BSAI Crab Rationalization Program 10 year review: Community Vulnerability and Well-Being Indices

Amber Himes-Cornell and Stephen Kasperski

Alaska Fisheries Science Center

Outline

- Background
- What are we measuring?
- Methods: Development of the Indices
- Application in the 10 year review

Social indices of vulnerability and resiliency

- National and international focus on use of indicators to measure well-being in communities
- Jacob and Jepson (2007) and Jacob et al (2010) - Gulf Coast fishing communities
    - Created vulnerability index to measure community sustainability and fishery dependence in the face of changing fisheries regulations
- Colburn and Jepson (2013) – Northeast and Southeast fishing communities
    - Also include indicators of gentrification
- Being incorporated into analyses for each of the East Coast Councils
- Applicability
    - Fisheries management program performance (e.g., catch shares), predicting social impacts of proposed management programs (and doing social impact statements), vulnerability to climate change

What are we measuring?

- Vulnerability is about the ***existing condition***
  - Easy to measure from existing data
- Resilience is about the ***response to change over time***
  - More difficult to measure until after an event occurs
- ***Need to track vulnerability over time to understand community resilience***

- We consider well-being to encompass both concepts of vulnerability and resilience, as well as other components.
  - Recognizing that that well-being is a multi-faceted concept, made up of objective, subjective and inter-relational components (Coulthard et al. 2011).

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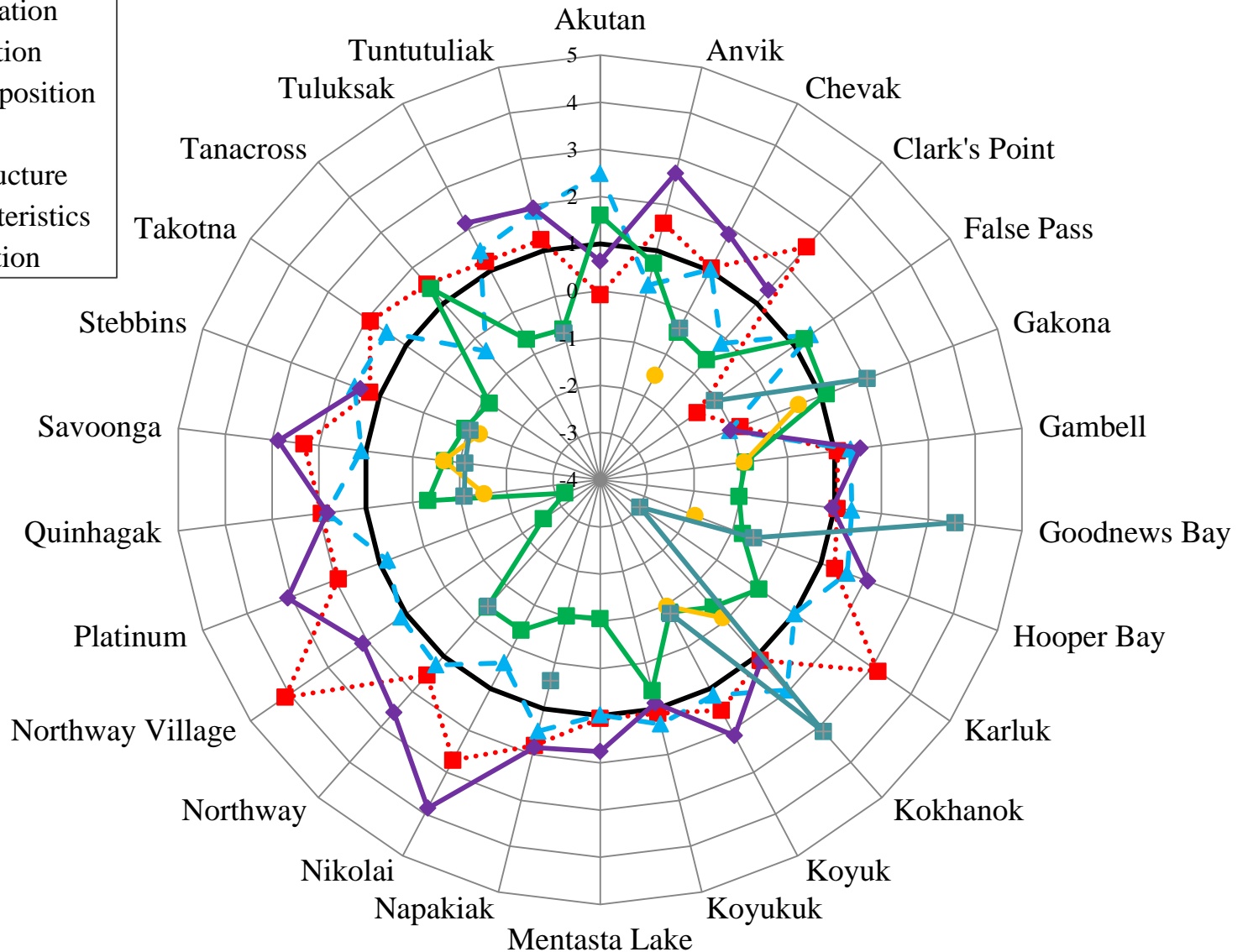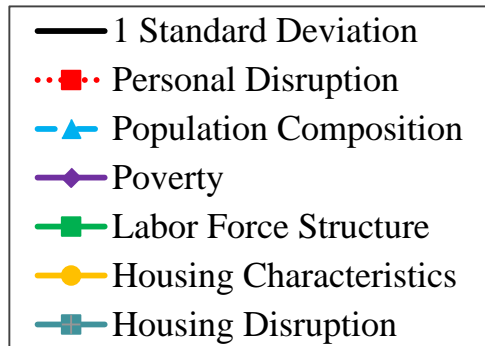# Method: Principal Component Factor Analysis

