

Responding to Climate Change: Mapping Fishing Community Precarity and the Foundations of Environmental Justice*

*NOAA, Sea Grant #6189-0000 : Developing Indices of Vulnerability to Climate Change for Ground Fishing Communities in the Northeast.



Kevin St. Martin⁴, Rebecca Selden³, Leonardo Calzada⁴, Borja Nogué Algueró⁵, Zoë Kitchel¹, Kaycee Coleman²

Rutgers Climate Symposium, 2022

¹Department of Ecology, Evolution, and Natural Resources, Rutgers University

²Department of Marine and Coastal Sciences, Rutgers University

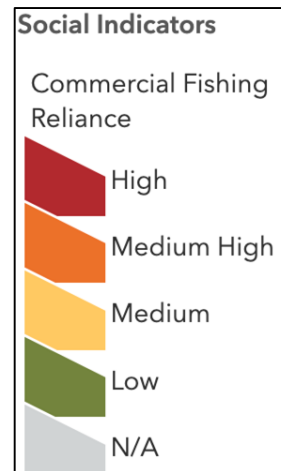
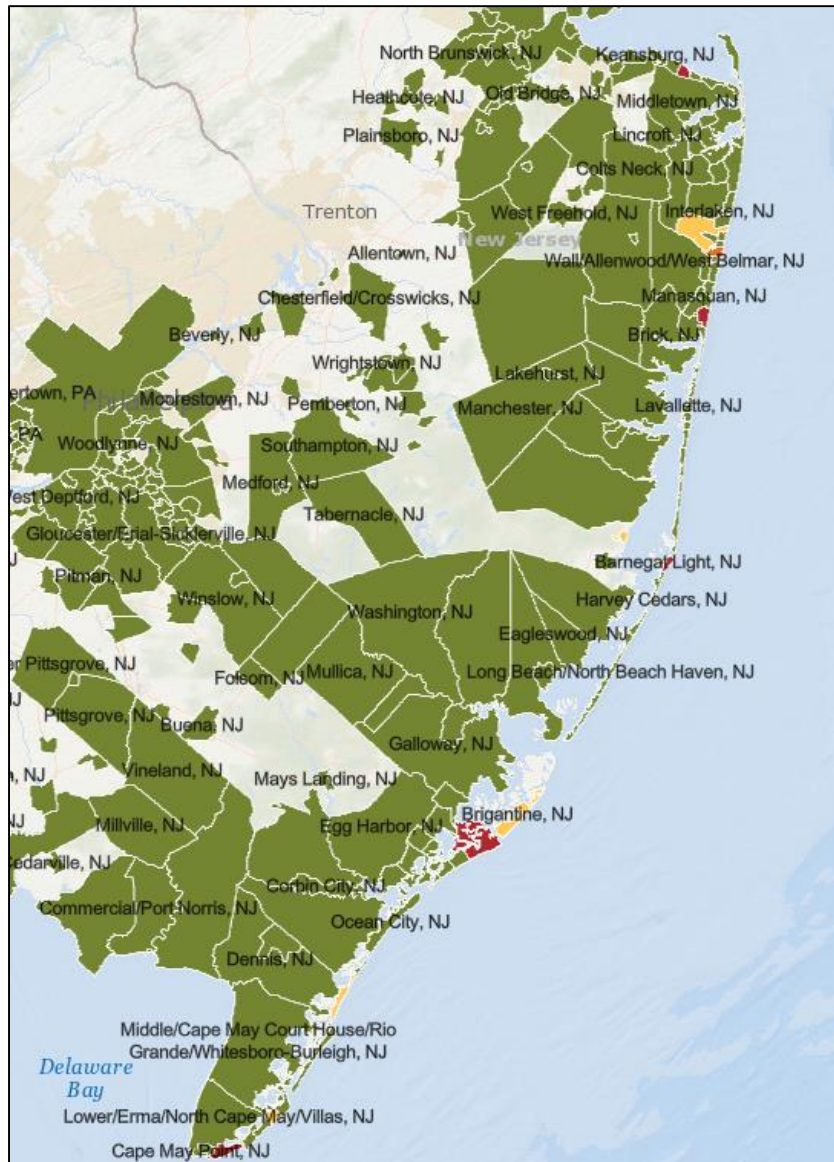
³Biological Sciences, Wellesley College

⁴Department of Geography, Rutgers University

⁵Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona

NOAA Indicators of Community Vulnerability

Commercial Fishing Engagement and Reliance

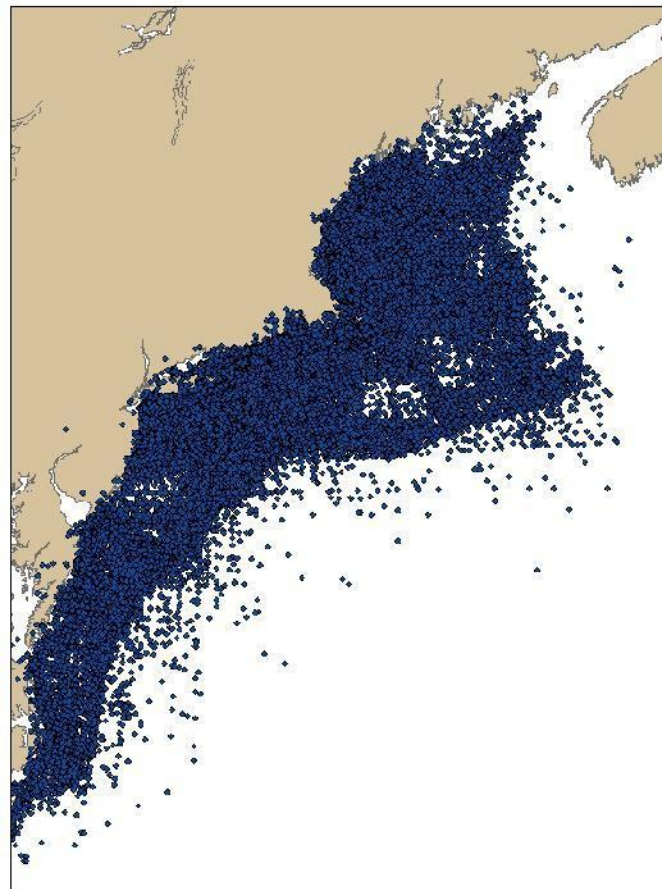


Point Pleasant Beach, NJ		2019
Commercial Fishing Engagement:	High	High
Commercial Fishing Reliance:	Medium	Medium
Recreational Fishing Engagement:	High	High
Recreational Fishing Reliance:	Med-High	Med-High
Poverty:	Low	Low
Population Composition:	Low	Low
Personal Disruption:	Low	Low
Sea Level Rise Risk*:	Med-High	Med-High
Storm Surge Risk*:	Med-High	Med-High
Labor Force:	Low	Low
Housing Characteristics:	Low	Low
Housing Disruption:	High	High
Retiree Migration:	Low	Low
Urban Sprawl:	Med-High	Med-High

*This indicator first appears in the year it was created. Values will be repeated annually until updated.

VTR to “Communities at Sea”

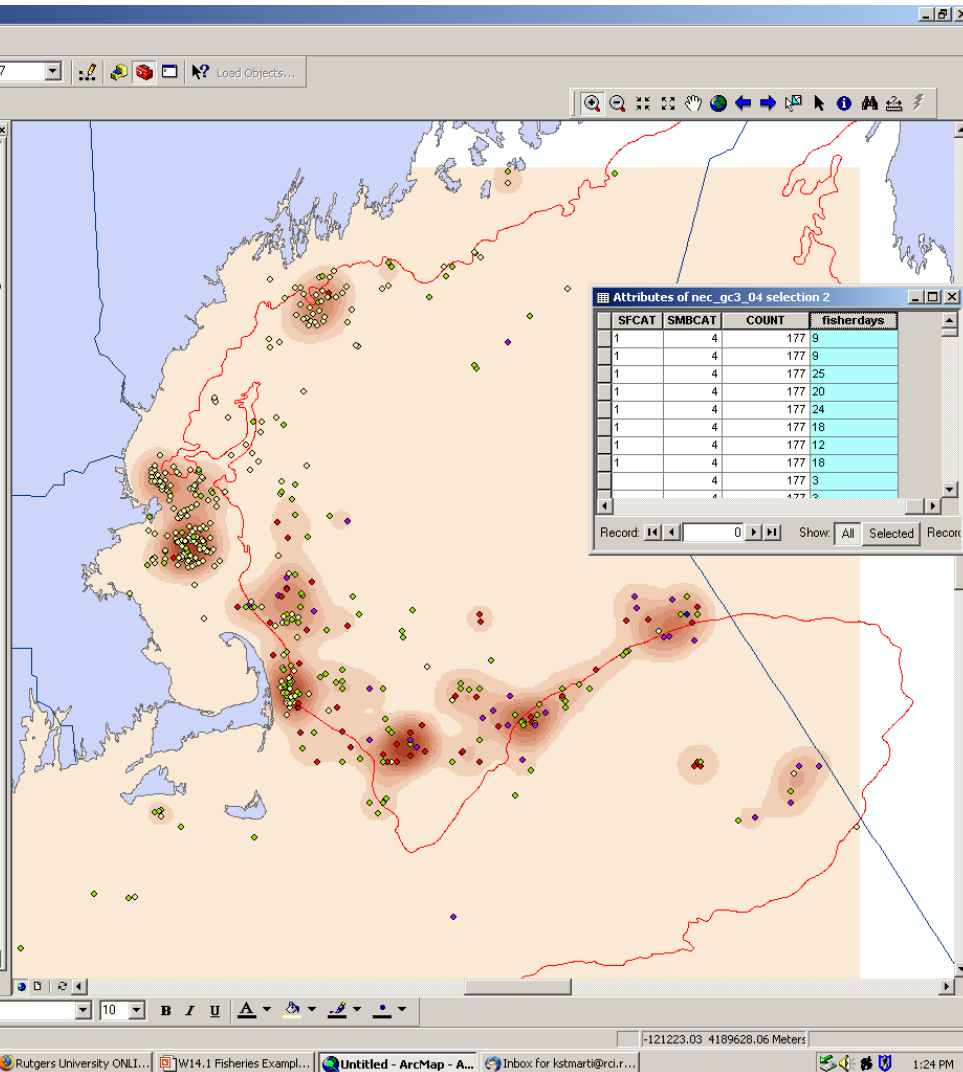
- From Vessel Trip Reports (VTR)
 - Select trips of interest: [PORTLAND] and [GEARCODE]
 - Join PERMIT to trips ([PPORT], [HPORT])
- Calculate community association for each trip
 - If [PPORT] = [OFFICIALPORT] then [DECPORT] = [PPORT]
Else If [HPORT] = [OFFICIALPORT] then [DECPORT] = [HPORT]
 - [PERPORT] = port with 50% or greater landings by a vessel.
 - If [PORTLAND] = ([DECPORT] or [PERPORT]) then [COMMUNITY] = [PORTLAND]



