

Adaptations of fishing communities to rapid climate velocities

Malin Pinsky

Kevin St. Martin, Talia Young, Emma Fuller,
Kaycee Coleman, Eli Fenichel, Bonnie
McCay, Simon Levin



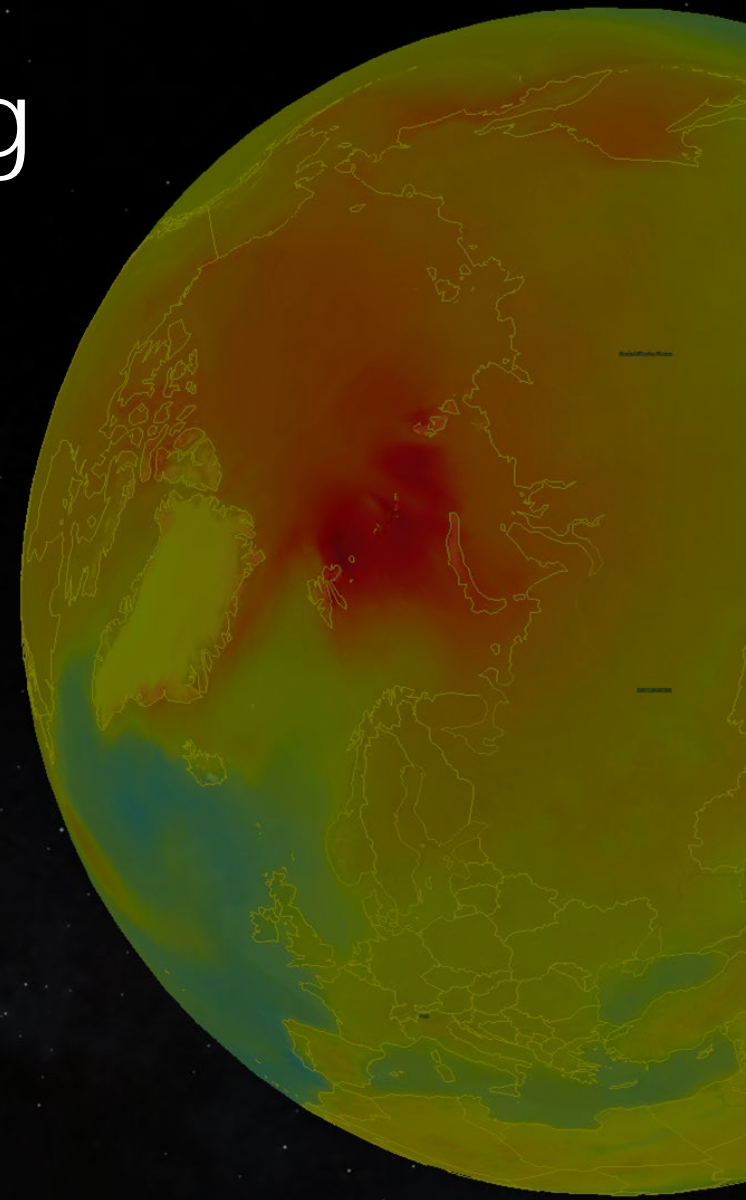
Rutgers



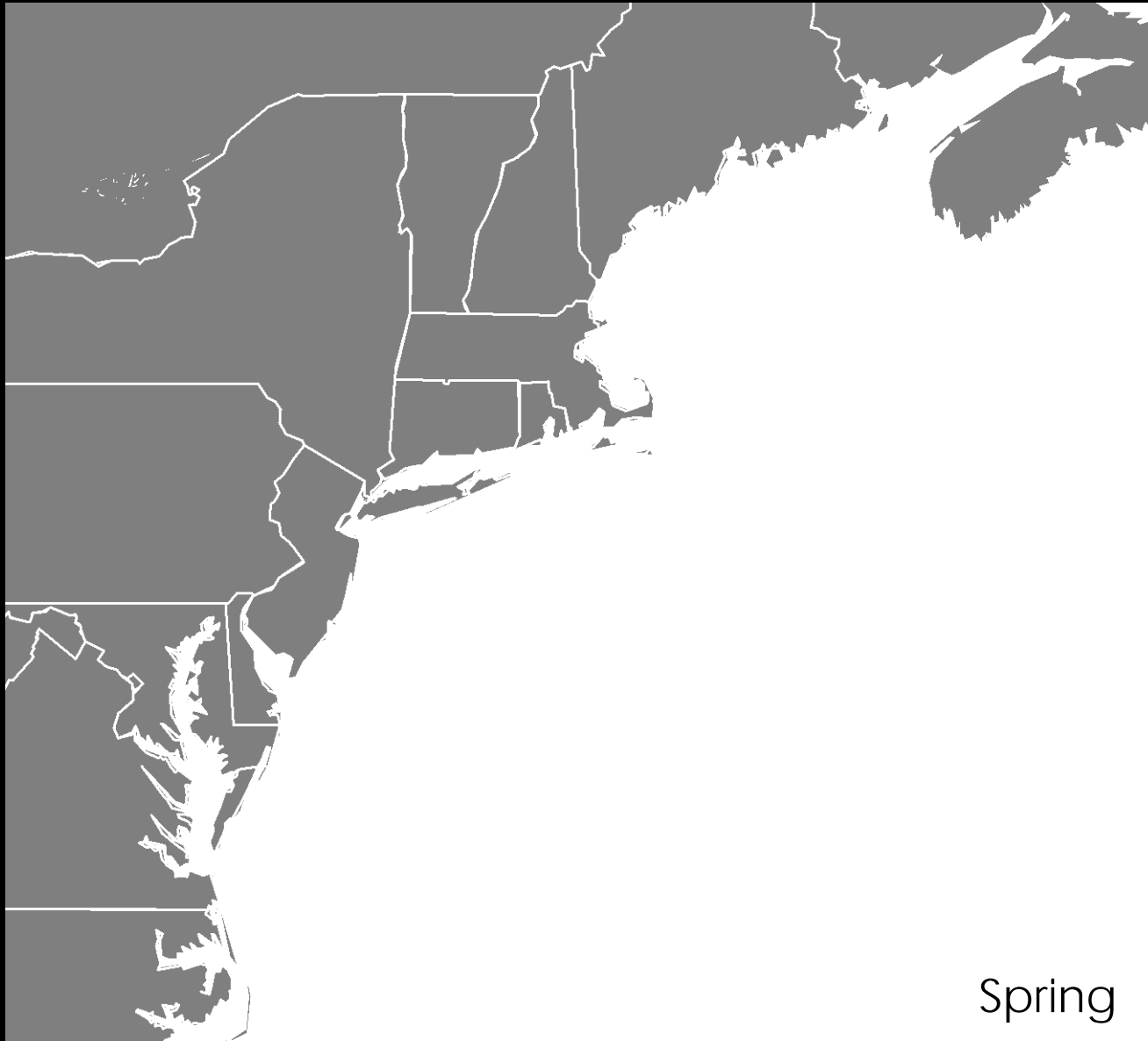
Yale



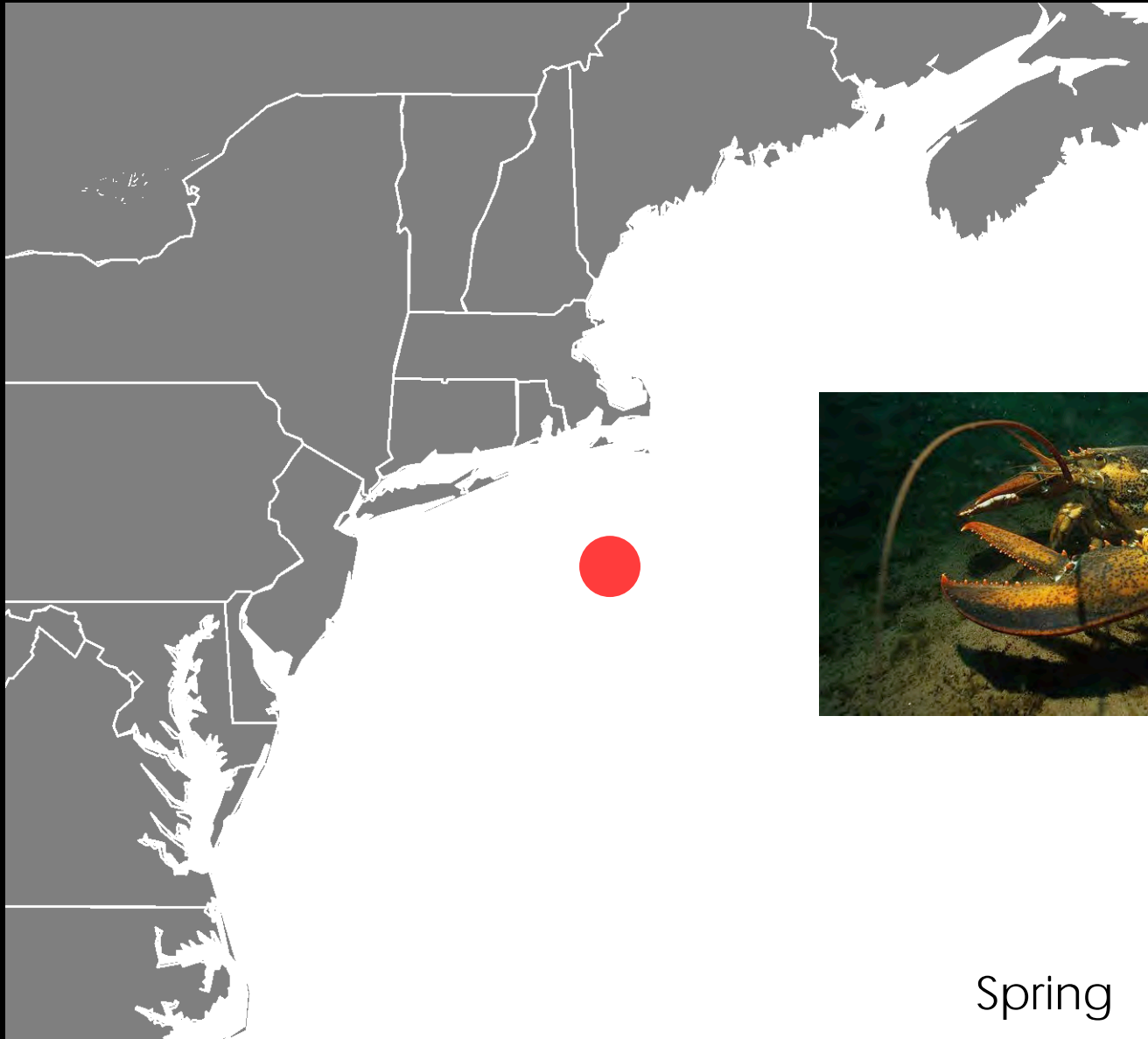
Princeton



