# Atlantic States Marine Fisheries Commission

## South Atlantic State/Federal Fisheries Management Board

*August 6, 2019*
*10:15 a.m. – Noon*
*Arlington, Virginia*

## Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

| | | |
|---|---|---|
| 1. | Welcome/Call to Order (*P. Geer*) | 10:15 a.m. |
| 2. | Board Consent<br>• Approval of Agenda<br>• Approval of Proceedings from May 2019 | 10:15 a.m. |
| 3. | Public Comment | 10:20 a.m. |
| 4. | Amendment 1 to the Cobia Fishery Management Plan for Final Approval **Final Action**<br>• Review Options and Public Comment Summary (*M. Schmidtke*)<br>• Review Committee Reports (*M. Schmidtke, A. Giuliano*)<br>• Consider Final Approval of Amendment 1 (*P. Geer*) | 10:30 a.m. |
| 5. | Review 2019 Traffic Light Analyses for Atlantic Croaker and Spot *(*C. *McDonough*) | 11:20 a.m. |
| 6. | Consider Approval of 2019 Fishery Management Plan Reviews and Compliance for Atlantic Cobia and Atlantic Croaker *(M. Schmidtke)* **Action** | 11:35 a.m. |
| 7. | Other Business/Adjourn | 12:00 p.m. |

The meeting will be held at the Westin Crystal City, 1800 S Eads Street, Arlington, VA 22202; 703.486.1111

# MEETING OVERVIEW

**South Atlantic State/Federal Fisheries Management Board Meeting**
**Tuesday, August 6, 2019**
**10:15 a.m. – 12:00 p.m.**
**Arlington, Virginia**

| | | |
|---|---|---|
| Chair: Pat Geer (VA)<br>Assumed Chairmanship: 02/18 | Technical Committee (TC) Chairs:<br>Black Drum: Harry Rickabaugh (MD)<br>Cobia: Angela Giuliano (MD)<br>Atlantic Croaker: Chris McDonough (SC)<br>Red Drum: Vacant | Law Enforcement Committee Representative: Capt. Bob Lynn (GA) |
| Vice Chair: Robert H. Boyles, Jr. | Advisory Panel Chair: Tom Powers (VA) | Previous Board Meeting: February 6, 2019 |
| Voting Members: NJ, DE, MD, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS, SAFMC (12 votes) | | |

**2. Board Consent**

- Approval of Agenda
- Approval of Proceedings from May 2, 2019

**3. Public Comment –** At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

**4. Amendment 1 to the Cobia Fishery Management Plan (10:30 a.m. – 11:20 p.m.) Final Action**

**Background**

- In May 2018, the Board initiated Draft Amendment 1 to the Cobia Fishery Management Plan (FMP) to reflect removal of Atlantic cobia from the South Atlantic and Gulf of Mexico Fishery Management Councils' Coastal Migratory Pelagic Resources FMP and establish recommendations for measures in federal waters.
- In October 2018, the Board reviewed public comment on a Public Information Document (PID) and gave direction to the Cobia Plan Development Team (PDT) on options to be included in Draft Amendment 1.
- In May 2019, the Board approved Draft Amendment 1 for Public Comment. Four public hearings were held via webinar and in-person in Virginia, North Carolina, and South Carolina (**Briefing Materials**). Written comments were accepted through July 15, 2019 (**Briefing Materials**).

- The Advisory Panel (**Briefing Materials**) and Cobia Technical Committee (**Supplemental Materials**) met via webinar and have developed or will develop recommendations for Board consideration.

**Presentations**

- Public Comment Summary for Draft Amendment 1 to the Interstate Fishery Management Plan for Atlantic Migratory Group Cobia by M. Schmidtke.
- Advisory Panel and Cobia Technical Committee Report on Draft Amendment 1 by M. Schmidtke and A. Giuliano.

**Board actions for consideration at this meeting**

- Review public comment and consider final approval for Draft Amendment 1 to the Cobia FMP.

**5. 2019 Traffic Light Analyses for Atlantic Croaker and Spot (11:20 a.m. – 11:35 a.m.)**

**Background**

- Addendum II (2014) of the Atlantic Croaker Fishery Management Plan (FMP) and Addendum II (2014) of the Spot FMP establish the Traffic Light Analyses (TLA) as a new management framework for these species in non-assessment years (**Supplemental Materials**).

**Presentations**

- 2019 TLA Reports for Atlantic croaker and Spot by C. McDonough.

**6. Consider Approval of 2019 Fishery Management Plan Reviews and Compliance for Atlantic Cobia and Atlantic Croaker (11:35 a.m. – 12:00 p.m.) Action**

**Background**

- Atlantic cobia state compliance reports are due on July 1. The Atlantic Croaker Plan Review Team (PRT) has reviewed state reports and compiled the annual FMP Review. New Jersey, Delaware, and Maryland have requested *de minimis* status (**Supplemental Materials**).
- Atlantic croaker state compliance reports are due on July 1. The Atlantic Croaker Plan Review Team (PRT) has reviewed state reports and compiled the annual FMP Review. Delaware (commercial), South Carolina (commercial), Georgia (commercial), and Florida (commercial) have requested *de minimis* status (**Supplemental Materials**).

**Presentations**

- 2019 FMP Reviews for Atlantic cobia and Atlantic croaker by M. Schmidtke.

**Board actions for consideration at this meeting**

- Consider approval of the 2019 FMP Reviews, state compliance, and *de minimis* requests for Atlantic cobia and Atlantic croaker.

**7. Other Business/Adjourn**

# Atlantic States Marine Fisheries Commission

## Cobia Technical Committee

## Call to Review Draft Amendment 1

*July 25, 2019*

**Call Summary**

**TC Attendees:** Shanna Madsen (NJ), Angela Giuliano (MD), Alex Aspinwall (VA), Anne Markwith (NC), Mike Denson (SC), Chris Kalinowsky (GA), Mike Larkin (NOAA-SERO)

**ASMFC Staff:** Mike Schmidtke

The Cobia Technical Committee (TC) met to review and provide recommendations to the South Atlantic State/Federal Fisheries Management Board on issues and options addressed in Draft Amendment 1.

Mike Schmidtke presented the issues of Draft Amendment 1. Prior to going through the issues, Schmidtke described current management and assessment information for Atlantic cobia. Of note, current management is still being conducted using recreational catch estimates derived using the Marine Recreational Information Program's (MRIP) effort data from the Coastal Household Telephone Survey (CHTS). Following completion of the currently ongoing stock assessment (Southeast Data, Assessment, and Review [SEDAR] 58), future management will use estimates derived using the new, mail-based Fishing Effort Survey (FES).

The issues of Draft Amendment 1 and the TC's recommendation and a summary of discussion for each are listed below:

**Issue 1: Edit to Section 2.3 Goal**
**The TC supports this edit.**

**Issue 2: Edit to Section 2.4 Objectives**
**The TC supports this edit.**

**Issue 3: Edit to Section 2.6 Definition of Overfishing**
**The TC supports this edit.**

**Issue 4: Edit to Section 3.1.1 Commercial Landings/Catch Monitoring**
**The TC supports this edit.**

**Issue 5: Section 4.1 Harvest Specification Process**
**The TC supports Option b:** The coastwide total harvest quota, vessel limits, possession or bag limits, minimum size limits, and commercial closure triggering mechanism may be specified by

Board action for up to three years. Subsequent harvest specification would occur for implementation after expiration of the previous specification (up to two years apart) or following a completed stock assessment.

- The TC supports this option with recognition that it allows the Board to specify harvest on a timeframe shorter than 3-years, should circumstances in the management or assessment of this fishery necessitate.

**Issue 6: Section 4.2 Sector Quota Allocation**
**The TC supports the section as written (92% recreational, 8% commercial allocations).**

**Issue 7: Edit to Section 4.3.5 Evaluation of Recreational Landings and Overage Response**
**The TC supports the edit.**

**Issue 8: Section 4.3.6 Recreational Units**
**The TC supports Option b:** Recreational landings, quotas, and targets will be evaluated and set in units of numbers of fish.

- Mike Denson asked when the current default conversion average weight (28 lb) would be re-evaluated. Schmidtke commented that if the assessment can convey a quota in numbers of fish in the future, this conversion would not be necessary. Denson noted that this conversion strategy could result in leaving fish "on the table" in some years and dealing with overages in others, as the average weight varies over time. Schmidtke noted that average weight can vary spatially as well, which was considered by the Plan Development Team when writing this option.
- Denson asked how often alternative state data could be brought up for consideration. Schmidtke noted that evaluation of such data could be completed between consecutive Board meetings and applied after approval, so it could be brought to the Board's attention at any time.
- The TC notes that management through numbers of fish removes some steps of catch estimate uncertainty that are specific to the estimation of poundage from numbers.
- Option b also agrees with the TC's memo to the Board discussing recreational landings evaluation from July, 2018.

**Issue 9: Section 4.4.1 Commercial Size Limit**
**The TC supports Option b:** All states shall maintain a minimum size limit of 36 inches fork length or the total length equivalent (40 inches).

- The TC noted that biologically the current difference in commercial and recreational size limits does not make much difference, especially since the quotas are managed based on weight. However, if aligning these limits could reduce stakeholder confusion on regulations or improve enforcement, that could be worthwhile.

**Issue 10: Section 4.4.3 Commercial Vessel Limit**
**The TC supports Option a:** (Status Quo) All states shall maintain a daily vessel limit, not to exceed 6 fish per vessel.

- Motivation for this issue came primarily from SC recreational fishermen that want cobia to have greater recreational value and possible consideration as a coastwide gamefish.
- Biologically, maintaining or changing the vessel limit would not matter due to the limiting of the commercial fishery by a quota and closures if the quota is reached. The main difference in the options would be in potentially how long into a year the commercial fishery could remain open.
- Some current state regulations already limit the commercial fishery beyond the requirements of the FMP.
- The TC recommends status quo due to no information indicating a need to divert from it.

**Issue 11: Section 4.4.4 Commercial Quota Based Management**
**The TC supports the section as written.**

**Issue 12: Section 4.5.3.3 Commercial *De Minimis***
**The TC supports Option b:** States may apply for *de minimis* status for their commercial fishery.

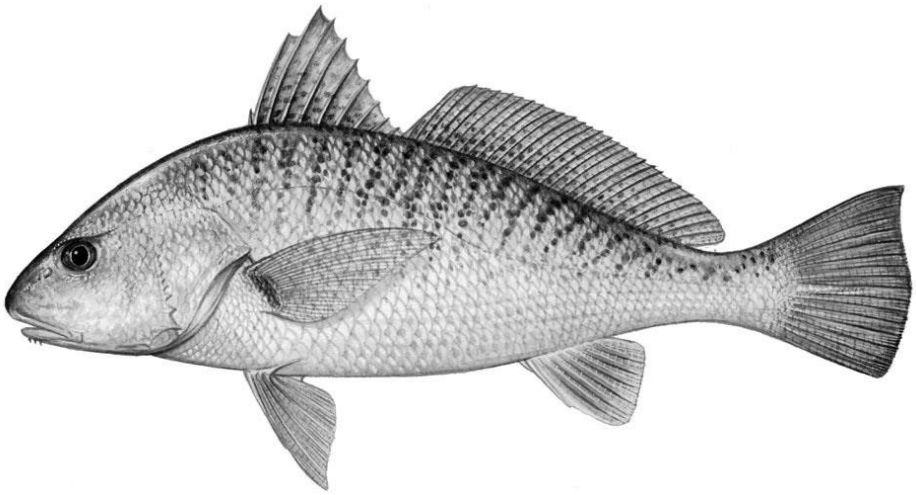
**Issue 13: Section 4.9 Recommendation to the Secretary of Commerce for Complementary Actions in Federal Jurisdictions**
**The TC supports Option b:** Recreational regulations in federal waters will be recommended to correspond to the location of catch, with regulations persisting along a latitudinal extension (due directly east) of state boundaries into federal waters. Commercial regulations in federal waters will be recommended to correspond to those of the vessel's permitted or licensed state of landing. If possessing permits or licenses for multiple states with open seasons, regulations for the most restrictive open state shall apply. If possessing permits or licenses for multiple states, only one of which is open, regulations for the state with an open season shall apply.

- Regardless of which option is selected, states with possession or landing limits would still be able to determine how many cobia can be brought into their state. State laws still apply in state waters. The only difference for vessels from such states would be in how regulations are enforced during on-the-water law enforcement stops in federal waters.

The TC also elected Angela Giuliano (MD) as the Chair and Mike Denson (SC) as the Vice Chair.

# Traffic Light Analysis of Atlantic Croaker (*Micropogonias undulatus)* for the Atlantic States Marine Fisheries Commission Fishery Management Plan Review.

## 2018 Fishing Year




**Atlantic Croaker Plan Review Team**

*****Chris McDonough, South Carolina Department of Natural Resources
Mike Schmidtke, Ph.D., Atlantic States Marine Fisheries Commission, Chair
Ethan Simpson, Virginia Marine Resources Commisison
Daniel Zapf, North Carolina Division of Marine Fisheries

*Prepared Analysis and Report

## Introduction

Atlantic croaker are managed under Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker (2005) and Addenda I (2011) and II (2014). The Amendment does not require any specific measures restricting harvest but encourages states with conservative measures to maintain them. It also implemented a set of management triggers, based on an annual review of certain metrics, to respond to changes in the fishery or resource and initiate a formal stock assessment on an accelerated timeline if necessary. Addendum I revised the management program's biological reference points to assess stock condition on a coastwide basis as recommended by the 2010 stock assessment.

In August 2014, the South Atlantic State/Federal Fisheries Management Board (SAB) approved Addendum II to Amendment I to the Atlantic Croaker Fishery Management Plan (FMP). The Addendum established the Traffic Light Approach (or TLA) to evaluate fisheries trends and develop state-specified management actions (i.e., bag limits, size restrictions, time & area closures, and gear restrictions) when harvest and abundance thresholds are exceeded. The most recent benchmark stock assessment for Atlantic croaker was completed in 2017 (ASMFC, 2018) and provided more data for further refinement and modification of the existing TLA, as recommended by the Atlantic Croaker Technical Committee (TC). This report still uses the TLA established in Addendum II, which will be presented to the SAB in August of 2019. The revised TLA will be presented as part of Draft Addendum III, which will be considered by the SAB to be released for public comment in October of 2019.

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. It is often used for data-limited species, or species that are not assessed on a frequent basis. As such, its serves as an excellent management tool for Atlantic croaker. 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). For example, as harvest or abundance increase relative to their long-term mean, the proportion of green in a given year will increase, and as harvest or abundance decrease, the amount of red in that year becomes more predominant. Under Addendum II, 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.

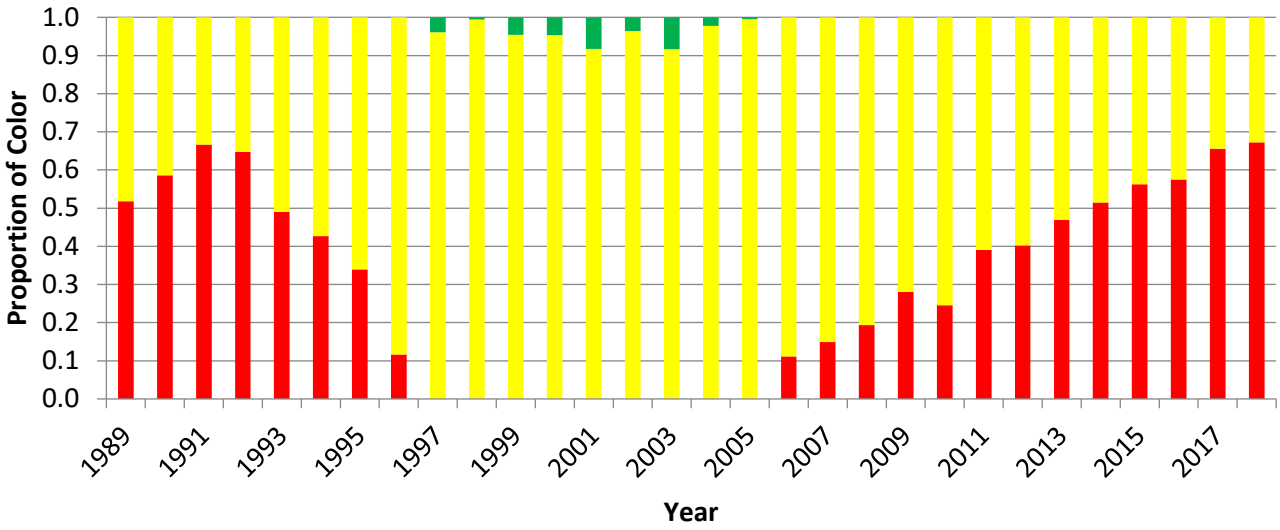
The indices used for the TLA include both commercial and recreational harvest (fishery dependent) and four fishery-independent monitoring surveys that occur in different areas of the Atlantic coast of the United States. The fishery-independent surveys include the Northeast Fisheries Science Center (NMFS) fall ground fish trawl survey, the Virginia Institute of Marine Science (VIMS) trawl survey, the North Carolina Division of Marine Fisheries trawl program 195, and the Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey. The VIMS and NC Program 195 surveys are juvenile surveys that are used to monitor the status of recruitment but do not necessitate management action if tripped.

## Traffic Light Analysis (Fishery Dependent)

*Commercial Landings*

- Commercial landings continued to decline in 2018 (1,619 metric tons) from 2017 (1,845 metric tons) and represented the 13th year of decline in commercial croaker landings.
- The TLA for commercial landings has been above the 30% threshold every year since 2011 (Fig. 1) and 2018 was the 8th year in a row where landings were above the 30% threshold.
- More concerning is that the red proportion has been above the 60% red threshold for the last two years of the series (2017-2018).
- The three year mean red proportion for croaker has exceeded 30% since 2010 and has exceeded 60% for the last three years. The continued steady decline in croaker landings in recent years represent some of the lowest landings levels in the time series.

**Figure 1. Annual TLA color proportions for Atlantic croaker commercial landings for the Atlantic coast of the US.**

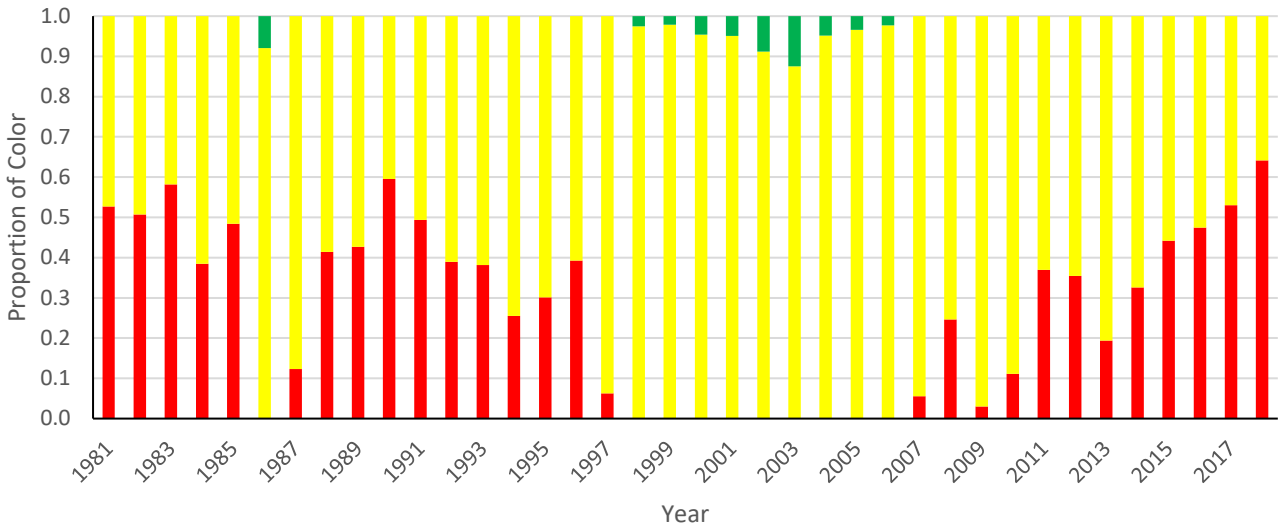



*Recreational Harvest*

- In July, 2018, the Marine Recreational Information Program transitioned from the catch estimates based on effort information from the Coastal Household Telephone Survey (CHTS) to effort information from the mail-based Fishing Effort Survey (FES). FES estimates are used in this and future reports, so recreational estimates and analyses may be different from previous years that used CHTS estimates.
- The recreational harvest index continued to decline, down 39.8% (2,205 metric tons) in 2017 from harvest levels seen in 2017 (2,205 metric tons).
- The recreational harvest level in 2018 (1,366 metric tons) was the lowest annual harvest in the entire time series (1981-2018).

