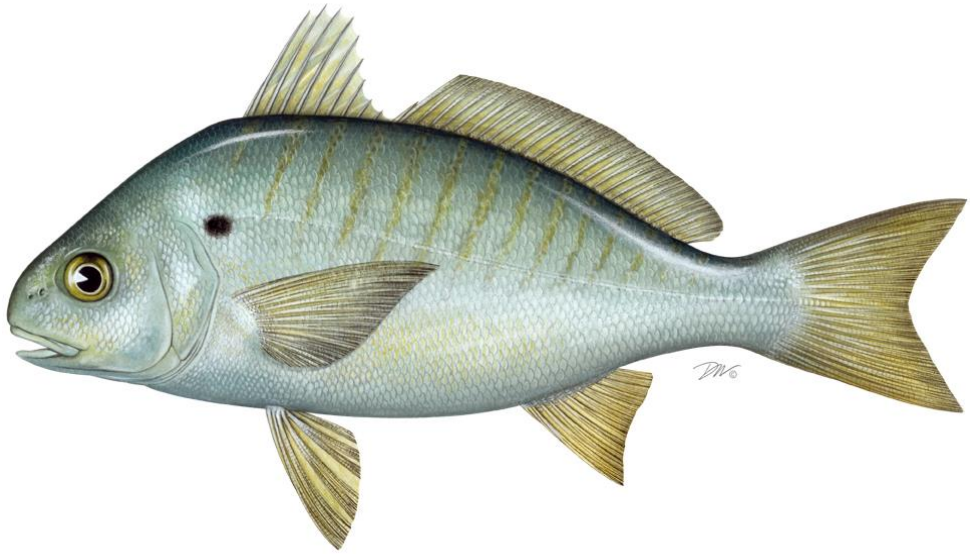
2018 Traffic Light Analysis of Spot (*Leiostomus xanthurus)* for the Atlantic States Marine Fisheries Commission Fishery Management Plan Review.

2017 Fishing Year
&
Proposed Changes to TLA Management Scheme



Plan Review Team

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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 accepted for management purposes due to the lack of reliable stock biomass and the impact of the shrimp trawl fishery on the population.

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 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 the Addendum, 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 Dept. of Natural Resources juvenile striped bass seine survey, and the Southeast Area Monitoring Assessment Program (SEAMAP) trawl survey.

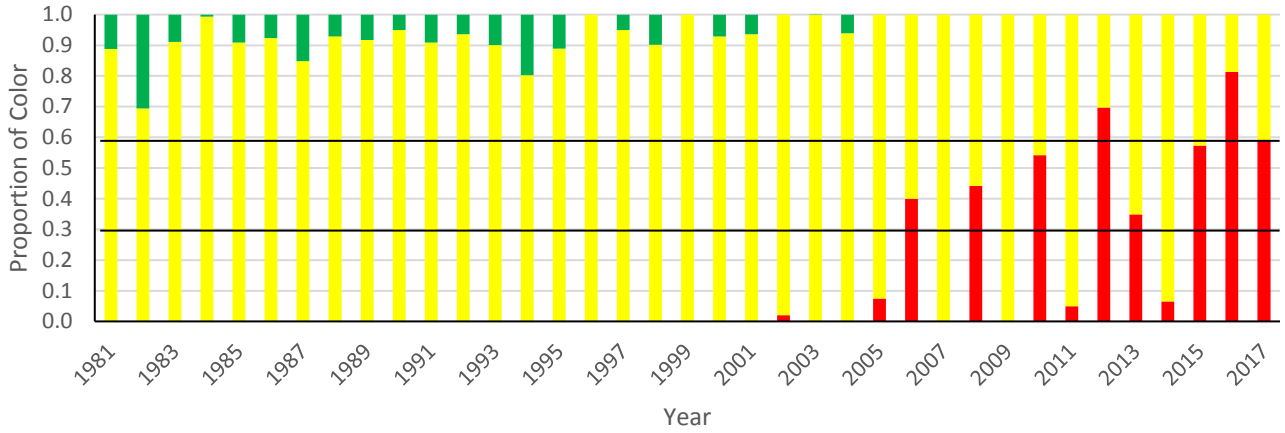
Traffic Light Analysis (Fishery Dependent)

Commercial

- Commercial landings for spot on the Atlantic coast increased 217% in 2017 from 2016. However, landings were still well below the long term mean and the increase in 2017 was 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 90.7% from 2004 to 2016.

- 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 value of 1,989,804 pounds in 2017.
- The TLA commercial index did trip at the 30% level in 2017.

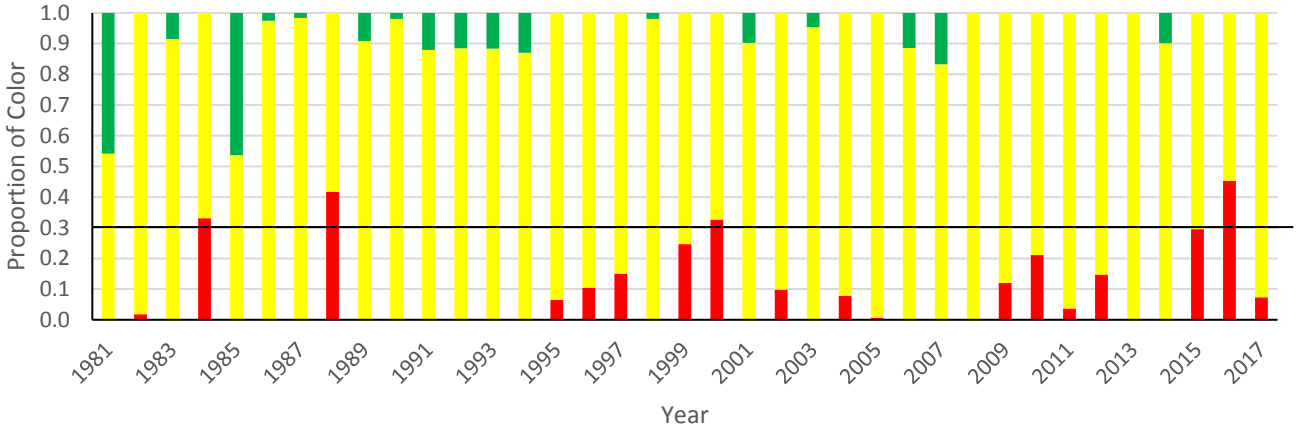
Figure 1. Annual TLA color proportions using 1989-2012 reference period for spot from commercial landings for the Atlantic coast of the US.



