Science, Service, Stewardship

Sea Scallop *(Placopecten magellanicus)* Predation on the Northeast U.S. Continental Shelf: Trends in Groundfish Feeding Habits

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Woods Hole, MA

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Objectives

- Describe predation on sea scallops by groundfish.
- Examine spatial and temporal feeding trends on sea scallops.

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Background

- Sea scallops are currently the most valuable fishery in the U.S.
  - In 2011 meat weight landings were 58.7 millions lbs, worth slightly more than $580 million at the dock.
- Scallop populations increased substantially in the mid 90s.
- Groundfish are known to consume sea scallops but previous studies have focused on specific geographic areas or feeding behaviors.
- Invertebrates also consume sea scallops, here we focus on groundfish consumption.

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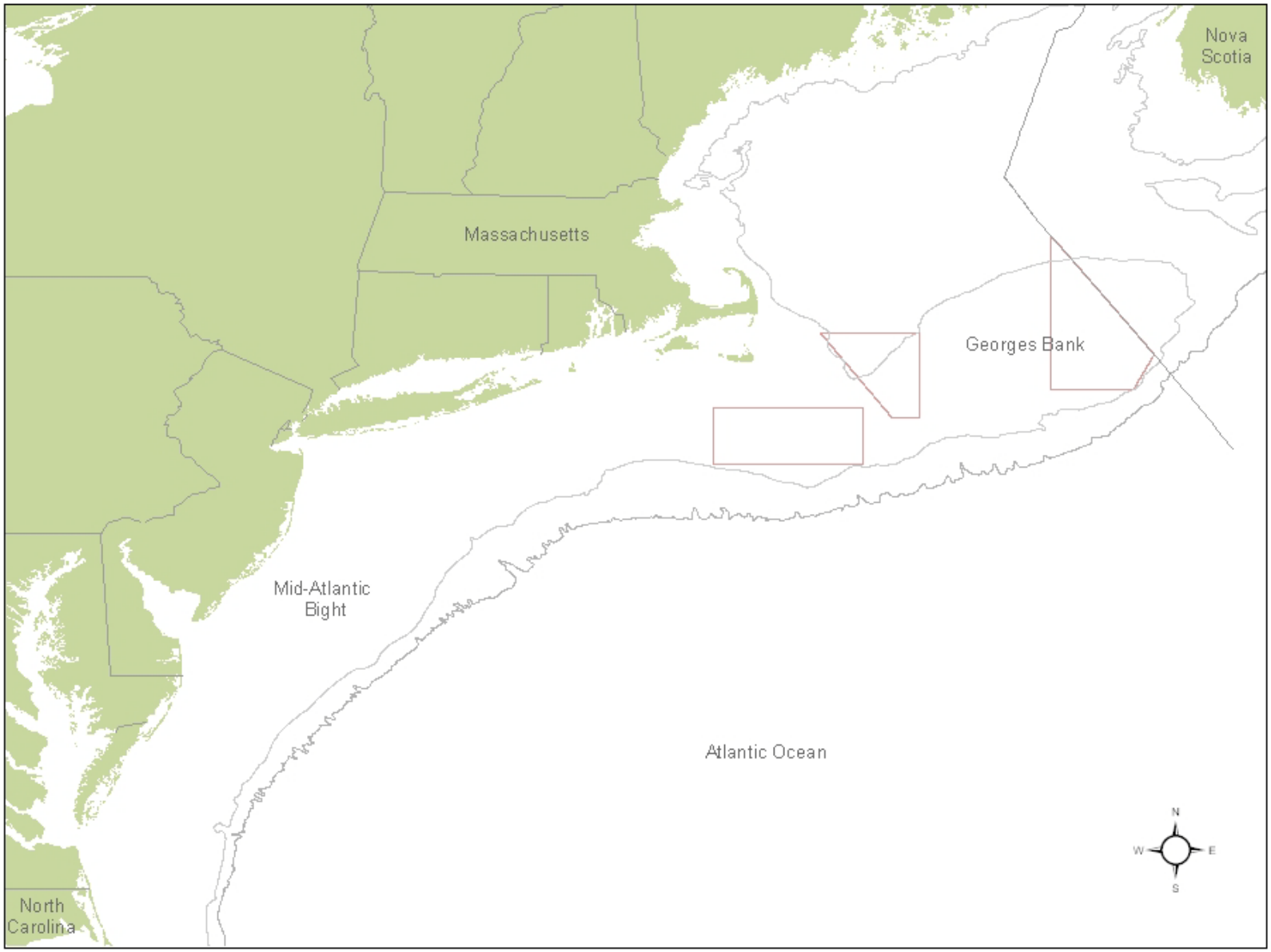
Food Web Database Background