- The proportion of red in the TLA was 64.1% in 2018 increasing from 53.0% in 2017 (Fig. 2), indicating the recreational index would has reached trigger levels for the last 5 years at the 30% level.
- As with commercial landings, the continued decline in harvest levels for Atlantic croaker in the recreational fishery are also cause for concern.

**Figure 2. Annual TLA color proportions for Atlantic croaker from Atlantic coast (NJ-FL) recreational harvest of the U.S. based on a 1996-2008 reference period.**

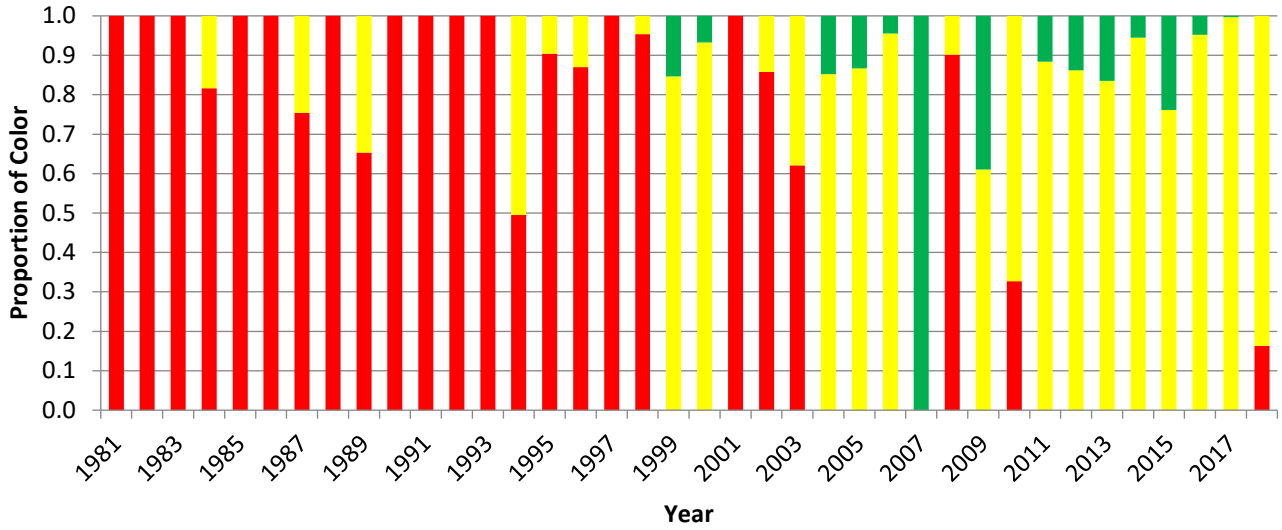



## Traffic Light Analysis (Fishery-Independent Surveys)

*NEFSC/NMFS Fall Groundfish Survey*

- The index value for 2018 was 394.0 fish per tow and represented a 13.9% decrease from 2016 (522.1 fish per tow).
- The NEFSC/NMFS was not carried out in 2017 due to mechanical problems with the RV Bigelow. In the interim, a placeholder index for 2017 was calculated as the mean of 2015-2016 and 2018 (Fig. 3).
- The index was below the long term mean (452.7 fish per tow) for both 2017 and 2018.
- The index has been declining since the series peak in 2007.
- The TLA trigger would not have tripped on the NMFS index in 2018.

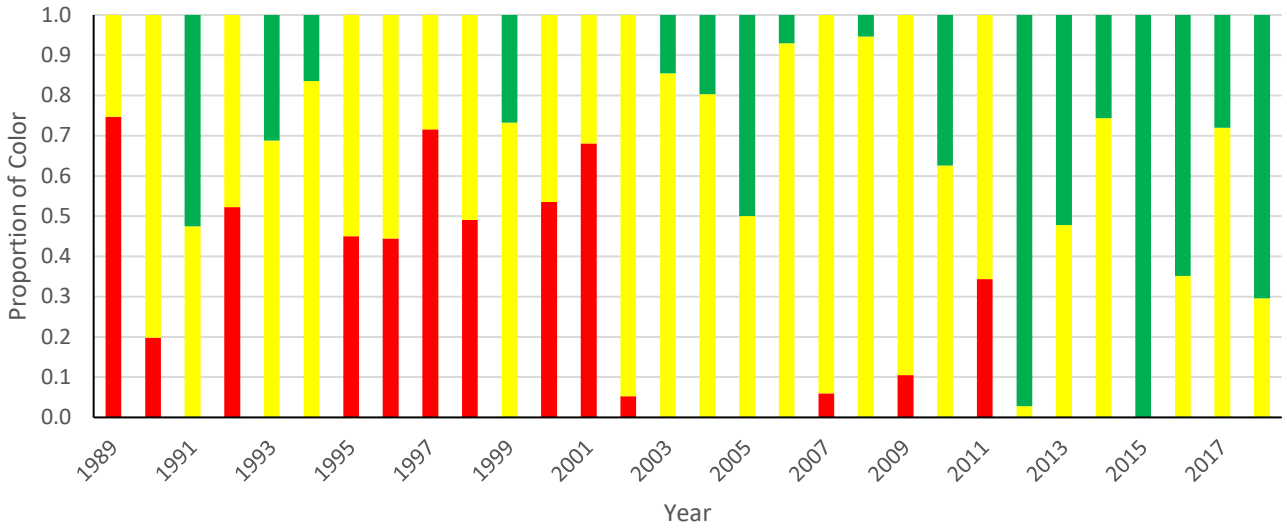
**Figure 3. Annual TLA color proportions for Atlantic croaker from NMFS ground-fish trawl survey based on 1996-2008 reference period.**




*SEAMAP Survey*

- The SEAMAP index increased 65% in 2018 (14.7 kg/tow) from 2017 (8.9 kg/tow).
- Index values have remained above the long term mean since 2012 so there was no red in the TLA (Fig. 4).
- The TLA trigger for the SEAMAP survey did not trip in 2018.

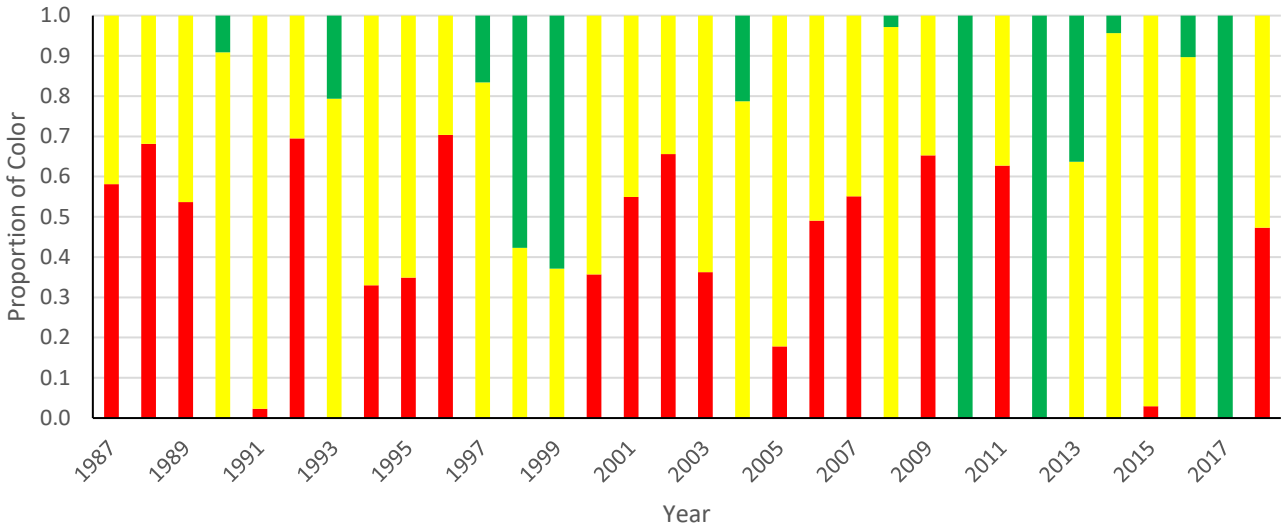
**Figure 4. Traffic Light Model for SEAMAP catch data by weight using a 1996-2008 reference period.**



*North Carolina Program 195*

- The North Carolina index decreased in 2018 (88.1%) to 25.9 fish/tow (versus 137.6 fish/tow in 2017) and was below the long term mean (290.3 fish per tow) resulting in an elevated red proportion (47.3%) in the TLA.
- The low catch level in 2018 was a significant decrease from 2017.

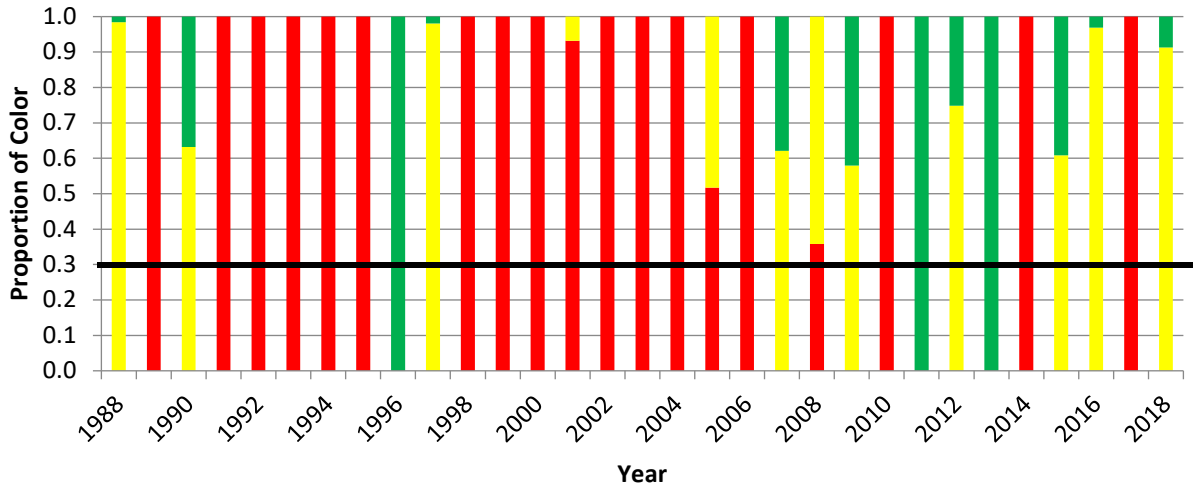
**Figure 5. NCDMF Program 195 TLA color proportions for Atlantic croaker using 1996-2008 reference period.**




*VIMS Survey*

- The VIMS index increased significantly (2447%) in 2018 from 2017 going from 0.614 fish per tow in 2017 to 15.64 fish per tow in 2018. The alternating high variability in annual index values was evident in the alternating proportions of red and green in the TLA for the last 6 years (Fig. 6). High variability in the TLA color proportions was likely due to annual recruitment variations, which would not be uncommon for a juvenile index. The index increase in 2018 was above the long term mean for the 1996-2008 reference period (11.9 fish per tow) but still was 74.3% below the recent peak catch years of 2011 and 2013.
- The index value was above the long term mean in 2018 with no red and a green proportion of 8.6%, so the index would not have tripped the TLA trigger in 2018.

**Figure 6. Annual TLA color proportions for Atlantic croaker from VIMS spring trawl survey using 1996-2008 reference period.**

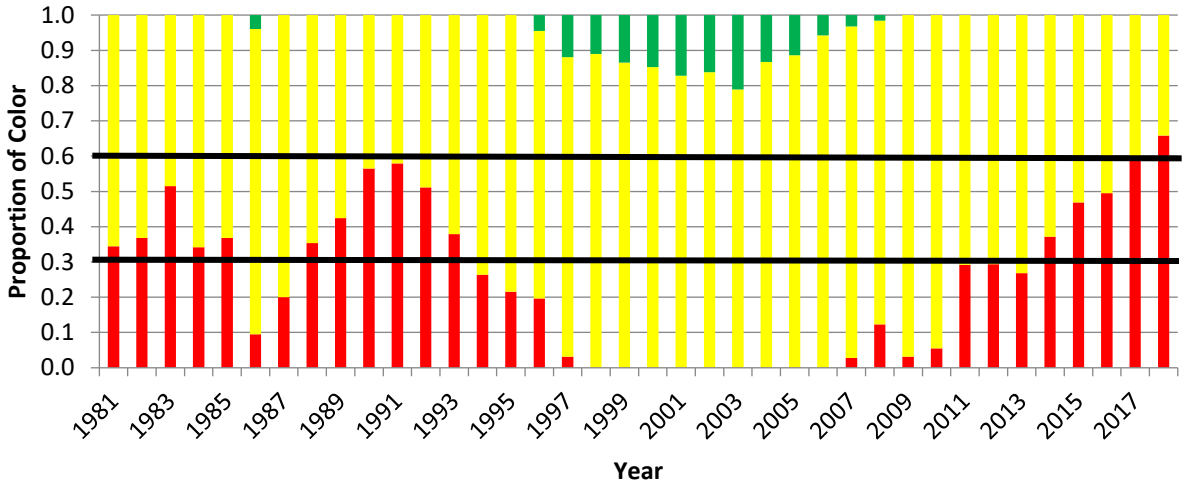



## Traffic Light Analysis (Composite Indexes)

*Harvest Composite Index*

- The harvest composite TLA index indicates that the management response trigger would have been tripped for the fifth year in a row.
- The mean red proportion for the most recent three year time period (2016-2018) was 58.1% with the red proportion being above 60% in 2018 which indicates a significant level of concern.
- The important trend to point out is the continuing decline in recreational and commercial landings for Atlantic croaker with TLA red proportions now exceeding 60%.

**Figure 7. Annual color proportions for harvest composite TLA of Atlantic Croaker recreational and commercial landings**



*Abundance Composite Characteristic Indexes*

The abundance composite TLA index was broken into two components based age composition. The adult composite index was generated from the NMFS and SEAMAP surveys since the majority of Atlantic croaker captured in those surveys were ages 1+. The juvenile composite index was generated from the NC program 195 and VIMS surveys because these two captured primarily young-of-the-year Atlantic croaker.

- Three of the four abundance indexes showed increases in red proportions in 2018.
- The adult composite TLA characteristic (Fig. 8) showed a trend of slowly increasing red proportions over the last three years.
- The juvenile composite TLA characteristic (Fig. 9) in 2018 was below the 30% red threshold. Two of the last three years have been below this threshold.

**Figure 8. Adult croaker TLA composite characteristic index (NMFS and SEAMAP surveys).**

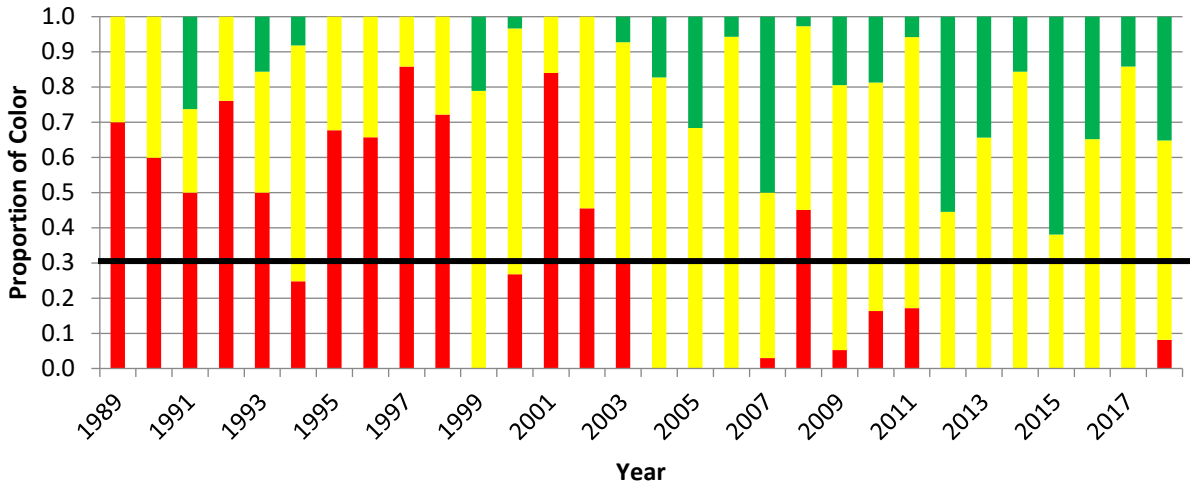
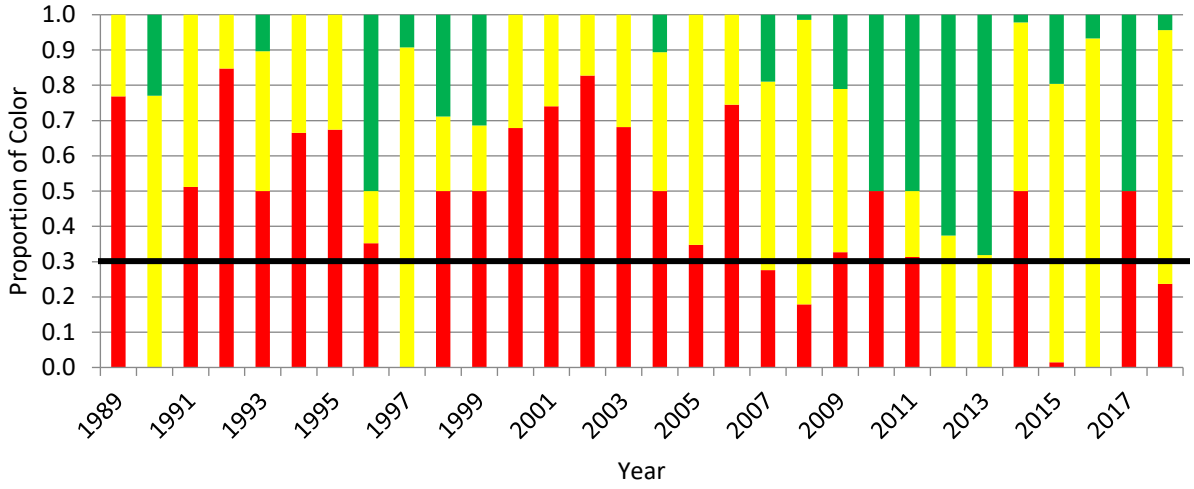


**Figure 9. Juvenile croaker TLA composite characteristic index (NC 195 and VIMS surveys).**



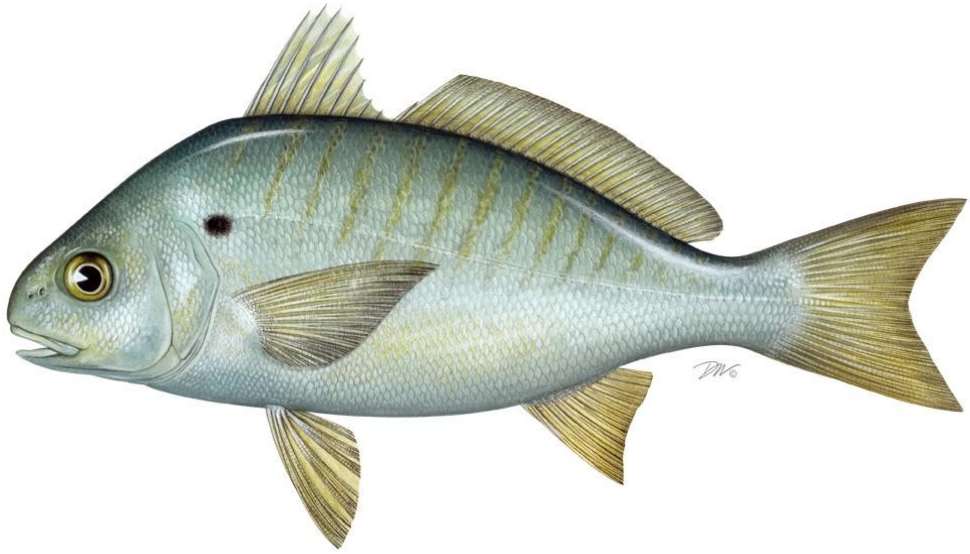

Neither the adult or juvenile composite characteristic index tripped in 2018, with red proportions less than 30% for all of the three terminal years of the adult composite index and two of the three terminal years of the juvenile composite index. The higher annual variability for the different color proportions in the juvenile composite characteristic (compared to the adult composite characteristic) is likely a reflection of annual recruitment variability rather than population trends.

