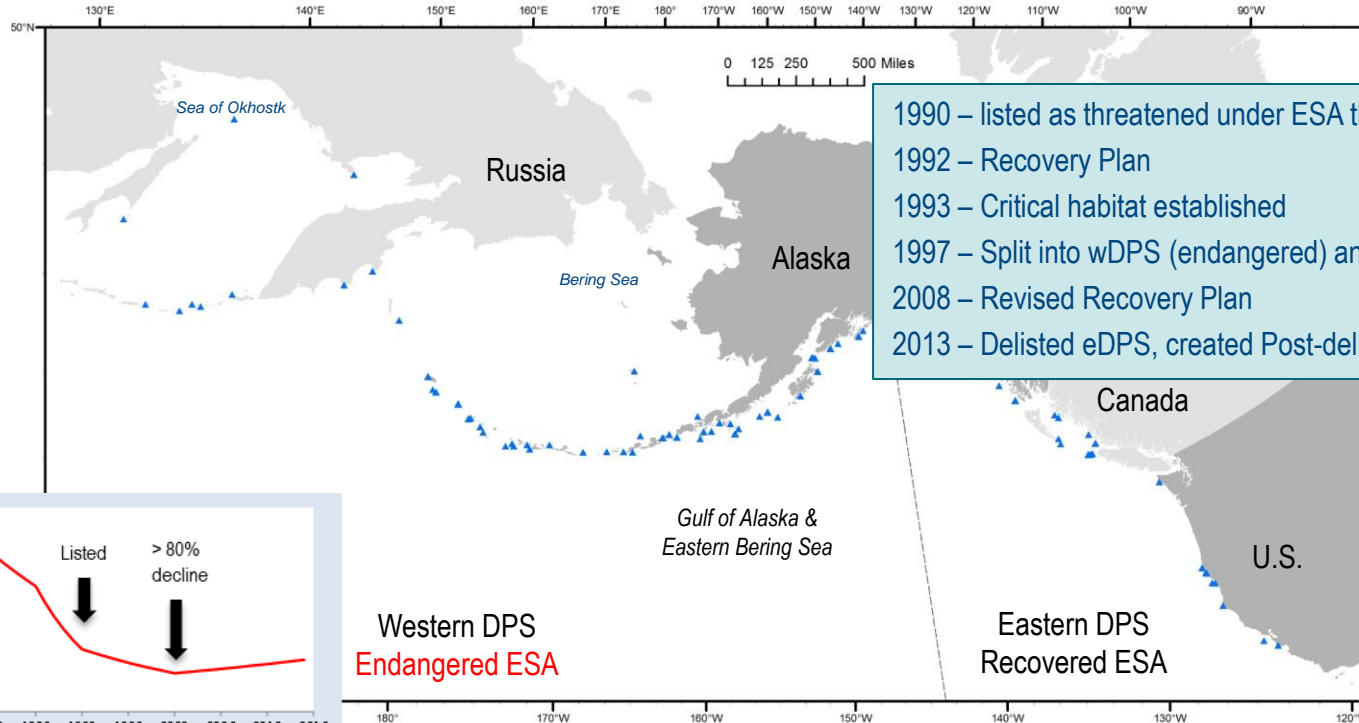


# Steller sea lion abundance and stock structure

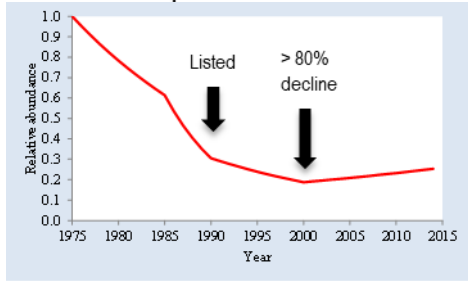


- ~165,000 Steller sea lions breed at 76 rookeries across North Pacific Ocean rim
- Sub-structure within wDPS
  - Asia, “Oceanic” AK west of Samalga Pass, “Shelf” AK east of Samalga Pass

