

Environmental Influences on Marine Survival and Maturity of Coho Salmon



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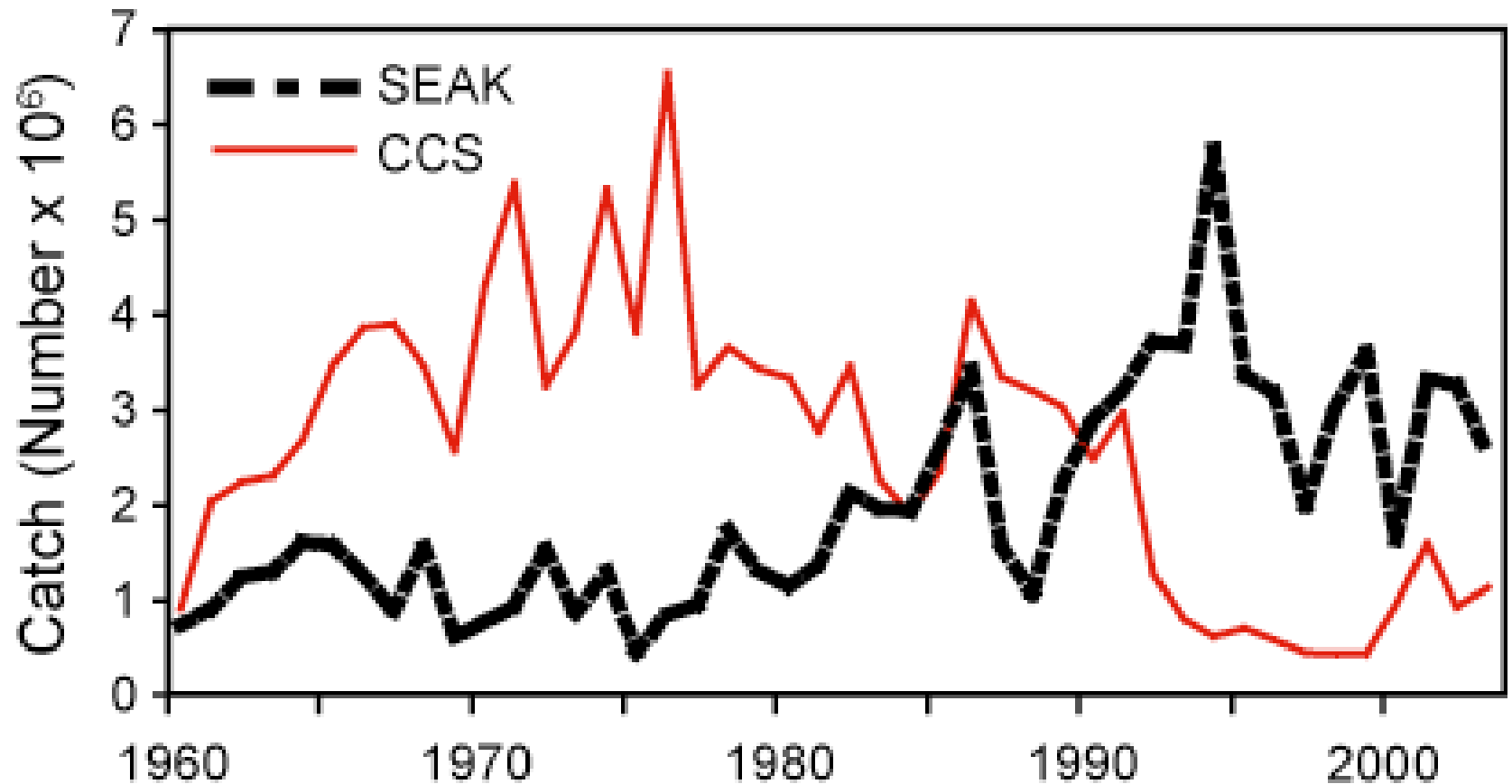


