Nothing Compares
NORTH CAROLINA

Stock Assessment of Southern Flounder in the South Atlantic

N.C. Marine Fisheries Commission Meeting | Amy Flowers

November 14, 2018

Department of Environmental Quality

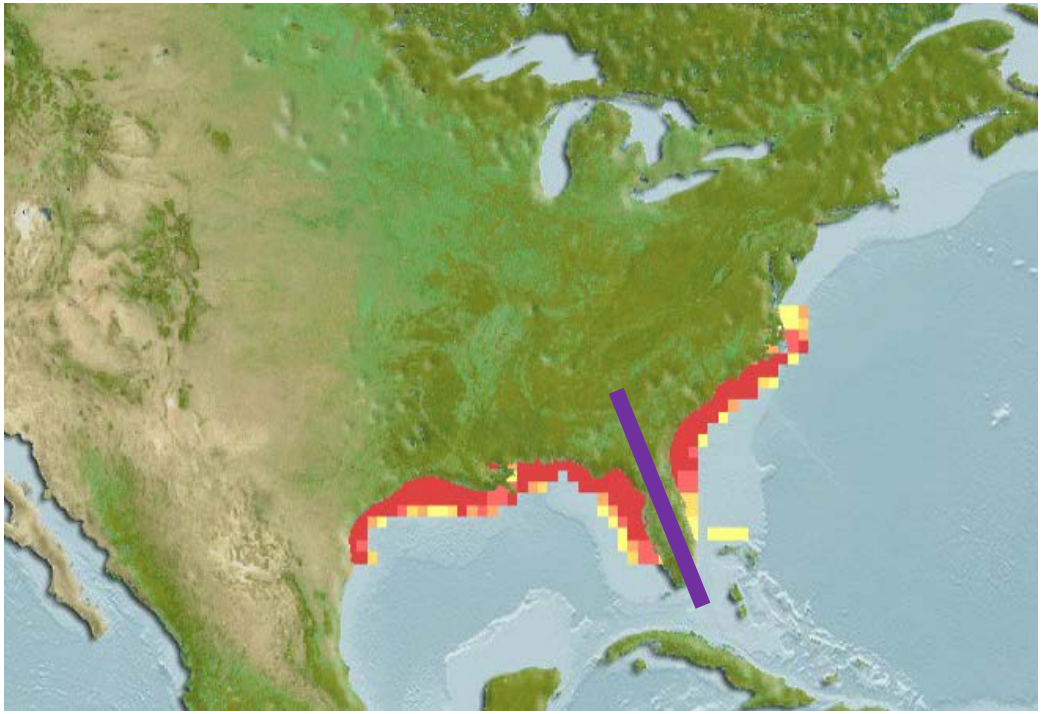
Marine Fisheries

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



Source: Hollensead, L.D. 2018. Dissertation. UNCW, Wilmington.

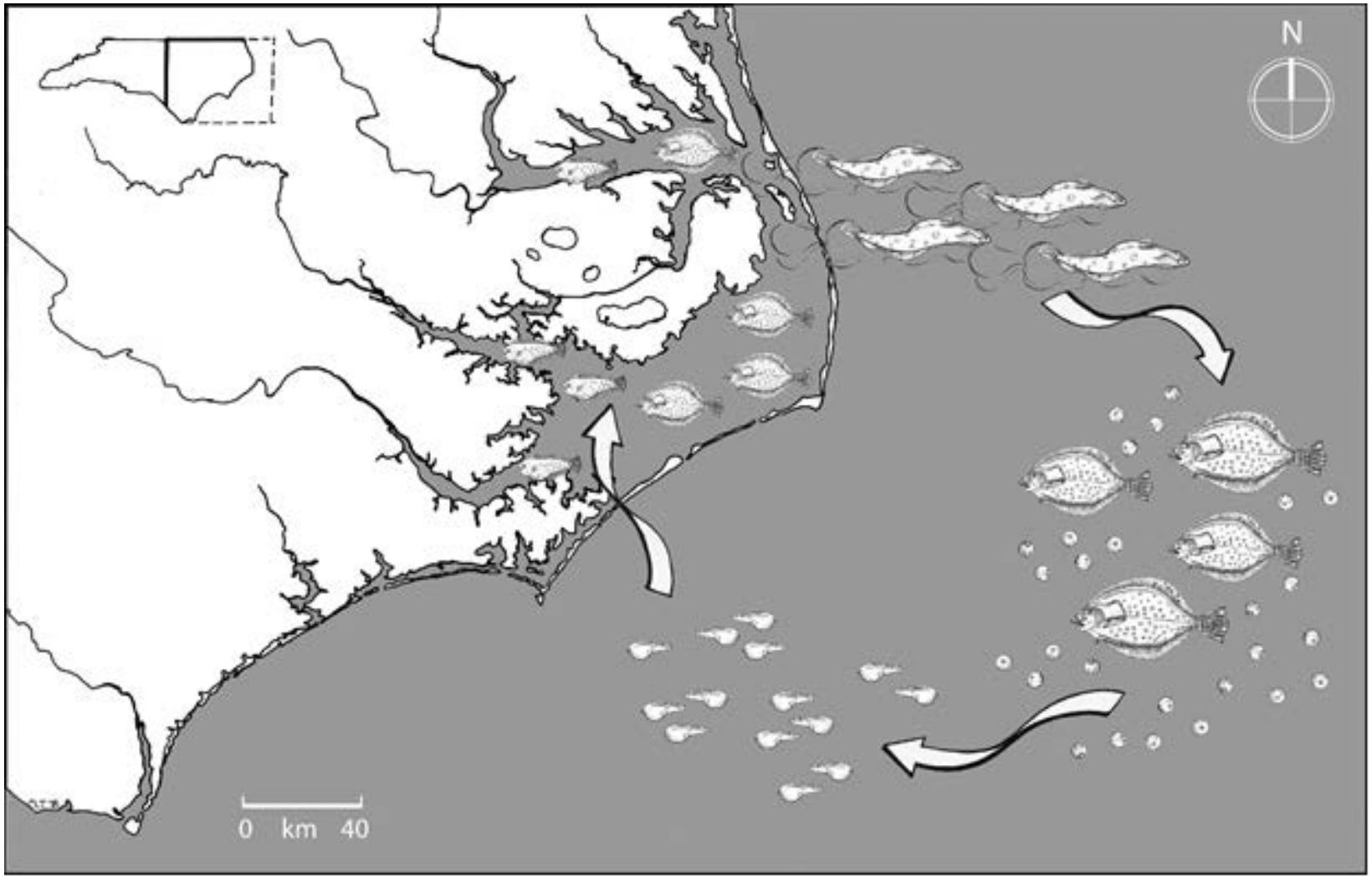


Fig. 1. Generalized life-history cycle for southern flounder off North Carolina and the Southeast US Atlantic continental shelf.

NCDMF Assessment History

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

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

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

Reminder

- This is an update
  - Limited to the model decisions that were made in the peer reviewed benchmark assessment

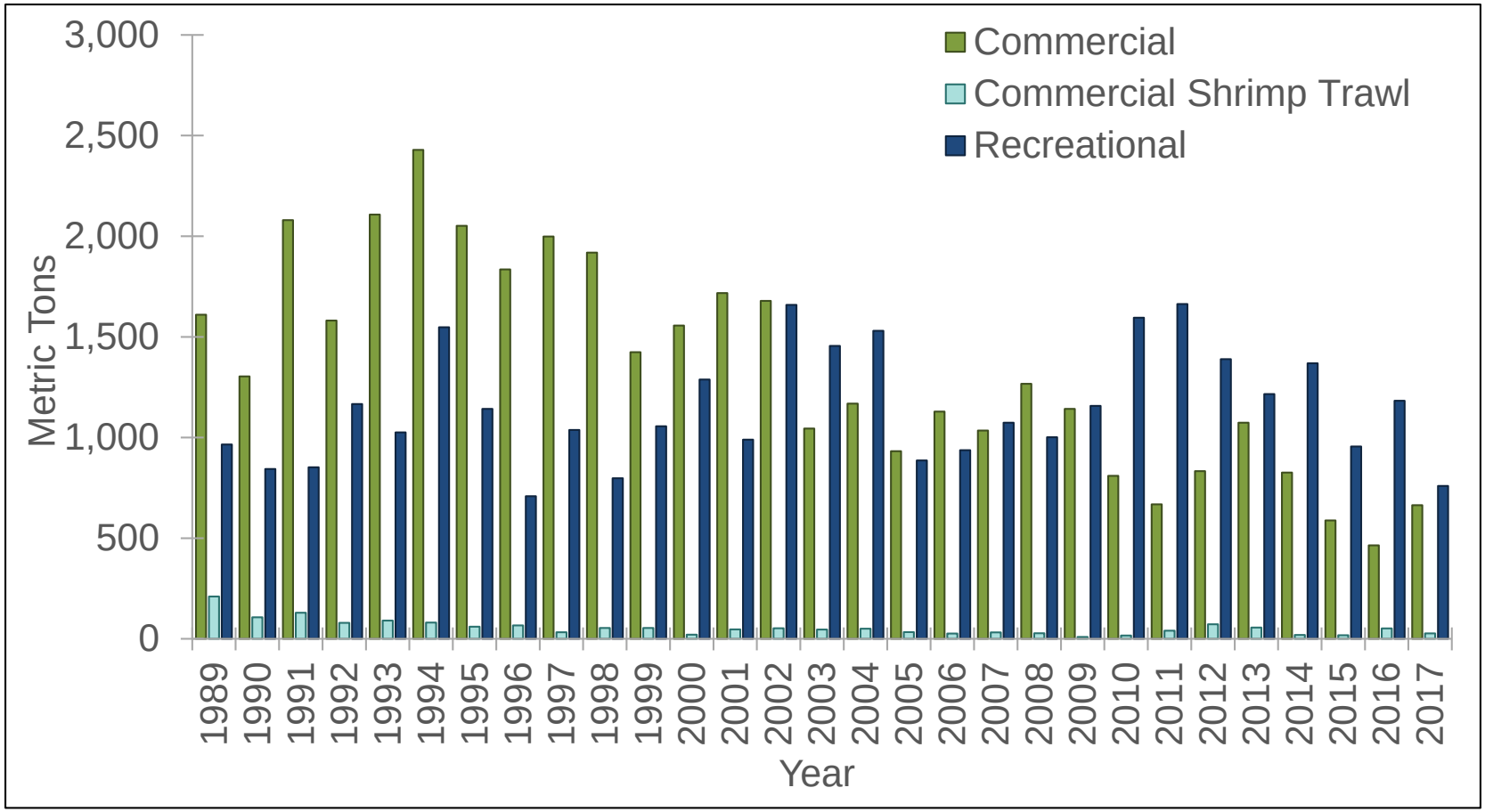
Model Structure

- Age Structured Assessment Program (ASAP)
  - Unit stock: North Carolina through the east coast of Florida
  - Calendar year: 1989 through 2017
  - 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)