# Steller sea lion management actions

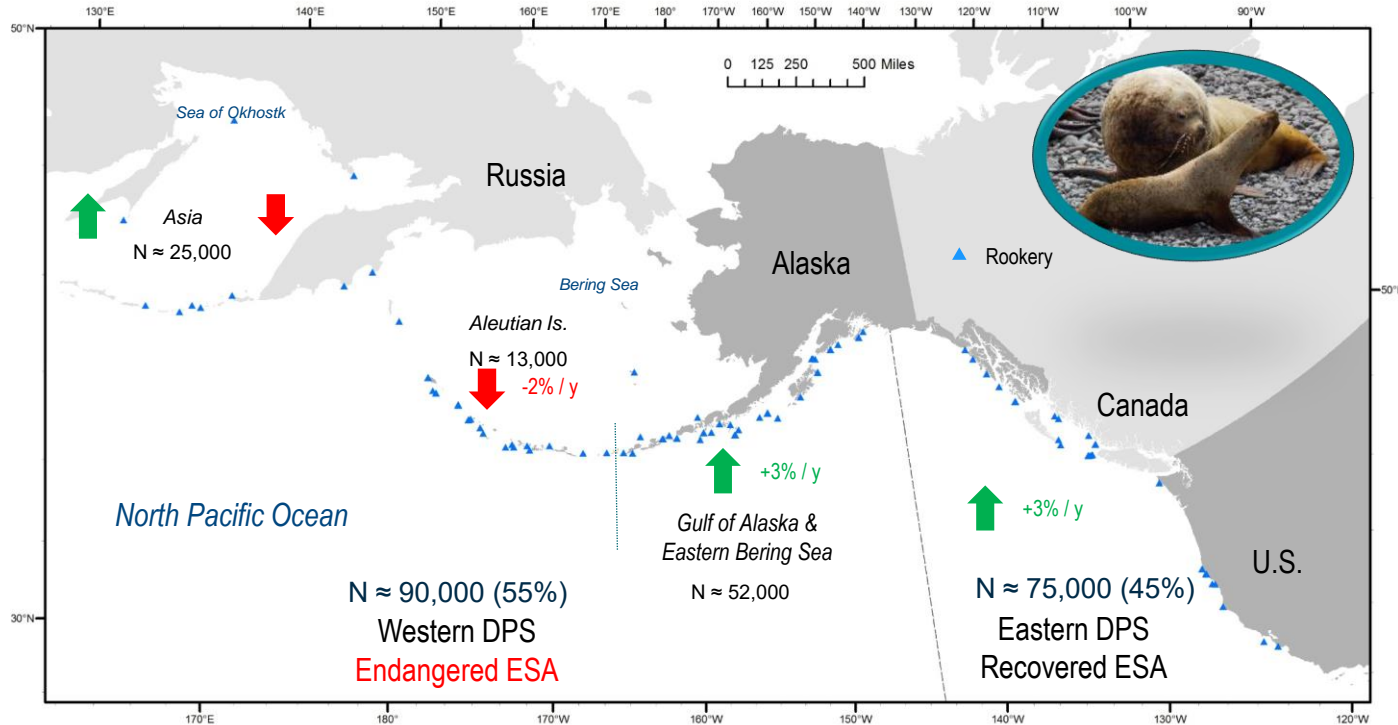


- 1990 – listed as threatened under ESA throughout entire range
- 1992 – Recovery Plan
- 1993 – Critical habitat established
- 1997 – Split into wDPS (endangered) and eDPS (threatened)
- 2008 – Revised Recovery Plan
- 2013 – Delisted eDPS, created Post-delisting Monitoring Plan





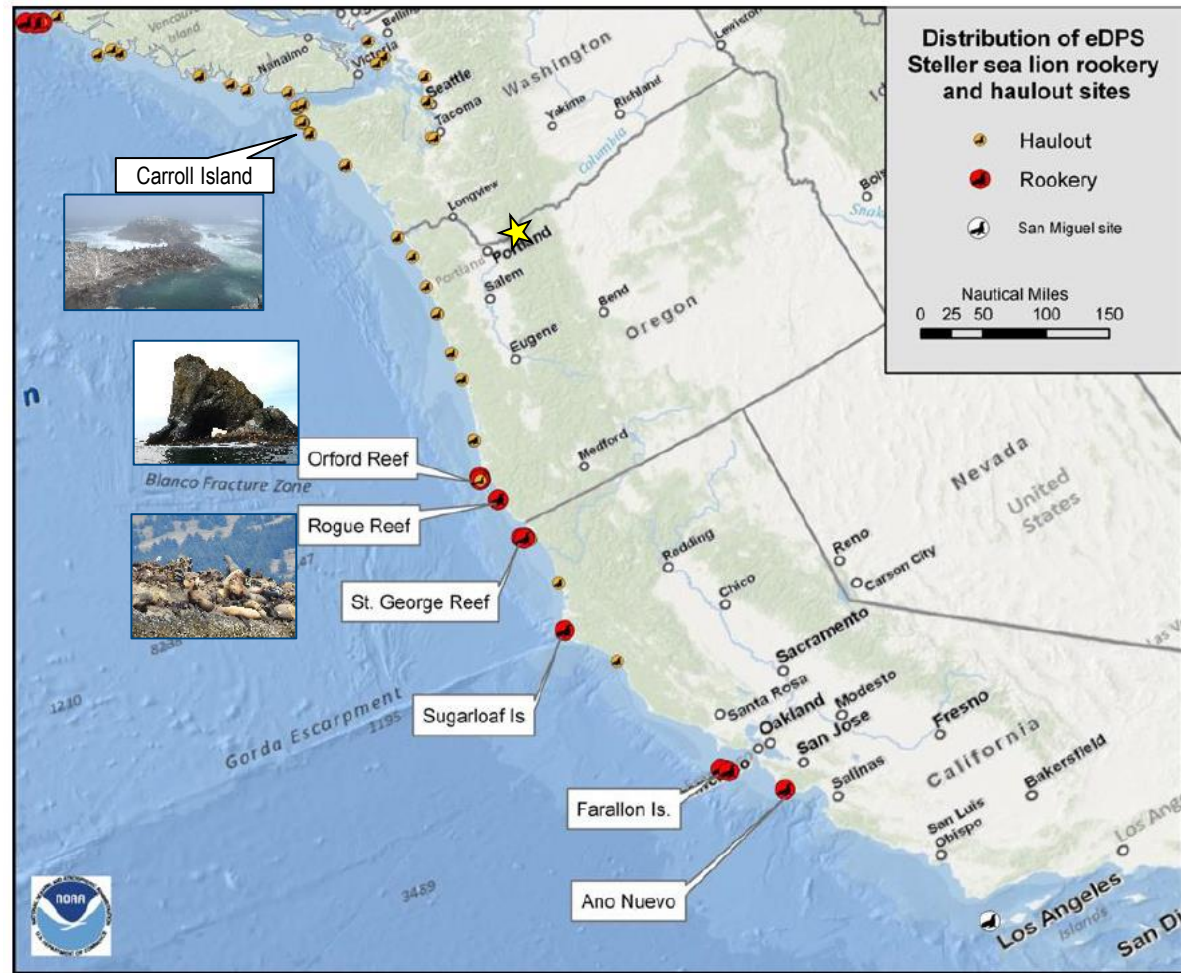
# Steller sea lion recent population trends



