Spatial Considerations for SEDAR 86 - Red Grouper

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South Atlantic SSC Meeting
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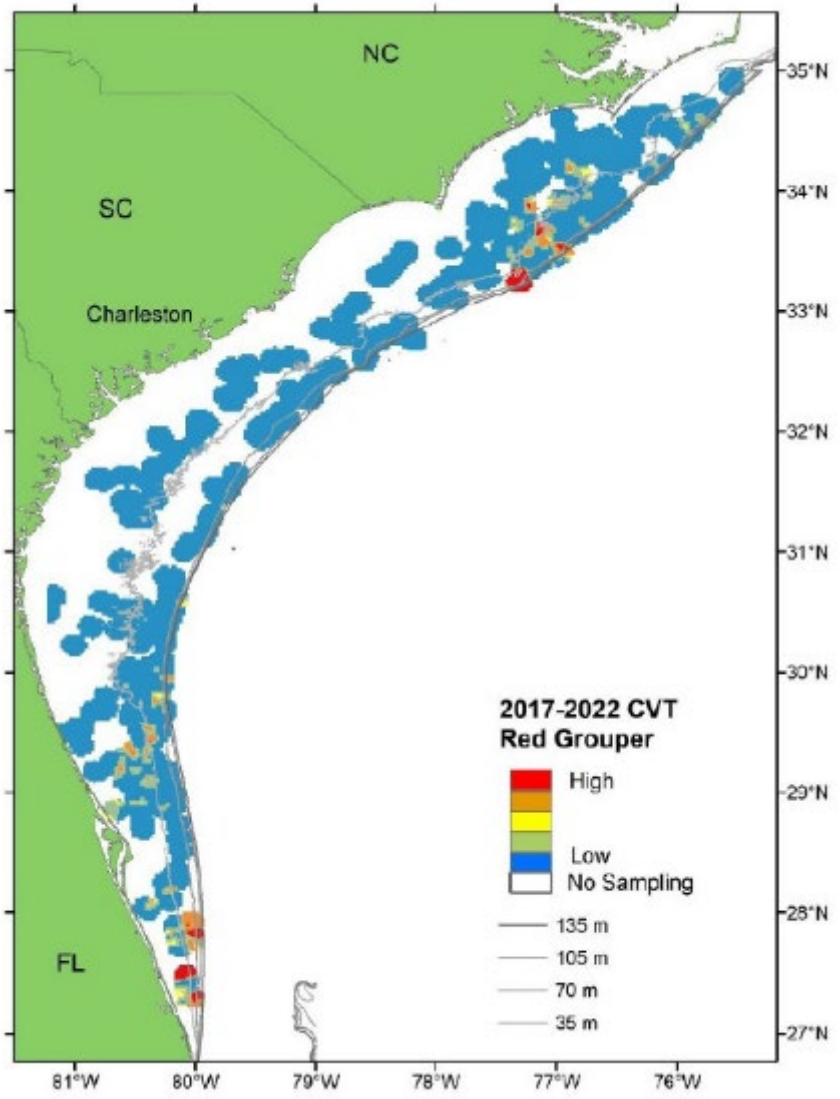
Presentation Objectives

- Review information on the distribution, fishery, and demographic patterns of South Atlantic red grouper.
  - Following previous recommendations:
    - SEDAR 19 CIE Review.
    - SEDAR 19 SSC Review
    - SEDAR 53 SSC Review
- Request flexibility to explore alternative stock assessment model configurations to acknowledge population spatial structure.

SSC Review of SEDAR 19

- *"The SSC discussed different aspects of the assessment. The issue of whether red grouper's discontinuous distribution between North Carolina and south Florida indicates a two-stock structure was identified as a significant source of uncertainty. The SSC recommends a possible two-stock scenario be considered for the next assessment."*

South Atlantic Red Grouper are Highly Spatially Aggregated



Trends in relative abundance of reef fishes in fishery-independent surveys in waters off the southeastern United States

Standardized Abundance Based on the Southeast Reef Fish Survey Chevron Trap (1990-2019, 2021-2022), the MARMAP/ SEAMAP-SA Short Bottom Longline (1996-2019, 2021-2022), and Long Bottom Longline Surveys (1996-2011, 2015-2016, 2019)

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(SEFIS data provided by C. Schobernd)

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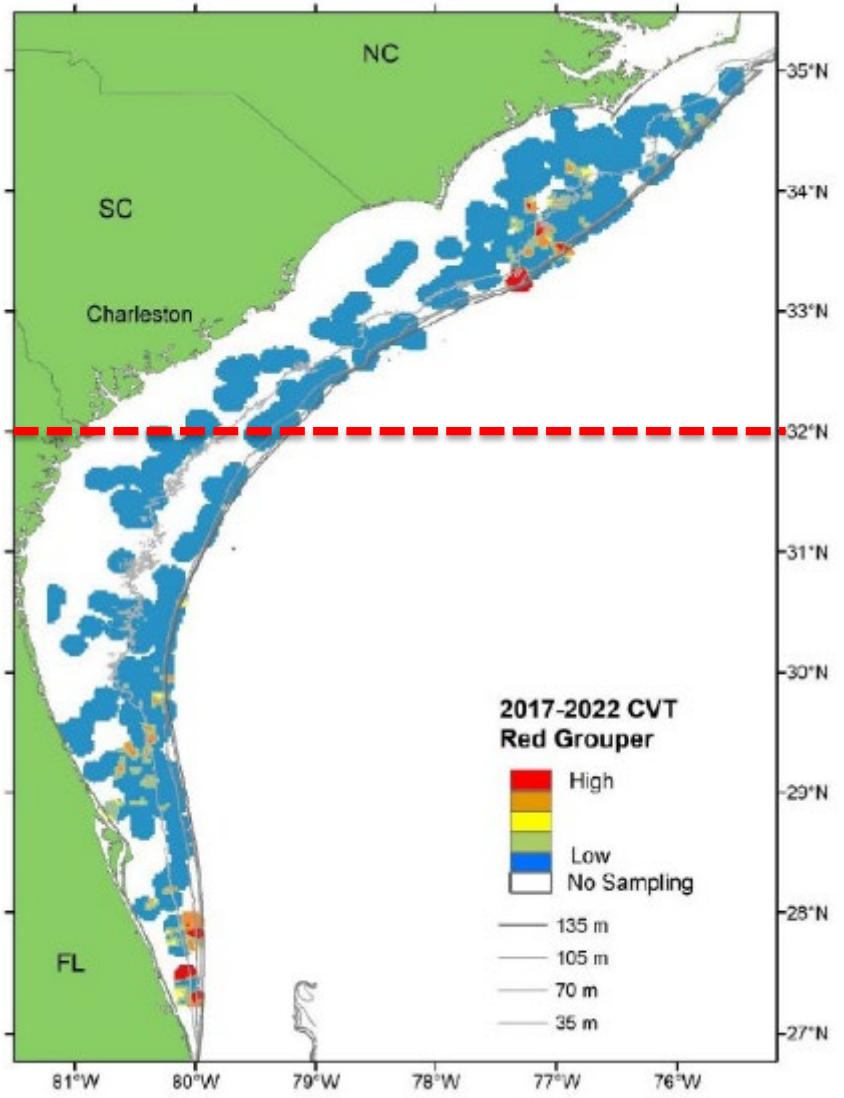
May 8, 2023

