

November 2014 Revision
to
Amendment 1
to the
**North Carolina Estuarine Striped Bass
Fishery Management Plan**

Prepared By The

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North Carolina Estuarine Striped Bass Fishery Management Plan

Effective January 1, 2015

I. ISSUE

Reducing the striped bass total allowable landings in the Albemarle Sound and Roanoke River Management Areas to remain in compliance with the Atlantic States Marine Fisheries Commission Addendum IV to Amendment 6 to the Interstate Fisheries Management Plan for Atlantic Striped Bass, based on results from the 2014 benchmark stock assessment, declining trends in landings, and declining trends in surveys of abundance.

II. ORIGINATION

North Carolina Division of Marine Fisheries, Fisheries Management staff and North Carolina Wildlife Resources Commission, Division of Inland Fisheries staff.

III. BACKGROUND

Atlantic striped bass from Maine through North Carolina are managed under the jurisdiction of the Atlantic States Marine Fisheries Commission (ASMFC) since Congress passed the Atlantic Striped Bass Conservation Act in 1984. The Albemarle/Roanoke (A/R) stock of striped bass is migratory at older ages, but contributes minimally to the overall Atlantic striped bass stock complex compared to the Chesapeake Bay, Delaware, and Hudson stocks (Berggren and Lieberman 1978; Callihan et al. 2014). Due to the non-migratory behavior of striped bass stocks south of the Albemarle Sound Management Area (ASMA), the striped bass stocks within the Central Southern Management Area are not included in ASMFC's interstate fishery management plan for Atlantic striped bass.

Under ASMFC's Amendment 6 to the Interstate Fishery Management Plan (FMP) for Atlantic Striped Bass, the A/R stock was managed so as not to exceed a fishing mortality (F) rate of 0.27 (Atlantic States Marine Fisheries Commission 2006). This was the same target F as the Chesapeake Bay because both the Chesapeake Bay and Albemarle Sound fisheries have an 18 inch minimum size limit rather than a 20 inch minimum size limit like other producer areas. The A/R stock is assessed to determine the F rate anytime the ASMFC Striped Bass Technical Committee assesses the coastwide stock, or when the North Carolina Division of Marine Fisheries (NCDMF) initiates an amendment to the North Carolina Estuarine Striped Bass FMP. The ASMFC Atlantic Striped Bass Management Board approved Addendum IV to Amendment 6

to the Interstate Fishery Management Plan for Atlantic Striped Bass in October 2014 (Atlantic States Marine Fisheries Commission 2014). Through this addendum process the ASMFC Striped Bass Technical Committee determined it was more biologically appropriate to use NCDMF's A/R stock assessment to determine appropriate F and spawning stock biomass (SSB) reference points specifically for the A/R stock rather than using the same F reference point as the Chesapeake Bay stocks. Future A/R benchmark stock assessments will recalculate biological reference points accordingly. The ASMFC Atlantic Striped Bass Technical Committee and Management Board will continue to approve each NCDMF A/R striped bass benchmark stock assessment for management use as a point of compliance.

The A/R stock has had various forms of catch at age based assessments to estimate fishing mortality rates since 1992 (Gibson and Crecco 1992). From 1999 through 2006 virtual population analysis based assessments were used to determine estimates of F and SSB. Since 2010 a statistical catch at age based model (Takade-Heumacher 2010) has been used to evaluate stock status. The most recent assessment (Mroch and Godwin 2014) is considered a benchmark as there were significant changes made to the model inputs, including an updated maturation schedule, age specific natural mortality, and improved fishing mortality estimates for large fish harvested outside the ASMA. This benchmark assessment was approved for management use by a group of three external reviewers as well as the ASMFC Striped Bass Technical Committee. Because it was a benchmark assessment, new F and SSB reference points were calculated. Final results indicated both F and SSB are between their respective targets and thresholds.

Projections from the model also indicated that harvest of the current total allowable landings (TAL) of 550,000 lbs is not sustainable, and if annually harvested, would cause stock abundance to decline to near zero within twenty years. Harvest levels in all sectors have ranged from 44% to 80% below the current TAL since 2006 and indices from three independent surveys of abundance have declined to levels at or below 1997 levels when the stock was declared recovered. Management action is required to lower the TAL in an effort to ensure a sustainable fishery and increase overall stock abundance due to declining trends in landings and survey indices, results from the recent benchmark stock assessment, and approval of ASMFC's Addendum IV to Amendment 6 to the Interstate FMP for Atlantic Striped Bass.

North Carolina's existing fisheries management system is powerful and flexible, with rule-making authority vested in the North Carolina Marine Fisheries Commission (NCMFC) and the North Carolina Wildlife Resources Commission (NCWRC) within their respective jurisdictions. The NCDMF implements NCMFC rules and policies. The NCMFC and NCWRC have authorized the NCDMF Director and the NCWRC Executive Director proclamation authority. Depending on the agency, proclamations may be utilized to establish seasons, authorize or restrict fishing methods and gear, limit quantities taken or possessed, and restrict fishing areas. Thus, all necessary authority needed for management of the striped bass fisheries is available through the existing state fishery management process.

