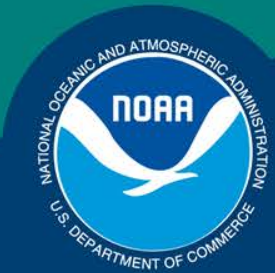Science, Service, Stewardship

Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being

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NOAA FISHERIES SERVICE

Overview

- Background information on the context of fishing communities in Alaska and NMFS mandates
- Defining well-being, vulnerability, and resilience
- Applications of quantitative indicators
- Challenges

Demographics (Average 2005-2009)

- Total of 578 Communities throughout Alaska
- 393 Census Designated Places

| Variable	N	Mean	Std. Dev.	Min	Max
Population	366	1,812	14,834	0	279,268
Age	313	34.59	10.73	10.2	63.2
Household Size	308	3.16	1.18	1.32	11.04
Household Income	303	$47,575	$20,836	$2,499	$115,417
Unemployment Rate	314	16.34%	14.99	0	69
Home Value	285	$140,769	$88,396	$18,800	$1,000,001
% Native Population	319	46.12%	39.80	0	100

Overview: Alaska Population
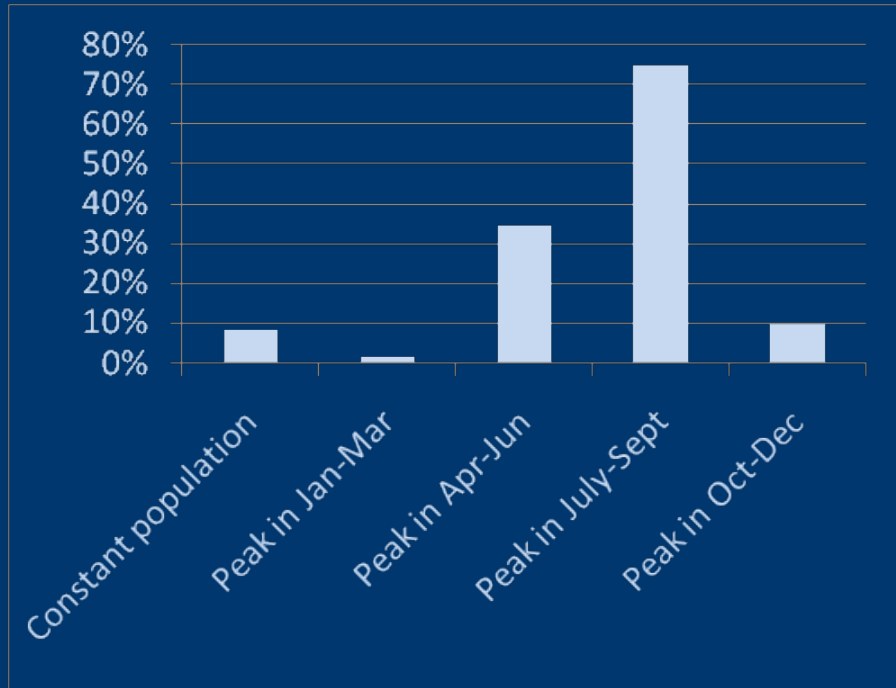
Timing of seasonal residents

Annual population peak
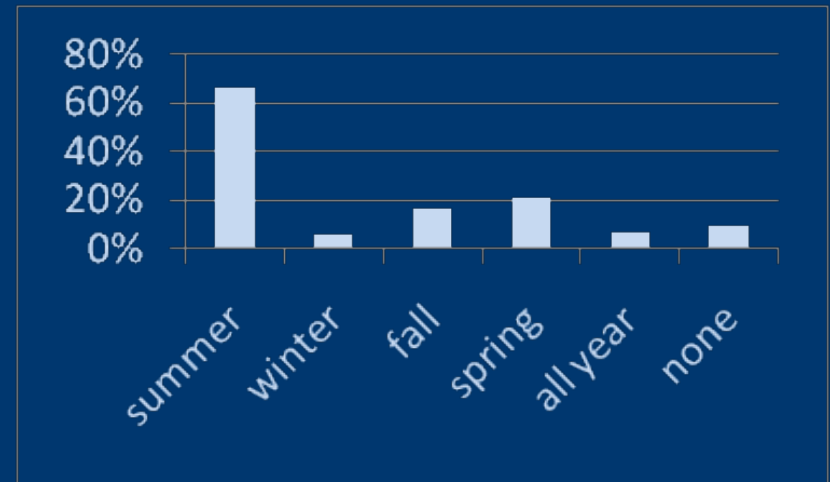
Degree population fluctuations due to fishing sector
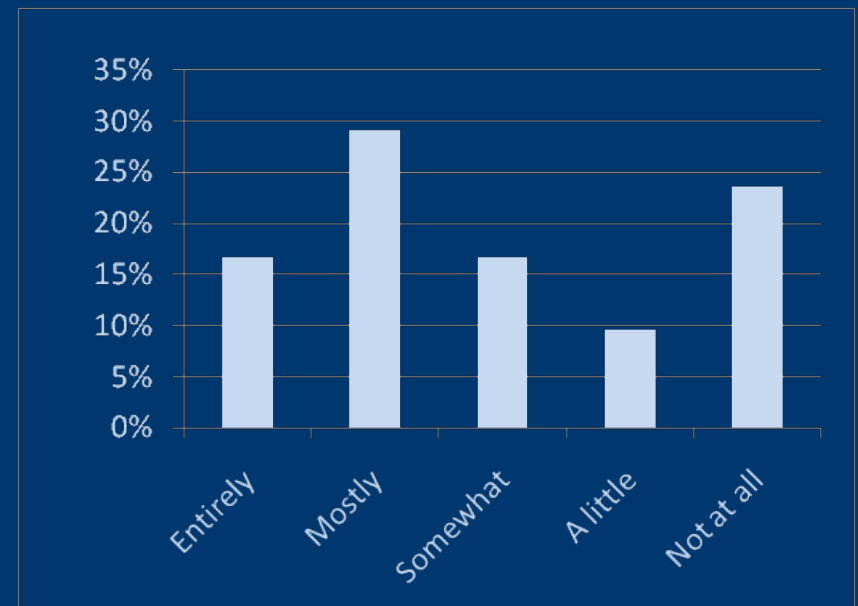
NMFS activities relating to protecting fishing communities