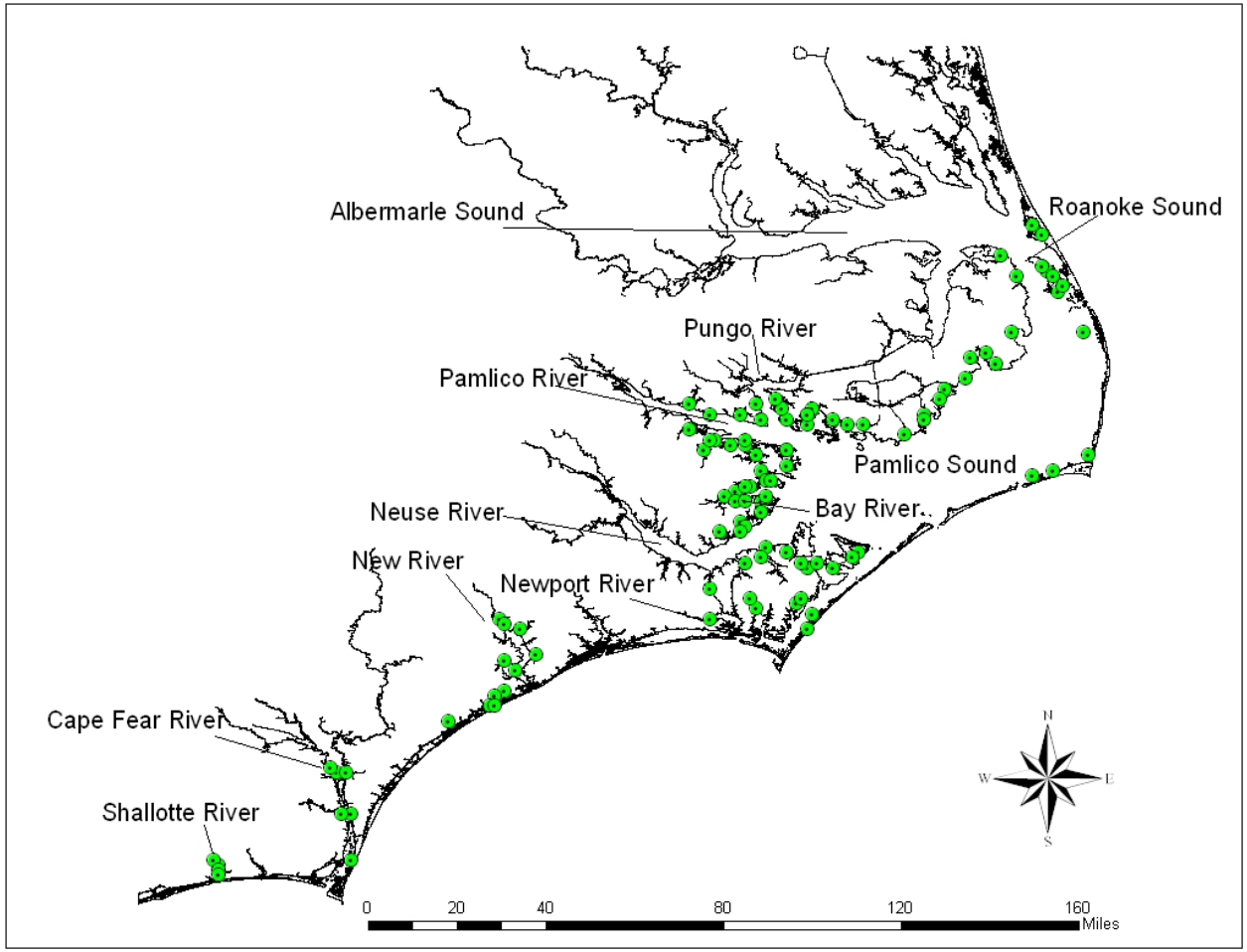


Department of Environmental Quality

Surveys

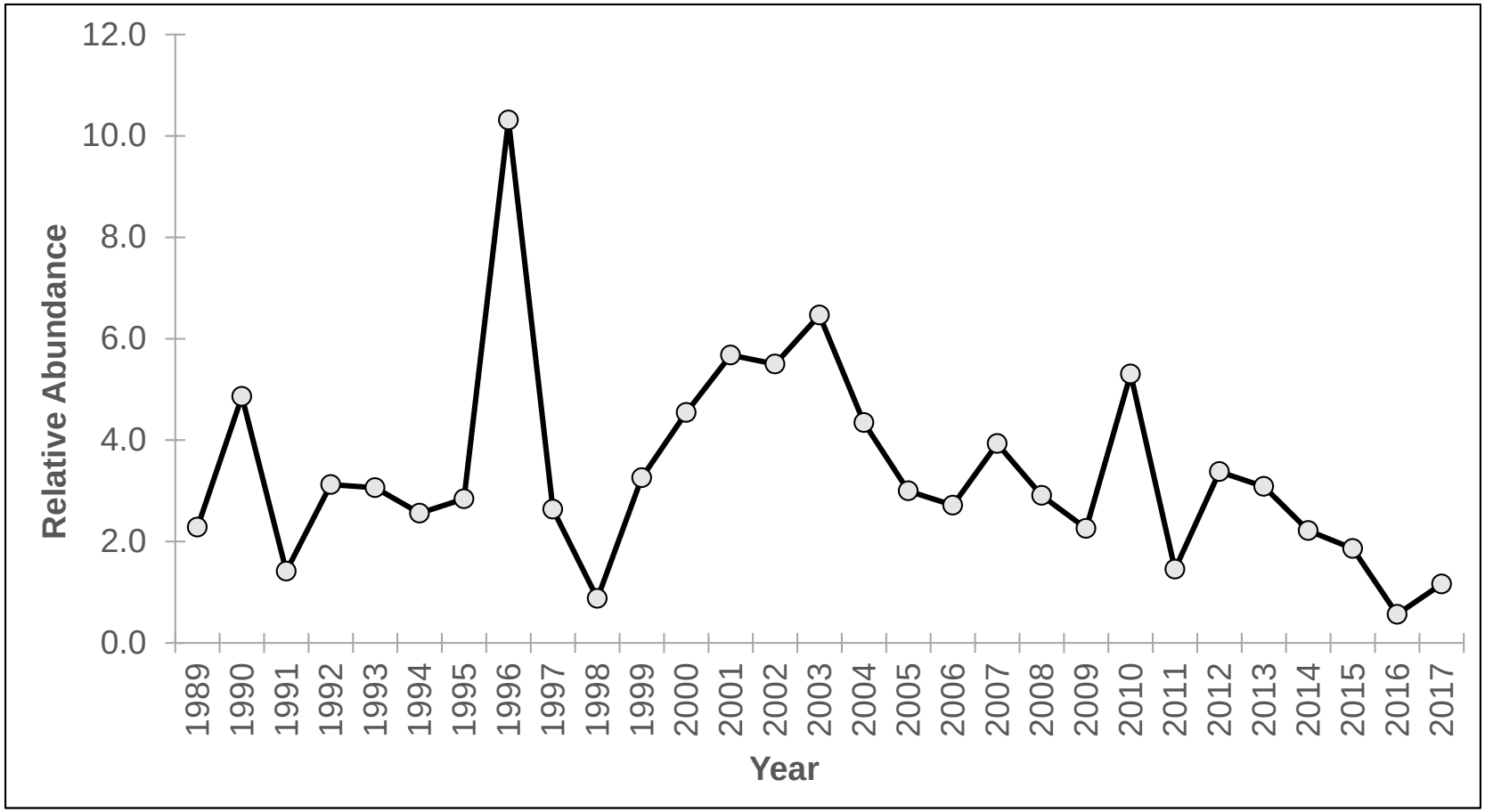
- One juvenile (recruitment) survey from each state, except Georgia
- One primarily adult survey from each state
- One ocean survey (SEAMAP)

