Research Needs of the Southern Flounder Stock Assessment Model for the South Atlantic Stock

DEPARTMENT OF ENVIRONMENTAL QUALITY

Marine Fisheries

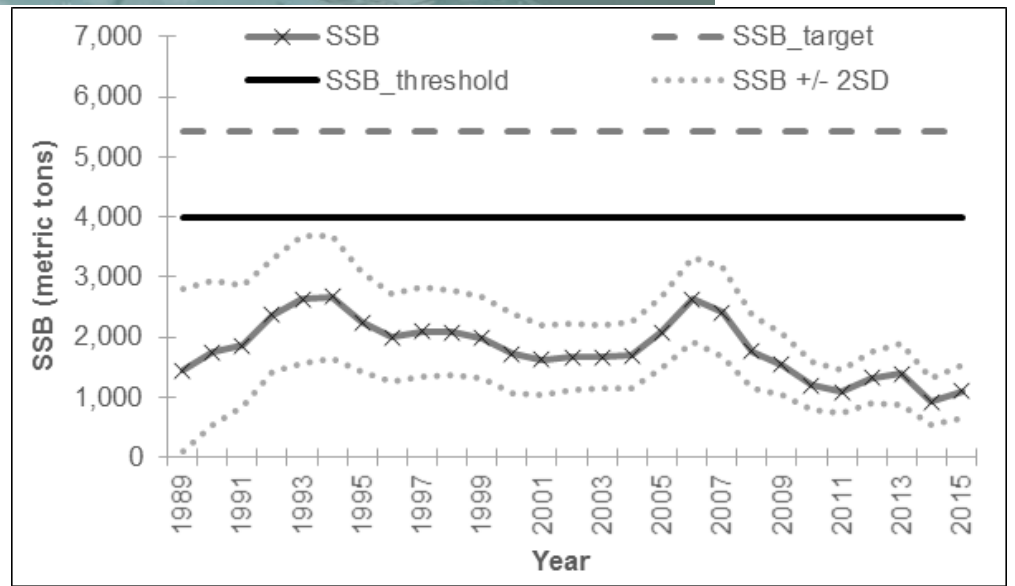
Southern Flounder Symposium| CJ Schlick, PhD| March 20, 2024

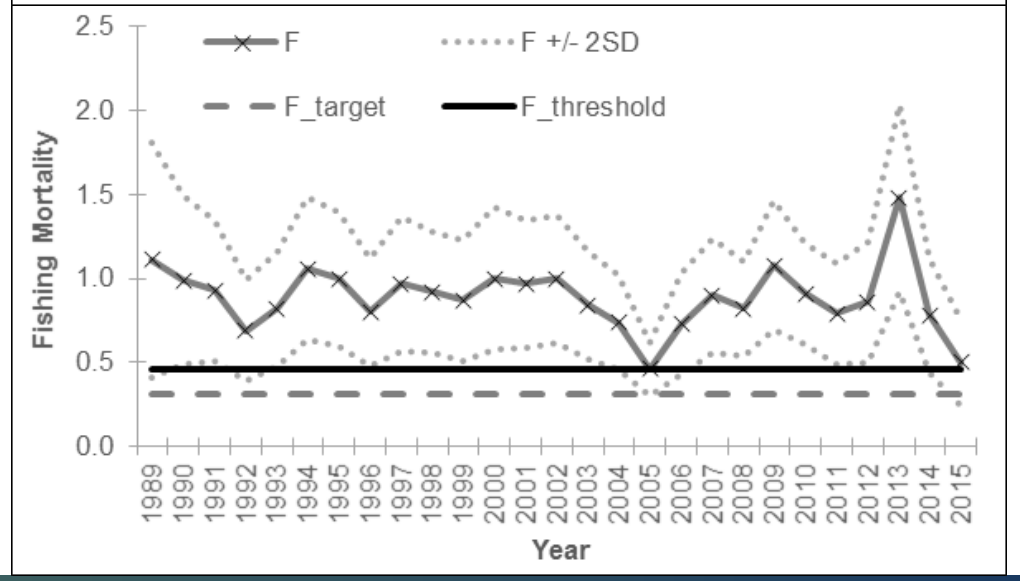
Assessment History

- Past Benchmark Assessments: 2005, 2009, 2014, and **2018**
  - All concluded stock was overfished with overfishing occurring
- Update Assessment in 2019 used the 2018 model
  - Current ongoing update uses 2018 model
- Years in models:
  - 2018 Benchmark: 1989-2015
  - **2019 Update: 1989-2017**
  - 2024 Update: 1989-2022

2018 Stock Assessment Model Conclusions

- Low recruitment that continued to decrease since 2006
- The probability that the 2015 stock is overfished is 100%
- The probability that the 2015 stock is experiencing overfishing is 53%





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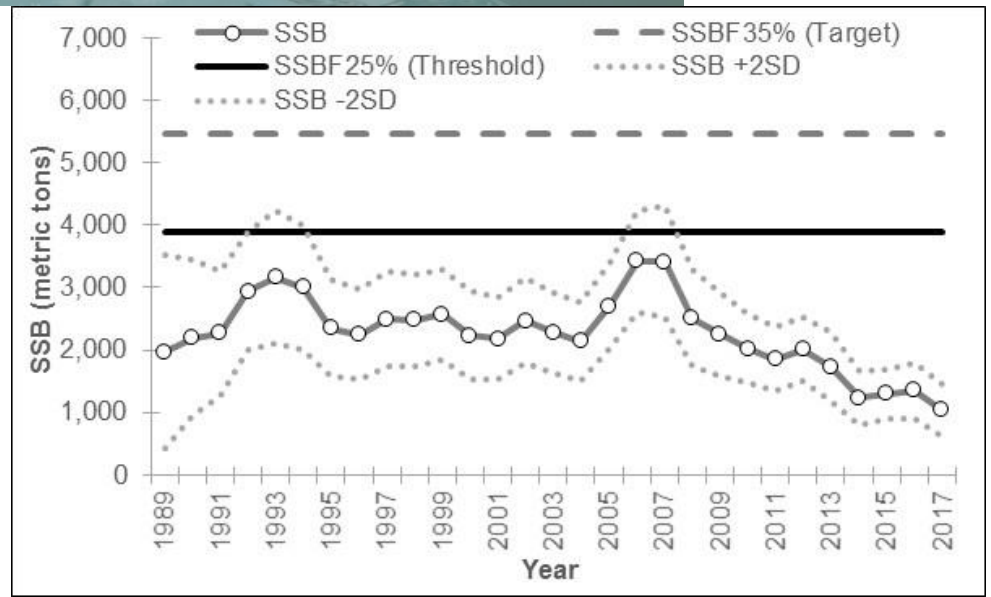
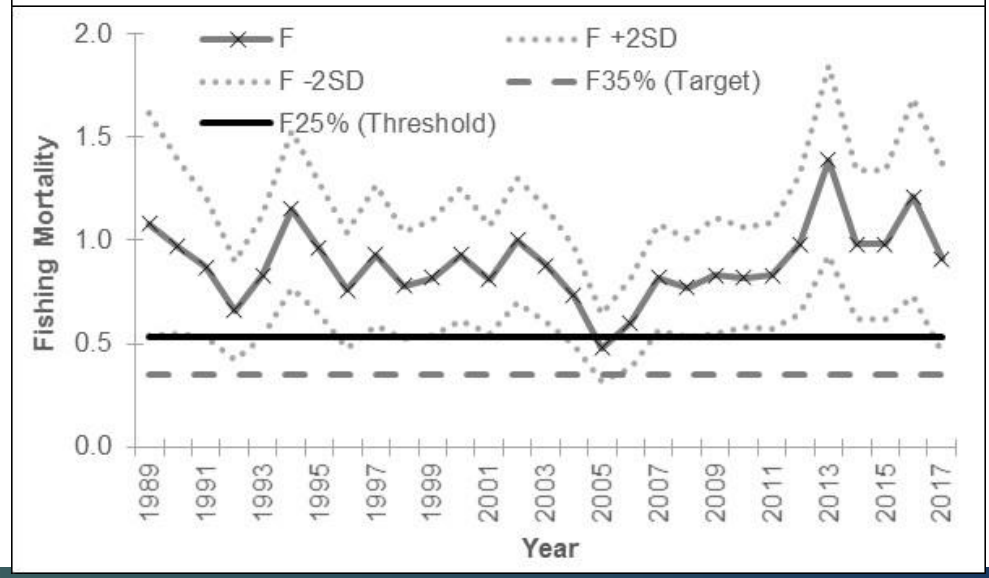
2019 Stock Assessment Model Conclusions

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





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South Atlantic Southern Flounder Stock Assessment Model

- Age Structured Assessment Program (ASAP)
- Pooled across Unit Stock: North Carolina, South Carolina, Georgia, & Florida (east coast)
- 1989-2017 (*1989-2022*)
- Birth date: Jan. 1
- Sex combined
- Age 1-4 plus group
- Age-specific natural mortality (Lorenzen 1996)
- Maturity based on previous study (Midway and Scharf 2012)—100% mature by age 4

Commercial

- Commercial Landings (Trip Ticket Programs)
- Gill-Net Discards (NC Onboard Observer Monitoring Program)