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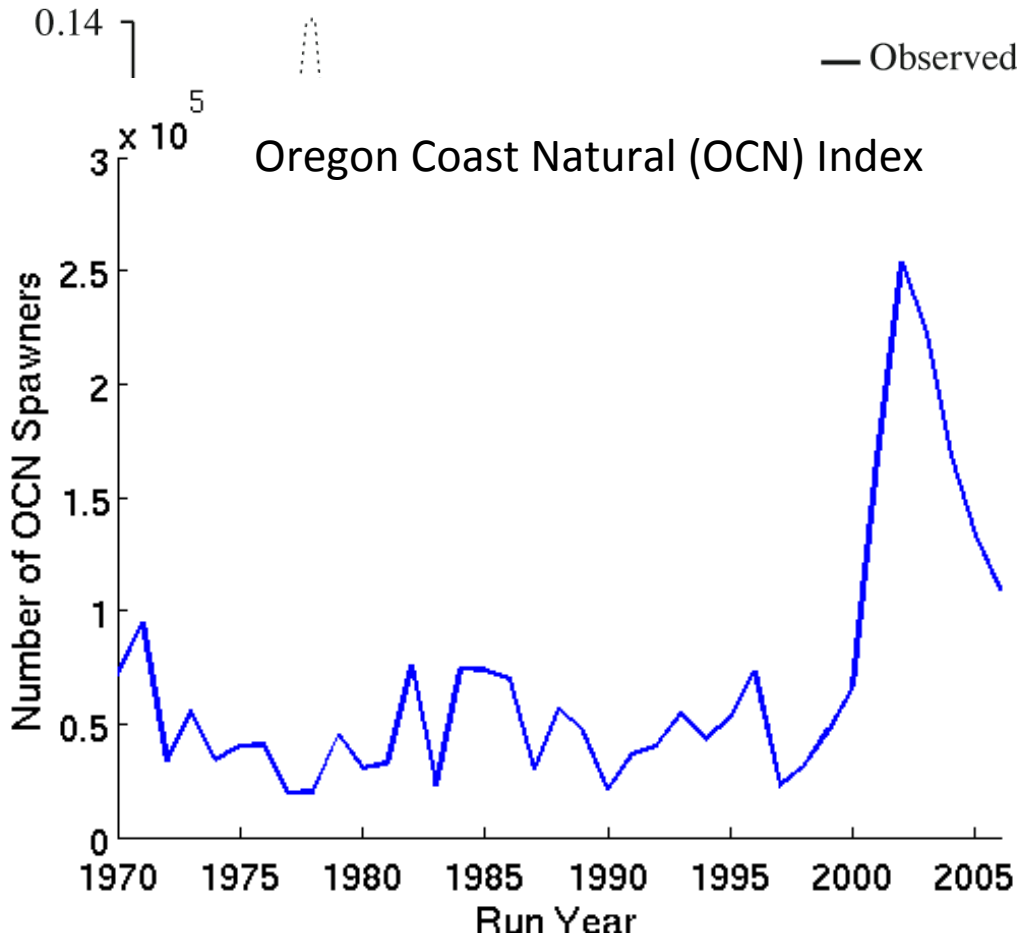
²Dept. Environmental Science & Policy, UC Davis

22-26 June 2009, Globec Open Science Meeting

Inverse Covariability in Coho Catch between SEAK & CCS

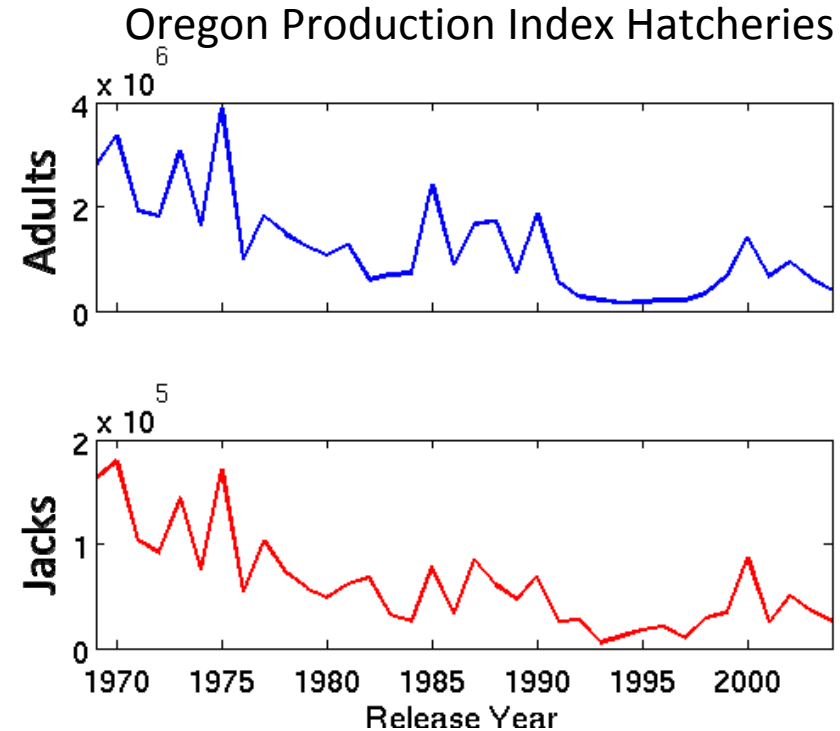
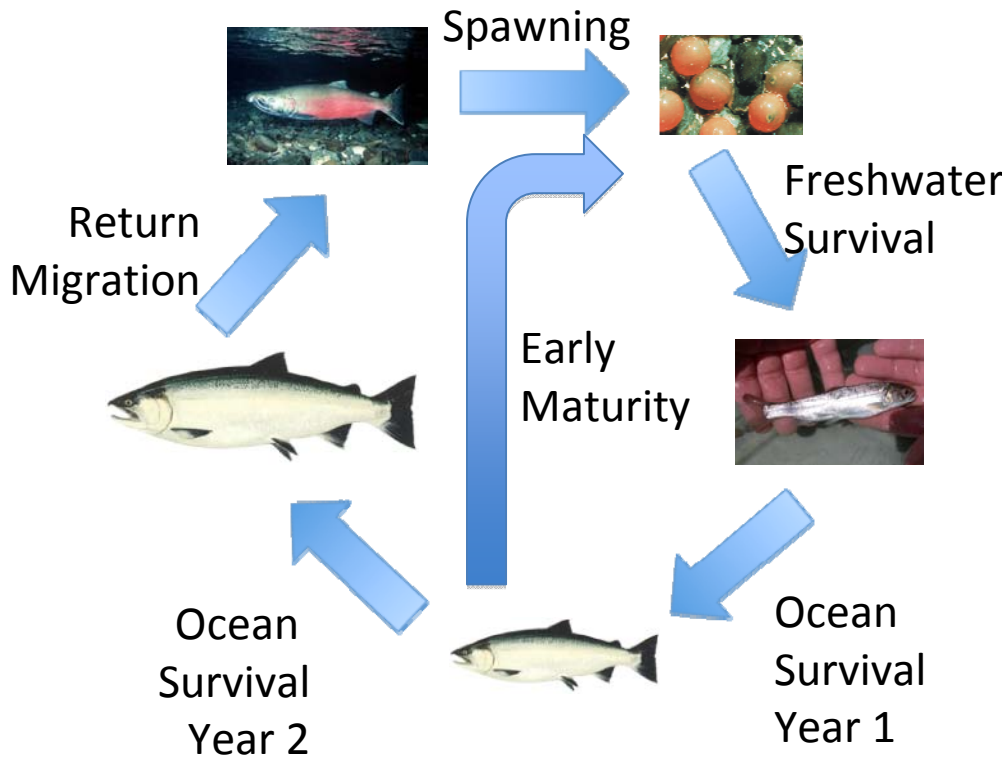


