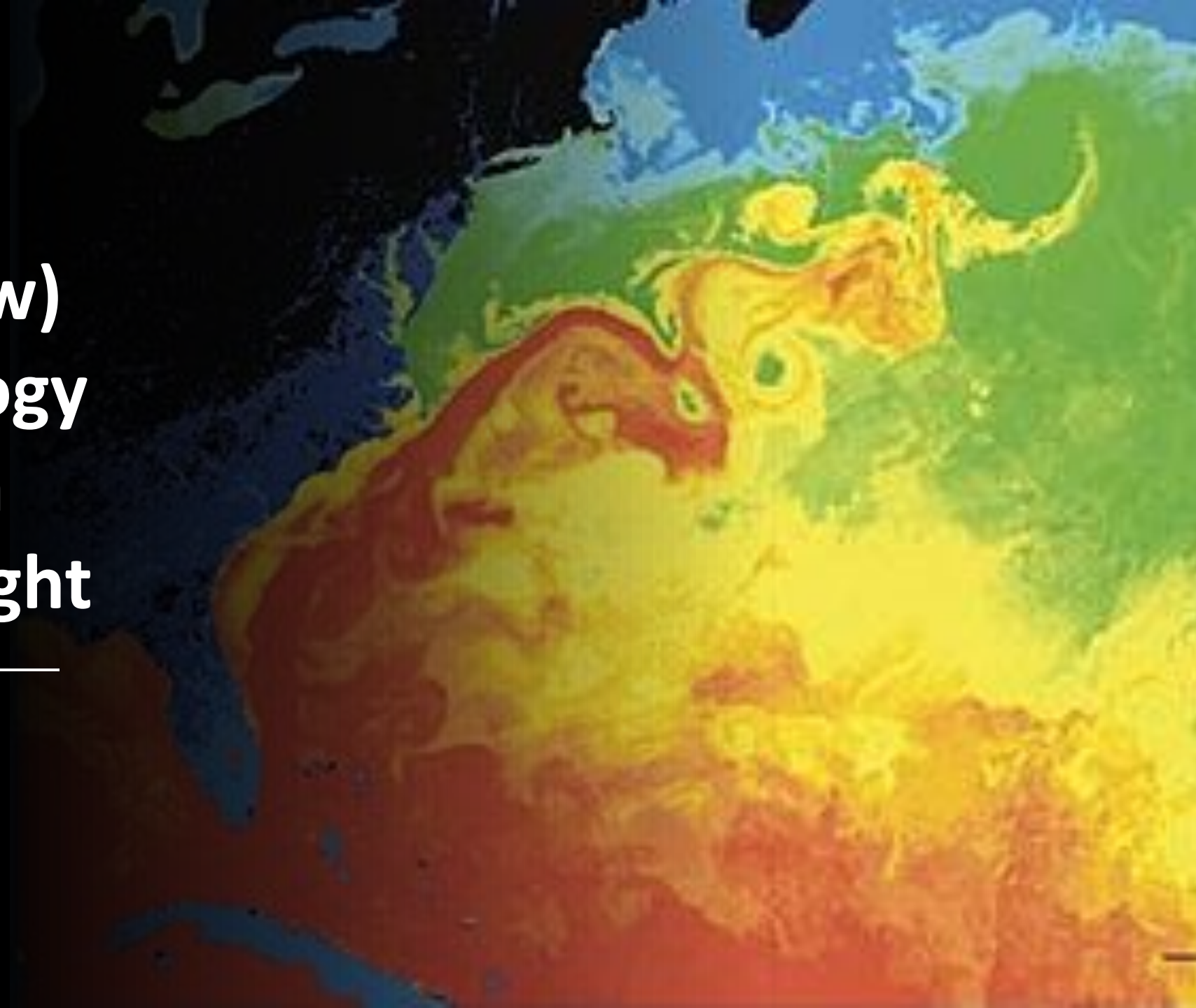
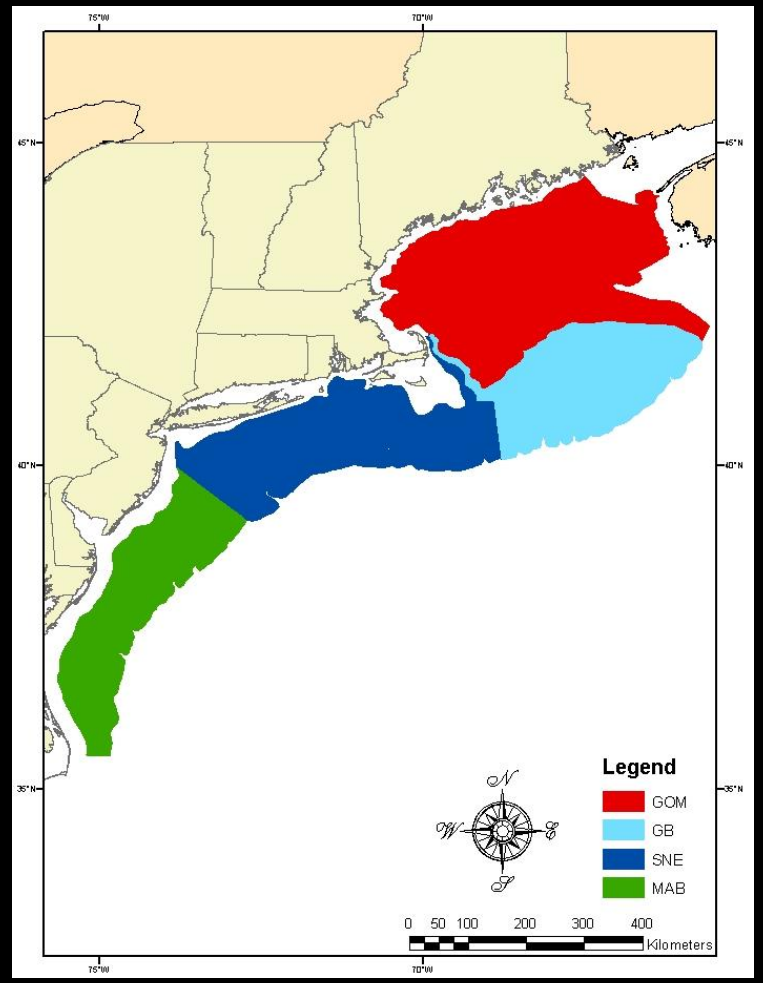
What we know (and don’t know) about the ecology of the southern Mid-Atlantic Bight



Dr. Janet Nye
UNC Chapel Hill
Department of Earth Marine and Environmental Sciences Institute of Marine Sciences

Setting the Stage



(Lucey & Nye 2010)

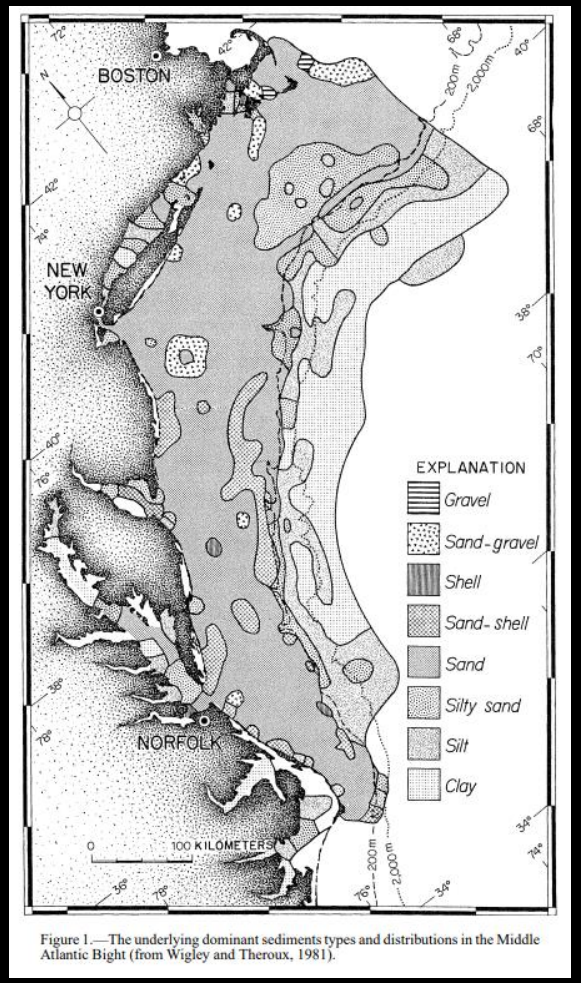


Figure 1.—The underlying dominant sediments types and distributions in the Middle Atlantic Bight (from Wigley and Theroux, 1981).

(from Wigley and Theroux, 1981)

