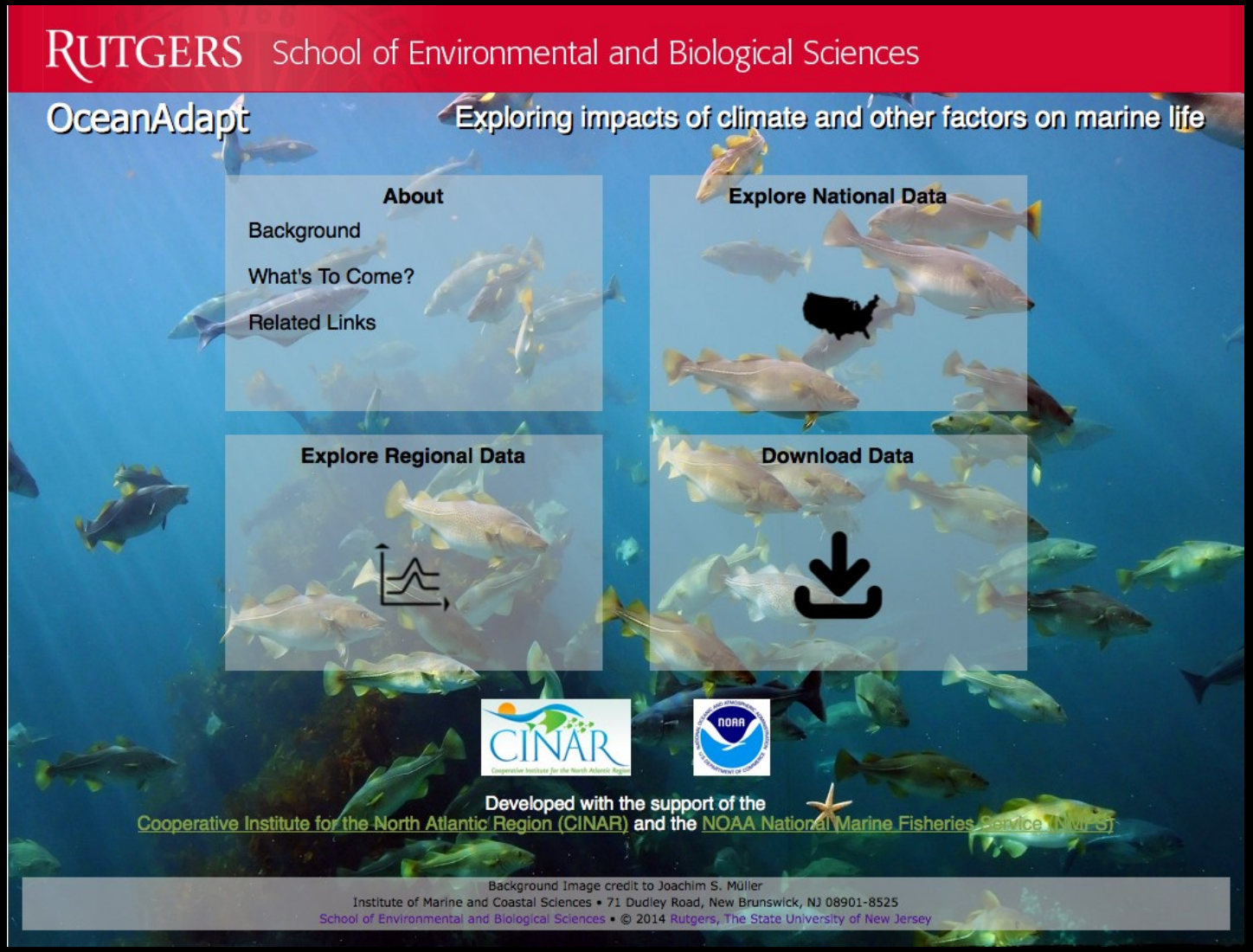
Where's my fish?

New tools to visualize climate and other impacts on marine animals

Malin Pinsky and Jon Hare

OceanAdapt: Data to aid climate adaptation



Outline

1. Climate impacts on marine fishes

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2. Implications for management

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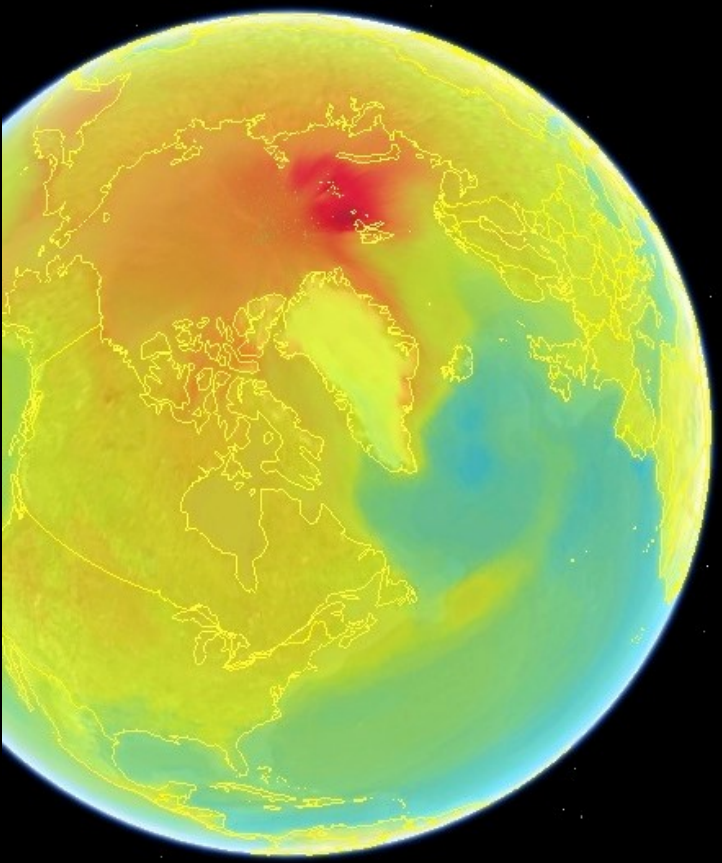
The challenge of climate change