Traditional Approach in Fisheries Oceanography



- Correlate Smolt to Adult Return (SAR) rate with environment
- Common and useful approach
- SAR consists two years of survival and probability of early maturity
- Lack information on population dynamics
- Less useful for natural populations

Models and Data



$$J = Ns_1p$$

$$A = Ns_1s_2(1 - p)$$

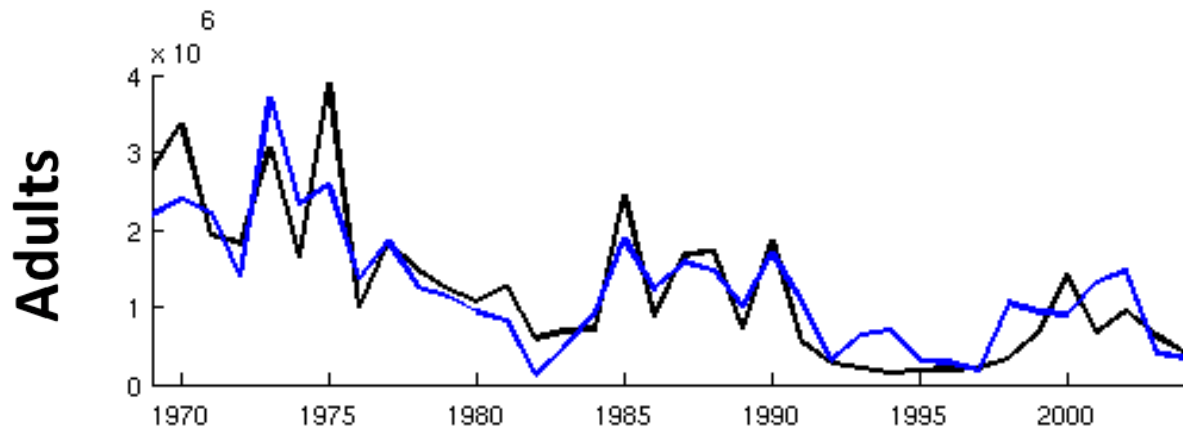
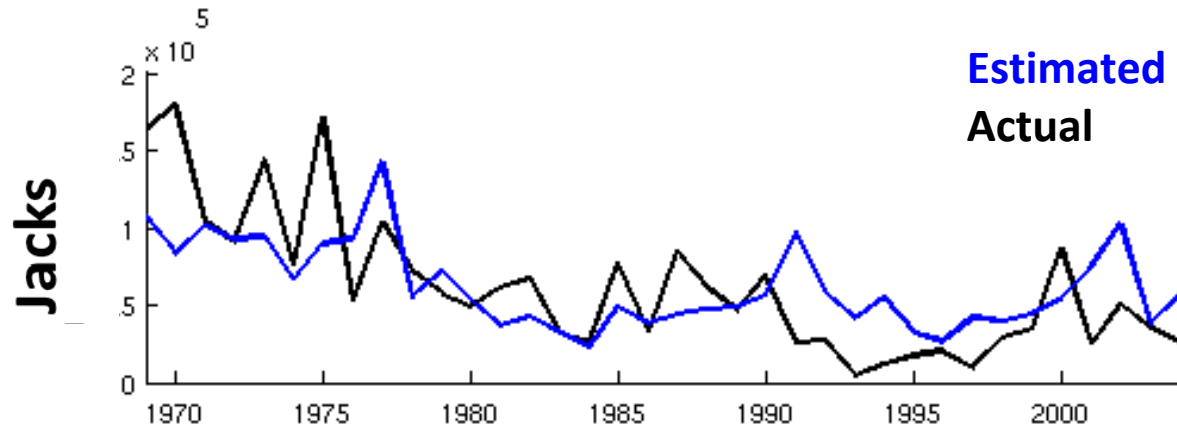
$$R = \frac{\alpha S}{1 + \beta S}$$