- Identify variables that represent the well-being concepts
- Conduct a principal components analysis
  - Varimax Rotation
  - Kaiser Normalization
  - Achieve a single factor solution
- Create index scores from the rotated factor loadings using the regression method
- Group the least vulnerable 20% (yellow), middle 60% (orange) and most vulnerable 20% (red) communities by index scores

Overall community scores

- For each index (7 social; 7 fisheries):
  - Each community is given a score of 1 if they are +/- 1 standard deviation above the mean index score and a 0 otherwise
- Dichotomized score is then summed for each community
  - Across all socio-economic well-being indices
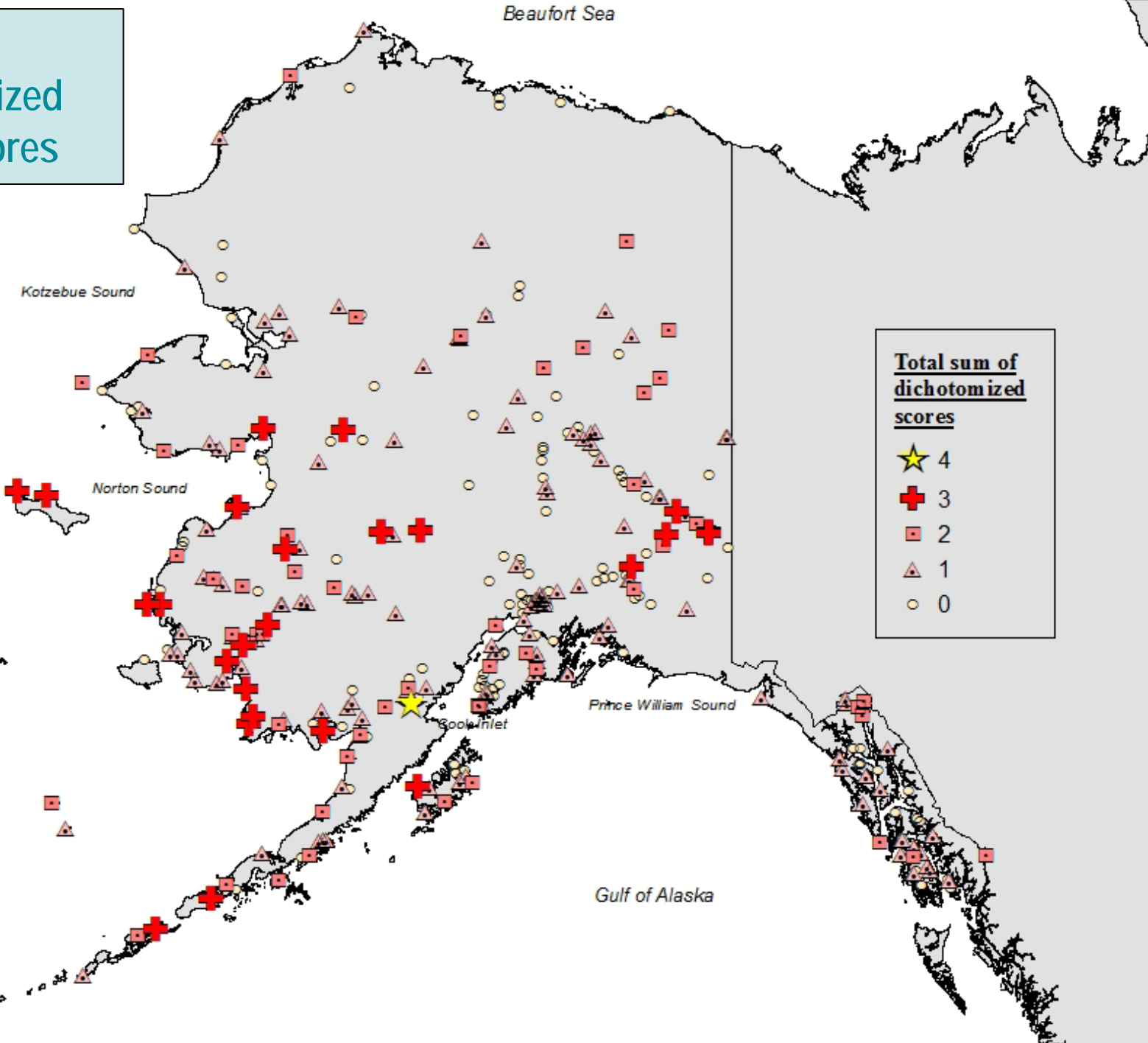 - Across all fishing involvement indices