## Summary

The harvest composite TLA tripped in 2018 (for the fourth year in a row) while the abundance TLA composite did not trip. The continued declining trend in the commercial and recreational harvests for the Atlantic coast is a concern since the decline has become greater in the last two years. The recently completed Atlantic croaker stock assessment (ASMFC 2017) was not accepted for management use, in part due to the conflicting signals shown by abundance and harvest metrics. The explanation for this discrepancy may lie in differing size and age structures of the different fishery-independent surveys and commercial and recreational landings as well as confounding signals occurring in different regions (mid-Atlantic vs. south Atlantic). Using an age partitioning approach while examining different (and additional) indices on a regional perspective was recommended by the Atlantic croaker Technical Committee for further refinement of the TLA, providing more synchrony between the harvest and landings metrics for adults as well as juveniles. The next section of this report illustrates this point by presenting both an age structured and regional TLA with additional fishery-independent surveys.

# 2019 Traffic Light Analysis of Spot (*Leiostomus xanthurus)* for the Atlantic States Marine Fisheries Commission Fishery Management Plan Review.

## 2018 Fishing Year




## Plan Review Team

*Chris McDonough, South Carolina Dept. of Natural Resources
Mike Schmidtke, Atlantic States Marine Fisheries Commission (Chair)
Dawn Franco, Georgia Dept. of Natural Resources
Ethan Simpson, Virginia Marine Resources Commission
Harry Rickabaugh, Maryland Dept. of Natural Resources
Daniel Zapf, North Carolina Division of Marine Fisheries

*Prepared analysis and report

## Introduction

Spot is managed under the Omnibus Amendment for Spot, Spotted Seatrout, and Spanish Mackerel (2011) and Addendum I (2014). The Omnibus Amendment updates all three species plans with requirements of the Commission's ISFMP Charter. The Benchmark Stock Assessment for spot in 2017 was not recommended for management use due to uncertainty in biomass estimates due to conflicting signals among abundance indices and catch time series, as well as sensitivity of model results to assumptions and model inputs.

Previously, in the absence of a coastwide stock assessment, the South Atlantic Board approved Addendum I to the Spot FMP in 2014. The Addendum establishes use of a Traffic Light Analysis (TLA), similar to that used for Atlantic croaker, to evaluate fisheries trends and develop state-specified management actions (e.g., bag limits, size restrictions, time and area closures, and gear restrictions) when harvest and abundance thresholds are exceeded for two consecutive years. The most recent benchmark stock assessment for spot (ASMFC, 2018) provided more data for further refinement and modification of the existing TLA as recommended by the Spot Plan Review Team (PRT). This report still uses the TLA established by Addendum I, which will be presented to the SAB in August of 2019. The revised TLA will be presented as part of Draft Addendum II, which will be considered by the SAB to be released for public comment in October of 2019.

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. It is often used for data-poor species, or species which are not assessed on a frequent basis. 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). For example, as harvest or abundance increase relative to their long-term mean, the proportion of green in a given year will increase and as harvest or abundance decrease, the amount of red in that year becomes more predominant. The TLA improves the management approach as it illustrates long-term trends in the stock and includes specific management recommendations in response to declines in the stock or fishery. Under Addendum I, state-specific management action would be initiated when the proportion of red exceeds specified thresholds (30% or 60%), for both harvest and abundance, over two consecutive years.

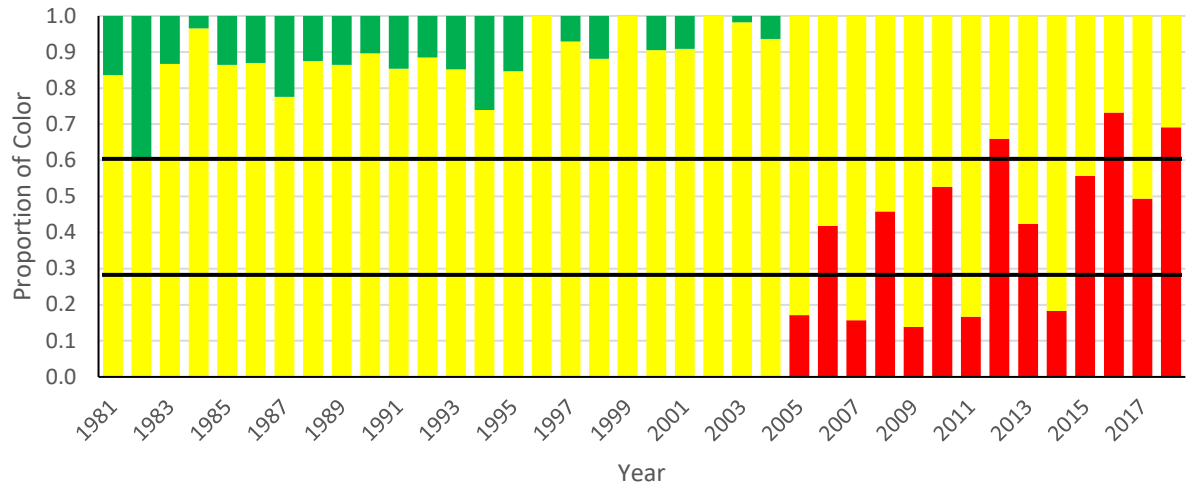
The current management triggers for spot compare annual changes in various indices (e.g. recent landings and survey information) to review trends in the fisheries. The spot Plan Review Team expressed concern that the previous review methodology did not illustrate long-term trends in the stock nor did it include specific management measures to implement in response to declines in the stock or fishery. 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, the Maryland Department of Natural Resources juvenile striped bass seine survey, and the Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey.

## Traffic Light Analysis (Fishery Dependent)

*Commercial*

- Commercial landings for spot on the Atlantic coast decreased 59.5% in 2018 from 2017. Landings were still well below the long term mean although they were up from the time series low which occurred in 2016. Long term, there is still a declining trend in commercial landings that has been occurring since 2003. Total annual landings have declined 86.7% from 2004 to 2018.
- The TLA for commercial landings had relatively stable proportions of green and yellow throughout the 1980s and 1990s but began declining in the early 2000s as evidenced by increasing proportions of red (Fig. 1). The long term mean for the reference time series (1989-2012) was 5,744,635 pounds per year but the average landings since 2010 have dropped to 2,886,785 pounds, with a total of 878,077 pounds in 2018.
- The TLA commercial index did trip at the 60% level in 2018 and represents the third year since 2012 where this has happened.

Figure 1. Annual TLA color proportions using 1989-2012 reference period for spot from commercial landings for the Atlantic coast of the US.

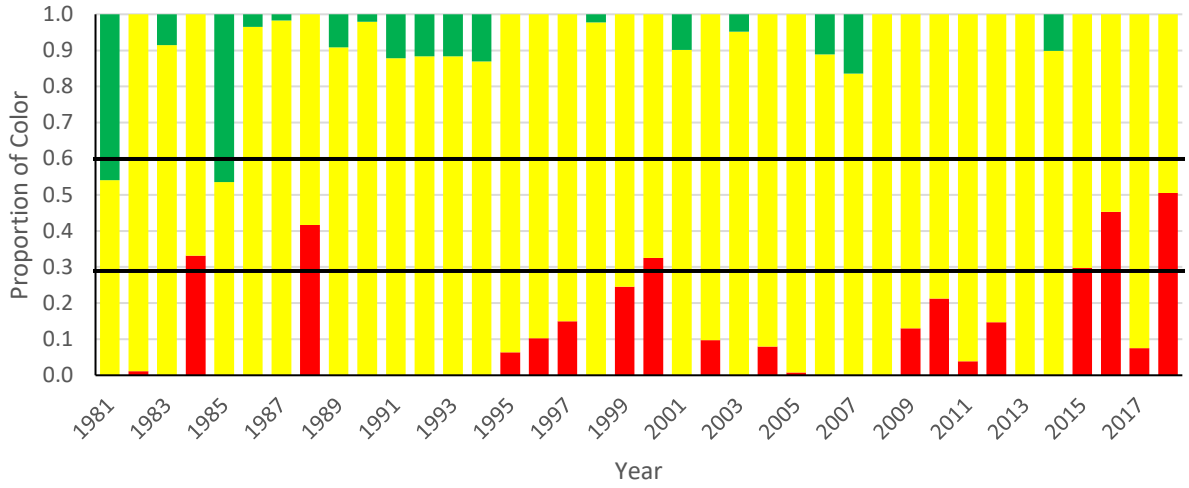



*Recreational*

- In July, 2018, the Marine Recreational Information Program transitioned from the catch estimates based on effort information from the Coastal Household Telephone Survey (CHTS) to effort information from the mail-based Fishing Effort Survey (FES). FES estimates are used in this and future reports, so recreational estimates and analyses may be different from previous years that used CHTS estimates.

- The recreational harvest for spot on the Atlantic coast decreased 59.7% from 2017 to 2018, with values of 7,636,915 pounds and 3,068,469 pounds, respectively.
- Annual harvest in the recreational fishery has been below the long term mean (LTM) since 2009 (with the exception of one year, 2014) and was still below that threshold in 2018.
- The red proportion of the TLA increased dramatically in 2018 to 50.5%. While the red proportion in 2017 was below the concern threshold, the recreational TLA did not trip in 2018 since it was not above the 30% threshold for both of the previous two years.

Figure 2. Atlantic coast TLA for recreational spot harvest on the Atlantic coast of the United States.

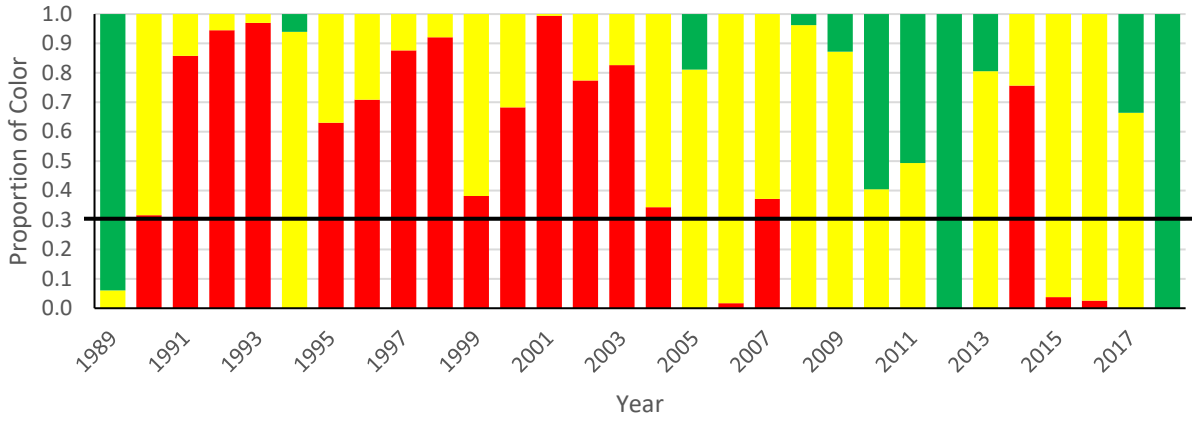



## Traffic Light Analysis (Fishery Independent)

*NEFSC/NMFS Fall Groundfish Trawl Survey*

- The NEFSC/NMFS survey was not carried out in 2017 due to mechanical problems with the RV Bigelow. In the interim, a placeholder index for 2017 was calculated as the mean of 2015-2016 and 2018 (Fig. 3).
- The CPUE for spot in 2018 increased significantly from 2016 and the placeholder value estimated for 2017.
- There was no red in the TLA index for 2018, so this index did not trigger.

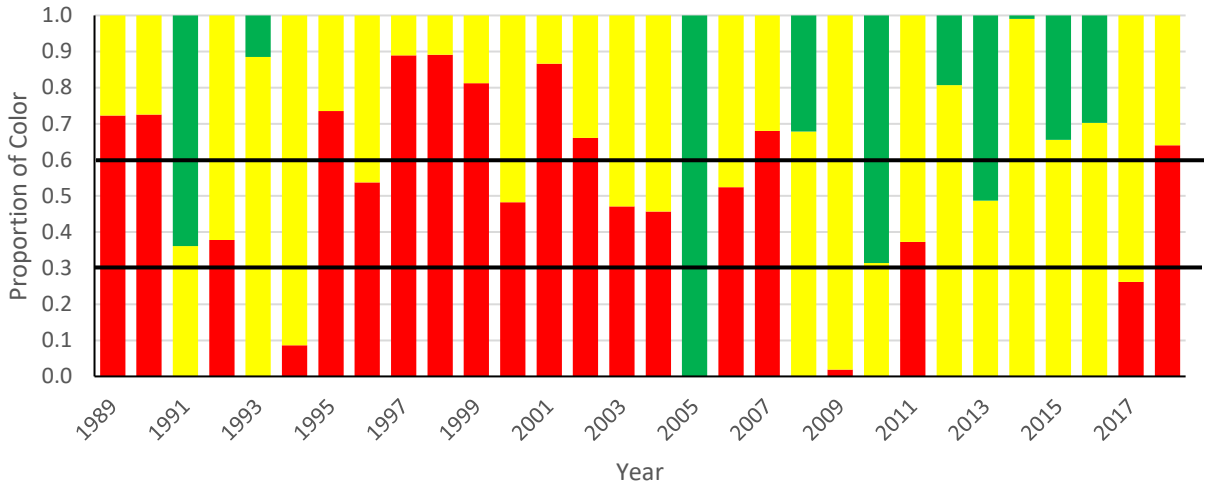
Figure 3. Non-proportioned annual TLA model using 1989-2012 reference time period for Spot from NMFS fall groundfish trawl survey.




*SEAMAP Trawl Survey*

- The annual CPUE declined 51.2% in 2018 from 2017 and represented two consecutive years below the long term mean (11.3 kg fish per tow).
- The TLA index did trigger in 2018 for the first time since 2007 with a red proportion of 64% (Fig. 4).

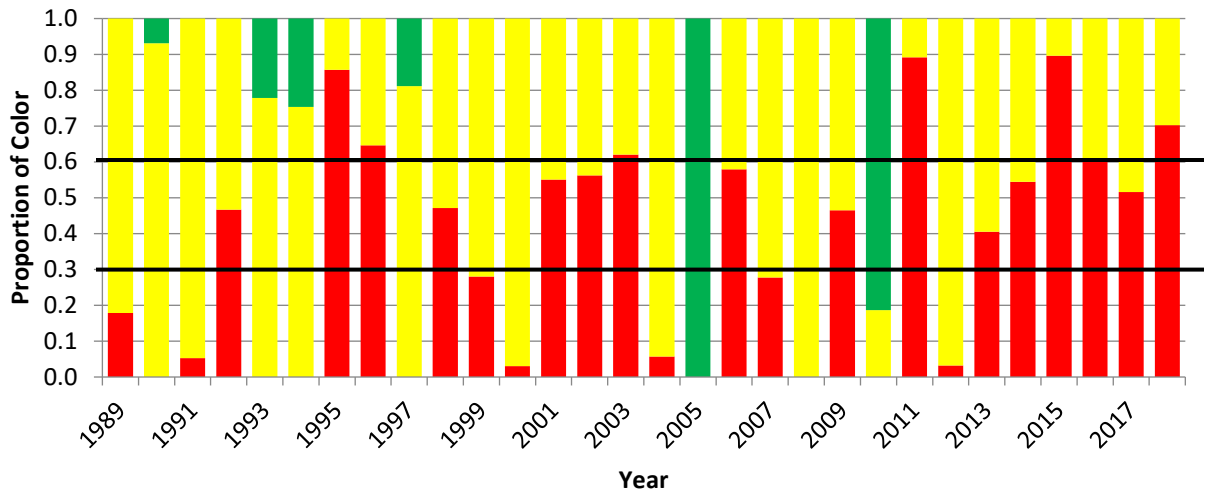
Figure 4. Annual color proportions for spot TLA from the fall SEAMAP survey using a 1989-2012 reference period



*Maryland Juvenile Striped Bass Survey*

- Since the Maryland survey was the only juvenile index used in the trigger exercise it was used by itself to compare to the other two composite characteristic indices (harvest and abundance).
- The Maryland CPUE declined 41.4% in 2018 from 2017 and remained below the long term mean (0.526 fish per tow) (Fig. 5).
- Mean annual CPUE was below the long term mean for the eighth year in a row, indicating annual recruitment and year-class strength remain poor in the Maryland portion of the Chesapeake Bay.
- The TLA trigger did trip in 2018 for the sixth year in a row with a red proportion of 70.2%.
- The index tripping at both the 30% and 60% levels for 2013-2018 indicates cause for concern as the general decline in this index indicates a decline in spot recruitment in Maryland waters has been occurring.

Figure 5. Annual TLA color proportions for the Maryland seine survey juvenile index using 1989-2012 reference period.



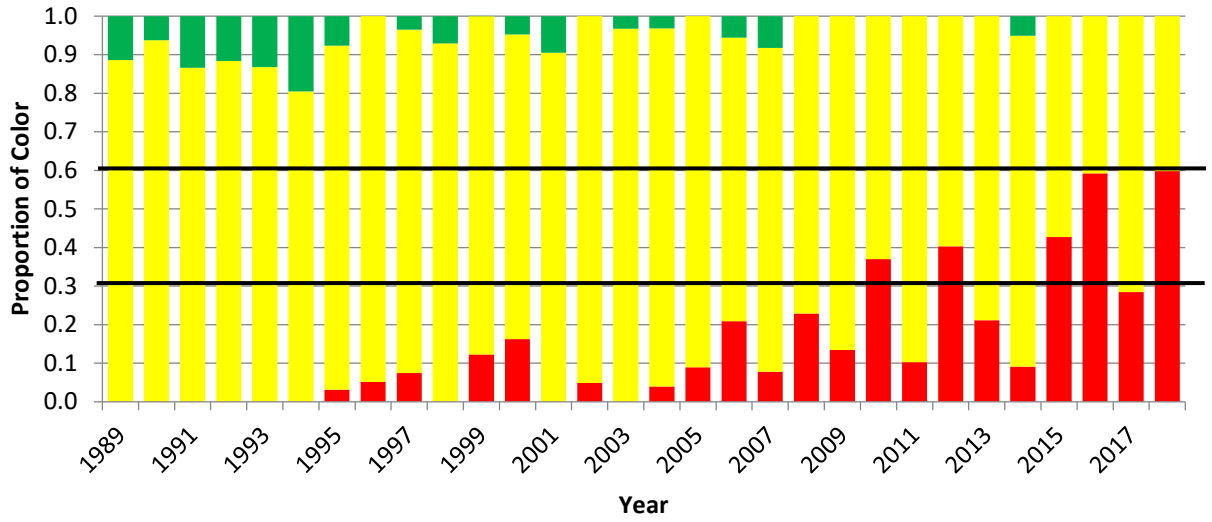

## Traffic Light Analysis (Composite Indexes)

*Harvest Composite Characteristic Index*

- The harvest composite characteristic TLA shows the general decline in landings since 2008, with increasing proportions of red annually (Fig. 6).
- The composite characteristic did trip in 2018 (30% level) but does not trigger a management response because the 2017 proportion red was below 30%.

