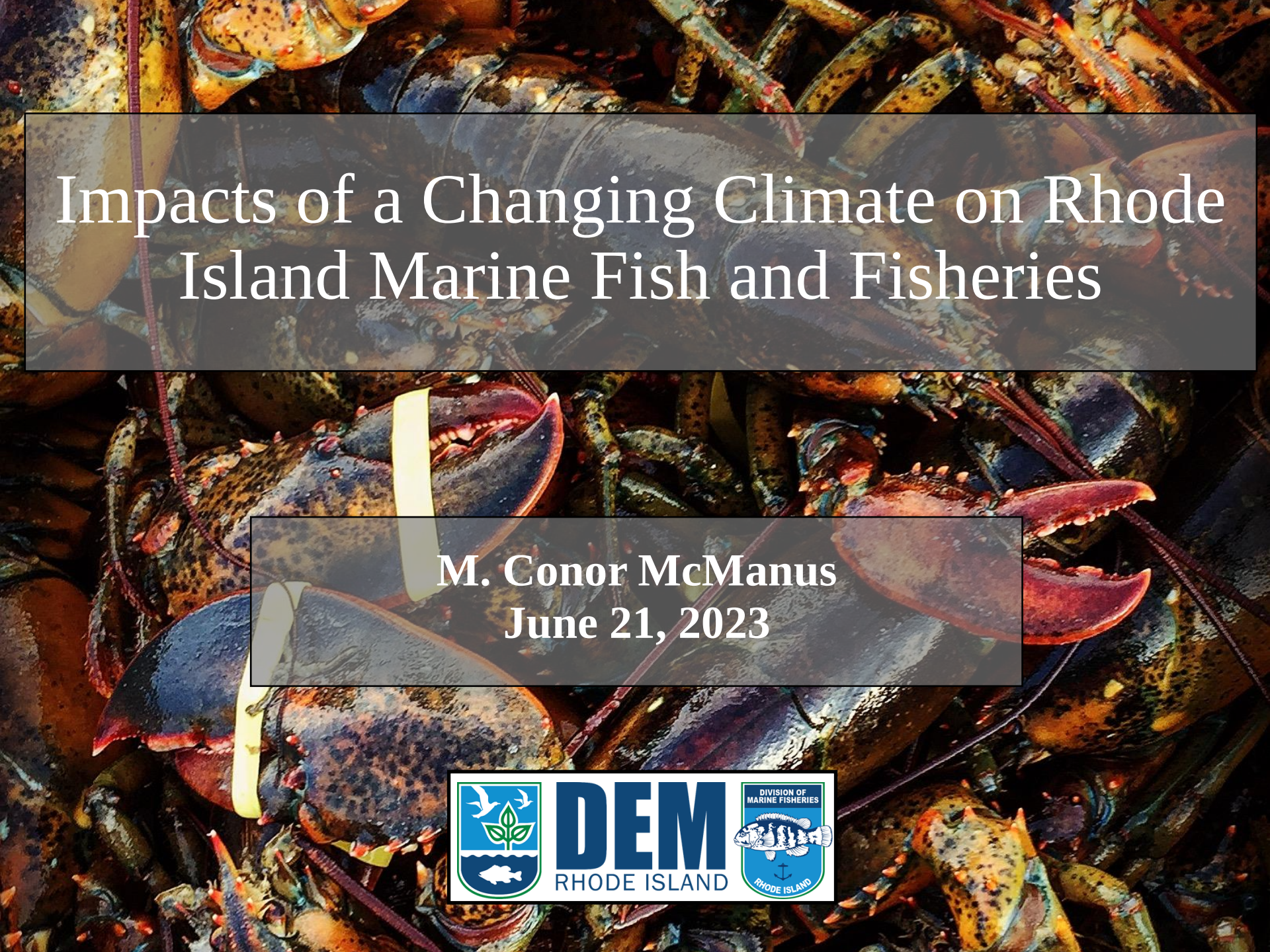


Impacts of a Changing Climate on Rhode Island Marine Fish and Fisheries

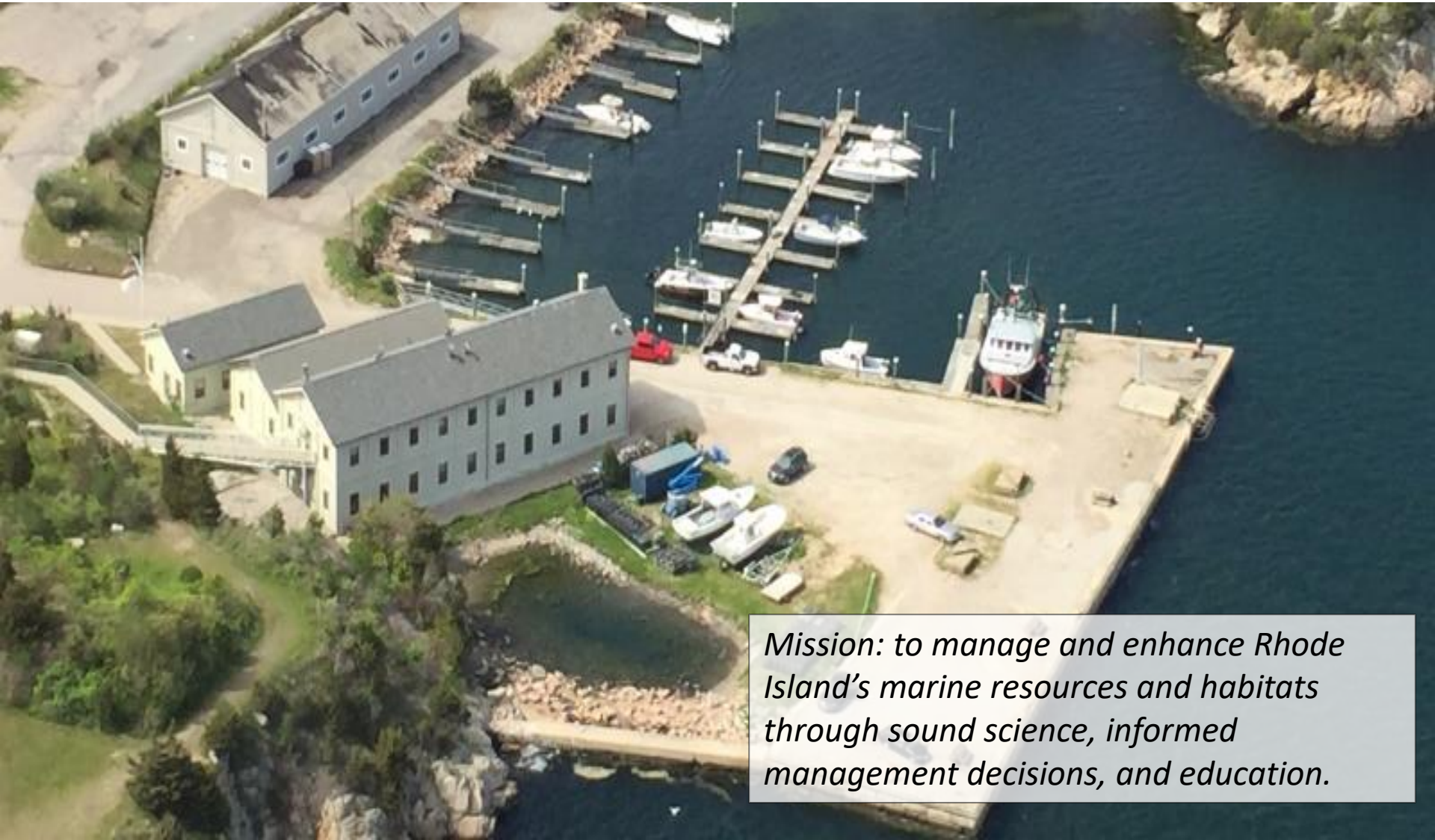
M. Conor McManus

June 21, 2023

DEM RHODE ISLAND

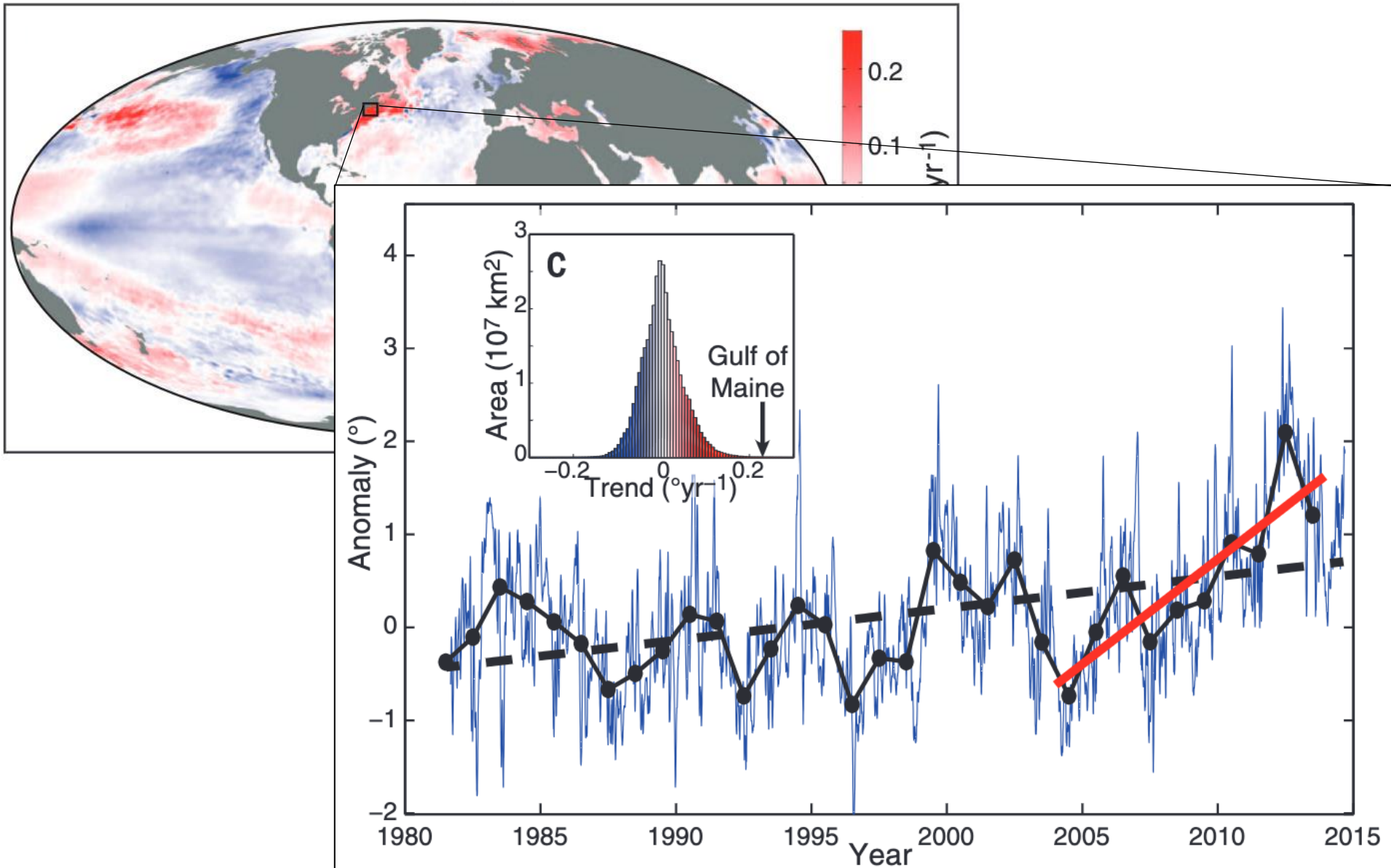
DIVISION OF MARINE FISHERIES RHODE ISLAND

