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Salish Sea Ecosystem Conference

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Apr 6th, 1:30 PM - 1:45 PM

Age truncation and portfolio effects in Puget Sound Pacific herring

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Speaker

Margaret Siple, Andrew O. Shelton, Tessa B. Francis, Dayv Lowry, Adam P. Lindquist, and Timothy E. Essington

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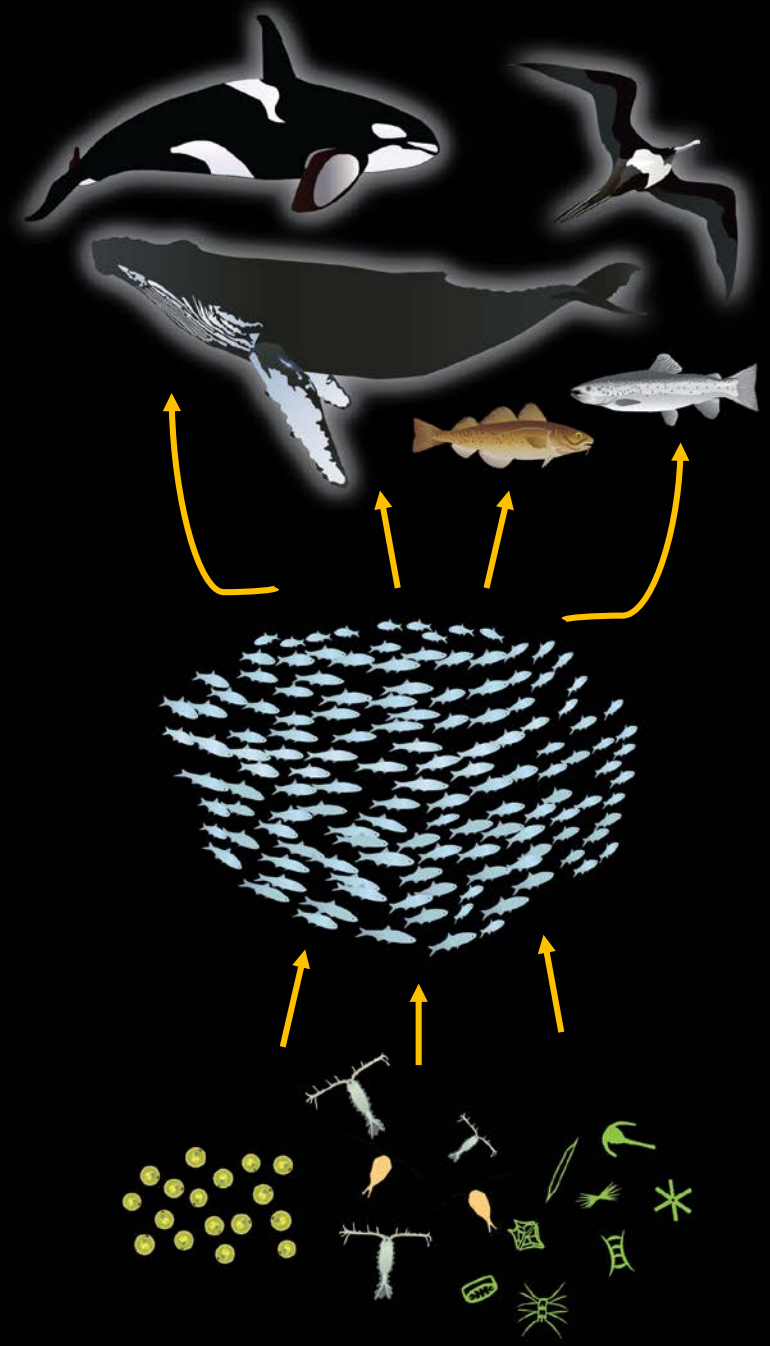
Portfolio effects and age truncation in Puget Sound Pacific herring

Siple MC[1], Shelton AO, Francis TB[1], Lowry D, Lindquist AP, Essington TE[1]