North Carolina Program 120 Trawl Survey Recruitment



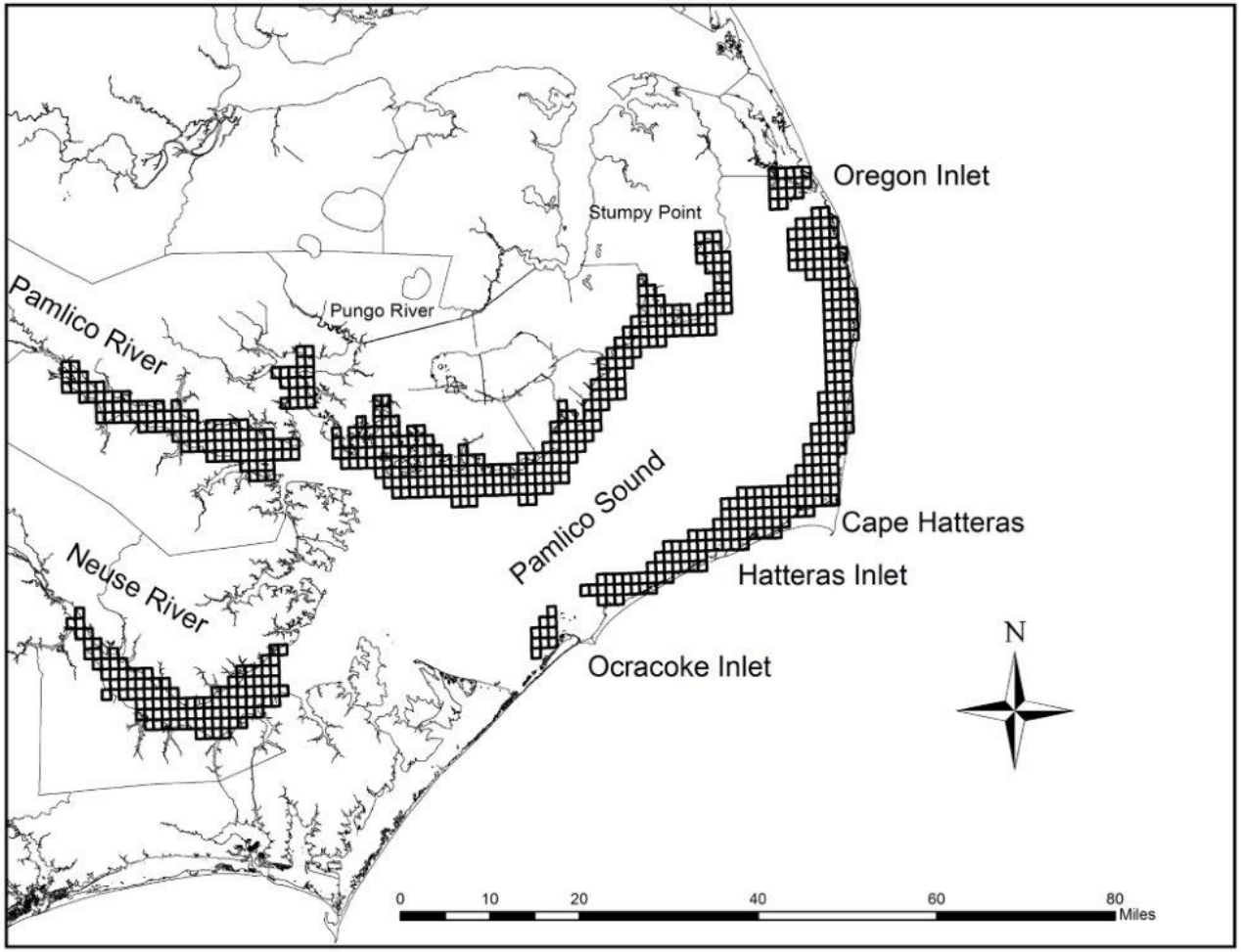
Department of Environmental Quality

North Carolina Program 120 Trawl Survey Recruitment



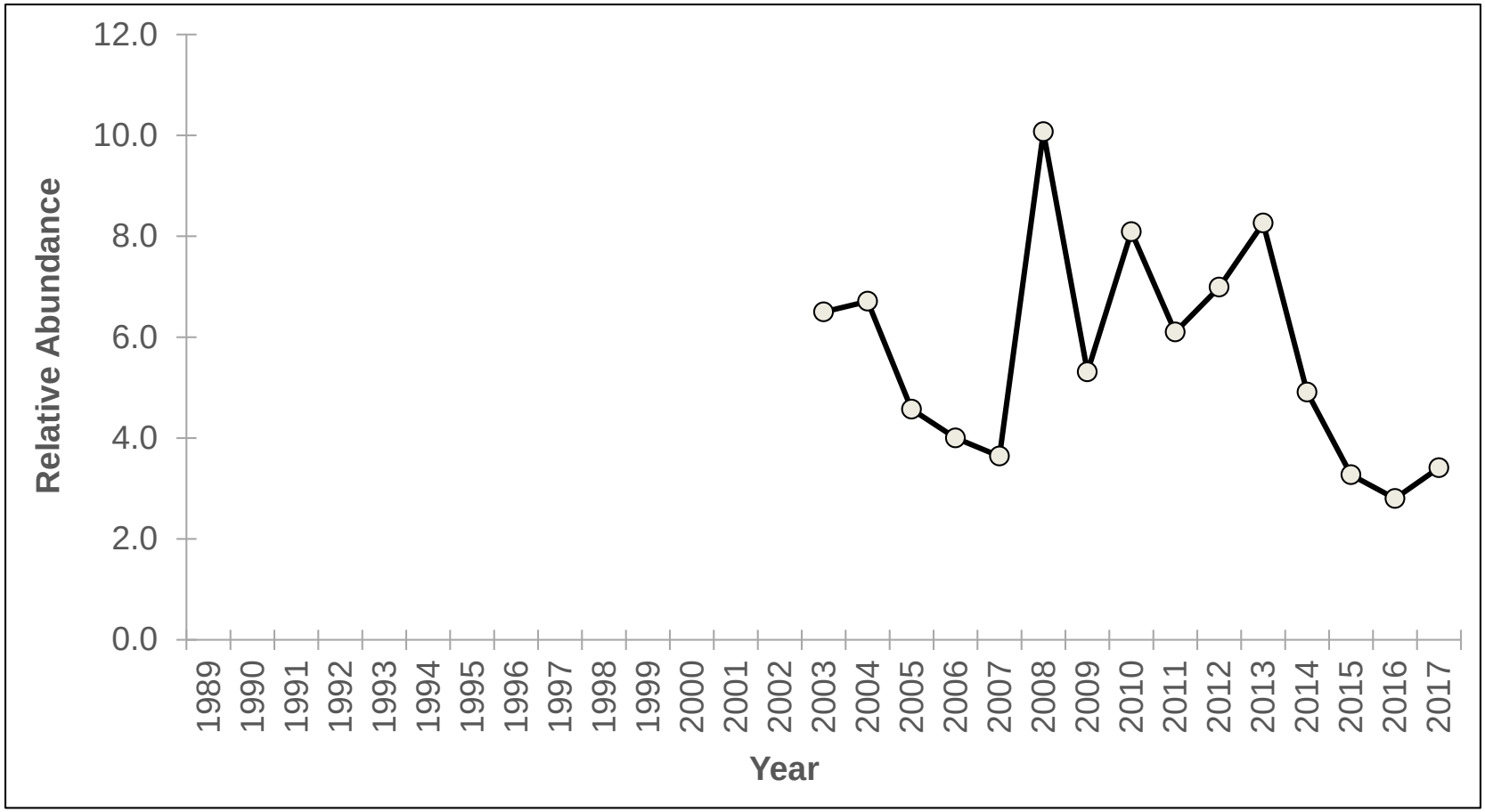
Department of Environmental Quality

North Carolina Program 915 Gill-Net Survey Adult



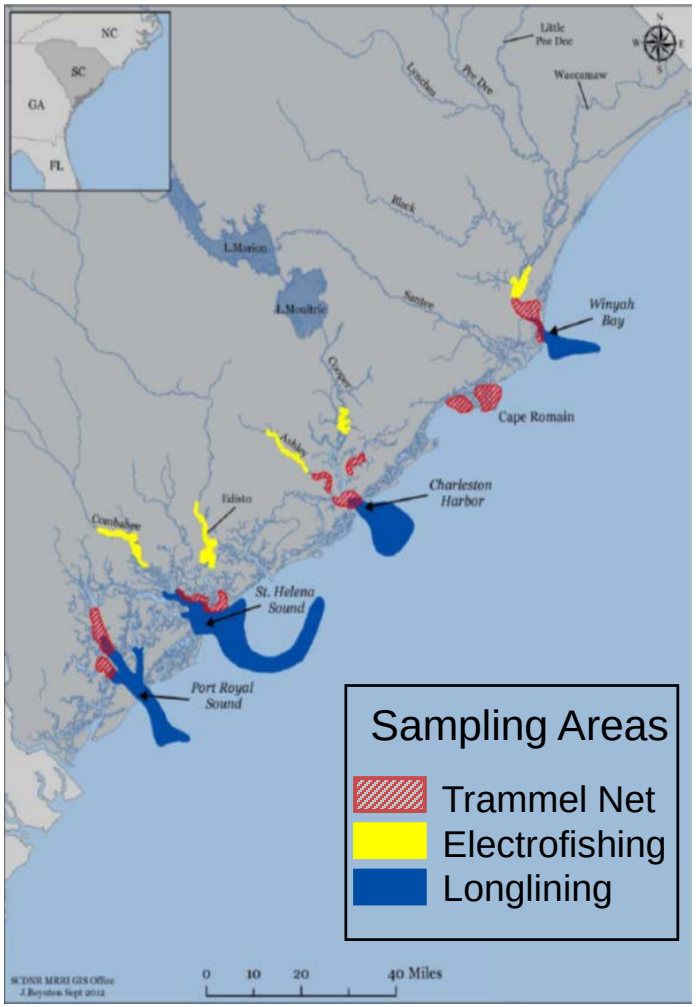
Department of Environmental Quality

North Carolina Program 915 Gill-Net Survey Adult



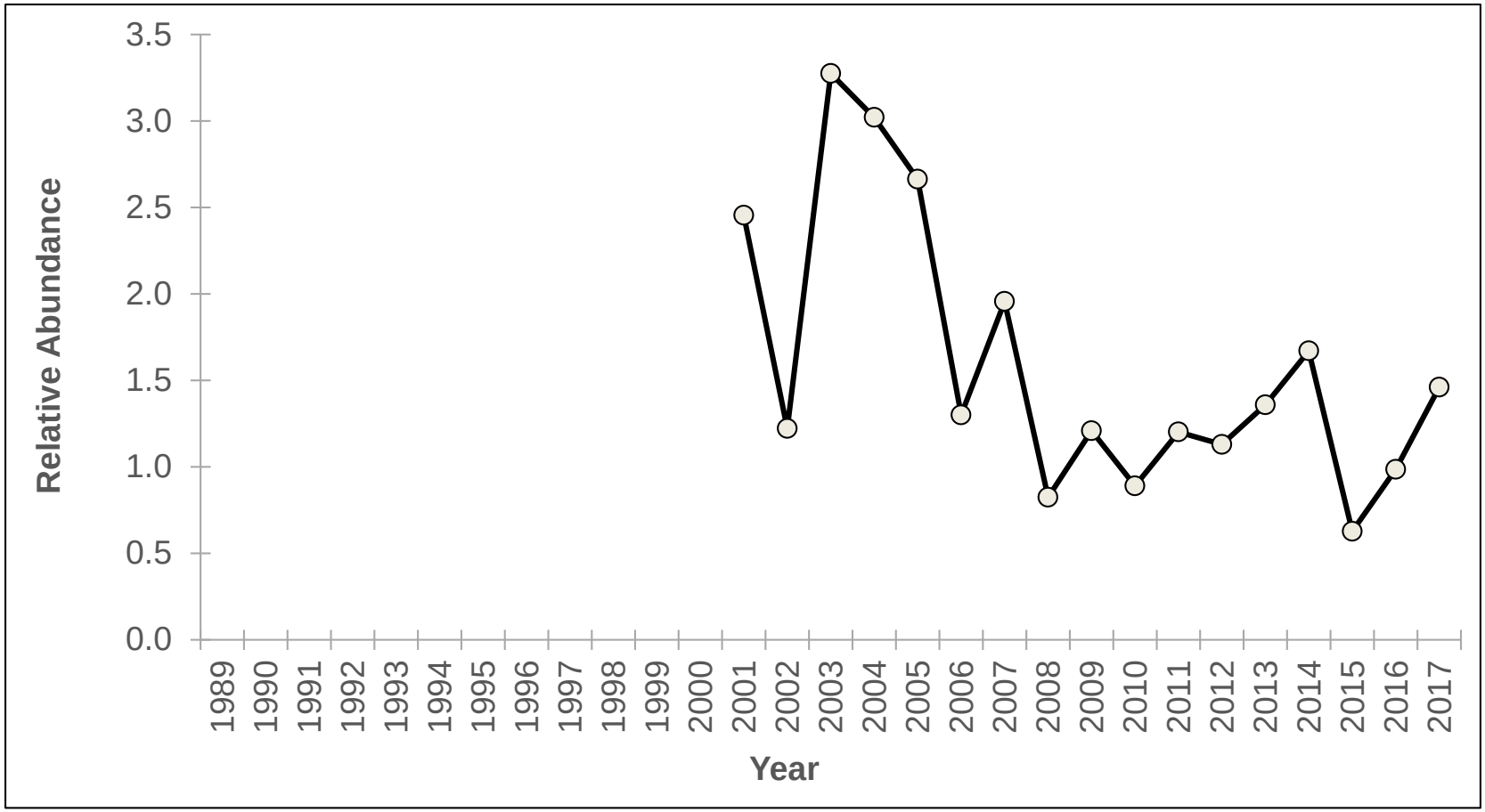
Department of Environmental Quality

South Carolina Electrofishing Survey Recruitment



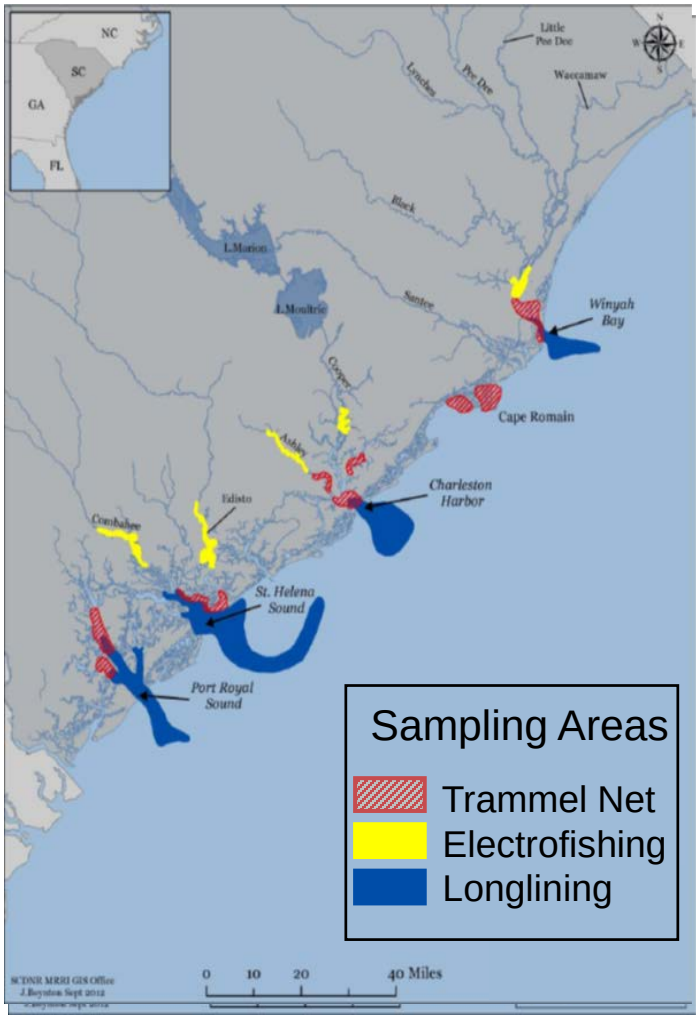
Department of Environmental Quality

