

DRAFT – SUBJECT TO CHANGE

APPENDIX 2: ACHIEVING SUSTAINABLE HARVEST IN THE NORTH CAROLINA SPOTTED SEATROUT FISHERY

ISSUE

Implement management measures to end overfishing and achieve sustainable harvest in the North Carolina Spotted Seatrout fishery.

ORIGINATION

The North Carolina Division of Marine Fisheries (DMF).

BACKGROUND

North Carolina and Virginia tagging studies indicate Spotted Seatrout in North Carolina coastal waters are part of a combined North Carolina and Virginia stock (Ellis 2014). The 2022 North Carolina Spotted Seatrout benchmark stock assessment indicated the Spotted Seatrout stock in North Carolina and Virginia waters is not overfished; however, overfishing is occurring (NCDMF 2022). Reference point thresholds for the Spotted Seatrout stock status are based on a 20% spawning potential ratio which is the comparison of spawning stock biomass (SSB) under a specific fishing regime – i.e., 20% – to a hypothetical unfished SSB. If SSB is below this ratio, the stock is overfished. If fishing mortality (F) is above the level that would lead to this ratio, overfishing is occurring. Due to large uncertainty in the stock assessment terminal year (2019) and based on the recommendation of the external, independent peer review panel, a weighted average of F and SSB from 2017-2019 was used to represent the terminal year and to estimate the threshold and target reference points (NCDMF 2022). The SSB target (SSB_{30%}) and SSB threshold (SSB_{20%}) were estimated at 3,778,723 pounds and 2,519,884 pounds respectively and both were based on 2017-2019 averages. The estimated SSB_{2019Avg} was 4,980,243 pounds which indicates the Spotted Seatrout stock is not overfished (Figure 1). The F target (F_{30%}) and F threshold (F_{20%}) were estimated at 0.38 and 0.60 respectively and were also based on 2017-2019 averages. F_{2019Avg} was estimated at 0.75 which is above the threshold indicating overfishing is occurring (Figure 1).

The General Statutes of North Carolina require a Fishery Management Plan to specify a timeframe not to exceed two years from the date of adoption of the plan to end overfishing (G.S. 113-182.1). A harvest reduction of 19.9% is required to reach the F_{20%} threshold while a harvest reduction of 53.9% will reach the F_{30%} target. A harvest reduction of at least 19.9% meets the statutory requirement to end overfishing. In developing management measures in Amendment 1 to end overfishing, only harvest reductions from the North Carolina portion of Spotted Seatrout harvest were considered. The original Spotted Seatrout FMP and Supplement A management will remain in place until adoption of Amendment 1 to the Spotted Seatrout Fishery Management Plan.

Discussion of management measures focuses on quantifiable measures that meet the reductions necessary to comply with statutory requirements. Harvest of Spotted Seatrout primarily occurs in the recreational fishery, however; harvest in both the recreational and commercial fisheries increased sharply in 2019 and has remained high through 2022 (Figure 2.1). As such, discussion will focus on both sectors. Management measures considered include seasonal closures, size limits, trip/creel limits, and combinations of these management measures. For an in-depth characterization of the commercial and recreational fisheries as well as management measures intended to support sustainable harvest, please see Appendix 1: Small Mesh Gill Net Characterization in the North Carolina Spotted Seatrout Fishery and Appendix 3: Supplemental Management Options in the North Carolina Spotted Seatrout Fishery. Single solution management measures that do not meet the necessary reductions to comply with statutory requirements will still be discussed here. Such measures may be included in combination management options but will not be presented as single solution management options.