MARMAP/SEAMAP-SA Reef Fish Survey Technical Report 2023-002

Spatial Structure of Data Summaries

- Northern Region:
  - North Carolina and South Carolina
- Southern Region:
  - Georgia and Florida
- Preliminary Results Subject to Change



Landings

Figure 1 Headboat Landings

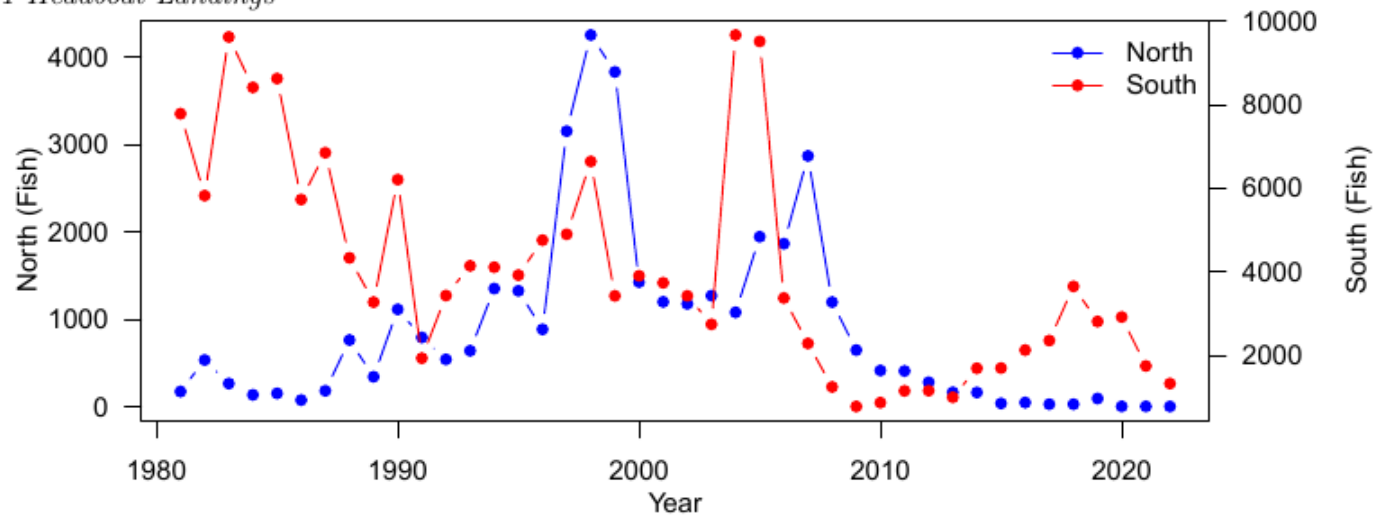
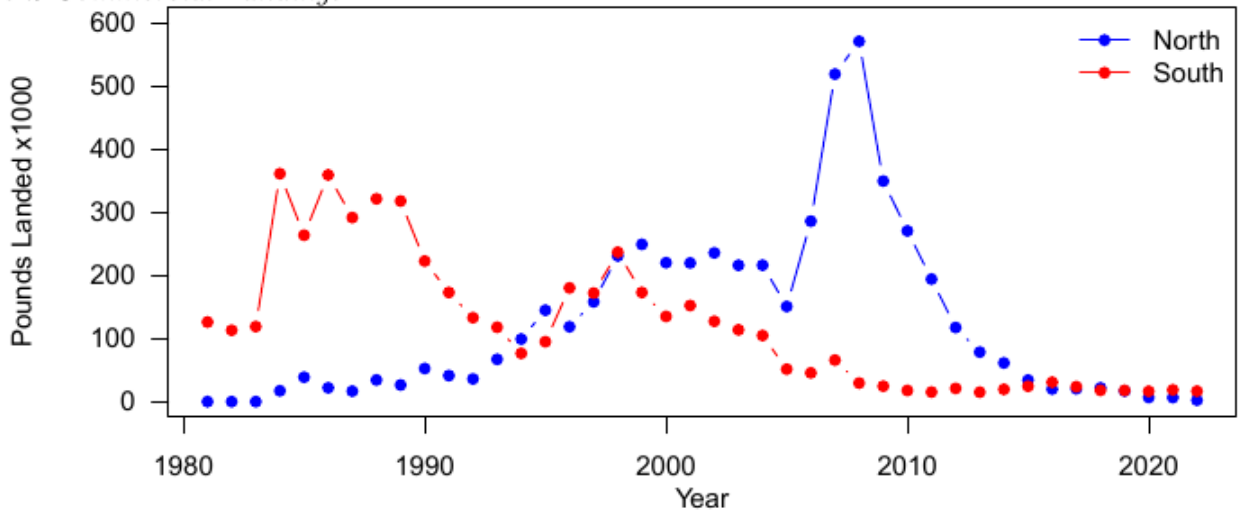
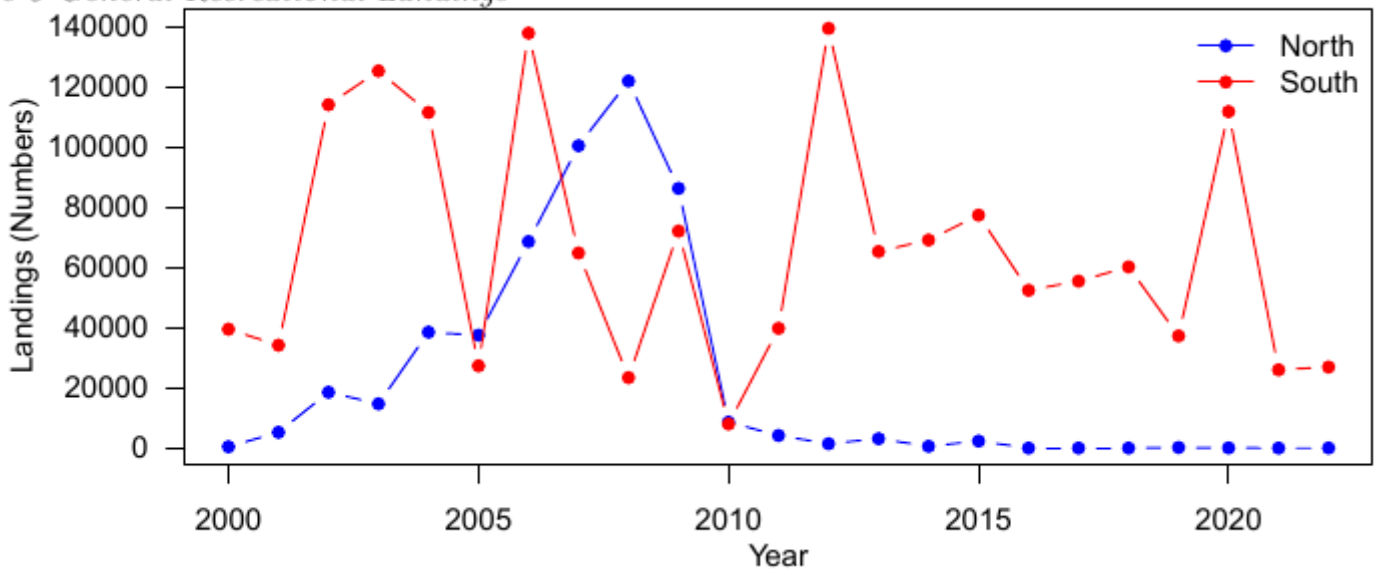