[1]University of Washington

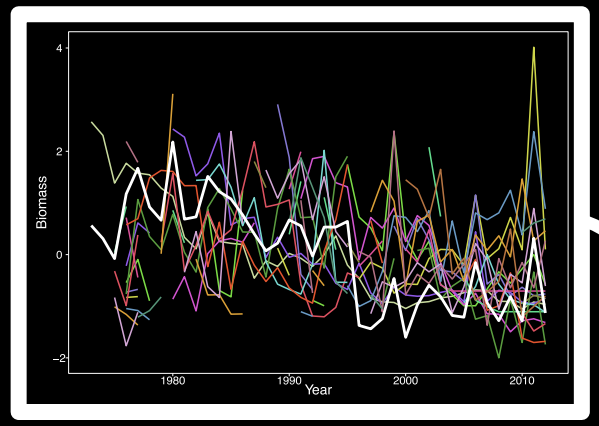
[2]NOAA

[3]WA Department of Fish & Wildlife

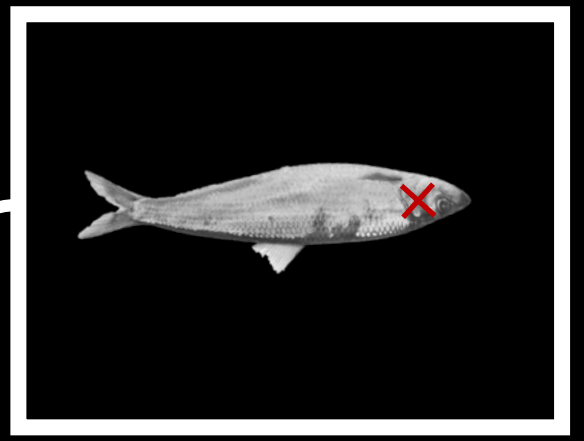


My goal today

I. Spatial dynamics



II. Demographic changes

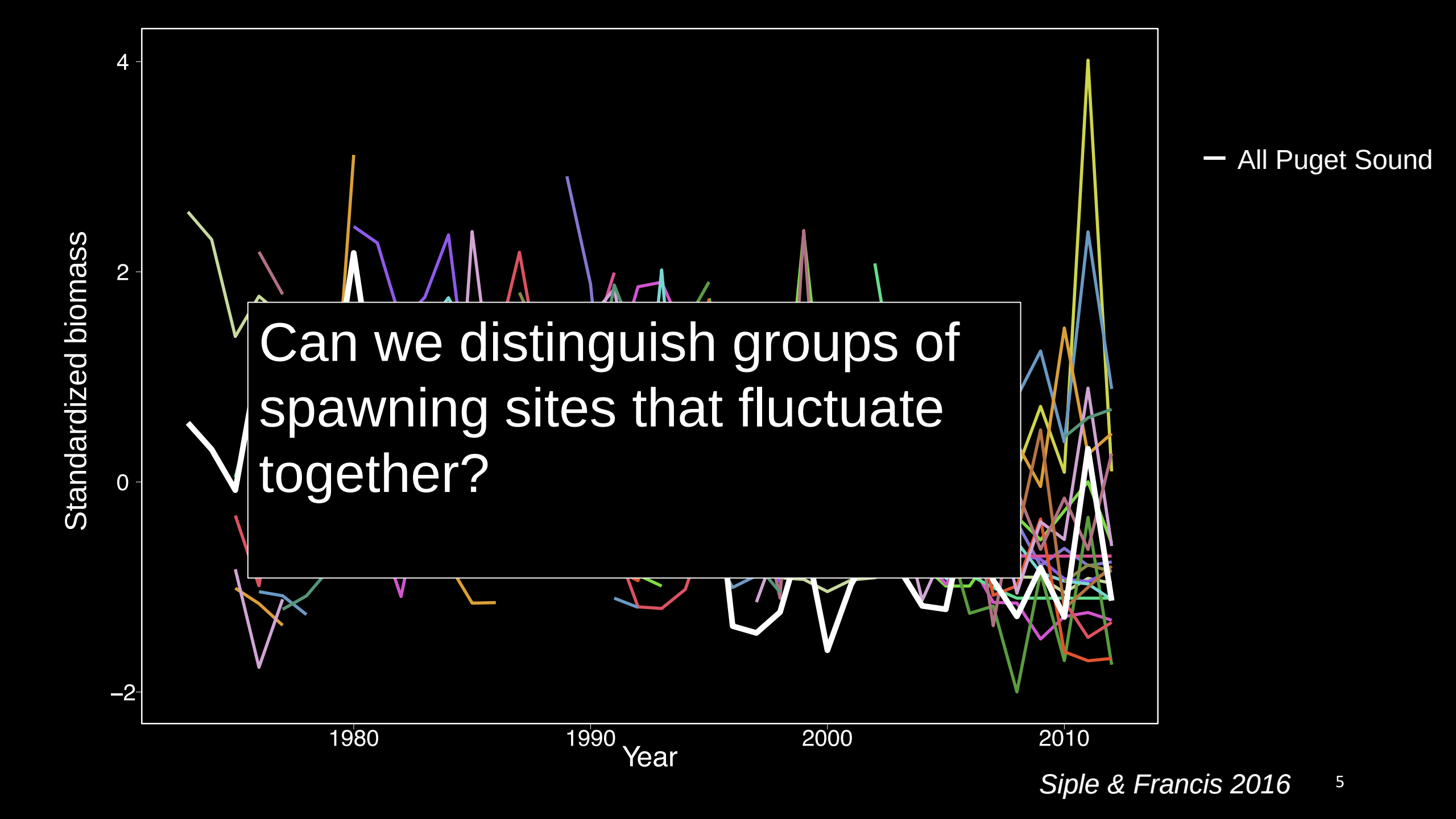


Insights about ecology and management

Possible next steps

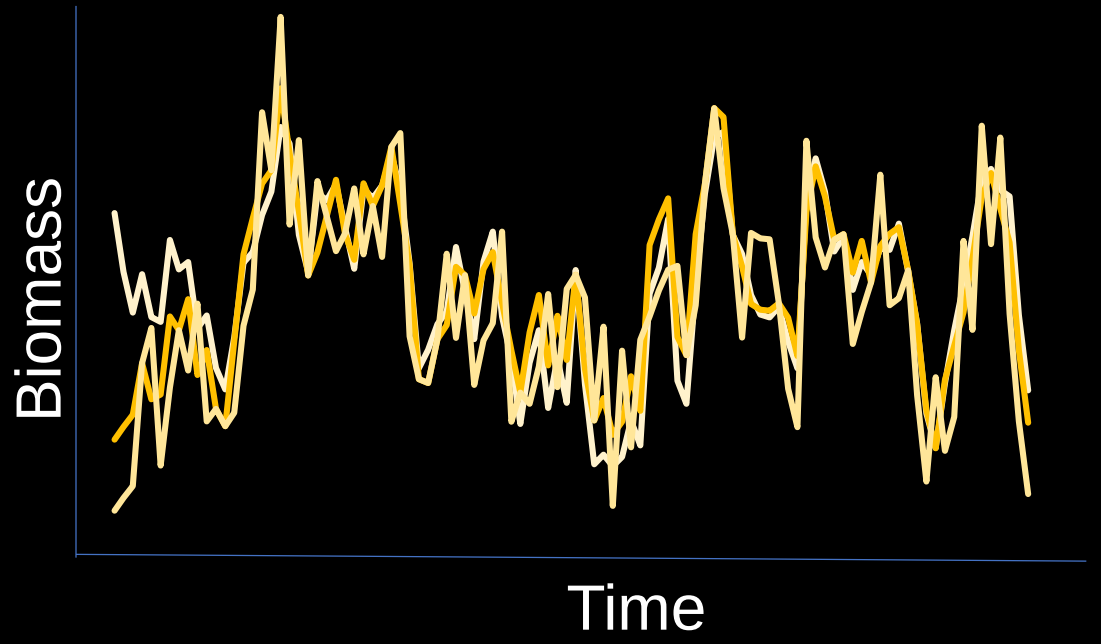

CANADA
White Rock
Strait of Georgia
Bellingham
San Juan
CANADA
Capital
Saanich
Victoria
Mt Vernon
Strait of Juan de Fuca
Oak Harbor
Island
UNITED STATES
Port Angeles
Clallam
Jefferson
Seattle
Kitsap
Tacoma
Mason

We are here



Siple & Francis 2016

Panmictic
(all one population)