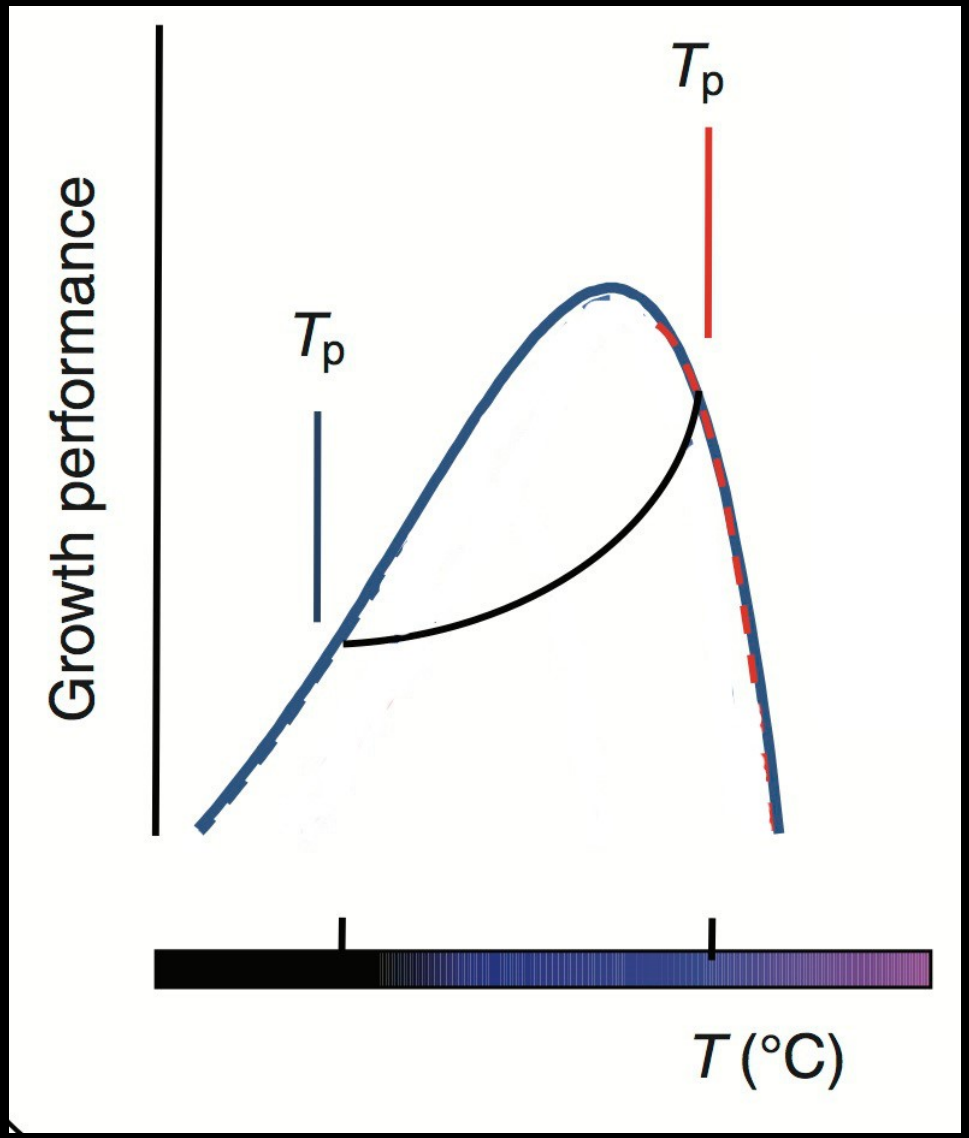
Colonize

Tolerate

Evolve

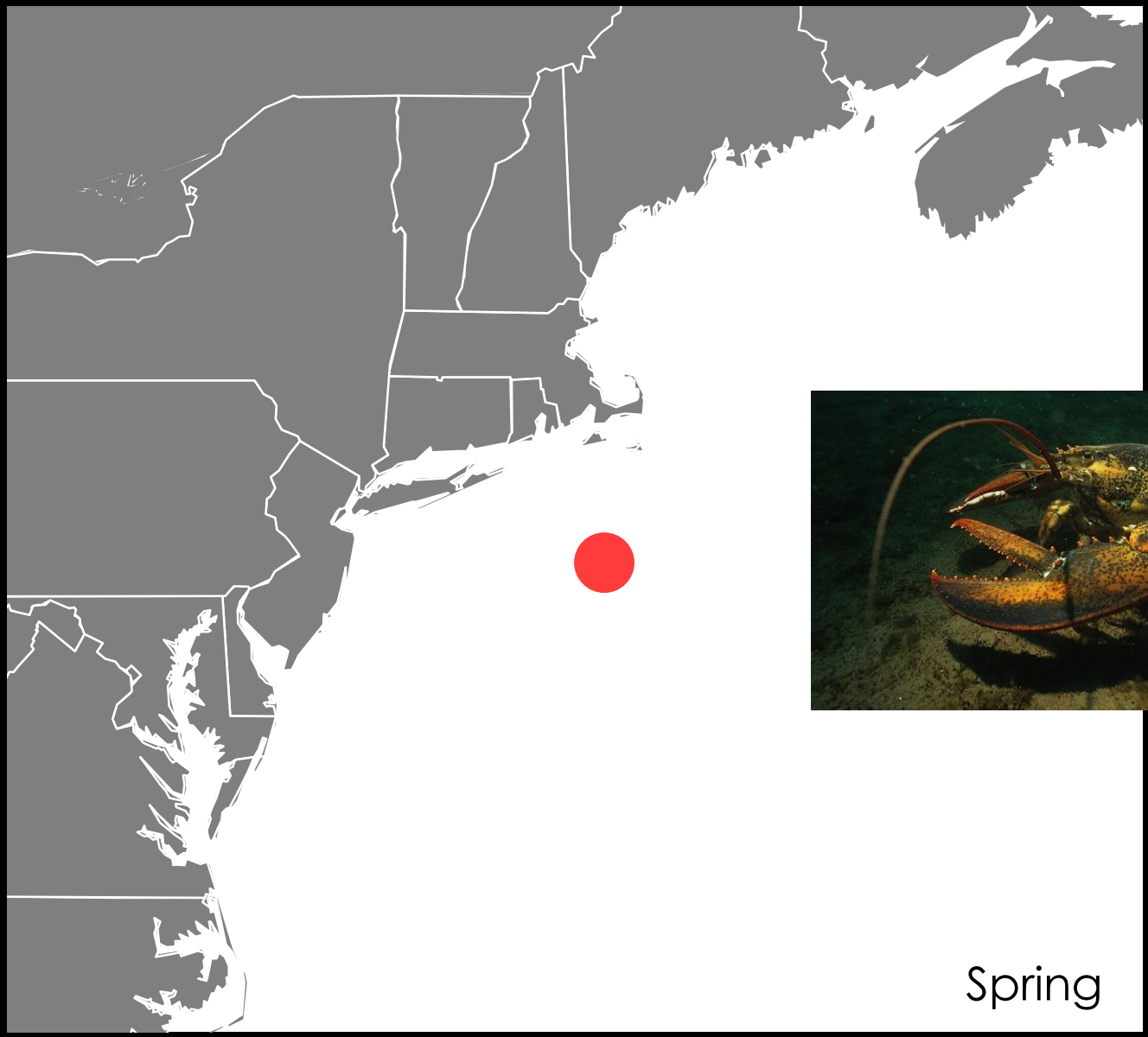
Extinct

Temperature affects physiology



Pörtner 2010
J Exp Biol

Distribution shifts 1968-2008



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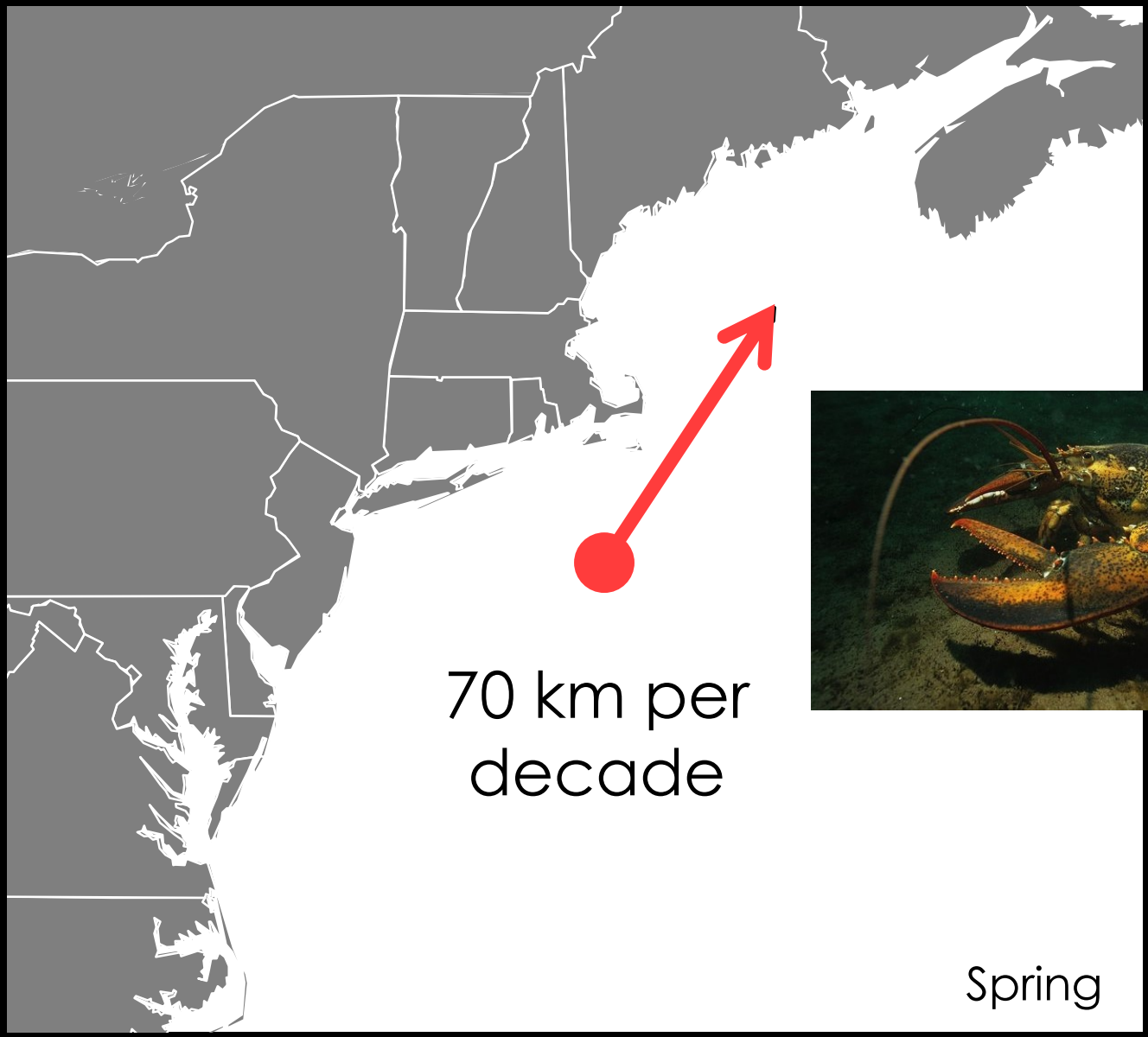

