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Steller sea lion & northern fur seal population updates and discussion

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SSL and NFS discussion and update

1. GOA Steller sea lion population trends
2. St. Paul Island pup production estimate
3. Merrill et al. 2021 publication summary



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Maternal foraging trip duration as a population-level index of foraging and reproductive success for the northern fur seal

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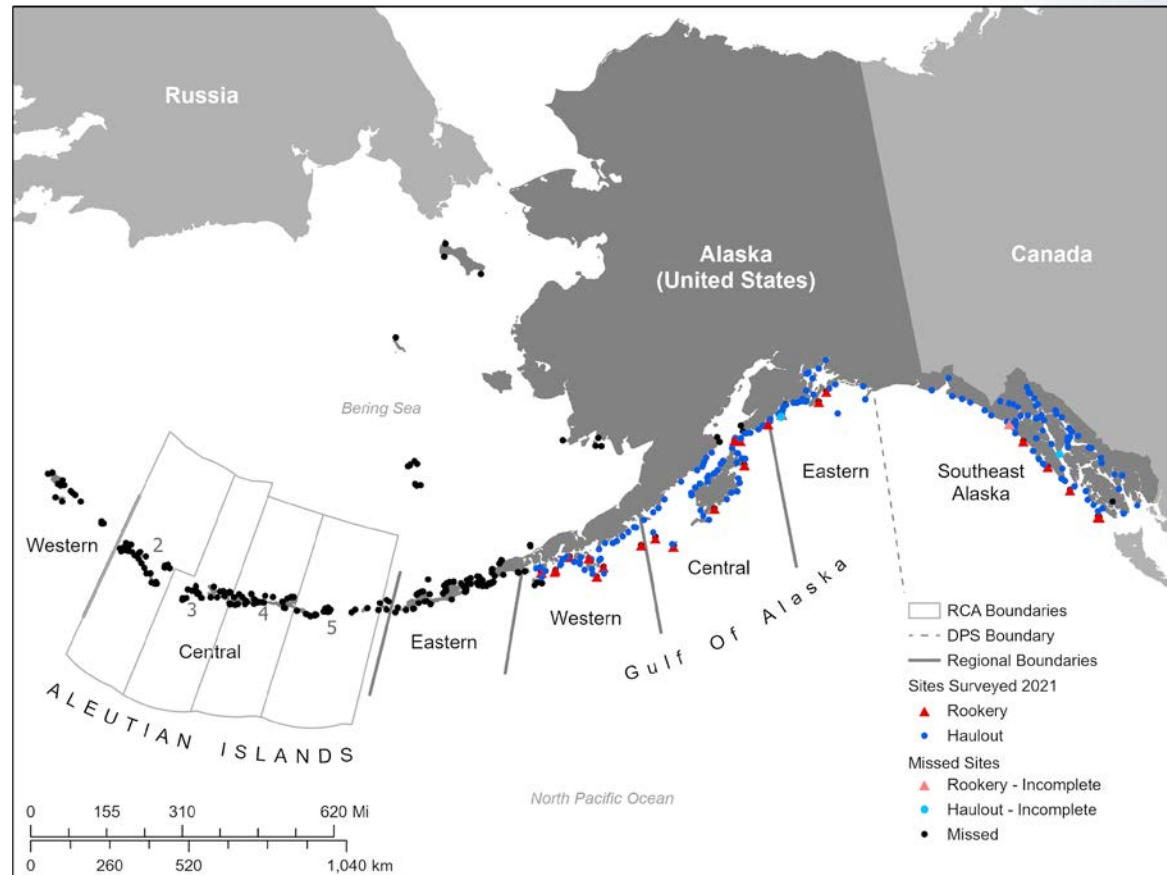


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2021 Steller sea lion aerial survey

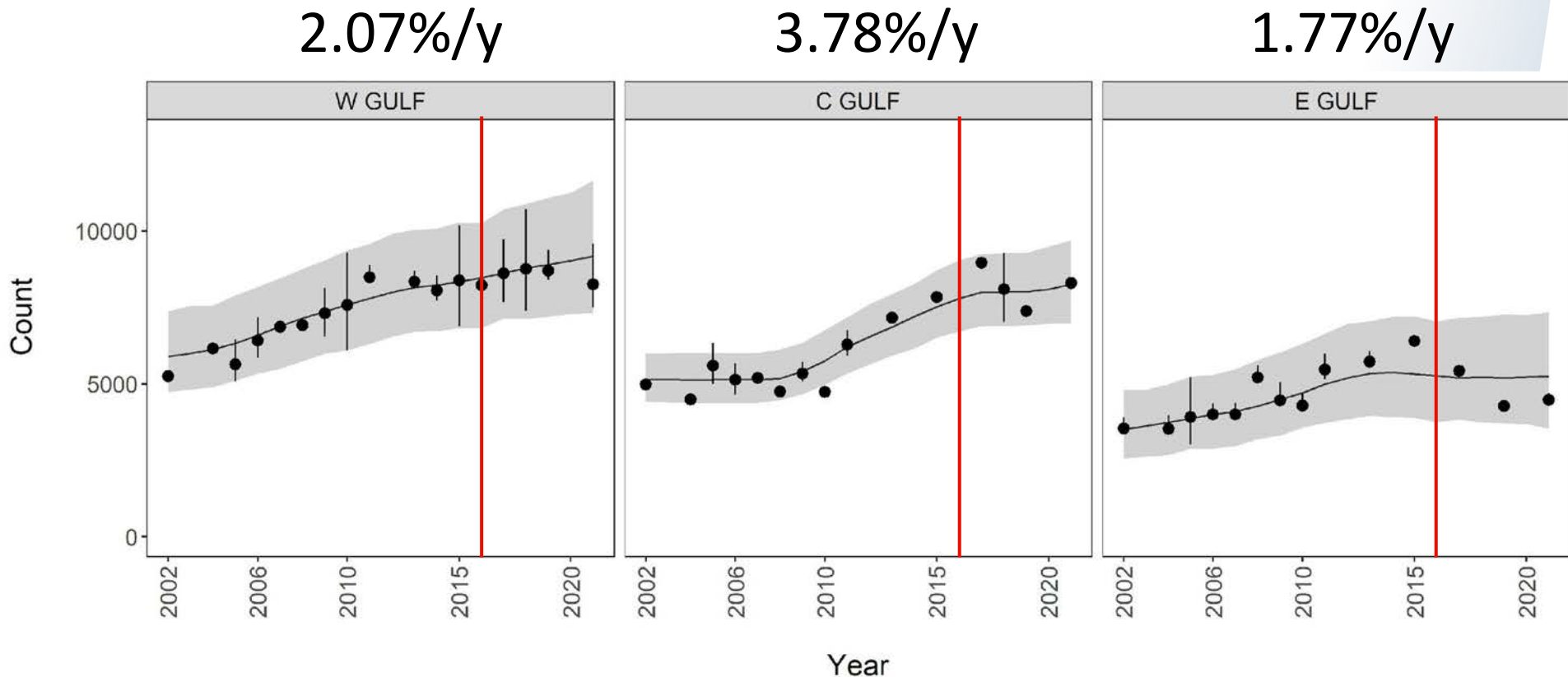
Gulf of Alaska: June 23 – July 8, 2021

- No 2020 survey
- Found four “new” sites
- Surveyed 126 sites in wDPS Gulf of Alaska regions
- Surveyed 81 sites in southeast Alaska (eDPS)