- National Environmental Policy Act (NEPA), 1970
  - Beginning of social impact assessments (SIAs)
- Magnuson-Stevens Act - National Standard 8, 2006
  - *"Conservation and management measures shall, …take into account the importance of fishery resources to fishing communities … in order to (a)* **provide for the sustained participation of such communities**, *and (b)* **to the extent practicable, minimize adverse economic impacts on such communities**.*"*
- Environmental Justice Initiative (Executive Order 12898), 1994
  - Achieving environmental protection for all communities (particularly minorities and low-income populations)

Community Social Indices: Project objectives

1. Determine key components of community well-being, vulnerability and resilience

2. Construct indices – Create objective measures of the social condition of communities to predict well-being, vulnerability and resilience

3. Use indices as reference points to understand how community vulnerability and resilience may change over time in response to changes in fisheries management regulations, ecosystem changes, and other external forces

Relationship between vulnerability, resilience, and well-being

- 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 interrelational components (Coulthard et al. 2011).

7

Social indicators of vulnerability and resiliency

- National and international focus on use of indicators to measure well-being in communities

- Cutter et al. (2003,2008) – National, based on county-level data
  - Created social vulnerability index (SoVI) to environmental hazards

- 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

- Effort within NOAA to create nationwide database of social indicators
  - 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

Understanding Alaska Fishing Community Well-being

Understanding Alaska Fishing Community Well-being

- 14 indices of community well-being in 2 categories:
  - Socioeconomic well-being indices (7)
  - Fishing involvement indices (7)
- 346 communities throughout Alaska
- Data from 2005-2009 from the U.S. Census Bureau's American Community Survey

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Socioeconomic Well-being indices

- Personal disruption
- Population composition
- Poverty
- Labor force structure
- Housing disruption
- Housing characteristics
- Status of schools

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Fishing Involvement Indices

- Commercial processing engagement
- Commercial processing reliance
- Commercial harvesting engagement
- Commercial harvesting reliance
- Recreational fishing engagement
- Recreational fishing reliance
- Subsistence harvesting involvement

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Methods

- Identify variables that represent the well-being concepts mentioned previously

- Conduct a principal components factor analysis
  - Varimax rotation with Kaiser normalization
  - Achieve a single factor solution

- Create index scores from the rotated factor loadings using the regression method

