Draft Fishery Management Plan for Atlantic Migratory Group Cobia for Public Comment

ASMFC Summer Meeting

Alexandria, Virginia

August 2, 2017

Primary FMP Objectives

- Complement SAFMC Coastal Migratory Pelagics FMP for Cobia
- Constrain harvest to Annual Catch Limits established by the SAFMC
- Provide states with maximum flexibility to manage their specific cobia fisheries

FMP Background

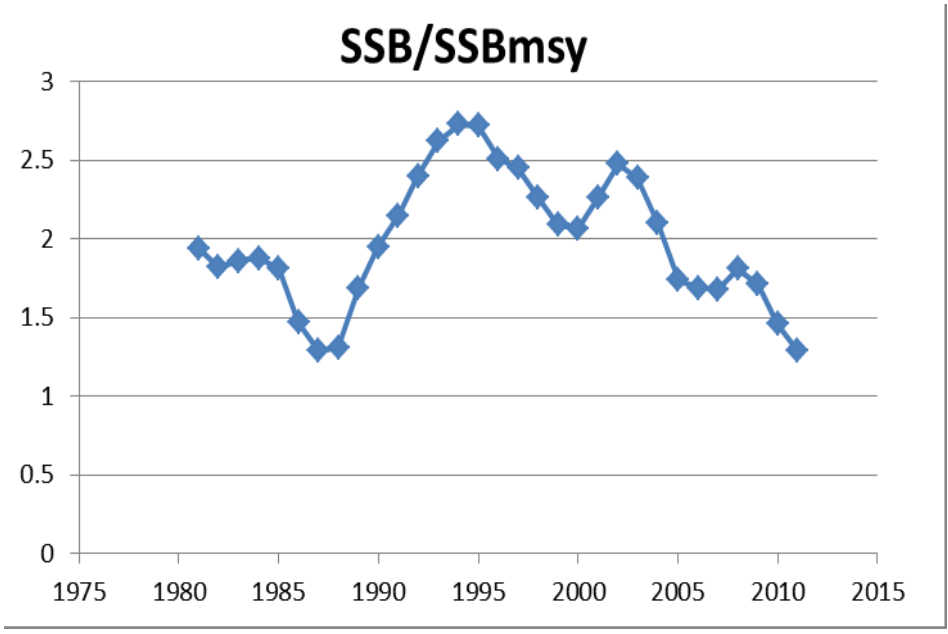
- Significant overages of the recreational ACL in 2015 and 2016 resulted in closures to the EEZ
- Overages raise concerns for upcoming stock assessment and stock status
- Disproportionate impacts on closures within the management area and recognition that majority of fishery occurs in state waters prompt ASMFC FMP development

Management Unit

- The Atlantic Migratory Group Cobia range from Georgia through New York
- Microsatellite DNA analysis and tag-recapture data support the current boundaries
- Additional data and analyses continue to better delineate the stock and define mixing areas

Stock Status

- SEDAR 28 assessed cobia through 2011
- Not overfished/ overfishing not occurring
- Concern with declining SSB
- Recent overages a concern for 2018 assessment



Cobia Life History

- Cobia are moderately long lived and mature at age 2-3 with maximum age at 8-9
- Spawning begins in spring and may extend through summer, consistent with peak fishing activity
- Data needed on all aspects of cobia life history due to their episodic appearance in coastal waters

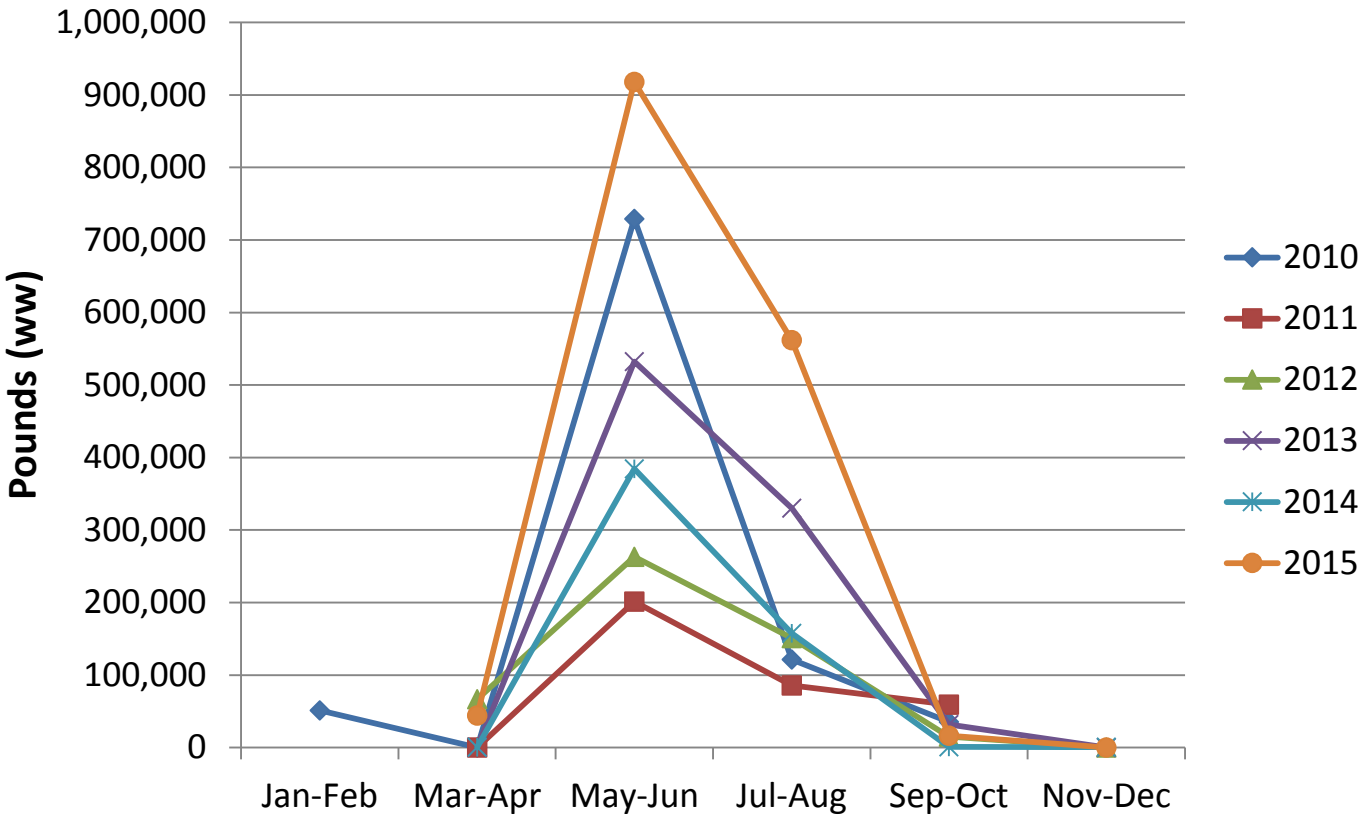
Recreational Fisheries

- Valuable recreational fishery, particularly from Georgia through Virginia; landings north of Virginia are episodic
- For hire and tackle manufacturing play a large role in value
- Directed fisheries earlier in the season give way to more bycatch fisheries as the season progresses

Recreational Fisheries

- Current recreational ACL for cobia is 620,000 pounds
- Landings in 2015 and 2016 exceeded 1 million pounds
- Federal closure of the EEZ as a result of overages had disproportionate impacts on states from Georgia through Virginia

Seasonal Recreational Landings



(Figure 1)

Annual Recreational Landings

Recreational Landings (pounds ww)					
	GA	SC	NC	VA	Total
2010	77,064	63,678	559,476	237,528	937,746
2011	88,049	1,554	119,678	137,931	347,213
2012	102,996	222,353	66,645	103,995	495,989
2013	28,427	19,159	492,998	354,463	895,048
2014	19,768	32,010	277,846	214,426	544,050
2015	67,250	124,057	631,024	718,647	1,540,978
Average	63,926	77,135	357,945	294,498	793,504

(Table 4)

Commercial Fisheries

- Commercial ACL – 50,000 pounds
- Average landings from 2010-2015 – 56,158 pounds
- Historically a bycatch in various fisheries; more directed activity appears to be developing in some jurisdictions
- North Carolina accounts for 67% of commercial landings

Commercial Landings and Value

	GA/SC	NC	VA	Total
	Pounds (ww)			
2010	3,174	43,737	9,364	56,275
2011	4,610	19,950	9,233	33,793
2012	3,642	32,008	6,309	41,959
2013	4,041	35,496	13,095	52,632
2014	4,180	41,848	23,111	69,139
2015	3,555	52,315	27,277	83,148
Average	3,867	37,559	14,732	56,158
	Dockside Revenues (2014 $)			
2010	$11,377	$70,377	$19,976	$101,730
2011	$19,666	$37,893	$21,666	$79,224
2012	$15,554	$66,887	$14,597	$97,038
2013	$15,639	$79,397	$35,792	$130,828
2014	$13,320	$95,462	$67,972	$176,754
2015	$11,151	$147,160	$75,360	$233,672
Average	$14,451	$82,863	$39,227	$136,541

(Table 2)

Socio-Economic Data

- Specific data on the socio-economic impacts of the cobia fishery are sparse
- In general, cobia are an important and valuable bycatch to commercial fisheries
- The larger recreational fishery is far more difficult to characterize
- Further study is needed to adequately characterize all cobia-dependent fisheries

Cobia Habitat Issues

- There are few, if any, studies that directly characterize habitat preferences and needs for cobia
- Information on early life history is limited and data are primarily based on incidental captures of limited numbers of fish in various fishery independent programs

Cobia Habitat Issues

- Juvenile cobia are taken incidental to both commercial and recreational fishing activities as well as fishery-dependent data collection programs. These collections tend to occur in estuaries and the near shore coastal ocean.
- Adults tend to migrate north and south as well as inshore and offshore, tending to be closer to shore during spawning activity.
- Ongoing tagging efforts may provide more data.

Research and Data Needs

- Virtually any new information on cobia would add to our existing understanding of this valuable fishery.
- Biological information such as age and growth, reproductive ecology, movements, habitat needs and preferences, are all lacking.
- Socio-economic studies specific to the cobia fishery are needed.

Protected Species

- In North Carolina, commercial gill nets take a high but variable percentage of the North Carolina commercial cobia catch as bycatch in the southern flounder fishery. This fishery is held to strict observer program requirements.
- No specific threats to protected species from cobia fisheries have been identified.

Management Program Implementation

- Management options for cobia were developed based on efforts to complement those actions proposed by the SAFMC in framework 4 and options developed by the Board Working Group and Plan Development Team.
- All approved management options would need to be implemented by April 1, 2018 to effect 2018 season.

Recreational Size Limit Options

- **Option 1: Status Quo:** No coastwide size limit option.
- **Option 2: Coastwide size limit:** Minimum size limit of 36 inches FL. A total length equivalent may be considered by the TC and Management Board.

Recreational Bag Limit Options

- **Option 1: Status quo:** No coastwide bag limit option.
- **Option 2: Coastwide bag limit:** 1 fish per person.

Recreational Vessel Limit Options

- **Option 1: Status quo:** No coastwide vessel limit option.
- **Option 2: Vessel limit:** State-specific daily vessel limits of no more than 6 fish per vessel.

Recreational Season and Allocation Options

Option 1:

- State-defined seasons/harvest control measures
- State-by-state hard recreational quota shares of fed ACL (based on **Sub-Options a-d**)
- Shares divided among non-*de minimis* states only
- Overharvest paid back in following year; under harvest does not carry over

Recreational Season/Allocation Options

Option 1:

- **Historical Landings Ref. Period Sub-Options for Option 1 (a-d; allocation % based on numbers):**

State	a. 3-yr Average (2013-2015)	b. 5-yr Average (2011-2015)	c. 10-yr Average (2006-2015)	d. 5-yr/10-yr Average
GA	n = 1,421 4.5%	n = 2,150 9.0%	n = 2,445 10.0%	n = 2,298 9.5%
SC	n = 1,984 6.3%	n = 2,558 10.8%	n = 3,312 13.6%	n = 2,935 12.2%
NC	n = 15,065 48.2%	n = 10,344 43.5%	n = 8,203 33.6%	n = 9,273 38.5%
VA	n = 12,799 40.9%	n = 8,714 36.7%	n = 10,465 42.9%	n = 9,589 39.8%
Total	N = 31,269 100%	N = 23,766 100%	N = 24,425 100%	n = 24,095 100%

(Table 10)

Recreational Season/Allocation Options

Option 1:

- **Historical Landings Ref. Period Sub-Options for Option 1 (a-d; in lbs with rec. ACL of 620,000 lbs):**

State	a. 3-yr Average (2013-2015)	b. 5-yr Average (2011-2015)	c. 10-yr Average (2006-2015)	d. 5-yr/10-yr Average
GA	27,900	55,800	62,000	58,900
SC	39,060	66,960	84,320	75,640
NC	298,840	269,700	208,320	238,700
VA	253,580	227,540	265,980	246,760

(Table 11)

Recreational Season/Allocation Options

Option 2:

- State-defined seasons/harvest control measures
- State-by-state soft recreational quota share of fed ACL (based on **Sub-Options a-d**)
- Shares divided among non-*de minimis* states only
- Avg. annual landings evaluated against state-allocated quotas (**Sub-Options a-d**) over multi-year period (**Sub-Options e-f**)
- Overharvest paid back in following multi-year period (**Sub-Options e-f**); Relaxed measures considered after under harvest

Recreational Season/Allocation Options

Option 2:

- **Historical Landings Ref. Period Sub-Options for Option 2 (a-d; allocation % based on numbers):**

State	a. 3-yr Average (2013-2015)	b. 5-yr Average (2011-2015)	c. 10-yr Average (2006-2015)	d. 5-yr/10-yr Average
GA	n = 1,421 4.5%	n = 2,150 9.0%	n = 2,445 10.0%	n = 2,298 9.5%
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Total	N = 31,269 100%	N = 23,766 100%	N = 24,425 100%	n = 24,095 100%

(Table 10)

Recreational Season/Allocation Options

Option 2:

- **Historical Landings Ref. Period Sub-Options for Option 2 (a-d; in lbs with rec. ACL of 620,000 lbs):**

State	a. 3-yr Average (2013-2015)	b. 5-yr Average (2011-2015)	c. 10-yr Average (2006-2015)	d. 5-yr/10-yr Average
GA	27,900	55,800	62,000	58,900
SC	39,060	66,960	84,320	75,640
NC	298,840	269,700	208,320	238,700
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(Table 11)

Recreational Season/Allocation Options

Option 2:

- **Avg. Landings Monitoring Timeframe Sub-Options for Option 2 (e-f):**
  - **e) 2 years**
  - **f) 3 years**

Recreational Season/Allocation Options

Option 3:

- Coastwide season and daily vessel limit (**Sub-Options a-f**)
- **Sub-Options (a-f)** based on SAFMC CMP Framework 4 analysis
- 1 fish per person bag limit and 36 inch FL min. size limit
- Coastwide overages paid back with reduction in recreational ACL in the following year

Recreational Season/Allocation Options

Option 3:

- **Coastwide season and vessel limit Sub-Options (a-f):**
  - **a) January 1-August 22; 1 fish vessel limit**
  - **b) January 1-July 28; 2 fish vessel limit**
  - **c) January 1-July 20; 3 fish vessel limit**
  - **d) January 1-July 18; 4 fish vessel limit**
  - **e) January 1-July 17; 5 fish vessel limit**
  - **f) January 1-July 15; 6 fish vessel limit**

Commercial Size Limit Options

- **Option 1: Status Quo:** No coastwide size limit option.
- **Option 2: Coastwide size limit:** Minimum size limit of 33 inches FL. A total length equivalent may be considered by the TC and Management Board.

Commercial Possession Limit Options

- **Option 1: Status Quo:** No coastwide possession limit option.
- **Option 2: Coastwide size limit:** State-specific possession limits of no more than 2 fish per license holder, not to exceed 6 fish per vessel.

De Minimis Options

- **Option 1: No *de minimis* program.**
- **Option 2: Include *de minimis* program**
  - **Criteria:** State's average total (commercial + recreational) landings for the previous 2 years must be less than 1% of average total coastwide landings for the same time period.
  - **Regulations:** 1 fish per vessel limit with minimum size limit

De Minimis Options

- **Option 2: Include *de minimis* program**
  - **Regulations:**
    - 1 fish per vessel limit with minimum size limit
    - **Minimum Size Limits for *De Minimis*:**
      a) **33 inches FL for commercial and 36 inches FL for recreational**
      b) **36 inches FL for both commercial and recreational**

SAFMC Framework 4 Recreational

- 620,000 pound ACL
- 1 fish per person
- 36” FL size limit
- Vessel limit up to 6 per vessel

SAFMC Framework 4 Commercial

- 50,000 pound ACL
- 2 fish per person
- 33” FL size limit
- Vessel limit up to 6 per vessel

Framework 4 Implementation

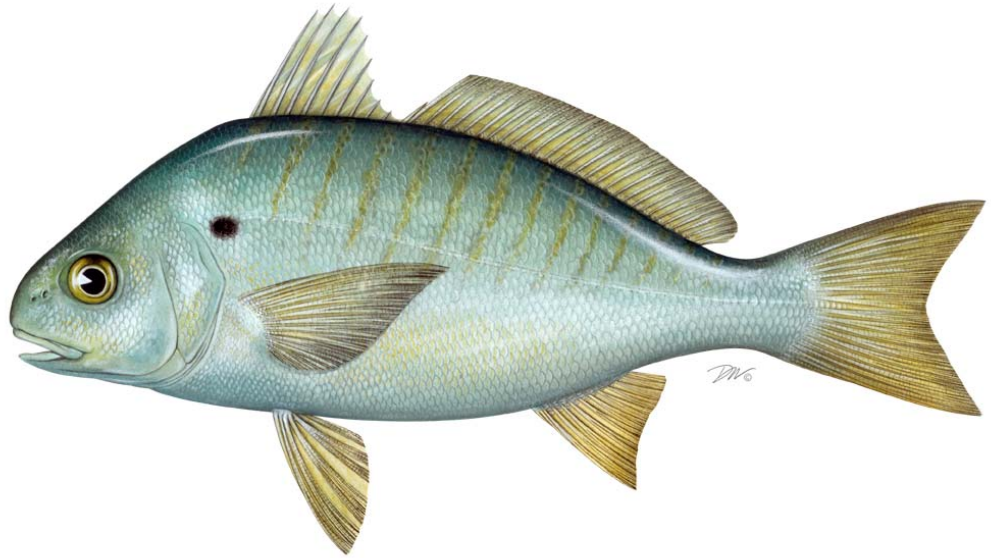
- Once approved, measures will be implemented to control, harvest to the ACL.
- Methods (Accountability Measures) to address overharvest
  - Reduce vessel limits
  - Shorten season
  - Close fishery or EEZ

Proposed Public Hearing & Compliance Schedule

- Sept. 2017 - Conduct public hearings
- October 2017 – Review public comment and consider final approval of FMP
- January 1, 2018 – Submit management programs for PDT/TC review and Board approval
- April 1, 2018 – Implementation of state management program
- July 1 each year – State compliance reports due

Questions?