- The red proportion increased in 2018 from 2017 and approached the 60% threshold. This was likely driven more by the decline in commercial landings rather than the recreational harvest.
- 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.

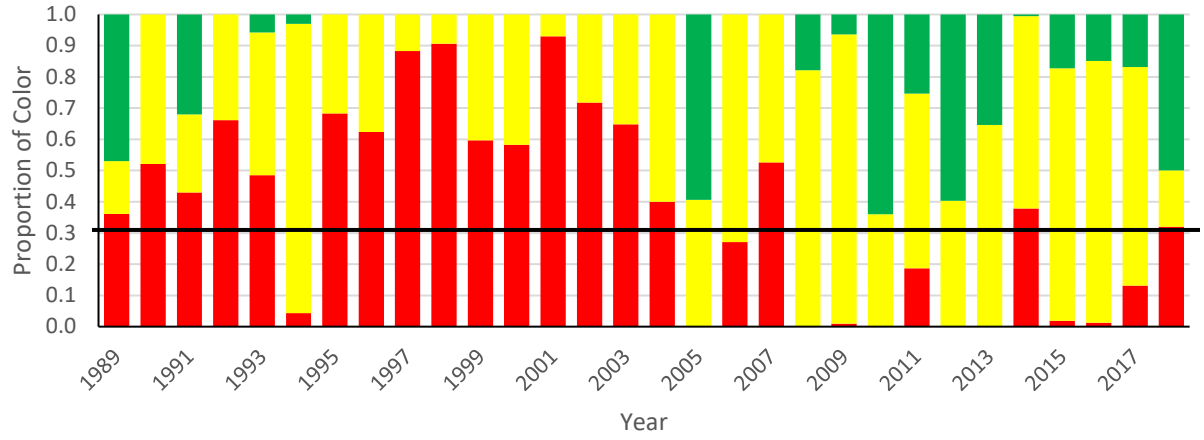
Figure 6. Annual TLA color proportions for harvest composite (commercial and recreational landings) for spot on the Atlantic coast of the US using 1989-2012 reference period.




*Abundance Composite Characteristic Index*

- The TLA composite characteristic for adult spot (NMFS and SEAMAP surveys) was a bit odd in 2018 in that it showed an increase in both the proportions of red and green (Fig. 7).
- The decline in catch levels in the SEAMAP index (red proportion of 64%) and the increase in the NMFS index (green proportion of 100%) would account for this.
- While the composite characteristic TLA for the abundance indices did have a red proportion greater than 30% from the SEAMAP index, it did not trigger because it represents the first year since 2014 where red values have exceeded the 30% threshold.

**Figure 7. Annual TLA for spot for composite characteristic of adult fishery independent surveys (NMFS and SEAMAP) using a 1989-2012 reference period.**




## Summary

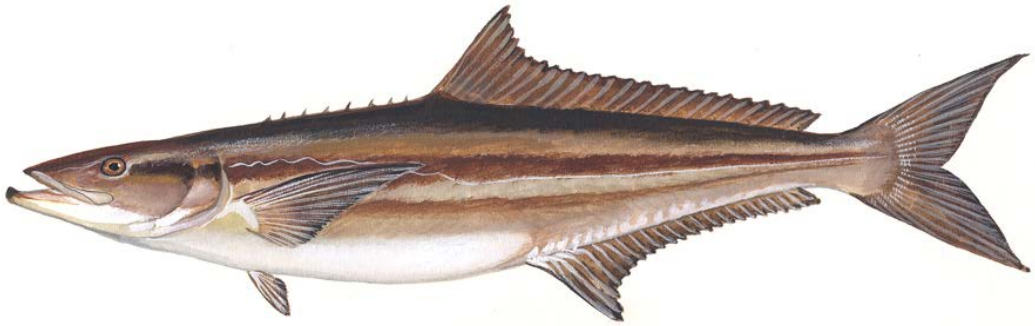
Neither the harvest composite index nor the adult composite index triggered in 2018. However, the TLA characteristic index for juvenile spot did trip in 2018 indicating continued poor recruitment.

The 2017 Spot Stock Assessment utilized age partitioning in the Catch Survey Analysis model (CSA), separating indices into age 0 and age 1+ (pre-recruits and recruits). The PRT suggests considering a similar age partitioning for the TLA as well as a regional approach if it can provide better information on annual changes as well as synchrony between the different indices. These updates will be considered as part of Draft Addendum II.

# 2019 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR

# ATLANTIC COBIA (*Rachycentron canadum*)

2018 FISHING YEAR




**Cobia Plan Review Team**

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Alex Aspinwall, Virginia Marine Resources Commission
Chris McDonough, South Carolina Department of Natural Resources

## Table of Contents

## I. Status of the Fishery Management Plan

Date of FMP Approval: Original FMP – November 2017

Management Areas: The distribution of the Atlantic stock of cobia from Georgia through New York

Active Boards/Committees: South Atlantic State/Federal Fisheries Management Board; Cobia Technical Committee, Plan Development Team, and Plan Review Team; South Atlantic Species Advisory Panel; SEDAR 58 Stock Assessment Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted an interstate Fishery Management Plan (FMP) for the Atlantic Migratory Group of cobia (Atlantic cobia) in 2017 (ASMFC, 2017). Prior to the FMP, federal management was through the South Atlantic Fishery Management Council's (SAFMC) Fishery Management Plan for Coastal Migratory Pelagic Resources (CMP FMP), while New York, New Jersey, Delaware, Virginia, North Carolina and South Carolina had regulations for their respective state waters.

The FMP established a complementary management approach between the ASMFC and SAFMC. Under the ASMFC, Atlantic cobia are managed as part of the South Atlantic State/Federal Fisheries Management Board (Board). Through the FMP, regulations for states with a declared interest are now required to reflect several measures established federally through the CMP FMP. These include a 36-inch fork length (or 40 inch total length) recreational minimum size limit, 1 fish per person recreational bag limit, a recreational daily vessel limit not to exceed 6 fish per vessel, a 33-inch fork length (or 37-inch total length) commercial minimum size limit, a commercial possession limit of 2 cobia per person not to exceed 6 cobia per vessel, and a commercial Annual Catch Limit (ACL) of 50,000 pounds. State regulations can be found in Table 1. The FMP also allocates a Recreational Harvest Limit (RHL), derived from the CMP FMP's recreational ACL (620,000 pounds), to non-*de minimis* states, establishing recreational harvest targets. States may set their own seasons and vessel limits (while adhering to the coastwide maximum vessel limit of 6 fish) to achieve their targets. Adherence to the targets is evaluated based on a 3-year average of landings. If a state's 3-year recreational landings average exceeds its target, that state would be required to reduce their season or vessel limit to achieve the target, but the target would not change (i.e. no payback). The FMP also includes a management framework to adaptively respond to future concerns or changes in the fishery or population.

There are four plan objectives:

1) Provide a flexible management system to address future changes in resource abundance, scientific information, and fishing patterns among user groups or areas.
2) Promote cooperative collection of biological, economic, and social data required to effectively monitor and assess the status of the cobia resource and evaluate management efforts.
3) Manage the cobia fishery to protect both young individuals and established breeding stock.
4) Develop research priorities that will further refine the cobia management program to maximize the biological, social, and economic benefits derived from the cobia population.

During the development of the FMP, the SAFMC initiated Regulatory Amendment 31 to the CMP FMP to remove Atlantic cobia from the CMP FMP (SAFMC, 2018), which would result in management solely through the ASMFC. In May, 2018, the Board initiated Amendment 1 to the FMP to reflect the (at the time, impending) removal of Atlantic cobia from the CMP FMP and establish recommendations for measures in federal waters. Regulatory Amendment 31 was approved and became effective in March, 2019. Draft Amendment 1 has been released for Public Comment and will be considered for final approval at the Board's Summer Meeting in August, 2019.

## II. Status of the Stock

SEDAR 28

Atlantic cobia were last assessed by Southeast Data, Assessment, and Review (SEDAR) 28 in 2013. The SEDAR 28 stock assessment determined that the stock is not overfished nor experiencing overfishing (Figures 1 and 2). The primary model used in SEDAR 28 was the Beaufort Assessment Model (BAM), a forward-projecting statistical catch-at-age model (SEDAR, 2013). This model included data from two fishery-dependent surveys and the recreational and commercial fisheries. Results of this assessment are summarized in the following sections.

*Stock Structure*

SEDAR 28 established the stock boundary between Atlantic and Gulf of Mexico cobia at the FL/GA border, based on tagging and genetic information and applicability to management. Therefore, the stock boundary for the assessment was also established at the FL/GA line. The Atlantic stock extends northward to New York.

*Spawning Stock Biomass*

Estimated biomass at age showed a slight truncation of the oldest ages compared to the 1980s, but in general there was little obvious change in age structure over time. Total biomass and spawning biomass showed similar trends - generally higher biomass in the 1990s and early 2000s compared to the 1980s and a decline in more recent years. The stock was estimated to be at its lowest point in the late 1980s and was estimated to be at a comparable level in the terminal year.

Estimated time series of stock status (Spawning Stock Biomass [SSB]/ Minimum Stock Size Threshold [MSST], SSB/SSB producing Maximum Sustainable Yield [SSBMSY]) showed a general decline through the 1980s, an increase in the late 1980s and early 1990s, followed by a decline in more recent years. The increase in stock status in the 1990s may have been driven by several strong year classes and perhaps reinforced by the 2-fish per person bag limit implemented in 1990. Base run estimates of spawning biomass have remained above MSST throughout the time series. Current stock status from the base run was estimated to be SSB2011/MSST = 1.75, indicating that the stock is not overfished (Figure 1).

*Fishing Mortality*

The estimated time series of fishing mortality rates (F) from the BAM was highly variable, with F for fully selected ages varying greater than four-fold since the 1980s. There was a drop in F in the 1990s following the implementation of the 2-fish per person bag limit, but there was a notable increase

since the early 2000s. Since 2003, estimates of F averaged about 0.30. The recreational fleet has been the largest contributor to total F throughout the time series.

The estimated time series of F divided by F producing Maximum Sustainable Yield (FMSY) from the base run suggested that overfishing has not been occurring over the course of the assessment period but with considerable uncertainty, particularly since the mid-2000s. Current fishery status, with current F represented by the geometric mean from 2009-2011, is estimated by the base run to be F2009-2011/FMSY = 0.599, but with much uncertainty in that estimate. As current F is less than FMSY, overfishing is not occurring (Figure 2).

SEDAR 58

Another stock assessment, SEDAR 58, is currently ongoing and scheduled for completion by the beginning of 2020. A Stock Identification Workshop was conducted in 2018 to prepare for this assessment. This Workshop maintained the FL/GA border as the stock boundary, because this border is within a transition zone that occurs from the southern boundary of Brevard County, FL, to Brunswick, GA (SEDAR, 2018). Data that would categorize cobia within the transition zone as belonging to either of the two defined stocks (Atlantic or Gulf) are not available.

## III. Status of the Fishery

***This report includes updated recreational estimates from the Marine Recreational Information Program's transition to the mail-based Fishing Effort Survey (FES) on July 1, 2018. Figure 3 shows coastwide recreational landings including estimates using both the previous Coastal Household Telephone Survey (CHTS) and FES calibration for comparison, but since management currently uses recreational limits and targets based on the CHTS data, other figures, tables, and text will only be based on this estimation.***

Total Atlantic cobia landings are estimated at 1.3 million pounds in 2018, a 129% increase from total harvest in 2017 (Figure 4, Tables 2 and 3). 2018 harvest is 57% above the previous ten-year (2008-2017) average. The commercial and recreational fisheries harvested 4% and 96% of the 2018 total, respectively.

Commercial landings of Atlantic cobia in 2018 span from Rhode Island through Georgia (Table 2). Coastwide commercial landings show an increasing trend since low harvests in the 1970s and early 1980s, but comprise a small portion of the total harvest due, in part, to a current 8% allocation of the total annual catch limit (Figure 4). Coastwide cobia commercial landings in 2018 were estimated at 50,314 pounds, a 4% decrease from those of 2017 and over the commercial ACL of 50,000 pounds. The commercial fishery was projected to meet the ACL and was closed on September 5, 2018, for the remainder of the year. Virginia (51%) and North Carolina (41%) harvested the majority of the commercial landings (Table 2).

Recreational harvest of Atlantic cobia peaked by weight in 2015 at 1.7 million pounds (Figure 4, Table 3) and by numbers of fish in 2018 at 45,442 fish (Figure 5, Table 4). Recreational harvests have fluctuated widely throughout the time series, often through rapid increases and declines. Average

harvests for the time series are 526,508 pounds and 18,517 fish. This fishery has grown noticeably over the time series, with average harvests over the last 10 years of 835,317 pounds and 27,340 fish. The 2018 recreational harvest was 1.2 million pounds or 45,442 fish, the third- and first-highest years on record for those respective metrics. Virginia (67% of pounds, 68% of fish) and North Carolina (28% of numbers, 27% of fish) harvested the majority of recreational landings by pounds and number of fish. Average weight (recreational harvest in pounds divided by recreational harvest in numbers) in 2018 was 27 pounds per fish, a 22% decrease from 2017.

Recreational releases of live fish have generally increased throughout the time series (Figure 5, Table 5). In 2018, 149,520 recreationally-caught fish were released, the highest year on record and 47% greater than 2017 (the second-highest year on record). Increased recreational releases over the last four years are likely attributable to a combination of management actions, including establishment of an ACL, closures of the recreational fishery in federal waters, and newly-introduced state regulations.

In 2018, implementation of the ASMFC's complementary FMP began. The FMP allocates a 613,800 pound recreational harvest limit (RHL) as recreational harvest targets to Virginia, North Carolina, South Carolina, and Georgia (Table 6), and requires these states to enact seasons and vessel limits that would achieve these targets, on average. State harvests are evaluated against targets as 3-year averages, with the next evaluation of these averages scheduled to include years from 2018-2020. In 2018, Virginia exceeded their target by 588,424 pounds (241%) and North Carolina exceeded their target by 104,618 pounds (44%). Coastwide harvest exceeded the recreational ACL previously used from the CMP FMP by 616,016 pounds (99%).

## IV. Status of Assessment Advice

Current stock status information comes from SEDAR 28 (SEDAR, 2013), which determined the stock is not overfished and overfishing is not occurring. Results of this assessment were approved for management use by the SAFMC and, as such, have been incorporated into the ASMFC's complementary FMP.

The stock assessment could be improved by developing a fishery-independent sampling program for abundance of cobia and other coastal migratory pelagic species. Currently used fishery-dependent indices cause notable uncertainty in part due to the lack of an effective sampling methodology. The assessment could also benefit from improved characterization of age, reproductive, genetic, and migratory characteristics, tag-based information on natural mortality, and more precise recreational catch estimates.

## V. Status of Research and Monitoring

There are no monitoring or research programs required annually of the states except for the submission of a compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2018 reports.

Fishery-Dependent Monitoring

- Maryland DNR – Commercial pound net survey in lower Chesapeake Bay and Potomac River from May through September. 5 fish since 1993 (2018: 1 fish, 734 mm total length (TL)).
- Virginia MRC – Recreational cobia permit that requires reporting of cobia trips and catch to renew harvest in the following year also collects weight and length information.
- North Carolina DMF – Commercial fishery-dependent sampling, 11 lengths in 2018. MRIP length sampling, 60 lengths in 2018. Recreational Carcass Collection Program, 39 lengths in 2018.
- South Carolina DNR – In 1993, the SCDNR initiated a mandatory trip-level logbook reporting system for all charter vessels to collect basic catch and effort data. The charter boat logbook reports include: date, number of fishermen, hours fished, fishing locale (inshore, 0-3 miles, and > 3 miles offshore), fishing location (based on a 10 x 10 mile grid map), fishing method, target species, species caught, catch (number landed versus number released by fish species), and estimated landed pounds per vessel per trip. There were 767 cobia reported in 2018.
- Georgia CRD – Collected age, length, and sex data through the Marine Sportfish Carcass Recovery Project (2018: 0 cobia).
- NMFS – Collected recreational catch, harvest, release, and effort data, as well as length measurements via MRIP.

Fishery-Independent Monitoring

- New Jersey DEP – Ocean Trawl Survey: 31-year time series (1988-2018), total of 21 cobia caught (2018: 1 fish, 40.6 lb).
- Delaware DFW – No cobia caught in either finfish trawl survey (16ft or 30ft) or any other fishery-independent sampling.
- Maryland DNR –Coastal Bays Surveys since 1972; 3 cobia caught in beach seine and 5 in otter trawl for entire time series (0 cobia in either gear in 2018).
- South Carolina DNR – Estuarine trammel net survey (1994-2018) has caught a total of 17 cobia. SEAMAP trawl survey (1989-2018) has caught a total of 354 cobia, with 1.6% positive tows.
- Georgia CRD – Marine Sportfish Population Health Survey, includes summer gillnet survey and fall trammel net survey, 1 cobia caught in 2018.

## VI. Status of Management Measures and Issues

*Fishery Management Plan*

The FMP requires all non-*de minimis* states to have established the following measures:

**Recreational Measures**

- Minimum Size Limit: 36 in fork length or 40 in total length
- Bag Limit: 1 fish per person
- Vessel Limit: No more than 6 fish per vessel

**Commercial Measures**

Minimum Size Limit: 33 in fork length or 37 in total length

Possession Limit: 2 cobia per person, not to exceed 6 cobia per vessel

The FMP also requires adherence to a 50,000 pound coastwide, commercial ACL and any associated closures enacted by NOAA Fisheries.

Finally, the FMP requires adherence to state harvest targets, allocated to non-*de minimis* states from a RHL. The RHL is derived from the CMP FMP's former recreational ACL. One percent of the recreational ACL is designated to account for harvest in *de minimis* states.

*De Minimis*
The FMP allows states to request *de minimis* status if their recreational harvests (in pounds) in two of the previous three years are less than 1% of annual coastwide recreational landings during that time period. If a state qualifies for *de minimis*, the state may choose to match all FMP-related recreational management measures (including seasons and vessel limits) implemented by an adjacent non-*de minimis* state (or the nearest non-*de minimis* state if none are adjacent) or the state may choose to limit its recreational fishery to 1 fish per vessel per trip with a minimum size of 29 inches fork length (or a total length equivalent) with no seasonal restrictions.

*De Minimis Requests*
New Jersey, Delaware, and Maryland requested *de minimis* status through the annual reporting process. All of these states qualify for *de minimis* status.

## VII. Implementation of FMP Compliance Requirements for 2018

Virginia reported 3 issued citations for undersized cobia, 1 for an altered (length cannot be determined) cobia, and 1 for possession of cobia without a permit.

The PRT finds that all states have implemented the requirements of the Fishery Management Plan.

## VIII. Recommendations of the Plan Review Team

*Management*
The PRT recommends that the Board approve the 2019 FMP Review, state compliance, and *de minimis* requests from New Jersey, Delaware, and Maryland.

*Research*

The following research recommendations are ordered, within each category, from highest to lowest recommended priority.

<u>Biological</u>

1) Obtain more precise and timely estimates of harvest from the cobia recreational fishery.

2) Investigate release mortality and fishing mortality within the commercial and recreational fisheries along the US Atlantic coast.