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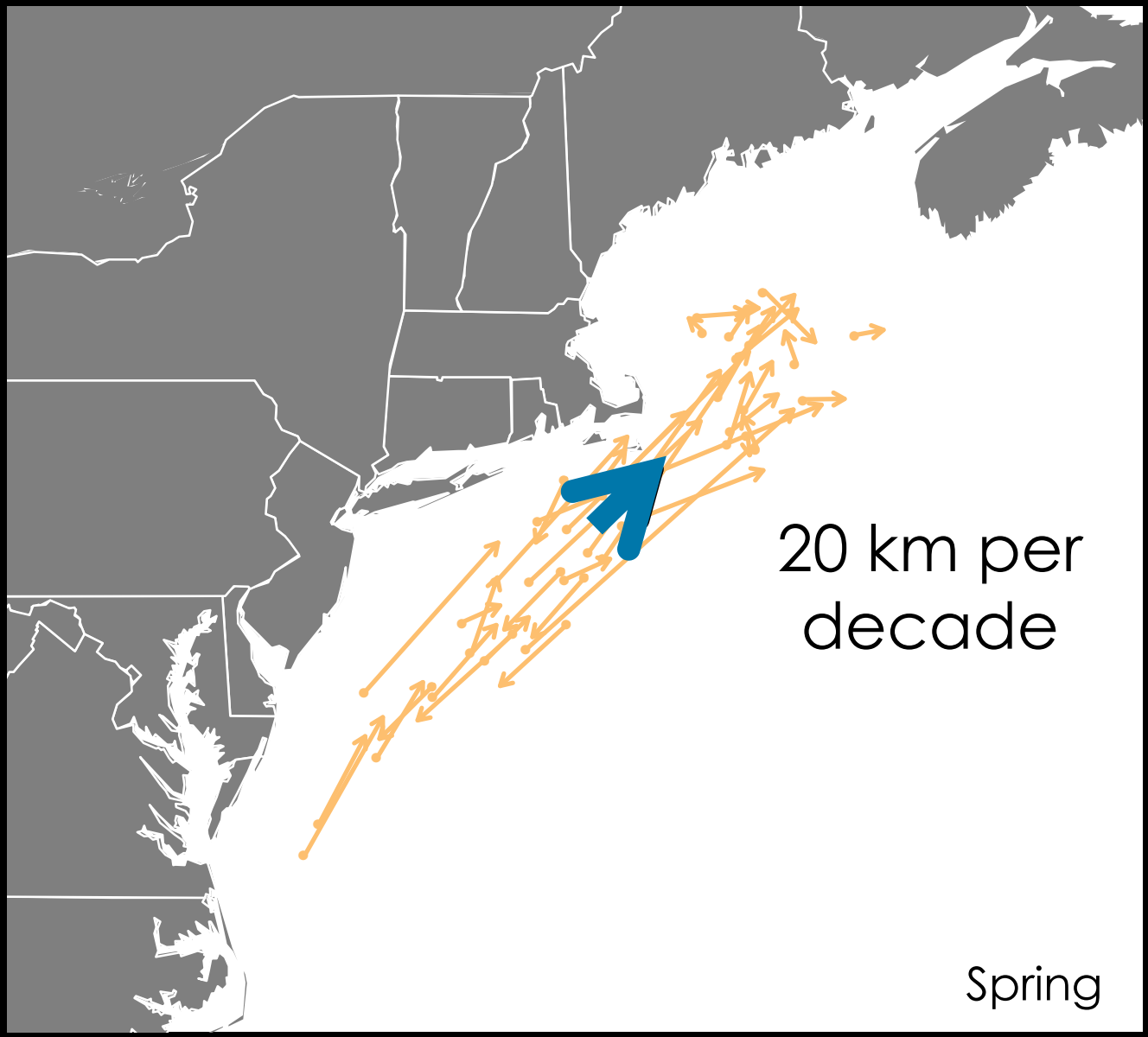
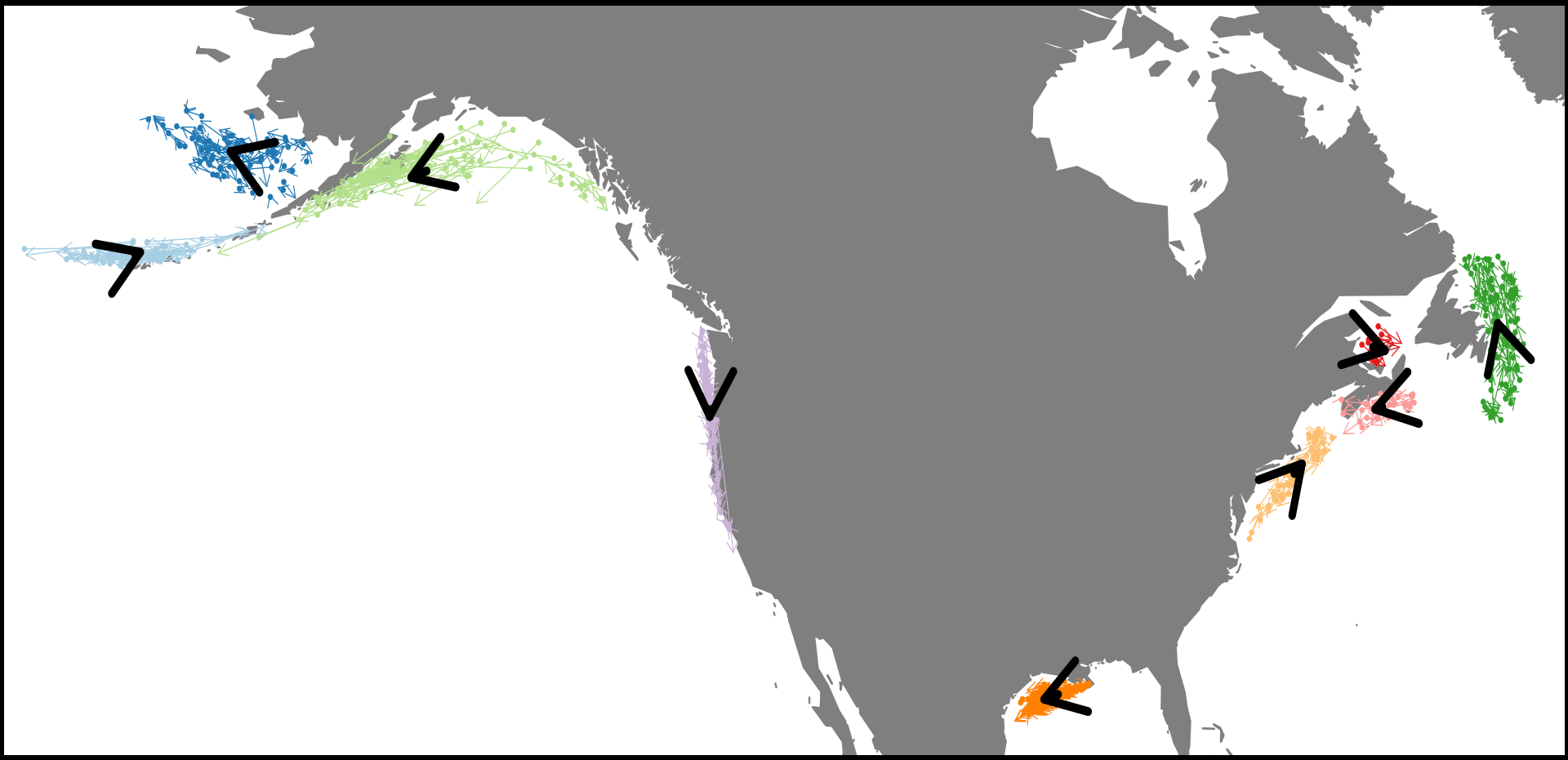
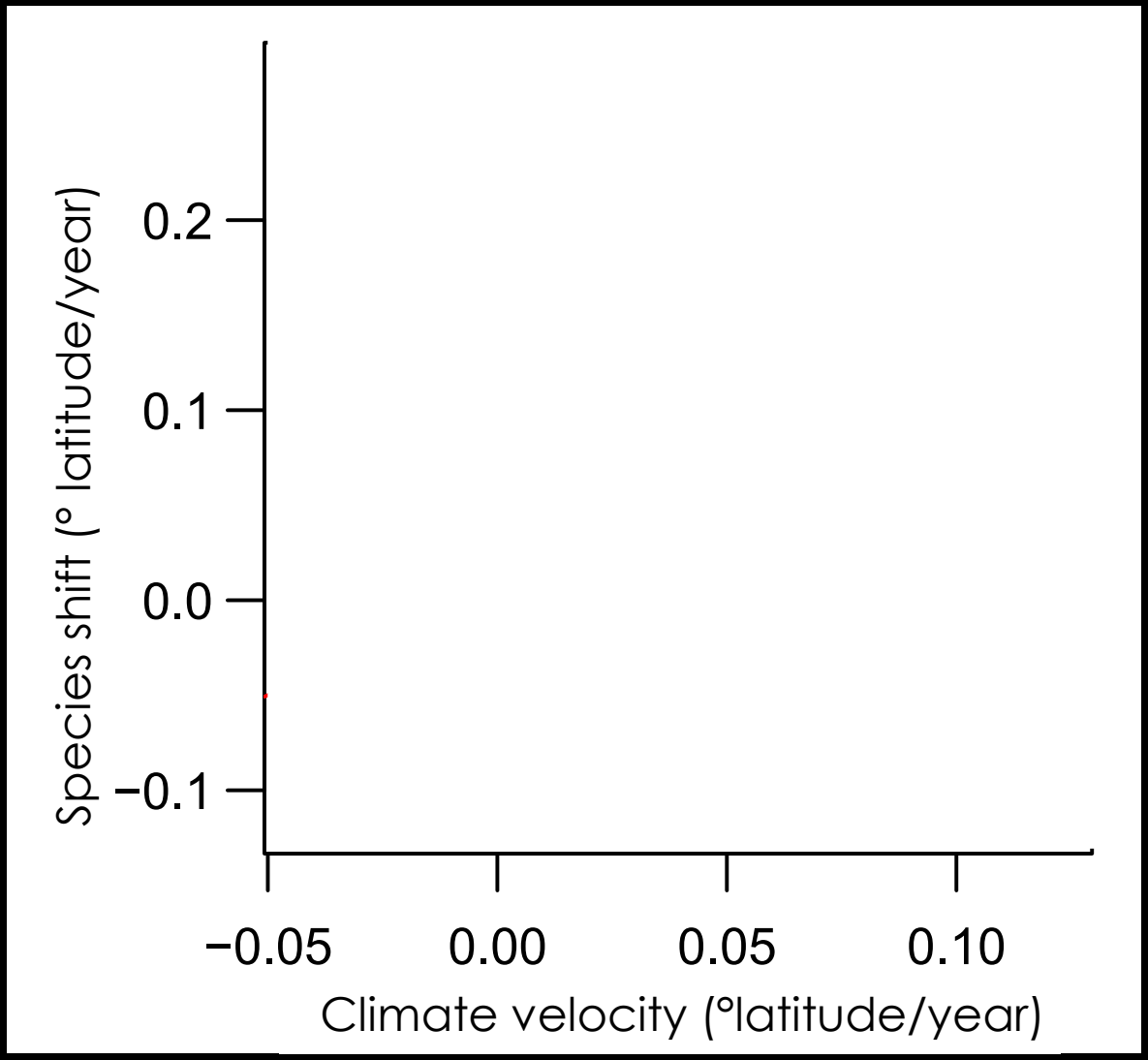