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Community	Personal Disruption	Population Composition	Poverty	Labor Force Structure	Housing Characteristics	Housing Disruption	Status of Schools	Total Social Score
Kokhanok	1	1	1	0	0	1	0	4
Akutan	0	1	0	1	0	0	1	3
Anvik	1	0	1	0	0	0	1	3
Chevak	1	1	1	0	0	0	0	3
Clark's Point	1	0	1	0	0	0	1	3
False Pass	0	1	0	1	0	0	1	3
Gakona	0	0	0	1	0	1	1	3
Gambell	1	1	1	0	0	0	0	3
Goodnews Bay	1	1	0	0	0	1	0	3
Hooper Bay	1	1	1	0	0	0	0	3
Karluk	1	1	0	0	0	0	1	3
Koyuk	1	1	1	0	0	0	0	3
Koyukuk	1	1	0	0	0	0	1	3
Mentasta Lake	1	0	1	0	0	0	1	3
Napakiak	1	1	1	0	0	0	0	3
Nikolai	1	0	1	0	0	0	1	3
Northway	1	1	1	0	0	0	0	3
Northway Village	1	1	1	0	0	0	0	3
Platinum	1	0	1	0	0	0	1	3
Quinhagak	1	1	1	0	0	0	0	3
Savoonga	1	1	1	0	0	0	0	3
Stebbins	1	1	1	0	0	0	0	3
Takotna	1	1	0	0	0	0	1	3
Tanacross	1	0	0	1	0	0	1	3
Tuluksak	1	1	1	0	0	0	0	3
Tuntutuliak	1	1	1	0	0	0	0	3

Social indices: Top 26 communities overall

Legend:
- 1 Standard Deviation
- Personal Disruption
- Population Composition
- Poverty
- Labor Force Structure
- Housing Characteristics
- Housing Disruption