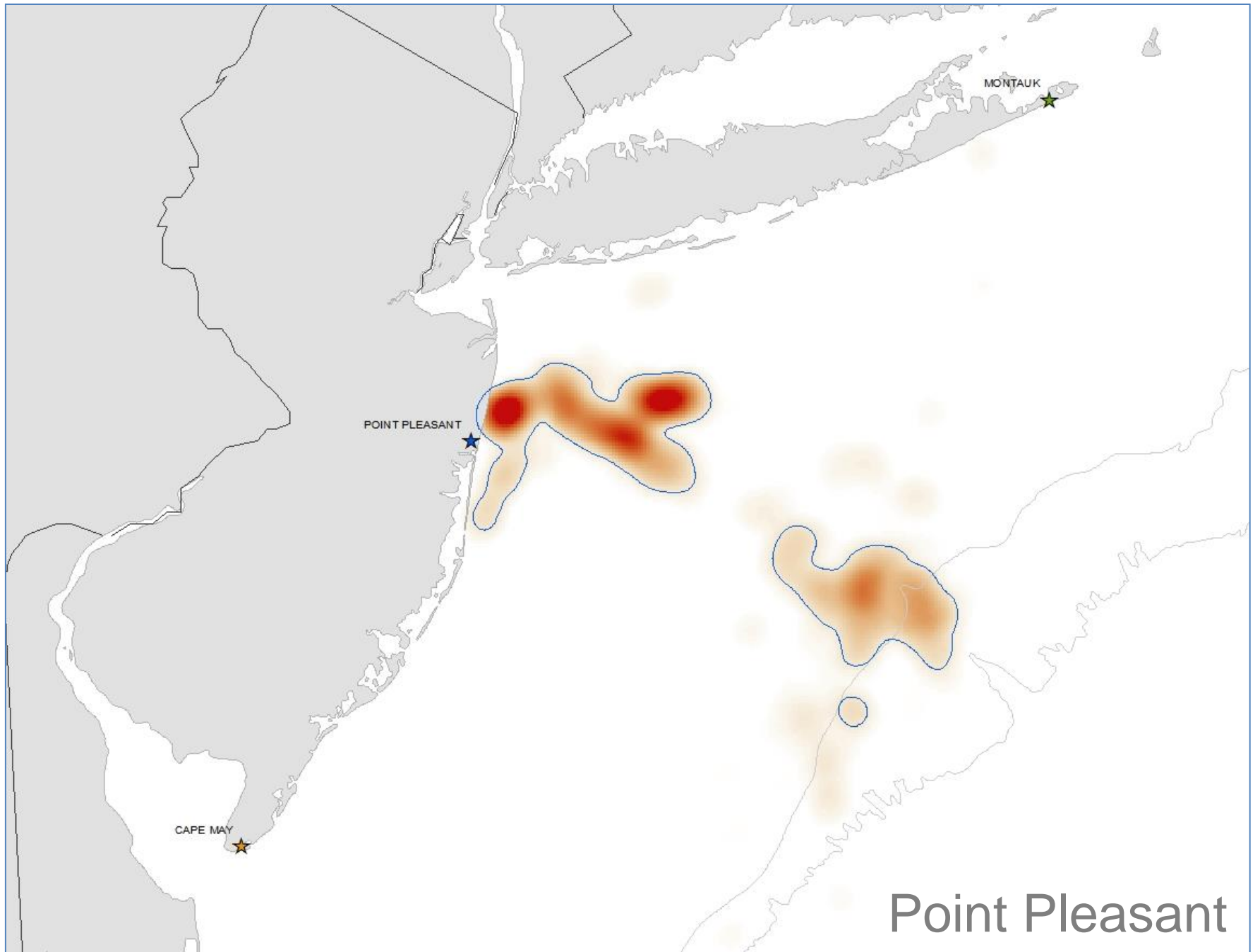
St. Martin, K. and J. Olson. 2017. “Creating Space for Community in Marine Conservation and Management: Mapping ‘Communities at Sea,’” in *Conservation in the Anthropocene Ocean*, Levin, P. and M. Poe eds. (Elsevier), pp. 123-141.

St. Martin, K. and M. Hall-Arber. 2008. “The Missing Layer: Geo-technologies, Communities, and Implications for Marine Spatial Planning” *Marine Policy* 32: 779-786.

Territories of Community Labor



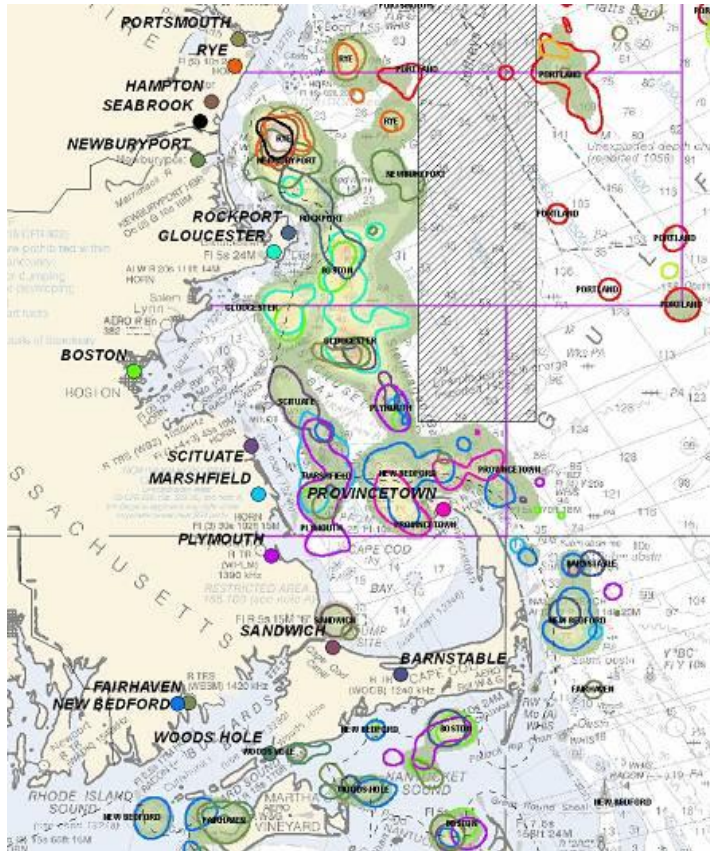
- Labor Time as Measure of Community Presence
- From Vessel Trip Reports (VTR)
 - Trip Length:
 $[TRIPDAYS] = [DATELAND] - [DATESAIL]$
 - Labor time per trip:
 $[FISHERDAYS] = [TRIPDAYS] \times [CREW]$



Point Pleasant

Engaging with Communities at Sea

- Giving meaning to locations on map.
- Giving meaning to “community”.
- Assessing LEK.



St. Martin, K. and M. Hall-Arber. 2008. “Creating a Place for ‘Community’ in New England Fisheries” *Human Ecology Review* 15(2): 161-170.

St. Martin, K. 2008. “Mapping Community Use of Fisheries Resources in the U.S. Northeast” *Journal of Maps* 2008: 38-41.

Database for Decision Making

[ABOUT](#) [SHARED REGIONAL PRIORITIES](#) [OCEAN PLANNING](#) [DATA PORTAL](#) [NEWS & EVENTS](#)

Renewable Energy

Planning for sustainable and compatible wind power in offshore waters.

[Climate Change Adaptation](#)

[Marine Habitats](#)

[Renewable Energy](#)

[Water Quality](#)

About MARCO

MARCO is the Mid-Atlantic Regional Council on the Ocean, formed in 2009 by a governors' agreement among New York, New Jersey,

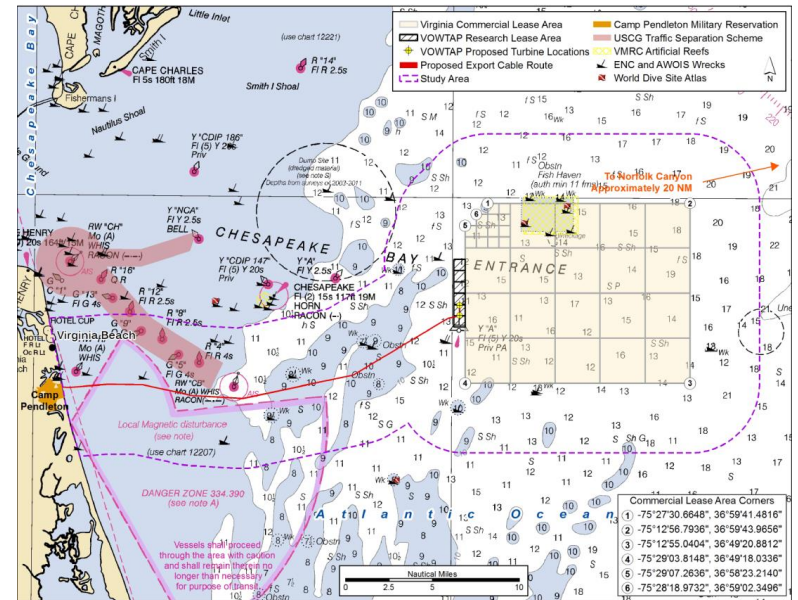
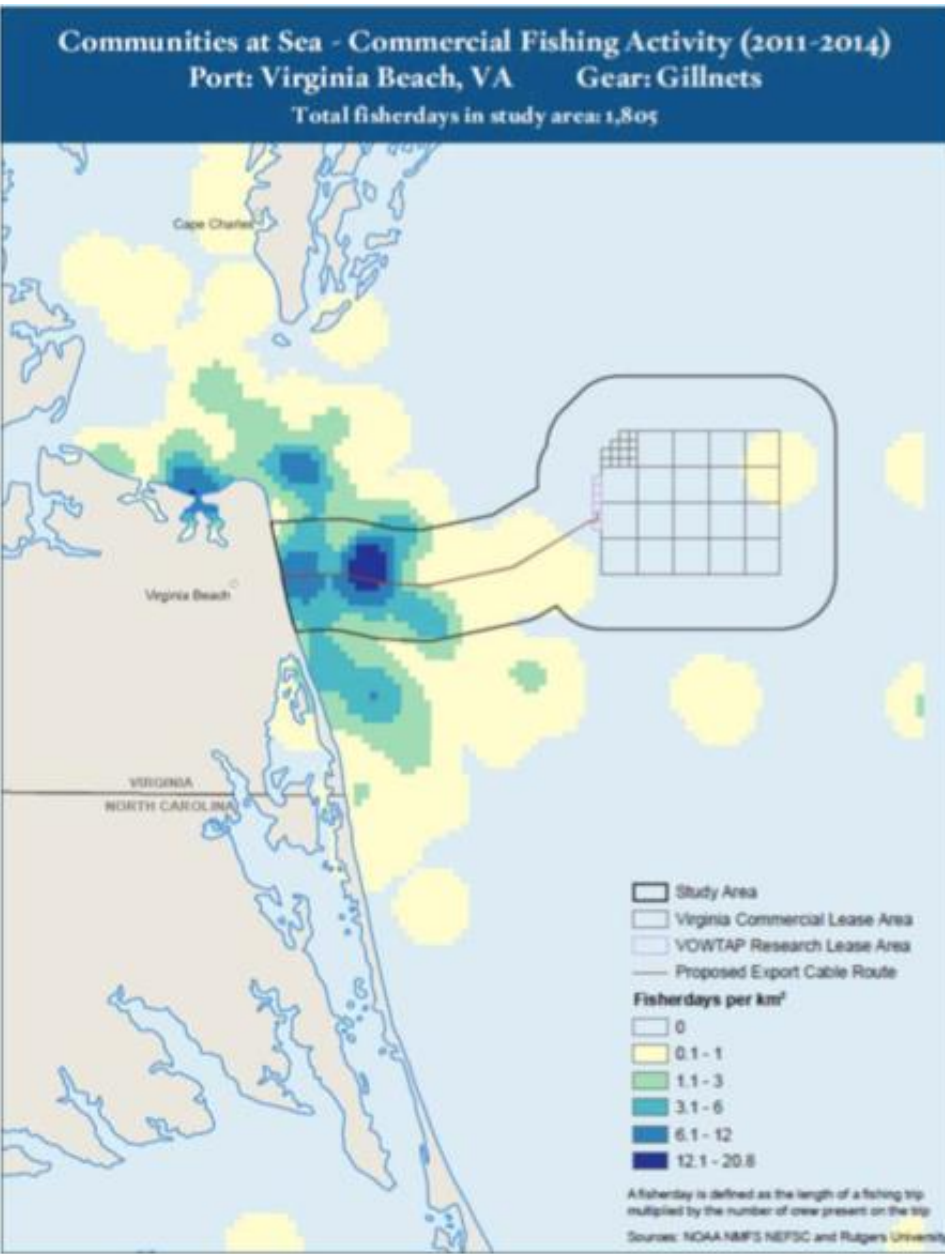
Mid-Atlantic Ocean Data Portal

The Portal is an ocean planning resource center featuring the Marine Planner, an interactive mapping tool.