Currently the A/R striped bass stock is managed through Amendment 1 to the North Carolina Estuarine Striped Bass FMP, approved by the NCMFC and NCWRC in early 2013. Rules went into effect for the commissions June 1 and August 1, 2013 respectively. The following management strategies are currently in place for the ASMA and RRMA:

A/R stock has been managed with a Total Allowable Catch (TAC)¹ since 1990

- Maintain current TAC of 550,000 lbs
- The TAC will continue to be split evenly between commercial and recreational sectors
- ASMA commercial TAC = 275,000 lbs
- ASMA recreational TAC = 137,500 lbs
- RRMA recreational TAC = 137,500 lbs

ASMA Commercial Harvest (TAC = 275,000 lbs)

- 18 inch TL minimum size limit (ASMFC compliance requirement)
- Continue to operate as a bycatch fishery
- Spring season, anytime between Jan 1 – Apr 30
- Fall Season, anytime between Oct 1 – Dec 31
- Daily trip limits for striped bass
- Maintain gill net mesh size and yardage restrictions
- Maintain seasonal and area closures
- Maintain attendance requirements for small mesh nets (mid – May through late November)

ASMA Recreational Harvest (TAC = 137,500 lbs)

- 18 inch TL minimum size limit
- Daily creel limit (can be adjusted as necessary to keep harvest below the TAC)
- Open 7 days a week all season (can be adjusted as necessary to keep harvest below the TAC)
- Spring season, anytime between Jan 1 – Apr 30
- Fall season, anytime between Oct 1 – Dec 31

RRMA Recreational Harvest (TAC = 137,500 lbs)

- 18 inch TL minimum size limit
- Protective slot (no harvest): 22-27 inches TL
- 2 fish daily creel, only one of which can be greater than 27 inches TL
- Harvest season in entire river opens on March 1 and closes on April 30 by rule since 2008
- Single barbless hook regulation from April 1 – June 30 in Inland waters above the US 258 Bridge

Management of TACs for ASMA and RRMA

- Short-term Overages: if the harvest point estimate exceeds the total TAC by 10% in a single year, overage is deducted from the next year and restrictive measures implemented in the responsible fishery (ies)
- Long-term Overages: five-year running average of harvest point estimate exceeds the five-year running average of the total TAC harvest by 2%, the responsible fishery exceeding the harvest limit will be reduced by the amount of the overage for the next five years. Should the target F be exceeded, then restrictive measures will be imposed to reduce F to the target level

¹ The term Total Allowable Catch does not accurately describe the existing management strategy, because the term “catch” refers to landings and discards. Since its inception the quota used to maintain striped bass harvest in the ASMA and RRMA at sustainable levels is for landings only, not landings and discards. From now on the term “total allowable landings” will be used instead of “total allowable catch”.

Proclamation Authority for the ASMA, RRMA, and CSMA striped bass stocks:

It should also be noted that under the provisions of this FMP the NCDMF Director will maintain proclamation authority to establish seasons, authorize or restrict fishing methods and gear, limit quantities taken or possessed, and restrict fishing areas as deemed necessary to maintain a sustainable harvest. The NCWRC Executive Director will maintain proclamation authority to establish seasons.

IV. AUTHORITY

The NCMFC can regulate fishing times, areas, fishing gear, seasons, size limits, and quantities of fish harvested and possessed (G.S. 113-182 and 143B-289.52). General Statute 143B-289.52 allows the NCMFC to delegate the authority to implement its regulations for fisheries “which may be affected by variable conditions” to the Director of the NCDMF who may then issue public notices called “proclamations”. The NCWRC has authority to set rules and regulations in waters in its jurisdiction. The Executive Director of the NCWRC also has proclamation authority to set seasons.

G.S. 113-134. RULES

G.S. 113-182. REGULATION OF FISHING AND FISHERIES

G.S. 143B-289.52. MARINE FISHERIES COMMISSION—POWERS AND DUTIES

N.C. Marine Fisheries Commission Rules and N.C. Wildlife Resources Commission Rules 2013
(15A NCAC)

15A NCAC 03M .0512 PROCLAMATION AUTHORITY OF FISHERIES DIRECTOR

15A NCAC 03M .0201 GENERAL

15A NCAC 03M .0202 SEASON, SIZE, AND HARVEST LIMIT: INTERNAL COASTAL WATERS

15A NCAC 03M .0202 SIZE AND CREEL LIMIT: INTERNAL COASTAL WATERS (REPEALED)

15A NCAC 10C .0110 MANAGEMENT RESPONSIBILITY FOR ESTUARINE STRIPED BASS IN JOINT WATERS

15A NCAC 10C .0111 IMPLEMENTATION OF ESTUARINE STRIPED BASS MANAGEMENT PLANS: RECREATIONAL FISHING

V. DISCUSSION

The Albemarle/Roanoke (A/R) striped bass stock has had a fixed station survey to monitor the stock’s annual spawning success since 1955. Termed the juvenile abundance index (JAI), it has proven a reliable estimator of year class strength and future harvest potential. Due to numerous causes including poor water quality, an undesirable flow regime in the Roanoke River during the spring spawning season, and overfishing, the A/R striped bass stock crashed in the late 1970s. During the next fourteen years the stock produced only three spawns that did not meet the recruitment failure definition, which is a JAI value less than 75% of all values from 1955 to 2009 (ASMFC 2010). Starting in 1993 the stock began producing successful spawns once again, due to severe management restrictions, improved water quality, agreements about a water flow regime on the Roanoke River during the spawning season, and favorable environmental conditions during the spawning season. Within an eight year period spanning 1993-2000, the stock produced the four highest JAI values in the entire 46 year time series. The average JAI during 1993-2000 was 24.04, over three times higher than the average of the JAI prior to the

stock crashing (1955-1977 JAI = 7.87; Figure 1). Based on this level of recruitment, the stock was declared recovered by the ASMFC in 1997. From 1991 through 1997 the TAL was 156,800 lbs. Beginning in 1998 ASMFC approved several TAL increases based on A/R stock assessment projections. Total allowable landing increases were made in 1998, 1999, 2000, and 2003, as unprecedented spawning success from 1993 to 2000 led to greater abundance in the exploitable portion of the stock (i.e. ages 3-6).

