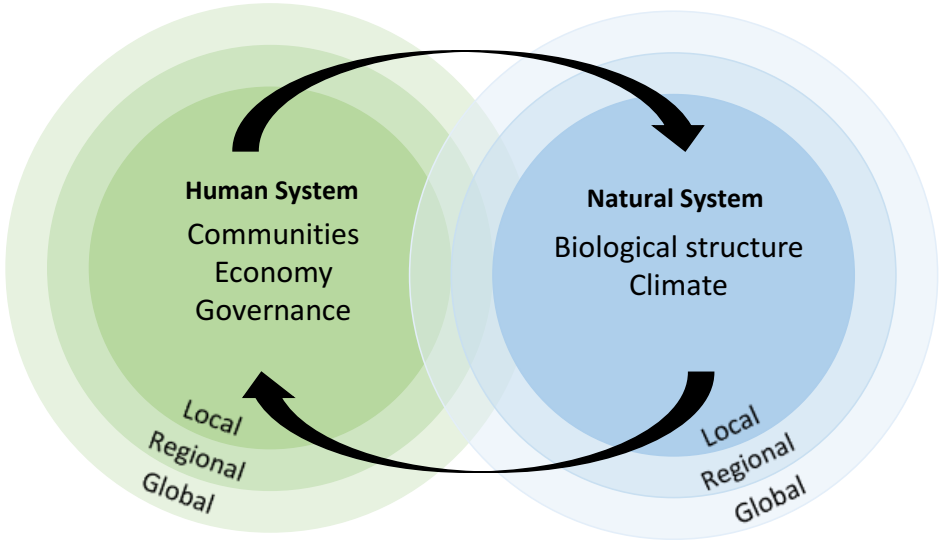
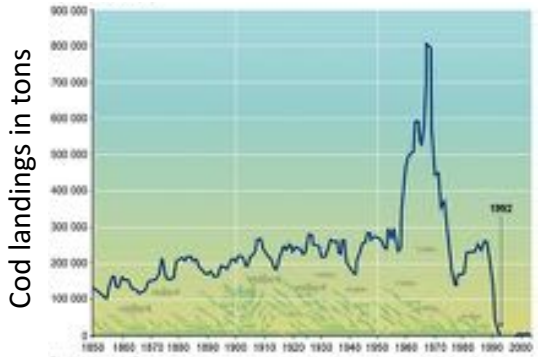
Variability and uncertainty challenge human communities

Credit: NOAA



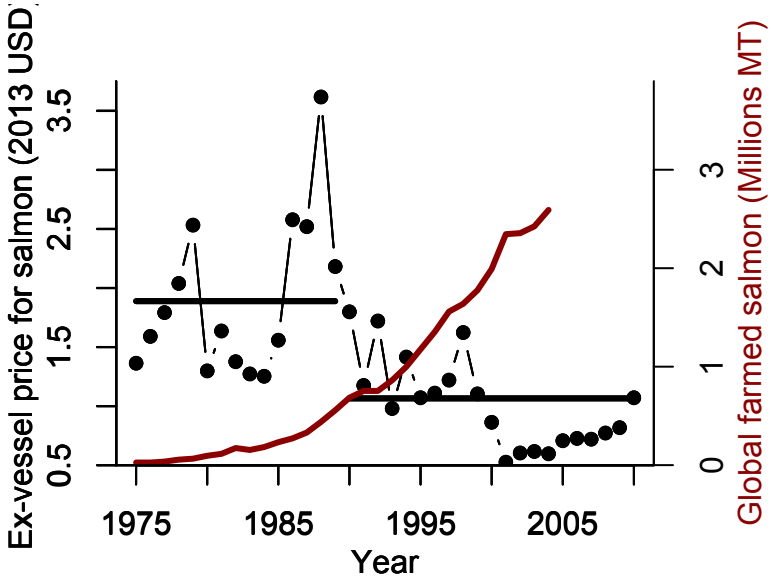
Human communities need to be able integrate over variability in the aggregate social-ecological system

