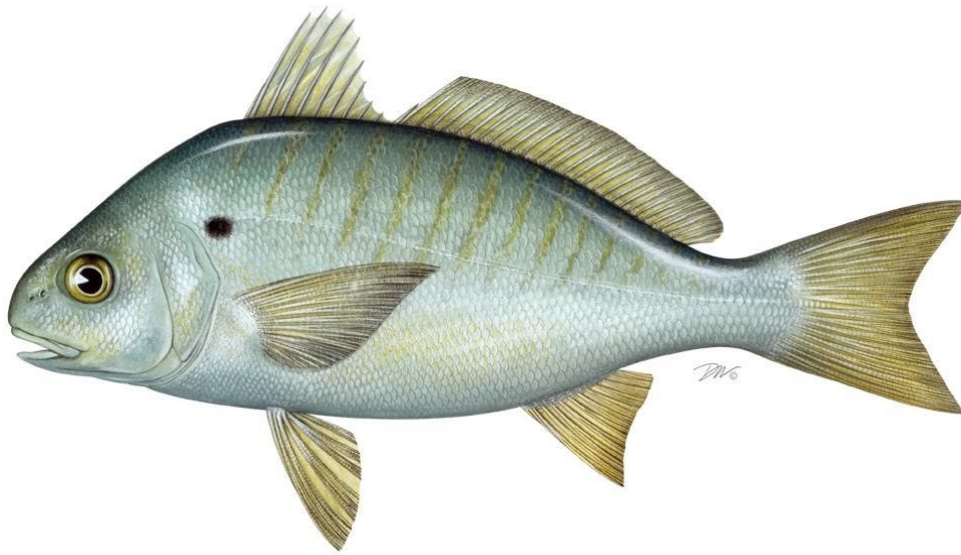


ATLANTIC STATES MARINE FISHERIES COMMISSION

2022 TRAFFIC LIGHT ANALYSIS REPORT FOR SPOT (*Leiostomus xanthurus*)

2021 Fishing Year



Prepared by the Technical Committee
July 2022



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

EXECUTIVE SUMMARY

Background

The purpose of this report is to evaluate the current status of spot using the annual Traffic Light Analysis (TLA). Spot is managed under Addendum III (2020) which outlined the population characteristics evaluated, management triggers, and management responses. Annually, the Technical Committee (TC) conducts a TLA to evaluate a Mid-Atlantic and a South Atlantic harvest metric, combining commercial and recreational landings in the region. The TC also evaluates a Mid-Atlantic (NJ-VA) and South Atlantic (NC-FL) abundance metric, combining indices of abundance from surveys in the region. Each metric is evaluated using a color proportion of green, yellow, or red based on comparing that year to a 2002-2012 reference period. Addendum III defined 30% red as a moderate concern and 60% red as a significant concern to the fishery. Management action is triggered according to the 30% red and 60% red thresholds if both the adult abundance and harvest thresholds are exceeded in any two of the three terminal years.

Data Availability Issues

There have been several data availability issues in recent years due to the COVID-19 pandemic and other factors. The pandemic caused some data gaps in 2020 which are detailed in the 2021 TLA report. The Mid-Atlantic abundance index is based on the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) and the Northeast Fishery Science Center (NEFSC) Multispecies Bottom Trawl Survey. ChesMMAP has not had available data for 2019-2021 due to lack of calibration factors from a change in survey methodology. NEFSC's survey did not operate in 2020 but did operate in 2021. Because of the missing survey data in the Mid-Atlantic region, the NorthEast Area Monitoring and Assessment Program (NEAMAP) was evaluated for trends in the region despite it not being accepted for use in the TLA due to having a shorter time series (2007-2021) that does not include the reference period (2002-2012). The South Atlantic abundance index is based on the North Carolina Division of Marine Fisheries Pamlico Sound Survey, which was not able to sample all stations in 2020 and 2021, and the Southeast Area Monitoring and Assessment Program (SEAMAP) Coastal Trawl Survey which did not operate in 2020 and the spring of 2021. Therefore, both the Mid-Atlantic and South Atlantic abundance metrics continued to have data availability issues in 2021.

2021 Harvest Metrics

The Mid-Atlantic harvest metric did not exceed the red threshold at 30% in two of the three terminal years in 2021. The South Atlantic harvest metric did exceed the red threshold at 30% in all three terminal years in 2021. The harvest metrics in 2021 cannot be used as a trigger mechanism since they represent a year with catch restrictions in place.

2021 Abundance Metrics

These metrics could not be run due to missing 2020 and 2021 data. For the Mid-Atlantic, the only survey available in 2021 under the current TLA guidelines (2002-2012 reference period) was the NEFSC. The NEFSC survey and the NEAMAP survey, which was also active in 2021, did not exceed the 30% red threshold. For the South Atlantic, survey data for two of the three terminal years were not available and therefore it is unknown if this metric triggered.

Conclusions

Harvest exceeded the 30% threshold in South Atlantic in all three terminal years but only once out of the past three years in the Mid-Atlantic. Harvest restrictions were in place in 2021 and so the harvest metric cannot be used as a trigger mechanism in that year. The abundance composite metrics are unknown for the Mid-Atlantic and South Atlantic due to missing data, and so it could not be determined if further management would be triggered.

Addendum III requires that the management actions taken in 2021 remain in place for a minimum of two years (through and including the 2022 season) before evaluation and that action be re-considered in 2022. However, the continued impacts of missing data make evaluating the effects of the 2021 management actions difficult. Therefore, the TC recommends maintaining management actions in their current state and waiting to evaluate their effects until 2023 when it is anticipated all survey data will be available again.

1 INTRODUCTION

Spot is managed under the Omnibus Amendment for Spot, Spotted Seatrout, and Spanish Mackerel (2011), Addendum II (2014), and Addendum III (2020). The Omnibus Amendment updates all three species plans with requirements of the Atlantic States Mariner Fisheries Commission's (ASMFC) Interstate Fisheries Management Program (ISFMP) Charter. The benchmark stock assessment for spot in 2017 was not recommended for management use due to uncertainty in biomass estimates from 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 (SAB) approved Addendum II to the Spot Fishery Management Plan (FMP) in 2014. The Addendum established the 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 way to incorporate multiple data sources (both fishery -independent and -dependent) into an 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 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 two consecutive years.

Starting in the late 2000s, there were inconsistent signals in the data used to examine the resource. While strong declines in harvest and reports of poor fishing prompted concern, management action was not triggered through the TLA because similar declines were not observed in abundance indices. These conflicting signals suggested the abundance indices being used in the TLA may not adequately represent coastwide adult abundance and the TLA may not be sensitive enough to trigger management action if declines in the population and fishery occur. Additionally, management lacked specificity in what measures to implement if a trigger did occur and how the fishery should be evaluated following management action. In February 2020, the SAB approved Addendum III to the Spot FMP. Addendum III addressed these issues by modifying the TLA to better reflect stock characteristics and identify achievable management actions based on stock conditions.

Addendum III incorporated the use of a regional approach to better reflect localized fishery trends and changed the TLA to trigger management action if two of the three most recent years of characteristics exceed threshold levels. These changes allow the TLA to better detect population and fishery declines. Addendum III also defined management responses for the

recreational and commercial fisheries and a method for evaluating the population's response to TLA-triggered management measures.

The following changes were incorporated into the TLA by Addendum III:

- Incorporation of indices from the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) and the North Carolina Division of Marine Fisheries (NCDMF) Pamlico Sound Survey (Program 195) into the adult composite characteristic index, in addition to the currently used indices from the Northeast Fisheries Science Center (NEFSC) Multispecies Bottom Trawl Survey and the South Atlantic component of the Southeast Area Monitoring and Assessment Program (SEAMAP).
- Use of revised adult abundance indices from the surveys mentioned above, in which age-length keys and length composition information are used to estimate the number of adult (age 1+) individuals caught by each survey.
- Use of regional metrics to characterize the fisheries north and south of the Virginia-North Carolina state border. The ChesMMAP and NEFSC surveys will be used to characterize abundance north of the border, and the NCDMF Program 195 and SEAMAP surveys will be used to characterize abundance south of the border.
- Change/establish the reference time period for all surveys to be 2002-2012.
- Change the triggering mechanism to the following: Management action will be triggered according to the current 30% and 60% red thresholds if both the abundance and harvest thresholds are exceeded in any two of the three terminal years.

Addendum III also established a Spot Technical Committee (TC) with the ability to alter the TLA as needed to best represent trends in spot harvest and abundance, including selection of surveys and methods to analyze and evaluate these data. Such changes may be made without an addendum, but Addendum III was necessary because of the change to the management-triggering mechanism. The TC will evaluate state implementation of management responses triggered through the TLA. Since the implementation of Addendum III, spot management has been moved to the newly formed Sciaenids Management Board.