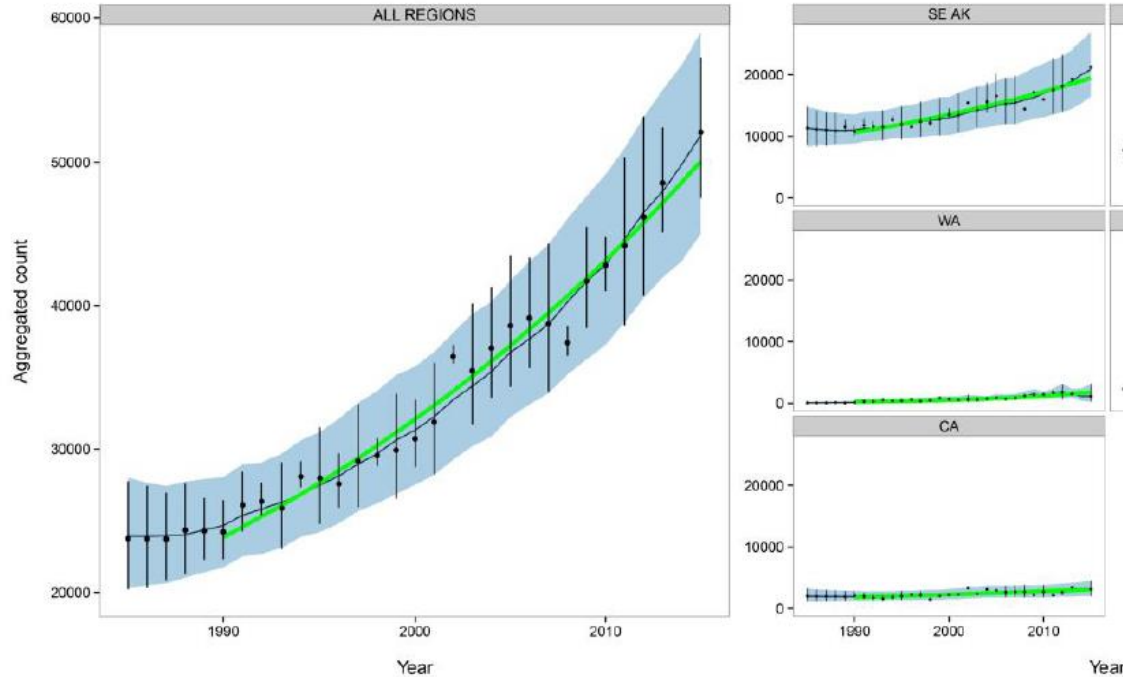
# Distribution of eDPS Steller sea lion haulouts and rookeries

Pups appearing in Washington since about 2008 (>200 in 2019)

San Miguel Island rookery last used in 1981



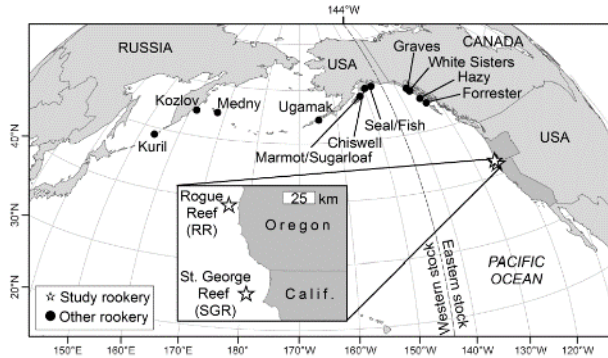
# Steller sea lion estimated eDPS non-pup counts 1989-2015