Figure 2 Commercial Landings

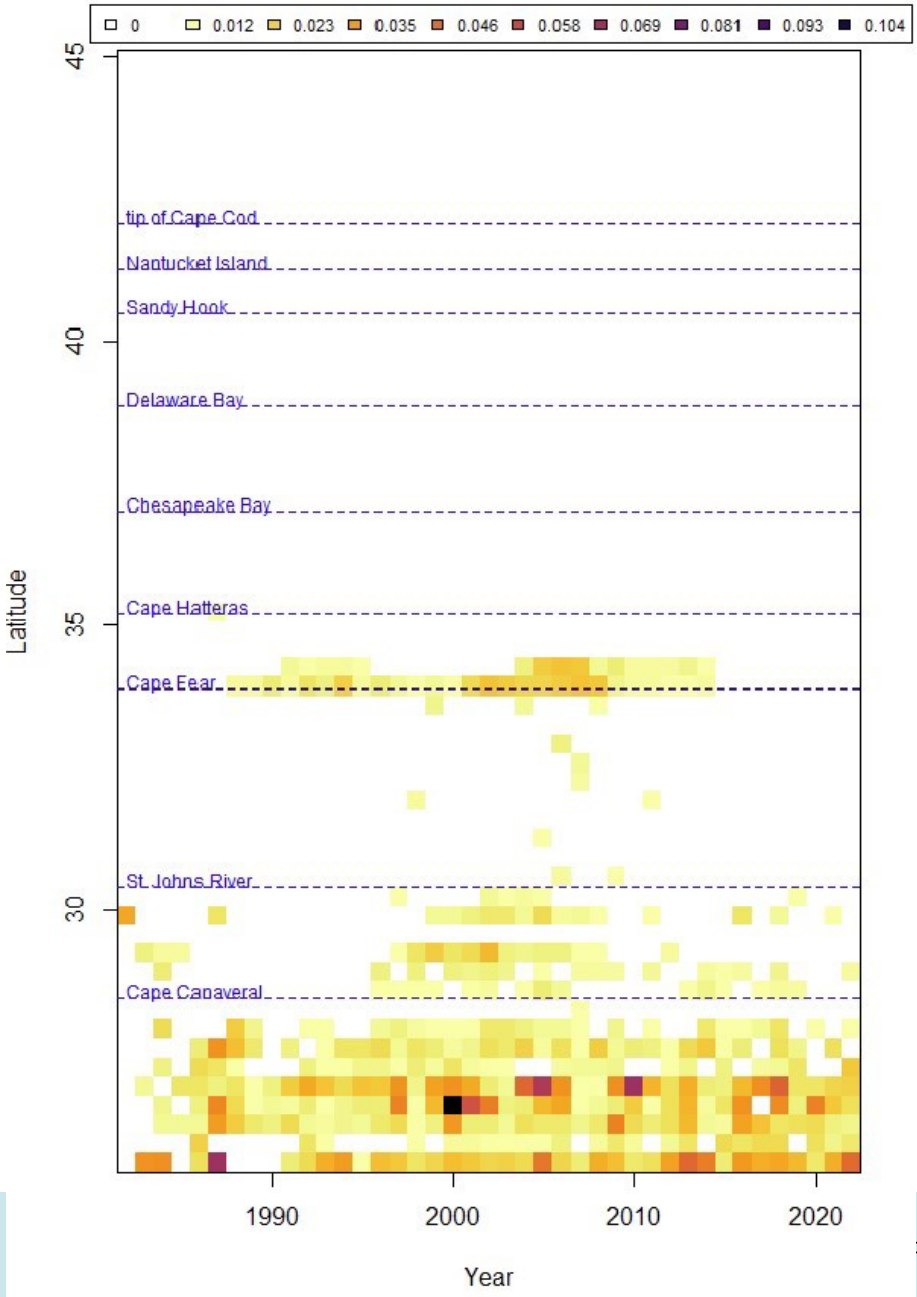


Landings

Figure 3 General Recreational Landings



MRIP - Proportion of Positive Angler Intercepts (all modes) for Red Grouper