South Carolina Electrofishing Survey Recruitment



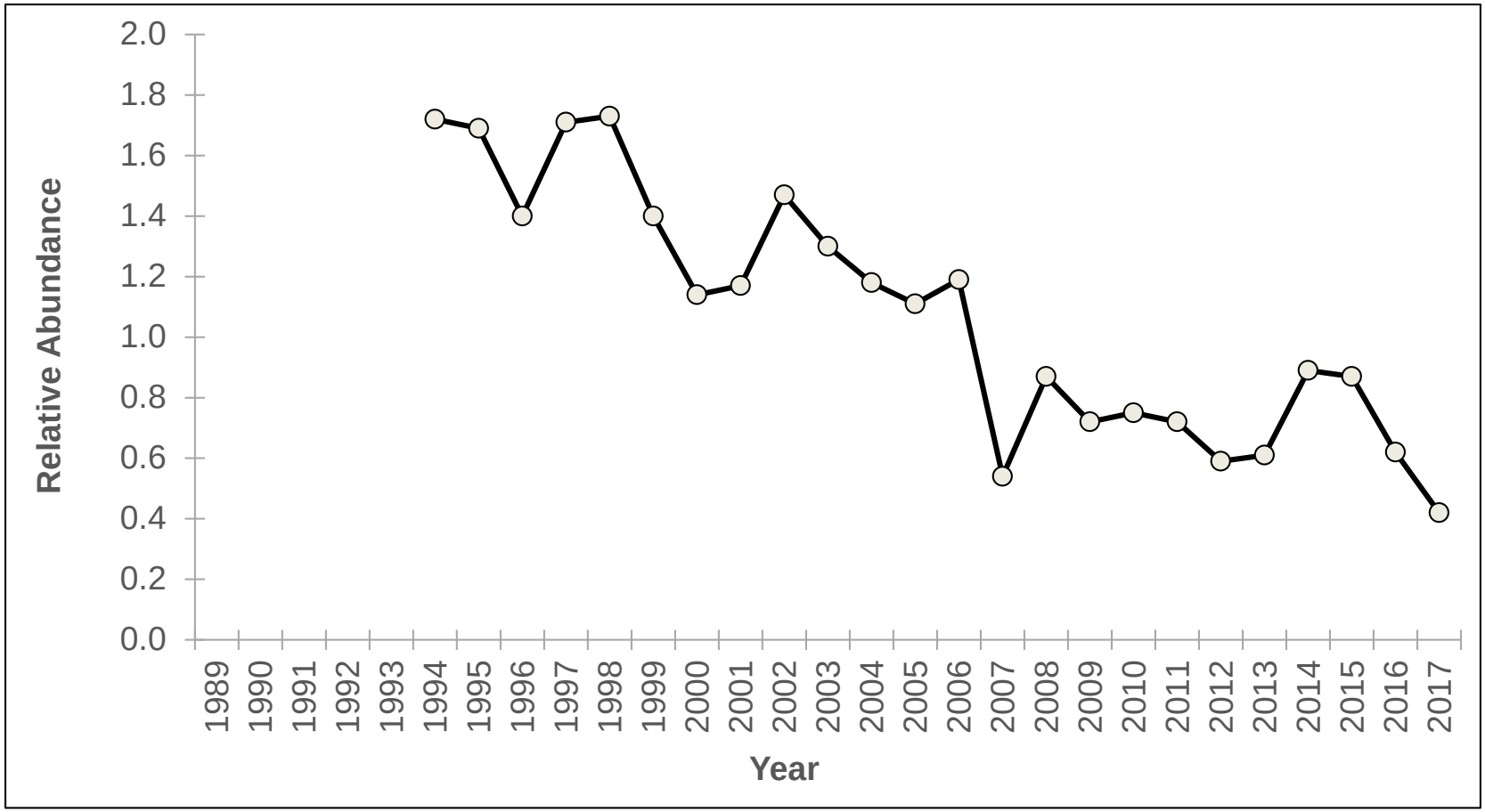
Department of Environmental Quality

South Carolina Trammel Net Survey Adult



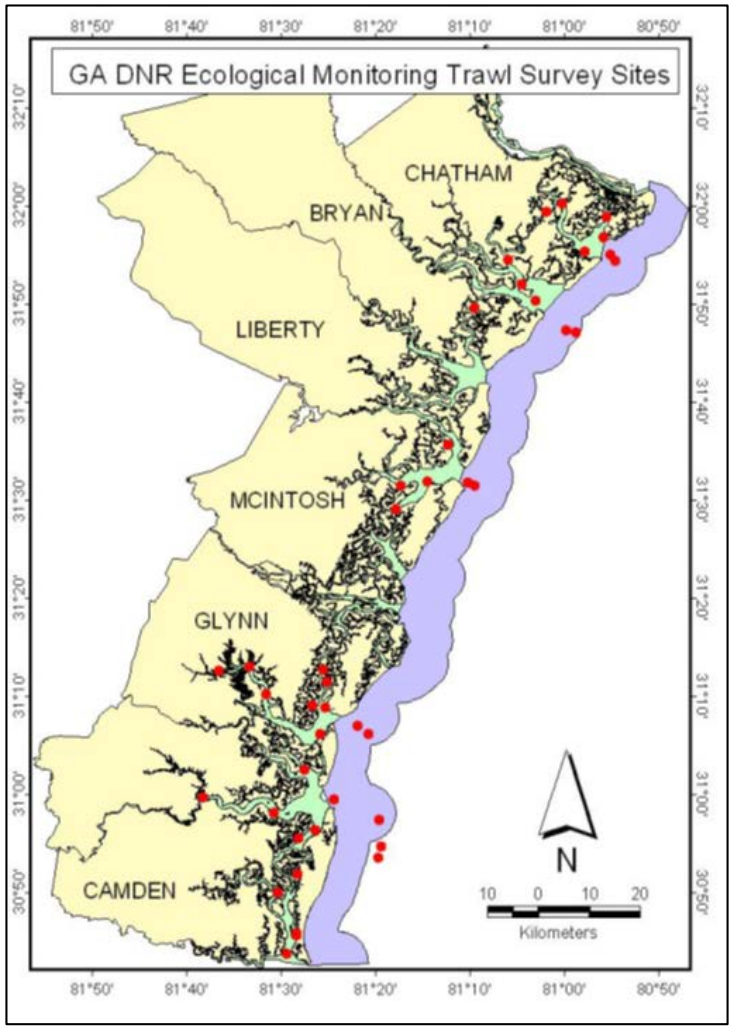
Department of Environmental Quality

South Carolina Trammel Net Survey Adult



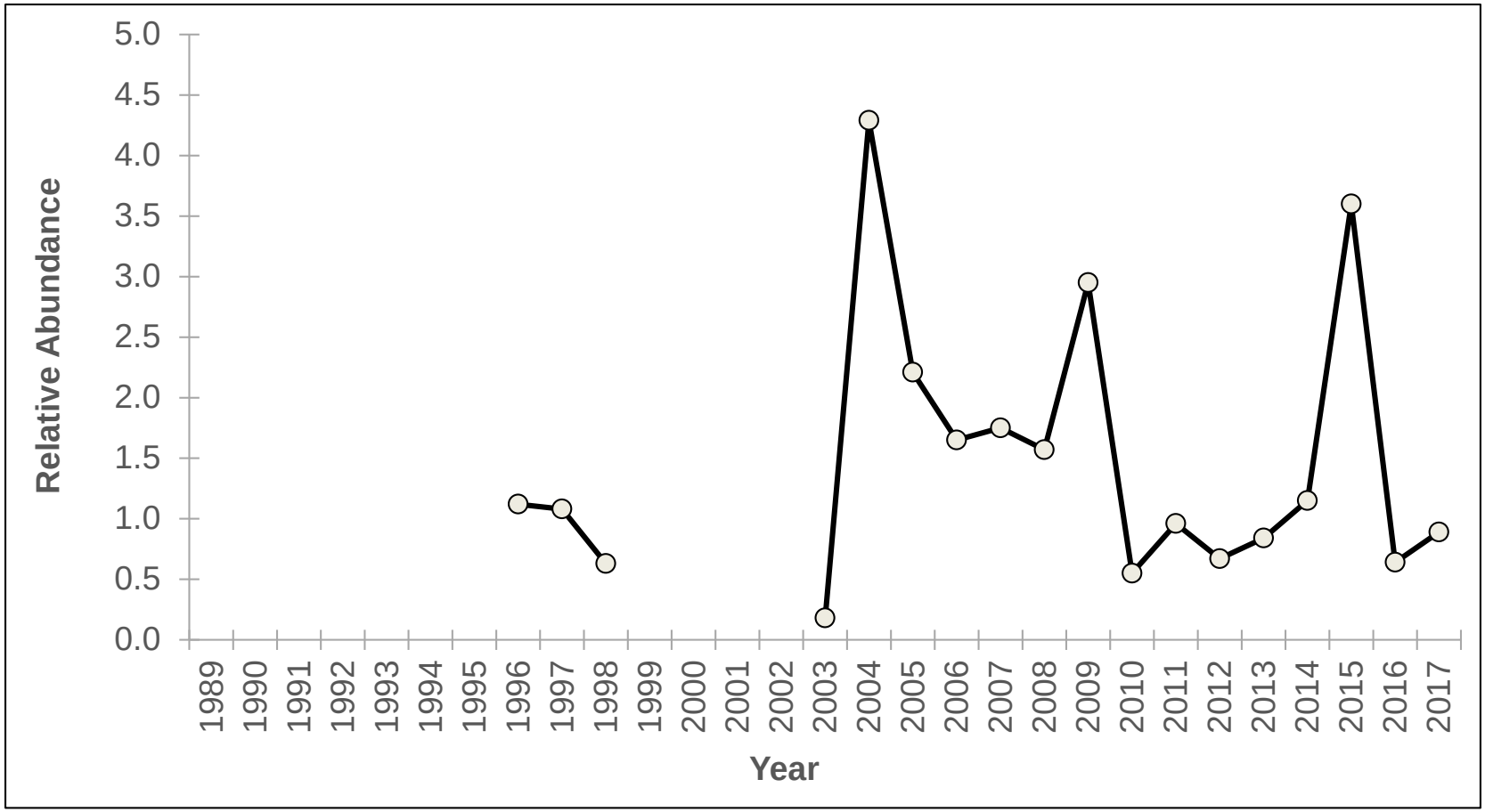
Department of Environmental Quality

Georgia Trawl Survey Adult



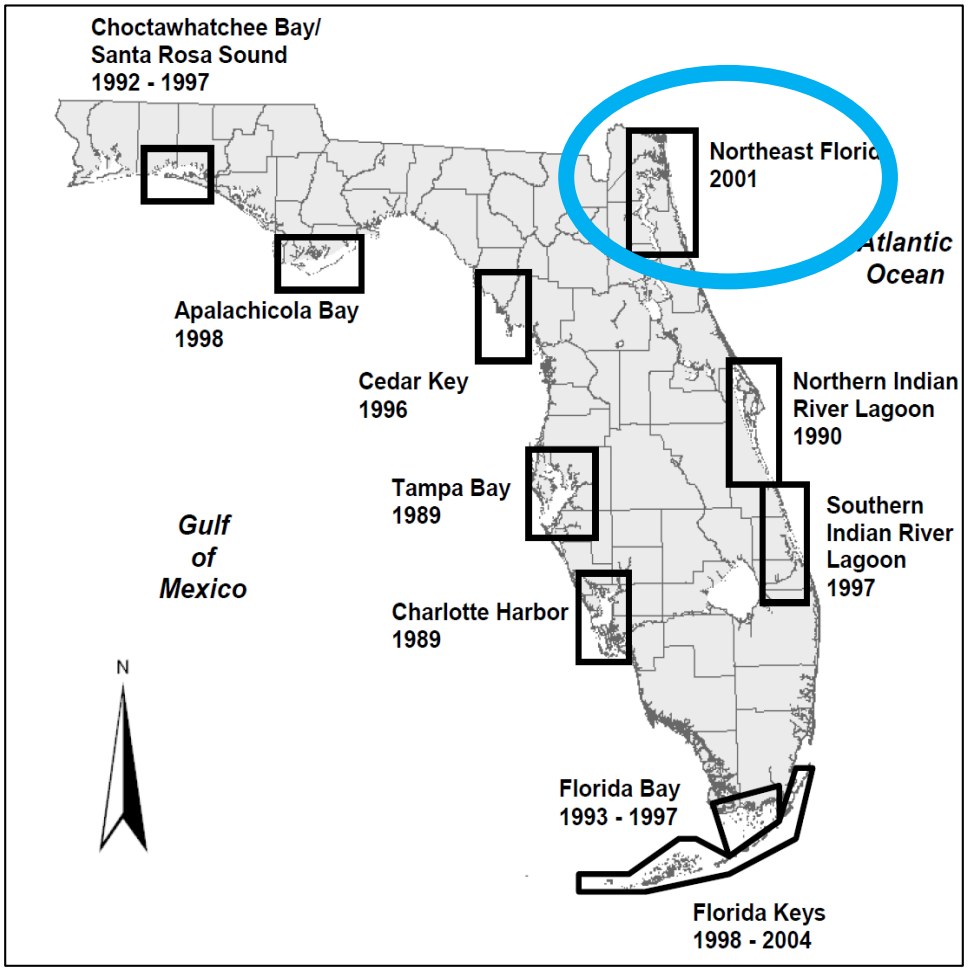
Department of Environmental Quality

Georgia Trawl Survey
Adult



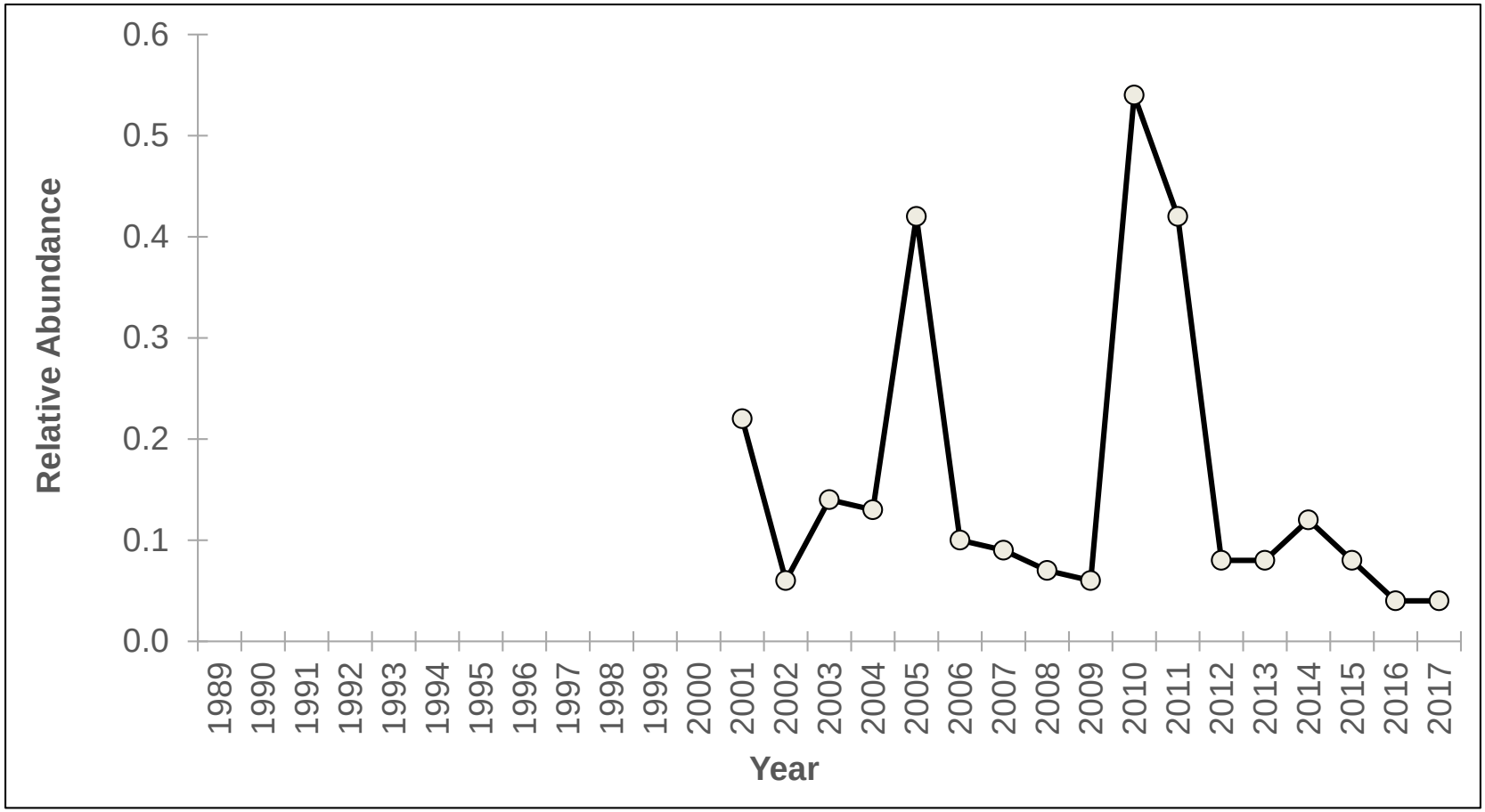
Department of Environmental Quality

Florida Trawl Survey Recruitment & Adult