Variability in social-ecological systems occurs at many scales



Credit: MEA

38% of fish stocks exhibit regime shifts
(Vert-pre et al. 2013)



Regime shift in salmon prices
impacted Alaskan fishers

Strategies for coping with variability

Forecasting

difficult to predict the future

Insurance

transfer damages from unexpected shocks

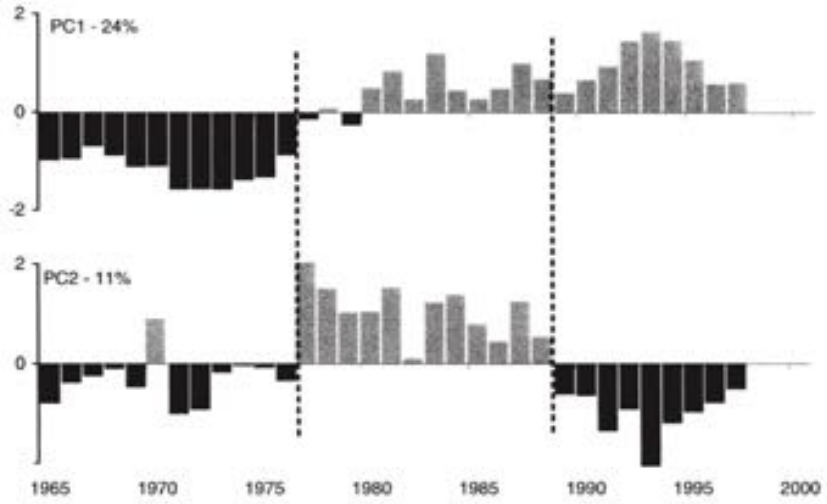
Diversification

shown to benefit individual fishers from interannual variation (Kasperski and Holland 2013)

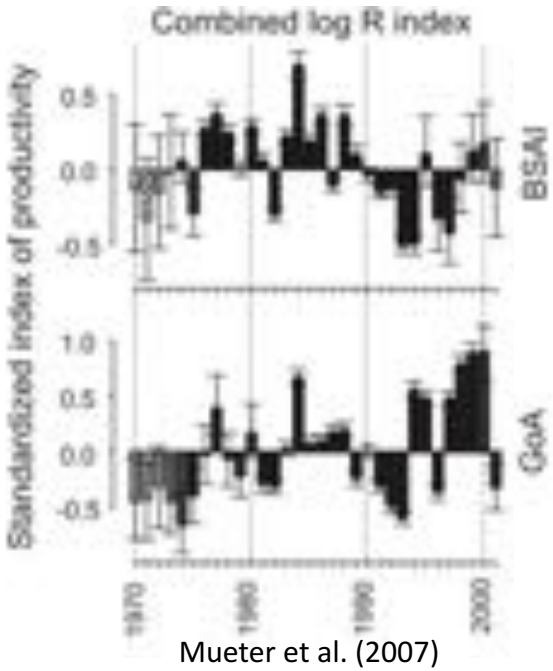
Maintain flexibility

adapt to changing conditions

The North Pacific ocean is notoriously variable



Hare and Mantua 2000

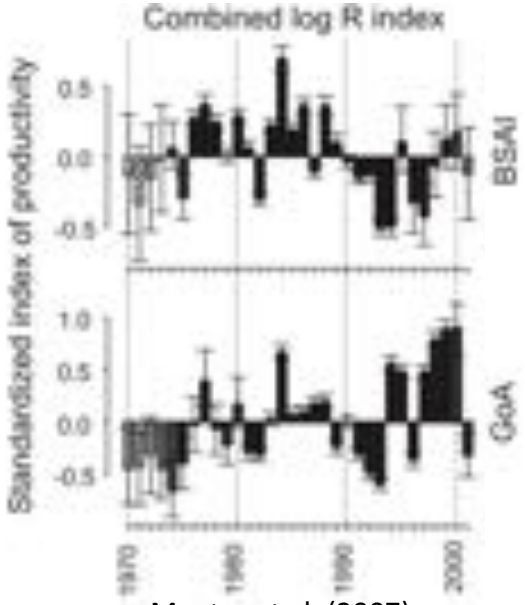


Mueter et al. (2007)