In 2020, the TLA for spot had red proportions that exceeded the threshold of 30% for the period of 2017-2019 in both harvest composite characteristics for the Mid-Atlantic and South Atlantic. Exceeding the 30% threshold represents moderate concern to the fishery and initiated a moderate management response. All non-*de minimis* states were required to institute a recreational bag limit of no more than 50 spot. States with more restrictive measures in place were encouraged to maintain those measures. For commercial fisheries, states had to set a regulation that, if applied to the state's 2010-2019 average commercial harvest, would have produced at least a 1% reduction. States established different measures by trip limits or season modifications, as long as measures implemented were quantifiable and are projected to achieve this 1% reduction. All states have submitted state implementation plans to meet required restrictions on recreational and commercial management measures. Addendum III states these management measures must be in place for at minimum two years, after which management will be reevaluated based on the composite regional abundance characteristics.

The current harvest composite index may be affected by these new management measures and thus cannot be considered when determining if management action is necessary.

In addition to triggering management, the COVID-19 pandemic occurred in 2020, which had far reaching impacts including limited or no sampling in state and federal fishery-independent monitoring programs. For the TLA, the impact was felt most significantly for the larger scale regional monitoring surveys (NEFSC groundfish survey and the SEAMAP survey) which were not able to sample at all in 2020. In 2021, the only survey that was directly impacted by COVID was SEAMAP which could not complete the spring 2021 cruise, but was able to finish the full summer and fall cruises. Additionally, the ChesMMAP survey has not completed the calibration estimates for converting the index for use over the entire time series due to the vessel and gear change that occurred in 2019, and so data are unavailable from 2019-2021.

This report includes the harvest and abundance composite indices in Sections 2 and 3 which were approved in Addendum III to trigger management action. Individual TLAs for commercial and recreational harvest by region, as well as effort and discards of spot in the South Atlantic Shrimp Trawl Fishery, are described in Section 4. TLAs for each fishery-independent index that go into the abundance composite or juvenile composite are described in Section 5. The discard data and juvenile indices are included as supplementary information to be reviewed by the TC and are not considered in the trigger mechanisms. Supplemental information with NEAMAP incorporated into the Mid-Atlantic composites is provided in Section 6.

2 TRAFFIC LIGHT ANALYSIS (COMPOSITE INDICES)

2.1 Harvest Composite Characteristic Index

- The harvest (recreational and commercial landings) composite characteristic TLA showed a slight decrease in landings in 2021 for both the Mid-Atlantic and South Atlantic (Figure 1 and Figure 2).
- The composite characteristic for the Mid-Atlantic has been below the 30% red threshold for the last two years of the series (Figure 1) with an average red proportion of 23.3%. While 2021 was similar in pattern to 2020, it should not be interpreted as a trigger mechanism since catch restrictions were in place that year.
- The composite characteristic for the South Atlantic has exceeded the 30% red threshold for the last six years (Figure 2). The red proportion in exceeded the 30% threshold again in 2021. The TC cautions that the 2021 harvest composite should not be used as a trigger in the TLA since harvest restrictions were in place that year.

Figure 1. Annual TLA color proportions for harvest composite (commercial and recreational landings) in the Mid-Atlantic coast (NJ-VA) for spot from 1989-2021 using a 2002-2012 reference period.

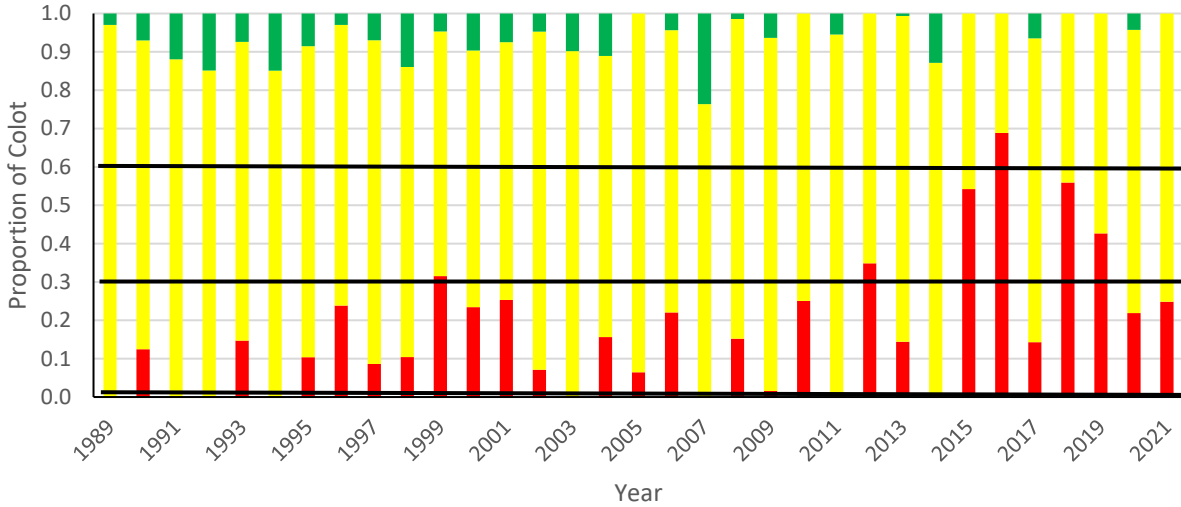
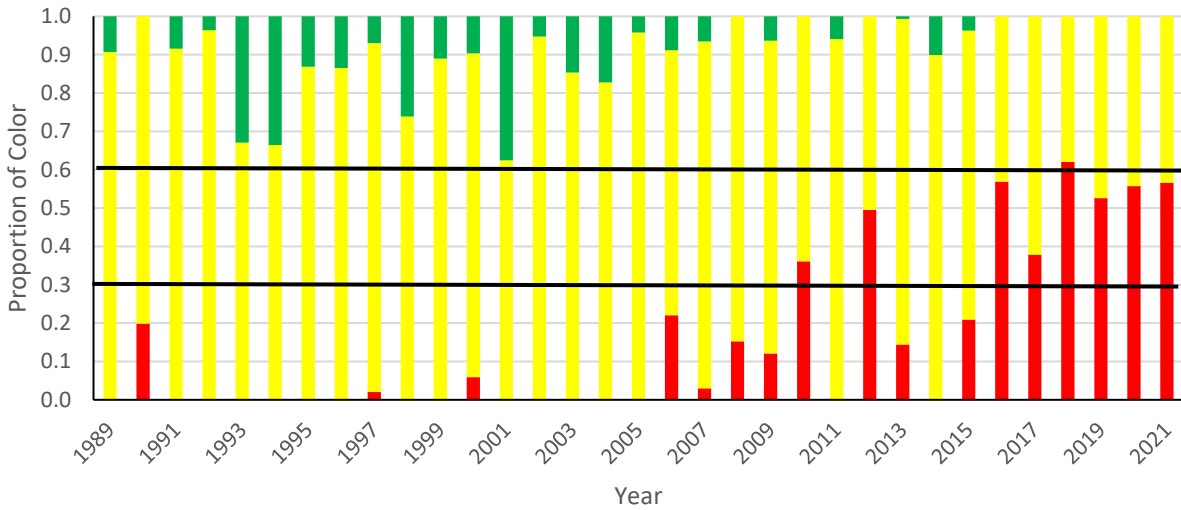


Figure 2. Annual TLA color proportions for harvest composite (commercial and recreational landings) for the South Atlantic coast (NC-FL) for spot from 1989-2021 using a 2002-2012 reference period.



2.2 Abundance Composite Characteristic Index

The abundance composite TLA index for spot is broken into two components based on age composition in each region. The adult composite index was generated from the NEFSC and ChesMMAAP surveys for the Mid-Atlantic and SEAMAP and NCDMF Program 195 (Pamlico Sound Survey) in the South Atlantic since the majority of spot captured in these surveys were ages 1+. Calculating the abundance indices for the TLA has been challenging since many surveys could

not operate during COVID and ChesMMAP has not provided data since 2018. Neither the NEFSC fall ground fish survey nor the SEAMAP survey were able to complete any sampling cruises/trips in 2020. In 2021, SEAMAP also was not able to complete its spring survey sampling. The ChesMMAP survey has not completed the calibrations necessary to convert the 2019-2021 index values that would allow full use of the entire time series after the vessel and gear changes that occurred in 2019. ChesMMAP was able to sample in 2019, 2020, and 2021, so once calibration exercises are complete, the index data should be available in 2023. Therefore, at this time, ChesMMAP only goes through 2018. The NCDMF Program 195 was not able to sample all stations in 2020 and 2021 due to COVID and staffing issues. Twenty-eight of the 54 stations were sampled in 2020 and 35 of the 54 stations were sampled in 2021.