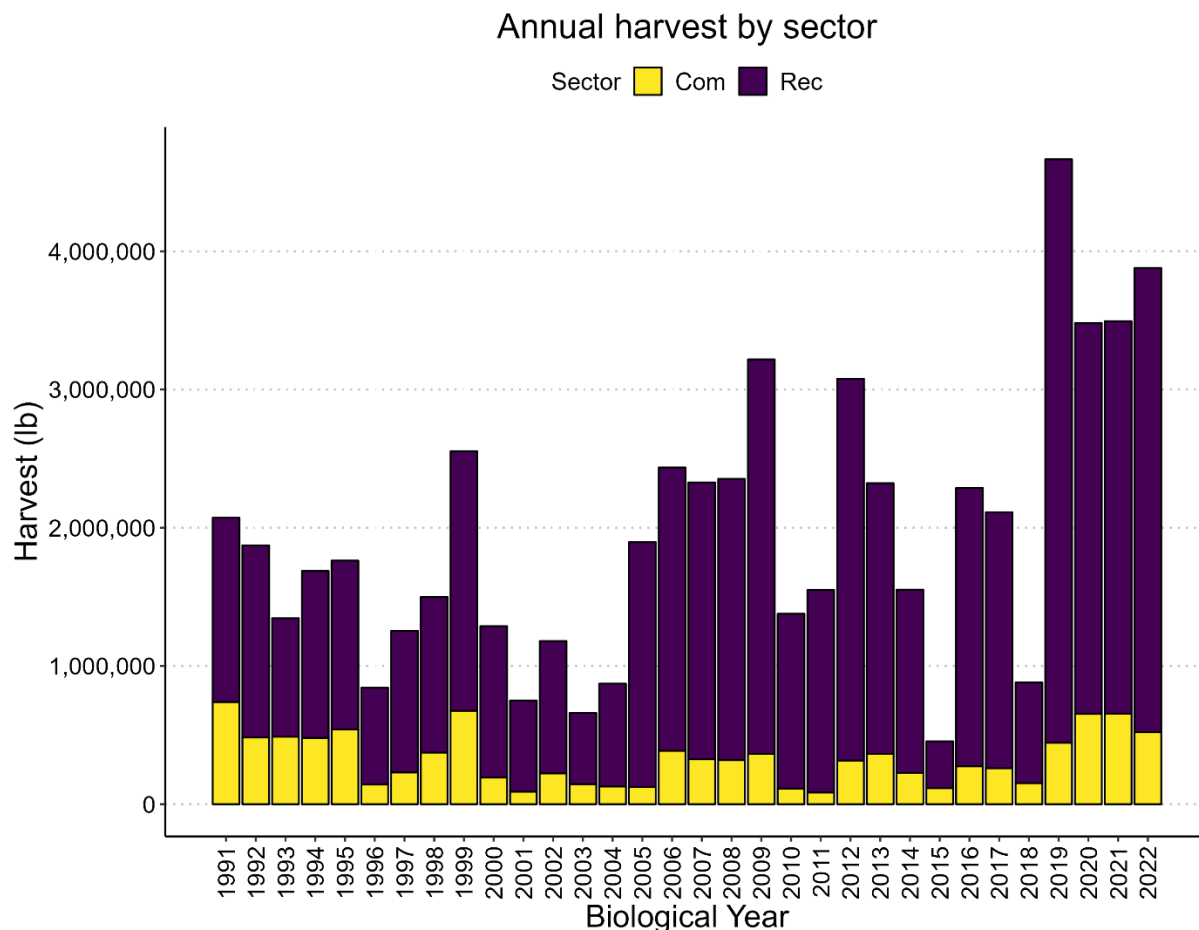


Figure 2.1. Annual harvest of spotted seatrout in pounds by biological year (March–February) and sector. Bars are total annual harvest with commercial harvest as the yellow portion and recreational harvest as the blue portion of the total.