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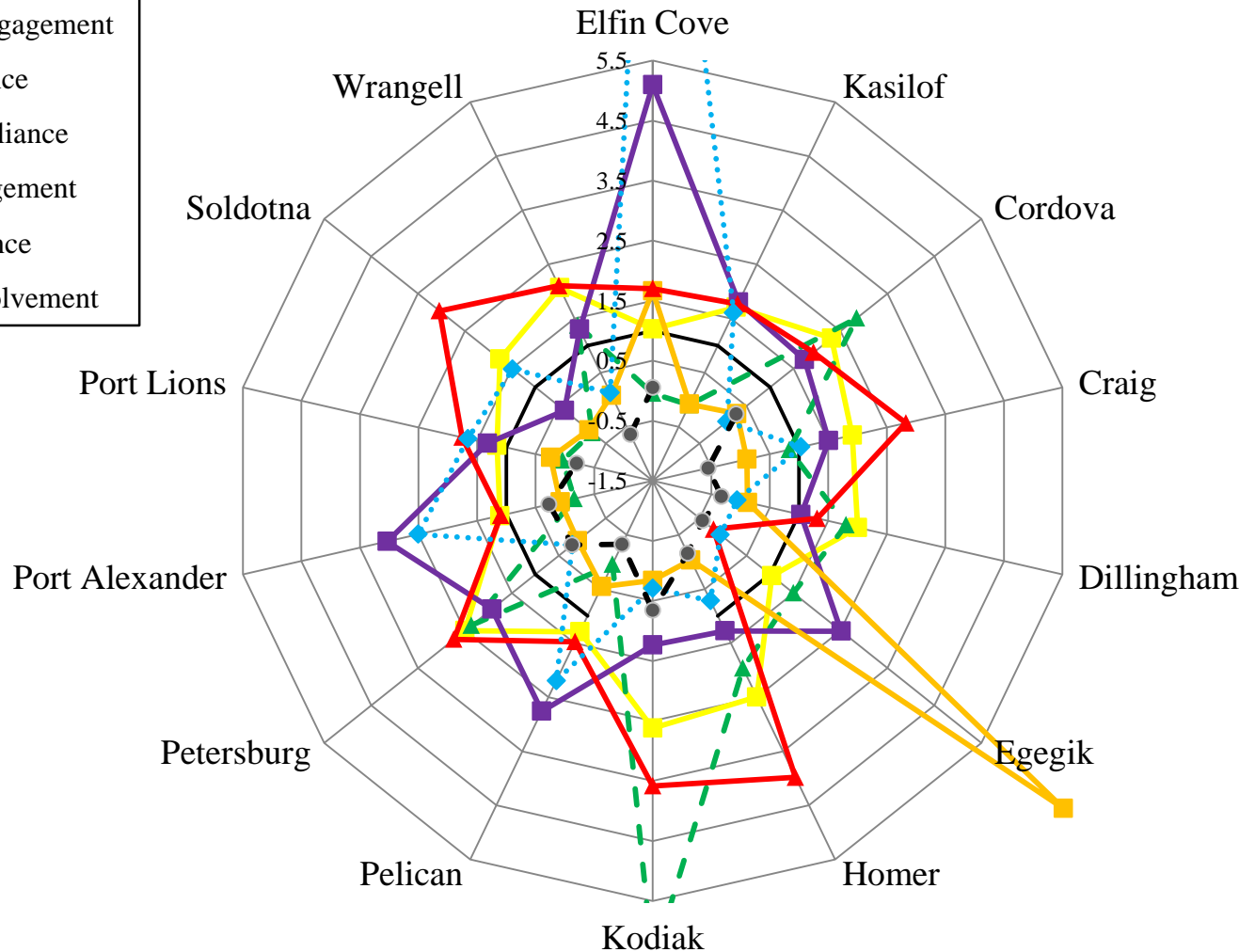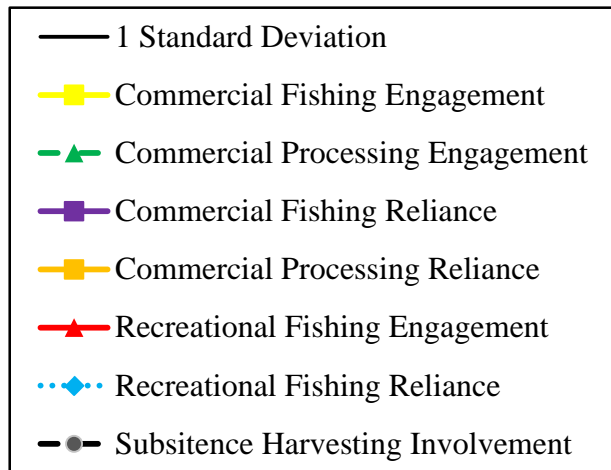Total sum dichotomized social scores

Fisheries indices

| Community	Commercial Processing Engagement	Commercial Harvesting Engagement	Commercial Processing Reliance	Commercial Harvesting Reliance	Recreational Engagement	Recreational Reliance	Subsistence Harvesting Involvement	Total Fishery Score
Elfin Cove	0	1	1	1	1	1	0	5
Kasilof	0	1	0	1	1	1	1	5
Cordova	1	1	0	1	1	0	0	4
Craig	0	1	0	1	1	1	0	4
Dillingham	1	1	0	1	1	0	0	4
Egegik	1	1	1	1	0	0	0	4
Homer	1	1	0	1	1	0	0	4
Kodiak	1	1	0	1	1	0	0	4
Pelican	0	1	0	1	1	1	0	4
Petersburg	1	1	0	1	1	0	0	4
Port Alexander	0	1	0	1	1	1	0	4
Port Lions	0	1	0	1	1	1	0	4
Soldotna	0	1	0	0	1	1	1	4
Wrangell	1	1	0	1	1	0	0	4