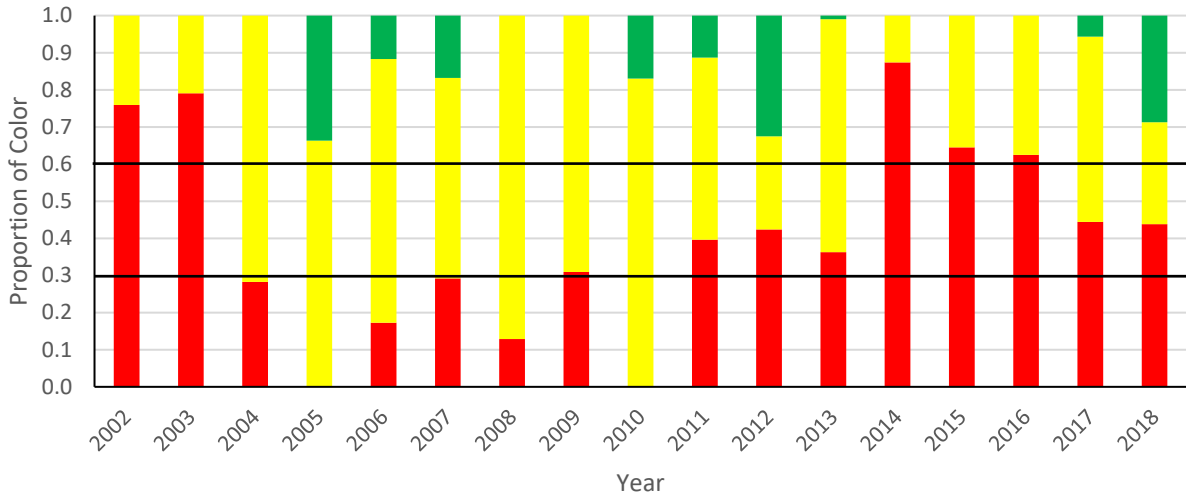
One additional survey that is available in the Mid-Atlantic is the Northeast Area Monitoring and Assessment Program (NEAMAP) which samples from Block Island Sound south to Cape Hatteras. The NEAMAP survey has been considered for use in the TLA but is currently not used due to the shorter series time frame (2007-2021) compared to all the other surveys. There is a supplemental section at the end of this report that describes the trends in the NEAMAP survey and gives composite characteristics that include NEAMAP for the Mid-Atlantic. Adult and juvenile data are presented as supplementary information only.

Additional potential indices available in the south Atlantic include the SCDNR trammel net survey (adults) and SCDNR electroshock survey (juvenile) if deemed necessary for future consideration.

2.2.1 Mid-Atlantic

- The TLA composite characteristics for spot abundance (NEFSC and ChesMMAP surveys) in the Mid-Atlantic did not have 2019-2021 data points because the ChesMMAP survey indices were not available (Figure 3).
- While the composite adult index triggered at the 30% threshold because the red proportions in the index have exceeded the 30% threshold for the previous five years up to 2018, the recent years cannot be included since the ChesMMAP data was unavailable (Figure 3). The NEFSC survey did have green proportions in 2021 (see Section 5.1) indicating increasing abundance. However, in the last few years when both surveys are available (2017-2018), NEFSC showed green proportions while ChesMMAP showed high red proportions. These contrasting conditions make it difficult to infer about the composite characteristic in recent years when ChesMMAP data are unavailable.
- Results of the TLA for the Mid-Atlantic abundance are inconclusive due to missing data.

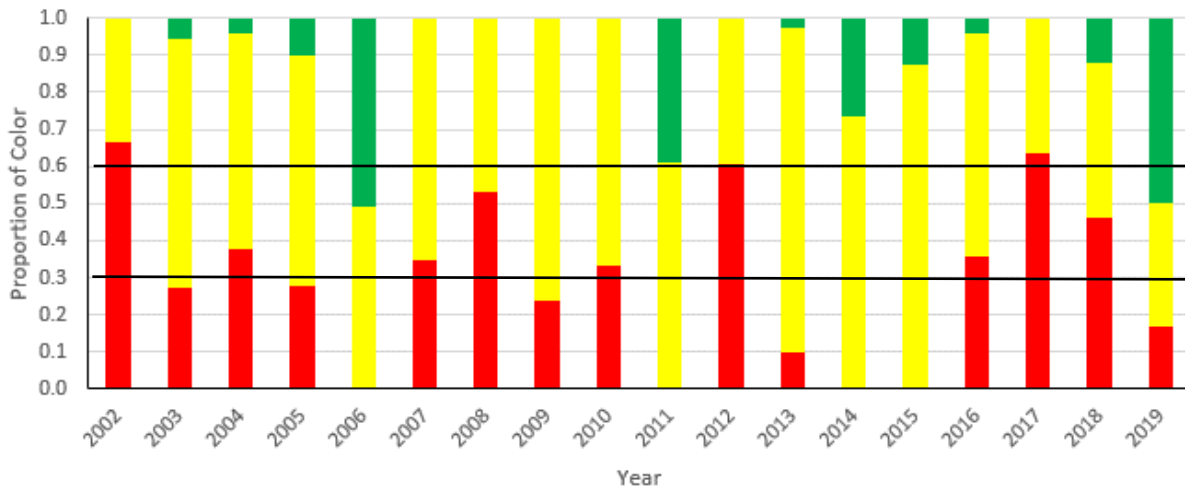
Figure 3. Annual TLA for adult (age 1+) spot for composite characteristic of adult fishery independent surveys in the Mid-Atlantic (NJ-VA) (NEFSC and ChesMMAP) from 2002-2018 using a 2002-2012 reference period.



2.2.2 South Atlantic

- Since SEAMAP spring cruise data was not available for 2020 or 2021, the TLA composite only goes through 2019. However, the NCDMF Program 195 data was available for 2020-2021 (see Section 5.4) and did not trigger at the 30% threshold for two out of the last three years. The results of the NCDMF Program 195 data analysis should be treated with caution however, as not all stations were sampled due to COVID and staffing issues. Twenty-eight of the 54 stations were sampled in 2020 and 35 of the 54 stations were sampled in 2021.
- The South Atlantic adult abundance composite characteristic did trigger in 2019 since two of the three recent years have exceeded the 30% red threshold (Figure 4). There has been a bit of conflict in the index with both red and green proportions in the same years. This has been due to the NCDMF Program 195 index having higher red proportions and SEAMAP having relatively high green proportions in recent years.
- Results of the TLA for the South Atlantic abundance are inconclusive due to missing data.

Figure 4. Annual TLA composite characteristic for adult spot (age 1+) in the South Atlantic (SEAMAP and NCDMF Program 195) from 2002-2019 using a 2002-2012 reference period.



3 SUMMARY

- The harvest composite TLA for spot exceeded the 30% threshold in the South Atlantic but not in the Mid-Atlantic in 2021. However, 2021 had catch restrictions in place and so the TLA harvest composite should not be interpreted as a trigger year.
- The Mid-Atlantic abundance composite characteristic did not have 2019-2021 data points, so no determination could be made.
- The South Atlantic abundance composite characteristic did not trigger at 30% in 2019. However, data from 2020 or 2021 were not complete, so no determination can be made.
- With both abundance composite TLAs unknown due to missing data, a determination of whether or not the TLA triggered in 2021 cannot be made. Any determination on the TLA should wait until 2023 when there is complete data from all surveys again.

Table 1. Traffic light metrics for the Mid- and South Atlantic regions with known and unknown values, given missing 2020 and 2021 data. Management action is triggered according to the current 30% red and 60% red thresholds if both the adult abundance and harvest thresholds are exceeded in any three of the four terminal years.

TLA Metric	Spot		
	2019	2020	2021
Mid-Atlantic Harvest	43% red	22% red	23% red*
South Atlantic Harvest	52% red	56% red	57% red*
Mid-Atlantic Adult Index	Unknown	Unknown	Unknown
South Atlantic Adult Index	50% green	Unknown	Unknown
2021 TLA Status	Status Unknown		

*Harvest metrics should not be interpreted as a trigger mechanism in the TLA since catch restrictions to lower harvest were in place for these years

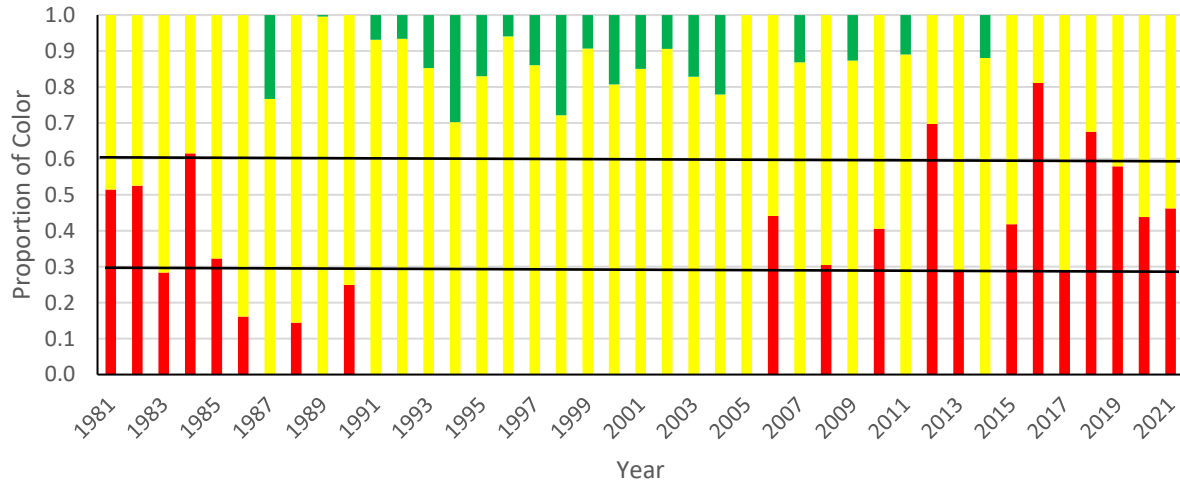
4 TRAFFIC LIGHT ANALYSIS (FISHERY-DEPENDENT)

4.1 Commercial Landings

4.1.1 Mid-Atlantic

- Commercial landings of spot on the Atlantic coast decreased 5.3% in 2021 from 2020. Long-term commercial landings are still relatively low, a trend that has been occurring since 2003.
- The proportion of red for commercial landings in the Mid-Atlantic peaked in the 1990s and early 2000s (Figure 5). Total annual landings in the Mid-Atlantic have declined 69.7% from 2004 to 2021, although there is some year-to-year variability between red and green proportions. In the last seven years the red proportion has been above the 30% threshold in all but one year.
- The commercial index's proportion of red was above the 30% threshold level in 2021 and represents the fourth year above this threshold. Several states implemented more restrictive management measures in 2021 as required by Addendum III, which may have impacted harvest.