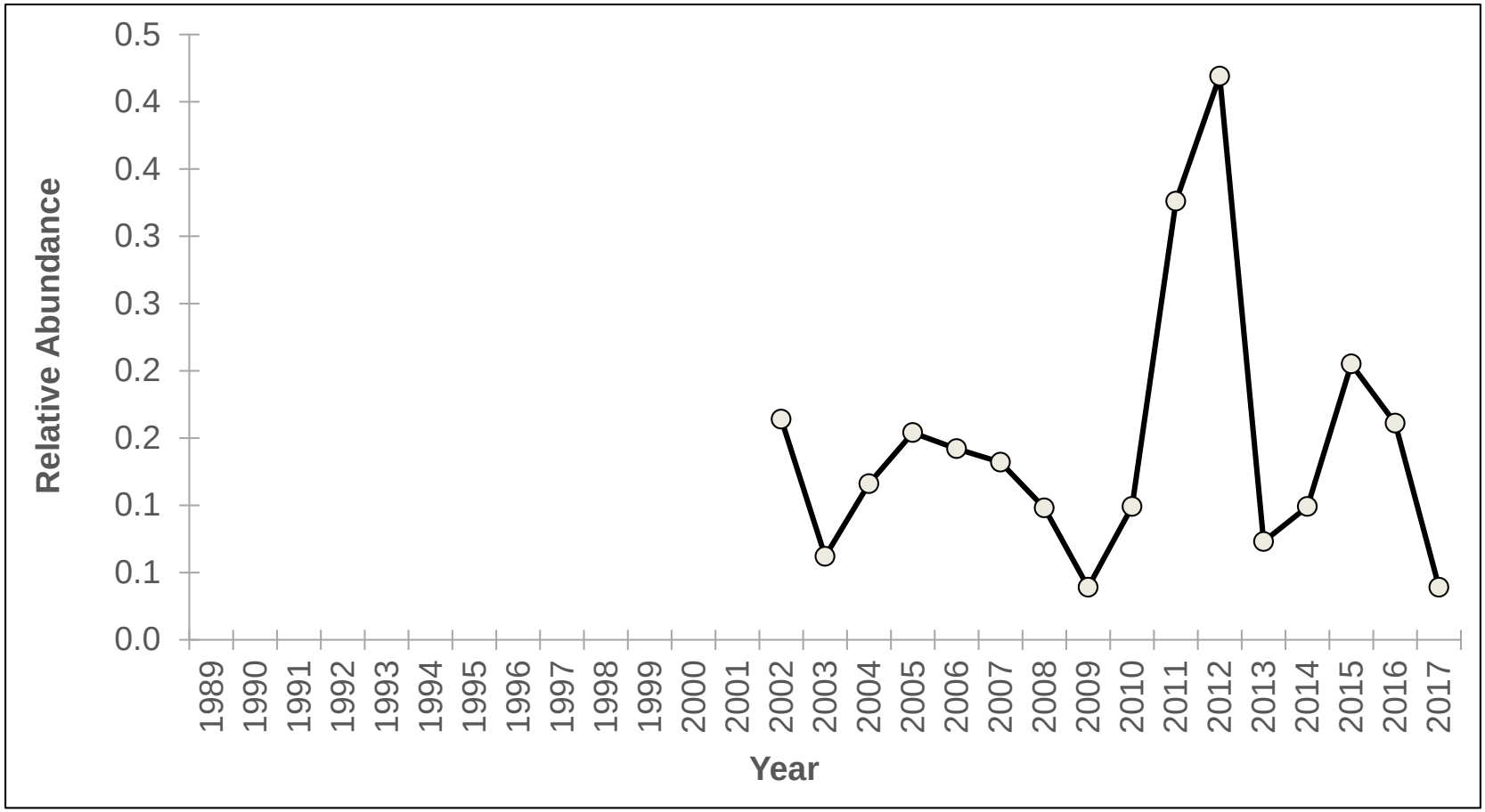
Department of Environmental Quality

Florida Trawl Survey Recruitment



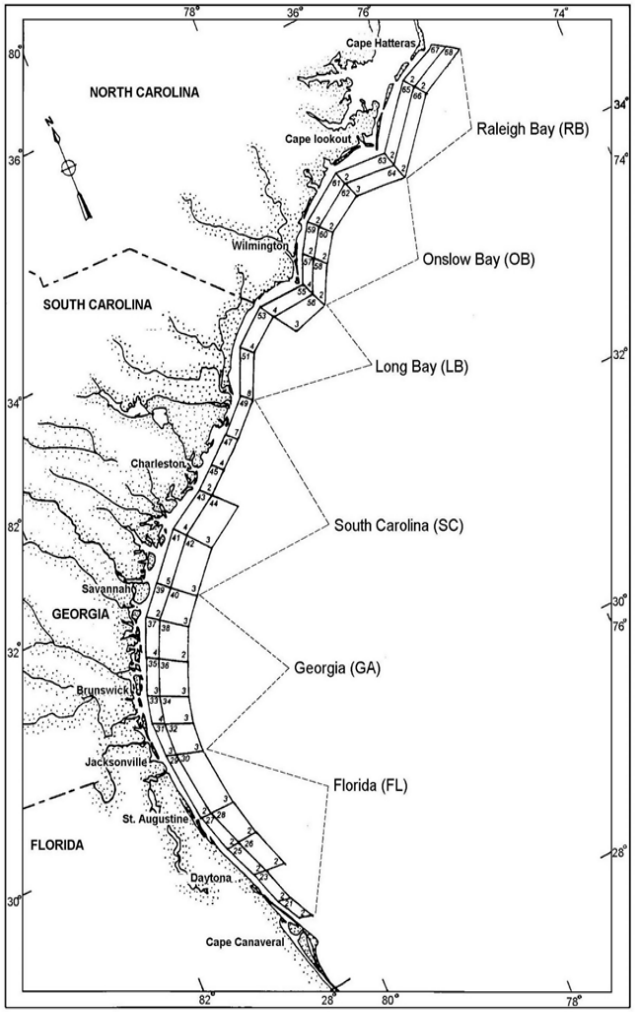
Department of Environmental Quality

Florida Trawl Survey
Adult



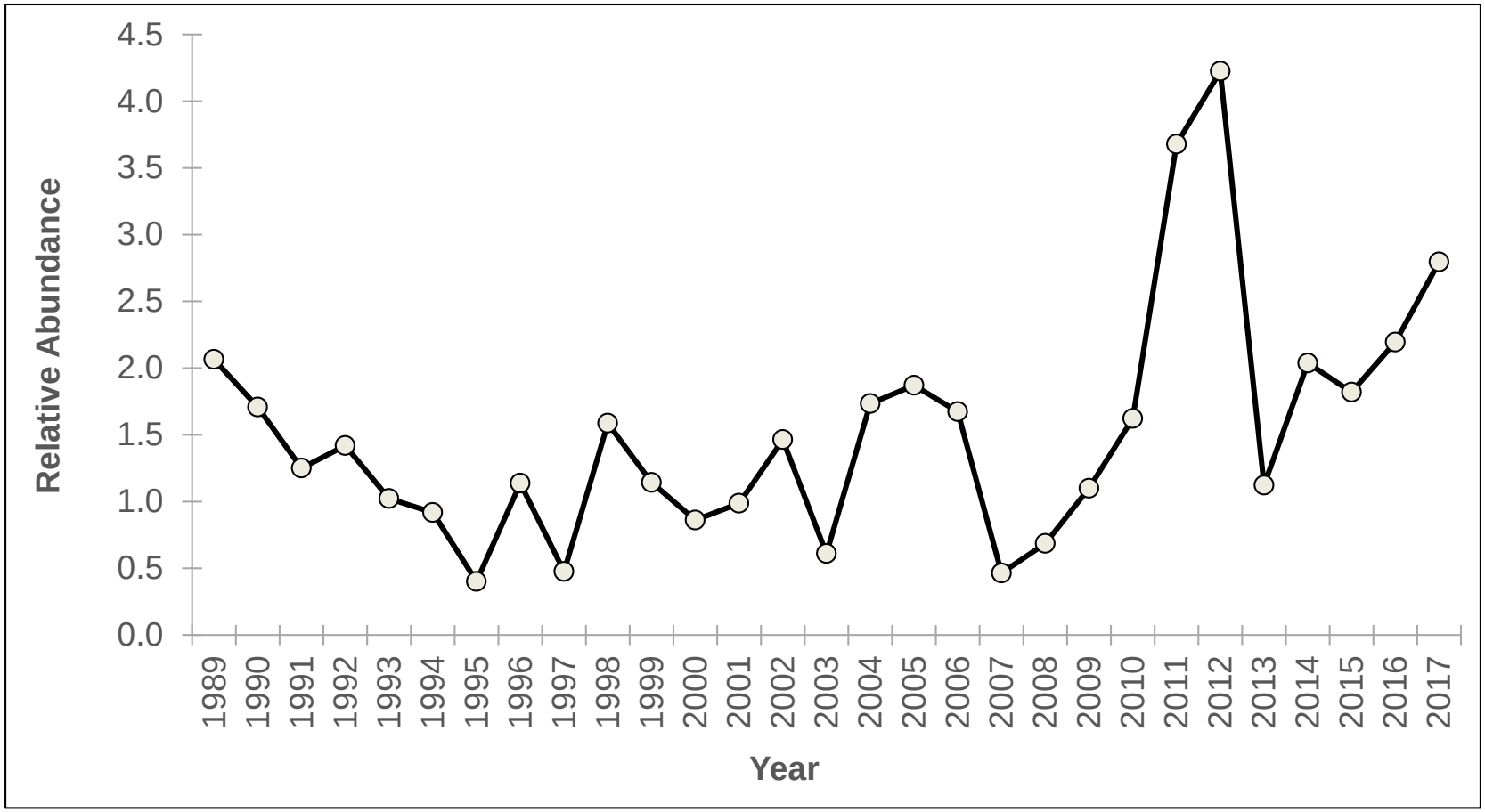
Department of Environmental Quality

SEAMAP Trawl Survey
Adult



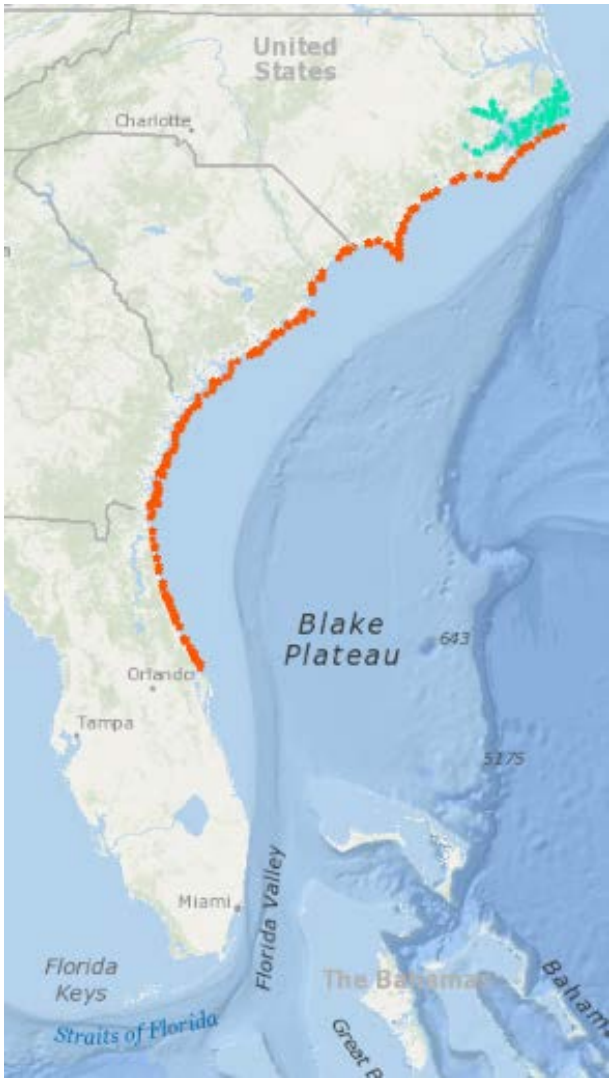
Department of Environmental Quality

SEAMAP Trawl Survey
Adult



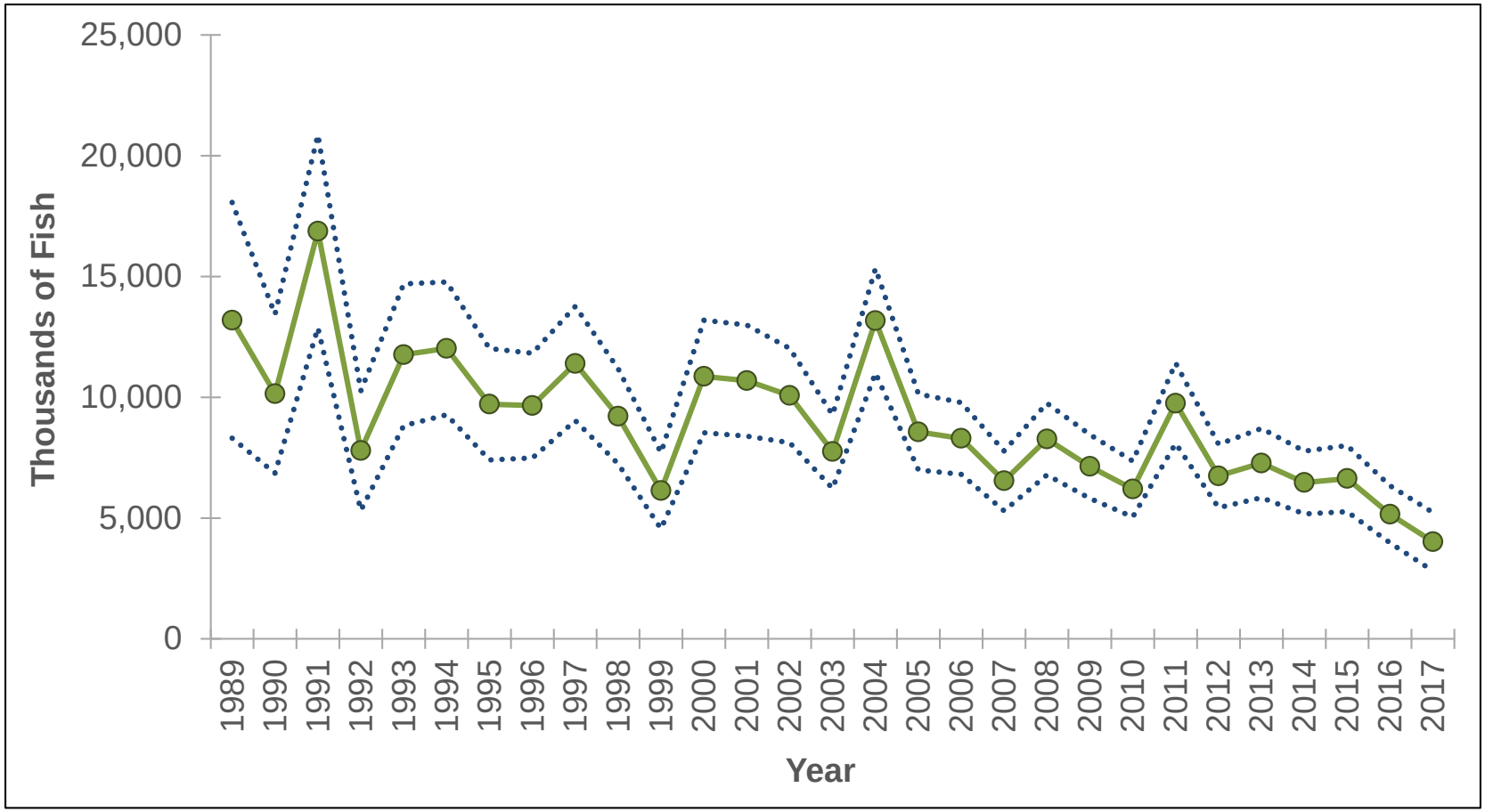
Department of Environmental Quality

Map of All Survey Areas



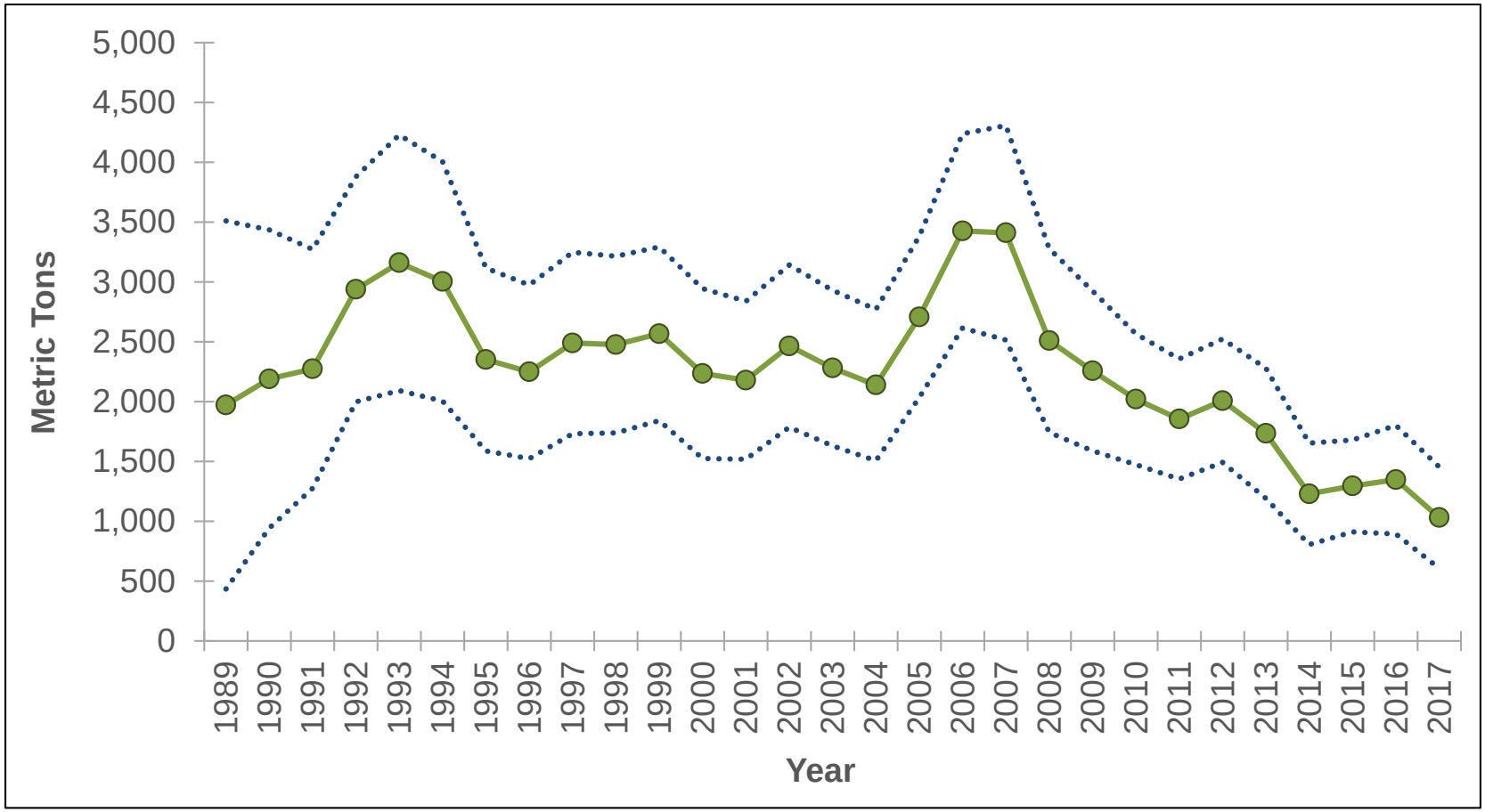
Department of Environmental Quality

Recruitment (Age-1)