Indices – Fishery Dependent

Figure 5 Headboat Index

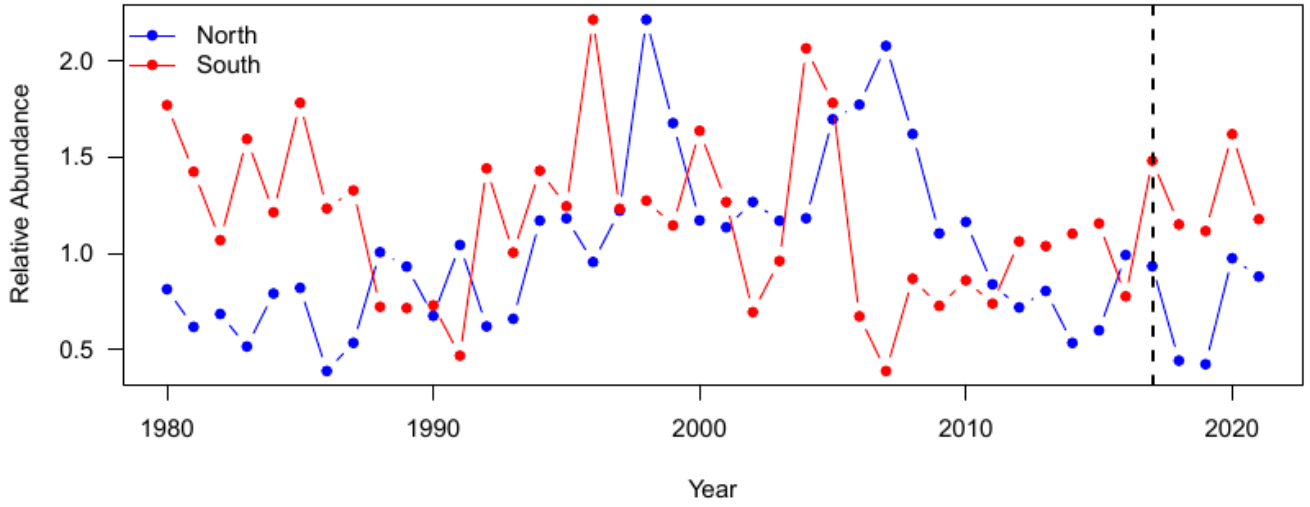
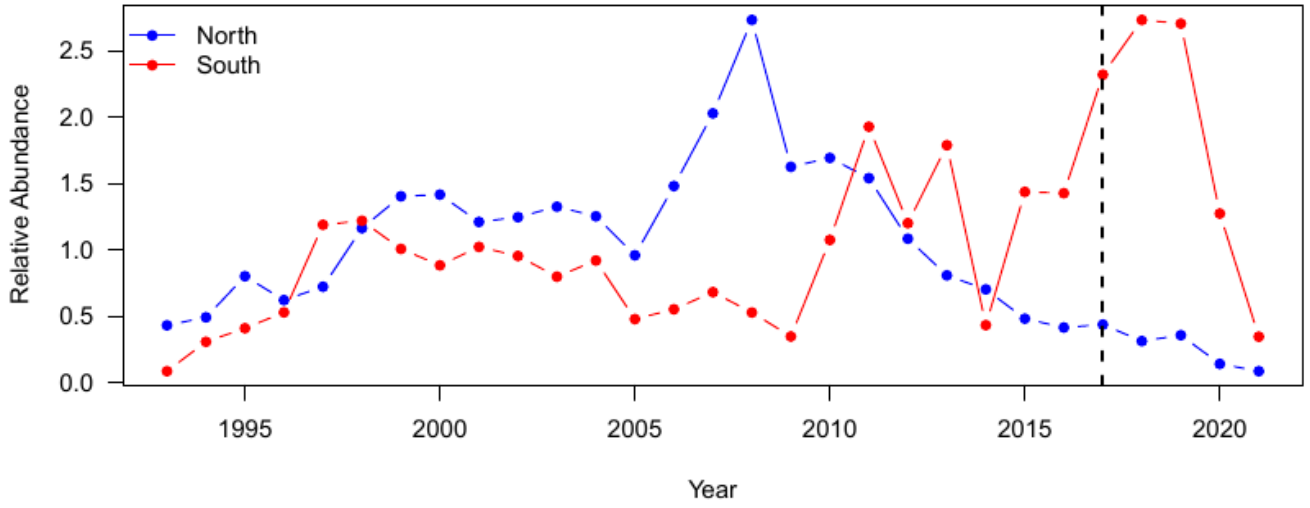
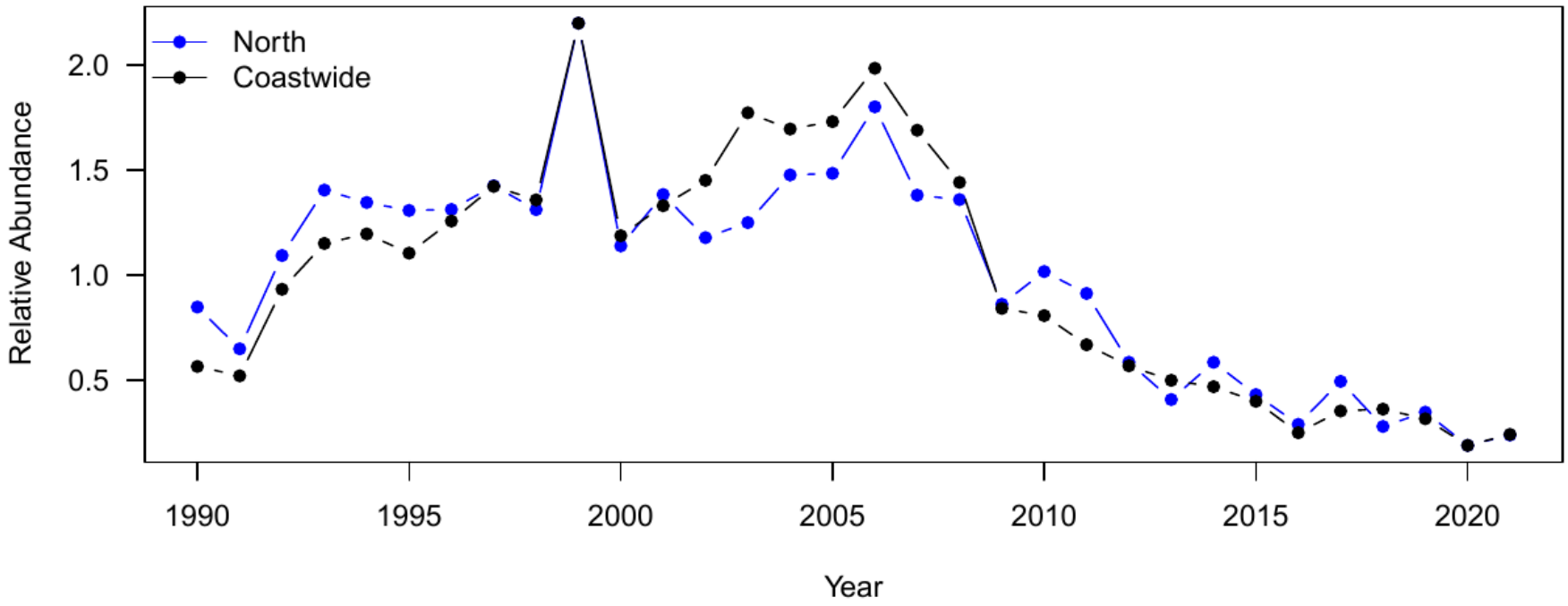