Spot Benchmark Stock Assessment



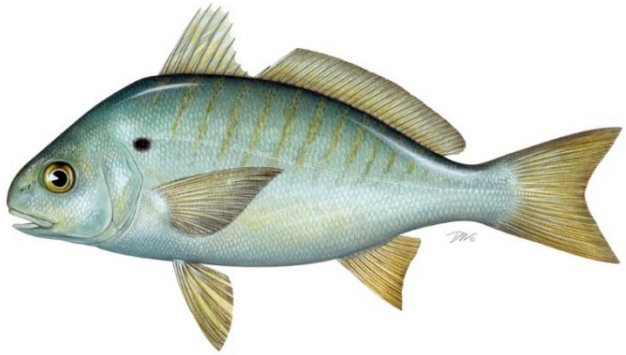
South Atlantic State/Federal Fisheries Management Board

August 1st 2017

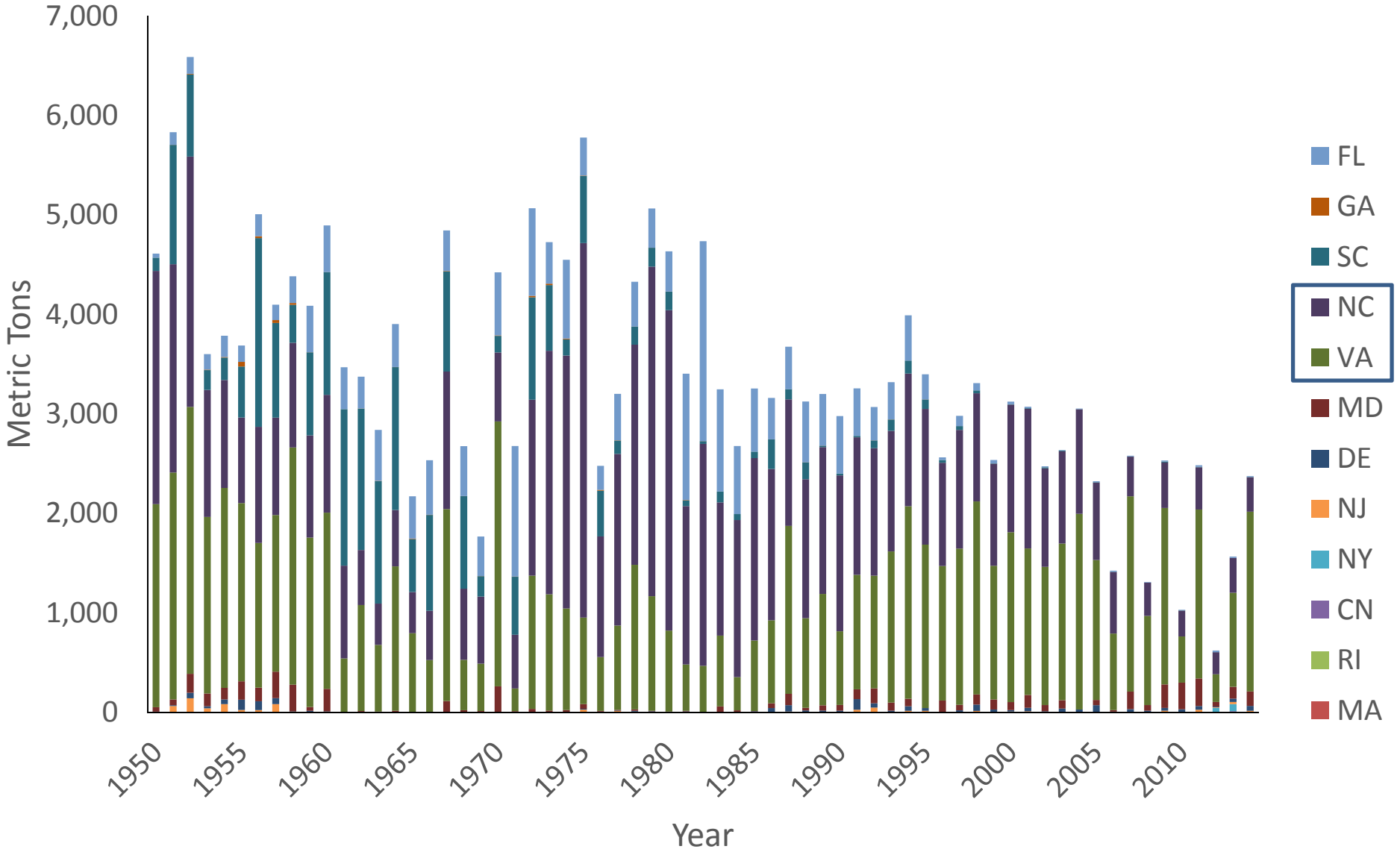
C.L. McDonough (SCDNR)

Outline

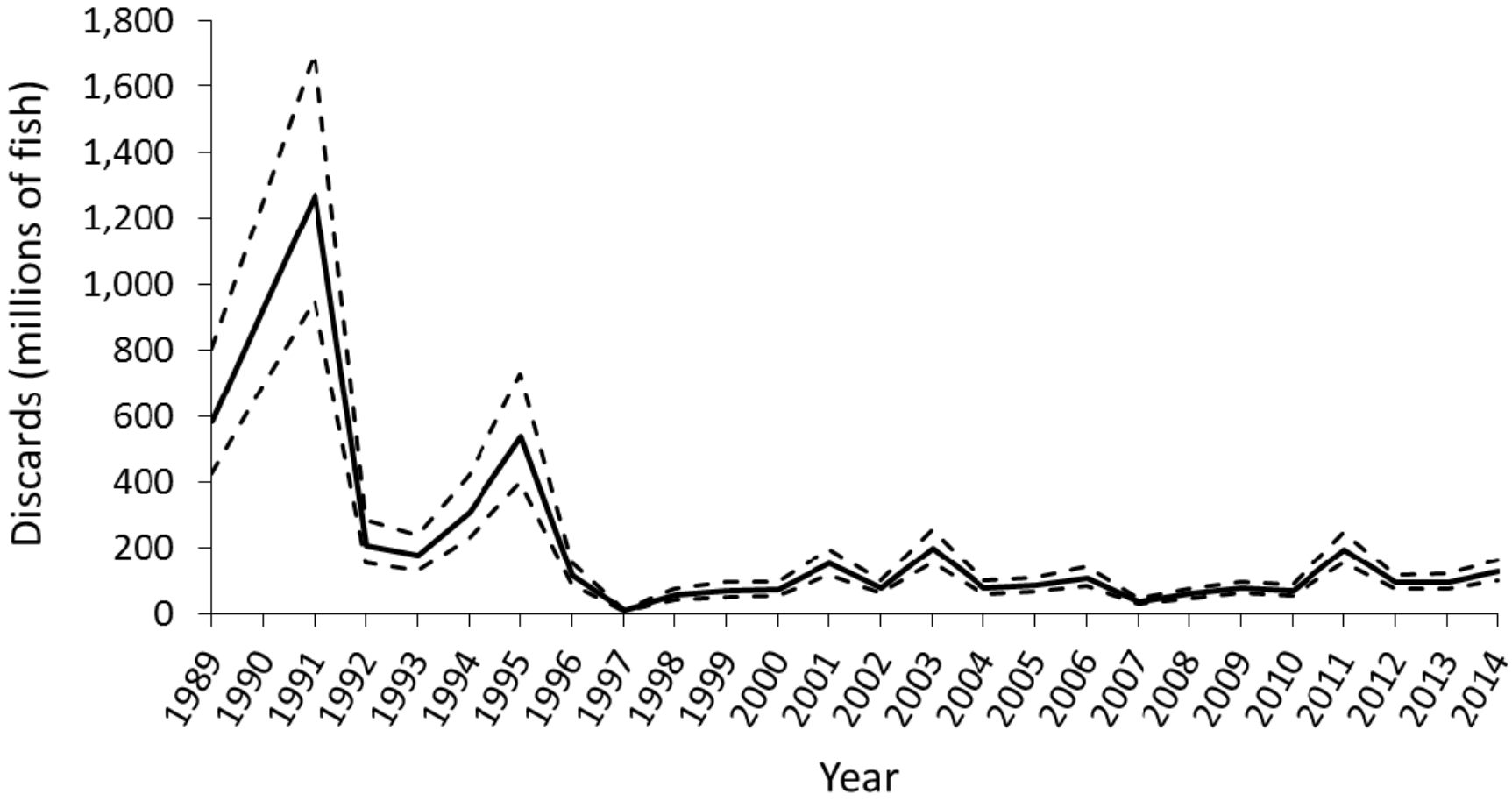
- Data
  - Commercial and recreational (FD)
  - Shrimp Trawl Fishery Discards (FD)
  - NCDMF Prog. 195, NMFS, SEAMAP (FI)
- Modeling Approaches and Results
- Reference Points and Stock Status



Commercial Landings By State

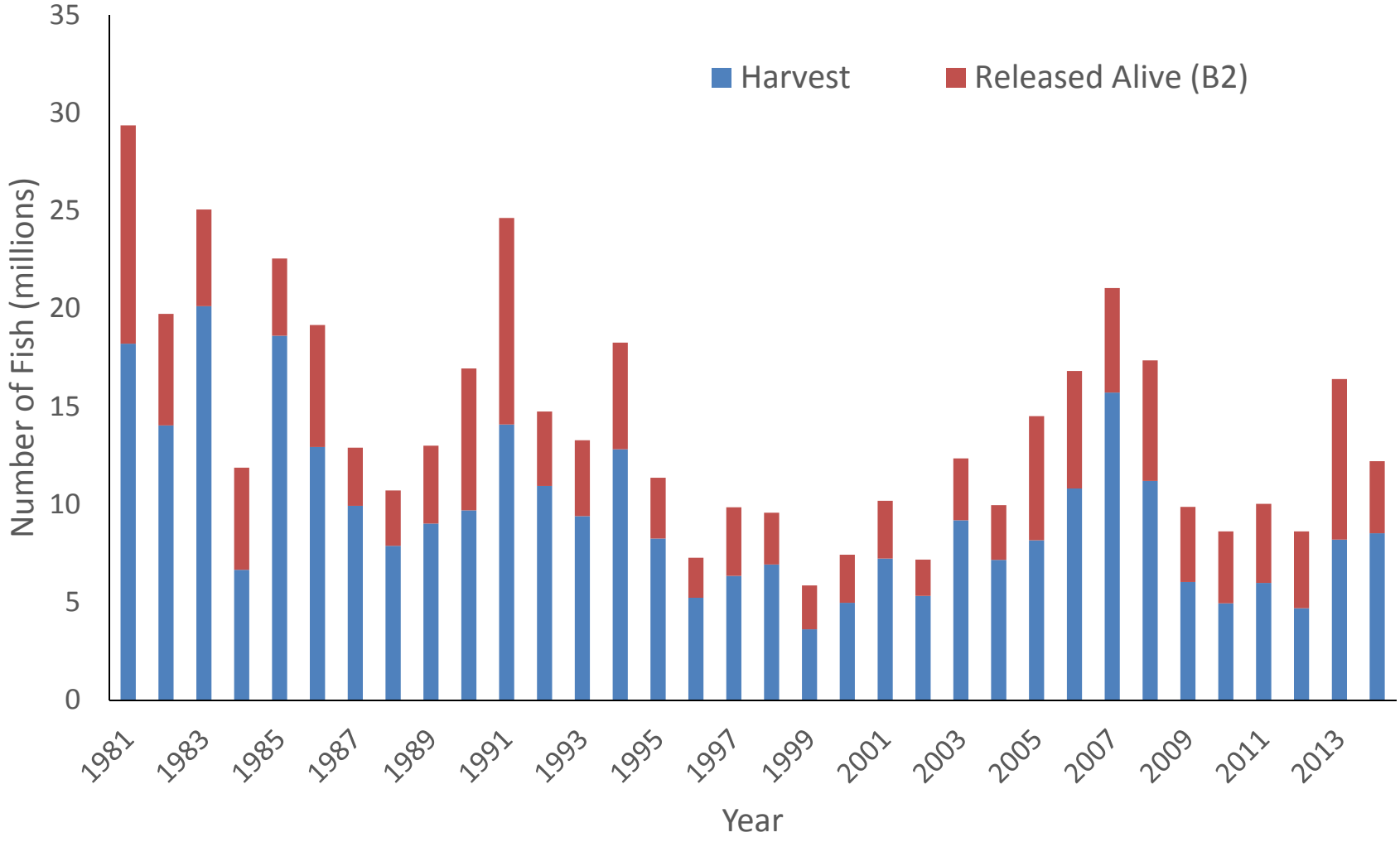


South Atlantic Shrimp Trawl Discards



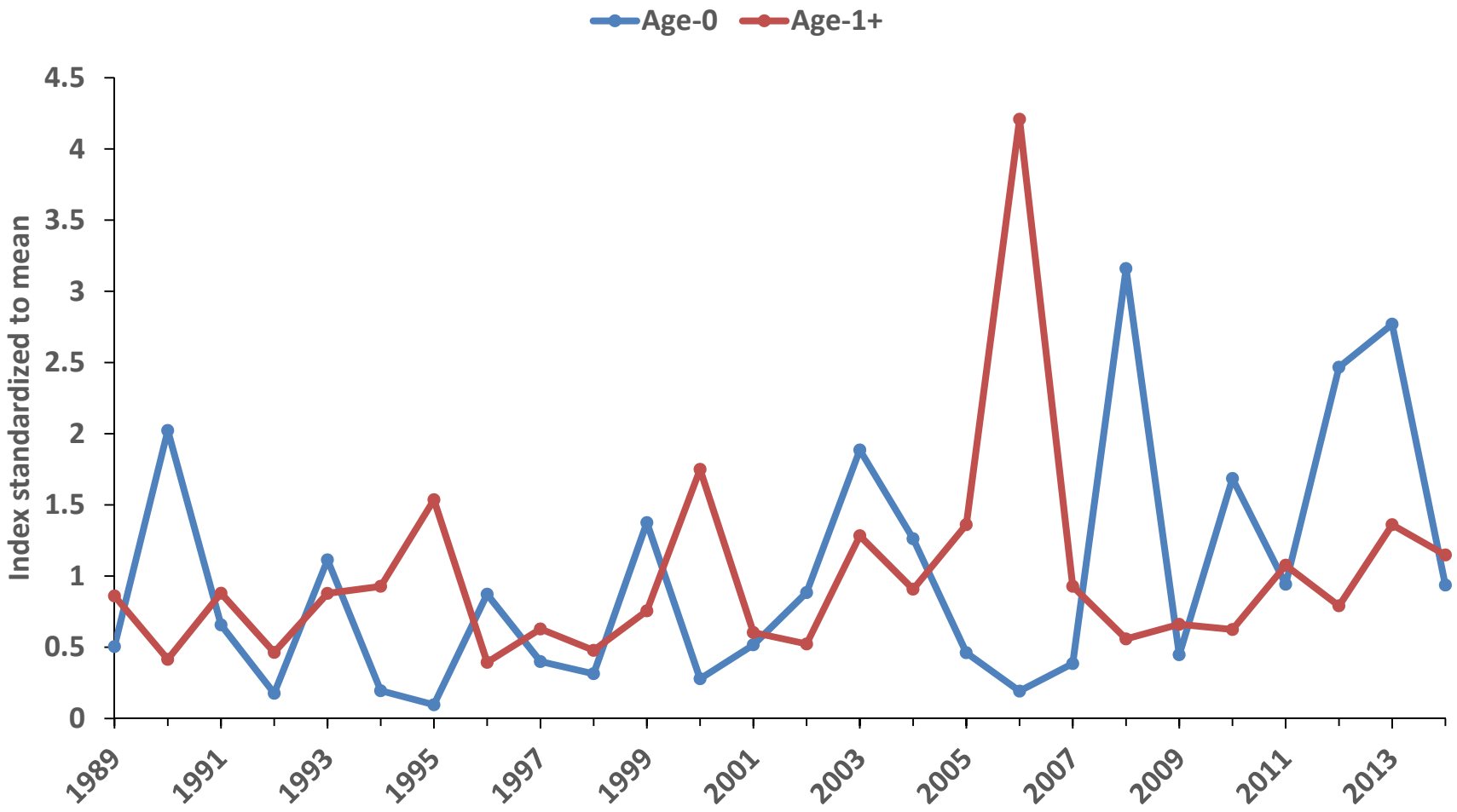
- **100% discard mortality assumed**

MRFSS and MRIP Total Catch



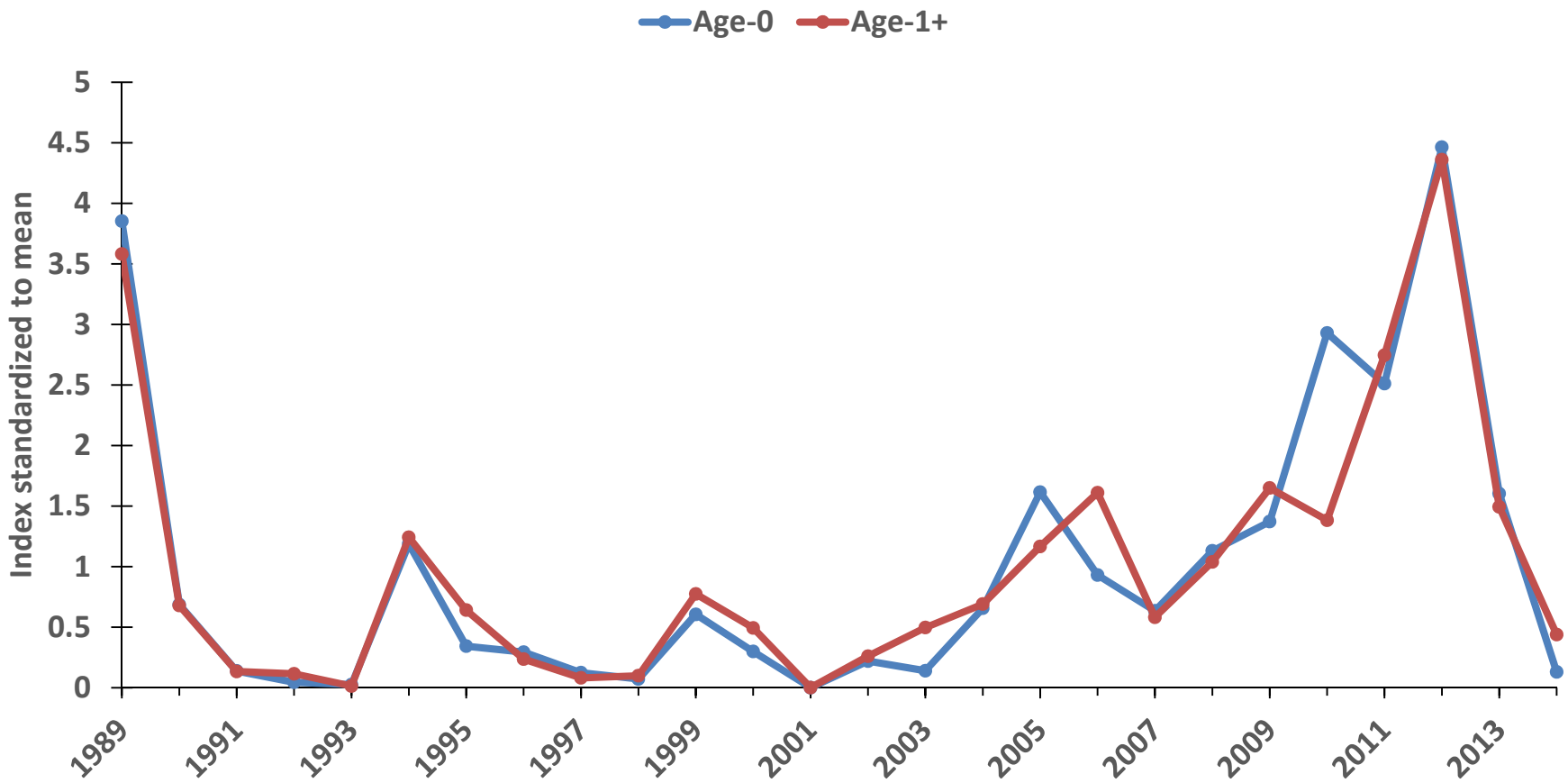
- **15% discard mortality assumed for fish released alive**

NCDMF Trawl



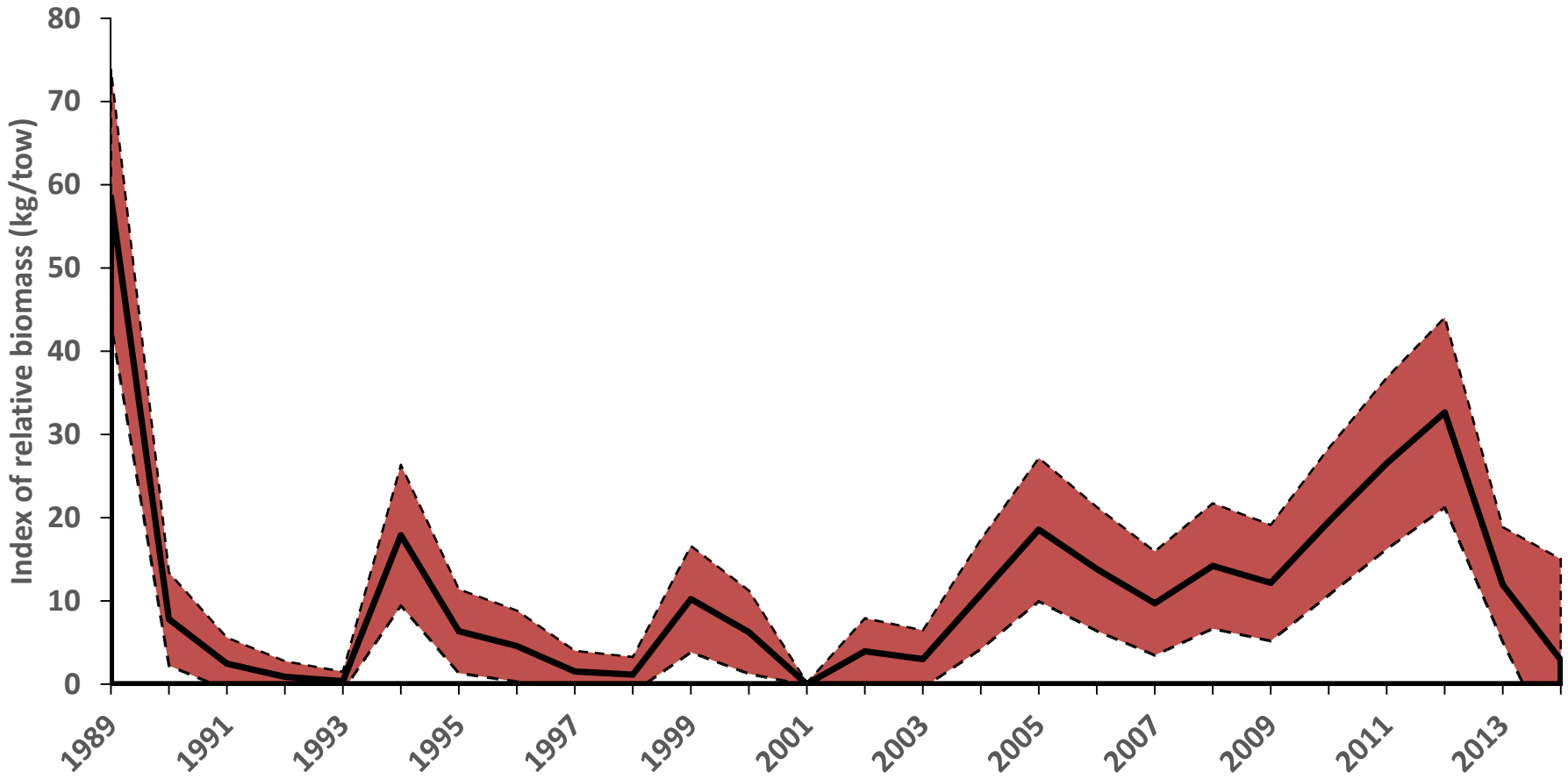
Age-0 and Age-1+ relative abundance indices developed from the June component of the NCDMF Trawl Survey. Indices were developed in numbers per tow and then standardized to their mean.