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Data

- Fisheries data
  - Commercial landings, permits, revenue, vessels, processors, quota share allocation (NMFS, ADFG)
  - Recreational licenses, guides, charter businesses (NMFS, ADFG)
  - Subsistence permits, halibut and salmon catch, marine mammal take (ADFG, USFWS, Alaska Beluga Whale Commission)
- Socioeconomic Data
  - American Community Survey 2005-2009 (Census Bureau)
  - 2000 and 2010 decennial census (Census Bureau)
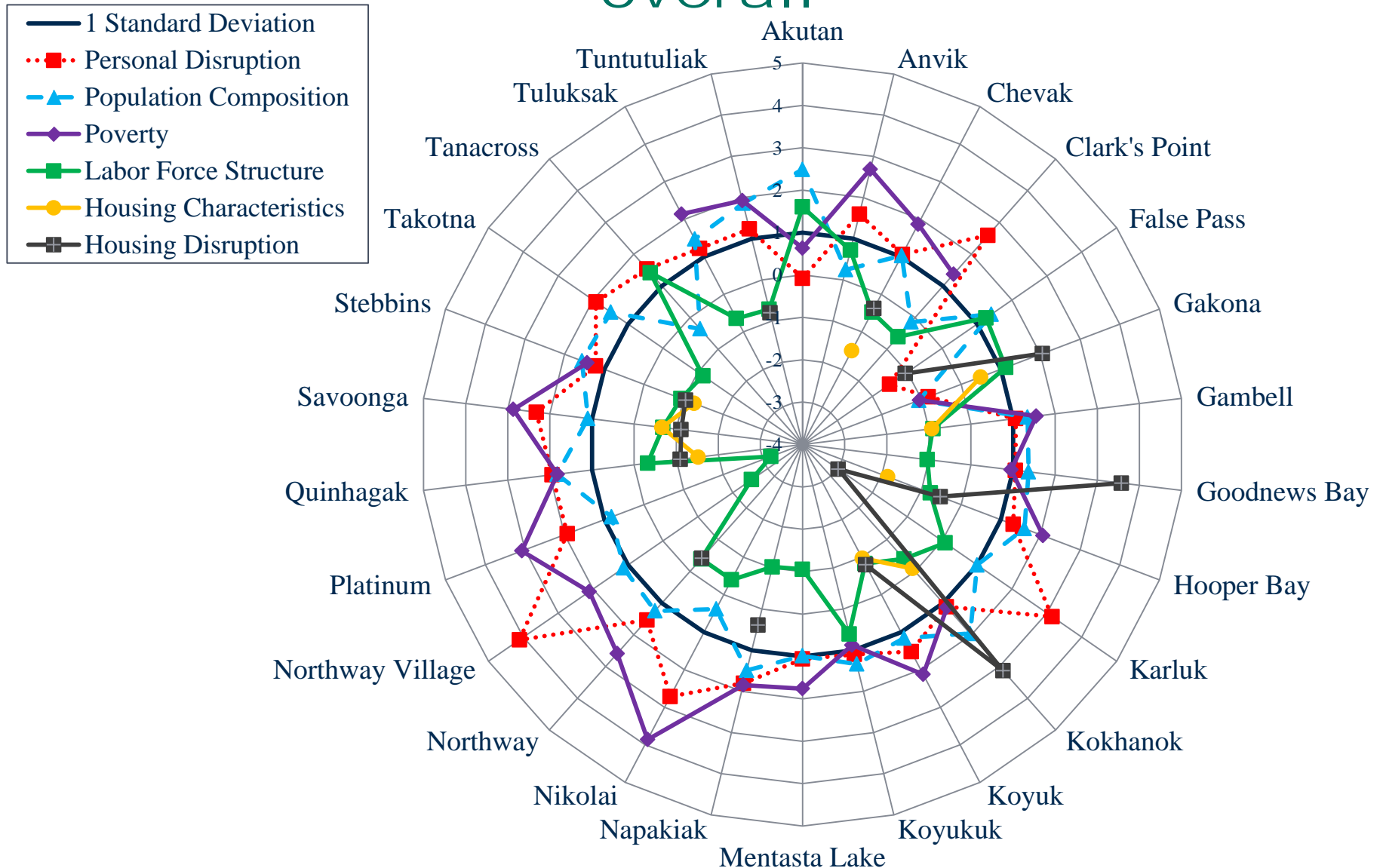 - Alaska Local and Regional Information (ALARI) database

From Himes-Cornell, A. and S. Kasperski. 2015. Using indicators to assess the vulnerability and resiliency of Alaskan communities to climate change. *Fisheries Research* 162:1-11.

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

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

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

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Total sum dichotomized social scores