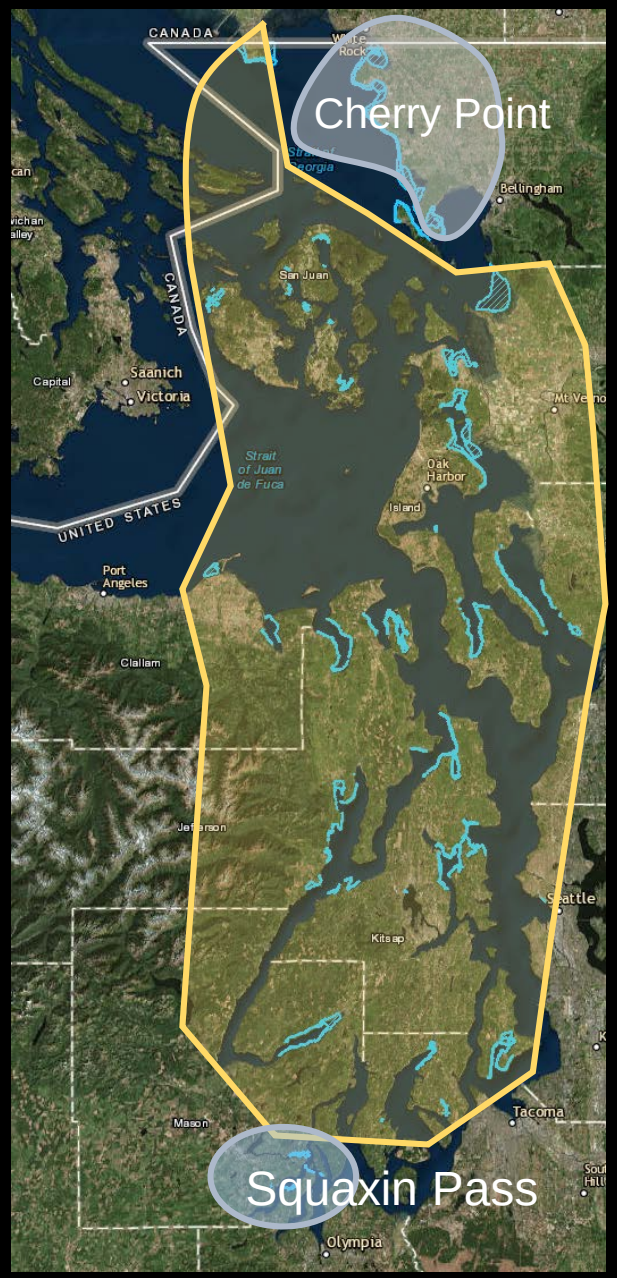


Genetics (microsatellite markers)