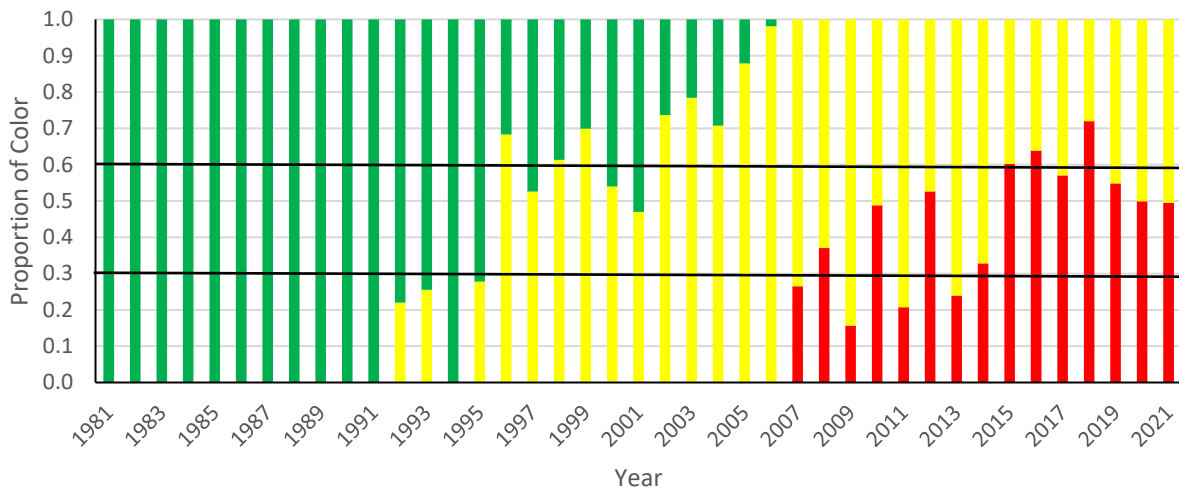
Figure 5. Annual TLA color proportions using 2002-2012 reference period for spot from commercial landings for the Mid-Atlantic (NJ-VA) coast of the US from 1981-2021.



4.1.2 South Atlantic

- In the South Atlantic, commercial spot landings were high from the 1980s through the mid-2000s (Figure 6). Commercial spot landings began to decline steadily from 2005 onward and red proportion levels have been above the 30% threshold for most years since 2010. Commercial spot landings in the south Atlantic decreased only slightly (0.97%) in 2021, but red proportion was still above the 30% threshold. Several states implemented more restrictive management measures in 2021 as required by Addendum III, which may have impacted harvest.
- The continued decline in commercial landings may be due to changes in effort in some other fisheries so it is difficult to determine the exact cause of the general decline in commercial landings in the South Atlantic. However, this trend is similar to what has been observed in the South Atlantic recreational fishery.

Figure 6. Annual TLA color proportions using a 2002-2012 reference period for spot from commercial landings from 1981-2021 for the South Atlantic (NC-FL) coast of the US.



4.2 Commercial Discards

4.2.1 South Atlantic

- Discard estimates of spot in the South Atlantic Shrimp Trawl Fishery are informed by catch rates observed during the SEAMAP survey and South Atlantic Shrimp Trawl Fishery Observer Program, and total effort of the South Atlantic Shrimp Trawl Fishery. Increases in discards could be an indicator of higher abundance of juveniles in the region, an increase in effort by the fishery, or a combination of both.
- Total effort (net hours) in the South Atlantic Shrimp Trawl Fishery declined from a time series high in 1991 to a time series low in 2005 (Figure 7). Effort then varied around an increasing trend through 2017 and was variable and lower through 2020. Effort declined slightly from 786,172 net hours in 2020 to 780,515 net hours in 2021.
- Total discards of spot in the South Atlantic Shrimp Trawl Fishery were highest during the late 1980s and early 1990s, declined to relatively low levels in the 2000s, and then increased to slightly higher levels in the 2010s (Figure 7; right). Discards were highly variable just prior to the terminal year, decreasing from one of the highest estimates in 2019 to one of the lowest estimates in 2020. Discards increased slightly from 42 million fish in 2020 to 53 million fish in 2021 and remain near time series lows.
- There were no SEAMAP tows conducted in 2020, so the estimated trend for the 2020 discard estimate relative to previous years is solely informed by South Atlantic Shrimp Trawl Fishery Observer catch rates. The observer catch rates of spot declined in 2020 relative to 2019 (Figure 8), and this decline can't be verified by SEAMAP catch rates. The SEAMAP survey did not sample in spring 2021, but began operations again during the peak of the shrimping season in July. The 2021 catch rates from both data sets show

similar declines relative to 2019. As in all years, the magnitude of the 2020 and 2021 discard estimates is informed by the observer data (magnitude of catch rates) and shrimp trawl effort data (expansion factor to expand catch rates to total discards).

- For additional information on the South Atlantic Shrimp Trawl Fishery discard estimation, please see Appendix 1 of the 2020 TLA Update Report.

Figure 7. Total net hours fished (left) and discards of spot (right) in the South Atlantic Shrimp Trawl Fishery.

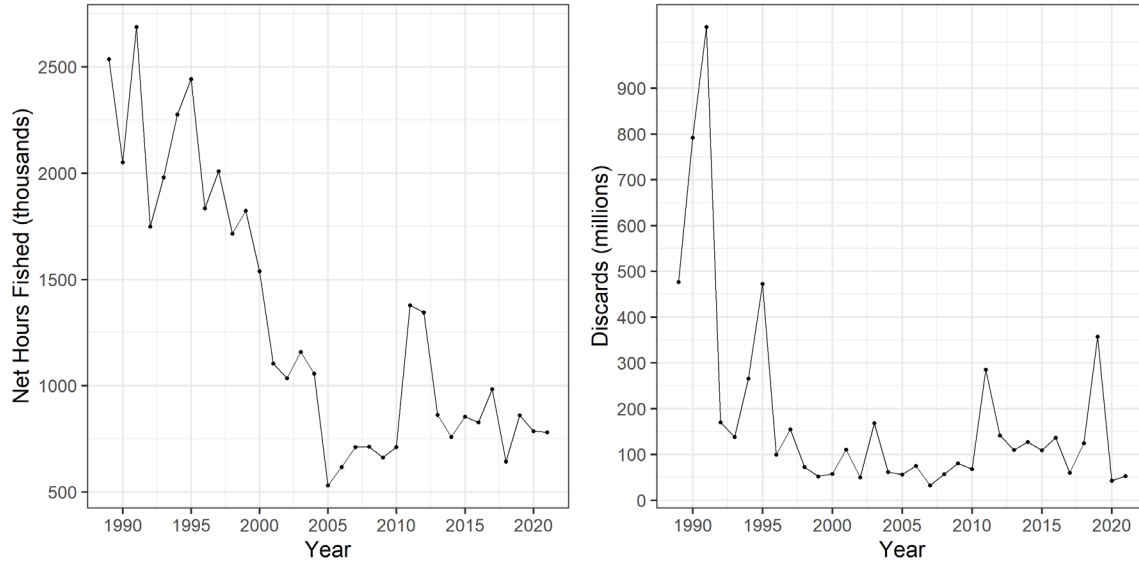
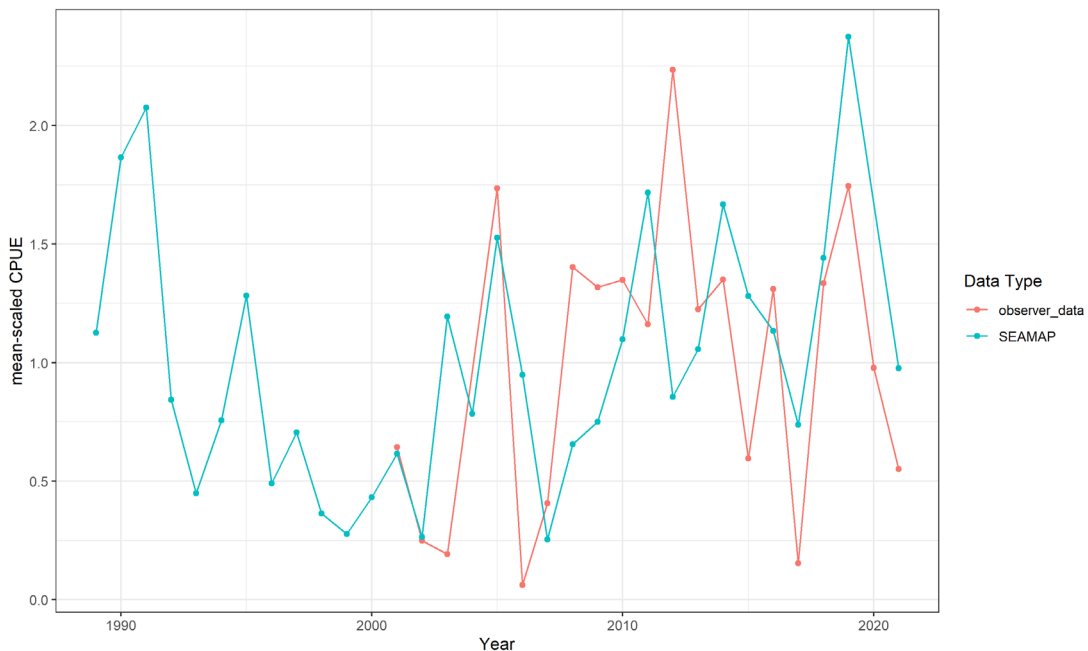