2021 Steller sea lion non-pup results

2006-2021 wDPS non-pups Gulf of Alaska Regions

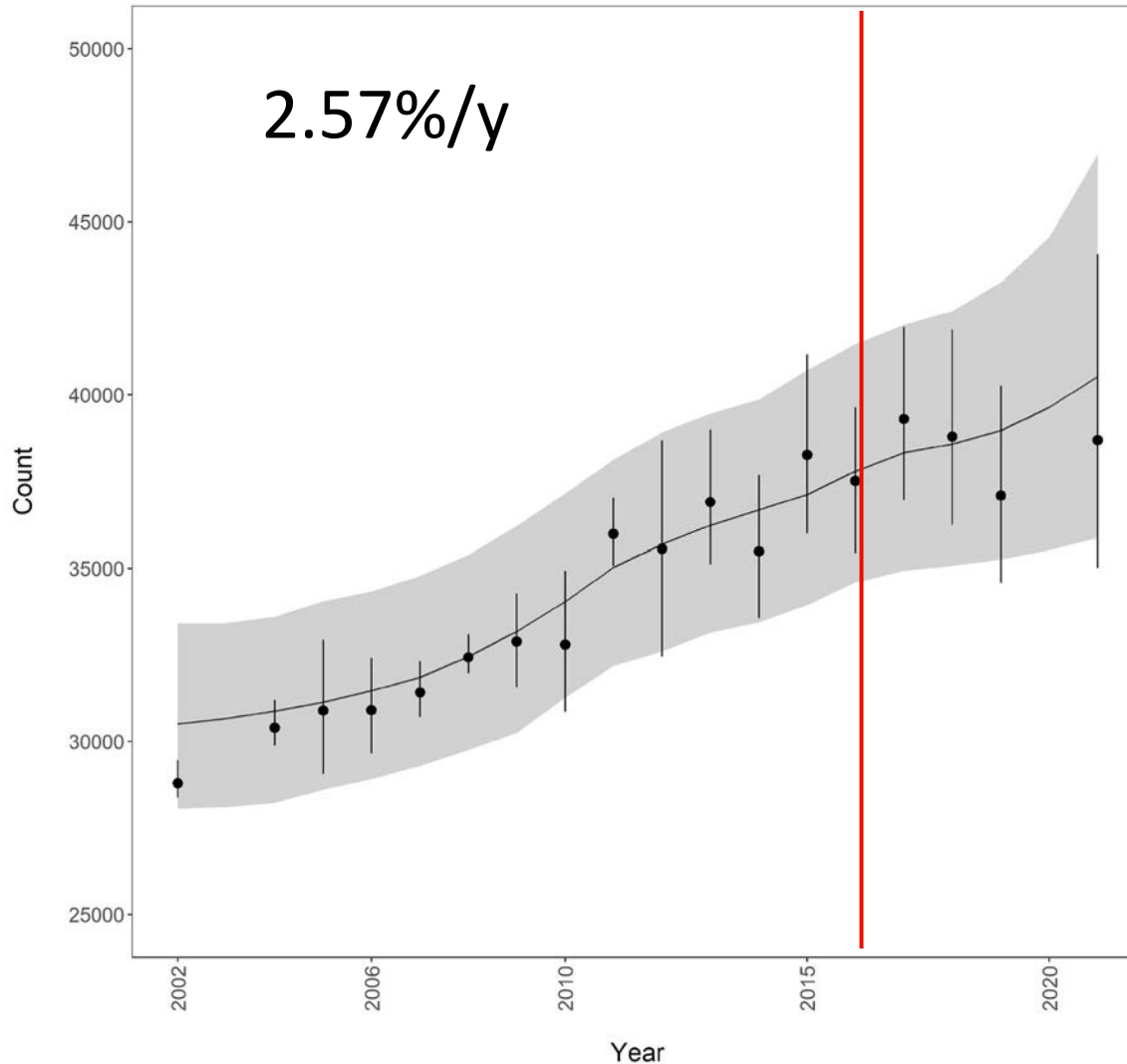


— Red line = 2016



2021 Steller sea lion non-pup results

2006-2021 wDPS non-pups Gulf of Alaska Total



— Red line
= 2016



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Non-pup SSL Conclusions

2006-2021 wDPS non-pups Gulf of Alaska Regions

- **2017**: Movement of ~1,000 females/juveniles from Eastern to Central Gulf of Alaska with no increase in non-pups
- **2019**: 19% decline in Eastern and Central Gulf of Alaska
- **2021**: 10% increase in Eastern and Central Gulf of Alaska and 5% decline in the western Gulf of Alaska



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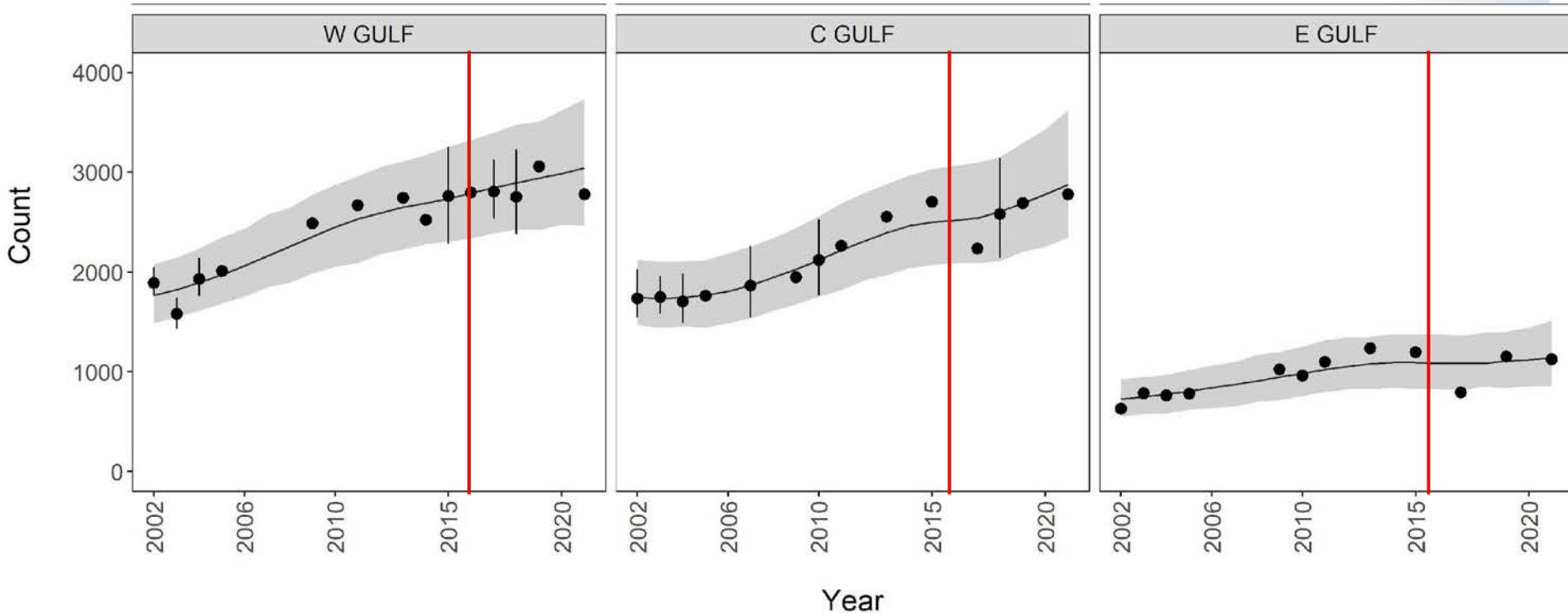
2021 Steller sea lion pup results

