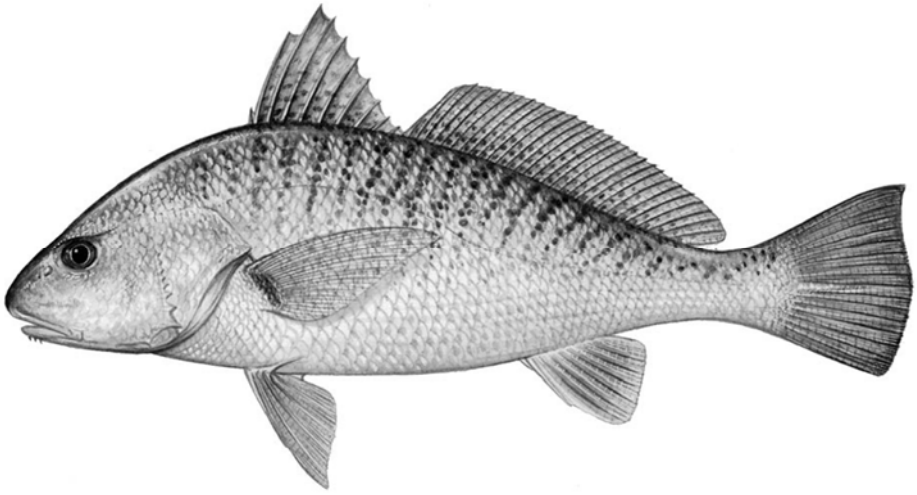
Traffic Light Analysis of Atlantic Croaker (*Micropogonias undulatus)* for the Atlantic States Marine Fisheries Commission Fishery Management Plan Review

Update for 2015-2016 Fishing Years



Atlantic Croaker Plan Review Team

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Introduction

Atlantic croaker are managed under Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker (2005) and Addendum I (2011). 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. The Addendum revises 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 approved Addendum II to Amendment I to the Atlantic Croaker Fishery Management Plan (FMP). The Addendum establishes a new management framework (i.e., 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 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, such as blue crabs in North Carolina and snow crabs in the Gulf of St. Lawrence. As such, its serves as an excellent management tool for Atlantic croaker, until the currently underway stock assessment is completed.

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 the 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 current management triggers for Atlantic croaker compare annual changes in various indices (e.g. recent landings and survey information) to review trends in the fisheries. The Atlantic Croaker Technical Committee expressed concern that 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. This resulted in the change to the TLA for annual review of Atlantic croaker. A new stock assessment for Atlantic croaker was begun in 2015 and the current management triggers from the TLA will be re-evaluated and adjusted as needed once the stock assessment has been completed.

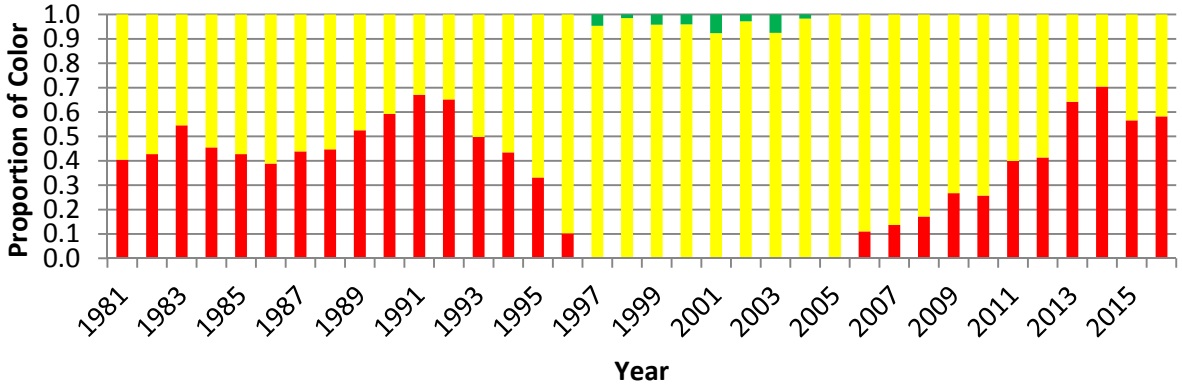
The indices used for the TLA include both commercial and recreational harvest (fishery dependent) and four fishery independent monitoring surveys that occur in different areas of the Atlantic coast of the United States. The fishery independent surveys include the Northeast Fisheries Science Center (NMFS) fall ground fish trawl survey, the Virginia Institute of Marine Science (VIMS) trawl survey, the North Carolina Dept. of Marine Fisheries trawl program 195, and the Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey.