Figure 6 Commercial Handline Index



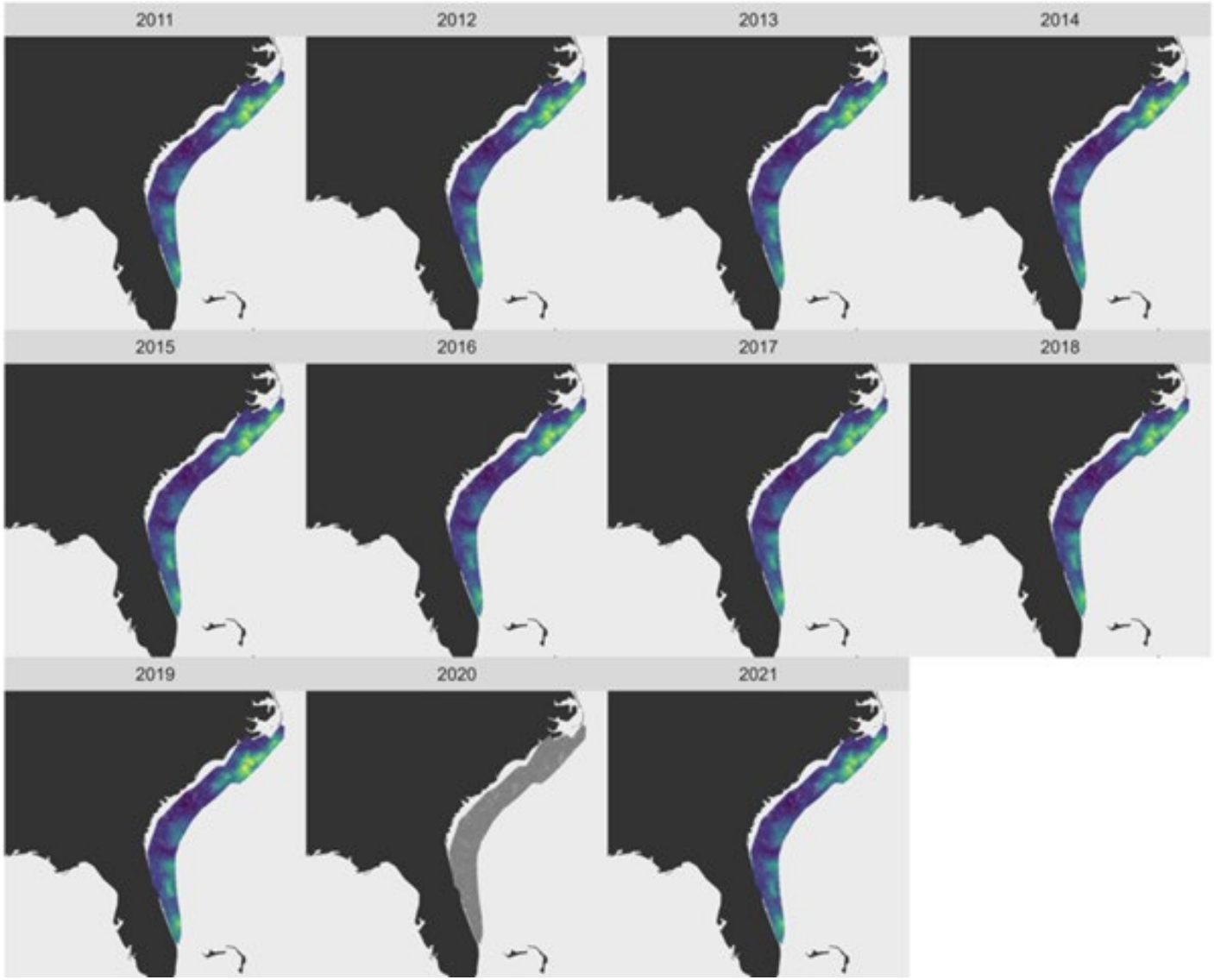
Indices – Fishery Independent (SERFS)

Figure 7 Southeast Reef Fish Survey Index

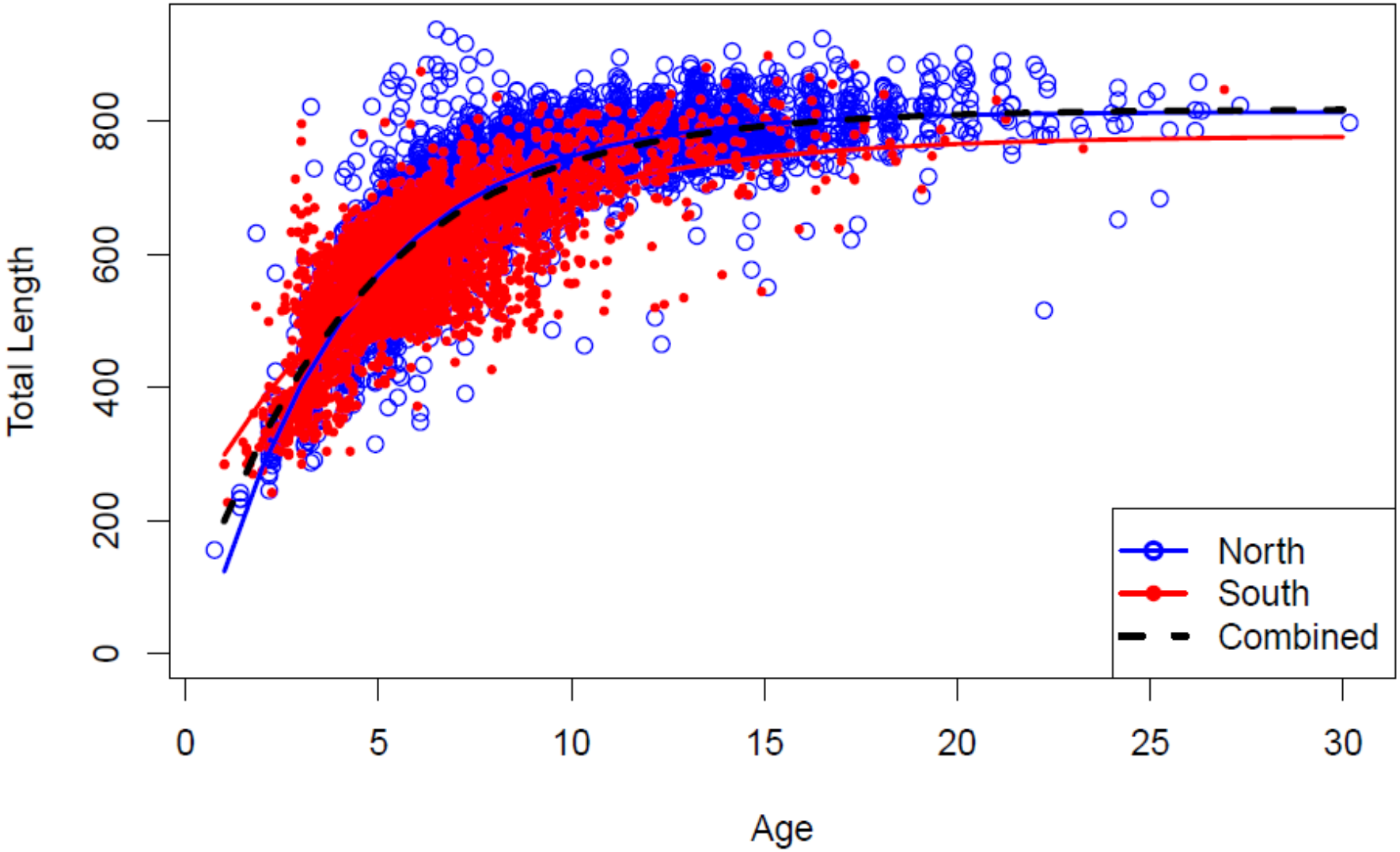


SERFS VAST Analysis Shows Similar Spatial Pattern

- Matt Damiano's Work
- VAST analysis of SERFS data
- Indicates same pattern in distribution
- Preliminary Results



Growth Differences?



Growth Differences?

Table 1. Von Bertalanffy growth model selection table. Results imply different growth rates between the Northern and Southern regions where model selection favors different values for all the Von Bertalanffy parameters.

