Stock Assessment of Southern Flounder in the South Atlantic

N.C. Marine Fisheries Commission Meeting | Laura M. Lee

February 15, 2018

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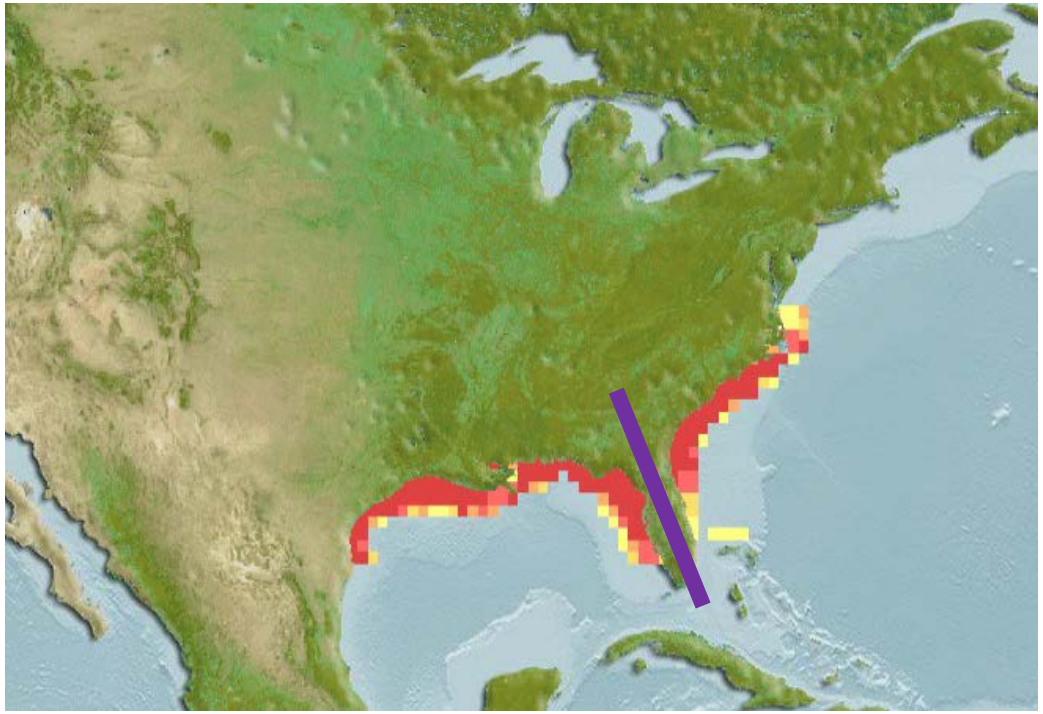
Marine Fisheries

Acknowledgements

- North Carolina Division of Marine Fisheries Plan Development Team
- North Carolina Division of Marine Fisheries Management Review Team
- Other North Carolina Division of Marine Fisheries staff
- Steve Arnott and Joey Ballenger, South Carolina Department of Natural Resources
- Ryan Harrell and BJ Hilton, Georgia Department of Natural Resources
- Shanae Allen and Behzad Mahmoudi, Florida Fish and Wildlife Conservation Commission
- Fred Scharf, University of North Carolina at Wilmington
- Steve Midway, Louisiana State University
- Jeff Kipp, Atlantic States Marine Fisheries Commission
- Rick Methot, NOAA Fisheries
- Peer reviewers: Katie Drew, Kevin Craig, Mark Fisher, and Gary Shepherd

Life History

- Demersal (bottom-dwelling)
- Marine and brackish water
- Female max age and size: 9 years and 33 inches
- Male max age and size: 6 years and 20 inches
- Female length at 50 percent maturity ~16 inches



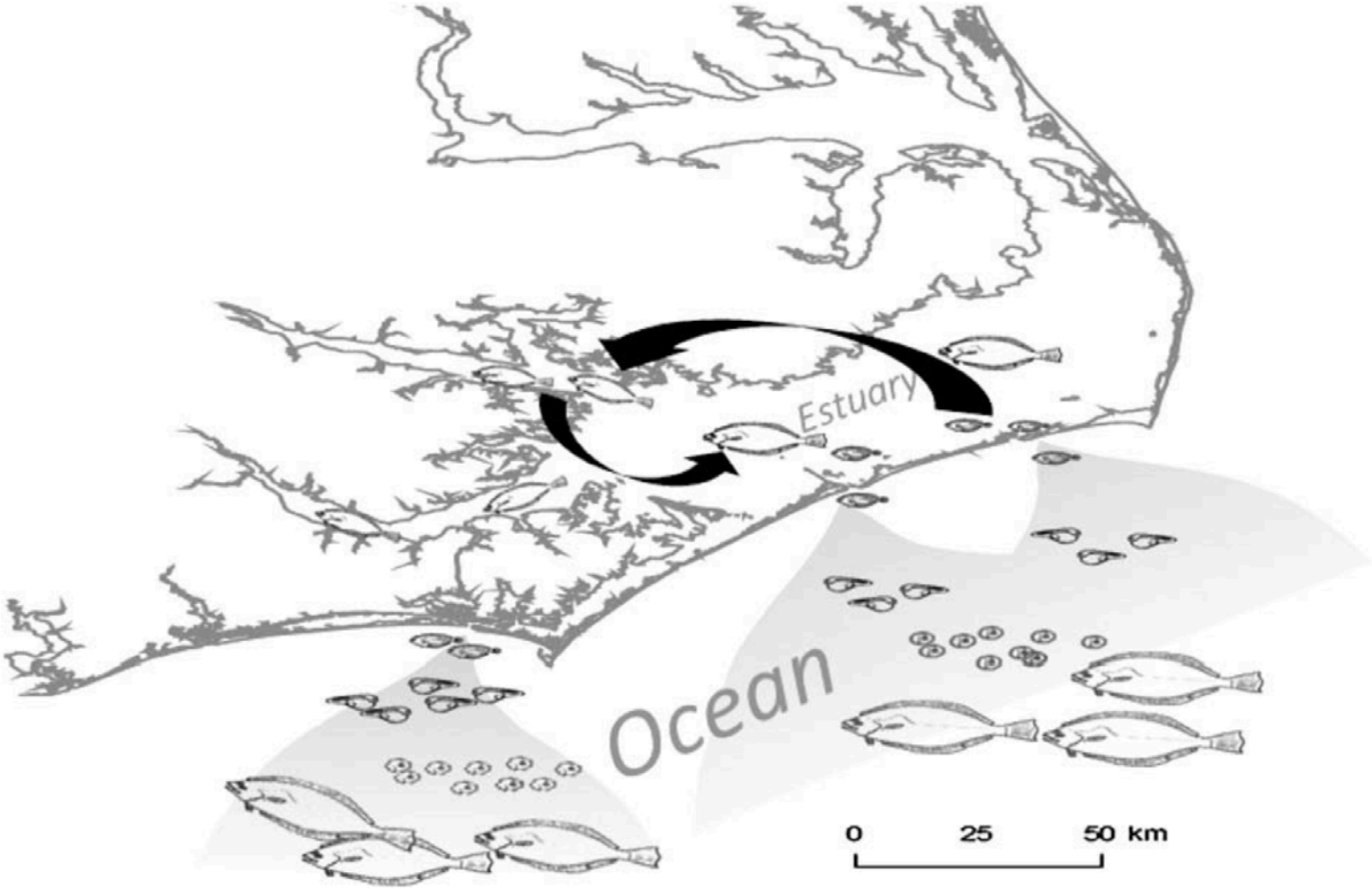


Fig. 1. Generalized life-history cycle for southern flounder off North Carolina and the Southeast US Atlantic continental shelf.

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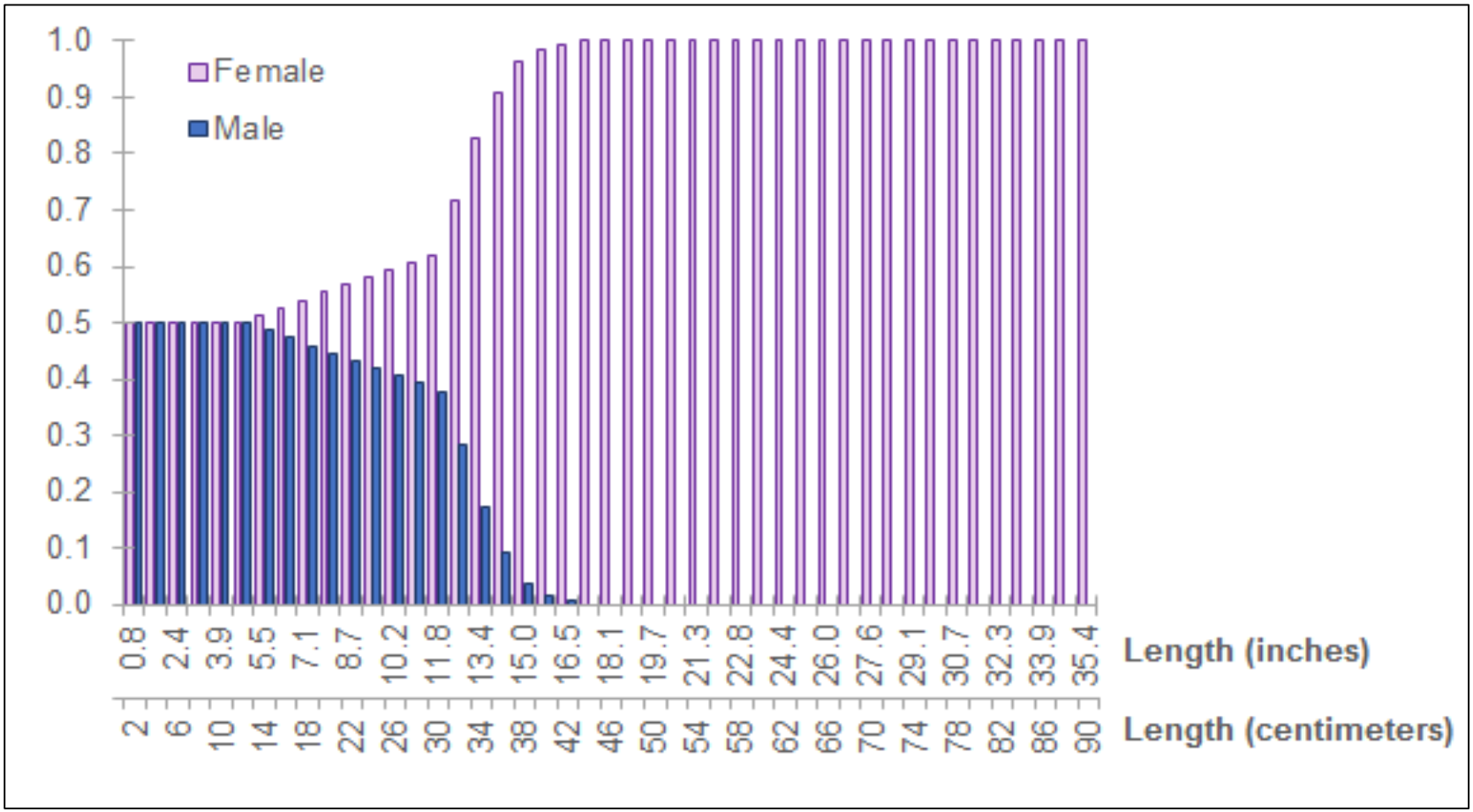
Sex Ratio at Length



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NCDMF Assessment History

- Assessments completed in 2005, 2009, and 2014
- All concluded stock is overfished and overfishing was occurring
- Most recent assessment (2014) not considered suitable for management by the N.C. Division of Marine Fisheries due to the assumed definition of unit stock
- Recommendation to expand unit stock based on genetics and tagging data

January 2018 Stock Assessment

- Pooled effort of multiple state agencies and universities
  - North Carolina
  - South Carolina
  - Georgia
  - Florida
  - University of North Carolina at Wilmington
  - Louisiana State University
  - Atlantic States Marine Fisheries Commission
- Includes fisheries-dependent and fisheries-independent data from throughout the South Atlantic
- Presented to peer review panel in December 2017
  - First public peer review
  - Three-day workshop

Peer Review

- Accepted the final assessment model (presented here), though use contingent on update
- Endorsed basing management on a more timely assessment (update using data through 2017)
- Update should incorporate expected changes to recreational catch estimates, if available

What is a Model

- A simple representation of a complex process
- Assessment model data needs
  - Catch—the amount of fish removed from a stock by fishing
  - Abundance—relative index of the number or weight of fish in a stock
  - Biology—provides information on growth, maturity, and natural mortality
- Data types
  - Fisheries-dependent
  - Fisheries-independent