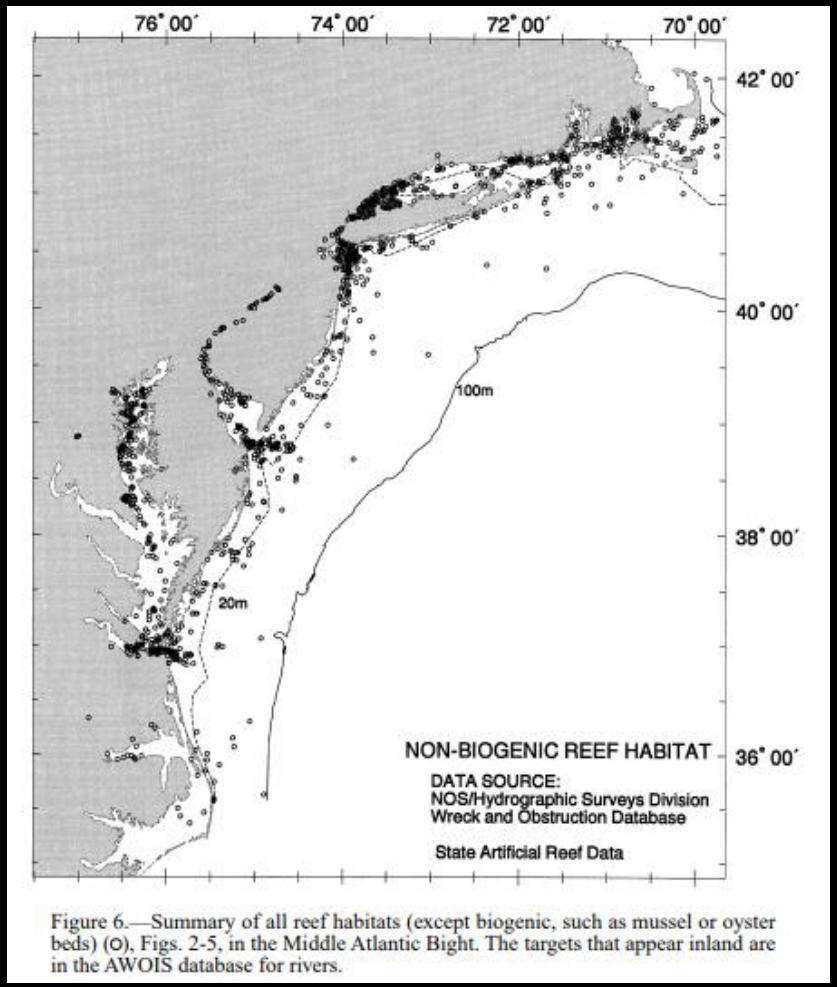
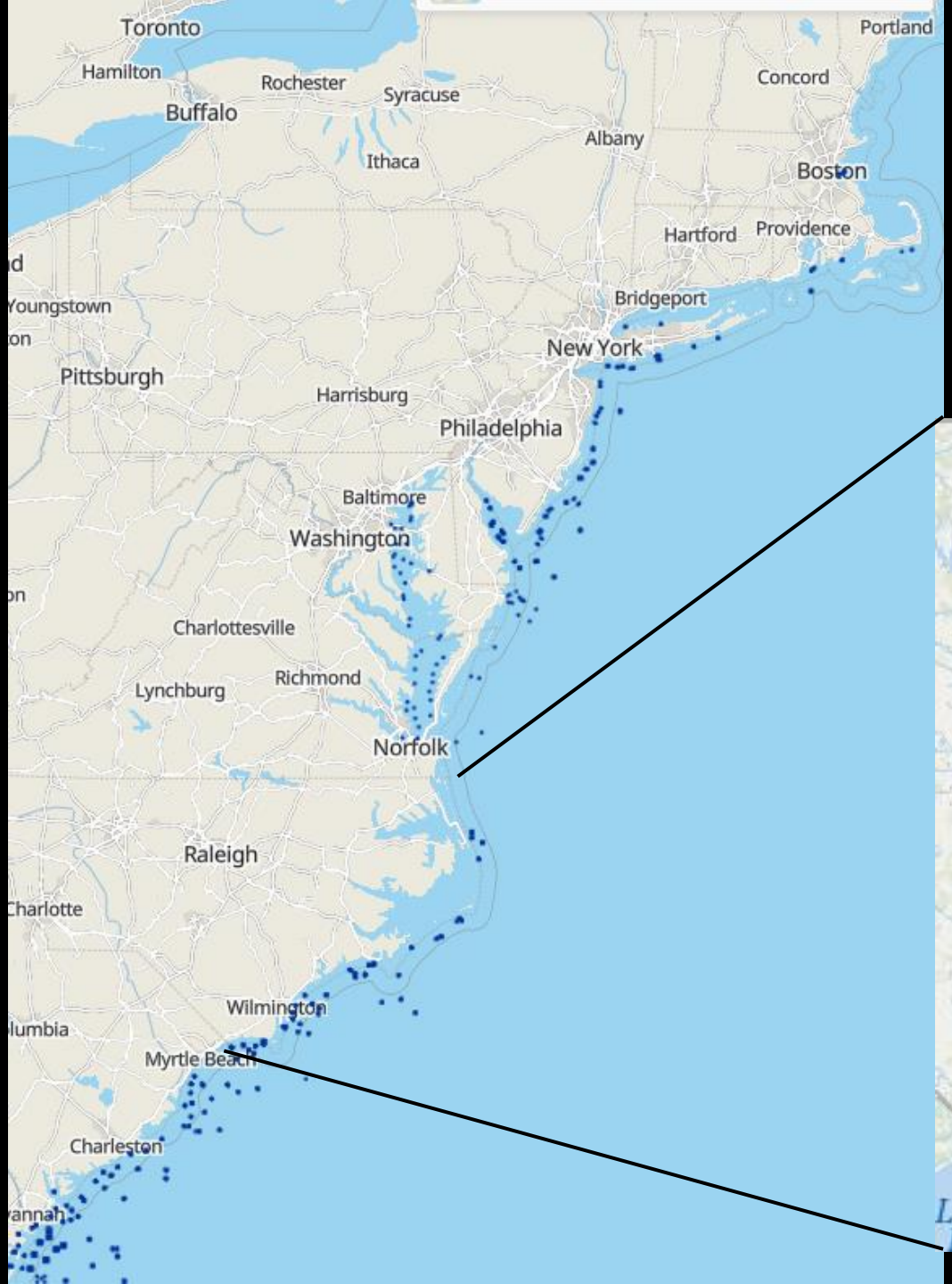
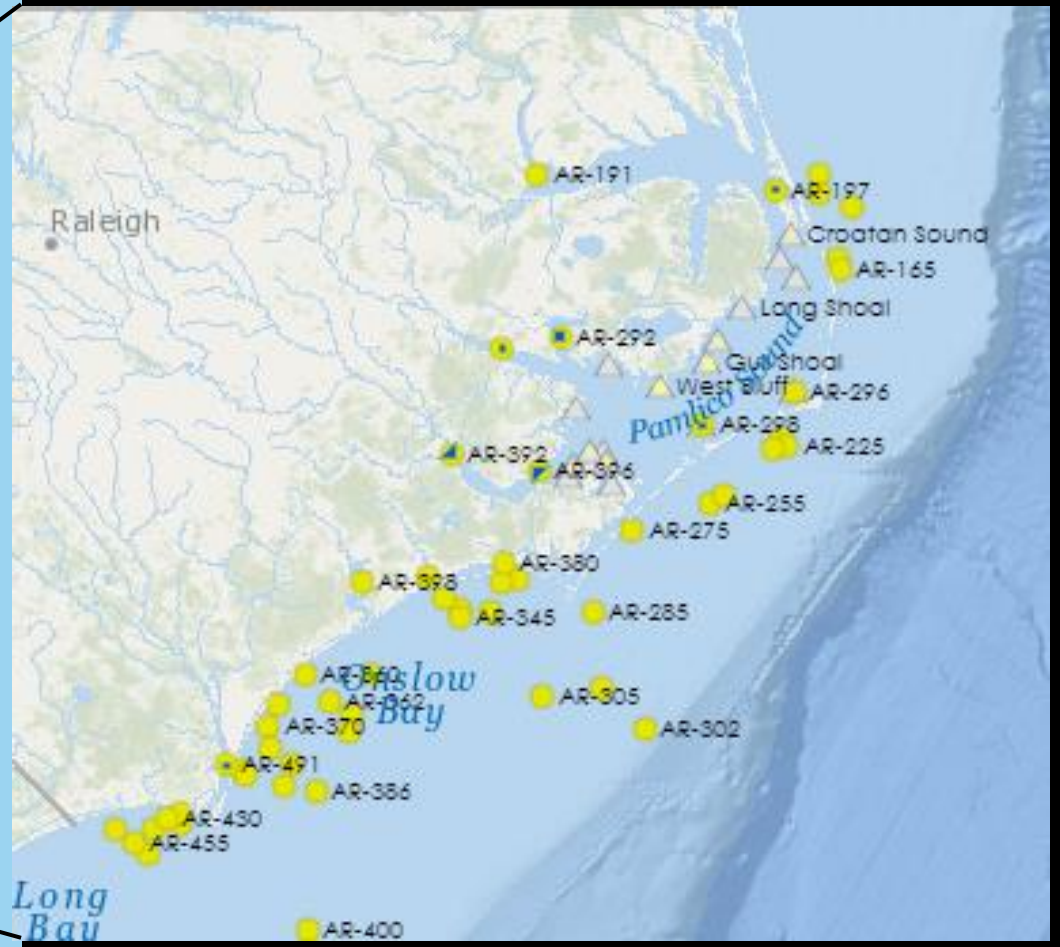


Figure 6.—Summary of all reef habitats (except biogenic, such as mussel or oyster beds) (O), Figs. 2-5, in the Middle Atlantic Bight. The targets that appear inland are in the AWOIS database for rivers.

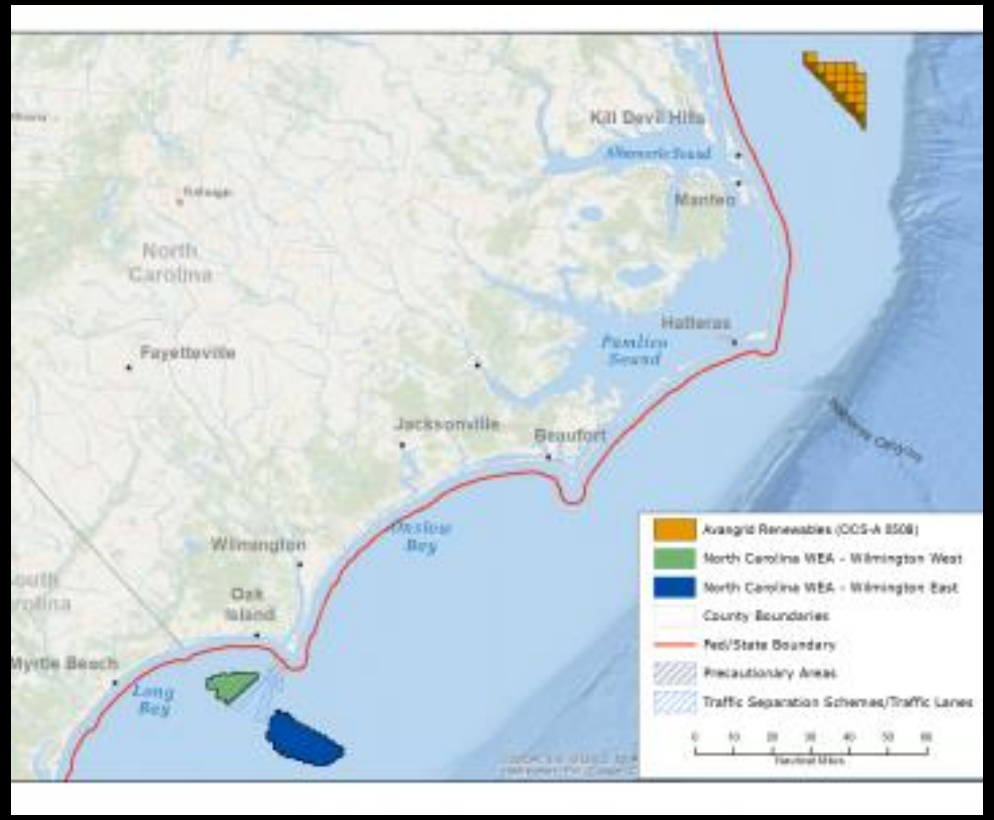
Steimle and Zetlin 2000. Reef Habitats in the Middle Atlantic Bight

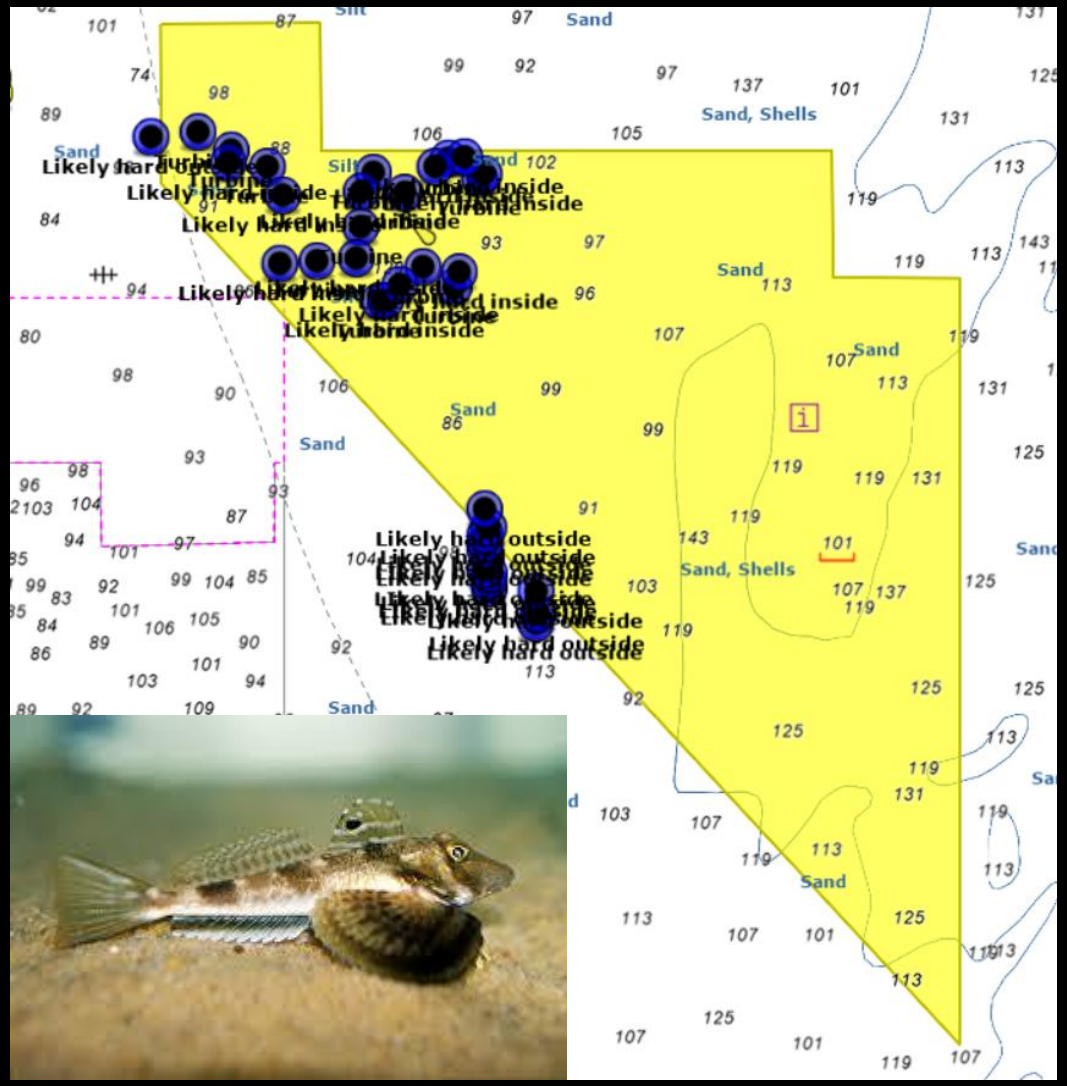
Artificial reef habitat





Lack of reef habitat





Low nutrients, low benthic diversity

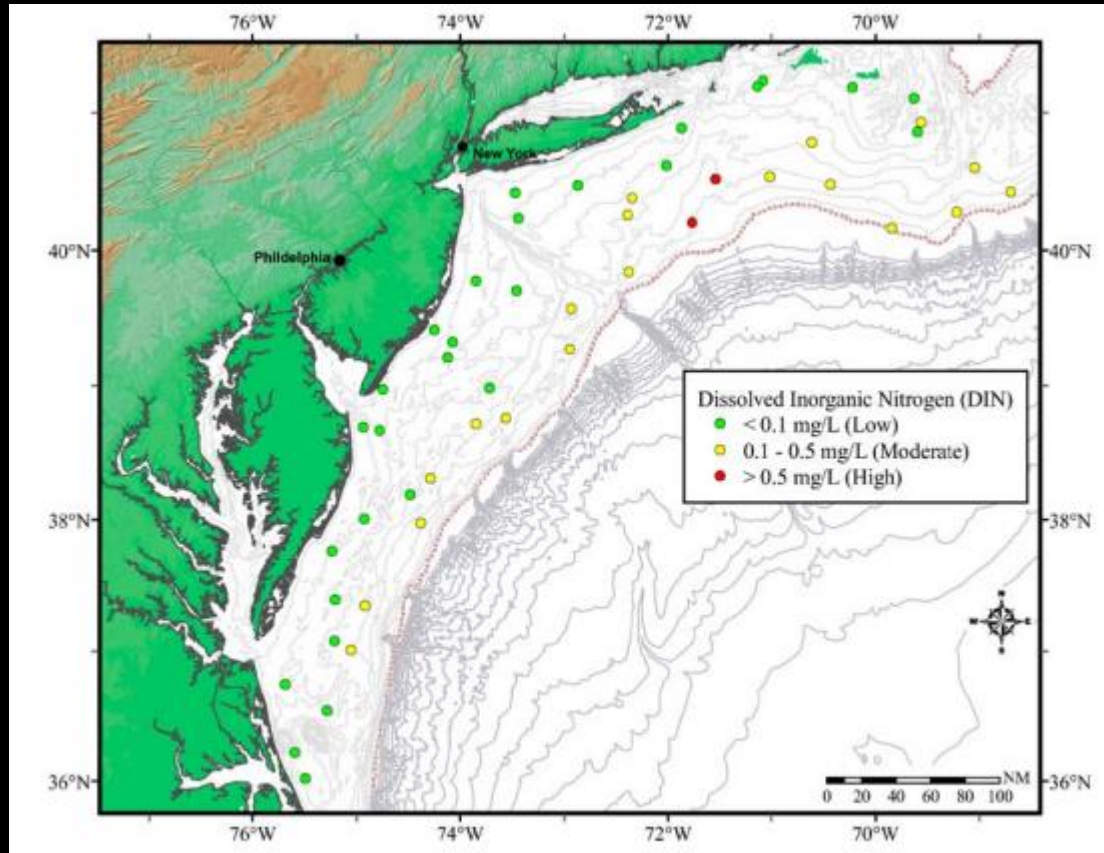


Figure 4. Map of study area showing distribution of DIN in bottom water.