Mid-Atlantic Committee on the Ocean

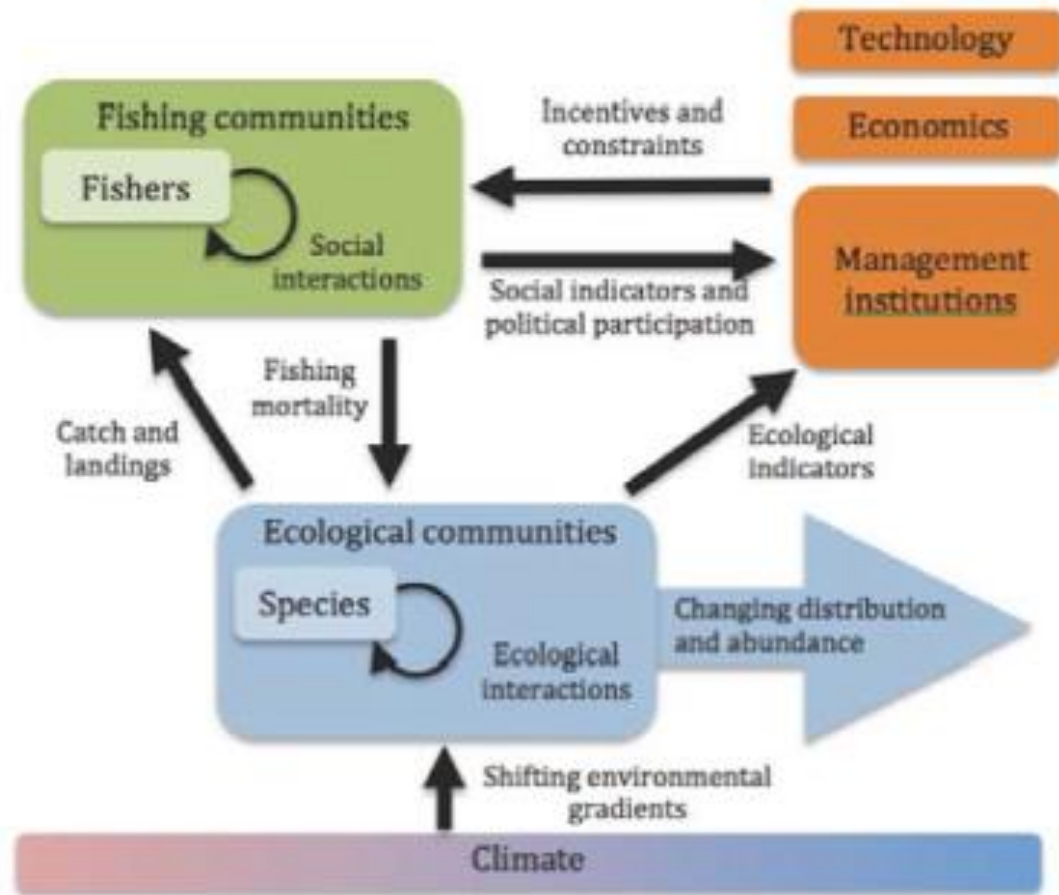
MACO is a committee established by MARCO to foster collaboration among states, federal

VA Wind Energy Initiative



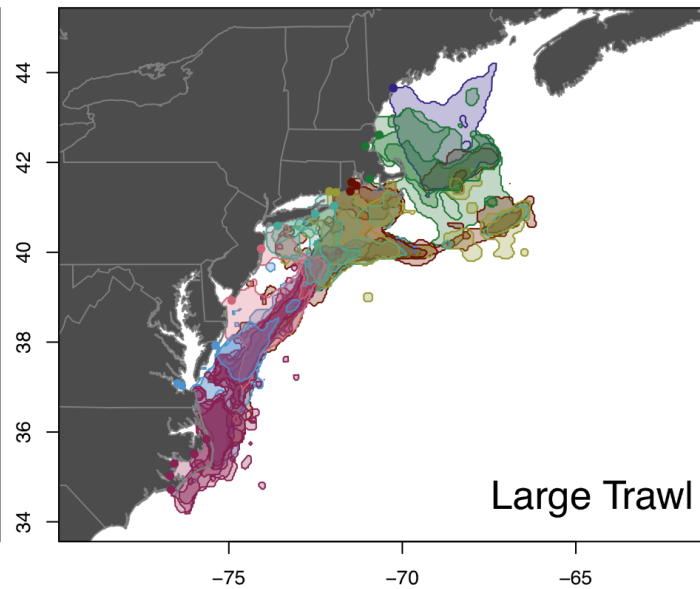
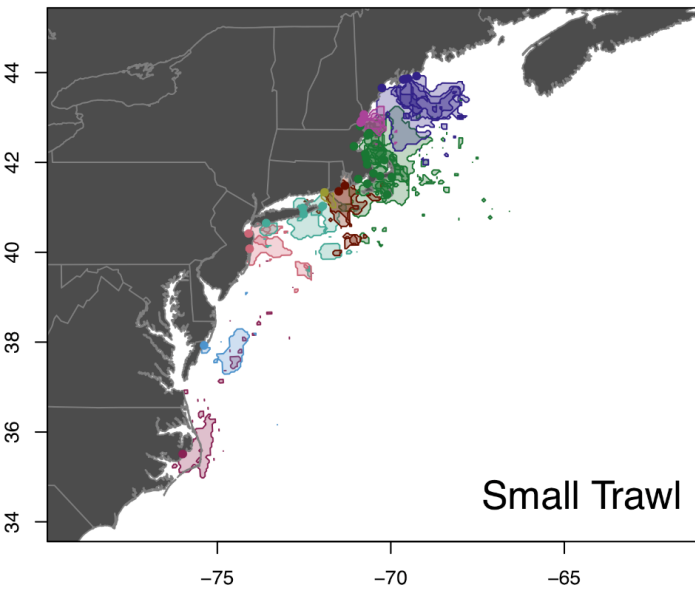
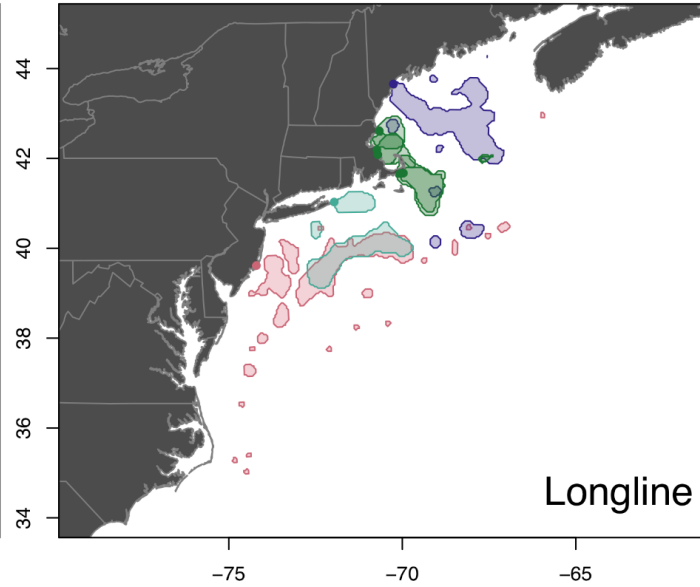
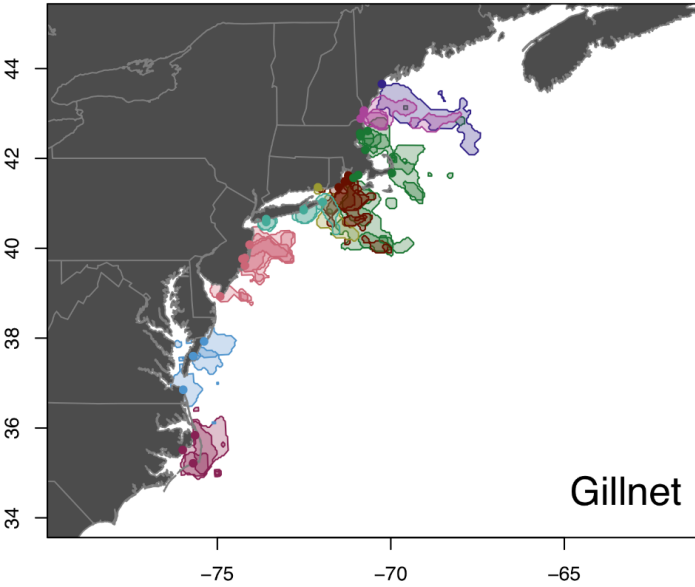
"They got input from the fishermen and from the community members, they vetted the maps with stakeholders. There was lots of engagement."

Climate Change and Impacts on Fishing Communities



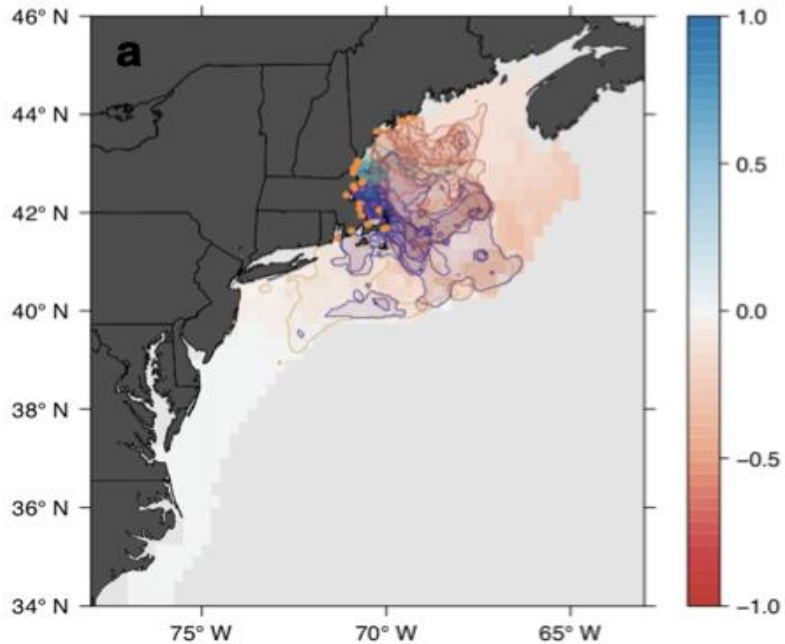
Pinsky, M., E. Fenichel, M. Fogarty, S. Levin, B. McCay, K. St. Martin, R. Selden, T. Young. 2021 "Fish and Fisheries in Hot Water: What is Happening and How do We Adapt?" *Population Ecology* 63: 17-26.