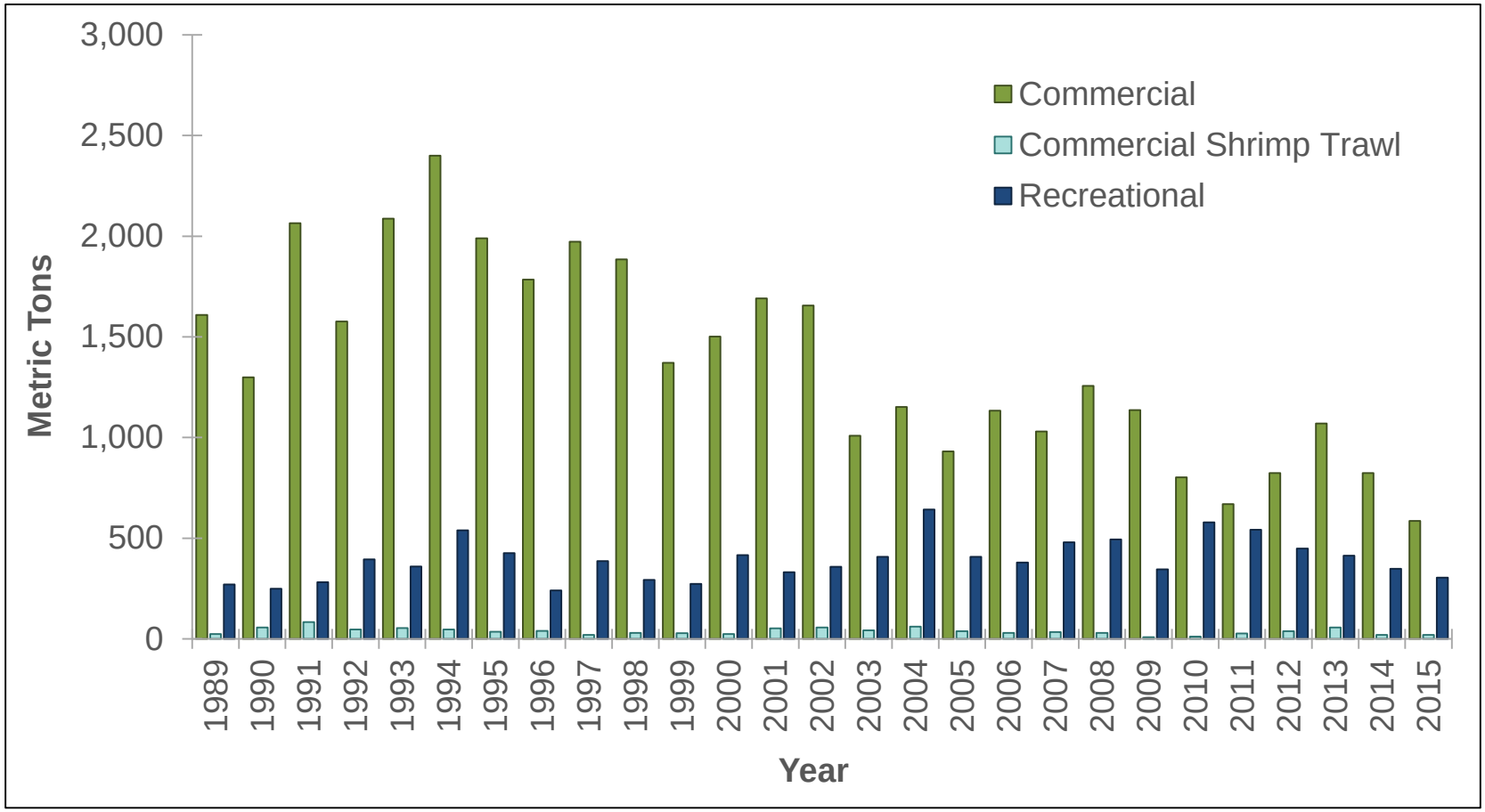
Model Structure

- Unit stock: North Carolina through the east coast of Florida
- Calendar year: 1989 through 2015
- Birth date: Jan. 1
- Gender: Sexes combined
- Age range: Age-4 plus group
- Natural mortality: Age-specific

Fleets

- Commercial
  - Landings and gill-net discards (dead)
- Commercial Shrimp Trawl
  - Bycatch (dead)
- Recreational
  - Harvest and dead releases
  - Includes hook-and-line and gig catches

Total Landings & Discards (North Carolina to Florida East Coast)



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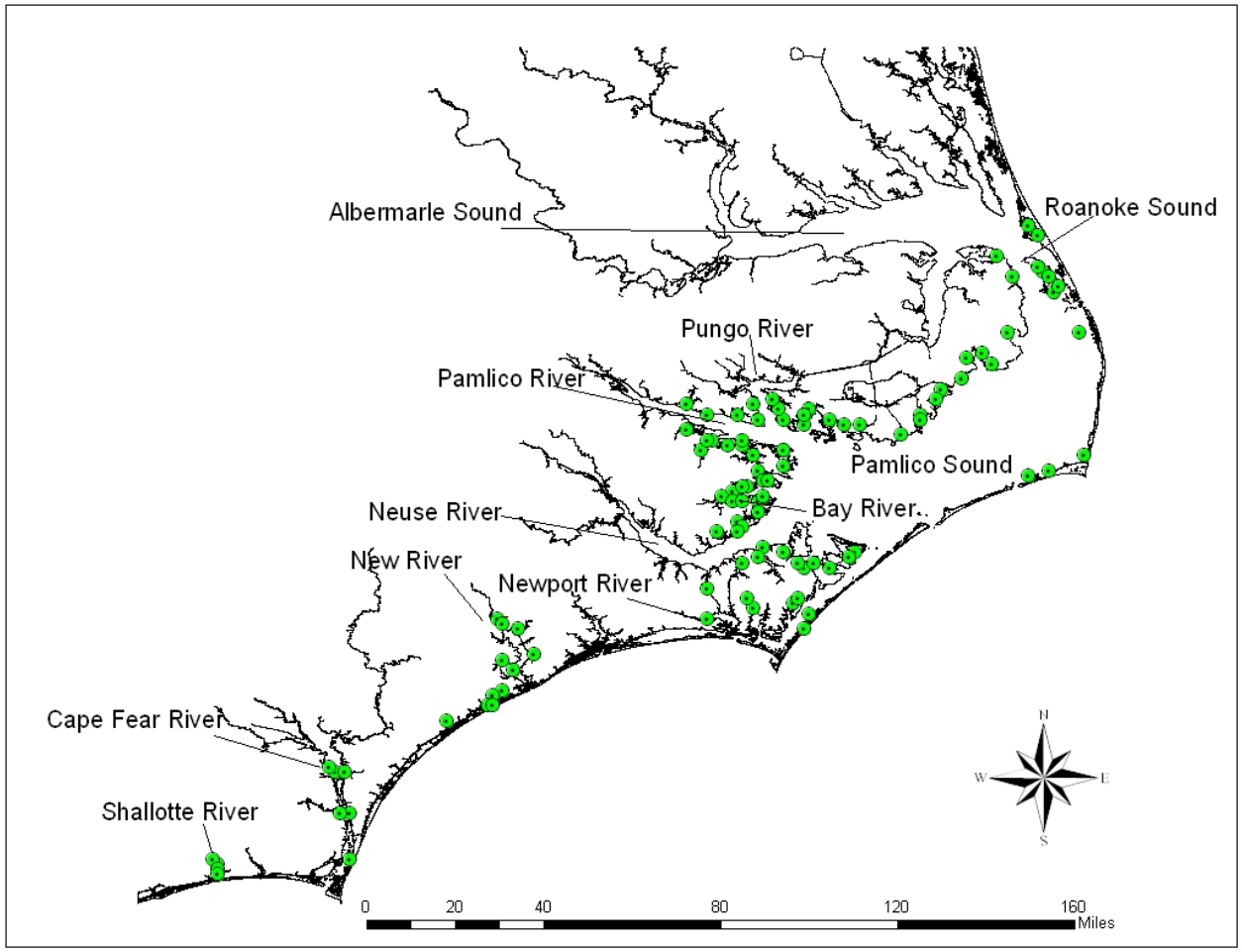
Surveys

- One juvenile survey from each state, except Georgia
- One primarily adult survey from each state
- One ocean survey (SEAMAP)

North Carolina Program 120 Trawl Survey Recruitment



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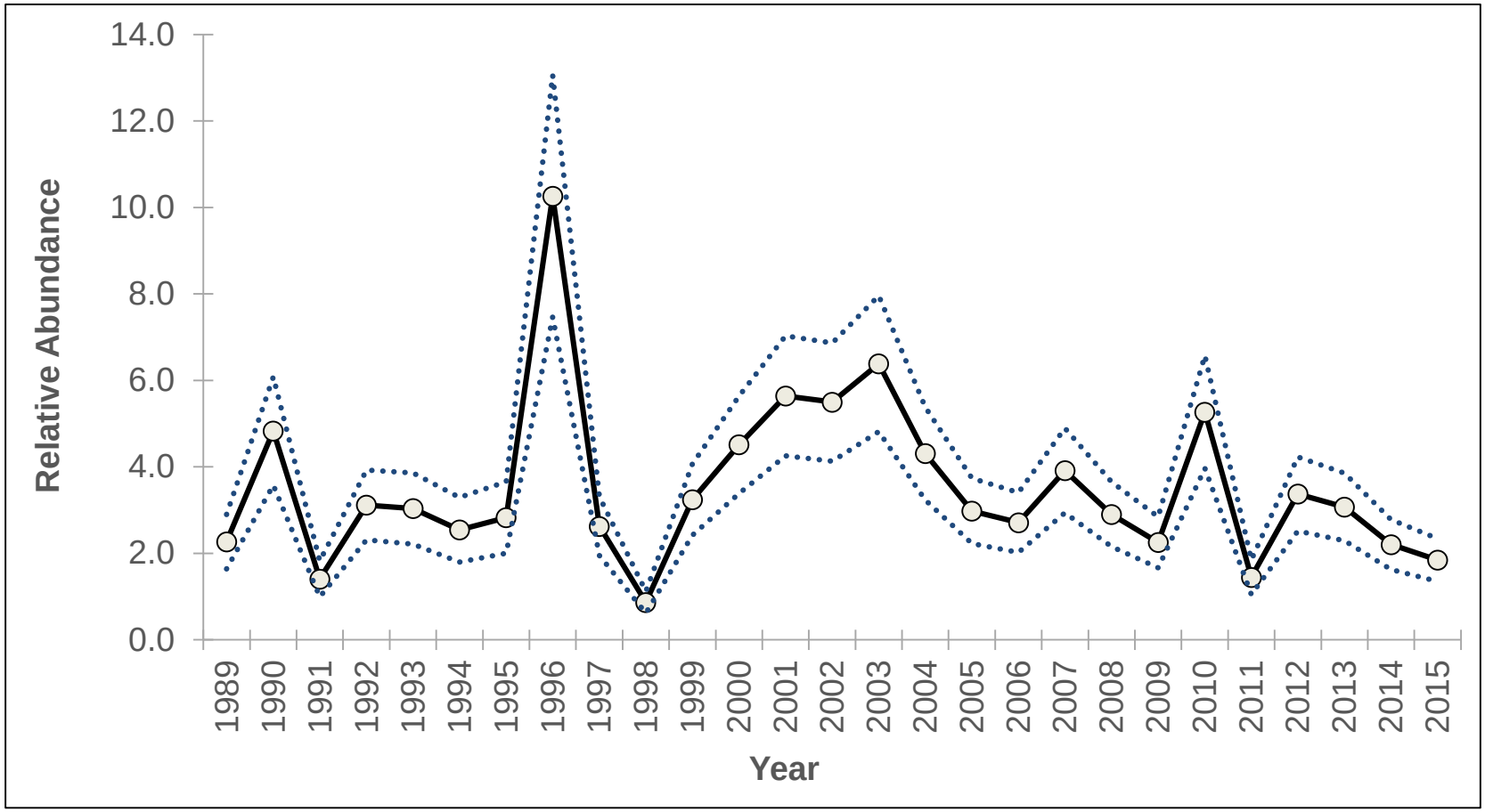
North Carolina Program 120 Trawl Survey Recruitment