$$s_1 = f(SST, SprTrans, NPGO, \dots)$$

$$s_2 = f(SST, SprTrans, NPGO, \dots)$$

$$p = f(SST, SprTrans, NPGO, \dots)$$

Model Fit



Release Year

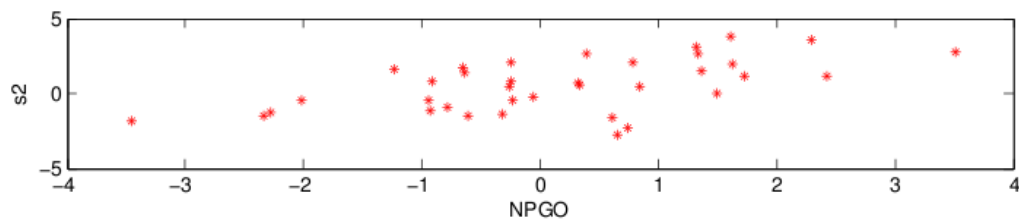
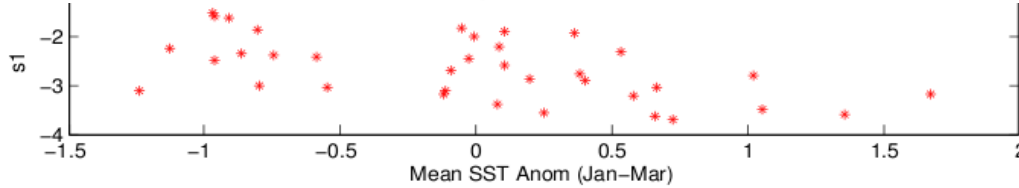
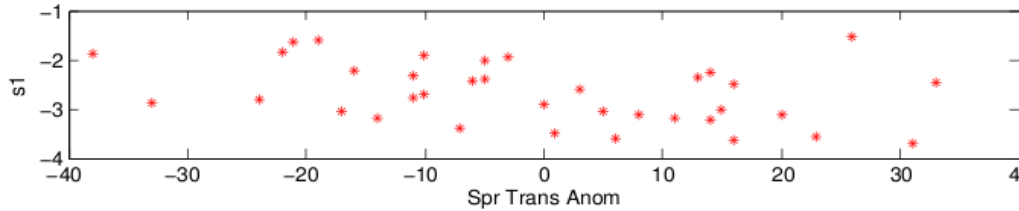
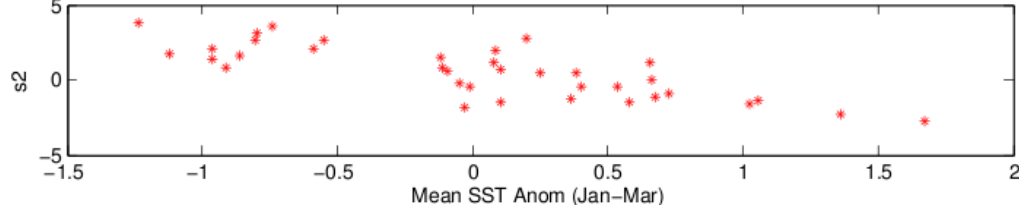
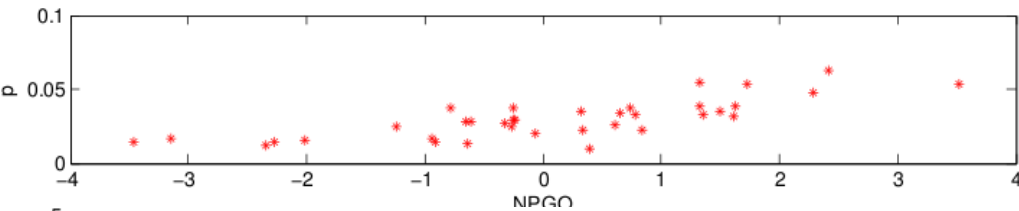
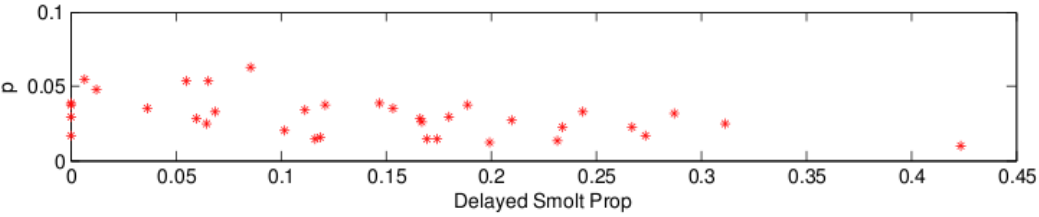
- Model fit is good for adults and reasonable for jacks