3) Continue to collect and analyze current life history data from fishery independent and dependent programs, including full size, age, maturity, histology workups and information on spawning season timing and duration. Any additional data that can be collected on any life stages of cobia would be highly beneficial.

4) Increase spatial and temporal coverage of age samples collected regularly in fishery dependent and independent sources. Prioritize collection of age data from fishery dependent and independent sources in all states.

5) Collect genetic material to continue to assess the stock identification and any Distinct Population Segments that may exist within the management unit relative to recommendations made by the SEDAR 58 Stock ID Process.

6) Conduct a high reward tagging program to obtain improved return rate estimates. Continue and expand current tagging programs to obtain mortality and growth information and movement at size data.

7) Conduct studies to estimate fecundity-at-age coastwide and to estimate batch fecundity.

8) Obtain better estimates of bycatch and mortality of cobia in other fisheries, especially juvenile fish.

9) Obtain estimates of selectivity-at-age for cobia through observer programs or tagging studies.

10) Define, develop, and monitor adult and juvenile abundance estimates through the expansion of current or development of new fishery independent surveys.

Social

1) Using social impact analysis approaches such as updating applicable recreational and commercial fisheries community profiles and measures of social vulnerability (See Jepson & Colburn, 2013), evaluate the local and regional dependency on cobia resources managed by the Commission.

Economic

1) Obtain better data (e.g. more comprehensive and timely) to estimate the annual economic impacts, net benefits, and economic contributions of recreational and commercial Atlantic cobia fishing on coastal communities and regions.

2) Obtain cost and expenditure data for recreational fishing trips targeting cobia by fishing mode, for different states, and for anglers returning to private sites, who would not be sampled by the MRIP.

3) Estimate willingness-to-pay associated with recreational cobia angling.

Habitat

1) Expand existing fishery independent surveys in time and space to better define and cover cobia habitats.

2) Conduct otolith microchemistry studies to identify regional recruitment contributions.

3) Conduct new and expand existing satellite tagging programs to help identify spawning and juvenile habitat use and regional recruitment sources.

## IX. References

ASMFC. 2017. Interstate Fishery Management Plan for Atlantic Migratory Group Cobia. ASMFC, Arlington, VA. 85 p.

SAFMC. 2018. Amendment 31 to the Fishery Management Plan for Coastal Migratory Pelagics Resources in the Gulf of Mexico and Atlantic Region. NOAA Award # FNA10NMF441001. Charleston, SC. 209 pp.

## X. Figures

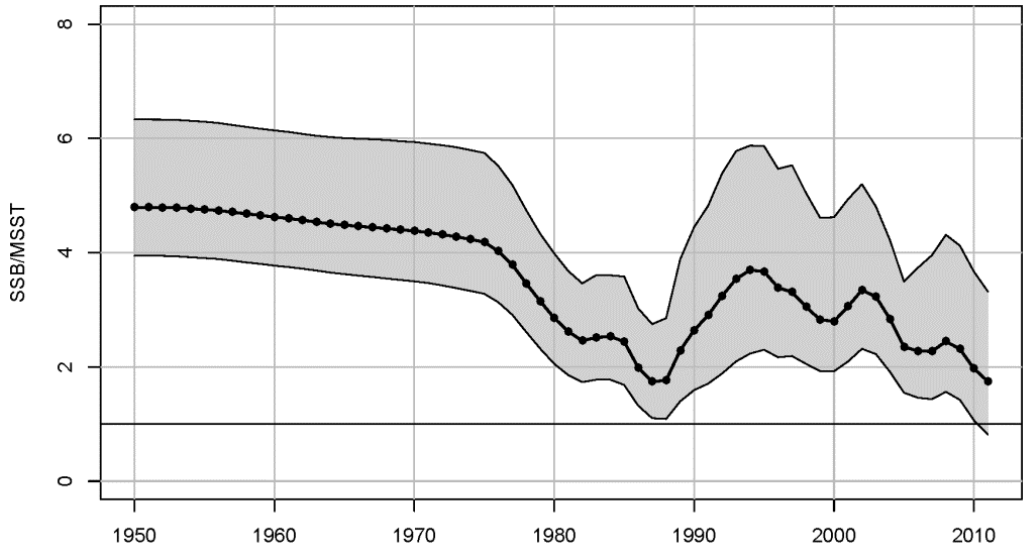



**Figure 1. Estimated time series of Spawning Stock Biomass (SSB) relative to the Minimum Stock Size Threshold (MSST)** (SEDAR, 2013).

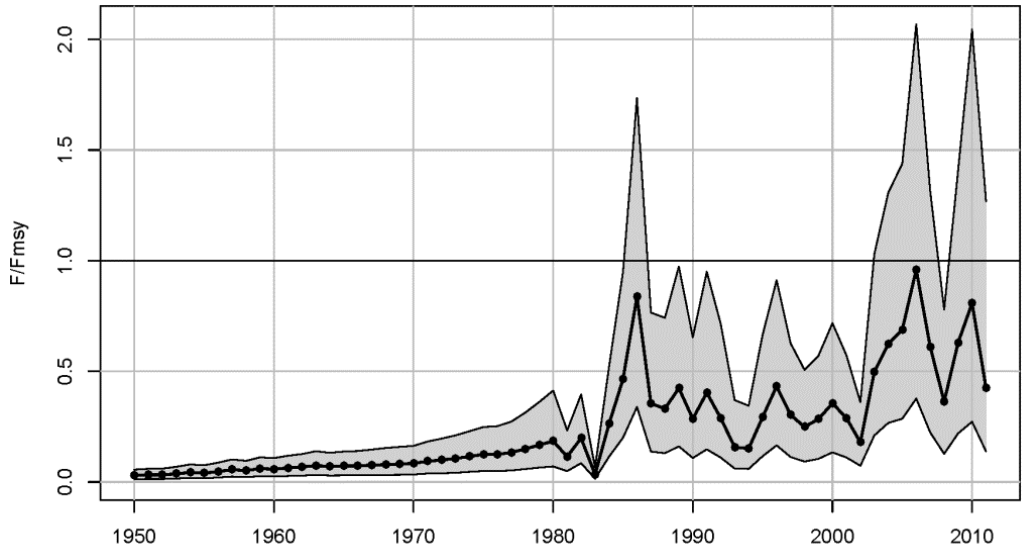



**Figure 2. Estimated time series of Fishing Mortality (F) relative to F at Maximum Sustainable Yield ($F_{MSY}$)** (SEDAR, 2013).

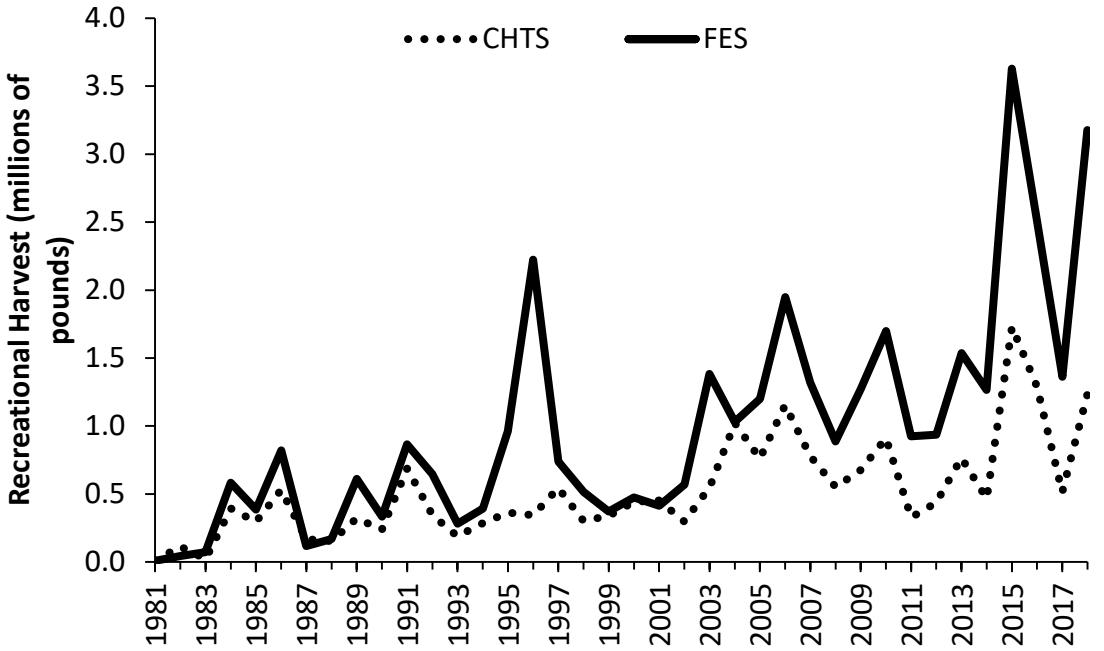



**Figure 3. Cobia recreational harvest estimated using the Coastal Household Telephone Survey (CHTS) and the mail-based Fishing Effort Survey (FES).** (Source: personal communication with NOAA Fisheries, Fisheries Statistics Division. [05/2019])

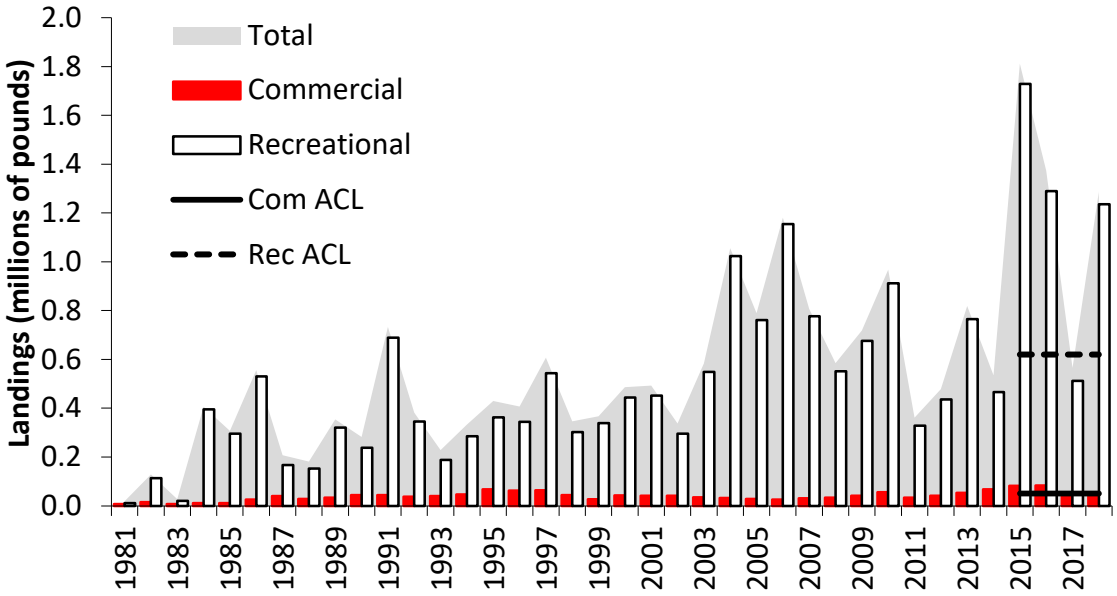



**Figure 4. Commercial and recreational landings (pounds) of Atlantic cobia.** Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

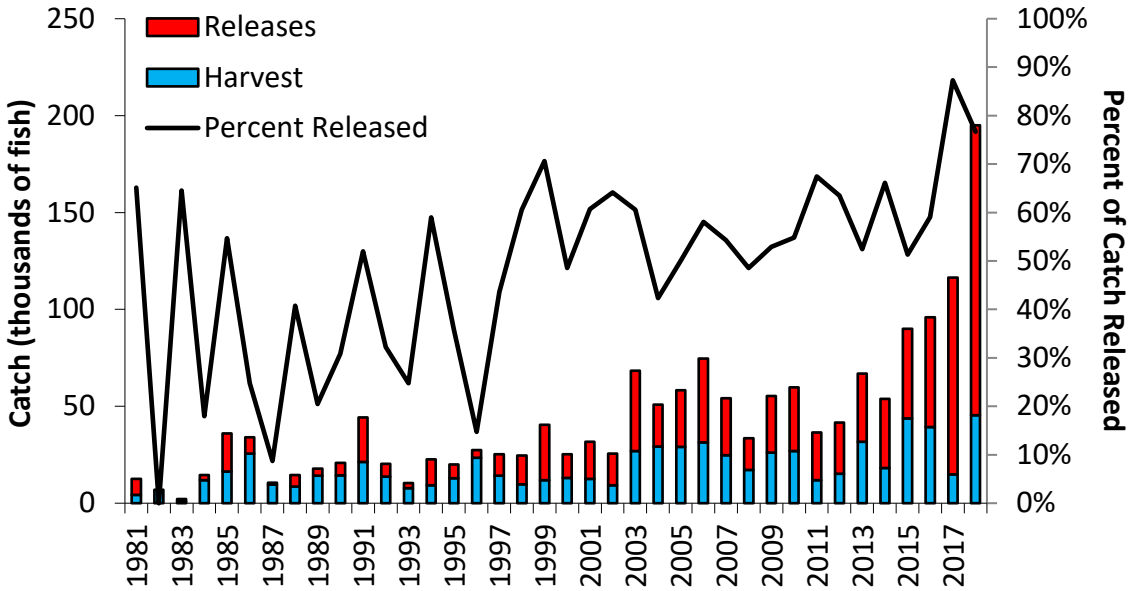



**Figure 5. Recreational catch (harvest and live releases) of Atlantic cobia (numbers) and the proportion of catch that is released.** See Tables 4 and 5 for values and data sources.

## XI. Tables

**Table 1. Atlantic cobia regulations for 2018.**

| State | Recreational Measures | Commercial Measures |
|---|---|---|
| NJ | *De minimis*; same as Virginia | Coastwide<br>Possession Limit: 2 fish per person<br>Minimum Size: 33 in fork length or 37 in total length<br>Vessel Limit: 6 fish<br>If commercial fishing in federal waters is closed, commercial fishing in state waters is also closed.<br><br>Deviations<br>-Virginia possession limit is per licensee rather than per person<br>-No commercial harvest in South Carolina state waters<br>-GA possession limit is 1 fish per person and minimum size is 36 in fork length |
| DE | *De minimis*; management pending | |
| MD | *De minimis*; same as Virginia | |
| PRFC | *De minimis*; same as Virginia | |
| VA | Bag Limit: 1 fish per person<br>Minimum Size: 40 in total length<br>Vessel Limit: 3 fish<br>Season: June 1-September 30 | |
| NC | Bag Limit: 1 fish per person<br>Minimum Size: 36 in fork length<br>Vessel Limits/Seasons:<br>Private<br>May 1-31: 2 fish<br>June 1-Dec 31: 1 fish<br>For-Hire<br>May 1-Dec 31: 4 fish | |
| SC | Bag Limit: 1 fish per person<br>Minimum Size: 36 in fork length or 40 in total length<br>Vessel Limits:<br>Southern Cobia Management Zone from June 1-April 30: 3 fish<br>Other areas: 6 fish<br>Season:<br>Southern Cobia Management Zone: June 1-April 30<br>Other Areas: Open year-round<br>-If recreational fishing in federal waters is closed, recreational fishing in all SC state waters is also closed. | |
| GA | Bag Limit: 1 fish per person<br>Minimum Size: 36 in fork length<br>Vessel Limit: 6 fish<br>Season: March 1-October 31 | |
| For all instances when a bag or possession limit is not equal to the vessel limit, the more restrictive rule applies. | | |

**Table 2. Commercial landings (pounds) of Atlantic cobia by state, 1999-2018.** (Sources: 2019 state compliance reports for 2018 fishing year; for years prior to 2018, personal communication with Atlantic Coastal Cooperative Statistics Program [ACCSP], Arlington, VA [07/16/2019])

| Year | N of NJ | NJ | DE | MD | VA | NC | SC | GA | Total |
|---|---|---|---|---|---|---|---|---|---|
| **1999** | 46 | 1,432 | | C | 5,808 | 15,491 | C | C | 27,501 |
| **2000** | 101 | 1,762 | | C | 7,525 | 28,754 | 2,974 | C | 42,605 |
| **2001** | 475 | 683 | | C | C | 24,718 | C | C | 40,900 |
| **2002** | 70 | 2,086 | | C | 11,445 | 21,058 | 5,007 | C | 41,012 |
| **2003** | 282 | 621 | C | C | 7,387 | 21,313 | 4,746 | C | 35,192 |
| **2004** | 758 | 576 | | 211 | 6,143 | 20,162 | 4,014 | 705 | 32,569 |
| **2005** | C | 329 | | C | 6,084 | 17,886 | 3,773 | C | 28,829 |
| **2006** | | C | | 48 | 2,705 | 20,270 | 2,405 | C | 25,428 |
| **2007** | 137 | 1,589 | | C | 5,928 | 19,005 | 3,408 | 245 | 30,312 |
| **2008** | C | C | | C | 6,755 | 22,047 | 3,016 | C | 33,096 |
| **2009** | 134 | 1,134 | | 196 | 5,980 | 31,898 | 2,078 | C | 41,900 |
| **2010** | C | 270 | | C | 8,504 | 43,715 | 2,499 | C | 55,755 |
| **2011** | 563 | C | | C | 8,500 | 19,924 | 4,019 | C | 33,394 |
| **2012** | 369 | 699 | | C | 5,382 | 31,972 | 3,359 | C | 41,781 |
| **2013** | 1,317 | 885 | C | C | 10,900 | 35,456 | 3,829 | C | 53,177 |
| **2014** | 311 | 359 | | C | 21,255 | 41,798 | 3,492 | C | 68,076 |
| **2015** | 235 | 212 | | C | 25,352 | 52,684 | 2,487 | C | 82,117 |
| **2016** | 297 | 282 | C | C | 29,459 | 48,244 | 4,064 | C | 83,583 |
| **2017** | 196 | C | C | C | 26,748 | 16,890 | 4,261 | C | 52,377 |
| **2018** | 678 | 707 | | C | 25,713 | 20,629 | 2,587 | C | 50,314 |

C: confidential landings.