2006-2021 wDPS pups Gulf of Alaska Regions

2.47%/y

3.01%/y

1.84%/y

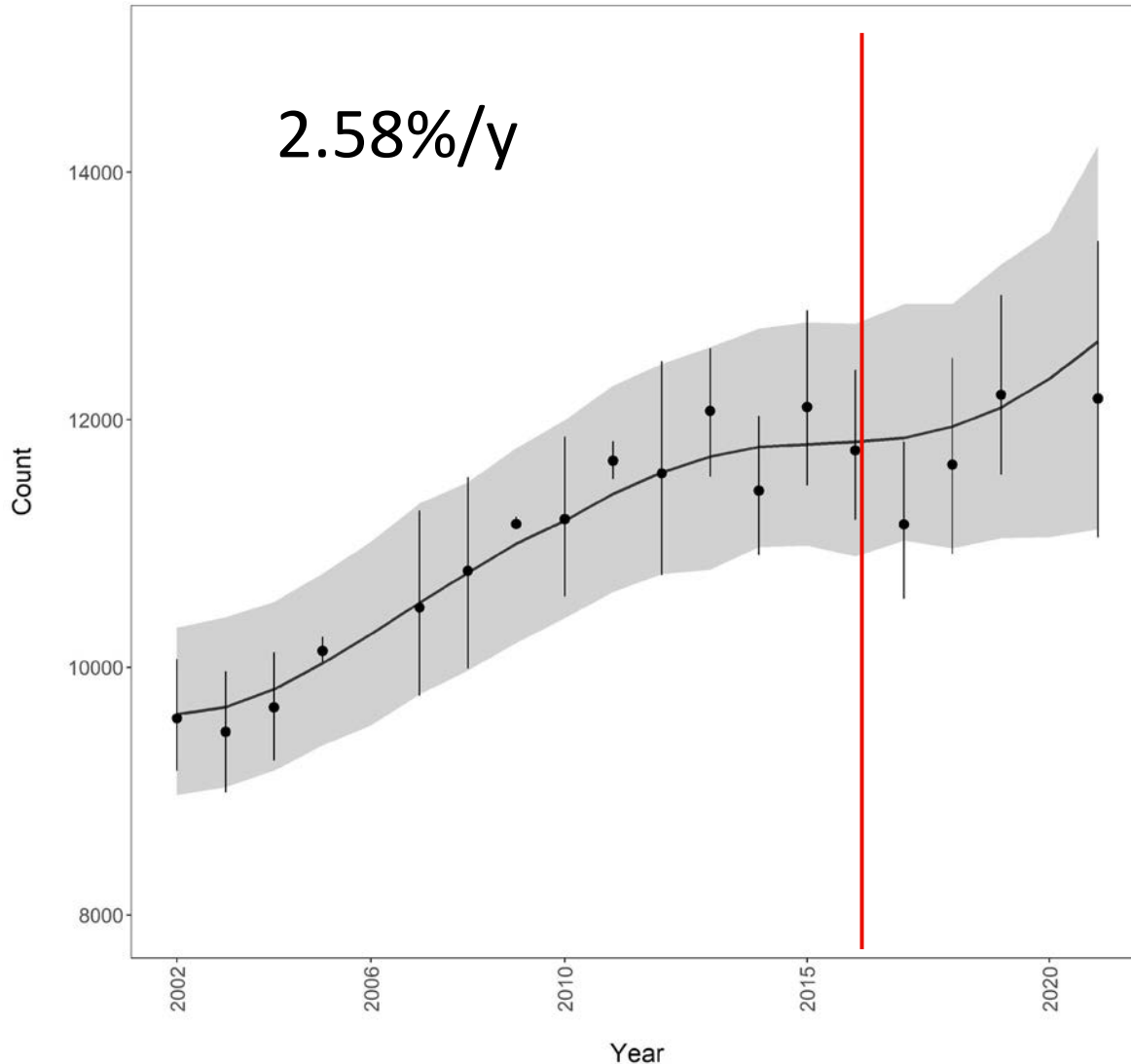


— Red line = 2016



2021 Steller sea lion pup results

2006-2021 wDPS pups Gulf of Alaska Total



— Red line
= 2016



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Pup SSL Conclusions

2006-2021 wDPS pups Gulf of Alaska Regions

- **2017**: 22% decline in pup counts in Eastern and Central Gulf of Alaska
- **2019**: 27% increase in pup counts in Eastern and Central Gulf of Alaska (close to 2015 counts)
- **2021**: No growth in pup counts since 2019 in Eastern and Central Gulf of Alaska and a 9% decline in pups in Western Gulf of Alaska



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Summary

wDPS SSL Gulf of Alaska

- Warming events in the Gulf of Alaska: 2014-2016 and 2018-2019
- 2017: E+C GULF pup decline, movement of 1,000 adult females/juveniles from the E to C GULF, and no growth in non-pup counts
- 2019: E+C GULF non-pup decline
- 2021: Southeast Alaska non-pup decline
- Plateaued non-pup and pup counts in the Gulf of Alaska regions (since 2011) and southeast Alaska (since 2011 and 2009, respectively)
- We plan on surveying the Aleutian Islands in 2022



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St. Paul Island



Pup production

- 2021 an “off” sampling year, no estimate in 2020 due to the pandemic
- Prioritize UAS photo aerial surveys and comparison to shear-sampling method
- Shear-sampled only 5 of 13 rookeries on St. Paul Island for pup census
- No pup census work on St. George Island