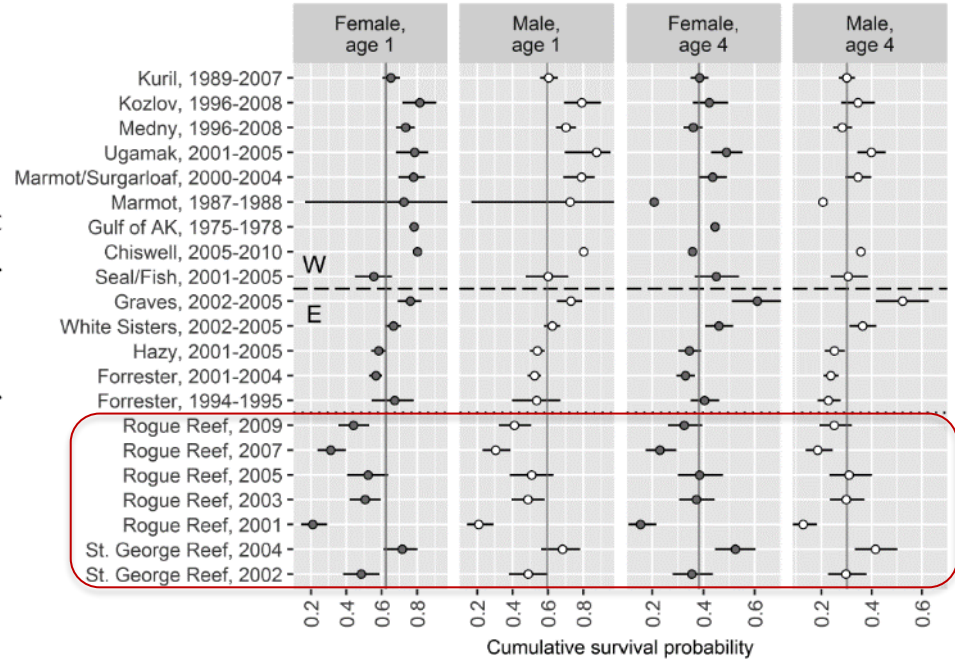
Region	Non-pups			
	Trend	-95%	+95%	2015
California, U.S.	1.95	0.36	3.53	3,120
Oregon, U.S.	2.39	1.08	3.54	5,634
Washington, U.S.*	8.77	6.00	11.37	1,407
British Columbia, Canada	3.43	2.64	4.22	20,689
Southeast Alaska, U.S.	2.33	1.54	3.07	20,756
<b>Total Eastern Stock</b>	<b>2.84</b>	<b>2.36</b>	<b>3.33</b>	<b>52,139</b>
<b>Total U.S. Eastern Stock</b>				<b>30,917</b>

# Juvenile survival

Wright et al. 2017, *J. Mammalogy*



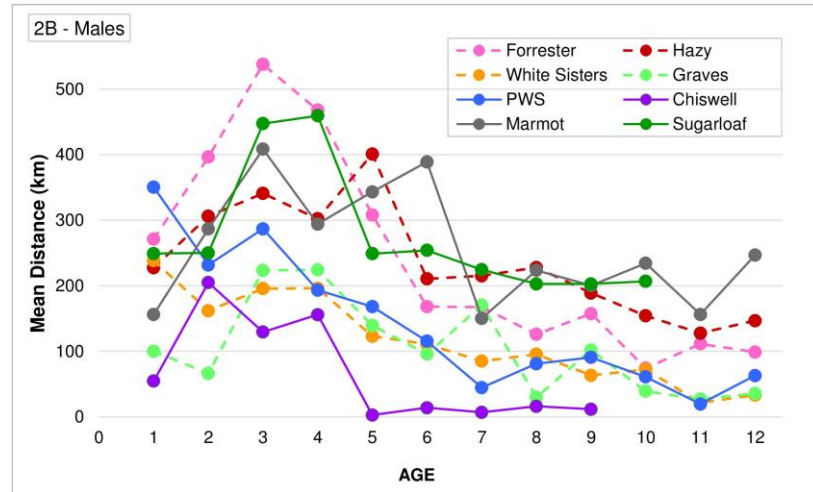
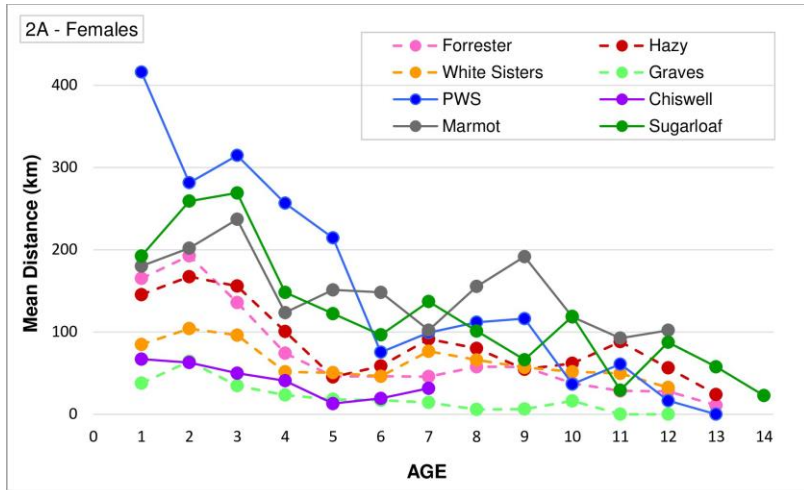
Study location and year(s)



Survival of Oregon/California pups to age 1 old is lowest of range and variable, but is offset by high yearling survival resulting in average survival rates to age 4 years old.



