Steller sea lions - Alaska
AFSC/Marine Mammal Laboratory/Alaska Ecosystems Program

Presenter: Brian Fadely
Abundance Surveys – Steller sea lions

• Annual Surveys
• NOAA Twin Otter: east of Delarof Islands
  • Even years: Aleutian Islands
  • Odd years: Gulf of Alaska
• Ship/Drone effort: west of Delarof Islands
  • Aerial image & visual counts
Abundance Surveys – Gulf of Alaska 2017

Sweeney et al. 2017. https://repository.library.noaa.gov/view/noaa/18790

- Pup declines at three northernmost rookeries and in Southeast Alaska (eDPS)
- WGOA seemingly unaffected
- Decline in pup production, stability of non-pups, notable since area was increasing since early 2000s. Potentially showing response to environmental variability associated with 71% reduction in Pacific cod as result of “Blob” (cod is 46% of winter diet).
• Unprecedented coverage of Gulf of Alaska sites.
• Covered all rookeries and major haulouts in Southeast Alaska
• Data currently being analyzed.
• 114 sites surveyed by aircraft, ship/drone surveyed 21 sites
Abundance Surveys – wDPS Alaska non-pups

Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018

2002-2018

2.05% y⁻¹

(95% credible interval: 1.46 – 2.66)
Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018
Abundance Surveys – wDPS Alaska non-pups

Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018
Abundance Surveys – wDPS Alaska pups

Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018

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<th>W ALEU</th>
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<td>-6.47% y⁻¹</td>
<td>-1.60% y⁻¹</td>
<td>2.54% y⁻¹</td>
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<td>(-7.42 – -5.57)</td>
<td>(-2.75 – -0.21)</td>
<td>(1.67 – 3.46)</td>
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<td>-33%</td>
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Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018
Sweeney et al. 2018, Results of Steller sea lion surveys in Alaska, June-July 2018
Mark-resight studies – Steller sea lion

- Survival to ages 1 & 2 years is similar across the range of the Western Stock in Alaska
- Survival to age 3 years MAY be lower in Western Aleutian Islands

Fritz et al. 2014; MML unpublished
Mark-resight studies – Steller sea lions

Analyzed >30,000 sightings collected from 2000–2014 of 2,385 sea lions

Density dependent movement patterns: animals from larger rookeries, and rookeries with slower population growth and lower survival, had wider dispersion than animals from smaller rookeries, or rookeries with high growth and survival.

animals born in the eastern Aleutian Islands had the most distinct movements and had little overlap with other western sea lions.

northern Southeast Alaska, within the eastern stock, is the area of greatest overlap between stocks, and is important to western animals, especially those born in Prince William Sound.
Steller sea lion Aleutian Islands winter diet biomass reconstruction


2008 & 2012
(N=700 scats)

% Energy Contribution

0%
10%
20%
30%
40%
50%

Atka mackerel  Salmon  Pacific cod  Pollock  Squid  Octopus  Scupins  Flatfish  Rockfish  Forage  Snail/Lump  O. Greenlings  Lanternfish  Skates

Areas 1-3  Area 4  Area 5

North Pacific Fishery Management Areas
Steller sea lion individual adult female diet diversity

Significant seasonal shifts in diet

Summer: higher proportion of lower trophic level species (Pacific Ocean Perch; northern rockfish, Atka mackerel, pollock)

Winter: more diverse diet with more higher trophic level species (arrowtooth flounder, Pacific cod, octopus, rock sole, snailfish)
Modeled Steller sea lion (*Eumetopias jubatus*) diet diversity.

Top three panels show breeding (filled squares and solid simple linear trend line) and non-breeding season (open triangles and dashed simple linear trend line) diversity.

Bottom three panels show estimated annual rate of change in counts of adult and juvenile Steller sea lions; dotted lines are simple linear trends over the same time period as non-breeding season diversity in each area.

No significant change in diet diversity over the 23-y study period, nor any significant differences across the Aleutian Islands.

Results consistent with prey abundance data from nine groundfish bottom trawl surveys.

Relationship between Steller sea lion diet metrics and population trends in the Aleutian Islands over a 22-y period (1990-2012) is inconsistent/non-existent.

While diet studies detail *what* Steller sea lions eat and provide an estimate of their energy intake, they provide only limited information on the energy expended to obtain their food or the consequences of their diet and foraging ecology on individual or population fitness.
Habitat Use – Steller sea lions

Lander et al. *in review*. Mixing it up in Alaska: habitat use of adult female Steller sea lions reveals a variety of foraging strategies.

- Pronounced individual variation
- Primarily nocturnal foragers
- Deep Water: Shallow dives at night and deep during day. Possibly feeding on vertically migrating prey (e.g. Salmonidae, Myctophidae, and Gonatidae)
- Continental shelf: opposite with on bottom at night and shallow during day. Consistent with foraging on benthic species (e.g. Atka mackerel)
- Summer: 92% of time within critical habitat, and mostly within 200 m isobath
- Winter: 26% of locations beyond 200 m isobath, 80% within critical habitat

Fig. 5. Examples of monthly core (50% isopleths) and home range (95% isopleths) polygons plotted with respect to select environmental covariates to illustrate significant cases provided in Lander et al. *in review*. Mixing it up in Alaska: habitat use of adult female Steller sea lions reveals a variety of foraging strategies.