Figure 8. Comparison of spot mean-scaled catch-per-unit-effort from SEAMAP Coastal Trawl Survey data and South Atlantic Shrimp Trawl Fishery Observer data



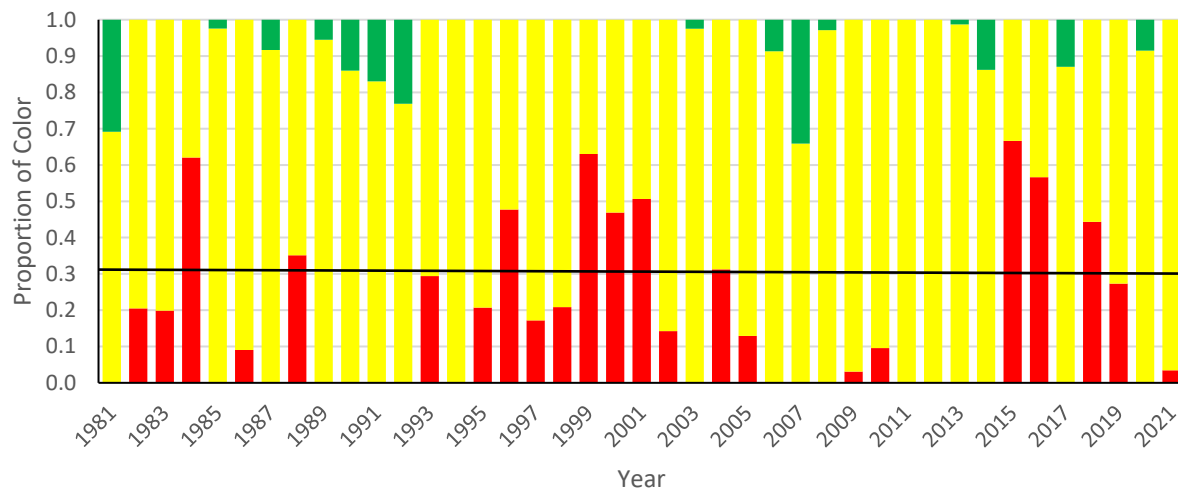
4.3 Recreational

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.

4.3.1 Mid-Atlantic

- The recreational harvest of spot on the Mid-Atlantic coast decreased 23.3% in 2021 from 2020, with values of 4,235,086 pounds and 5,814,976 pounds, respectively (Figure 9). Several states implemented more restrictive management measures in 2021 as required by Addendum III, which may have impacted harvest.
- There was no red in the TLA in 2020 and a green proportion of 11.2%. The recreational TLA only exceeded the 30% threshold in one of the last three years (2018; Figure 9).

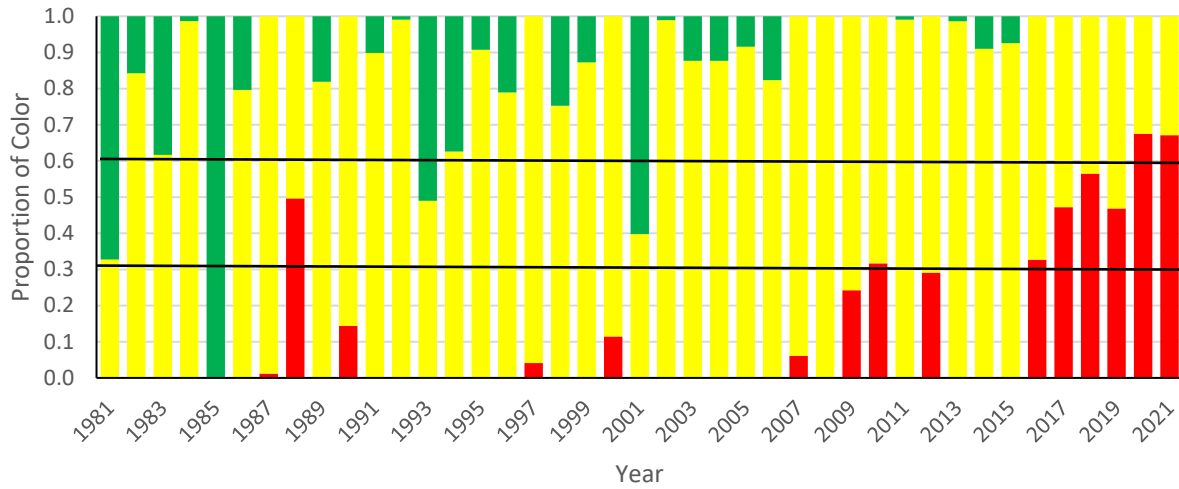
Figure 9. Annual color proportions for the Mid-Atlantic (NJ-VA) coast of the US for recreationally harvested spot from 1981-2021 using a 2002-2012 reference period.



4.3.2 South Atlantic

- In the South Atlantic, recreational harvest increased 2.4% in 2021 (692,950 lbs) from 2020 (676,727 lbs). Several states implemented more restrictive management measures in 2021 as required by Addendum III, which may have impacted harvest.
- Red proportions have been above the 30% threshold since 2016 for recreational harvest (Figure 10).

Figure 10. Annual color proportions for the South-Atlantic (NC-FL) coast of the US for recreationally harvested spot from 1981-2021 using a 2002-2012 reference period.

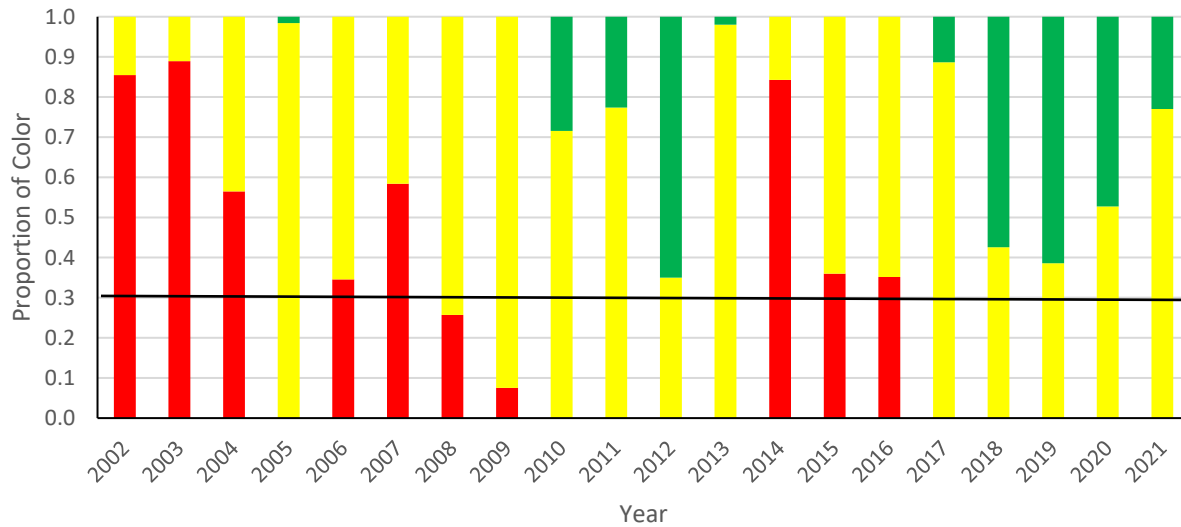


5 TRAFFIC LIGHT ANALYSIS (FISHERY-INDEPENDENT)

5.1 NEFSC Fall Groundfish Trawl Survey

- Since there was no sampling carried out in 2020 for the NEFSC survey, an intermediary placeholder value was estimated for 2020 (as the mean of 2018-2019 and 2021). Changes in the index are made as comparison to 2019 since that was the last year of the survey with data.
- There was no red in the TLA index for 2021, so this index did not exceed the 30% threshold (Figure 11).