Recreational

- The recreational harvest for spot on the Atlantic coast increased 110% from 2016 to 2017, with values of 3,620,388 pounds and 7,636,915 pounds, respectively.
- Annual harvest in the recreational fishery has been below the long term mean (LTM) since 2009 and was still below that threshold in 2017.
- The red proportion of the TLA decreased in 2017 to 7.3%. While the red proportion in 2017 was below the concern threshold, the recreational TLA did trip in 2017 since it was above the 30% threshold for the previous two years (2015-2016).

Figure 2. Atlantic coast TLA for recreational spot harvest on the Atlantic coast of the United States. Note: figure uses revised MRIP estimates (July 2018).

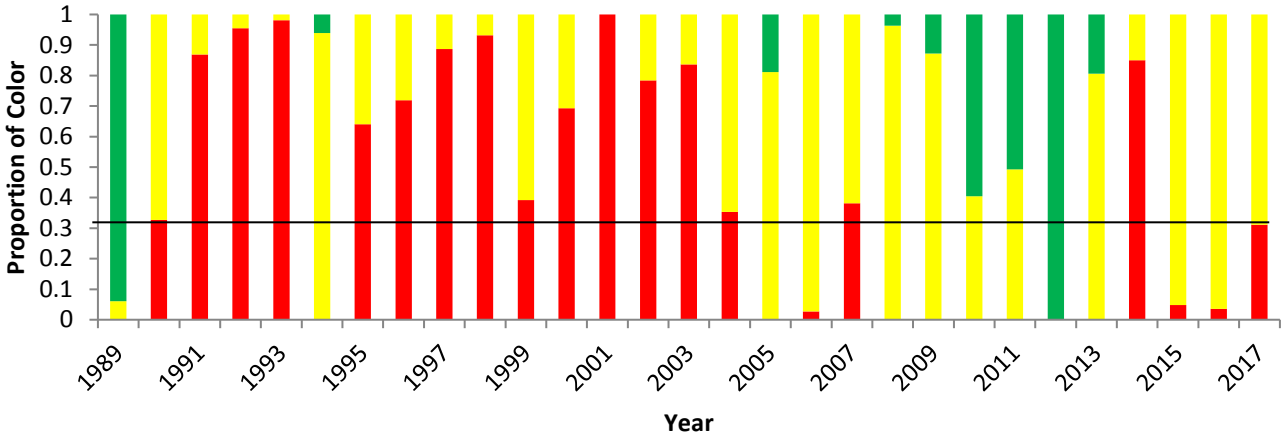


Traffic Light Analysis (Fishery Independent)

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 for the previous three years (2014-2016) (Fig. 3).
- While the red proportion did increase in 2017 using the 3 year placeholder index value, it was still below the 30% threshold.
- The TLA did not trigger in 2017 with the placeholder index

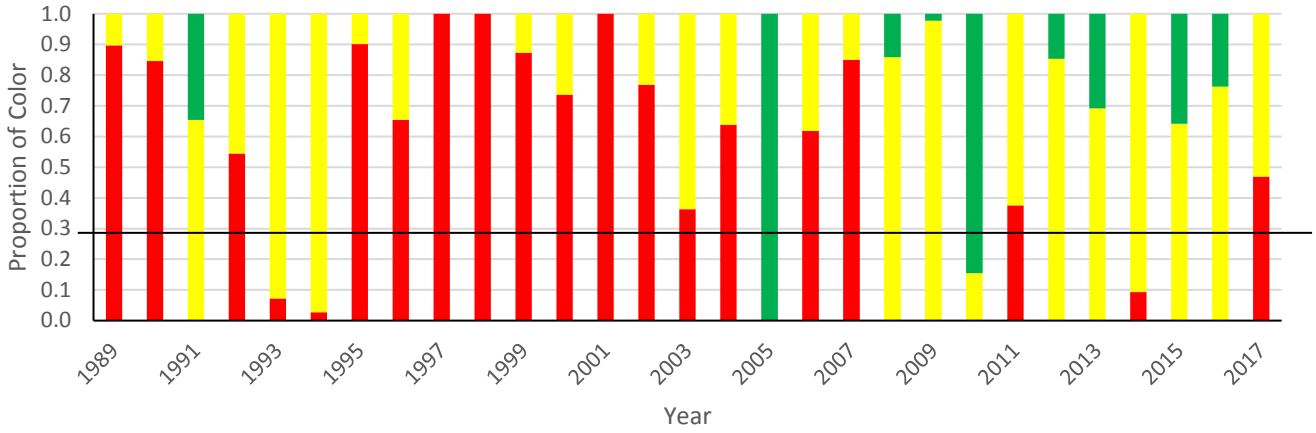
Figure 3. Non-proportioned annual TLA model using 1989-2012 reference time period for Spot from NMFS fall groundfish trawl survey.



SEAMAP Trawl Survey

- The annual CPUE declined 6.9% in 2017 from 2016 and remained above the long term mean (11.3 kg fish per tow).
- The TLA index did not trigger in 2017, and under the current TLA trigger scheme hasn't triggered since 2007.

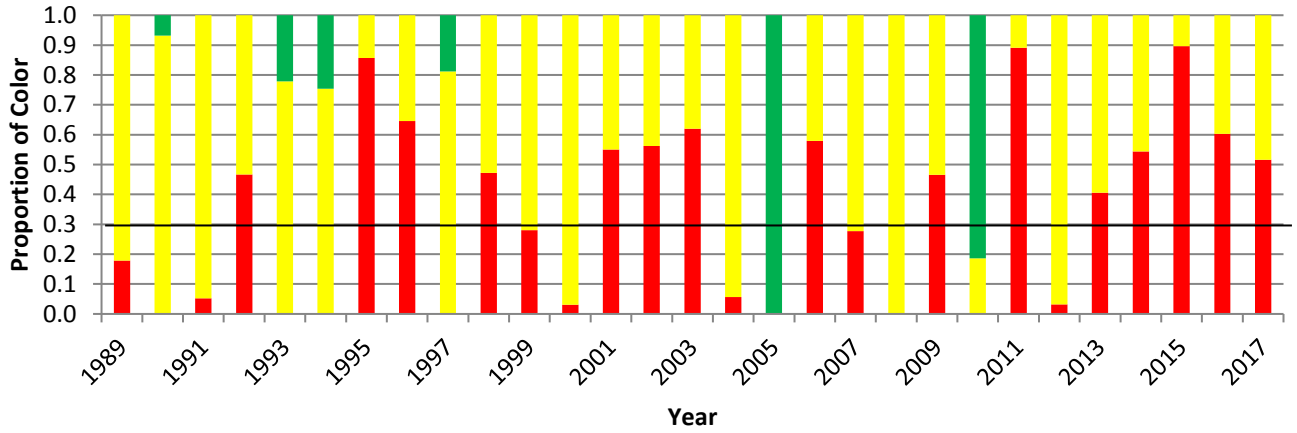
Figure 4. Annual color proportions for spot TLA from the fall SEAMAP survey using a 1989-2012 reference period



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 increased 24.1% in 2017 from 2016; however the 2015 index value was the lowest in the entire time series and both 2016 and 2017 index values were still quite low (Fig. 5).
- Mean annual CPUE was below the long term mean for the seventh 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 2017 for the fourth year in a row.
- The index tripping at the 30% level in 2013-2017 indicates cause for concern as the general decline in this index indicates a decline in spot recruitment in Maryland waters has been occurring for the past 20 years.