Model	K	AICc	DeltaAICc	AICcWt	Cum.Wt	LL
All differ	7	161813.2	0.00	0.98	0.98	-80899.6
K & t0 differ	6	161821.1	7.86	0.02	1.00	-80904.5
Linf & t0 differ	6	161855.8	42.61	0.00	1.00	-80921.9
Linf & K differ	6	161966.3	153.12	0.00	1.00	-80977.2
Linf differs	5	162189.5	376.33	0.00	1.00	-81089.8
K differs	5	162448.6	635.36	0.00	1.00	-81219.3
t0 differs	5	162749.0	935.76	0.00	1.00	-81369.5
None differ	4	162994.5	1181.33	0.00	1.00	-81493.3

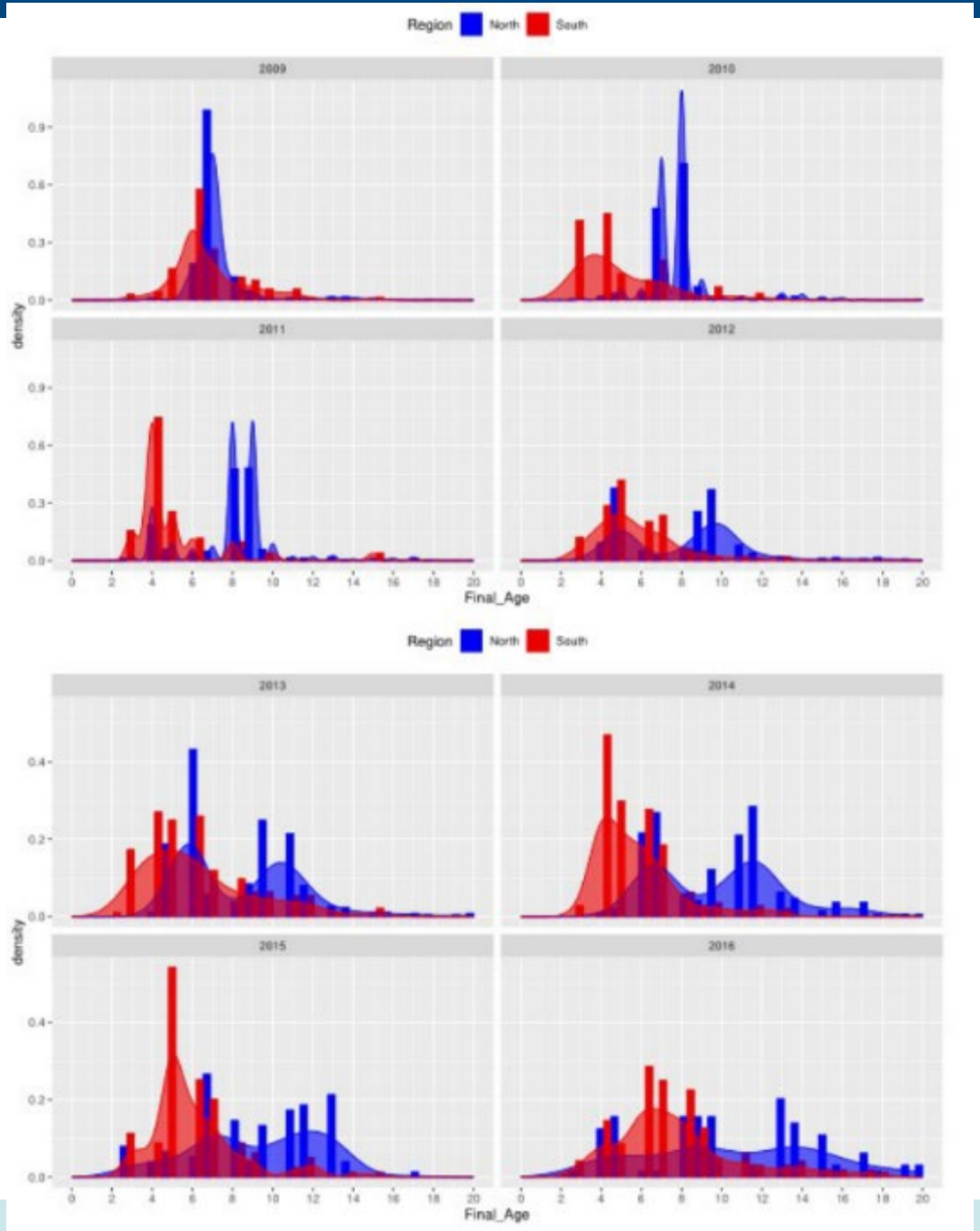
Table 2. Von Bertalannfy model parameter estimates and confidence intervals for the best (full) model corresponding to Northern region (1) and Southern region (2).

Parameter	Estimate	low 95 percent CI	upp 95 percent CI
K[1]	0.26	0.25	0.27
K[2]	0.19	0.18	0.21
t0[1]	0.37	0.29	0.45
t0[2]	-1.51	-1.81	-1.23
Linf[1]	814.20	810.50	818.10
Linf[2]	778.30	764.80	793.40