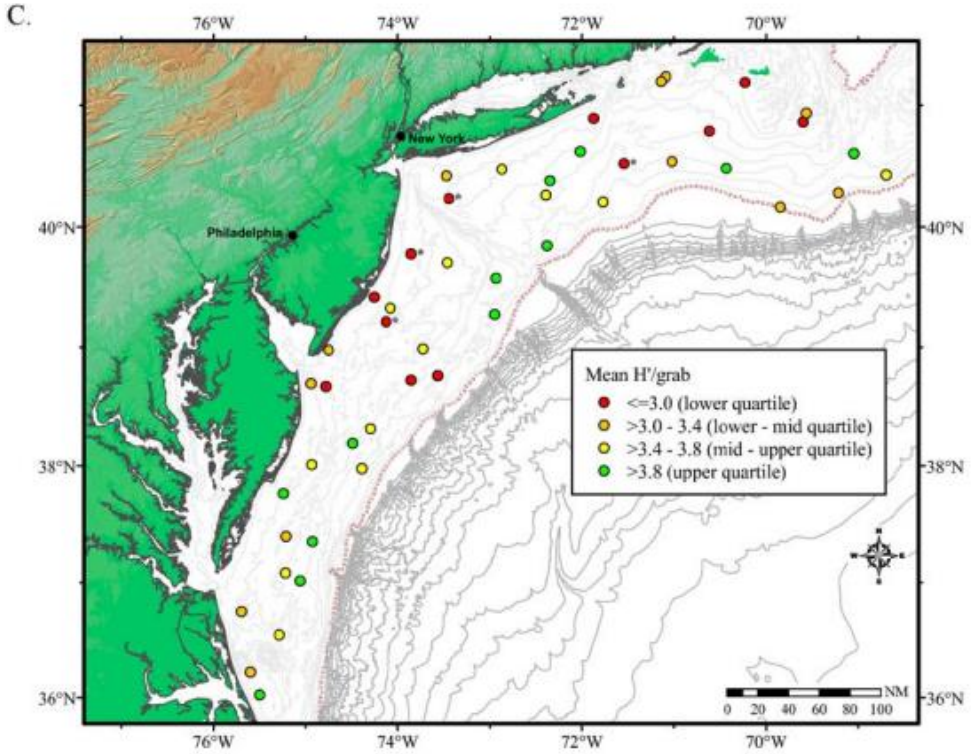
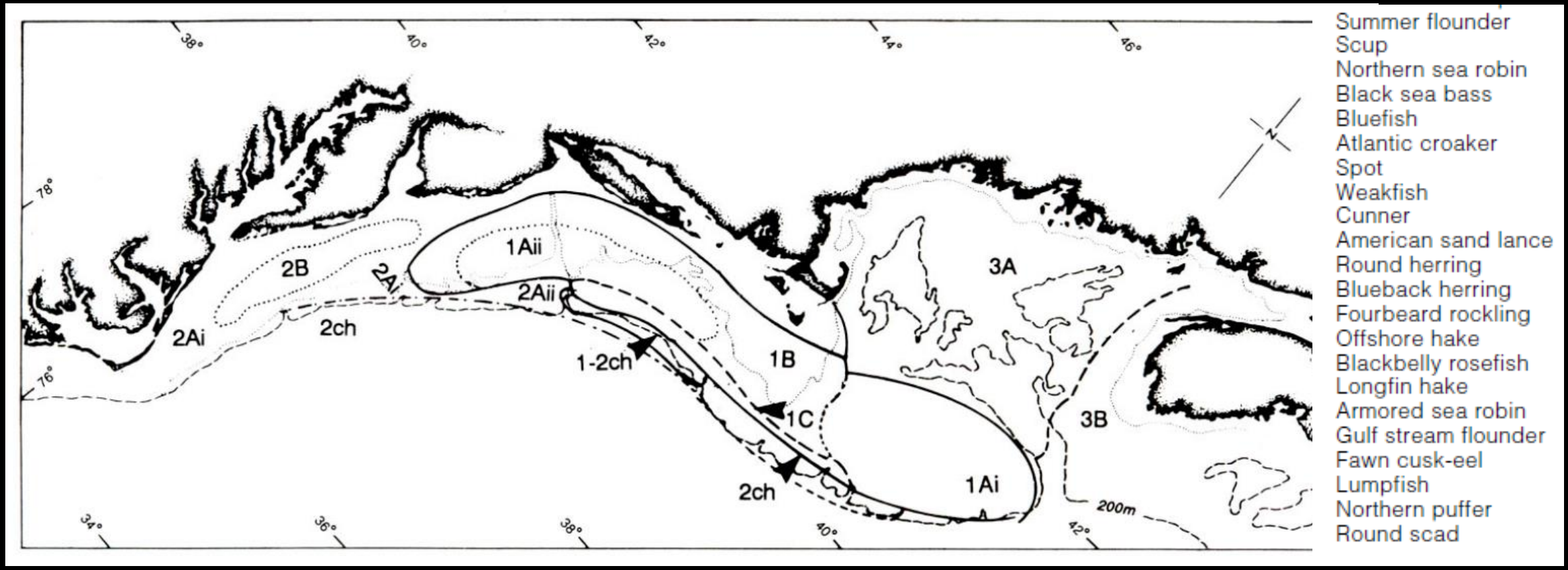


Figure 14. C. Spatial distribution of benthic taxonomic diversity (mean H′/0.04 m^2). Values within the lower 10^{th} percentile of all values are also flagged with an asterisk (*).

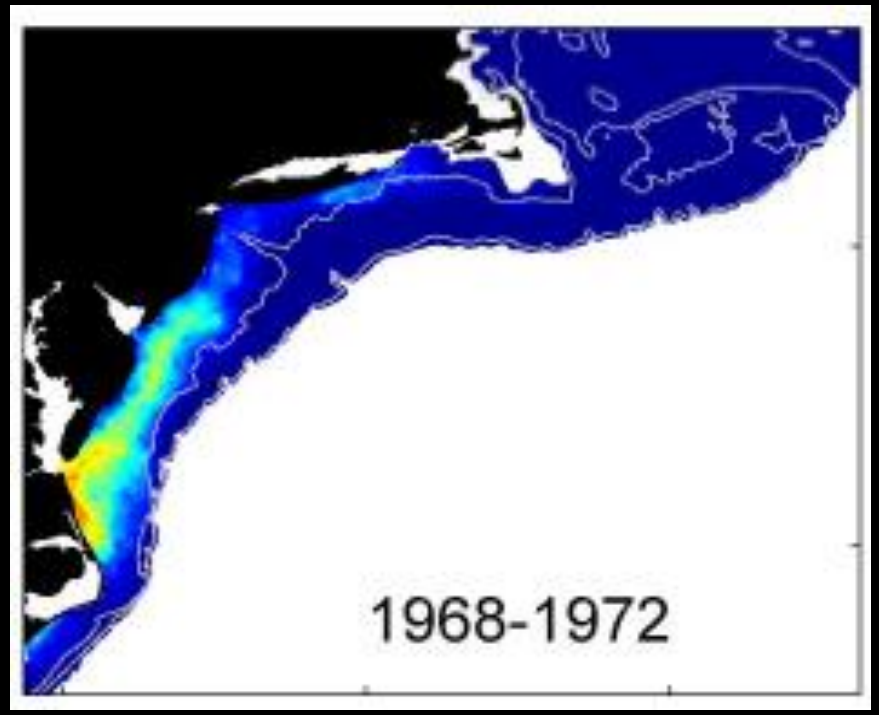
Balthis et al. 2009. Ecological Condition of Coastal Ocean Waters Along the U.S. Mid-Atlantic Bight: 2006. National Oceanic and Atmospheric Administration, Ann Arbor, MI, EPA/600/R-09/159, 2009.

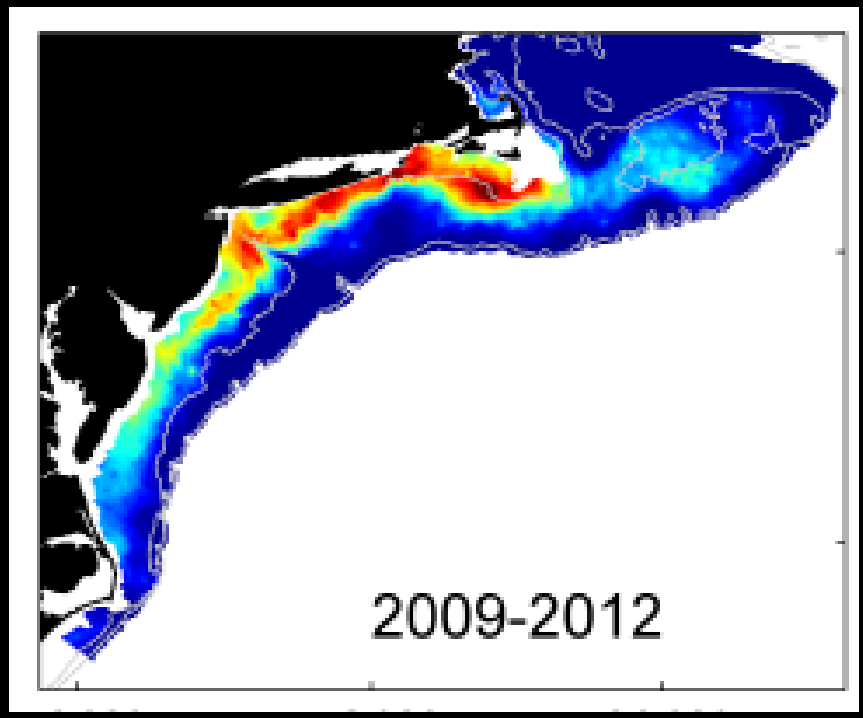
Persistent (but shifty) species assemblage in sMAB, (1967-1988)