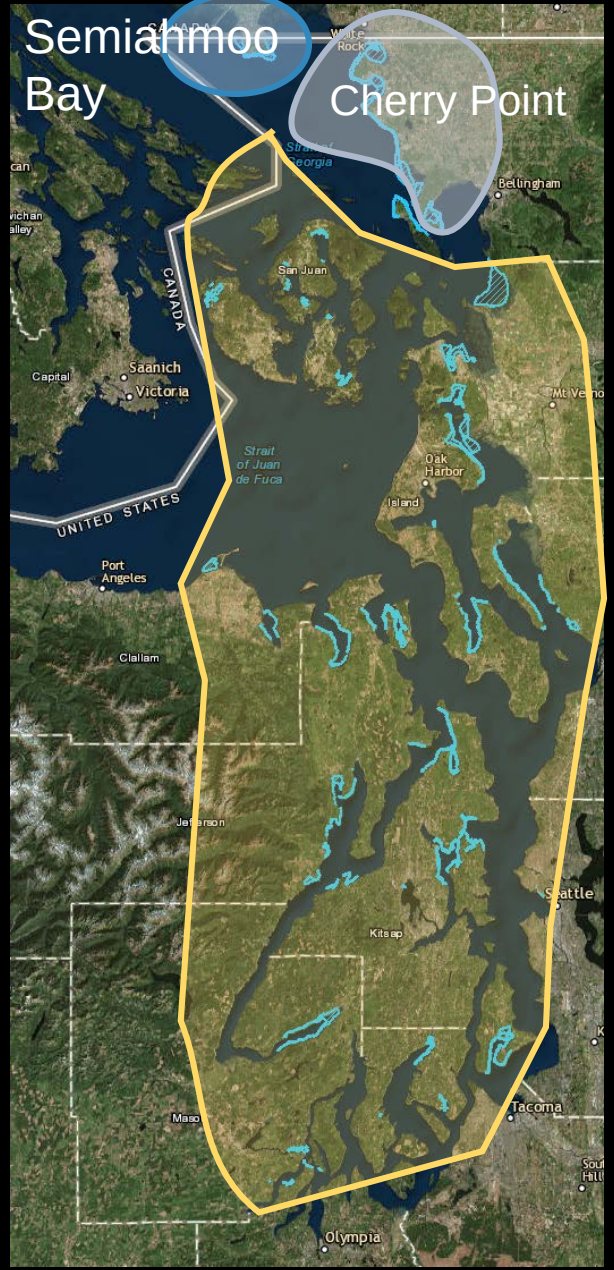
Contaminants

Geographic separation

All separate

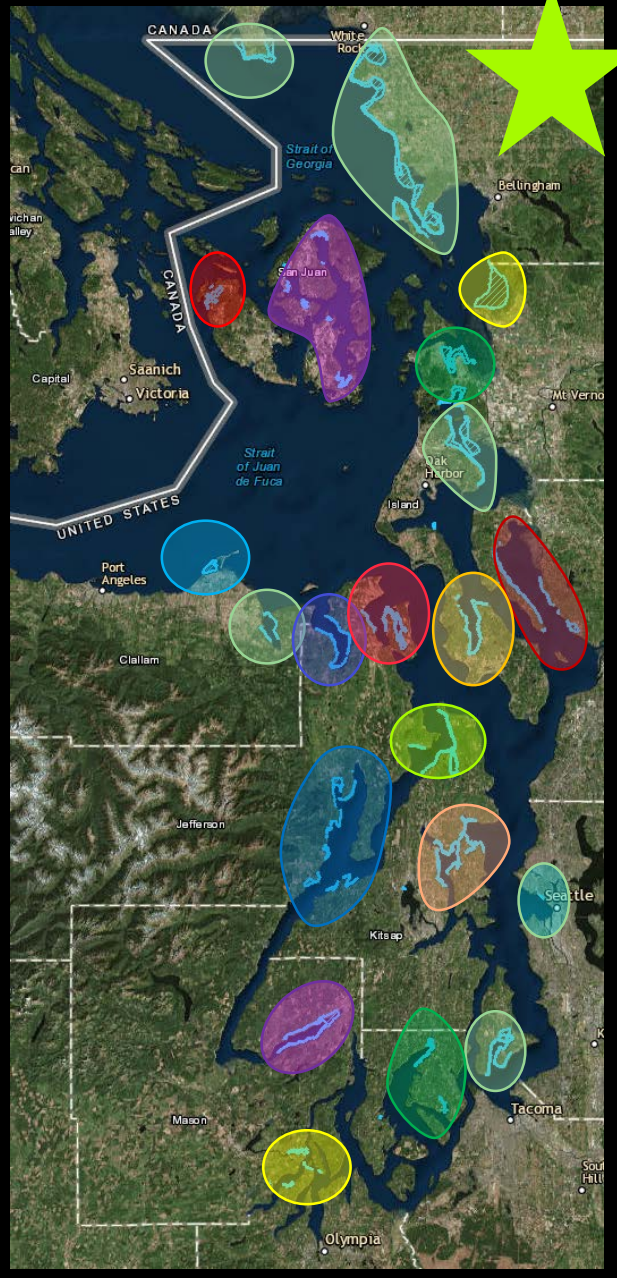


Small et al. 2005



West et al. 2008

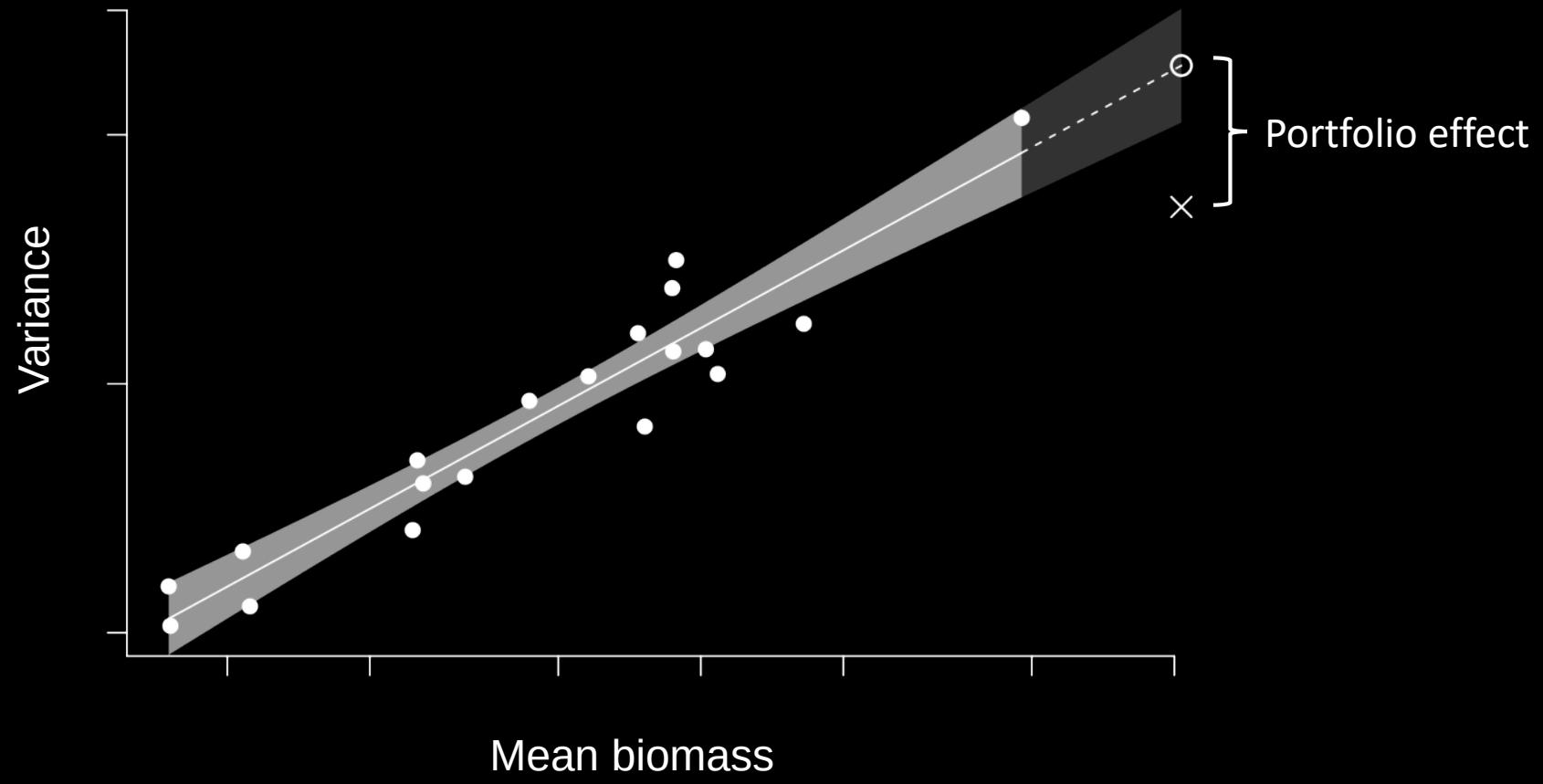
Penttila 2007



*Multivariate state-space model

Image: John Buchanan

Pacific herring are **1.92** times more stable as several subpopulations