Projecting Climate Change Impacts by Community

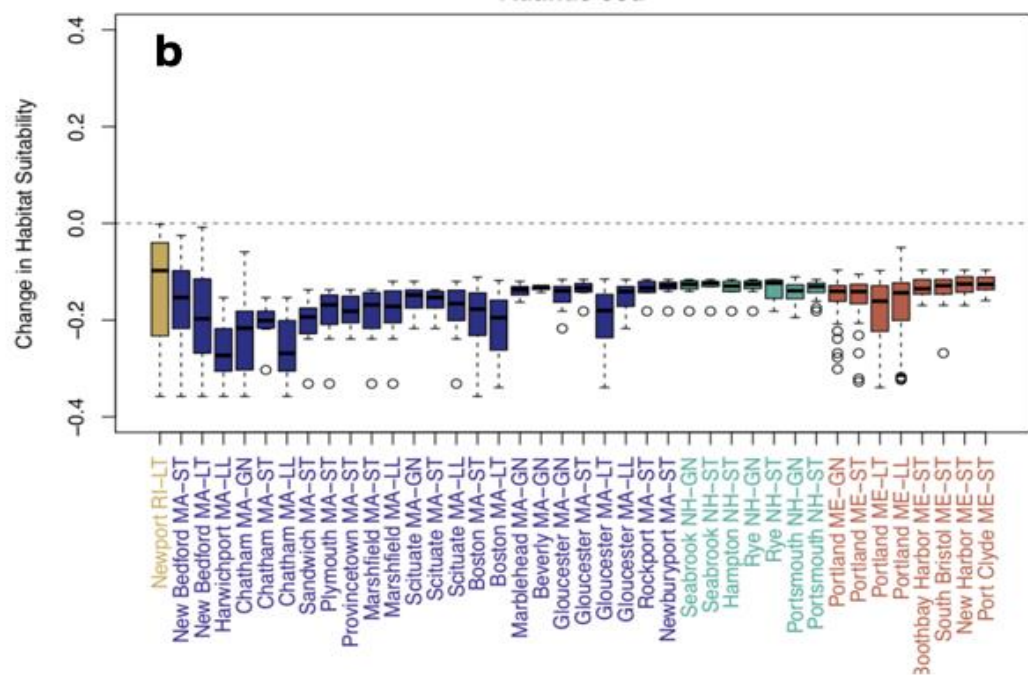


Rogers, L.A., Griffin, R., Young, T., Fuller, E., St Martin, K. and Pinsky, M.L., 2019. Shifting habitats expose fishing communities to risk under climate change. *Nature Climate Change*, 9(7), pp.512-516.