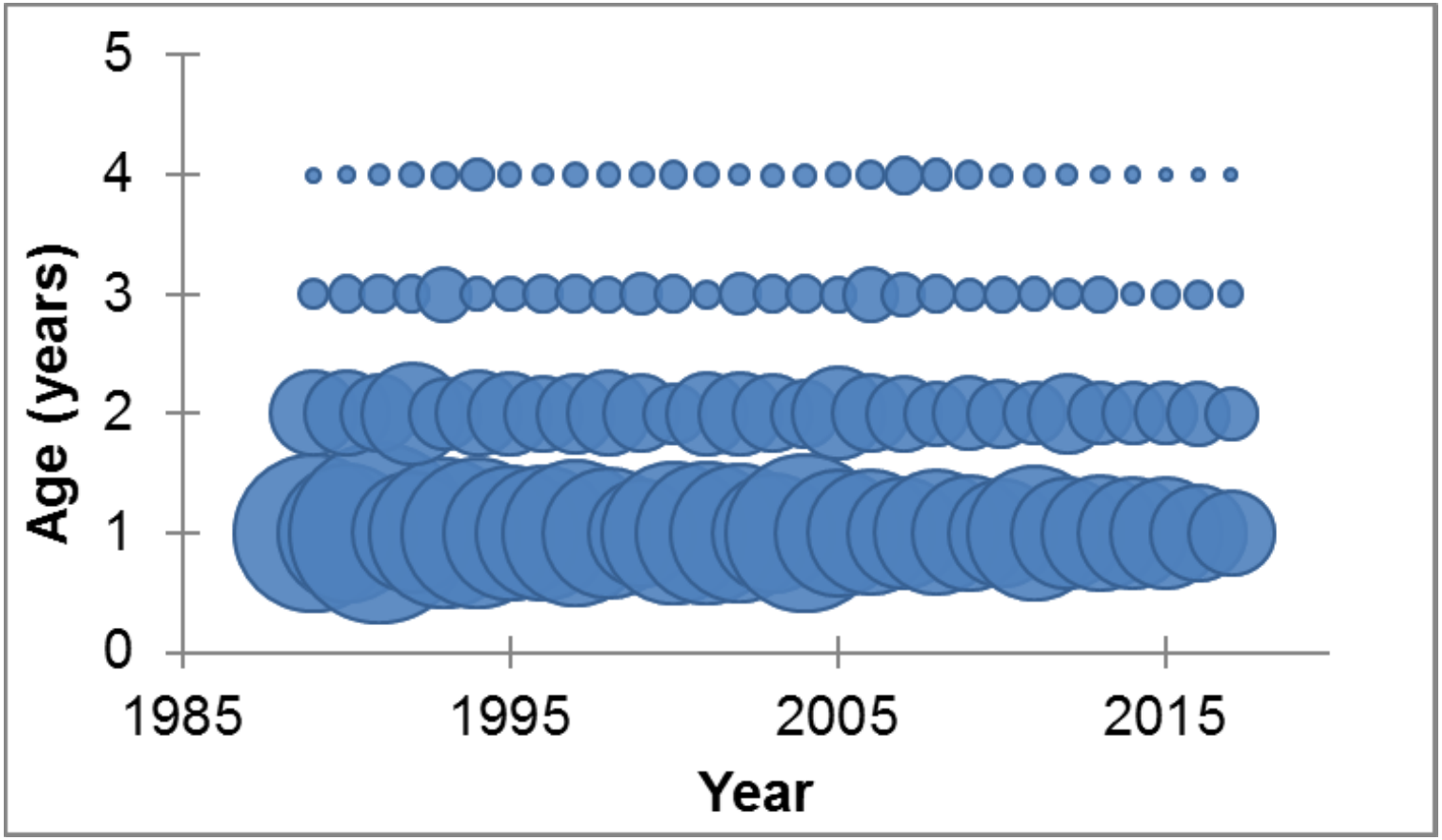
Department of Environmental Quality

Female Spawning Stock Biomass



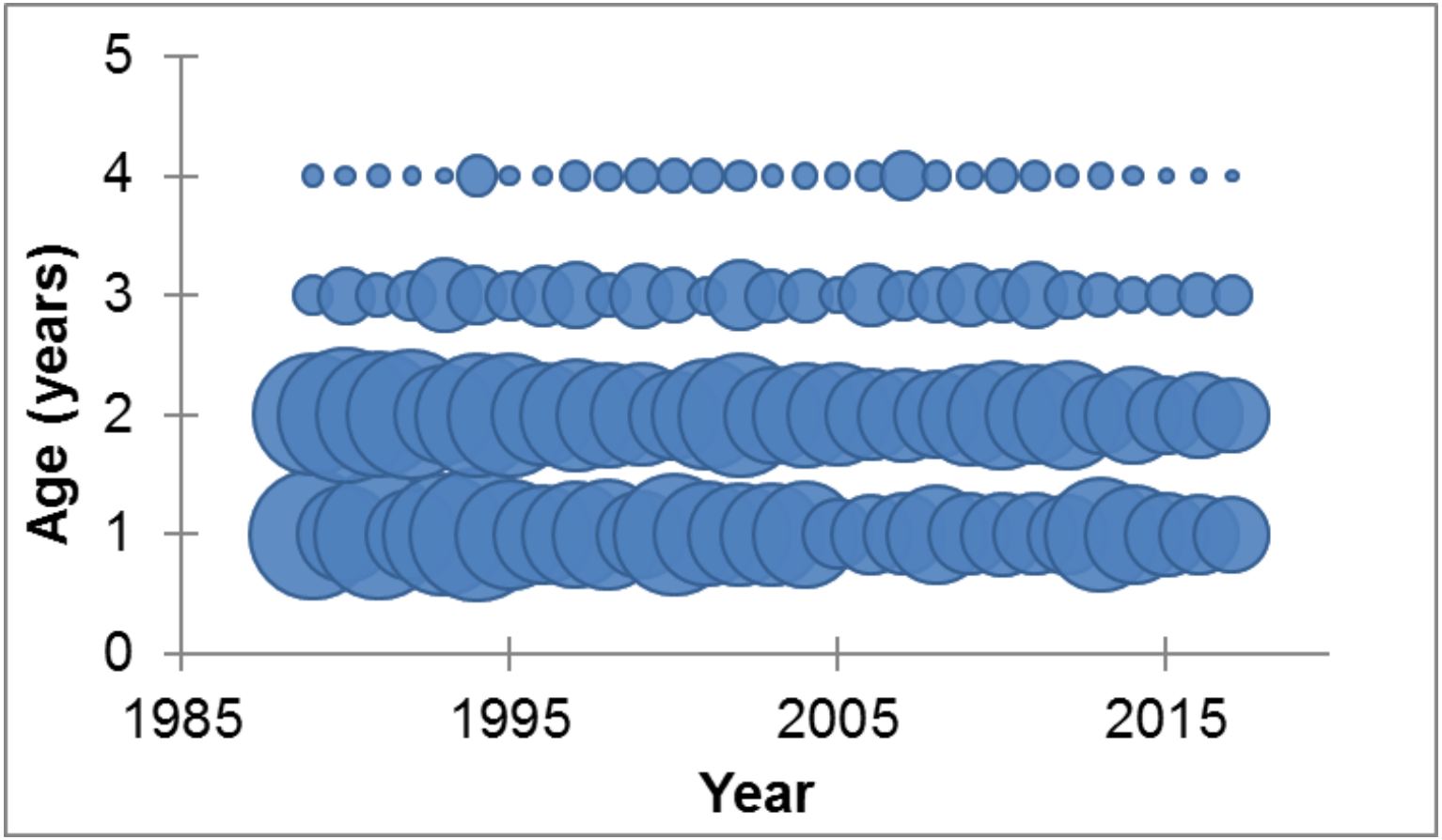
Department of Environmental Quality

Numbers at Age



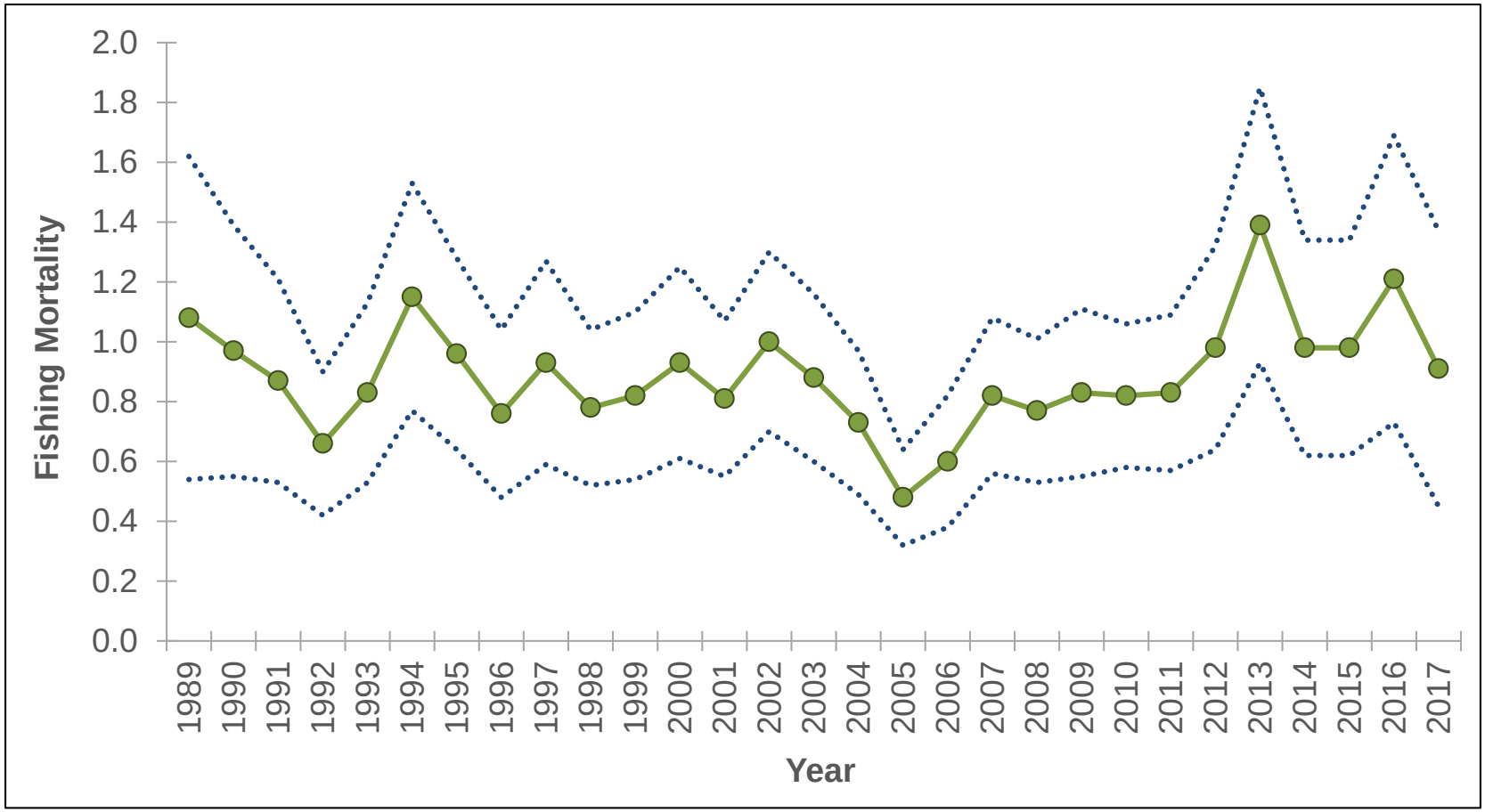
Department of Environmental Quality

Catch at Age



Department of Environmental Quality

Fishing Mortality



Department of Environmental Quality

Reference Points

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

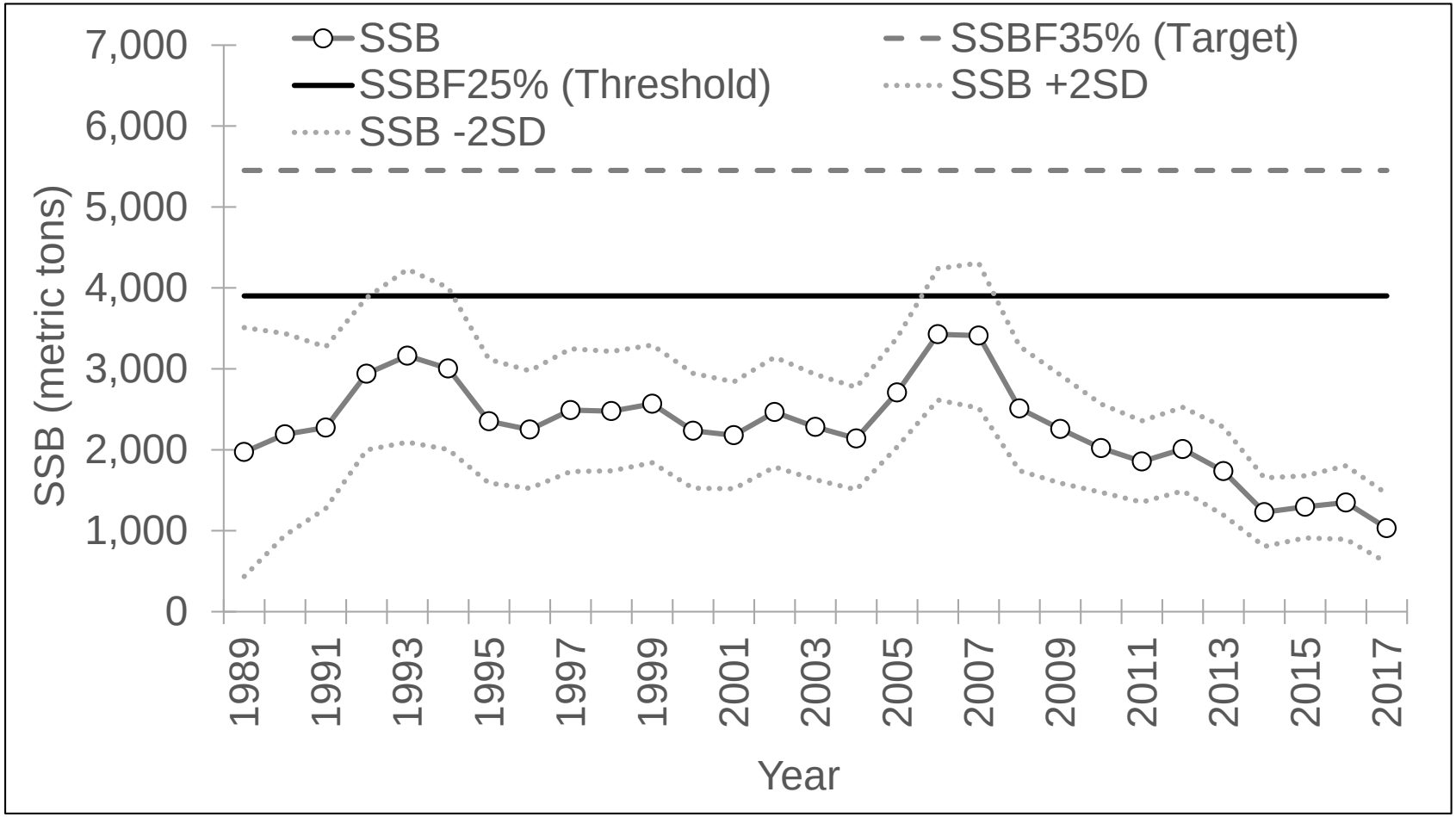
Determining Stock Status

- 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

- Female Spawning Stock Biomass (SSB)
  - SSB_{2017} = 1,031 metric tons
  - $SSB_{25\%}$ = 3,900 metric tons (threshold)
  - $SSB_{2017} < SSB_{25\%}$ stock is overfished
  - $SSB_{35\%}$ = 5,452 metric tons (target)

Stock Status—Female Spawning Stock Biomass

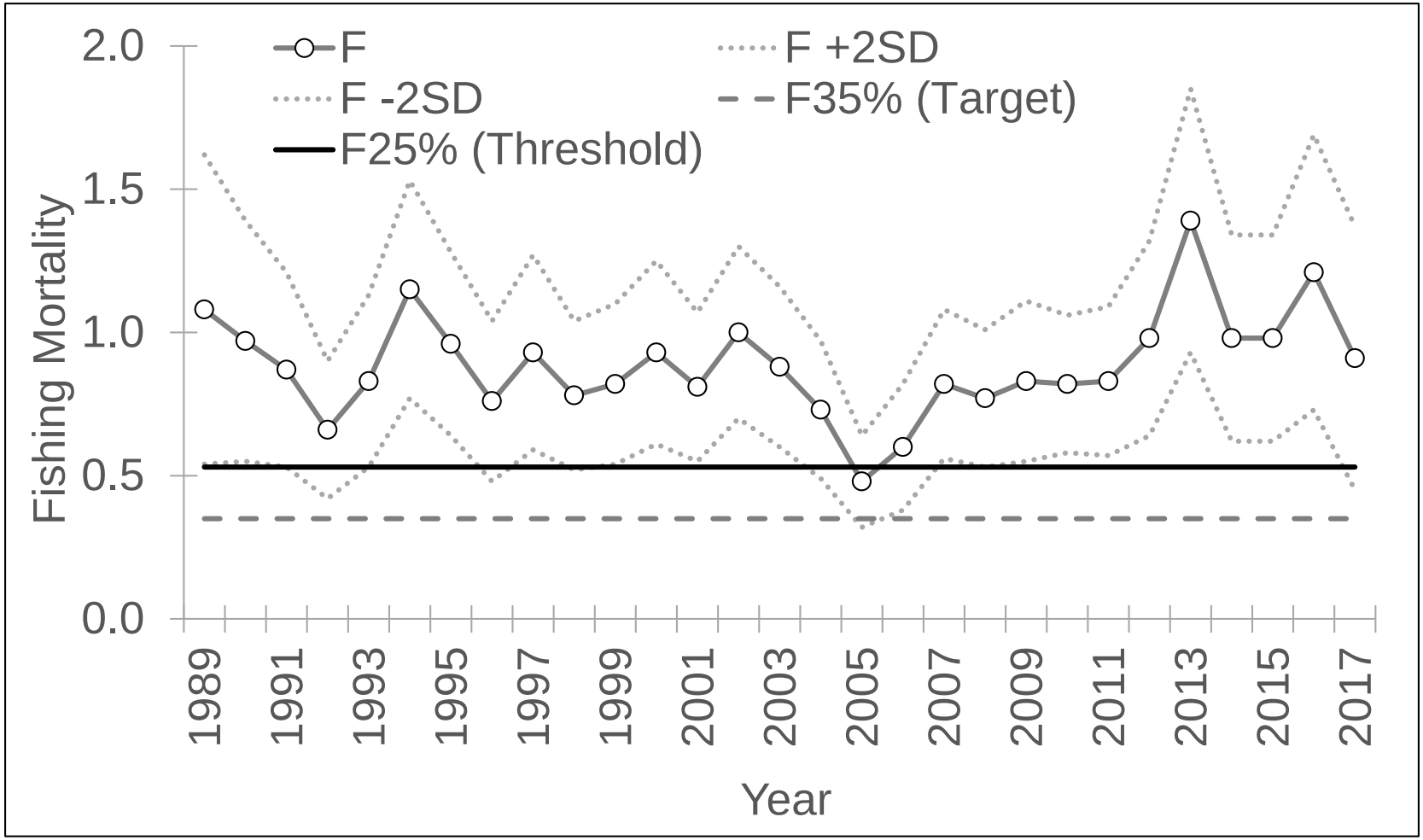


Department of Environmental Quality

Stock Status—Fishing Mortality

- Fishing Mortality
  - F_{2017} = 0.91
  - $F_{25\%}$ = 0.53 (threshold)
  - $F_{2017} > F_{25\%}$ overfishing is occurring
  - $F_{35\%}$ = 0.35 (target)