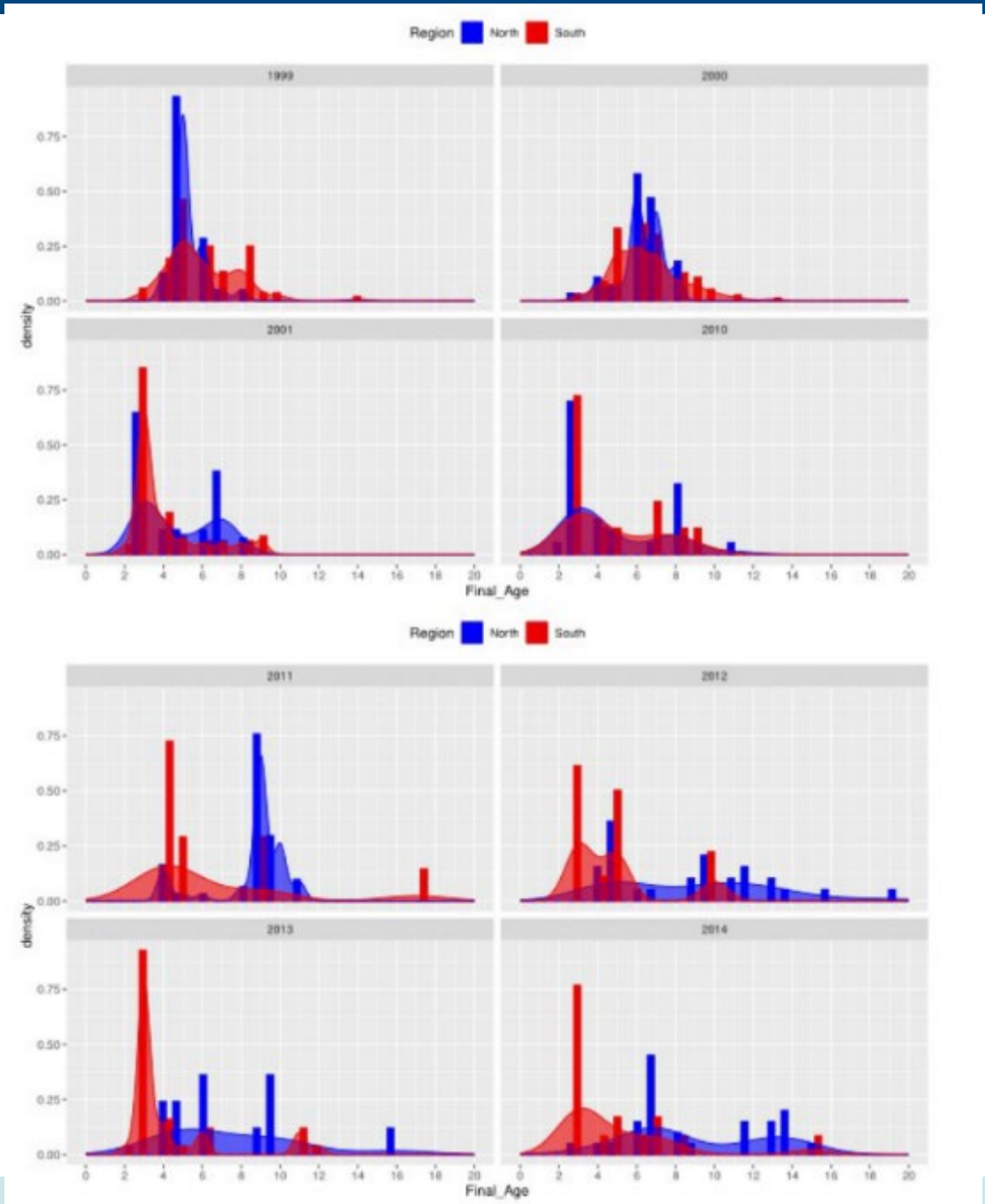
CIE Review of SEDAR 19

- *"For red grouper there is a need to investigate whether there is sub-stock structure in the south Atlantic that needs to be accounted for in the assessment."*
- *"It may also be possible that functionally independent units occur in the south Atlantic stock, and this can be investigated firstly by checking for gross differences in size/age distributions between the northern and southern regions."*

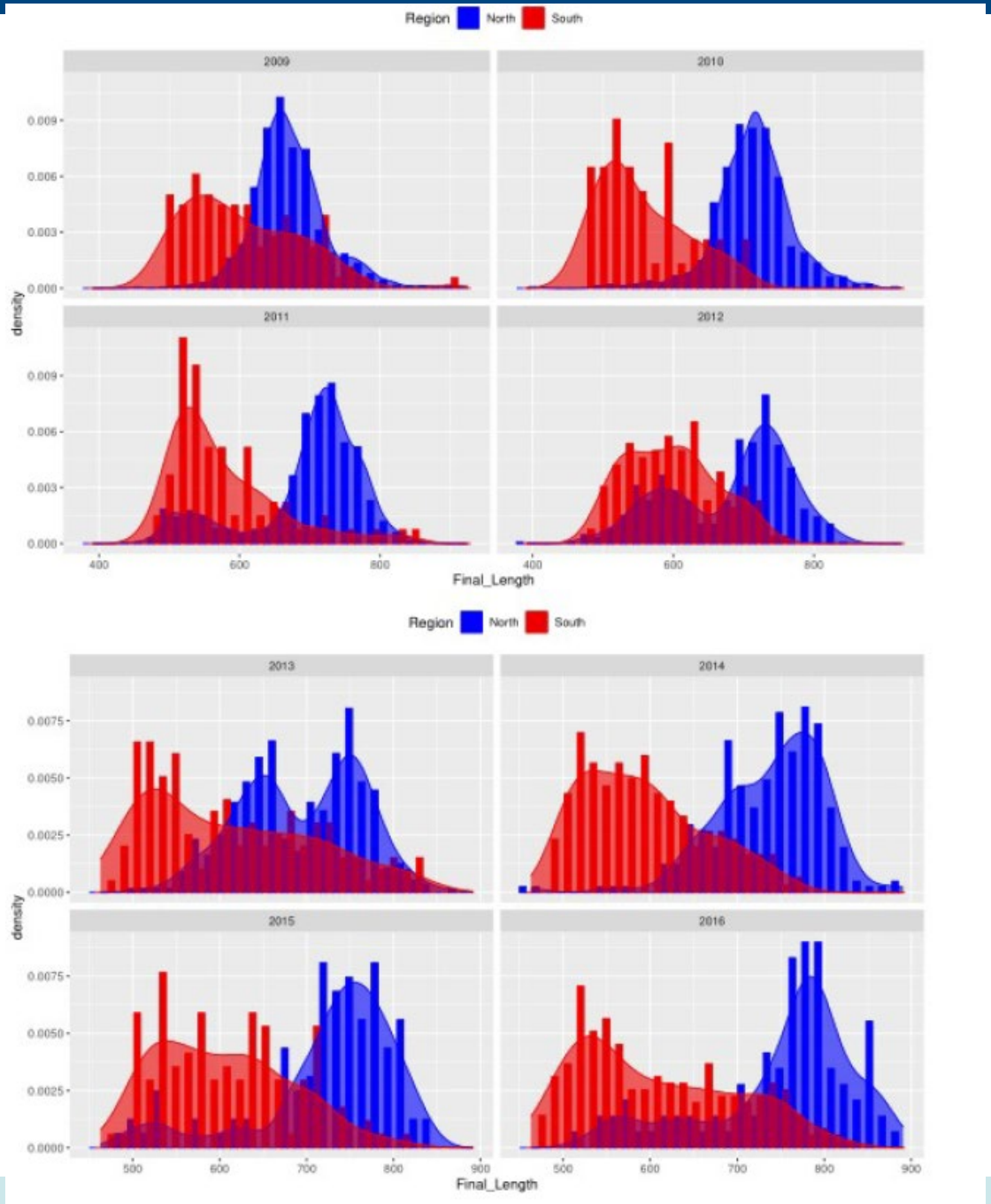
Fishery Dependent Age Composition - Example