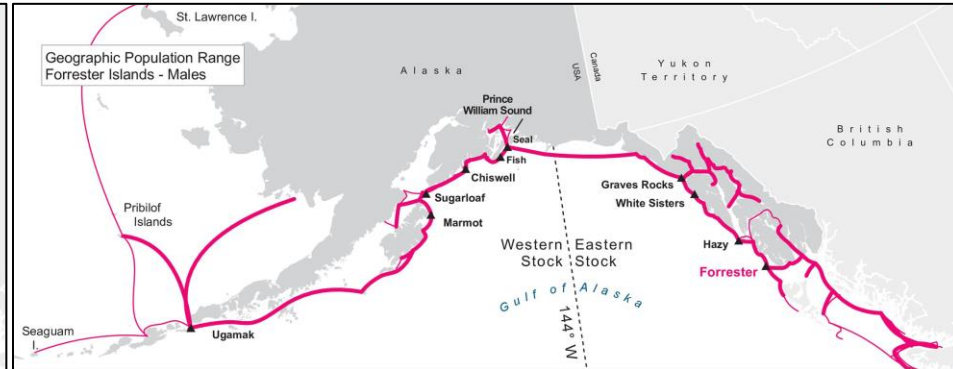
# Age/sex differences in movements



Mean distances Steller sea lions were observed from their natal rookeries in Alaska  
(Jemison et al. 2018, PLoS ONE)

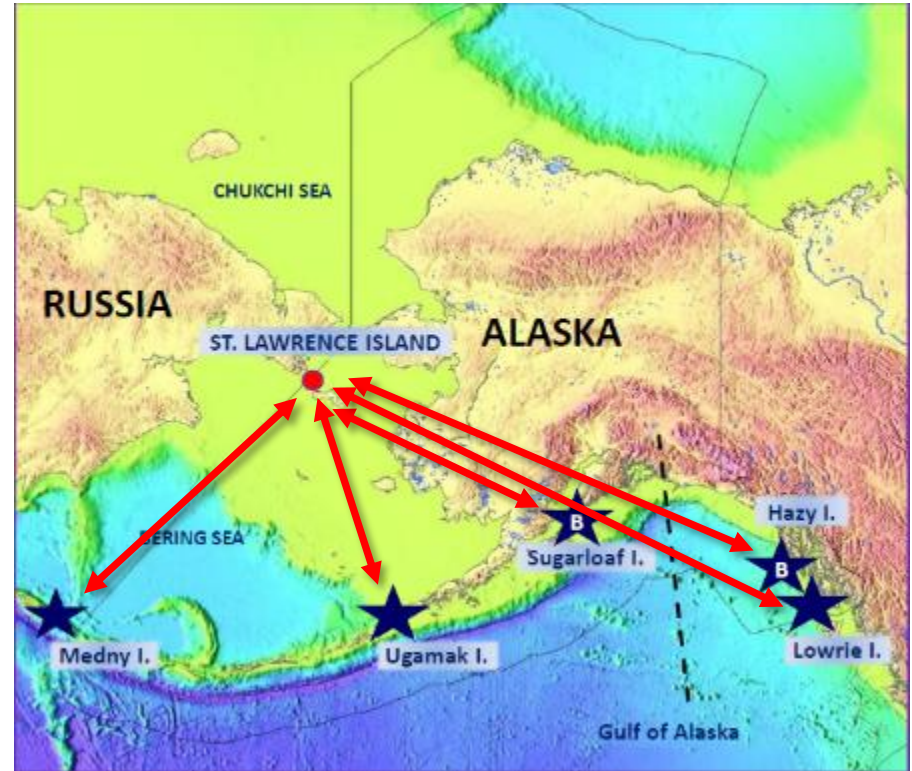
# Regional movements, females vs males

*Jemison et al. 2018, PLoS ONE*



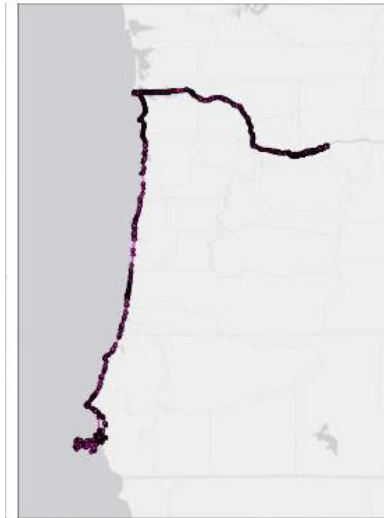
# Adult males travel far for dense prey aggregations

Adult male 4-10 year olds from rookeries (starred) at St Lawrence Is during late fall (Sheffield and Jemison 2012)

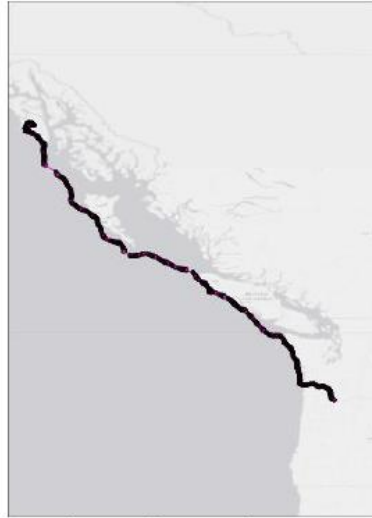


# Adult males travel far for dense prey aggregations

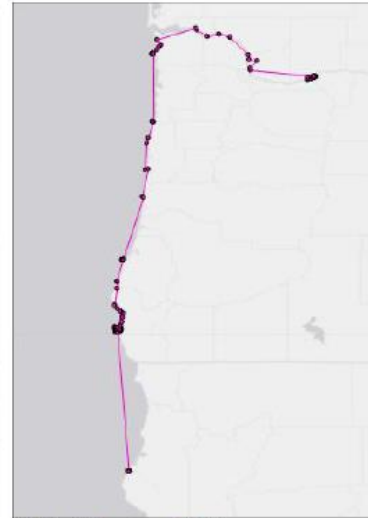
Bonneville adult males tracked with GPS-phone tags (Brown et al. 2012)