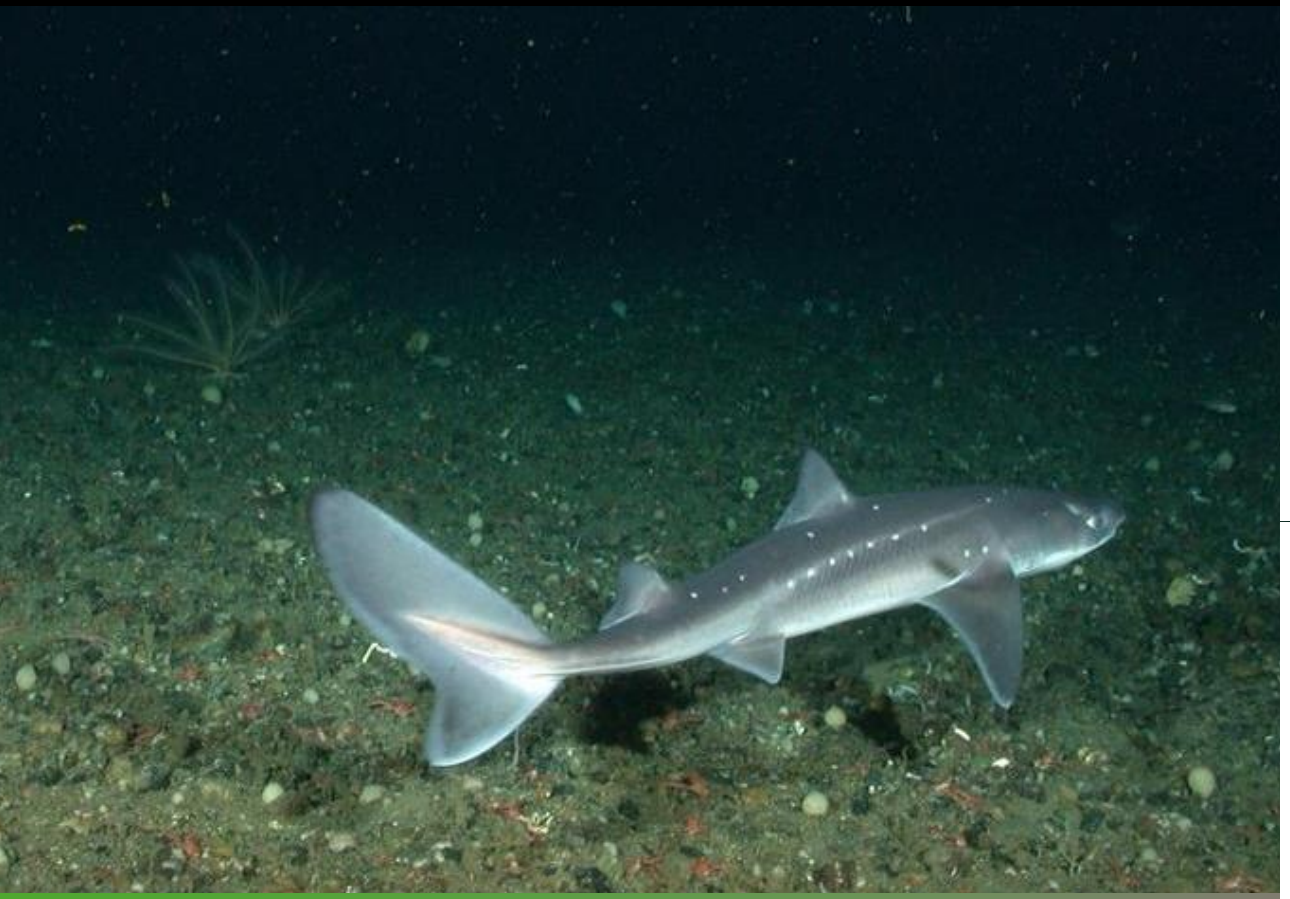


Gabriel 1992

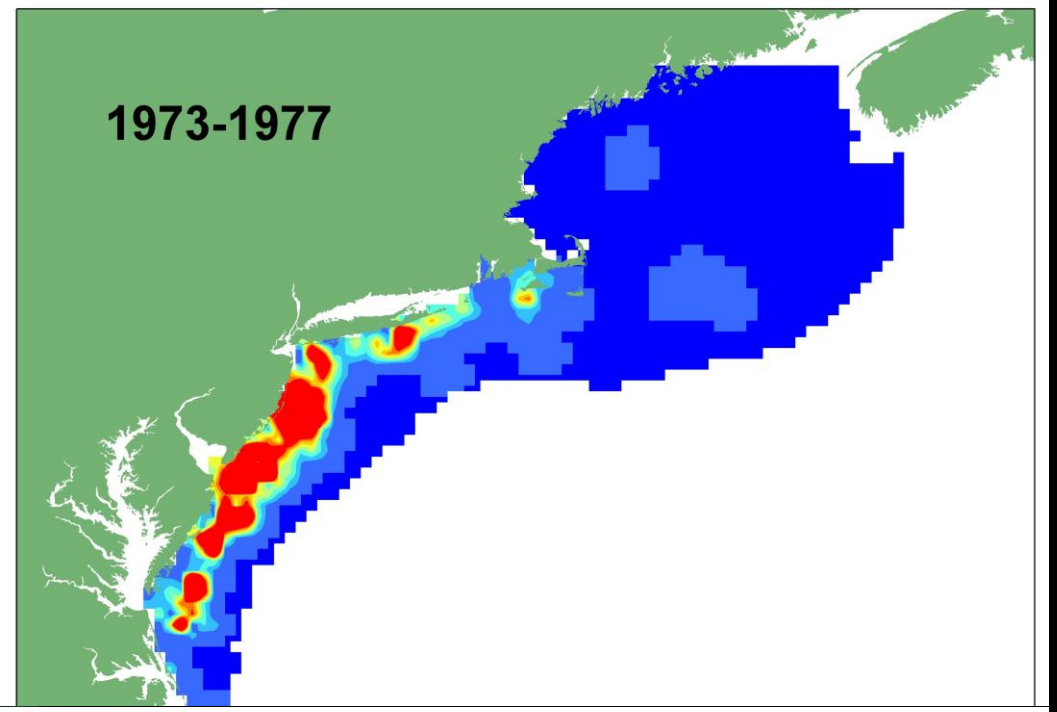
Change in fish community over time

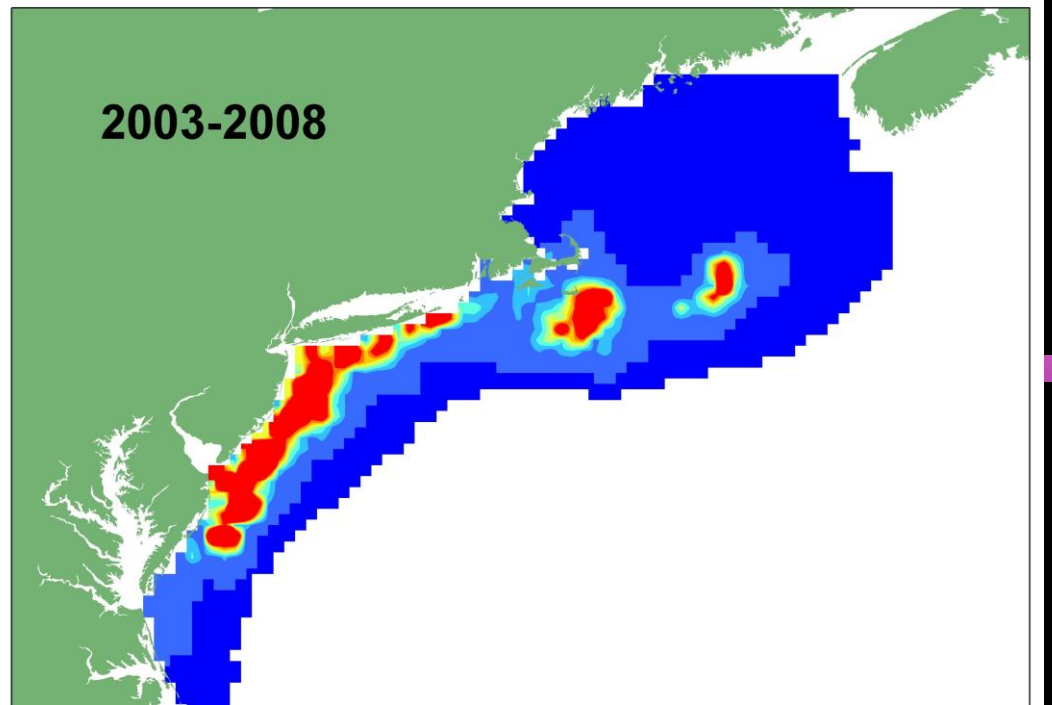




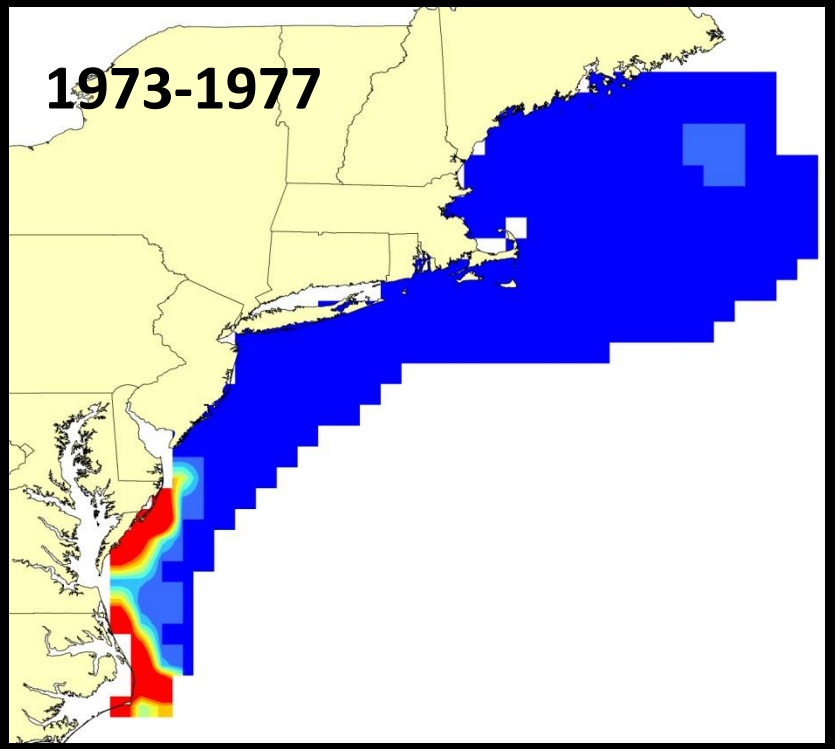


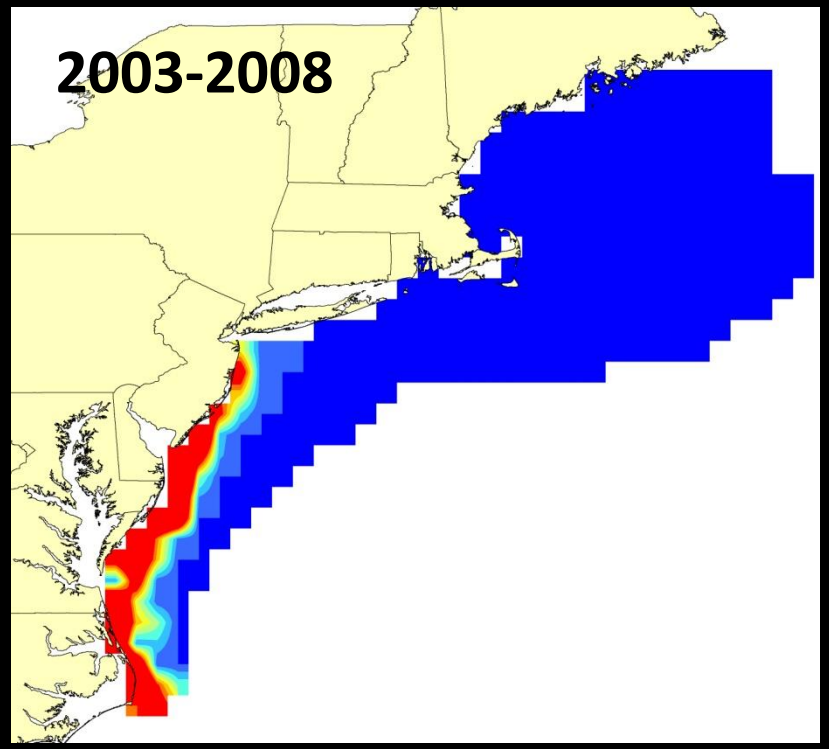
Smooth dogfish





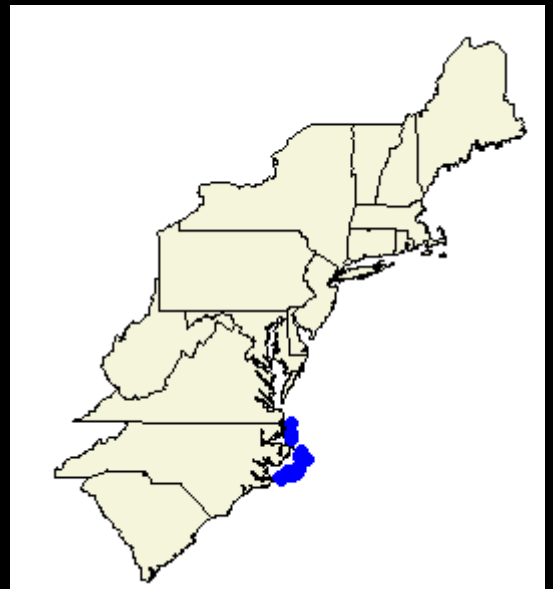
Atlantic croaker

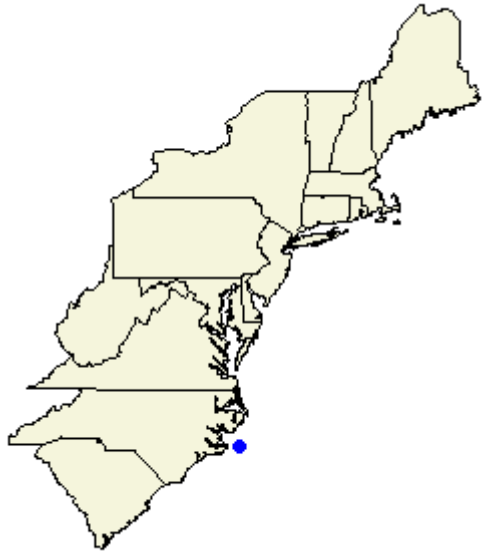




Banded drum