Distribution shifts 1968-2008

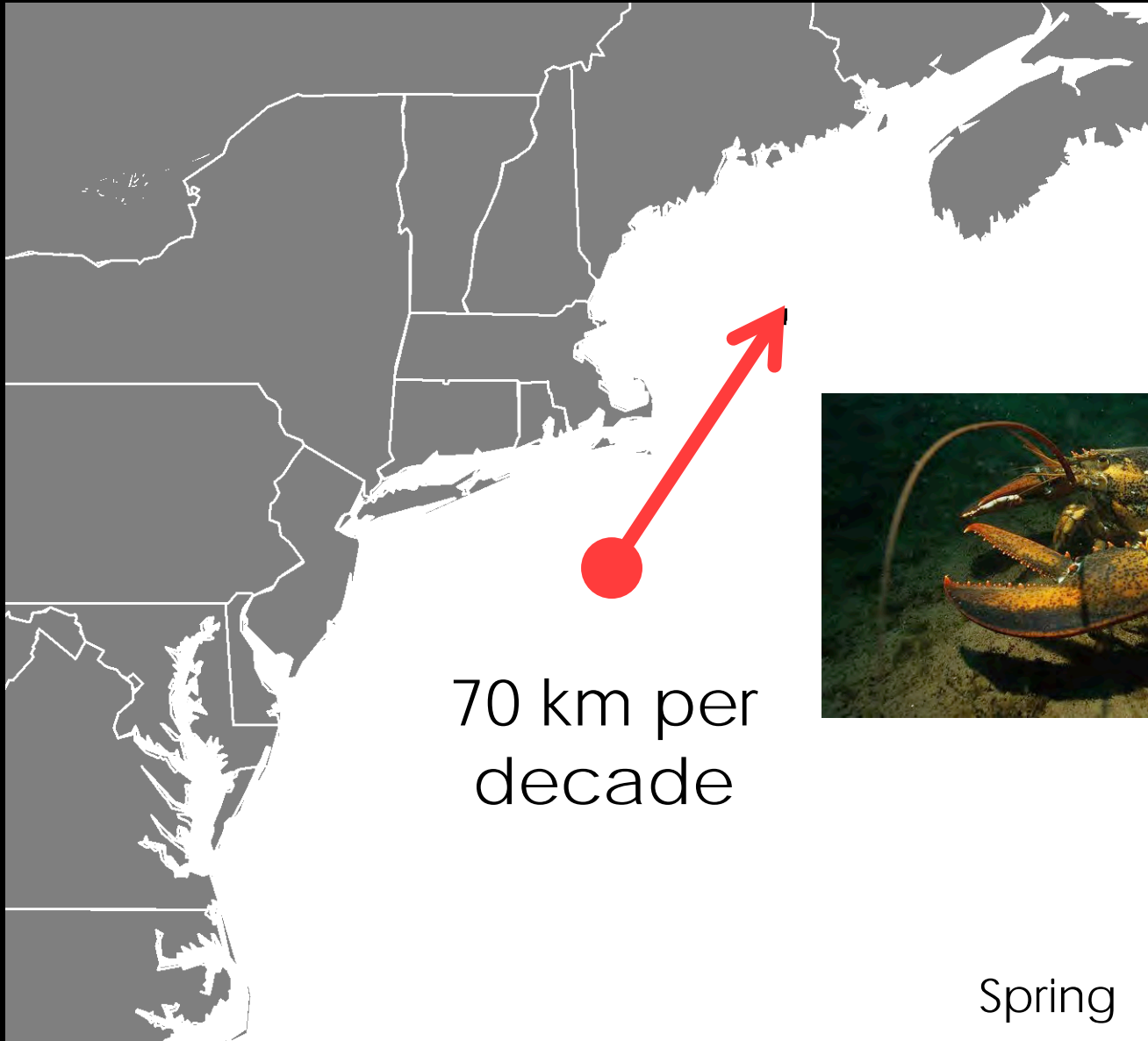


Distribution shifts 1968-2008

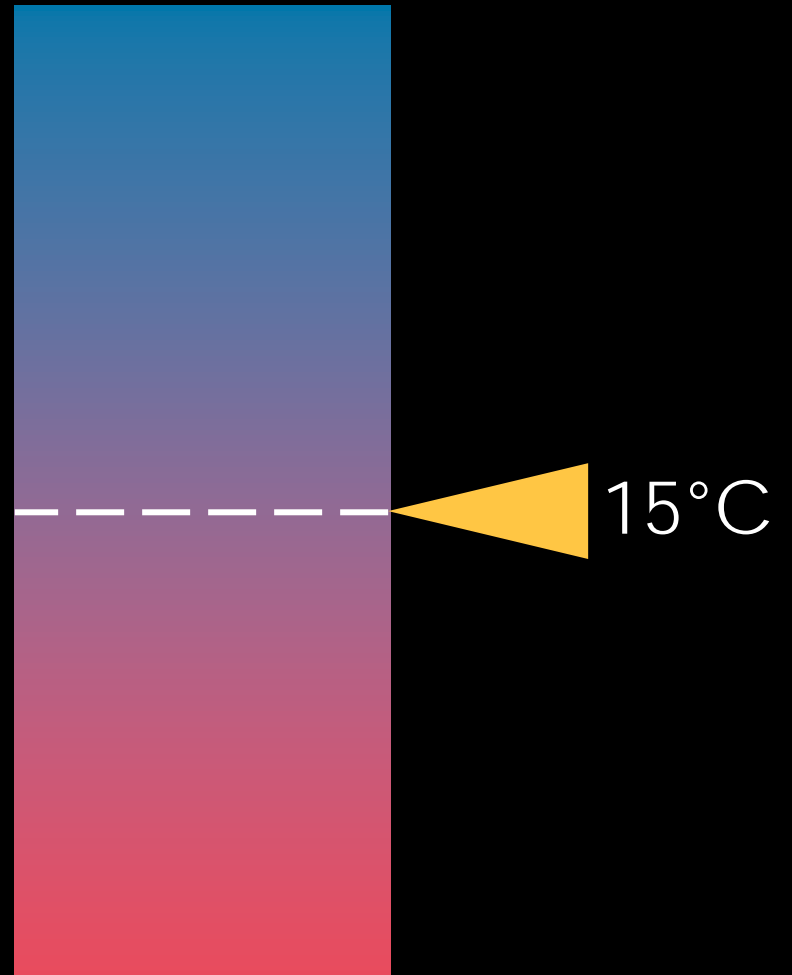


Spring

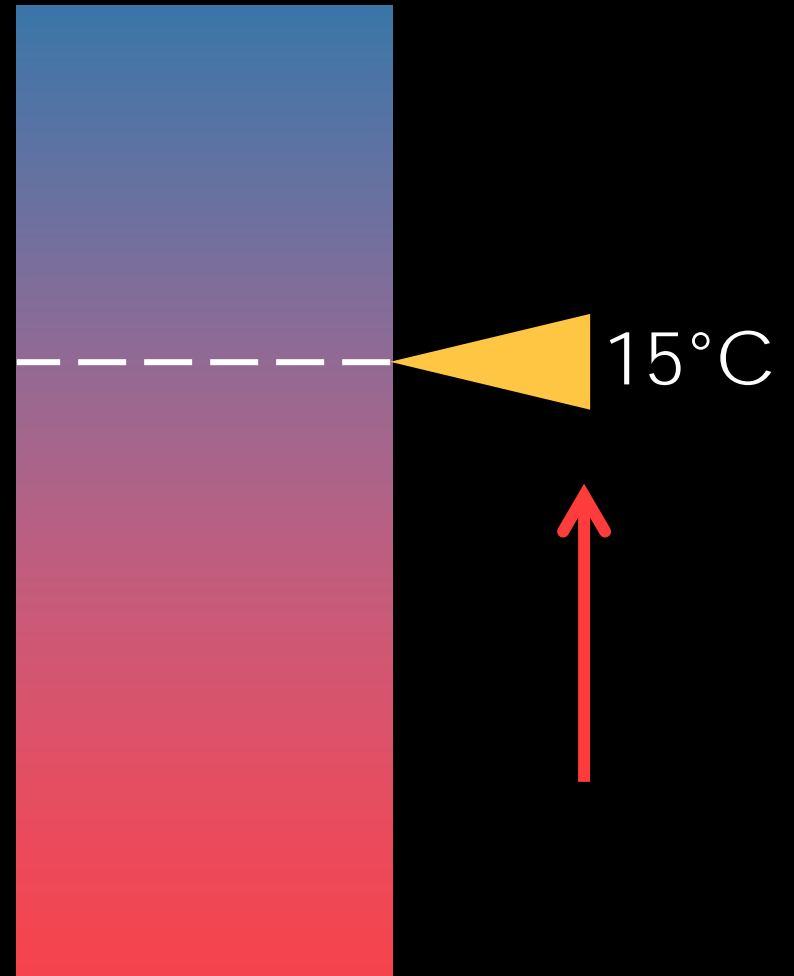
American Lobster 1968-2008



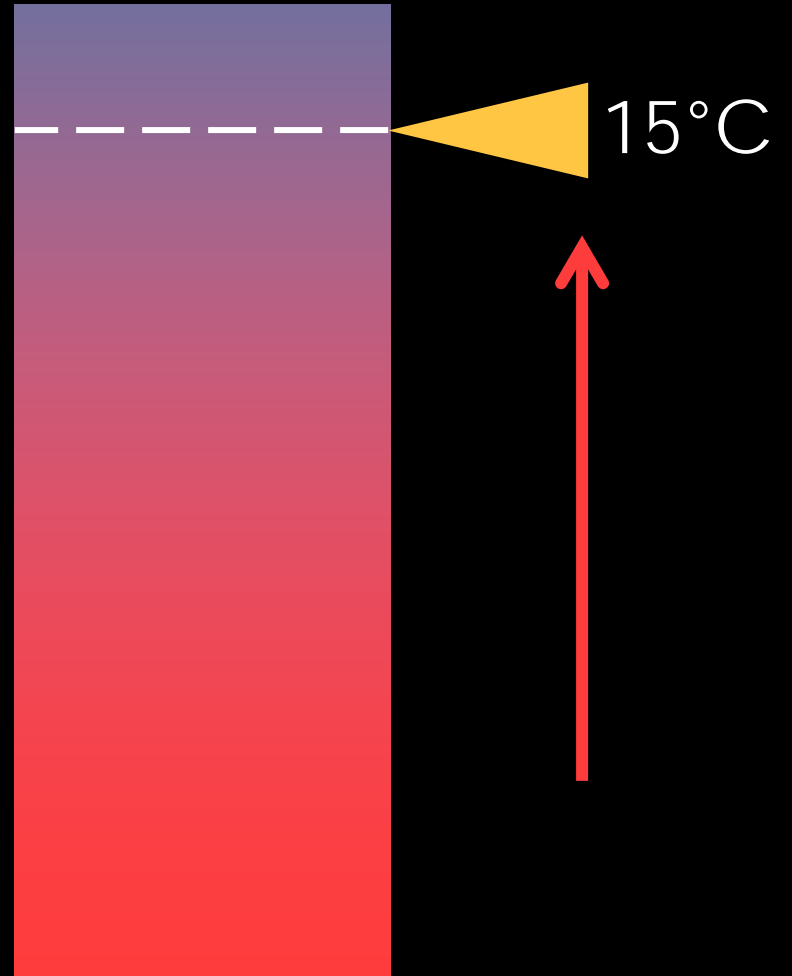
Climate velocity



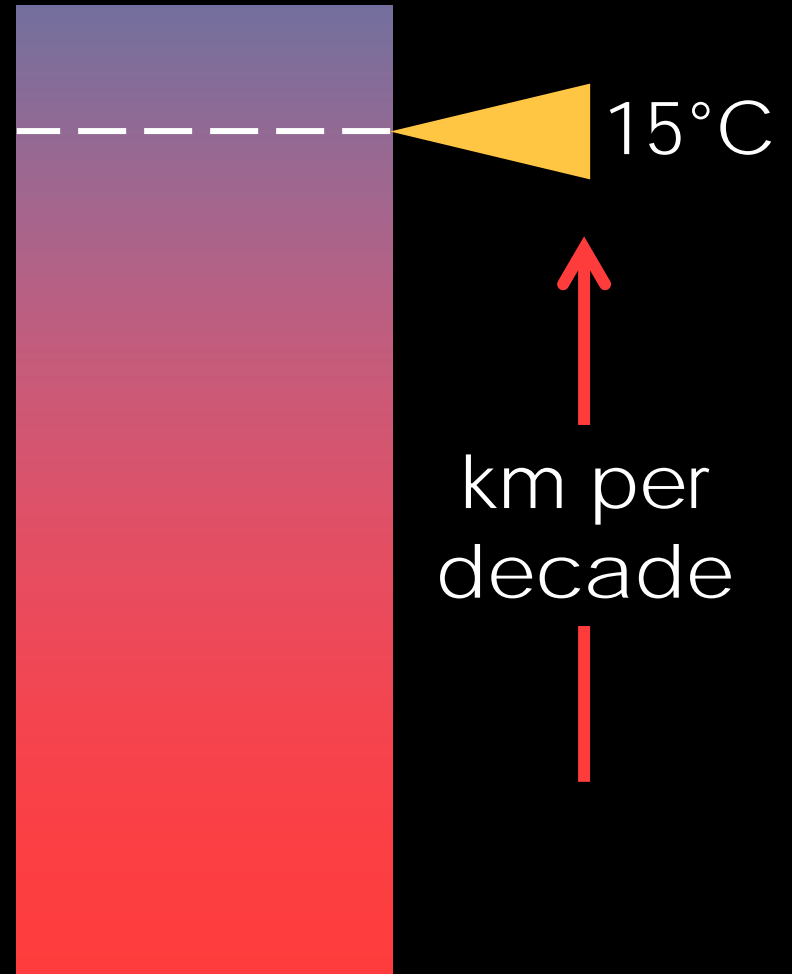