O20 (GPS-phone tag)  
Released: 2/15/2012  
Last detection: 7/14/2012  
Final tag disposition:  
Unknown



O23 (GPS-phone tag)  
Released: 2/28/2012  
Last detection: 3/26/2012  
Final tag disposition:  
Unknown



O11 (float pack 1)  
Released: 4/24/2012  
Last detection: 7/18/2012  
Final tag disposition: tag  
recovered, Eel River, CA



O35 (float pack 5)  
Released: 5/1/2012  
Last detection: 8/21/2012  
Final tag disposition:  
recovered Dall Island, AK,  
9/15/2012



# Alsek River (Dry Bay), AK Spring Eulachon run. > 3,000 sea lions in March April annually

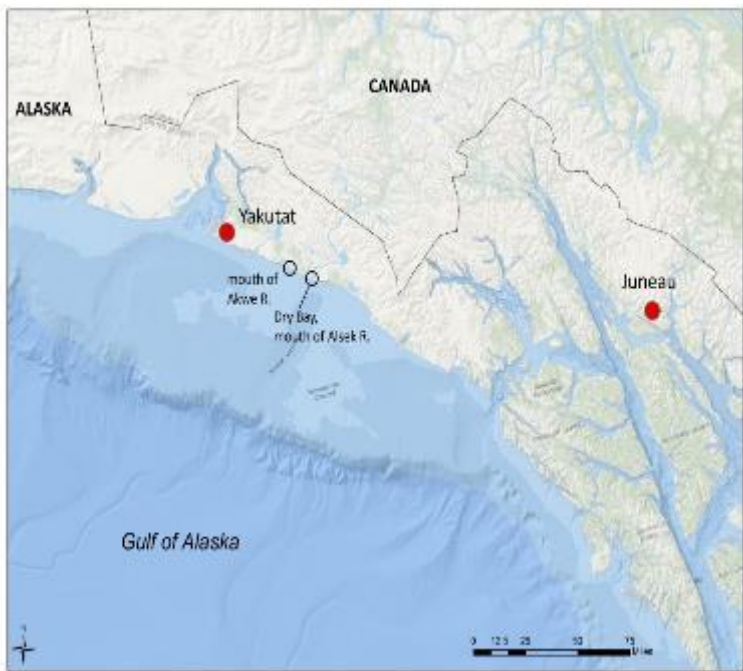


ADF&G 2014



Steller sea lions dominate but C. sea lions also take advantage of the prey abundance.

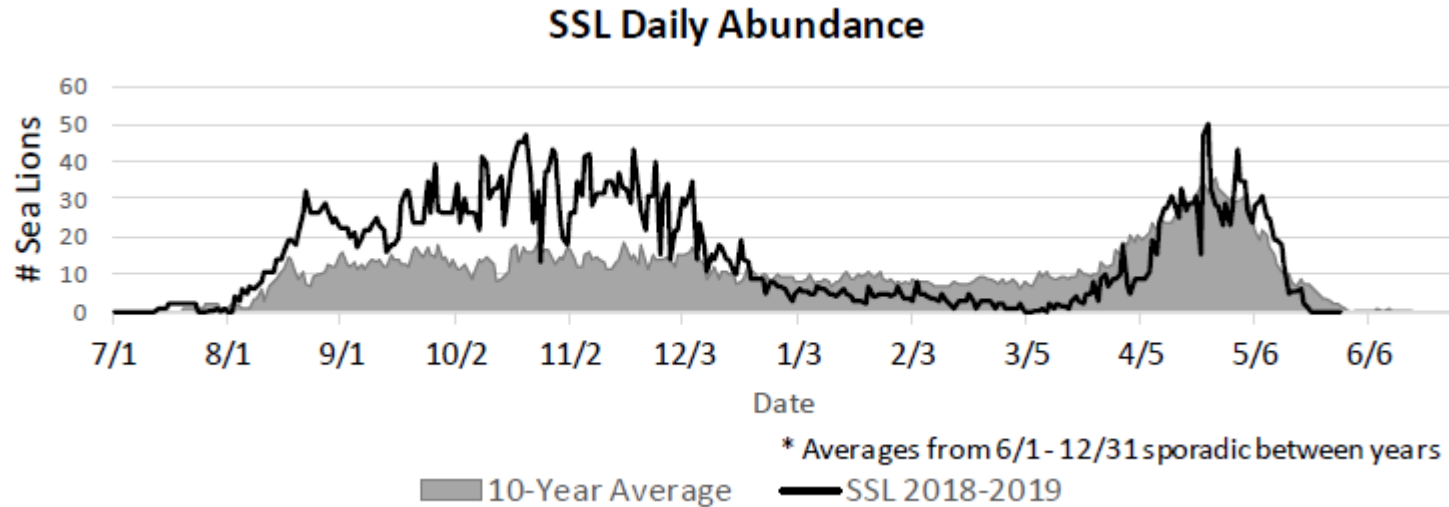
## Steller sea lions branded in Oregon and seen in Alaska. All males seen near Dry Bay during annual spring Eulachon run



11Y – branded at St. George Reef  
492R seen 2015, Alsek River/Dry Bay  
123Y seen 2014 and 2015 – Alsek/Dry Bay \*  
229R seen 3 years (2014, 15, 16) – Alsek/Dry Bay \*  
377R seen 3 years (2013, 2014, 2015) – at Alsek/Dry Bay \*  
(2013 & 2015) and Akwe River in 2014.