Before 2000

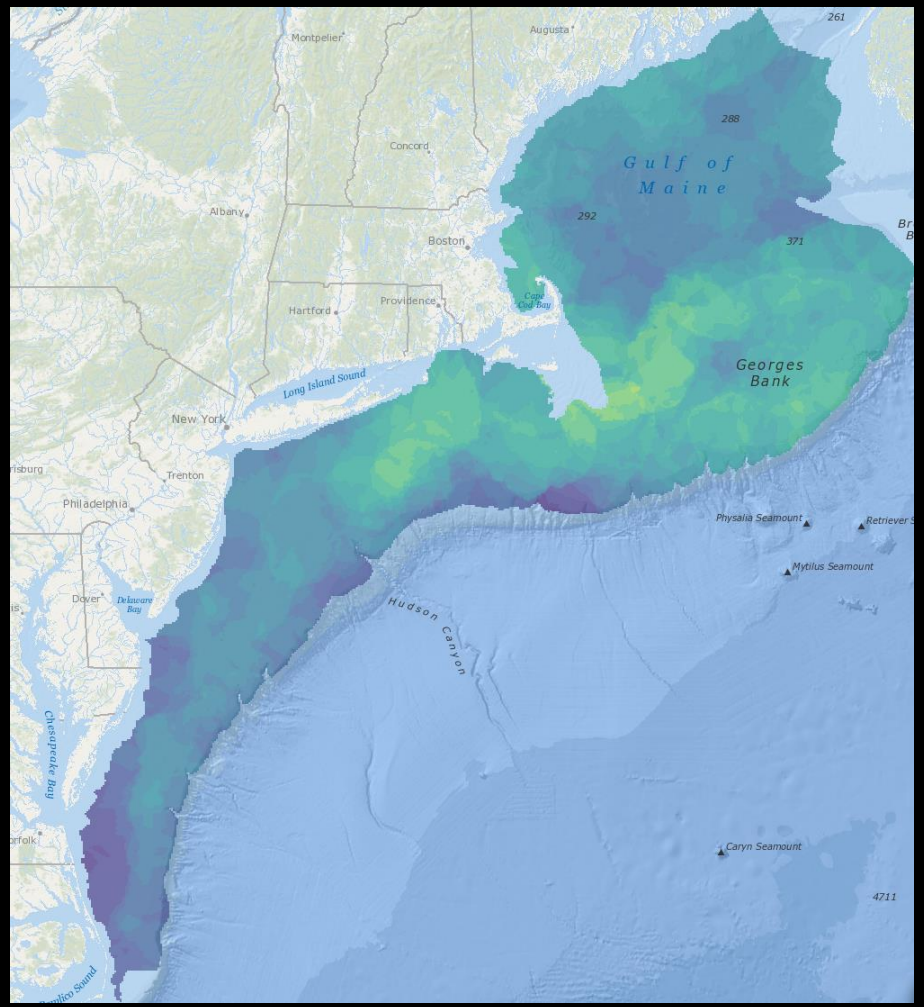


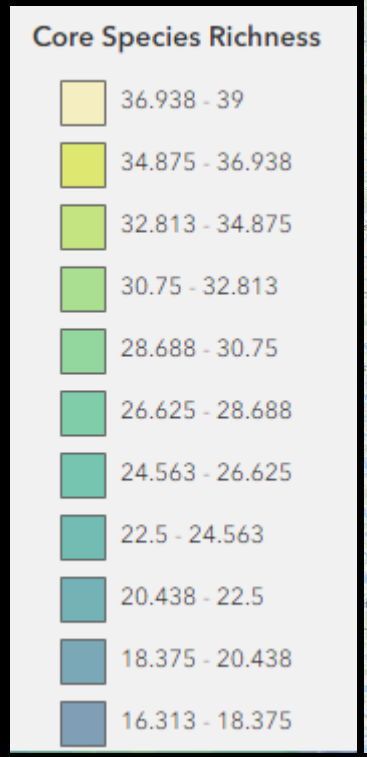


After 2000

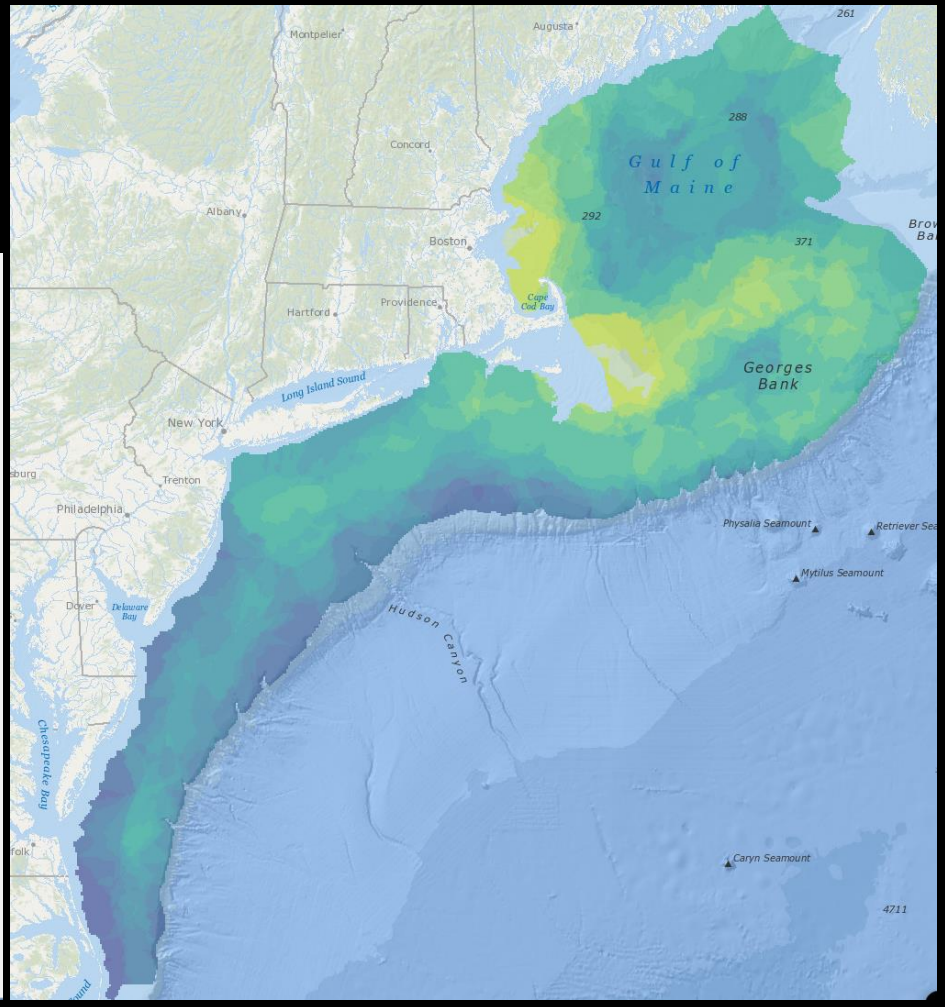
Predicted species richness

1974





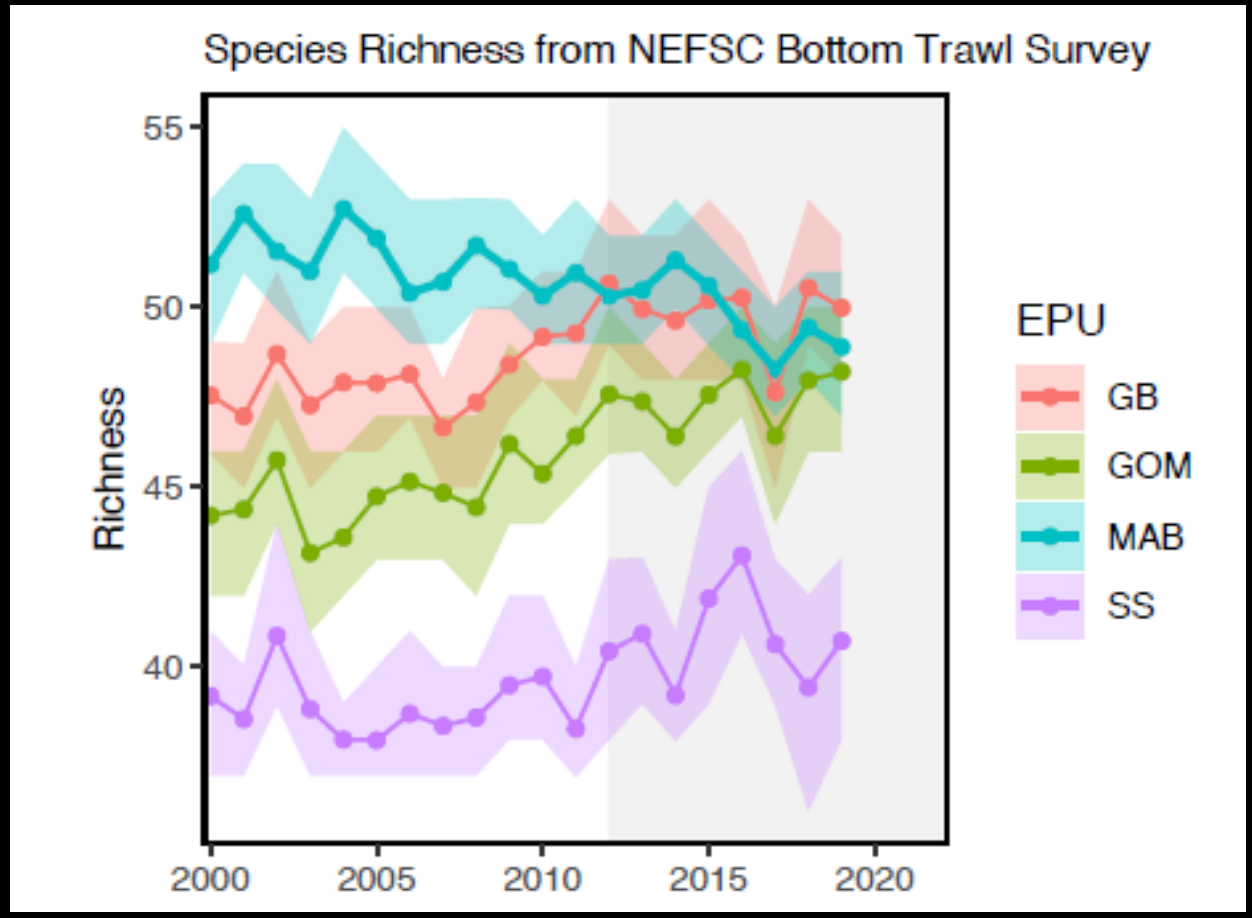
2024



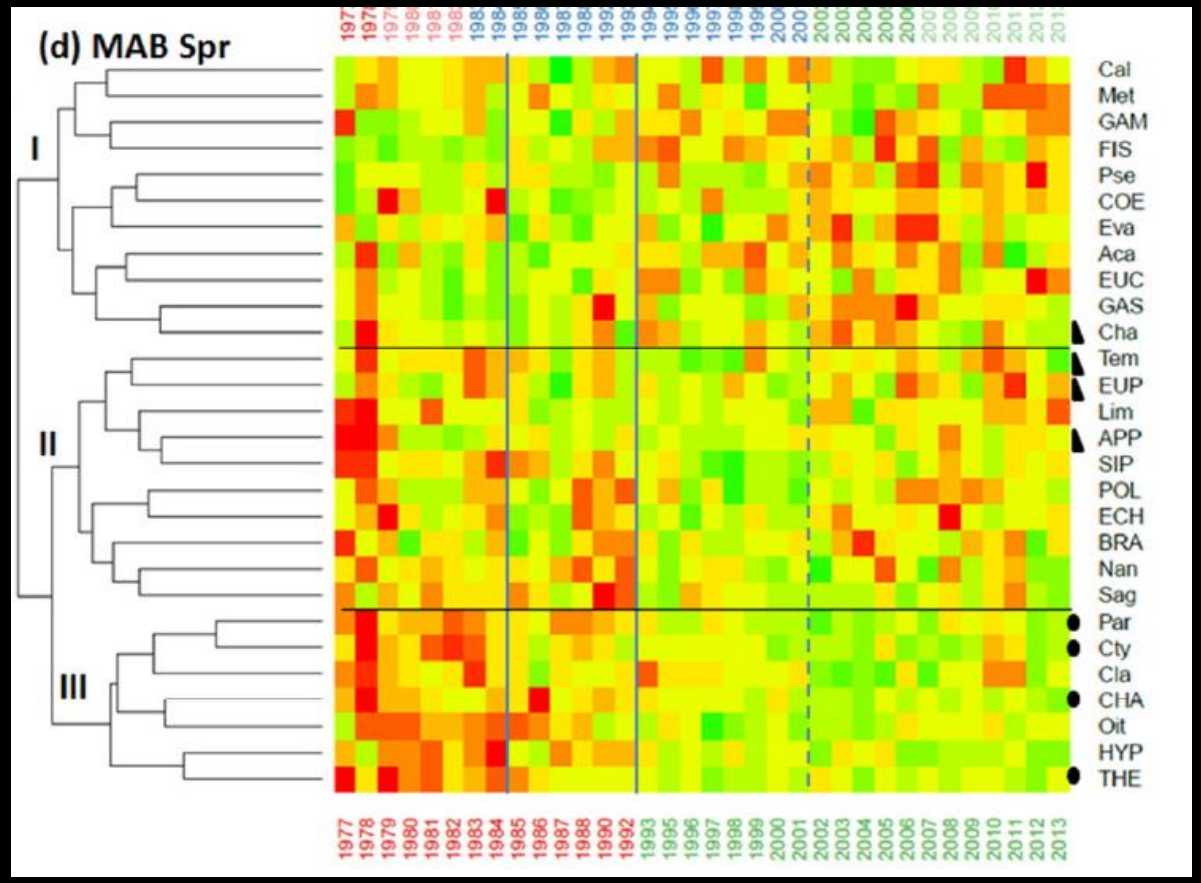
https://apps-st.fisheries.noaa.gov/dismap/DisMAP.html

Are these declines in species richness in the sMAB real?