NMFS Trawl



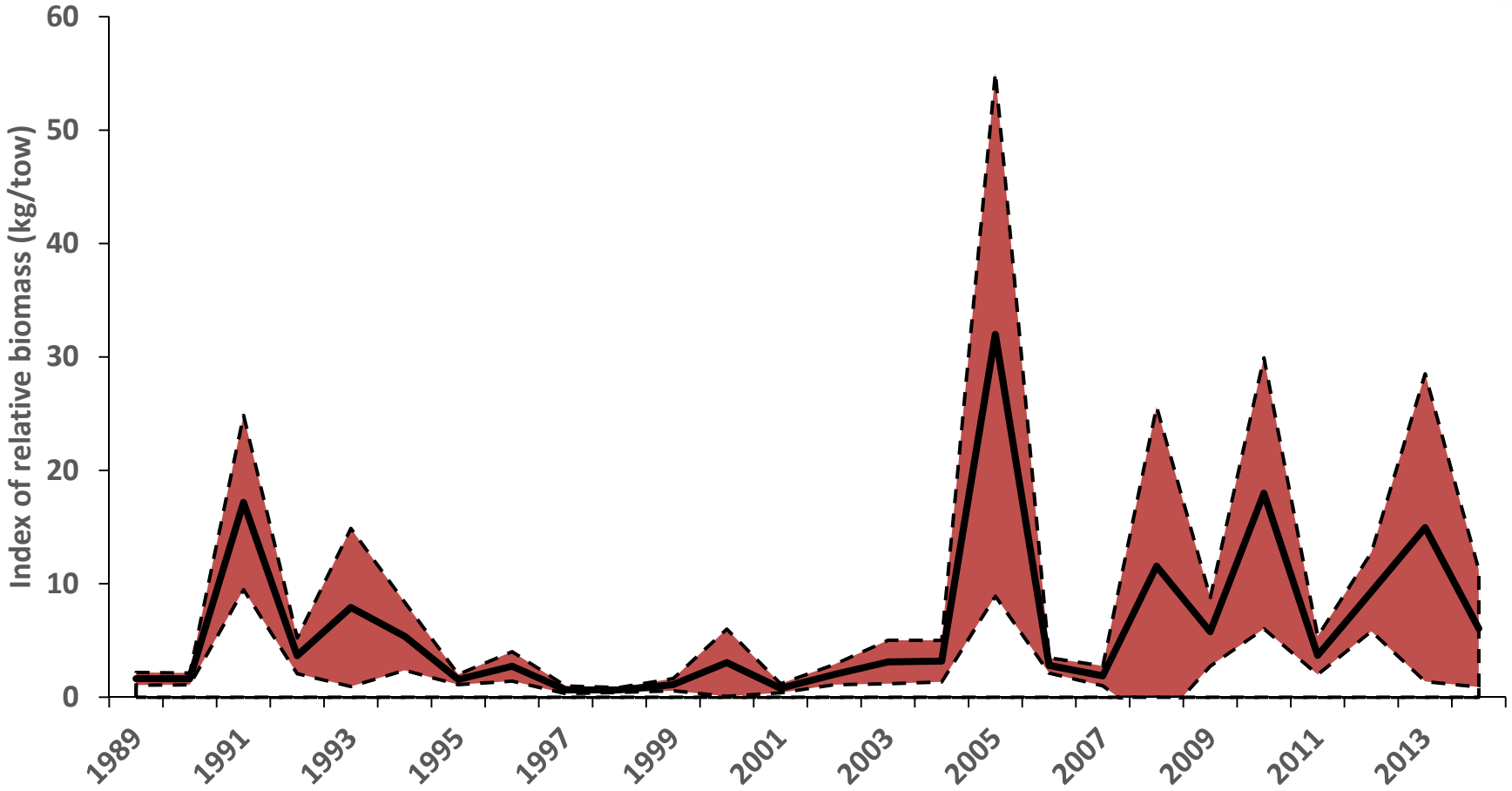
Age-0 and Age-1+ relative abundance indices developed from the fall months and offshore strata of the NMFS Trawl Survey. Indices were developed in numbers per tow and then standardized to their mean.

NMFS Trawl



Index of relative biomass developed from the fall months (September – November) and offshore strata of the NMFS Trawl Survey for 1989-2014 with 95% confidence intervals.

SEAMAP Trawl



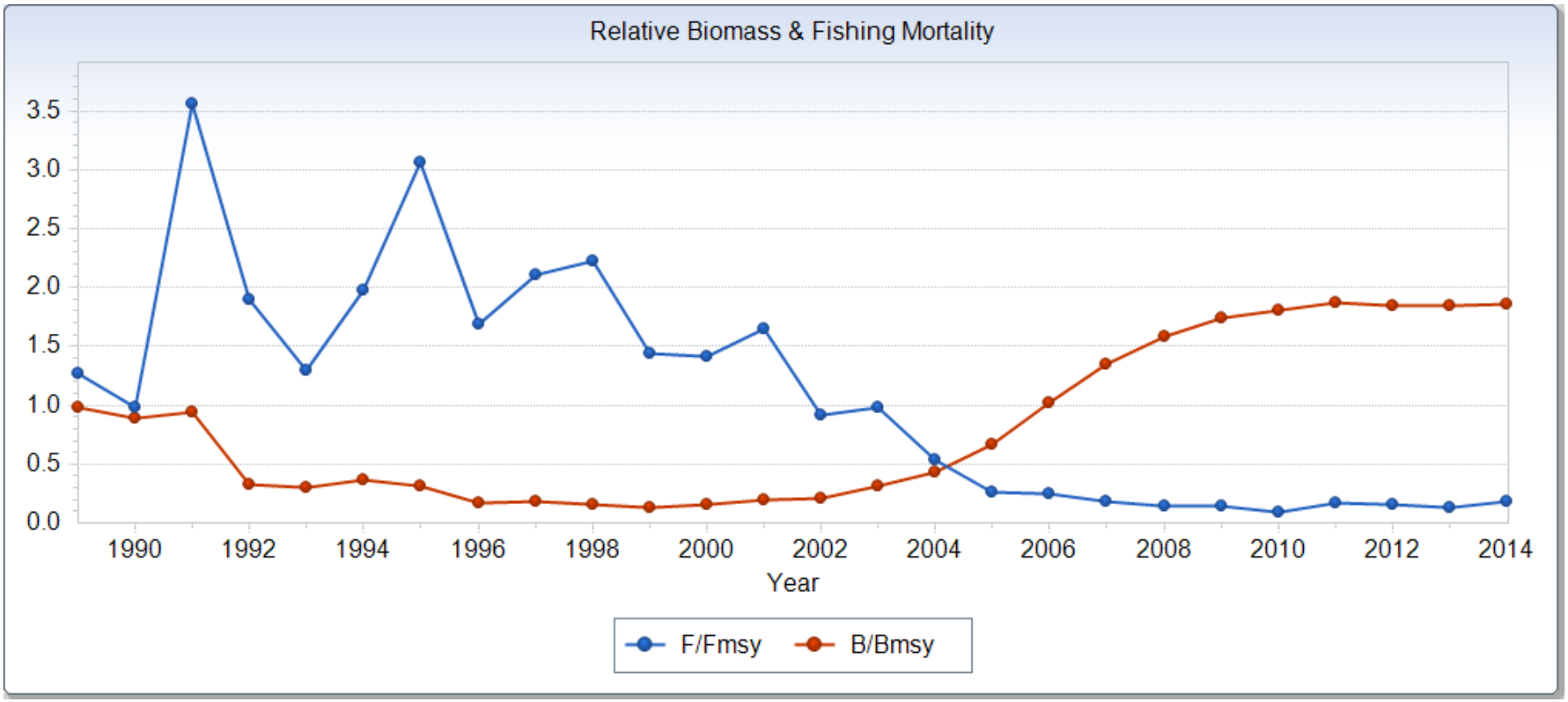
Index of relative biomass of spot developed from the fall (September-November) months of the SEAMAP Trawl Survey (1989-2014).

Modeling Approaches

- Surplus Production Model (ASPIC)
  - Aggregate indices tracking the exploitable relative biomass
  - Time series of fishery removals in biomass
- Modified-CSA
  - Forward projecting two-stage population model
  - Data or literature informing life history characteristics; spot short lived
  - Indices tracking the relative abundance of the stock that can be split into stages with similar life history and fishery (i.e., selectivity) characteristics
  - Time series of fishery removals in numbers
  - Lack of reliable time series of catch-at-age data
- Time series for both models is 1989-2014 due to availability of discard estimates
- Modified-CSA chosen as preferred model

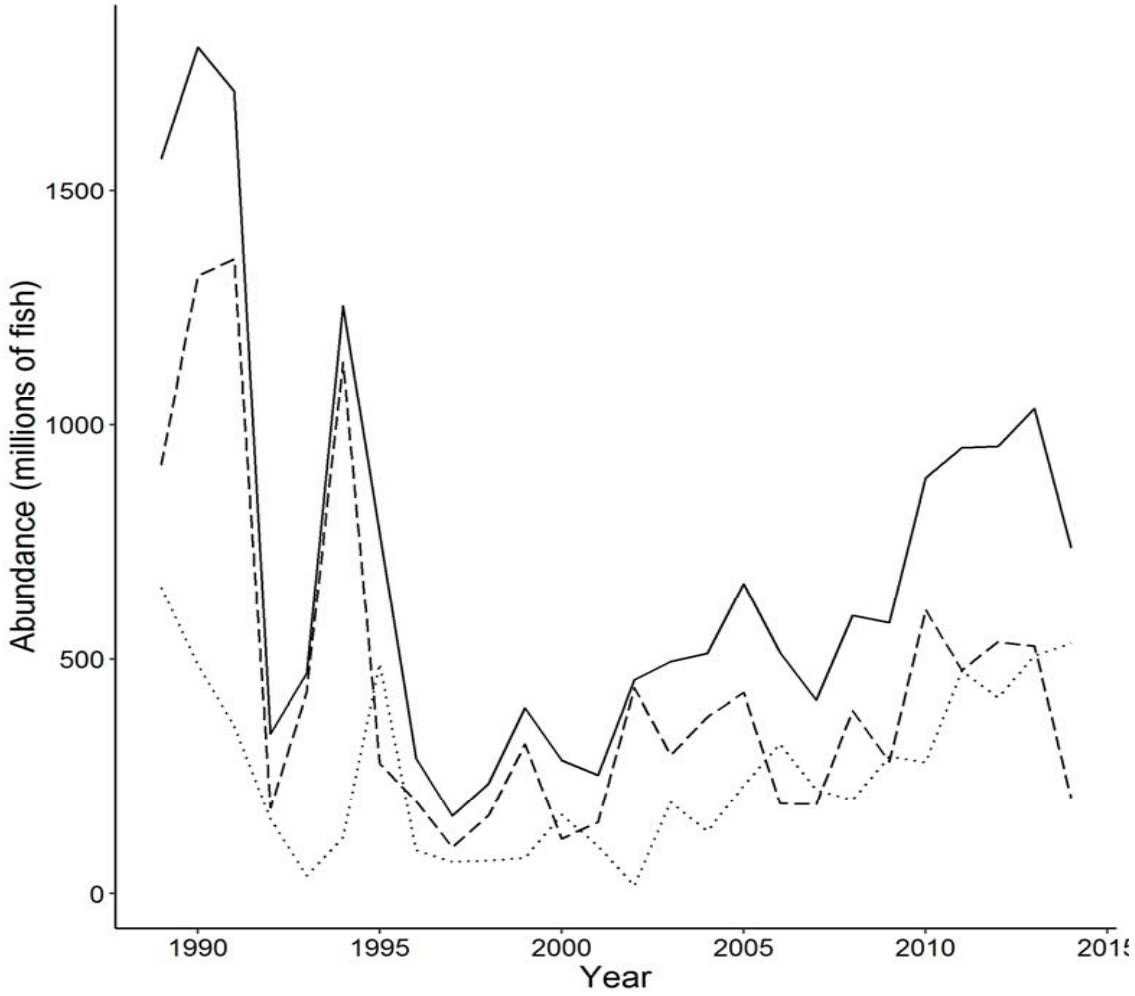
Surplus Production - Results

Relative biomass (B/B_{MSY}) and relative fishing mortality (F/F_{MSY})



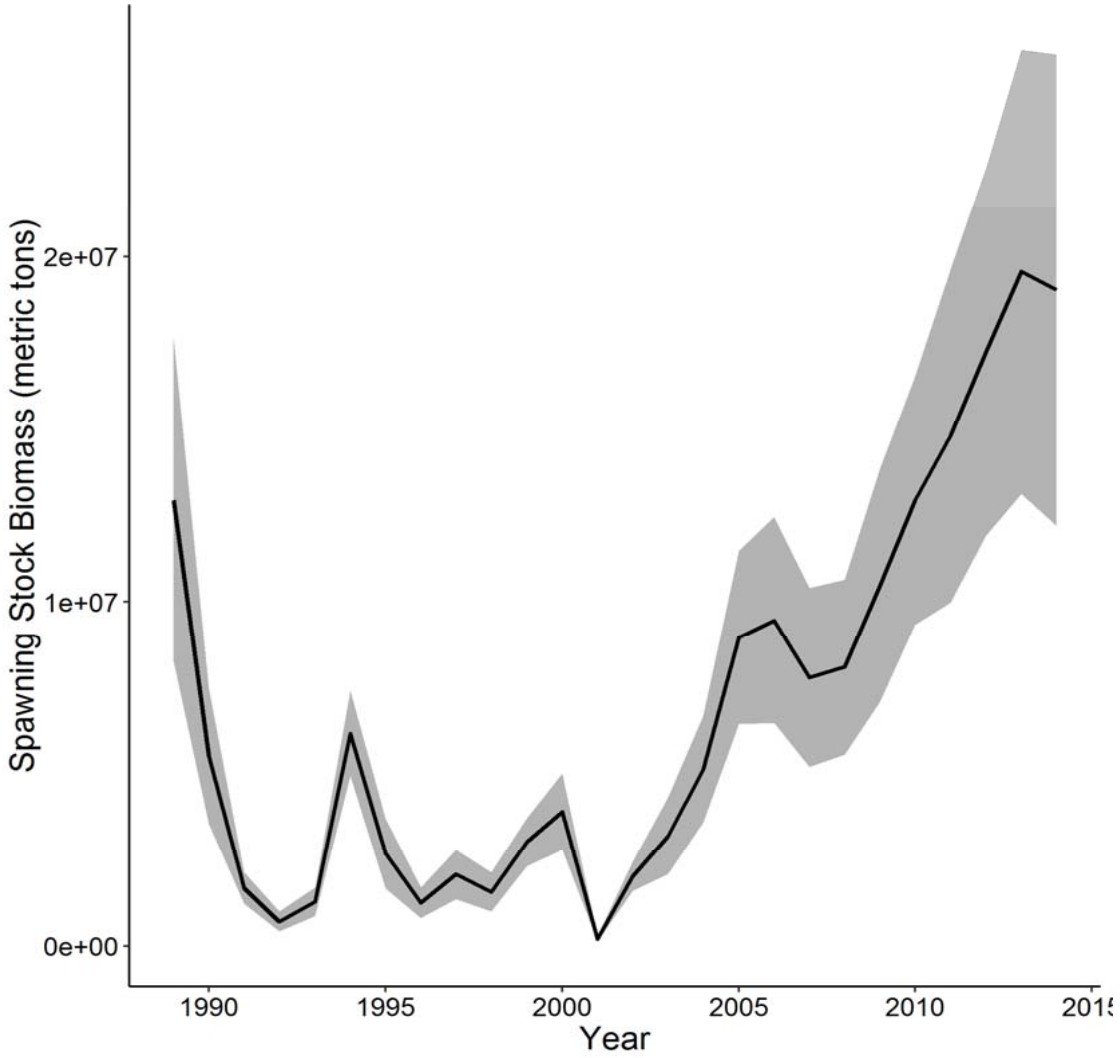
- Biomass has been increasing steadily since 1999 (the lowest point in the time series)
- F was at its highest in 1991 and has been on a decline since 1995

Modified-CSA - Abundance



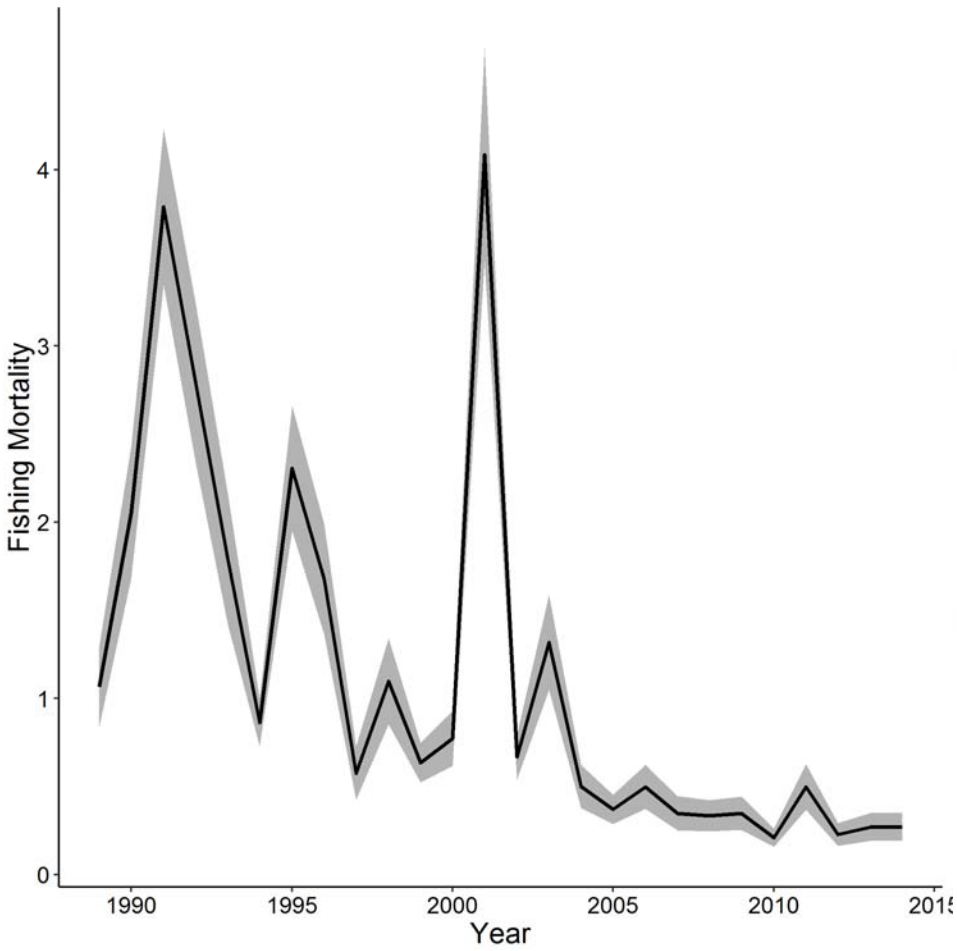
Base modified-CSA model recruitment (dashed line), post-recruit (dotted line), and total abundance (solid line) estimates for spot (millions of fish).