Traffic Light Analysis (Fishery Dependent)

Commercial Landings

- Commercial landings were up 156% in 2015 (3,120 metric tons) from 2014 (1,220 metric tons) and declined slightly (7.3%) in 2016 to 2,894 metric tons.
- The TLA for commercial landings has been above the 30% every year since 2011 (Fig. 1) and was the fifth year in a row where landings were above the 30%.
- More concerning is that the red proportion has been above the 60% red threshold for the last four years (2013-2016).
- The three year red proportion average was greater than 60% in 2015, and 2016 which indicates possible elevated management concern due to the decline in commercial landings.

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

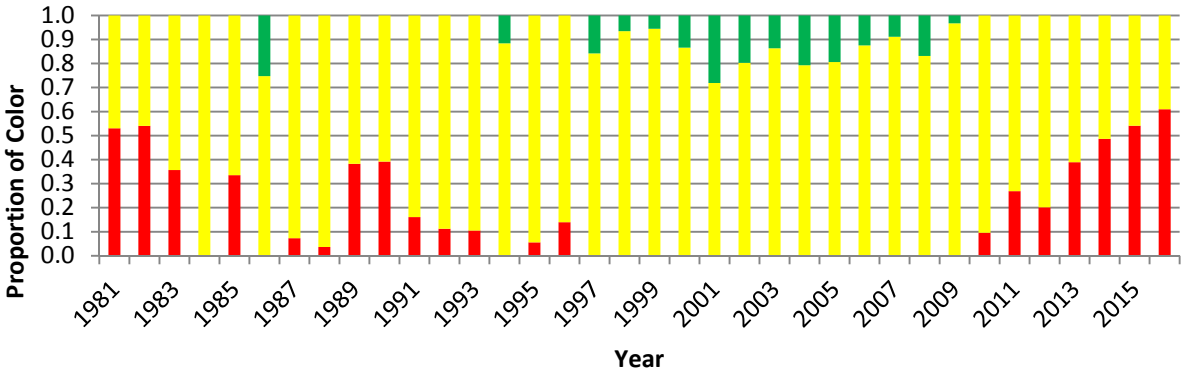


Recreational Harvest

- The recreational harvest index also continued to decline, down 16.4% in 2015 and 24.6% in 2016 from harvest levels seen in 2014.
- The recreational harvest level in 2015 (2,584,350 lbs) was among the lowest annual harvests in the entire time series (1981-2014) and 2016 (1,949,944 lbs) was the lowest year in the entire data series.
- Annual percent standard error (PSE) levels were elevated (> 20%) but not quite at the level where considered completely unreliable (> 50%).
- The 3 year average proportion of red in the TLA was 47.2% in 2015 and 54.6% in 2016 (Fig. 2), indicating the recreational index would has triggered the last three years at the 30% level.

- The decline in harvest levels for Atlantic croaker in the recreational fishery may be 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.

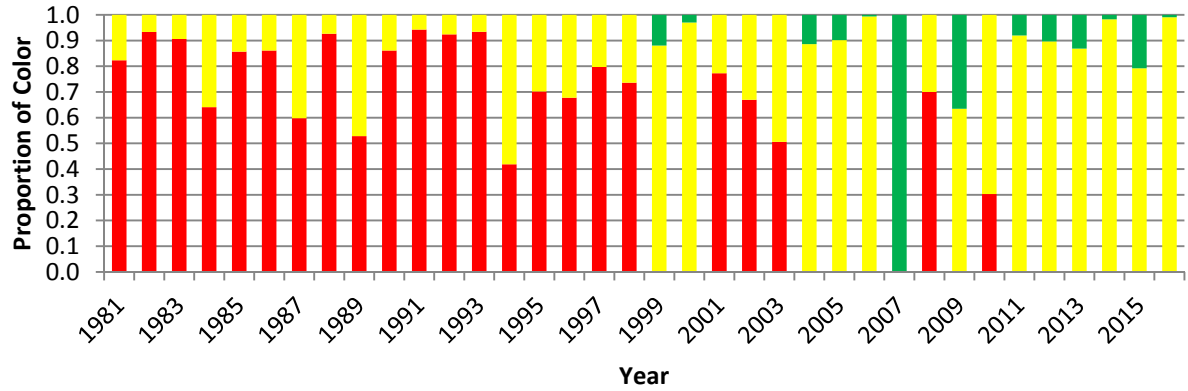


Traffic Light Analysis (Fishery Independent Surveys)

NEFSC/NMFS Fall Groundfish Survey

- The NMFS index increased 49.7% in 2015 and declined 34.6% in 2016 with no red in the TLA since 2010 (Fig. 3).
- The index has stayed above the long term mean since 2011.
- The TLA trigger would not have tripped on the NMFS index in either 2015 or 2016 given catch levels at or above the long term mean in the previous three years.