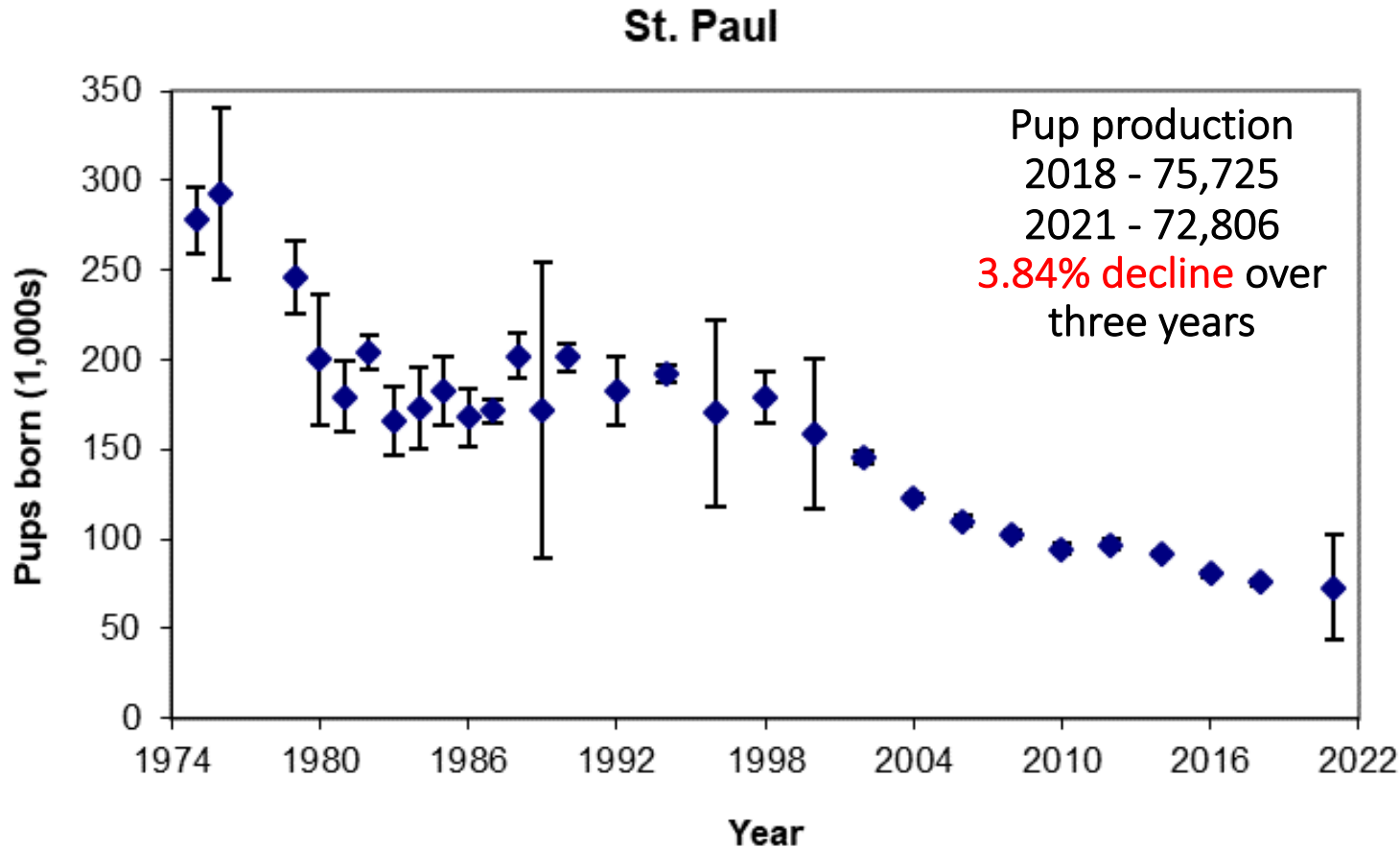


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St. Paul Island



Pup production

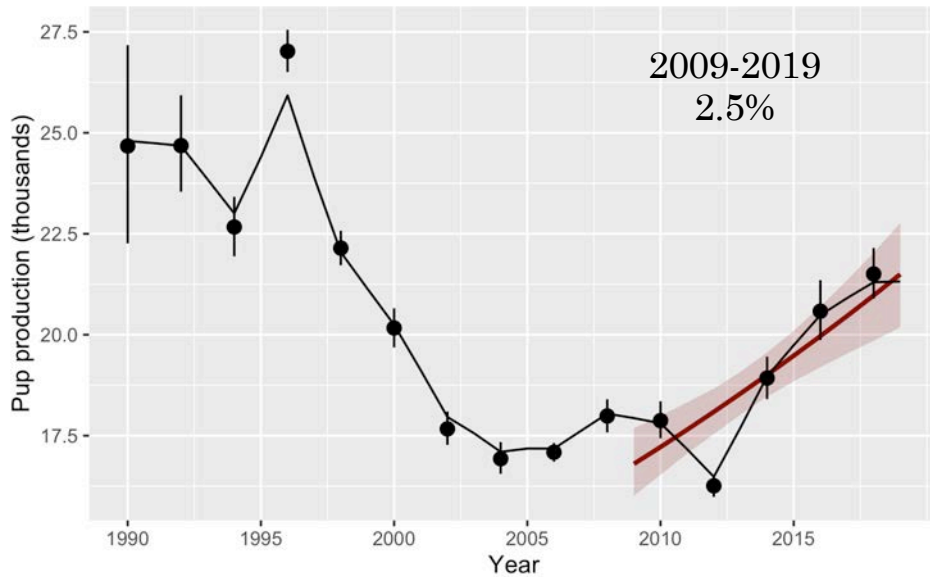


St. George and Bogoslof Islands

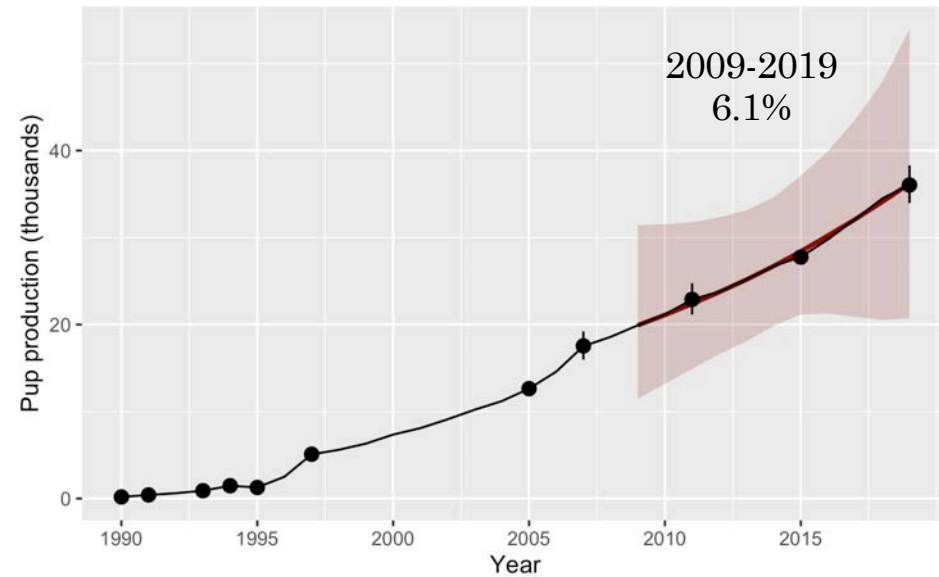


Pup production

St. George I.



Bogoslof I.



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Testing new census methods



Unmanned arial surveys



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Merrill et al. 2021



- Goals
 - Establish maternal foraging trip durations as an index of foraging success
 - Hopes to identify possible cause(s) of the Pribilof pup production decline
- Study sites on both St. Paul and St. George Islands

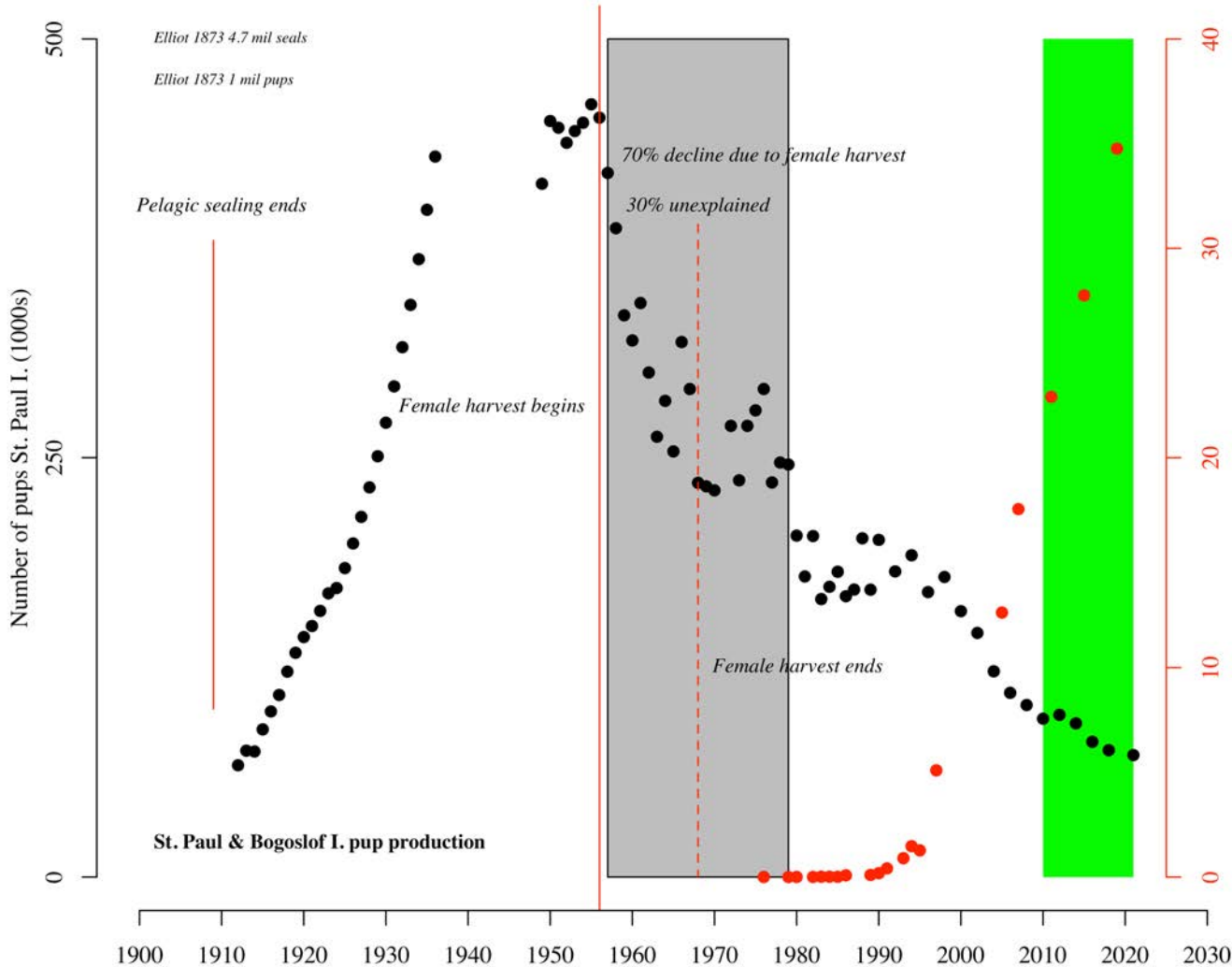


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Why focus on trip durations?

What's driving demographic trends?



- Survival
 - *Pup/juvenile*
 - Adult
- Reproduction

Numbers of pups Bogoslof I. (1000s)

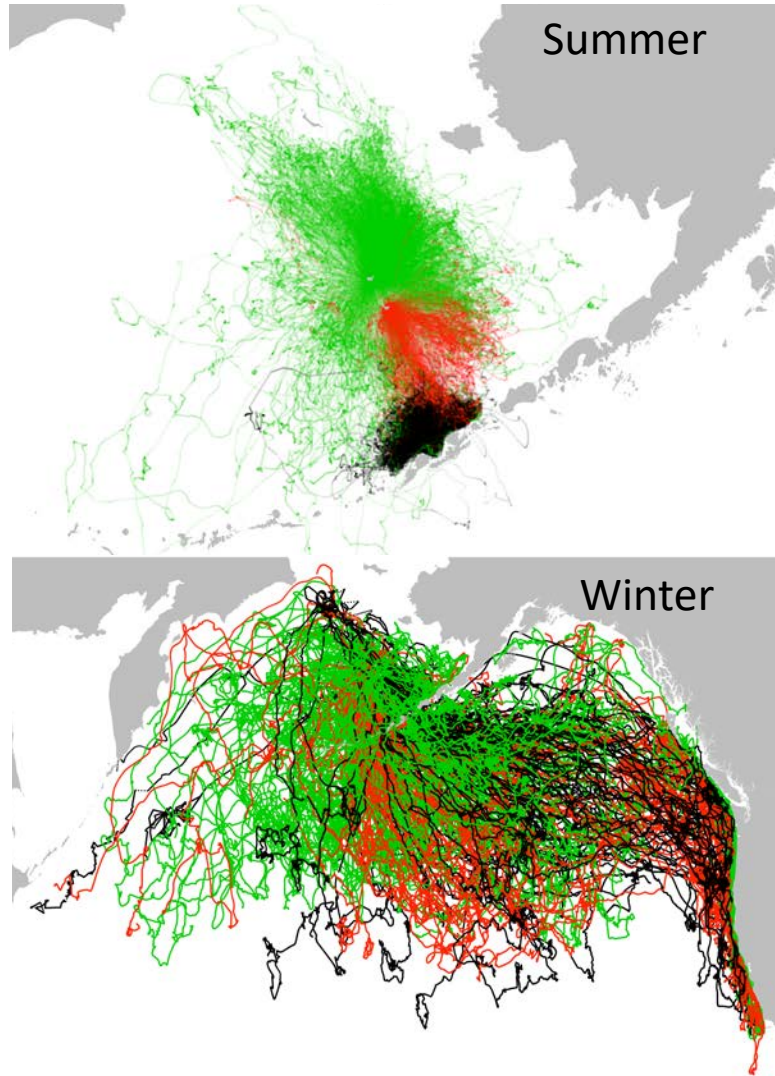


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Why focus on trip durations?