Total sum of dichotomized scores
★ 4
✚ 3
▣ 2
△ 1
○ 0

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.
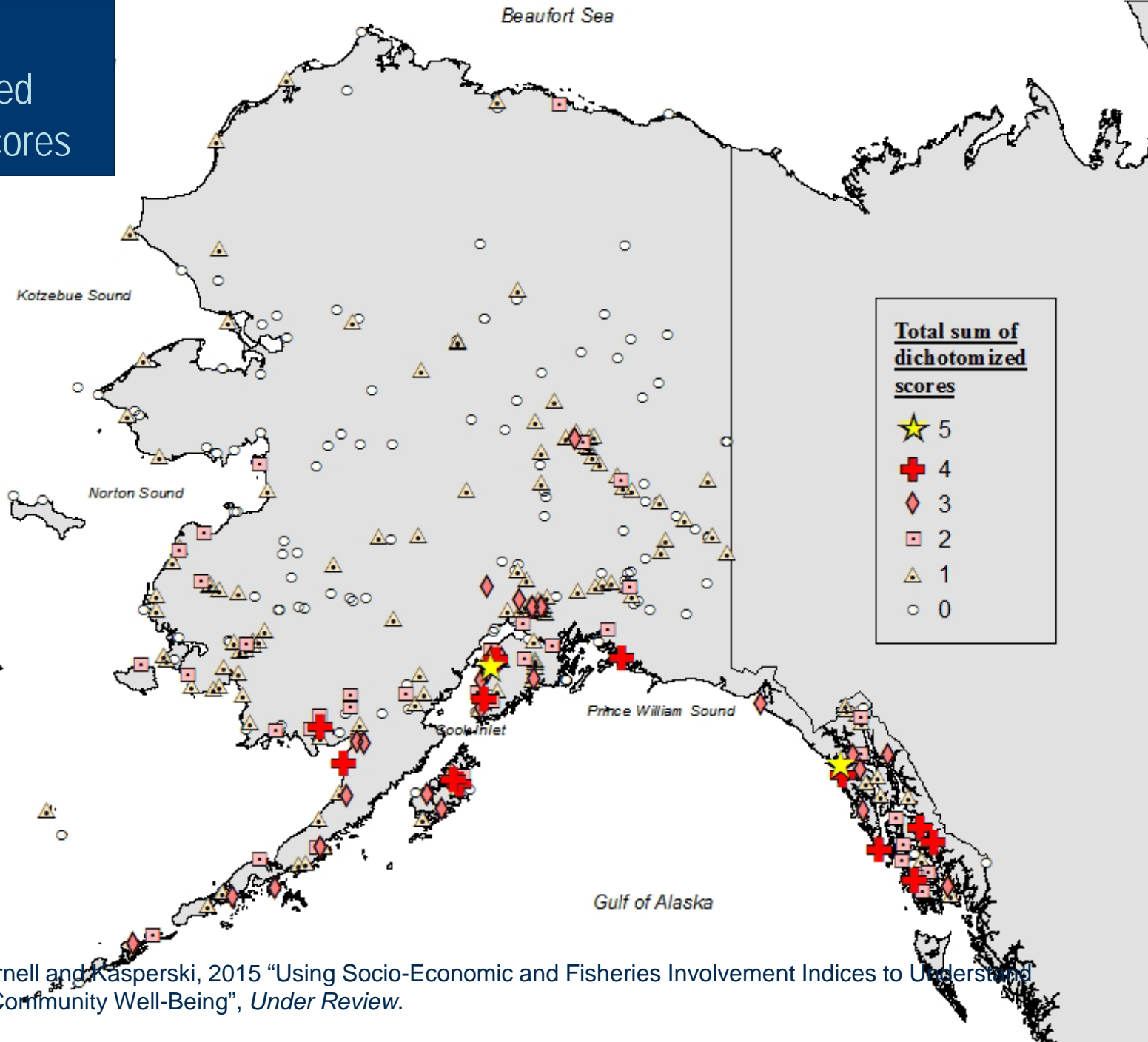
Fisheries indices

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

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Total sum dichotomized fisheries scores

Total sum of dichotomized scores
- ☆ 5
- ✚ 4
- ◆ 3
- ▣ 2
- △ 1
- ○ 0

From Himes-Cornell and Kasperski, 2015 "Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being", *Under Review*.

Groundtruthing the Indices: Can we believe any of this?

- Develop a rapid assessment methodology to test the external validity of the community well-being indices

- Compare in-person fieldwork assessments of well-being with quantitative social indicators of well-being described above

From Himes-Cornell, A., C. Maguire, S. Kasperski, K. Hoelting, and R. Pollnac. "Understanding vulnerability in Alaska fishing communities: A validation methodology for rapid assessment of well-being indices", *Under Review*.

Predictive Accuracy of the indices

- One goal of indices = Predicting community vulnerability to inform decision-making
- Before making predictions, need confidence in indices
  - Ensure indices represent socio-economic realities of communities

- Lack of confidence = potential to make erroneous conclusions

Project goal:

- Test predictive accuracy of indices to identify which communities will be hardest hit by change (e.g., climate change, fisheries management)
- Understand future vulnerability by looking at the past: Crab rationalization (2005)

Predicting vulnerability to proposed management changes

- Catch share programs
  - Gulf of Alaska trawl fishery rationalization
  - BSAI crab rationalization
- Significant allocation changes
  - Halibut PSC
- Proposed endangered species listings
  - Stellar Sea Lions

Challenges in Measuring Vulnerability

- Uncooperative data
  - American Community Survey (ACS) data are based upon annual 5-year estimates
  - Not all variables, and indices, seem to be appropriate or available for all communities
- New data collections needed to say more about human dimensions of any one ecosystem being assessed (e.g., cultural ecosystem services and other non-market valuations)
- Communities access are embedded in multiple socio-economic systems and ecosystems – many external factors to consider

Thank you!

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