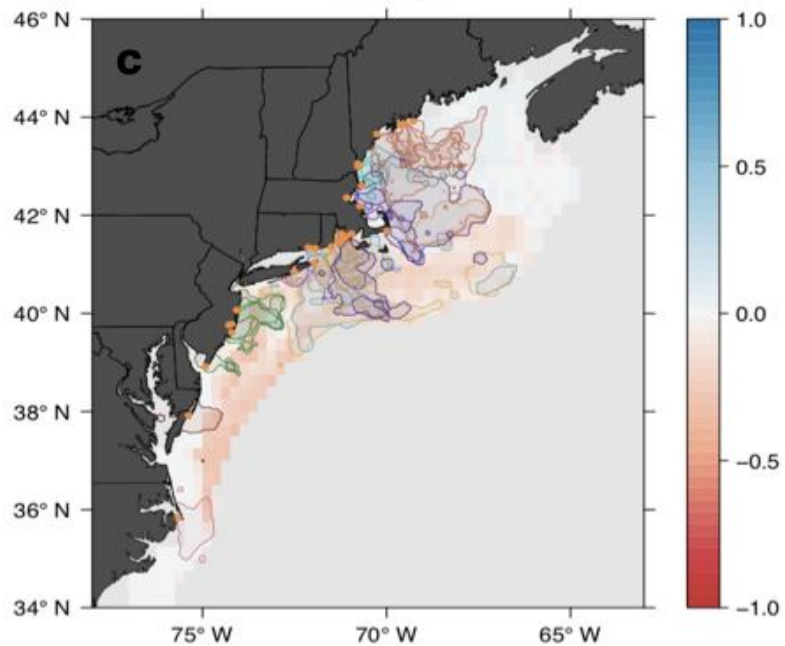
Atlantic cod



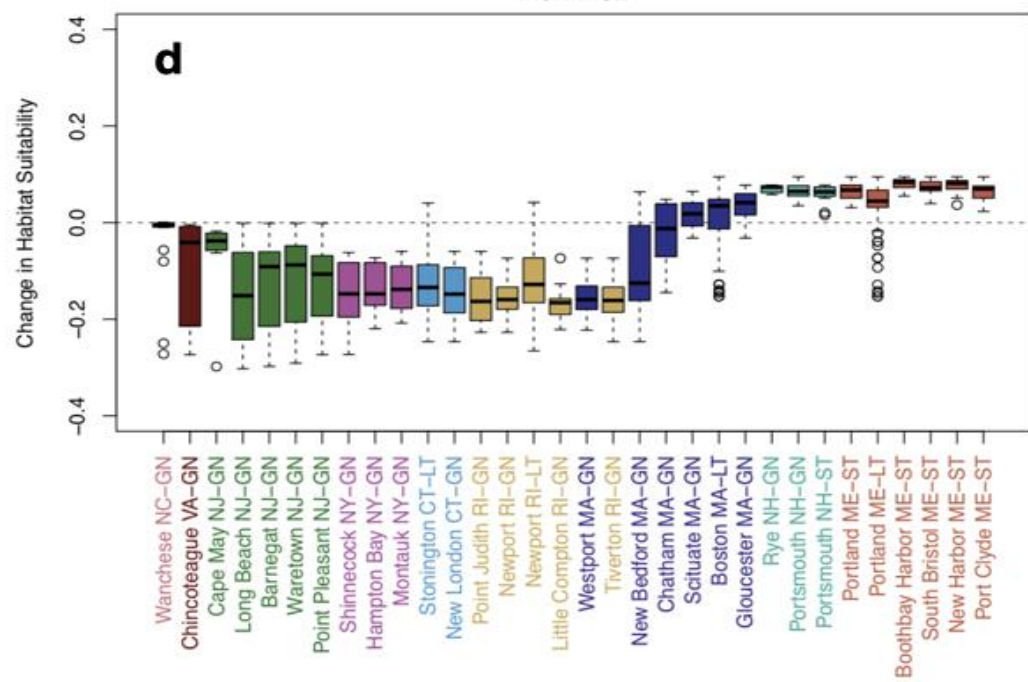
Atlantic cod

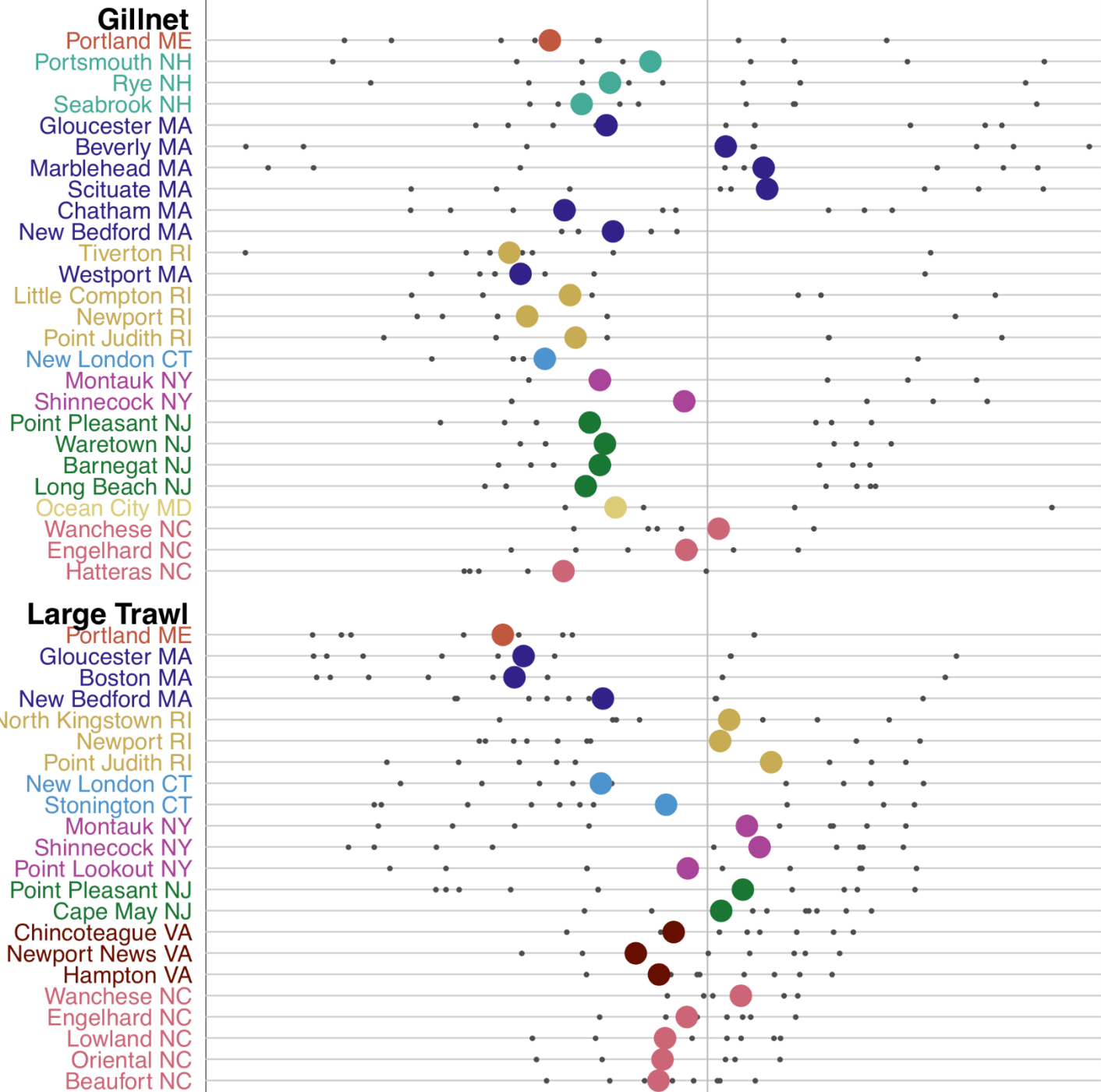


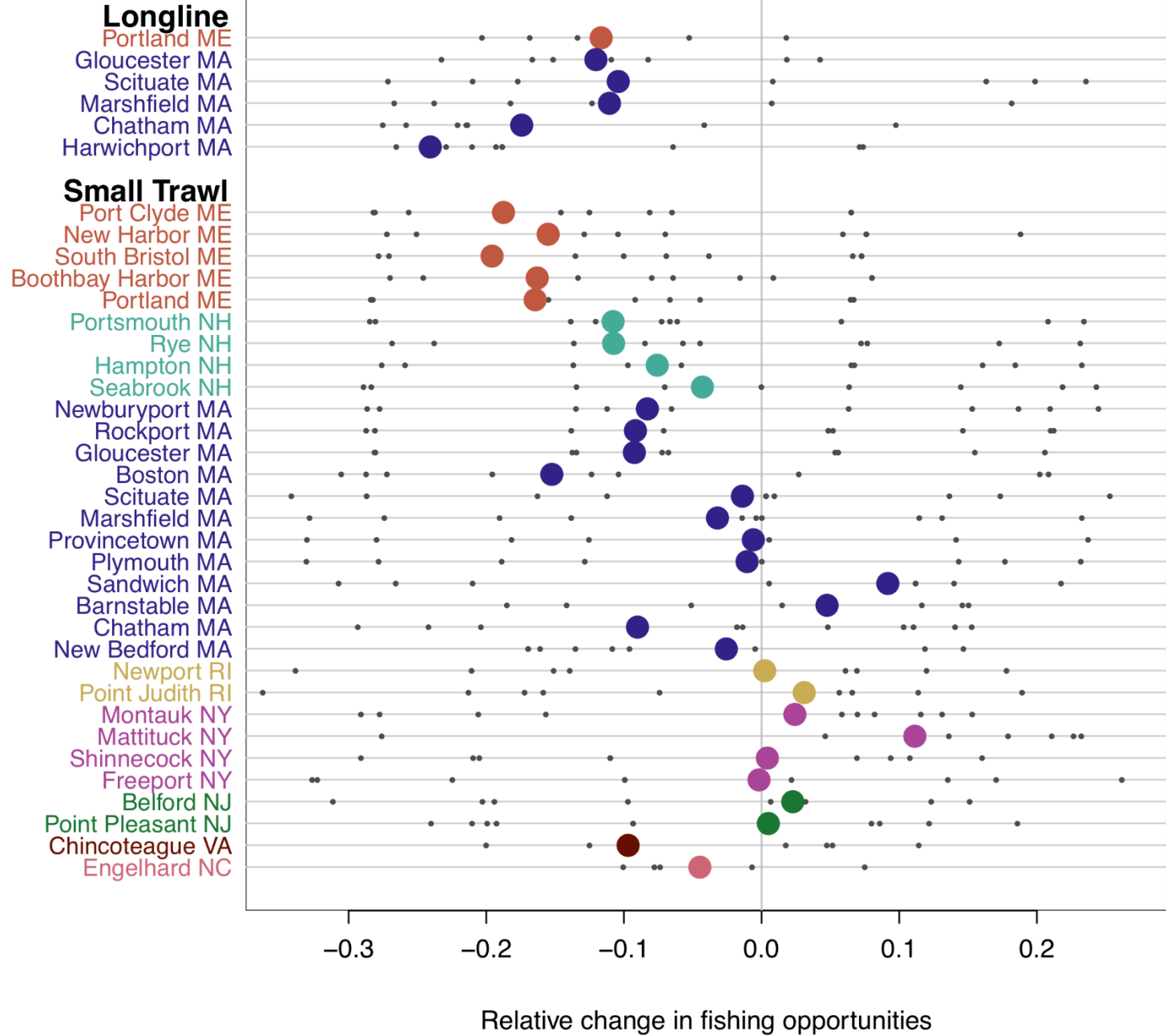
Monkfish



Monkfish





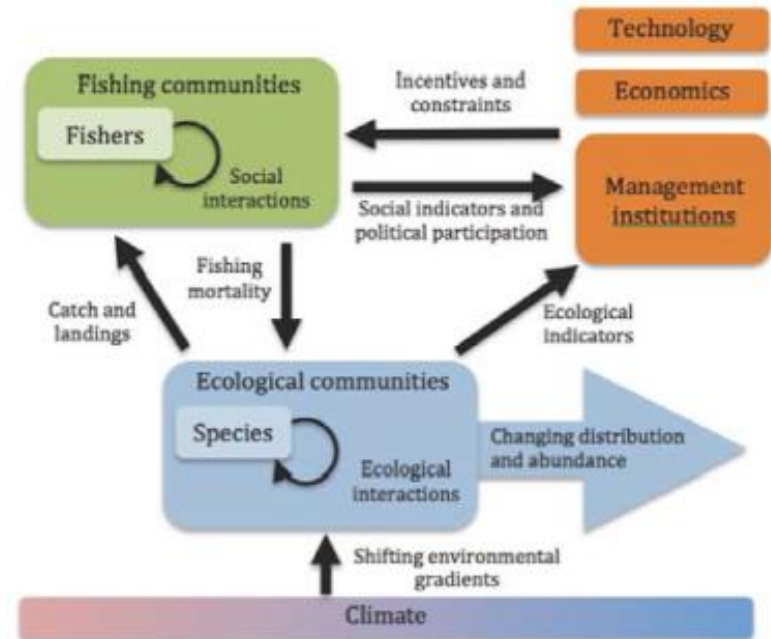


Climate Change and Community Response

Developing Key Metrics

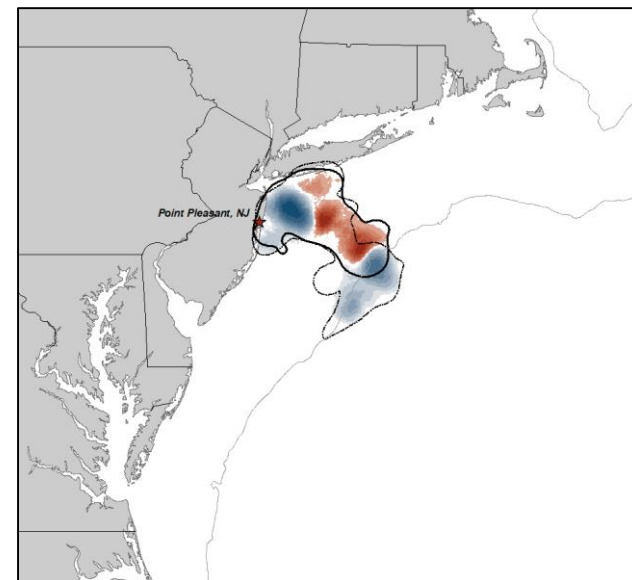
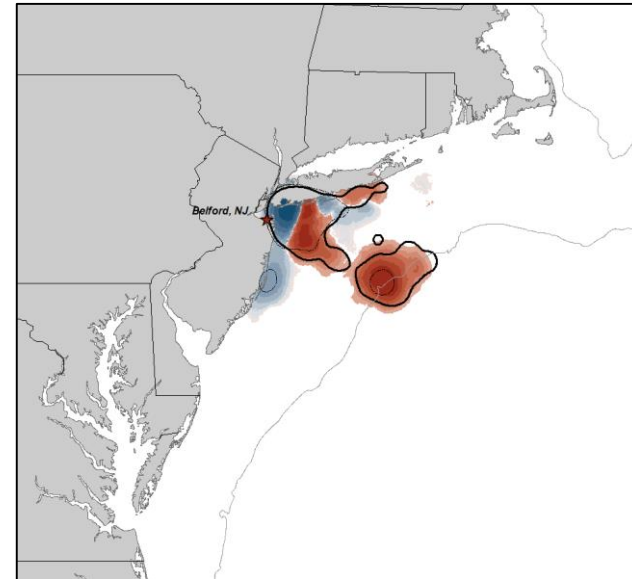
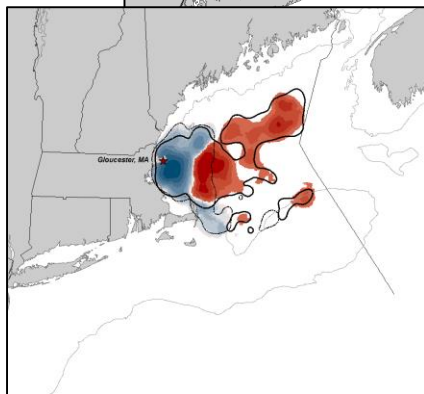
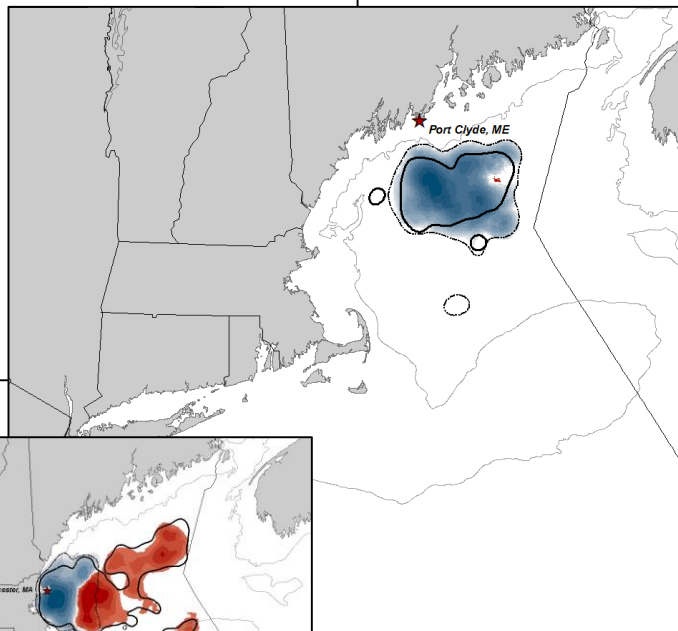
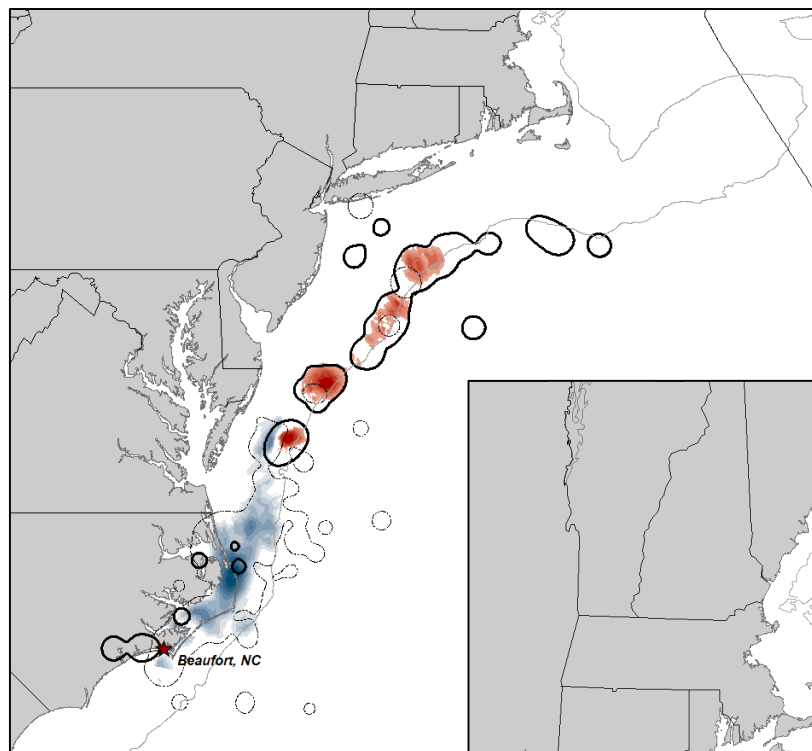
- Fidelity to Fishing Grounds (*Capacity to Follow Fish*)
- Target Species Composition (*Capacity to Shift Species*)
- Port Activity (*Movement and Migration Between Ports*)

Indexes of Vulnerability



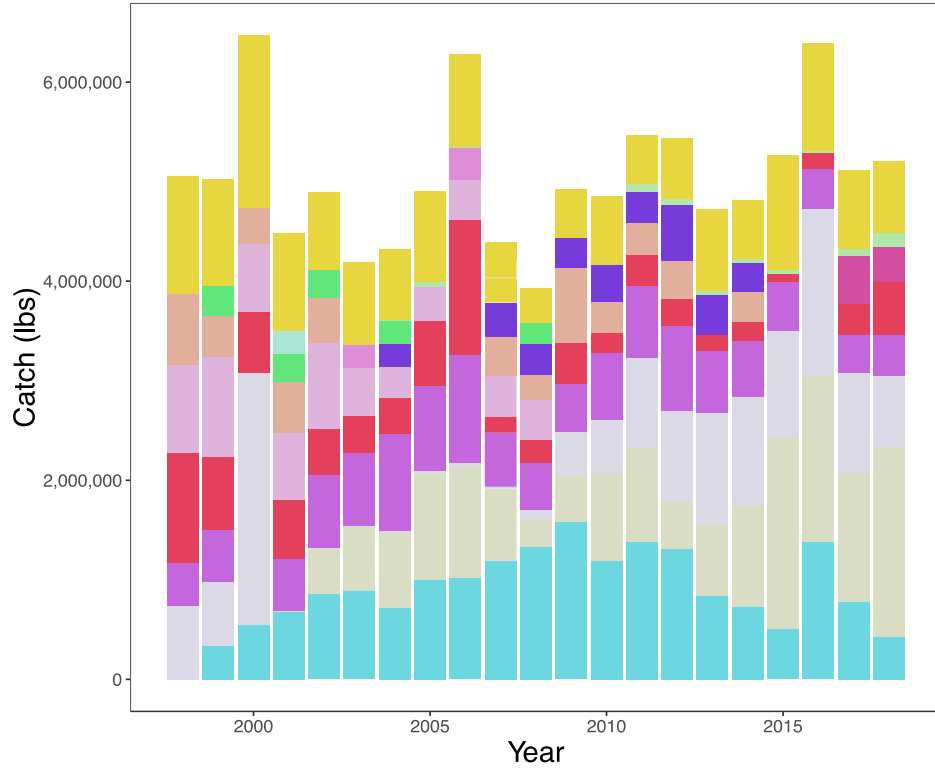
Papaioannou, E.A., R.L. Selden, J. Olson, B. McCay, M.L. Pinsky, and K. St. Martin. 2021. "Not All Those Who Wander are Lost – Responses of Fishers' Communities to Shifts in the Distribution and Abundance of Fish," *Frontiers in Marine Science* doi: 10.3389/fmars.2021.669094.