Many shifting species



Pinsky *et al.* 2013 *Science*

Climate velocity



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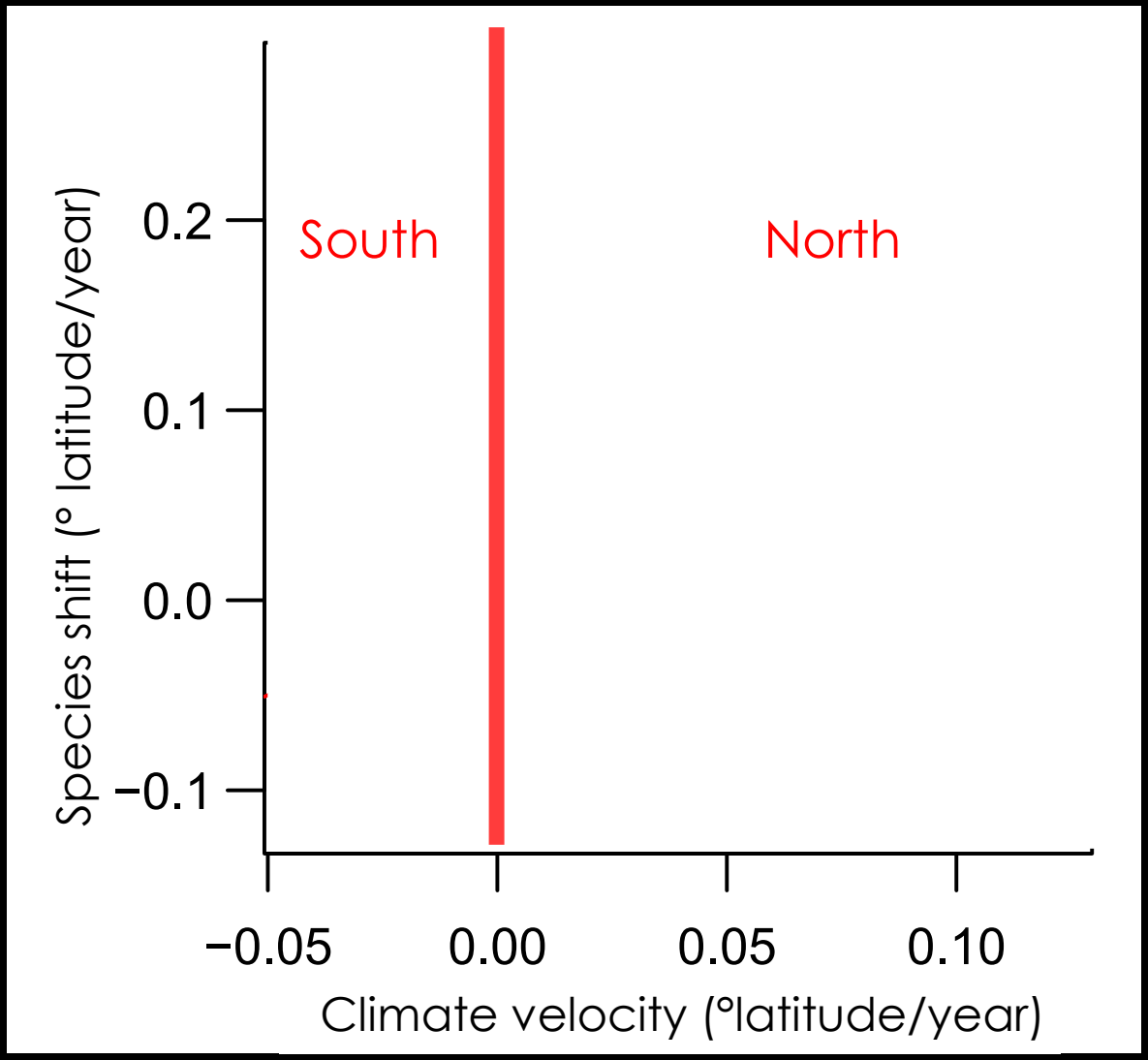

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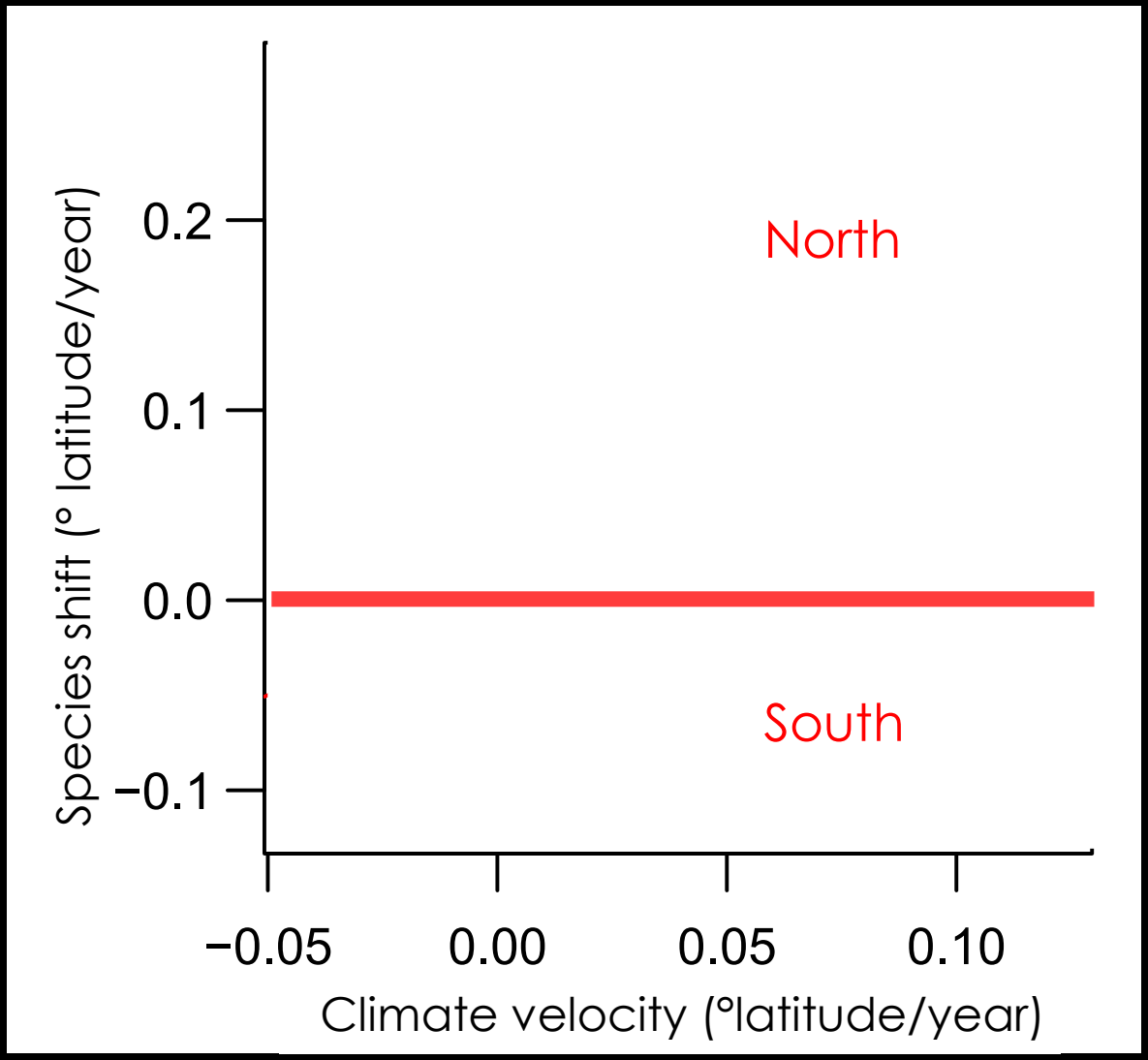
Climate velocity



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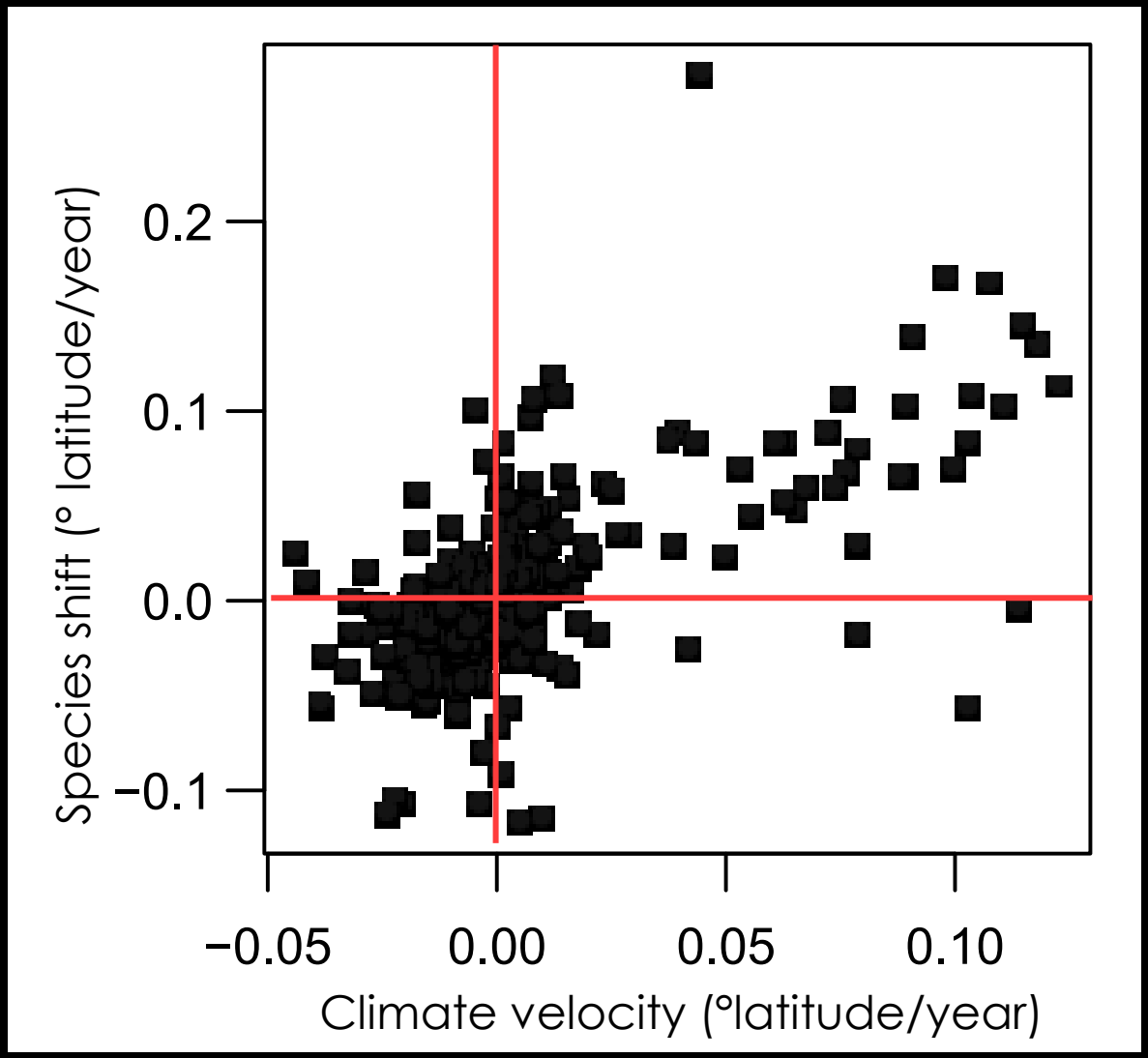
Species follow climate velocity