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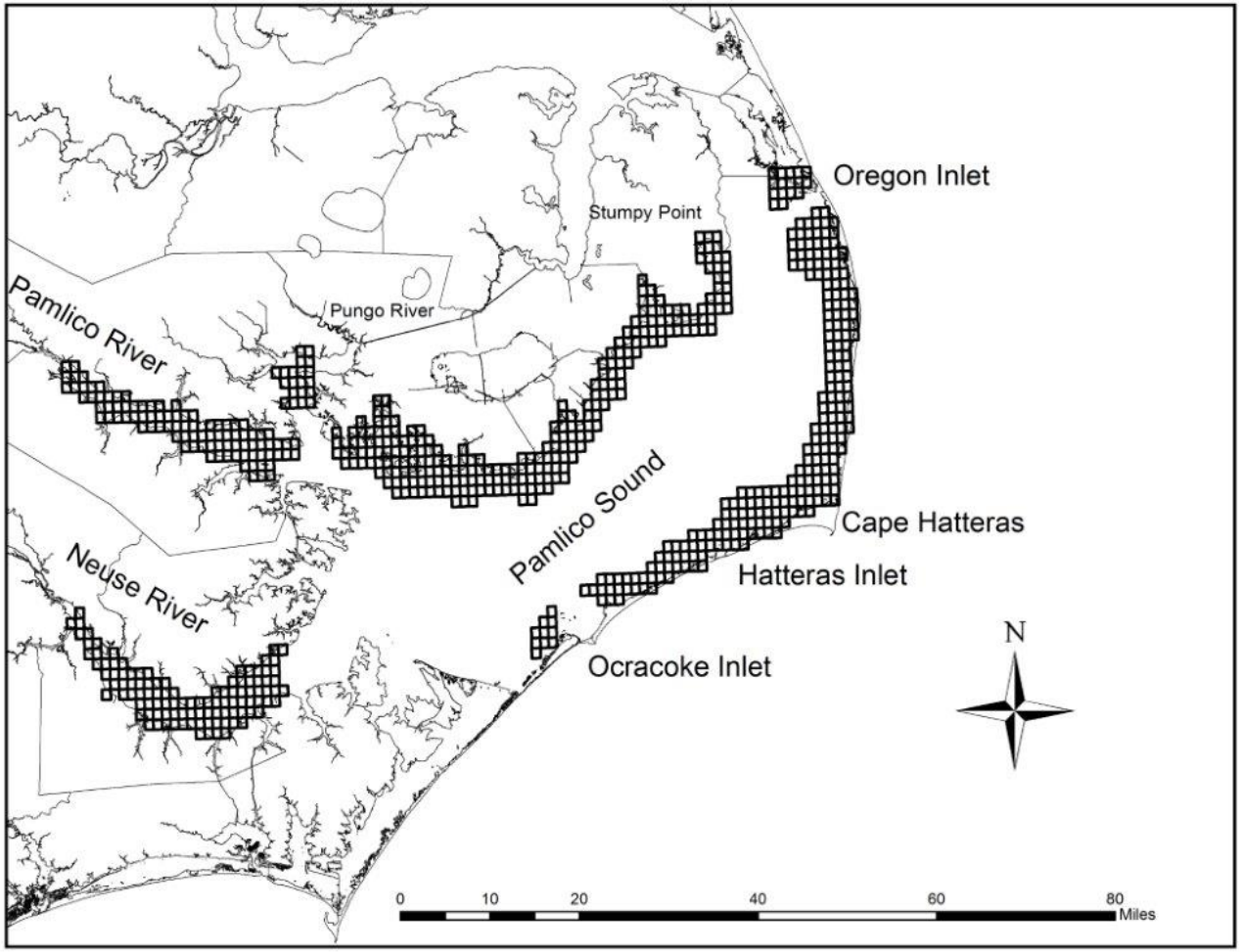
North Carolina Program 915 Gill-Net Survey Adult



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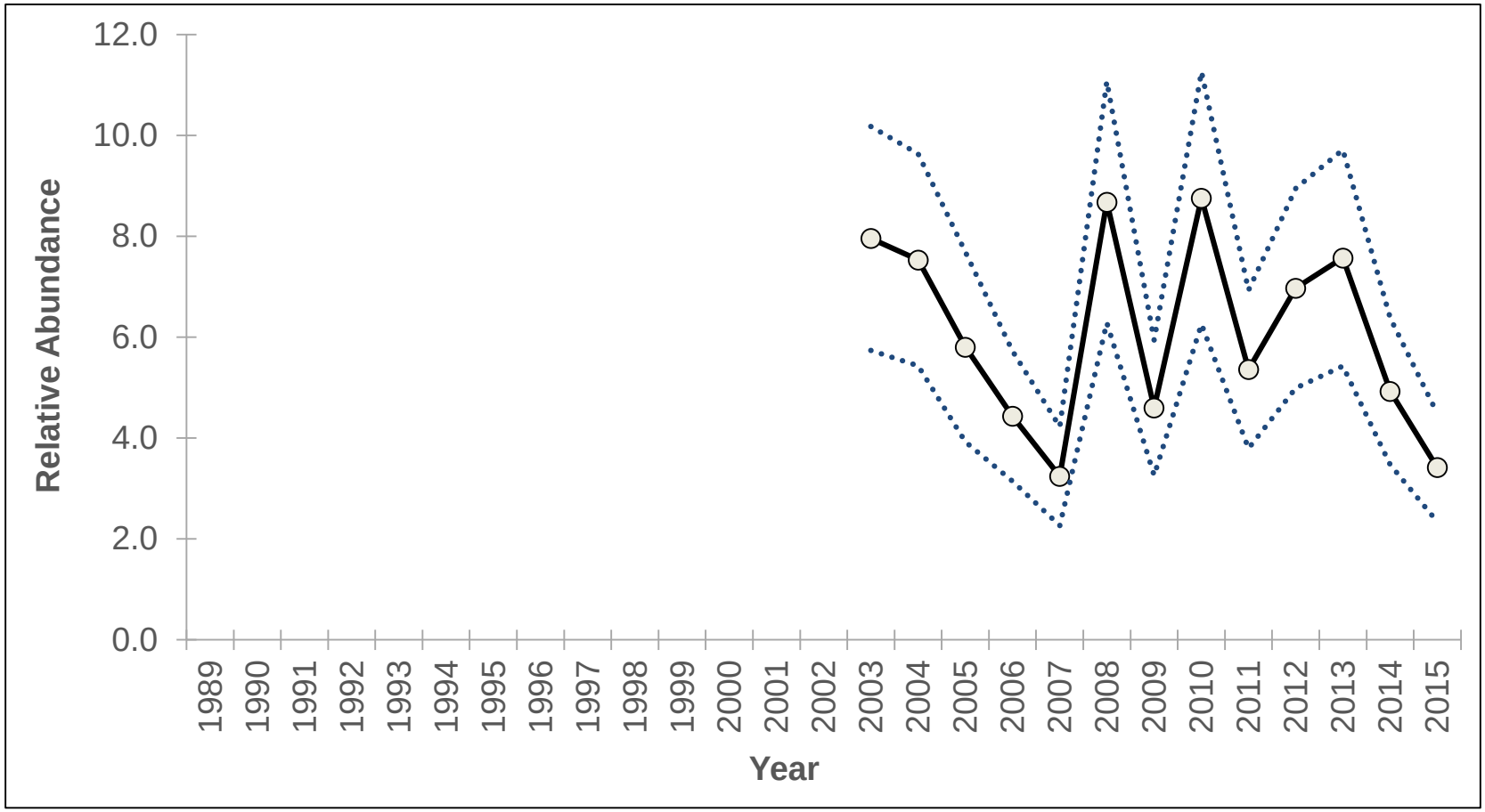

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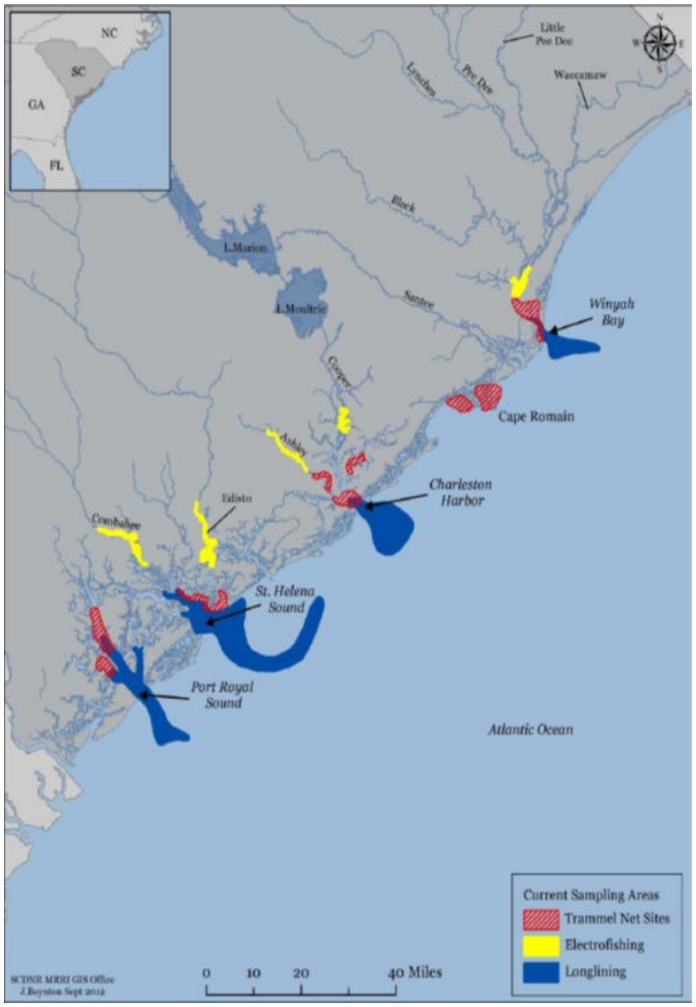
South Carolina Electrofishing Survey Recruitment



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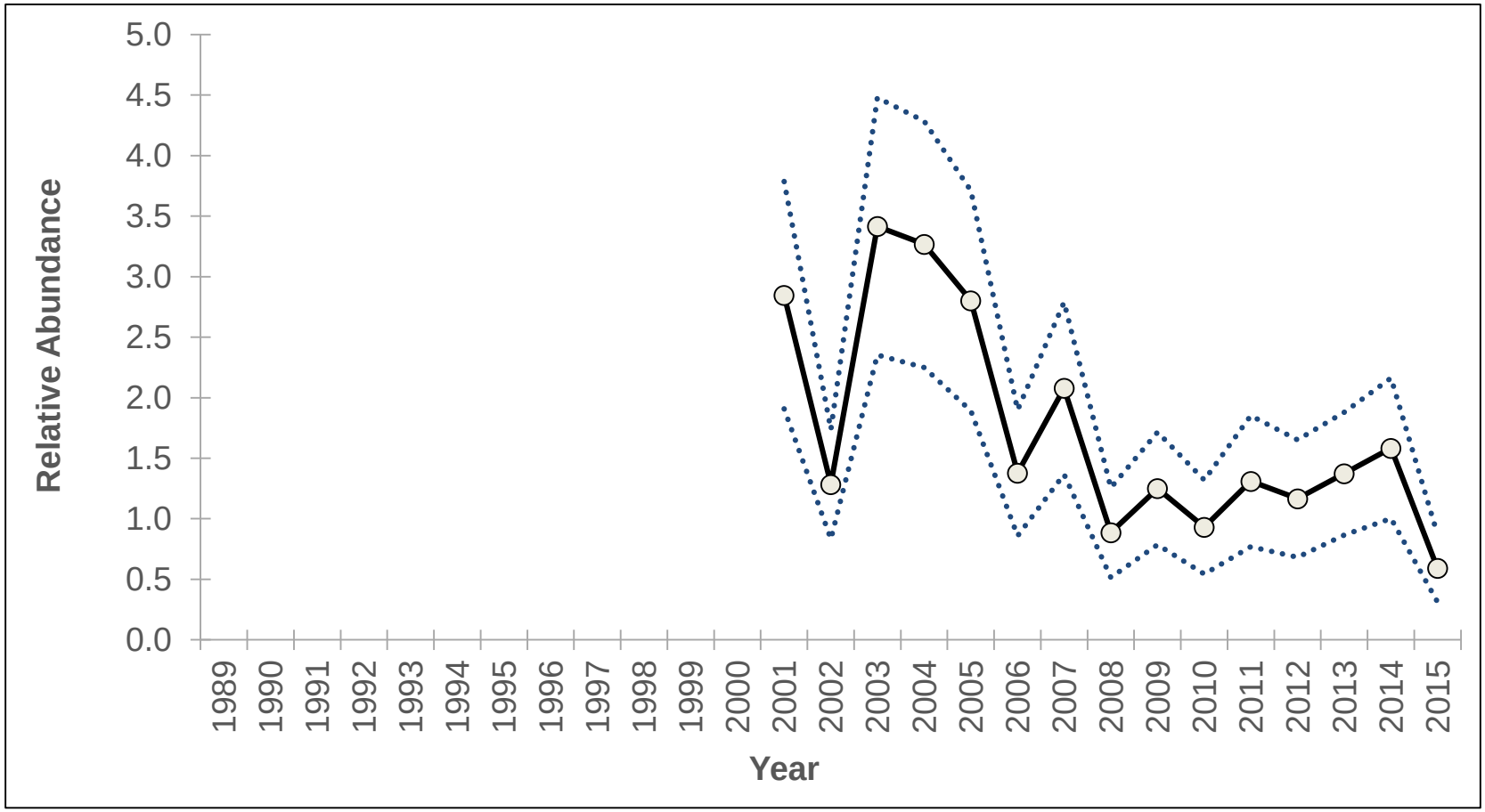
South Carolina Electrofishing Survey Recruitment



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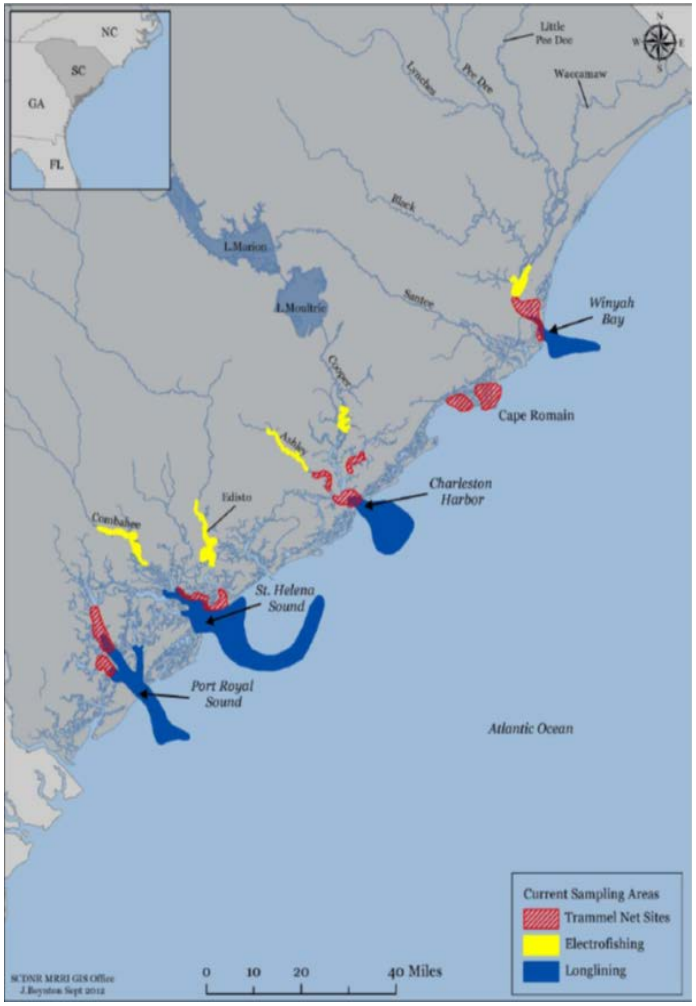
South Carolina Trammel Net Survey Adult