Since the last TAL increase to 550,000 lbs in 2003, total combined landings in the ASMA and RRMA has not exceeded 460,853 lbs, and has averaged 269,204 lbs with a low of 108,432 lbs in 2013. Commercial landings reached their TAL in 2003 and 2004, but have not since. The recreational sector has not reached its TAL since 2002 (Figure 2). Less than average recruitment since 2001, including several years that qualify as recruitment failure, is the main cause for the declining harvest since 2005. Although anchored gill net trips in the ASMA have declined significantly since 1994, they were fairly stable from 2004 thru 2009 at approximately 13,500 trips per year (Figure 3). There was a decline in trips in 2011, but in 2013 trips were back up to 14,014, similar to the number of trips in 2004 (14,393) when the commercial sector landed 276,565 lbs during the spring season alone. Large mesh gill net regulations in the ASMA American shad and flounder fisheries result in commercial striped bass landings consisting mainly of fish age 4-6. The current 275,000 lbs commercial TAL could be met at recent levels of gill net effort if age 4-6 abundance was adequate.

Recreational effort as measured in angler hours also exhibits no trend that would explain the decrease in recreational harvest (Figures 4 and 5). The recreational sector's landings are dominated by fish age 3-6 due to a slot limit in the RRMA, a no possession of river herring over six inches while engaged in fishing activities rule statewide, and general angling techniques in the ASMA and RRMA. Because the majority of harvest is on only three or four year classes (Figure 6), one poor year class can result in lower harvest totals, and two poor year classes within a few years can reduce harvest even more. Since 2000 the JAI data indicates there have been several poor year classes including 2003, 2004, 2009, and 2012. The 2011 year class appears to be strong and is only one of two year classes (2011 and 2010) in the past eight years that had a JAI value above the long term average. The 2013 JAI was classified as recruitment failure, resulting in two consecutive years of poor recruitment. As the 2012 and 2013 year classes move through the age 3-6 harvest window, harvest potential will be reduced.

Survey indices of relative abundance also exhibit a declining trend in recent years. The NCDMF annually conducts two gill net surveys in the Albemarle Sound area to monitor the relative abundance of the overwintering and spawning portions of the A/R stock. Both the fall/winter overwintering stock survey and the spring spawning stock survey show a decline in relative abundance of fish age 4-6 to below levels observed in 1997 when the stock was declared recovered (Figure 7). The NCWRC conducts an annual electrofishing survey to monitor the relative abundance of the spawning stock on the spawning grounds in the Roanoke River. Relative abundance of all year classes and the relative abundance of the age 9+ group from the electrofishing survey are also showing declining trends in recent years (Figures 8 and 9).

A recent NCDMF A/R striped bass stock assessment, peer reviewed and approved for management use by an independent group of external scientists and the ASMFC Atlantic Striped Bass Technical Committee, indicates harvest at the current TAL of 550,000 lbs is not sustainable at recent levels of recruitment and stock size (Figure 10). Results also indicate that SSB is below the target and very close to the threshold (Figure 11) and F is slightly above the target (Figure 12) (NCDMF 2014). Adaptive management measures in Amendment 1 to the North Carolina Estuarine Striped Bass FMP are triggered if stock assessment results indicate F

is above the target. Issue 9 under Amendment 1 to the North Carolina Estuarine Striped Bass FMP states:

“Issue 9: Albemarle Sound Management Area and Roanoke River Management Area Striped Bass Management Measures:

Management of TACs for ASMA and RRMA

- Short-term Overages: if the harvest point estimate exceeds the total TAC by 10% in a single year, overage is deducted from the next year and restrictive measures implemented in the responsible fishery (ies)
- Long-term Overages: if the five-year running average of harvest point estimate exceeds the five-year running average of the total TAC harvest by 2%, the responsible fishery exceeding the harvest limit will be reduced by the amount of the overage for the next five years. Should the target F be exceeded, then restrictive measures will be imposed to reduce F to the target level.

Proclamation Authority for the ASMA, RRMA, and CSMA striped bass stocks:

It should also be noted that under the provisions of this FMP the NCDMF Director and the NCWRC Executive Director will maintain the ability to establish seasons, authorize or restrict fishing methods and gear, limit quantities taken or possessed, and restrict fishing areas as deemed necessary to maintain a sustainable harvest.”

Based on results from the recent stock assessment the new F and SSB reference points and their associated TALs are:

Reference Point	Fishing Mortality (F)	Spawning Stock Biomass (SSB)	Total Allowable Landings (TAL)
Target	0.33	969,496 lbs	305,762 lbs
Threshold	0.41	785,150 lbs	325,905 lbs

At minimum, the current TAL needs to be reduced to 305,762 lbs in order to maintain a target F of 0.33 which will maintain SSB at or near its target reference point. Due to the 2012 estimate of SSB being so close to the threshold, there is concern that reducing the TAL only to the new target level (305,762 lbs) will not provide the necessary reduction in mortality because harvest in recent years has not exceeded this amount. Currently SSB is above the threshold, but is within one standard deviation. If SSB falls below the threshold in coming years, additional management measures may have to be implemented to further reduce harvest.

