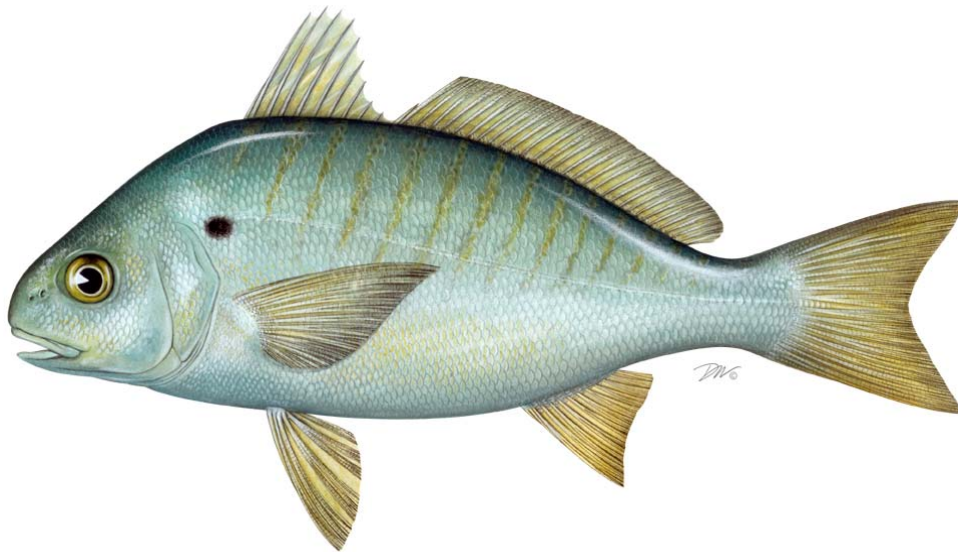# 2017 Traffic Light Analysis of Spot (*Leiostomus xanthurus)* for the Atlantic States Marine Fisheries Commission Fishery Management Plan Review

2016 Fishing Year

Plan Review Team
Ryan Jiorle: Virginia Marine Resources Commission
*Chris McDonough: South Carolina Dept. of Natural Resources
Harry Rickabaugh: Maryland Dept. of Natural Resources
Dan Zapf: North Carolina Division of Marine Fisheries
Mike Schmidtke: Atlantic States Marine Fisheries Commission (Chair)

*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. No coastwide assessment has been performed for spot; however, spot are a target or component of several state surveys using trawls, gillnets, or seine nets. Abundance indices have been highly variable throughout the survey time series. The Commission has begun preparations for the development of the first coastwide benchmark stock assessment in 2015 for final presentation to the South Atlantic Management Board in 2017.

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 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 spot. A new stock assessment for spot 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 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 declined 70% in 2016 from 2015, continuing 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 lbs per year but the average landings since 2010 have dropped to 2,886,785lbs with a value of 627,220 lbs in 2016.
- The landings in 2016 represent the lowest annual landings for spot in the entire commercial data time series (1950-2016) and are only 10.9% of the long term mean landings.
- The TLA commercial index did trip at the 30% level in 2016 and has done so in 5 of the last 7 years, with the 2 year average proportion exceeding 30%.