Climate velocity



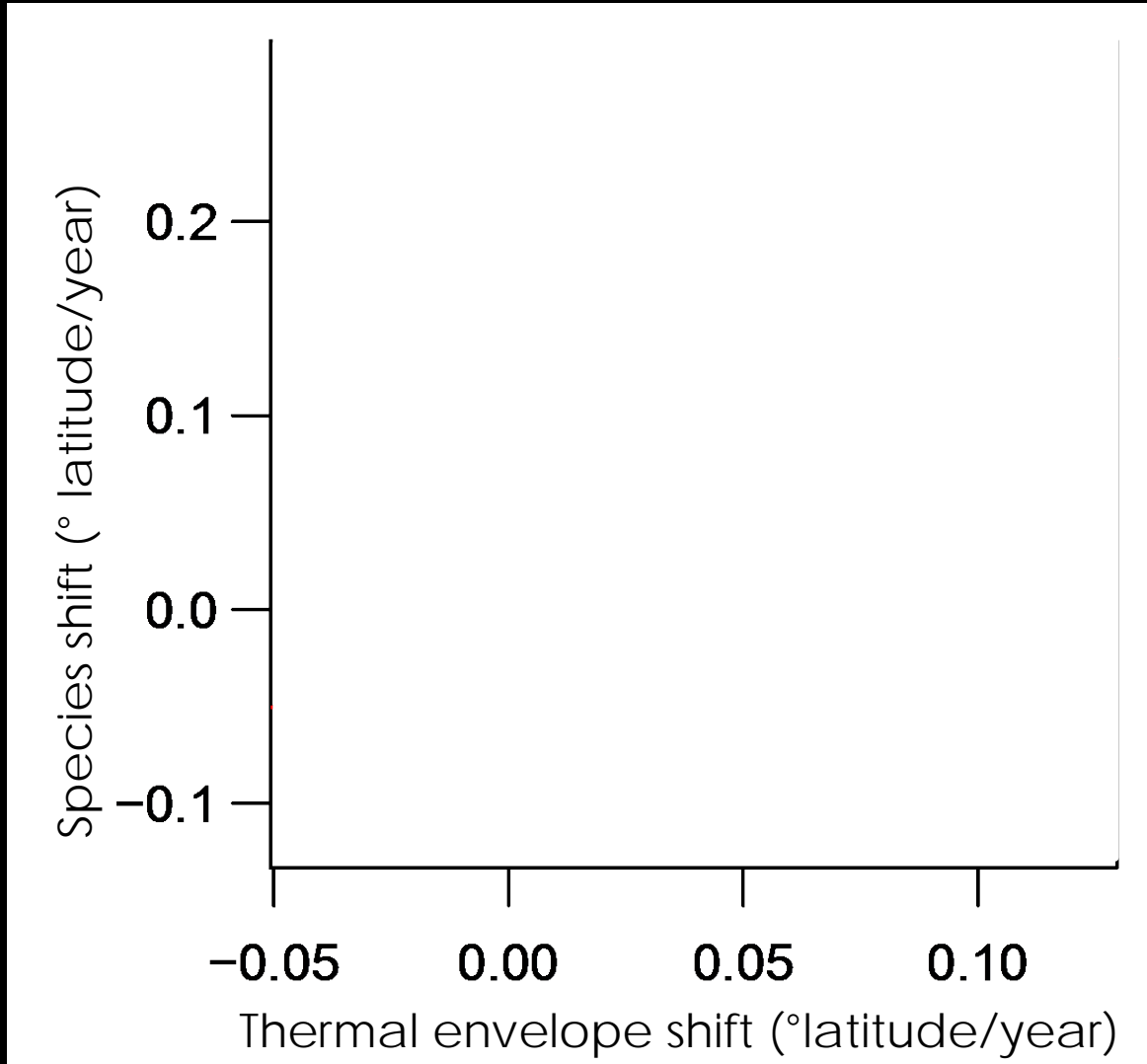
Climate velocity



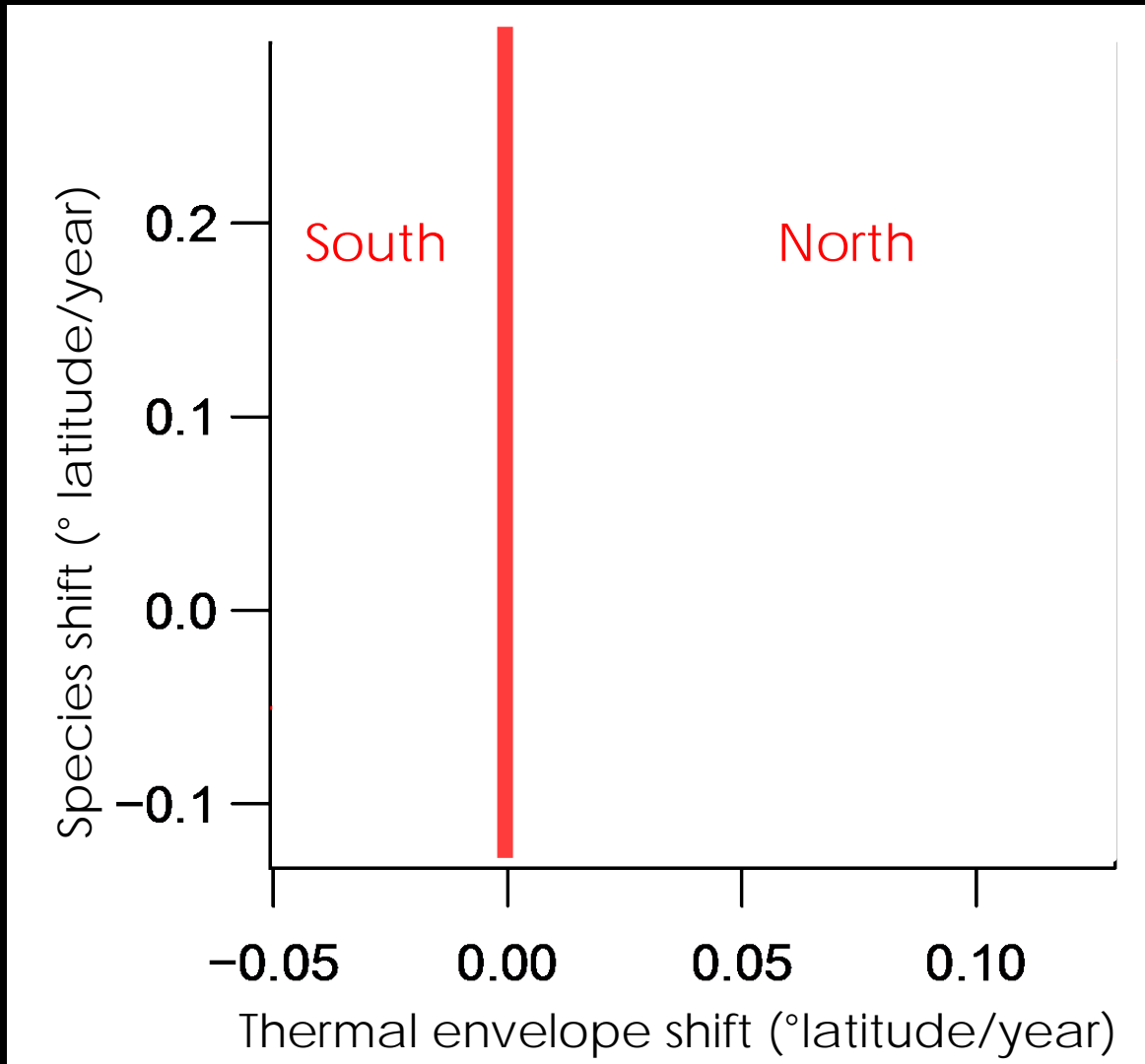
Climate velocity



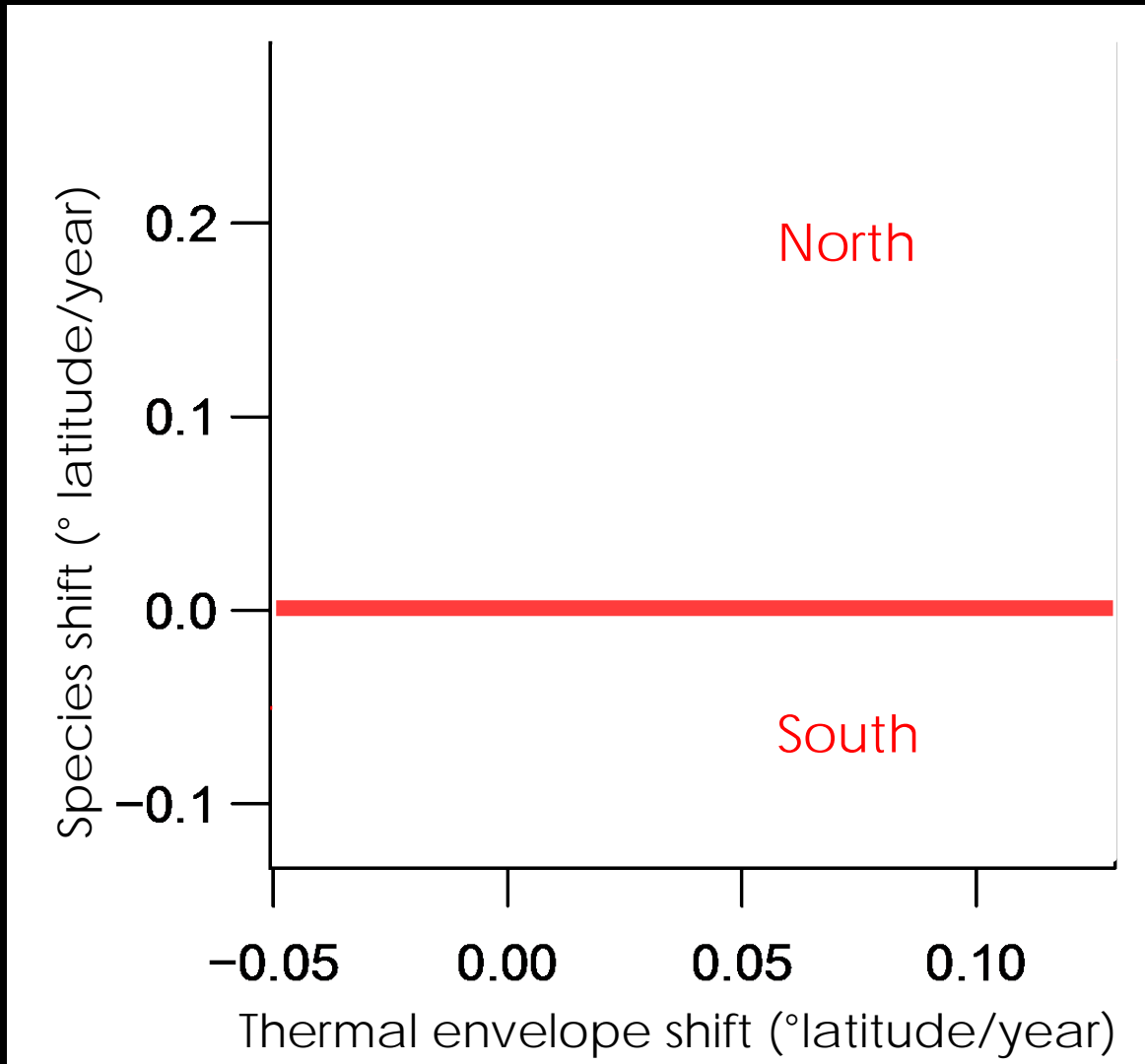
Across 325 taxa...



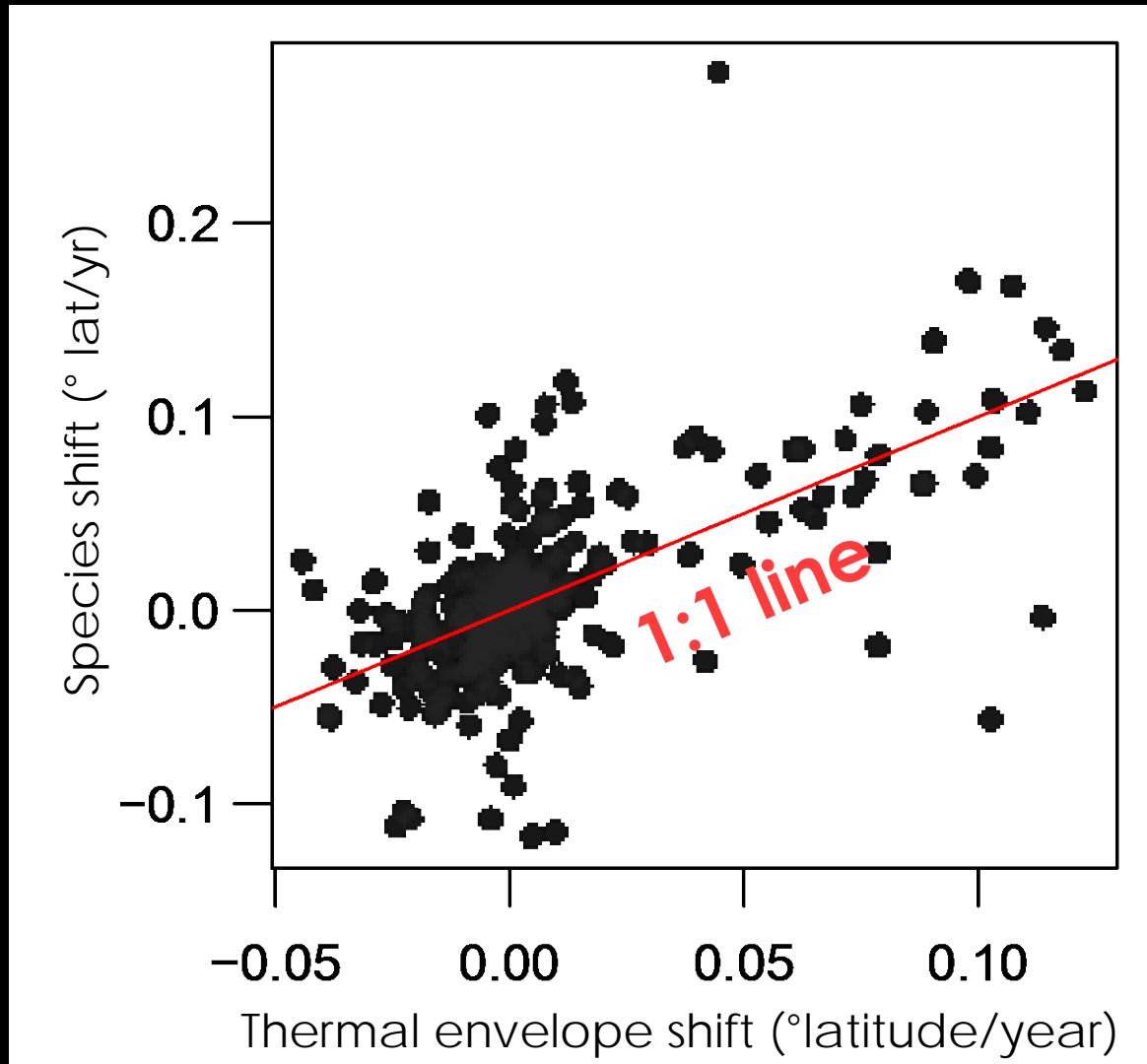
Across 325 taxa...



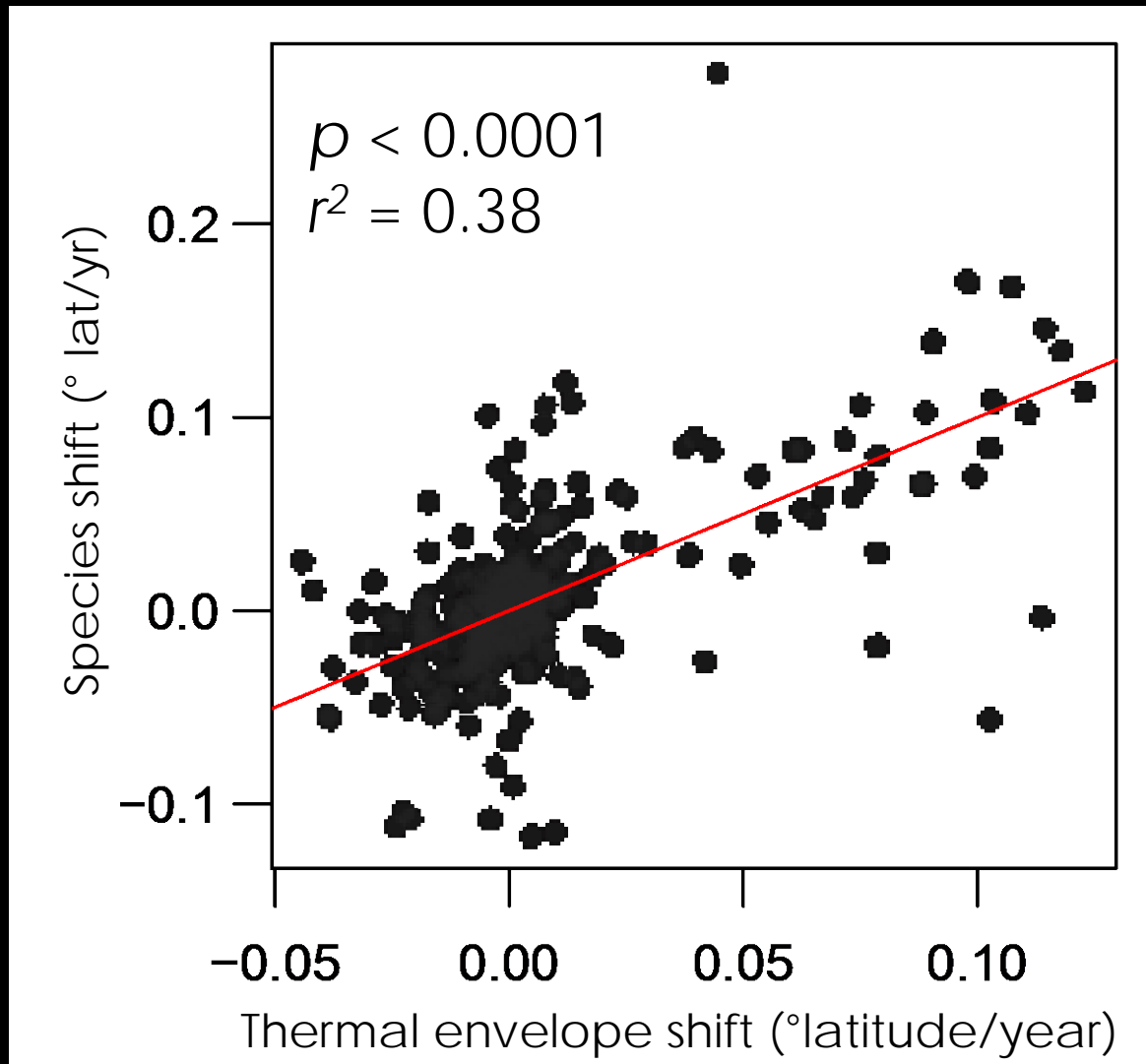
Across 325 taxa...