**Table 3. Recreational harvest (pounds) of Atlantic cobia by state, 1999-2018. Values shown are Coastal Household (CHTS)-calibrated estimates.** (Sources: 2019 state compliance reports for 2018 fishing year; for years prior to 2018, personal communication with ACCSP and NOAA Fisheries, Fisheries Statistics Division. [07/16/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | Total |
|---|---|---|---|---|---|---|---|---|
| **1999** | | | 6,787 | 101,308 | 47,477 | 178,753 | 5,192 | 339,517 |
| **2000** | | | | 324,562 | 118,349 | 763 | | 443,674 |
| **2001** | | | | 367,003 | 74,757 | | 10,074 | 451,834 |
| **2002** | | | | 75,489 | 209,043 | 10,691 | 1,172 | 296,395 |
| **2003** | | | 0 | 37,213 | 84,773 | 425,939 | 342 | 548,266 |
| **2004** | | | | 35,189 | 294,042 | 649,803 | 44,045 | 1,023,079 |
| **2005** | | 818 | | 516,764 | 239,195 | 3,130 | 774 | 760,680 |
| **2006** | 17,035 | | | 898,542 | 184,300 | 53,634 | 1,733 | 1,155,244 |
| **2007** | | | | 352,071 | 106,213 | 271,431 | 46,729 | 776,444 |
| **2008** | | | | 116,420 | 82,566 | 32,497 | 320,174 | 551,657 |
| **2009** | | | | 445,993 | 166,195 | 62,332 | 2,009 | 676,530 |
| **2010** | | | 1,069 | 254,414 | 498,581 | 67,946 | 89,840 | 911,850 |
| **2011** | | | | 107,424 | 145,796 | | 74,651 | 327,871 |
| **2012** | 6,796 | | | 26,537 | 104,106 | 201,223 | 97,766 | 436,427 |
| **2013** | | | | 224,442 | 506,067 | 9,873 | 25,183 | 765,565 |
| **2014** | | | | 173,772 | 247,386 | 26,439 | 19,079 | 466,677 |
| **2015** | | | | 882,022 | 695,842 | 124,933 | 26,499 | 1,729,296 |
| **2016** | | | 193 | 915,151 | 298,090 | 76,754 | | 1,290,187 |
| **2017** | | | | 252,683 | 259,737 | | 328 | 512,748 |
| **2018** | 0 | 7,289 | 4,647 | 832,716 | 340,934 | 44,350 | 6,081 | 1,236,016 |

**Table 4. Recreational harvest (numbers) of Atlantic cobia by state, 1999-2018. Values shown are Coastal Household Telephone Survey (CHTS)-calibrated estimates.** (Sources: 2019 state compliance reports for 2018 fishing year; for years prior to 2018, personal communication with ACCSP and NOAA Fisheries, Fisheries Statistics Division. [07/16/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | Total |
|---|---|---|---|---|---|---|---|---|
| **1999** | | | 456 | 5,352 | 1,355 | 4,533 | 176 | 11,872 |
| **2000** | | | | 10,224 | 2,773 | 31 | | 13,028 |
| **2001** | | | | 9,370 | 2,700 | | 430 | 12,500 |
| **2002** | | | | 3,405 | 5,412 | 323 | 47 | 9,187 |
| **2003** | | | 1,119 | 1,923 | 4,271 | 19,644 | 15 | 26,972 |
| **2004** | | | | 1,161 | 9,363 | 17,046 | 1,696 | 29,266 |
| **2005** | | 44 | | 17,573 | 11,381 | 59 | 44 | 29,101 |
| **2006** | 822 | | | 22,352 | 4,098 | 3,931 | 105 | 31,308 |
| **2007** | | | | 9,802 | 3,222 | 9,456 | 2,296 | 24,776 |
| **2008** | | | | 5,069 | 2,136 | 1,426 | 8,592 | 17,223 |
| **2009** | | | | 16,831 | 5,754 | 3,419 | 71 | 26,075 |
| **2010** | | | 38 | 7,056 | 15,125 | 2,102 | 2,637 | 26,958 |
| **2011** | | | | 4,119 | 4,478 | | 3,304 | 11,901 |
| **2012** | 2,055 | | | 1,051 | 2,050 | 6,835 | 3,185 | 15,176 |
| **2013** | | | | 10,735 | 19,224 | 634 | 1,189 | 31,782 |
| **2014** | | | | 6,490 | 9,804 | 1,137 | 792 | 18,223 |
| **2015** | | | | 21,173 | 16,166 | 4,182 | 2,282 | 43,803 |
| **2016** | | | 35 | 27,382 | 9,293 | 2,541 | | 39,251 |
| **2017** | | | | 7,469 | 7,308 | | 16 | 14,793 |
| **2018** | 0 | 281 | 206 | 30,720 | 12,459 | 1,543 | 233 | 45,442 |

**Table 5. Recreational live releases (numbers) of Atlantic cobia by state, 1999-2018. Values shown are Coastal Household Telephone Survey (CHTS)-calibrated estimates.** (Sources: 2019 state compliance reports for 2018 fishing year; for years prior to 2018, personal communication with ACCSP and NOAA Fisheries, Fisheries Statistics Division. [07/16/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | Total |
|---|---|---|---|---|---|---|---|---|
| **1999** | | | | 15,993 | 6,328 | 6,233 | | 28,554 |
| **2000** | | | | 7,908 | 4,249 | 125 | 27 | 12,309 |
| **2001** | | | | 10,448 | 8,836 | | | 19,284 |
| **2002** | | | | 10,450 | 4,930 | 1,067 | | 16,447 |
| **2003** | | | 3,336 | 14,931 | 8,720 | 13,888 | 514 | 41,389 |
| **2004** | 40 | | | 5,438 | 5,182 | 10,178 | 678 | 21,516 |
| **2005** | | | | 16,548 | 9,660 | 2,993 | | 29,201 |
| **2006** | | | | 22,761 | 8,389 | 12,226 | | 43,376 |
| **2007** | | | | 3,353 | 7,804 | 18,263 | 17 | 29,437 |
| **2008** | 58 | | | 3,486 | 8,008 | 2,030 | 2,649 | 16,231 |
| **2009** | | | | 12,721 | 16,527 | 47 | | 29,295 |
| **2010** | 3,032 | | | 8,919 | 19,180 | 1,580 | 44 | 32,755 |
| **2011** | | | | 9,443 | 12,282 | 606 | 2,304 | 24,635 |
| **2012** | 169 | | 0 | 8,516 | 13,917 | 3,572 | 195 | 26,369 |
| **2013** | | | | 16,498 | 14,638 | 3,110 | 841 | 35,087 |
| **2014** | | | | 15,326 | 10,530 | 9,678 | | 35,534 |
| **2015** | 170 | | | 25,412 | 17,409 | 3,124 | 89 | 46,204 |
| **2016** | | | 515 | 33,490 | 14,707 | 7,371 | 565 | 56,648 |
| **2017** | | | | 44,023 | 51,142 | 3,775 | 2,613 | 101,553 |
| **2018** | 2,699 | 0 | 5,833 | 91,974 | 28,549 | 16,811 | 3,652 | 149,520 |

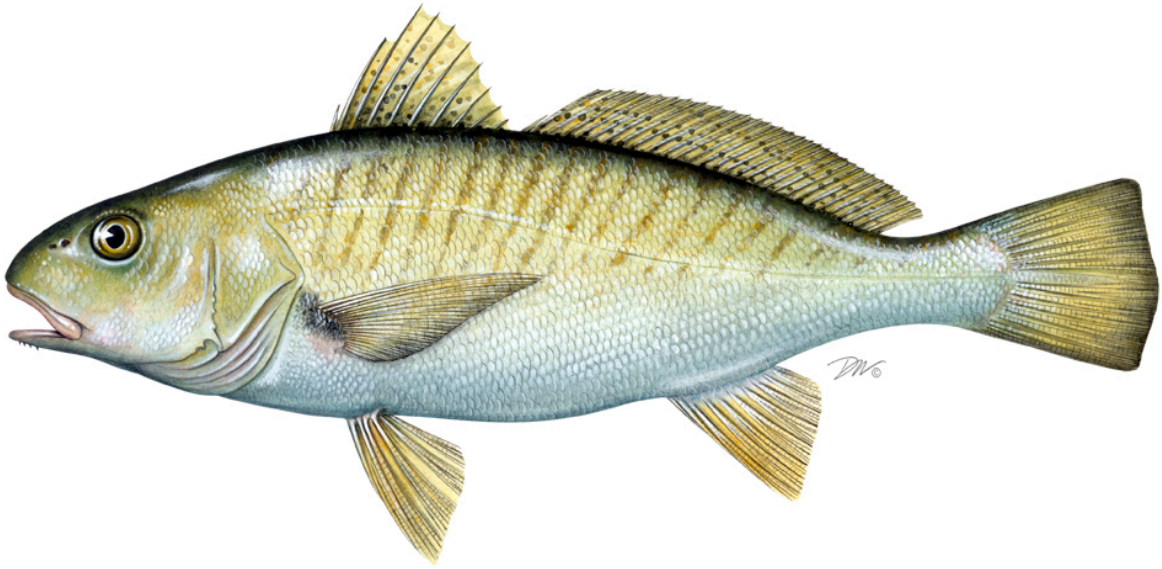
**Table 6. State recreational harvest targets, 2018 recreational harvests (pounds; CHTS), and 3-year averages for the next evaluation of non-*de minimis* states.** (Source: see Table 3)

| State | VA | NC | SC | GA |
|---|---|---|---|---|
| **Harvest Target (pounds)** | 244,292 | 236,313 | 74,885 | 58,311 |
| **2018 Harvest** | 832,716 | 340,934 | 44,350 | 6,081 |
| **2019 Harvest** | | | | |
| **2020 Harvest** | | | | |
| **Average** | 832,716 | 340,934 | 44,350 | 6,081 |

2019 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR

# ATLANTIC CROAKER
## *(Micropogonias undulatus)*

2018 FISHING YEAR




**Atlantic Croaker Plan Review Team**
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## I. Status of the Fishery Management Plan

Date of FMP Approval: Original FMP – October 1987

Amendments: Amendment 1 – November 2005 (implemented January 2006)
Addendum I – March 2011
Addendum II – August 2014

Management Areas: The Atlantic coast distribution of the resource from New Jersey through Florida

Active Boards/Committees: South Atlantic State/Federal Fisheries Management Board; Atlantic Croaker Technical Committee, Stock Assessment Subcommittee, and Plan Review Team; South Atlantic Species Advisory Panel

The Fishery Management Plan (FMP) for Atlantic Croaker was adopted in 1987 and included the states from Maryland through Florida (ASMFC 1987). In 2004, the South Atlantic State/Federal Fisheries Management Board (Board) found the recommendations in the FMP to be vague, and recommended that an amendment be prepared to define management measures necessary to achieve the goals of the FMP. The Interstate Fisheries Management Program Policy Board also adopted the finding that the original FMP did not contain any management measures that states were required to implement.

In 2002, the Board directed the Atlantic Croaker Technical Committee to conduct the first coastwide stock assessment of the species to prepare for developing an amendment. The Atlantic Croaker Stock Assessment Subcommittee developed a stock assessment in 2003, which was approved by a Southeast Data Assessment Review (SEDAR) panel for use in management in June 2004 (ASMFC 2005a). The Board quickly initiated development of an amendment and, in November 2005, approved Amendment 1 to the Atlantic Croaker FMP (ASMFC 2005b). The amendment was fully implemented by January 1, 2006.

The goal of Amendment 1 is to utilize interstate management to perpetuate the self-sustainable Atlantic croaker resource throughout its range and generate the greatest economic and social benefits from its commercial and recreational harvest and utilization over time. Amendment 1 contains four objectives:

1) Manage the fishing mortality rate for Atlantic croaker to provide adequate spawning potential to sustain long-term abundance of the Atlantic croaker population.
2) Manage the Atlantic croaker stock to maintain the spawning stock biomass above the target biomass levels and restrict fishing mortality to rates below the threshold.
3) Develop a management program for restoring and maintaining essential Atlantic croaker habitat.
4) Develop research priorities that will further refine the Atlantic croaker management program to maximize the biological, social, and economic benefits derived from the Atlantic croaker population.

Amendment 1 expanded the management area to include the states from New Jersey through Florida. Consistent with the stock assessment completed in 2004, the amendment defined two Atlantic coast management regions: the south-Atlantic region, from Florida through South Carolina; and the mid-Atlantic region, from North Carolina through New Jersey.

Amendment 1 established biological reference points (BRPs) to define an overfished and overfishing stock status for the mid-Atlantic region only. Reliable stock estimates and BRPs for the South Atlantic region could not be developed during the 2004 stock assessment due to a lack of data. The BRPs were based on maximum sustainable yield (MSY), and included threshold and target levels of fishing mortality (F) and spawning stock biomass (SSB): F threshold = $F_{MSY}$ (estimated to be 0.39); F target = 0.75 X $F_{MSY}$ (estimated to be 0.29); SSB threshold = 0.7 X $SSB_{MSY}$ (estimated to be 44.65 million pounds); and SSB target = $SSB_{MSY}$ (estimated to be 63.78 million pounds). An SSB estimate below the SSB threshold resulted is an overfished status determination, and an F estimate above the F threshold resulted is an overfishing status determination. The Amendment established that the Board would take action, including a stock rebuilding schedule if necessary, should the BRPs indicate the stock is overfished or overfishing is occurring.

Amendment 1 did not require any specific measures restricting recreational or commercial harvest of Atlantic croaker. States with more conservative measures were encouraged to maintain those regulations (Table 1). The Board was able to revise Amendment 1 through adaptive management, including any regulatory and/or monitoring requirements in subsequent addenda, along with procedures for implementing alternative management programs via conservation equivalency.

The Board initiated Addendum I to Amendment I at its August 2010 meeting, following the updated stock assessment, in order to address the proposed reference points and management unit. The stock assessment evaluated the stock as a coastwide unit, rather than the two management units established within Amendment I. In approving Addendum I, the Board endorsed consolidating the stock into one management unit, as proposed by the stock assessment. In addition, Addendum I established a procedure, similar to other species, by which the Board may approve peer-reviewed BRPs without a full administrative process, such as an amendment or addendum.

In August 2014, the Board approved Addendum II to the Atlantic Croaker FMP. The Addendum established the Traffic Light Approach (TLA) as the new precautionary management framework to evaluate fishery trends and develop management actions. The TLA was originally developed as a management tool for data poor fisheries. The name comes from assigning a color (red, yellow, or green) to categorize relative levels of population indicators. When a population characteristic improves, the proportion of green in the given year increases. Harvest and abundance thresholds of 30% and 60% were established in Addendum II, representing moderate and significant concern for the fishery. If thresholds for both population characteristics achieve or exceed a threshold for a three year period, then management action is enacted.

The TLA framework replaces the management triggers stipulated in Addendum I, which dictated that action should be taken if recreational and commercial landings dropped below 70% of the previous two year average. Those triggers were limited in their ability to illustrate long-term declines or increases in stock abundance. In contrast, the TLA approach is capable of better illustrating trends in the fishery through changes in the proportion of green, yellow, and red coloring. A 2018 TC report recommended several updates to the current TLA approach (ASMFC 2018). The Board has initiated an addendum to incorporate these updates.

Addenda I and II did not add or change any management measures or requirements. The only existing requirement is for states to submit an annual compliance report by July 1st of each year that contains commercial and recreational landings as well as results from any monitoring programs that intercept Atlantic croaker.

## II. Status of the Stock

The most recent stock assessment, conducted in 2017, upon peer review was not recommended for management use. Therefore, current stock status is unknown, although the Peer Review Panel did not indicate problems in the Atlantic croaker fishery that would require immediate management action. The Peer Review Panel did recommend continued evaluation of the fishery using the annual TLA.

The conclusions of the 2010 stock assessment (ASMFC 2010), which is the most recent assessment that was recommended by peer review for management use, were that Atlantic croaker was not experiencing overfishing and biomass had increased and fishing mortality decreased since the late 1980s. The 2010 assessment was unable to confidently determine stock status, particularly with regards to biomass, due to an inability to adequately estimate removals from discards of the South Atlantic shrimp trawl fishery. Improvements on estimation of these discards were made in the 2017 assessment, allowing the potential for shrimp trawl discards to be included as supplemental information with the annual TLA. Annual monitoring of shrimp trawl fishery discards is important because these discards represent a considerable proportion of Atlantic croaker removals, ranging from 7% to 78% annually during 1988-2008, according to the 2010 assessment (ASMFC 2010).

One of the primary reasons that the 2017 stock assessment did not pass peer review was due to conflicting signals in harvest and abundance metrics. Theoretically, increases in adult abundance should result in more fish available to be caught by the fishery; thus, fishing would be more efficient (greater catch per unit effort) and harvest would increase in a pattern similar to adult abundance. However, several of the most recent abundance indices have shown increases while harvest has declined to some of the lowest levels on record. One factor that has been identified to contribute to overestimates of adult abundance is an increase in the number of juveniles misclassified as adults in surveys that historically have typically caught adults. In response to this conflict, the Atlantic Croaker Technical Committee has recommended several changes to the annual TLA such as additional abundance indices and survey length-composition

information so that the TLA abundance metric would more accurately reflect trends in the stock. These changes may be incorporated through an addendum currently being developed.

## III. Status of the Fishery

***This report includes updated recreational estimates from the Marine Recreational Information Program's transition to the mail-based Fishing Effort Survey (FES) on July 1, 2018. Past recreational estimates have been calibrated to the FES and, therefore, are different from those shown in FMP Reviews and state compliance reports prior to 2018.***

Total Atlantic croaker harvest from New Jersey through the east coast of Florida in 2018 is estimated at 6.5 million pounds (Tables 2 and 3, Figure 1). This represents an 86% decline in total harvest since the peak of 47.4 million pounds in 2003 (87% commercial decline, 85% recreational decline). The commercial and recreational fisheries harvested 57% and 43% of the 2018 total, respectively.

Atlantic coast commercial landings of Atlantic croaker exhibit a cyclical pattern, with low harvests in the 1960s to early 1970s and the 1980s to early 1990s, and high harvests in the mid-to-late 1970s and the mid-1990s to early 2000s (Figure 1). Commercial landings increased from a low of 3.7 million pounds in 1991 to 28.6 million pounds in 2001 (Table 2); however, landings have declined every year since 2010 to 3.7 million pounds in 2018, well below the time series (1950-2018) average of 12.5 million pounds. Within the management unit, the majority of 2018 commercial landings came from Virginia (53%) and North Carolina (44%).

From 1981-2018, recreational landings of Atlantic croaker from New Jersey through Florida have varied by count between 7.1 million fish and 36.2 million fish and by weight between 2.8 million pounds and 18.9 million pounds (Tables 3 and 4, Figure 2). Landings generally increased until 2003, after which they showed a declining trend through 2018. The 2018 landings are estimated at 7.1 million fish and 2.8 million pounds, the lowest recreational harvest on record. Virginia was responsible for 68% of the 2018 recreational landings, in numbers of fish, followed by Florida (13%).

The number of recreational releases generally increased over the time series until 2013, after which numbers of releases have generally decreased through 2018 (Figure 2). However, percentage of released recreational catch has shown a slight increasing trend from the 1990s through 2018. In 2018, anglers released 16.8 million fish, a decline from the 23.9 million fish released in 2017. Anglers released an estimated 70% of the recreational croaker catch in 2018, the highest percentage on record (Figure 2).

## IV. Status of Assessment Advice

A statistical catch-at-age (SCA) model was used in the 2010 Atlantic croaker stock assessment (ASMFC 2010). This model combines catch-at-age data from the commercial and recreational fisheries with information from fishery-independent surveys and biological information such as growth rates and natural mortality rates to estimate the size of each age class and the

exploitation rate of the population. The assessment was peer reviewed by a panel of experts in conjunction with the Southeast Data, Assessment, and Review (SEDAR) process.

The Review Panel was unable to support some of the 2010 assessment results due to uncertainty regarding the estimation of Atlantic croaker discards in the shrimp trawl fishery, and the application of estimates in modeling. Specifically, model-estimated values of stock size, fishing mortality, and biological reference points are too uncertain for use; however, the trends in model-estimated parameters and ratio-based fishing F reference points are considered reliable. Despite the uncertainty in assessment results caused by shrimp trawl bycatch, the Review Panel concluded that it is unlikely that the stock is in trouble. The stock is not experiencing overfishing, biomass has been trending up, commercial catches are stable, and discards from the shrimp trawl fishery have been reduced.

A benchmark stock assessment was conducted in 2017, but was not recommended for management use due to uncertainty in biomass estimates resulting from conflicting signals among abundance indices and catch time series as well as sensitivity of model results to assumptions and model inputs. Because the most recent assessment was not recommended for management use, current stock status is unknown. One noted improvement in this assessment was in the estimation of Atlantic croaker discards by the shrimp trawl fishery. The Review Panel recommended incorporation of shrimp trawl discard estimates into the annual monitoring of Atlantic croaker through the TLA. The TC has recommended several changes to the TLA that would help resolve some of the conflict between harvest and abundance signals. The Board has initiated an addendum to the Atlantic Croaker FMP to incorporate these changes.

## V. Status of Research and Monitoring

There are no research or monitoring programs required of the states except for the submission of an annual compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2018 compliance reports.