Stock Status—Fishing Mortality



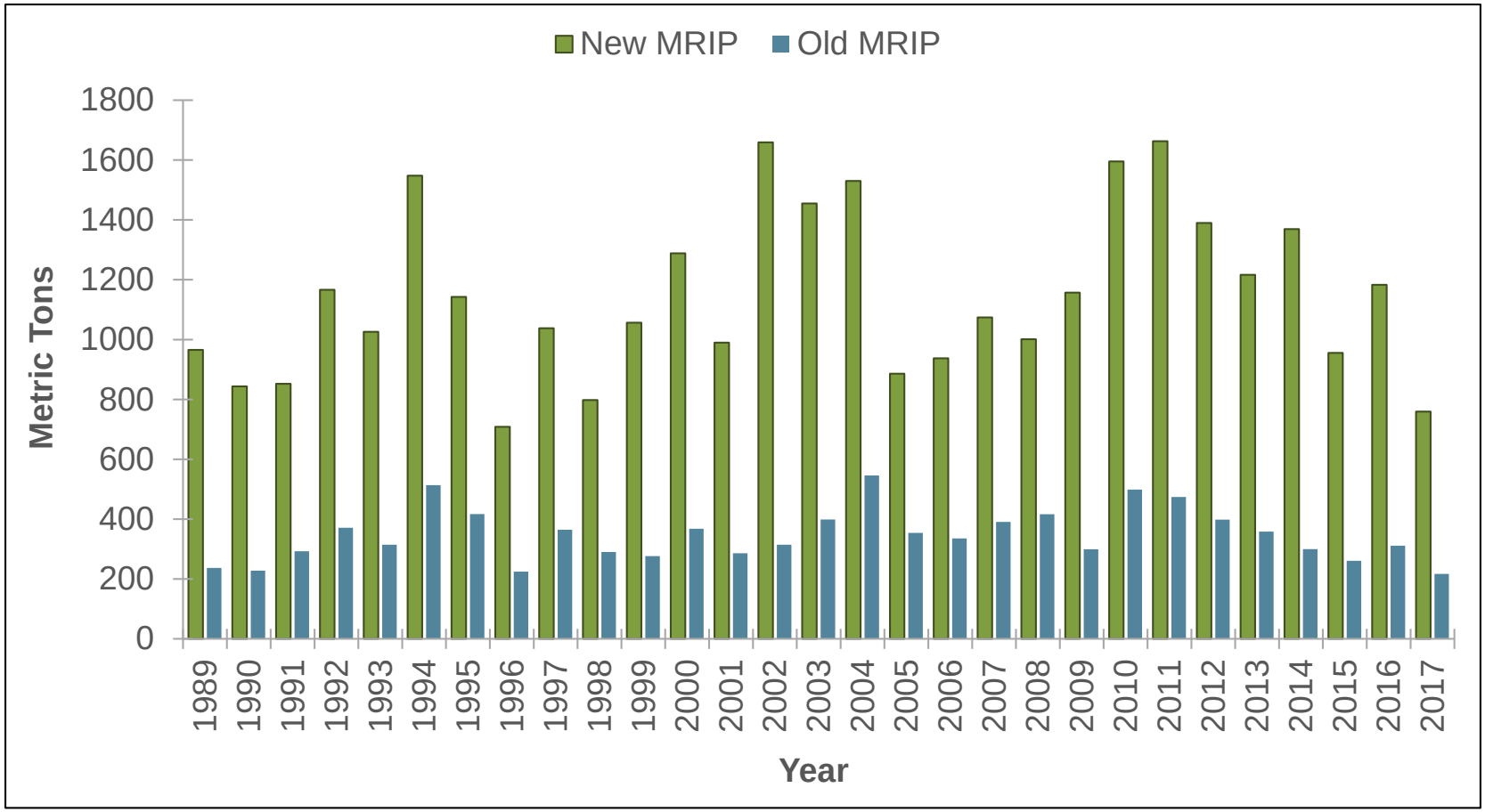
Department of Environmental Quality

Current Stock Status in 2017

- Large proportion of immature fish comprise landings
- No evidence of recent high recruitment
- The probability that the 2017 stock is experiencing overfishing is 96.4 percent
- The probability that the 2017 stock is overfished is 100 percent

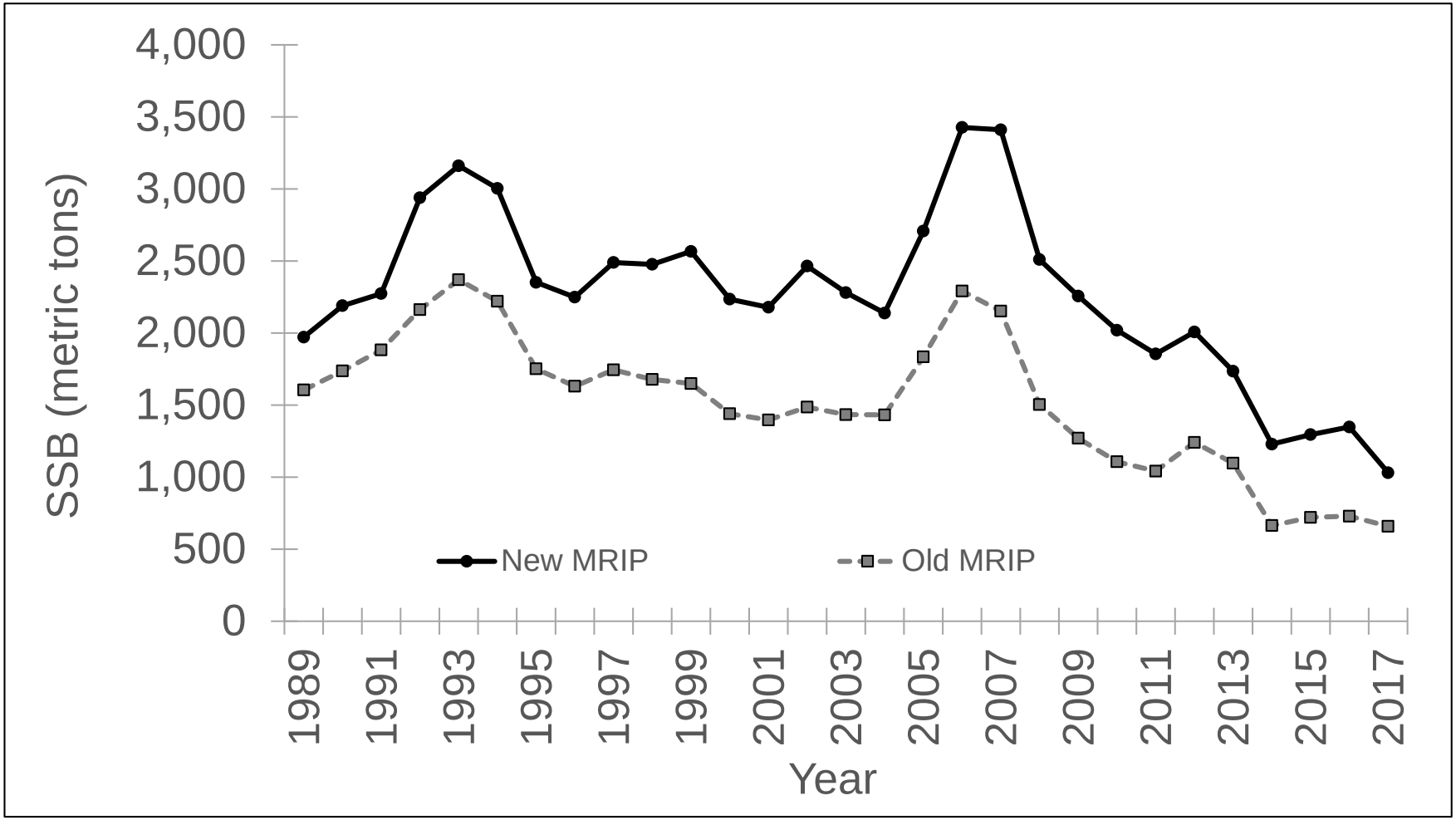
Questions?

Recreational Catch (North Carolina to Florida East Coast)