Rhode Island Department of Environmental Management – Division of Marine Fisheries

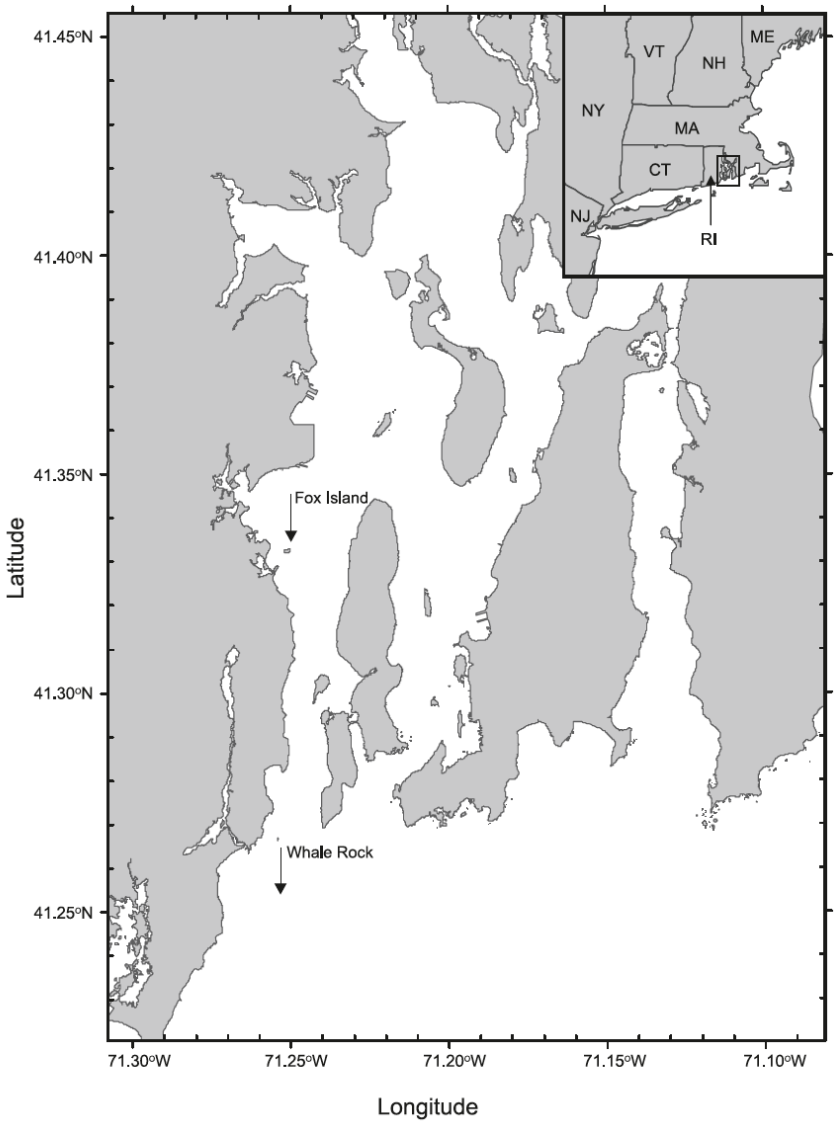


Mission: to manage and enhance Rhode Island's marine resources and habitats through sound science, informed management decisions, and education.