- Long-term database: 1973 to 2010
- Over 150 predator species in database
  - 40 species with more than 1,000 stomach samples
- More than 550,000 stomachs examined
- Region sampled: continental shelf from Cape Hatteras, NC to Nova Scotia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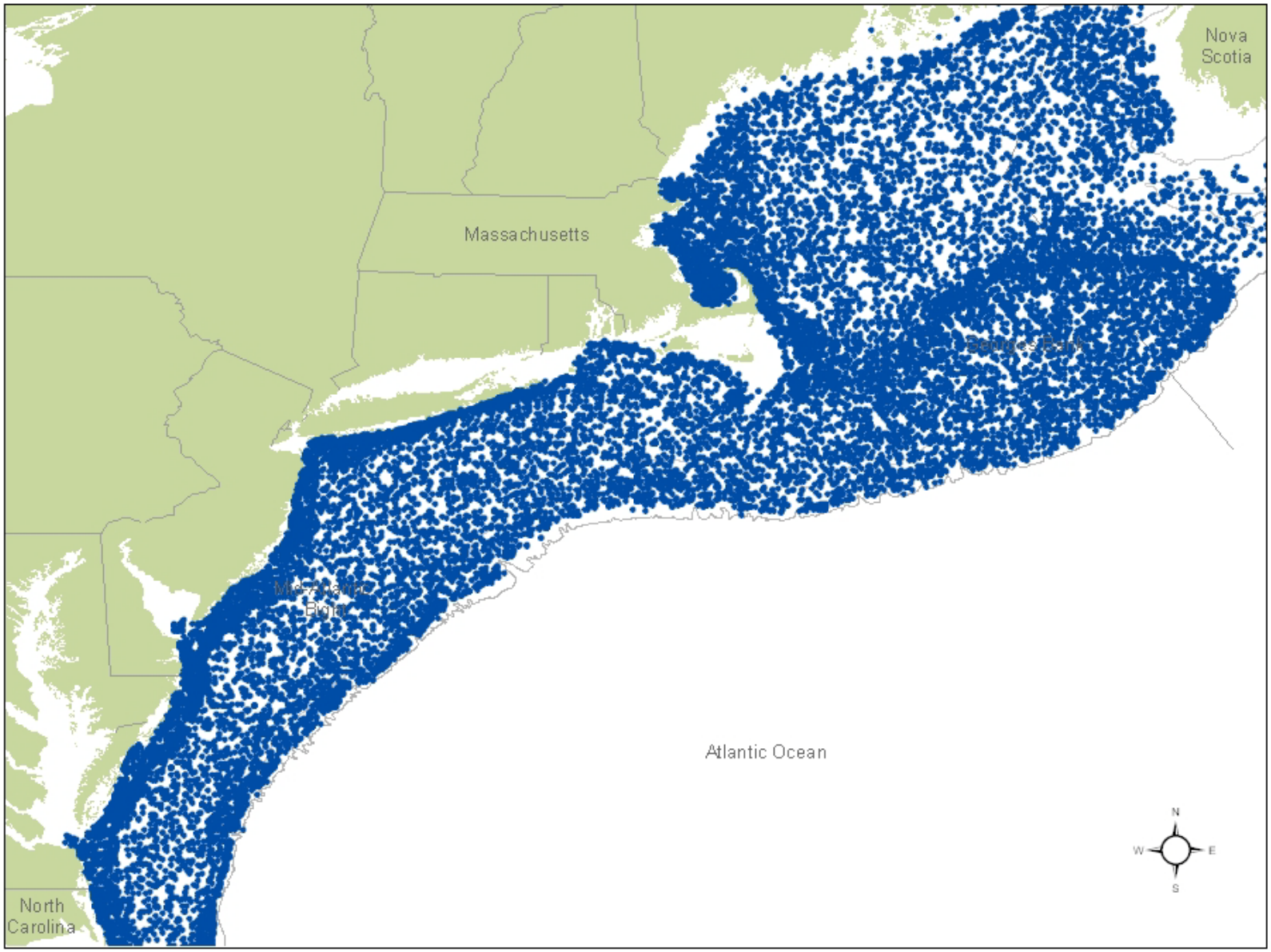
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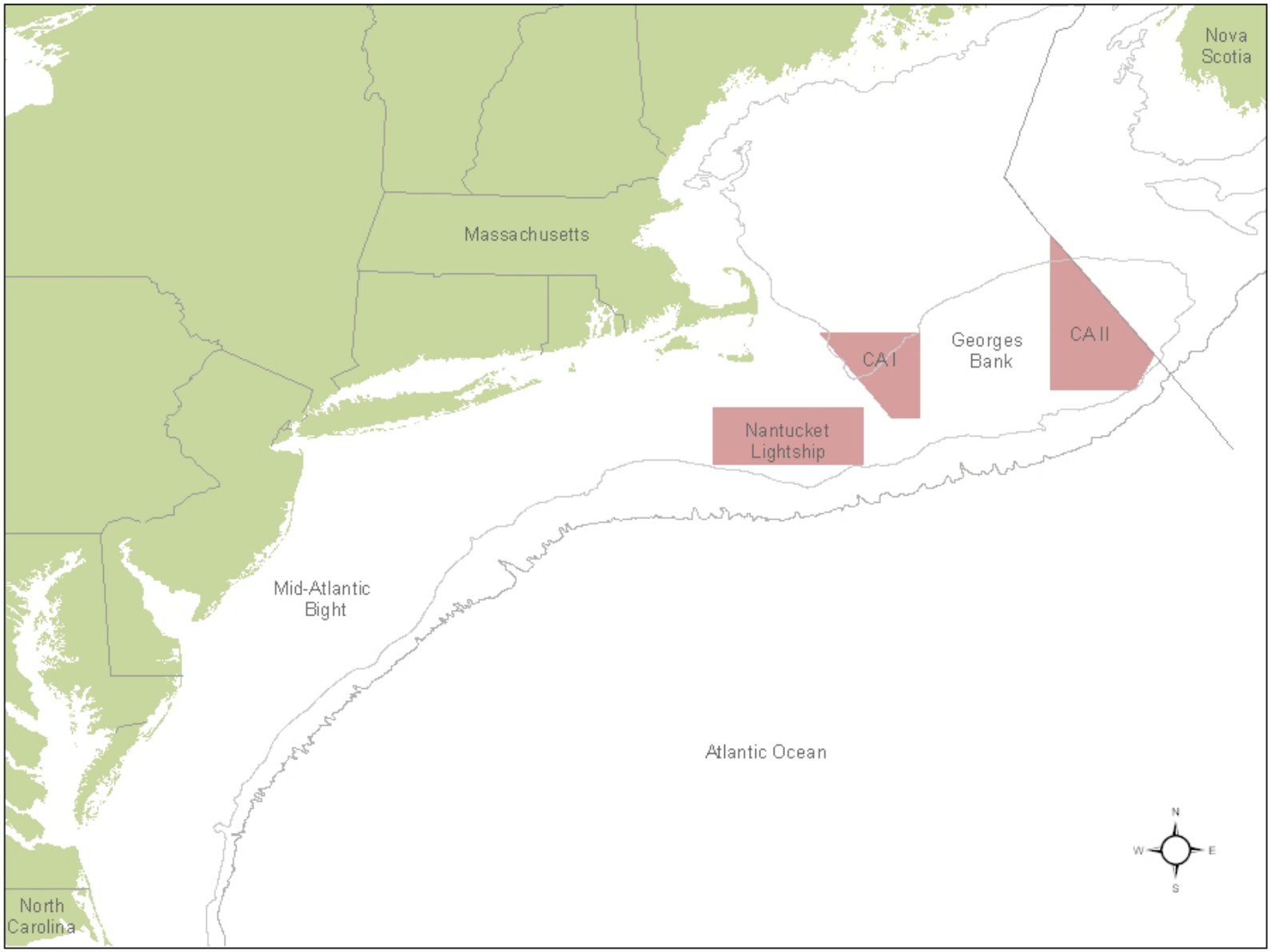
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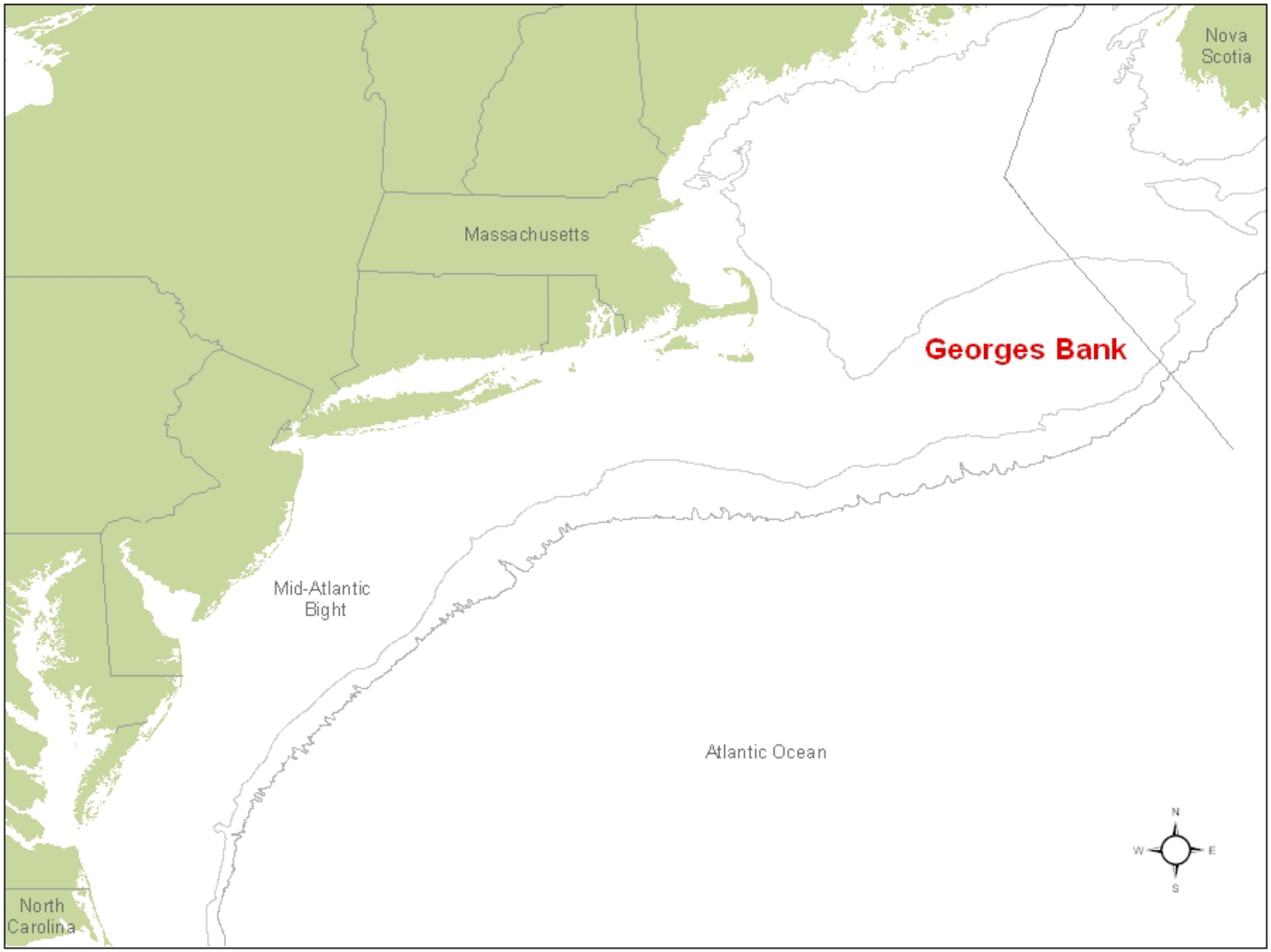
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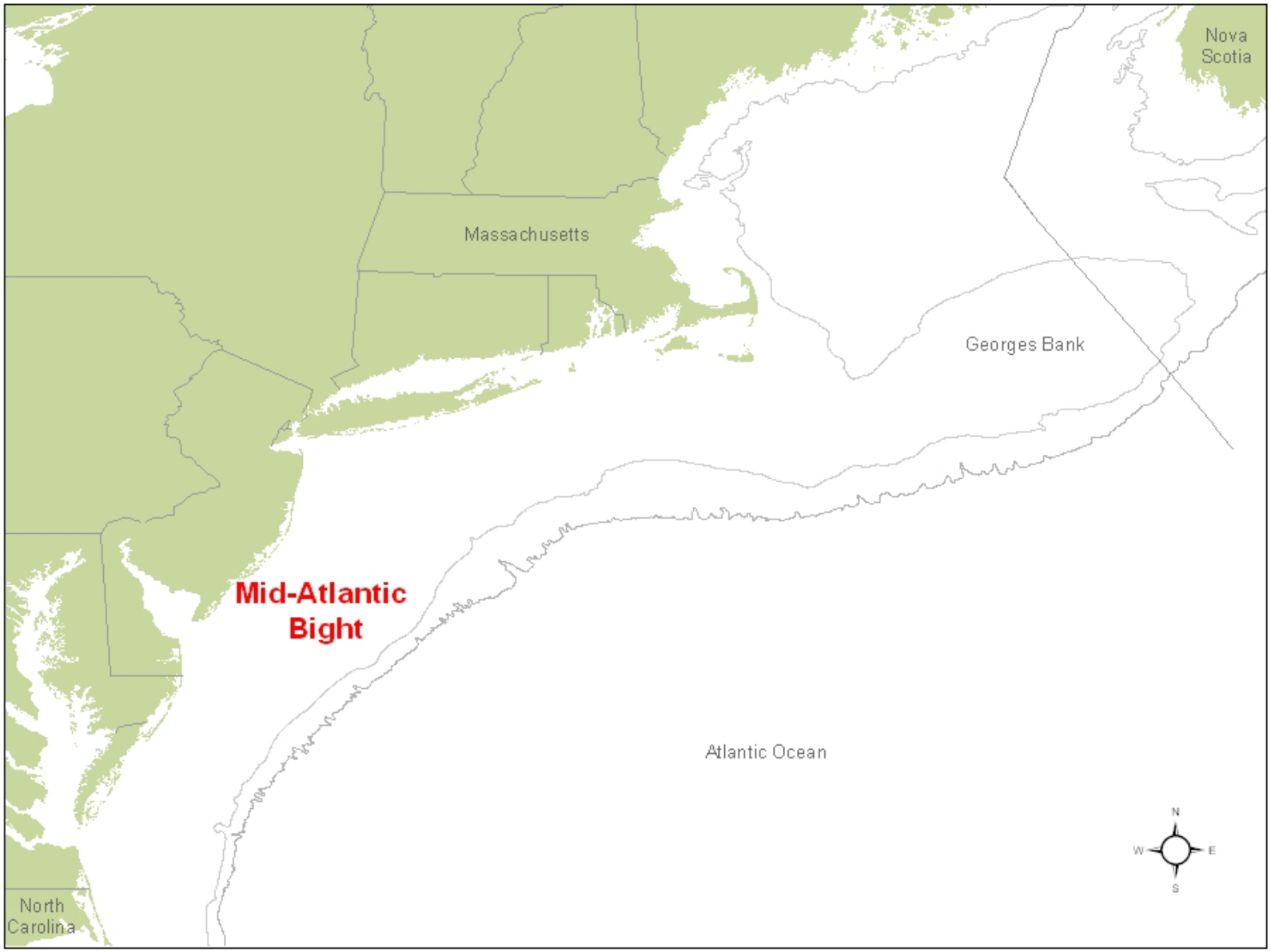
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Massachusetts
Georges Bank
Mid-Atlantic Bight
Atlantic Ocean
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Methods