\* Fidelity to a known ephemeral prey source

# Steller sea lion adult male abundance at Bonneville Dam



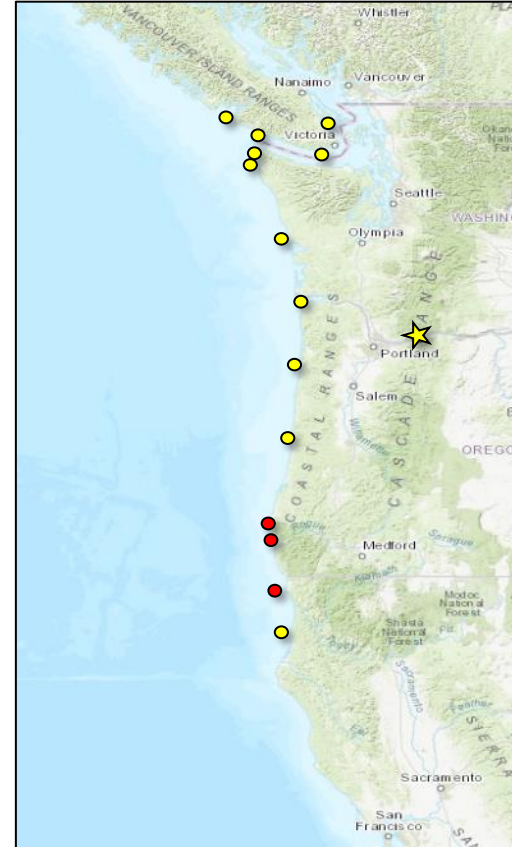
*Tidwell et al. 2020*

# Sighting locations of Bonneville Dam SSL males

55 males captured/marked at Bonneville Dam

February – May, 2010-2013/2017-2019

Data source: ODFW



# Steller sea lion diet varies regionally and seasonally

## Food habits of Steller sea lions (*Eumetopias jubatus*) off Oregon and northern California, 1986–2007

Susan D. Riemer<sup>1</sup> (contact author)

Bryan E. Wright<sup>2</sup>

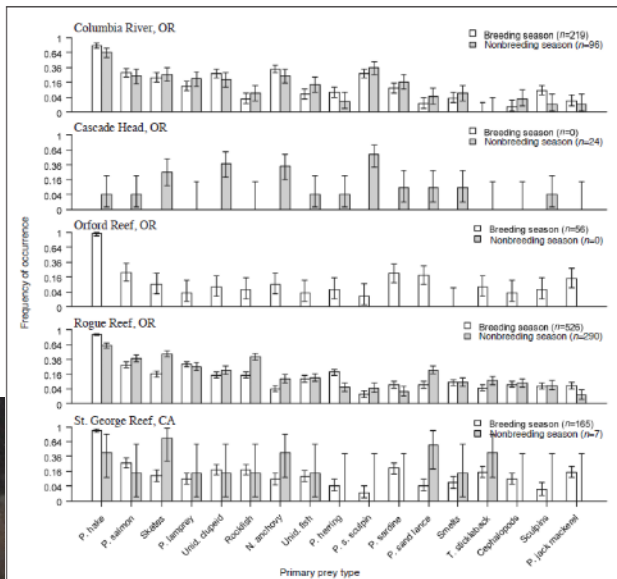
Robin F. Brown<sup>2</sup>

Email address for contact author: susan.d.riemer@state.or.us

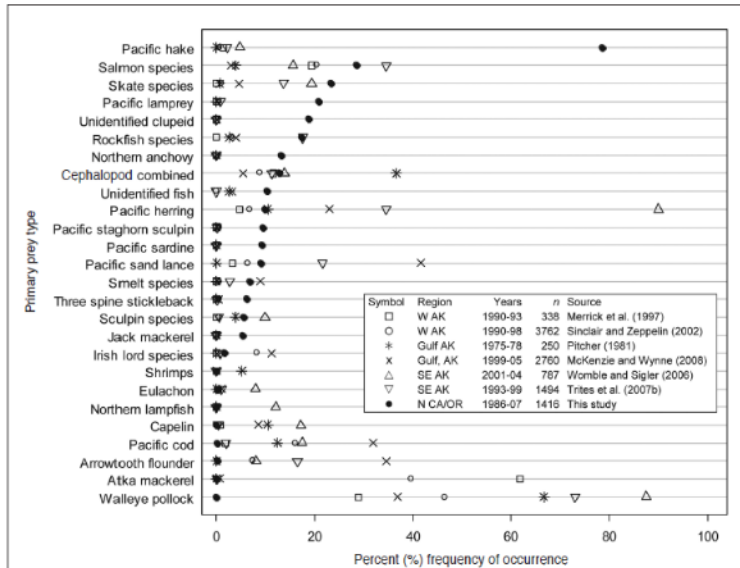
<sup>1</sup> Oregon Department of Fish and Wildlife  
Marine Mammal Research Program  
1495 E. Gregory Road  
Central Point, Oregon 97502