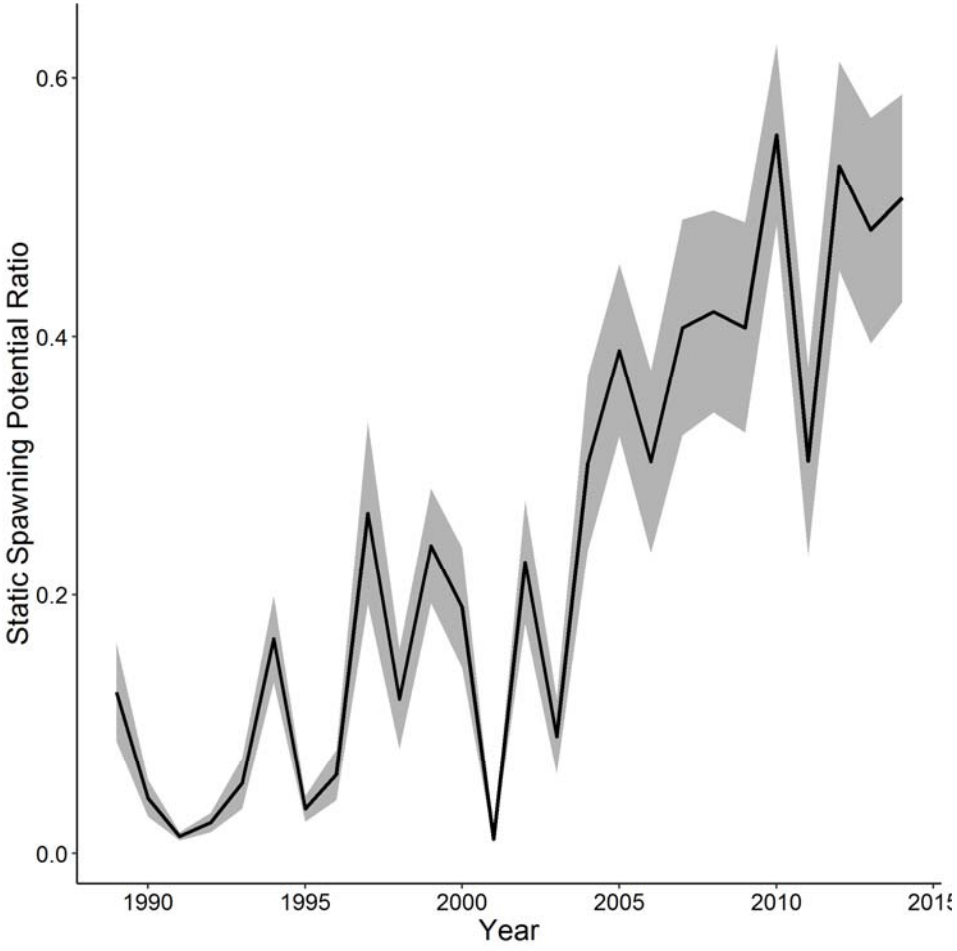
Modified-CSA - SSB



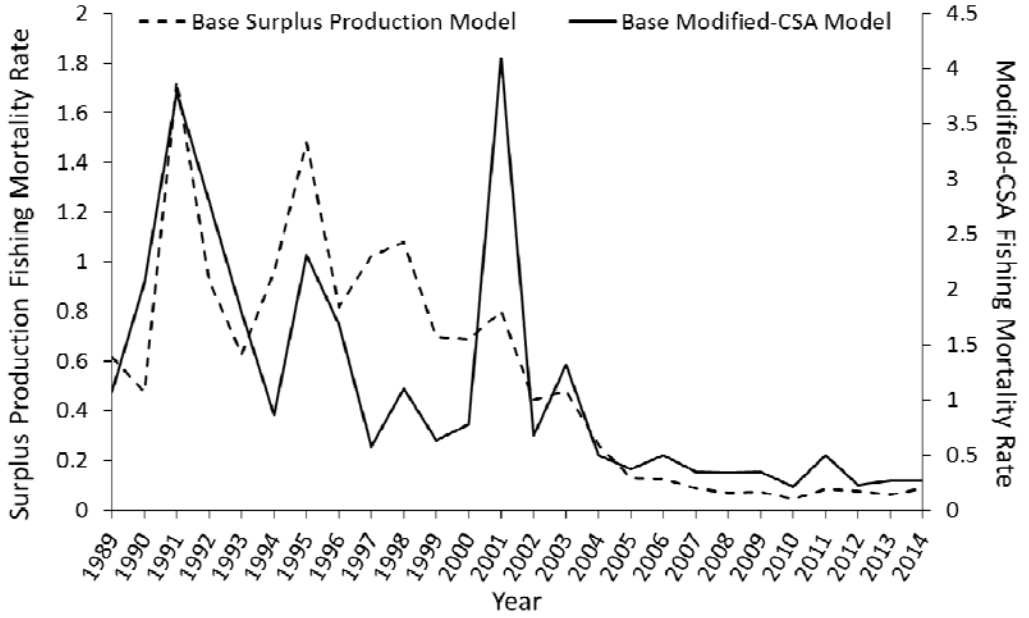
Base modified-CSA model end-year spawning stock biomass estimates for spot (metric tons) with 95% confidence intervals derived from asymptotic standard errors.

Modified-CSA - Results



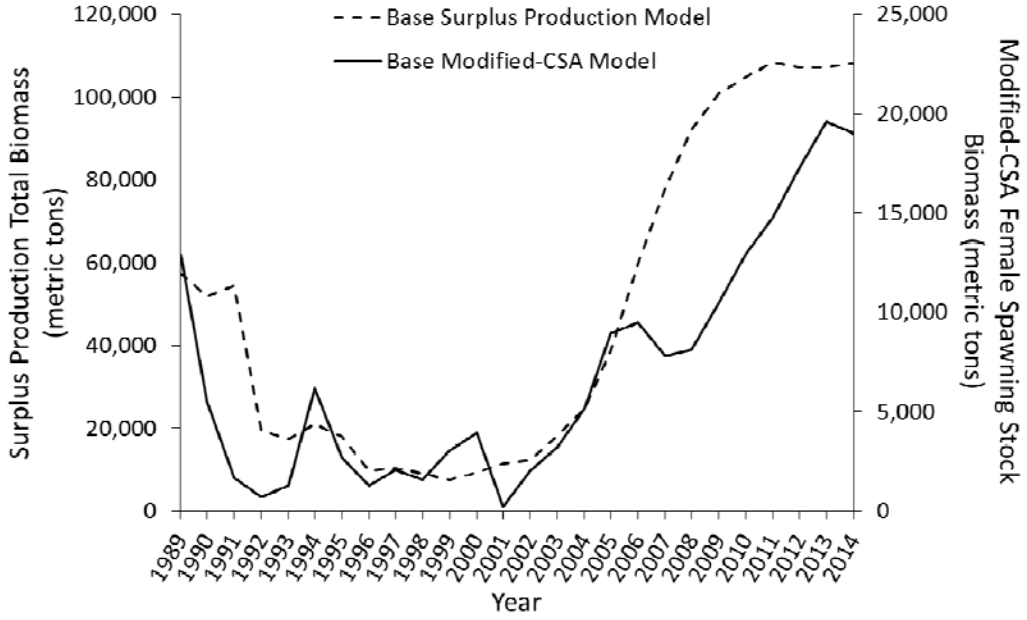


Model Comparison

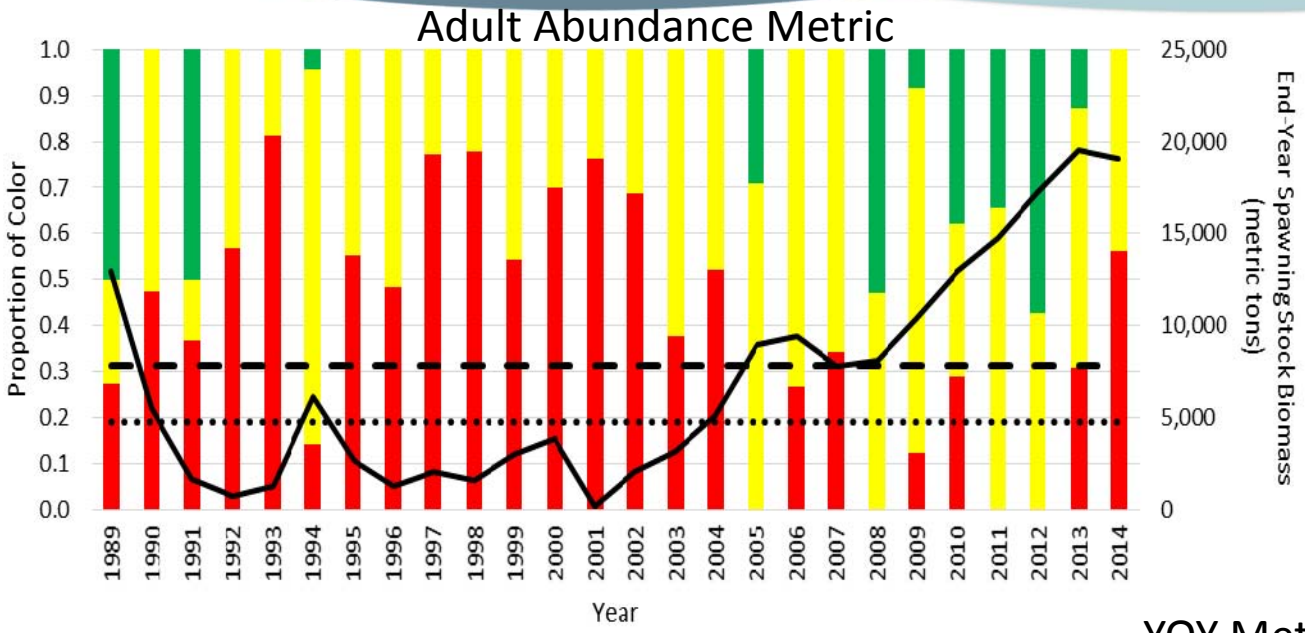


- The general trends in population estimates from the base surplus production and base modified-CSA models are similar and verify the general dynamics of the stock over the modelled time series.

The Surplus Production model tended to underestimate F and overestimate biomass compared to the Modified-CSA model.

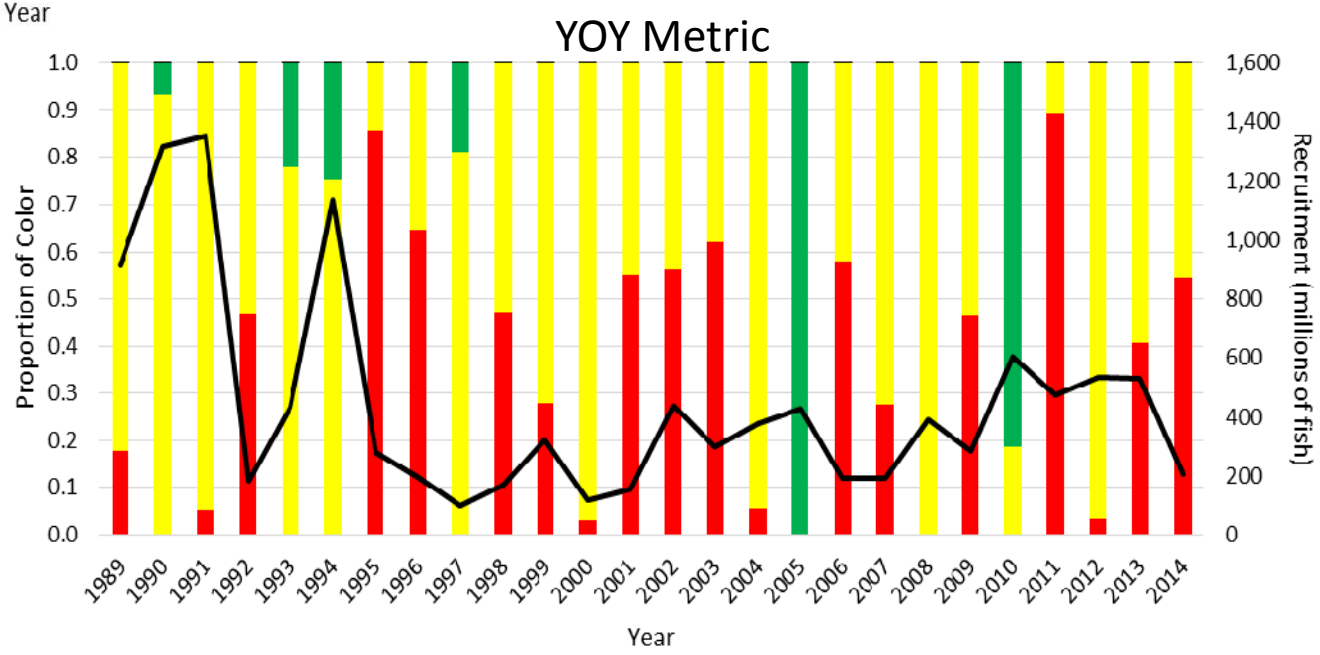


Comparison to TLA

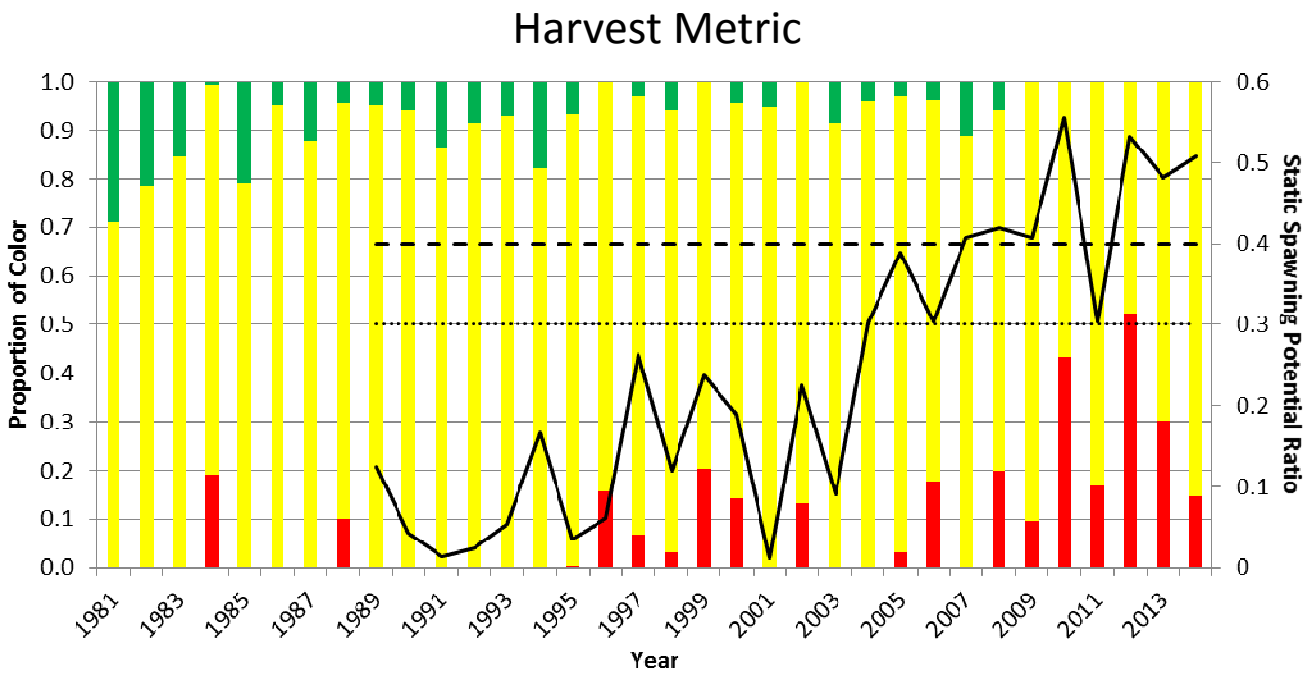


The pattern in the estimates of spawning stock biomass from the modified-CSA model are in agreement with the established abundance metric of the TLA (i.e., adult abundance from the regional SEAMAP Trawl and NMFS Trawl Surveys).

There is no recruitment reference point estimated by the modified-CSA, but a qualitative comparison suggests the annual recruitment estimates match the TLA YOY abundance metric proportions well in many (but not all) years



Comparison to TLA



- The harvest metrics from the TLA were not in as close agreement with the modified-CSA sSPR estimates.
- The established harvest metric from the TLA, as the name suggests, does not include discard information, as there was not a time series of discard estimates established for the TLA.
- This is not surprising considering the high proportion of fishery removals used in the modified-CSA attributed to shrimp trawl discards.
- One consideration for improving the TLA in the future would be to incorporate fishery removals as an additional metric.

F Reference Points

- Static spawning potential ratios were used due to uncertainty of the stock-recruit relationship
- 30% sSPR threshold and 40% sSPR target
- Fishing reference points (F%) based on fishing mortality necessary to achieve the reference sSPR
- Biomass reference points estimated from F% reference points and model estimated recruitments

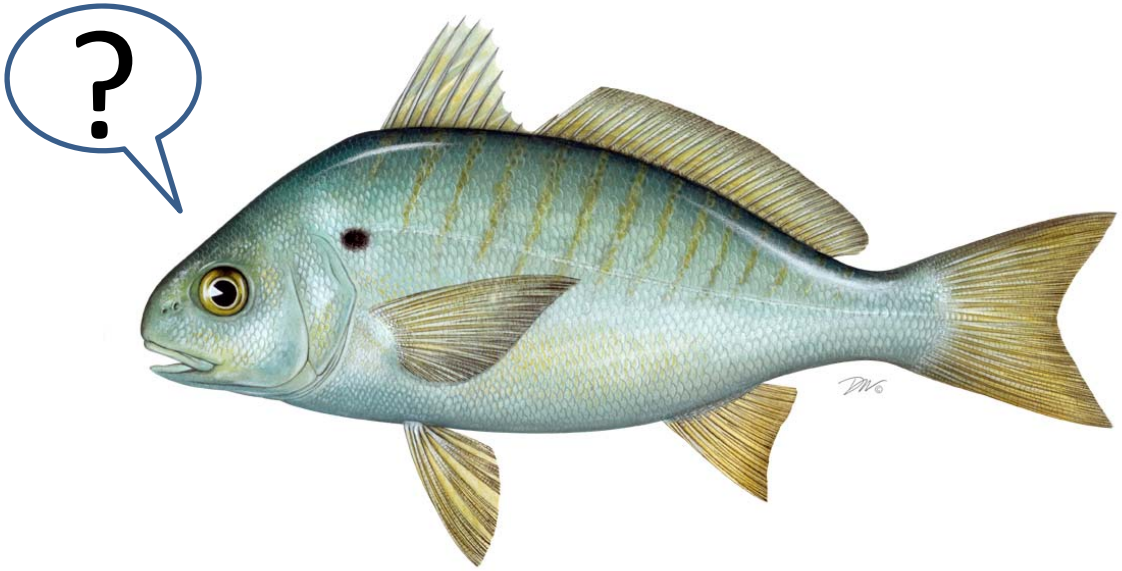
Fishing Mortality Reference Point	Estimate	
F20%	0.74	
F30%	0.5	Fishing Mortality Threshold
F40%	0.36	Fishing Mortality Target

Stock Status

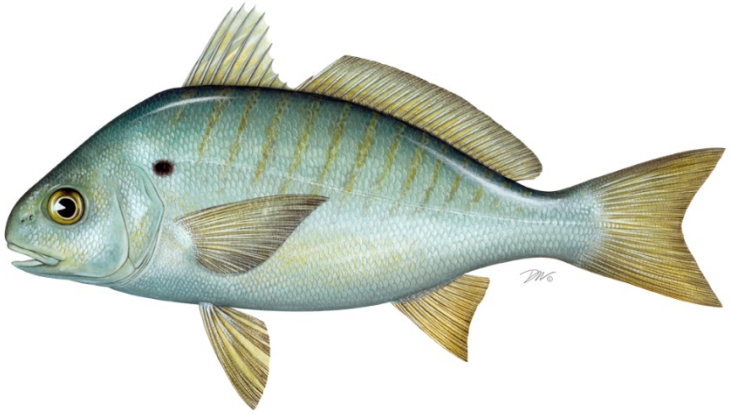
- Stock not overfished at the beginning of 2014
  - End-year 2013/beginning-year 2014 SSB estimate of 19,032 metric tons above the target (7,854 metric tons)

- Overfishing did not occur in 2014
  - 2014 fishing mortality estimate of 0.249 below the target (0.36)
  - 2014 sSPR estimated at 0.507

Questions?



