Age truncation and portfolio effects in Puget Sound Pacific herring

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Portfolio effects and age truncation in Puget Sound Pacific herring

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My goal today

I. Spatial dynamics
II. Demographic changes

Insights about ecology and management
Possible next steps
Can we distinguish groups of spawning sites that fluctuate together?
Panmictic
(all one population)
Genetics (microsatellite markers) - Small et al. 2005

Contaminants - Cherry Point, Semiahmoo Bay - West et al. 2008

Geographic separation - Penttila 2007

All separate

*Multivariate state-space model
Pacific herring are 1.92 times more stable as several subpopulations
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

Site-specific recruitment

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

[Graph showing trends in proportion over age 4 and observed biomass for Cherry Point, Port Gamble, and Squaxin Pass from 1980 to 2000.]
Consequences

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

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

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