- Predator selection
  - Data retrieval of species with the highest % frequency of occurrence of sea scallops in stomach contents (>.4%).
- Diet indices
  - % frequency of occurrence
  - % diet by mass

- 2 categories in our database for sea scallops
  - Sea Scallop
  - Sea Scallop Viscera (available starting in 1981)

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Methods

- Who's eating scallops?
  - Atlantic Cod *(Gadus morhua)*
  - Haddock *(Melanogrammus aeglefinis)*
  - Spiny Dogfish *(Squalus acanthias)*
  - Longhorn Sculpin *(Myoxocephalus octodecemspinosus)*
  - Ocean Pout *(Zoarces americanus)*
  - Atlantic Wolffish *(Anarhichas lupus)*

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Methods

Geographical Feeding Locations

- Plotted occurrences of feeding on sea scallops by species.
  - whole vs viscera

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Methods

Temporal feeding trends

- Scallop biomass vs. % scallops in diet, data were aggregated:
  - Annually for Spiny Dogfish, Cod, Haddock, and LH Sculpin
  - 5 year-blocks for Ocean Pout
  - 10 year-blocks for Wolffish
  - Geographically
    - Entire NE Shelf for Spiny Dogfish & Ocean Pout
    - Georges Bank for Cod, Haddock, LH Sculpin, & Wolffish

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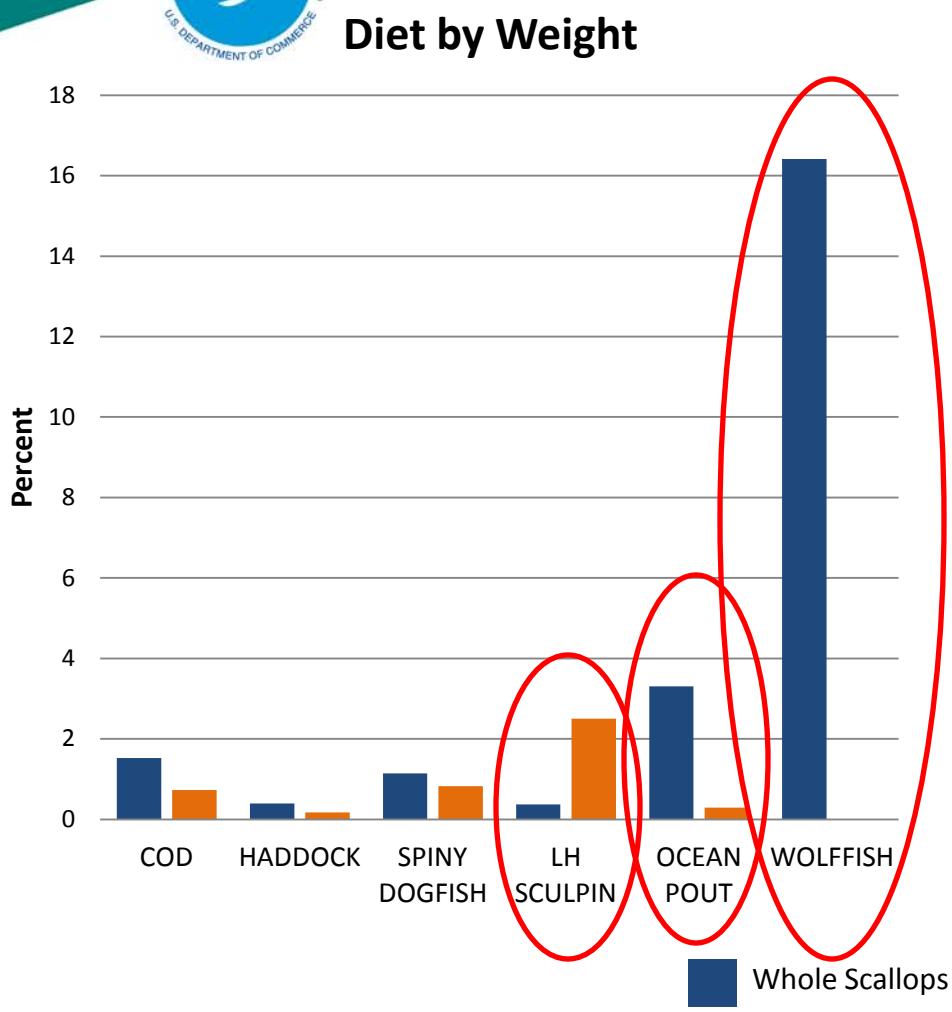
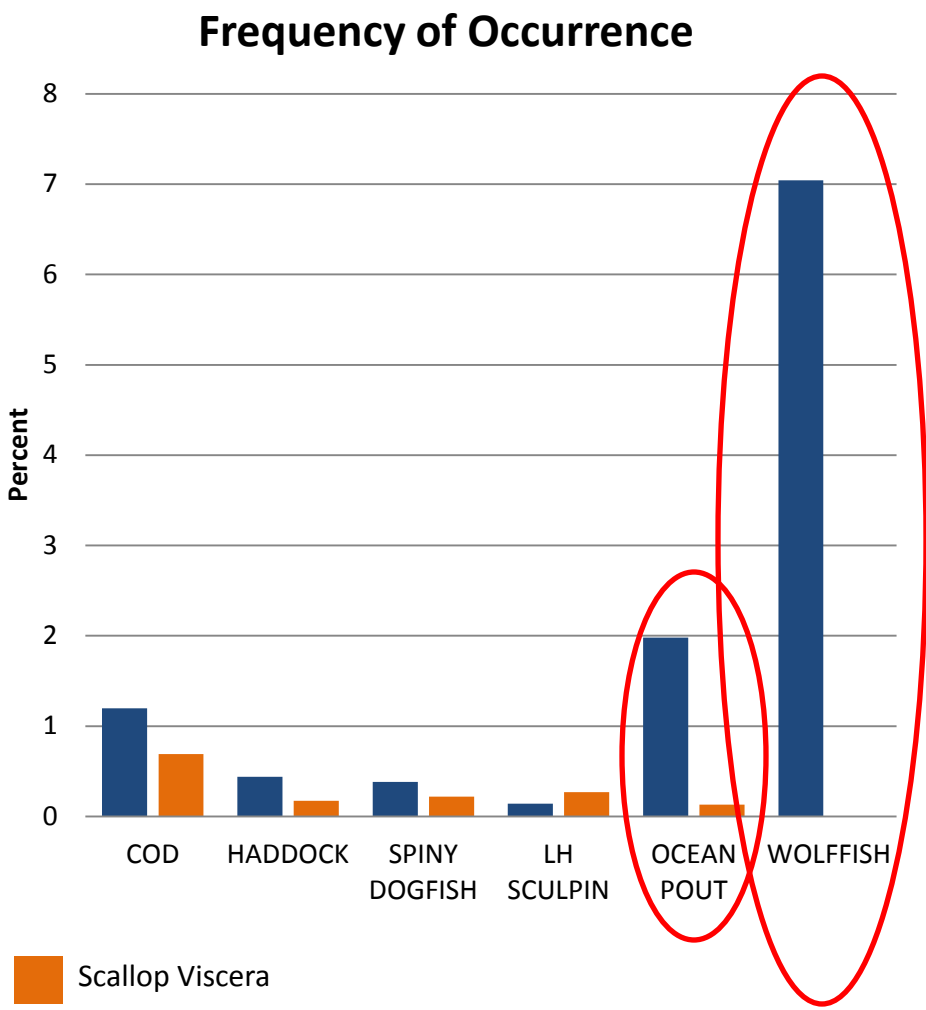
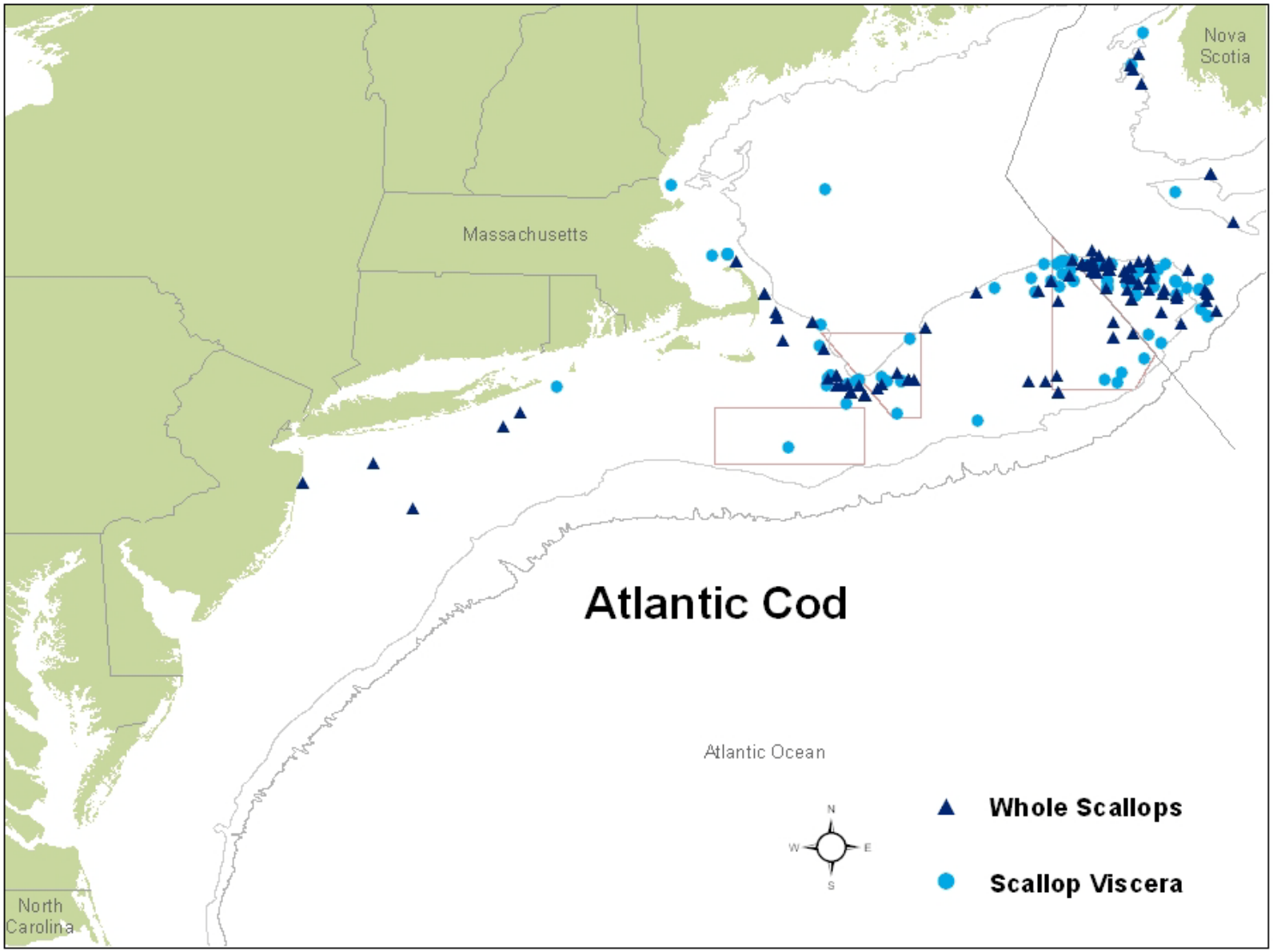
Results