Species follow climate velocity



Species follow climate velocity



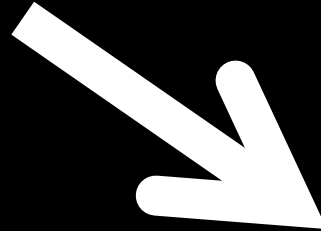
How do people adapt?



How do people adapt?



Does adaptation feed back?



Interdisciplinary Teams

Coastal SEES



Kevin St. Martin
Geography



Bonnie McCay
Anthropology



Eli Fenichel
Economics



Simon Levin
Ecology & Evolution



Mike Fogarty
Fisheries

Interdisciplinary Teams

Coastal SEES



Summer flounder



Kevin St. Martin
Geography



Bonnie McCay
Anthropology



Eli Fenichel
Economics



Chris Kennedy
Economics



Janet Nye
Ecology



Hyemi Kim
Climate



Simon Levin
Ecology & Evolution



Mike Fogarty
Fisheries



Ken Able
Ichthyology



Olaf Jensen
Fisheries



Joel Fodrie
Ecology

Questions

- Are fisheries moving?

Questions

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- How is fishing behavior changing?

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- Are fisheries moving?
- How is fishing behavior changing?
- Which behaviors matter for feedbacks to ecological dynamics?

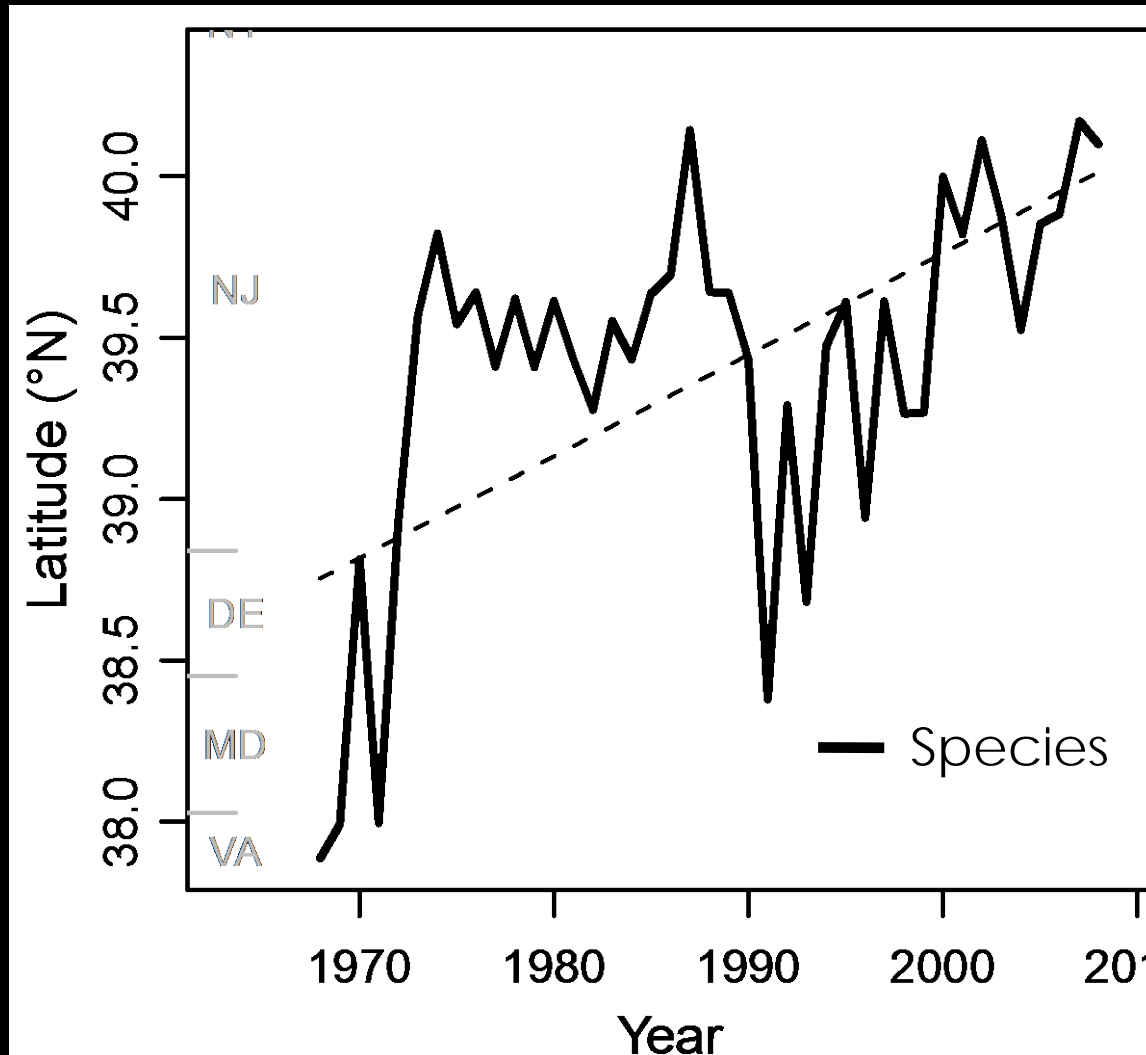
Questions

- Are fisheries moving?
- How is fishing behavior changing?
- Which behaviors matter for feedbacks to ecological dynamics?
- What counts as “sustainable” adaptation?

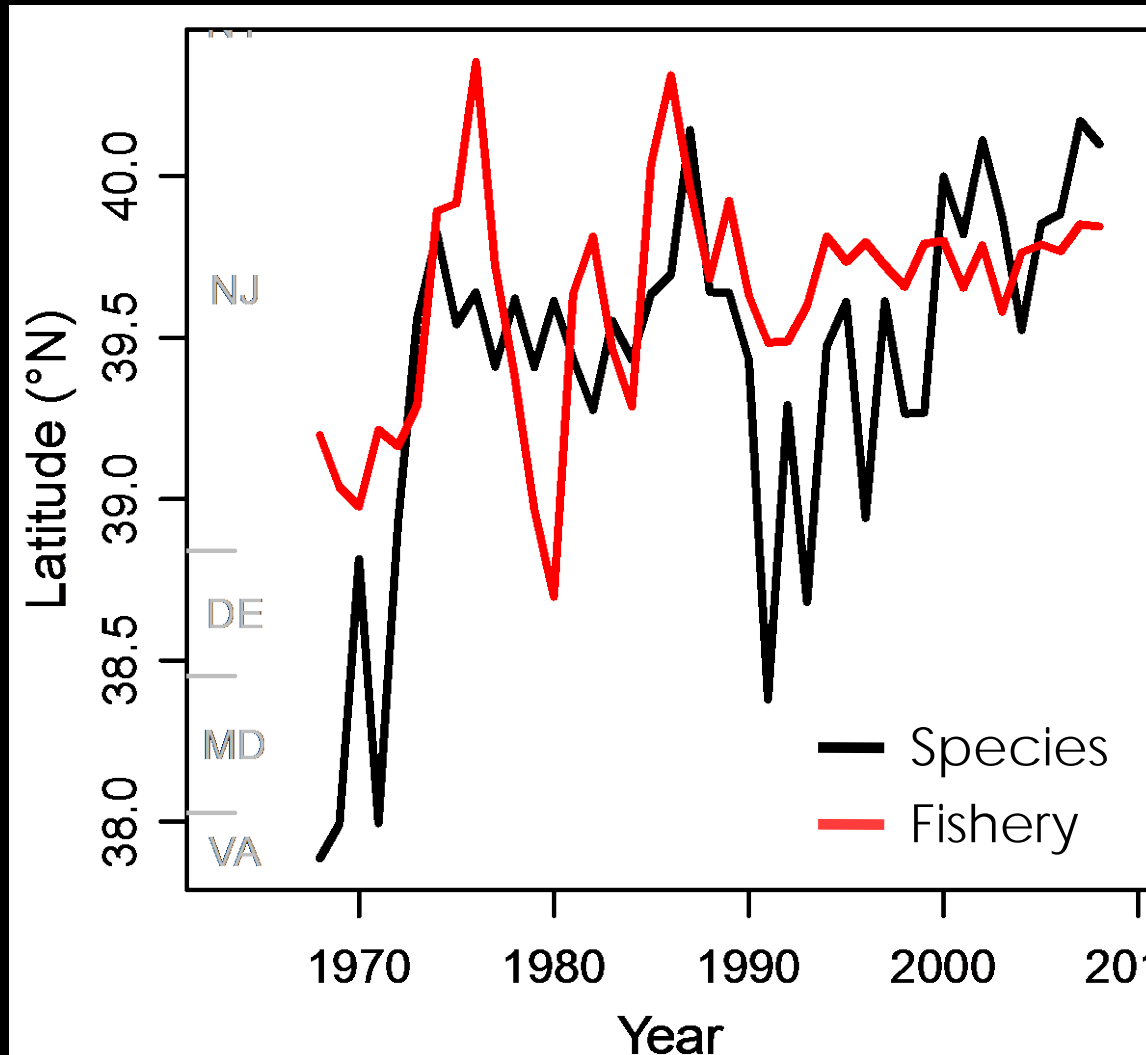
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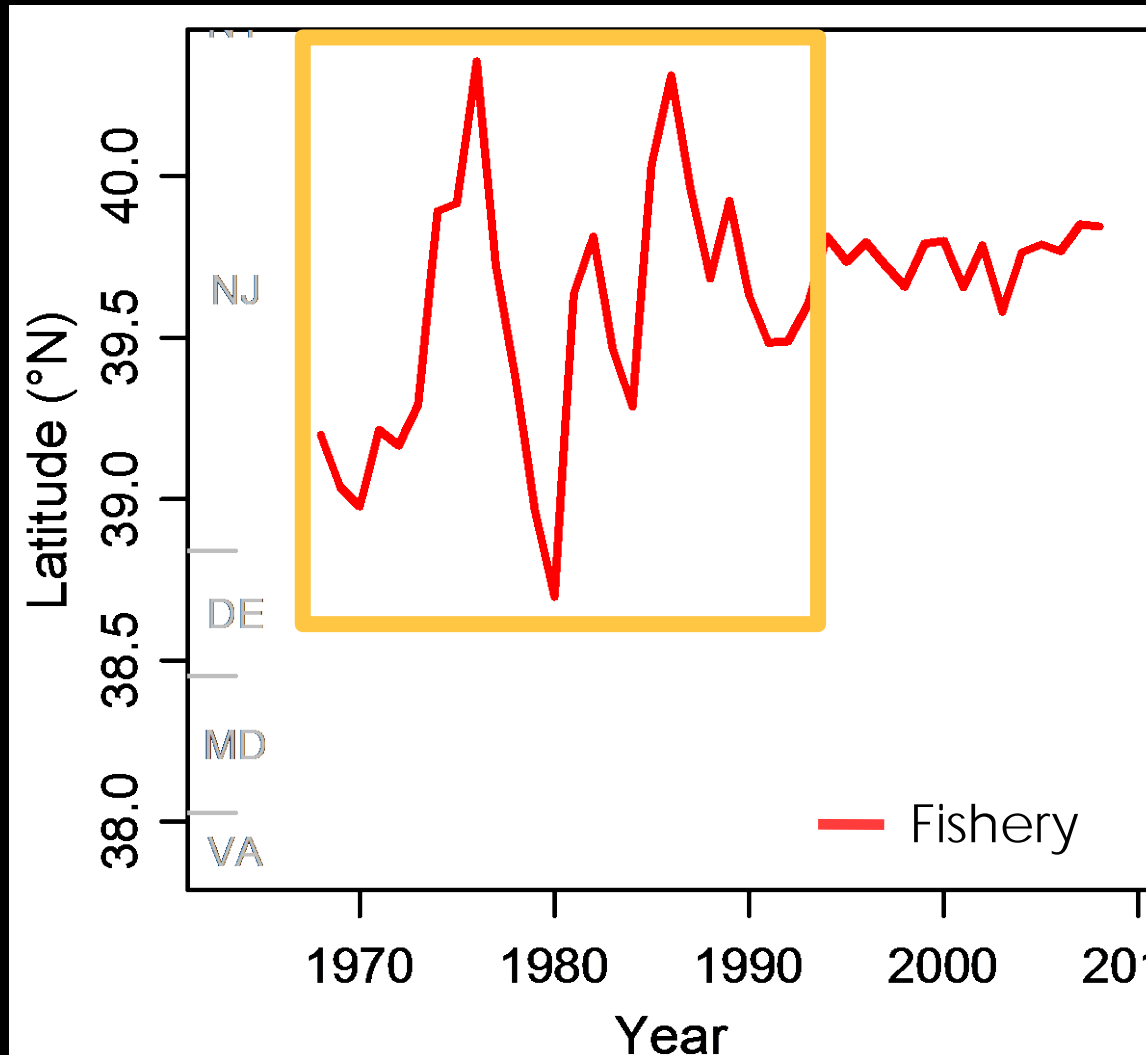
Poleward shift of summer flounder