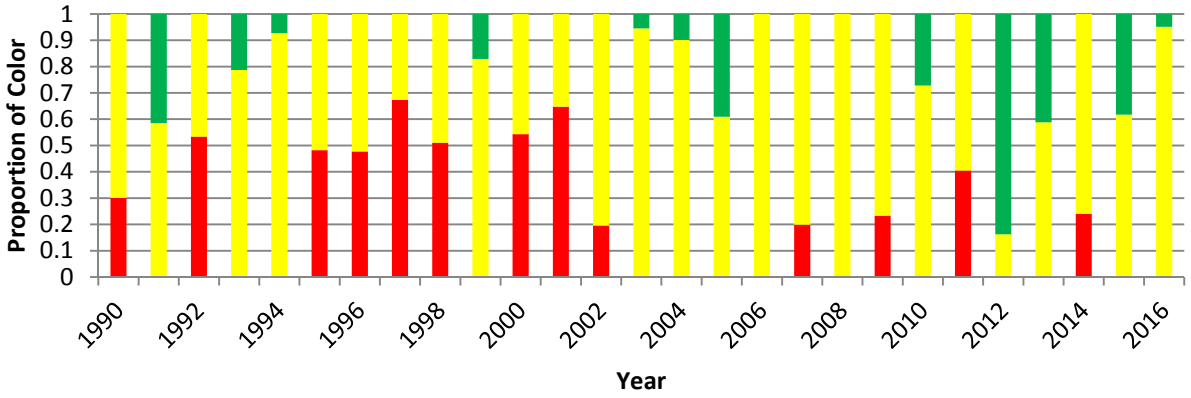
Figure 5. Annual TLA color proportions for Atlantic croaker from NMFS ground-fish trawl survey based on 1996-2008 reference period.



SEAMAP Survey

- The SEAMAP index increased 174% in 2015 and then declined 40.8% in 2016.
- Index values remained above the long term mean for both years, so there was no red in the TLA (Fig. 4).
- The TLA trigger for the SEAMAP survey did not trip in either 2015 or 2016.

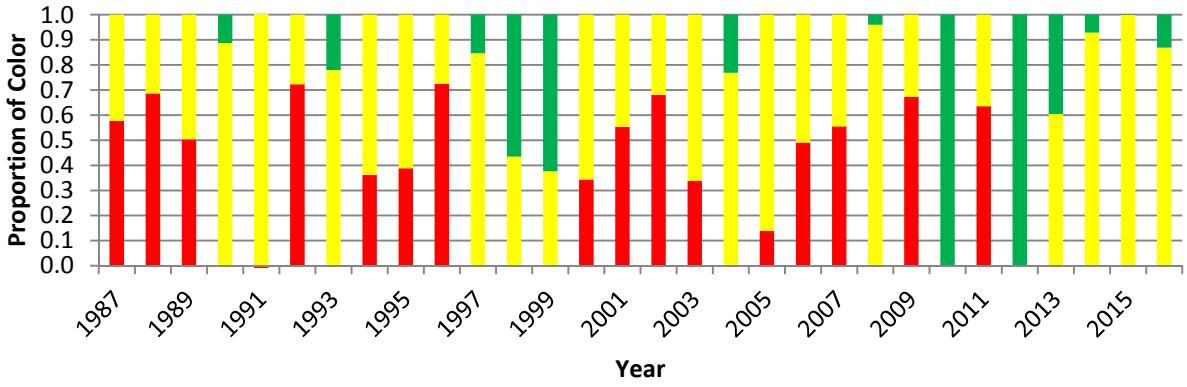
Figure 4. Traffic Light Model for SEAMAP catch data by weight using a 1996-2008 reference period.



North Carolina Program 195

- The North Carolina index declined in 2015 (down 16.5% from 2014) and increased in 2016 (36.7%) from 2015, but did not drop below the long term mean for the data series in either year.
- While the TLA indicates declining index values since the peak in 2012 (decreasing green proportions, Figure 5), general catch levels in the index remained above the long term mean for the series and did not trigger in 2015 or 2016.