Fisheries indices: Top 14 communities overall
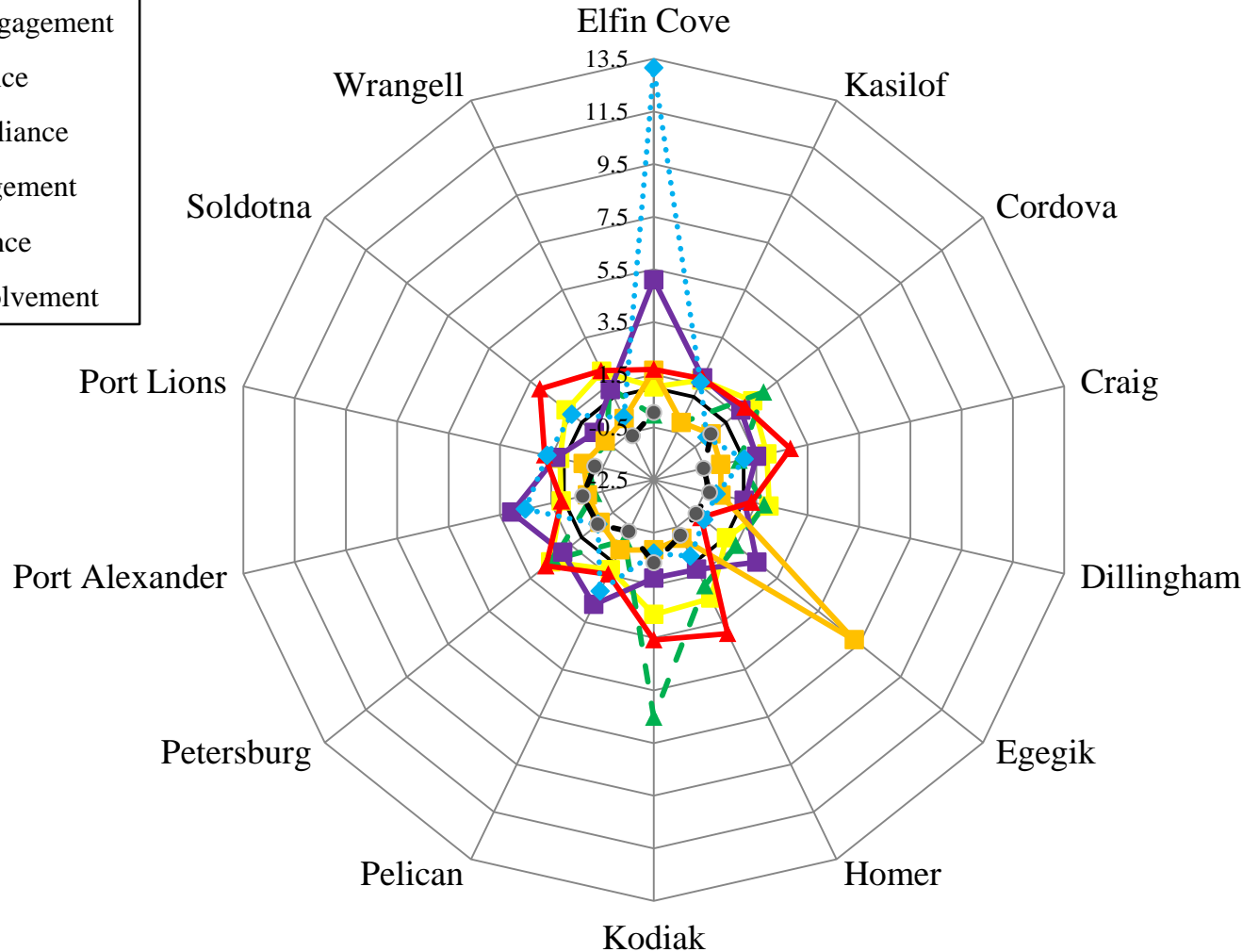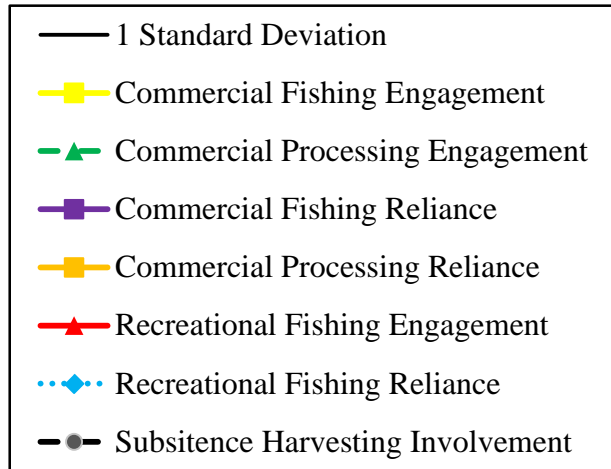
Fisheries indices: Top 14 communities overall