Recreational

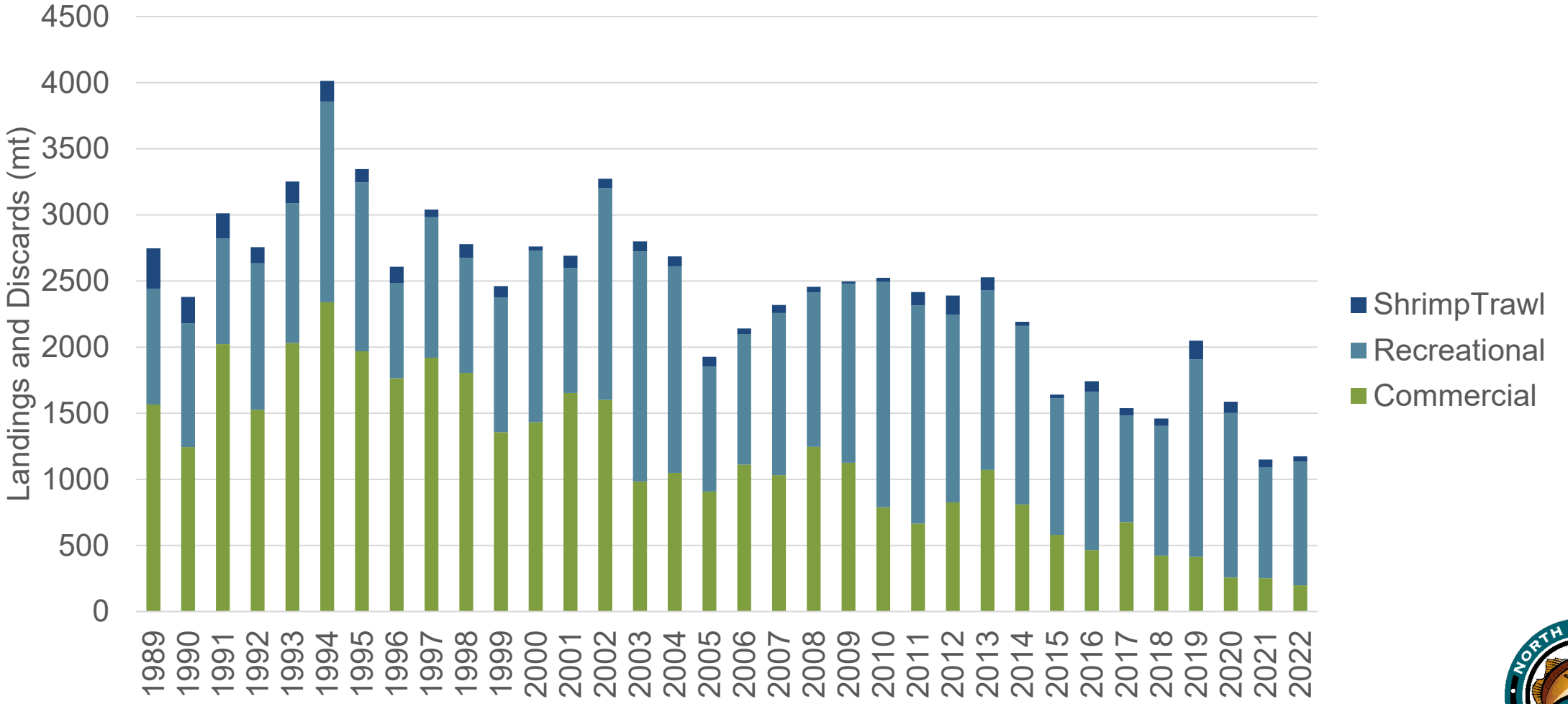
- MRIP FES
- NC Gig Survey
- Length data from MRIP intercept survey and SCDNR Volunteer Angler Tagging Program

Shrimp Trawl Bycatch (treated separate from Commercial fleet)

- Shrimp Trawl Bycatch (voluntary shrimp trawl bycatch observer program)
- Lengths from NC Commercial Shrimp Trawl Characterization Study (ran 2007-2009 and 2012-2017)

Three Fleets

Commercial, Recreational, Shrimp Bycatch
Catch and Discards combined



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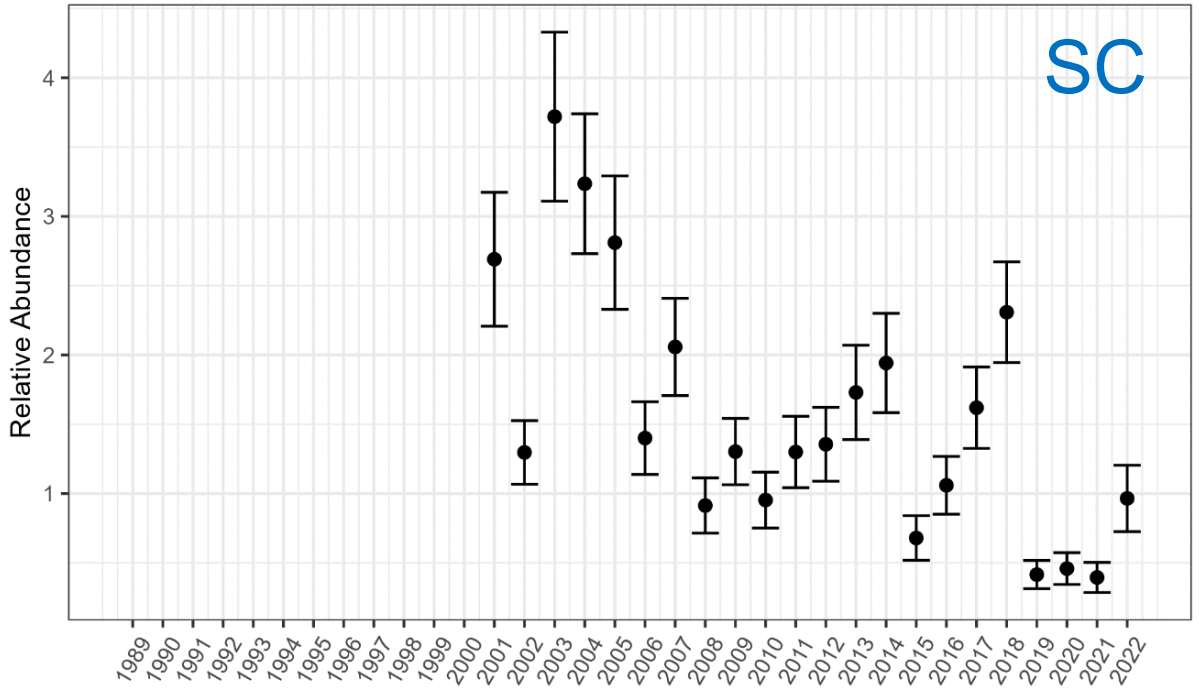
Indices

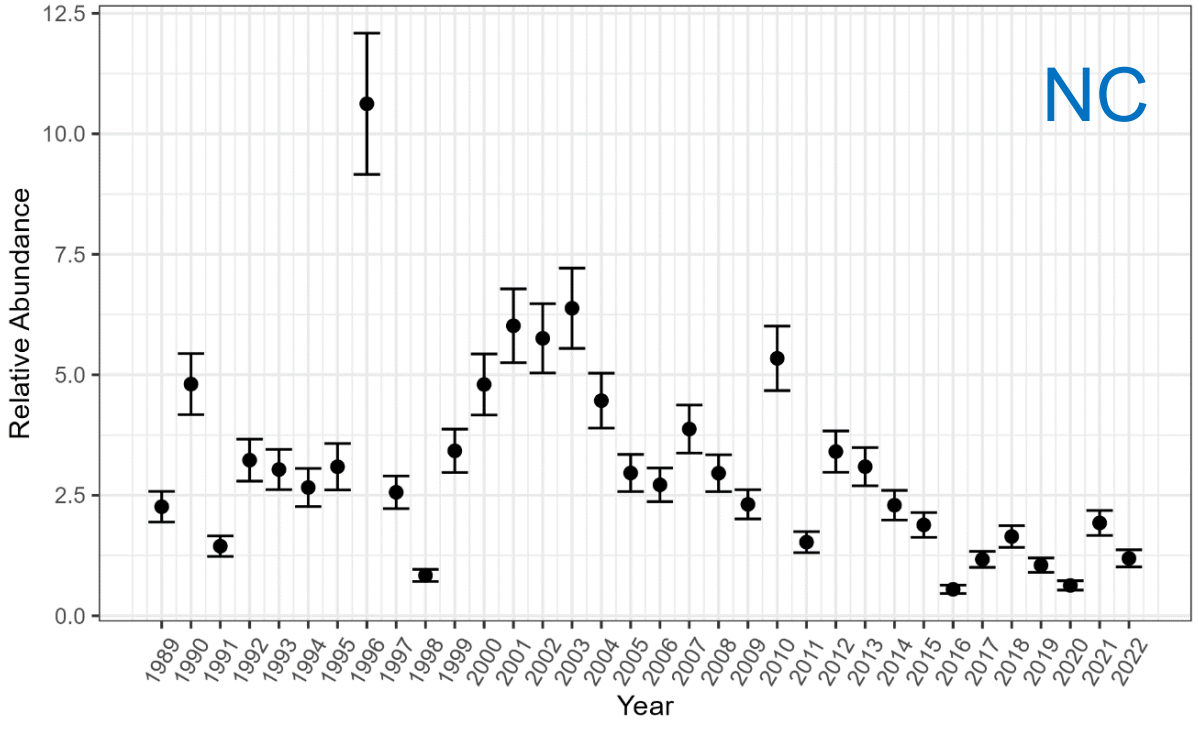
- Three Recruitment Surveys
  - North Carolina 120
  - South Carolina Electrofishing
  - Florida Young-of-year Trawl Survey
- Four State Adult Surveys
  - North Carolina (915) Gill-net Survey
  - South Carolina Trammel Net Survey
  - Georgia Trawl Survey
  - Florida Adult Trawl Survey
- One Ocean Survey (SEAMAP)
  - COVID-19 restrictions and budgetary restrictions have impacts since 2019 Assessment Update

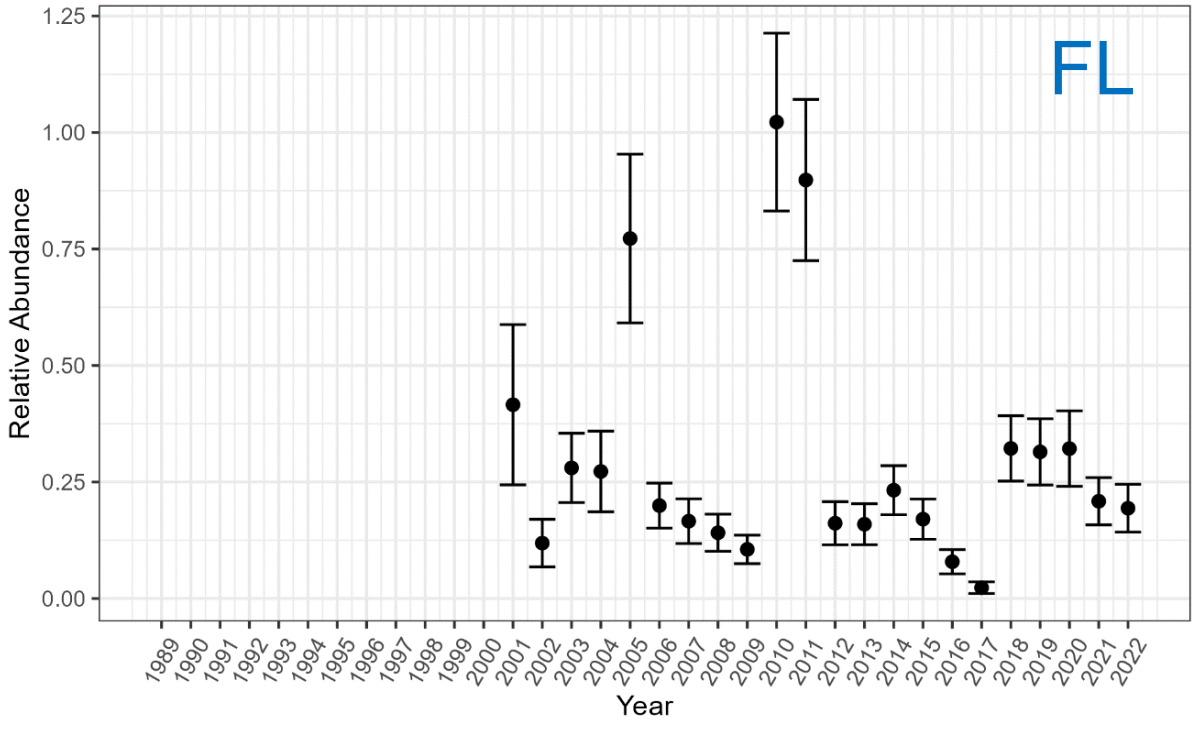
Three Age 0 Surveys

- NC120 Trawl Survey (2003-2022)
- SC Electrofishing Survey (2001-2022)
- FL Trawl Survey (2001-2022)