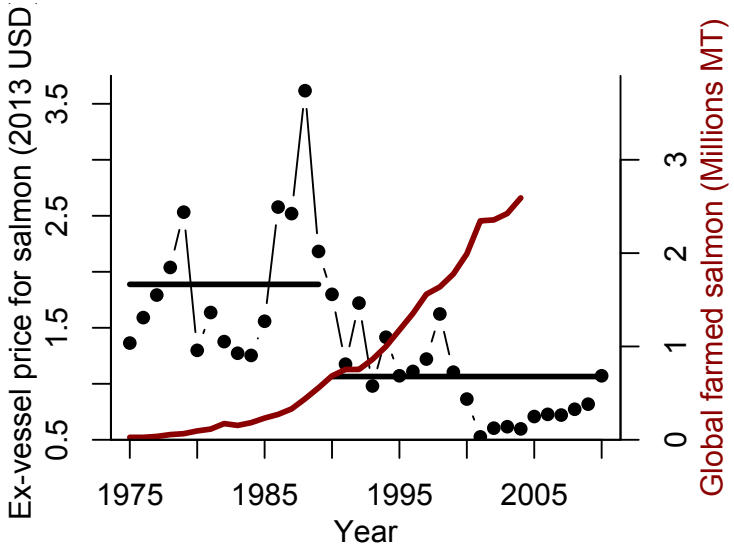
These regime shifts affect species differently and change the overall composition

Fishing is important to Alaskan communities

Credit: NOAA



Mueter et al. (2007)

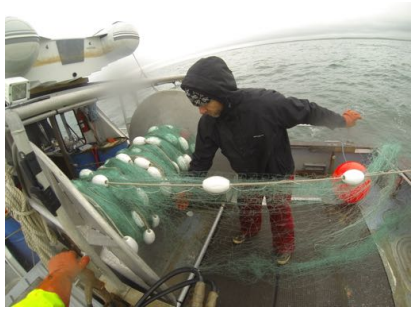


Questions

Were fishing revenues in Alaskan communities impacted by regime shifts in the North Pacific ecosystem and in salmon prices?

Were communities with more diverse fishing opportunities buffered and better able to adapt to these regime shifts?

Alaskan fishing revenue data



Commercial Fisheries Entry Commission

Census of fishing catches and revenues for Alaska since 1975

Credit: T. Walsworth

Catch records for 64 for stocks (species and locations)

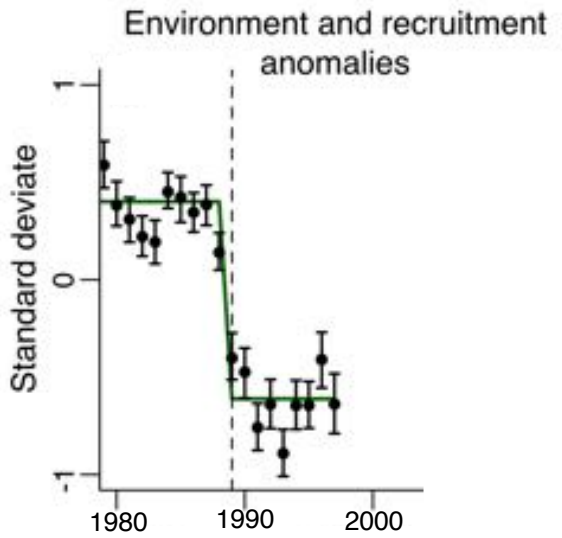
Revenue allocated to 105 individual fishing communities