Projections were made for years 2013-2020 to investigate trends in SSB and F at various harvest amounts. The harvest scenarios used in the projections included 241,650 lbs, 250,000 lbs, 275,000 lbs, and 305,000 lbs. The 250,000 lbs and 275,000 lbs harvest levels were chosen because they represent previous TALs at similar stock size (1998 and 1999 respectively). The 241,650 lbs harvest level is the average landings of 2006-2012, while 305,000 lbs represents the TAL that will maintain F and SSB at their respective targets. Included in the projections are the estimated discards associated with each TAL (Table 1).

Projection results indicate that at the 241,560 lbs, 250,000 lbs, and 275,000 lbs harvest levels F falls below F_{TARGET} in 2013 and remains below the F_{TARGET} through 2020. At the 305,000 lbs

harvest level F remains above the F_{TARGET} through 2014 and falls below the F_{TARGET} in 2015 (Figure 13). A major concern that must be considered with a reduction in the TAL is the potential for increased discards. A TAL that is too low may not have the desired effect of increasing the stock size as potential harvestable fish are shifted into discards with no positive gain to sustainable harvest. In the past six years landings in the commercial sector have exceeded the most conservative potential new TAL twice and landings in the ASMA and RRMA recreational sectors have exceeded it a combined five times (Figures 14 and 15).

There are several management strategies available through proclamations or rules that allow the NCDMF and NCWRC to keep harvest levels below the TAL in the ASMA and RRMA. For the commercial fishery these include daily reporting of landings by striped bass dealers for daily monitoring of harvest, mandatory tagging of all striped bass sold, adjusting the daily possession limit, adjusting the opening and closing of the season, area closures, and gill net yardage restrictions. For the ASMA and RRMA recreational fisheries strategies include a creel survey that allows for weekly estimates of harvest, adjusting the daily possession limit, adjusting the allowable harvest days during the open season, adjusting the opening and closing of the season, and area closures.

The NCDMF/NCWRC Stock Assessment Workgroup met several times to discuss the issues outlined in this Information Paper. Based on those discussions the NCDMF and NCWRC recommend a TAL for the A/R striped bass stock of 275,000 lbs. The following section serves to revise Amendment 1 to the North Carolina Estuarine Striped Bass FMP to reflect the new TAL.

VI. MANAGEMENT REVISIONS TO AMENDMENT 1 TO THE NORTH CAROLINA ESTUARINE STRIPED BASS FMP

Amendment 1 to the North Carolina Estuarine Striped Bass FMP, in conjunction with the Interjurisdictional FMP, provides the framework for the changes in management proposed herein. This Information Paper will be incorporated as a Revision to Amendment 1 to the North Carolina Estuarine Striped Bass FMP, and will serve to document the rationale agreed to by the NCDMF Fisheries Management staff and the NCDMF/NCWRC Stock Assessment Workgroup for the following changes in management to be implemented January 1, 2015:

- Biological Reference Points (F and SSB) for the A/R stock will be determined through benchmark NC A/R striped bass stock assessments, which must be approved by the ASMFC Striped Bass Management Board
- Total Allowable Landings (TAL) for the ASMA and RRMA of 275,000 lbs, to be split evenly between the commercial and recreational sectors
- ASMA commercial TAL = 137,500 lbs
- ASMA recreational TAL = 68,750 lbs
- RRMA recreational TAL = 68,750 lbs

All other management strategies contained in Amendment 1 will remain in force until another Revision or Amendment to the North Carolina Estuarine Striped Bass FMP occurs.

Table 1. The total allowable landings and associated discard estimates used in stock projections.

Total Allowable Landings (lbs)	Estimated Discards (lbs)
241,650	29,072
250,000	30,693
275,000	36,546
305,000	46,900

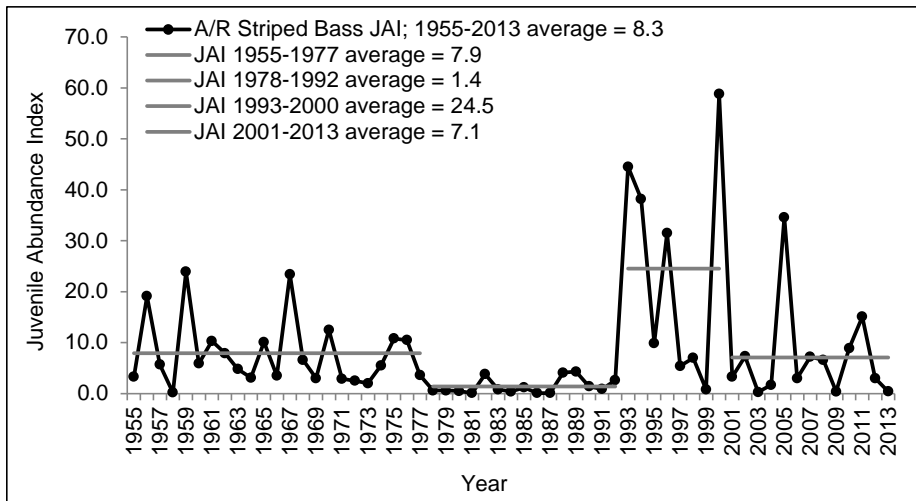


Figure 1. Juvenile abundance index for the Albemarle/Roanoke striped bass stock.