Figure 11. Annual TLA color proportions for adult spot (age 1+) from Mid-Atlantic NEFSC fall groundfish trawl survey from 2002-2021 using a 2002-2012 reference period.



5.2 ChesMMA P Trawl Survey

- The ChesMMA P survey made major changes to the survey in 2019 (vessel change, gear change, altered protocols, etc.) but maintained the same sampling strata and design. Side-by-side comparison tows are being made between the new and old vessels/gears and the survey is in the process of producing conversion factors by species so that historic survey index values can be compared to ongoing survey values in the future. Since the conversion factor determination won't likely be finished until 2023, the ChesMMA P index is only available through 2018 for the adult and juvenile TLA composite characteristics.
- The juvenile spot index showed a declining trend from the late 2000s through the present (Figure 12) with high proportions of red. Red proportions exceeded the 30% threshold for all years since 2011 and exceeded the 60% threshold for six of the last eight years in the data series.
- The adult spot index also showed a similar declining trend during the same time period (2010-2018) with red proportions exceeding the 60% threshold in the terminal four years of the time series (Figure 13).
- Whether the ChesMMA P index would have exceeded either the 30% or 60% thresholds of concern is unknown due to the currently missing values for 2019-2021 (Figure 12 and Figure 13). These index values are expected to be available in 2023, but until then any estimate of whether the ChesMMA P index triggered in 2019-2021 is speculative.

Figure 12. Annual TLA color proportions for juvenile spot (age 0) from the Mid-Atlantic ChesMMAP survey from 2002-2018 using a 2002-2012 reference period.

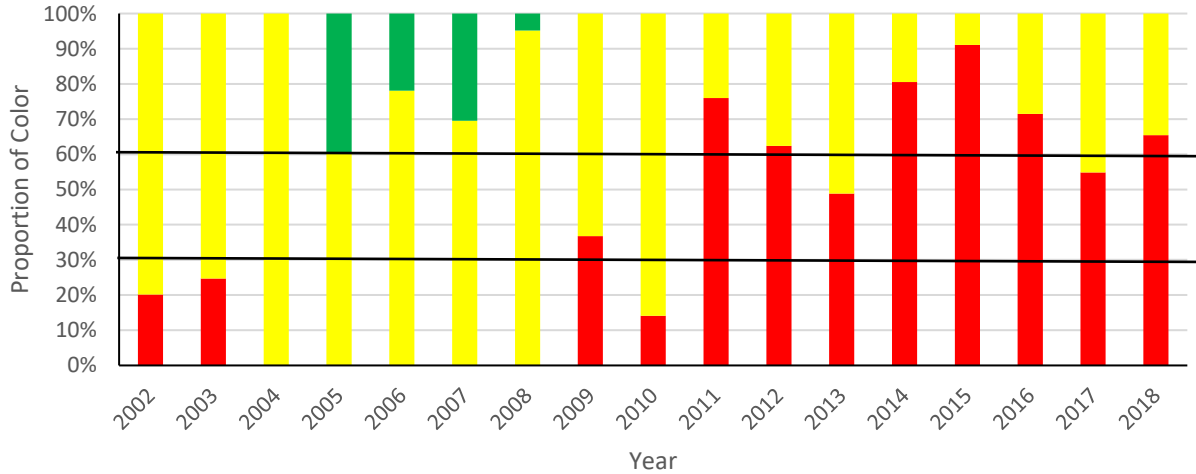
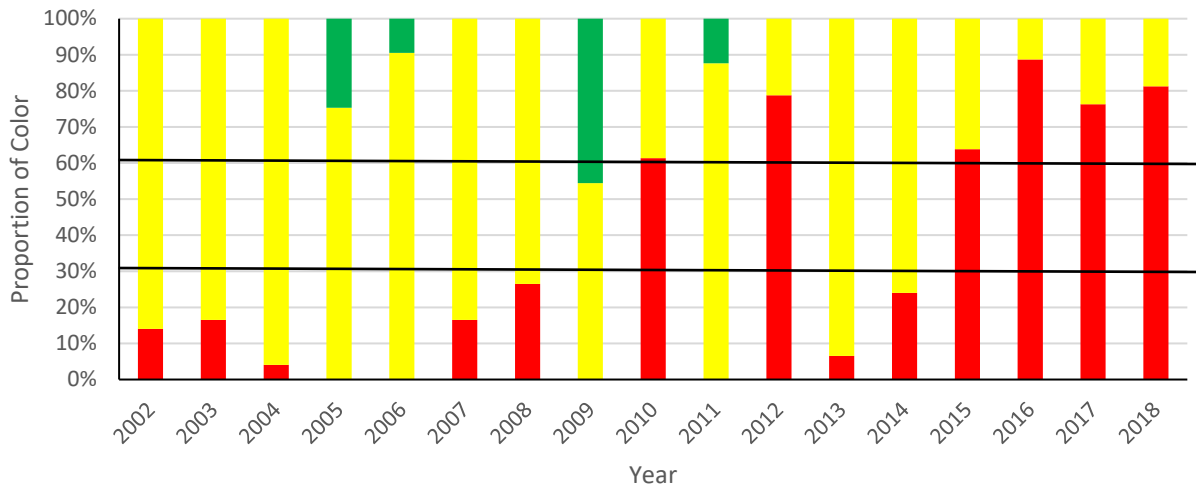


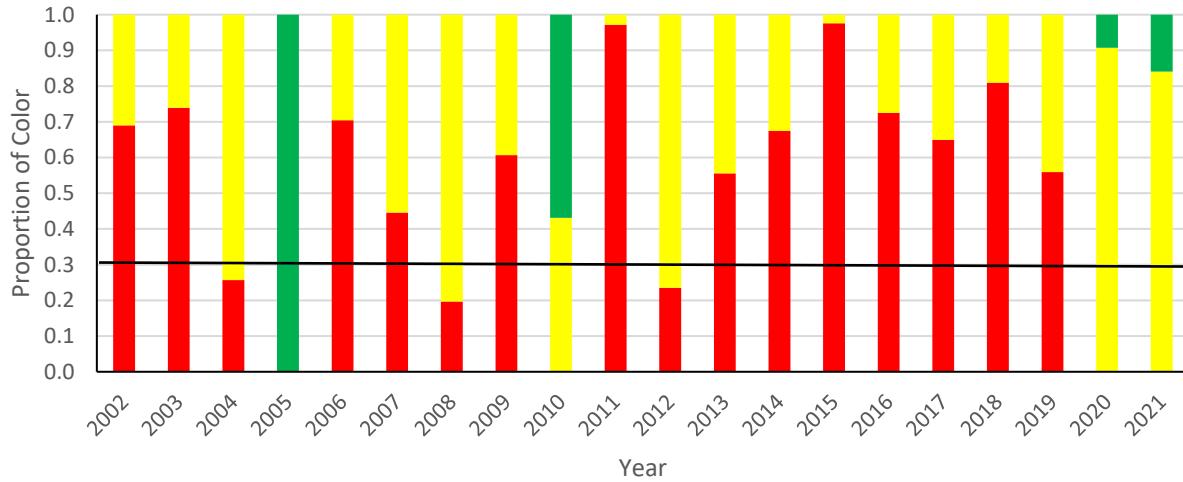
Figure 13. Annual TLA color proportions for adult spot (age 1+) from the Mid-Atlantic ChesMMAP survey from 2002-2018 using a 2002-2012 reference period.



5.3 Maryland Juvenile Fish Seine Survey

- The Maryland CPUE increased 16.9% in 2021 from 2020, and was above the long-term mean for the second year in a row (Figure 14).
- CPUE was above the long-term mean for the two terminal years, indicating annual recruitment was up in the Maryland portion of the Chesapeake Bay in 2021.
- While spot numbers were up in both 2020 and 2021, with no red portion, the index still exceeded the 30% threshold level for the 2013-2019 time period indicating there is still cause for concern for a general decline in recruitment in Maryland waters.