Spot Stock Assessment Peer Review Report



South Atlantic State-Federal

Fisheries Management Board

August 1, 2017

ASMFC Stock Assessment Peer Review Process

Spot Stock Assessment Review Workshop, April 18-21, 2017

Scientific Peer Review Panel

- Chair + 2 additional Technical Reviewers
  - expertise in spot biology and population dynamics, stock assessment modeling, and statistics
- Scientific review focusing on data inputs, model results and sensitivity, overall assessment quality

Review Panel:

Dr. Ken Able (Chair), Rutgers University, Institute for Marine & Coastal Sciences

Dr. Shannon Cass-Calay, NMFS Southeast Fisheries Science Center, Population Dynamics Branch

Dr. Michael Wilberg, University of Maryland, Center for Environmental Science

Peer Review Overall Findings

- Stock assessment provides best available science
- Stock status determinations uncertain
  - Biomass increasing in all model runs
  - Assessment data components show conflicting population trends
  - Model struggled to reconcile differing trends between indices (e.g., NMFS and NC Trawl indices)
- Panel does not recommend using absolute estimates of population size…however, **trends in landings and surveys suggest current removals are sustainable**

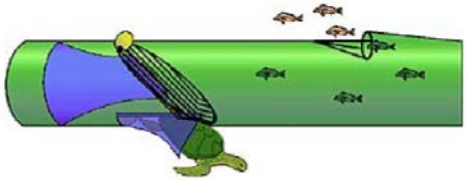
Review Findings

✓ **ToR 1:** All potential data sources considered, selected, weighted, and uncertainties described correctly

- ***Recommendation 1:*** *develop fishery-dependent CPUE indices → enhances understanding of fishery trends*
- ***Recommendation 2:*** *consider standardizing all survey indices (for base or sensitivity runs)*

✓ **ToR 2*:*** Improved methods for estimating bycatch and discards

- Southern shrimp trawl fishery bycatch estimation methods innovative and consistent with SEDAR assessments' methods



Review Terms of Reference

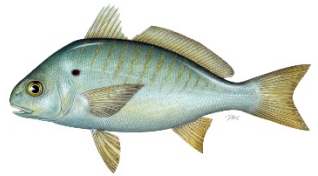
ToR 3: *Evaluate the methods and models used to estimate population parameters and biological reference points.*

Panel Conclusions:

- Commended SASC for running multiple models:

  Catch Survey Analysis (CSA) and Surplus Production

  → agreed CSA is preferred
- Concerned about declining vs. stable total mortality trends in CSA vs. catch curve analyses
- Model struggled to reconcile differing trends between indices
- Consider age-length structured models (e.g., SCALE), allows fuller use of all available data
- Model parameterization followed best assessment practices
- ***Recommendation 3:*** *explore time-varying parameter estimation for catchability*



Review Terms of Reference

ToR 4: Sensitivity and retrospective analyses conducted appropriately, showed no concerning retro patterns

Panel Conclusions:

- Model sensitive to index selection
- Additional sensitivity runs using total mortality (Z) time series vs. average Z resulted in different overfishing stock status determinations → **model instability**

✓ **ToR 5:** Appropriate methods used to characterize uncertainty in the stock assessment (MCMC runs)

Review Terms of Reference

ToR 6: *Recommend best estimates of stock biomass, abundance, and exploitation from the assessment for use in management*

- Panel does not recommend using assessment estimates of absolute biomass, abundance, and exploitation due to model sensitivity to key assumptions (treatment of external Z estimates, selectivity of recruits)

<u>Assessment and Review Panel Take Homes:</u>

1) abundance indices stable or increasing across stock range

2) Catch stable or declining over time

3) Catch and indices patterns together indicate declining fishing mortality rates → relative status of the stock in recent years better than late 1980s-early 1990s.

4) Shrimp fishery effort and spot bycatch magnitude declining; review shrimp bycatch estimates annually in TLA

→ substantial contribution to overall removals and mortality

Review Terms of Reference

ToR 7: *Evaluate the choice of reference points and the methods used to estimate them. Recommend stock status determination from the assessment*

Panel Conclusions:

- Review Panel agrees with SPR reference points at 40% (target) and 30% (threshold)
- Stock status cannot be determined reliably; models with alternative assumptions resulted in different stock status

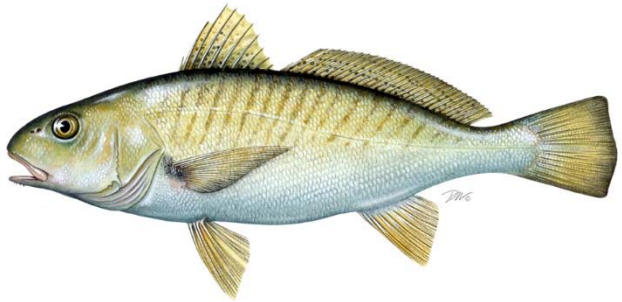
Review Terms of Reference

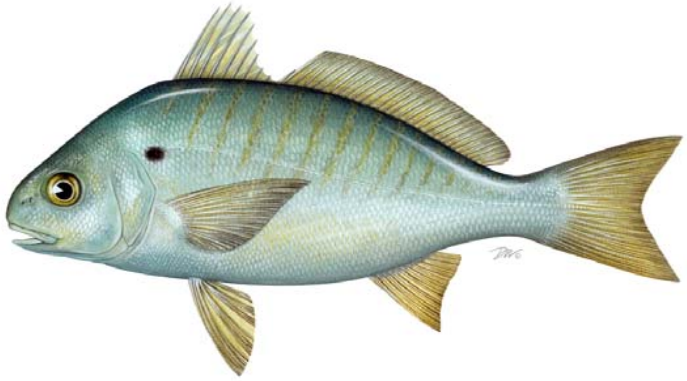
✓ **ToR 8:** Top Priority Research Recommendations

- Increase shrimp trawl fishery observer coverage; increase collection of discarded spot lengths and ages
- Expand collection of life history data for lengths and ages, especially fishery-dependent data sources
- Organize otolith exchange and develop an ageing protocol

✓ **ToR 9:** Recommend next benchmark assessment in 5 years, add shrimp bycatch estimation to annual Traffic Light Analyses

Traffic Light Analysis Update for Atlantic Croaker and Spot: 2016





South Atlantic Fisheries Management Board

Atlantic States Marine Fisheries Commission

August 1, 2017

Traffic Light Analysis: Review

- TLA management framework established in 2014 under Addendum II to Amendment I for croaker and Addendum I to the Omnibus Amendment for spot to evaluate fisheries trends and develop state-specified management actions.

- The TLA is a statistically-robust way to incorporate multiple data sources (both fishery-independent and -dependent) into a single, easily understood metric for management advice.

- The name comes from assigning a color (red, yellow, or green) to categorize relative levels of indicators on the condition of the fish population (abundance metric) or fishery (harvest metric).

- State-specific management action would be initiated when the proportion of red exceeds specified thresholds (30% or 60%), for both harvest and abundance, over three consecutive years for croaker and two consecutive years for spot.

Atlantic Croaker

- TLA uses a 1996-2008 reference period based on time frame from 2010 stock assessment.

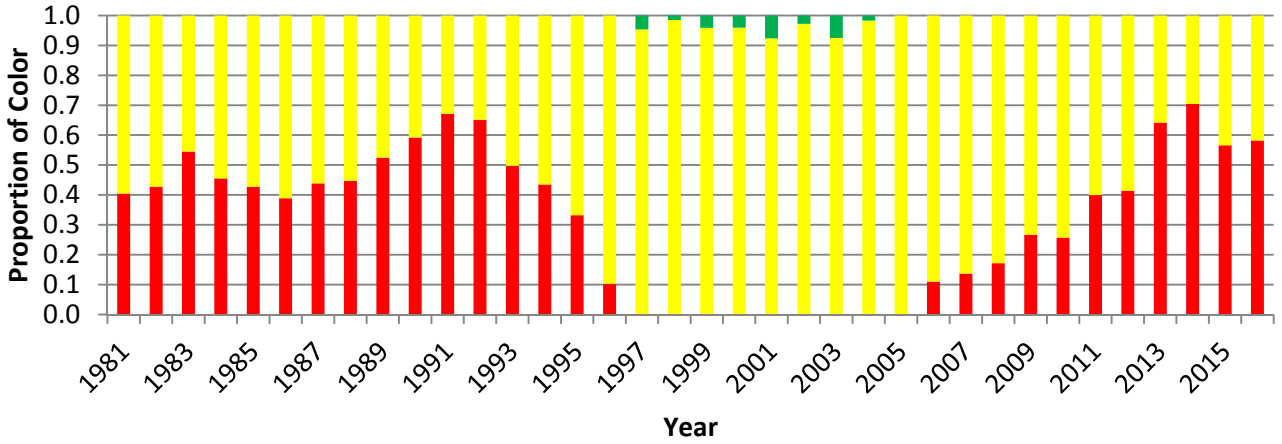
- The indices used for the TLA include both commercial and recreational harvest (fishery dependent) and four fishery independent monitoring surveys that occur in different areas of the Atlantic coast of the United States.

- The fishery independent surveys include:

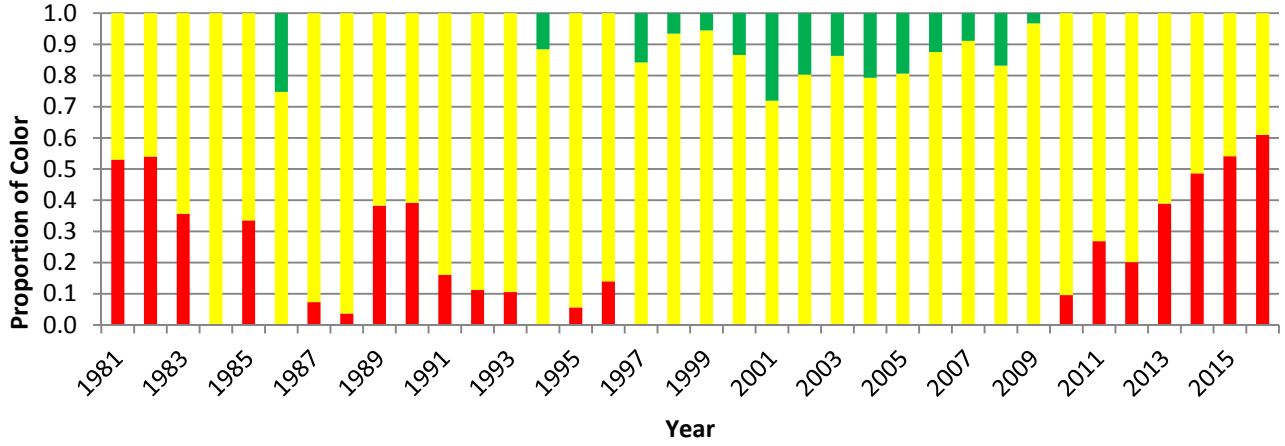
  - The Northeast Fisheries Science Center (NMFS) fall ground fish trawl survey (1981-2016).
  - the Virginia Institute of Marine Science (VIMS) trawl survey (1988-2016).
  - The North Carolina Dept. of Marine Fisheries trawl program 195 (1987-2016).
  - The Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey (1989-2016).

Harvest

Annual TLA for Atlantic croaker: Commercial.

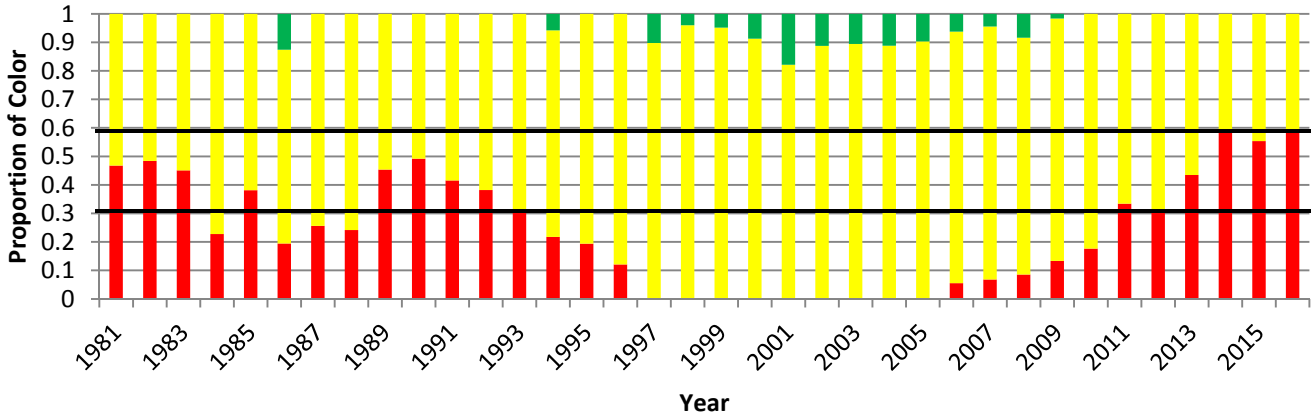


Annual TLA for Atlantic croaker: Recreational



Harvest Composite

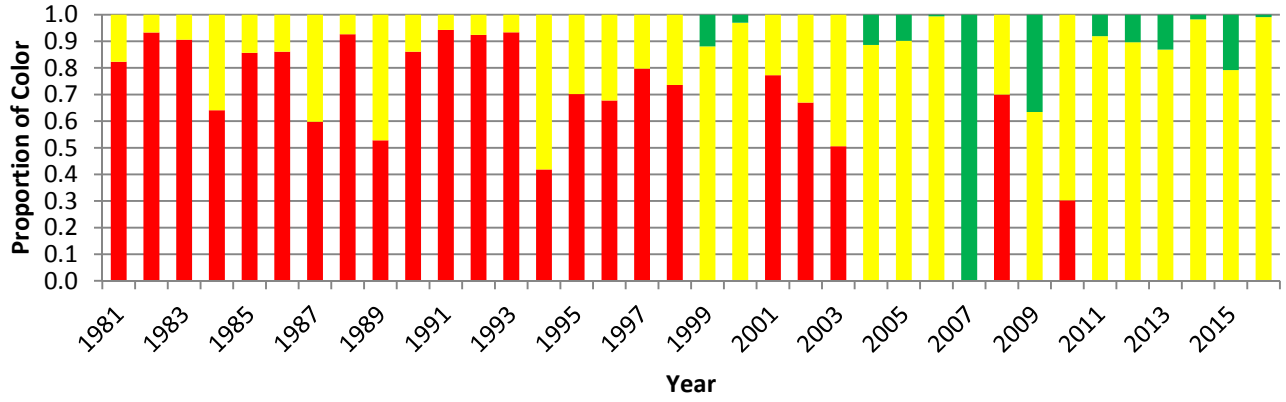
Annual color proportions for harvest composite TLA of Atlantic Croaker



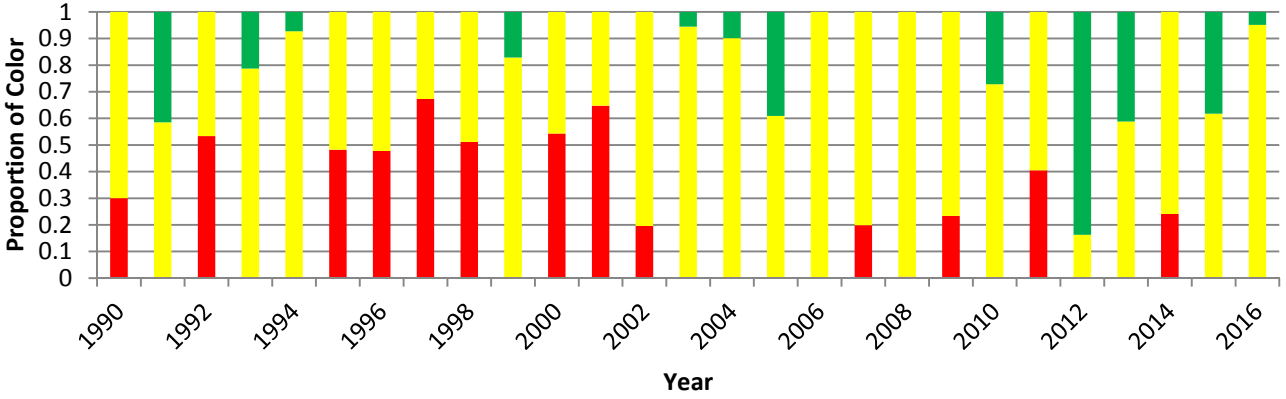
- Red proportions have been above 30% since 2011 with the index tripping from 2013 through 2016.
- The harvest composite TLA index indicates that the management response trigger would have been tripped for the fourth year in a row (Fig. 3).
- The important trend to point out is the continuing decline in both recreational and commercial landings for Atlantic croaker.

Fishery-Independent Adult

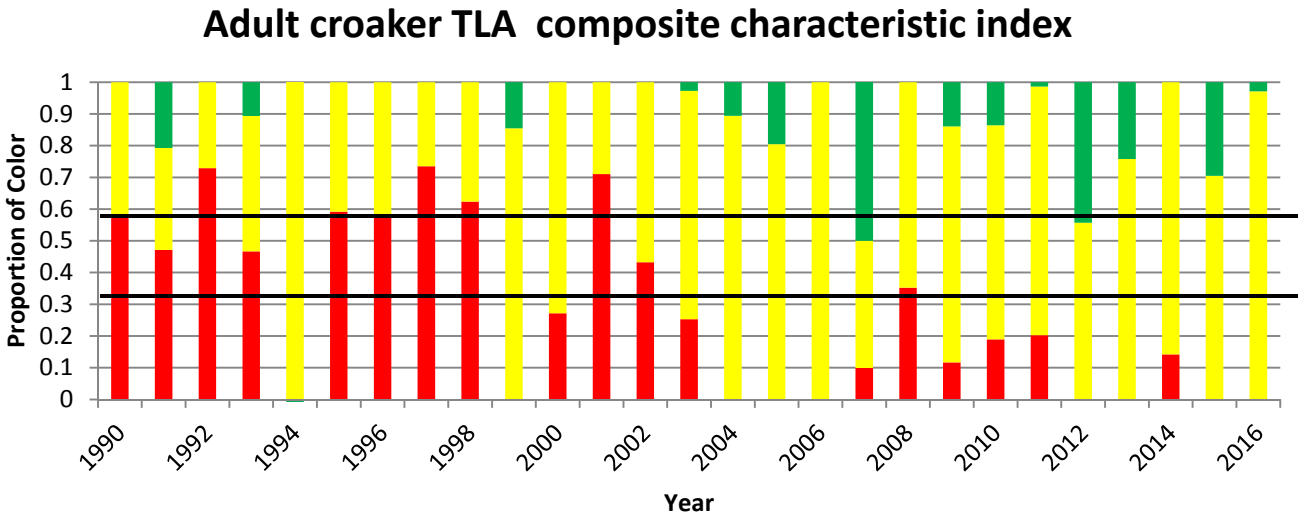
Annual TLA color proportions for Atlantic croaker from NMFS trawl



Annual TLA color proportions for Atlantic croaker from SEAMAP survey



Fishery-independent Adult Composite

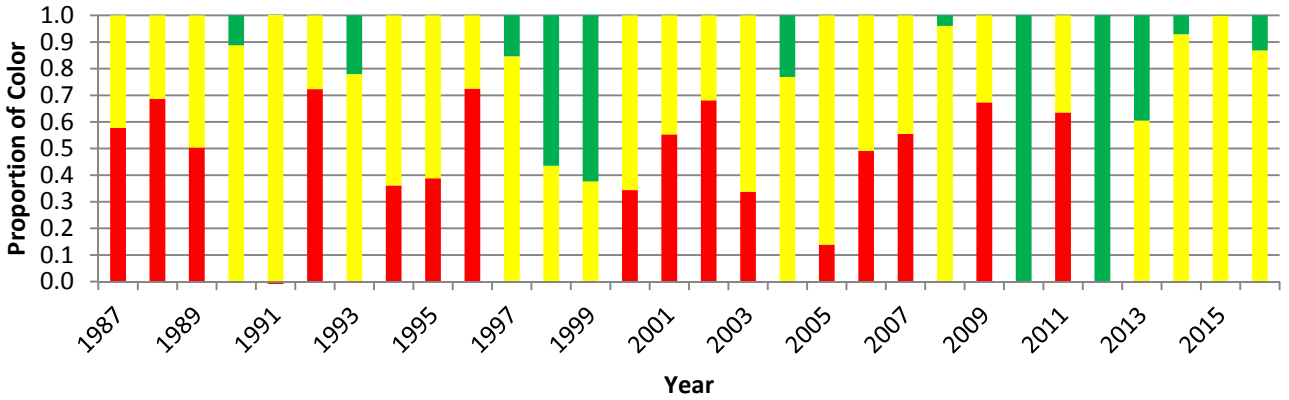


- The adult composite TLA characteristic showed a higher proportion of green in 2015 (29.5%) than in 2016 (2.9%).