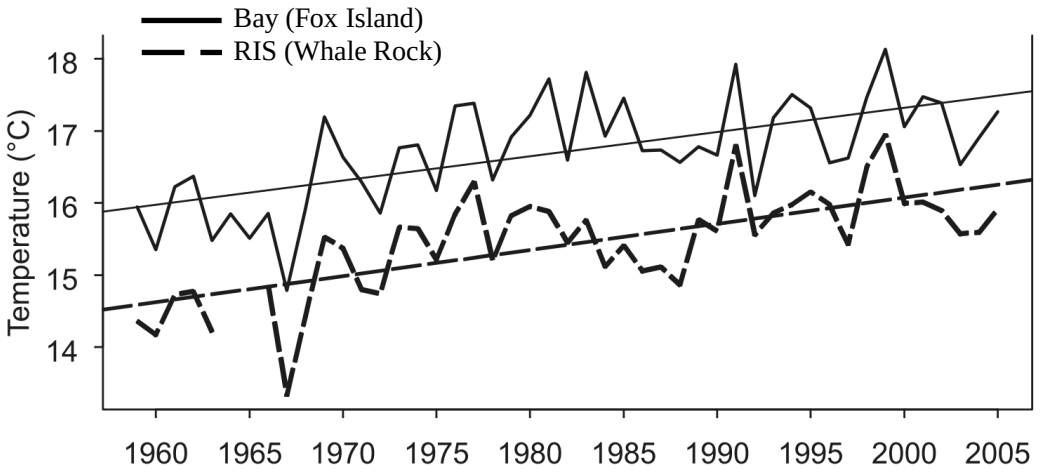
A Warming Northeast United States



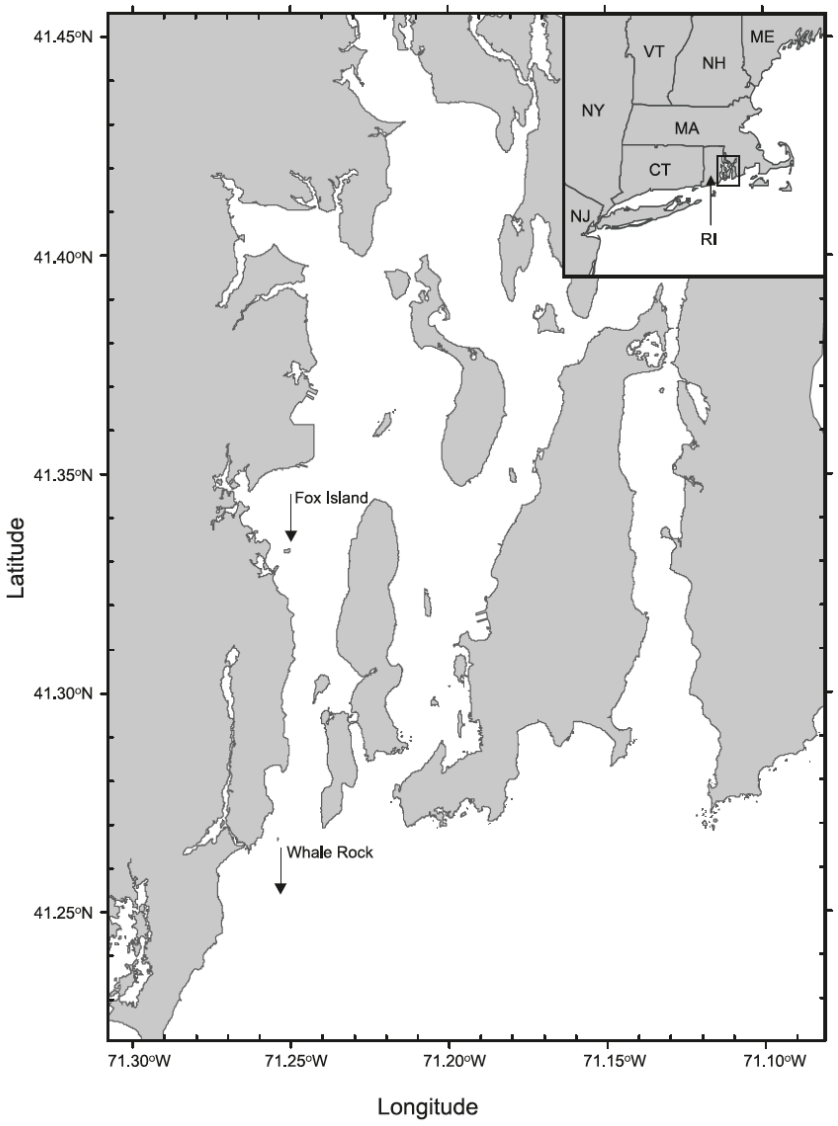
Changing Narragansett Bay Ecosystem

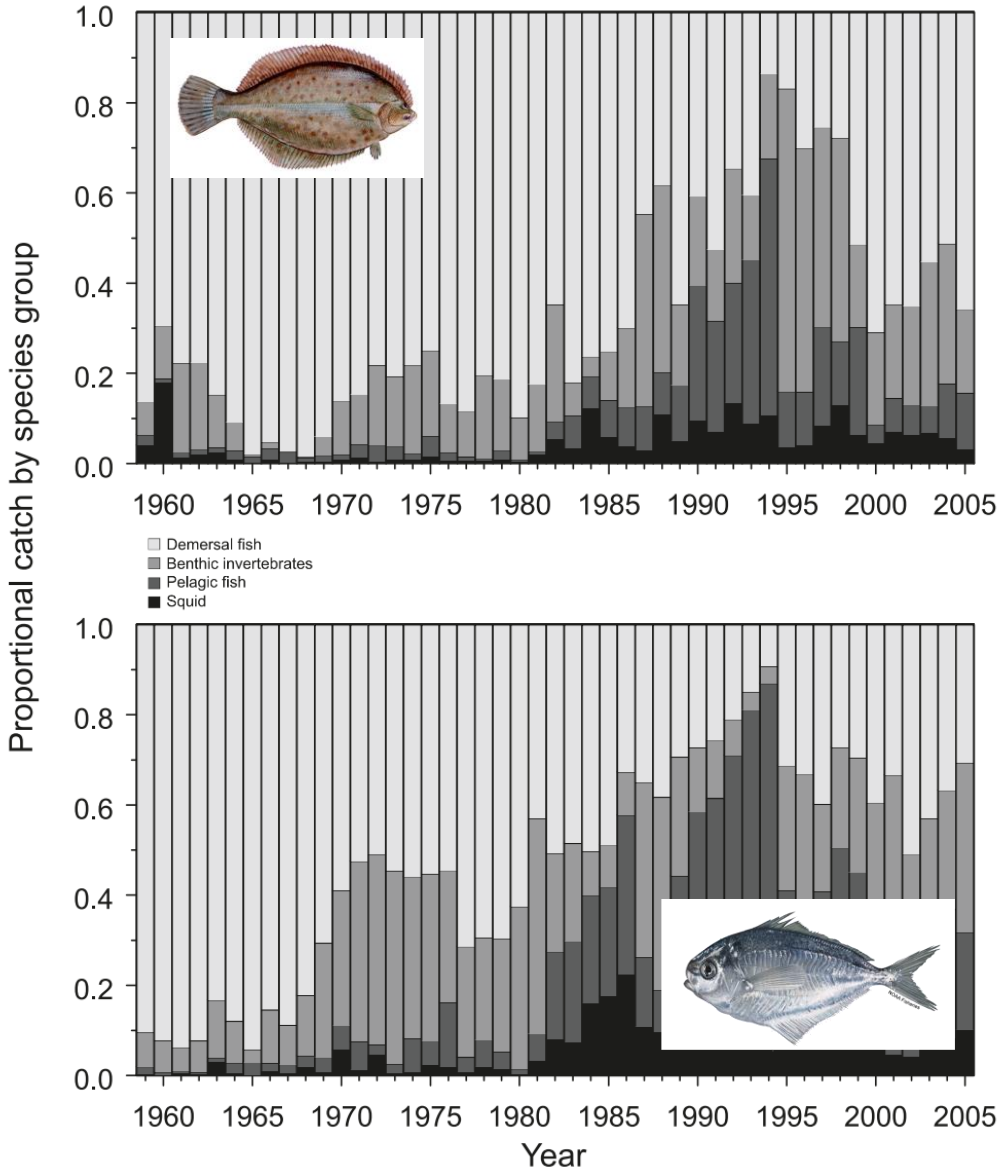


Sea surface temperature has increased in the Bay over time.



