Gulf of Alaska Fisheries Climate Vulnerability Assessment

Objectives and Methodology

Presentation to the GOA Groundfish Plan Team
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Presentation Objectives

- Receive feedback from Plan Team on:
  - Methods
  - Extensions of species assessment to new dimensions
- Alert Plan Team to upcoming requests for input
  - For species profiles and scoring

Project Description and Objectives

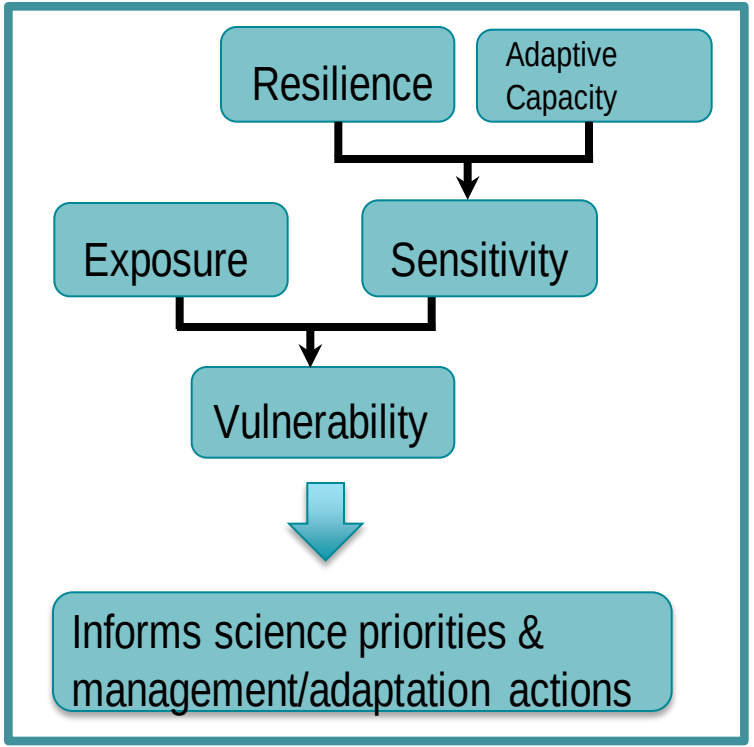
- The objective is to apply a rapid, semi-quantitative method to obtain a “first-cut” indication of the relative vulnerability of fish stocks to climate change.
- Can assist in communicating individual, local, and/or regional vulnerabilities based on fishing portfolios.
- We are integrating socioeconomic dimensions of vulnerability at the outset
- Species vulnerability assessments have been conducted throughout many regions, including the EBS (e.g., Spencer et al. 2019).

Assessing Vulnerability

Vulnerability – the degree to which a stock would be affected by climate change (usually considered as "risks")

Exposure – changes in the stock's physical or biological environment that can affect productivity and/or distribution.

Sensitivity – Inherent biological attributes of a stock that are predictive of their ability to respond to potential environmental changes. Includes adaptive capacity.



http://www.st.nmfs.noaa.gov/ecosystems/climate/activities/assessing-vulnerability-of-fish-stocks

Vulnerability Assessment Methodology

Species Vulnerability

Exposure

- Sea surface temperature*
- Air temperature*
- Salinity*
- Ocean acidification (pH)*
- Precipitation*
- Currents**
- Sea level rise**

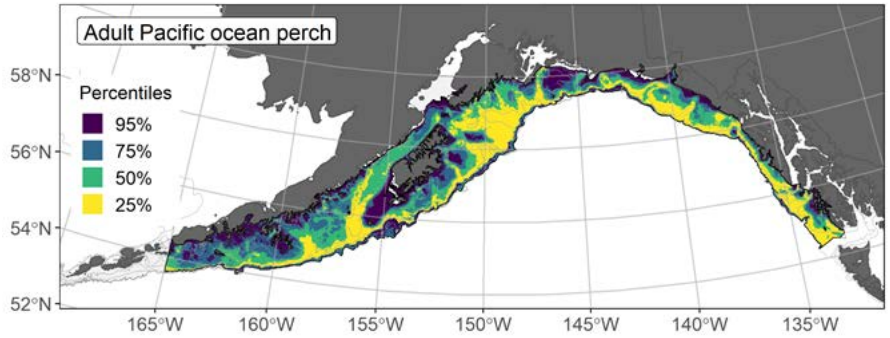
**modelled results (mean & variance)*
***written description only*

Sensitivity

- Habitat Specificity
- Prey Specificity
- Sensitivity to Ocean Acidification
- Sensitivity to Temperature
- Stock Size/Status
- Other Stressors
- Adult Mobility
- Spawning Cycle
- Complexity in Reproductive Strategy
- Early Life History Survival and Settlement Requirements
- Population Growth Rate
- Dispersal of Early Life Stages

Process (for scoring, and preparation for scoring)

1. Develop species profiles
   - A species profile is a brief summary of the relevant information for the sensitivity attributes for each stock.
   - The species profile includes information on data quality.
   - The purpose of a species profile is to ensure a baseline level of information for all people scoring each stock.
2. Identify climate variables and projections
3. Identify species distributions (use new SDM ensemble EFH maps) →
4. Preliminary and final scoring
5. Compute and bootstrap results, write final report



Methodology - 5 Point Tally Scoring System

- The scoring for each attribute is done by the experts assigning 5 tallies within the 4 scoring bins
- This gives experts the ability to express uncertainty in their score
- Experts also provide an estimate of quality (0= no data, 1= expert knowledge, 2= limited data, 3 = good data)

Example:

Expert Scores - Low uncertainty scenario			
Low	Moderate	High	Very High
	5		

Expert Scores - Moderate uncertainty			
Low	Moderate	High	Very High
		3	2

Expert Scores - Higher uncertainty scenario			
Low	Moderate	High	Very High
1	1	2	1

Process - Expert Scoring

- Multiple Experts
- Two stage scoring

Preliminary Scoring

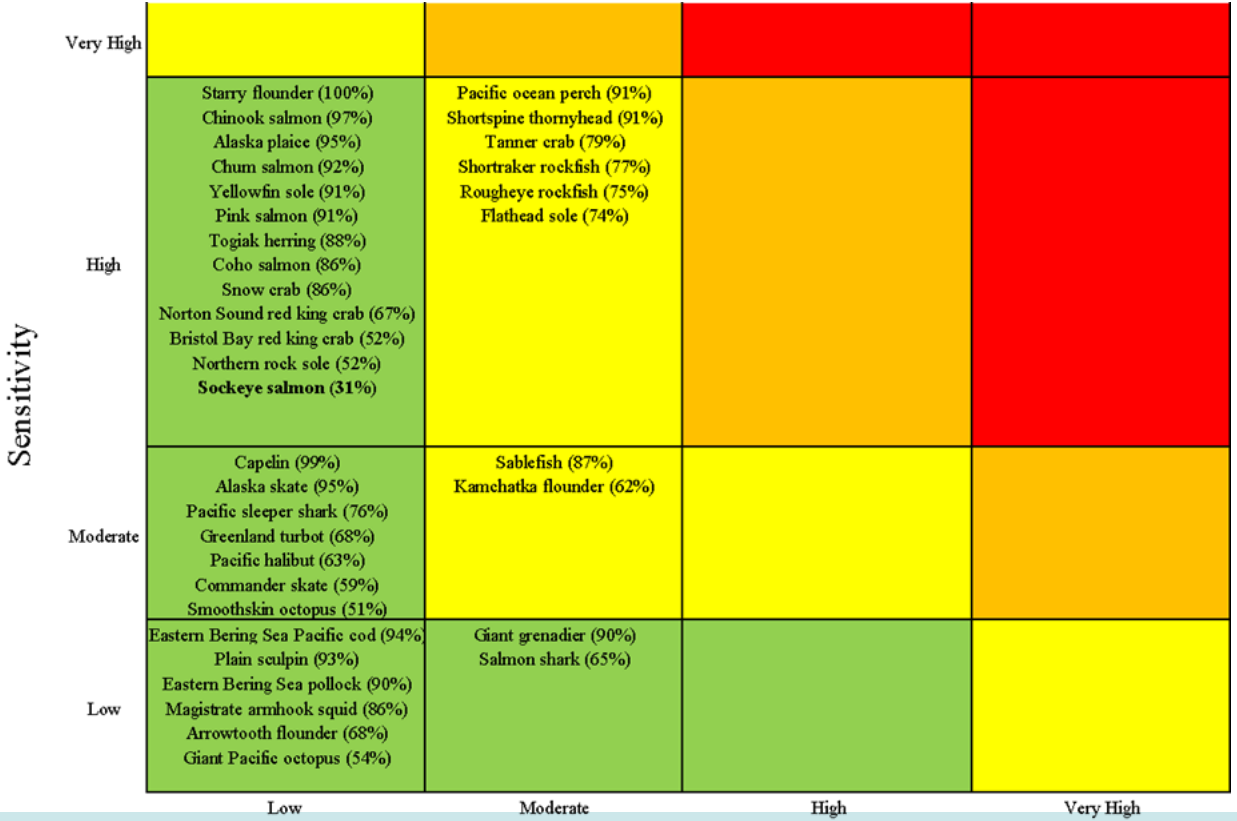
- Independent
- Based on species profiles and expert opinion
- All attributes scored
- Adequate time

Final Scoring

- Group
- Based on discussion
- Facilitated
- Focus on inconsistencies in the preliminary scores

EBS climate vulnerability

(parentheses show the proportion of bootstrap samples with the same vulnerability as the original analysis)



Coupled species-socioeconomic vulnerability

- Baseline socioeconomic vulnerability
  - Does vulnerability differ over harvest portfolios?
  - We can link species vulnerability to harvesting and processing portfolios at various levels - fleets, communities
- Coupled species-socioeconomic vulnerability
  - How does fishing portfolio vulnerability intersect with underlying socioeconomic vulnerability?
    - Socioeconomic vulnerability is measured in terms of poverty, education, etc.
  - We can superimpose species vulnerability over socioeconomic vulnerability to understand this intersection

Socioeconomic extensions to species vulnerability

- Socioeconomic vulnerability can be incorporated within species profiles as well
  - Emergent fisheries
    - Emerging fisheries can mediate vulnerability associated with current fishing portfolios
    - Expert input could help explore this dimension of fisheries adaptation in the Gulf of Alaska.
    - Specifically - questions around what species, where, when, uncertainty
  - Disentangle sensitivity
    - Size of fish, depth of fish, quality/health of fish
      - These have implications for which fleets and fishing communities may successfully adapt and how
    - Shocks vs. gradual change
      - Explore species vulnerability to heat waves vs. more gradual climate-driven stress
      - Shocks have different implications for fishermen, managers, disaster relief, etc. than gradual changes in fisheries

Next Steps

- Post September Plan Team
  - Poll of PT about species expertise
  - Develop proposal for MSA RFP
- Post November Plan Team
  - Send out species profile questionnaires for experts to fill out

Plan Team Feedback

- Questions or concerns?