AUTHORITY

G.S. 113-134 RULES

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

G.S. 113-182.1 FISHERY MANAGEMENT PLANS

G.S. 113-221.1. PROCLAMATIONS; EMERGENCY REVIEW

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

15A NCAC 03H .0103 PROCLAMATIONS, GENERAL

15A NCAC 03M .0512 COMPLIANCE WITH FISHERY MANAGEMENT PLANS

15A NCAC 03M .0522 SPOTTED SEATROUT

DISCUSSION

Carry Forward Items from Original FMP

<insert carry forward management when recommended options are selected>

Size Limits

Throughout this section, unless otherwise specified, all lengths refer to total length (TL) which is a measurement from the tip of the snout to the tip of the compressed tail.

Size limits are a common fisheries management tool designed to protect smaller, juvenile fish from harvest until at least a portion of these fish are large enough to spawn and thus contribute to sustaining the population. Size limits should be set based on management objectives and species life history as these factors influence the effectiveness of the management. For example, setting a size limit below the length at which 50% of females are mature (L_{50}) does not allow most females to be large enough to spawn prior to being harvested. The Atlantic States Marine Fisheries Commission (ASMFC) manages Spotted Seatrout in all Atlantic states who have a declared interest in the species under the Omnibus Amendment to the Interstate Fishery Management Plans for Spanish Mackerel, Spot, and Spotted Seatrout (ASMFC 2012). The Omnibus Amendment sets a minimum size limit of 12 inches. In North Carolina, female Spotted Seatrout L_{50} is estimated at 9.88 inches (NCDMF 2022) with nearly all female Spotted Seatrout mature by the time they are recruited to the fishery at 14 inches (Roumillat and Brouwer 2004; Jensen 2009).

Spotted seatrout fecundity has been shown to increase with fish size as larger females produce more eggs and spawn more frequently (Brown-Peterson and Warren 2001; Nieland et al. 2002; Roumillat and Brouwer 2004; Murphy et al. 2010). In many species, due to their increased reproductive capacity, large, female fish are expected to have a disproportionately large contribution to populations (Froese 2004; Berkeley et al. 2004; Barneche et al. 2018). More recently however, the general impact of size-specific contributions of individual fish to populations has come into question with some evidence that the collective reproductive output of smaller, mature fish may contribute more to populations compared to the reproductive output of fewer, larger fish (Barneche et al. 2018; Lavin et al. 2021) indicating that simply protecting “BOFFFs” (big old fat fecund female fish) may not have the desired conservation effect.

Generally, recreational anglers and commercial fishers in North Carolina target any Spotted Seatrout of legal size. Fish harvested commercially tend to be slightly larger than those harvested recreationally (Table 2.1). There is a dedicated catch and release

segment of the recreational fishery (see Recreational Fishery section for more detail). Spotted Seatrout are harvested for consumption regardless of sector.

Slot limits are a specific type of size limit where harvest is restricted to fish above a minimum size but below a maximum size. Sometimes slot limit management will include a trophy limit which allows limited harvest of fish above the maximum size. A slot limit for Spotted Seatrout could protect fish below the minimum size that are not large enough to spawn and fish above the maximum size that may spawn more often and produce more eggs per batch (Brown-Peterson and Warren 2001; Nieland et al. 2002; Roumillat and Brouwer 2004; Murphy et al. 2010). Slot limits can help balance various competing interests that may exist in a fishery and provide a path to achieve management goals (Ahrens et al. 2020). For example, the Spotted Seatrout fishery includes part-time and full-time commercial fishers and part-time and full-time charter guides interested in the economic benefits of the fishery and recreational anglers who may want a robust trophy fishery or to maximize harvest potential, among a variety of other interests (Ahrens et al. 2020).

Table 2.1: Mean, minimum, and maximum lengths (fork length, inches) of Spotted Seatrout measured from the commercial and recreational fisheries, calendar years 2012–2022.