Pinsky *et al.* 2013 *Science*

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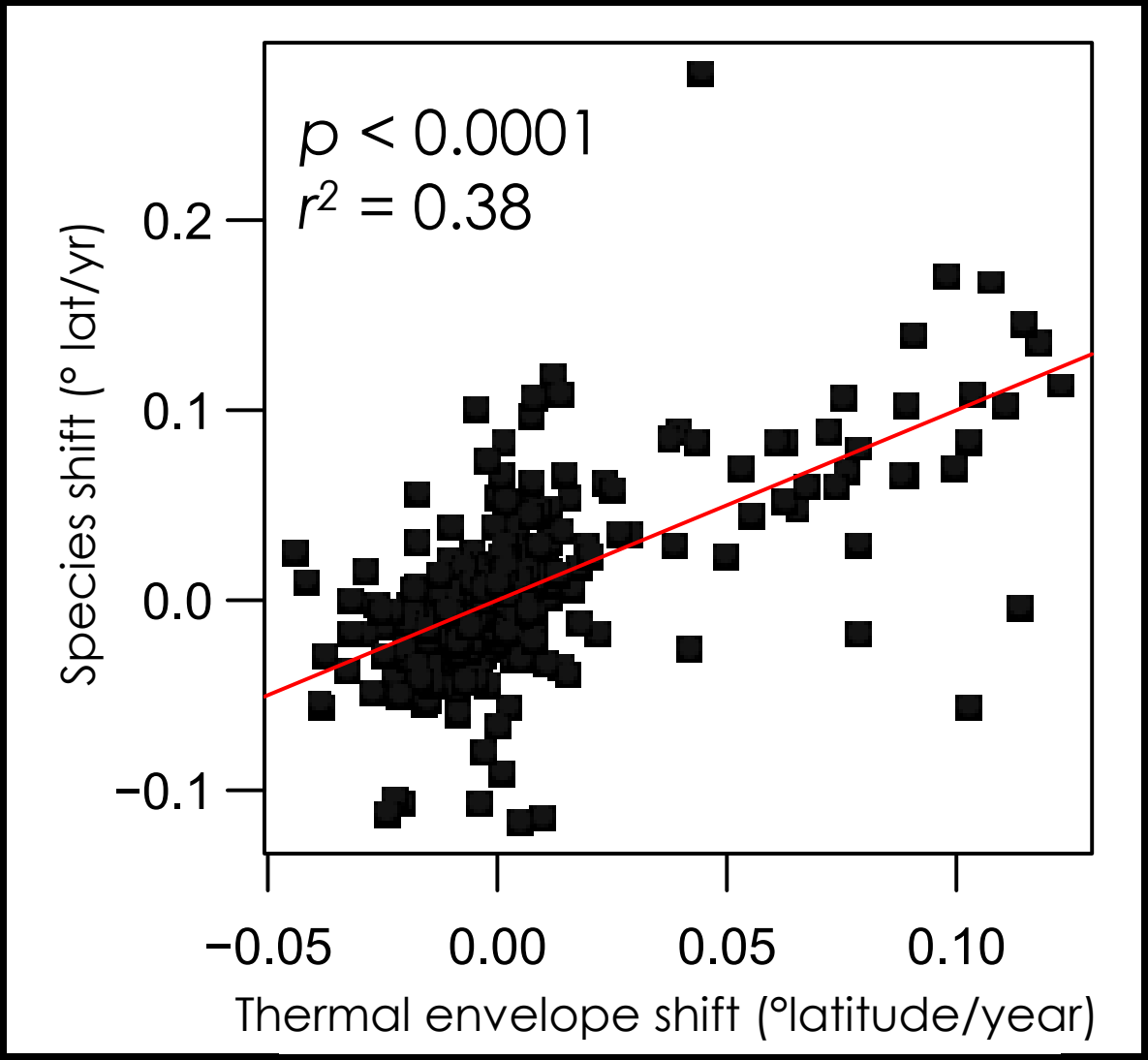
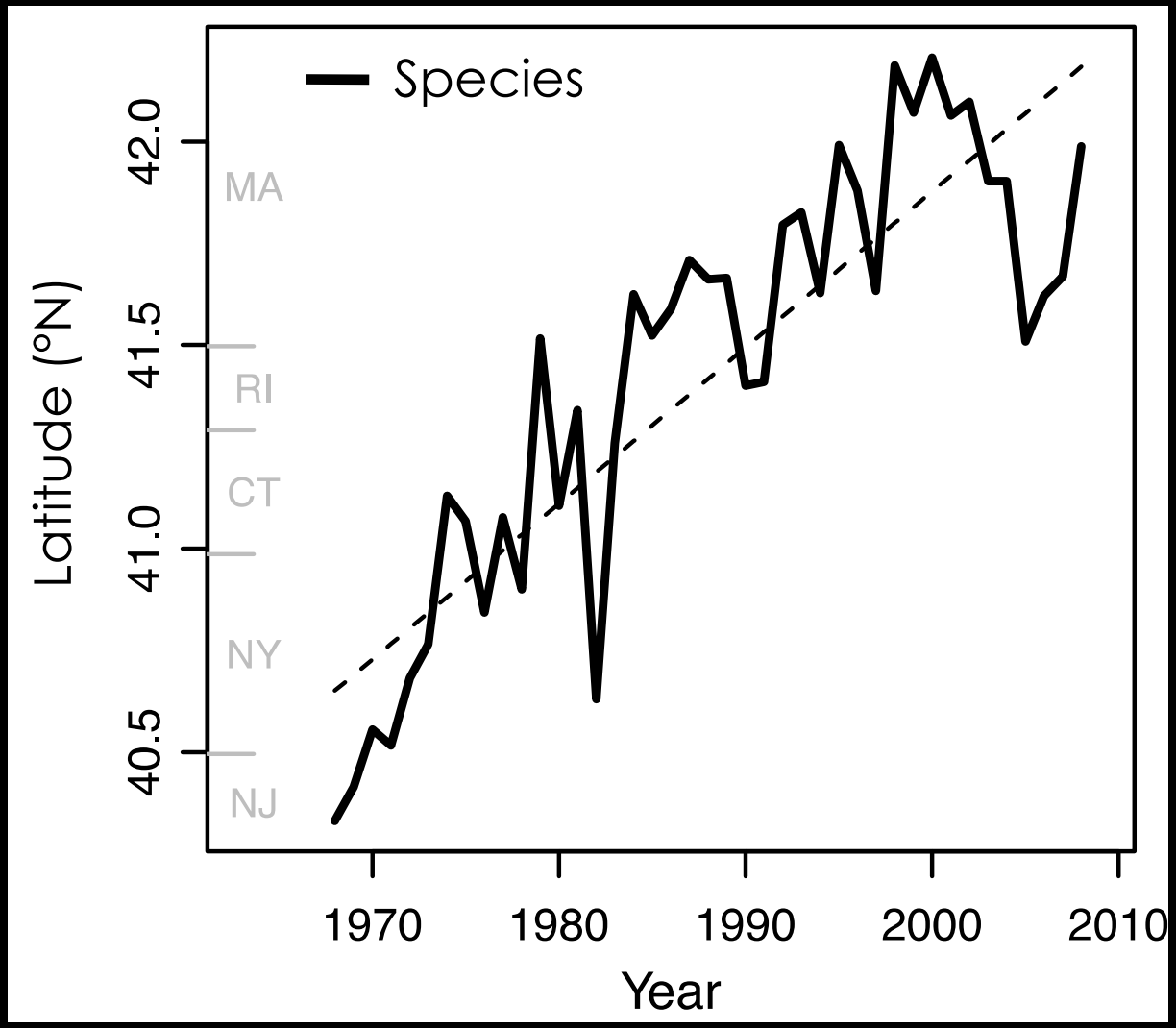


Pinsky *et al.* 2013 *Science*

Fisheries?