Total sum dichotomized fisheries scores
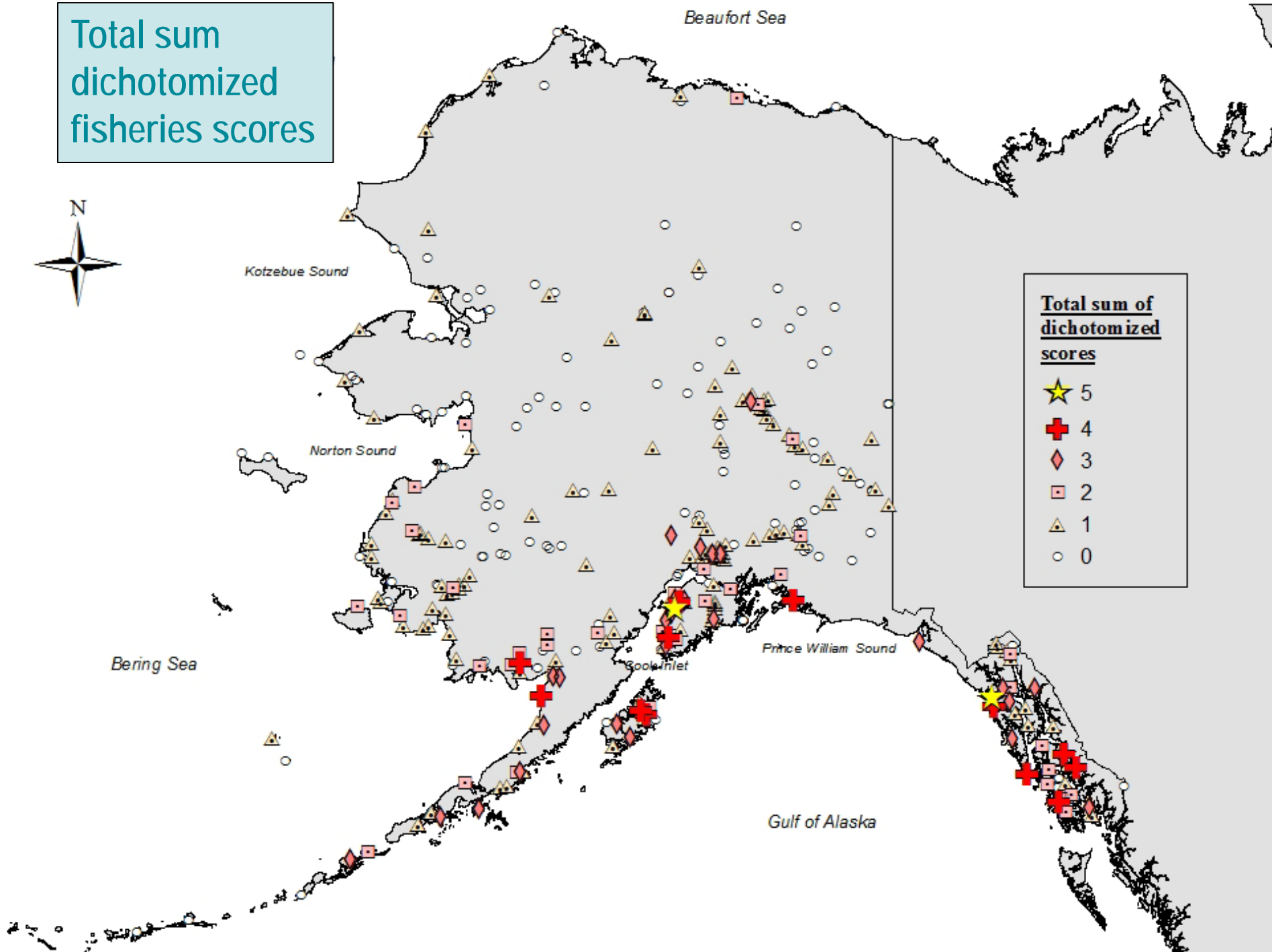
Application of Indices to the Crab Rationalization Program 10 year review

# Using indices to measure catch share performance

- It is important to modify indices to reflect changes before and after catch share program implementation
  - Time frame of social data
    - Need to compare changes before and after program implementation (not just using the 2005-2009 average values from the ACS), which may be difficult with current social data from the U.S. Census
  - Fishery engagement should be catch share program specific
    - Some communities may be actively involved in fisheries but have little involvement in the catch share program which can lead to errors in predicting impacts
  - Fishery dependence should be measured over all fisheries
    - Some communities may only be involved in 1 or 2 fisheries and are therefore very reliant on those particular fisheries
    - Dependence = share of all fishing in community