All bumped 1 year and 1 age

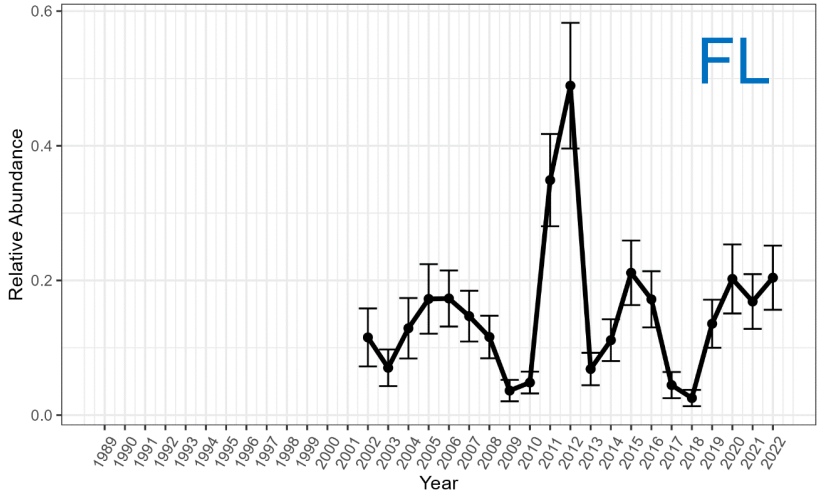


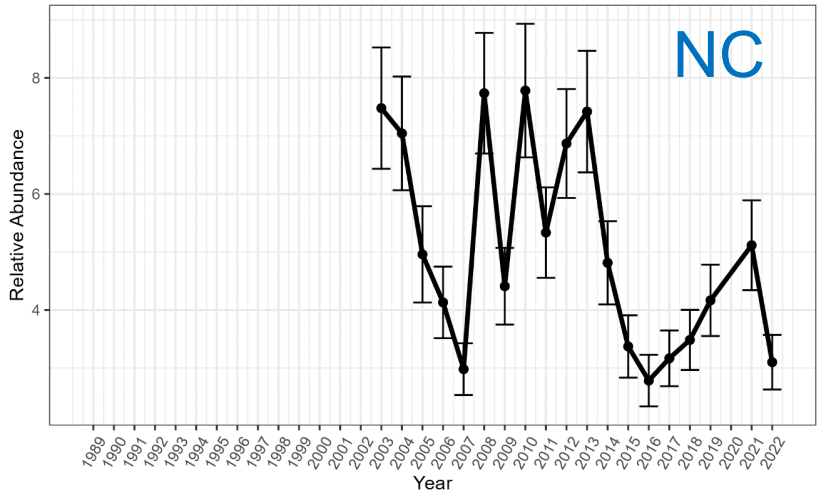


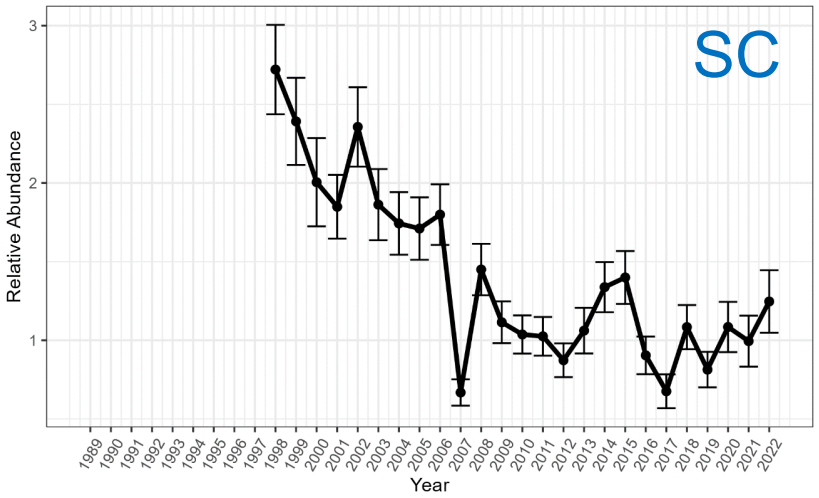


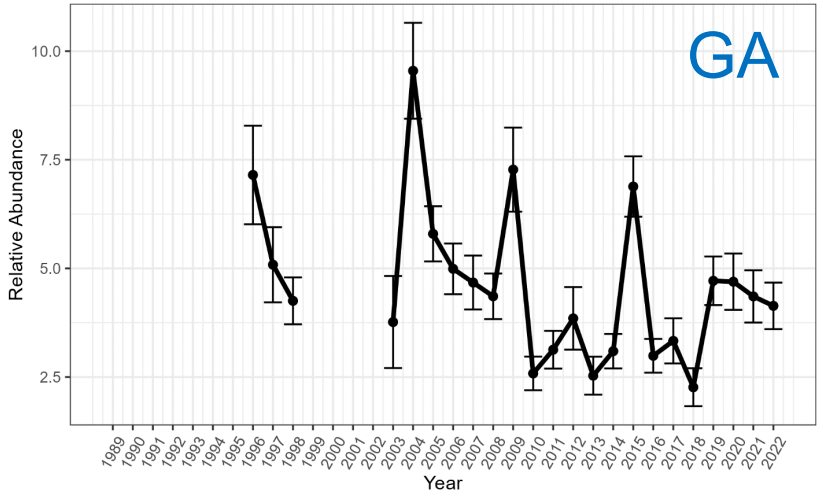
Four State Adult Surveys

- NC915 Gill-net Survey (2003-2022)
- SC Trammel Net Survey (1994-2022)
- GA Trawl Survey (1996-2022)
- FL Trawl Survey (2002-2022)