Where is the mortality occurring?



- Summer
 - *Pup pre migration*
 - (*~1-7% past 20 yrs*)
 - Adult (minimal)
 - 3 Eastern Stock islands segregate foraging areas
- Winter
 - Bycatch (minimal)
 - *Majority of mortality is unobserved & is occurring off the islands*
 - 3 Eastern Stock islands mix



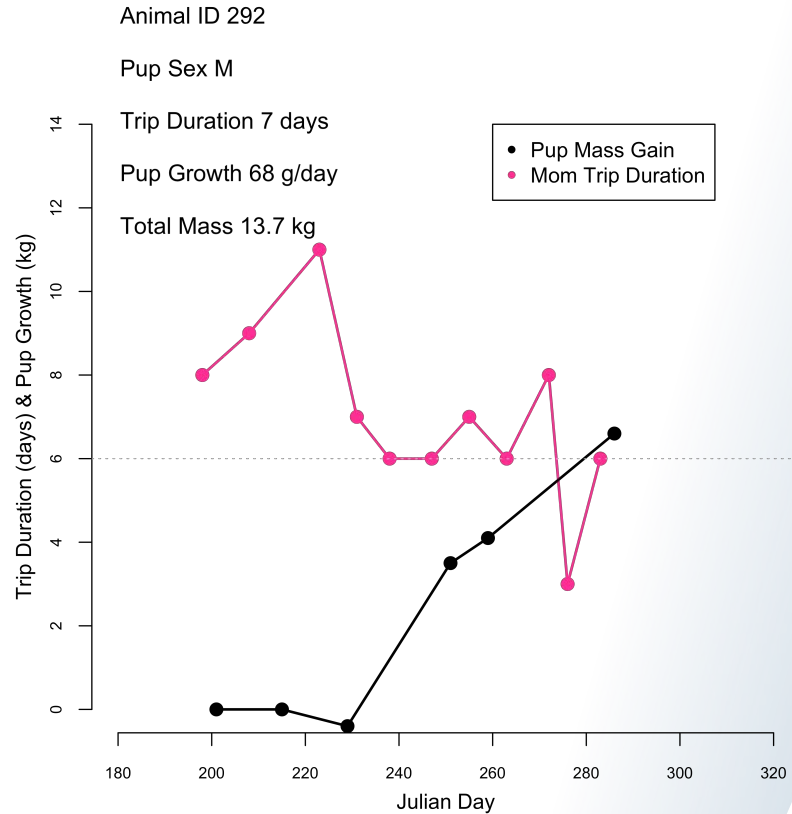
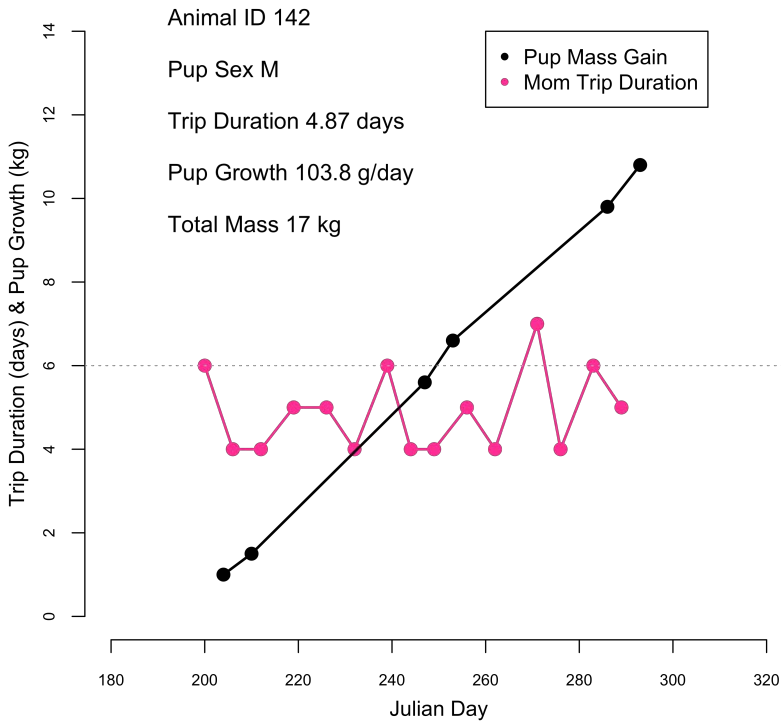
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Why focus on trip durations?



Proxies for reproductive success (Donahue Study 1995/1996)

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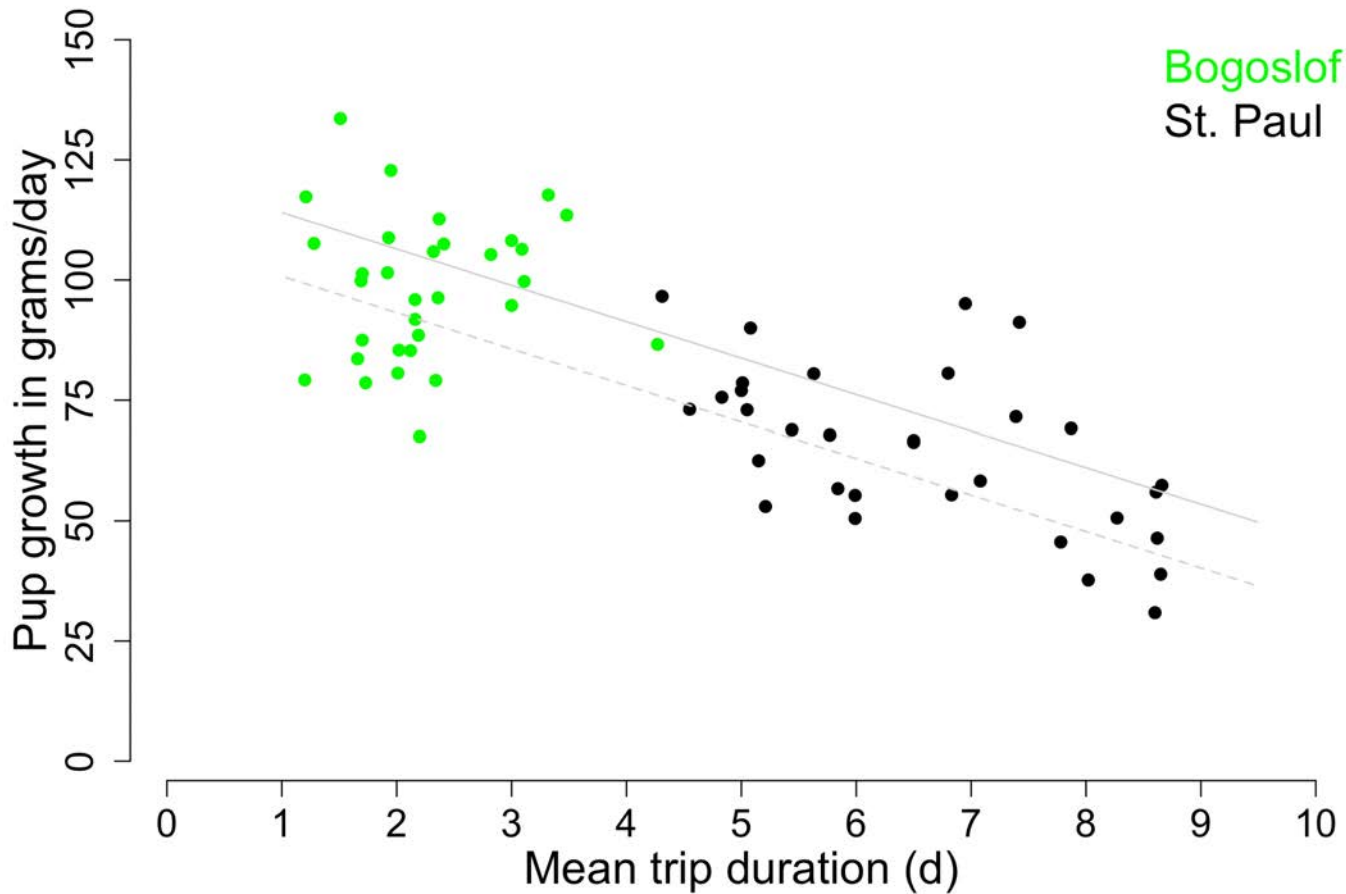
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Why focus on trip durations?