- Fit for jacks poorer in the 90s

- $s_2 > s_1 > p$

- Currently working on improving the fit of the model

Environmental Relationships

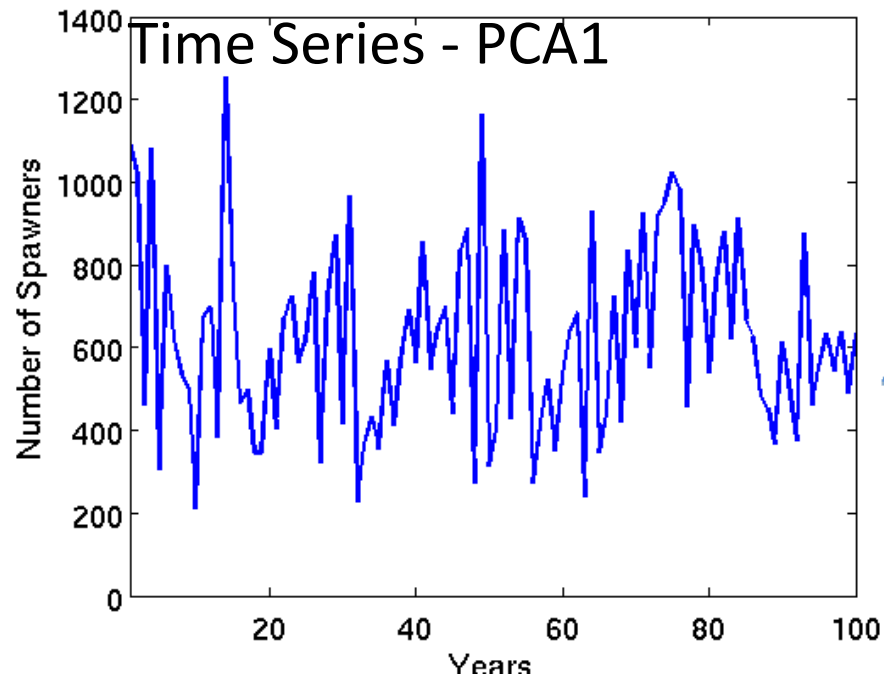


$$s_1 = f(SST, SprTrans, NPGO, \dots)$$

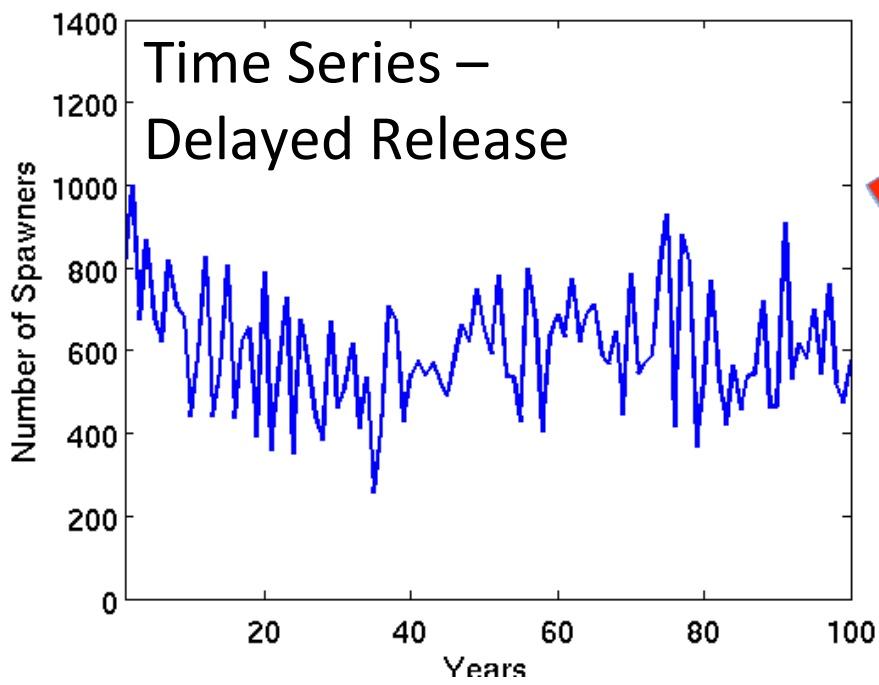
$$s_2 = f(SST, SprTrans, NPGO, \dots)$$

$$p = f(SST, SprTrans, NPGO, \dots)$$

- Estimated relationships between environment and s₁, s₂, and p were put into age structured model
- Environmental variability was simulated in the model by varying the PCAs of the environment one at a time
- Analyzed the population responses