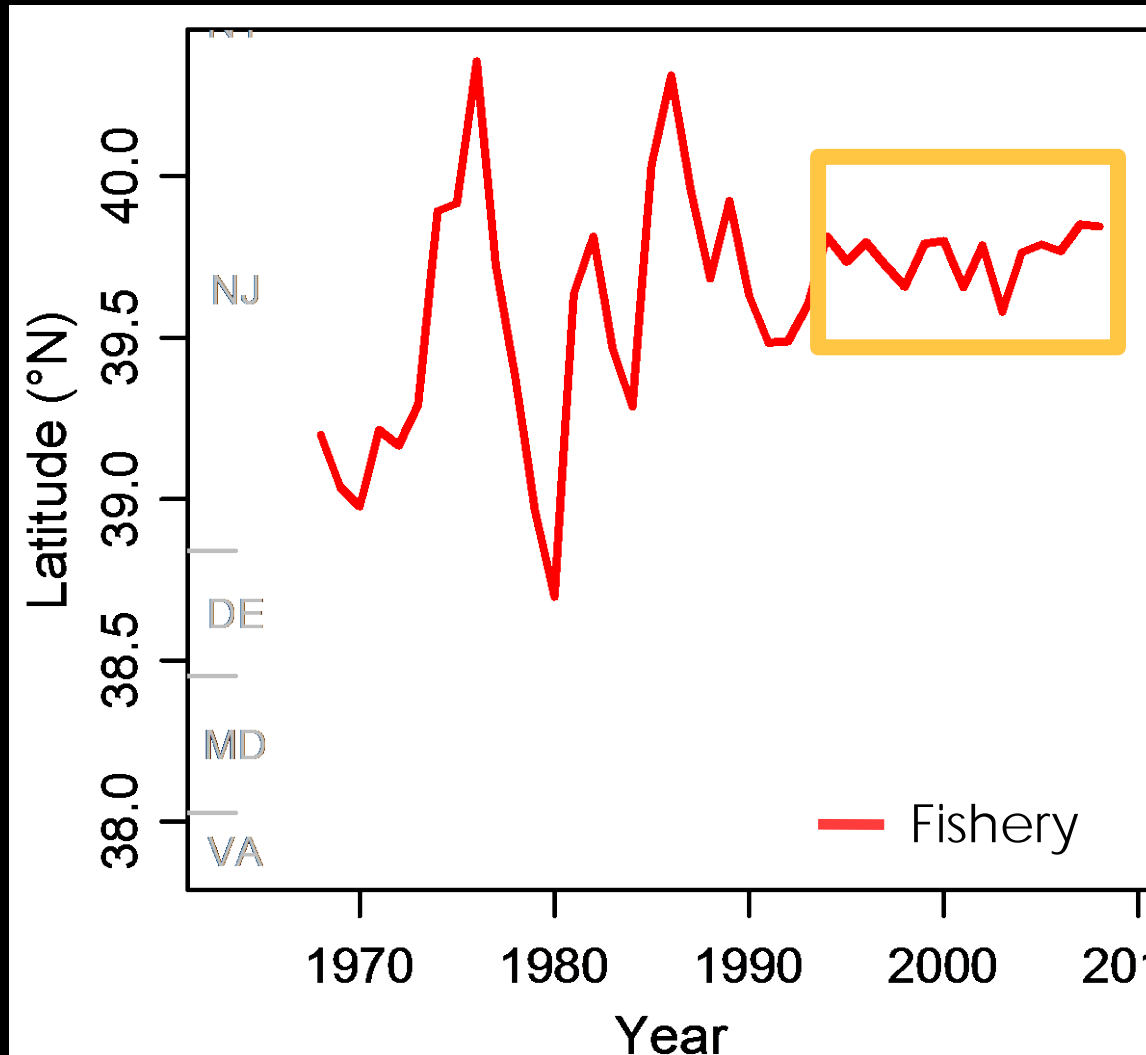
Fishery landings shift as well



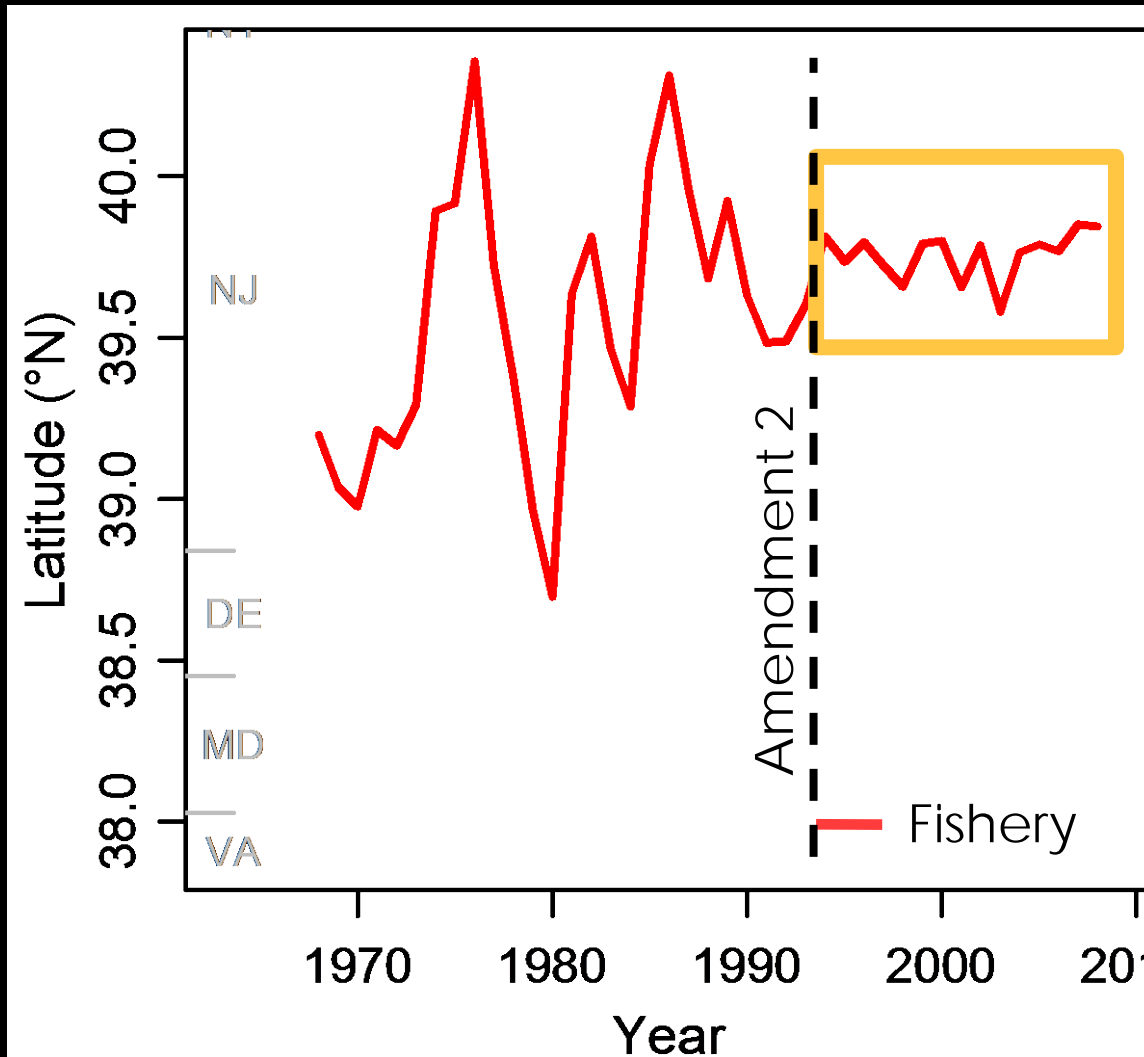
Early: high variability in fishery



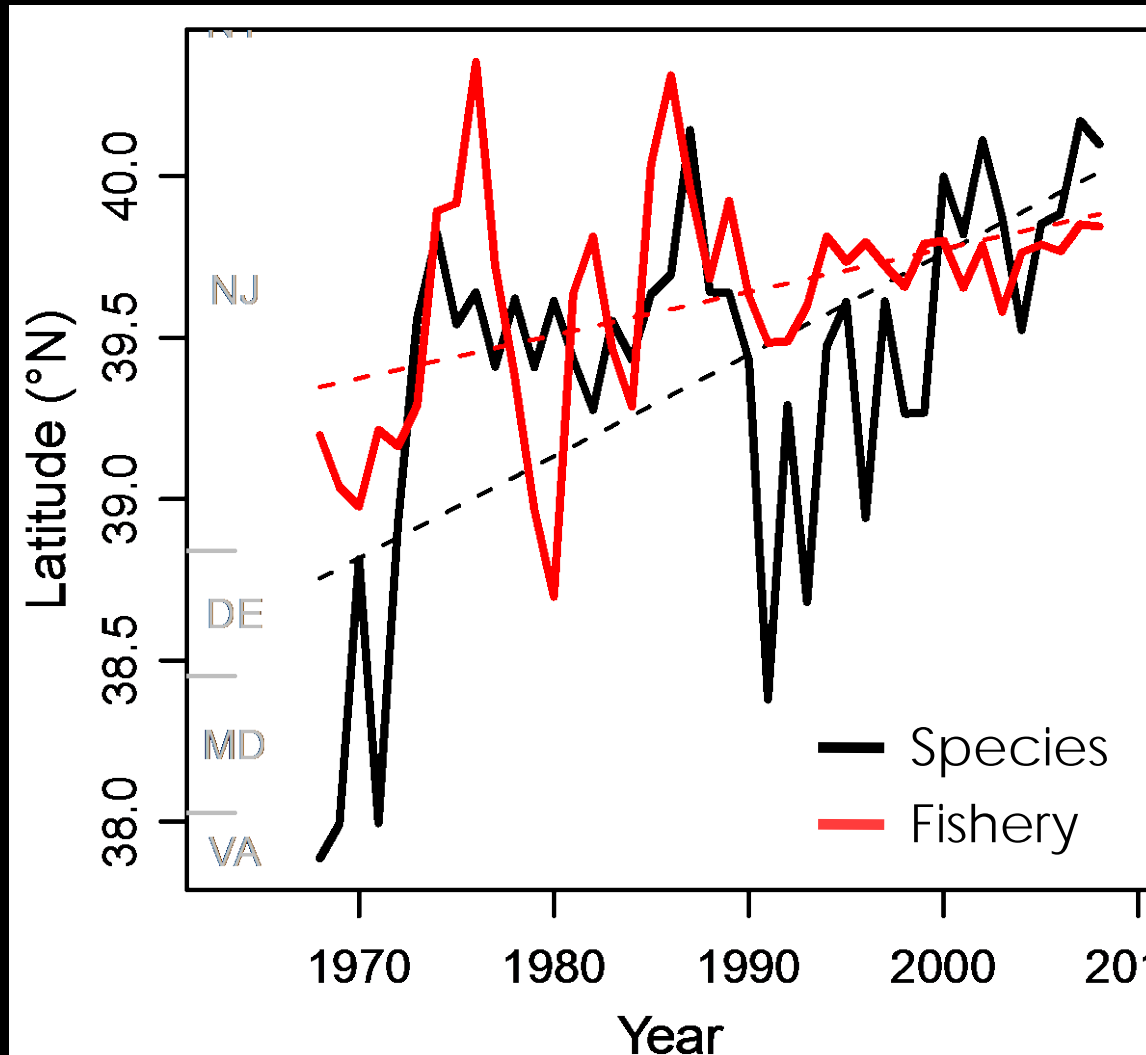
Late: low variability in fishery



State quotas implemented



Fishery landings shift more slowly



68%
slower



Fisheries lag behind fish

Red hake	75% slower
Summer flounder	68% slower
American lobster	87% slower
Yellowtail flounder	85% slower

Summary

- Fisheries often lag behind the fish
- How is fishing behavior changing?
- Which behaviors matter for feedbacks to ecological dynamics?
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Emma Fuller
Princeton



Talia Young
Rutgers



Kaycee Coleman
Rutgers

Trip reports for the Northeast US

- Fishing trips 1996-2013
- Amount of each species caught
- Gear used
- Location fished

FISHING VESSEL TRIP REPORT

Vessel Name: *Alanna Renee*
Date: *2-11-12*
Vessel No: *WH0578201*
Vessel Length: *150059*