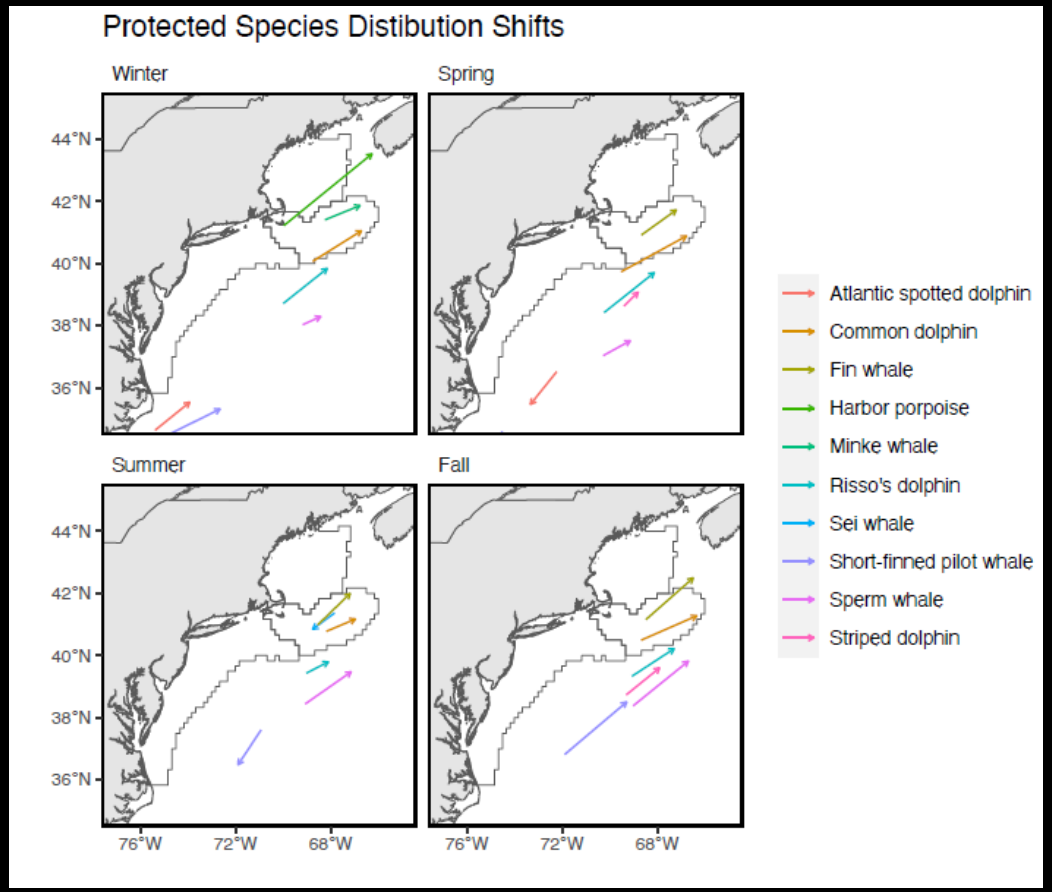
- Declines in species richness in MAB (2000-2019)
- Increases in richness north of MAB
- But based on only 55 most common species, most of which are not SAB or MAB species



Shifts from zooplankton to top predators



- Morse et al. 2017

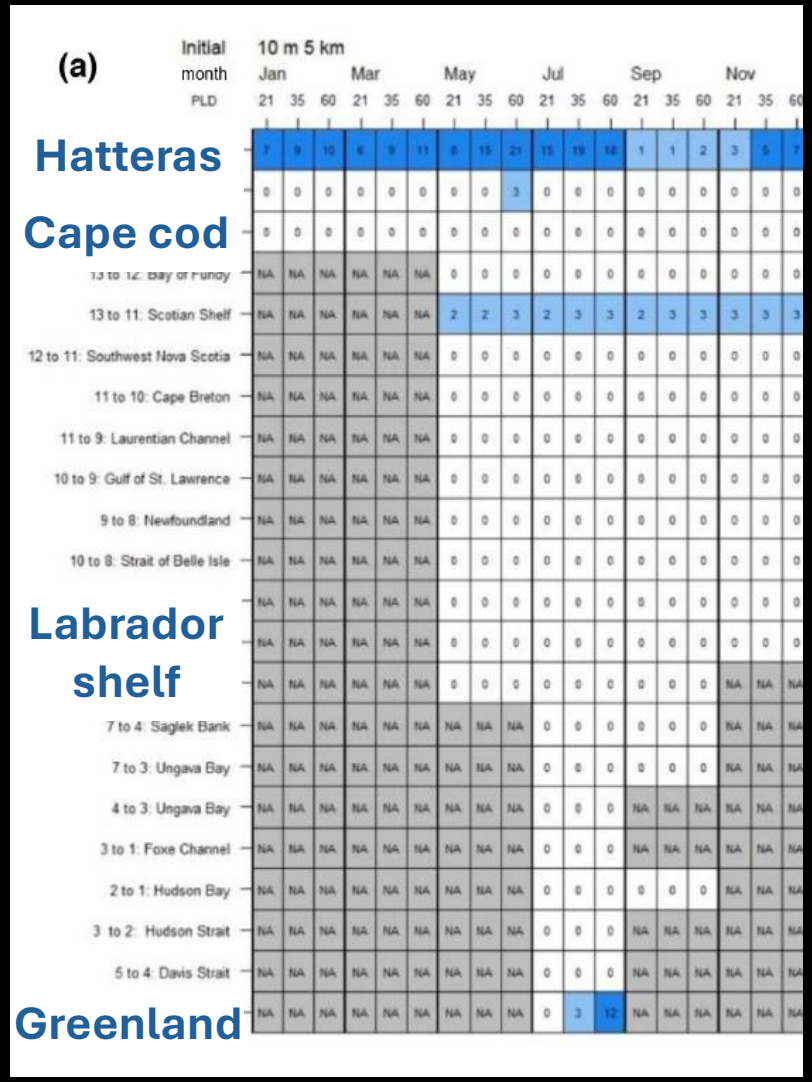


Lance Garrison (NOAA NMFS)

How permeable is the SAB to MAB?