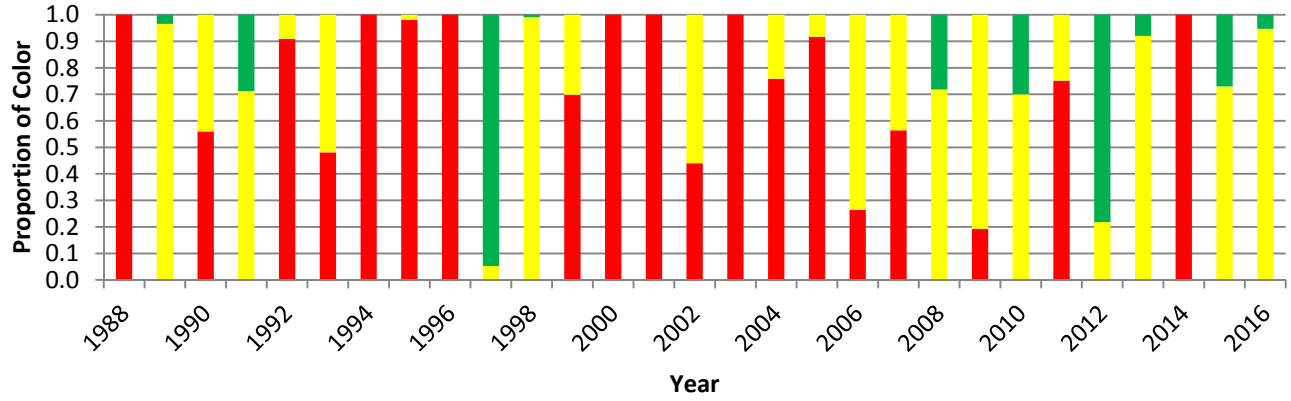
- Abundances have stayed above the long term mean (target threshold) for the last two years.

Fishery-independent - Juvenile

NCDMF Program 195 TLA color proportions for Atlantic croaker

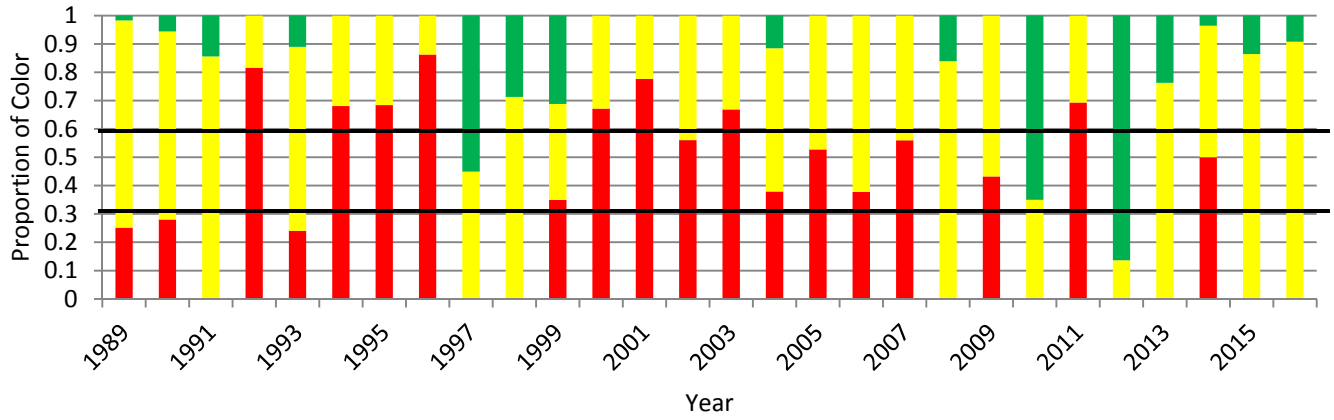


Annual TLA color proportions for Atlantic croaker from VIMS spring trawl survey.



Fishery-independent - Juvenile Composite

Juvenile croaker TLA composite characteristic index (NC 195 and VIMS surveys).

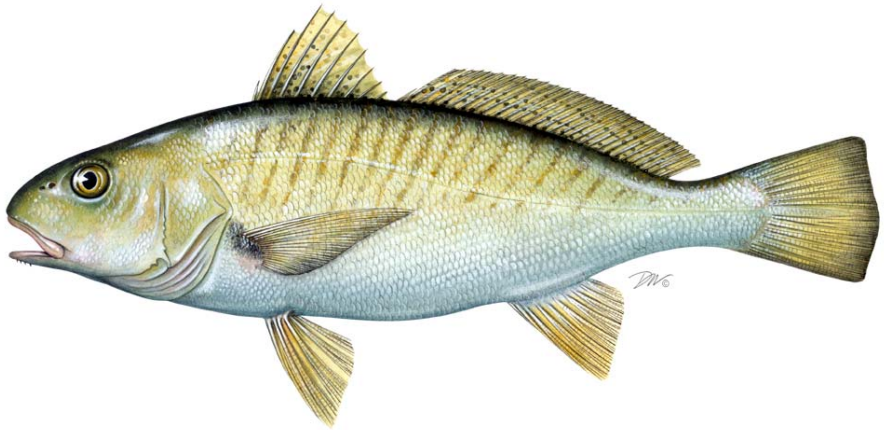


- The juvenile composite TLA characteristic had no red in the index for either 2015 or 2016 indicating and increase in abundance over 2014.
- The juvenile composite characteristic index did not trip in either 2015 or 2016 and had not had three consecutive years of red at 30% or greater since 2007..
- The higher annual variability for the different color proportions in the juvenile composite characteristic (compared to the adult composite characteristic) is likely a reflection annual recruitment variability rather than population trends.

Summary

- The harvest composite TLA did trip in both 2015 and 2016
- The abundance TLA composite showed the opposite trend with increasing abundance without either threshold tripping.
- With only the harvest TLA tripping and not either of the fishery independent TLA composites triggering, management action is not required under Amendment II.
  - However, the discrepancy between what is happening in the harvest index while not seeing any similar trends in the abundance indices warrants further study by the Atlantic croaker Technical Committee.
  - Likely explanations for the discrepancy in index trends could include differing size and age structure of sample populations, regional differences, or temporal shifts in movement patterns between inshore and offshore waters.
  - The croaker TC has begun preliminary investigations into using an age partitioned TLA as well as adding additional indices to the management triggers to better explain the discrepancies between the abundance and harvest metrics.

QUESTIONS



TLA: Spot

- TLA uses a 1989-2012 reference period based on the time frame of available data sets and the indexes trigger if 2 consecutive years of red proportions are greater than 30%.
  - With the recent completion of the benchmark Spot Stock Assessment, the reference period can now be re-evaluated by the spot Plant Review Team for further refinement.

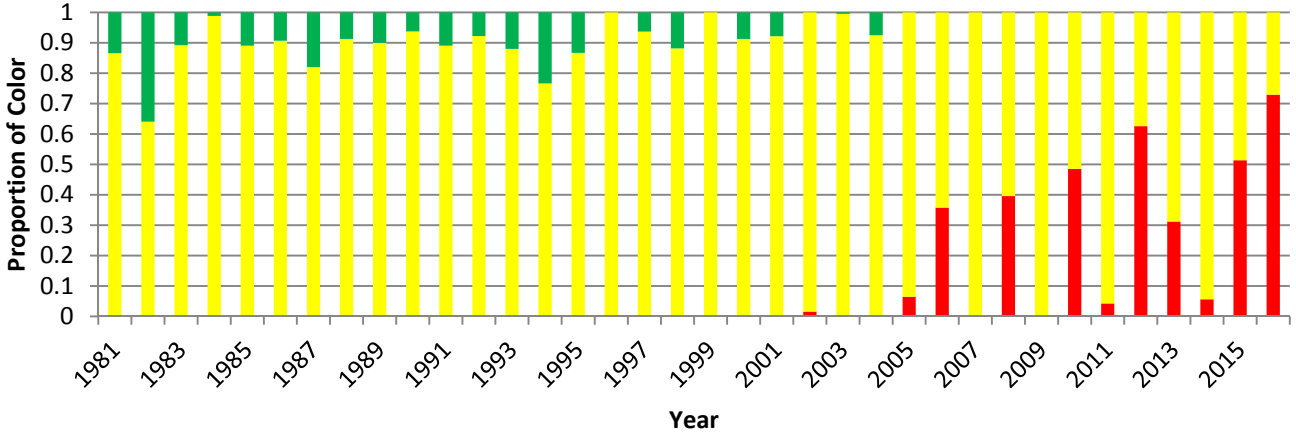
- The indices used for the TLA include both commercial and recreational harvest (fishery dependent) and three fishery independent monitoring surveys that occur in different areas of the Atlantic coast of the United States.

- The fishery independent surveys include:

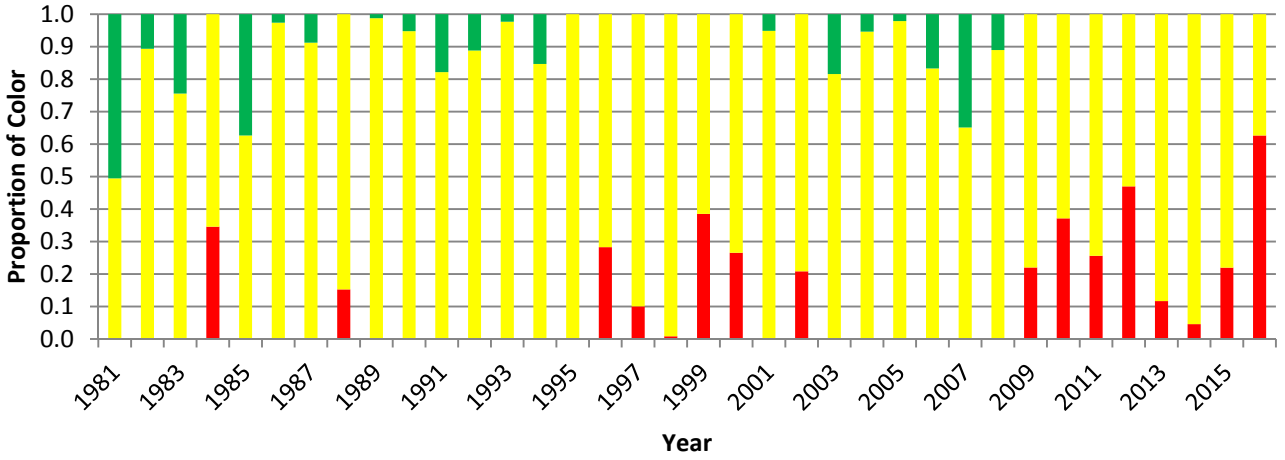
  - The Northeast Fisheries Science Center (NMFS) fall ground fish trawl survey (1981-2016). Adult Spot (primarily age 1+).
  - The Maryland Department of Natural Resources juvenile fish survey (1989-2016). Juvenile Spot (age 0).
  - The Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey (1989-2016). Adult Spot (primarily age 1+).

Harvest Indices

Annual TLA color proportions for Spot from commercial landings.

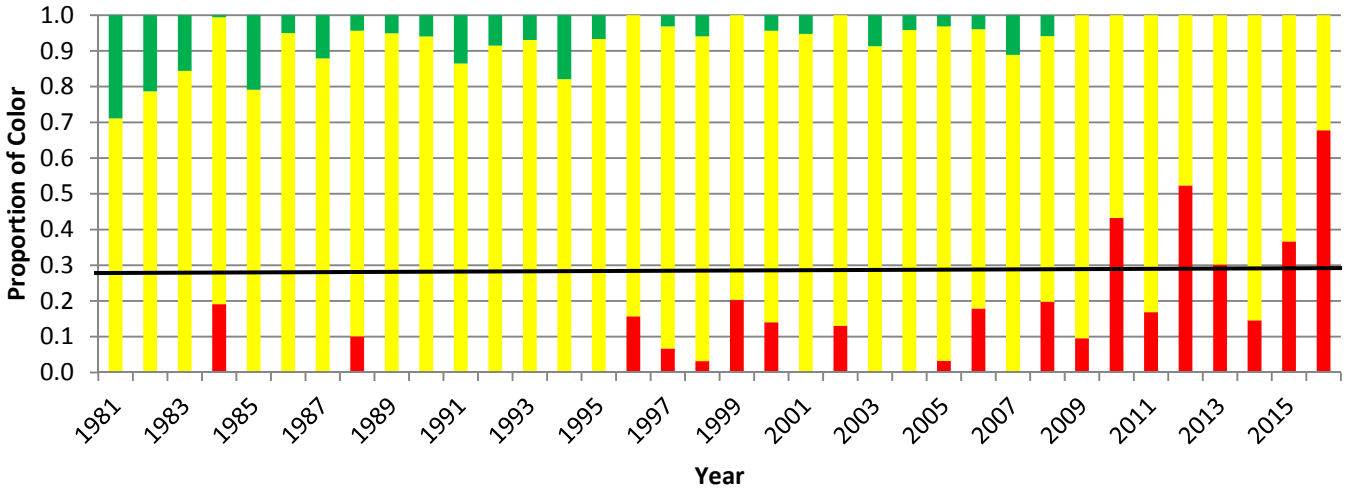


Annual TLA color proportions for spot from recreational harvest.



Harvest Composite

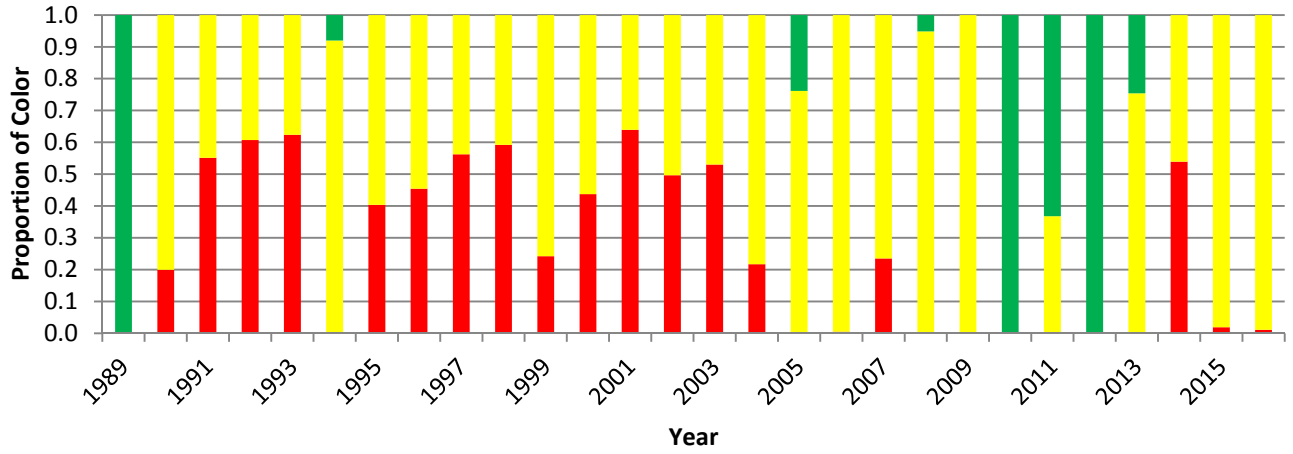
Annual TLA color proportions for harvest composite for spot.



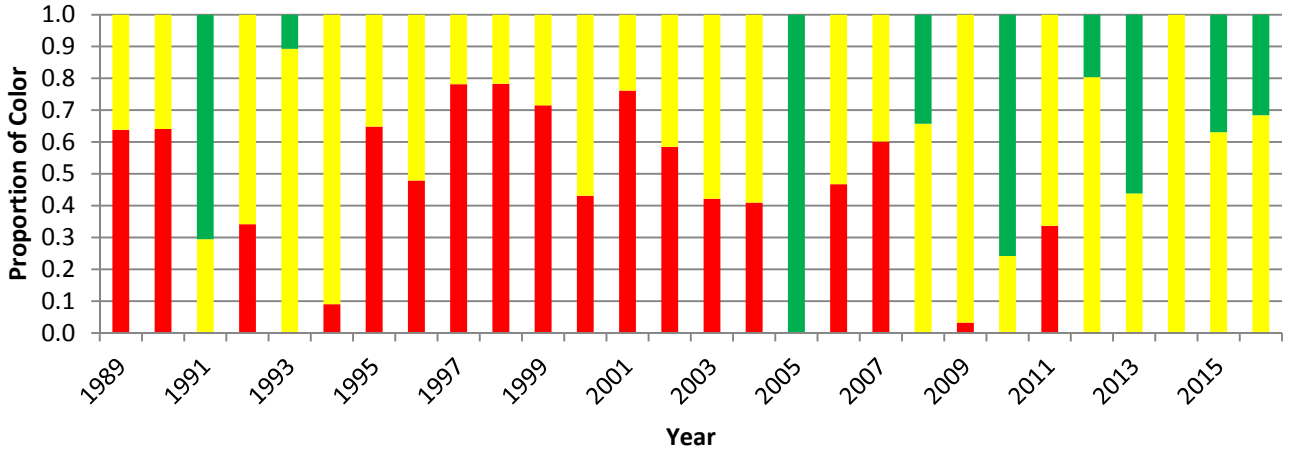
- The harvest composite characteristic TLA shows the general decline in landings since 2008, with increasing proportions of red annually
- The composite characteristic did trip in 2016 (30% level) with 2 consecutive years of red proportion above 30.0%.
- The increase in red proportion was likely driven more by the decline in commercial landings rather than the recreational harvest, particularly given the series low value in 2016.
- The continued declining trend in spot fishery landings was driven primarily by declining landings in the mid-Atlantic region where the majority of coastwide landings occur.

Adults Abundance Indices

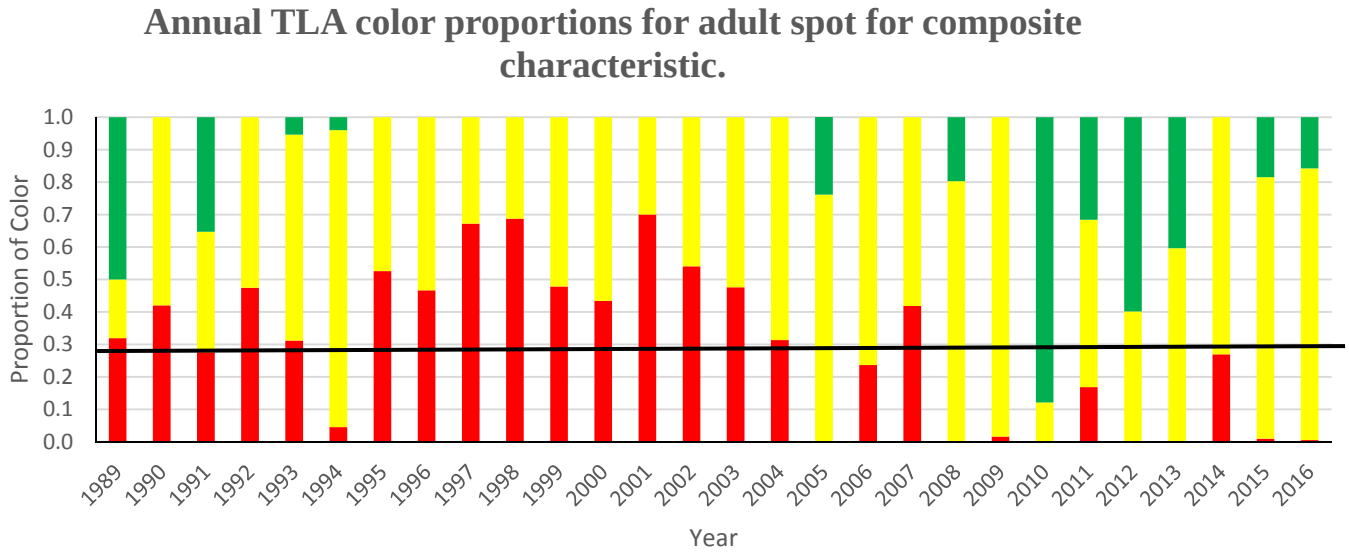
Annual TLA model for Spot from NMFS trawl survey.