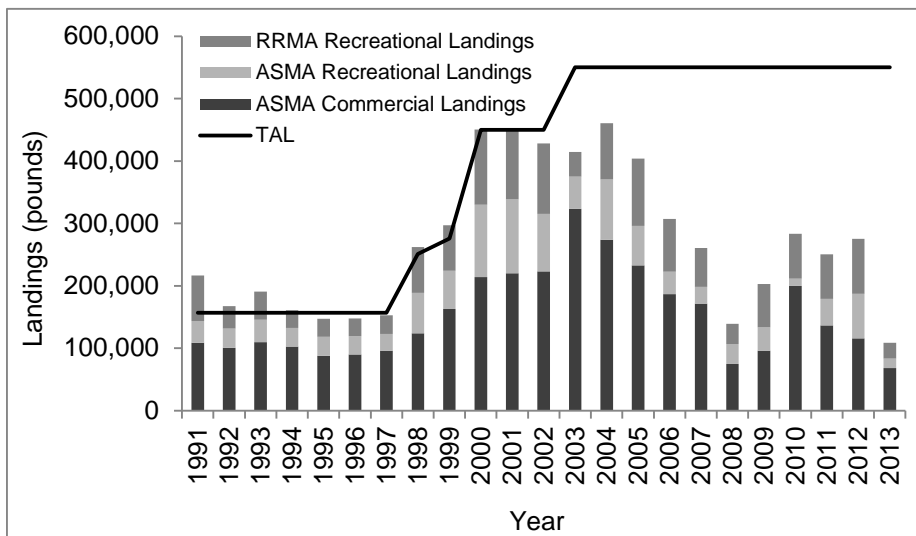


Figure 2. Landings from the ASMA commercial and ASMA and RRMA recreational sectors and the TAL for the A/R striped bass stock.

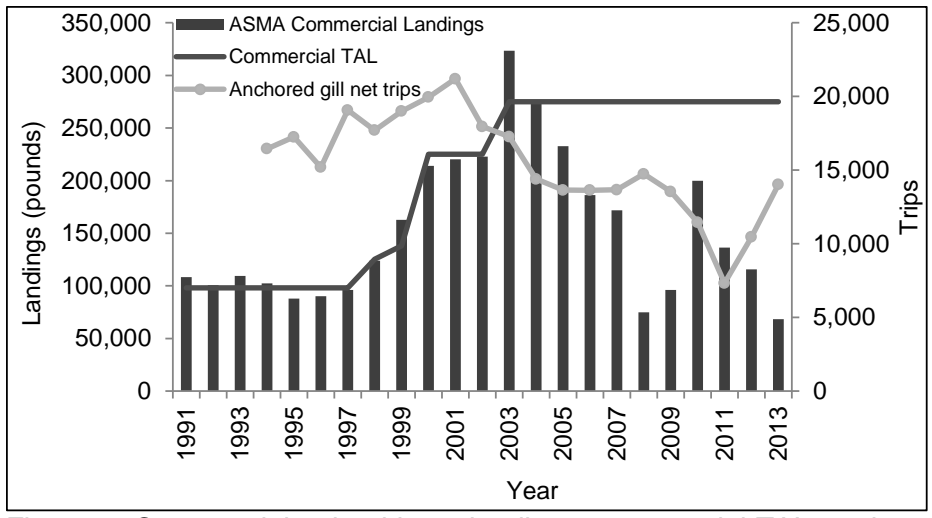


Figure 3. Commercial striped bass landings, commercial TAL, and anchored gill net trips in the ASMA.

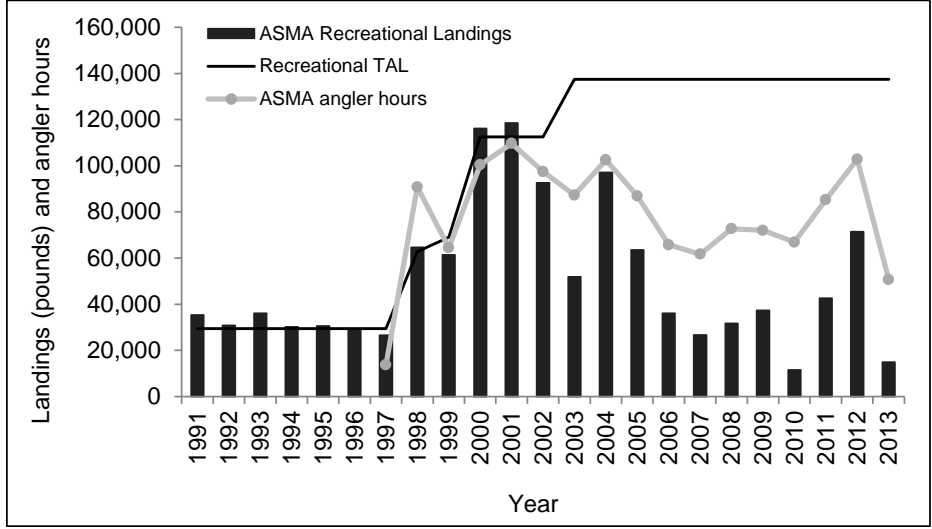


Figure 4. Recreational striped bass landings, TAL, and angler hours in the ASMA.