Proxies for reproductive success (COFFS Study 2005/2006)

COFFS NPRB Study in 2005/06



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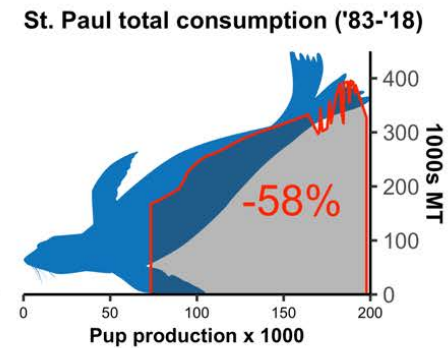
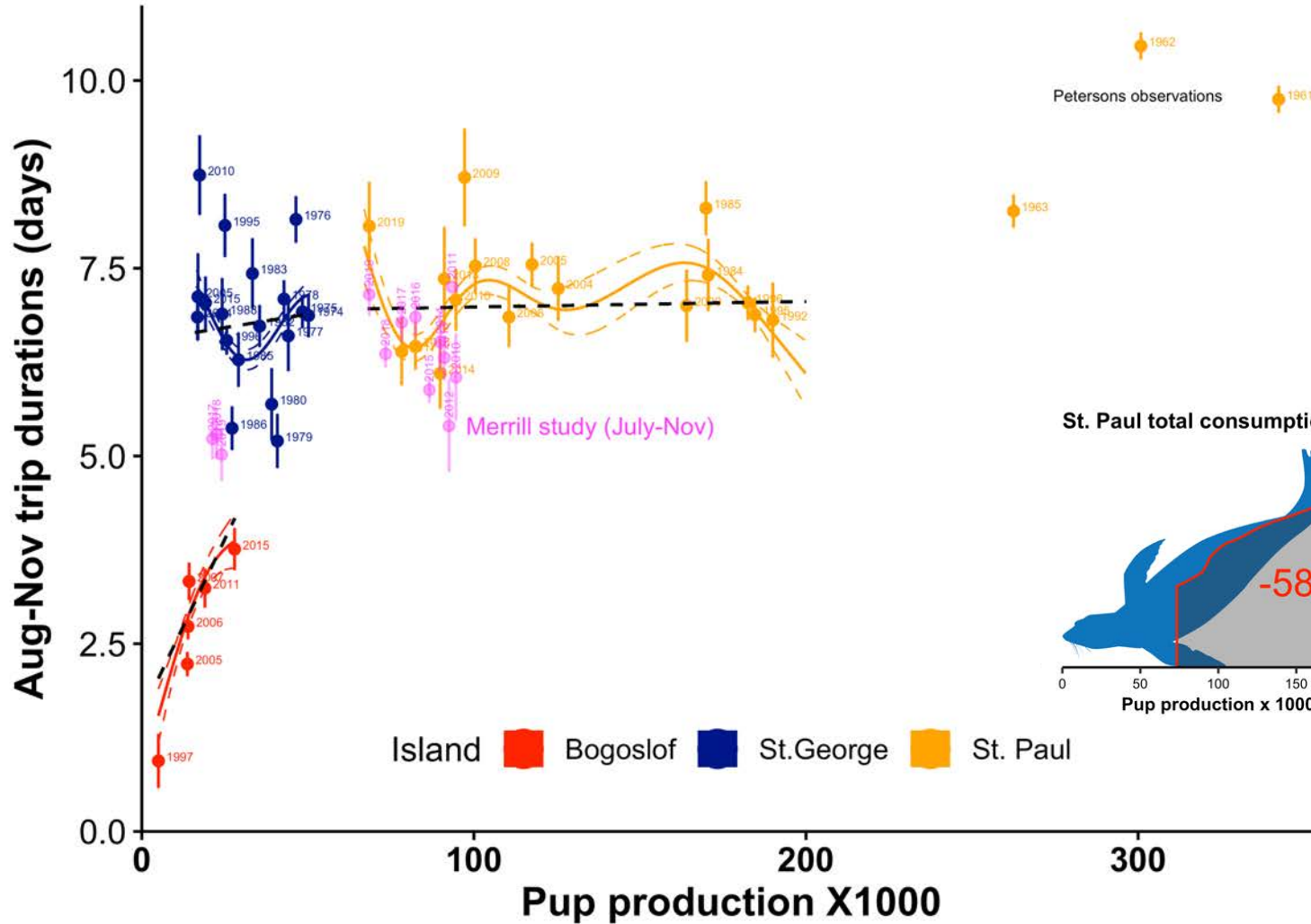


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Why focus on trip durations?



Merrill et al. 2021 results with other studies



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Merrill et al. 2021



- Goals
 - Aims to establish mean foraging trip durations as an index of foraging success
 - Hopes to identify possible cause(s) of the Pribilof pup production decline

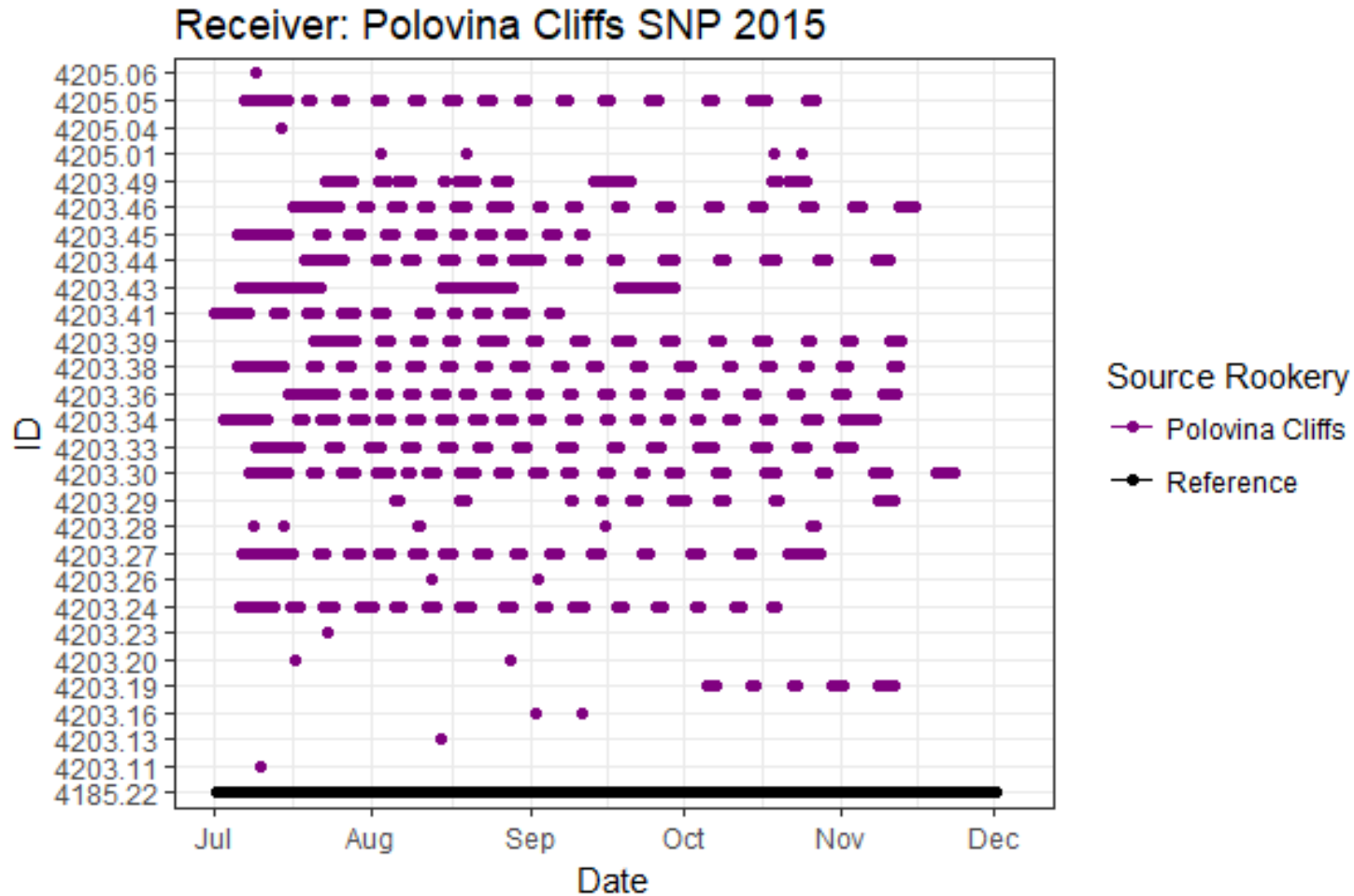


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Data – 9 years Polovina, 3 years Zapadni Reef, North, East Reef, South, Zapadni