Shifting Fishing Grounds



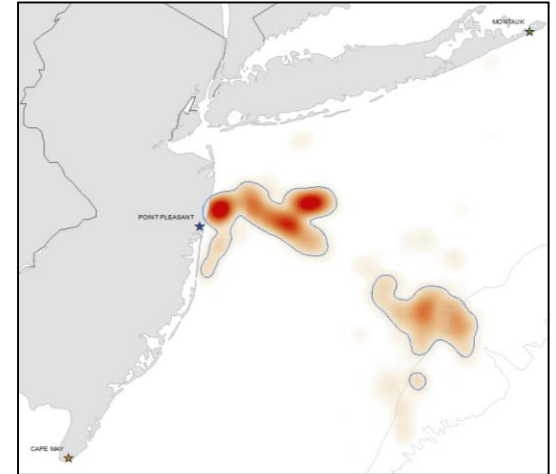
Shifting Target Species

Point Pleasant, NJ

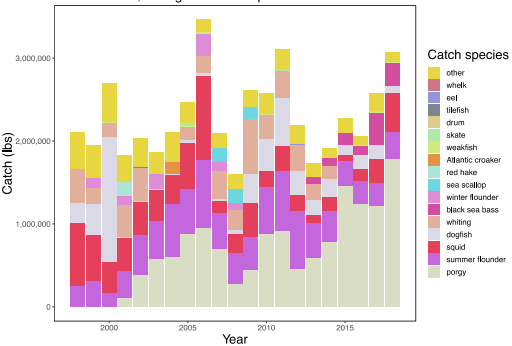


Catch species

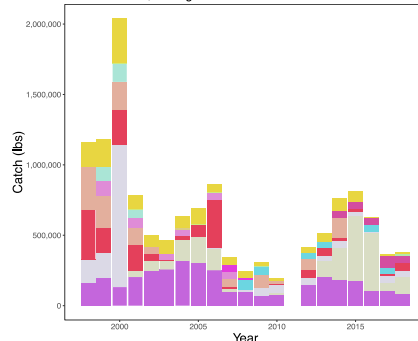
- other
- red hake
- skate
- winter flounder
- black sea bass
- bluefish
- American lobster
- whiting
- monkfish
- squid
- summer flounder
- dogfish
- porgy
- sea scallop



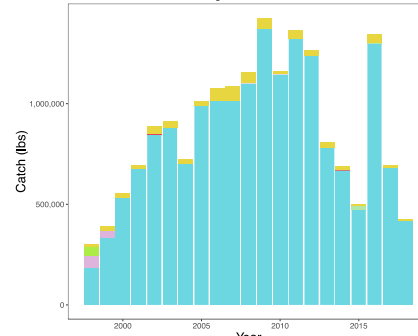
Point Pleasant, NJ – groundfish-65plus



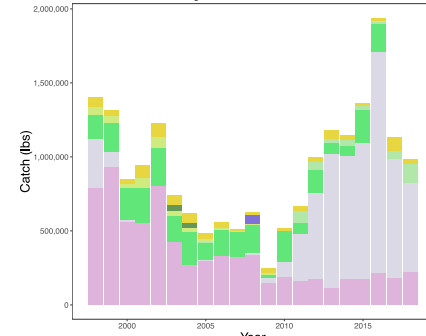
Point Pleasant, NJ – groundfish-65minus



Point Pleasant, NJ – dredge

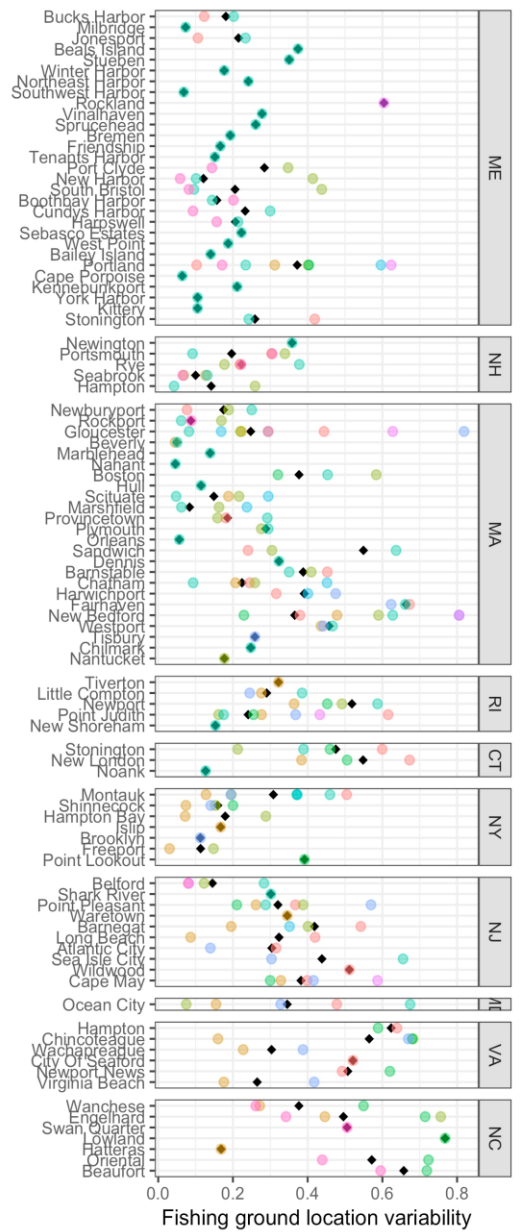
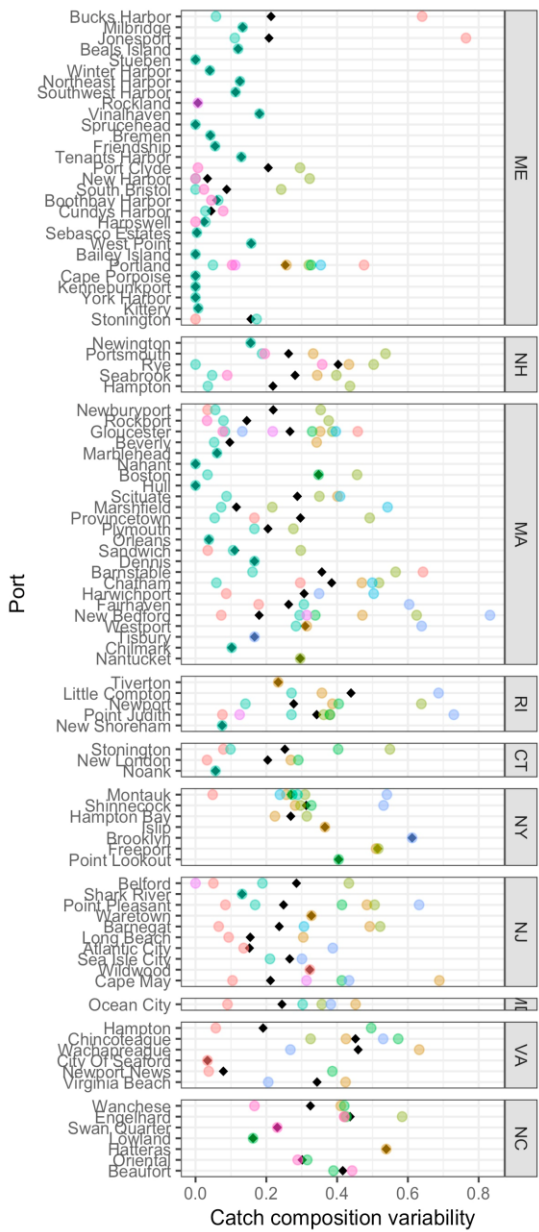


Point Pleasant, NJ – gillnet

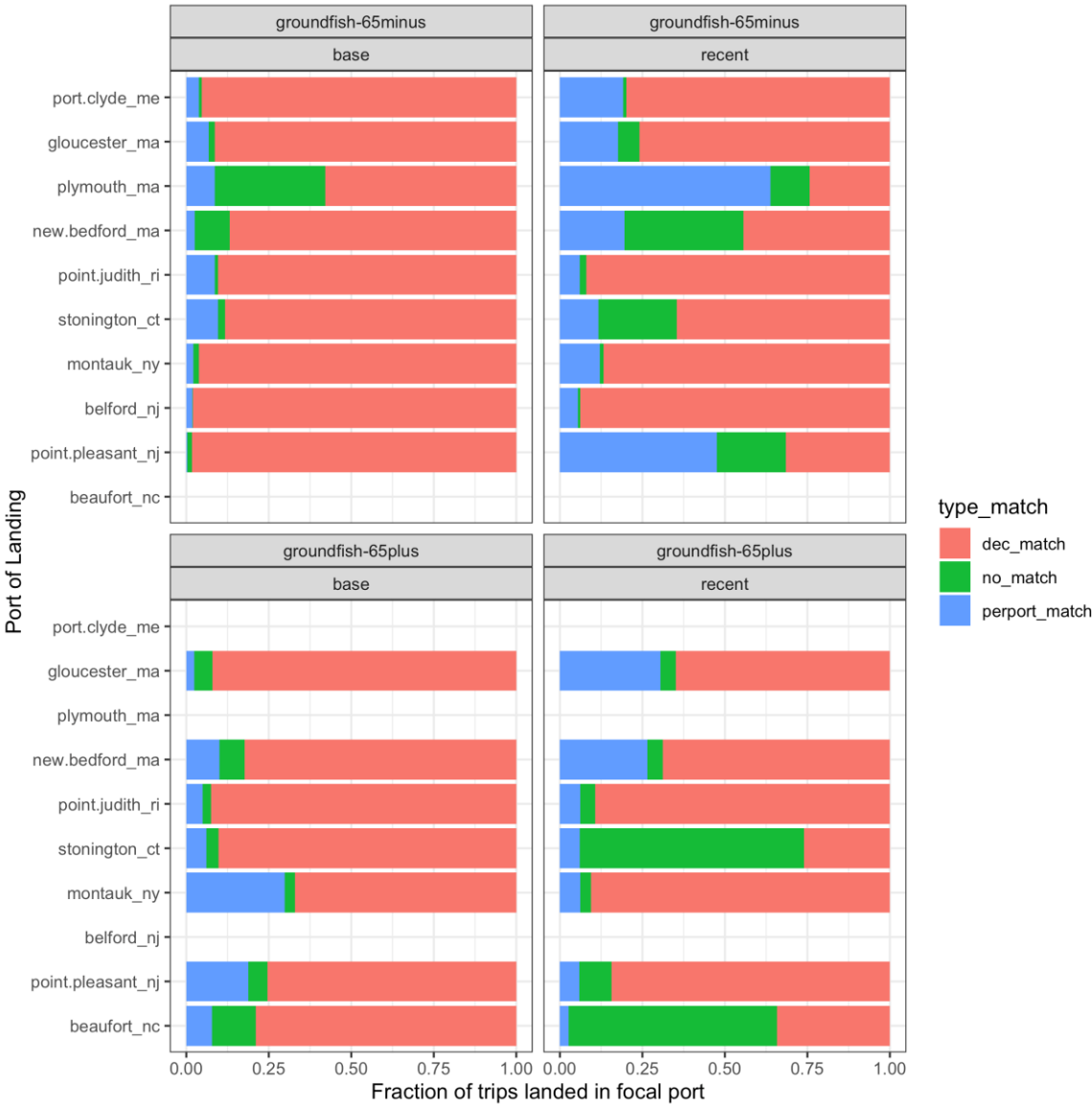


Geargroup

- dredge
- groundfish-65minus
- lobster
- other-pots.traps
- shrimptrawl
- gillnet
- groundfish-65plus
- longline
- seine-midwater