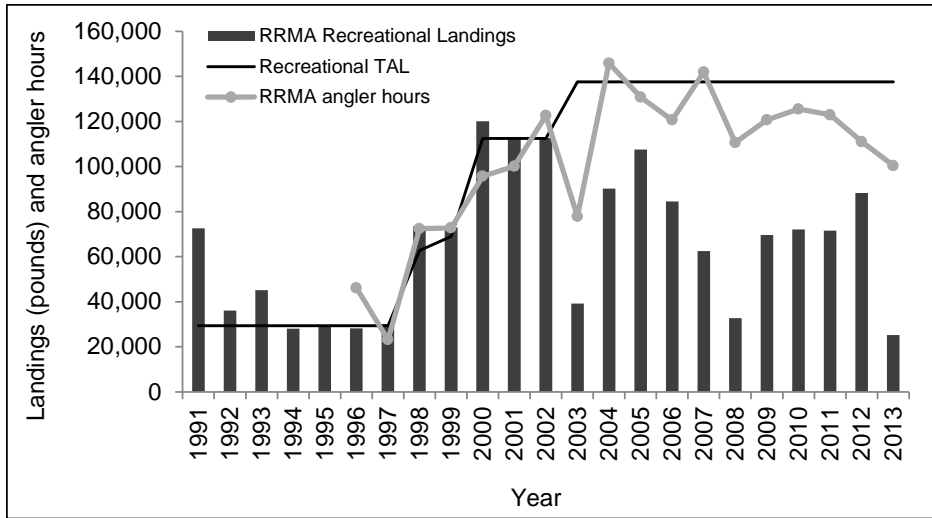


Figure 5. Recreational striped bass landings, TAL, and angler hours in the RRMA.

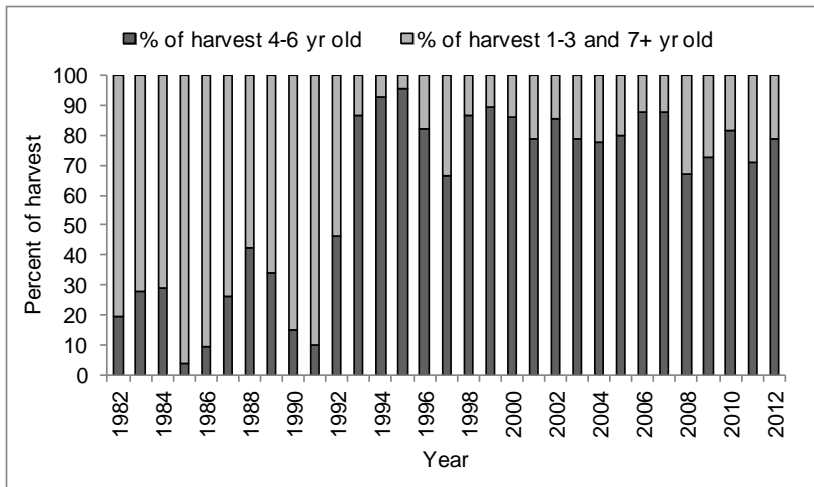


Figure 6. Percent of the total striped bass harvest in the ASMA and RRMA by age groups, 4-6 year old and 1-3 and 7+ year old.

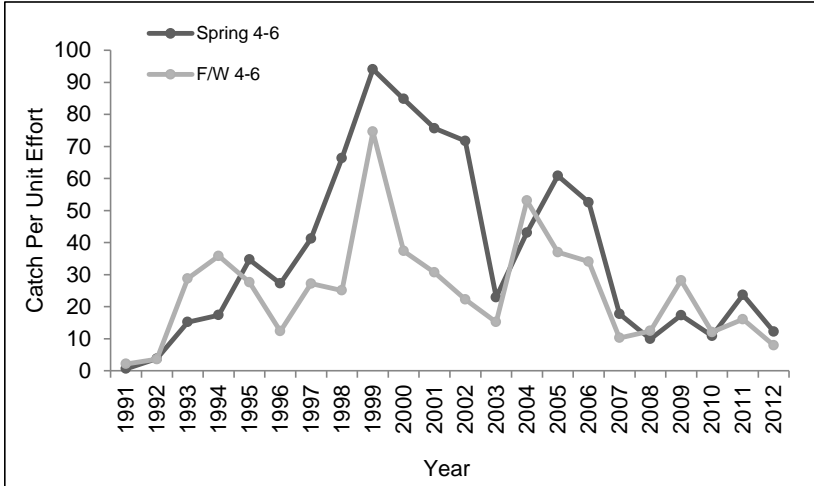


Figure 7. Age 4-6 striped bass relative abundance from the Albemarle Sound spring and fall/winter Independent Gill Net Surveys.

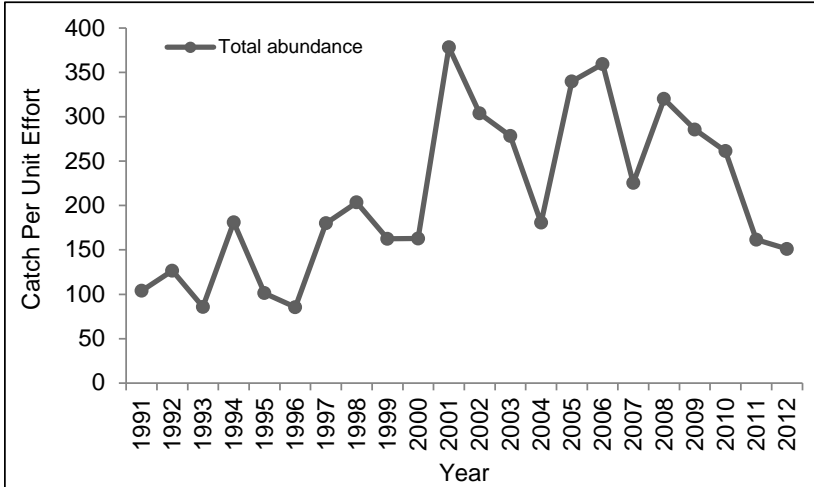


Figure 8. Striped bass relative abundance from the Roanoke River spawning ground electrofishing survey.