Year	Commercial				Recreational			
	Mean Length	Min Length	Max Length	Total Number Measured	Mean Length	Min Length	Max Length	Total Number Measured
2012	16.5	7.4	31.1	4,822	16.5	13.0	24.1	939
2013	16.7	8.7	28.5	6,144	16.8	10.1	23.5	865
2014	17.3	5.5	28.3	3,321	17.6	13.1	26.0	381
2015	18.3	8.9	30.9	2,676	16.9	12.8	25.0	154
2016	17.3	9.4	31.7	3,025	16.8	13.0	25.2	647
2017	17.6	7.6	32.9	3,066	17.0	11.6	25.8	864
2018	17.2	10.5	28.0	1,180	15.7	9.3	23.3	274
2019	17.3	10.1	28.9	2,622	16.7	10.7	24.6	1,574
2020	17.5	10.9	33.4	2,851	17.0	12.1	26.8	1,119
2021	17.5	10.9	29.9	3,432	17.0	11.1	26.5	1,019
2022	17.9	13.2	28.3	3,314	17.4	12.6	28.0	632

As a standalone management measure, changes to the current Spotted Seatrout minimum size limit are unlikely to reach the necessary harvest reductions to meet statutory requirements. Reductions from increasing the minimum size limit are most likely to be achieved in the short term while long term harvest reductions are lower with some portion of harvest recouped. A delay in harvest could allow more fish to spawn prior to harvest, providing non-quantifiable benefits to the stock. However, Spotted Seatrout growth rates would likely minimize the non-quantifiable benefits from harvest delay as sub-legal fish are recruited to the fishery within a spawning season. Increasing the minimum size limit to 15 inches appears to result in an 8.6% harvest reduction. On average, Spotted Seatrout grow 4.5 inches between year one and year two (Table 2.2) meaning a 14-inch fish at the beginning of the biological year (March) is likely to be well over a 15-inch minimum size during the spawning season (May-August). Most harvest occurs in October, November, and December which means fish well below a 15" minimum size will likely enter the fishery prior to the end of the fishing year but may have a chance

to spawn prior to being subject to harvest in the fall. Fish of sub-legal size in the fall would probably not recruit to the fishery until the following spring allowing for some reduction in harvest. As females grow faster than males, sub-legal female fish will recruit to the fishery more rapidly diminishing any potential quantifiable or non-quantifiable benefits from a size limit increase. With the current minimum size at L₁₀₀ and the growth rates of Spotted Seatrout, an increase in the minimum size may be less effective at reducing harvest than anticipated but may have unquantifiable benefits. Increasing the minimum size limit should be considered in conjunction with other measures as means to ensure sustainable harvest.

Table 2.2. Average length at age in inches for female and pooled (male and female) Spotted Seatrout calculated using von Bertalanffy growth parameters from 2022 stock assessment (NCDMF 2022).

Age	Mean Length (female)	Mean Length (pooled)
0	7.6	6.6
1	14.3	12.1
2	19.4	16.6
3	23.1	20.1
4	25.9	23.0
5	28.0	25.3
6	29.6	27.2
7	30.8	28.7
8	31.6	29.9
9	32.8	30.8

While implementing a slot limit alone will not end overfishing (Table 2.3), reductions from a slot limit are more likely to be realized over the long-term than reductions from increasing the minimum size. Rapid growth early in life means Spotted Seatrout recruit to the fishery quickly but will also quickly grow out of a narrow slot limit. The average length of a one-year-old female fish is 14.3 inches and average length increases to 19.4 inches and 23.1 inches by ages two and three respectively (Table 2.2). On average, a female Spotted Seatrout will be recruited to the fishery with a narrow slot range for about a year. The probability of a short harvest window of each year class, especially for female fish, makes a slot limit a potentially useful management measure when combined with other measures. Allowing the harvest of a “trophy”, or over slot fish, should be considered with caution. Relatively few Spotted Seatrout over 24” are harvested meaning a trophy allowance of less than 24” will result in a minimal overall harvest reduction. Most of the reduction in harvest gained from a 14”–20” slot limit is from fish between 20” - 22” with almost all the harvest reduction coming from fish less than 26” (Table 2.3). A trophy limit with a higher minimum trophy size (e.g., allowing harvest of one fish over 24” or over 33.5” which is the length of the current state record Spotted Seatrout) would maintain most of the harvest reductions gained from a traditional slot limit while still allowing for the harvest of “a fish of a lifetime” or the setting of a new Spotted Seatrout state record.