Credit: T. Walsworth

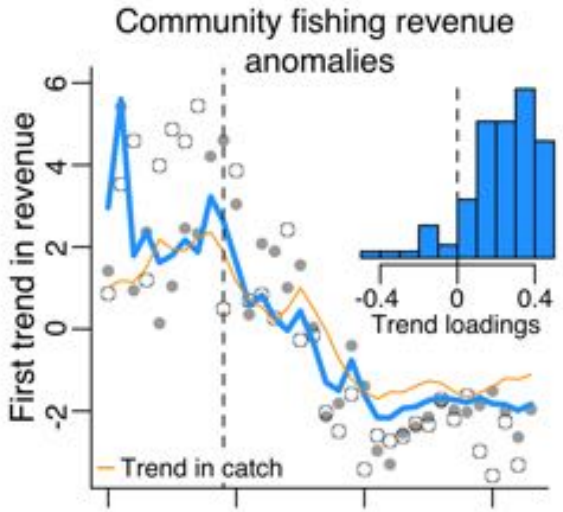
Thousands of permit holders

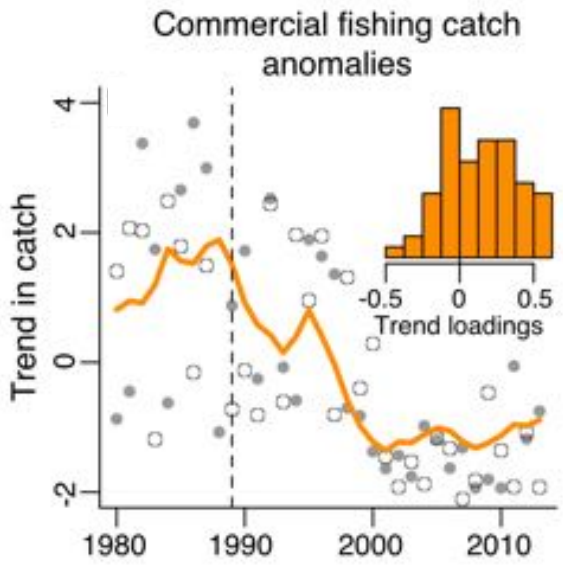
Socio-economic benefits at the scale of communities as fishing generates taxes and other commerce with the communities

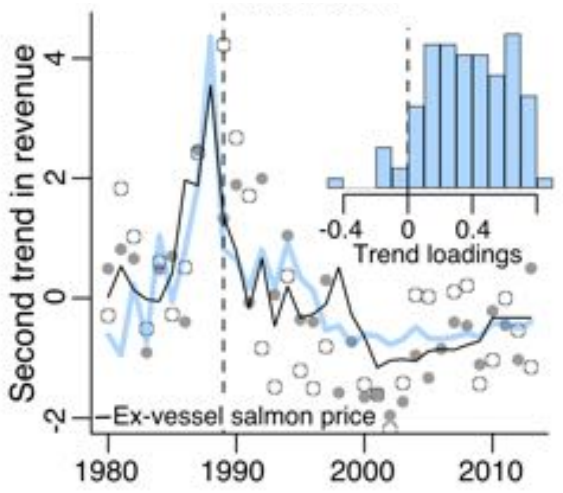
Ocean regime changes and market shifts impact fisheries catch and revenue



Redrawn from Hare and Mantua (2000)