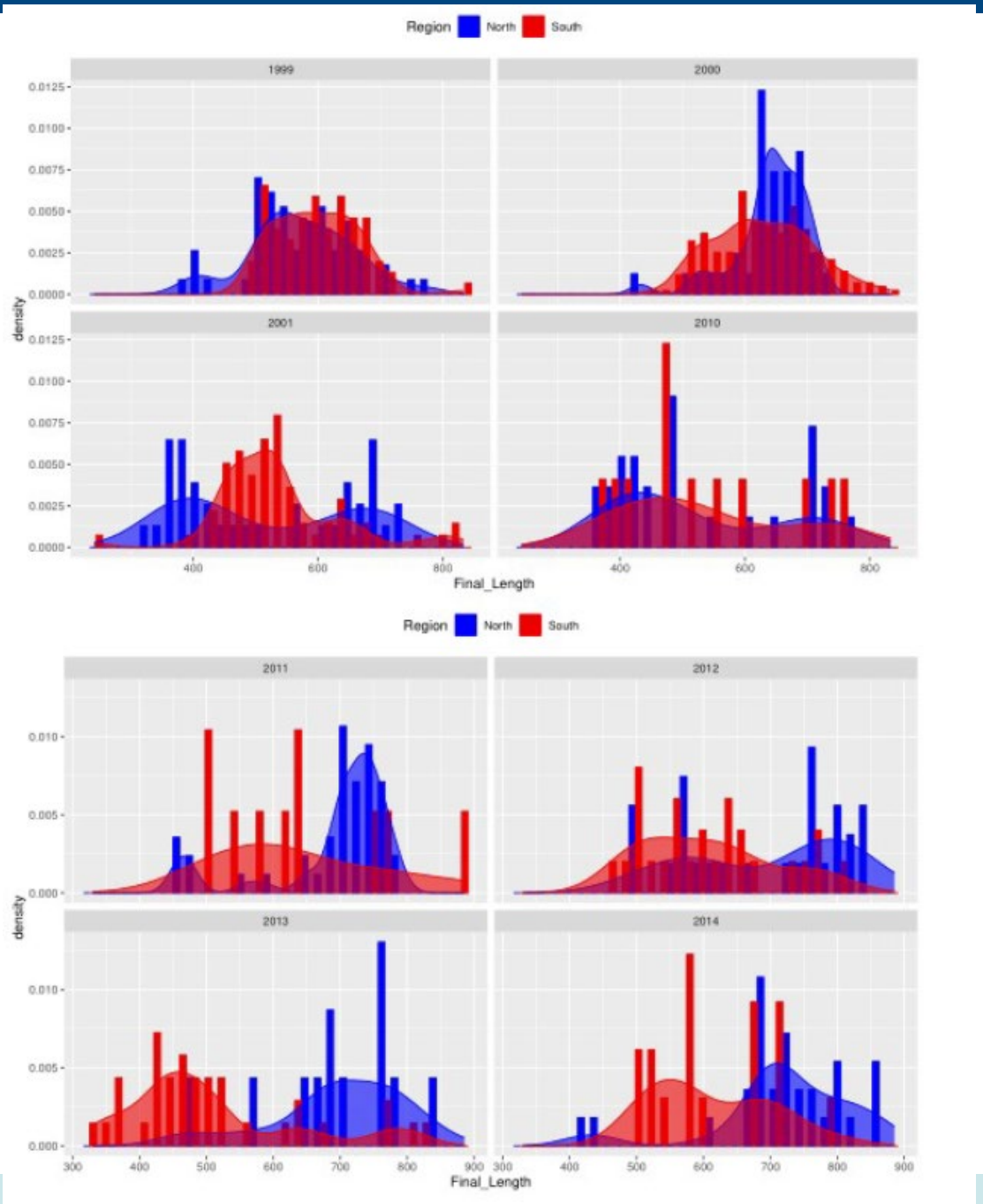
Fishery Independent Age Composition - Example



Fishery Dependent Length Composition - Example



Fishery Independent Length Composition - Example



SSC Review of SEDAR 53

- Are key uncertainties identified, and if not, indicate additional uncertainties and comment on their possible impacts on the assessment and fishing level recommendations.
  - *"Public comment suggested that episodic larval transport or movement of older stages from the Gulf into the South Atlantic may have caused the high recruitment levels seen in the SEDAR 53 assessment, such as the recruitment spike in 2003-2004. A 2004 genetic study found that there was no genetic difference between the Gulf of Mexico stock and the South Atlantic stock, suggesting there is enough mixing between the Gulf and South Atlantic to cause genetic homogeneity. In other words, although the information available is incomplete and no formal analysis has been conducted, some lines of evidence seem to point to the fact that the dynamics of Red Grouper in the South Atlantic Region is not completely independent of episodic inputs from the Gulf. Although at this point the SSC considers this just as a working hypothesis, this might explain the fact that Red Grouper SSB has been under SSBMSY and F above FMSY for pretty much the entire time series used in this assessment."*

Studies potentially useful to understand the recruitment dynamics of South Atlantic red grouper

- Current genetic information suggests no difference between Gulf of Mexico and South Atlantic red grouper.

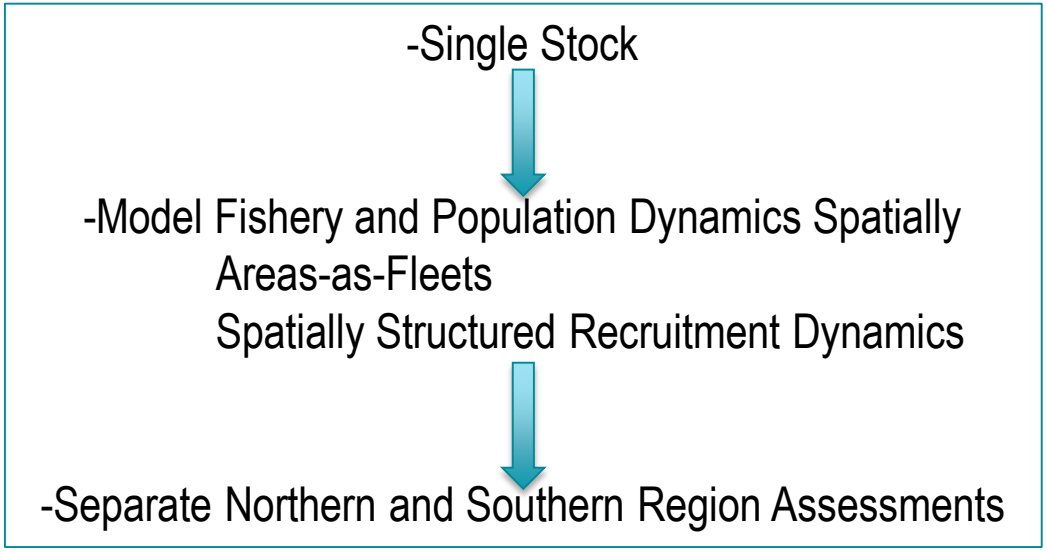
- Population Structure, Connectivity, and Life History of Three Exploited Groupers in the US South Atlantic and Gulf of Mexico
  - Portnoy and O'Leary
  - Using genetic and life history information to assess stock structure.

Studies potentially useful to understand the recruitment dynamics of South Atlantic red grouper

- Biophysical Modeling to Simulate Red Grouper Recruitment Contribution from the Gulf of Mexico and South Atlantic
  - Brothers et al. *in progress*
  - Very preliminary results suggest the majority of recruitment in the South Atlantic likely a result of Gulf of Mexico spawning.
  - Primarily a result of much larger red grouper population in Gulf of Mexico.

Potential Assessment Models for SEDAR 86

- Our evaluation of available evidence suggests that a single stock model (continuity from SEDAR 53) may be indefensible.
- Continuum of possible modeling options (Not exhaustive):



- Model structure should be dictated by data availability and ability to inform structural assumptions

Request to the SSC

- Provide recommendation considering approaches in the Options Paper.
  - Input on the need to investigate alternative model structures (i.e., besides coastwide continuity model).
  - Would the SSC endorse a SEDAR 86 assessment that differs from an operational assessment?
    - Willingness to review such an assessment?
    - What additional oversight procedures (e.g., topical working groups, revised TOR) are required?