SOUTH

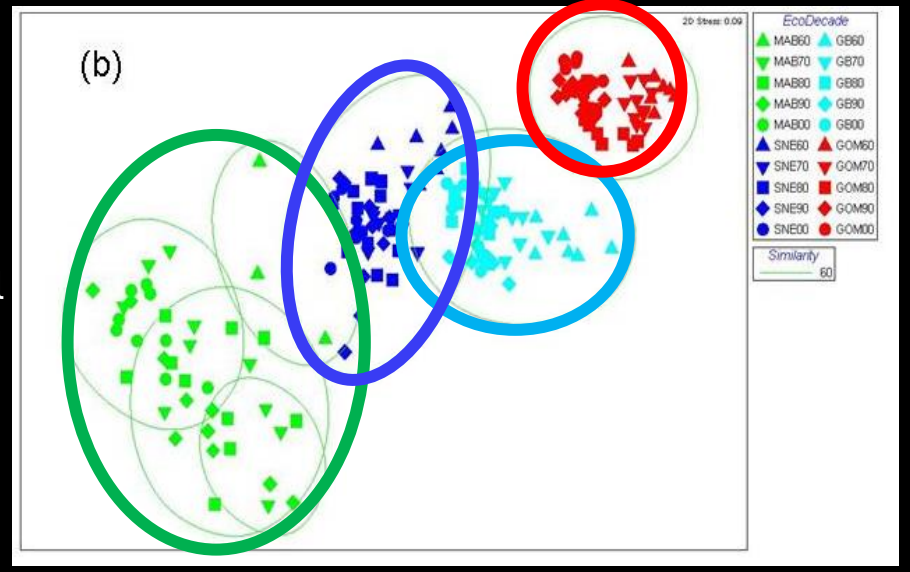
NORTH



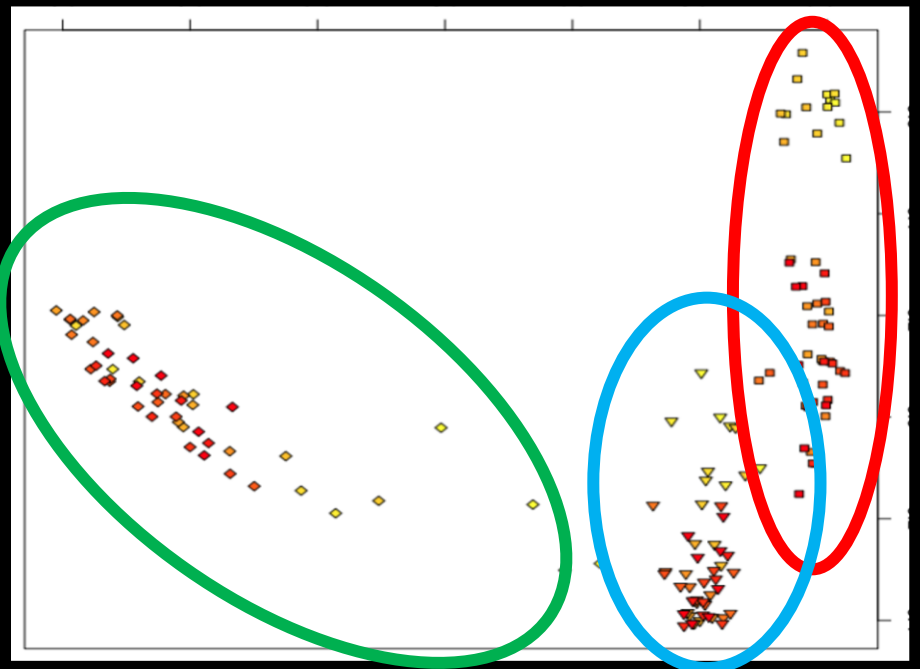
Krumhansl et al. 2023

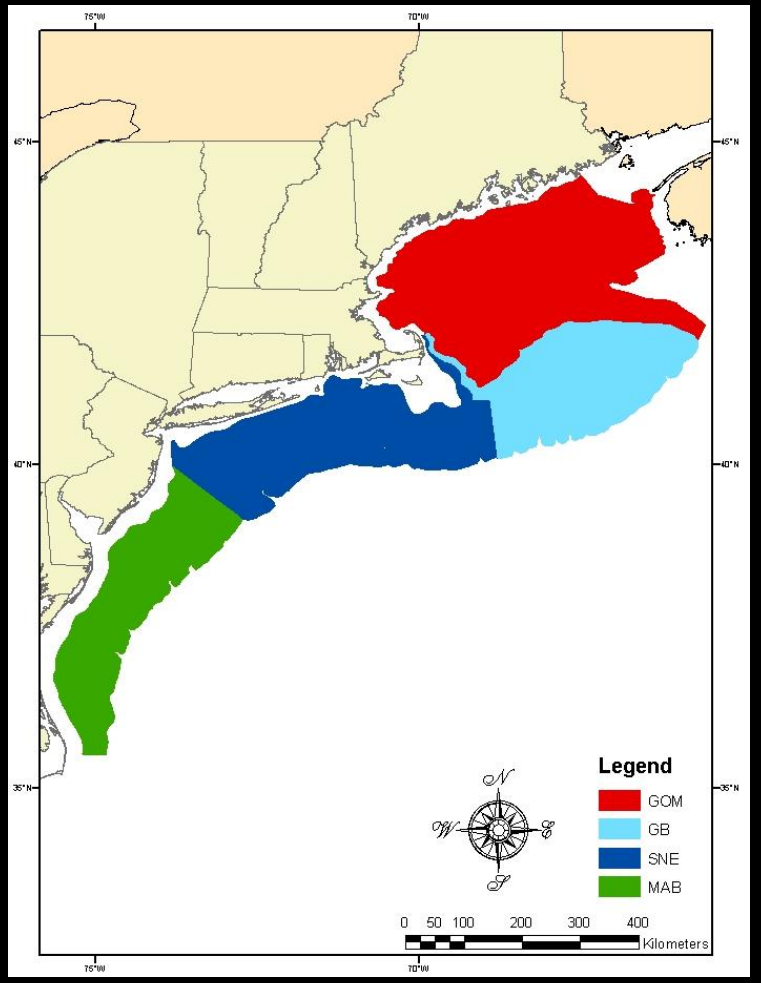
Shifts in community assemblage

Non-metric Multidimensional scaling



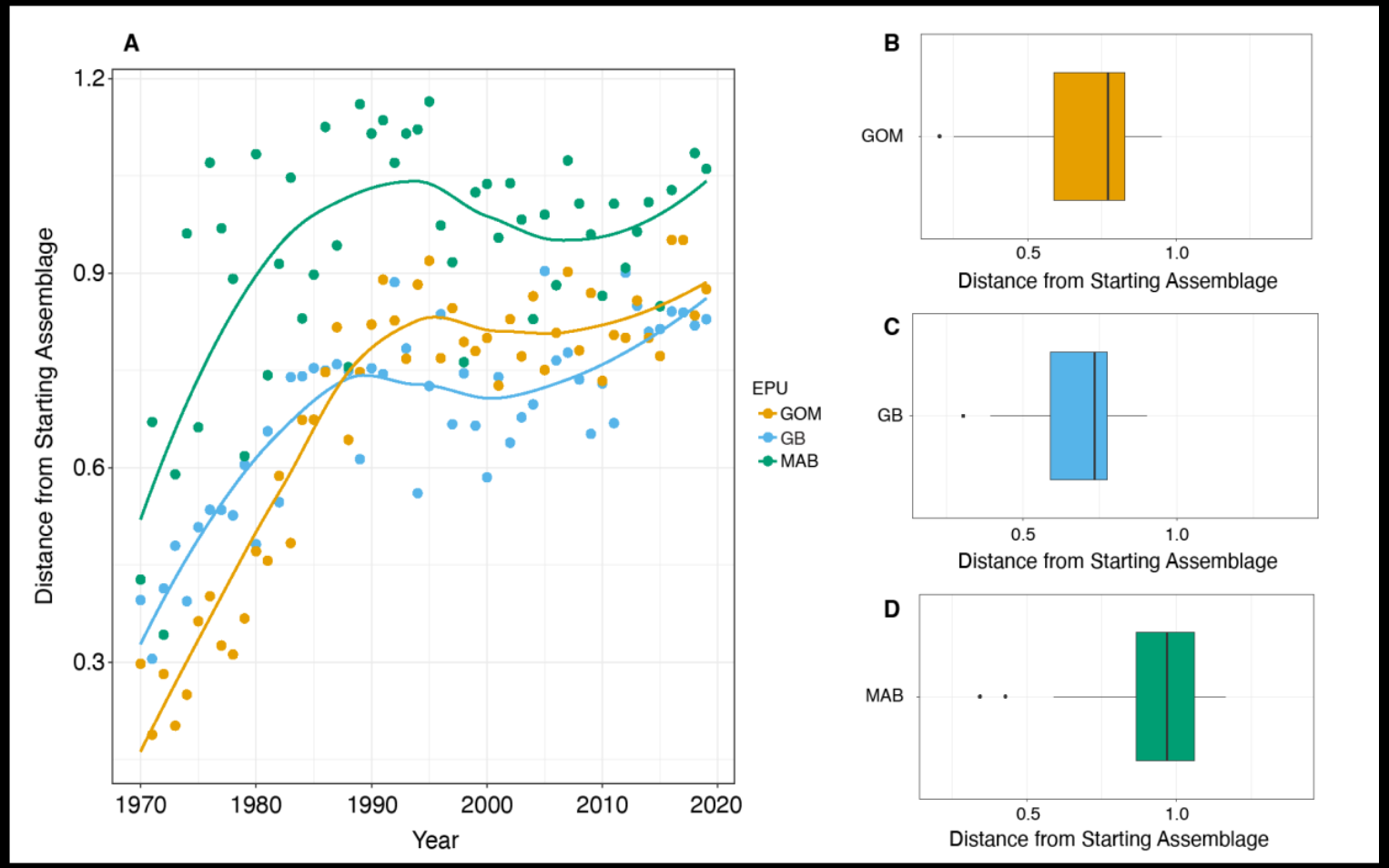
Community trajectory analysis





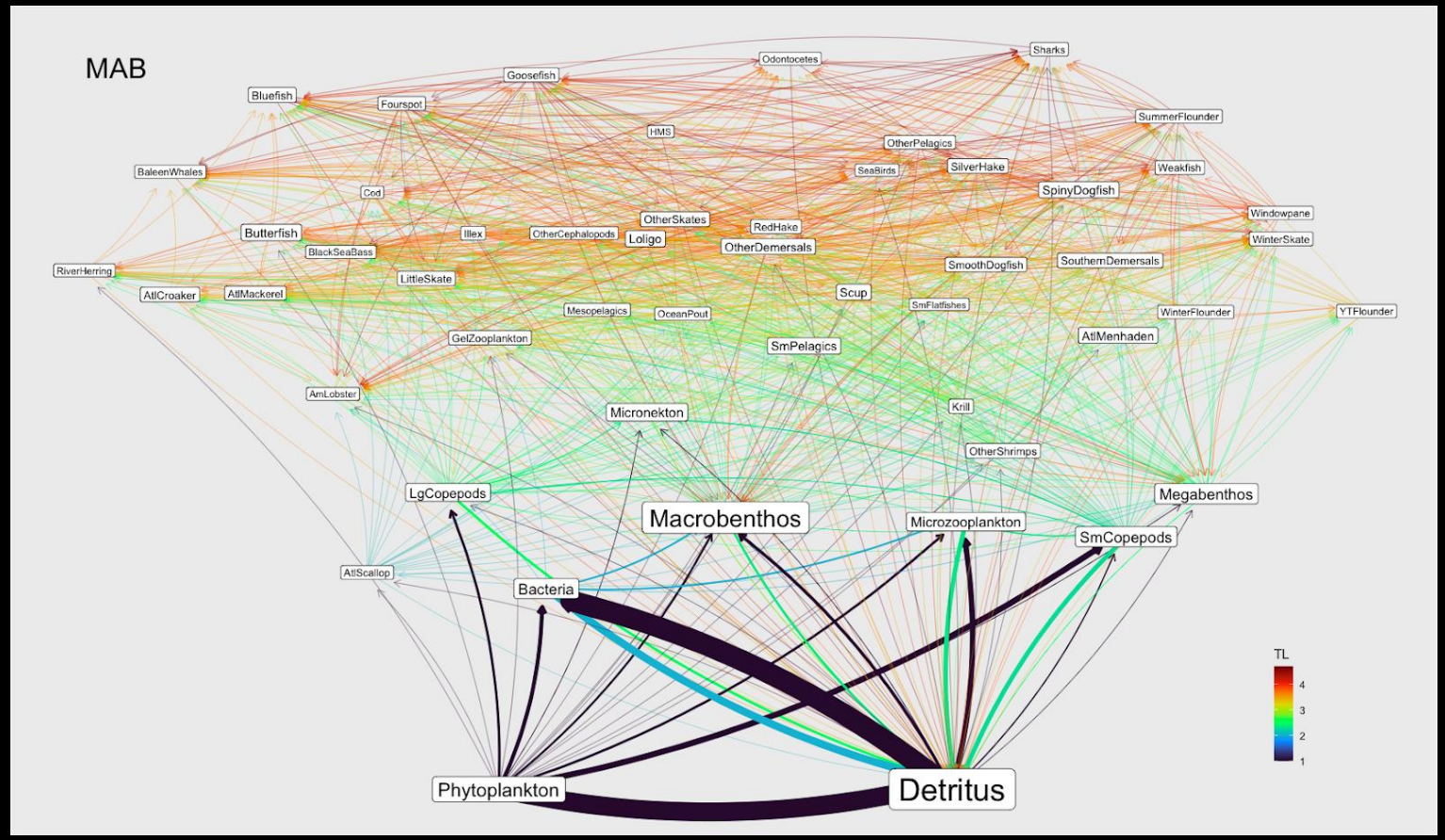
(Lucey & Nye 2010, Kleisner et al. 2016)

A resilient, but dynamic system



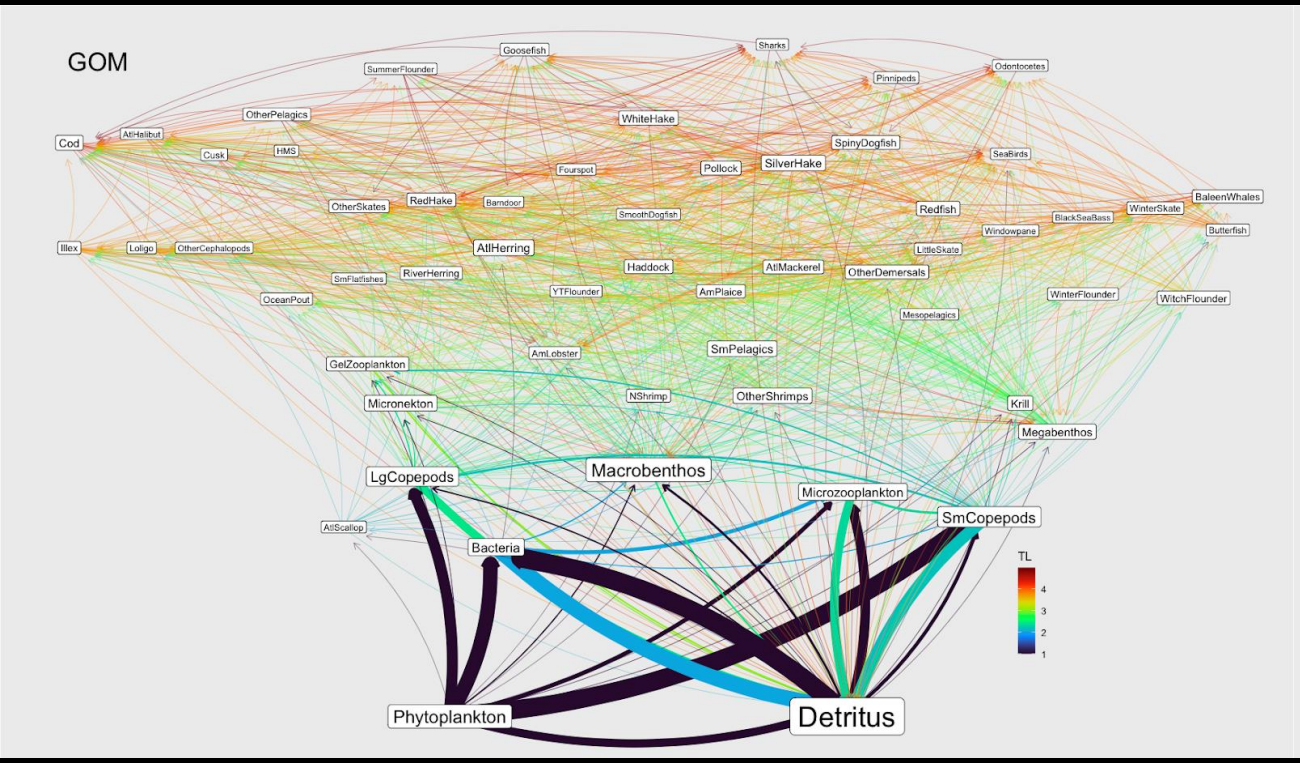
Fenwick et al .2024 Marine Ecology Progress Series