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Overall Processing Engagement
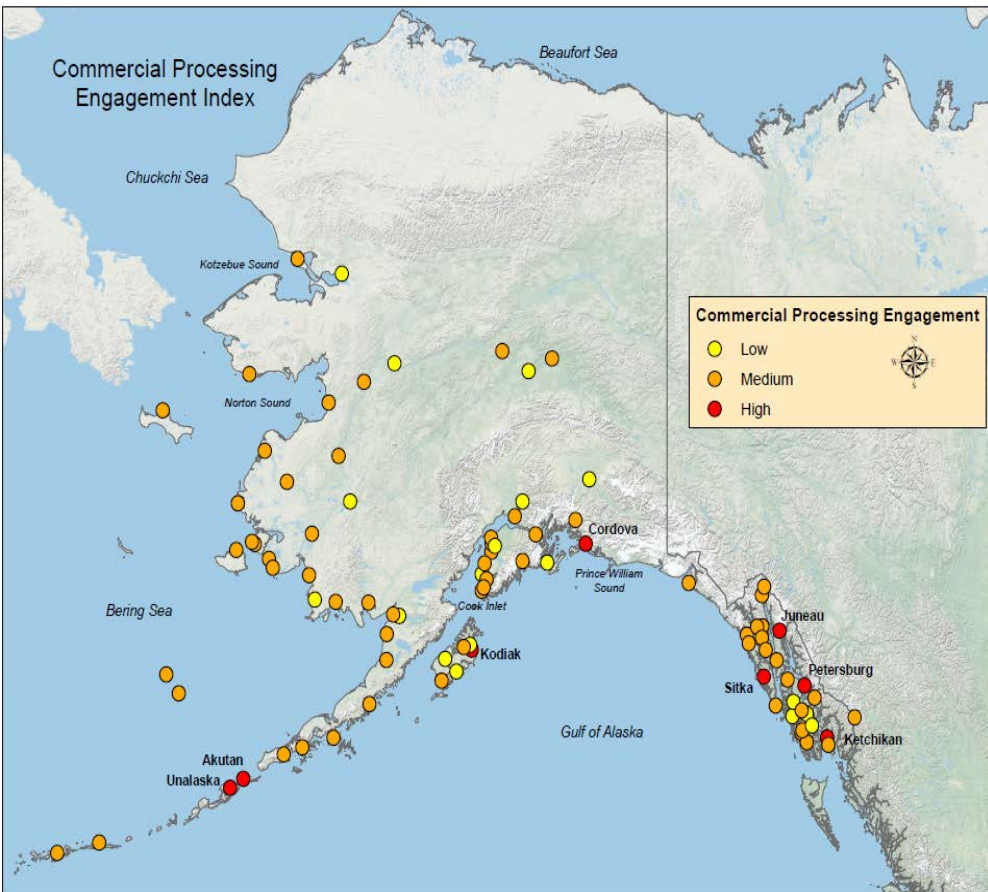
# Sablefish IFQ Processing Engagement
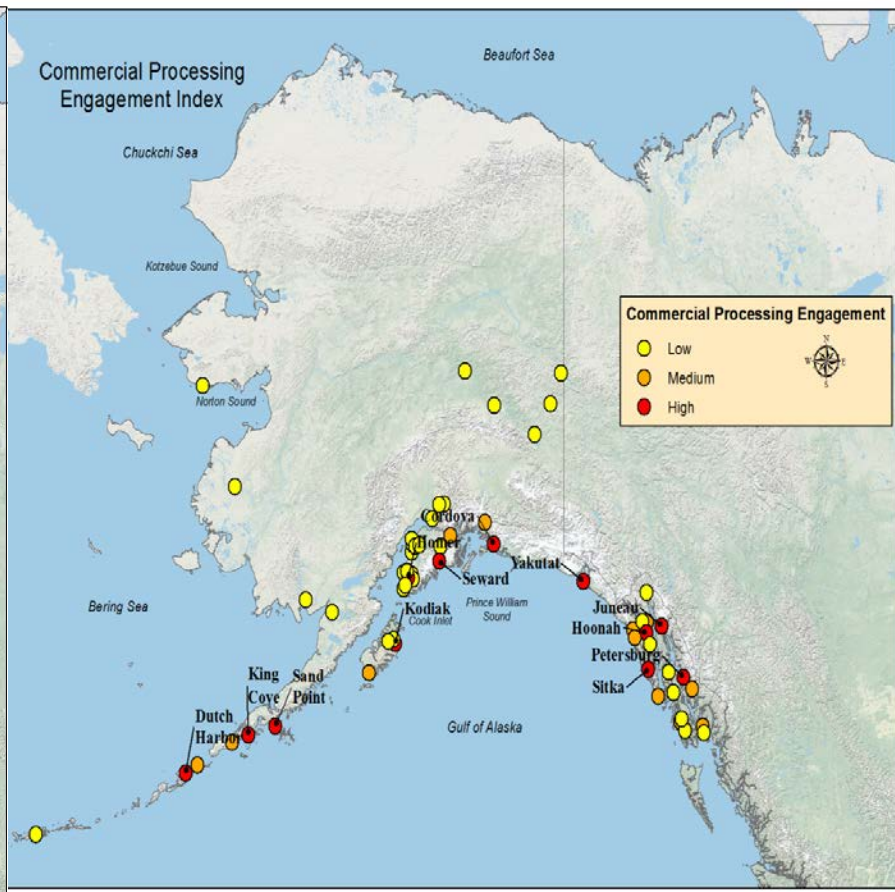
Possible Analyses