Annual TLA model for spot from SEAMAP survey



Adults Abundance Composite



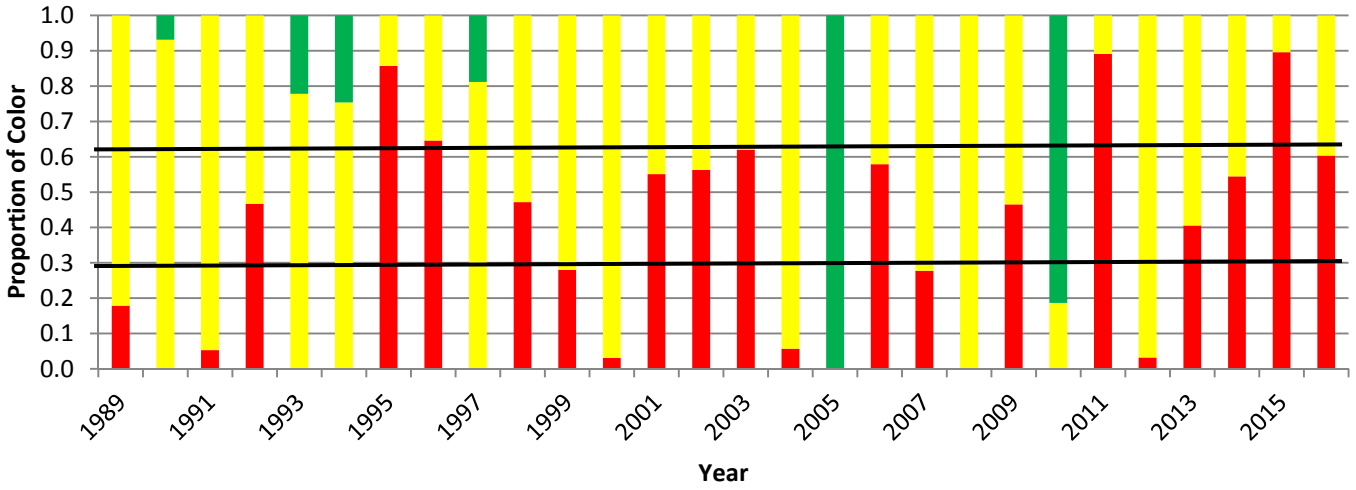
- The TLA composite characteristic for adult spot (NMFS and SEAMAP surveys) showed very little change from 2015 with only a slight decline in the green proportion

- The slight increase in catch levels in the NMFS index and the slight decrease in the SEAMAP index resulted in only a slight change in the TLA for 2016.

- The composite characteristic TLA for the abundance indexes did not trigger in 2016

Juvenile Abundance

Annual TLA color proportions for the Maryland seine survey juvenile index



- The Maryland CPUE increased 422% in 2016 from 2015, however the 2015 index value was the lowest in the entire time series.

- Mean annual CPUE was only above the LTM twice since 1998 with peak years occurring in 2005 and 2010.

- The TLA trigger did trip in 2016 at the 60% threshold. In previous years of the index, the trigger would have also tripped at the 30% threshold in 1996,2002-2003, and 2014-2015.
- This trend points towards a decline in recruitment in the Chesapeake

Summary

- The TLA composite characteristic indexes tripped for juvenile spot index (60% threshold) but not for the adult composite characteristic index.

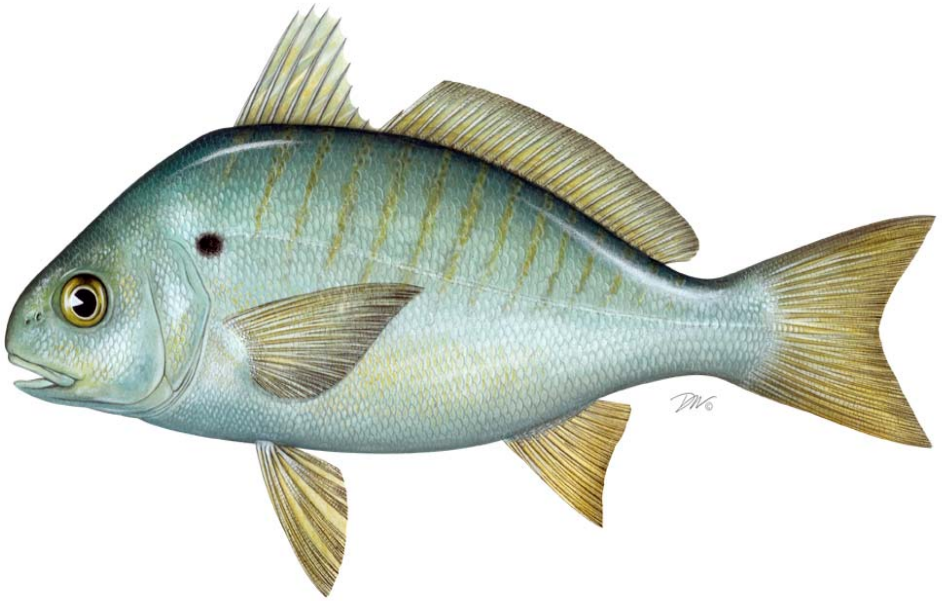
- The harvest composite characteristic also triggered in 2016, mostly due to declines in commercial harvest.

- With declines in the harvest metric as well as the juvenile abundance metric (that appears ongoing) there is some management concern for spot, particularly in the mid-Atlantic region, however management action is not required.

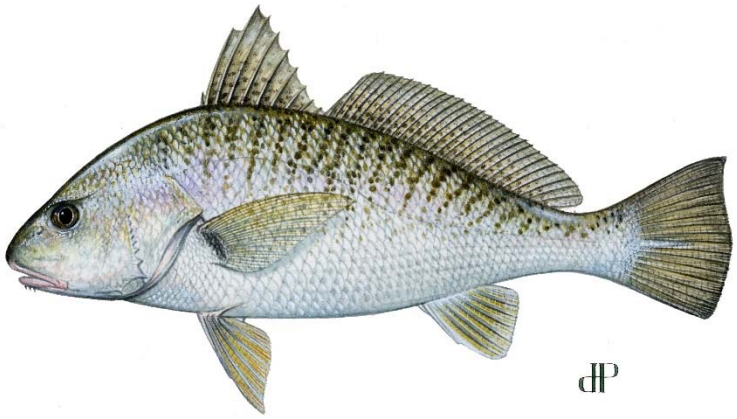
- With the benchmark stock assessment now complete, further refinement of the TLA for spot by the PRT should be considered through either adding additional TLA metrics (by-catch, F, or SPR) or some additional abundance indices (ChesMMAP, NEAMAP).

- The just completed Spot Stock Assessment (ASMFC, 2017) utilized age partitioning in the Catch Survey Analysis model (CSA) separating indices into age 0 and age 1+ (pre-recruits and recruits). The PRT has begun a similar preliminary partitioning for the TLA in order to see if it can provide better information on annual changes as well as synchrony between the different indices.

QUESTIONS?



Age Partitioned Traffic Light Analysis: Atlantic Croaker



Presentation to the *South Atlantic Board*,

Atlantic States Marine Fisheries Commission

August 1, 2017

C.J. McDonough (SCDNR)

Background

- The primary issue was the marked decline in commercial and recreational landings TLA, while the abundance index TLA did not show a similar decline.

- The most likely reason for the difference in the TLA output is differing age and size structure of the fish captured in the abundance indices compared to the size and age structure of the recreational and commercial harvest.

- The exercise was accomplished using annual age length keys applied to the total length frequency distribution data from each data set in order to get an expanded number at age annually.

- Ages were split between pre-recruits (ages 0-1) and recruits (age 2+).

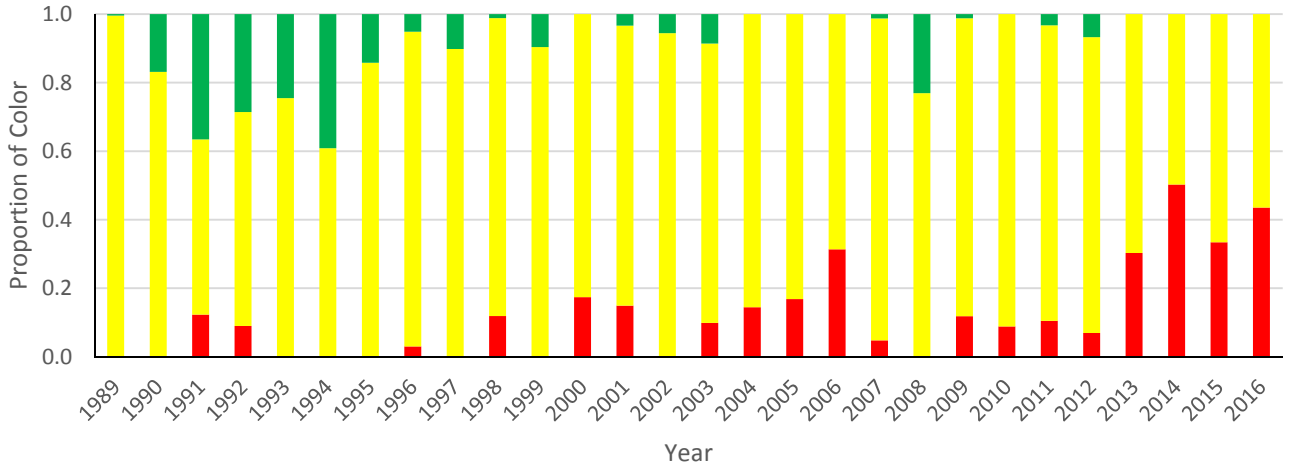
Atlantic Croaker: Methods

- The same four fishery independent data sets and 2 fishery dependent data sets were used.
  - FI: NMFS and SEAMAP (currently used as an adult index), NC195 and VIMS (currently used as a juvenile index)
  - FD: Commercial and Recreational Harvest

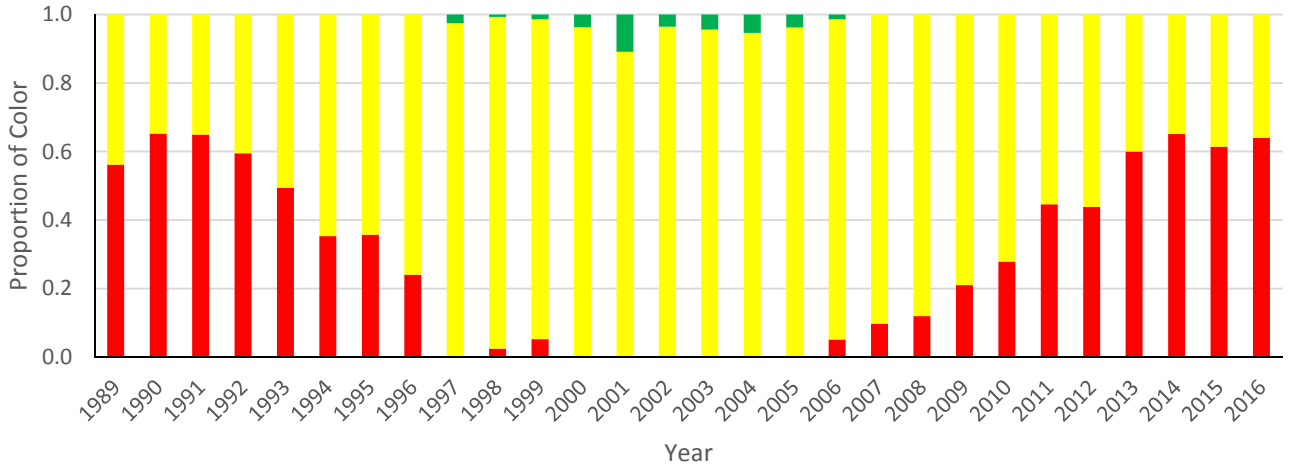
- Two additional data sets were examined to determine if adding them to the TLA would enhance it.
  - The Chesapeake marine monitoring survey (ChesMMAP) and
  - Southeastern Shrimp Trawl Fishery Bycatch Estimates
    - While this data has not been run through the TLA process before, it represents a significant source of mortality for Atlantic croaker.
    - See 2017 Atlantic Croaker Stock Assessment for full description of bycatch estimate methodology.

Harvest Composite TLA

Composite TLA for Age 0-1 Atlantic croaker commercial and recreationa harvest

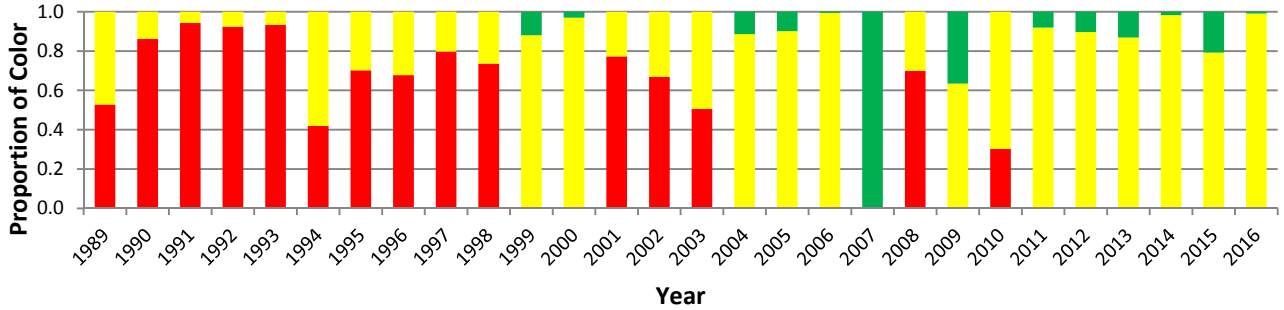


Composite TLA for Age 2+ Atlantic croaker commercial and recreational harvest

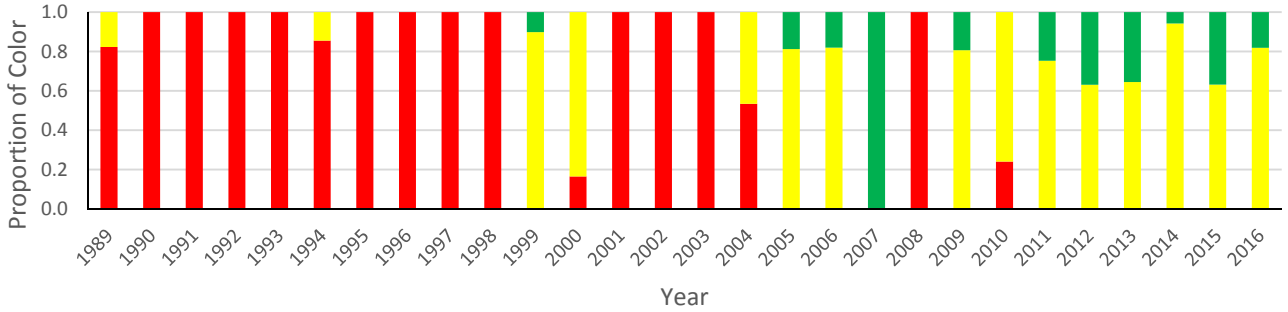


Results: NMFS (FI)

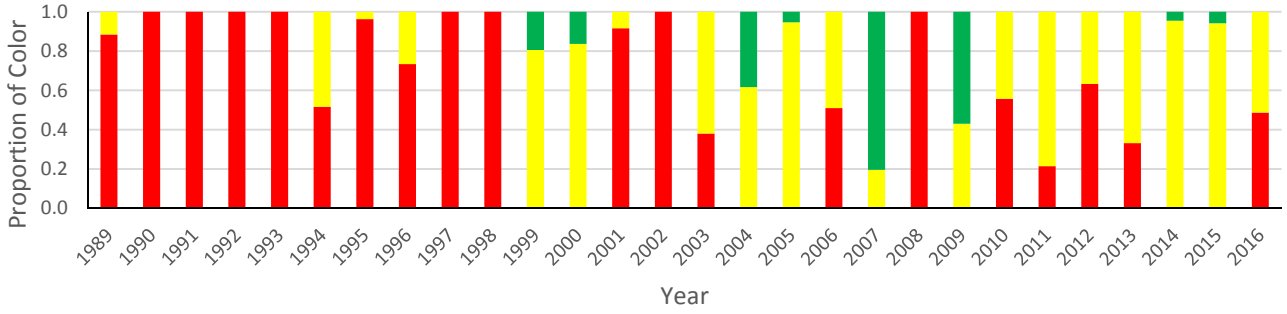
Non-Partitioned TLA for Atlantic croaker.



NMFS: Ages 0-1

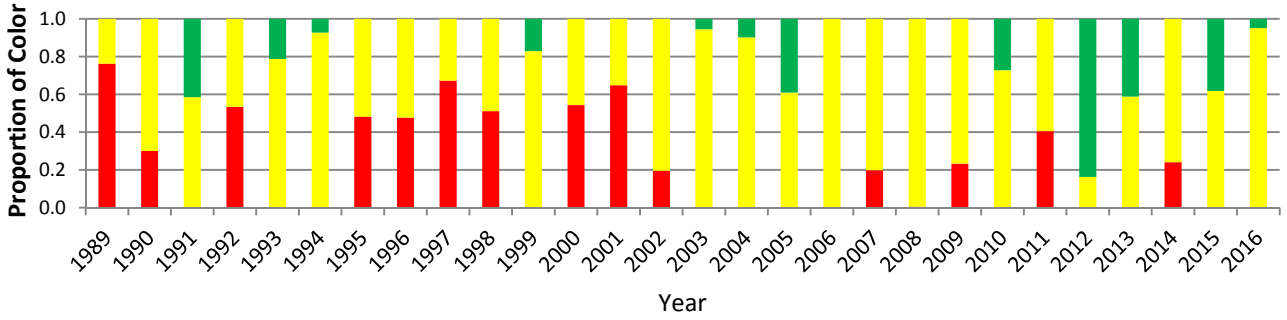


NMFS: Ages 2+

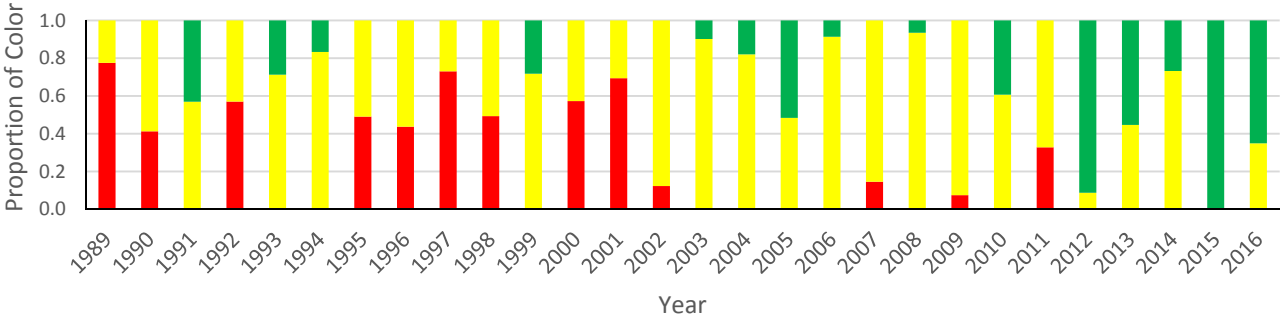


Results: SEAMAP (FI)

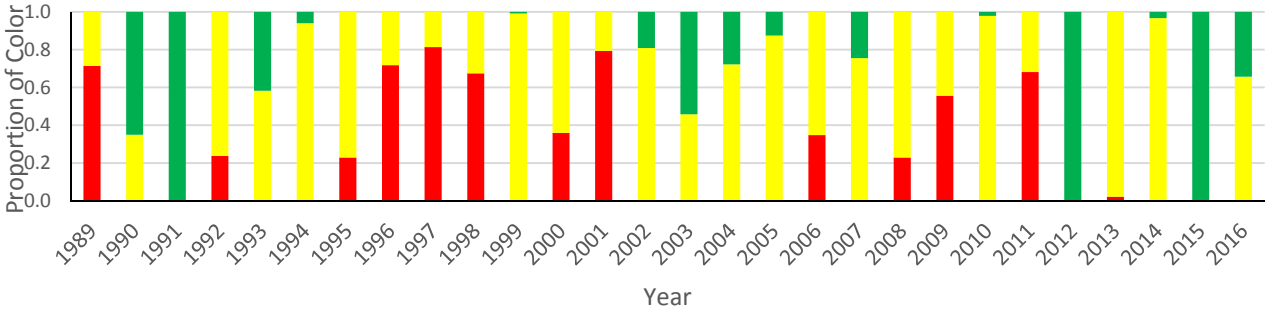
SEMAP non-partitioned TLA



SEAMAP: Ages 0-1 TLA



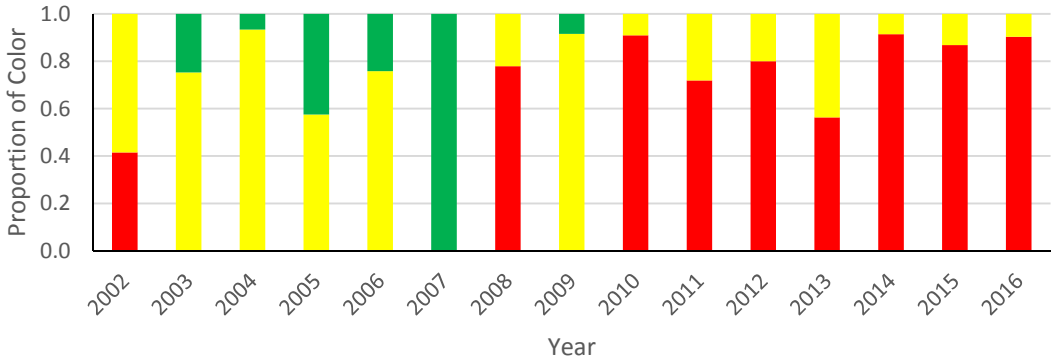
SEAMAP: Age 2+ TLA



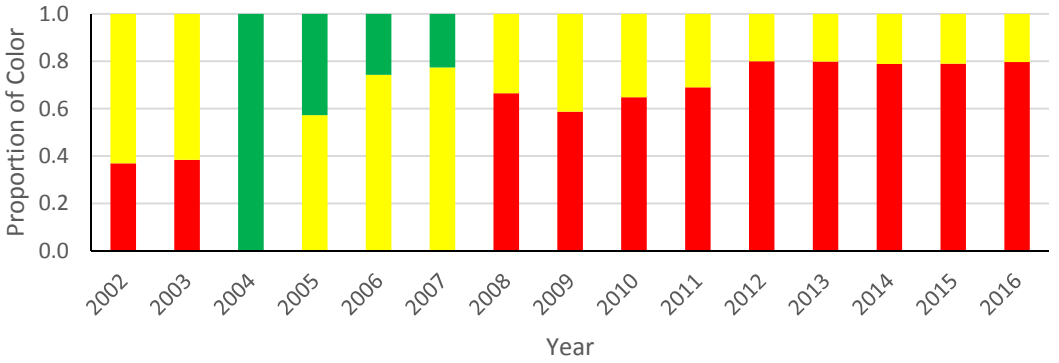
Results: ChesMMAP (FI)

Stratified mean annual CPUE by age group for Atlantic croaker from ChesMMAP.