Figure 1. Annual FTLA color proportions using 1981-2012 reference time period for Spot from NMFS commercial landings for the Atlantic coast of the U.S.
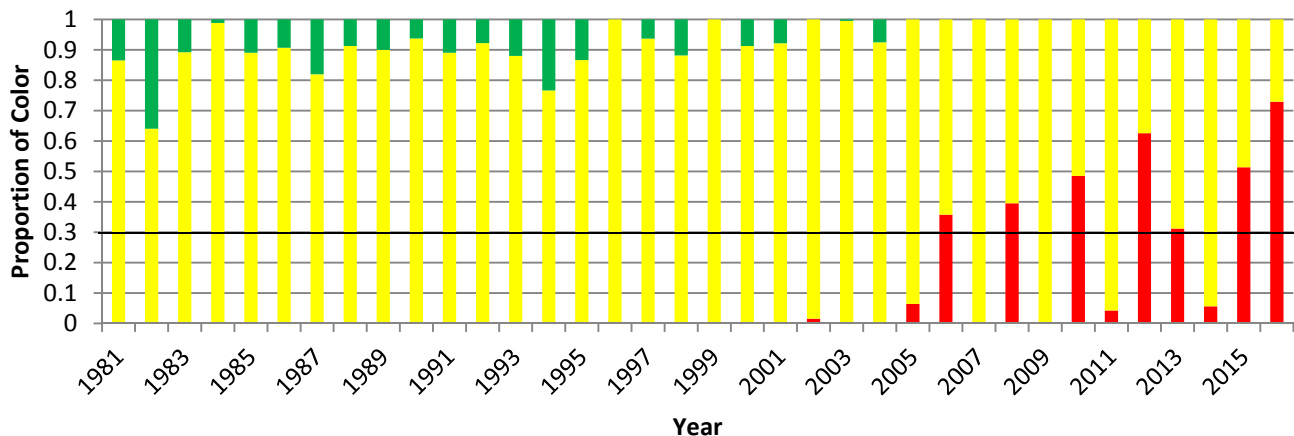
Recreational

- The recreational harvest (in lbs) for spot on the Atlantic coast declined 66.9% in 2016 from 2015, down to 751,332 lbs in 2016 from 2,270,859 lbs in 2015.
- Annual harvest in the recreational fishery has been below the long term mean (LTM) since 2009 and was still below that threshold in 2016.
- The red proportion of the TLA increased in 2016 to 62.6%, well above the 30% trigger level. The recreational TLA did not trip in 2016 as it did not exceed the 2 year (2015-2016) average proportion of 30% or greater.

Figure 2. Annual TLA color proportions using 1989-2012 reference period for spot from recreational harvest in LBS on the Atlantic coast of the U.S.
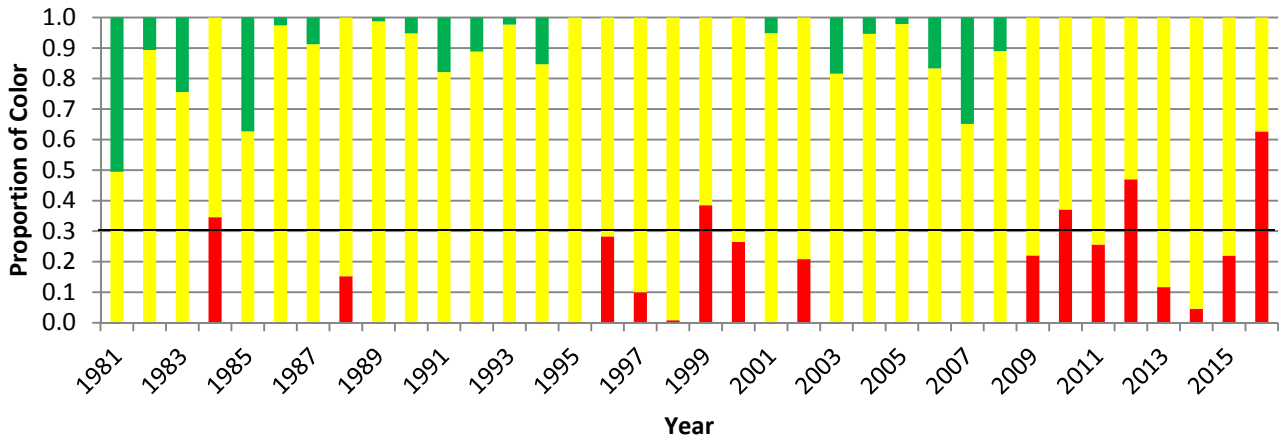

Traffic Light Analysis (Fishery Independent)

NEFSC/NMFS Fall Groundfish Trawl Survey

- The NMFS index had only a slight increase (1.3%) in 2016 from 2015, however it was still below the long term mean (green/yellow boundary for the TLA).
- The longest time period with high red proportions in the TLA occurred from 1990-2003 (Fig. 3), after which catch steadily increased until the peak in 2012. Higher proportions of green in the index did not occur until 2010-2012 when the catch was well above the LTM.
- The TLA did not trigger in 2016 with the 2 year average red proportion below the 30% threshold.