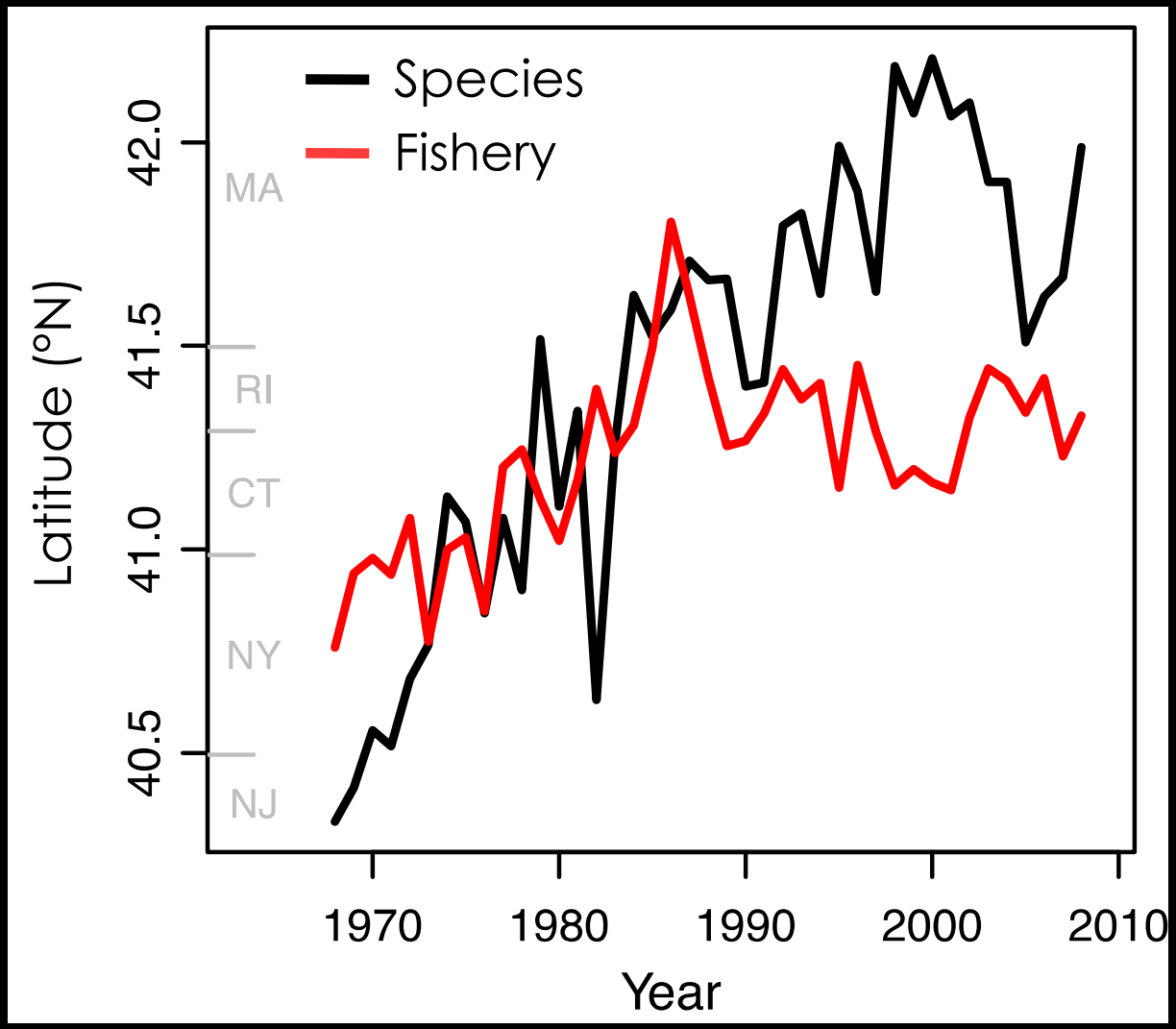
Rapid poleward shift of red hake



Urophycis chuss

Pinsky & Fogarty 2012 *Climatic Change Letters*

Fishery landings shift as well



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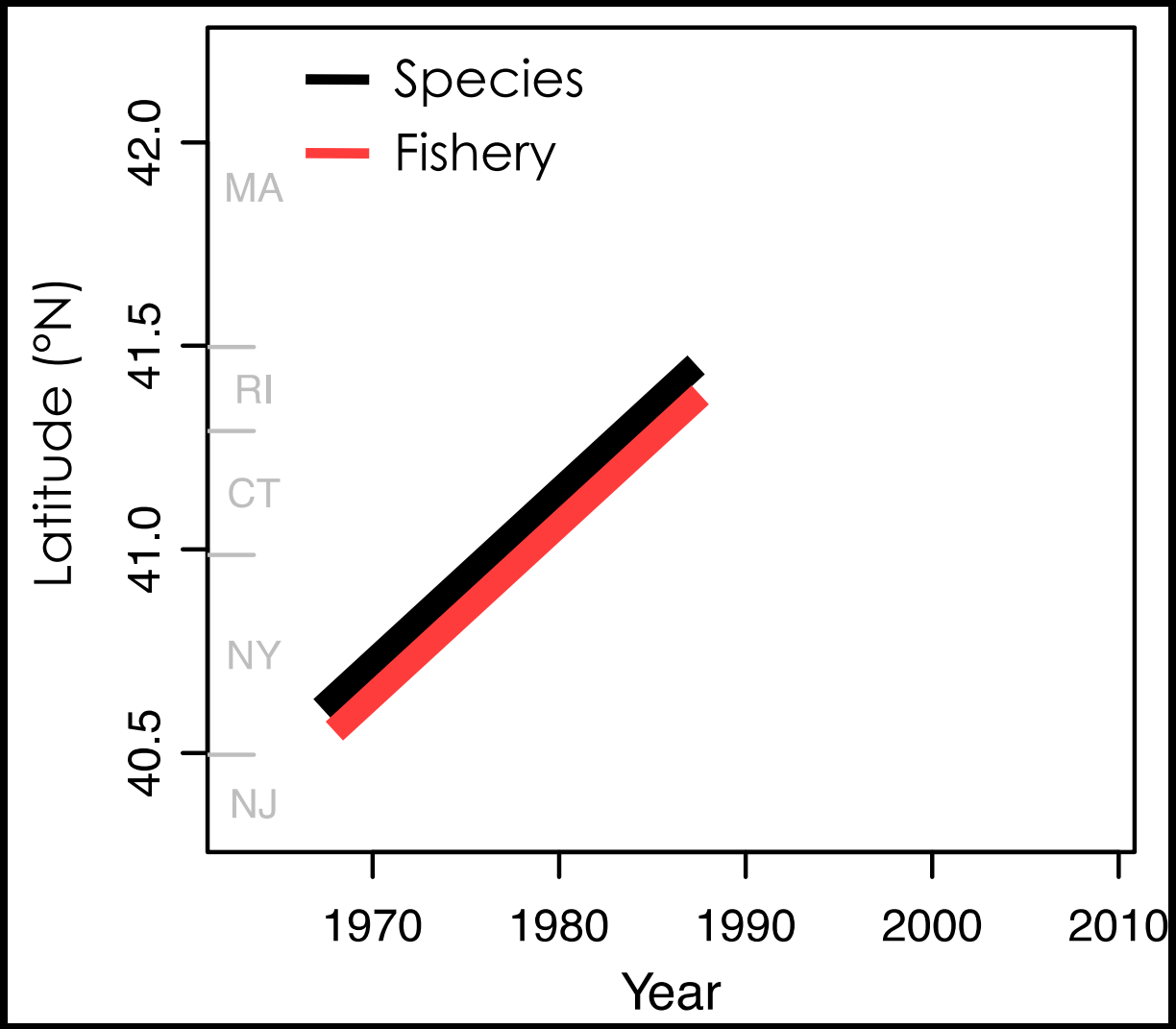