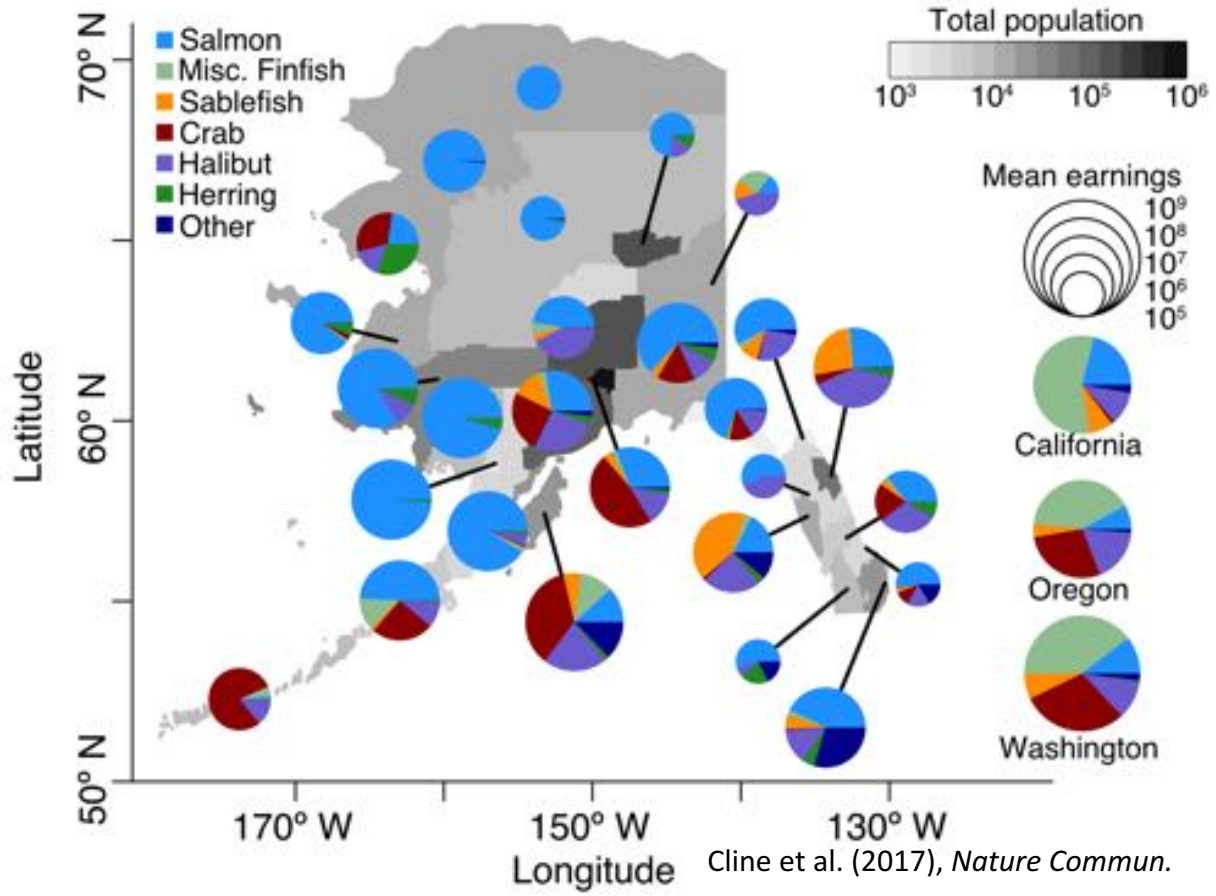






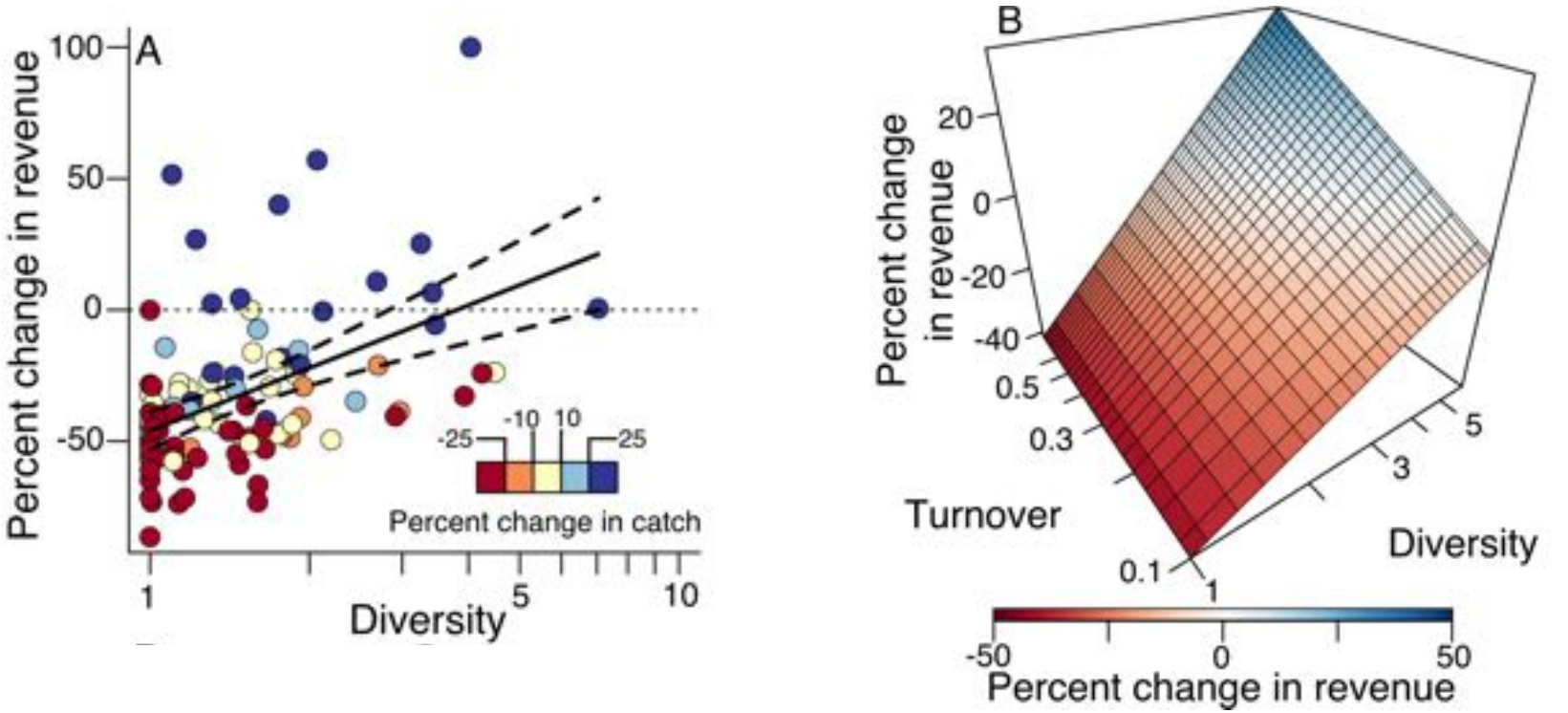
Cline et al. (2017), *Nature Commun.*

Variation in the diversity of fishing opportunities across Alaskan fishing communities



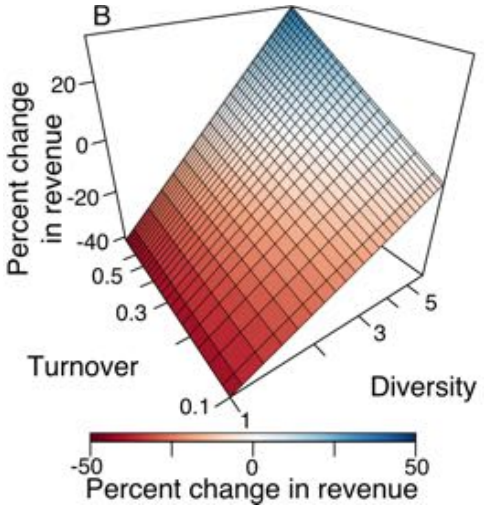
Cline et al. (2017), *Nature Commun.*

Diversification and turnover of fishing opportunities buffer against abrupt shifts



Cline et al. (2017), *Nature Commun.*

Conclusions



Ecosystems rarely collapse, but often undergo significant shifts in composition

Diversification and turnover of fishing opportunities can buffer communities against large scale unexpected shifts

These are tangible strategies that may ensure sustainable communities despite deep uncertainty about the future

Credit: NOAA