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

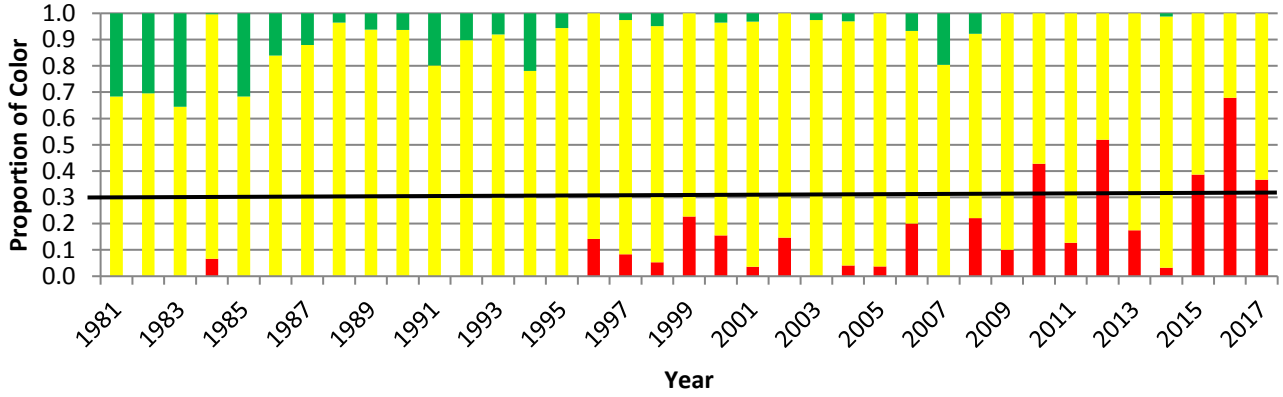


Traffic Light Analysis (Composite Indexes)

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 2017 (30% level) with three consecutive years greater than 30%.
- While the red proportion did decline in 2017 it was still above the 30% 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.

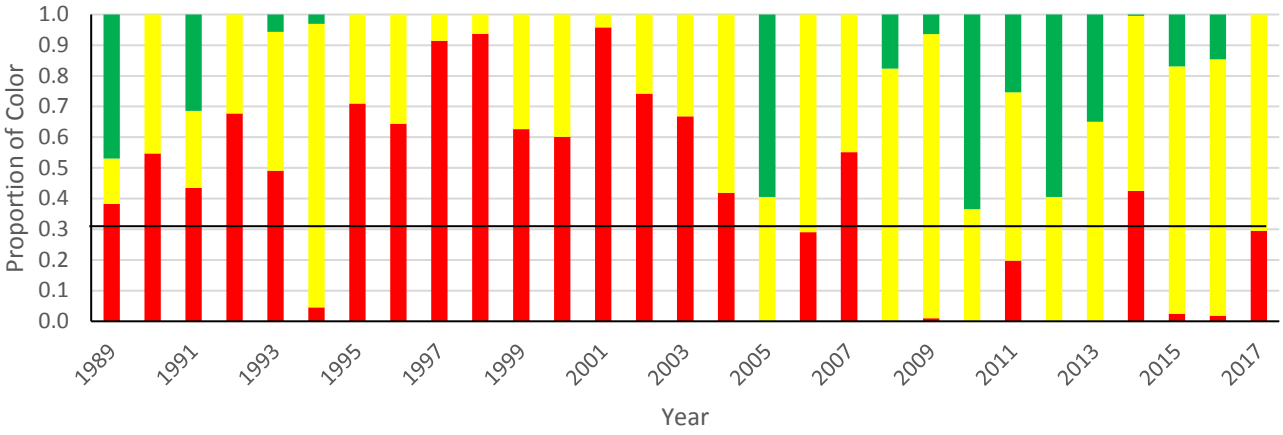
Figure 6. Annual TLA color proportions for harvest composite (commercial and recreational landings) for spot on the Atlantic coast of the US using 1989-2012 reference period.



Abundance Composite Characteristic Index

- The TLA composite characteristic for adult spot (NMFS and SEAMAP surveys) showed a decline from 2016 with a red proportion of 23.3% (Fig. 7).
- The decline in catch levels in the SEAMAP index and the decrease in the NMFS placeholder index would account for this.
- The composite characteristic TLA for the abundance indices did not trigger in 2017.

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



Summary

The harvest composite characteristic triggered in 2017, mostly due to declines in commercial harvest, while the adult composite index did not and the TLA composite characteristic index for juvenile spot also tripped.

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 TC 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. The next section of this report outlines the proposed changes to the TLA by the TC for further refinement of the annual trigger exercises.

Proposed Changes to Existing Management Traffic Light Approach for Spot

The current Traffic Light Analysis (TLA) for spot has not triggered management action to date despite declining trends in harvest and indices of abundance to very low values for some areas, particularly since 2014. There has also been discussion about regional differences and the reliability of data sources with contradictory trends for tracking changes in abundance. Data sources considered in the TLA and assessment were explored in attempts to explain differences in trends and identify potential changes in TLA metrics.

Seven recruitment (age-0) indices were evaluated: the SEAMAP trawl index, the NCDMF P195 trawl index, the NMFS trawl index, the ChesMMAP trawl index, the NEAMAP trawl index, the MD seine index, and the VIMS trawl index. Four age-1+ indices were evaluated: the NCDMF P195 trawl index, the NMFS trawl index, the ChesMMAP trawl index, and the NEAMAP trawl index. Nine sources of catch were evaluated: commercial landings, recreational harvest, recreational releases, and recreational total catch, all split between the South Atlantic and Mid-Atlantic (VA-NC border), and South Atlantic shrimp trawl discards.