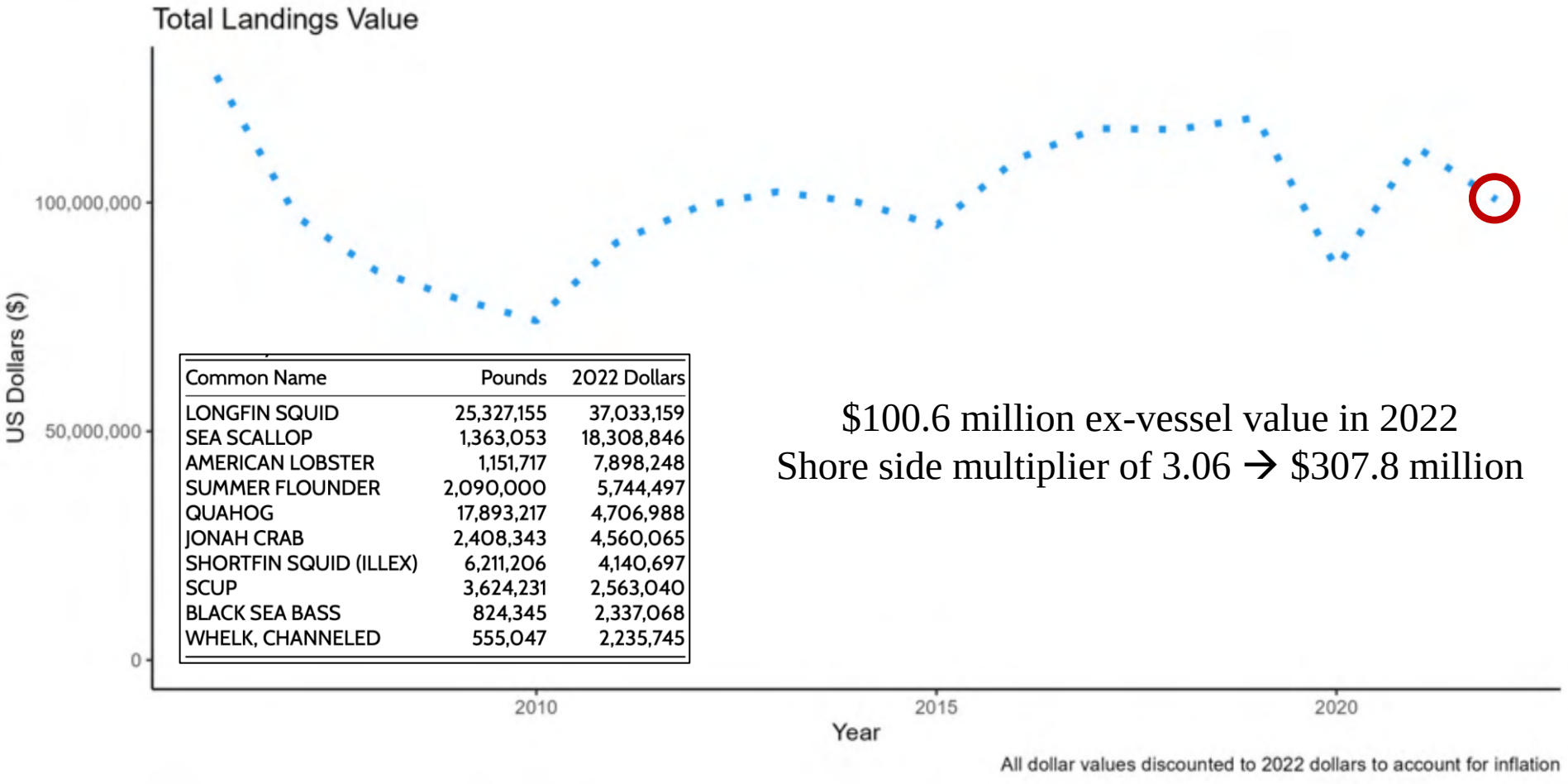
Changing Narragansett Bay Ecosystem





Importance of Fisheries to Rhode Island

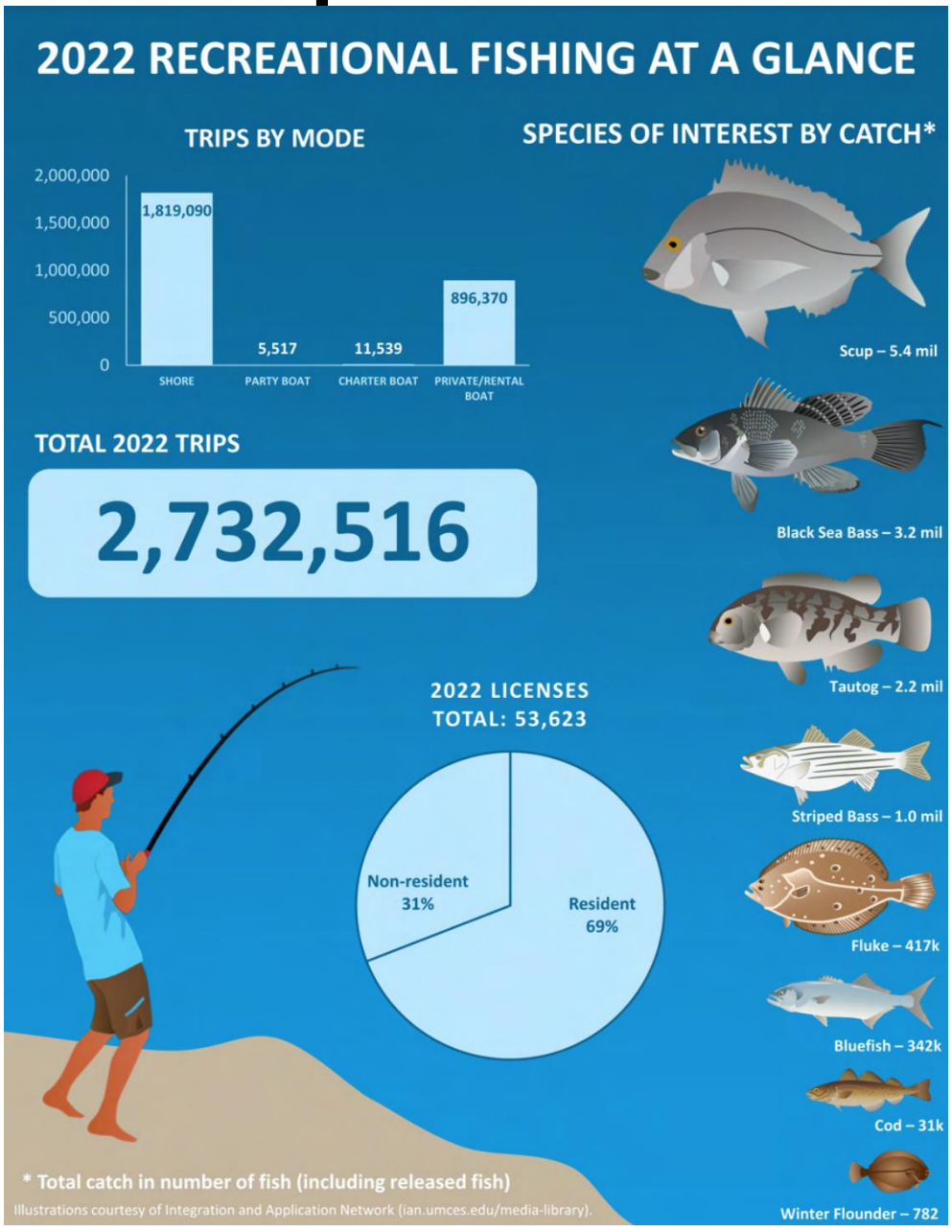
Commercial fisheries represent a significant component of Rhode Island's economy.



Common Name	Pounds	2022 Dollars
LONGFIN SQUID	25,327,155	37,033,159
SEA SCALLOP	1,363,053	18,308,846
AMERICAN LOBSTER	1,151,717	7,898,248
SUMMER FLOUNDER	2,090,000	5,744,497
QUAHOG	17,893,217	4,706,988
JONAH CRAB	2,408,343	4,560,065
SHORTFIN SQUID (ILLEX)	6,211,206	4,140,697
SCUP	3,624,231	2,563,040
BLACK SEA BASS	824,345	2,337,068
WHELK, CHANNELED	555,047	2,235,745

$100.6 million ex-vessel value in 2022
Shore side multiplier of 3.06 → $307.8 million

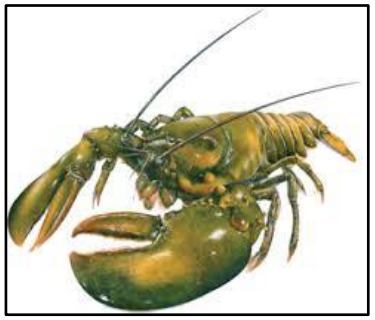
Importance of Fisheries to Rhode Island

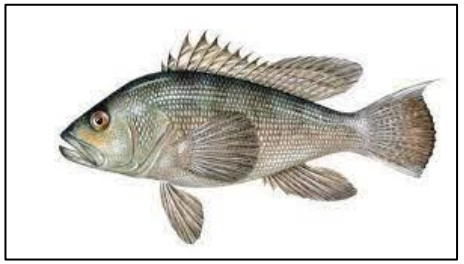


Recreational fisheries also represent a significant portion of harvest and support both recreation and the economy.

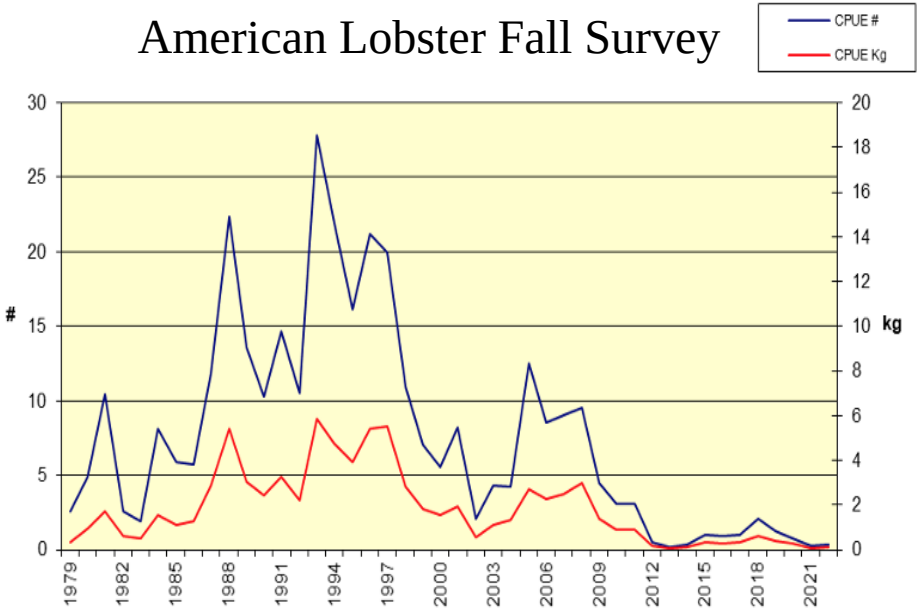
Winners and Losers of Climate Change

As Rhode Island waters warm, there will be climate change ‘winner’ and ’loser’ species.