Figure 3. Annual TLA color proportions for Fuzzy Traffic Light model using 1989-2012 reference time period for Spot from NMFS fall groundfish trawl survey.
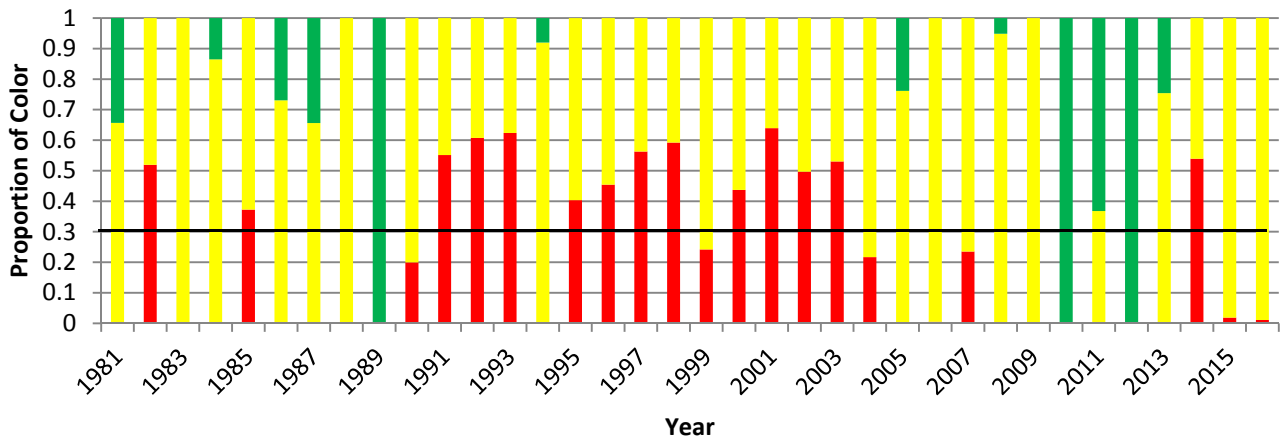
SEAMAP Trawl Survey

- The annual CPUE declined 6.9% in 2016 from 2015 and remained above the long term mean (11.3 kg fish per tow).
- The TLA index did not trigger 2016, and under the current TLA trigger scheme hasn't triggered since 2007.

Figure 4. Annual TLA color proportions for spot from SEAMAP survey using 1989-2012 reference time period.
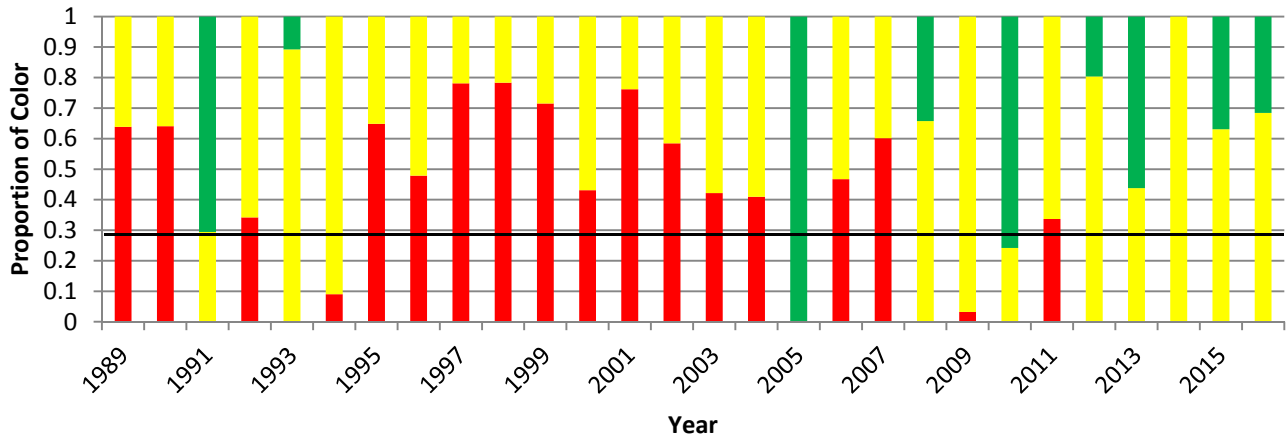
Maryland Juvenile Striped Bass Survey