Four options were developed by the TLA subcommittee (TLA-SC) for the Technical Committee's (TC) review. These options were presented for consideration in February 2018 at the Winter Meeting of the South Atlantic Fisheries Management Board (SAB) of the Atlantic States Marine Fisheries Commission (ASMFC). The four options considered included the following:

1. Status Quo (not recommended)
2. Coastwide TLA with Revised Indices
3. Regional TLA with Revised Indices
4. Relative Exploitation

The SAB requested that the TC further explore Option 3 (Regional TLA with Revised Indices) and present a revised TLA using this option along with the current TLA for the Summer Meeting of the ASMFC (August 2018). As decided during previous meetings, the South Atlantic shrimp trawl discards will be included with all options, but for informational purposes only (i.e., cannot trigger management). In addition, as is done in the current TLA, a recruitment metric is included with all options, not as a direct management trigger but for the TC's consideration during annual TLA updates to better inform management. The TLA recruitment metric includes a composite of VIMS and NC Program 195 indices for the following options, although the NMFS-NEFSC trawl and SEAMAP (ages 0 and 1) indices are available too.

For all options, the PRT has the responsibility of evaluating informational metrics (recruitment, shrimp trawl discards) during annual TLA updates, especially in years when management action is not triggered, to determine other signs of concern with the population. The PRT can recommend management action during years when the adopted option does not trigger management.

Option 3. Regional TLA with Revised Indices

For this option, the TLA-SC revised the abundance indices for spot to split them by age (recruitment indices and age 1+ indices) and region (Mid-Atlantic and South Atlantic) to better

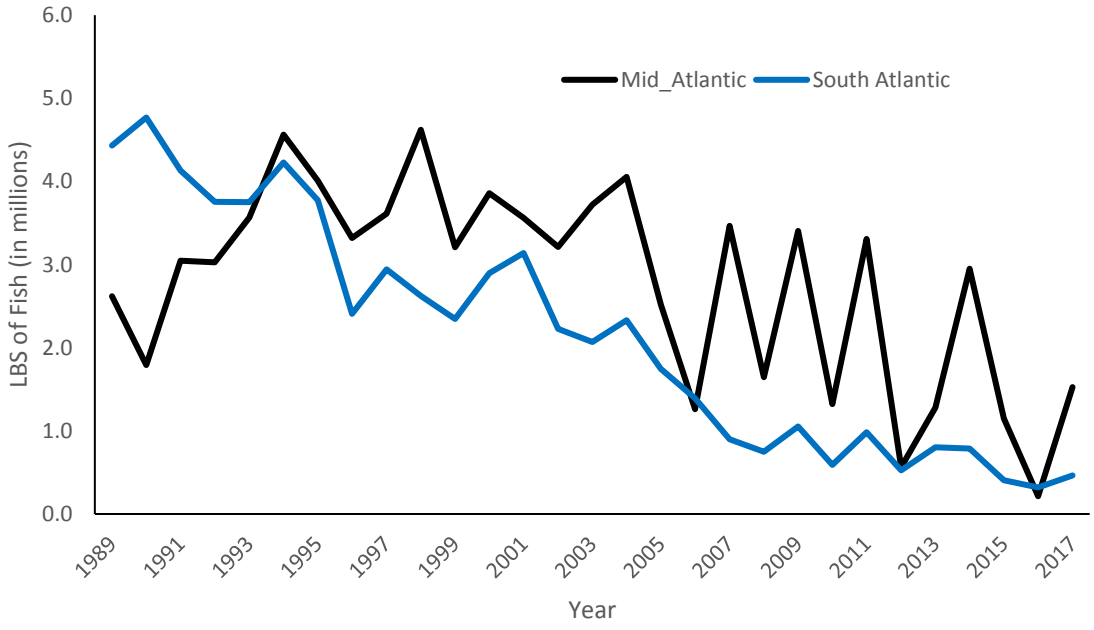
reflect the population. Adult indices for the regional TLA would be NMFS-NEFSC (age-1+, excluding NC strata) and ChesMMAP for the Mid-Atlantic and SEAMAP (age-1+) for the South Atlantic. The juvenile advisory indices used would be the Maryland juvenile fish trawl index and ChesMMAP for the Mid-Atlantic and the NCDMF Program 195 for the South Atlantic

The reference period for the TLA would be based on a 2002-2016 time period since this time frame was covered by all the proposed indices. In addition to an adult index for each region, there would also be regional harvest TLAs for the commercial and recreational fisheries based on annual landings. The TLA-SC suggested a change in the management triggers so that management action should be considered if 2 of the 3 latest years have tripped based on previous guidelines (30% red represents a moderate concern and 60% red represents a significant concern). Again, these would be based on the adult composite index and the harvest metrics, not the recruitment metric.

Harvest Composite Index

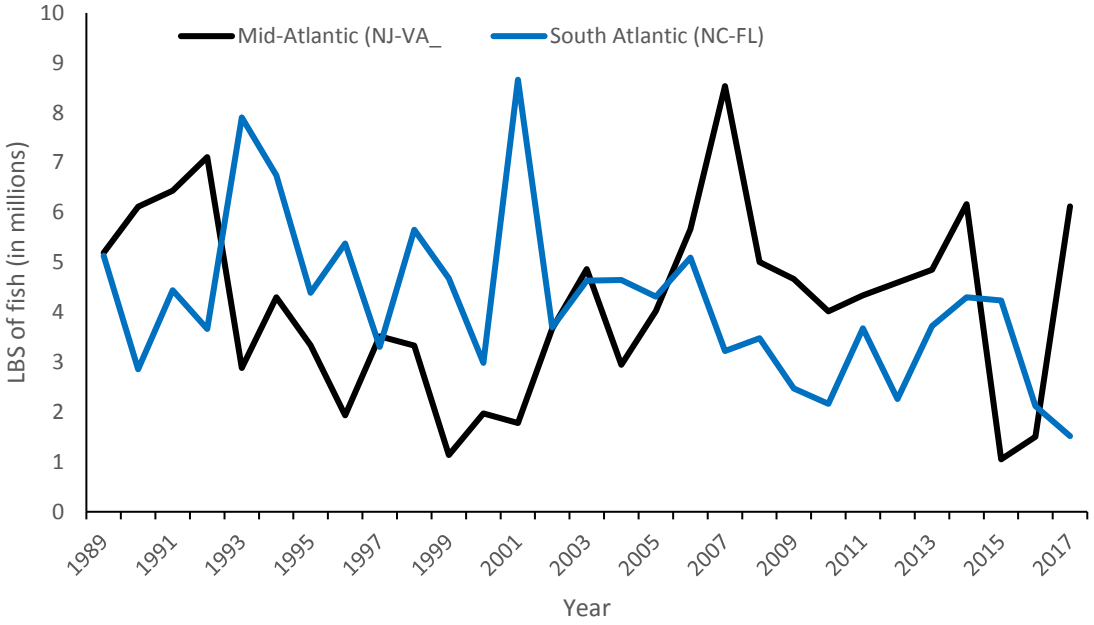
The majority of spot commercial landings occur in the Mid-Atlantic (New Jersey – Virginia), although landings have declined more consistently in the South Atlantic (North Carolina – Florida) (Fig. 8). Landings in the Mid-Atlantic have been highly variable annually over the last ten years with less variation in the South Atlantic.