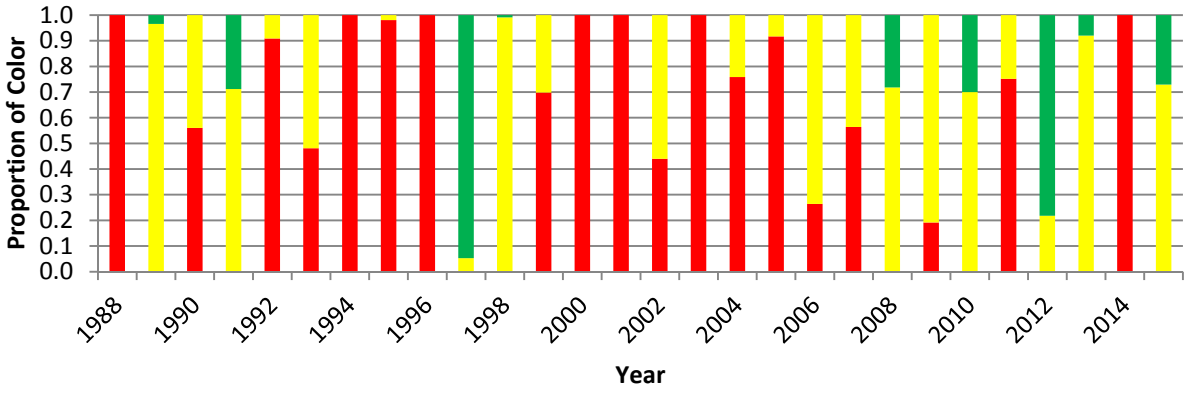
Figure 5. NCDMF Program 195 TLA color proportions for Atlantic croaker using 1996-2008 reference period.



VIMS Survey

- The VIMS index increased significantly (1668%) in 2015 from 2014 going from 1.55 fish per tow in 2014 to 27.4 fish per tow in 2015. The alternating high variability in annual index values was evident in the alternating proportions of red and green in the TLA (Fig. 6).
- The index value was above the long term mean in 2015 and the three year average red proportion was below 30% so the index would not have tripped the TLA trigger.

Figure 6. Annual TLA color proportions for Atlantic croaker from VIMS spring trawl survey.

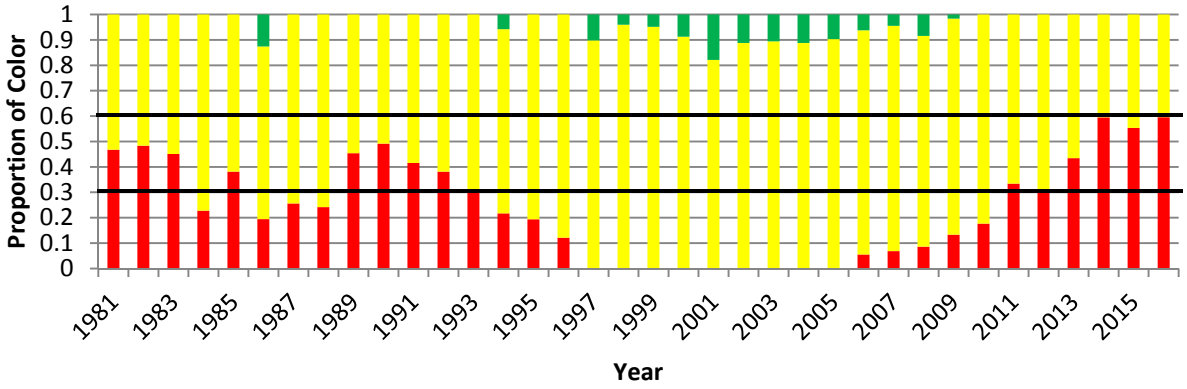


Traffic Light Analysis (Composite Indexes)

Harvest Composite Index

- The harvest composite TLA index indicates that the management response trigger would have been tripped for the fourth year in a row.
- The mean red proportion for the most recent three year time period (2014-2016) was 58.1% which was well above the 30% moderate concern threshold.
- The important trend to point out is the continuing decline in recreational and commercial landings for Atlantic croaker.

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.

- All four abundance indexes showed increases in both 2015 and 2016 with no red proportion occurring in either year.
- The adult composite TLA characteristic (Fig. 8) showed a higher proportion of green in 2015 (29.5%) than in 2016 (2.9%).
- The juvenile composite TLA characteristic (Fig. 9) had no red in the index for either 2015 or 2016 indicating and increase in abundance over 2014. The NC 195 index had a lower proportion of green compared to the VIMS index.
- The juvenile composite characteristic index did not trip in either 2015 or 2016.