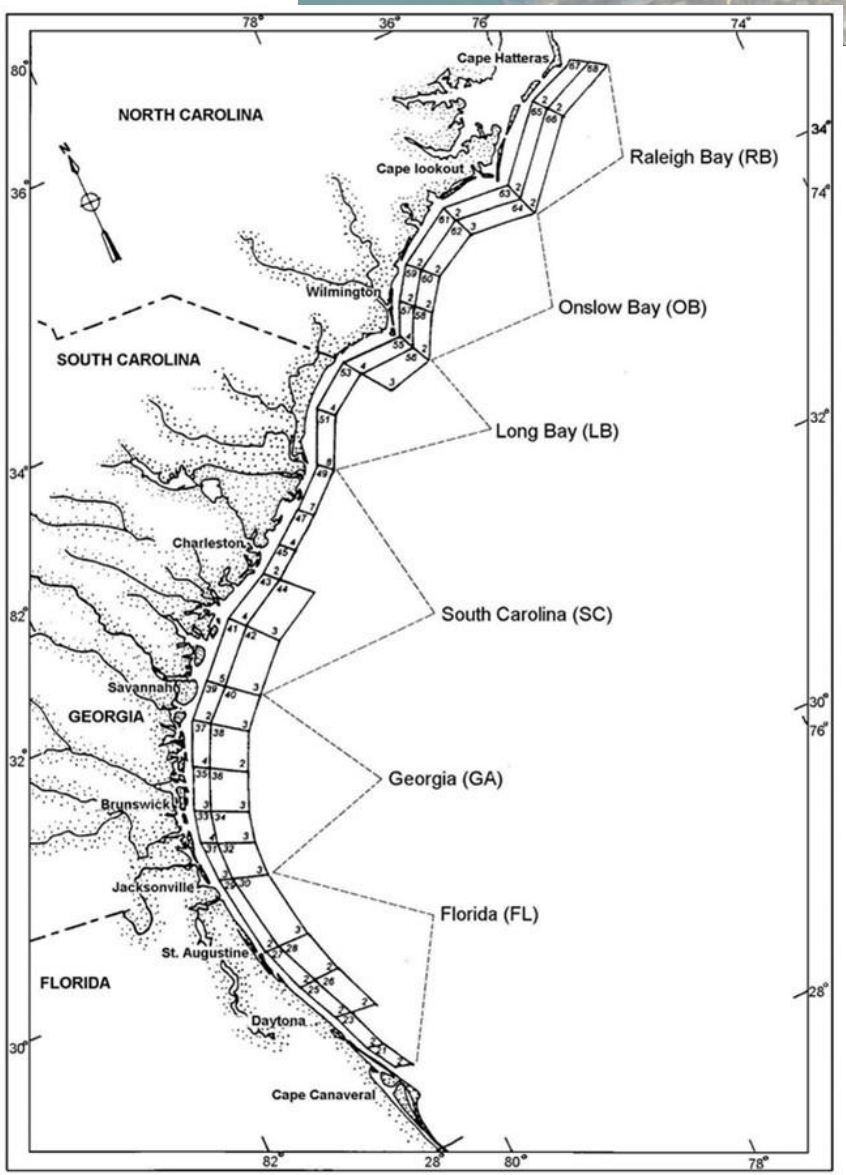




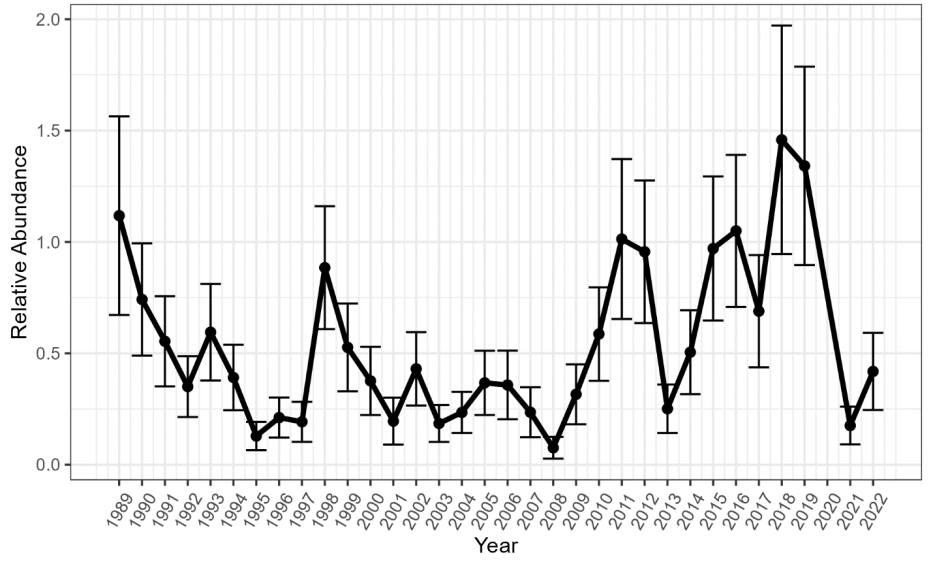




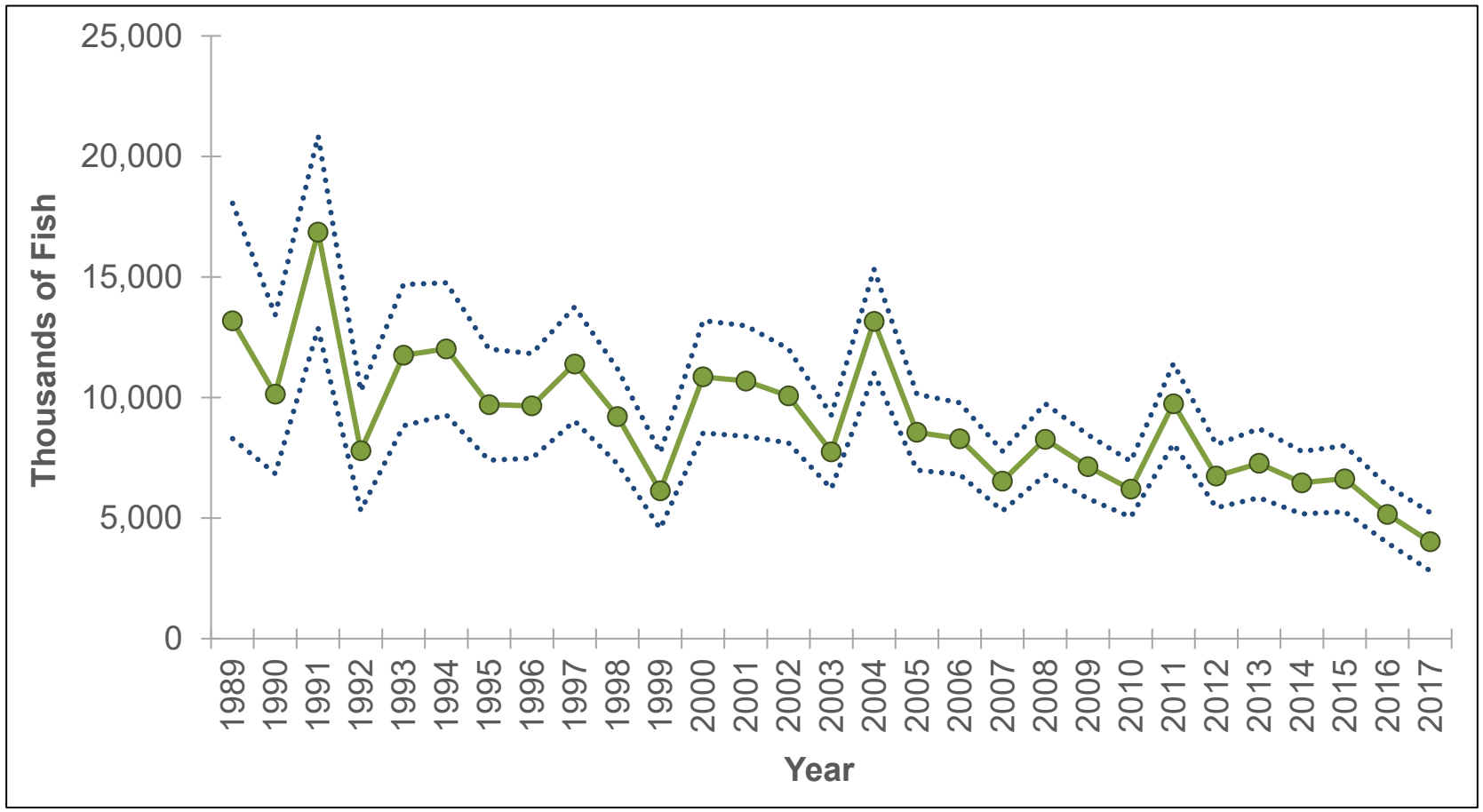
Adult Coastwide Survey
SEAMAP



	STATE																							
	Florida					Georgia					South Carolina							North Carolina						
	STRATUM																							
Year	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67
1989	4.4	4.4	4.8	4.2	4.5	7.5	12.5	8.8	12.7	7.8	11.1	8.7	3.7	11.1	20.7	25.3	12.2	12.0	10.8	3.5	3.3	7.8	8.0	3.5
1990		8.1	7.8	8.6	8.0	10.9	14.0	10.8	15.8	7.9	20.2	15.8	8.4	16.2	29.0	32.7	16.4	15.1	17.0	6.4	4.2	8.3	7.2	7.9
1991	7.4	7.4	7.0	7.8	8.2	11.9	15.9	12.5	16.9	9.0	20.3	17.5	7.7	14.7	25.5	32.0	15.4	16.8	16.9	3.5	3.6	7.8	9.4	8.5
1992	8.5	8.3	8.1	8.2	8.2	12.3	15.7	11.2	15.3	7.5	20.1	15.8	6.2	14.6	25.3	30.6	15.3	17.3	14.3	7.4	7.6	7.2	6.9	7.2
											.....													
2014	14.6	15.4	15.1	19.7	15.2	19.3	20.2	23.1	15.5	19.4	15.1	7.2	14.4	14.1	12.0	15.3	15.0	14.1	17.0	18.9	14.6	15.9	20.1	15.1
2015	15.0	15.1	17.5	21.3	18.4	21.4	18.1	22.2	13.8	20.5	17.7	7.5	15.7	14.6	10.6	13.7	15.1	18.4	17.6	22.0	15.1	18.9	7.4	15.0
2016	14.3	14.4	18.2	22.1	10.6	21.4	14.2	22.2	17.8	15.0	20.3	8.7	13.9	14.3	10.5	14.6	14.7	17.5	18.6	22.0	15.1	18.3	17.4	14.2
2017	11.8	14.5	19.6	16.9	17.6	10.5	18.1	6.2	14.4	17.6	18.4	6.9	12.9	15.6	10.8	14.4	14.3	17.5	13.3	14.8	10.9	14.7	10.2	3.2
2018	11.2	15.1	18.6	10.6		15.0	14.9	18.5	14.5	17.8	11.7	10.4	14.7	15.5	11.9	15.3	14.8	18.4						
2019					13.1	13.7	16.5	16.7	12.2	13.5	13.8	9.3	13.4	14.0	10.4	14.3	14.5	18.1	13.4	18.1	6.8			
2021	1.8	3.9	4.2		7.2	12.2	9.4	7.9	7.2	3.7	9.0	5.8	7.1	7.7	5.8	7.7	7.6	9.9	7.5	9.6	5.2			
2022				9.3	8.9	11.2	7.3	5.5	3.8	5.7	5.4	5.8	7.3	7.0	5.3	7.3	7.2	8.9	7.5	9.0	7.3	9.1		



Recruitment (Age-1)



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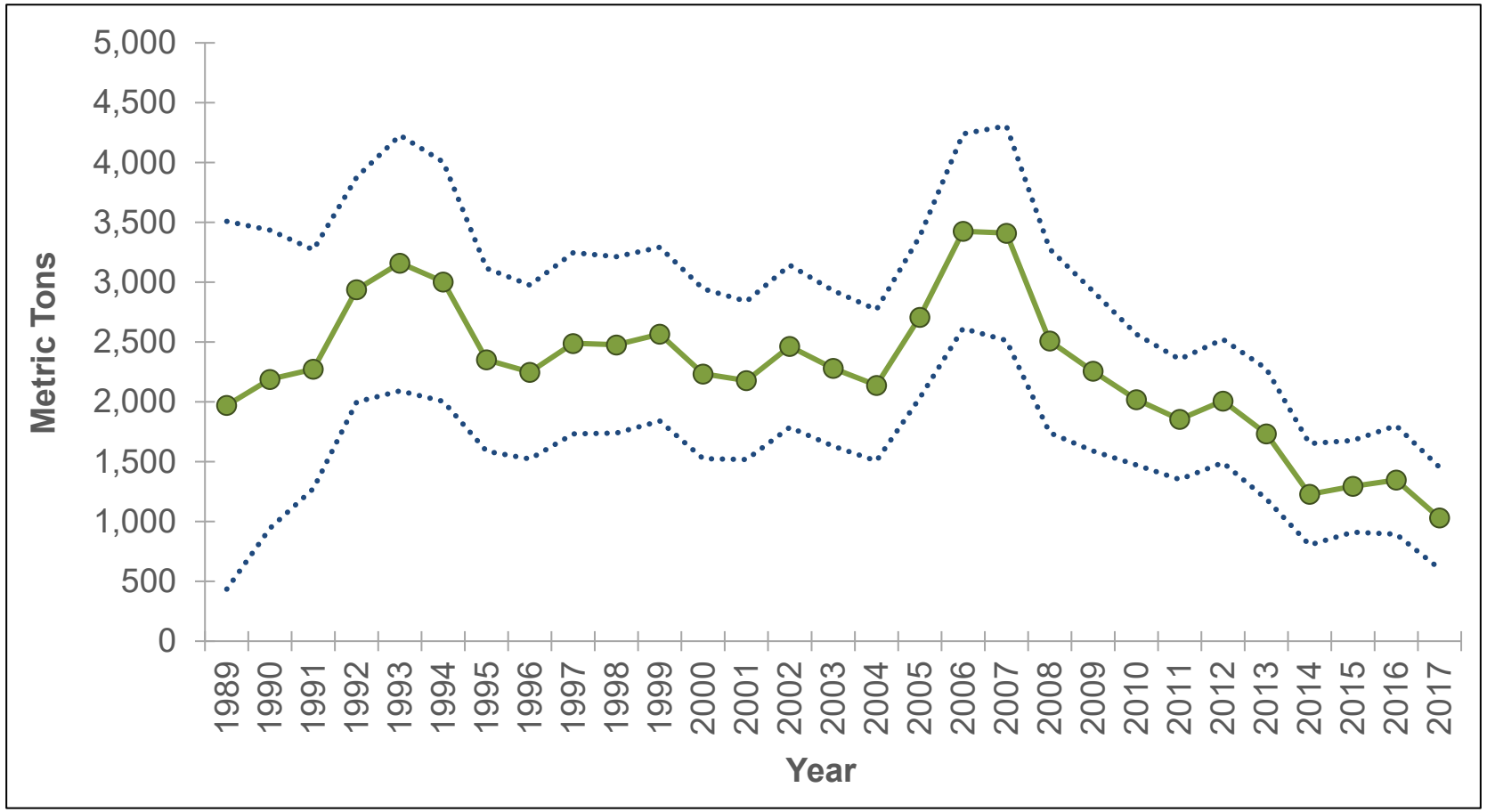
Female Spawning Stock Biomass