Figure 8. Annual commercial harvest by region for spot on the Atlantic coast of the United States.



Recreational harvest in the South Atlantic also showed a generally declining trend but nearly as much as the commercial harvest (Fig. 9). Recreational harvest in the Mid-Atlantic showed an increasing trend from 1999 to the series peak in 2007 but has been generally declining since then (Fig. 9).

Figure 9. Annual recreational harvest of spot by region for the Atlantic coast of the United States.



The harvest composite TLA for both regions indicated general decline in harvest in recent years (Figs. 10 and 11). Like the Atlantic coast composite index (Fig. 6) both of the regional composite TLAs would have tripped in both 2016 and 2017 since the red proportions were greater than 30% for two of the three terminal years.

Figure 10. Annual composite TLA color proportions for spot for the Mid-Atlantic (NJ-VA) coast of the United States.

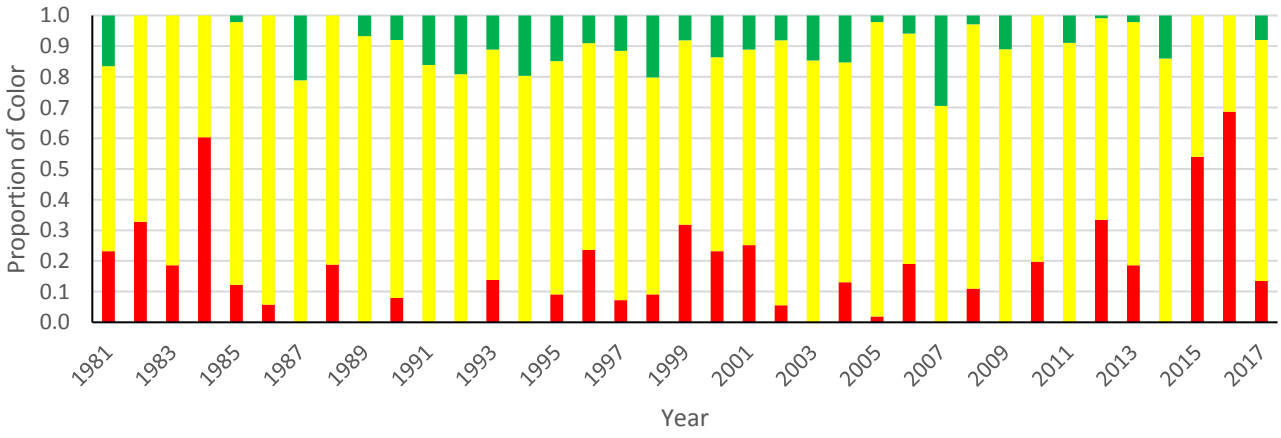
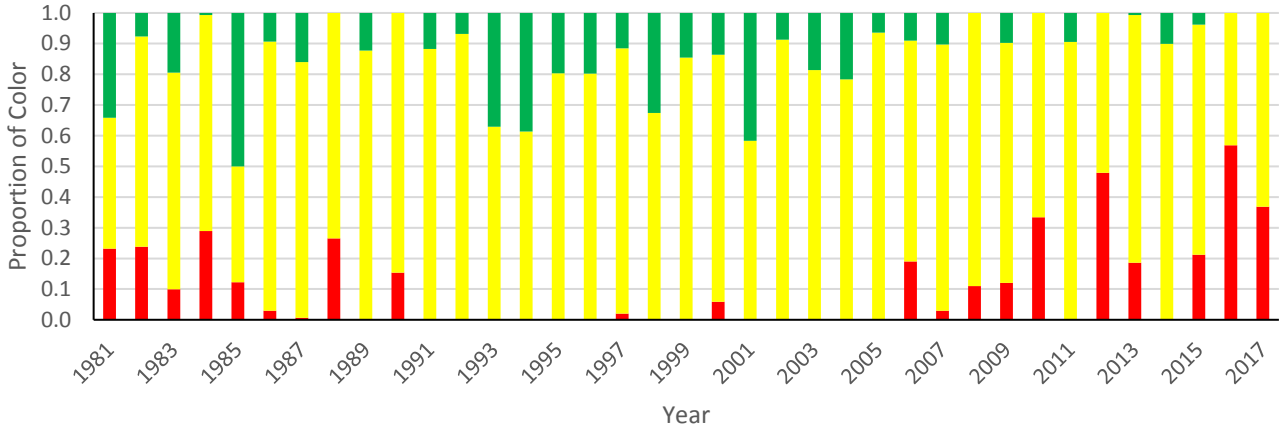


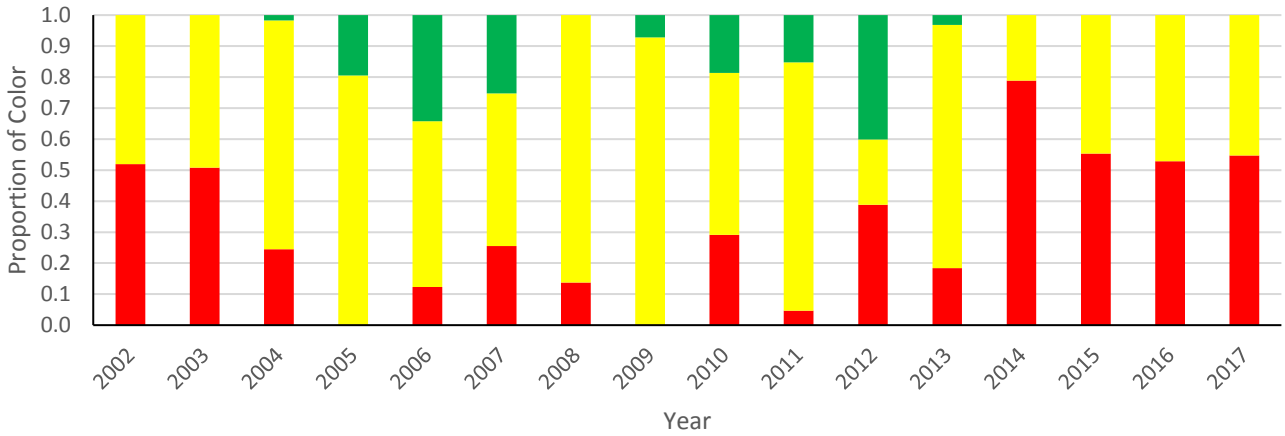
Figure 11. Annual composite TLA color proportions for spot for the South Atlantic (NC-FL) coast of the United States.