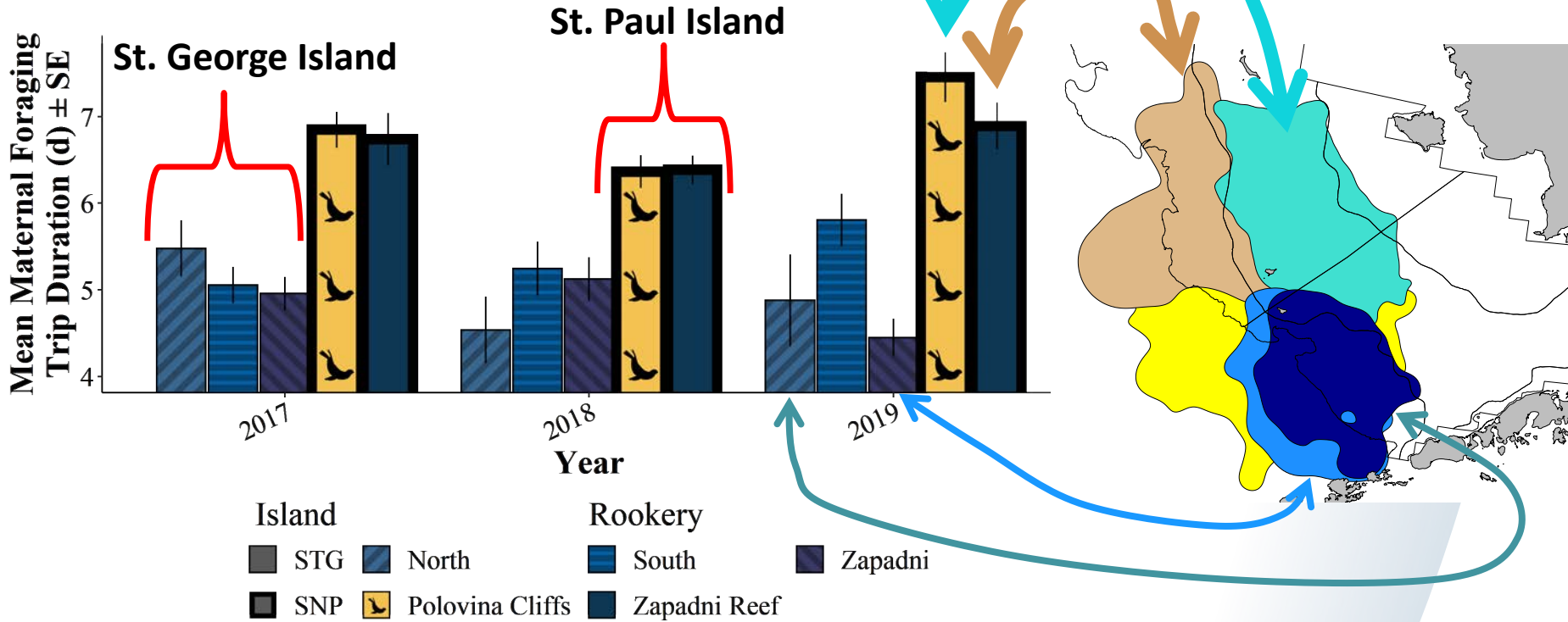


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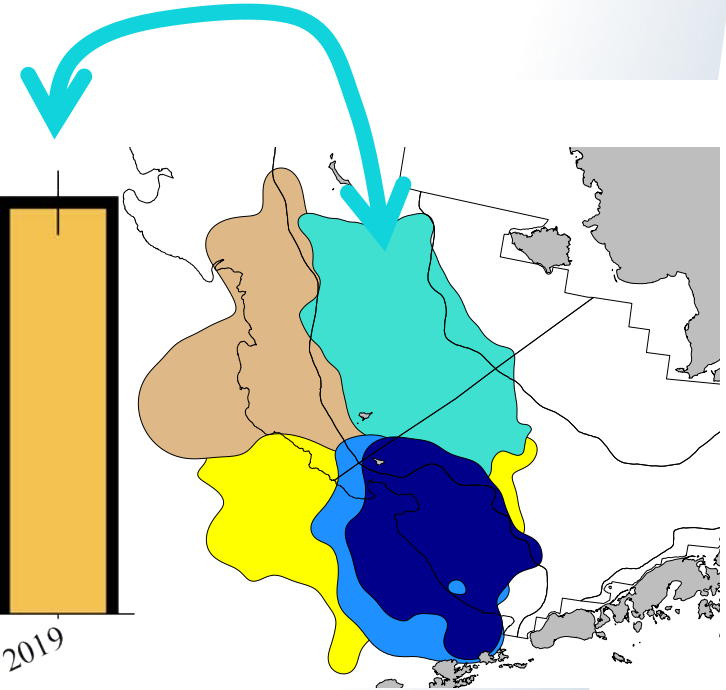
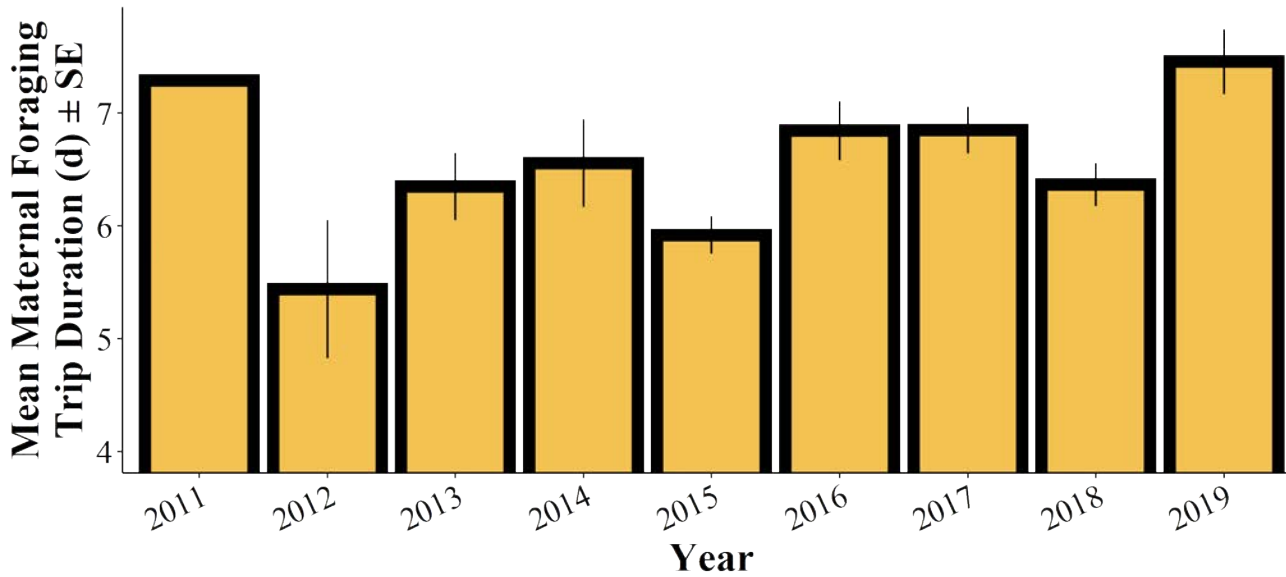
Results – trip durations longer on St. Paul Island compared to St. George