Anecdotally, the practice of “high grading” is common in the Spotted Seatrout fishery. High grading is where someone catches a legal limit of fish, keeps that limit in their possession, and continues fishing for larger or higher quality fish. Upon catching such a fish, the smaller or lower quality fish are discarded, and the larger or higher quality fish

are kept. These discarded fish have higher than usual mortality rates (Nelson et al. 2021). “Possession” is defined in NCMFC rule as “actual or constructive holding whether under claim of ownership or not” [NCMFC Rule 15A NCAC 03I .0101 (2)(g)] making the practice of high grading illegal as it involves possessing more than a legal limit of Spotted Seatrout. For example, an angler who catches a four fish limit of Spotted Seatrout and keeps those fish in a live well, but continues fishing until catching a larger Spotted Seatrout, then discards one of the fish from the live well has possessed five fish or one fish more than the legal possession limit for Spotted Seatrout, even if only for a short period of time. Despite the illegality of high grading, enforcement is exceedingly difficult. A trophy limit could encourage more anglers to participate in this behavior and subsequently decrease potential reductions by increasing dead discards in the fishery though it is impossible to quantify by how much.

Table 2.3. Expected reductions in harvest from various size limits in the North Carolina Spotted Seatrout fishery. There is no realistic minimum size or slot limit that will end overfishing as a standalone measure. *Total % Reduction includes a 4.3% reduction in commercial harvest. Commercial harvest reduction is 0% in all other cases.

Size limit examples (inches Total Length)		
Size Limit	Percent Reduction Rec	Total % Reduction
15" minimum	9.3	8.6*
14"-20"	18.5	15.8
14"-22"	7.2	6.2
14"-24"	3.2	2.7
14"-20" with one fish over 24"	15.2	13.0
14"-20" with one fish over 26"	18.0	15.4
14"-20" with one fish over 30"	18.5	15.8

A slot limit could be implemented either in the recreational sector or across both the recreational and commercial sectors. A recreational slot limit might lead to increased dead discards. Though the expected discard mortality rate for Spotted Seatrout caught with hook and line is low (Gearhart 2002), the already high number of discarded Spotted Seatrout underscores the importance of considering release mortality when exploring management options. Gear requirements (e.g., circle hooks when fishing live or natural bait) and ethical angling education could help minimize dead discards in the recreational fishery. Similarly, a commercial slot limit would likely lead to increased dead discards. North Carolina specific estimates for total mortality (at-net mortality plus delayed mortality) of discarded Spotted Seatrout only exist for the anchored small-mesh gill-net fishery and vary depending on mesh size with an average of 79% (Price and Gearhart 2002). Though anchored small-mesh gill nets have historically been the predominate gear in this fishery, recently runaround gill nets have become increasingly common. Data characterizing dead discards in the commercial fishery are limited. Observer Program data shows limited discards in the anchored gill-net fishery and about 84% of total trips land less than the 75 fish limit (Appendix 1). These data indicate dead discards are likely low under current management. However, it is unclear if dead discards will increase if

management changes. Pairing a commercial slot limit with corresponding mesh size changes may not be effective in reducing discards due to the lack of size selectivity across various mesh sizes for Spotted Seatrout (see Appendix 1). Prohibiting commercial gear based on reducing dead discards in the Spotted Seatrout fishery would affect a variety of other fisheries. Since implementing a commercial slot limit would either broadly affect other fisheries or likely increase dead discards, thus reducing the effectiveness of management, a commercial slot limit is not the most effective management option to reduce commercial harvest. Implementing a slot limit for the recreational sector only may simply shift the harvest of large fish to the commercial fishery resulting in the projected harvest reduction not being realized, though quantifying this shift is not possible. For example, a 14"-20" recreational only slot would lead to an 18.5% reduction in recreational harvest (Table 2.3), but it is possible a portion of that reduction would be recouped by the commercial sector, resulting in a realized reduction less than 18.5%. As such, more conservative management measures to buffer overall harvest reductions should be considered.