Figure 14. Annual TLA color proportions for the Mid-Atlantic Maryland seine survey juvenile spot (age 0) index from 2002-2021 using a 2002-2012 reference period



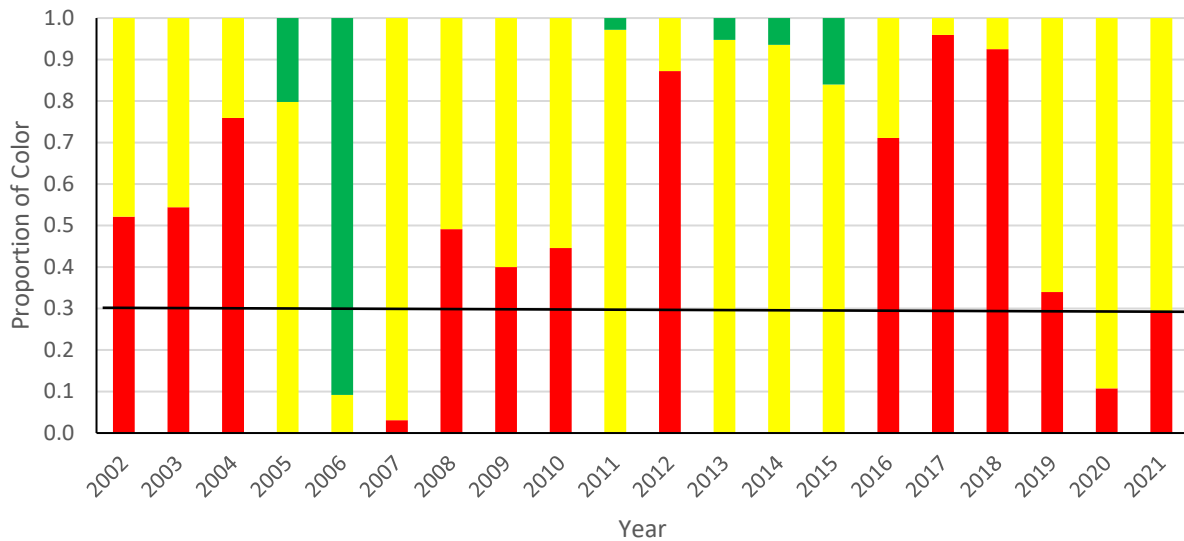
5.4 NCDMF Program 195 (Pamlico Sound Survey)

- The NCDMF Program 195 survey saw an increase in juveniles and a decline in adults as indicated by red proportions in both juvenile (Figure 15) and adult (Figure 16) indices.
- Juvenile spot CPUE increased in 2021 from 2020 with the red proportion exceeding the 30% threshold for the second year in a row (Figure 15).
- The adult CPUE decreased in 2021 from 2020 (Figure 16) with a red proportion of 29% in 2021.
- The results of the NCDMF Program 195 data analysis should be treated with caution, as not all stations were sampled due to COVID and staffing issues. Twenty-eight of the 54 stations were sampled in 2020 and 35 of the 54 stations were sampled in 2021.

Figure 15. Annual TLA color proportions for juvenile spot (age 0) from the South Atlantic NCDMF Program 195 Survey from 2002-2021 using a 2002-2012 reference period.



Figure 16. Annual TLA color proportions for adult spot (age 1+) from the South Atlantic NCDMF Program 195 Survey from 2002-2021 using a 2002-2012 reference period.



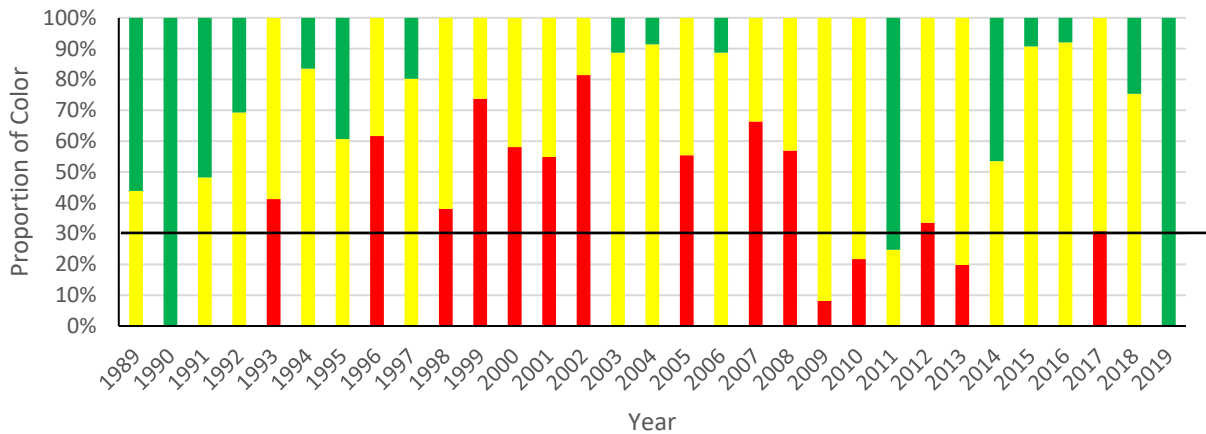
5.5 SEAMAP Trawl Survey

- There were no SEAMAP cruises in 2020 and the spring of 2021 due to COVID. As such, there was no adult TLA values for 2020 and 2021 and the index is only presented through 2019. The juvenile index (fall cruise) TLA for 2021 did occur and the missing 2020 value was imputed as an intermediary value (mean of 2018-2019 and 2021). The

SEAMAP index uses the spring season CPUE because it only catches adult spot (age 1+) during that season.

- The annual adult CPUE increased in 2019 from 2018 and was the highest value in the time series.
- The TLA index has only exceeded the 30% threshold once in the past seven years (Figure 17).

Figure 17. Annual color proportions for Adult spot (age 1+) TLA from the fall South Atlantic SEAMAP survey from 1989-2019 using a 2002-2012 reference period.

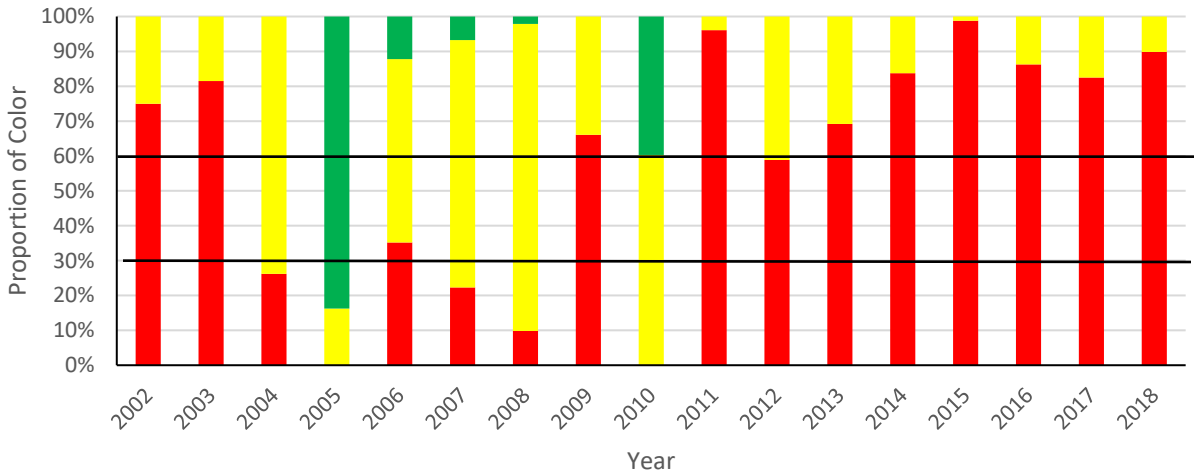


5.6 Juvenile Abundance Composite Indices

The juvenile composite index in the Mid-Atlantic was generated from the ChesMMAAP and the Maryland juvenile fish seine survey. ChesMMAAP has an age specific index for ages 0 which allowed its use as a juvenile index. The juvenile composite uses a terminal year of 2018, the most recent year the ChesMMAAP index is available.

- The juvenile spot TLA for the Mid-Atlantic (MD survey and ChesMMAAP) also showed a general decline in recruitment with very high red proportions for the last eight years (Figure 18).
- The juvenile composite index was above the 60% threshold for the past six years (Figure 18).

Figure 18. Annual TLA for juvenile (age 0) spot for composite characteristic of fishery independent suveys in the Mid-Atlantic (NJ-VA) (MD seine survey and ChesMMAAP) from 2002-2018 using a 2002-2012 reference period.



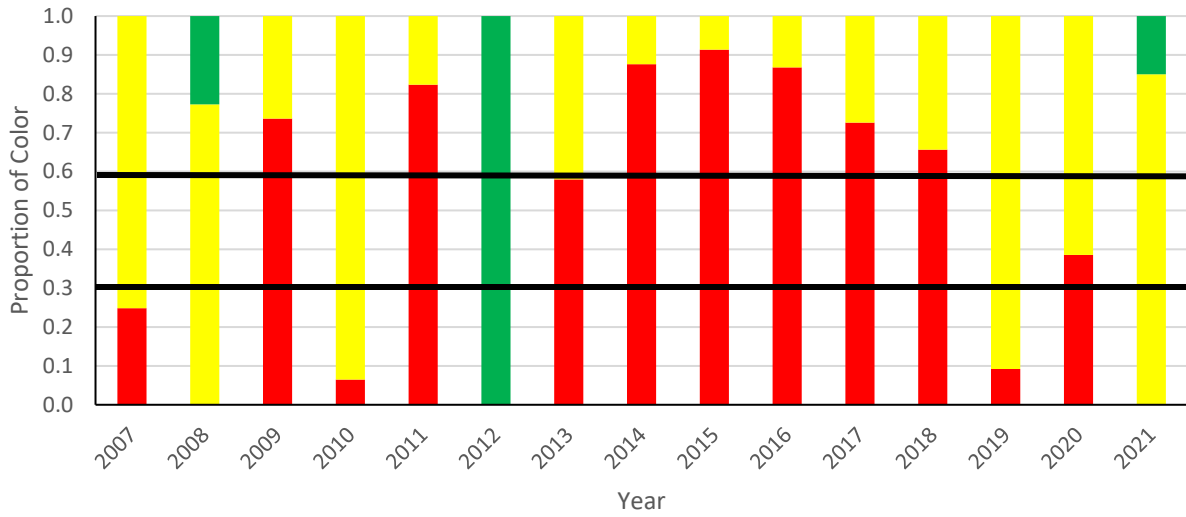
- The South Atlantic juvenile spot index (NCDMF Program 195) increased in 2021 from 2020 with the red proportion exceeding the 30% threshold for the second year in a row (Figure 15).