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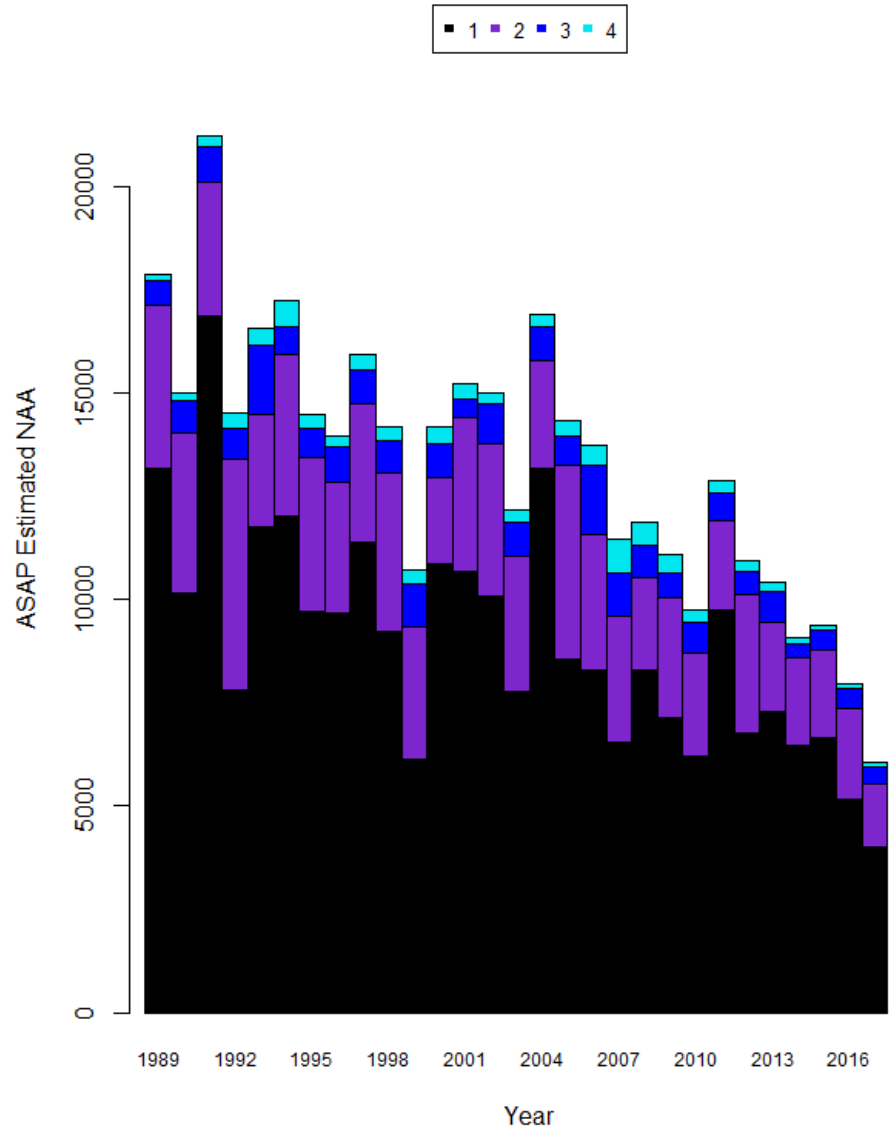
Numbers at age

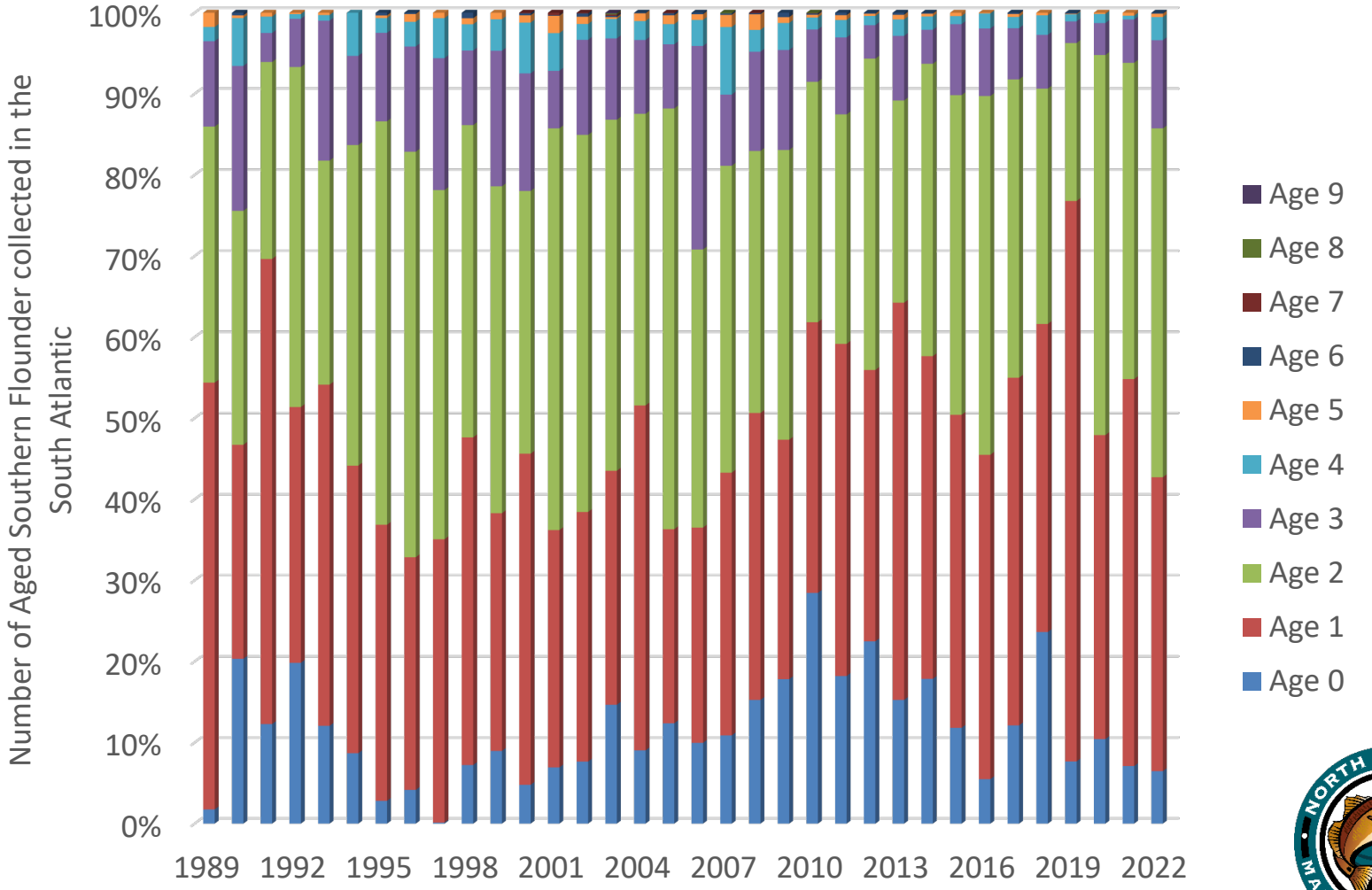
- Stock is mostly age 1 and age 2 fish

- Males live up to 6 years
  - < 6% have made it to 3 years old
  - < 1% have been more than 3 years old
- Females live up to 9 years
  - < 15% have made it to 3 years old
  - < 4% have been more than 3 years old



Numbers at age

- Samples 1999-2010:
  - 13% Age 0
  - 32% Age 1
  - 38% Age 2
  - 12% Age 3
  - 5% Age 4 or older
- Samples 2011-2022:
  - 13% Age 0
  - 44% Age 1
  - 35% Age 2
  - 6% Age 3
  - 2% Age 4 or older



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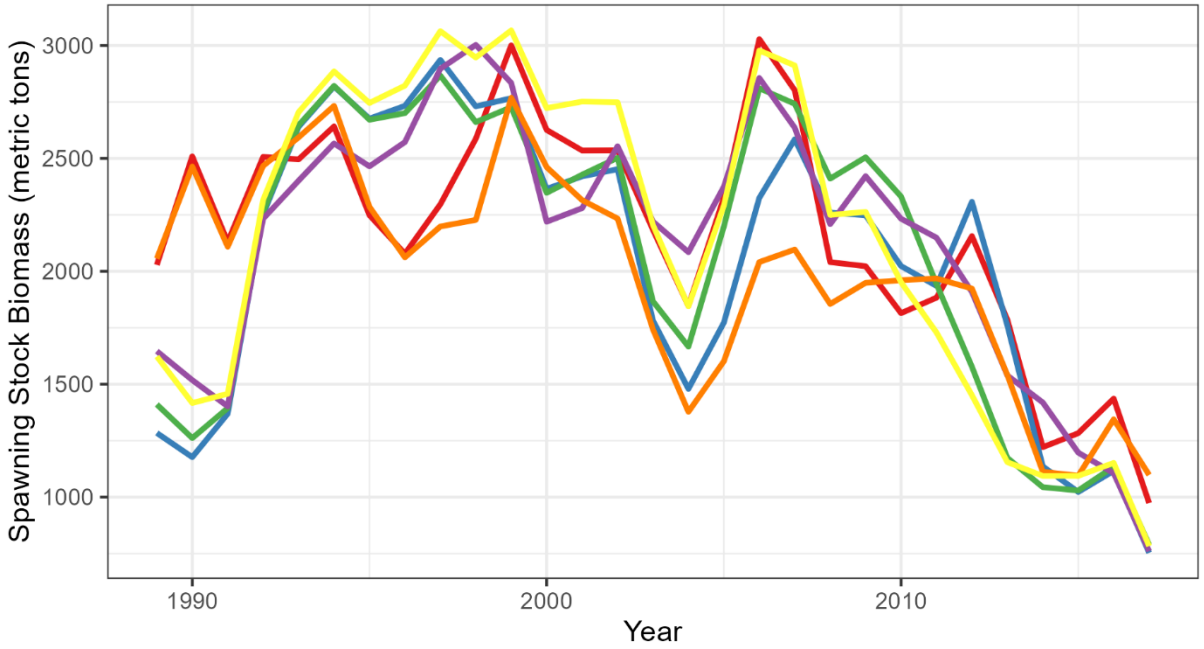
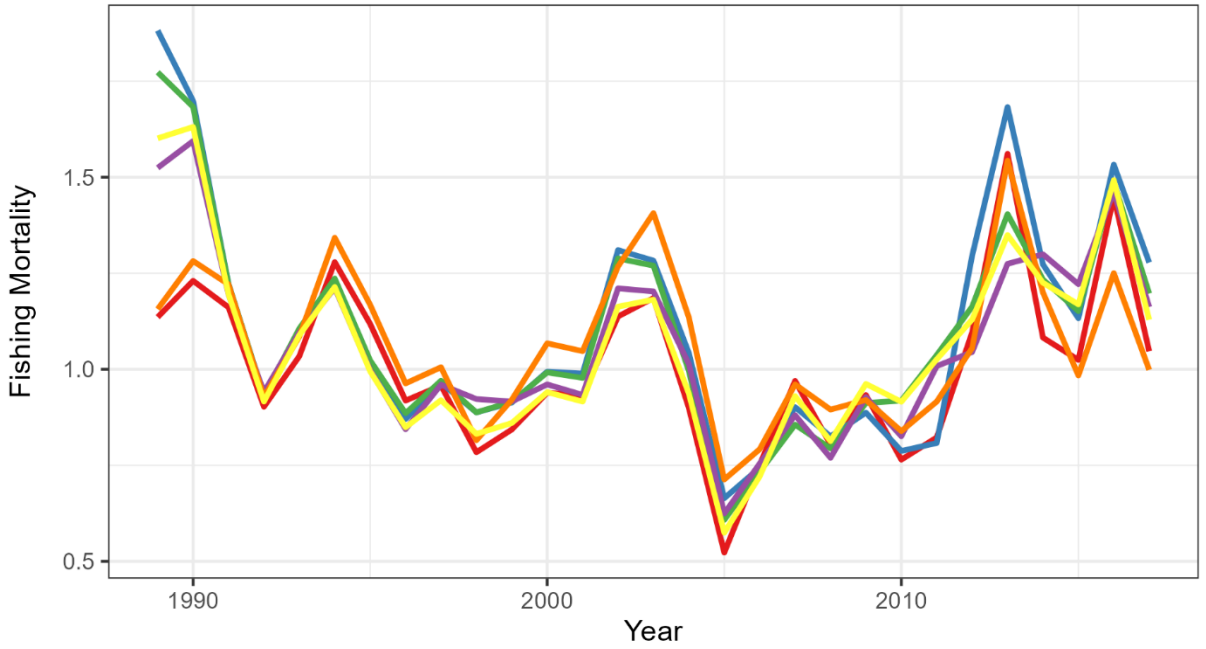
Research Recommendations