Seasonal Closures

The Spotted Seatrout fishery in North Carolina predominantly occurs in fall across both the recreational and commercial sectors (Figure 2.2). For a more detailed description of seasonal harvest, see the Commercial and Recreational Fishery sections of Amendment 1. While there might be small regional variations in these seasonal patterns, broadly the patterns are consistent statewide.

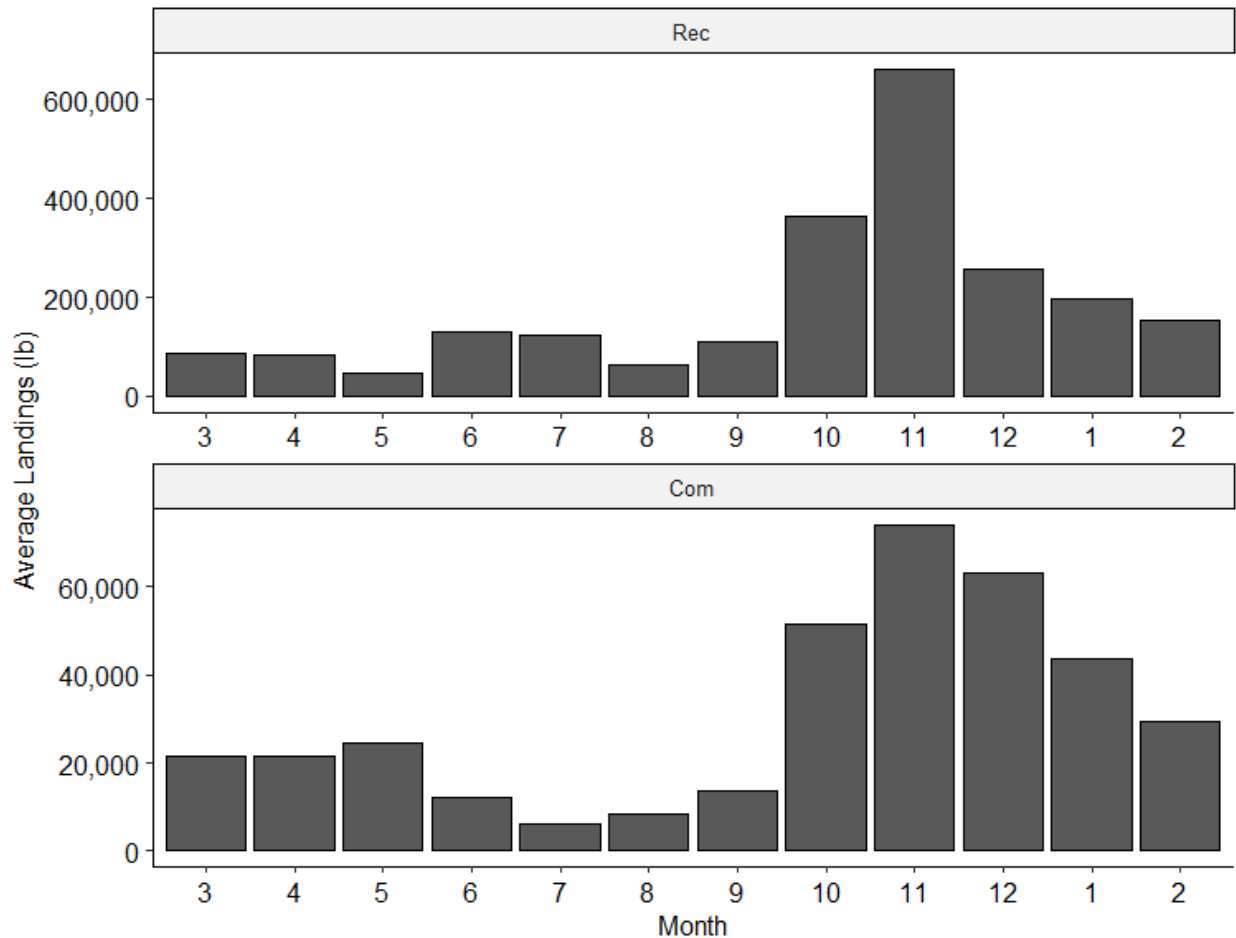


Figure 2.2 Average monthly harvest of Spotted Seatrout in pounds by sector from Biological Year 2012–2022. The top panel is recreational harvest, and the bottom panel is commercial harvest. Note: the vertical axis scale is different between panels to illustrate seasonal variation. The Biological Year is March – February.

Seasonal closures can be an effective way of limiting harvest, especially when closures are at the end of the fishing year to prevent recoupment of harvest. Closures prior to the end of the fishing year should include a buffer above the desired reduction to account for recoupment. It is possible to end overfishing in the Spotted Seatrout fishery through seasonal closures. In theory, a closure that spans the spawning season could reduce overall harvest enough to reach the threshold F (Table 2.4) and provide the added benefit of allowing more Spotted Seatrout to spawn each season. Though 2022 spawning stock biomass does not indicate the need for additional spawning protections, reducing harvest during the spawning season would have non-quantifiable benefits to the Spotted Seatrout stock. A spawning season closure, however, is not at the end of the fishing year therefore it is likely some amount of recoupment would occur after the season closure. A spawning season closure would also have to be longer than a winter closure to reduce harvest to a level that will meet management targets (Table 2.4). Because recoupment is likely with a spawning season closure the closure should be extended, or other management options considered in tandem with the closure to ensure harvest reductions end