Whole Scallops Scallop Viscera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Atlantic Cod
Atlantic Ocean
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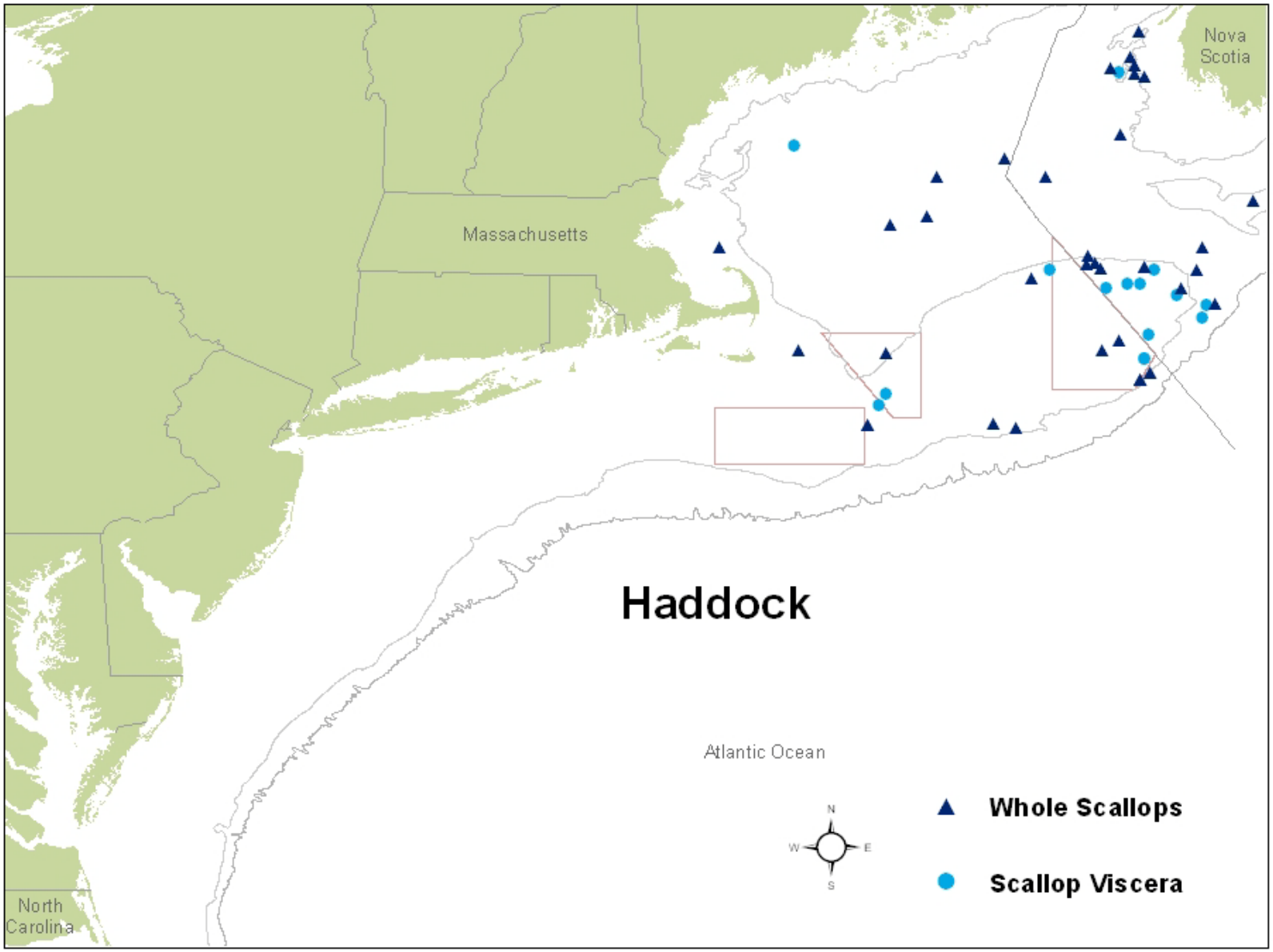
Whole Scallops
Scallop Viscera
North Carolina