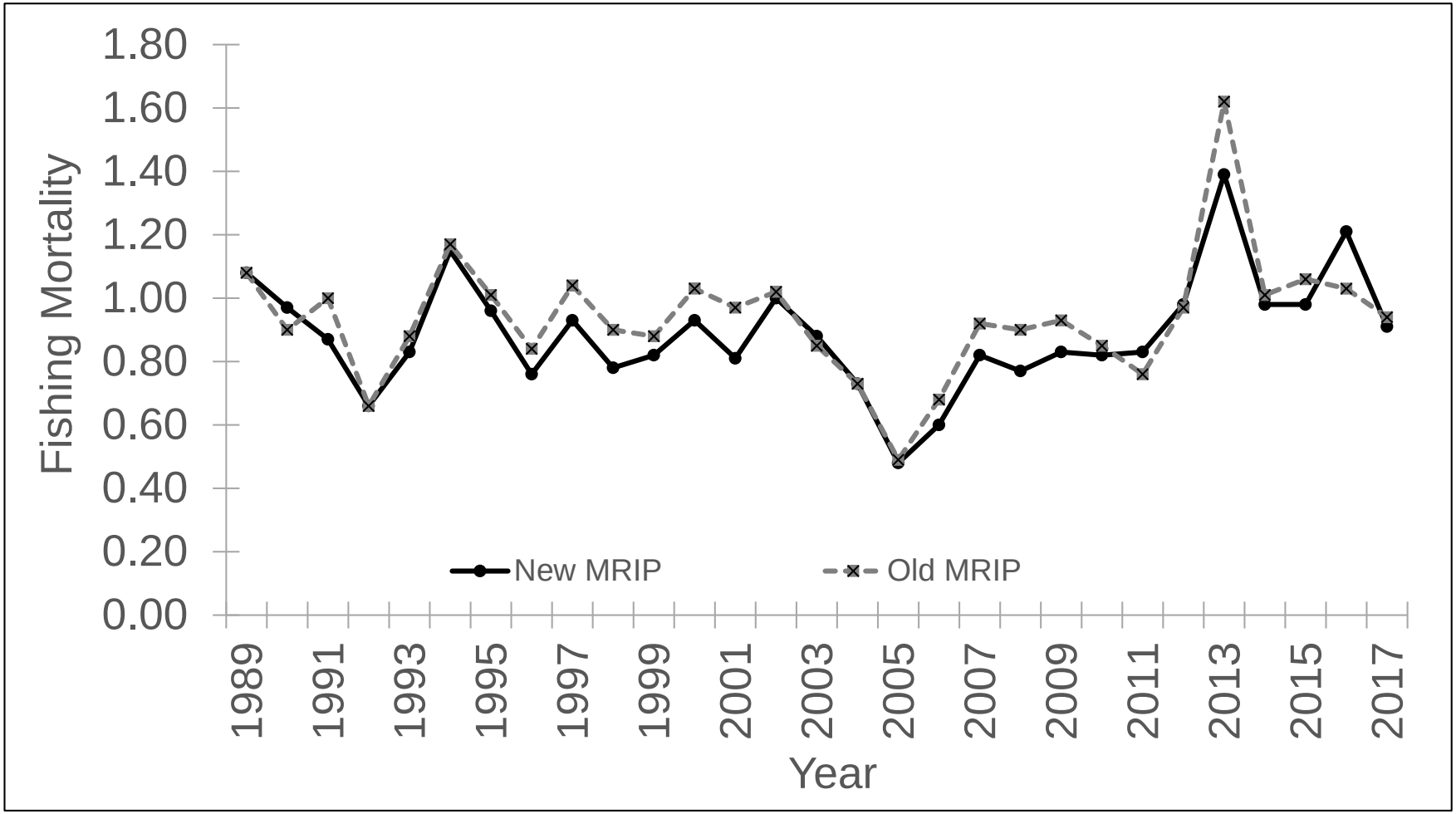


Department of Environmental Quality

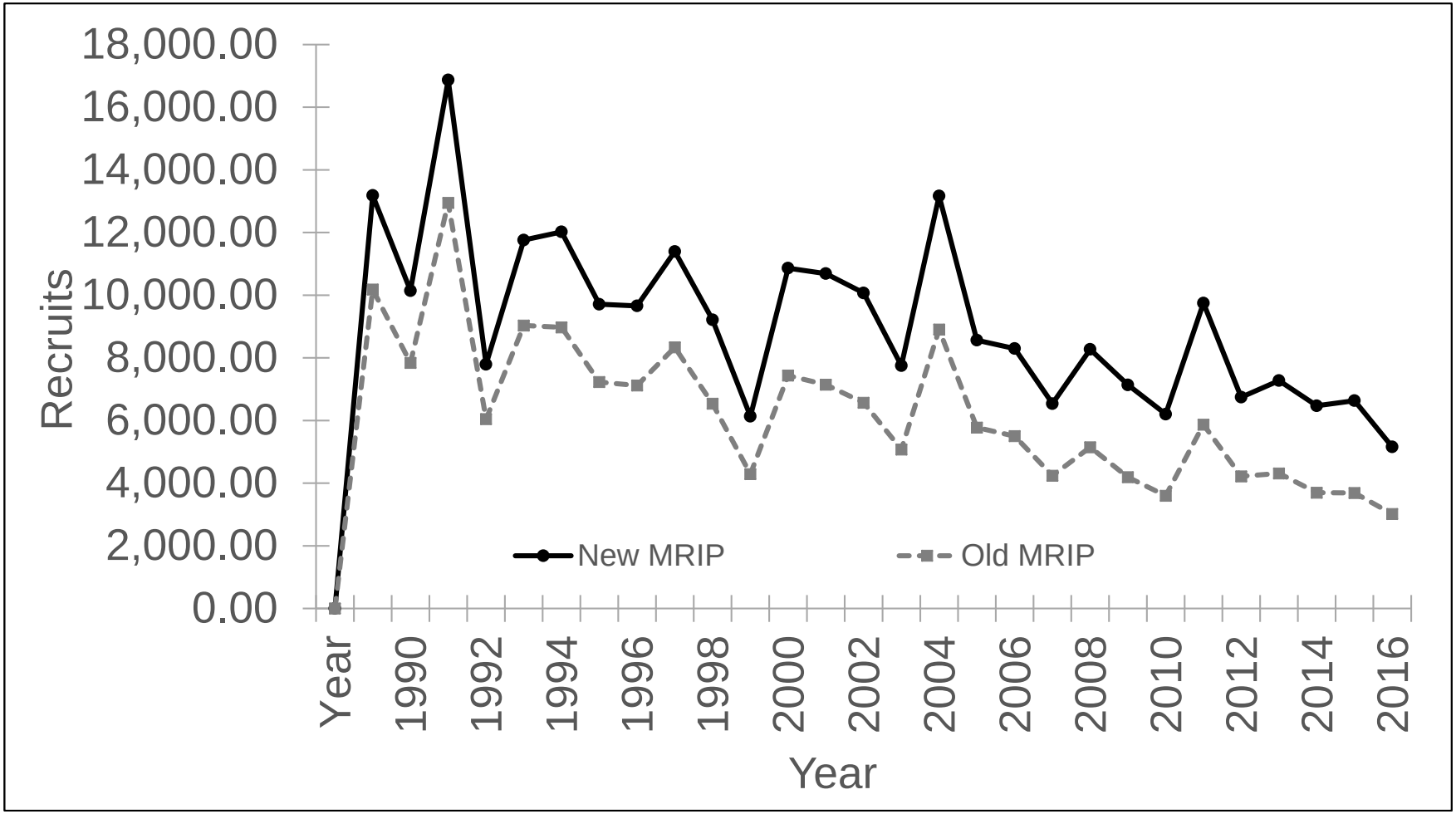
MRIP Changes



MRIP Changes



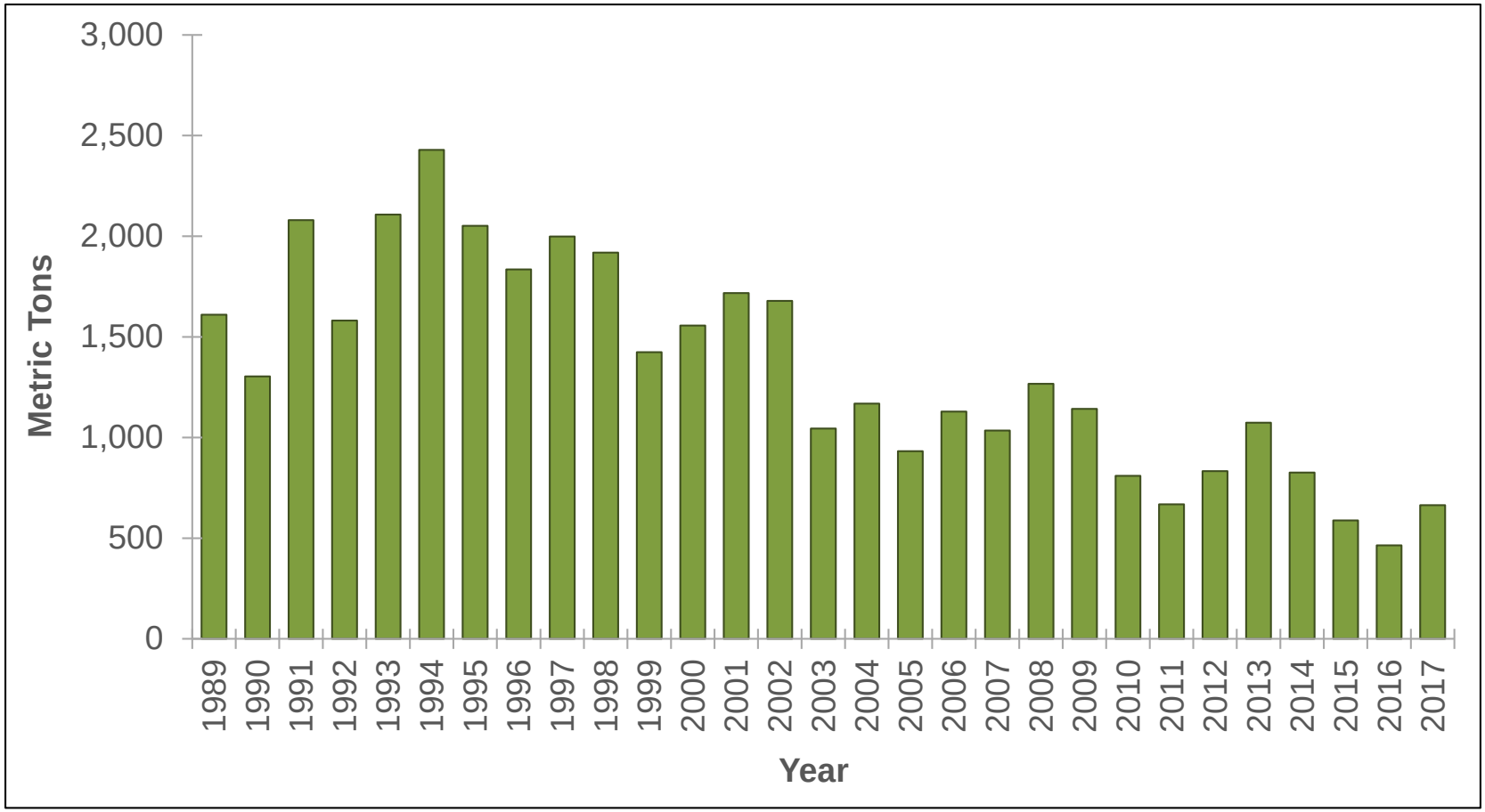
MRIP Changes



High Priority Research Recommendations

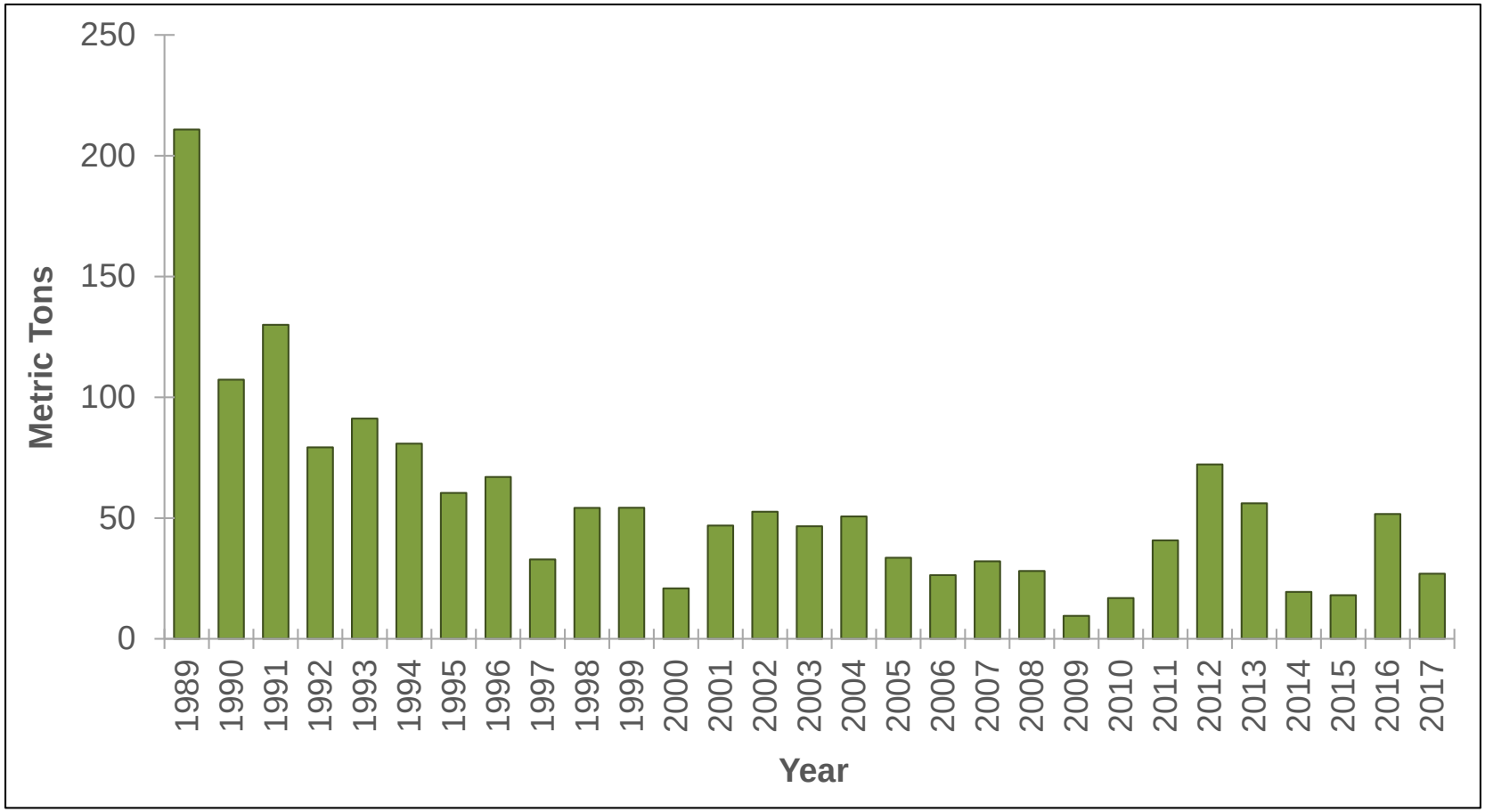
- Improve estimates of the recreational fishery live releases (catches, lengths, and ages) for southern flounder from the Marine Recreational Information Program
- Complete an age validation study using known age fish
- Expand, improve, or add fisheries-independent surveys of the ocean component of the 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)



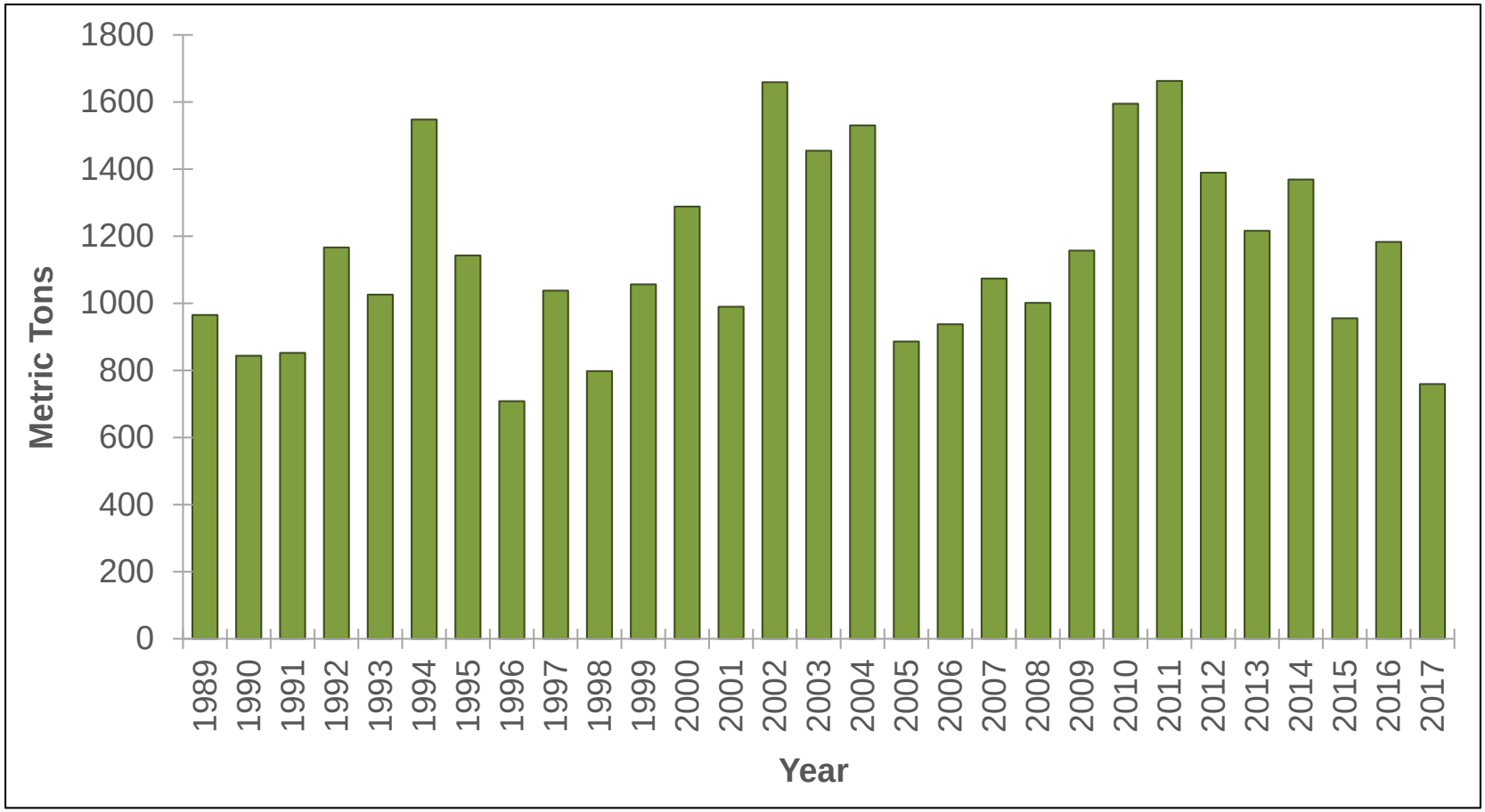
Department of Environmental Quality

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



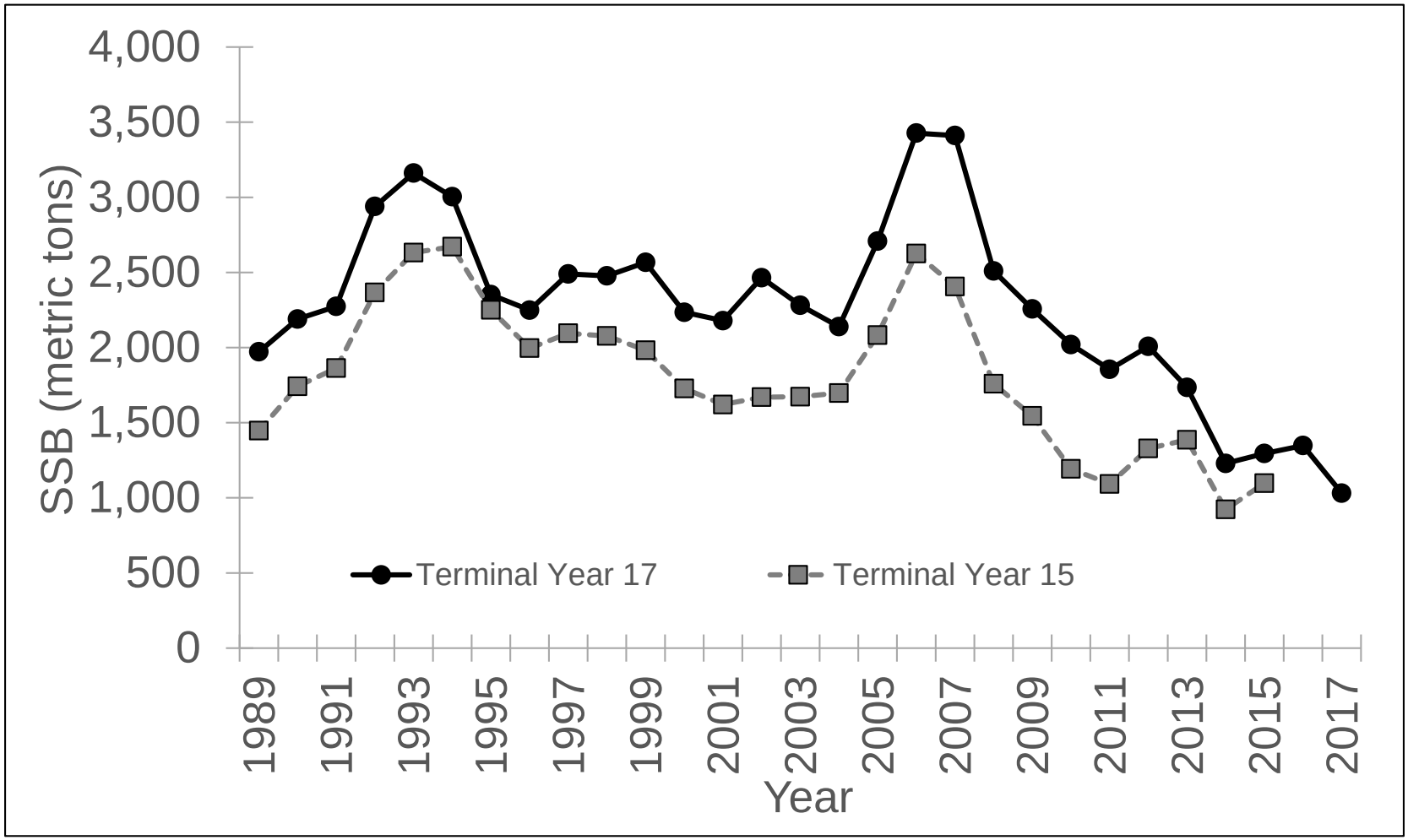
Department of Environmental Quality

Recreational Catch (North Carolina to Florida East Coast)



Department of Environmental Quality

Benchmark vs. Update



Benchmark vs. Update