Fishing Community Vulnerability: Concepts and Measurement

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Overview

- Community vulnerability and resilience concepts

- Measurement
  - Social indicators
  - Fishing dependence

Vulnerable communities in your region

- What are the characteristics of vulnerable communities?

Resilient communities in your region

What are the attributes that make communities resilient?

Vulnerability and resilience

- Concepts interrelated
- Often seen as two ends on a continuum:

Vulnerability ⟷ **Resilience**

Or, resilience as a component of vulnerability:

Vulnerability

Resilience

Vulnerability and resilience research

- Measurement
  - Greater emphasis on vulnerability

- Applications
  - Natural disasters and climate change

Social vulnerability

- Is the pre-existing condition that affects a community's (social system) ability to prepare for and recover from a disruptive event.

- Inherent characteristics of the community that create the potential for harm

- Patterns of differential access to resources or differential susceptibility to harm or loss
  - Powerlessness and marginality

Social resilience

- Ability of the community to absorb impacts and recover from disruptive events such as regulatory change

- Includes coping with the event as well as post-event adaptive response

Components of vulnerability

- **Exposure**
  - —Degree and duration of a disruptive event (regulatory change) - cumulative effects

- **Sensitivity**
  - —Degree to which a community is modified or affected by an event

- **Adaptive capacity, coping capacity, (aka resilience)**
  - —Ability to adjust to regulatory change, moderate neg. or pos. effects, and take advantage of opportunities

Vulnerability

Resilience

Measurement of vulnerability and resilience

- Social vulnerability is about the existing condition
  - Easier to measure from existing data

- Resilience is about the response to change over time
  - More difficult to measure until after an event

- Need to track vulnerability over time to understand community resilience

Questions or comments on the concepts
of social vulnerability or resilience?

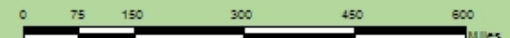# Social indicators of fishing community vulnerability and resilience

- **2,917 communities in coastal counties in the Eastern US and Gulf Coast**
  - **Over 1,000 with commercial and/or recreational activity**
- **19 states**
  - **North Carolina shared**
- **180 variables**
- **7 different secondary sources**

Scope

Social Indicators for Fishing Communities

NE & SE United States

Project objectives

- Determine key components of community vulnerability

- Construct indices – Objective measures of the social condition of communities to predict vulnerability

- Use indices as reference points to understand how community vulnerability (and resilience) may change over time in response to changes in fisheries management regulations

Parameters

- Feasible with available resources

- Data readily available

- Quantifiable

Applications

- Social Impact Assessment

- National Standard 8

- Environmental Justice

- National metric for evaluating the impact of catch share programs on communities

Methods

- Developed indices from 180 variables using principal component analysis

- Began with original set of 13 indices developed by Jacob et al. 2010

- Final 14 Indices with noteworthy results in both regions

Criteria for indices

- Used the following criteria to qualify indices that emerged:

  - Single factor solution
  - Factor loadings above .350
  - Kasier-Meyer-Olkin measure of sampling adequacy above .500
  - Bartlett's test of sphericity significance above .05
  - Theta reliability above .500
  - Variance explained at or above 45%
  - 14 indices (will discuss 10)

Community selection

- Small number selected to groundtruth statistical results

- Represent
    - Varying levels of dependence on commercial and recreational fishing
    - Varying levels of social and gentrification pressure vulnerability