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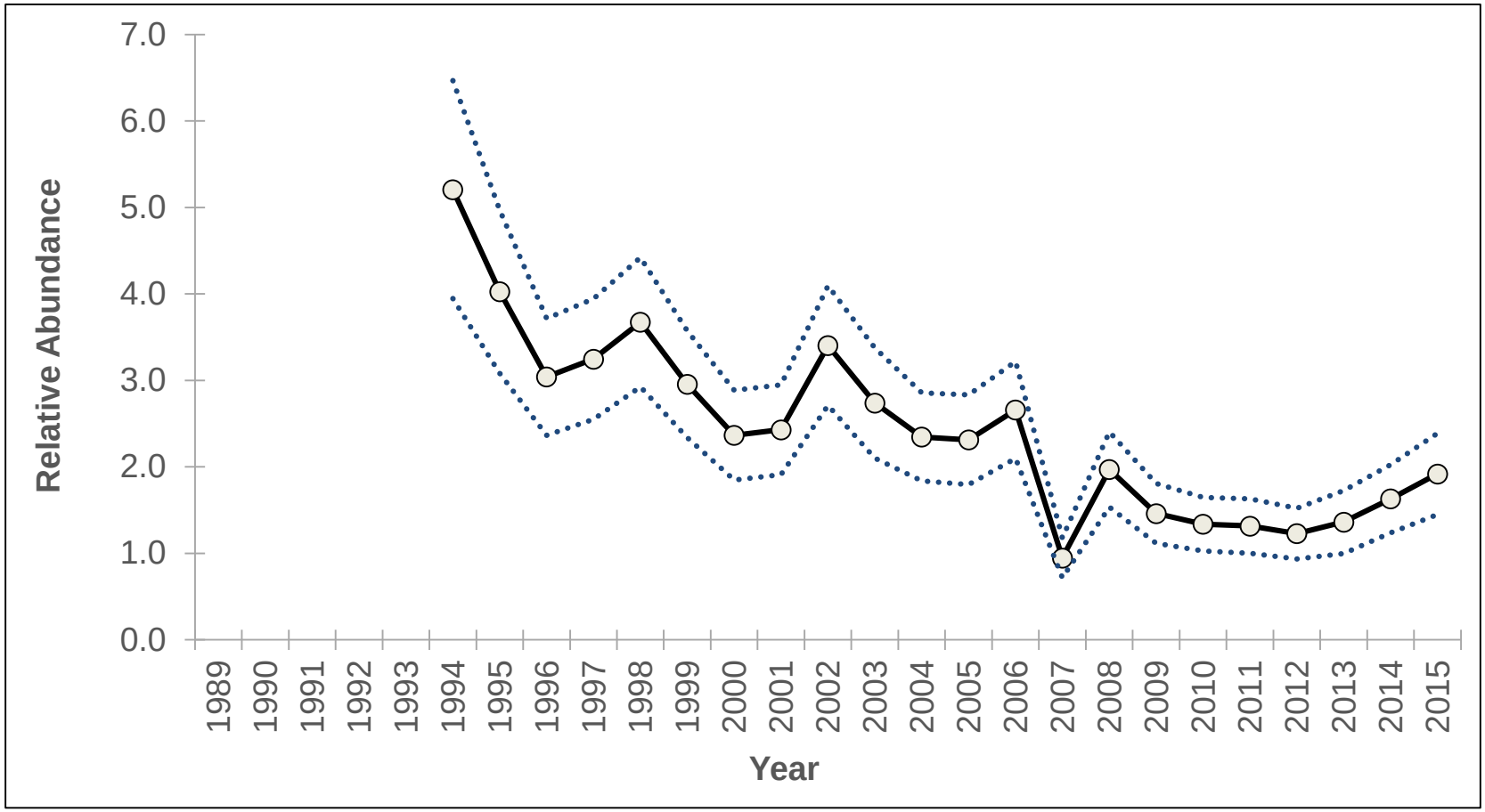

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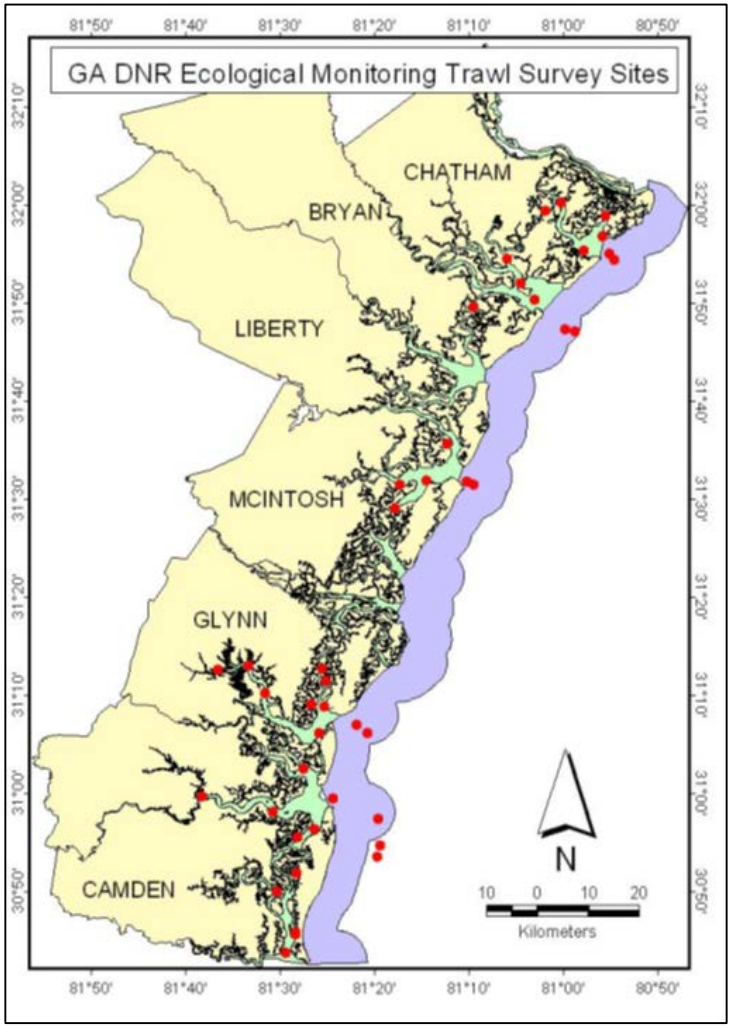
Georgia Trawl Survey Adult



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Georgia Trawl Survey
Adult

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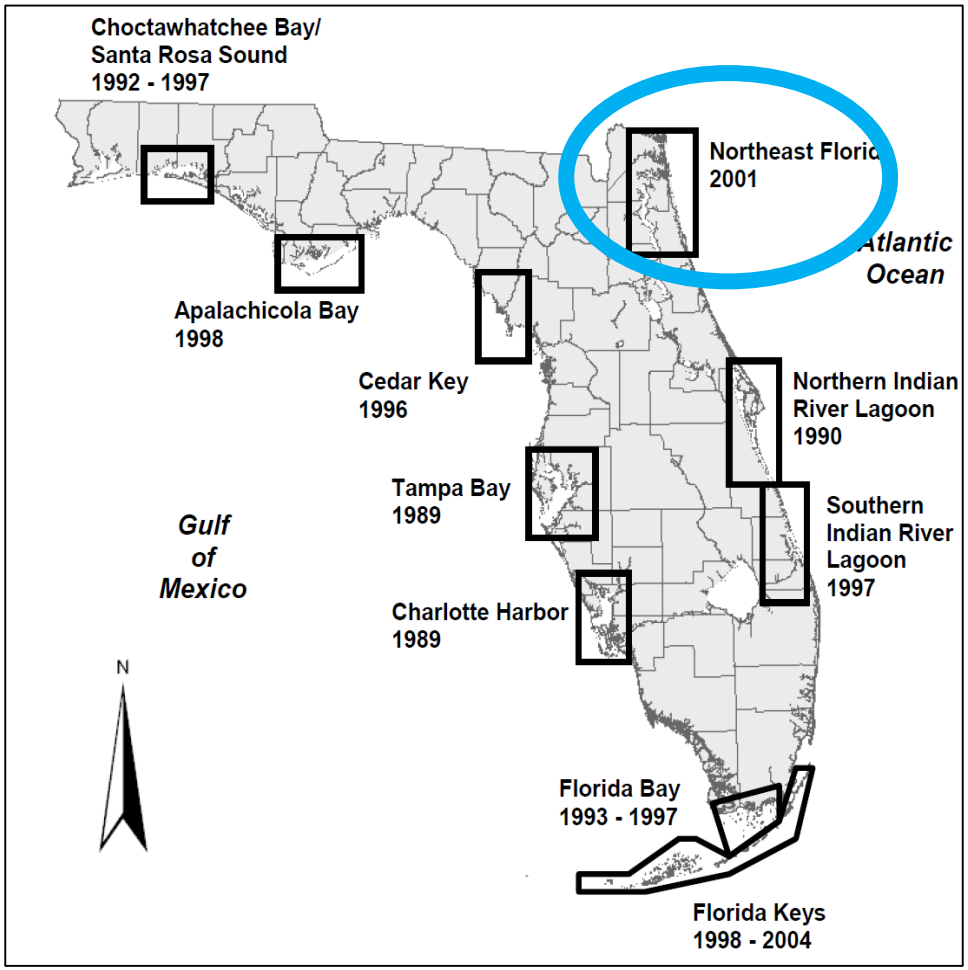
Florida Trawl Survey Recruitment & Adult



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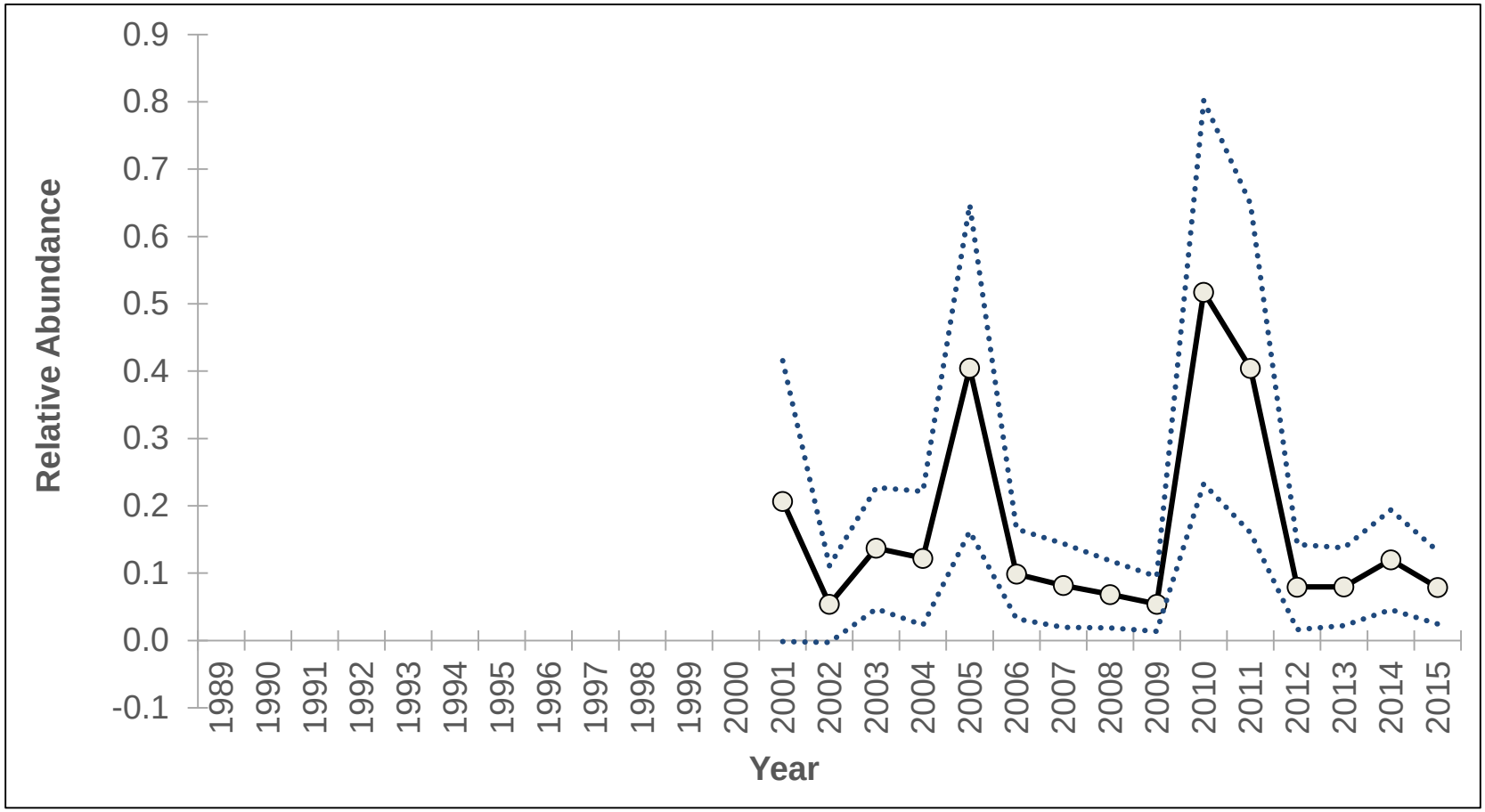
Florida Trawl Survey Recruitment