- 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 indexes (harvest and abundance).
- The Maryland CPUE increased 422% in 2016 from 2015, however the 2015 index value was the lowest in the entire time series (Fig. 5).
- Mean annual CPUE was only above the LTM twice since 1998 with peak years occurring in 2005 and 2010. The large fluctuations in CPUE (and alternating red and green proportions in the TLA) were likely due to changes in annual recruitment and year-class strength rather than population changes as this is a juvenile fish index.
- The TLA trigger did trip in 2016 at the 60% threshold. In previous years of the index, the trigger would have also tripped at the 30% threshold in almost all of the years from 1995-2013 except in the two peak years of 2005 and 2010.
- The index tripping at the 30% level 2012-2014 and at the 60% level in 2015 and 2016 may be cause for some 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 1990-2012 reference period.
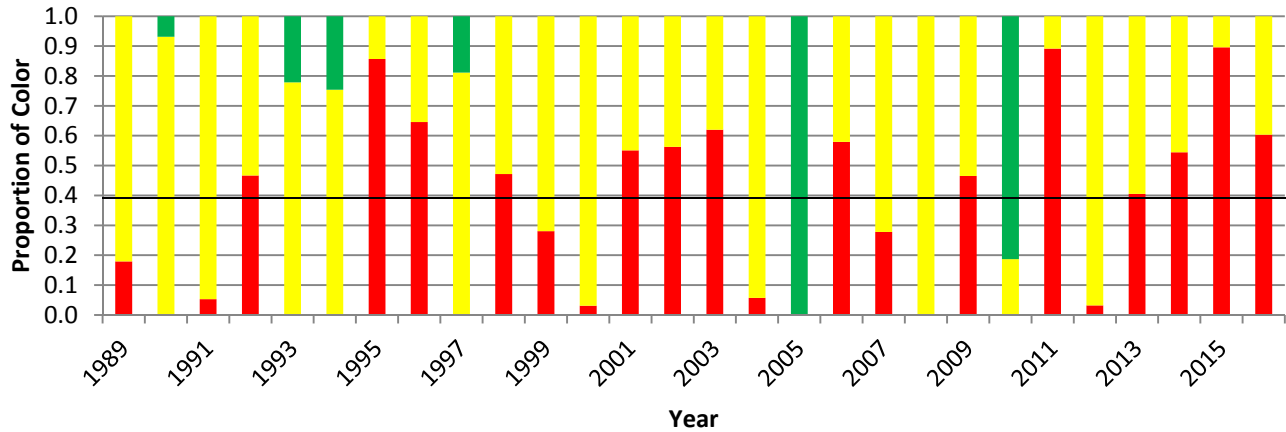

Traffic Light Analysis (Composite Indexes)

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 2016 with a 2 year red proportion greater than 30%. The proportion of red has shown an increasing trend recently and has triggered in 4 of the last 7 years.
- The increase in red proportion was likely driven more by the decline in commercial landings rather than the recreational harvest, particularly given the series low value in 2016.
- The continued declining trend in spot fishery landings was driven primarily by declining landings in the mid-Atlantic region where the majority of coastwide landings occur.