<u>Fishery-Dependent Monitoring</u>

- New Jersey: initiated biological monitoring of commercially harvested Atlantic croaker in 2006 in conjunction with ACCSP (2018 n=52 lengths, weights, and ages)
- Delaware: collects trip-based information on pounds landed, area fished, effort, and gear type data through mandatory monthly state logbook reports submitted by fishermen.
- Maryland: commercial pound net fishery biological sampling; seafood dealer sampling (121 lengths and weights)
- PRFC: has a mandatory commercial harvest daily reporting system, with reports due weekly.
- Virginia: commercial fishery biological sampling (8,127 length measurements, 8,074 weight measurements, 274 otolith ages, and 419 sex determinations in 2018)
- North Carolina: commercial fishery biological sampling since 1982 for length (2018 n=3,766), weight, otolith, sex determination, and reproductive condition.

- South Carolina: recreational fishery biological sampling via SCDNR State Finfish Survey, MRIP, and a SCDNR-managed mandatory trip reporting system for licensed charter boat operators. In 2013, SCDNR took over its portion of MRIP data collection.
- Georgia: collects biological information, including length, sex, and maturity stage, through the Marine Sportfish Carcass Recovery Project (1 fish in 2018)
- Florida: commercial fishery biological sampling

Fishery-Independent Monitoring

- New Jersey: 3 nearshore ocean (within 12 nm) juvenile trawl surveys (New Jersey Ocean Trawl Survey, 1988-present: 2018 CPUE (0.82) was well below time-series average (1.94); nearshore Delaware Bay juvenile trawl survey, 1991-present: 2018 survey index (0.33) was well below time series average (4.23); Delaware River juvenile seine survey, 1980-present: 2018 survey index (0.02) was well below time series average (0.22).
- Delaware: offshore Delaware Bay adult finfish trawl survey (1990-present; 2017 #/tow = 11.6; 99% increase in relative abundance from 2017 index, below mean for time series); nearshore Delaware Bay juvenile finfish trawl survey (1980-present; 2018 index increased from 0.81 in 2017 to 5.43; Inland Bays index increased from 0.30 in 2017 to 2.41 in 2018).
- Maryland: summer gill net survey was initiated in 2013 on lower Choptank (8 fish were captured in 2018); Atlantic coast bays juvenile otter trawl survey (standardized from 1989-present; 2018 GM of 0.46 fish/hectare is the fifth lowest value of the 30-year time series); Chesapeake Bay juvenile trawl index (standardized from 1989-present; CPUE decreased from 2.35 fish/tow in 2017 to 1.13 in 2018).
- PRFC: Maryland DNR conducts an annual juvenile beach haul seine survey in the Potomac River (1954-present; YOY GM decreased from 0.35 in 2017 to 0.00 in 2018).
- Virginia: Virginia Institute of Marine Science (VIMS) Juvenile Finfish and Blue Crab Trawl Survey (1988-present; 2018 index was FILL WHEN AVAILABLE, which is down from the 2017 value of 15.19).
- North Carolina: Pamlico Sound juvenile trawl survey (1987-present; 2018 juvenile abundance index (mean number of individuals/tow) was 136.8, down from 1,172.3 in 2017); Pamlico Sound gill net survey (2001-present; 2018 CPUE 0.5 fish per sample, below time series mean)
- South Carolina: SEAMAP shallow water (15-30 ft) trawl survey from Cape Hatteras to Cape Canaveral (1989-present; 2018 CPUE increased by 16% from 2017); inshore estuarine trammel net survey for adults (May-September, 1991-present; 2018 CPUE decreased 8.5% from 2017); estuarine electroshock survey for juveniles (2001-present; 2018 CPUE decreased by 76% since 2017, lowest value of time series); SCECAP estuarine trawl survey (1999-present, primarily targets juveniles, 2018: 41.9 #/hectare increased from 2017 by 757%).
- Georgia: Marine Sportfish Population Health Survey (trammel and gill net surveys in the Altamaha River Delta and Wassaw estuary, 2002-present; 2018 trammel net index (GM #/standard net set): 0.1, gill net index: 0.5); Ecological Monitoring Survey (trawl, 2003-present; 2018 index (GM #/standard trawl) was 11.3).

- Florida: YOY seine survey (2002-present; 2018 index increased by 167% from 2017); sub-adult/adult haul seine survey (2001-present; 2018 index value increased by 19% from 2017).

The Northeast Fishery Science Center (NEFSC) performs a randomly stratified groundfish survey along the U.S. east coast. Atlantic croaker are one of the main species caught throughout much of the survey area and, since the surveys started in 1972, it provides a long term data set. Regionally, mean CPUE (catch-per-unit-effort) of Atlantic croaker has increased from north to south. Since 1994, there has been an increase in annual catch variability. The NEFSC survey was not carried out in 2017 due to mechanical issues with the RV Bigelow. Catch levels in 2018 (394.0 fish per tow) declined 24.5% from 2016 (521.9 fish per tow) and dropped below the long term mean (498 fish per tow). The CPUE for 2017 was estimated as the mean of 2015-2016 and 2017 as a place holder in the index. The estimated CPUE for 2017 (457.9 fish per tow) was just below the long term mean. The traffic light analysis (TLA) of annual catch levels also reflected the decrease in CPUE in 2018 with the increasing proportion of yellow and a red proportion of 16.2%. The decline in catch levels in the last several years shows abundance levels just below the long term mean or yellow/green threshold for 2016-2018.

## VI. Status of Management Measures and Issues

*Fishery Management Plan*

Amendment 1 was fully implemented by January 1, 2006, and provided the management plan for the 2009 fishing year. There are no interstate regulatory requirements for Atlantic croaker. Should regulatory requirements be implemented in the future, all state programs must include law enforcement capabilities adequate for successfully implementing the regulations. Addendum I to Amendment 1 was initiated in August 2010 and approved in March 2011, in order to 1) revise the biological reference points to be ratio-based, and 2) remove the distinction of two regions within the management unit, based on the results of the 2010 stock assessment. Addendum II was approved August 2014 and established the TLA management framework for Atlantic croaker in order to better illustrate long-term trends in the fishery.

*Traffic Light Approach*

Addendum II established the TLA as the new management framework for Atlantic croaker. Under this management program, if thresholds for both population characteristics (harvest and adult abundance) achieve or exceed the proportion of threshold for the specified three year period, management action will be taken.

Analysis of the harvest composite index for 2018 shows that this population characteristic tripped for a third consecutive year (Figure 3). Recreational harvest was estimated based on MRIP's mail-based Fishing Effort Survey calibration. The mean proportion of red color from 2014-2018 was 55.2%, with a red proportion in 2018 exceeding the 60% threshold. The harvest composite index was comprised of commercial and recreational landings. Both commercial and recreational indices were above the 60% threshold in 2018 with commercial landings exceeding the 60% level for the past two years.

The abundance composite TLA index was broken into two components based on age composition. The adult composite index was generated from the NEFSC and SEAMAP surveys, since the majority of Atlantic croaker captured in those surveys were ages 1+. The juvenile composite index was generated from the North Carolina (NC) Program 195 and VIMS surveys because these two captured primarily young-of-the-year Atlantic croaker.

Two of four TLA abundance indices showed increases in red proportions for 2018. The NEFSC survey was not conducted in 2017 due to mechanical issues with the RV Bigelow but the 2018 index showed an increased red proportion in 2018 from 2016. The SEAMAP index showed increased abundance in the fall and had no red in the index and an increase in the green proportion. The adult composite TLA characteristic (Figure 4) did not trigger in 2018 with a red proportion of 16.3%. The juvenile composite characteristic index (Figure 5) was 24% red and 4% green, due to a large increase in the VIMS index and a large decrease in the NC Program 195 survey. The higher annual variability for the different color proportions in the juvenile composite characteristic, in comparison to the adult composite characteristic, is likely a reflection annual recruitment variability rather than population trends.

Overall, management triggers were not tripped in 2018 since both adult population characteristics (harvest and adult abundance) were not above the 30% threshold for the 2016-2018 time period. This continues a trend of disconnect between the harvest and abundance indices since the mid-2000s, with the harvest metric generally decreasing and abundance metric generally increasing.

*De Minimis Requests*

States are permitted to request *de minimis* status if, for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than 1% of the coastwide commercial or recreational landings for the same three year period. A state may qualify for *de minimis* in either its recreational or commercial sector, or both, but will only qualify for exemptions in the sector(s) that it qualifies for as *de minimis*. Amendment 1 does not include any compliance requirements other than annual state reporting, which is still required of *de minimis* states, thus *de minimis* status does not exempt states from any measures.

In the annual compliance reports, the following states requested *de minimis* status: Delaware (commercial fishery), South Carolina (commercial fishery), Georgia (commercial fishery), and Florida (commercial fishery). The commercial and recreational *de minimis* criteria for 2018 are based on 1% of the average coastwide 2016-2018 landings in each fishery: 47,066 pounds for the commercial fishery and 45,320 pounds for the recreational fishery. The Delaware commercial fishery qualifies for *de minimis* status, but landings are confidential. The South Carolina commercial fishery qualifies for *de minimis* status, but 2018 landings are confidential (the 2016-2017 average is 279 pounds). The Georgia commercial fishery qualifies for *de minimis* status with a three-year average of zero pounds. The Florida commercial fishery does not qualify for *de minimis* status with a three-year average of 51,660 pounds (1.1% of the coastwide three-year average).

*Changes to State Regulations*
In 2018, North Carolina enacted several gill net restrictions for coastal waters pertaining to area closures/openings, gear modifications, and attendance rules to avoid interactions with endangered species or bycatch species. These restrictions may indirectly affect the harvest and bycatch of Atlantic croaker and are defined by North Carolina Proclamations: M-10-2018, M-9-2018, M-7-2018, M-6-2018, and FF-48-2018.

Through 2017, Georgia had a general commercial fishing license. License applications had a voluntary survey asking purchasers to check off the species or species groupings they planned to pursue. The check-off was non-binding and the associated participation data were not useful for determining reporting requirements. In 2013, GADNR began issuing Letters of Authorization (LOAs) for several target species to improve the participation data. In 2017, the Georgia General Assembly approved the addition of species endorsements to commercial fishing licenses to replace LOAs (O.C.G.A 27-2-23). In 2017, the Georgia General Assembly approved the addition of species endorsements to commercial fishing licenses to replace LOAs (O.C.G.A. 27-2-23) which was followed by the Board of Natural Resources implementation in December 2017 (Board Rule 391-2-4-.17). Species endorsements, including one for finfish, were issued starting with the 2018-2019 fishing season.

A new seafood dealer license was also implemented April 1, 2018 (O.C.G.A. 27-2-23 and Board Rule 391-2-4-.09). Seafood dealers are defined as "any person or entity, other than the end-consumer, who purchases seafood products from a harvester unless the harvester is a licensed seafood dealer." Commercial harvesters fishing in Georgia waters and/or unloading seafood products must possess a commercial fishing license and the appropriate species endorsements. A harvester is required to have a dealer's license if he is selling his catch to end consumers.

*Atlantic Croaker Habitat*
In winter of 2017, the ASMFC Habitat Committee released *Atlantic Sciaenid Habitats: A Review of Utilization, Threats, and Recommendations for Conservation, Management, and Research*, which outlines the habitat needs of Atlantic croaker at different life stages (egg, larval, juvenile, adult). This report also highlights threats and uncertainties facing these ecological areas and identifies Habitat Areas of Particular Concern. It can be found online at: http://www.asmfc.org/files/Habitat/HMS14_AtlanticSciaenidHabitats_Winter2017.pdf.

*Bycatch Reduction*
Atlantic croaker is subject to both direct and indirect fishing mortality. Historically, croaker ranked as one of the most abundant bycatch species of the south Atlantic shrimp trawl fishery, resulting in the original FMP's recommendation that bycatch reduction devices (BRDs) be developed and required in the shrimp trawl fishery. Since then, the states of North Carolina through Florida have all enacted requirements for the use of BRDs in shrimp trawl nets in state waters, reducing croaker bycatch from this fishery (ASMFC 2010). However, bycatch and discard monitoring from the shrimp trawl fishery have historically been inadequate, resulting in a major source of uncertainty for assessing this stock, as well as other important Mid- and

South Atlantic species. Most of the discarded croaker are age-0 and thus likely have not yet reached maturity (ASMFC 2010). The North Carolina Division of Marine Fisheries conducted a two-year study, published in 2015, to collect bycatch data from state shrimp trawlers. It found that Atlantic croaker represent between 34-49% of the total observed finfish bycatch by weight in estuarine waters and between 20-42% in ocean waters. The at-net mortality for Atlantic croaker was found to be 23% (Brown 2015). These data will be valuable for incorporating estimates of removals in future stock assessments.

Atlantic croaker are also discarded from other commercial fishing gears, primarily due to market pressures and few restrictions on croaker harvest at the state level. The National Oceanic and Atmospheric Administration (NOAA) Fisheries Pelagic Observer Program provides data to estimate these discards for use in assessments; however, the time series is limited and only discards from gill nets and otter trawls could be estimated for the 2010 assessment based on the available data. Since 1988, estimated discards have fluctuated between 94 and 15,176 mt without trend, averaging 2,503 mt (ASMFC 2010).

Atlantic croaker is also a major component of the scrap/bait fishery. Landings from this fishery are not reported at the species level, except in North Carolina, which has a continuous program in place to sample these landings and enable estimation of croaker scrap landings for use in the stock assessment. As part of the 2010 stock assessment, North Carolina estimated the scrap/bait landings, which have declined in recent years, from a high of 1,569 mt in 1989 to a low of 84 mt in 2008, primarily due to restrictions placed on fisheries producing the highest scrap/bait landings (ASMFC 2010). Regulations instituted by North Carolina include a ban on flynet fishing south of Cape Hatteras, incidental finfish limits for shrimp and crab trawls in inside waters, minimum mesh size restrictions in trawls, and culling panels in long haul seines.

South Carolina has also begun a state monitoring program to account for scrap landings. The state initiated a bait harvester trip ticket program for all commercial bait harvesters licensed in South Carolina. The impetus for this program is to track bait usage of small sciaenid species (croaker, spot, and whiting) as well as other important bait species.

Several states have implemented other commercial gear requirements that further reduce bycatch and bycatch mortality, while others continue to encourage the use of the BRD devices. NOAA Fisheries published a notice on June 24, 2011 for public scoping in the Federal Register to expand the methods for reducing bycatch interactions with sea turtles, which may have additional effects on the bycatch of finfish like Atlantic croaker in trawls (76 FR 37050). Continuing to reduce the quantity of sub-adult croaker harvested should increase spawning stock biomass and yield per recruit.

Atlantic croaker are also subject to recreational discarding. The percentage of Atlantic croaker released alive by recreational anglers has generally increased over time. Discard mortality was estimated to be 10% for the 2010 stock assessment (ASMFC 2010). The use of circle hooks and appropriate handling techniques can help reduce mortality of released fish.

## VII. Implementation of FMP Compliance Requirements for 2019

The PRT finds that all states have fulfilled the requirements of Amendment 1.

## VIII. Recommendations

### Management and Regulatory Recommendations

- Consider approval of the *de minimis* requests from Delaware, South Carolina, Georgia, and Florida for their commercial fisheries.
- Encourage the use of circle hooks to minimize recreational discard mortality.
- Consider the basic research and monitoring information needed for informed management in light of the budgetary constraints limiting all state governments.

### Research and Monitoring Recommendations

<u>High Priority</u>

- Increase observer coverage for commercial discards, particularly the shrimp trawl fishery. Develop a standardized, representative sampling protocol for observers to use to increase the collection of individual lengths and ages of discarded finfish.
- Describe the coast-wide distribution, behavior, and movement of croaker by age, length, and season, with emphasis on collecting larger, older fish.
- Continue state and multi-state fisheries-independent surveys throughout the species range and subsample for individual lengths and ages. Ensure NEFSC trawl survey continues to take lengths and ages. Examine potential factors affecting catchability in long-term fishery independent surveys.
- Investigate environmental covariates in stock assessment models including climate cycles (e.g., Atlantic Multi-decadal Oscillation, AMO, and El Niño Southern Oscillation, El Niño) and recruitment and/or year class strength, spawning stock biomass, stock distribution, maturity schedules, and habitat degradation.
- Continue to develop estimates of length-at-maturity and year-round reproductive dynamics throughout the species range. Assess whether temporal or density-dependent shifts in reproductive dynamics have occurred.
- Re-examine historical ichthyoplankton studies for an indication of the magnitude of estuarine and coastal spawning, as well as for potential inclusion as indices of spawning stock biomass in future assessments. Pursue specific estuarine data sets from the states (NJ, VA, NC, SC, DE, MD) and coastal data sets (MARMAP, EcoMon).
- Investigate the relationship between estuarine nursery areas and their proportional contribution to adult biomass, i.e., are select nursery areas along Atlantic coast ultimately contributing more to SSB than others, reflecting better quality juvenile habitat?

<u>Medium Priority</u>

- Conduct studies of discard mortality for recreational and commercial fisheries by each gear type in regions where removals are highest.
- In the recreational fishery, develop sampling protocol for collecting lengths of discarded finfish and collect otolith age samples from retained fish.

- Encourage fishery-dependent biological sampling, with proportional landings representative of the distribution of the fisheries. Develop and communicate clear protocols on truly representative sampling.
- Quantify effects of BRDs and TEDs implementation in the shrimp trawl fishery by examining their relative catch reduction rates on Atlantic croaker.
- Utilize NOAA Fisheries Ecosystem Indicators bi-annual reports to consider folding indicators into the assessment; identify mechanisms for how environmental indicators affect the stock.
- Encourage efforts to recover historical landings data, determine whether they are available at a finer scale for the earliest years than are currently reported.
- Collect data to develop gear-specific fishing effort estimates and investigate methods to develop historical estimates of effort.
- Develop gear selectivity studies for commercial fisheries with emphasis on age 1+ fish.
- Conduct studies to measure female reproductive output at size and age (fecundity, egg and larval quality) and impact on assessment models and biomass reference points.
- Develop and implement sampling programs for state-specific commercial scrap and bait fisheries in order to monito the relative importance of Atlantic croaker. Incorporate biological data collection into the program.

## IX. References


Atlantic States Marine Fisheries Commission (ASMFC). 1987. Fishery Management Plan for Atlantic Croaker. Washington (DC): ASMFC. Fishery Management Report No. 10. 90 p.

ASMFC. 2005a. Atlantic Croaker Stock Assessment & Peer Review Reports. Washington (DC): ASMFC. 370 p.

ASMFC. 2005b. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker. Washington (DC): ASMFC. Fishery Management Report No. 44. 92 p.

ASMFC. 2010. Atlantic Croaker 2010 Benchmark Stock Assessment. Washington (DC): ASMFC. 366 p.

ASMFC. 2018. Memorandum 18-8: Recommended Updates to the Annual Traffic Light Analyses for Atlantic Croaker and Spot.

Kevin Brown. 2015. Characterization of the commercial shrimp otter trawl fishery in the estuarine and ocean (0-3 miles) waters of North Carolina. Morehead City (NC): NCDEQ, Division of Marine Fisheries. Abstract.