Operator: *3*
Trip Date: *2-11-12*
Trip Time: *13 15*

Species: *615*
Quantity: *513*

Chart Area: *42*
Gear Type or Meshing Size: *300*

Fishing Depth: *60*
Number of Hours: *3*

Health Name: *H.E.F.*
Date: *2-11-12*



Fishing communities

Port + gear



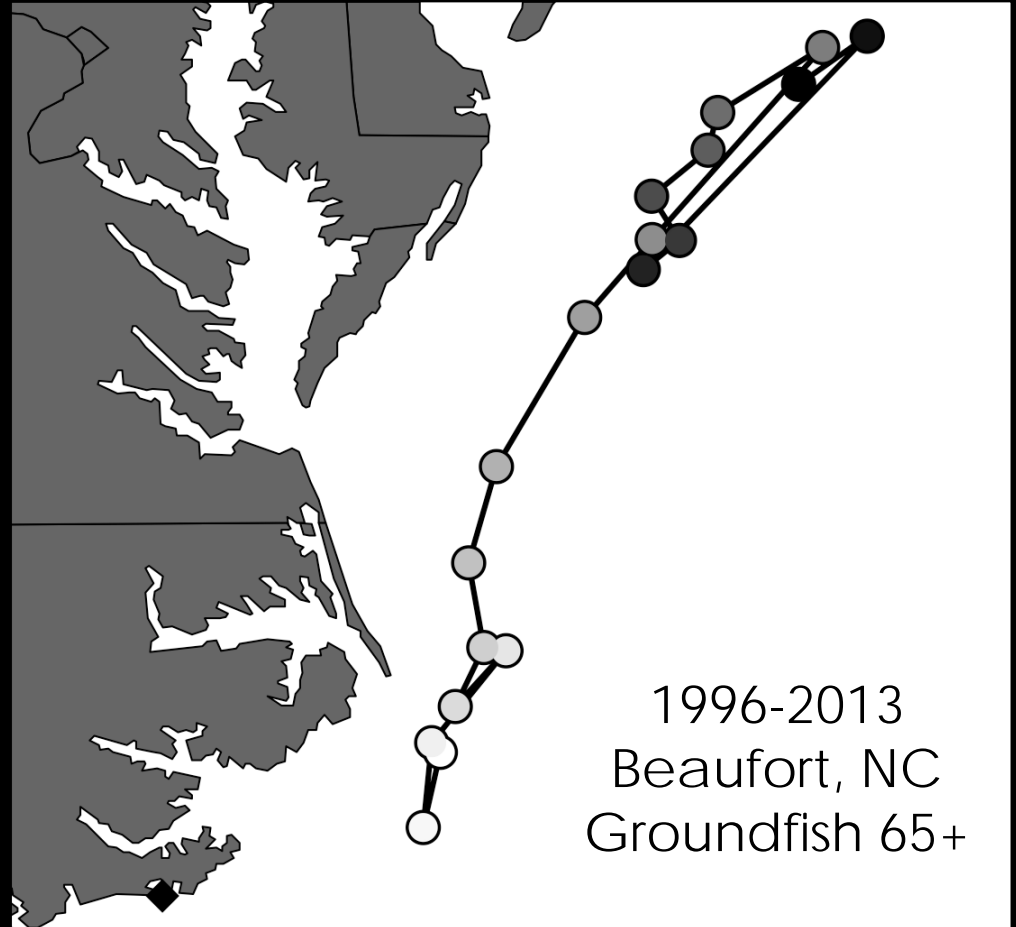
Cutler, ME
Traps & pots



New Bedford, MA
Dredge

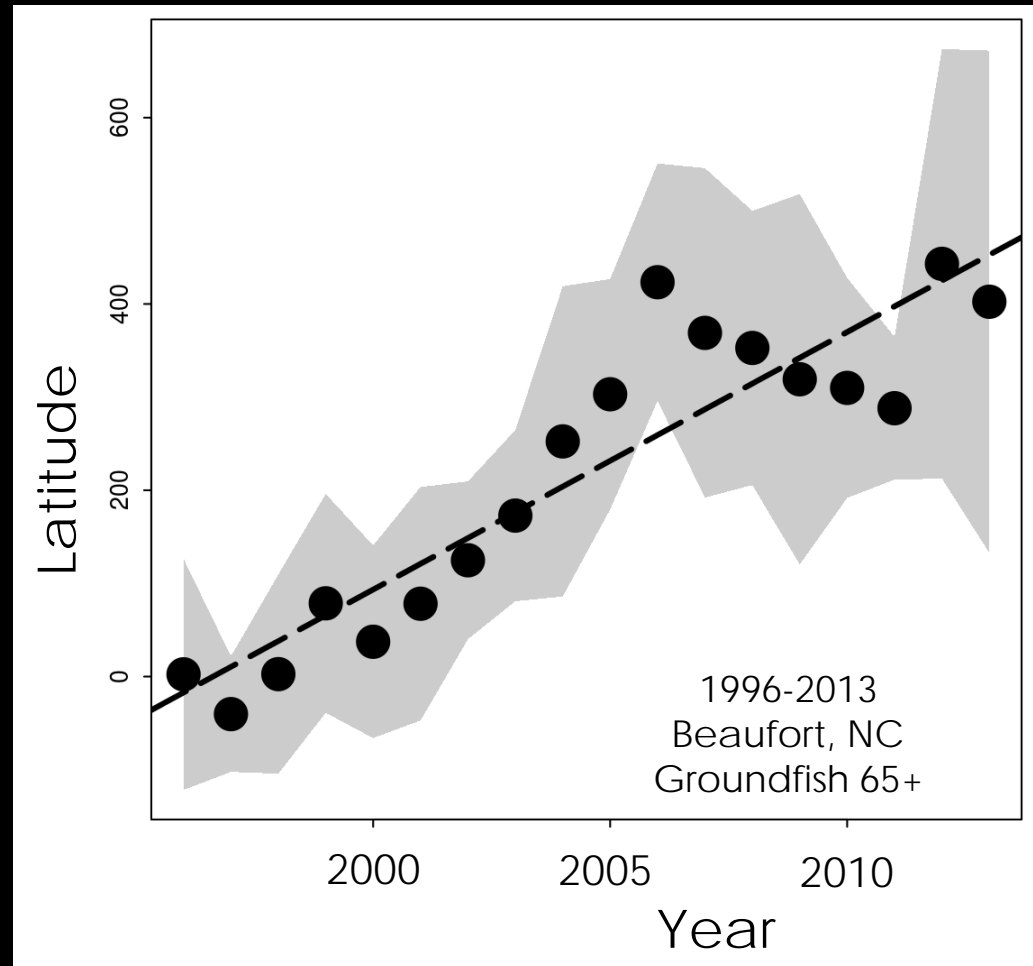
How are communities changing?

- In space



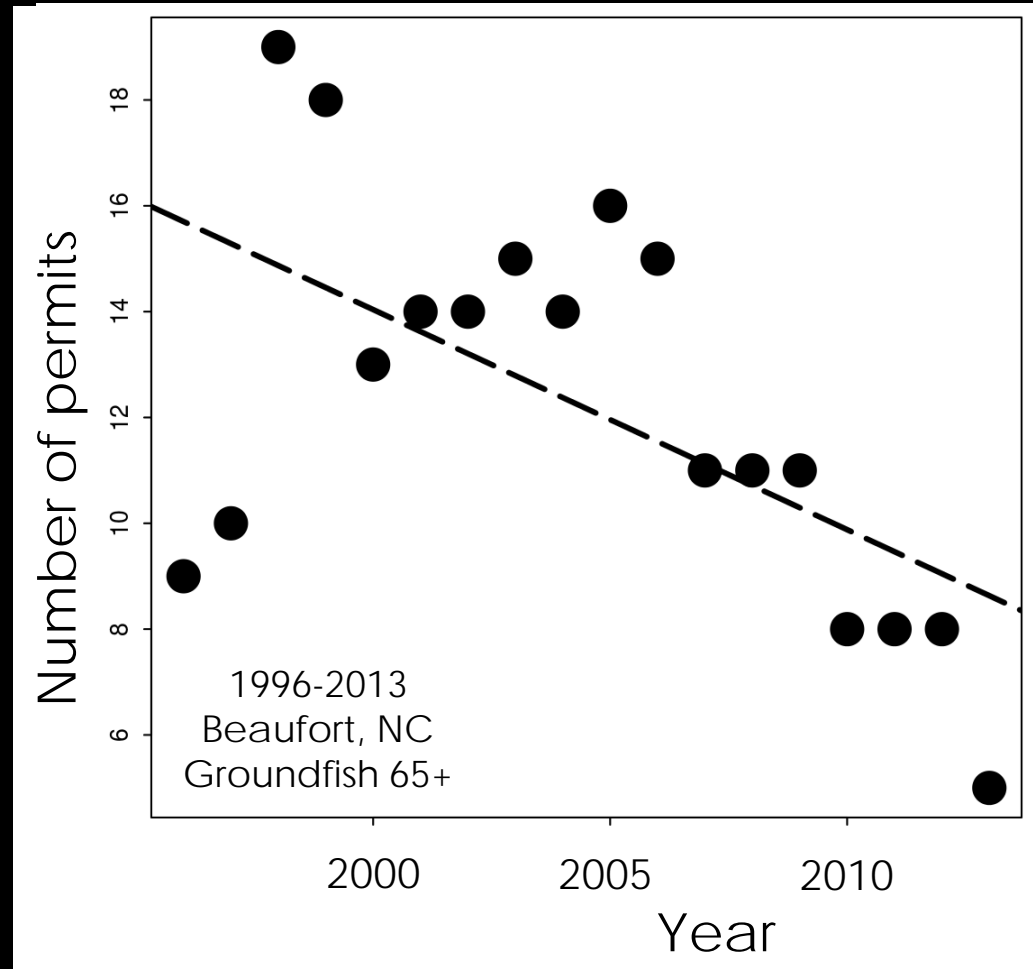
How are communities changing?

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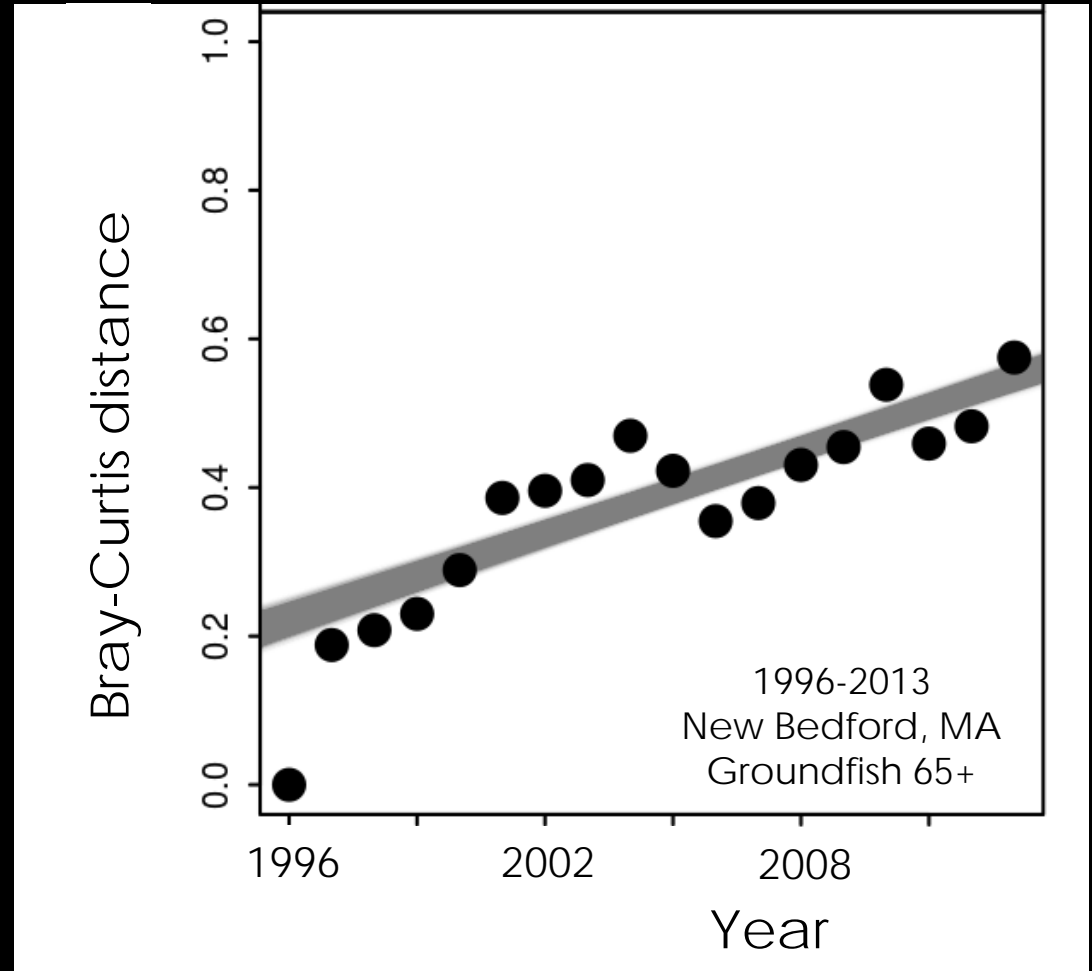
How are communities changing?