Social vulnerability indices

- **Poverty**

- **Personal disruption**

- **Population composition vulnerability**

Social vulnerability indices

Indices	Factor Loadings	% Variance Explained
Personal Disruption		
% unemployed	0.628	
Crime index	0.477	
% with no diploma	0.786	44.62
% in poverty	0.811	
% females separated	0.600	
Population Composition Vulnerability		
% white alone	-0.898	
% female single headed households	0.719	
Population age 0-5	0.675	58.12
% that speak English less than well	0.739	
Poverty		
% receiving assistance	0.544	
% of families below poverty level	0.915	
% over 65 in poverty	0.716	59.72
% under 18 in poverty	0.862	
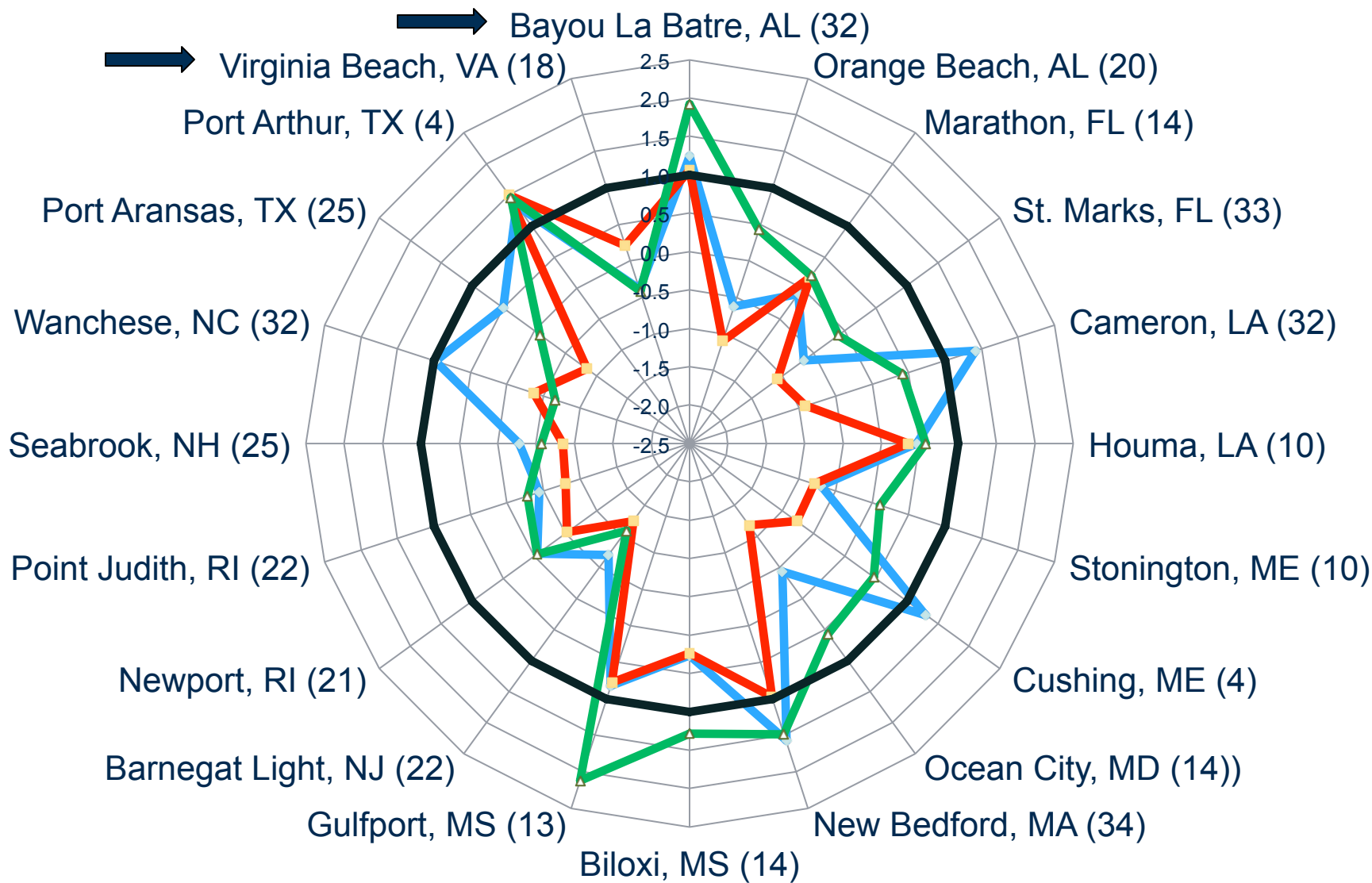
Gentrification pressure indices