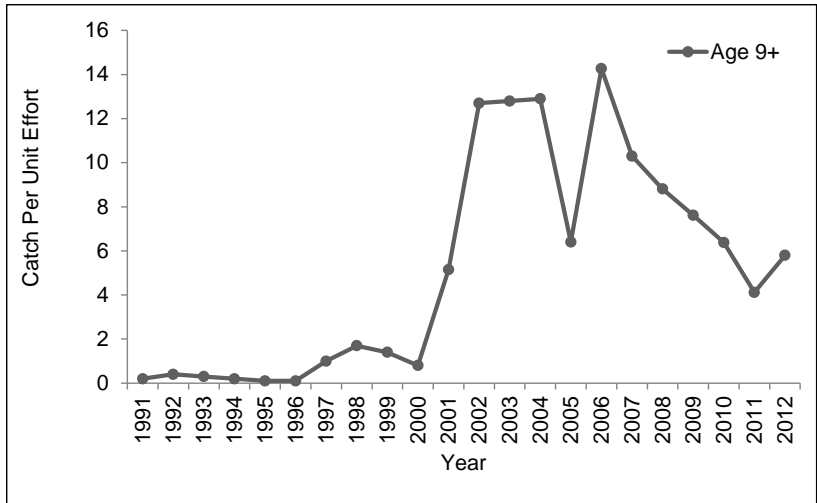


Figure 9. Age 9+ striped bass relative abundance from the Roanoke River spawning ground electrofishing survey.

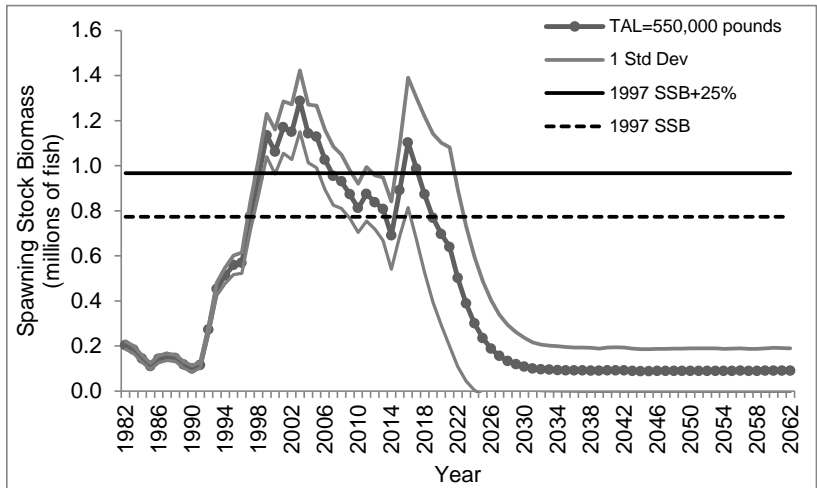


Figure 10. Projected A/R striped bass spawning stock biomass based on constant harvest of 550,000 lbs.

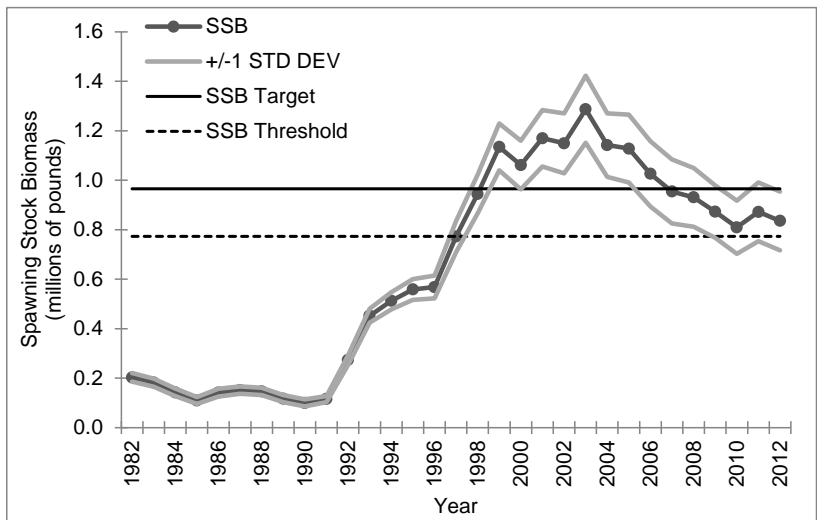


Figure 11. Estimated A/R striped bass spawning stock biomass compared to target and threshold reference points.

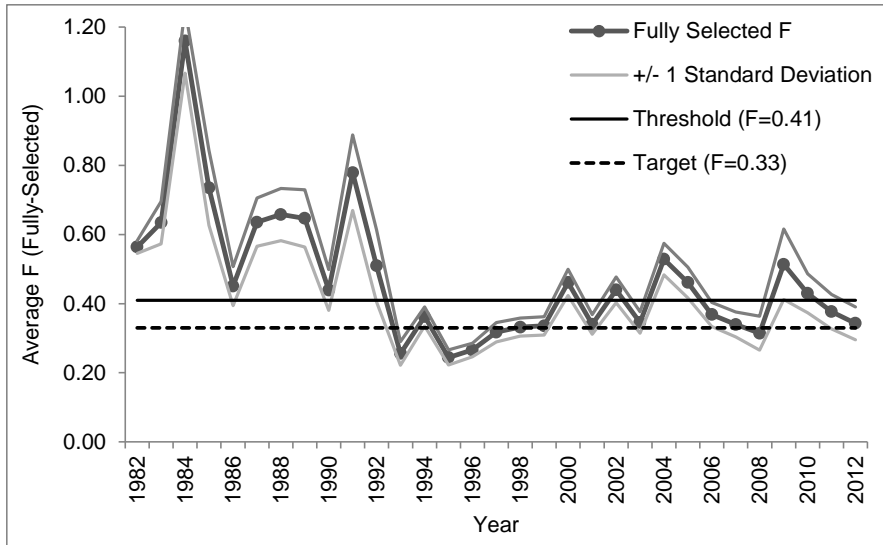


Figure 12. Fully-selected (age-4) A/R striped bass fishing mortality compared to target ($F=0.33$) and threshold ($F=0.41$) reference points.