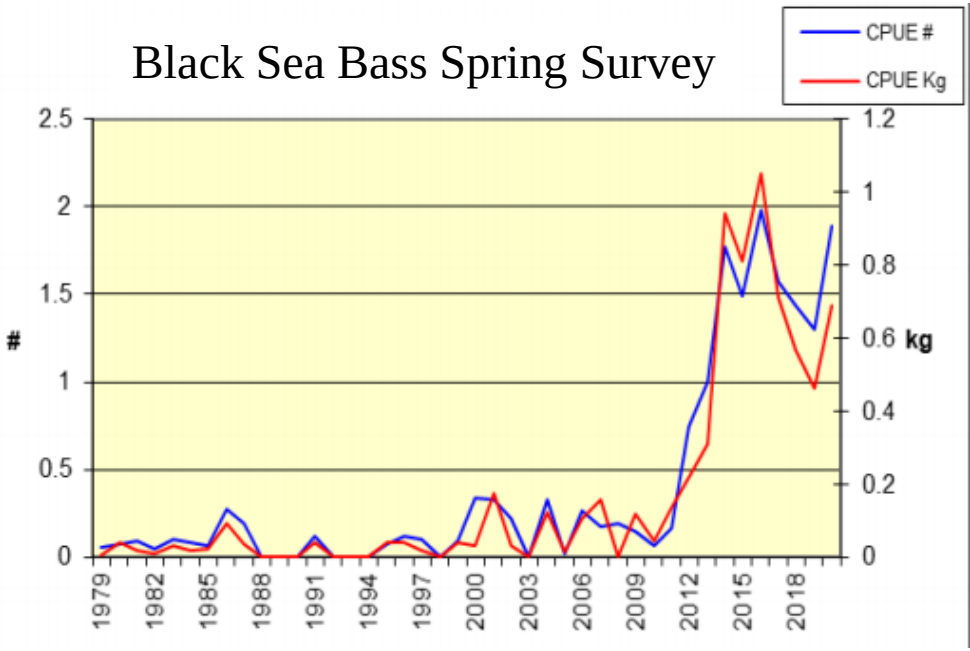




American Lobster Fall Survey



Black Sea Bass Spring Survey

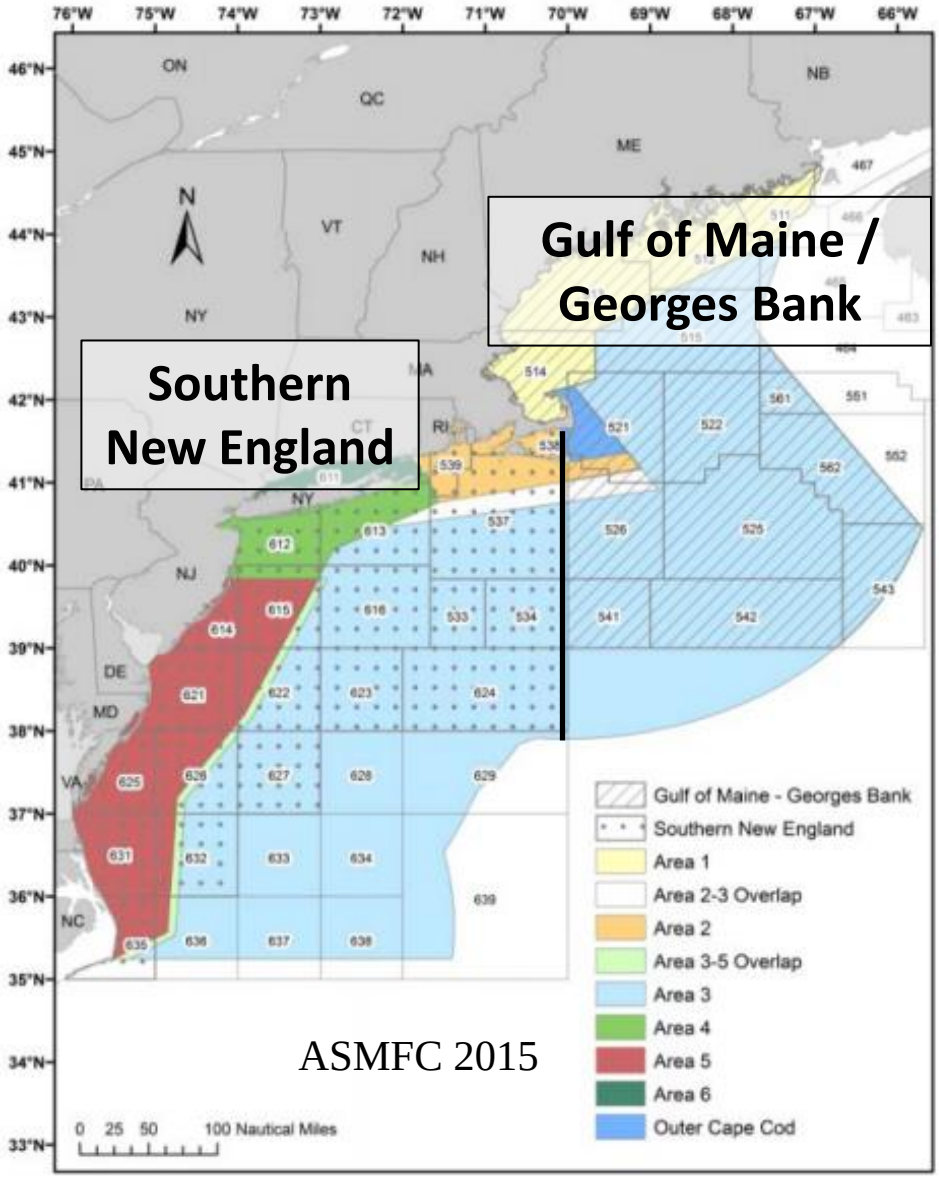


U.S. Lobster Stocks

Two stocks for the U.S.

1.) Gulf of Maine / Georges Bank

2.) Southern New England



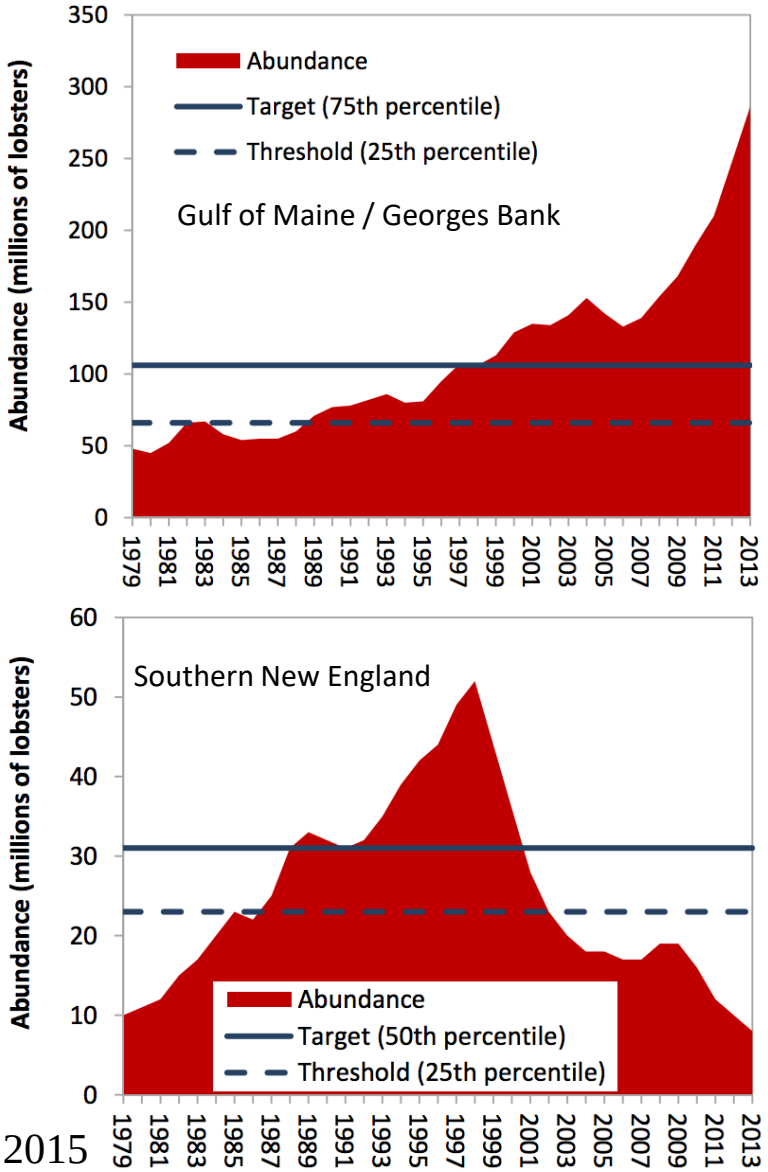
ASMFC

Lobster Stock Statuses

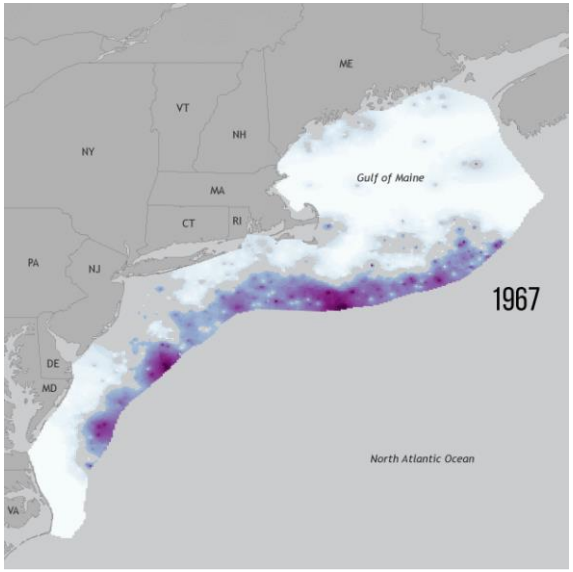
Two stocks for the U.S.