Merrill et al. 2021



Results – Polovina interannual variation



- Island
- Rookery
- SNP
- Polovina Cliffs

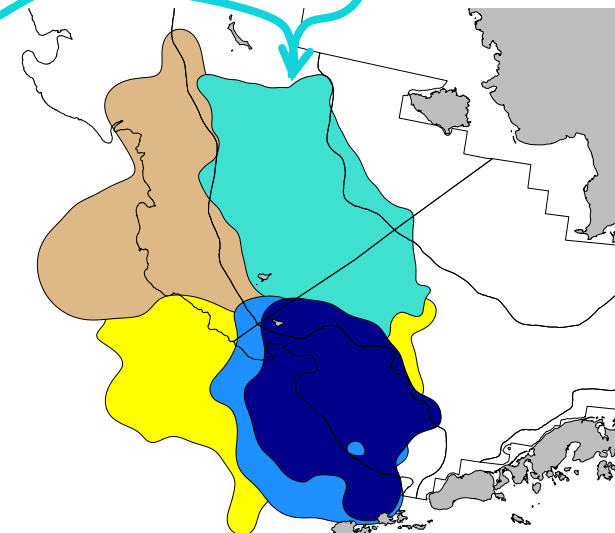
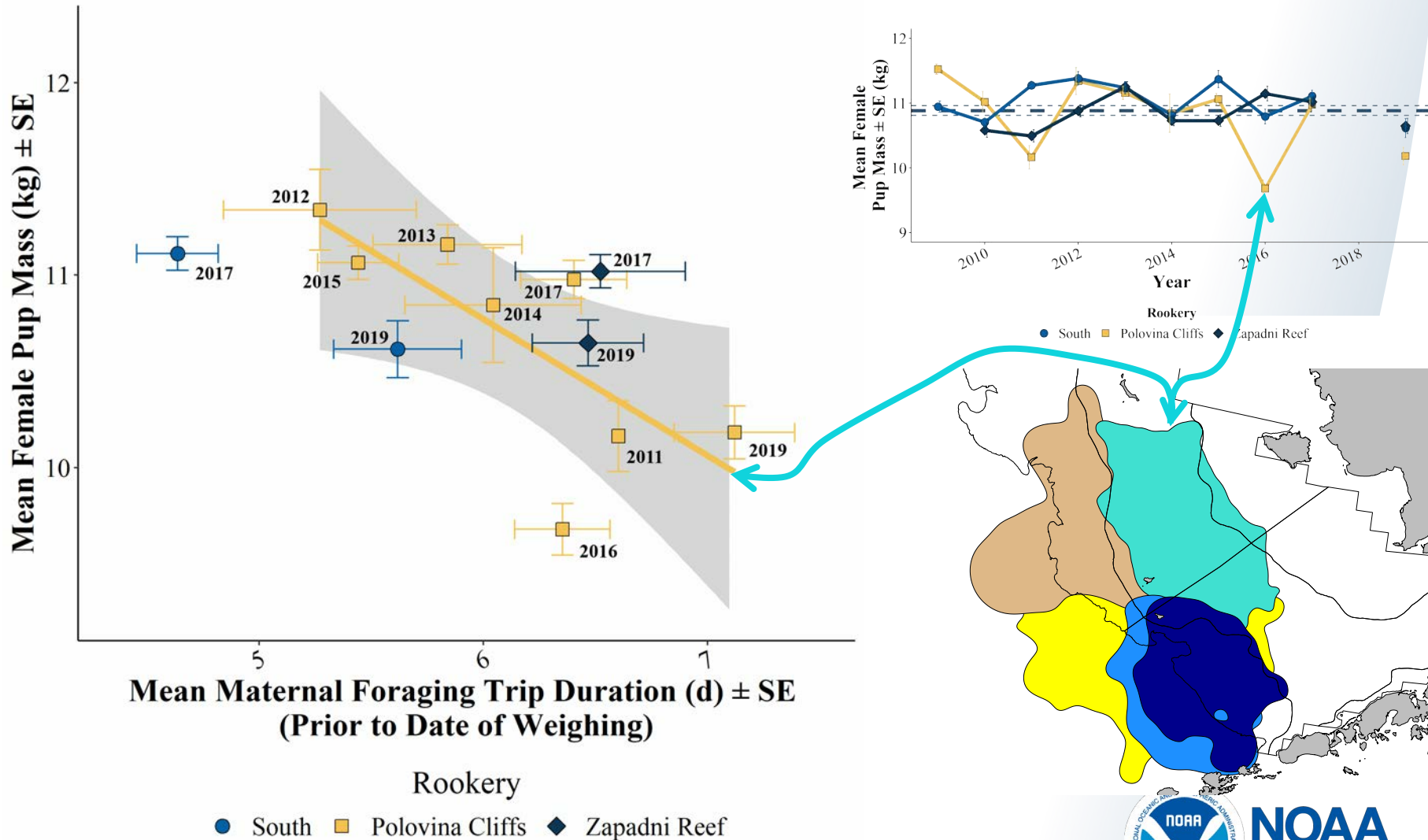


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Merrill et al. 2021



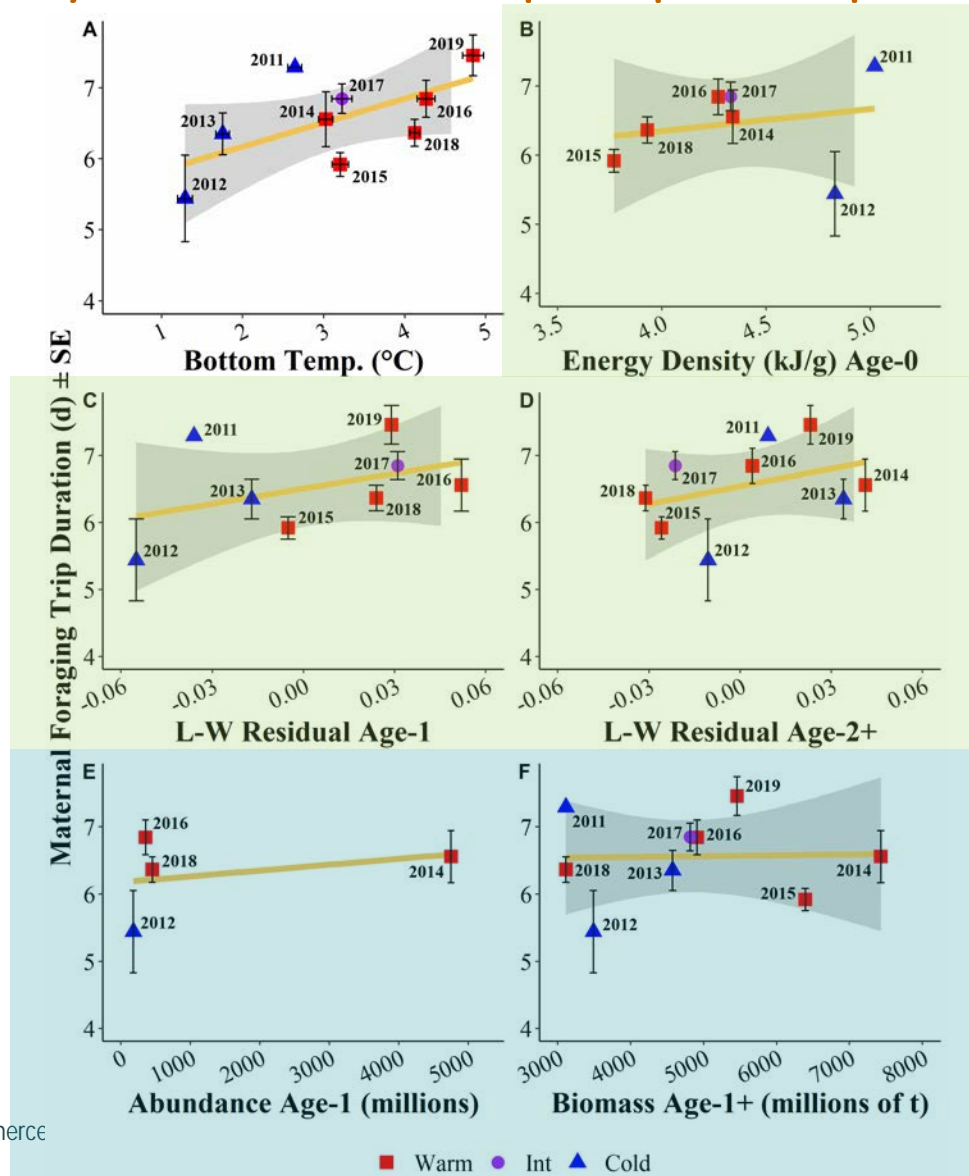
Results – Cross sectional Polovina pup weights correlated to trip durations



Merrill et al. 2021



Results – Only BTS bottom temps explain trip duration



No relationship
w/ examined
indicators of
QUALITY

No relationship
examined
indicators of w/
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Summary



Merrill et al. 2021

1. Trip durations were shorter for seals on St. George Is. than those on St. Paul Is. and showed interannual variation
2. Changes in pup mass were broadly synchronous among rookeries and Polovina Cliffs pup masses were correlated with trip durations (1d increase = 6.52% decrease in mass)
3. Trip durations were correlated with eastern Bering Sea summer bottom temperatures (1°C increase in temperature = 8 hour increase in trip durations)
4. Concluded that the variation of observed pup mass and trip durations during the study period were too small to explain the ongoing population decline.
5. Conclude that monitoring foraging trip durations is a promising metric for tracking broad environmental changes.



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Thanks for your attention



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