Pinsky & Fogarty 2012 *Climatic Change Letters*

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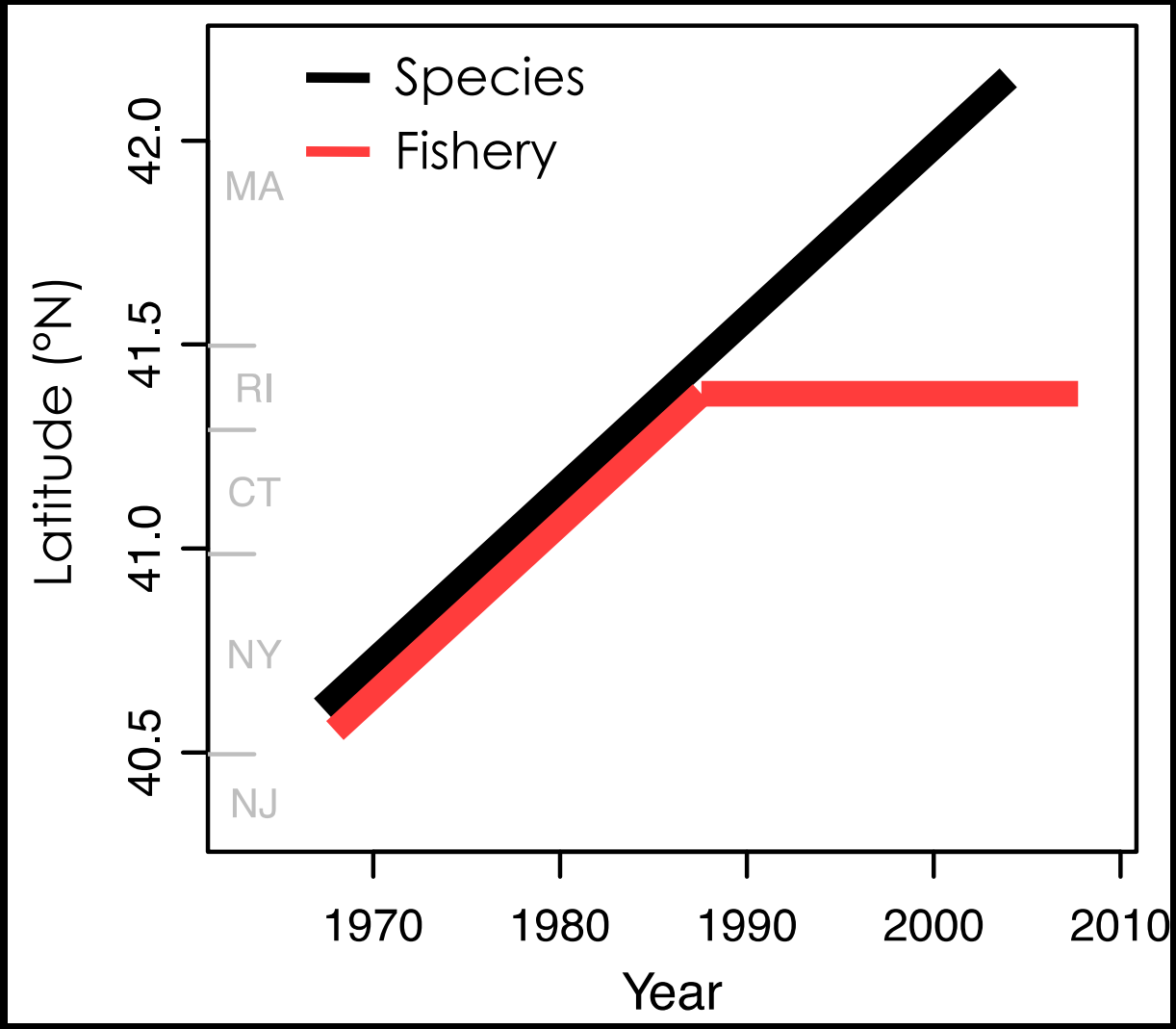
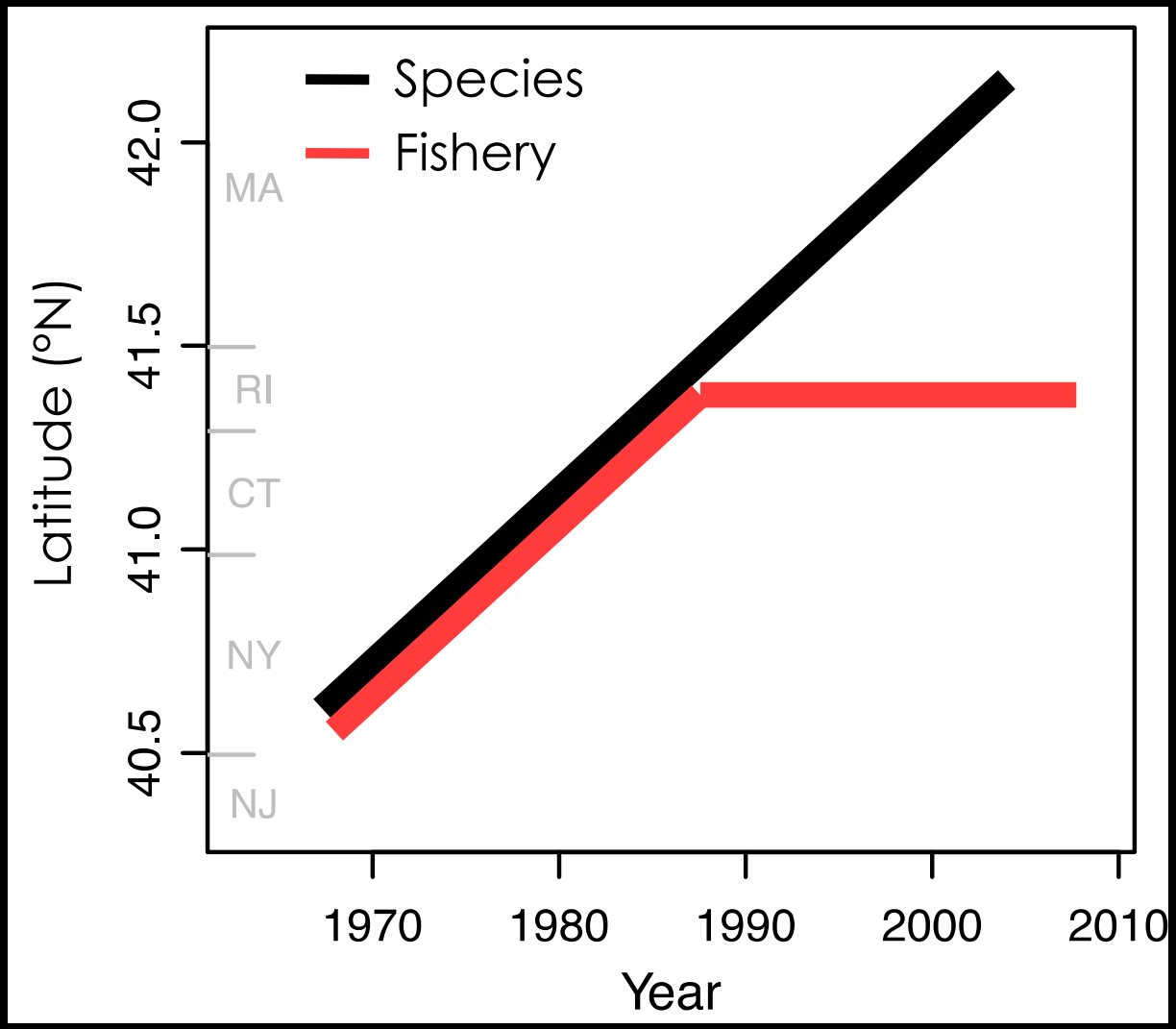


Pinsky & Fogarty 2012 *Climatic Change Letters*

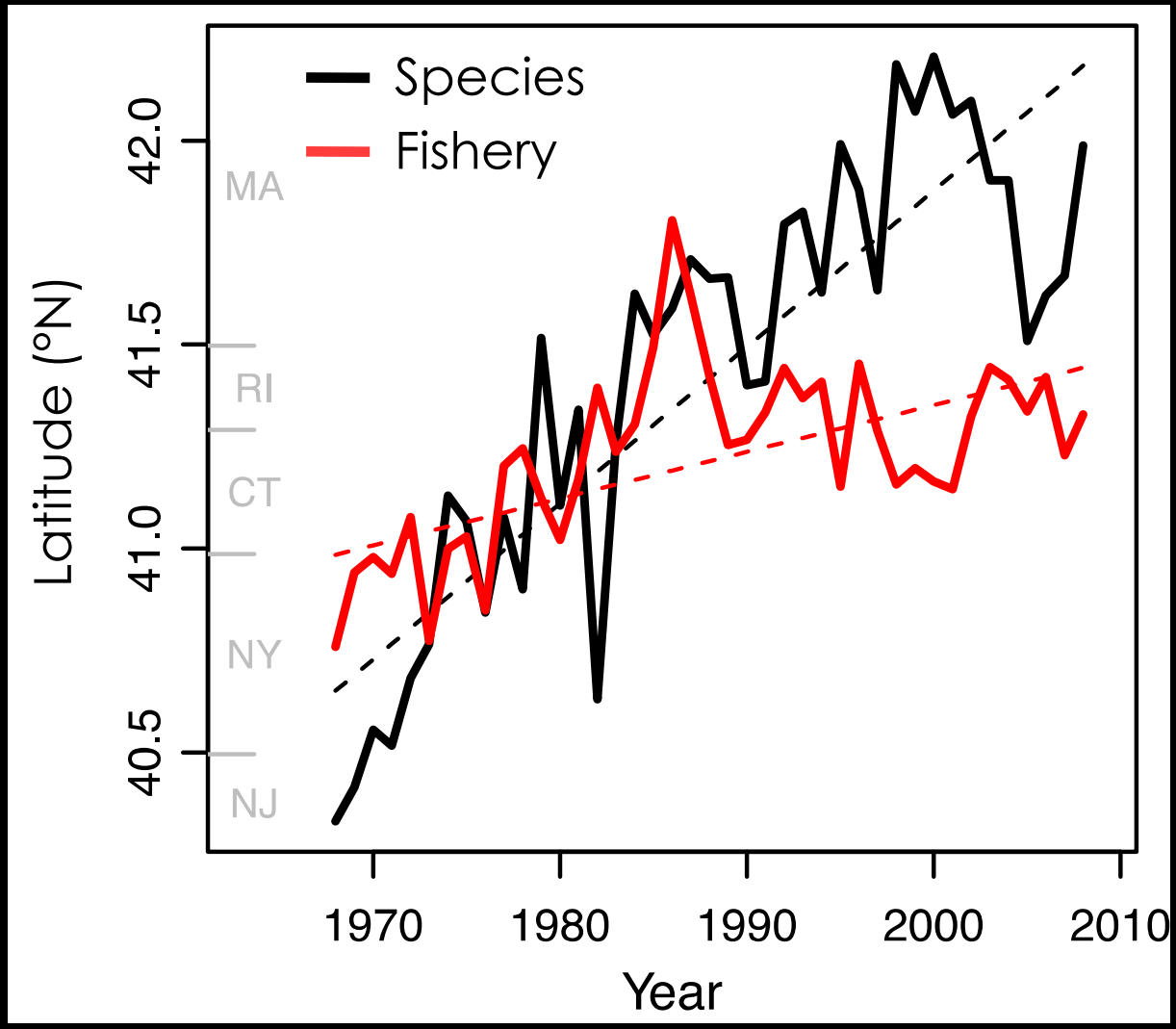
Social, economic, and regulatory constraints