- Indices:
  - Examine use and analysis of indices with appropriate combinations and weighting
  - Add ocean component of stock

- Selectivity
  - Explore time blocks to capture changes in selectivity
  - Examine appropriate selectivities to use for each fleet
  - Explore fleets-as-areas approach to take differing management strategies into account

Sensitivity Analysis: Indices from each state alone





Scenario

Base
Only Georgia
Only SEAMAP
Only Florida
Only North Carolina
Only South Carolina

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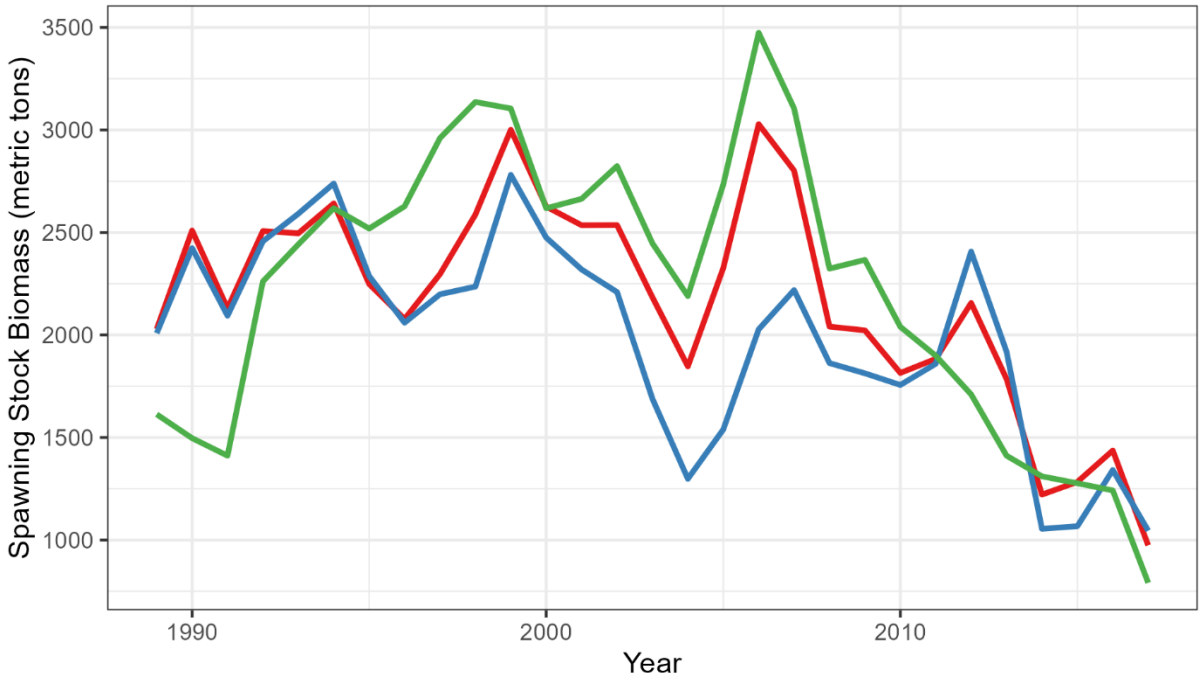
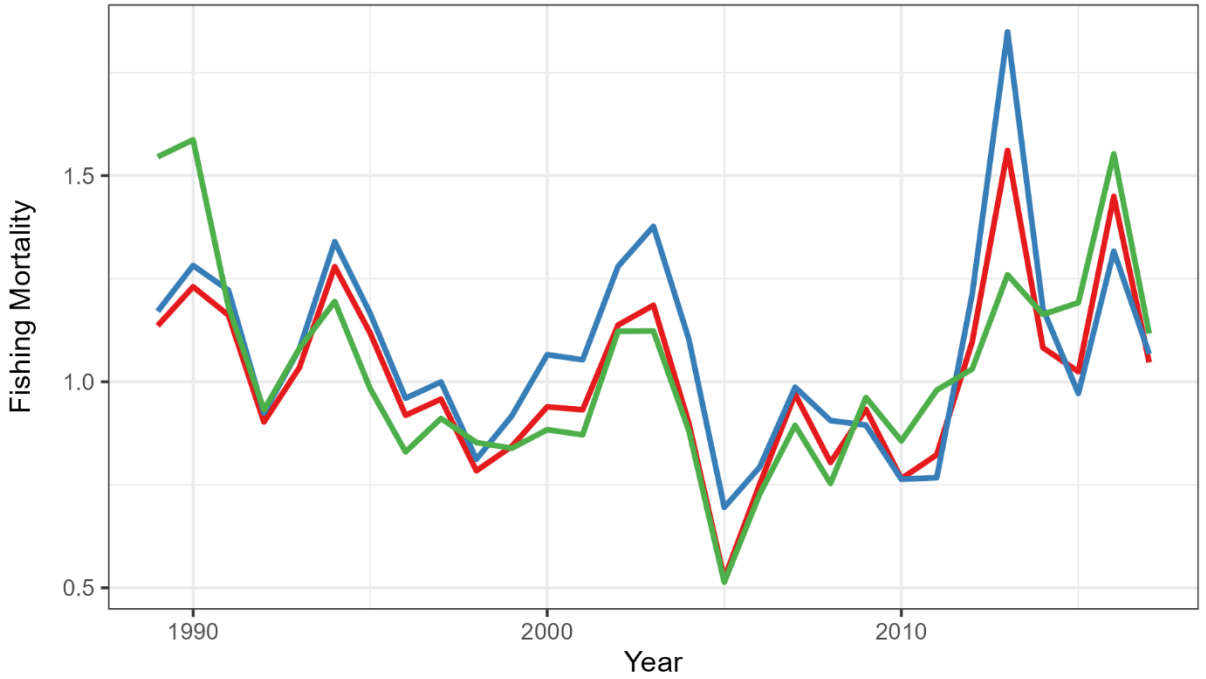
Sensitivity Analysis: Indices modeled by trend





Scenario — Base — FL-SEAMAP — NC-SC-GA

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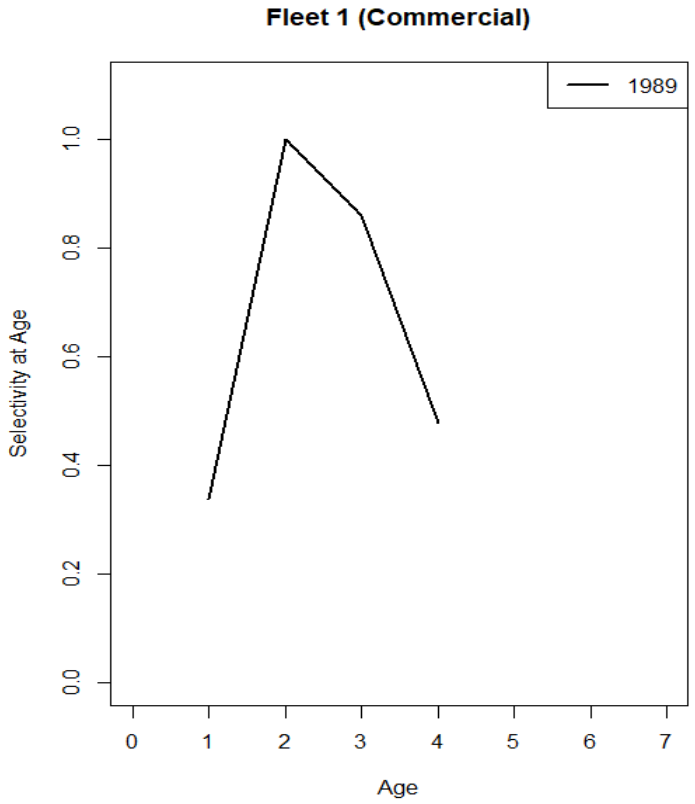
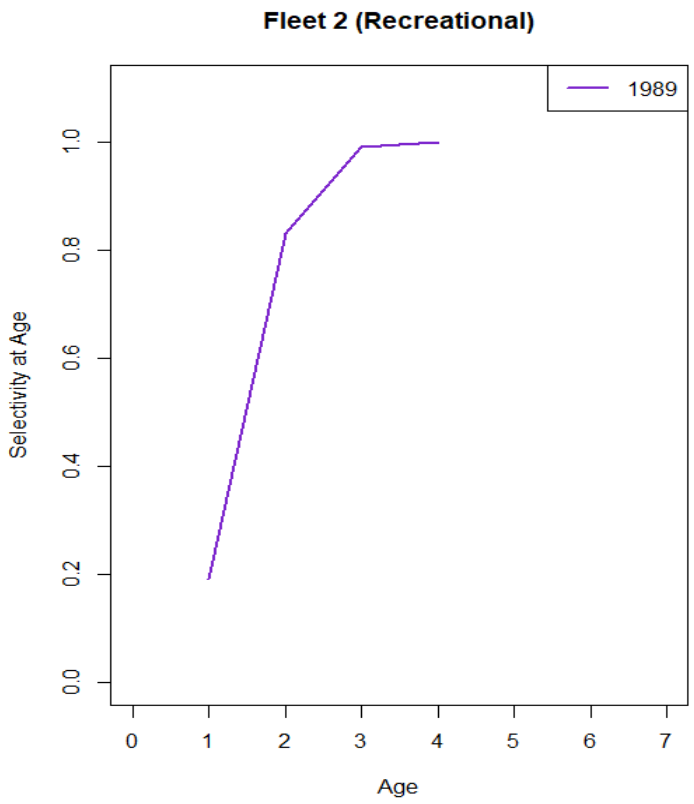
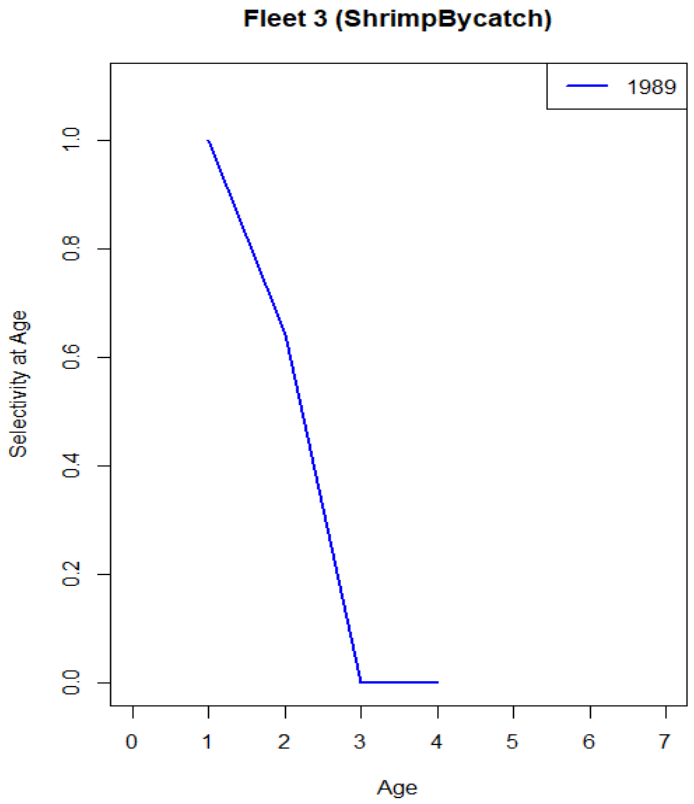
Fleet Selectivities