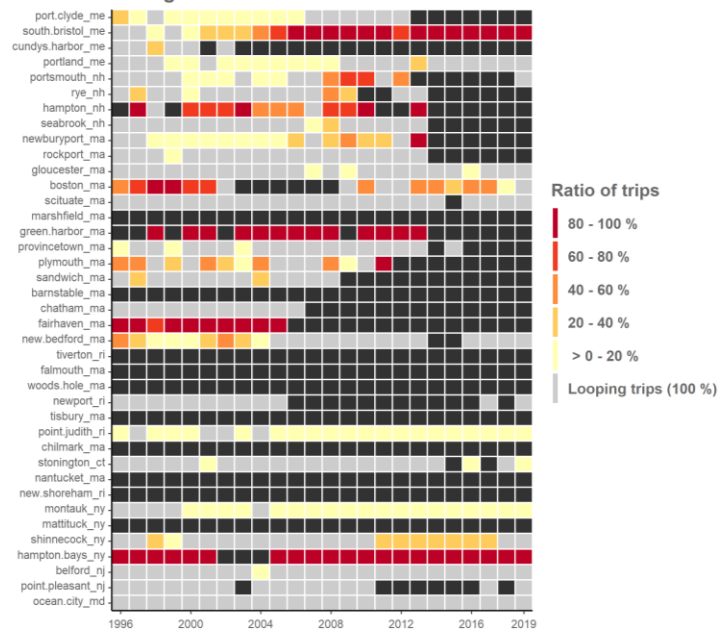
Shifting Port Association



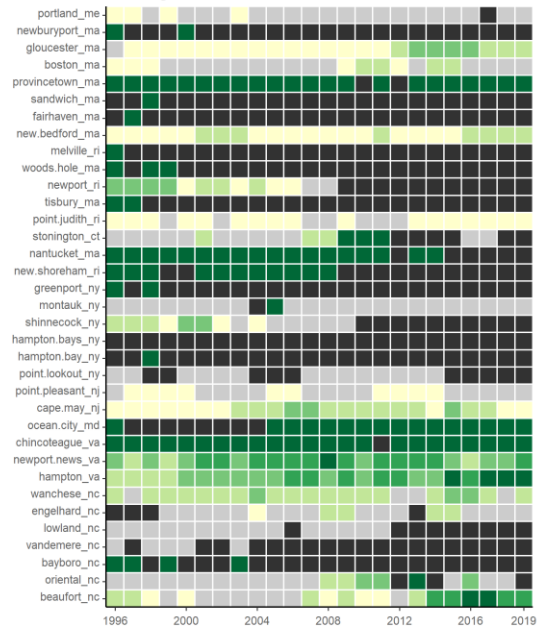
Number of outgoing trips with groundfish-65plus



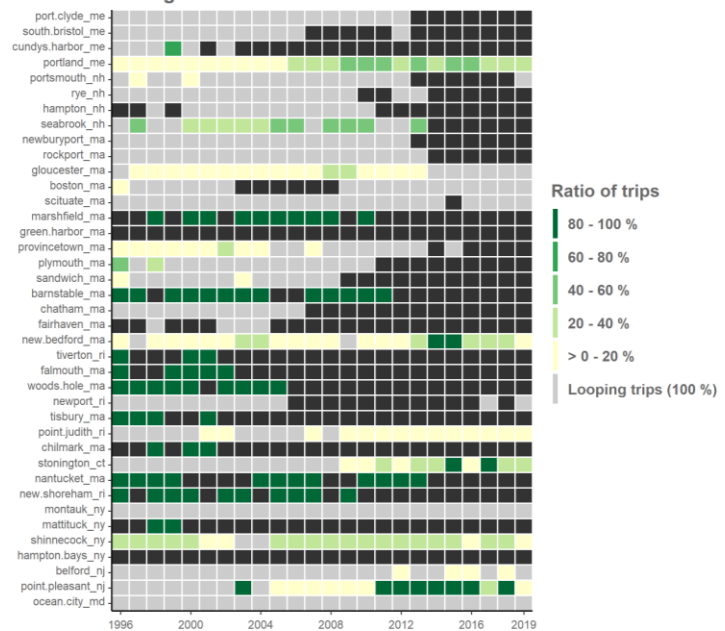
Number of outgoing trips with groundfish-65minus



Number of incoming trips with groundfish-65plus



Number of incoming trips with groundfish-65minus

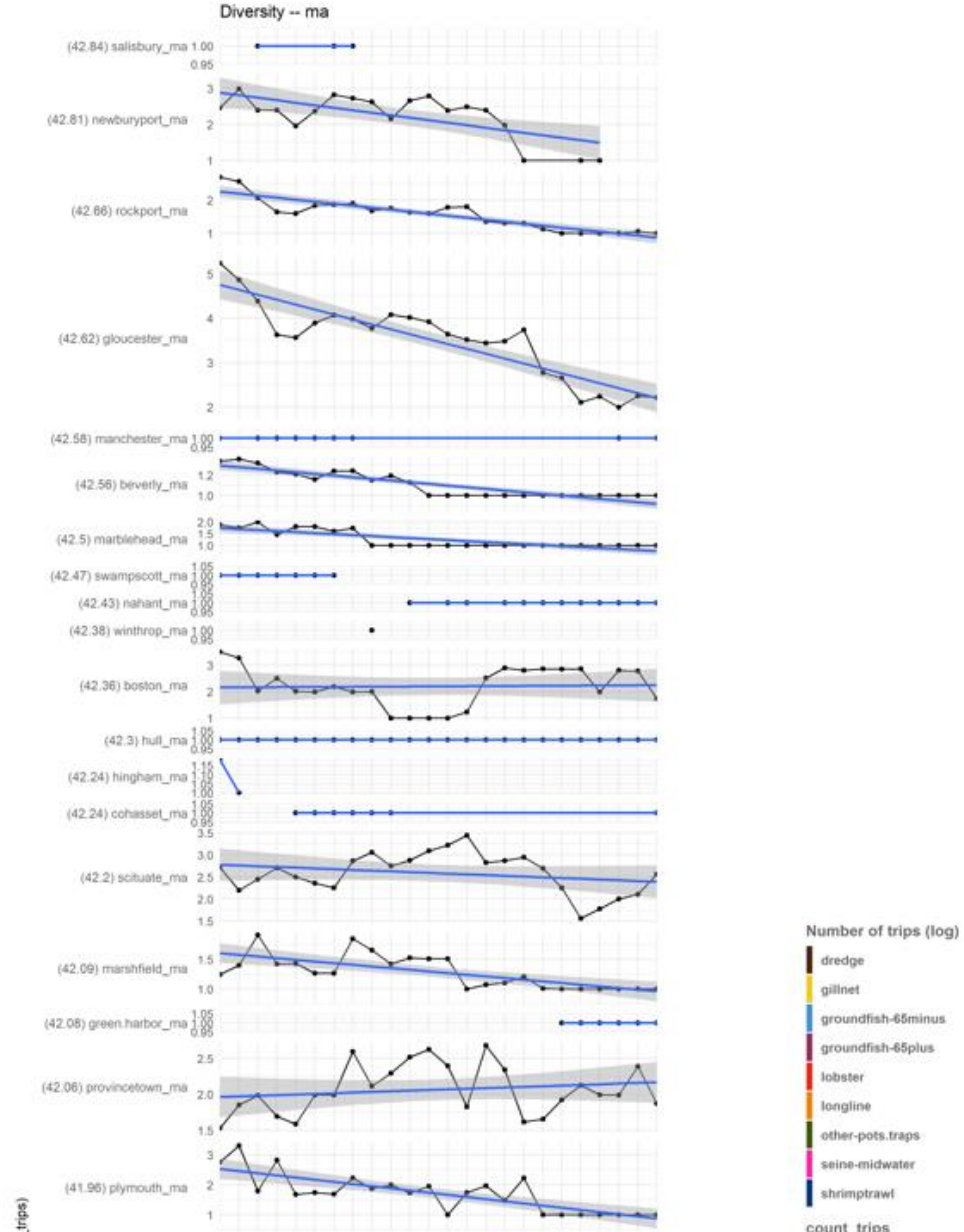
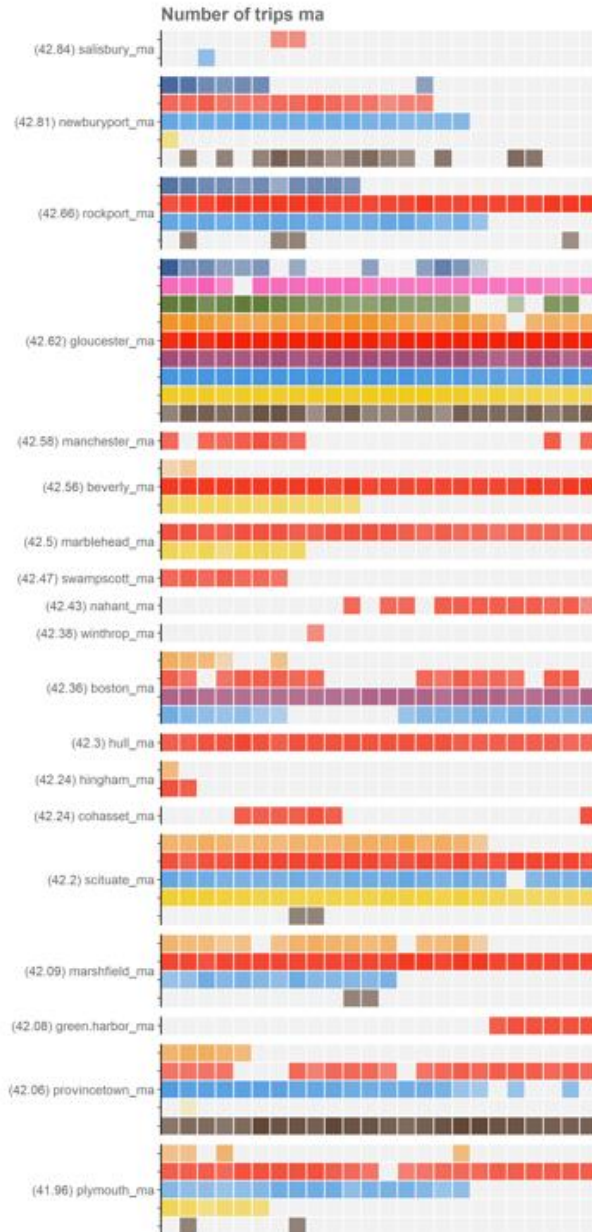