1. Fisheries dependence and engagement indices

   - Annually 2000 to present

2. Socio-economic well-being indices

   - 2000, average of 2005-09 and 2010-14 (if available)

3. Measurement of community change over time

   - Comparison of 2000 to present

Measuring Community Changes Over Time

- There are certain scenarios that will cause change in a subset of indices, but not all indices

- Dependent communities will have the most difference before and after treatment (e.g., fisheries management change)

Example Test Case
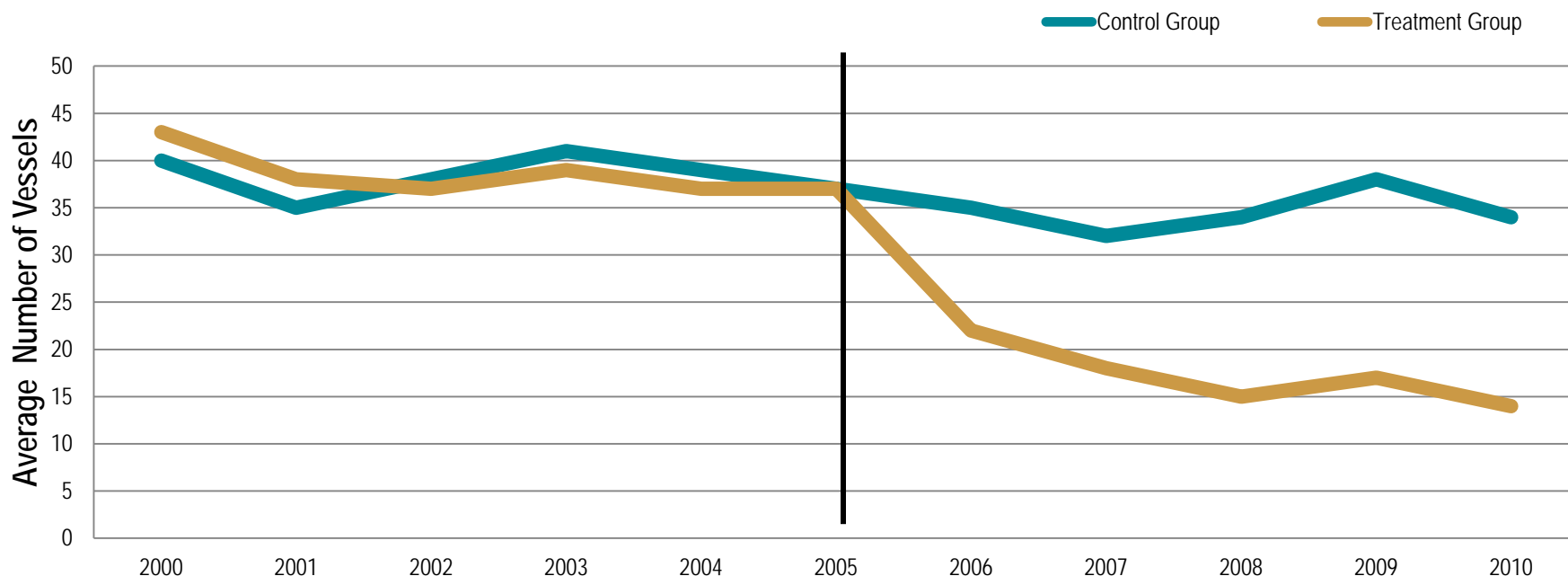
Measuring Community Changes Over Time

<u>Simple Approach: Differences-in-differences</u>

Assesses the average treatment effect of program implementation on indicators of well being

<u>Treatment</u> = Communities dependent on crab

<u>Control</u> = Communities not dependent on crab, but dependent on fisheries overall

Average number of vessels	Control: Crab Independent	Treatment: Crab Dependent
Before Rationalization	50	60
After Rationalization	45	20
Differences	50-45= **5**	60-20= **40**
Differences in Differences	5-40 = **-35**	

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Questions?
Contact: Dr. Amber Himes-Cornell
* Email: amber.himes@noaa.gov   ***   Phone: (206) 526-4221 *