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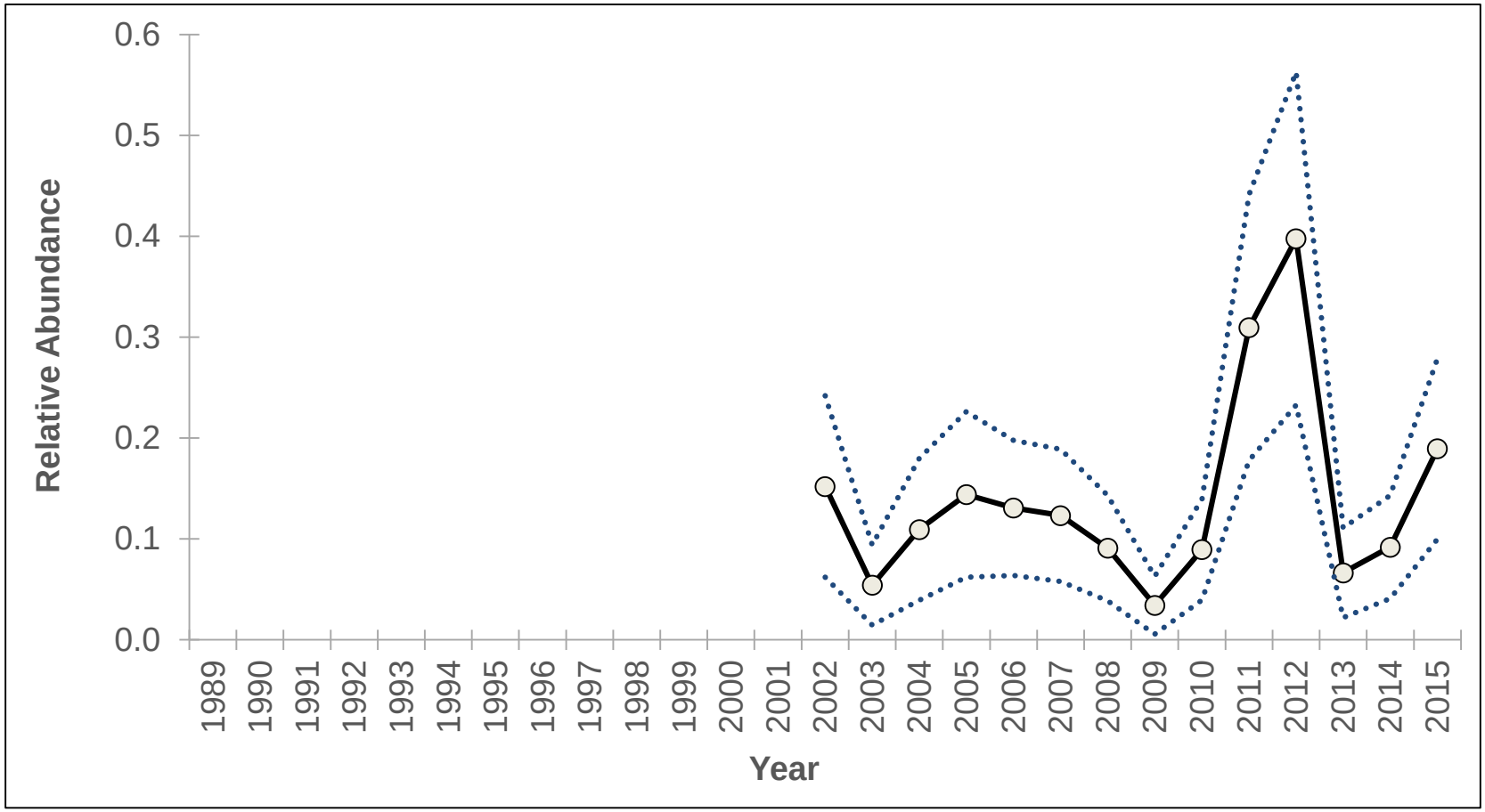
Florida Trawl Survey
Adult



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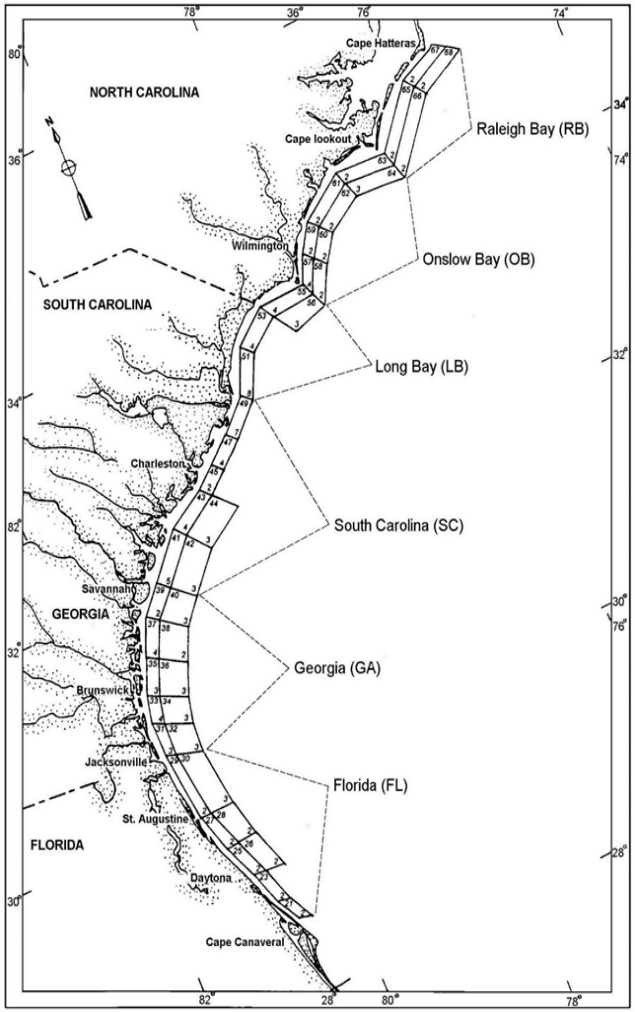
SEAMAP Trawl Survey Adult



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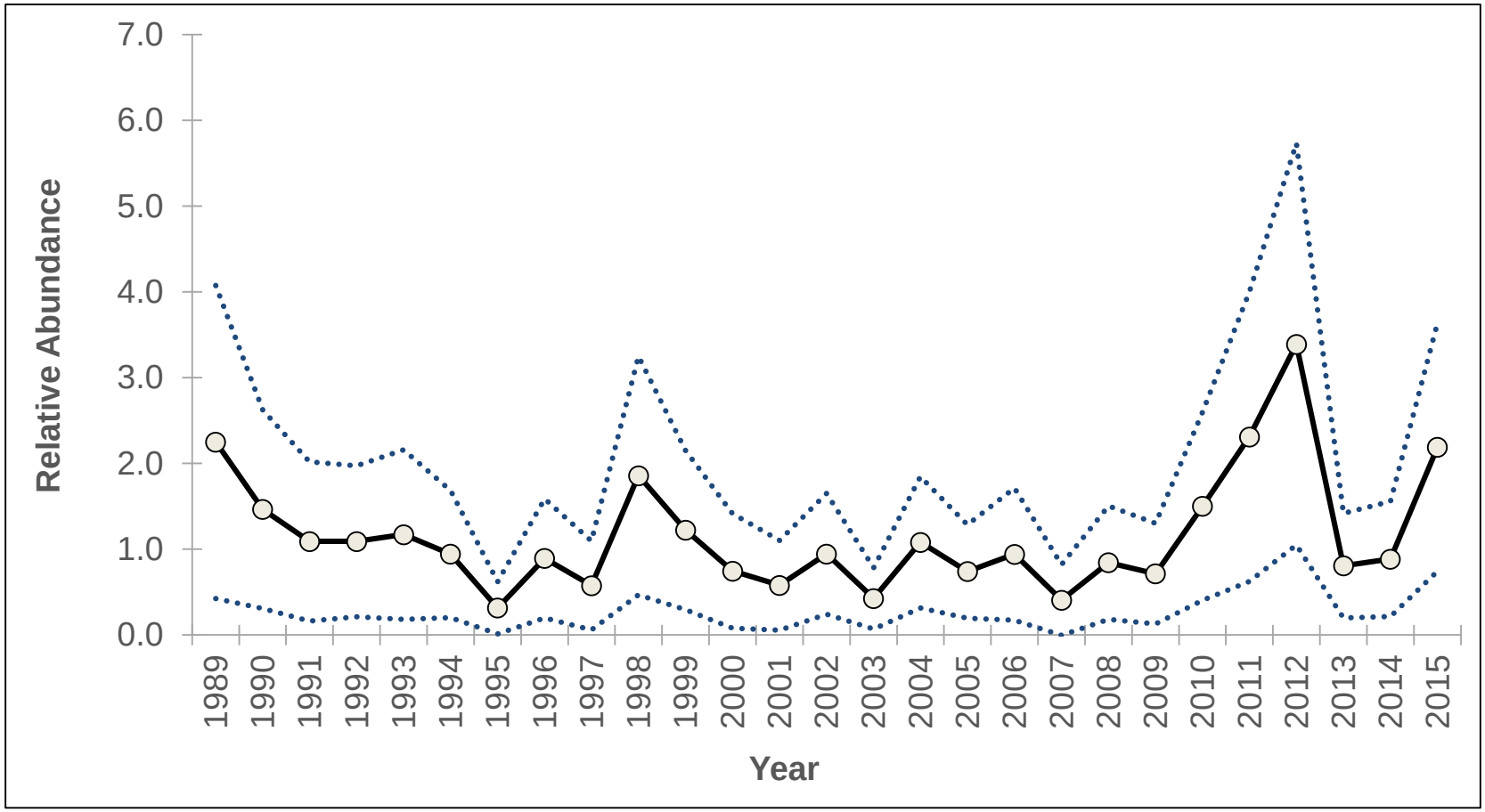
SEAMAP Trawl Survey
Adult



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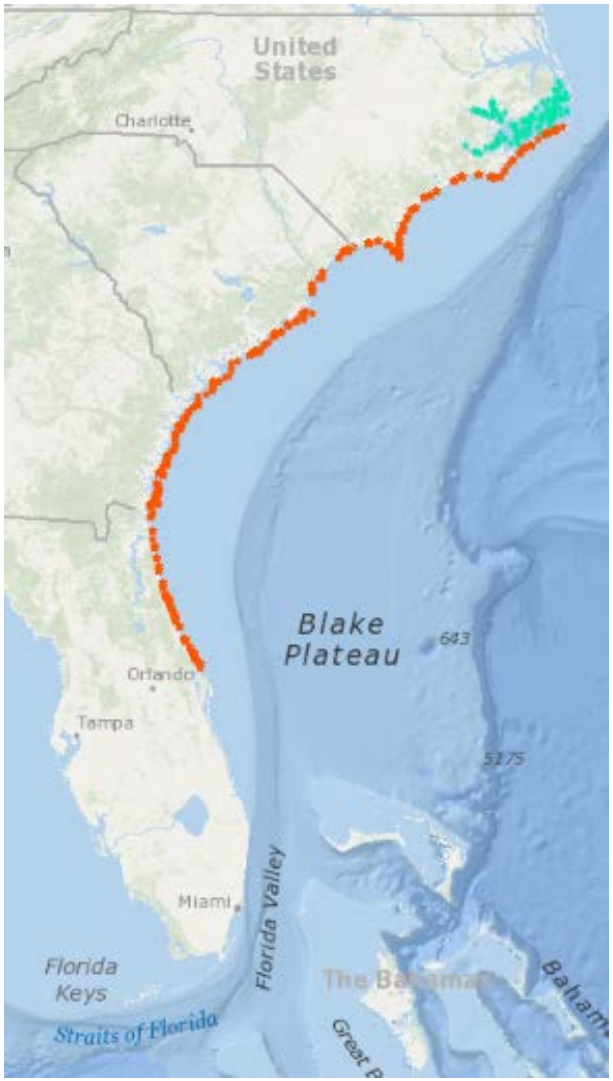
Map of All Survey Areas