Estimated by Double Logistic

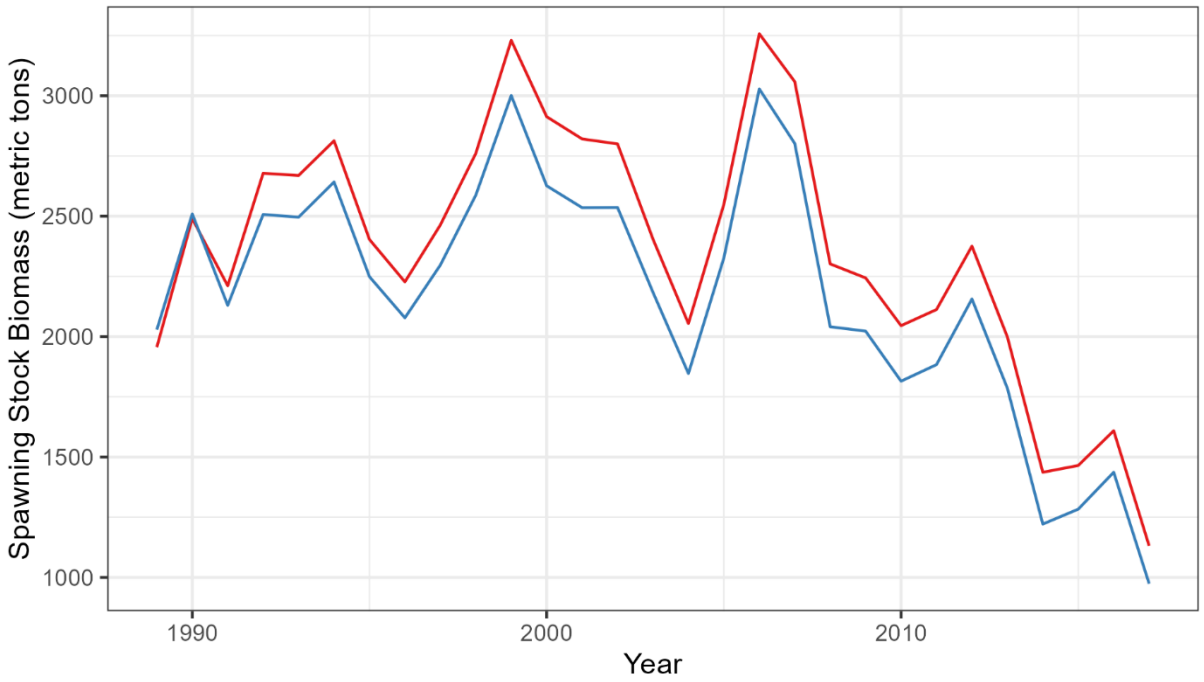


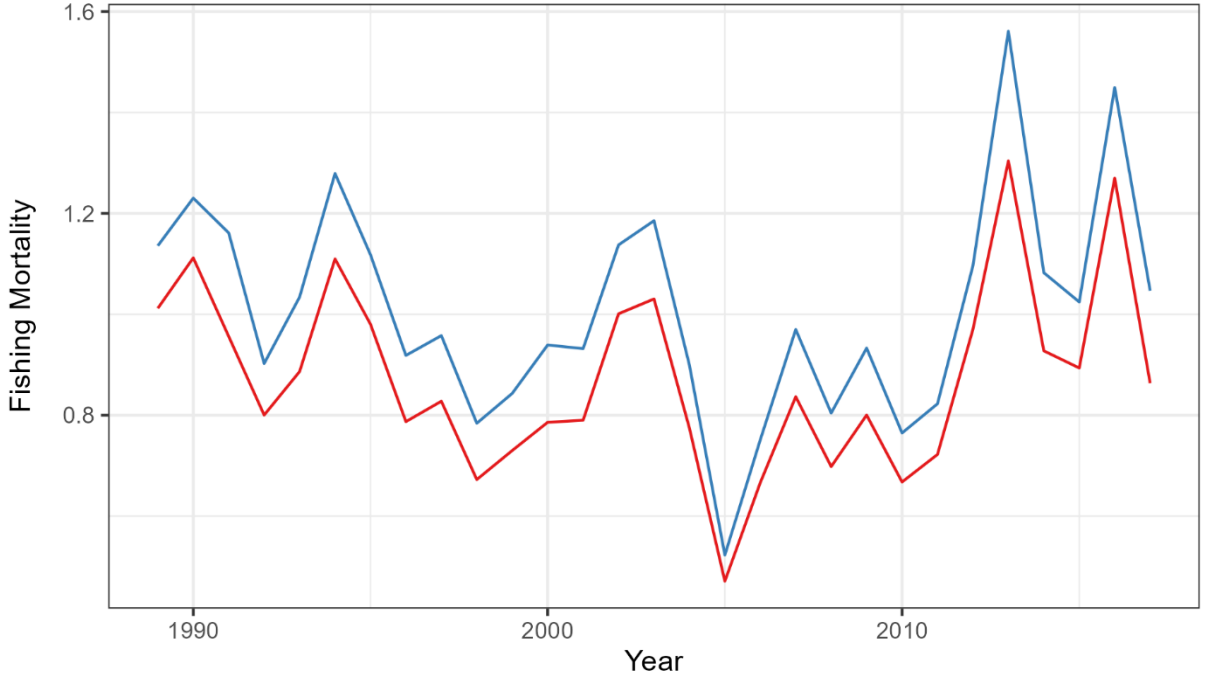
Estimated by Logistic



Estimated Selectivity at Age

Sensitivity Analysis: Changing Selectivity Estimates





Scenario — All Age Based — Base

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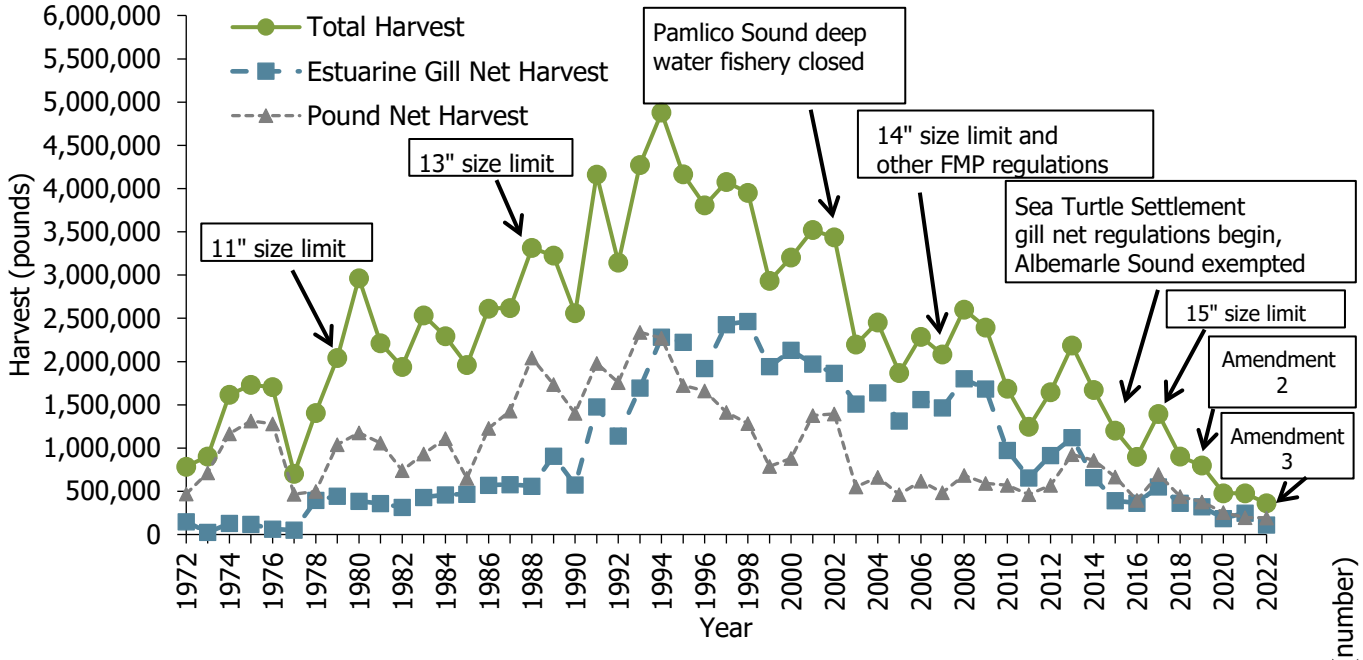
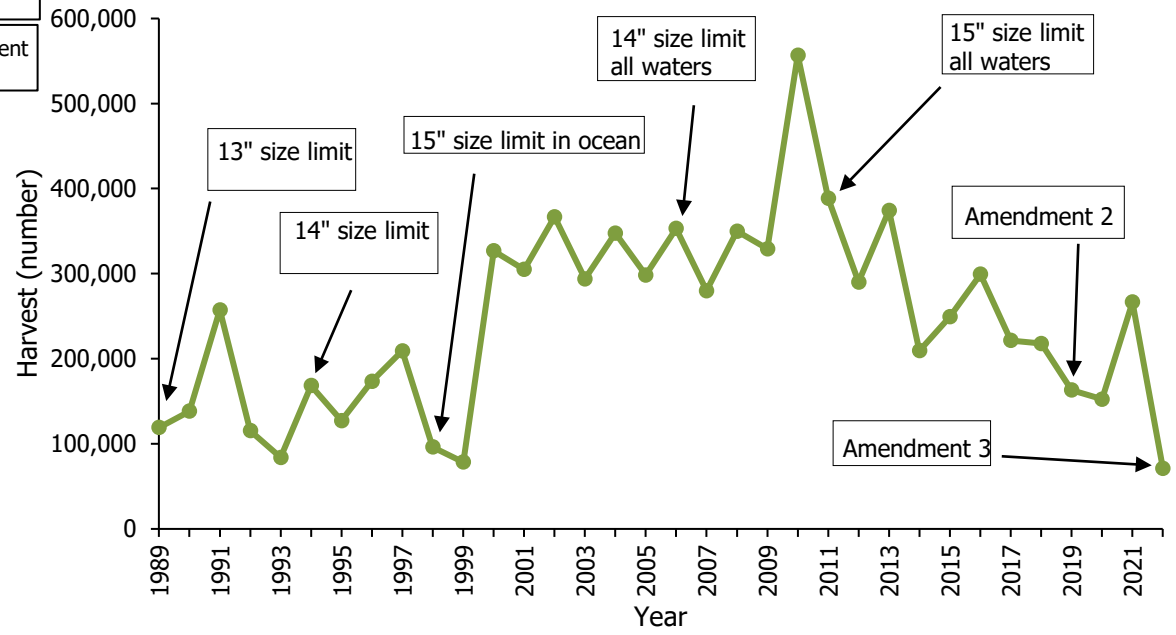
Selectivity Through Time