Nova Scotia
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Haddock
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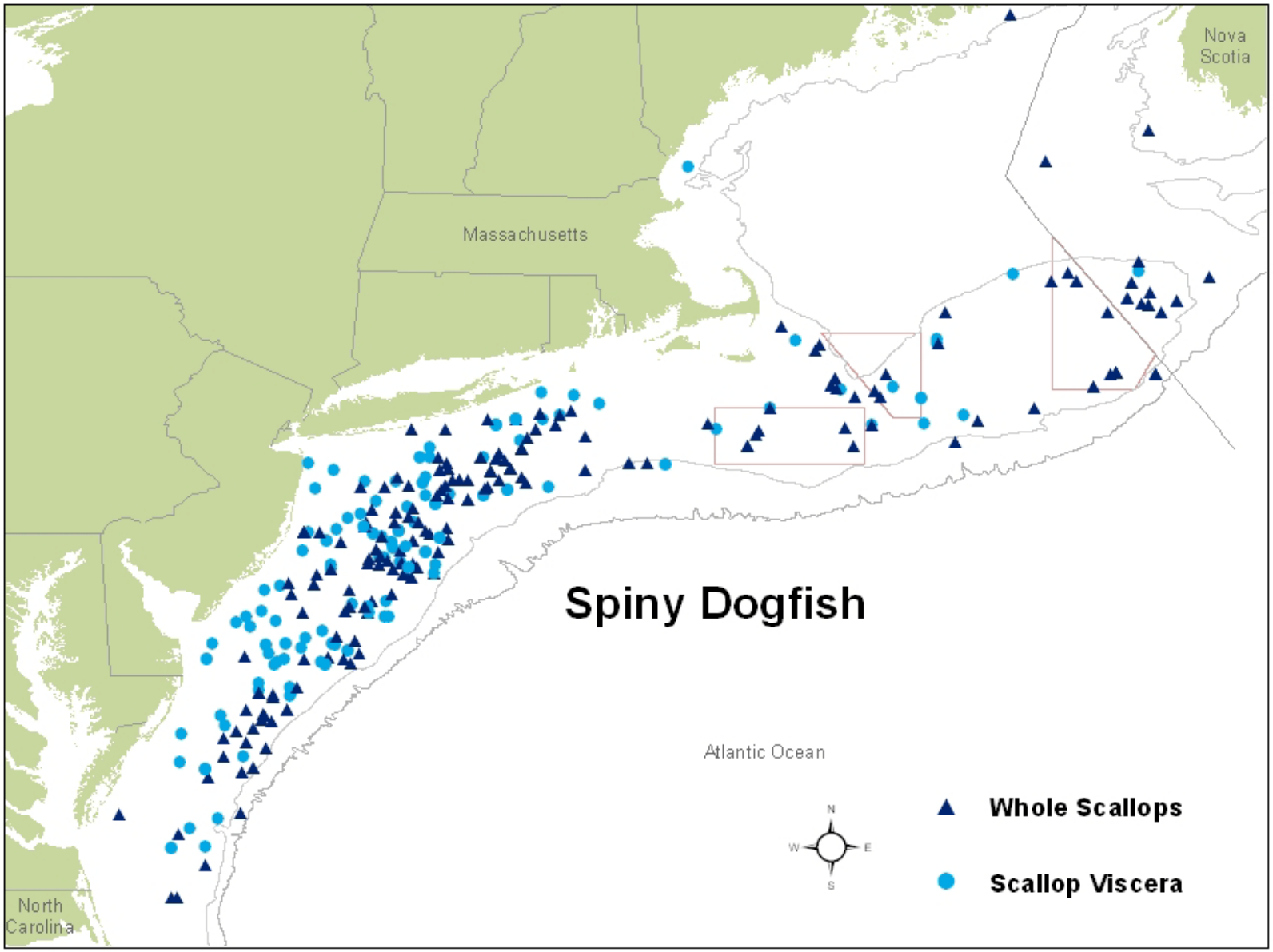
Whole Scallops
Scallop Viscera
North Carolina


Nova Scotia
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Spiny Dogfish
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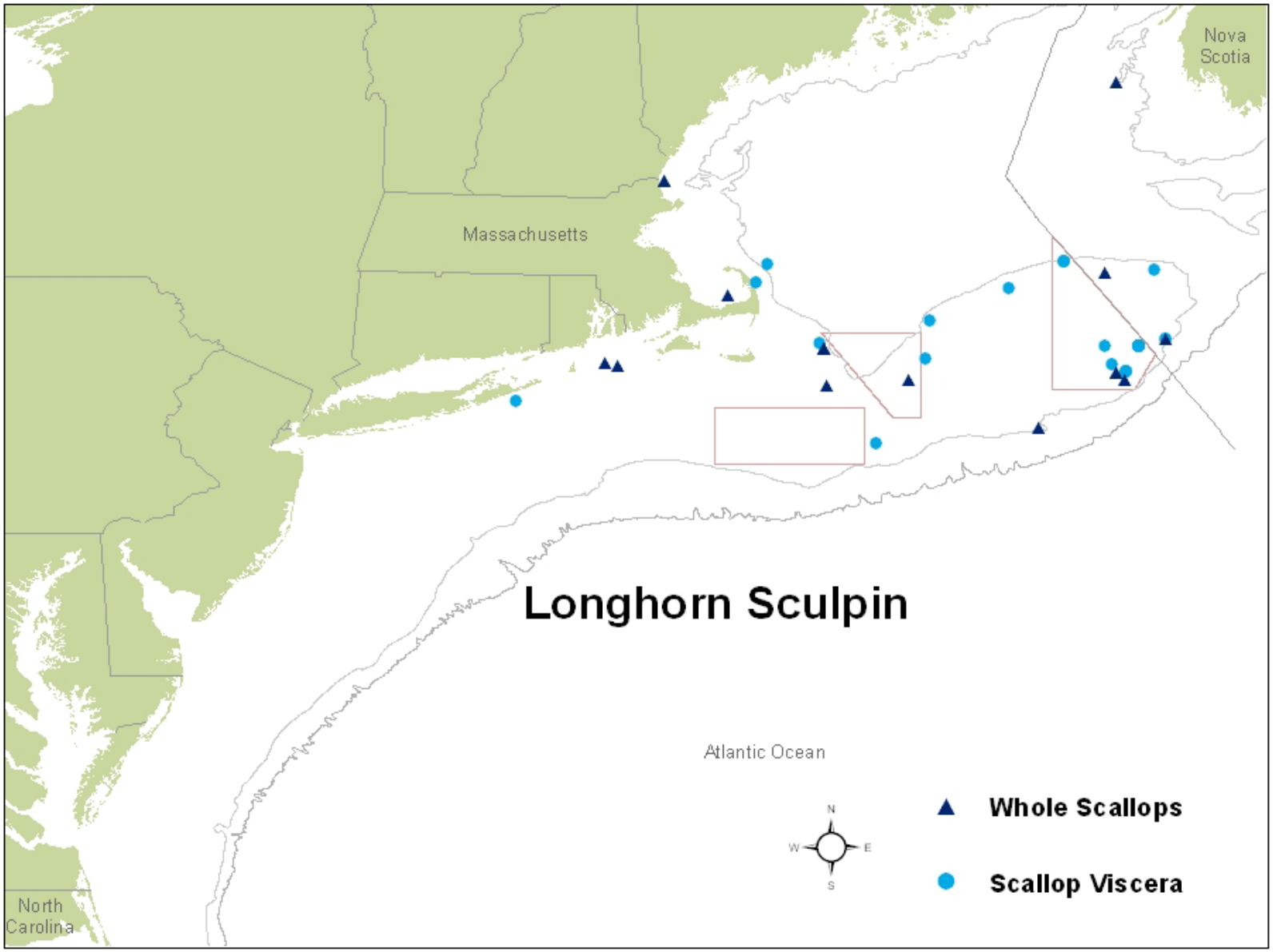
Whole Scallops
Scallop Viscera
North Carolina