- Retiree migration
- Urban sprawl
- Natural amenities

Gentrification pressure indices

Indices	Factor Loadings	% Variance Explained
Retiree Migration		
Households with one or more over 65	0.950	
% receiving social security	0.951	
% receiving retirement income	0.766	78.58
% in labor force	-0.866	
Urban Sprawl		
Population density	0.387	
Nearest city w/50k population in miles	-0.589	
Cost of living index	0.894	49.32
Median home value	0.819	
Natural Amenities		
Rental vacancy rate	0.770	
% homes vacant	0.824	
Boat launches by population	0.605	47.15
% watercover	0.493	

Legend: Retiree Migration Index, Urban Sprawl Index, Natural Amenities Index, 1 Std Dev

Axis labels (clockwise from top): Bayou La Batre, AL (32); Orange Beach, AL (20); Marathon, FL (14); St. Marks, FL (33); Cameron, LA (32); Houma, LA (10); Stonington, ME (10); Cushing, ME (4); Ocean City, MD (14)); New Bedford, MA (34); Biloxi, MS (14); Gulfport, MS (13); Barnegat Light, NJ (22); Newport, RI (21); Point Judith, RI (22); Seabrook, NH (25); Wanchese, NC (32); Port Aransas, TX (25); Port Arthur, TX (4); Virginia Beach, VA (18)

Radial scale: 5.0, 4.0, 3.0, 2.0, 1.0, 0.0, -1.0, -2.0, -3.0, -4.0, -5.0

Fishing dependence indices

- **Commercial**
  - Commercial fishing engagement
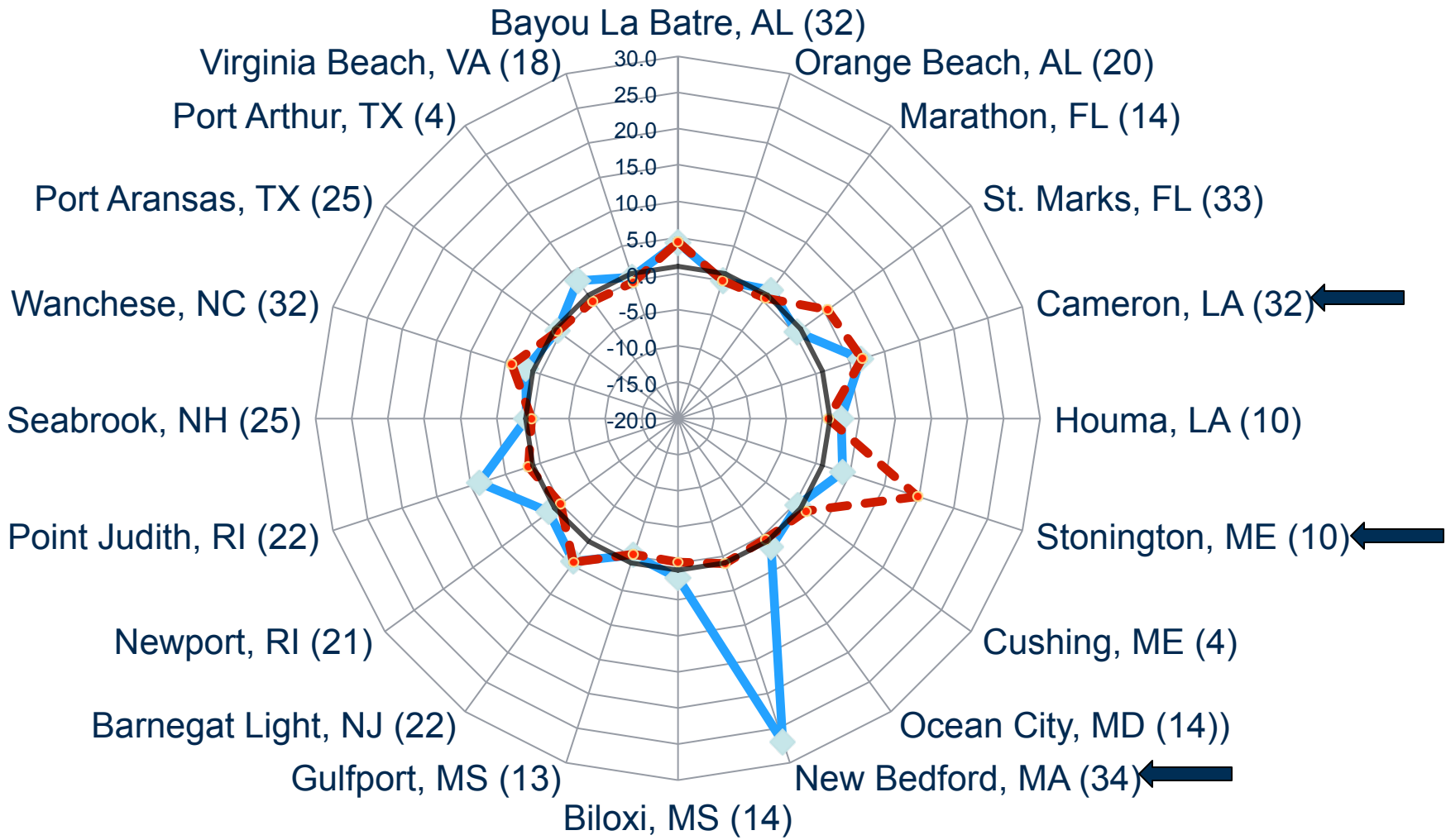 - Commercial fishing reliance