Food web

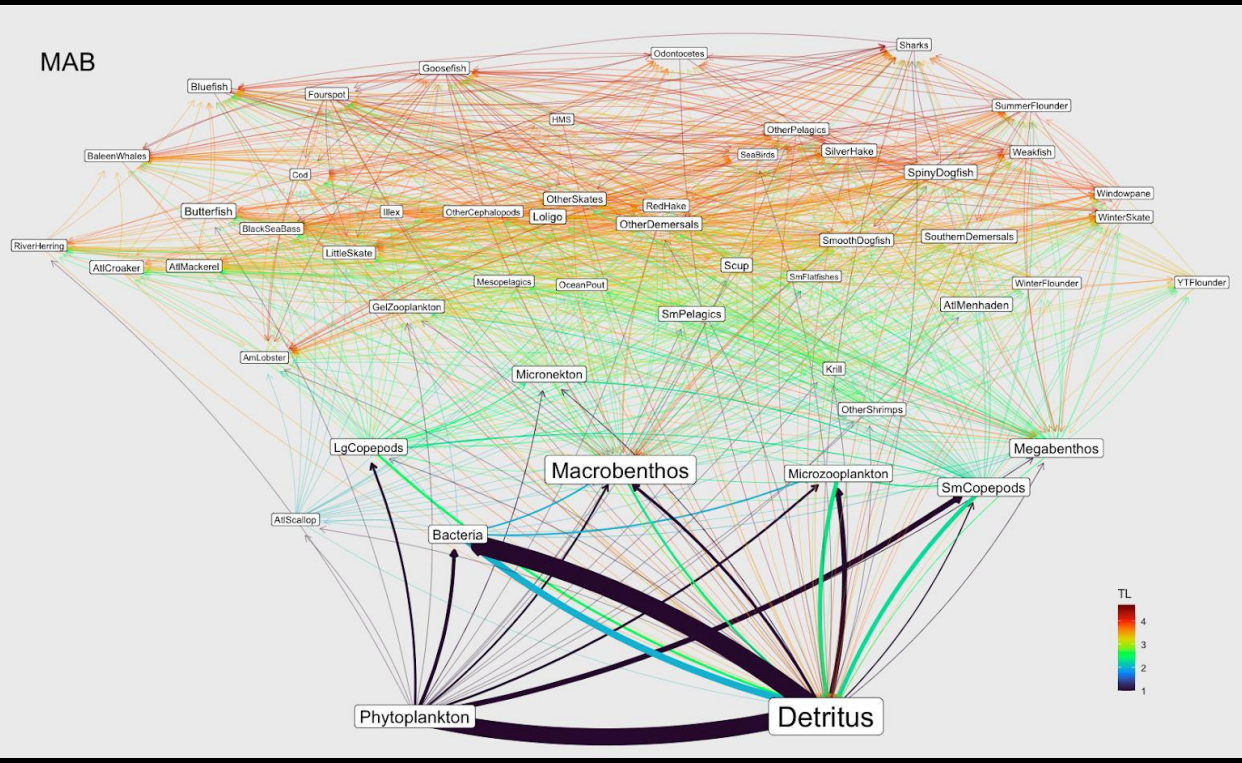


Max Grezlik, Umass Dartmouth

Food web

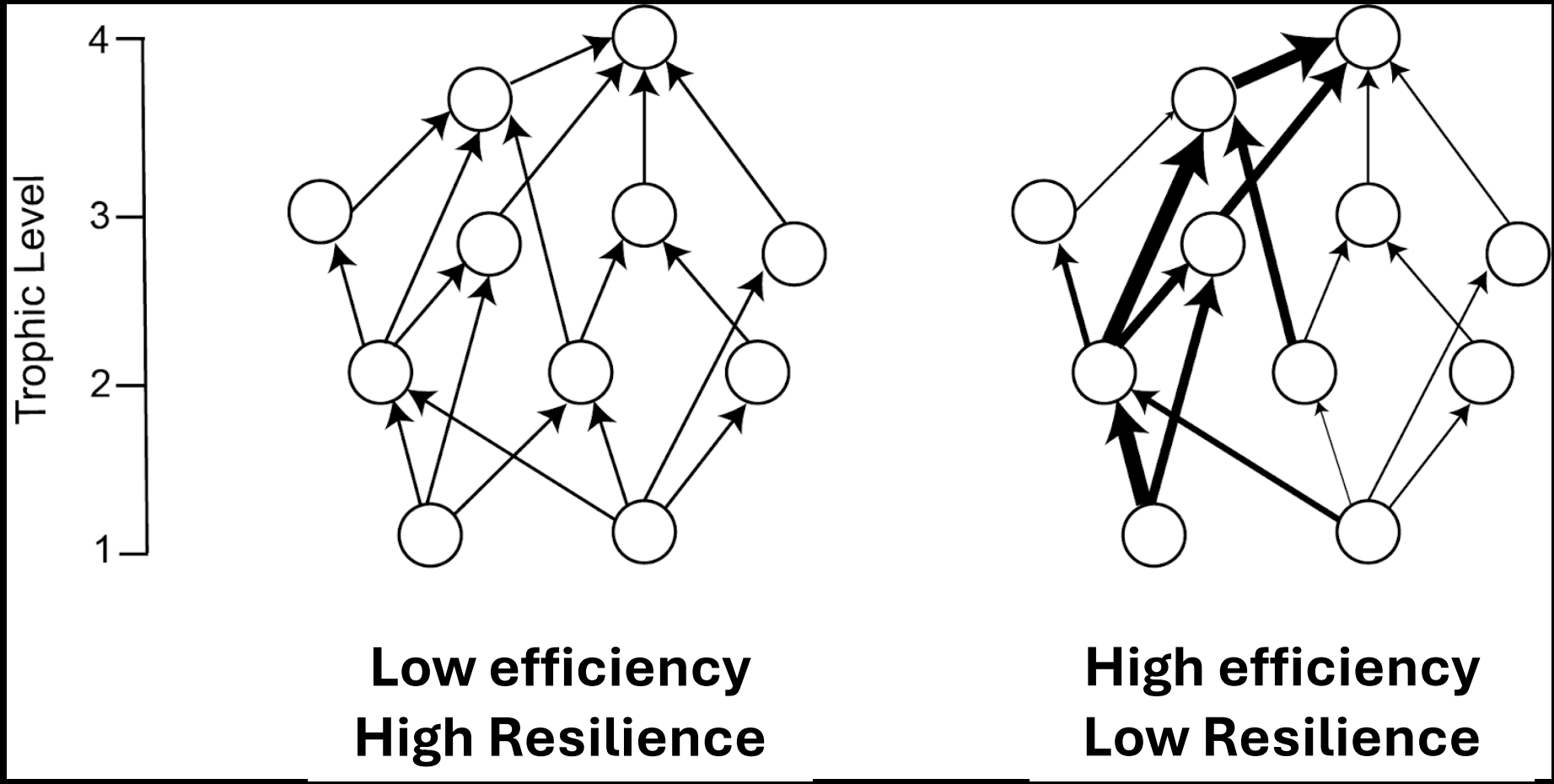


Sarah Weisberg, Stony Brook University



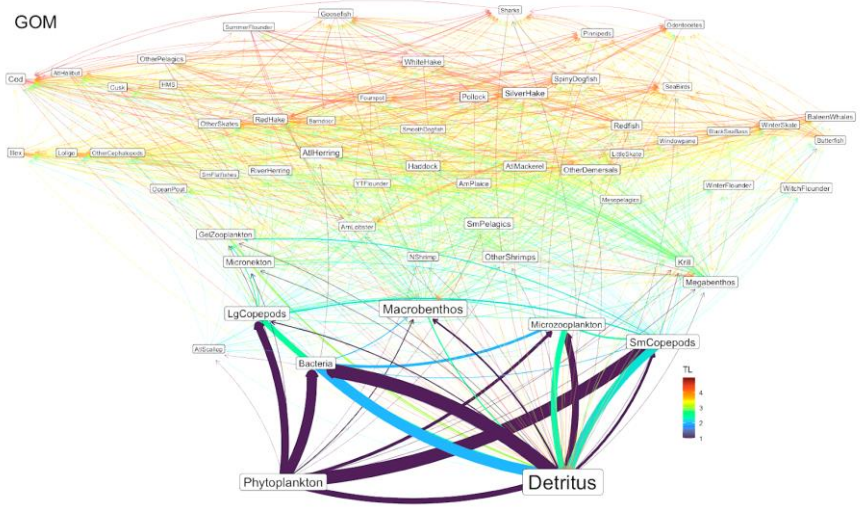
Max Grezlik, Umass Dartmouth

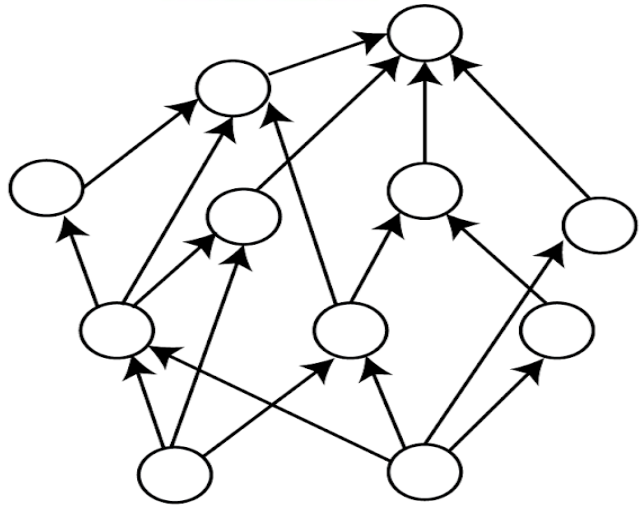
Tradeoff between resilience and efficiency



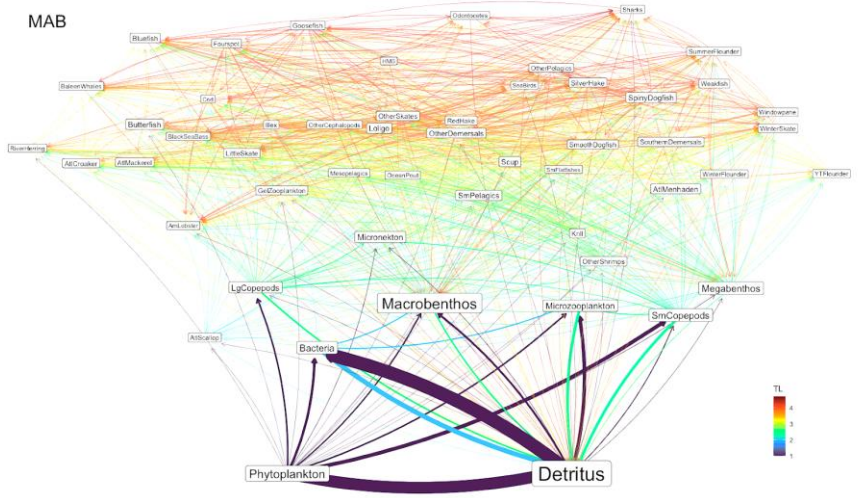
Sarah Weisberg, Stony Brook University

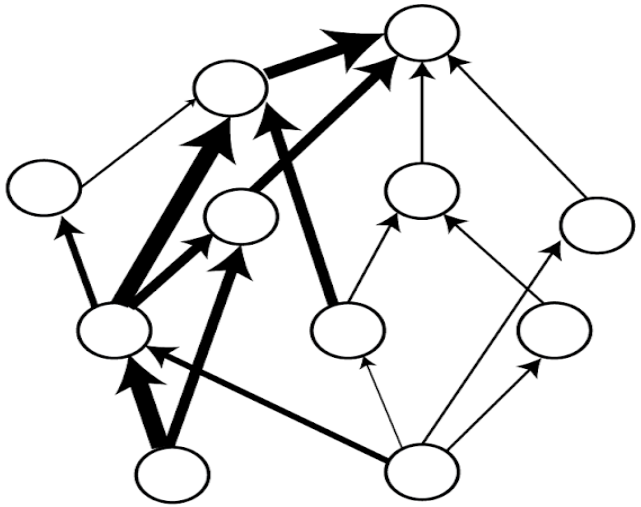
Gulf of Maine
Low efficiency
High Resilience





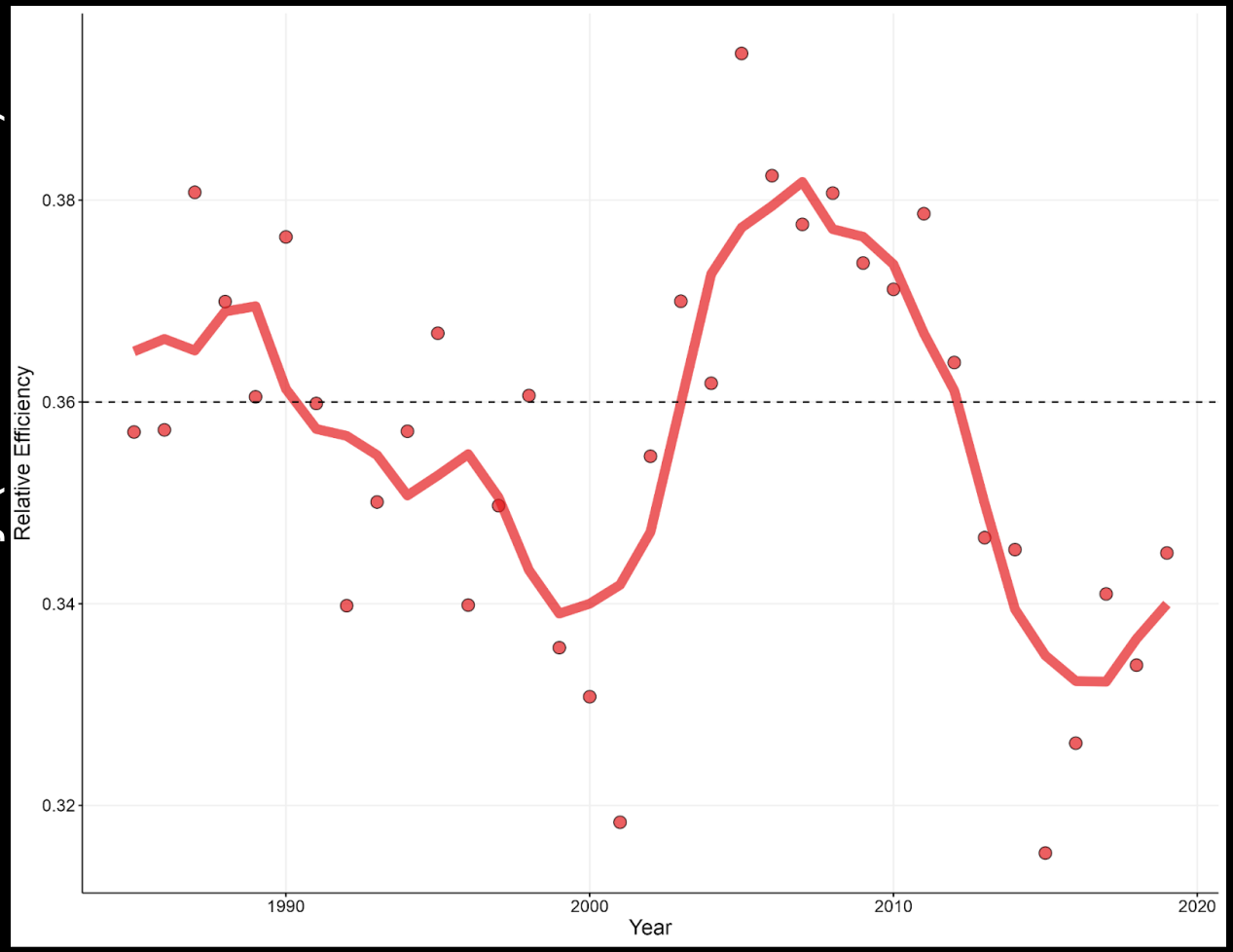
MidAtlantic Bight
High efficiency
Low Resilience





Quantifying biomass and trophic interactions is critical to understanding ecosystem resilience

Ascendency (or reseilience)



What we need to know

- What species are shifting in and out of the southern MAB and by what mechanisms?
- Will reef species shift into the sMAB?
- Better understanding of the flow through benthic and pelagic pathways to understand resilience of the ecosystem
- No zooplankton or ichthyoplankton surveys since the 1990s in SAB

Questions?