Nova Scotia
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Longhorn Sculpin
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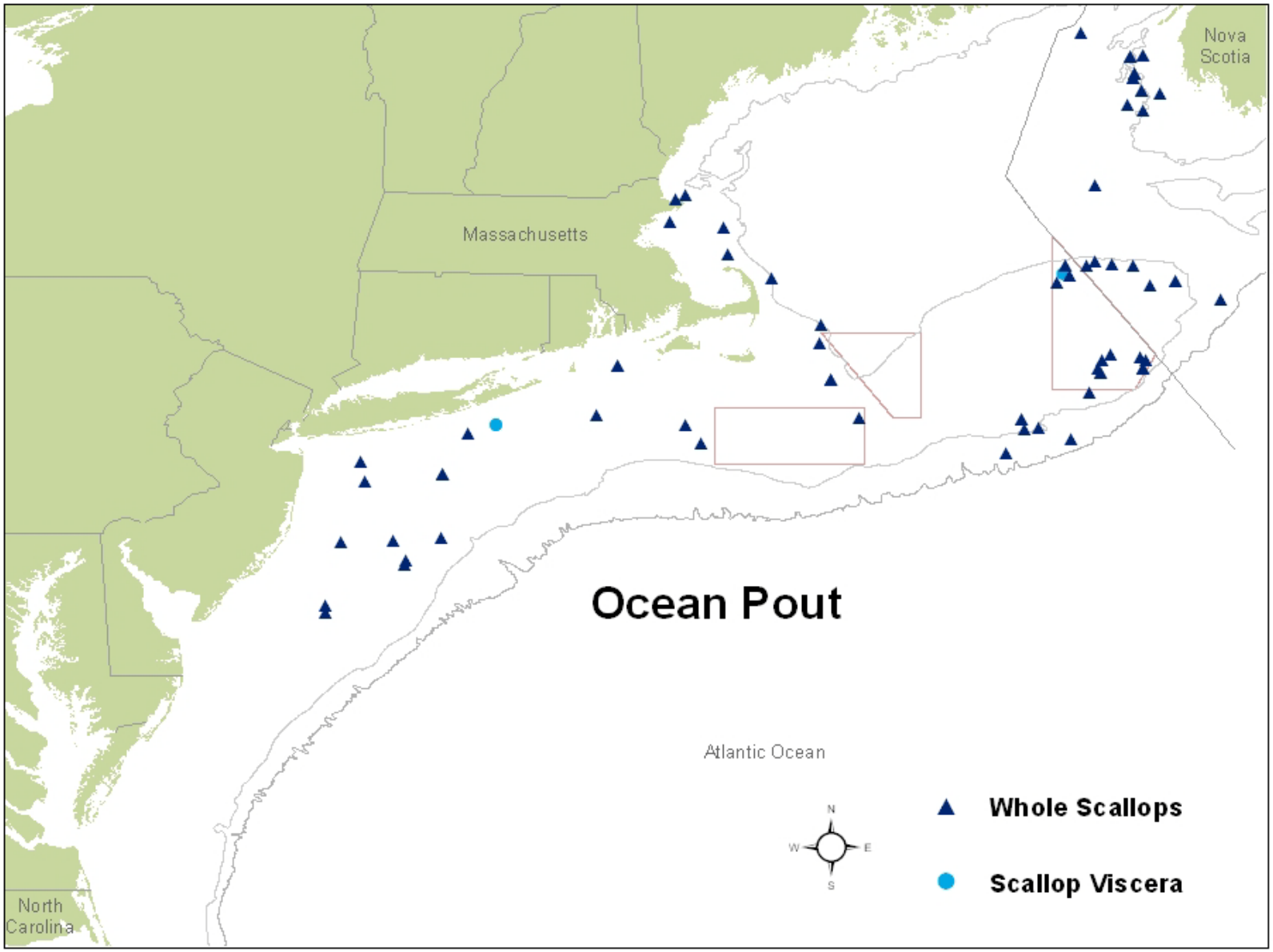
Scallop Viscera
North Carolina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Ocean Pout
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Scallop Viscera
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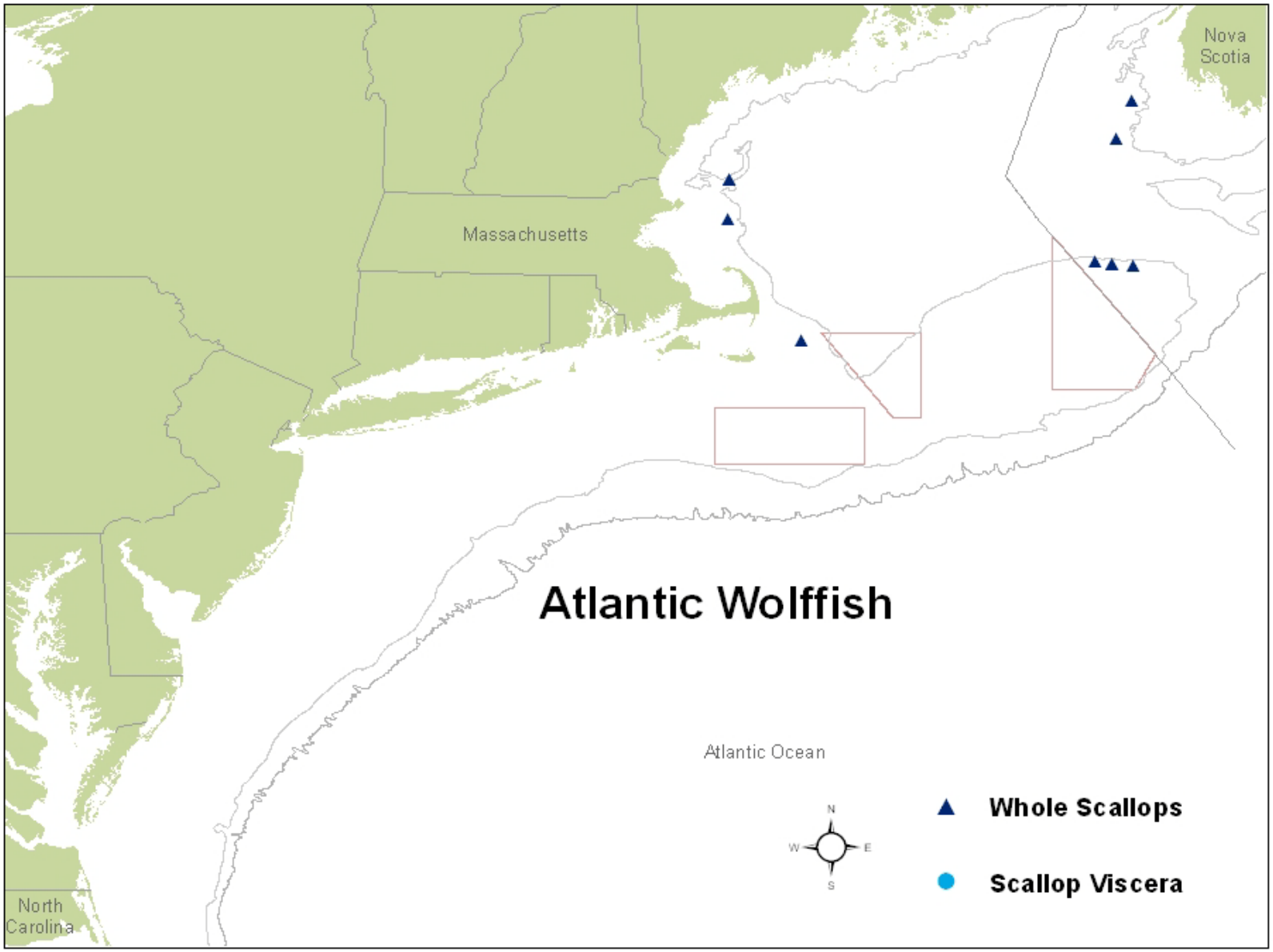
Nova Scotia
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Scallop Viscera
North Carolina