6 SUPPLEMENTAL MATERIALS

6.1 NEAMAP Survey

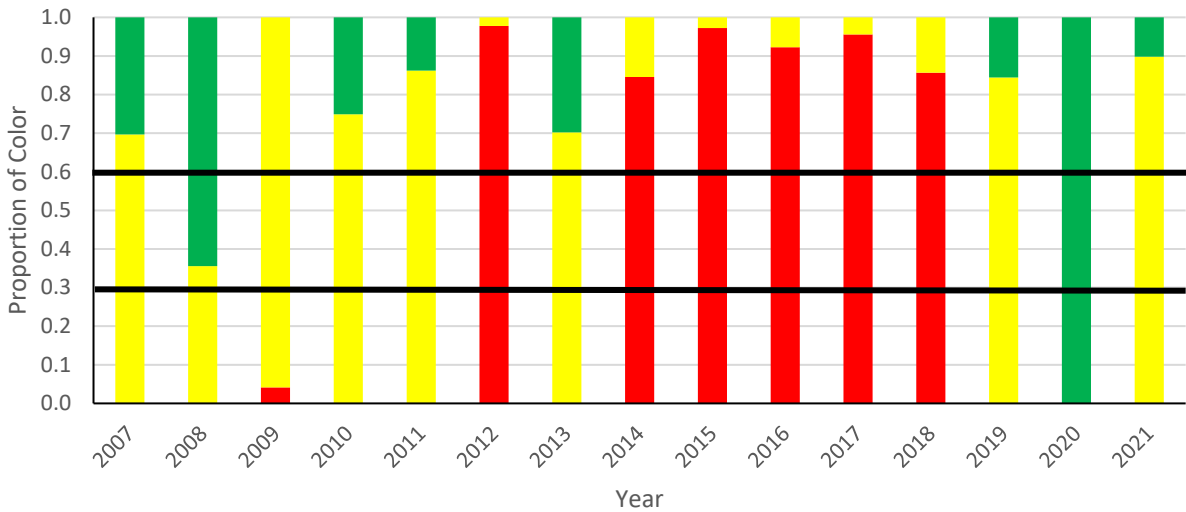
- The juvenile spot TLA index shows the evidence of low recruitment across all years except 2008, 2012, and 2021 (Figure 19). This is similar to the declining trends seen in the MD seine survey and the ChesMMAAP survey across the same years.

Figure 19. Annual color proportions from TLA for juvenile (age 0) spot from the Mid-Atlantic NEAMAP survey from 2007-2021 using a 2007-2019 reference period.



- The adult spot TLA index showed a generally declining trend from 2010 through 2018 with red proportions exceeding the 60% threshold (Figure 20). However, the last three years, 2019-2021, have had no red proportions, indicating an increase from previous years.

Figure 20. Annual color proportion from TLA for adult (age 1+) spot from the Mid-Atlantic NEAMAP survey using a 2007-2019 reference period.



6.2 Composite TLA Characteristic for Mid-Atlantic including NEAMAP

In order to generate the composite TLA index that included NEAMAP in the Mid-Atlantic, the other Mid-Atlantic indices (NEFSC, ChesMMAP, and MD Seine Survey) had to be recalculated using the common time period of all three surveys (2007-2019) in order to have a common reference. Since the ChesMMAP survey was not available for 2019-2021, the juvenile composite TLA (age 0) is presented using only NEAMAP and the MD juvenile fish seine survey. Since ChesMMAP for adults (age 1+) in 2019-2021 was also not available, the adult composite TLA was calculated using NEFSC and NEAMAP only.

- The juvenile spot composite characteristic (Figure 21) showed an increase in recruitment in 2021 in the Mid-Atlantic region with green proportions from both the MD and NEAMAP surveys. The continued increase in 2021 put the composite TLA below the 30% threshold for the second year in a row since 2012.
- The adult spot composite characteristic (Figure 22) showed an increase in abundance from both surveys (NEFSC and NEAMAP).
- Neither the juvenile or adult indices tripped in either of the two terminal years presented for each TLA with two of the three terminal years well below the 30% threshold.

Figure 21. Juvenile spot (age 0) TLA composite characteristic index for the Mid-Atlantic (NJ-VA) using NEAMAP and MD Seine surveys from 2007-2021 with a 2007-2019 reference period.

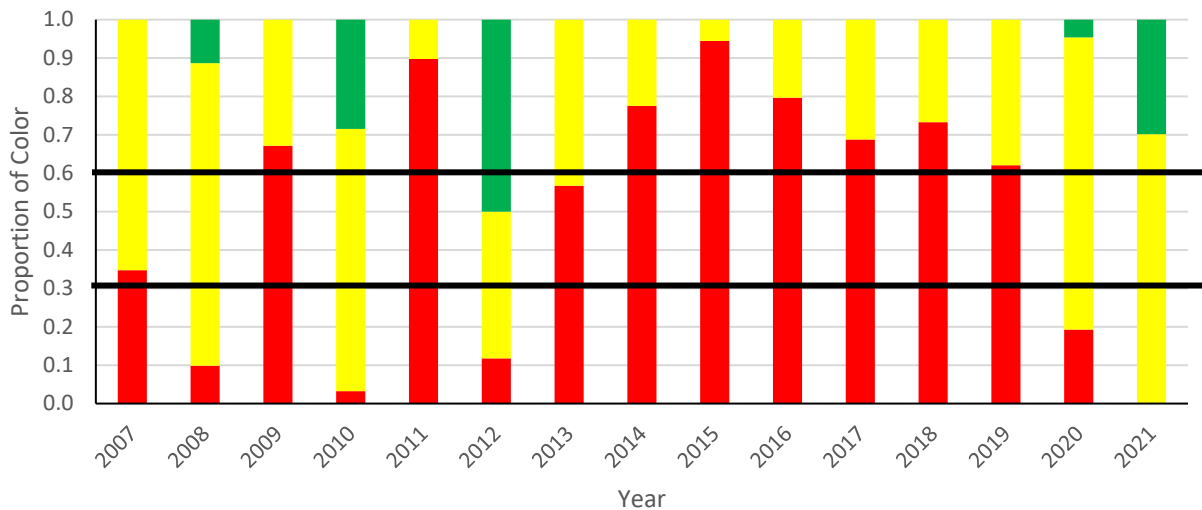
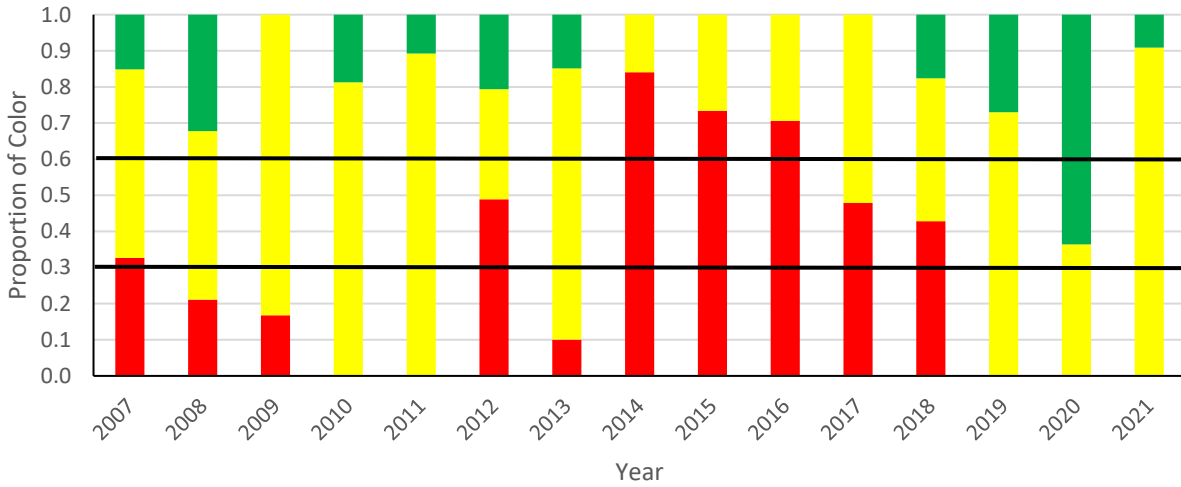


Figure 22. Adult spot (age 1+) TLA composite characteristic index for Mid-Atlantic (NJ-VA) using NEFSC and NEAMAP surveys from 2007-2021 with a 2007-2019 reference period.



6.3 Summary

The addition of the NEAMAP survey generally supported the increasing abundance trends in the last couple of years in the fishery-independent surveys (NEAMAP and NEFSC). The TC might consider adding the NEAMAP survey to the Traffic Light Analysis before the next scheduled benchmark assessment for spot and re-evaluate all fishery independent surveys for use in the TLA.