- The higher annual variability for the different color proportions in the juvenile composite characteristic (compared to the adult composite characteristic) is likely a reflection annual recruitment variability rather than population trends.
- It is also worthwhile to point out that the trends in the two abundance composite characteristics reflect each other closely for the last three years with similar trends in color proportions.

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

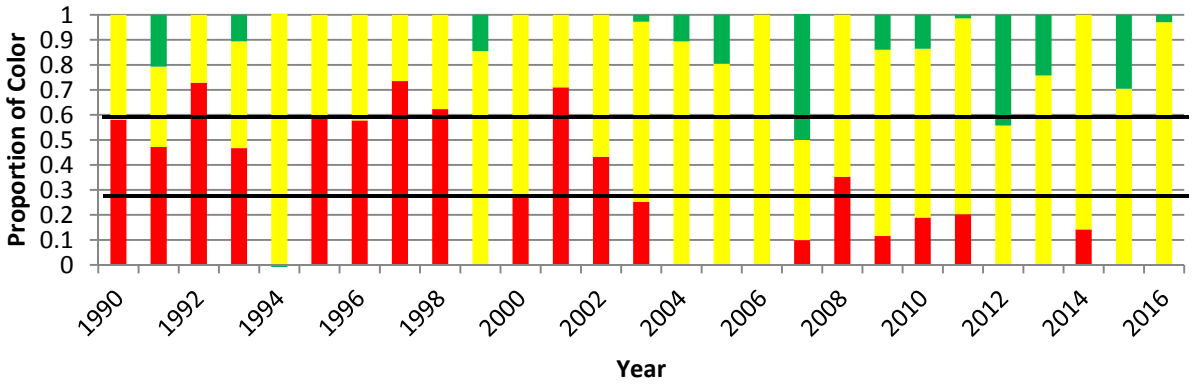
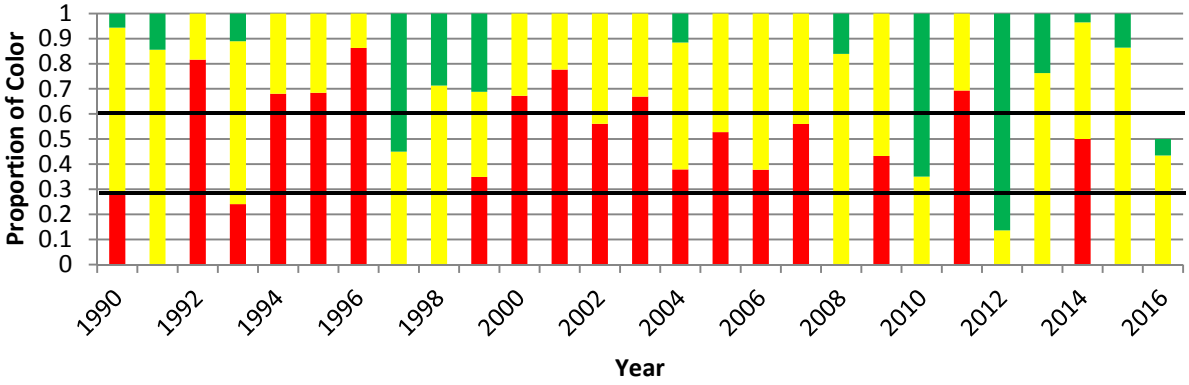


Figure 9. Juvenile croaker TLA composite characteristic index (NC 195 and VIMS surveys).



Summary

The harvest composite TLA did trip in both 2015 and 2016 while the abundance TLA composite showed the opposite trend with increasing abundance and not having the management concern threshold tripped. The continued declining trend in the commercial and recreational harvests for the Atlantic coast is of concern. The recently completed Atlantic croaker stock assessment (ASMFC, 2017) showed that overfishing was not occurring and that Atlantic croaker were not overfished with biomass levels (SSB) at relatively high levels and fishing mortality (F) being relatively low. This contrasts the decline seen in the harvest TLA for both recreational and

commercial landings, while the increasing trends seen in the abundance indices more closely resemble the results of the stock assessment. The explanation for this discrepancy may lie in differing size and age structures of the different fishery independent surveys and commercial and recreational landings, with older/larger fish being the more likely target of the fishery. An age partitioning approach of the different indices may allow better refinement of the TLA providing more synchrony between the harvest and landings metrics for adults as well as juveniles. This approach should be examined by the TC for future consideration.