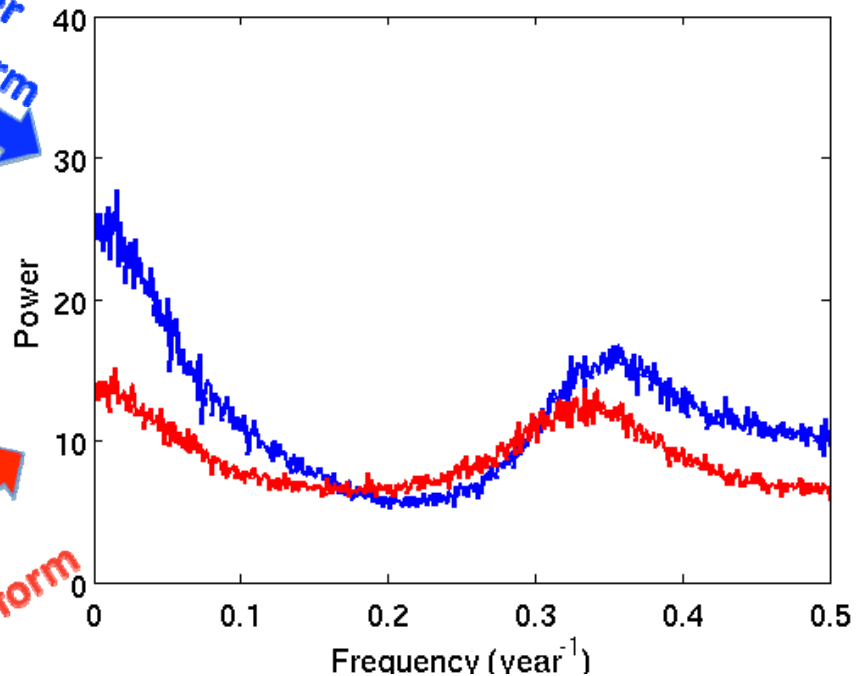


Fourier Transform

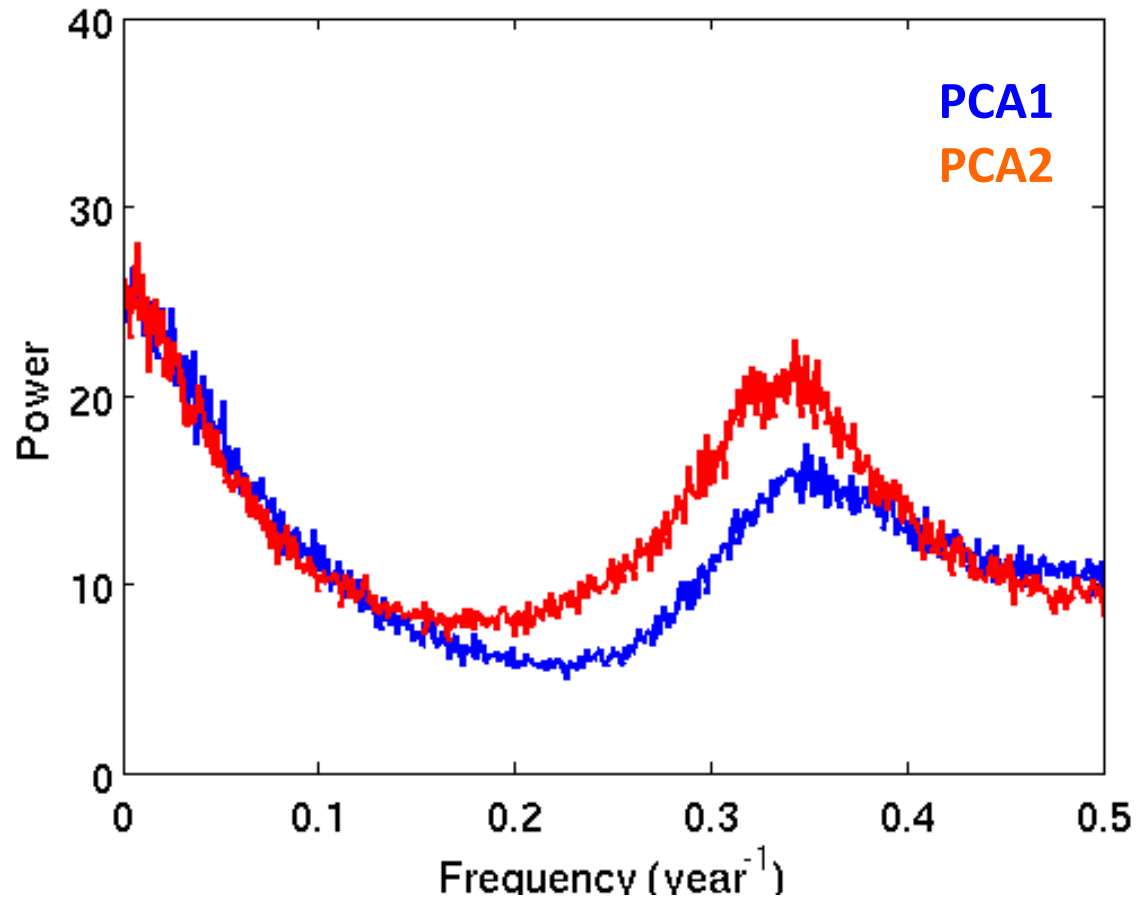


Fourier Transform

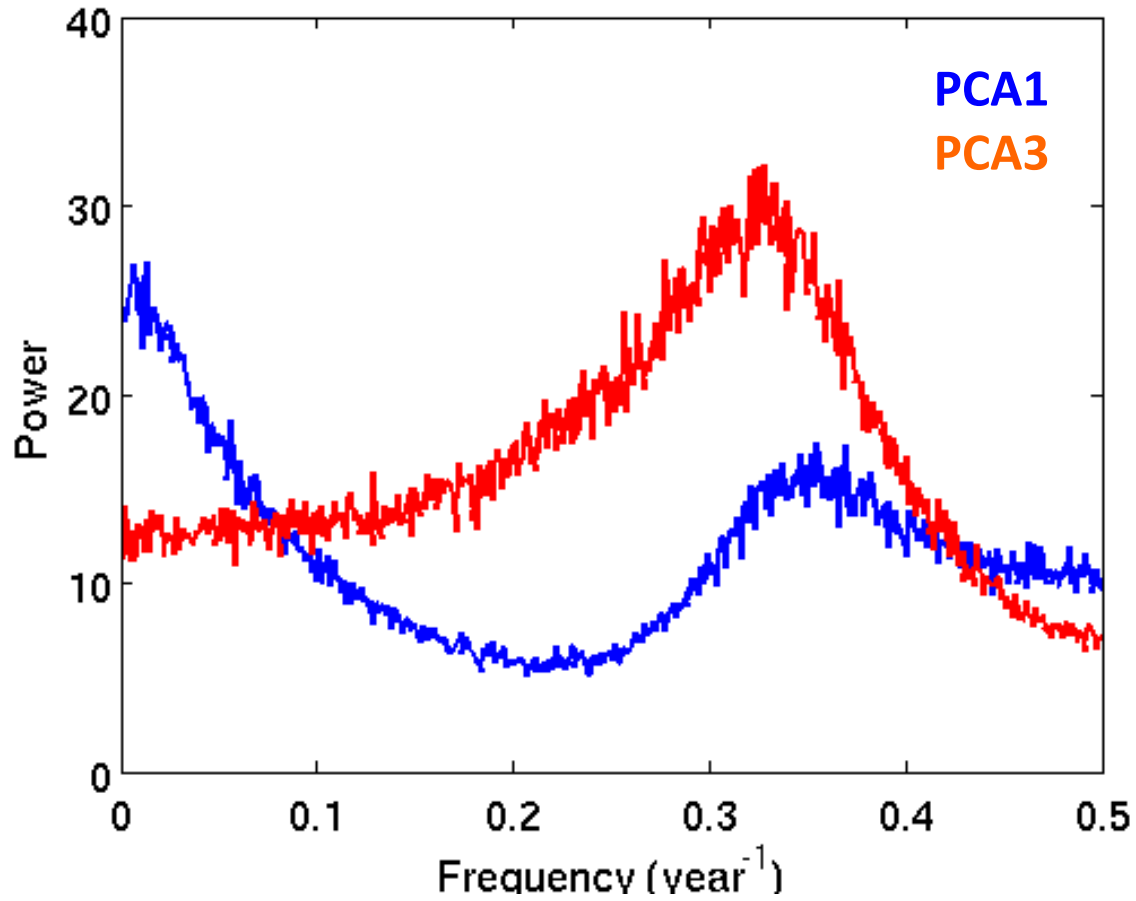
Power Spectrum



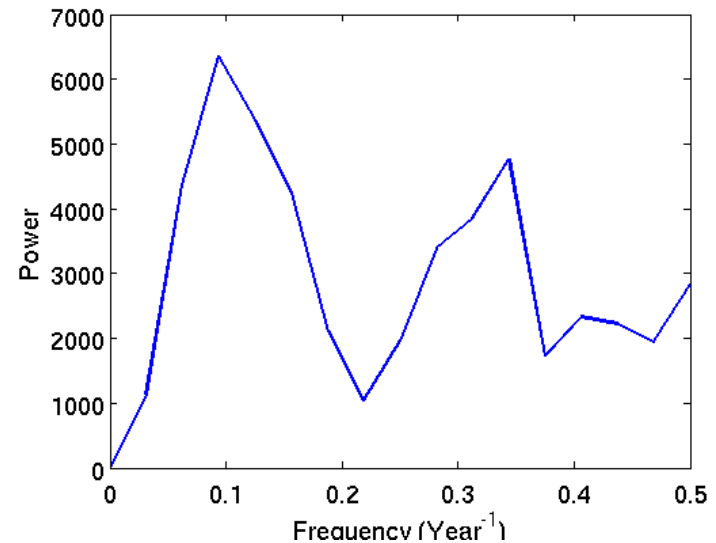
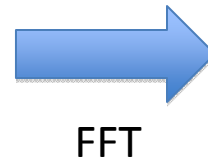
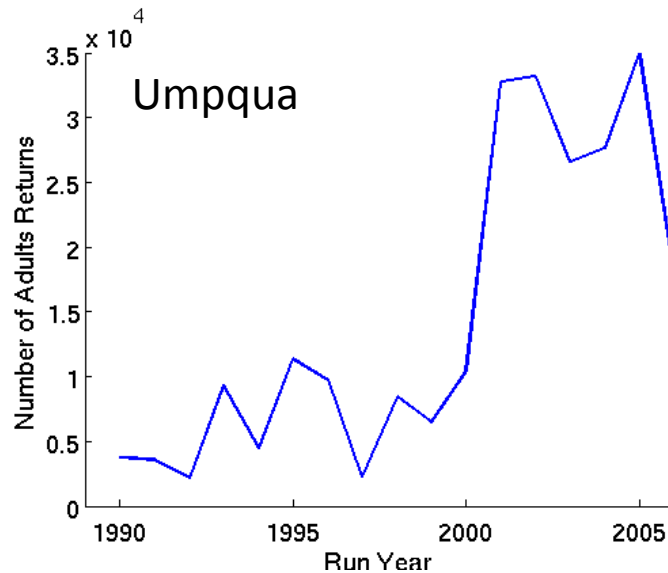
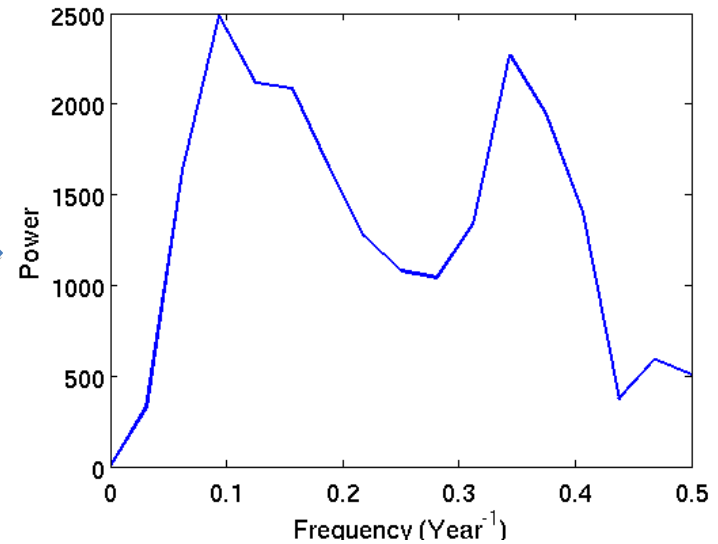
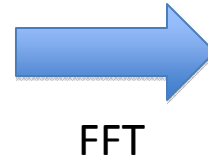