Siple & Francis 2016

Take home points so far

Herring populations in Puget Sound fluctuate **independently**, at localized scales but seem to share regional drivers

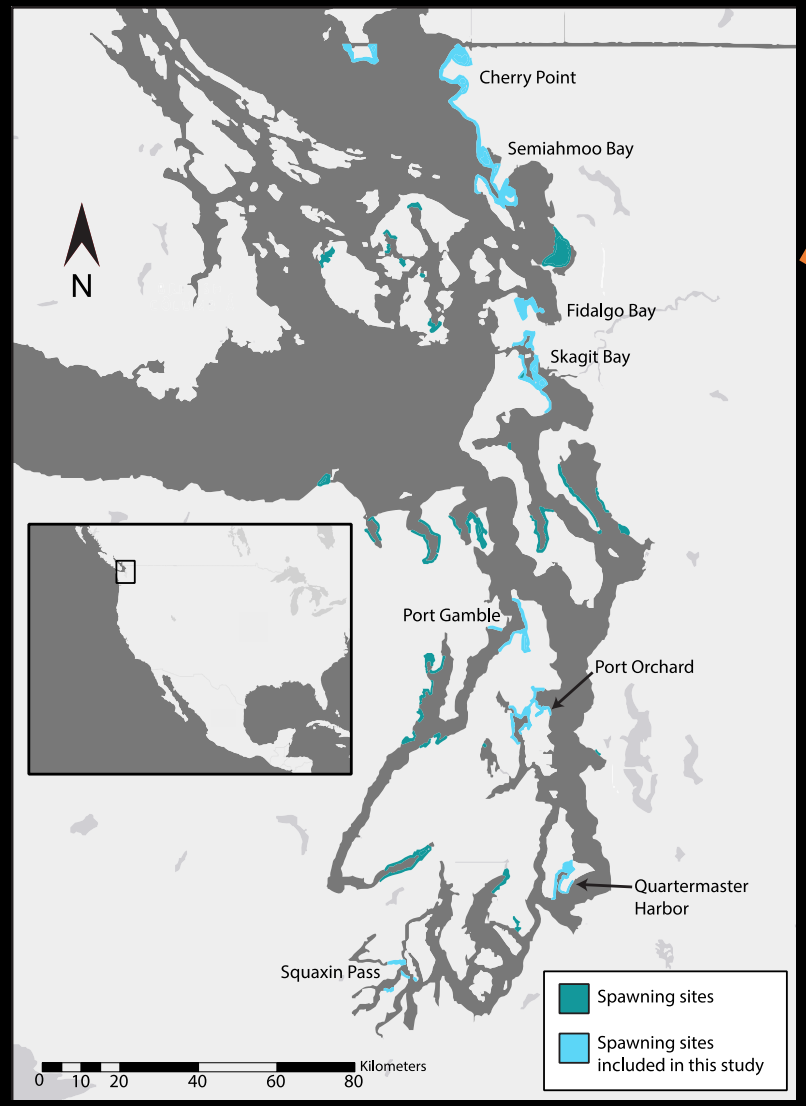
Spatial diversity is a buffer for predators

But what are demographic drivers?