ChesMMAP age 0-1 TLA for Atlantic croaker

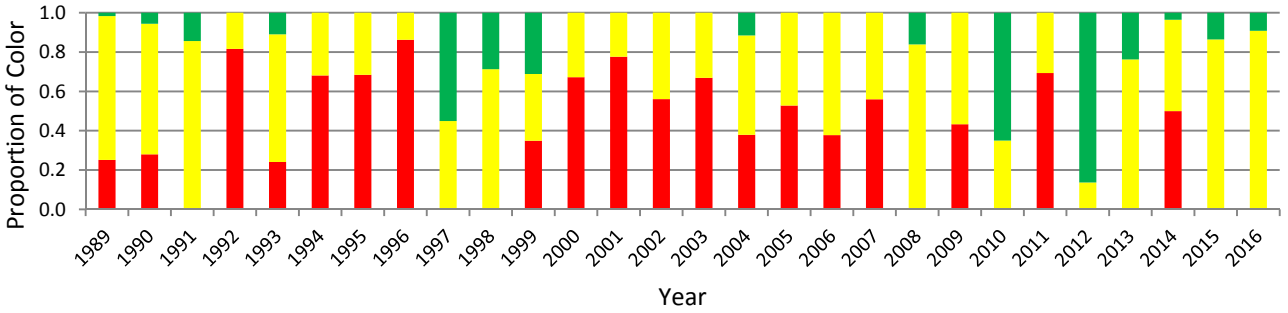


ChesMMAP age 2+ TLA for Atlantic croaker

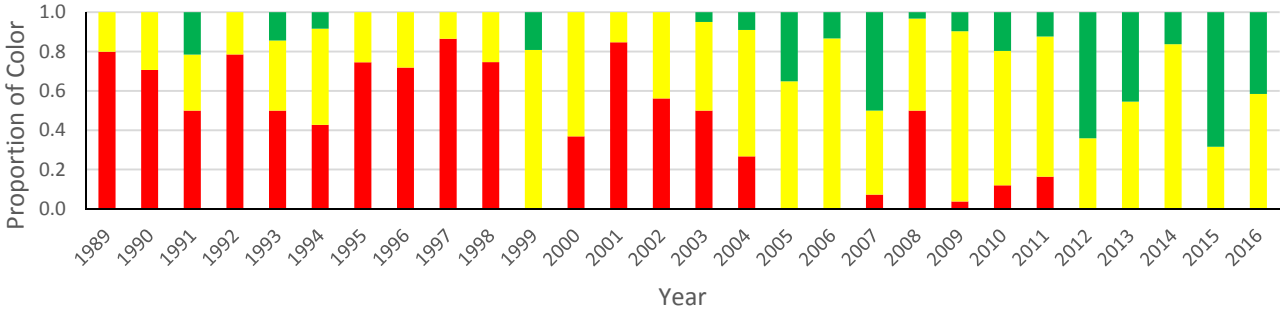


Age 0-1 (juvenile) Composite TLA

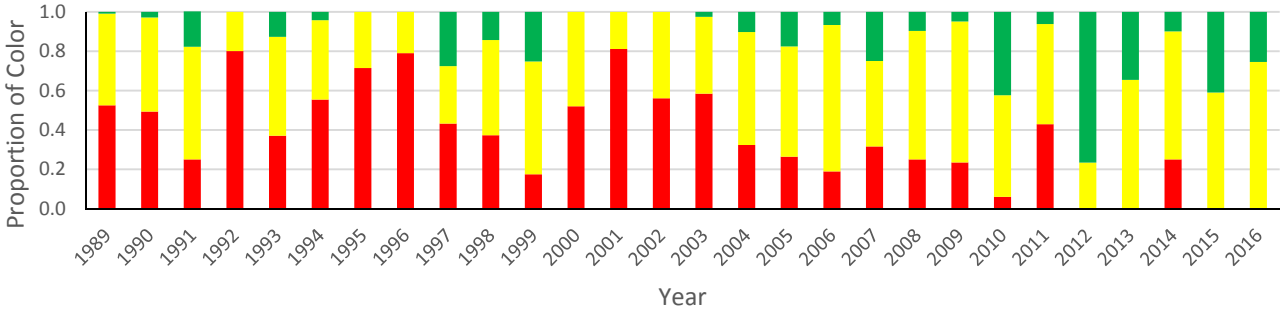
Age 0-1 NC 195 and VIMS surveys



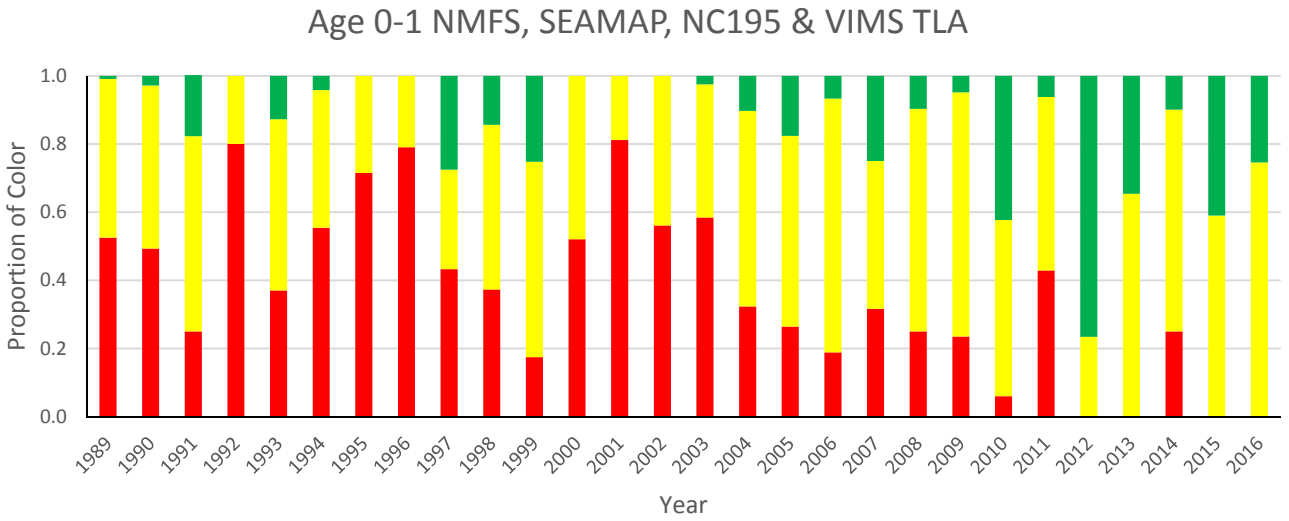
Age 0-1 NMFS & SEAMAP TLA

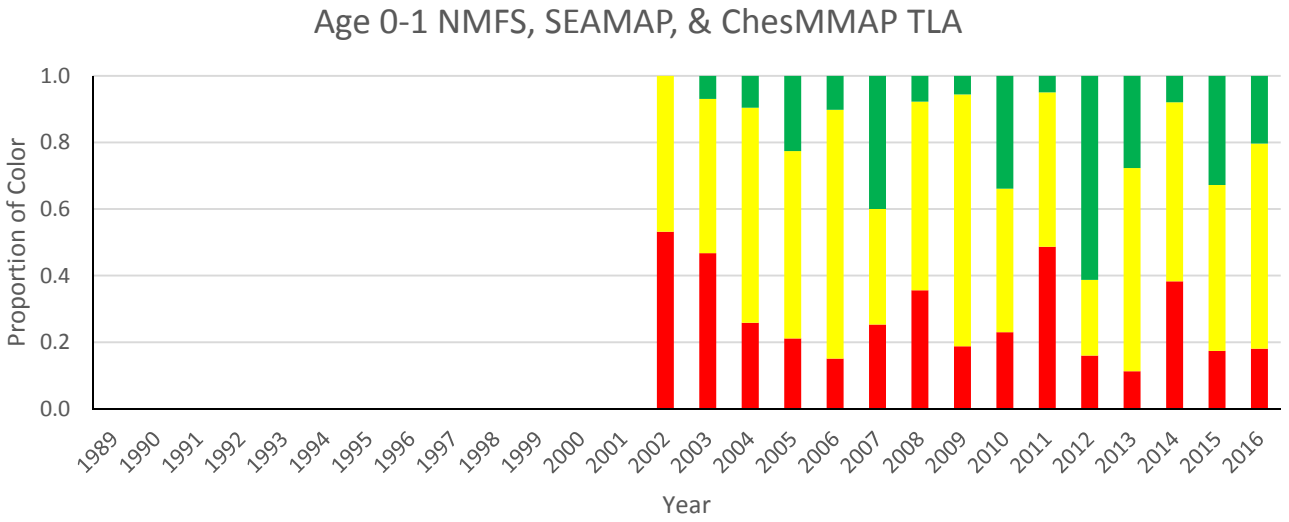


Age 0-1 NMFS, SEAMAP, NC195 & VIMS TLA

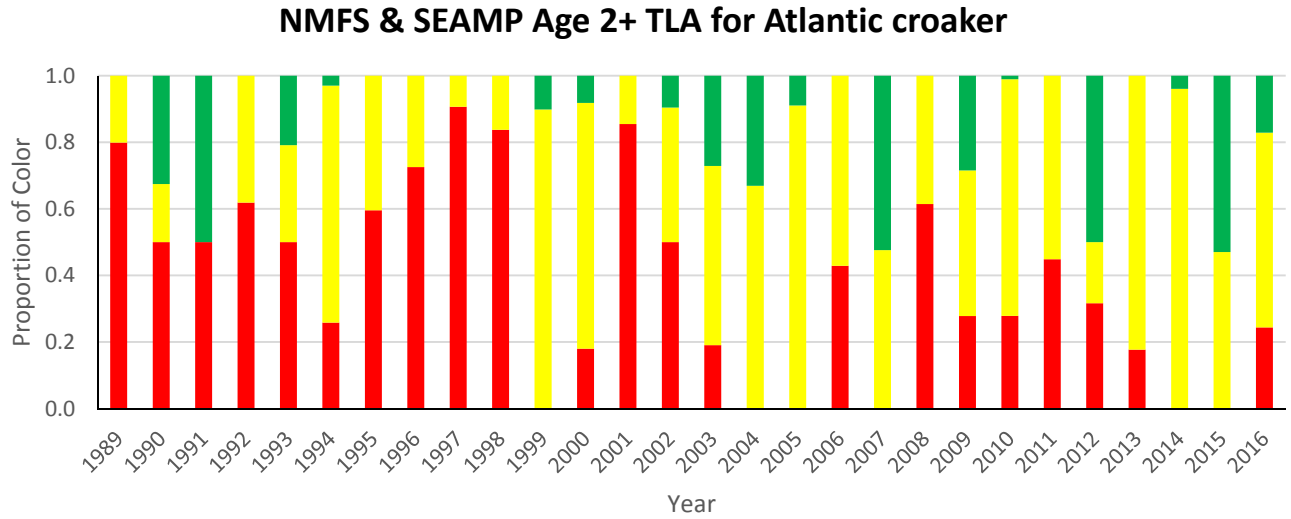


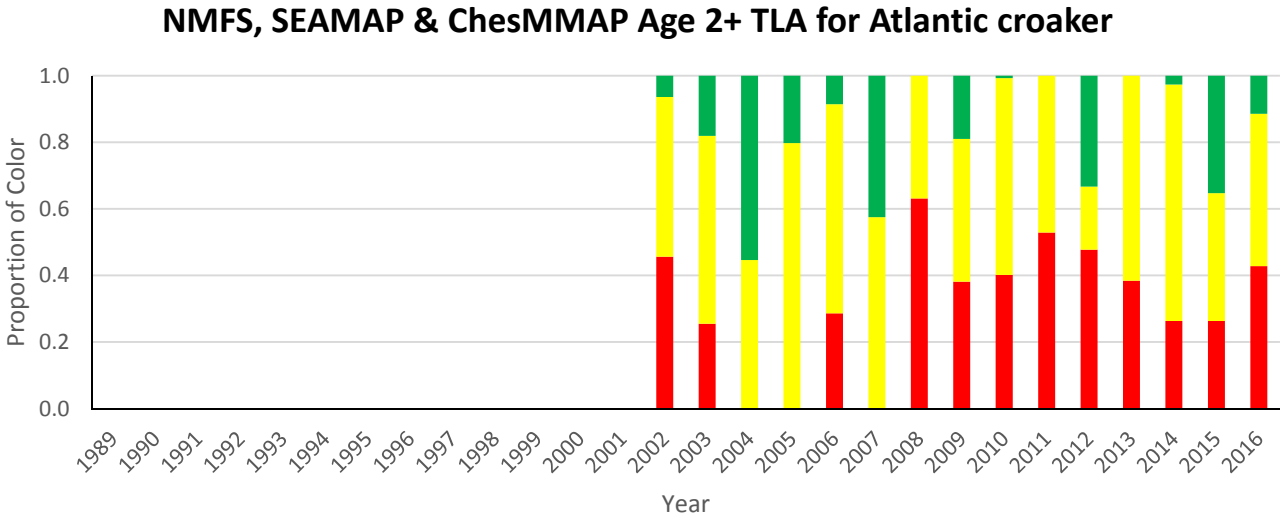
Age 0-1 TLA with additional data sets





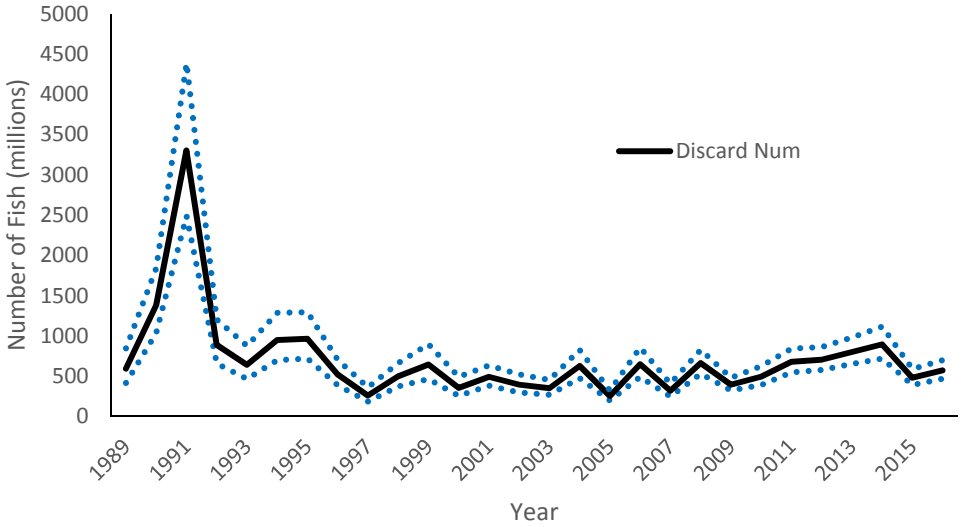
Age 2+ TLA with additional data sets



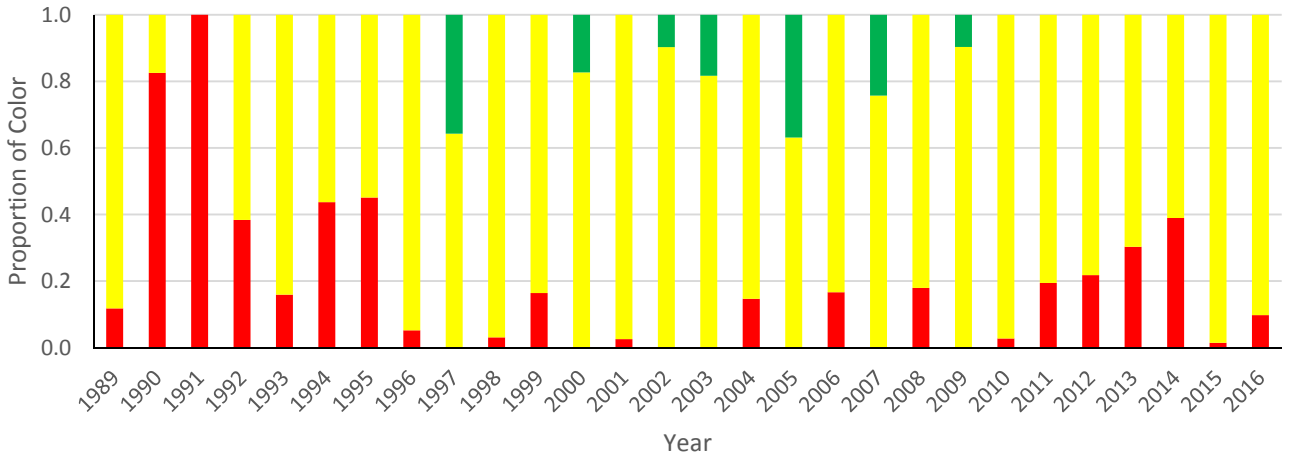


Results: Shrimp Fishery Discards (FD)

Annual estimated discards of Atlantic croaker from southeast shrimp trawl fishery. Dotted lines are 95% confidence limits



Shrimp fishery discards TLA using a 1996-2008 reference period.



Atlantic Croaker: Summary

- Declines in commercial and recreational harvests over the last 5-6 years have not always been mirrored in the fishery independent abundance indices.

- The use of age-partitioned indices provided better clarification of trends among the different indices, particularly between the harvest TLA and the abundance TLA.

- The age partitioned TLA also illustrated which age group was contributing more to the overall trend in each index. It was readily apparent that ages 2+ were driving the trends in the harvest TLA, while the increased variability of ages 0-1 in the harvest TLA behaved more like the abundance surveys.

- Further refinement of the TLA through age partitioning of the annual index CPUE values as well as harvest estimates from the recreational and commercial fisheries could provide a greater degree of synchrony between the different TLA metrics as well as account for discrepancies between TLAs that were not age-partitioned.

Atlantic Croaker: Summary

- The ChesMMAP survey would be a more appropriate addition to the TLA at this time because it has a longer time series (2002-present) that has a great deal of overlap with the reference time period.

- NEAMAP, while providing valuable data on abundance across a wide geographic range, still has a relatively short time series that doesn't cover a complete generation cycle for Atlantic croaker (~15 years).

- Since Atlantic croaker make up such a large proportion of the shrimp trawl fishery by-catch, and are the single largest sources of annual removals, the inclusion of this metric really helps inform on total fishery directed mortality on the Atlantic croaker population.
    - However, due to uncertainties in the effort levels of shrimp fishery discard estimates, this index would be better utilized as an advisory index in the management trigger exercise and not one of the actual management triggers.

QUESTIONS?