- **Recreational**
  - Recreational fishing engagement
  - Recreational fishing reliance

Commercial fishing indices

Indices	Factor Loadings	% Variance Explained
Commercial Fishing Reliance		
Value of landings by population	0.833	
Number of commercial fishing permits by population	0.686	
Dealers with landings by population	0.592	50.30
% in forestry, farming and fishing occupation	0.705	
Commercial Fishing Engagement		
Value of landings	0.906	
Number of commercial fishing permits	0.862	
Number of dealers with landings	0.58	57.57
Pounds of landings	0.635	

Commercial Engagement Index — Commercial Reliance Index — 1 Std Dev

Bayou La Batre, AL (32)
Virginia Beach, VA (18)
Orange Beach, AL (20)
Port Arthur, TX (4)
Marathon, FL (14)
Port Aransas, TX (25)
St. Marks, FL (33)
Wanchese, NC (32)
Cameron, LA (32)
Seabrook, NH (25)
Houma, LA (10)
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Barnegat Light, NJ (22)
Ocean City, MD (14))
Gulfport, MS (13)
New Bedford, MA (34)
Biloxi, MS (14)

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Recreational fishing indices

Indices	Factor Loadings	% Variance Explained
Recreational Fishing Reliance		
Recreational fishing mode charter by population	0.352	
Recreational fishing mode private by population	0.917	58.97
Recreational fishing mode shore by population	0.897	
Recreational Fishing Engagement		
Recreational charter fishing pressure	0.352	
Recreational private fishing pressure	0.815	63.02
Recreational shore fishing pressure	0.761	