<sup>2</sup> Oregon Department of Fish and Wildlife  
Marine Mammal Research Program  
7118 NE Vandenberg Avenue  
Corvallis, Oregon 97330

Riemer et al. 2011, *Fish. Bull.*



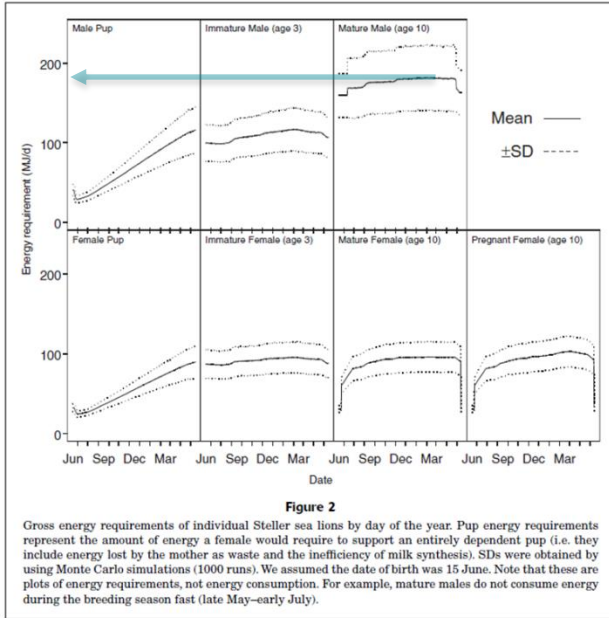
Frequency of occurrence (FO) of primary prey (prey with total FO values  $\geq 0.05$ ) identified from Steller sea lions (*Eumetopias jubatus*) scat collected in Oregon and northern California from 1986 through 2007. FO is presented by collection site and season (breeding season=May–August, nonbreeding season=September–April) in descending order of overall pooled FO. Error bars indicate exact 95% binomial confidence intervals. Scientific names for prey types can be found in Table 1. P=Pacific; N=northern; s=staghorn; T=threespine.



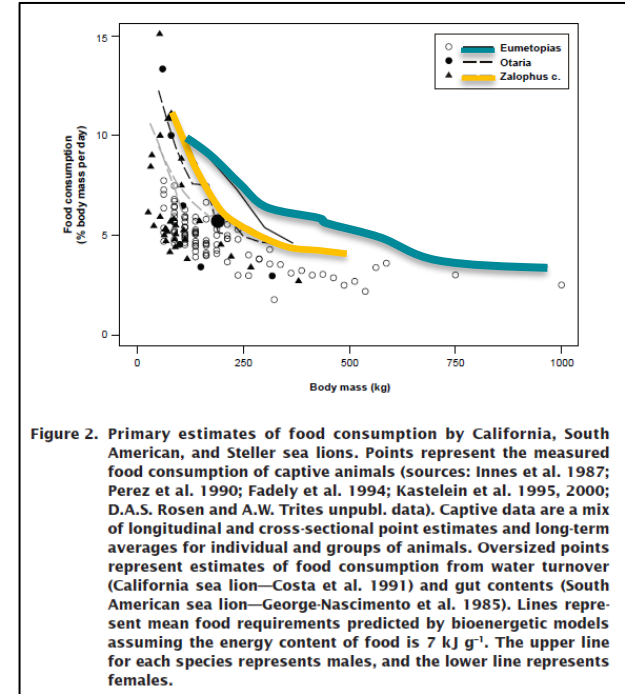
Percent frequency of occurrence (FO) of primary prey reported for Steller sea lions (*Eumetopias jubatus*) in Alaska ( $n=6$  studies) and northern California and Oregon (this study). FO summary for Trites et al. (2007b) and Merrick et al. (1997) was calculated by the authors of the present study. Scientific names for prey types can be found in Table 1.

# Food intake

## Steller sea lion



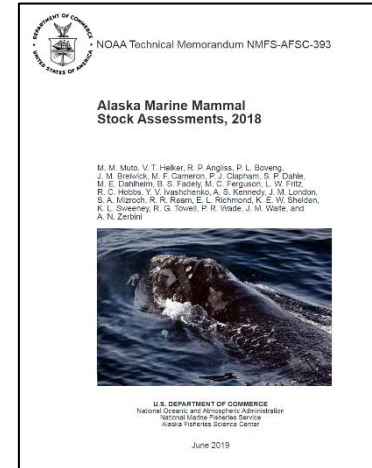
Does not reflect actual consumption or required prey abundance  
*Winship and Trites 2003, Fish. Bull.*



*Winship et al. 2006*

# Sources of human-caused injury/mortalities

- Minimum estimated annual mortality/serious injury rate 2010-2014 (from Stock Assessment Report)
  - Fisheries total: 52
    - Commercial U.S. fisheries: 14  
(WA/OR/CA groundfish bottom trawl, midwater at-sea and shoreside hake trawl)
    - Unknown fisheries (from stranding): 38
    - Recreational fisheries: 0.2
  - Other (illegal shooting, foreign fishery gear, explosives, etc): 45



# Questions?



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