1.) Gulf of Maine / Georges Bank
- Stock at all-time highs
- Not overfished

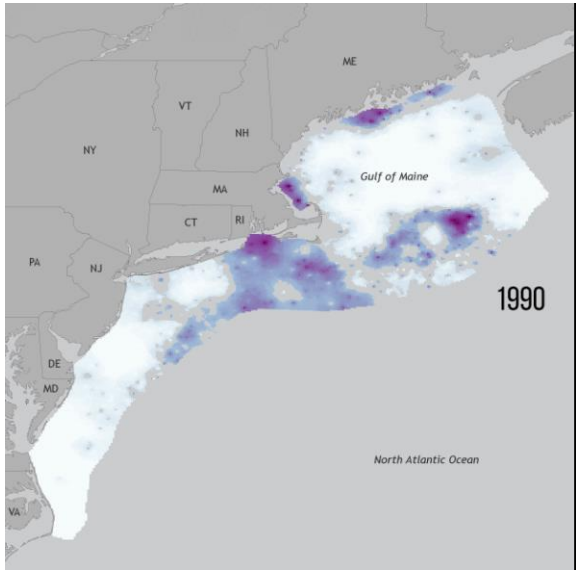
2.) Southern New England
- Stock at all-time lows
- Severely depleted



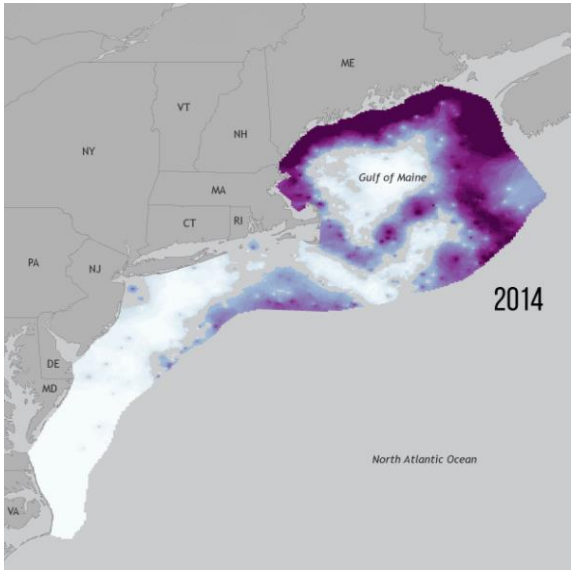
Lobster Biomass Shift North



Pre-Lobster Boom



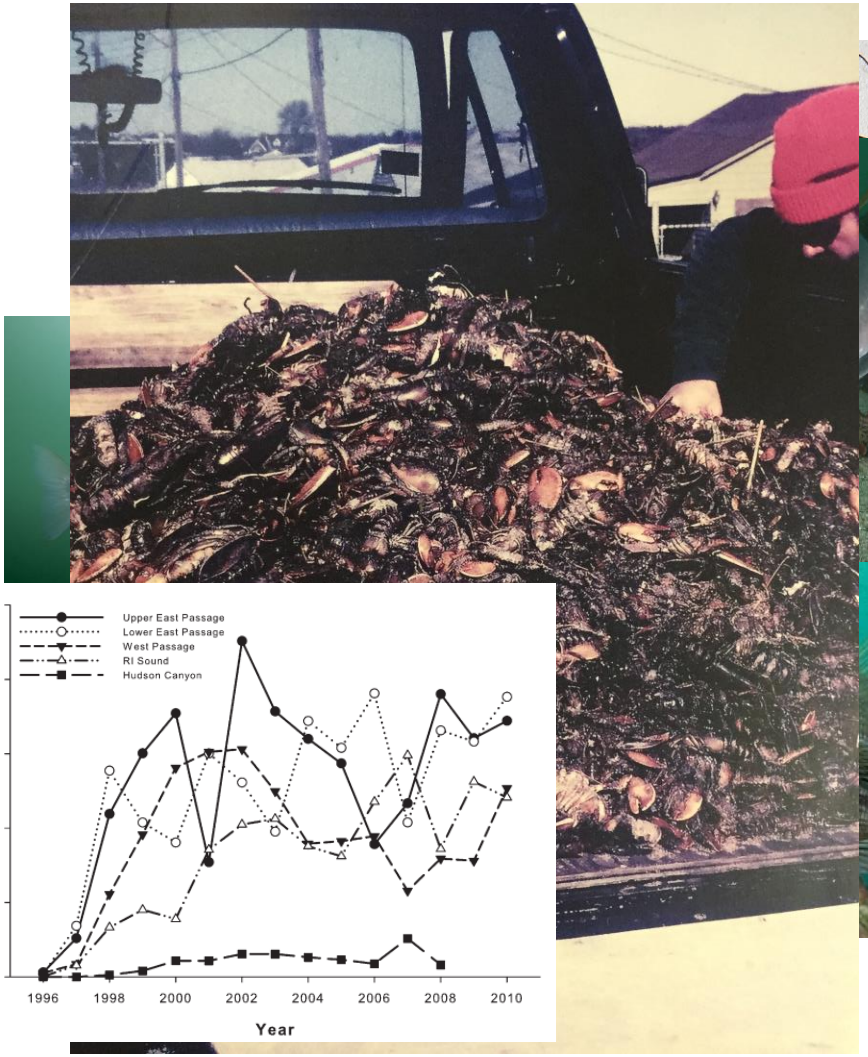
SNE Boom



GOM Boom

Stressors for SNE American Lobster

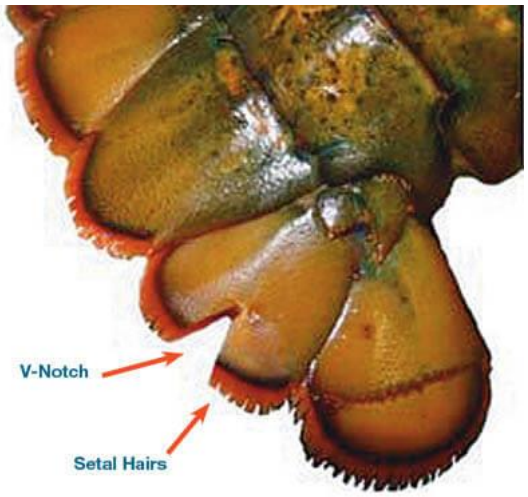
- ★Warming Sea Temperatures
- ★ Shell Disease
- ★Increased Predation
- Ocean Acidification
- Low Oxygen
- Loss of Habitat
- ★Pollutants



1996 *North Cape* Oil Spill

Lobster Fishery

- Landings have followed similar trajectory as the population
- Unlike other fisheries, lobstering is regulated by the number of traps that you can use, not number you can keep.
- Other management tools:
  - Min/Max sizes
  - Egg bearing
  - V-notch
  - Trap configurations (vent size)

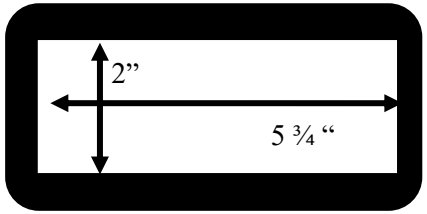


How Can We Help SNE Lobster Rebuild?

Previous Fisheries Management Proposals:

- Increase Minimum Size.
- Decrease Maximum Size.
- Trap Configurations.
- Reduce # of Traps Allowed.
- Control # of Lobsters Landed?

Vent Size



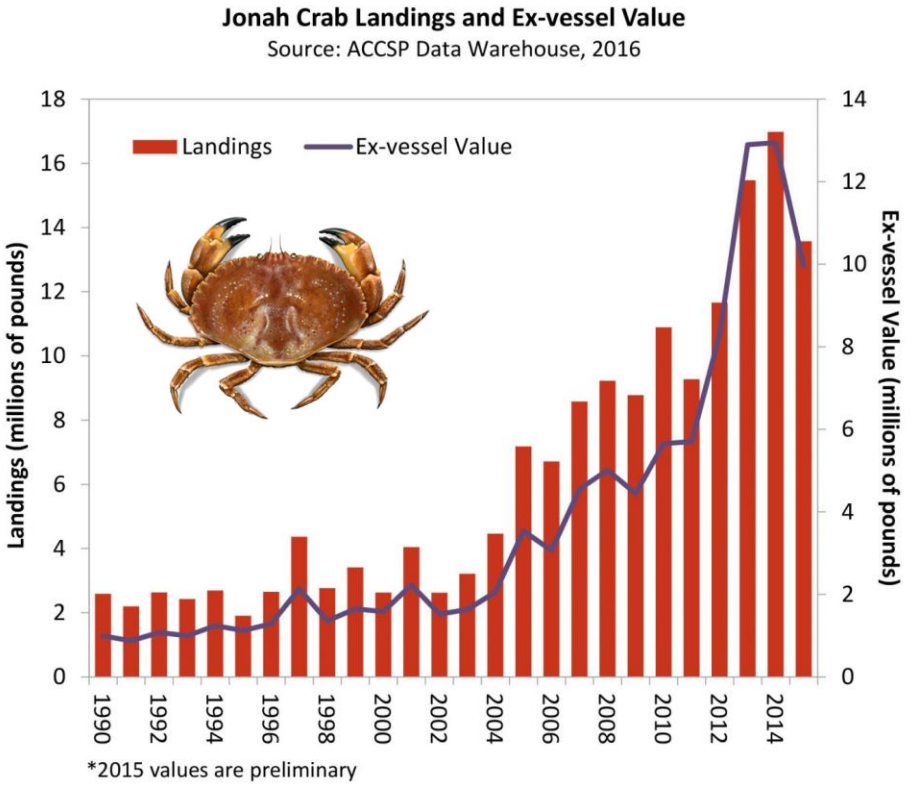
Management Challenges and Tradeoffs?