overfishing. A winter closure at the end of the biological year could reach similar harvest reductions as a spawning season closure over a shorter timeframe with no recoupment of harvest. Only options that would end overfishing and decrease fishing mortality (F) to the threshold or target level are presented in this section.

Table 2.4. Expected reductions in harvest for each sector from seasonal closures in the North Carolina Spotted Seatrout fishery. Unless otherwise noted, closures are for the entire month. Reduction of at least 19.9% (threshold) is needed to end overfishing. *Reduction for period did not meet the harvest reduction necessary to meet the F threshold (Rec Jan-Feb, Combined Jan-Feb, and Com May 16-Oct) or the F target (Com May 16-Nov 30).

Season Closure Examples			
Closure Dates (Winter)	Percent Reduction Recreational	Percent Reduction Commercial	Percent Reduction Combined
Jan – Feb	17.4*	21.6	18.0*
Dec 16 – Feb	22.1	29.6	23.2
Nov – Feb	55.2	56.9	55.4
Closure Dates (Spawning)			
May 16 – Sep	21.4	14.2*	20.4

A seasonal closure could be over the same timeframe for the commercial and recreational sectors or could vary depending on sector. A consistent season for both sectors is easier for recreational anglers and commercial fishers to understand, would ease the enforcement burden, and can decrease user group conflict. Ending overfishing in both sectors is more complicated with the same season across sectors as is ensuring a similar reduction for each sector. For example, if the Spotted Seatrout fishery is closed January 1 and does not reopen until the end of February, there would be a 21.6% reduction in commercial harvest (ends overfishing in the commercial sector), but only a 17.4% reduction in recreational harvest (does not end overfishing in the recreational sector). Different seasons for each sector could help ensure parity between sectors and that harvest is reduced to the threshold or target F but could cause confusion for stakeholders though there is precedent for different recreational and commercial seasons in multiple N.C. fisheries (e.g., Southern Flounder and Striped Bass).