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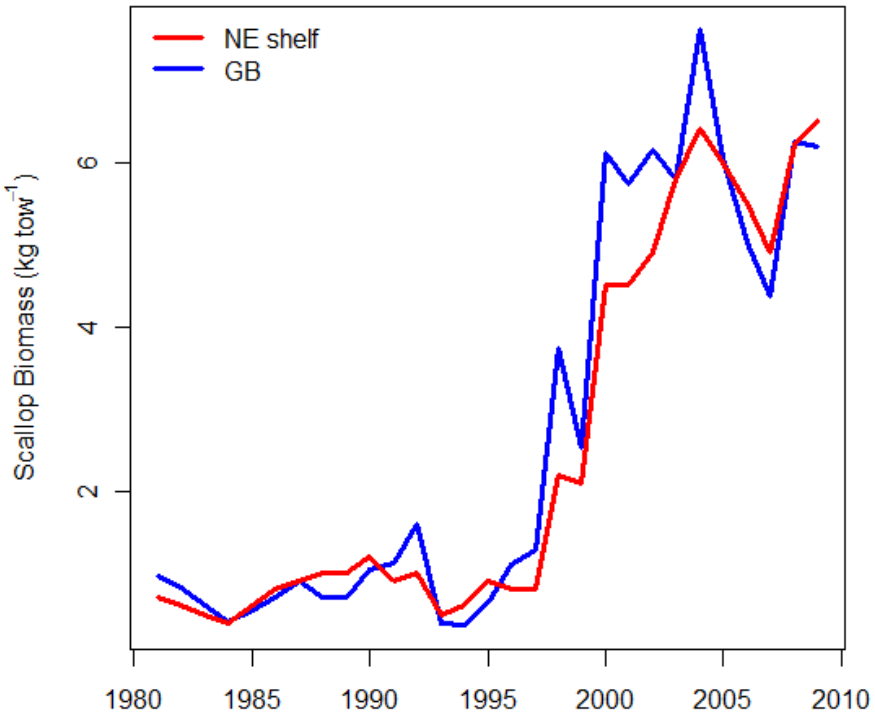
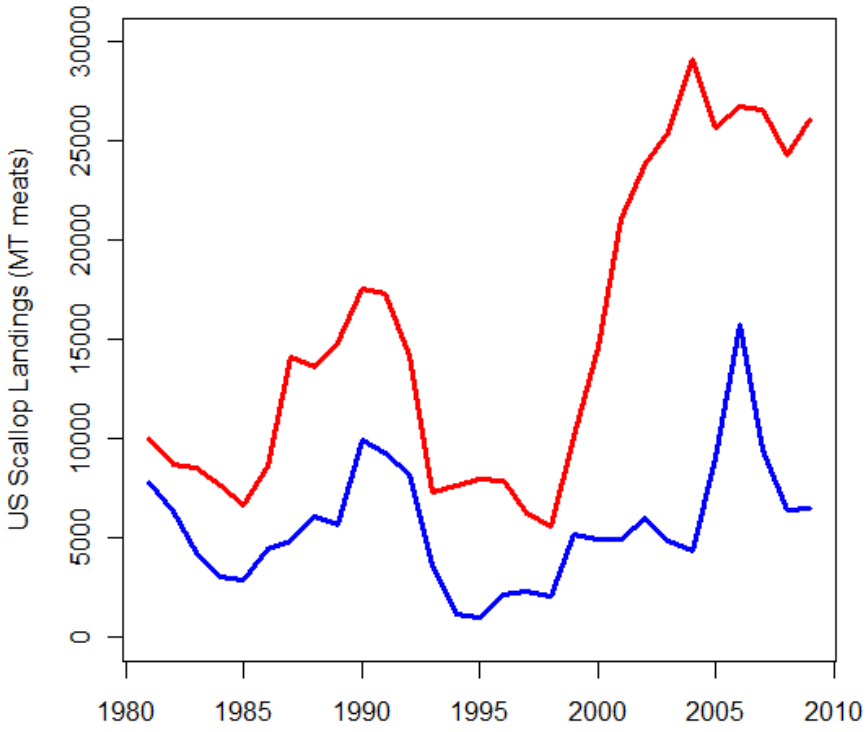
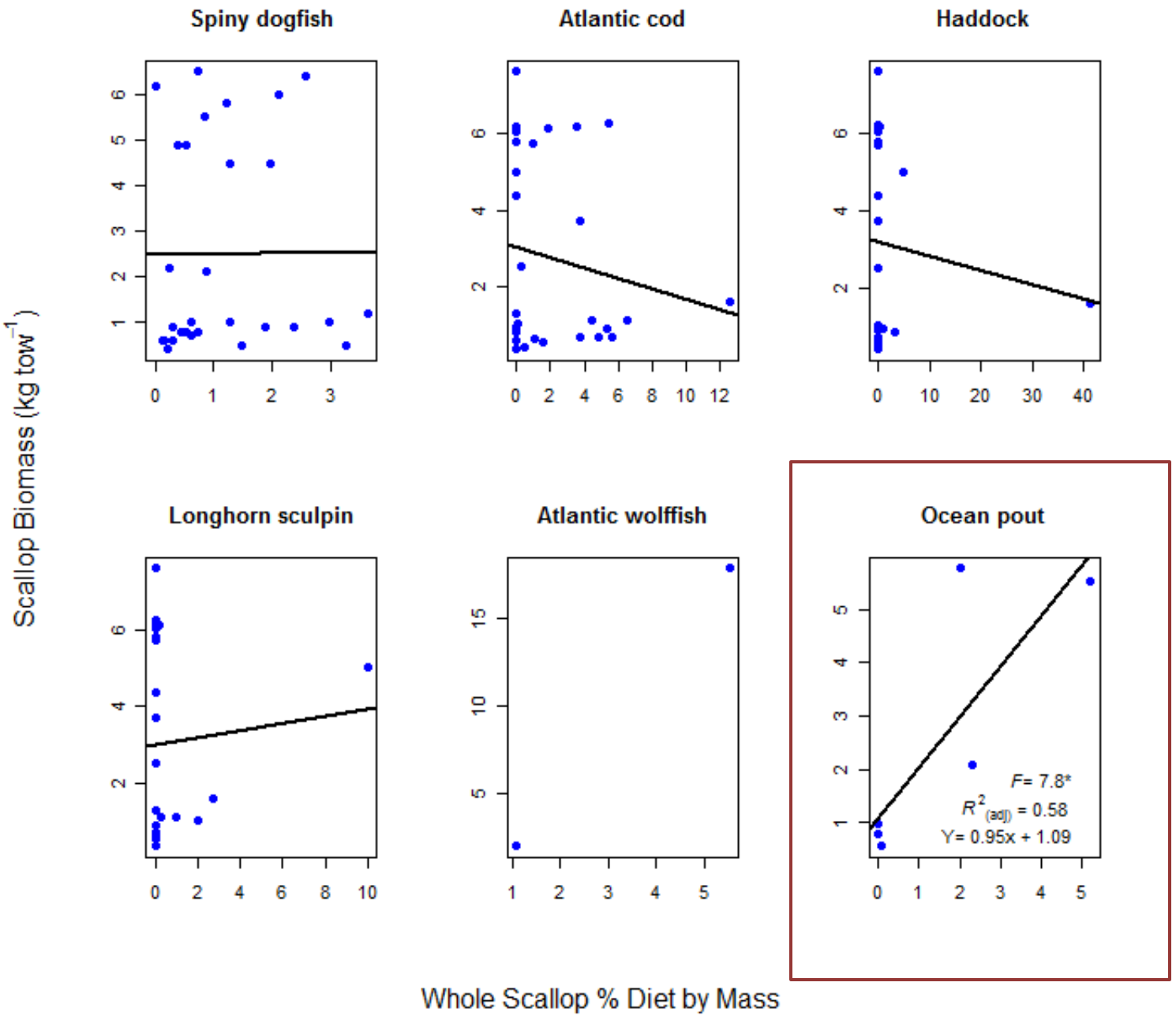
Scallop Population Indices