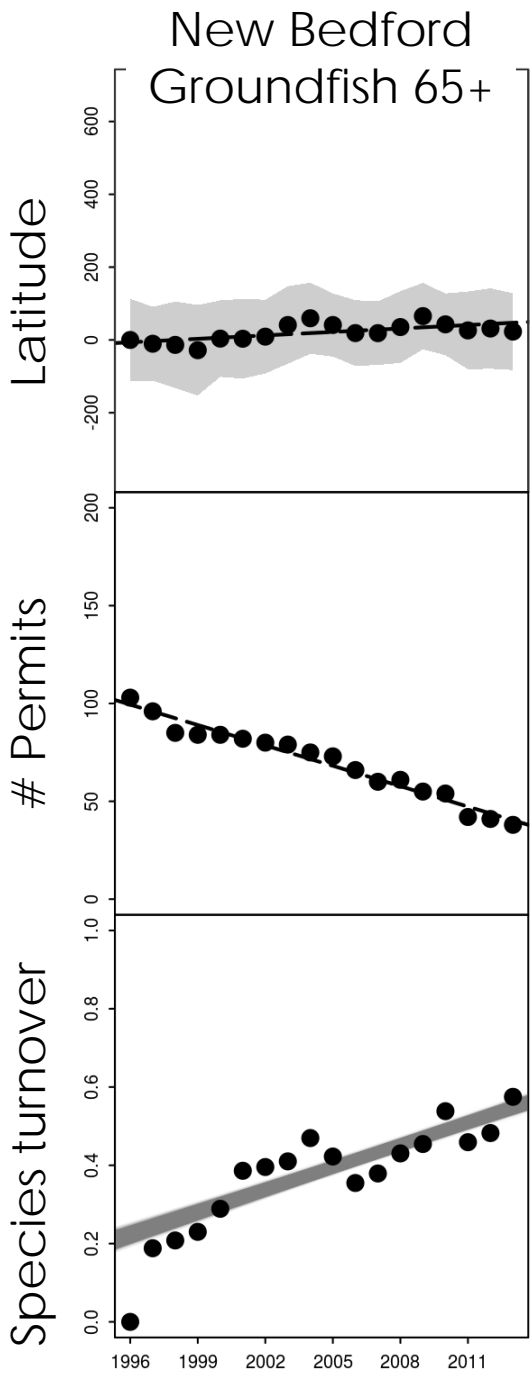
- In space
- In effort

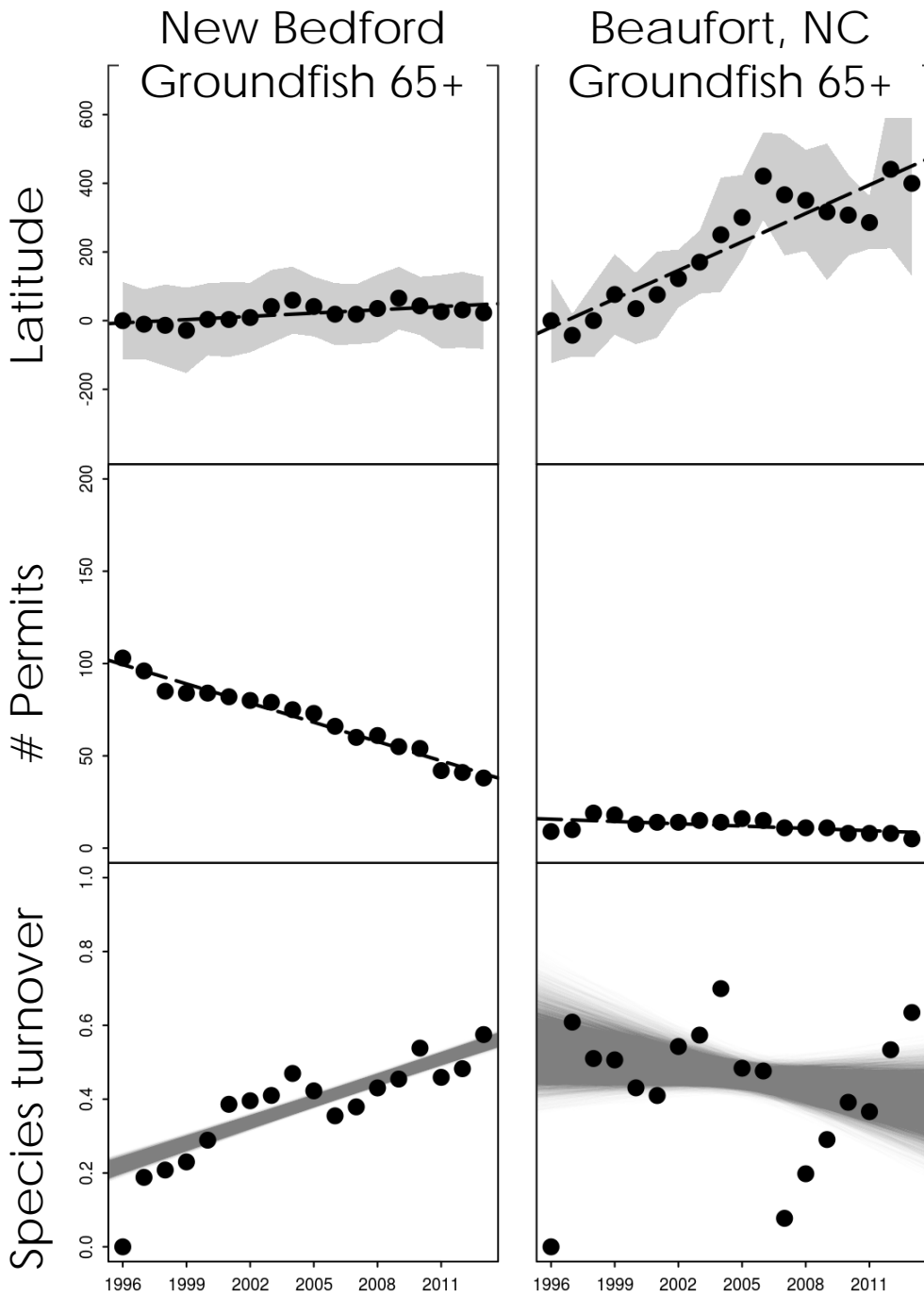


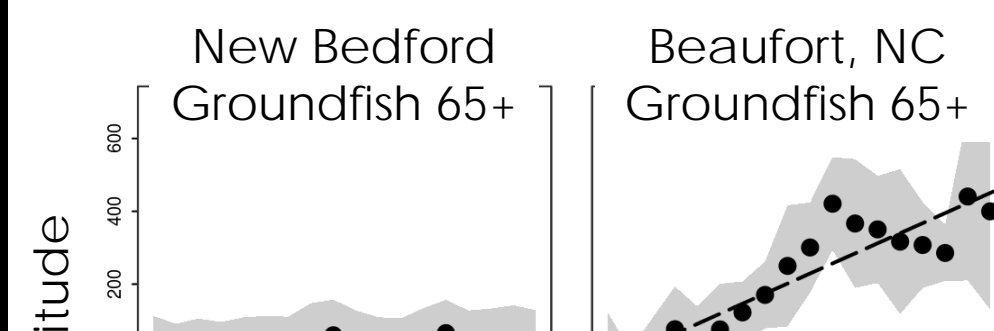
How are communities changing?

- In space
- In effort
- In species



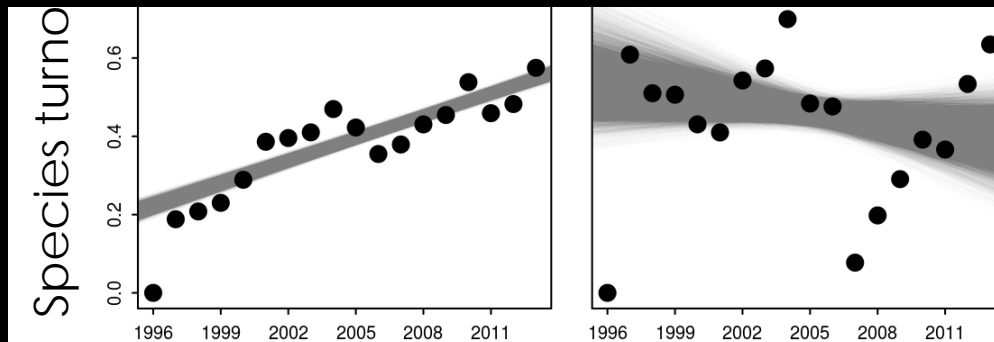






What are the drivers?

- Regulations?
- Economics?
- Climate?



Fishing community interviews



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- Which behaviors matter for feedbacks to ecological dynamics?
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Harvest and climate velocity



time t



Space

Harvest and climate velocity



time t



Space

Harvest and climate velocity



time t

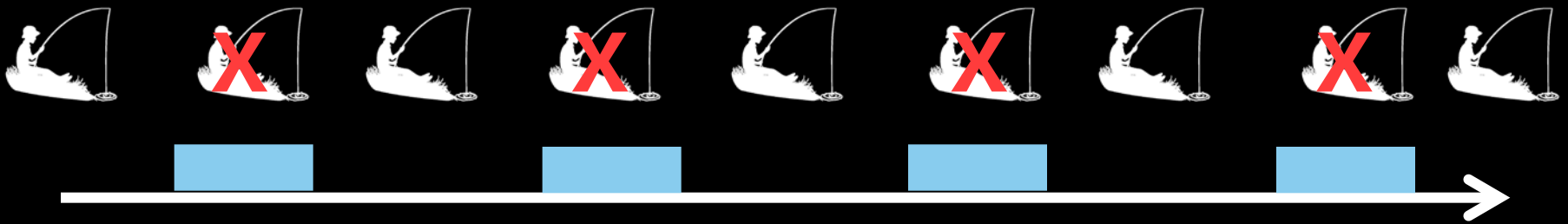


Space

Solution: protected areas?



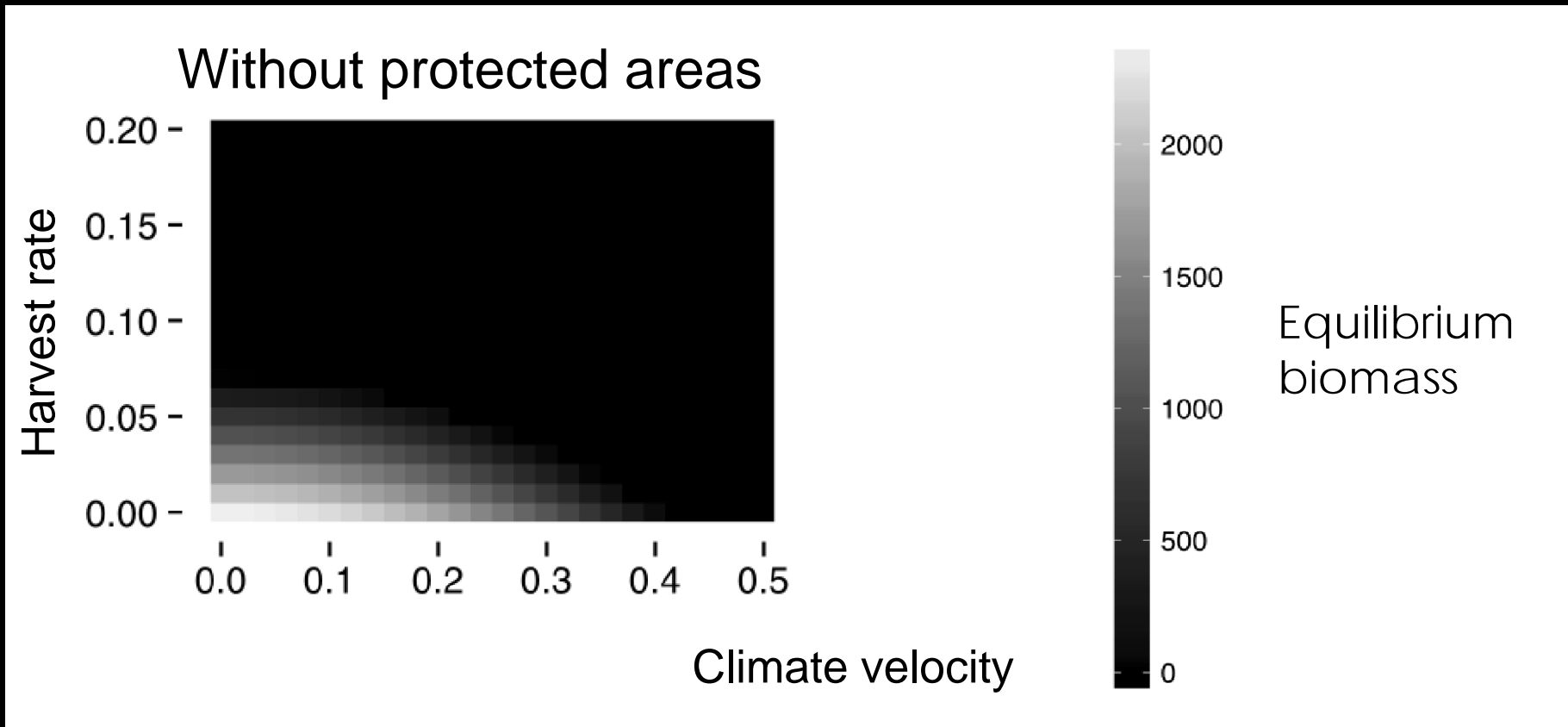
Solution: protected areas?