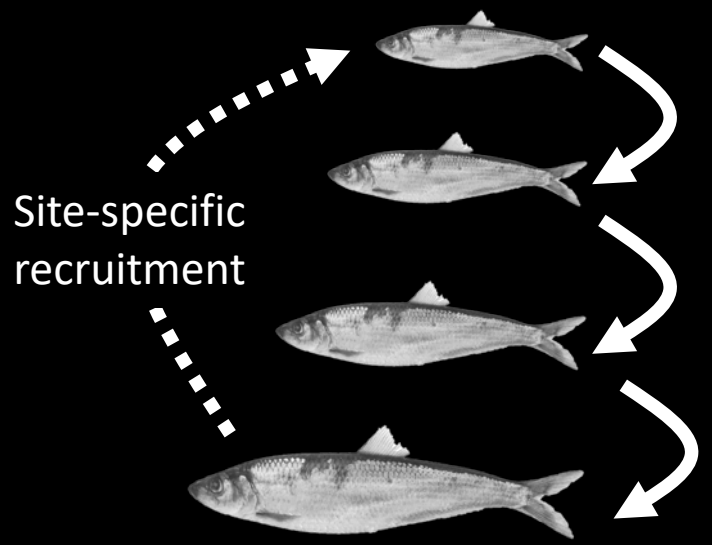
Does natural mortality vary more in time or in space?