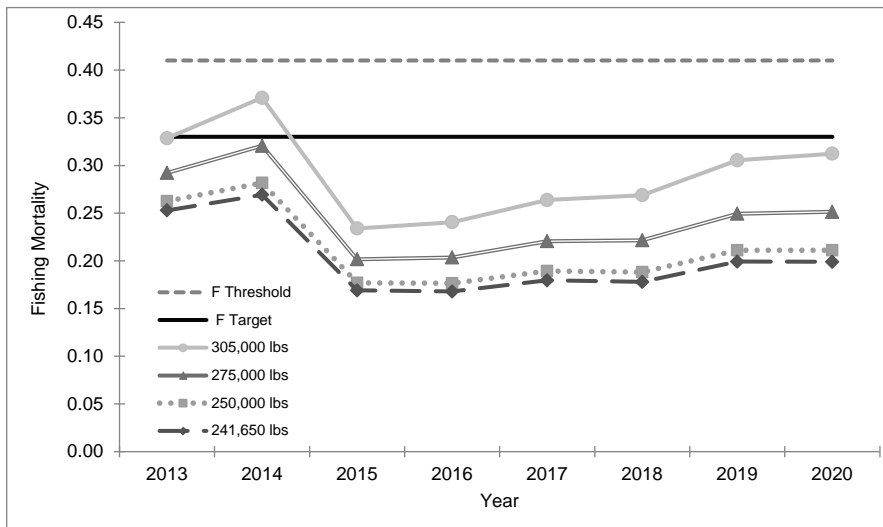


Figure 13. Fishing mortality projections at various harvest levels for 2013-2020 and the target and threshold fishing mortality reference points.

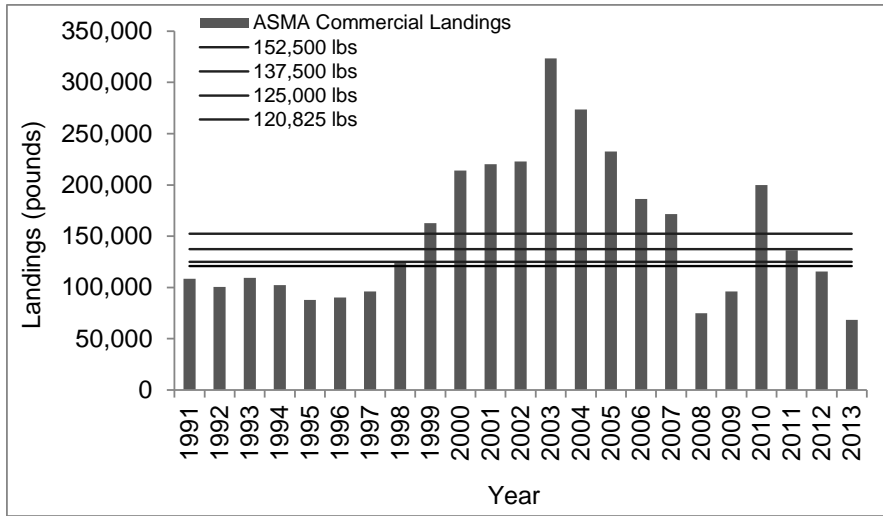


Figure 14. ASMA commercial landings and proposed new TALs.

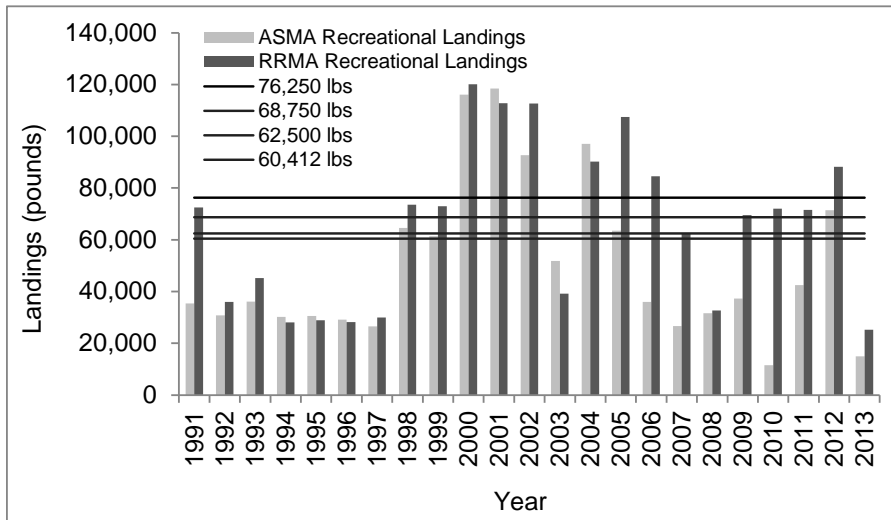


Figure 15. ASMA and RRMA recreational landings and proposed new TALs.

VII. REFERENCES CITED

- Atlantic States Marine Fisheries Commission (ASMFC). 2003. Amendment # 6 to the interstate fishery management plan for Atlantic striped bass. ASMFC, Washington, DC. Fisheries Management Report No. 41.
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