Recreational Engagement Index · Recreational Reliance Index — 1 Std Dev

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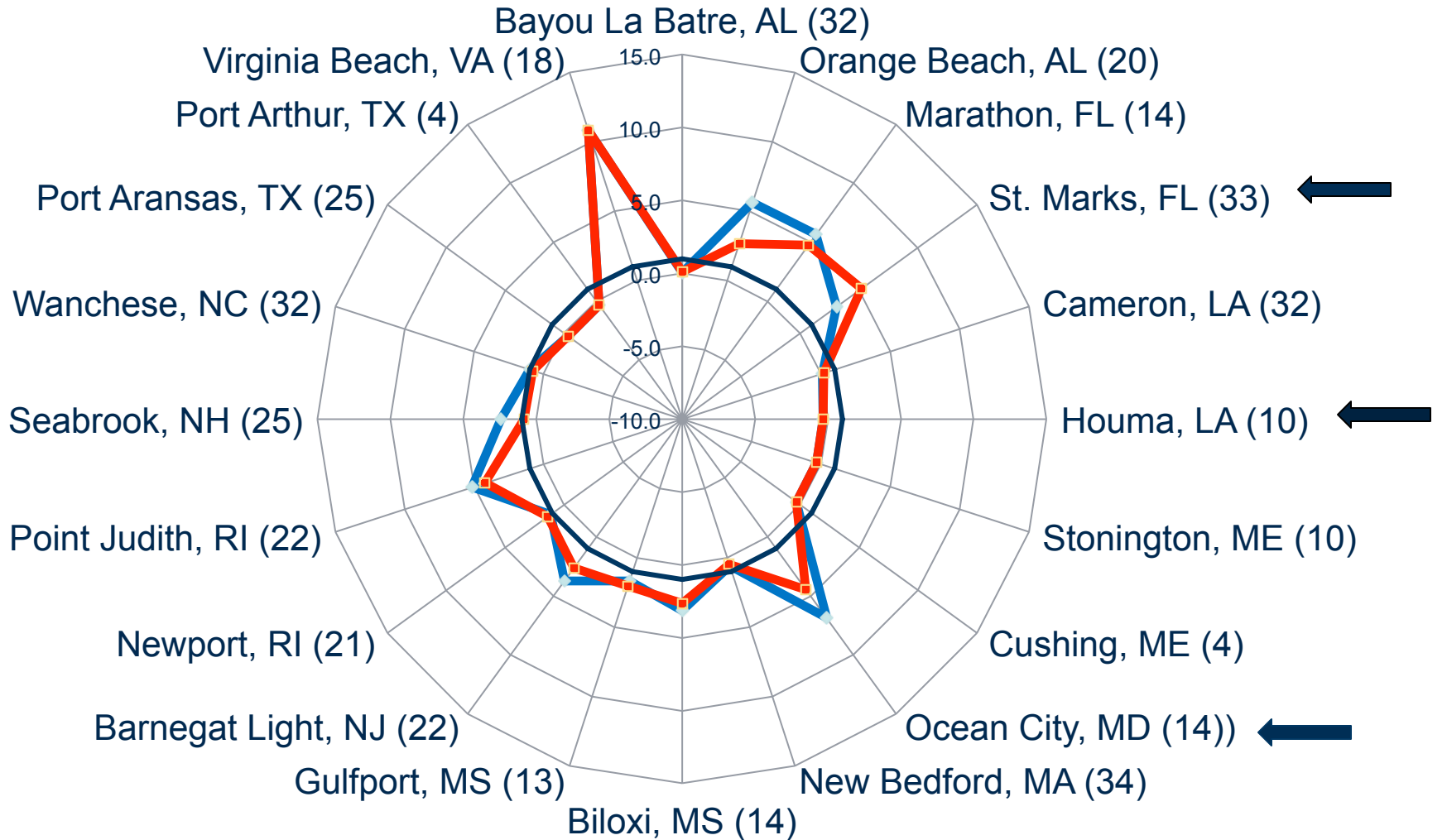
Degrees of fishing dependence
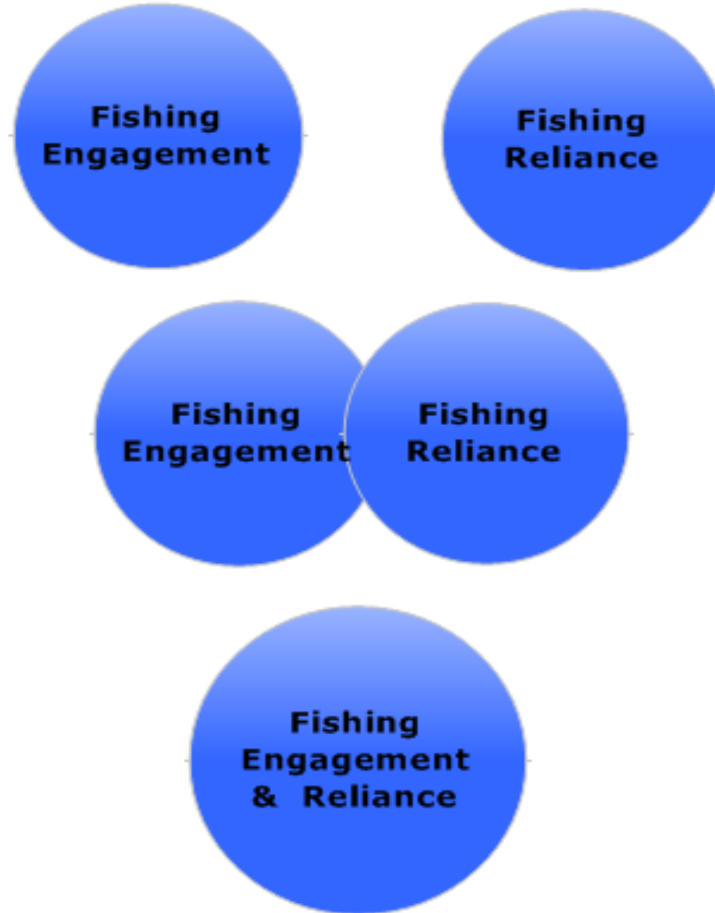
Community	Social and Gentrification Vulnerability			Fishing Dependence		
	Social	Gent-rification	**Sum**	Com	Rec	**Sum**
Barnegat Light, NJ	2	3	**5**	2	2	**4**
Bayou La Batre, AL	4	0	**4**	2	0	**2**
Marathon, FL	1	1	**2**	1	2	**3**
Virginia Beach, VA	0	0	**0**	0	2	**2**