## X. Figures

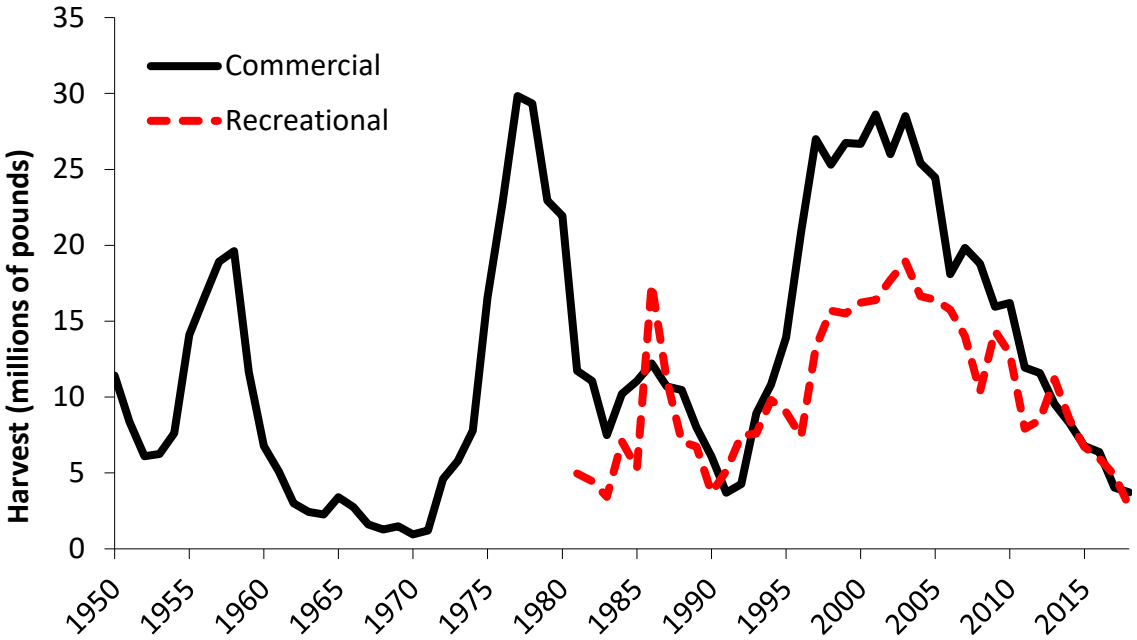


**Figure 1. Atlantic croaker commercial and recreational landings (pounds) from 1950-2018.** (See Tables 2 and 3 for source information. Commercial landings estimate for 2018 is preliminary. Reliable recreational landings estimates are not available prior to 1981. Recreational landings estimates are based on the mail-based Fishing Effort Survey.)

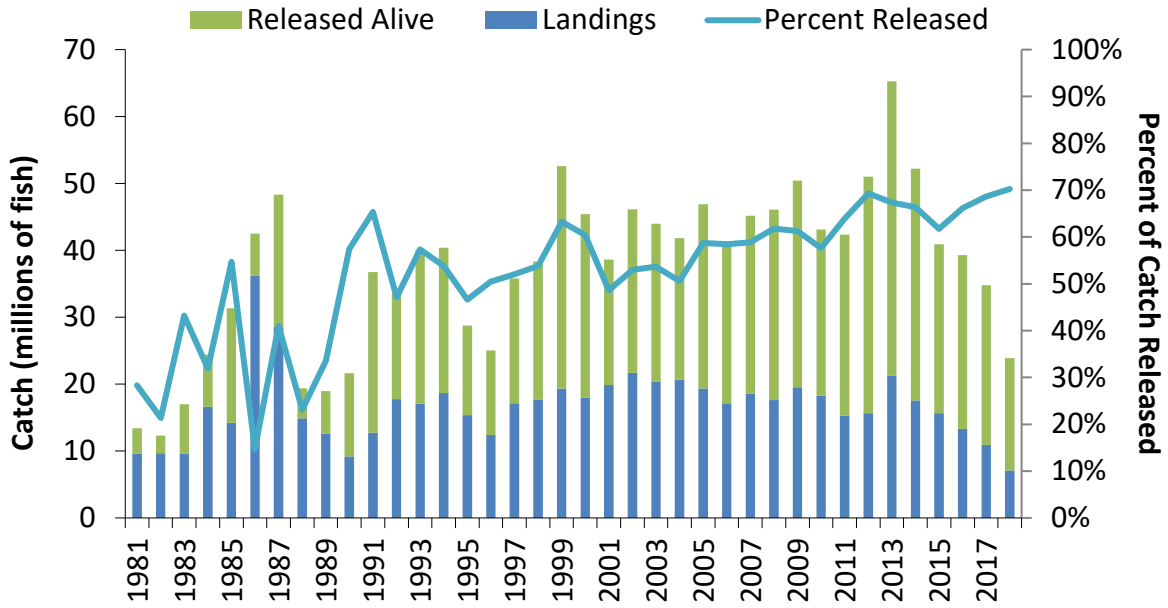


**Figure 2. Recreational catch (landings and alive releases, in numbers) and the percent of catch that is released, 1981-2018, based on the mail-based Fishing Effort Survey calibration.** (See Tables 4 and 5 for values and source information.)

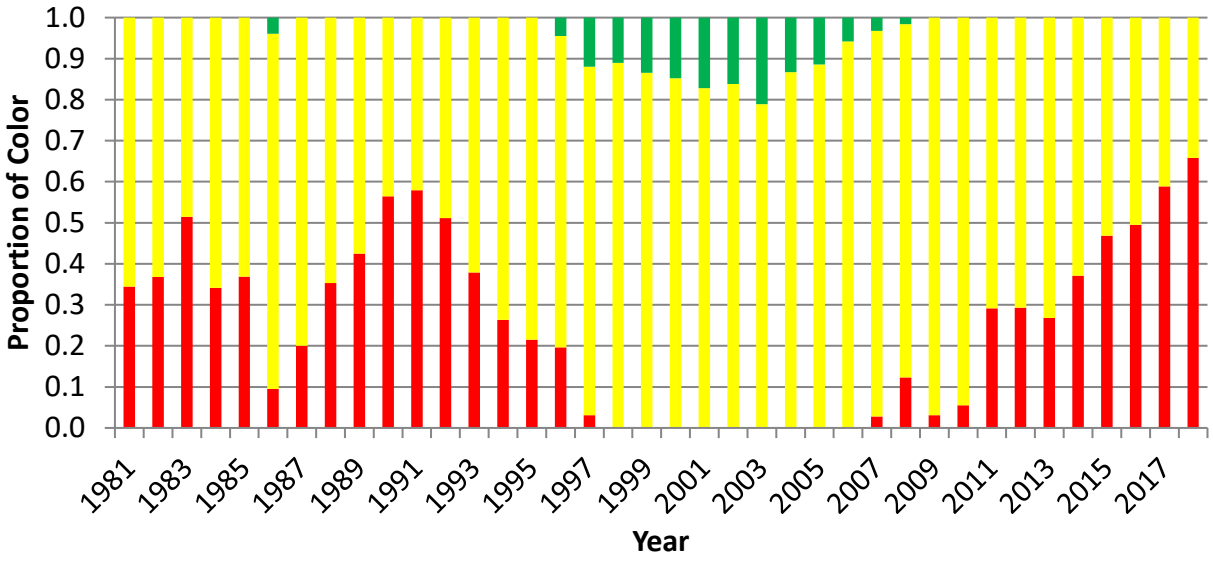


**Figure 3. Annual color proportions for the harvest composite TLA of Atlantic croaker recreational and commercial landings.**

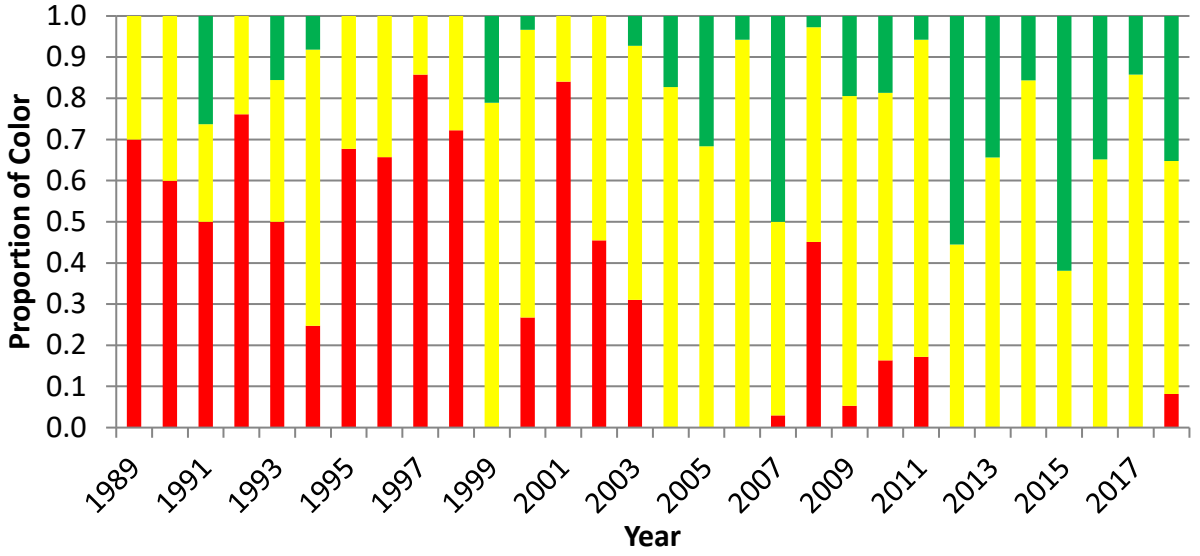


**Figure 4. Adult croaker TLA composite characteristic index (NEFSC and SEAMAP surveys). The NEFSC survey was not conducted in 2017 due to mechanical problems with the RV Bigelow. The 3-year average of 2014-2016 values was imputed to estimate the 2017 value for this index.**

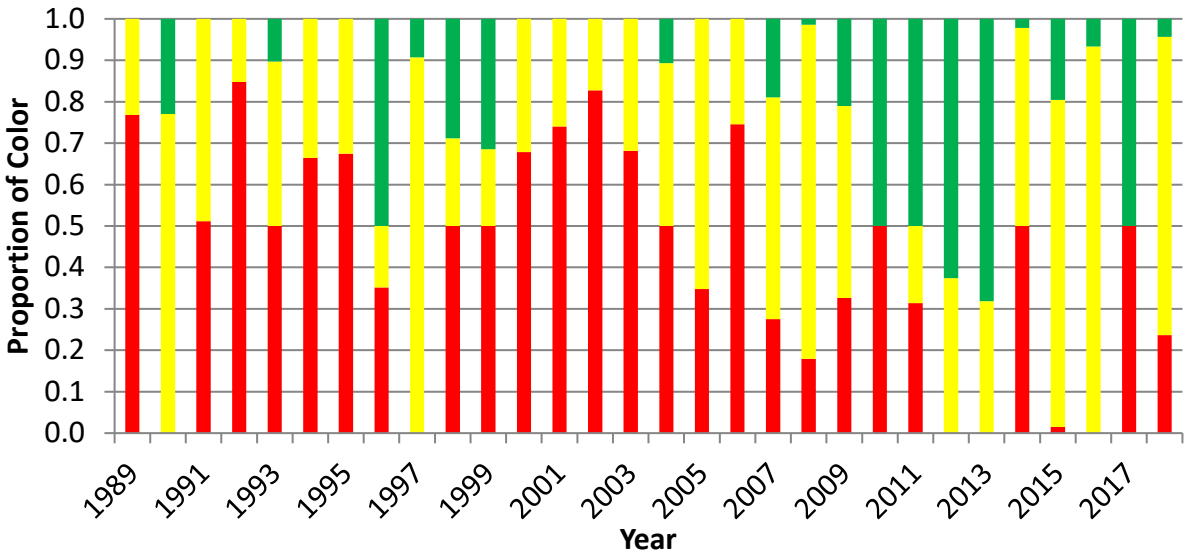


**Figure 5. Juvenile croaker TLA composite characteristic index (NC 195 and VIMS surveys).**

## XI. Tables

**Table 1. Summary of state regulations for Atlantic croaker in 2017.**

| State | Recreational | Commercial |
|---|---|---|
| NJ | none | otter/beam trawl mesh restriction for directed croaker harvest (>100 lbs in possession) |
| DE | 8" minimum; recreational gill nets (up to 200 ft.) with license | 8" minimum |
| MD | 9" min, 25 fish/day, charter boat logbooks | 9" minimum; open 3/16 to 12/31 |
| PRFC | 25 fish/day | pound net season: 2/15 to 12/15 |
| VA | none | none |
| NC | recreational use of commercial gears with license and gear restrictions | |
| SC | mandatory for-hire logbooks, small Sciaenidae species aggregate bag limit of 50 fish/day | |
| GA | 25 fish/day | 25 fish/day limit except for trawlers harvesting shrimp for human consumption (no limit) |
| FL | none | none |

* A commercial fishing license is required to sell croaker in all states with fisheries. For all states, general gear restrictions affect commercial croaker harvest.

**Table 2. Commercial harvest (pounds) of Atlantic croaker by state, 2009-2018.**
(Estimates for 2018 are preliminary. Sources: 2019 state compliance reports for 2018 fishing year and for years prior to 2018, personal communication with ACCSP, Arlington, VA [07/10/2019], except PRFC [compliance reports only].)

| Year | NJ | DE | MD | PRFC | VA | NC | SC | GA | FL | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 585,552 | C | 448,589 | 234,101 | 8,489,772 | 6,135,437 | 75 | | 32,151 | 15,942,018 |
| 2010 | 342,116 | C | 542,233 | 162,571 | 7,796,179 | 7,312,159 | C | | 37,229 | 16,198,548 |
| 2011 | 458,397 | C | 714,347 | 243,196 | 5,415,432 | 5,054,186 | C | | 47,649 | 11,945,181 |
| 2012 | 363,381 | C | 915,432 | 273,849 | 6,842,005 | 3,106,616 | C | | 74,527 | 11,578,682 |
| 2013 | 332,813 | C | 820,777 | 130,285 | 6,237,602 | 1,927,938 | C | | 76,463 | 9,532,551 |
| 2014 | 265,166 | C | 443,661 | 177,777 | 4,697,381 | 2,629,908 | 247 | | 45,587 | 8,269,374 |
| 2015 | 81,311 | C | 294,038 | 118,996 | 4,426,957 | 1,819,067 | C | | 39,096 | 6,783,689 |
| 2016 | 55,210 | C | 101,949 | 168,889 | 3,825,737 | 2,164,015 | 302 | | 57,538 | 6,374,435 |
| 2017 | 1,068 | C | 42,958 | 114,319 | 2,822,005 | 1,007,963 | 256 | | 43,033 | 4,031,880 |
| 2018 | C | C | 44,305 | 16,561 | 1,953,794 | 1,643,607 | C | | 54,409 | 3,713,470 |

C: Confidential data

**Table 3. Recreational harvest (pounds) of Atlantic croaker by state, 2009-2018.** (Sources: 2019 state compliance reports for 2018 fishing year and for years prior to 2018, personal communication with ACCSP, Arlington, VA [07/10/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | FL | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2009 | 662,763 | 615,692 | 3,012,580 | 8,282,280 | 359,703 | 214,212 | 69,031 | 1,120,776 | 14,337,037 |
| 2010 | 79,889 | 106,268 | 2,472,032 | 9,295,413 | 638,817 | 27,184 | 35,593 | 209,519 | 12,864,715 |
| 2011 | 50,153 | 123,487 | 1,188,916 | 4,584,599 | 360,390 | 583,280 | 38,219 | 995,506 | 7,924,550 |
| 2012 | 259,645 | 147,737 | 1,980,417 | 4,664,264 | 307,338 | 30,149 | 29,815 | 1,063,337 | 8,482,702 |
| 2013 | 1,637,516 | 253,447 | 1,581,384 | 6,442,166 | 453,881 | 84,248 | 89,781 | 642,887 | 11,185,310 |
| 2014 | 750,580 | 427,615 | 1,265,217 | 4,354,046 | 758,751 | 104,434 | 138,423 | 712,090 | 8,511,156 |
| 2015 | 263,749 | 189,320 | 871,596 | 3,514,410 | 557,735 | 181,909 | 248,431 | 881,185 | 6,708,335 |
| 2016 | 7,133 | 10,959 | 407,010 | 2,998,022 | 443,728 | 81,896 | 116,313 | 1,893,203 | 5,958,264 |
| 2017 | 0 | 26,429 | 238,659 | 3,383,506 | 237,160 | 310,621 | 100,565 | 555,389 | 4,852,329 |
| 2018 | 34,125 | 5,859 | 191,854 | 1,935,837 | 128,011 | 81,251 | 82,174 | 326,265 | 2,785,376 |

**Table 4. Recreational harvest (numbers) of Atlantic croaker by state, 2009-2018.** (Sources: 2019 state compliance reports for 2018 fishing year and for years prior to 2018, personal communication with ACCSP, Arlington, VA [07/10/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | FL | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1,059,267 | 983,173 | 2,586,887 | 10,789,517 | 958,128 | 733,845 | 185,129 | 2,252,473 | 19,548,419 |
| 2010 | 142,887 | 207,601 | 2,994,889 | 12,961,723 | 1,280,446 | 88,399 | 121,252 | 470,168 | 18,267,365 |
| 2011 | 91,014 | 212,613 | 1,530,723 | 8,891,276 | 873,659 | 949,132 | 129,941 | 2,593,963 | 15,272,321 |
| 2012 | 830,891 | 202,283 | 2,565,599 | 8,786,350 | 848,495 | 132,264 | 104,944 | 2,190,268 | 15,661,094 |
| 2013 | 2,707,410 | 530,236 | 2,308,987 | 12,517,286 | 1,300,804 | 336,140 | 264,984 | 1,332,465 | 21,298,312 |
| 2014 | 852,733 | 806,256 | 2,197,125 | 9,533,829 | 1,935,961 | 600,482 | 289,781 | 1,359,207 | 17,575,374 |
| 2015 | 339,021 | 334,676 | 1,738,576 | 8,024,381 | 1,437,019 | 555,263 | 790,014 | 2,429,723 | 15,648,673 |
| 2016 | 8,236 | 24,546 | 659,318 | 7,276,719 | 1,109,570 | 268,470 | 402,254 | 3,553,777 | 13,302,890 |
| 2017 | 0 | 65,575 | 425,987 | 7,637,843 | 666,930 | 765,227 | 371,301 | 969,146 | 10,902,009 |
| 2018 | 104,321 | 12,371 | 305,469 | 4,815,585 | 372,397 | 335,833 | 241,957 | 919,981 | 7,107,914 |

**Table 5. Recreational releases (number) of Atlantic croaker by state, 2009-2018.** (Sources: 2019 state compliance reports for 2018 fishing year and for years prior to 2018, personal communication with ACCSP, Arlington, VA [07/10/2019])

| Year | NJ | DE | MD | VA | NC | SC | GA | FL | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2009 | 406,639 | 1,284,262 | 2,424,818 | 16,732,646 | 5,623,278 | 1,232,519 | 1,169,782 | 2,015,296 | 30,889,240 |
| 2010 | 380,916 | 1,056,528 | 3,060,983 | 13,470,836 | 4,571,287 | 621,497 | 651,984 | 1,014,552 | 24,828,583 |
| 2011 | 252,419 | 214,603 | 937,220 | 14,160,124 | 7,005,152 | 1,187,686 | 748,696 | 2,559,976 | 27,065,876 |
| 2012 | 3,336,964 | 1,036,383 | 7,090,976 | 15,140,369 | 3,878,710 | 1,070,703 | 781,302 | 2,999,225 | 35,334,632 |
| 2013 | 2,980,744 | 1,811,661 | 7,557,223 | 18,480,099 | 6,729,556 | 3,754,143 | 1,361,943 | 1,265,571 | 43,940,940 |
| 2014 | 703,031 | 1,396,970 | 2,806,693 | 10,314,405 | 10,347,332 | 4,742,718 | 2,057,898 | 2,265,961 | 34,635,008 |
| 2015 | 240,840 | 309,389 | 1,236,293 | 6,815,343 | 9,632,560 | 3,236,774 | 1,320,939 | 2,451,253 | 25,243,391 |
| 2016 | 139,085 | 390,655 | 726,662 | 6,993,470 | 7,254,382 | 5,233,835 | 1,178,630 | 4,073,001 | 25,989,720 |
| 2017 | 152,540 | 230,934 | 2,833,760 | 8,443,528 | 4,631,445 | 4,755,853 | 1,059,539 | 1,770,846 | 23,878,445 |
| 2018 | 144,637 | 85,424 | 203,081 | 4,980,703 | 3,580,227 | 5,568,892 | 1,395,514 | 816,536 | 16,775,014 |