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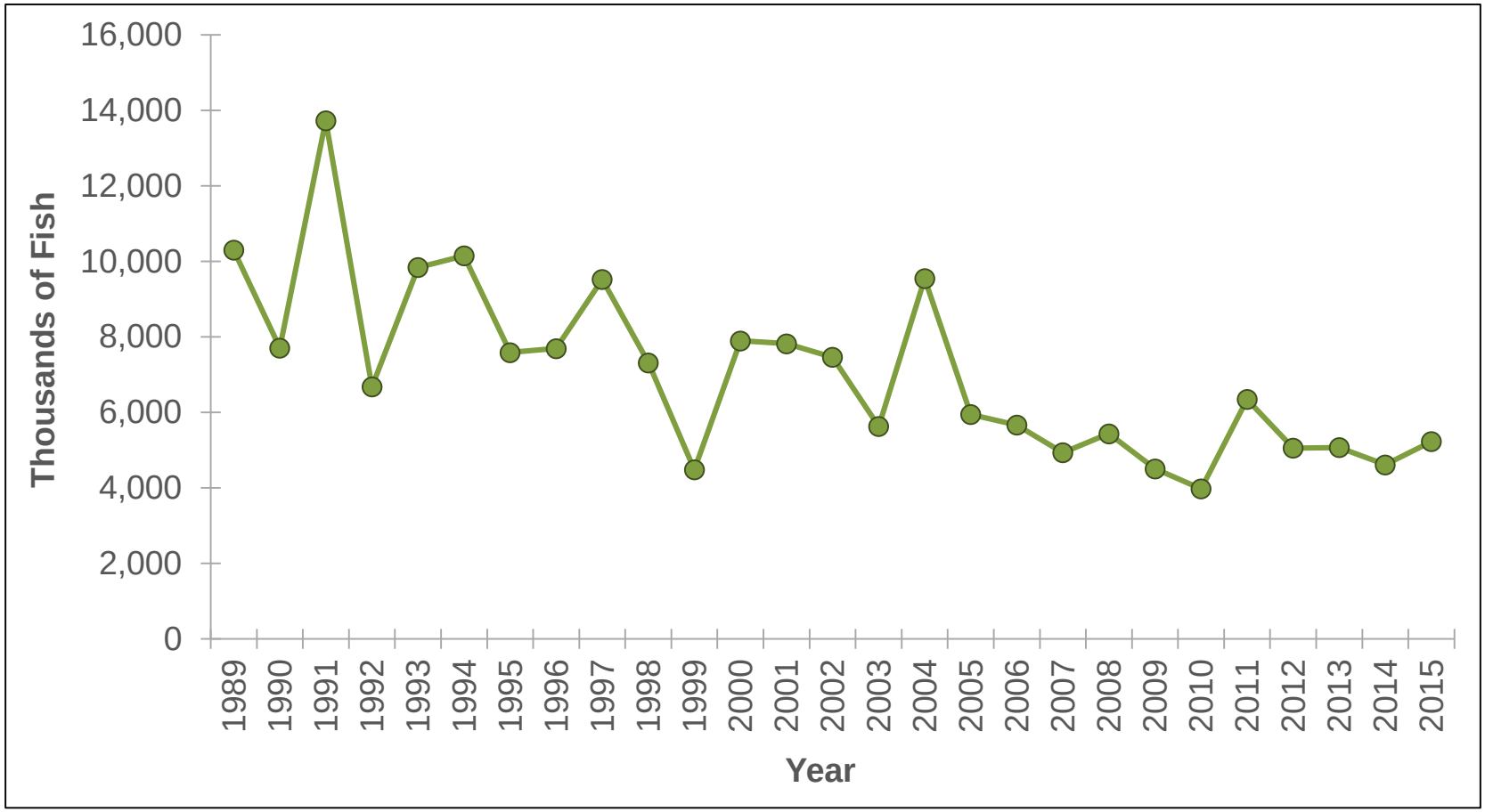
Recruitment (Age-1)



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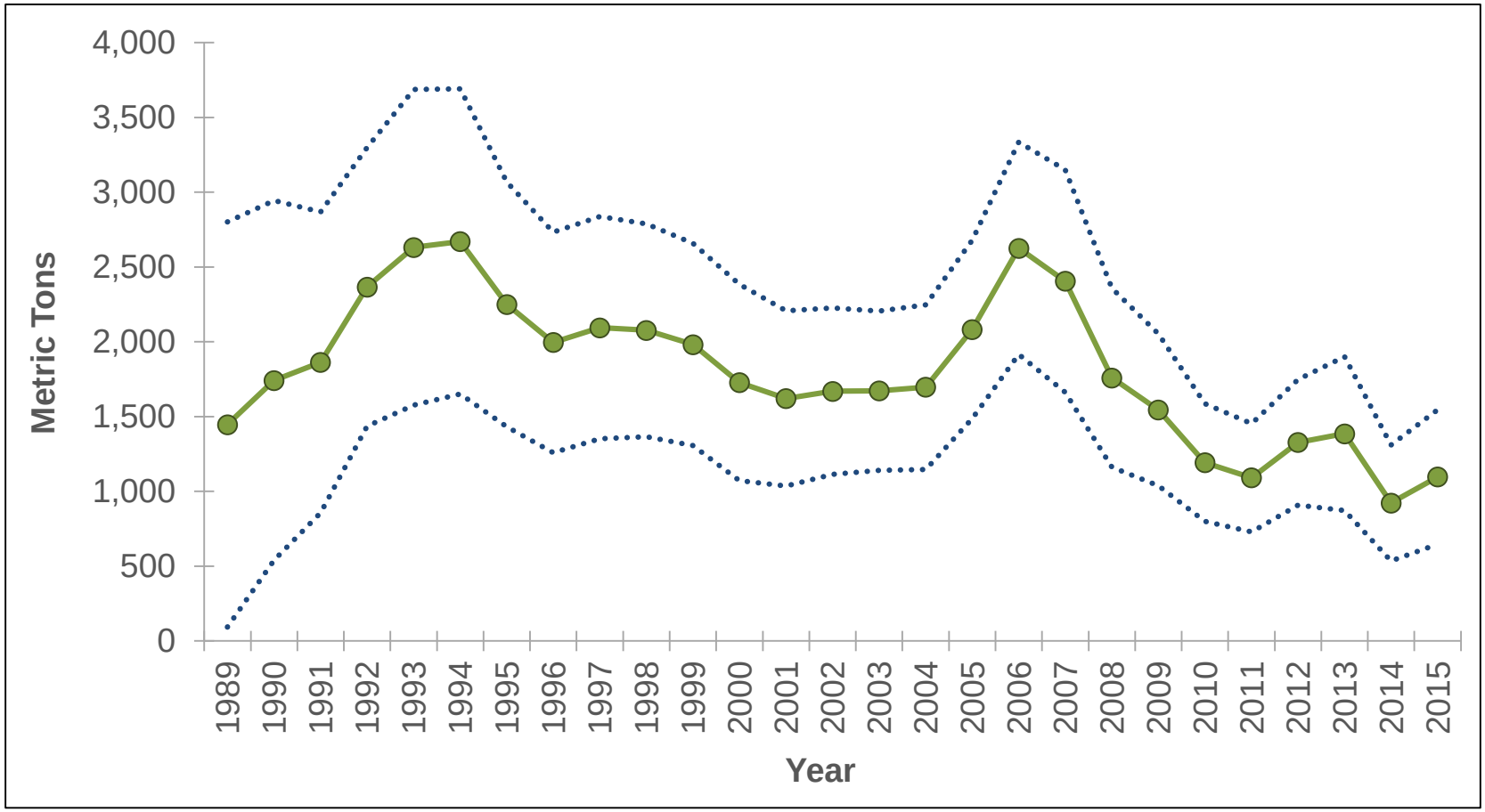
Female Spawning Stock Biomass



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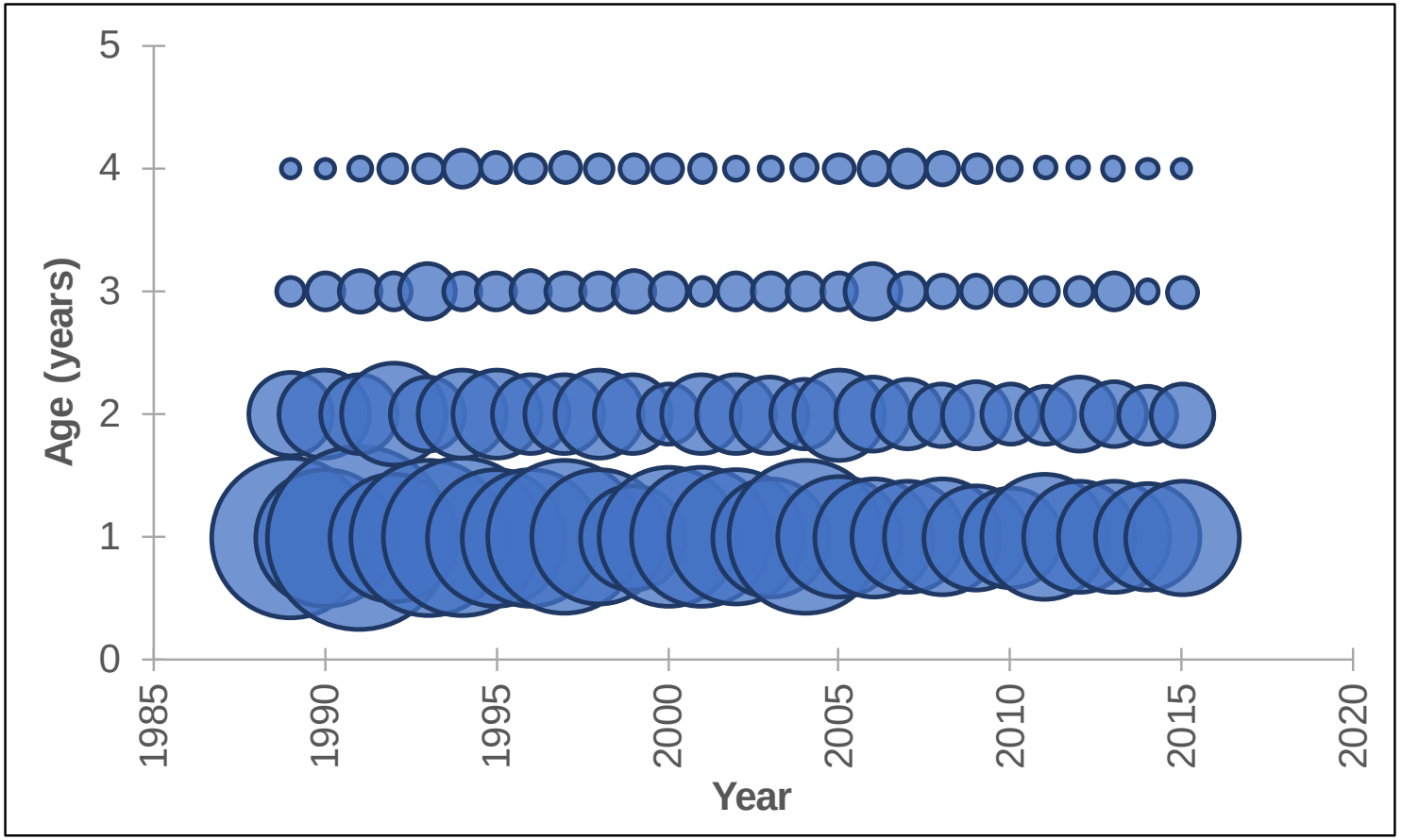
Numbers at Age



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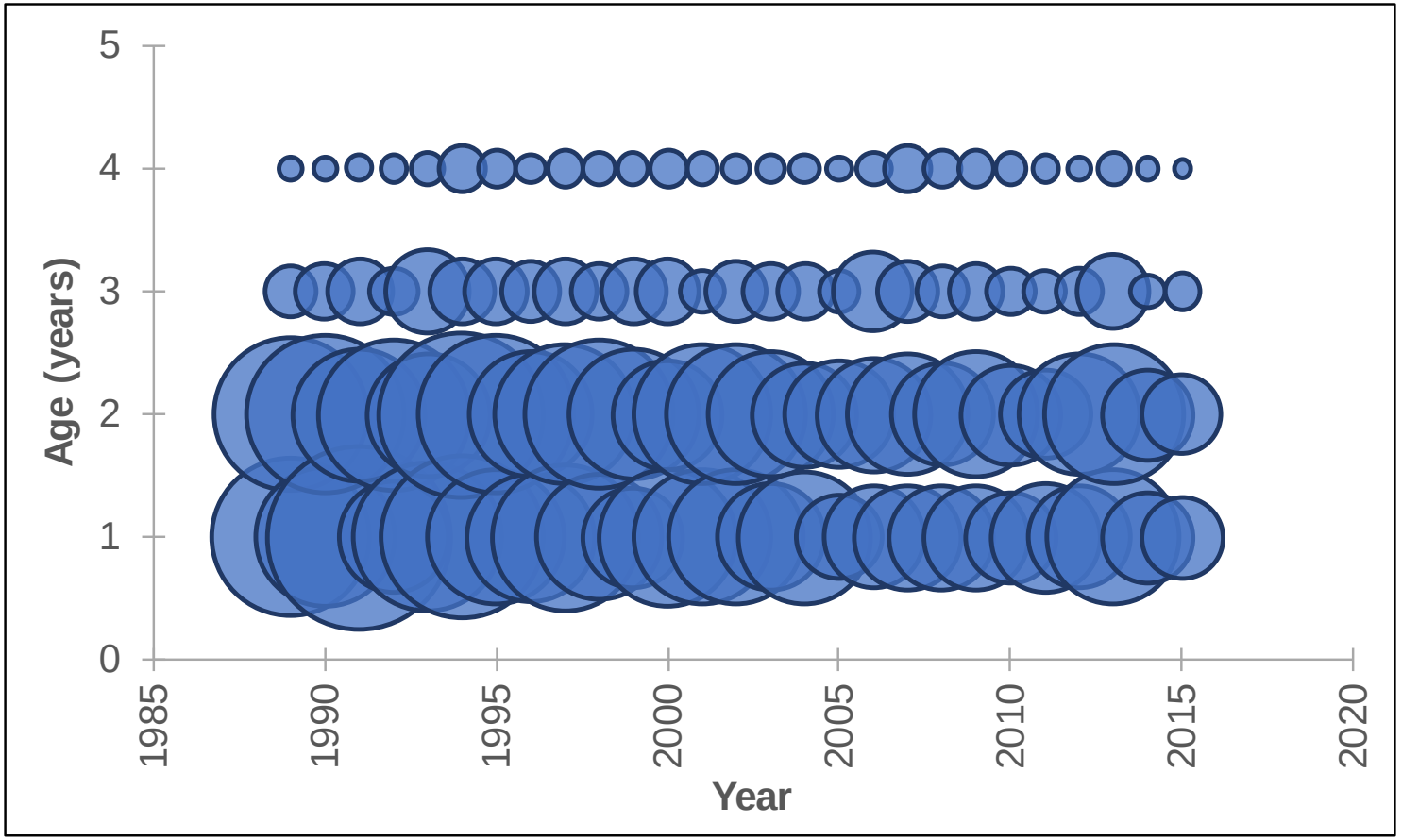
Catch at Age