Do these social indicators reflect the real life situation of fishing communities?

- Groundtruth communities
  - Compare statistical results to real life situation of communities
  - Ethnographic interviews
    - Commercial and recreational fishermen
    - Support businesses (fishing infrastructure)
    - Town officials
    - Community members
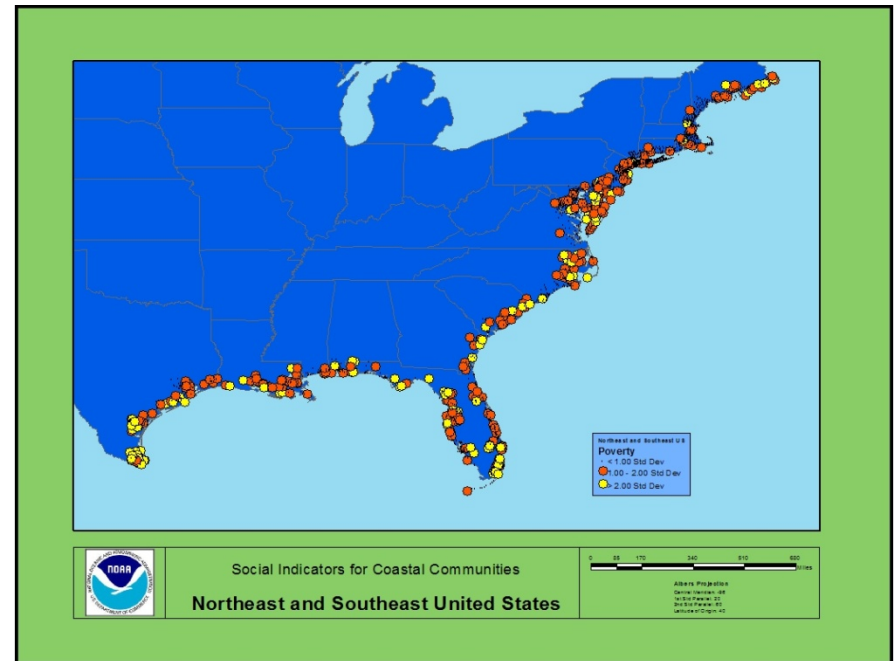   - Archival information
- Compare results

Next steps

- Fishery specific indices
- Time series analysis
- Indices
  - Fishing Infrastructure
  - Environmental
  - Social capital

Final Products

- Technical Memorandum available Summer 2012

- Website live Fall 2012
  - Public access
  - Data and mapping tools

Poverty Index

A parting thought:

- Tempting to shoot for a single index of vulnerability

- Communities are multi-dimensional

- Risk losing a finer grain understanding of the variation in the drivers of vulnerability for individual communities.

Questions?

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NOAA FISHERIES