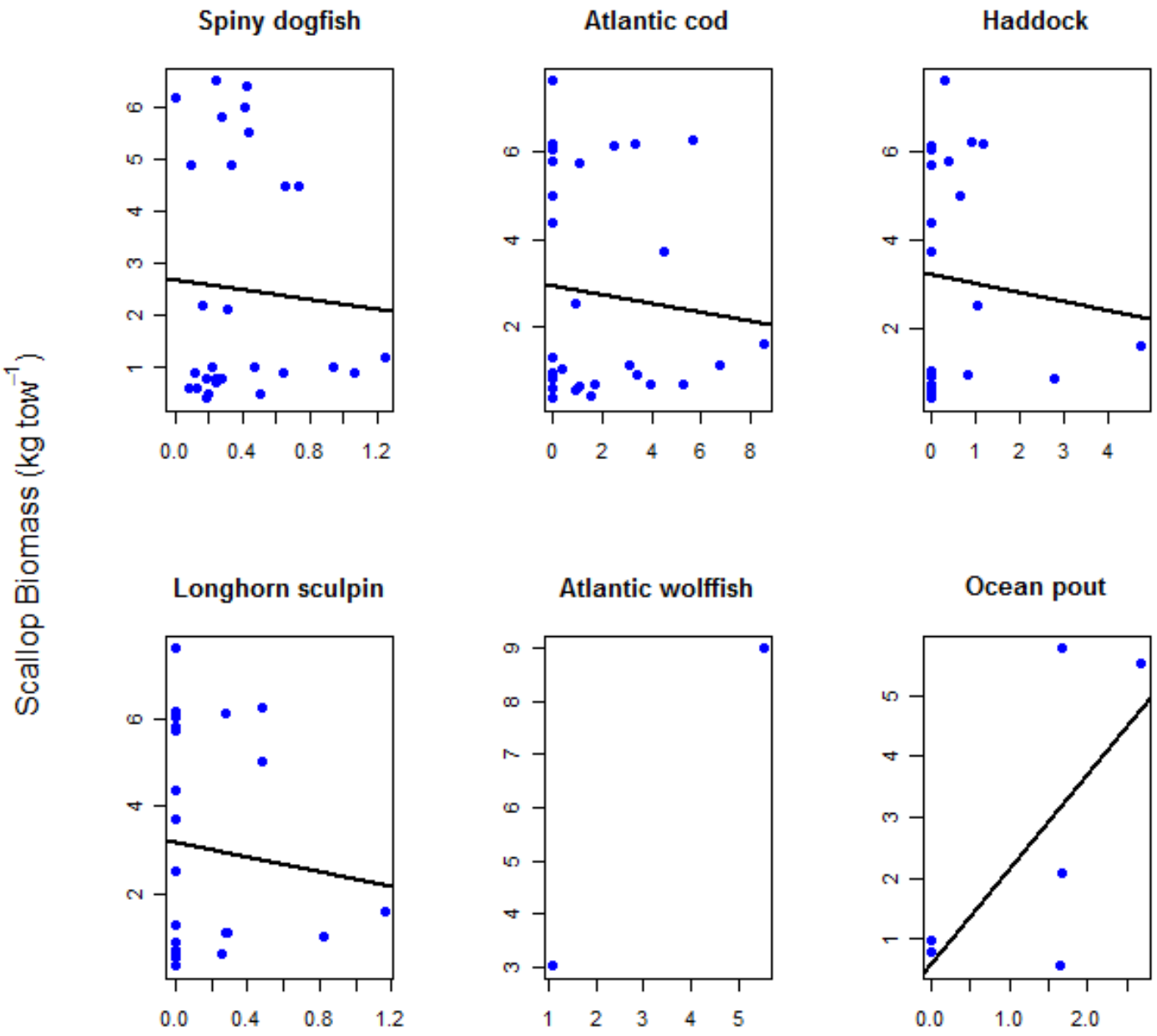


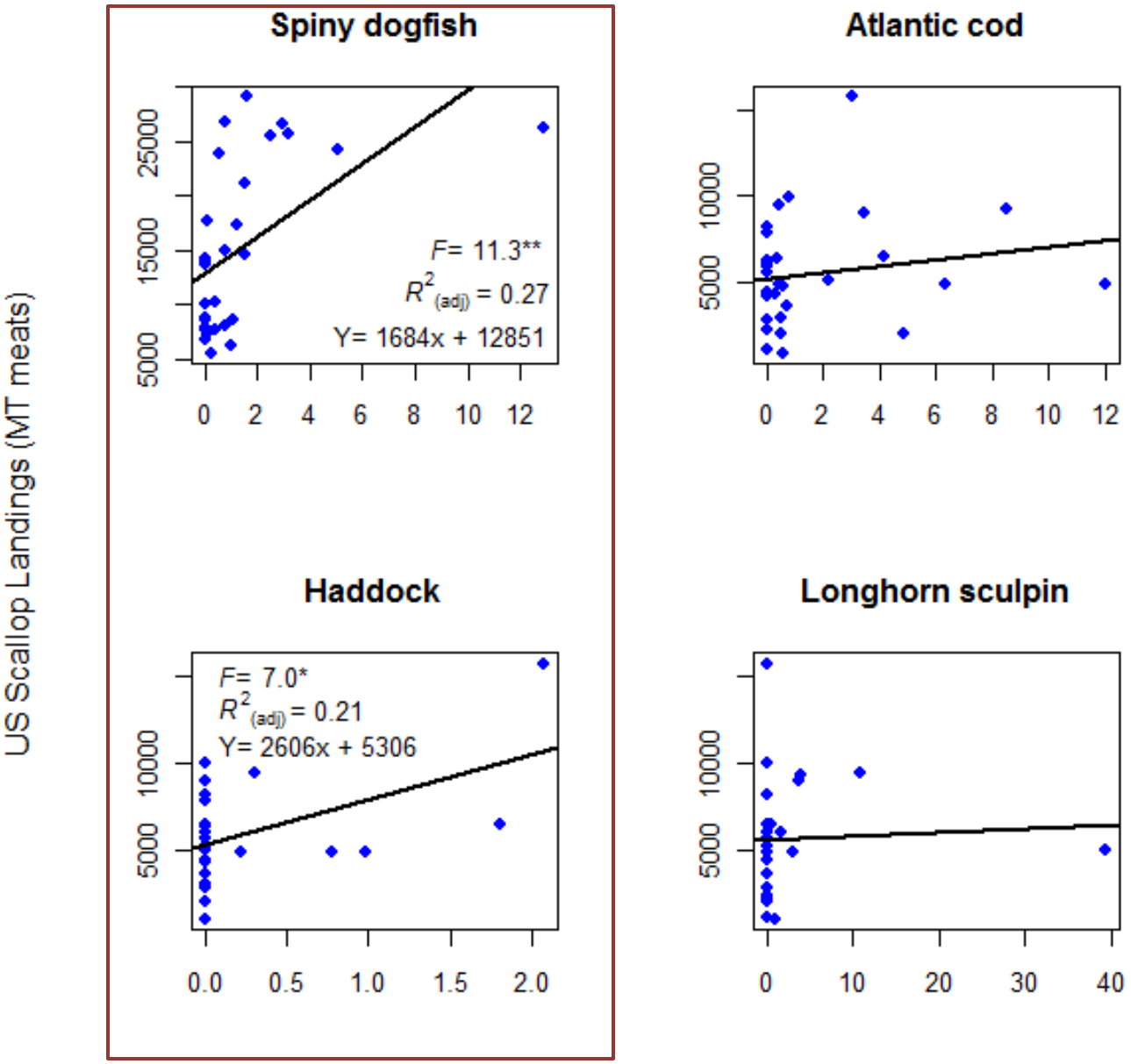


Stratified mean index from the NEFSC scallop survey

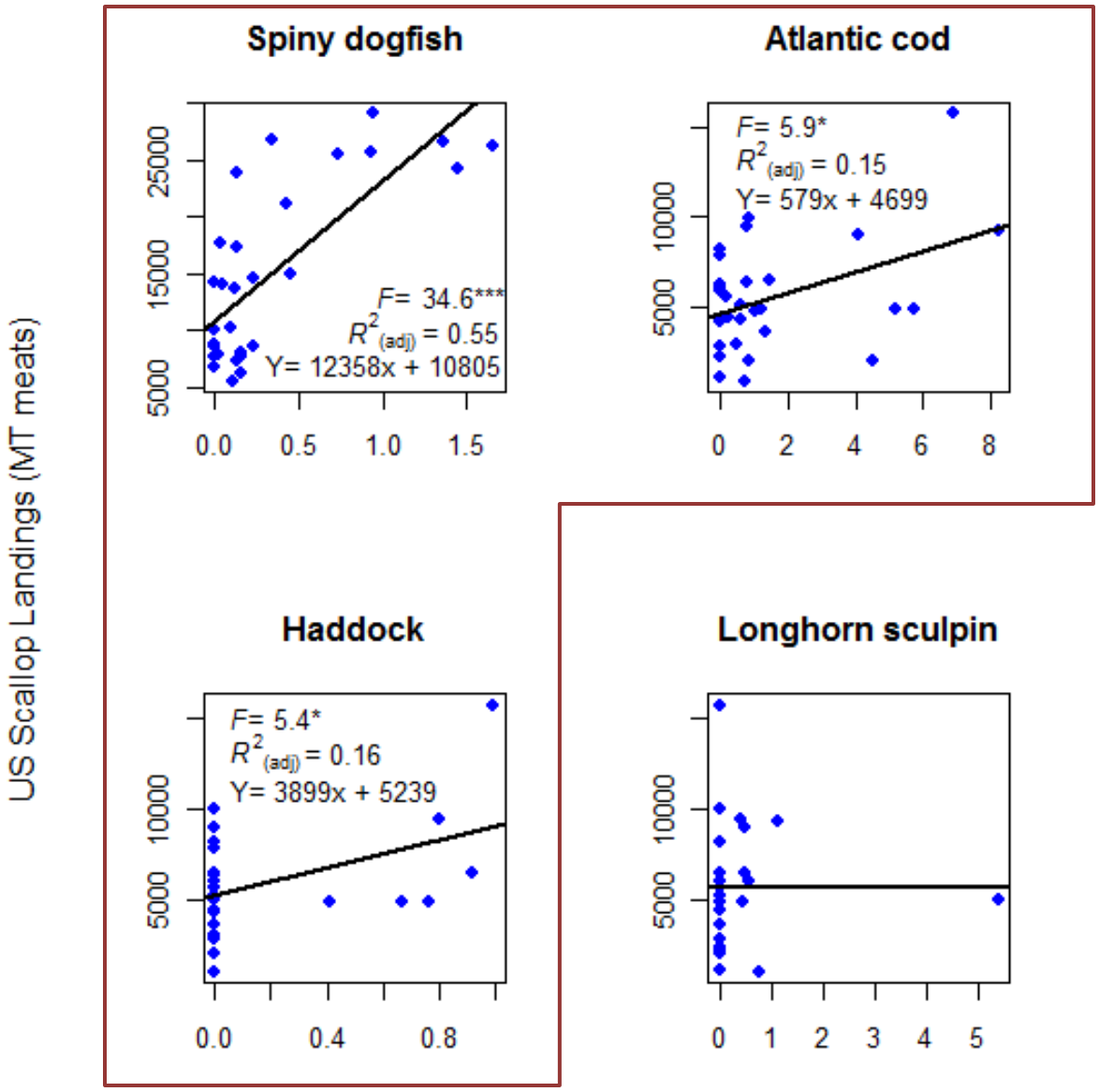


The presence of regression statistics denotes significance: $*p < 0.05$


Spiny dogfish
Atlantic cod
Haddock
Longhorn sculpin
Atlantic wolffish
Ocean pout
Scallop Biomass (kg tow^{-1})
Whole Scallop % Freq. of Occur. in Diet



The presence of regression statistics denotes significance: *$p < 0.05$, **$p < 0.01$



The presence of regression statistics denotes significance: *$p < 0.05$, ***$p < 0.001$

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Conclusions

- The importance of sea scallops in diet composition was generally low for the species examined.
  - Atlantic Wolffish were the exception, and possibly Ocean Pout.
- Trends over time were strongest for:
  - whole scallop feeders
  - feeding on viscera by opportunistic scallop feeders
- Total removals of whole scallops may be worth estimating for groundfish, but we should increase sampling of major predators (e.g. wolffish and ocean pout).

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Conclusions

- Other scallop predators worth investigating:
  - Whole scallop feeders
    - American Plaice
  - Viscera and whole scallop feeders
    - Red Hake
    - Little Skate
    - Spotted Hake
    - Winter Skate

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Thank You!