Figure 6. Annual TLA color proportions for harvest composite (commercial and recreational landings) for spot on the Atlantic coast of the US.
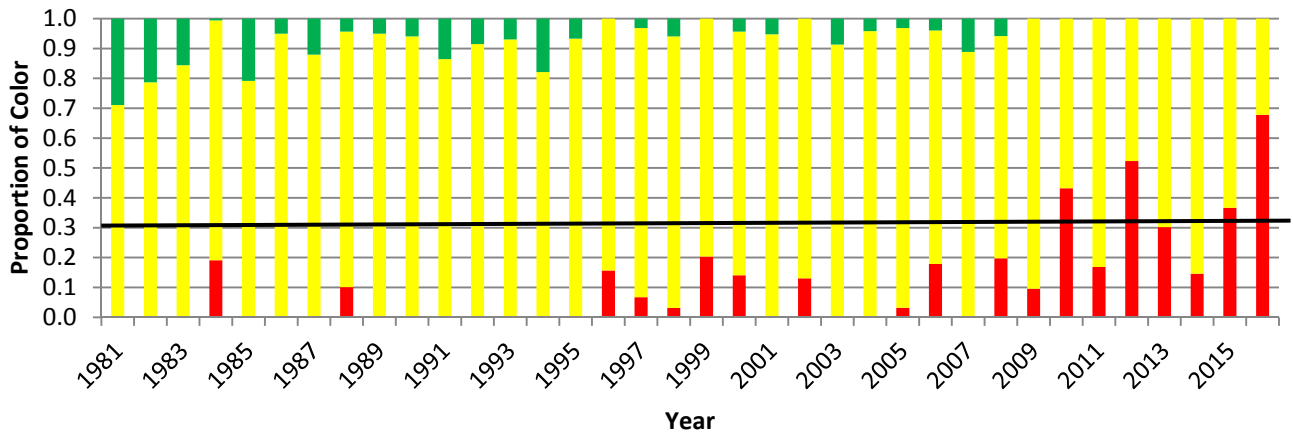
Abundance Composite Characteristic Index

- The TLA composite characteristic for adult spot (NMFS and SEAMAP surveys) showed very little change from 2015 with only a slight decline in the green proportion (Fig. 7).
- The slight increase in catch levels in the NMFS index and the slight decrease in the SEAMAP index resulted in only a slight change in the TLA for 2016.
- The composite characteristic TLA for the abundance indexes did not trigger in 2016.

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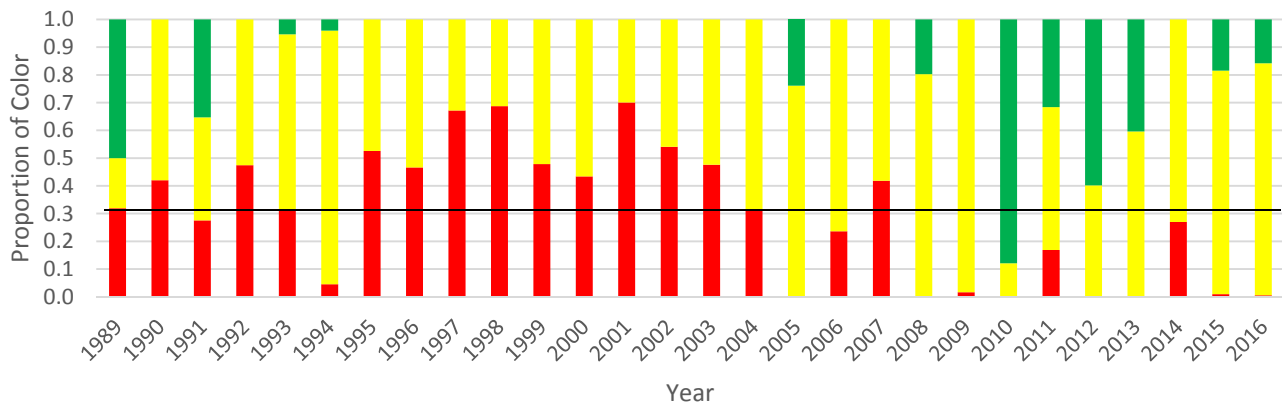
Summary

The TLA composite characteristic indexes tripped for juvenile spot index (60% threshold) but not for the adult composite characteristic index. The harvest composite characteristic also triggered at the 30% threshold in 2016, mostly due to declines in commercial harvest. Although the recreational index did not trigger at the 30% threshold it came very close (29.7%). With the benchmark stock assessment now complete, further refinement of the TLA for spot by the TC should be considered through either adding additional TLA metrics (bycatch, F, or SPR) or additional abundance indices (ChesMMAP, NEAMAP).

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