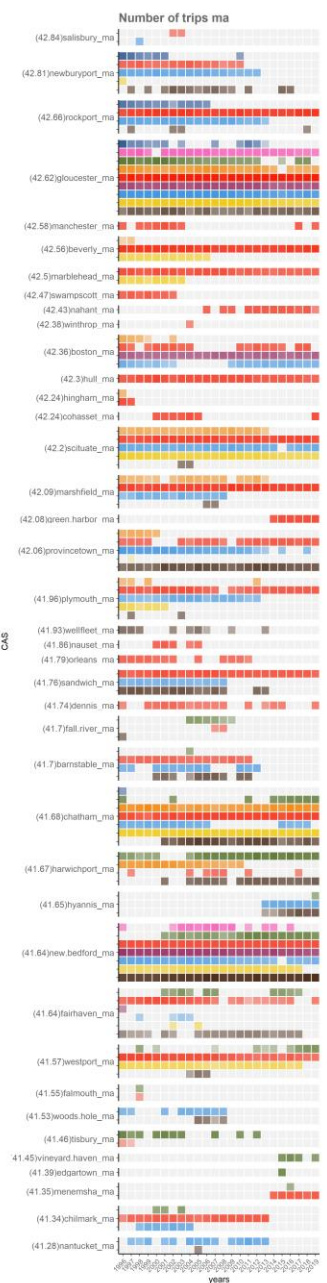
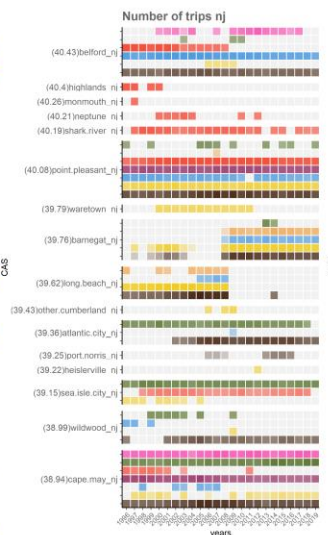
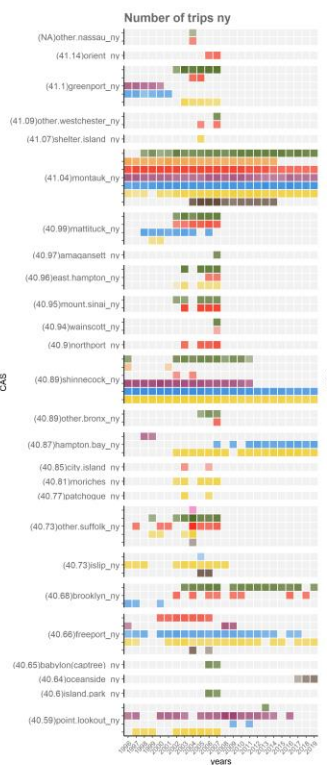
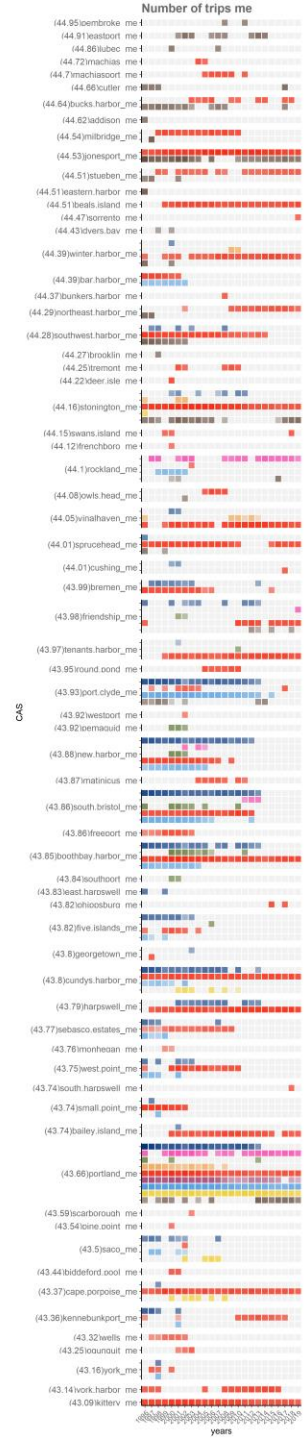
NOAA Fisheries

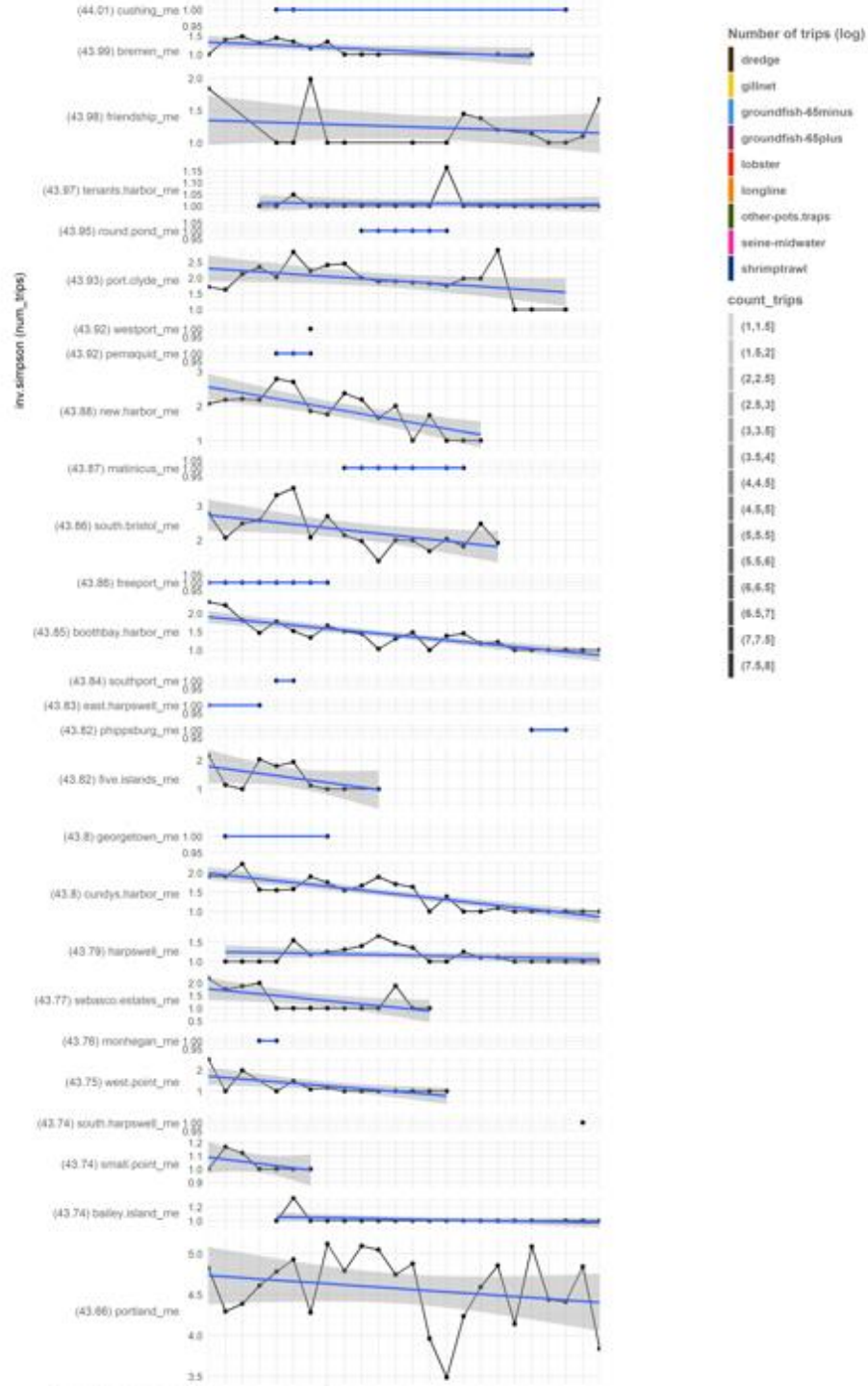
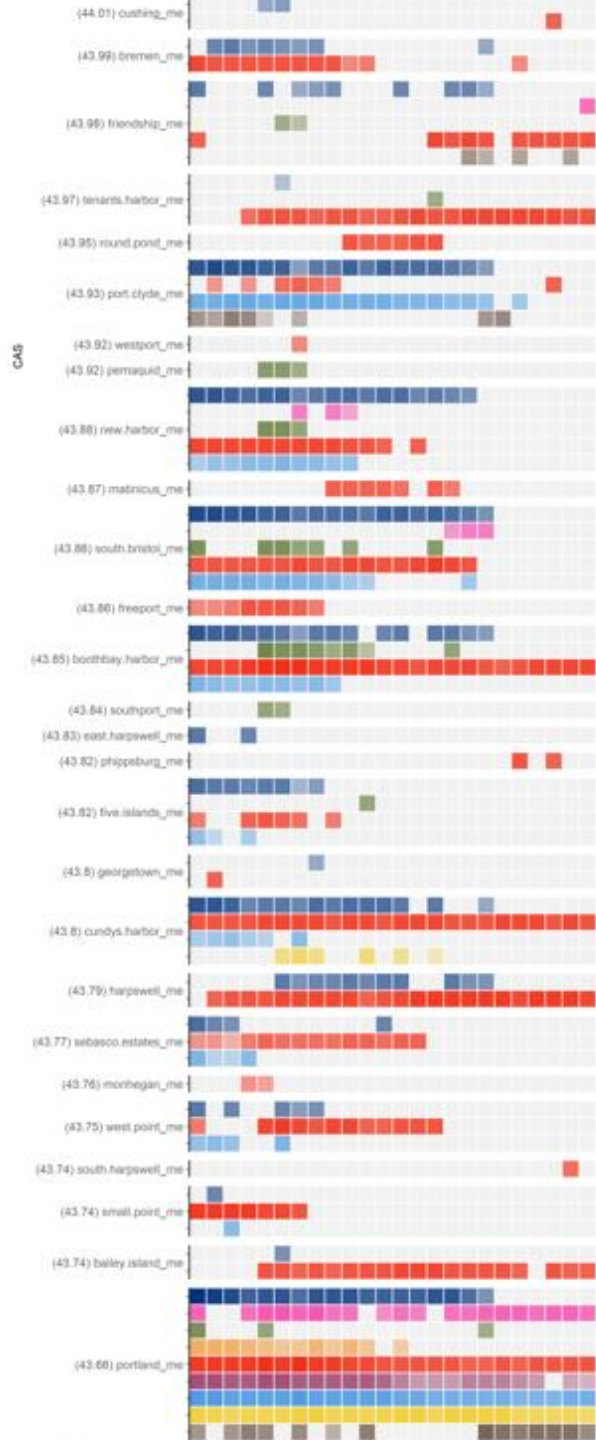
Equity and Environmental Justice Strategy

- *“Underserved Communities, as defined by Executive Order 13985, refers to communities that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. These include geographic communities as well as populations sharing a particular characteristic, history or identity.”*
- *Not just fishermen but also “subsistence fishery participants and their dependents, fishing vessel crews, and fish processor and distribution workers.”*
- *“NOAA identifies climate change as an EEJ issue because its impacts are unevenly experienced across the nation: long-standing socioeconomic inequities can make underserved communities, who often have the highest exposure to hazards and the fewest resources to respond, more vulnerable.”*

Change in Port Activity







Thank You

- NSF Convergence Accelerator Program:
Incorporating Communities into Equitable Ocean Planning for the Blue Economy
- NOAA, New Jersey Sea Grant: *Developing Indices of Vulnerability to Climate Change for Ground Fishing Communities in the Northeast*
- Indicators Project Collaborators
 - Becca Selden
 - Leo Calzada
 - Kaycee Colman
 - Talia Young
 - Patricia Clay
 - Lisa Colburn
 - Sean Lucey
 - Malin Pinsky