Methods

Trawl surveys in spawning areas

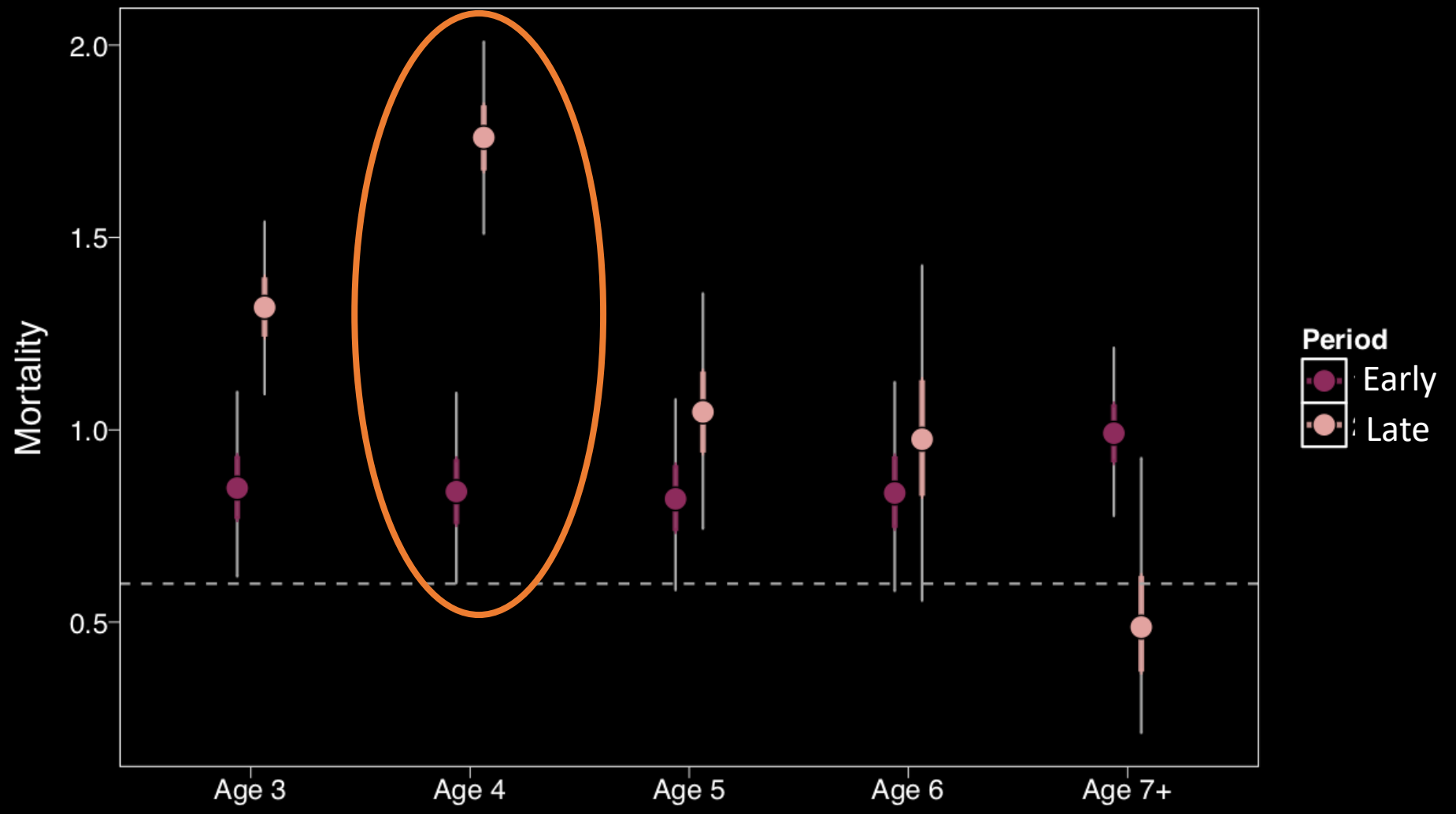


Age-structured population model



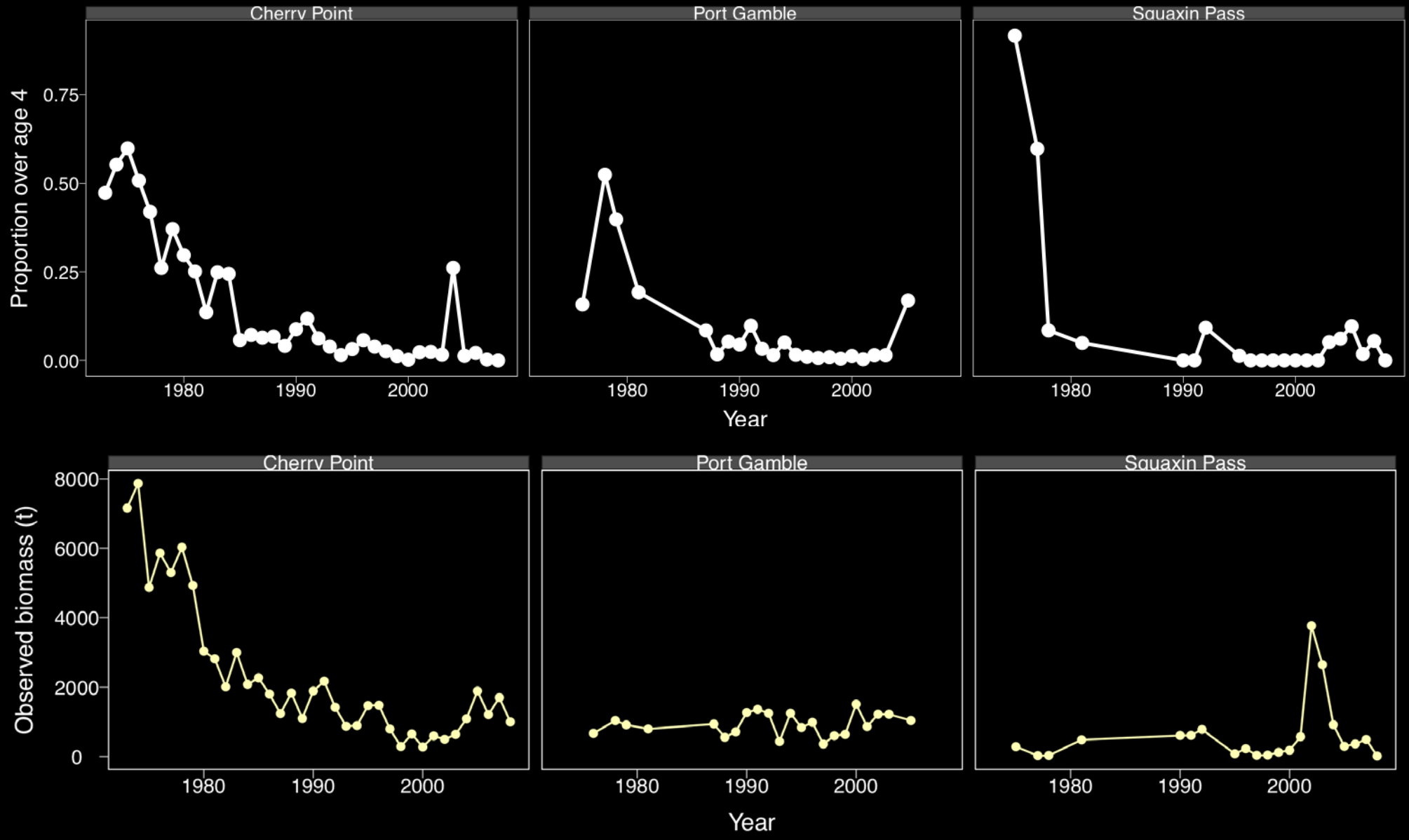
Fit different structures to test spatial vs. temporal differences in M

Adult mortality has increased since 1972



**Bayesian age-structured model*

Shifts in age structure



Consequences

1. Spatial diversity acts as a buffer[1]
2. Mortality increases are broad pattern[2]

3. Age truncation may also impact:
    - Increases in population variability[3]
    - Timing and location of spawning[4]

[1]Siple & Francis 2016 [2]Siple et al. 2017 [3]Anderson et al. 2008 [4]Francis unpubl., MacCall et al. submitted

What does this mean about herring ecology and management?

- Big, broad drivers, local responses
- Local responses could be environmental OR behavioral! (see Eleni's talk!)
- Spatial structure will be important for management

Thank you

Collaborators and coauthors

Kurt Stick
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Tessa Francis
Ole Shelton
Tim Essington
Alec MacCall
Essington Lab

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