Nets excluded

Pinsky & Fogarty 2012 *Climatic Change Letters*

Fishery landings shift more slowly



75% slower

Pinsky & Fogarty 2012 *Climatic Change Letters*

Fisheries lag behind fish

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

Pinsky & Fogarty 2012 *Climatic Change Letters*

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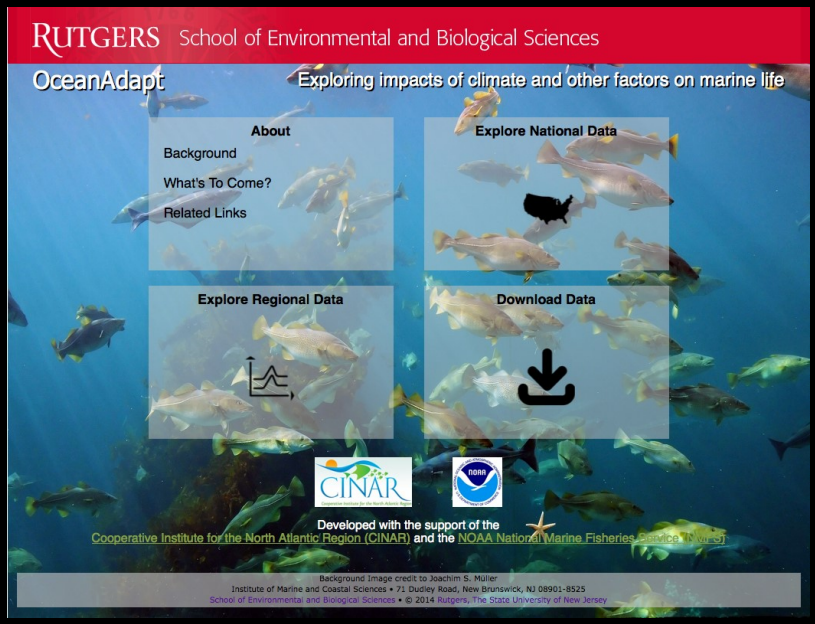
Data to guide adaptation?

http://oceanadapt.rutgers.edu

- Tracks shifts in distribution of U.S. marine fish and invertebrates



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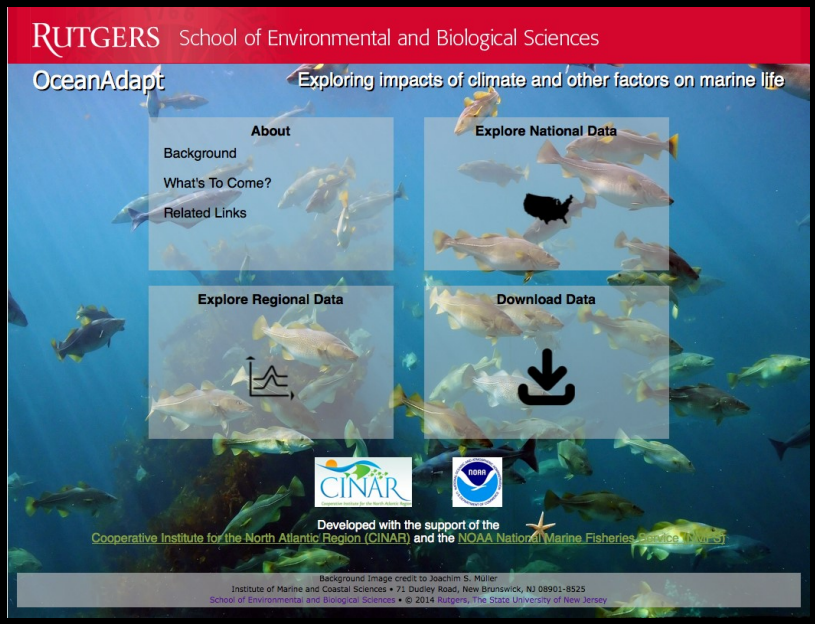
- Tracks shifts in distribution of U.S. marine fish and invertebrates
- Operational



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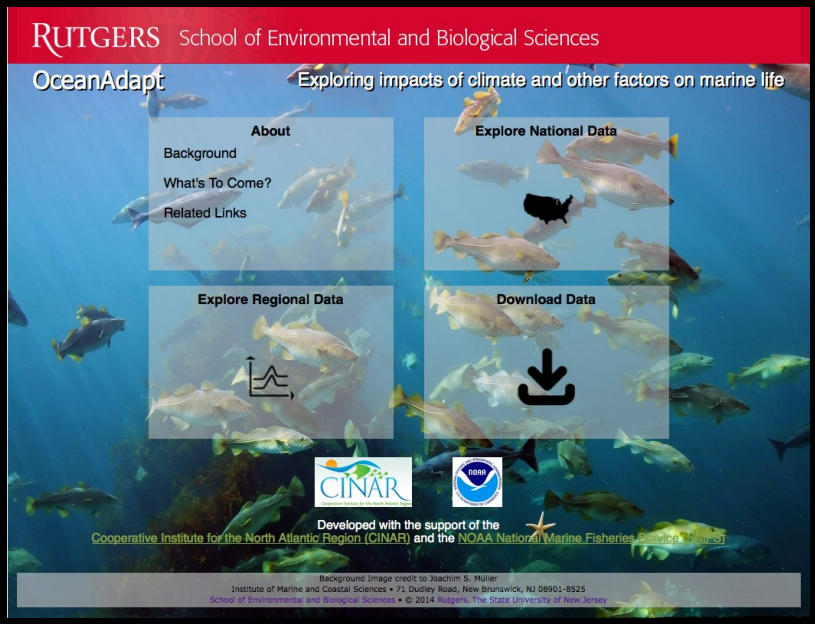
- Tracks shifts in distribution of U.S. marine fish and invertebrates
- Operational
- Open science



In support of...

- Global Change Information System
- National Fish, Wildlife, and Plant Climate Adaptation Strategy
- President's Climate Action Plan
- U.S. Climate Resilience Toolkit

Planned expansions (short-term)

- Data
  - Southeast U.S. (SEAMAP-SA)
  - Others?
- Visualizations
  - Maps
- Content
  - Feature stories and videos

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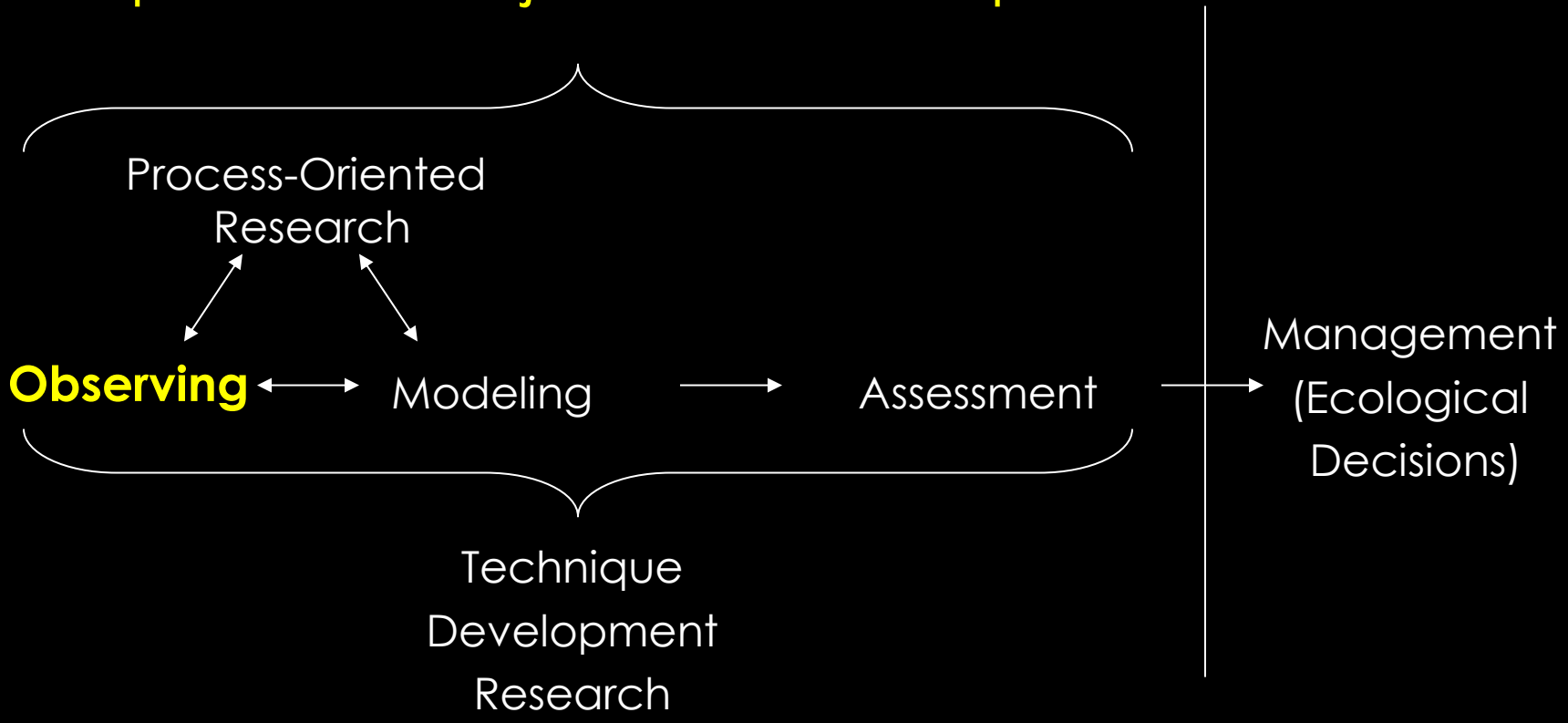
Open Data Initiatives (Executive Order 13642)

Open data is just the first step



Summary

1. Marine fish and fisheries are shifting in response to climate
2. Management can adapt to climate impacts
3. OceanAdapt website provides data to aid adaptation