Adult Composite Indices

The adult composite index for the Mid-Atlantic used the NMFS and ChesMMAP indices and showed declining abundance since 2009 with the TLA triggering at the 30% level from 2014 through 2017 (Fig. 12). The higher green proportions during mid to late 2000s was due to high green proportions in the NMFS survey where the higher red proportions in the last 6 years was driven by low numbers in the ChesMMAP survey as well as declining catch in the NMFS survey.

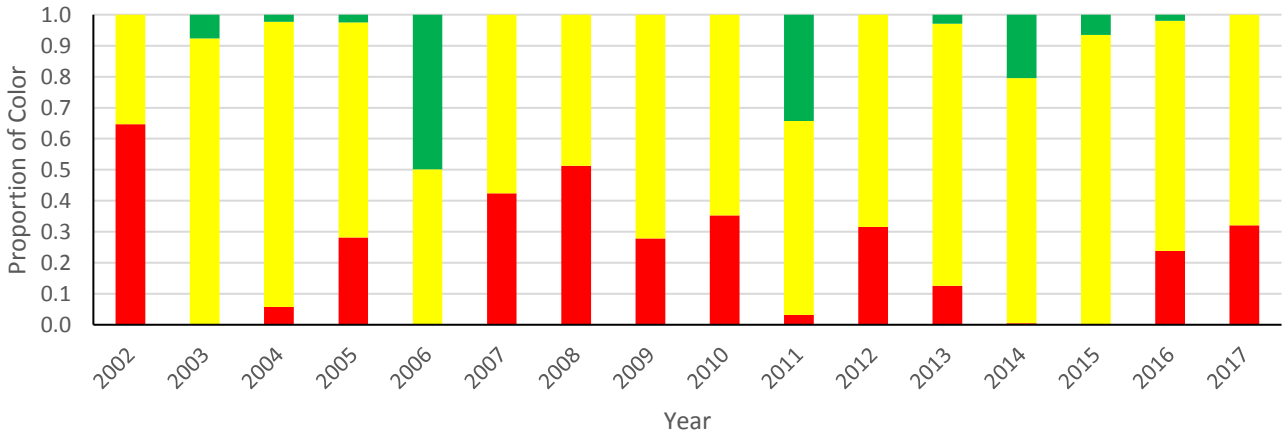
Figure 12. Annual composite TLA color proportions for adult spot for the Mid-Atlantic using 2002-2016 reference



The South Atlantic adult composite (SEAMAP and NC195) showed the highest red proportions during the mid-2000s and values approaching the 30% threshold for 2016-2017 (Fig. 13). The

composite index would not have triggered at the 30% threshold in the South Atlantic and hasn't since 2008-2010.

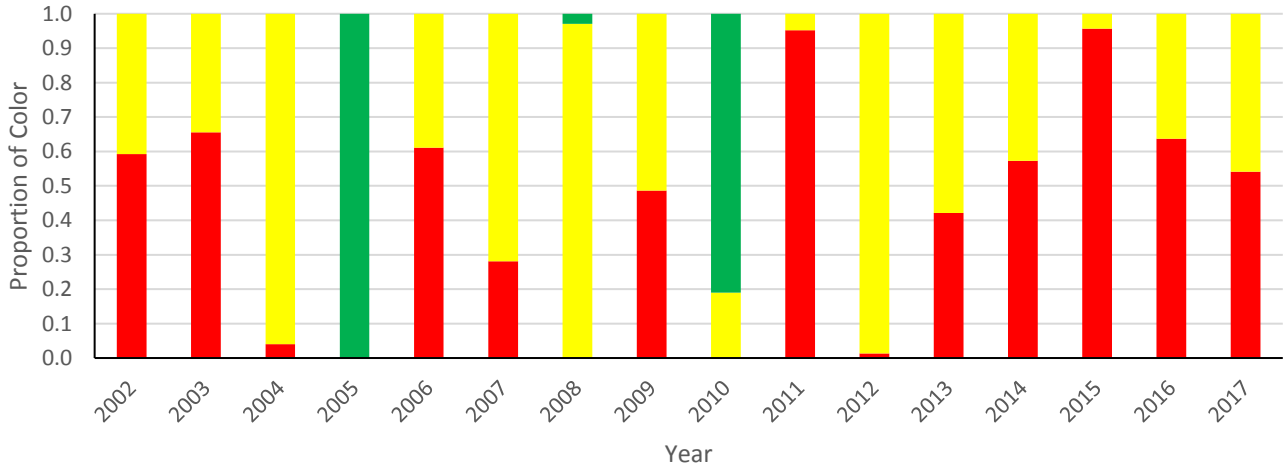
Figure 13. Annual composite TLA color proportions for adult spot for the South Atlantic using 2002-2016 reference period



Juvenile Composite Indices

The Maryland juvenile survey was the only juvenile spot survey available for use with the TLA and there was no juvenile survey available for the South Atlantic. The juvenile TLA showed a similar decline in the last 5-6 years as seen with the adult index with red proportions greater than the 30% threshold. While the juvenile index is not used directly in the trigger exercise, it would have triggered from 2014-2017 at the 30% level and at the 60% level in 2016 and 2017.

Figure 14. Mid-Atlantic (MD Juvenile Survey) TLA using 2002-2016 reference period



South Atlantic Shrimp Trawl Discards

Current estimates of relative spot by-catch from the South Atlantic shrimp fishery are only available through 2016 at the writing of this report. This will be amended when the by-catch index for 2017 become available.