- Can We Overcome Climate Change?
- Jobs Lost, People Unable to Support Families.
- Decreased Revenue and Prosperity for Society.
- Loss of Heritage.

Can Fisheries Adapt to Climate Change?

Example: Jonah Crab

- A common bycatch species in lobster traps.
- Landings increased with:
  - Fewer lobsters in SNE.
  - Increase in prices and demand for other crab species.
- What does this newfound harvest pressure on these crabs mean for their population abundance?



Black Sea Bass

North Atlantic stock

South Atlantic stock

Gulf of Mexico stock

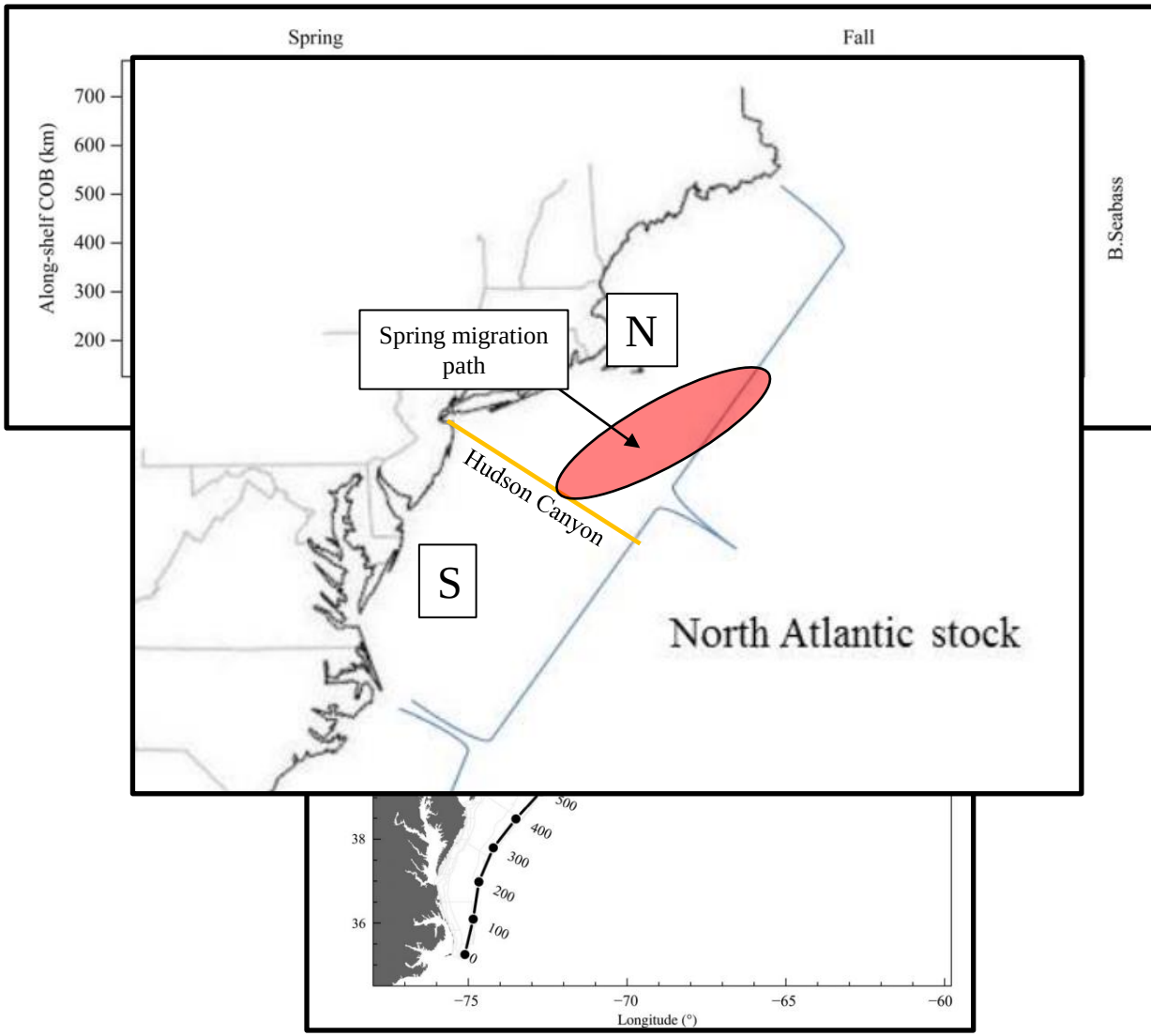
*Bowen and Avise 1990
Roy et al. 2012
Lewandowski 2014
McCartney et al. 2013

Black Sea Bass Expansion to the North

Warm waters have led to northern expansion.

Better overwinter survival offshore

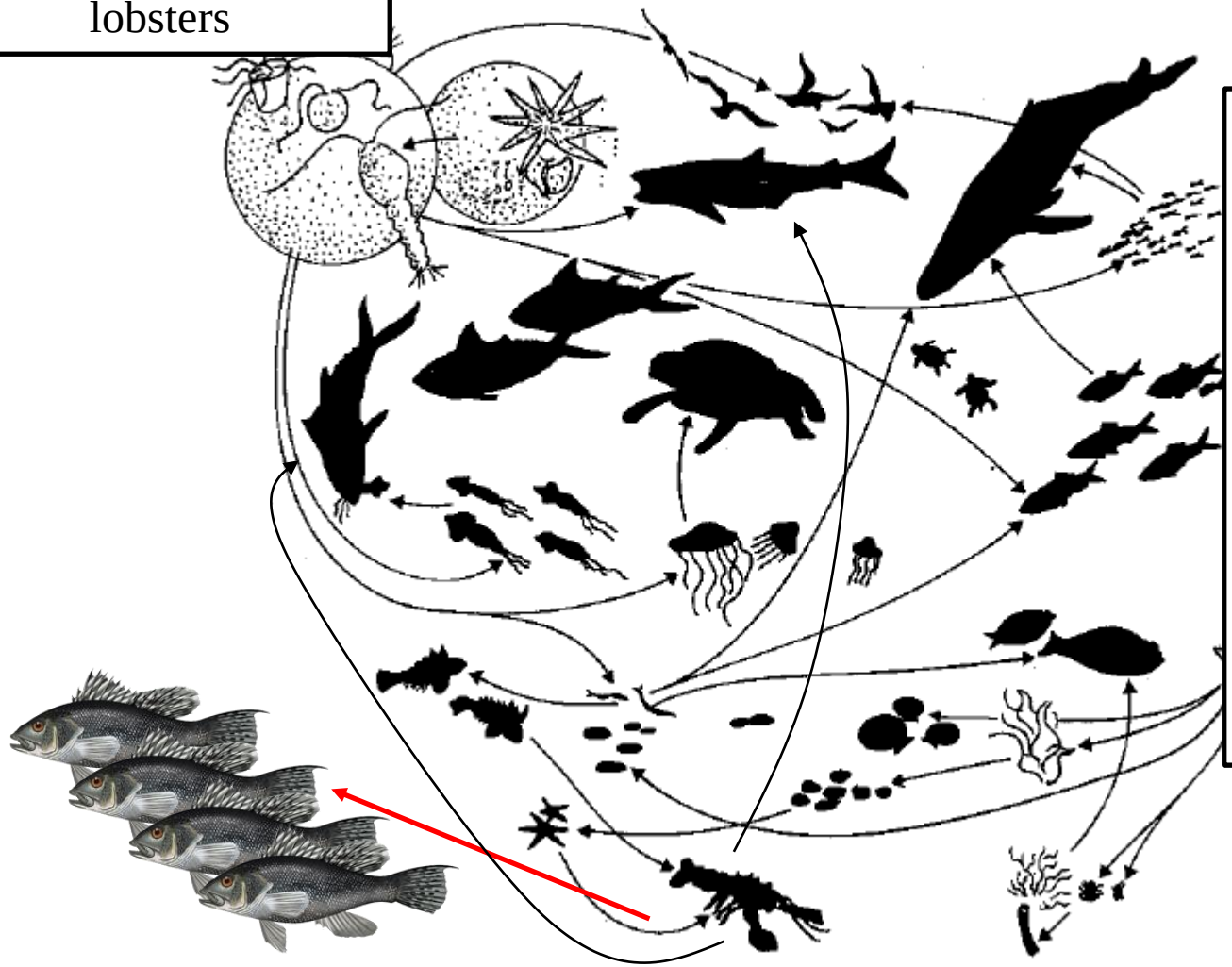
What are some of the consequences for the ecosystem and people with such an expansion?