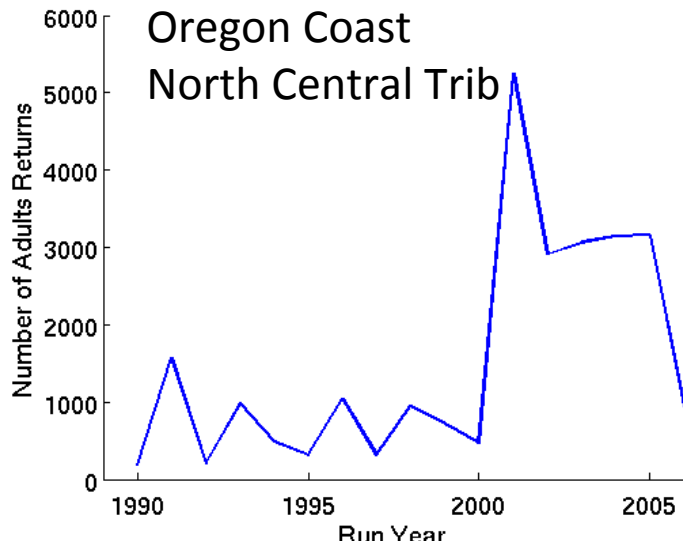
PCA1 vs PCA2



PCA1 vs PCA3



How does this Compare with Natural Populations?



Conclusions and To Do List

- Important to understand the effect of interactions between environment and life history parameters on populations dynamics
- 3 year cycles should be common for coho salmon, coupled with longer time scales cycles depending on environment
- Some natural populations of salmon do show expected frequency response
- Pink noise should be used rather than the white noise currently
- Improve fit of model – GAMs etc
- Comparison with chinook salmon and other populations (Pacific & Atlantic cod, Atlantic salmon)

Acknowledgements

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