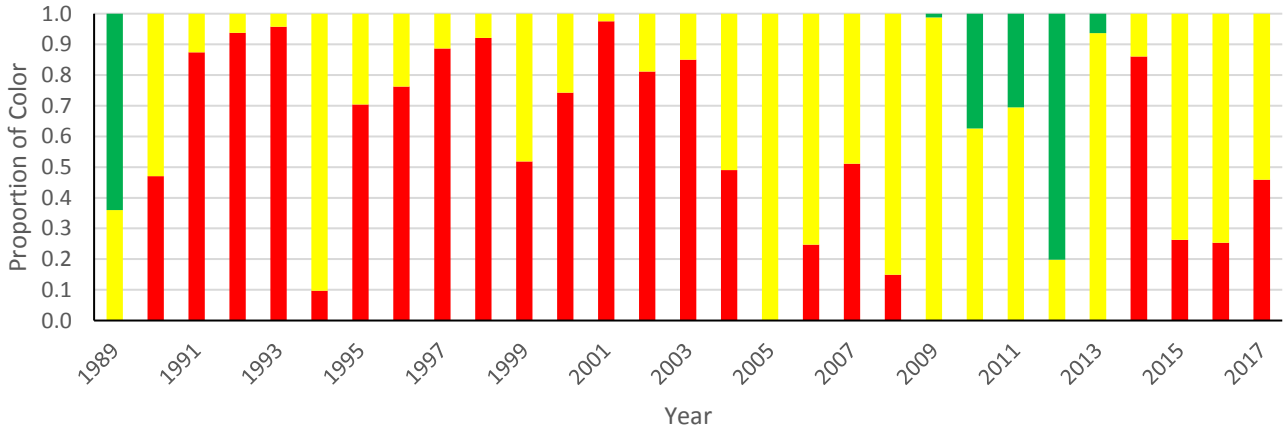
Supplemental Material: Fishery Independent Individual Index TLA's using 2002-2016 reference time period.

NMFS/NEFSC Survey

Since there was no NMFS sampling along the Mid-Atlantic due to mechanical issues on the RV Bigleow, a placeholder index using the three year (2014-2016) was used for the TLA. The TC shall have to decide if the NMFS index should remain in the 2017 index or not be used for this one year. Given the current trends over the last few years with this index, the author suggests using the placeholder proxy for 2017 only as trends have been consistent across the last few years and unless something drastic changes, the index is likely to have a minimal impact on the TLA.

The three-year (2014-2016) mean used for the 2017 placeholder in the NMFS index did exceed the 30% threshold because of the very high red proportion in 2014 and red proportions approaching 30% in 2015-2016.

Figure 15. Annual color proportions for spot TLA from NMFS survey using a 2002-2016 reference period.

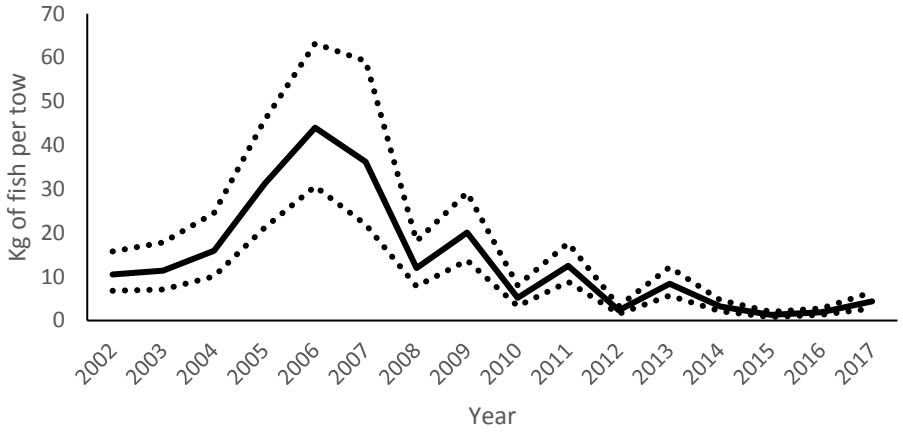


ChesMMAP Survey

The Chesapeake Marine Monitoring Program (ChesMMAP) is a general fish abundance trawl survey run by the Virginia Institute of Marine Science (VIMS) that covers the central portion of the Chesapeake Bay from the mouth up to approximately Aberdeen, MD. Spot are one of most abundant species in the survey. ChesMMAP has been in operation since 2002 with 15 years of currently available data. While not as geographically expansive as some of the other larger regional surveys (NMFS, NEAMAP, and SEAMAP), ChesMMAP does cover the full length of the Chesapeake Bay including both Virginia and Maryland.

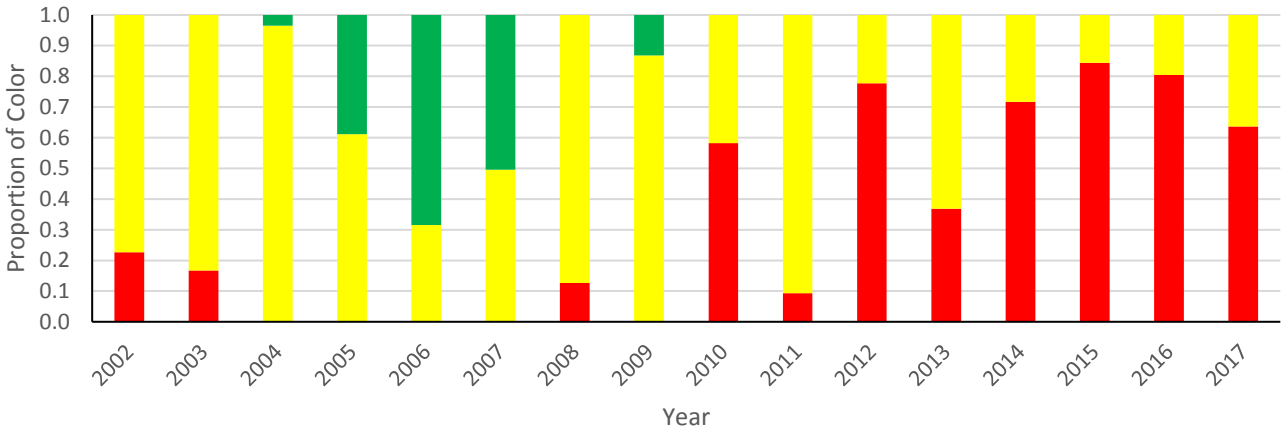
Annual catch levels for spot peaked in 2006 and have declined steadily since then (Fig. 16). Catch level variability was also much higher during the early 2000s versus later years.

Figure 16. Mean annual CPUE for spot from ChesMMAP survey. Dotted lines are 95% CI.