Ecosystem Changes

Increase in black sea bass can mean decrease in their prey: lobsters

Southern New England Ecosystem



How does this change our management for lobsters or black sea bass?

How else does the ecosystem change?

Fishery Changes: How to Slice the Pie?

Before Climate Change

Quota: a limited amount of fish that can be removed

How should the science direct the management?

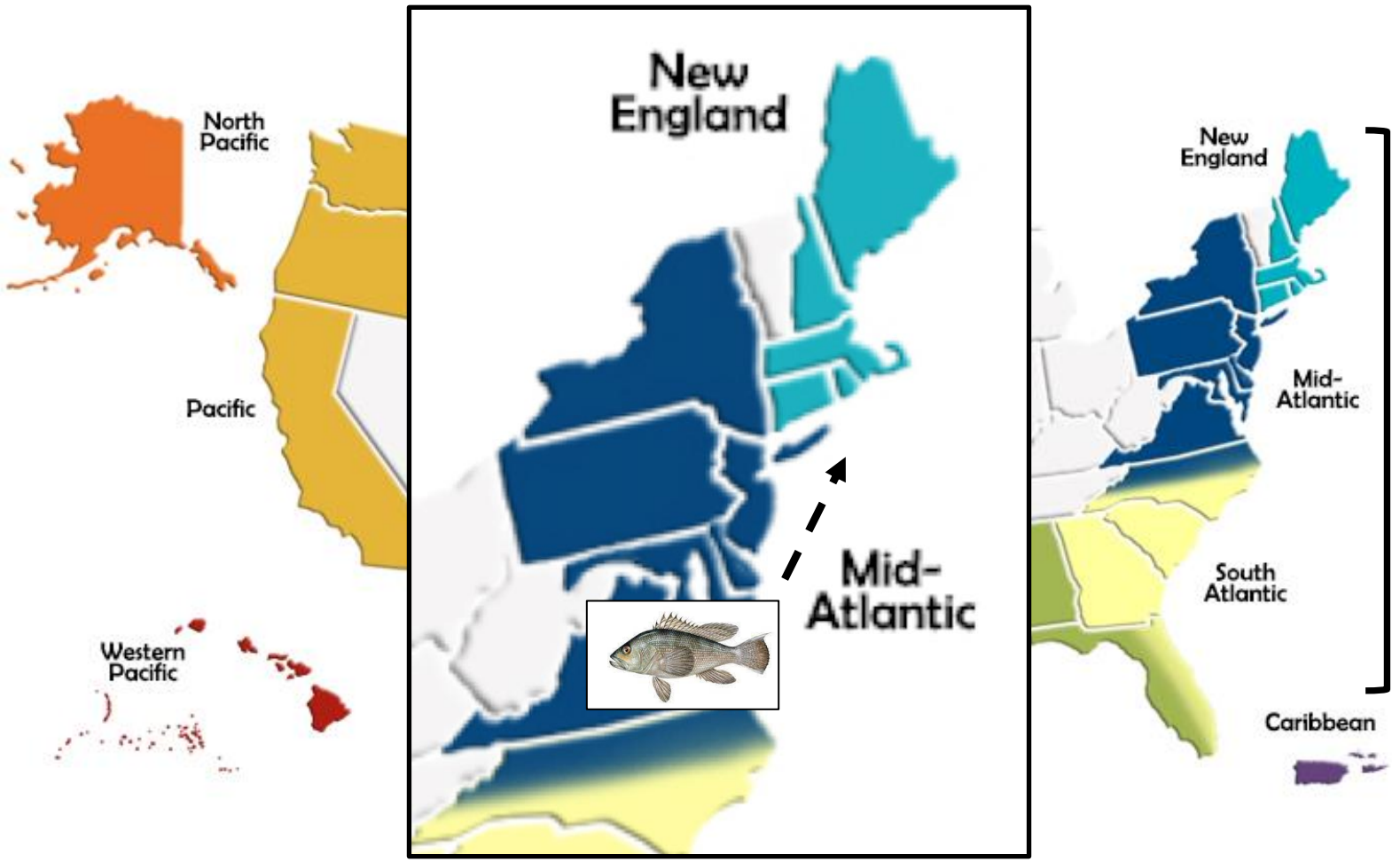
- Should quotas shift to reflect the biology?
- What about the businesses that rely on the system currently?
- What about the new business and economy that could grow in these newly flourishing regions?

Northern States

Southern States

Northern States

Joint Fisheries Management - Federal & Interstate Management



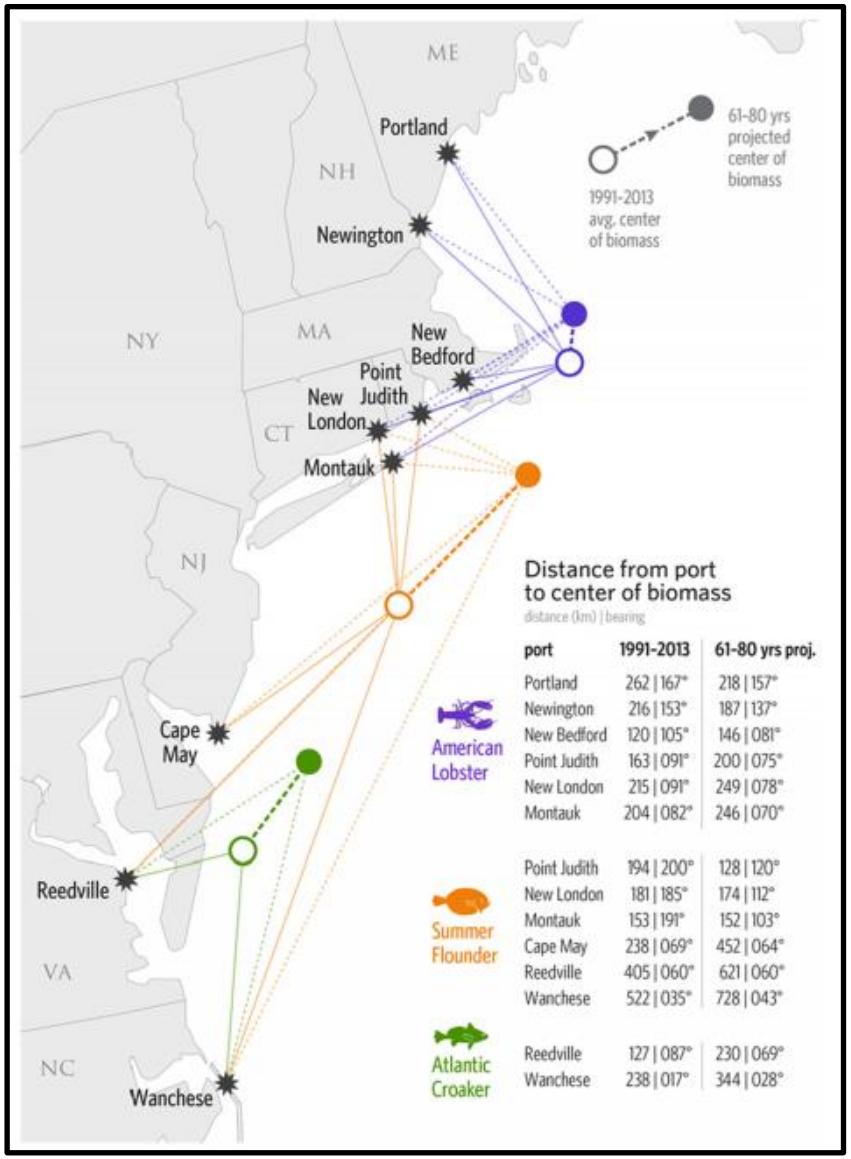
Incremental Change Toward Climate Change Considerations

In 2021, new quota reallocation for states based on historical fishery performances + science on species distribution shifts north

State	Allocations under Amendment 13	New Allocations Using Most Recent Biomass Distribution*	Difference from Amendment 13 to New Allocations
ME	0.50%	0.40%	-0.10%
NH	0.50%	0.40%	-0.10%
MA	13.00%	15.64%	+2.64%
RI	11.00%	13.23%	+2.23%
CT	1.00%	3.67%	+2.67%
NY	7.00%	8.57%	+1.57%
NJ	20.00%	20.10%	+0.10%
DE	5.00%	4.11%	-0.89%
MD	11.00%	8.88%	-2.12%
VA	20.00%	16.14%	-3.86%
NC	11.00%	8.88%	-2.12%
Total	**100.00%**	**100.00%**	

Summary

- Rhode Island marine ecosystems are changing.
- These changes impact end users of Rhode Island, such as those of and reliant on commercial and recreational fisheries.
- Fisheries science is a critical component of the management process!
- Time to rethink fisheries management under a changing climate.



Thank You!

With any questions or inquires, please reach me at
conor.mcmanus@dem.ri.gov