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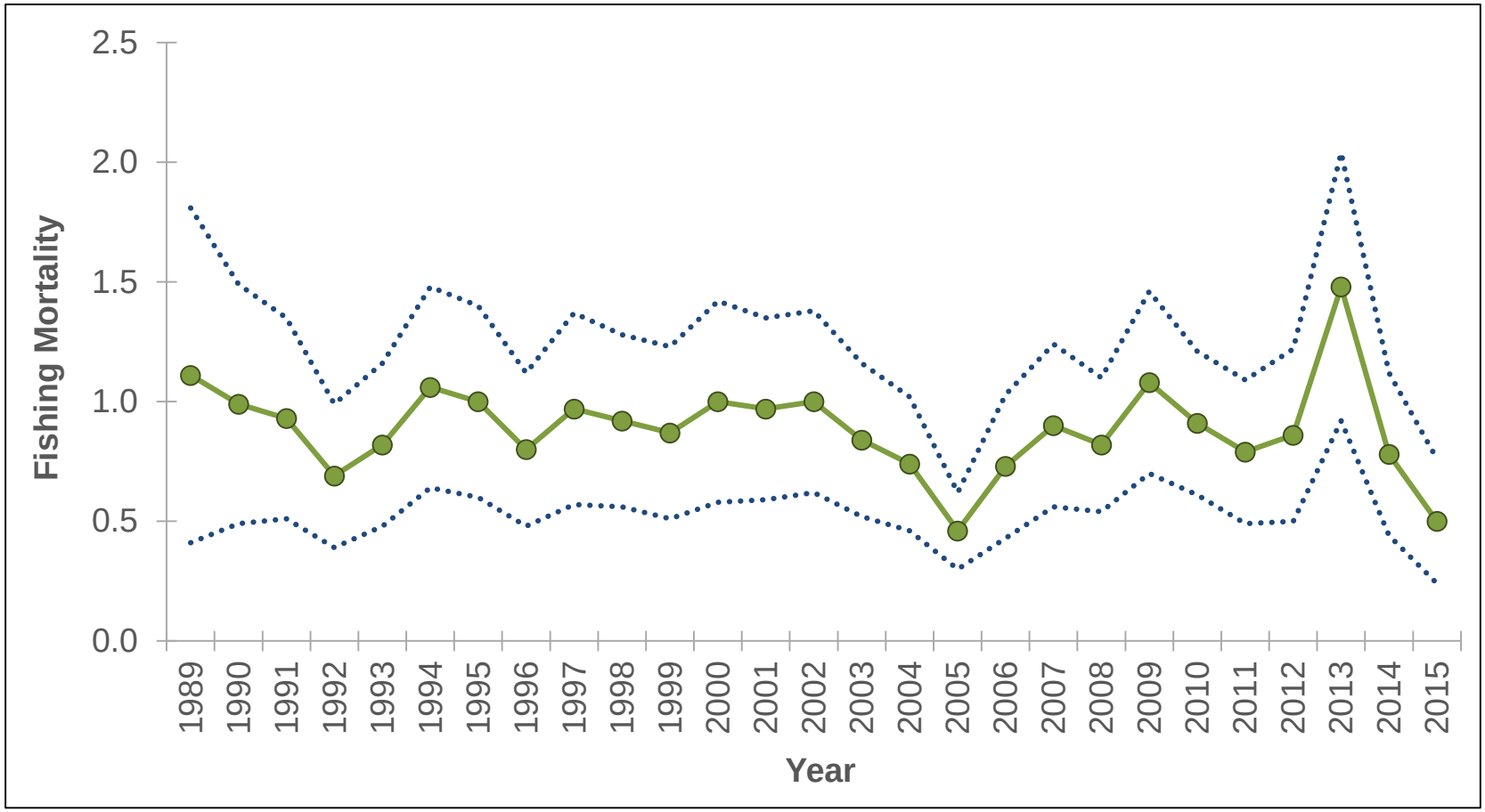
Fishing Mortality



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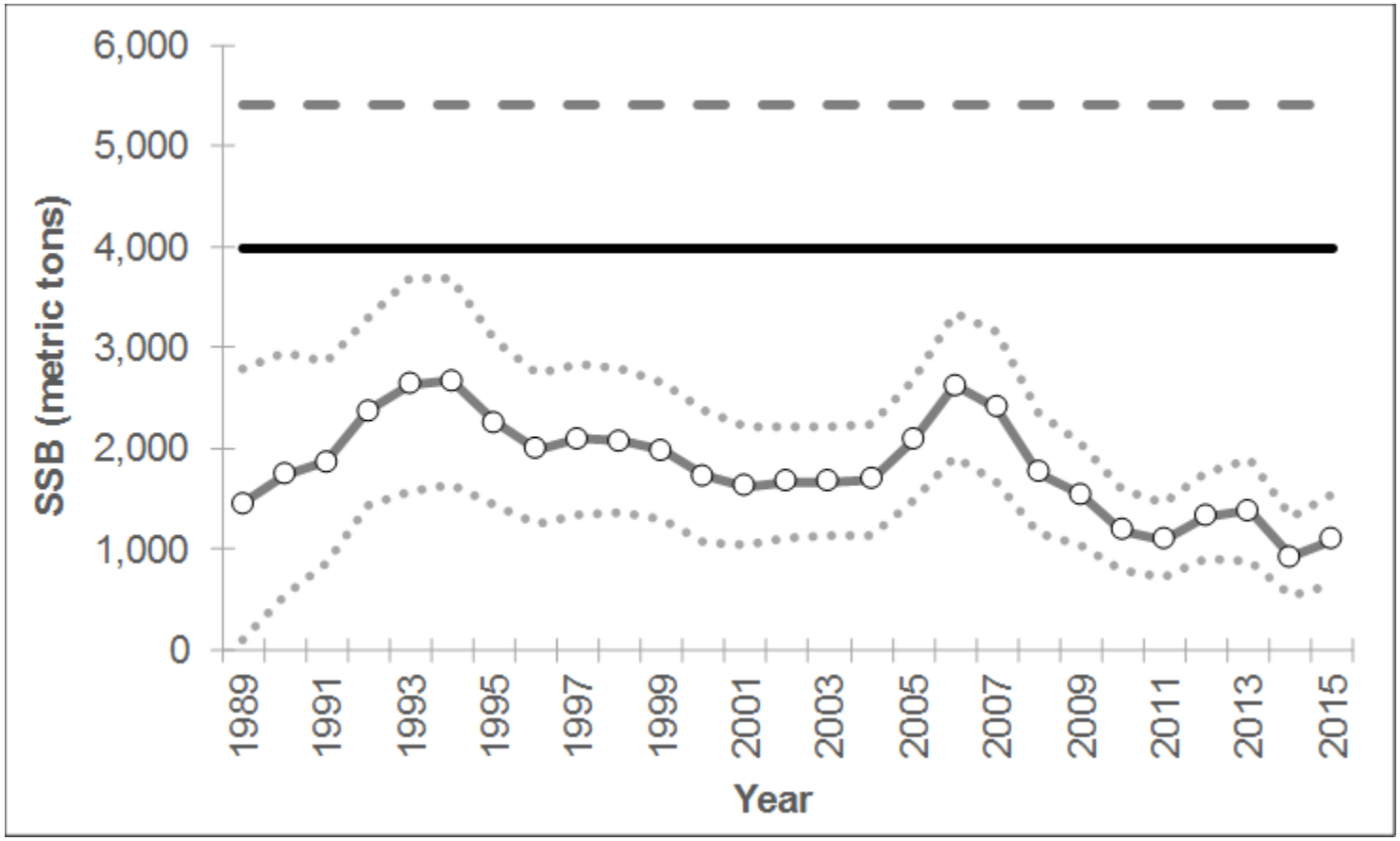
Reference Points

- Female Spawning Stock Biomass (SSB)
  - Target: $SSB_{35\%}$
  - Threshold: $SSB_{25\%}$
- Fishing Mortality (*F*)
  - Target: $F_{35\%}$
  - Threshold: $F_{25\%}$

Determining Stock Status

- Female Spawning Stock Biomass (SSB)
  - If current stock size < threshold ($SSB_{25\%}$), then stock is **overfished**
- Fishing Mortality (*F*)
  - If current *F* > threshold ($F_{25\%}$), then **overfishing** is occurring

Stock Status—Female Spawning Stock Biomass



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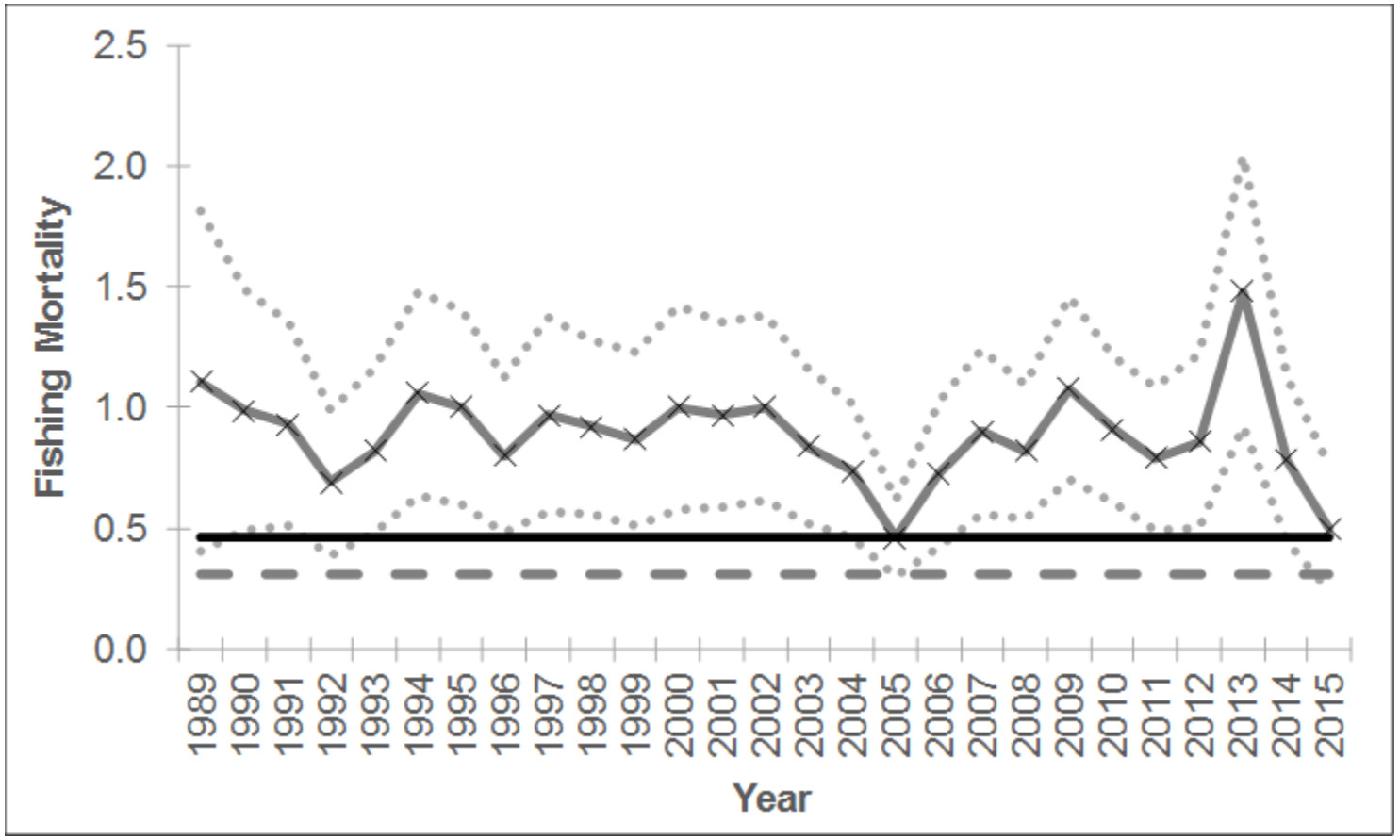
Stock Status—Female Spawning Stock Biomass