The TLA indicated high red proportions since 2010 when annual CPUE values were lowest (Fig. 17). The TLA would have triggered in 2012 at the 30% threshold and has been above the 60% red threshold since 2014.

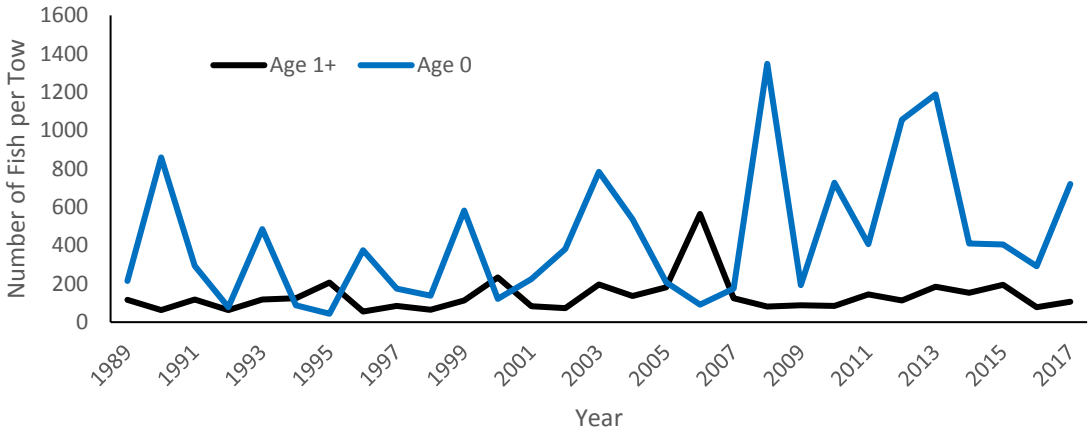
Figure 17. Annual color proportions of TLA for spot from the ChesMMAP survey using a 2002-2016 reference period.



NCDMF Program 195

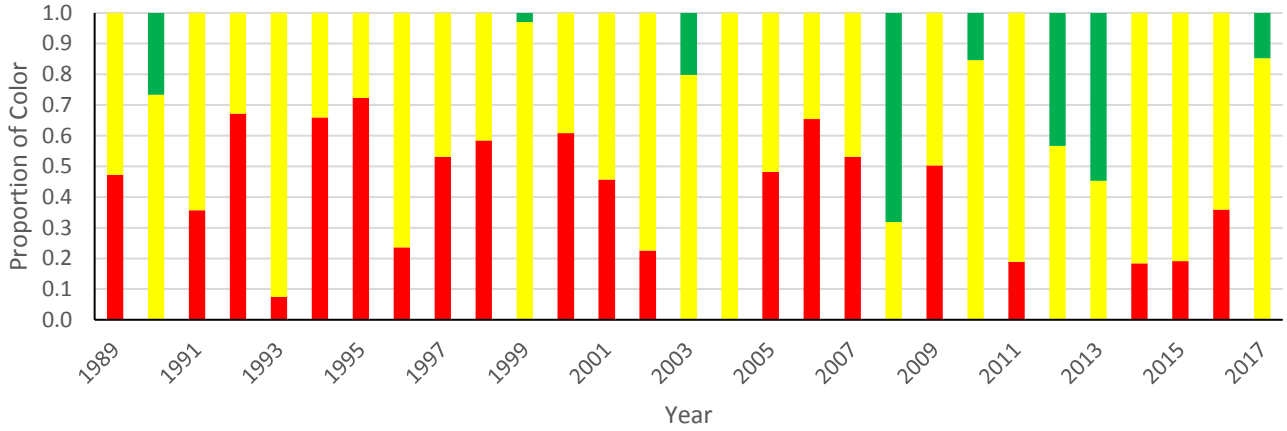
The NC Program 195 index showed a generally increasing trend for age 0 spot over the entire time series but it has declined since 2013 (Fig. 18). Adult spot catch levels remained relatively stable over time with three distinct peaks in 1995, 2000, and 2006.

Figure 18. Stratified mean annual CPUE for spot from NCDMF Program 195 suvey by age group.



The TLA for juvenile spot (age 0) showed high proportions of red throughout the 1990s and mid 2000s (Fig. 19). Peaks in juvenile abundance occurred in 2008 and 2012-2013 with declines in 2014-2016. The juvenile spot TLA hasn't triggered since 2009.

Figure 19. Annual color proportions for age 0 spot from the NCDMF Program 195 survey using a 2002-2016 reference period.



The TLA for adult spot (age 1+) had only one year with high green proportions (2006) and showed several years (1992, 1997-1998, 2009-2010, and 2017) where the index triggered (Fig. 20).

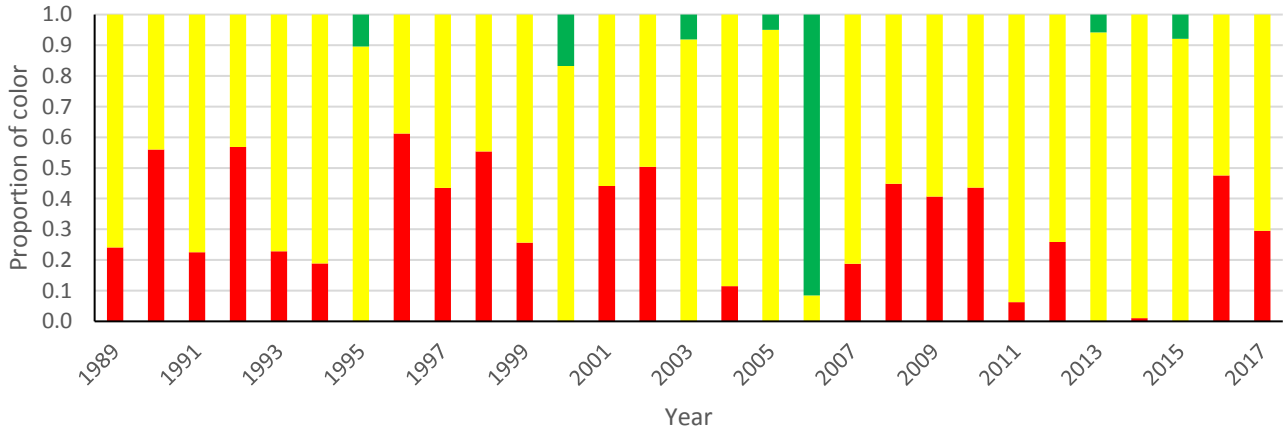



Figure 20. Annual color proportions for age 1+ spot from the NCDMF Program 195 using a 2002-2016 reference period.