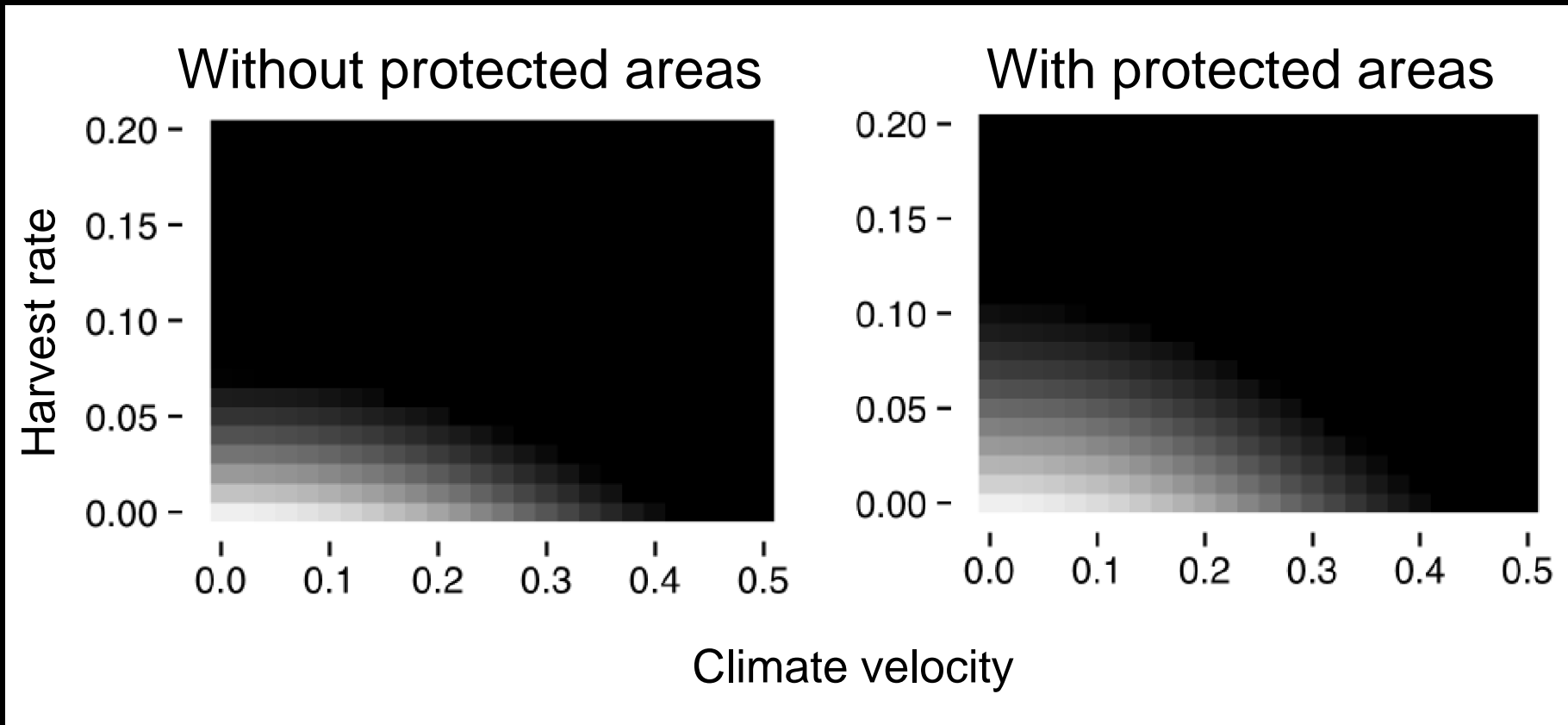
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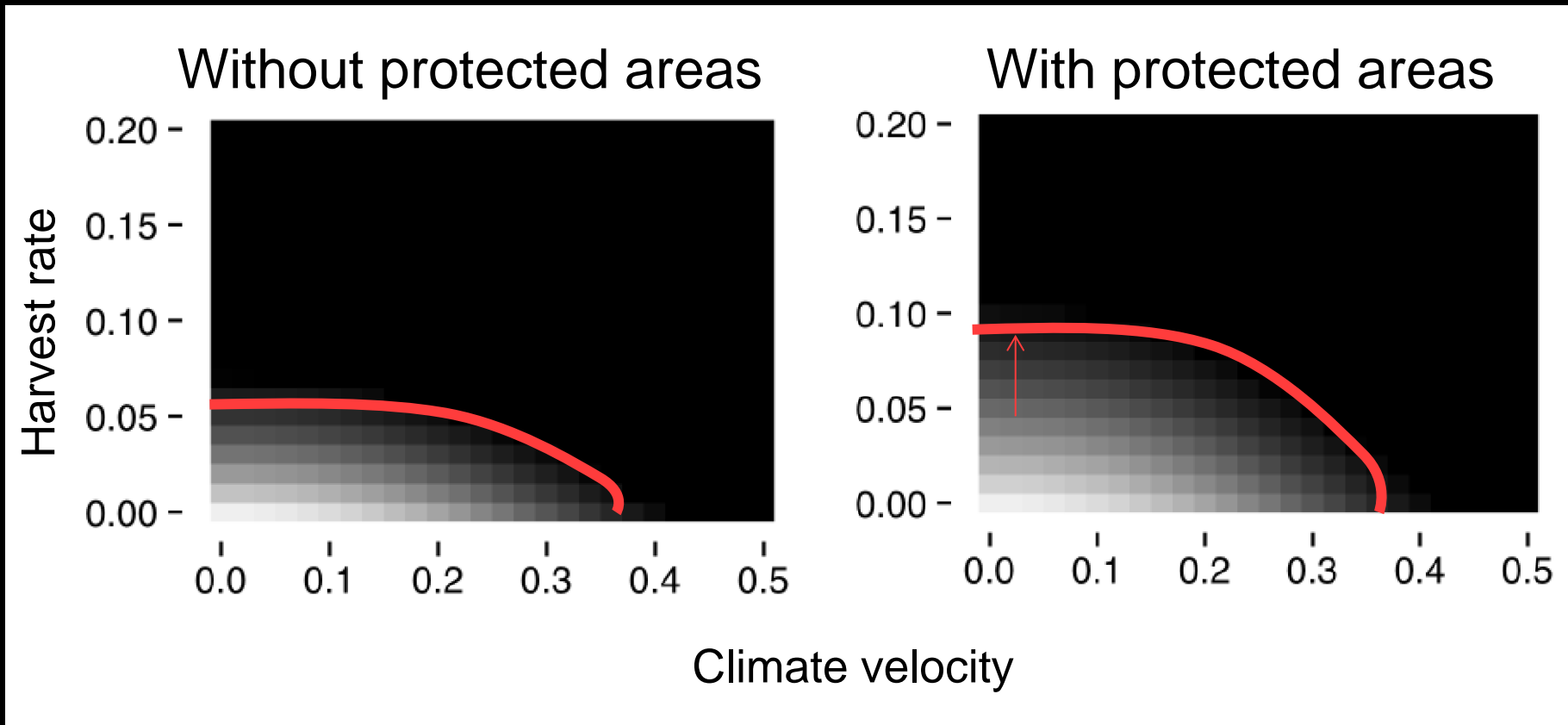
PAAs reduce harvest impacts



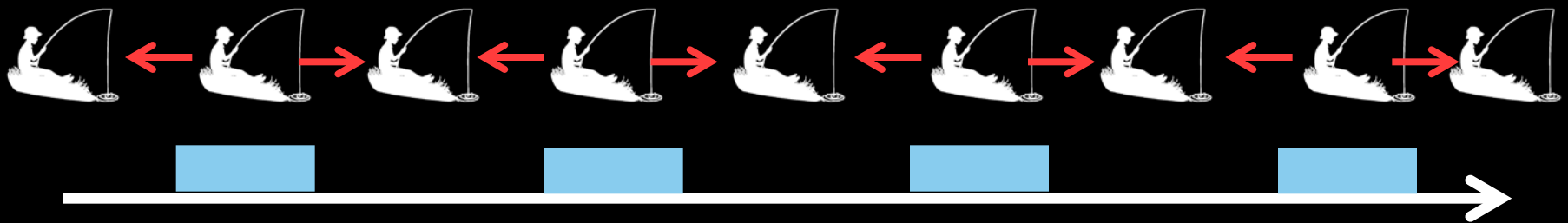
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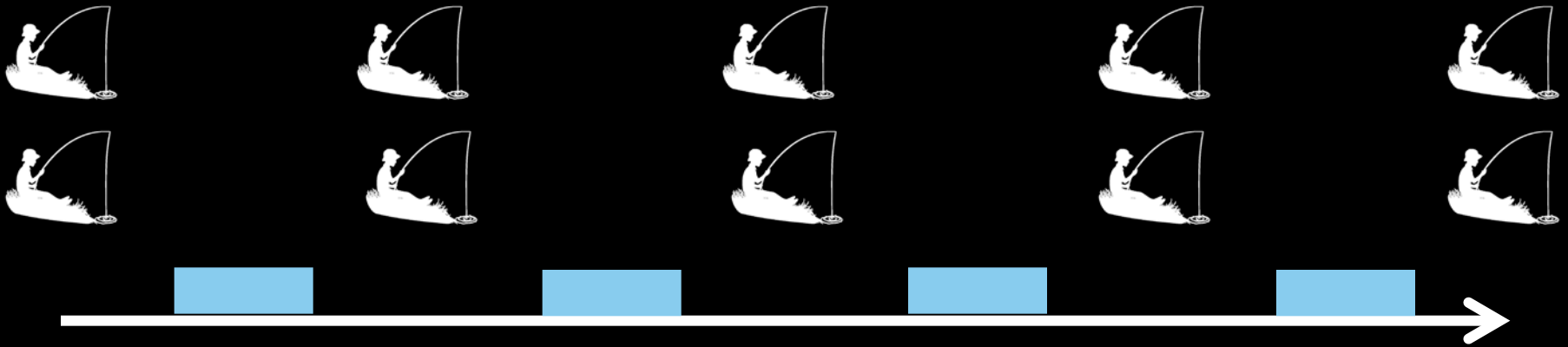
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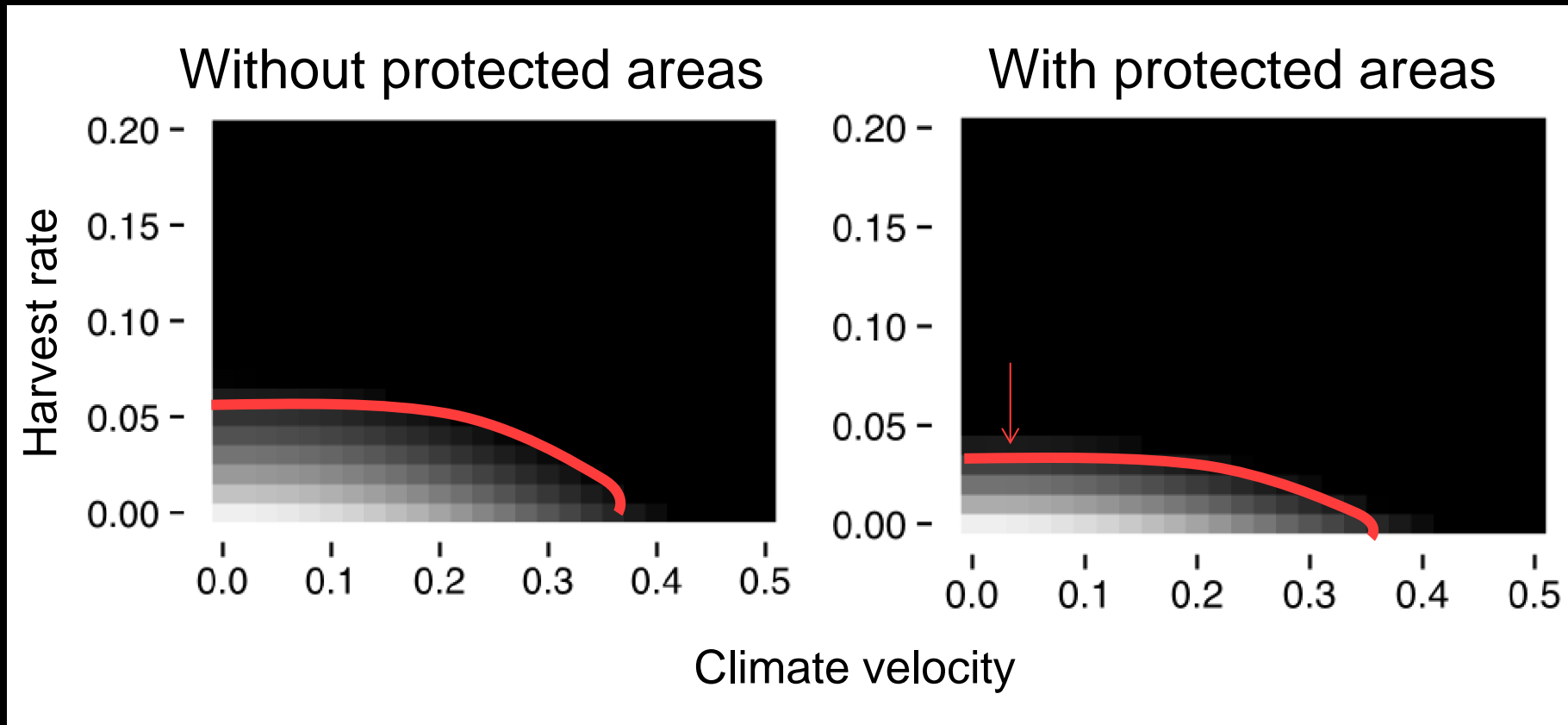
Harvest displaced by PAs?



Harvest displaced by PAs?



Higher impacts with displaced effort



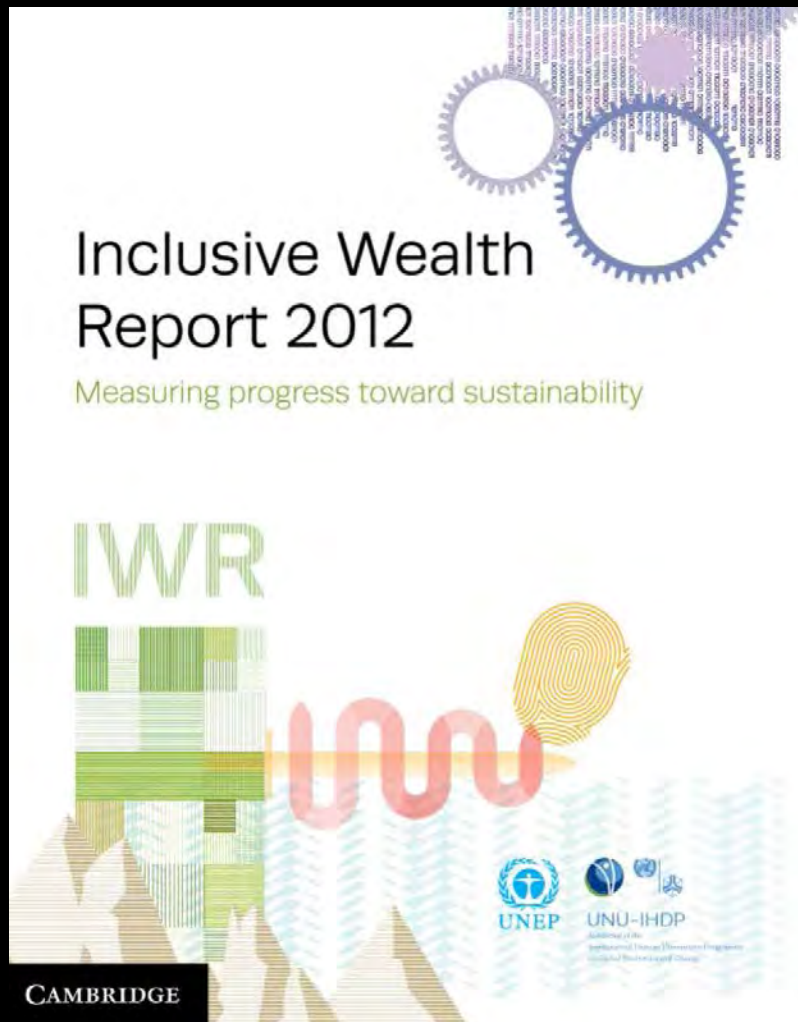
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- Fisher response may determine utility of MPAs for climate adaptation
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Inclusive wealth



Partha Dasgupta
Kenneth Arrow
Kirsten Oleson
Edward Barbier
Steve Polasky
Kevin Mumford

...

Inclusive wealth

Natural capital

Built capital

Human capital



+



+



Sustainability = non-declining

Natural capital

Built capital

Human capital



+



+



Acknowledgments

Julie Olson

Enrique Curchitser

Sean Lucey

NOAA trawl survey personnel

Emily Klein

James Watson

Pinsky Lab



Summary

- Fisheries often lag behind the fish
- Adaptation in space, in species, and in effort
- Fisher response may determine utility of MPAs for climate adaptation
- Inclusive wealth concept can help define what counts as “sustainable”