- Female Spawning Stock Biomass (SSB)
  - SSB_{2015} = 1,097 metric tons
  - $SSB_{25\%}$ = 3,985 metric tons (threshold)
  - $SSB_{2015} < SSB_{25\%}$ stock is overfished
  - $SSB_{35\%}$ = 5,413 metric tons (target)

Stock Status—Fishing Mortality



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Stock Status—Fishing Mortality

- Fishing Mortality
  - $F_{2015} = 0.50$
  - $F_{25\%} = 0.46$ (threshold)
  - $F_{2015} > F_{25\%}$ overfishing is occurring
  - $F_{35\%} = 0.31$ (target)

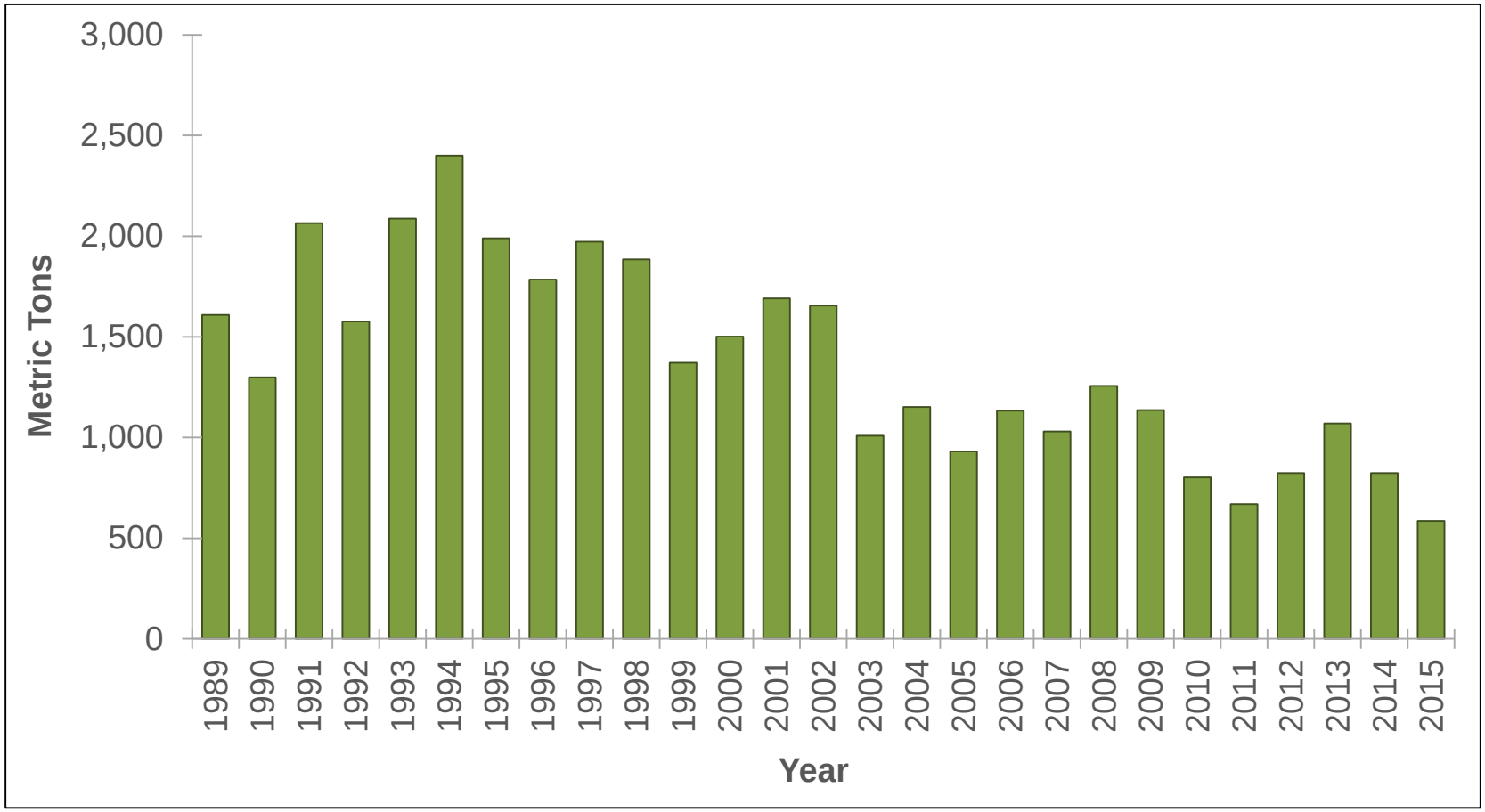
Current Stock Status in 2015

- The probability that the 2015 stock is overfished is 100 percent
- The probability that the 2015 stock is experiencing overfishing is 53 percent
- Large proportion of immature fish comprise landings
- No evidence of recent high recruitment

High Priority Research Recommendations

- Improve estimates of the recreational fishery live releases (catches, lengths, and ages) for southern flounder from the Marine Recreational Information Program
- Complete an age validation study using known age fish
- Expand, improve, or add fisheries-independent surveys of the ocean component of the stock
- Determine locations of spawning aggregations of southern flounder
- Investigate how environmental factors (wind, salinity, temperatures, or oscillations) may be driving the stock-recruitment dynamics for southern flounder

Commercial Catch (North Carolina to Florida East Coast)



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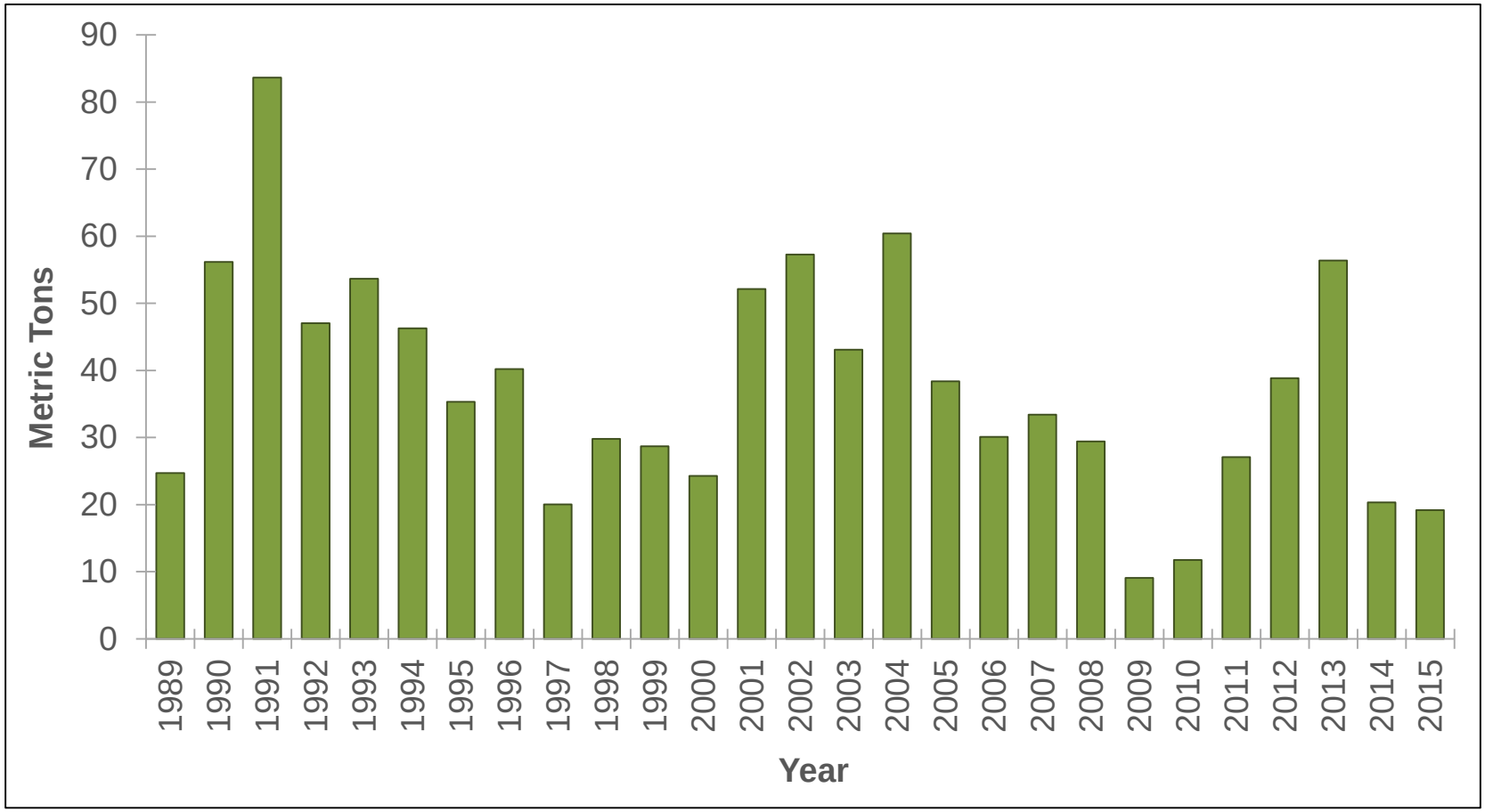
Commercial Shrimp Trawl Bycatch (North Carolina to Florida East Coast)



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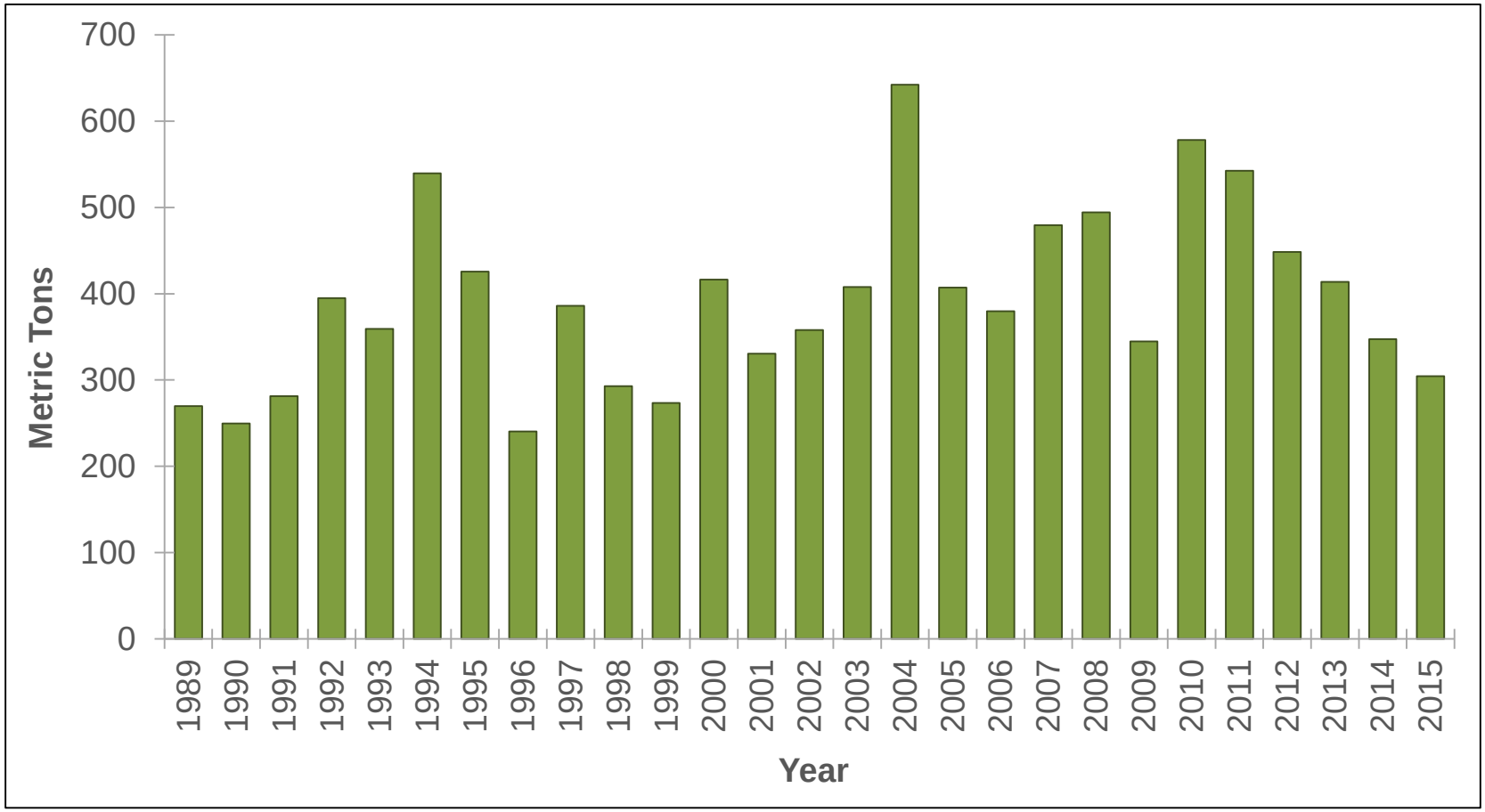
Recreational Catch (North Carolina to Florida East Coast)



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