North Carolina Specific Commercial Management



North Carolina Specific Recreational Management



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Selectivity Through Space

Differences between states:

- Effort
- Bag limits
- Size limits
- Gear restrictions

Fleets as areas Approach

- Can reduce bias caused by spatial structure
- High computational and data needs
- Need information on recruitment, movement and dispersal, and rich data sources on abundance

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Conclusions

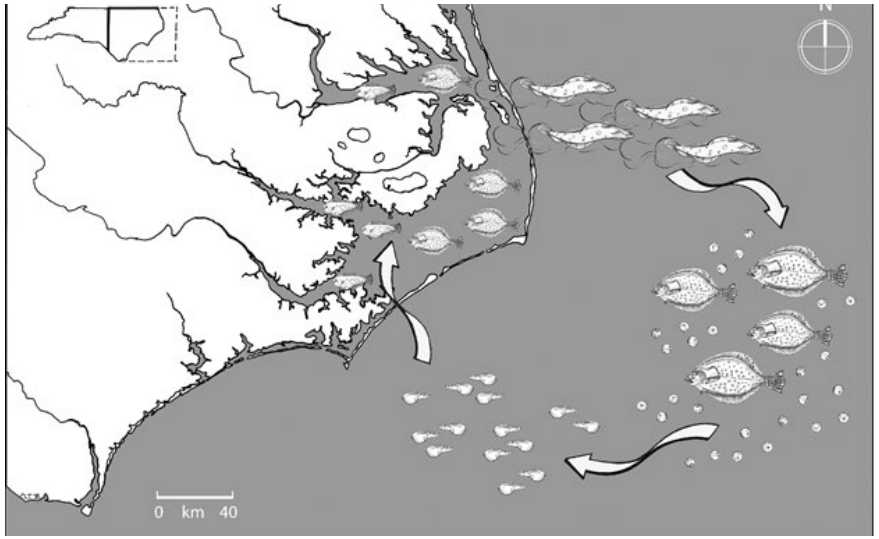
A stock assessment is a **process** of compiling and analyzing information for determining the **effects of fishing** on fished populations

Research should include impacts of management in the stock assessment process

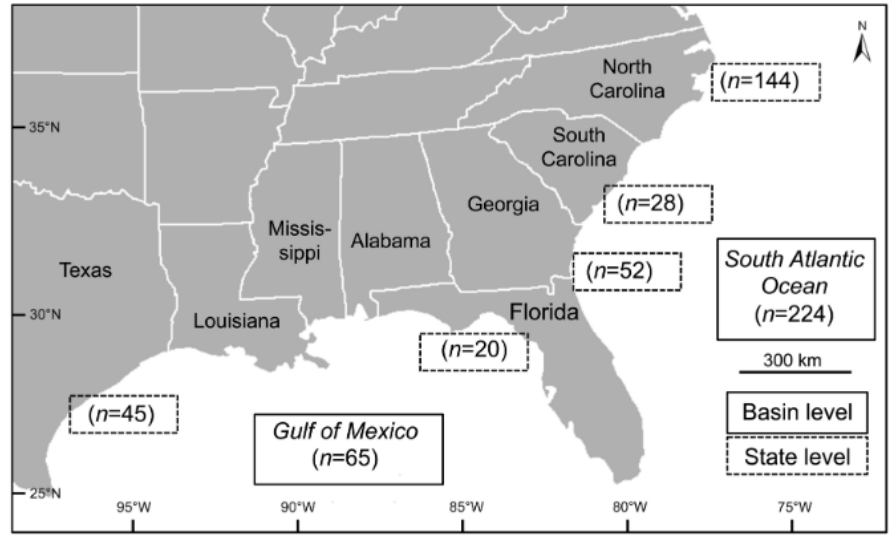
- Continuous examination of indices and fit to the model
- Further exploration how to capture management of the species in the assessment, as well as how these impact the model

Collaborative Research

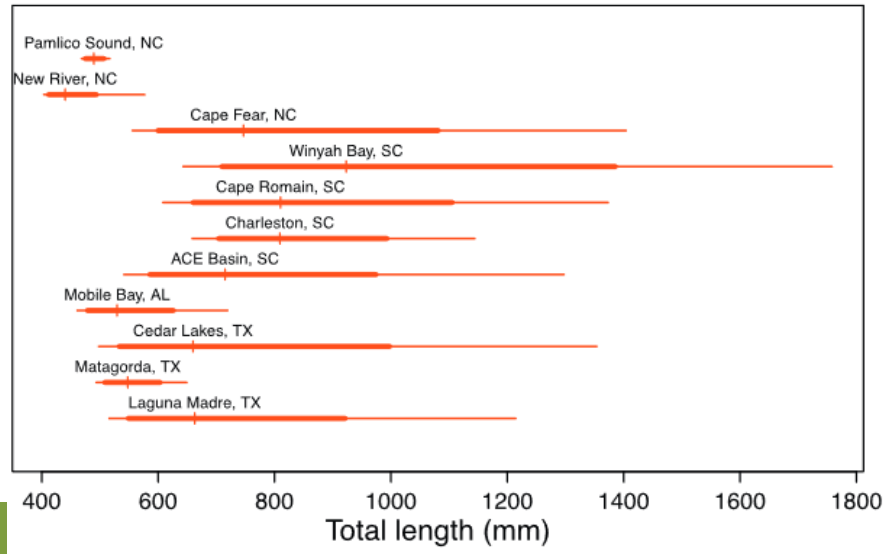
Source: Hollensead, L.D. 2018. Dissertation. UNCW, Wilmington.

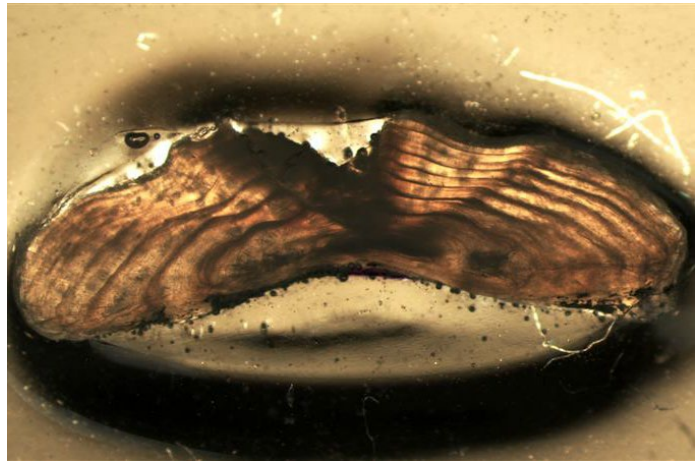


Source: Midway et al. 2014. *Fishery Bulletin*

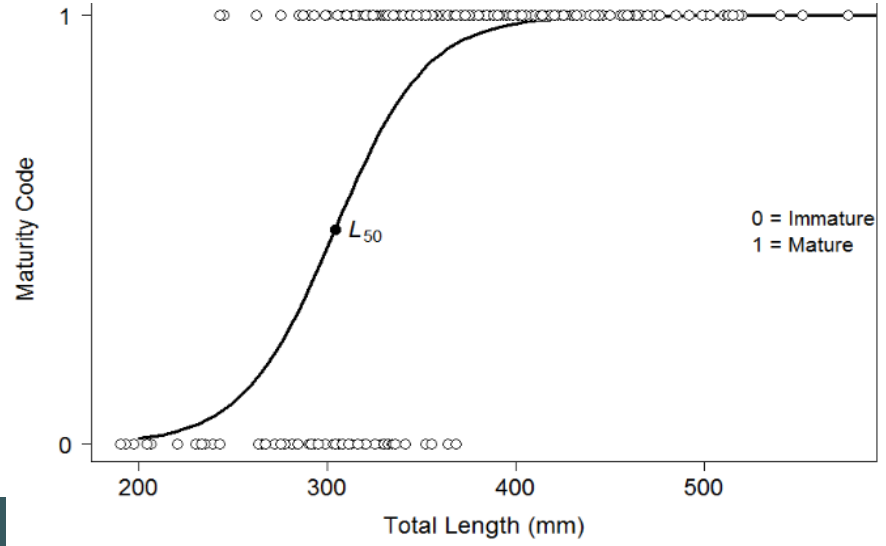


Source: Midway et al. 2015. *Fisheries Research*





Source: Corey, M. M. 2016. Dissertation. USM, Hattiesburg.



Acknowledgements

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