It is also important to consider other potential target species during a proposed closed season. The most common species landed on commercial trips that land Spotted Seatrout is Striped Mullet (see Appendix 1). Similarly, Spotted Seatrout is the most common species landed on commercial trips that land Striped Mullet. Fishers in both fisheries use similar gear types with runaround gill nets becoming more common in recent years but anchored small mesh gill nets still common. The overlap in gear types and landings provides strong evidence that the Spotted Seatrout and Striped Mullet commercial fisheries operate alongside each other underscoring the importance of considering how possible changes in the Striped Mullet FMP currently under development might affect Spotted Seatrout harvest and vice versa. The types of baits and gear used in the recreational fishery are also commonly used when targeting Red Drum, Striped Bass, Southern Flounder, and Black Drum. When open, Striped Bass and Southern Flounder are quota managed species, therefore harvest of these species could not increase if effort shifts occur. If recreational anglers unable to target Spotted Seatrout due

to a seasonal closure instead targeted Red Drum or Black Drum, this could lead to an increase in harvest. It is not possible to predict how angler behavior might change when regulations change, however; the seasonality of the Red Drum and Black Drum fisheries could be considered when determining the timeframe for a Spotted Seatrout seasonal closure.

Option 1: Seasonal Closure Options

- a. *Status Quo – manage fishery without seasonal closure*
 - + Spotted Seatrout fishery remains open year round
 - + I'm blanking on other positives here
 - May be more difficult to reach threshold or target reduction levels through other single management options
 - Same with negatives

- b. *Dec 16 – Feb 28/29 Closure (both sectors)*
 - + Ends overfishing in both sectors
 - + Commercial/Recreational seasons are the same
 - + Fishery is closed when cold stuns are most likely to occur
 - + No harvest recoupment
 - Increased discards in both sectors

- c. *Dec 16 – Feb 28/29 Recreational Closure and Jan 1 – Feb 28/29 Commercial Closure*
 - + Ends overfishing in both sectors
 - + Closure length is minimized for each sector
 - + Fishery is closed when cold stuns are most likely to occur
 - + No harvest recoupment
 - Increased discards in both sectors
 - Potential for confusion with different commercial and recreational seasons
 - Perception of lack of management equality with shorter closed season for commercial sector

- d. *Nov 1 – Feb 28/29 Closure (both sectors)*
 - + Ends overfishing and reduces harvest to target
 - + Closure length is minimized for each sector
 - + Same closed season for each sector minimizes confusion
 - Closure encompasses most of peak season for both sectors
 - Reduction in harvest to reach target F probably not necessary
 - Increased discards in both sectors

Bag and Trip Limit Reductions

The recreational bag limit for Spotted Seatrout is currently 4 fish per person per day. Most recreational anglers, however, harvest less than their limit of Spotted Seatrout. From

2019-2022 – just over 73% of anglers harvested two or fewer Spotted Seatrout and nearly 48% of anglers harvested just one Spotted Seatrout. Harvest reductions needed to reach the F threshold could be achieved in the recreational fishery through bag limit changes, but harvest reductions needed to reach the F target are not possible with bag limit changes as a standalone measure (Table 2.6). Reducing recreational harvest to reach the F threshold would require decreasing the recreational bag limit to two fish per person per day. Reducing the allowable bag limit to meet the minimum reduction necessary to end overfishing in the recreational sector would enact management that is easy to understand, easy to enforce, and straightforward. Even though a two fish bag limit would result in a 27.7% reduction (Table 2.6), the public could potentially conflate the number of fish an angler is theoretically allowed to harvest with the number of fish most anglers actually harvest leading to the misperception that a two fish bag limit is a 50% reduction (Figure 2.3).

Table 2.6. Expected reductions in recreational harvest and total harvest from bag limit changes. Total harvest reductions assume no other management is implemented. Reductions of at least 19.9% (threshold) up to 53.9% (target) are needed to end overfishing. *Reduction does not meet the 19.9 % threshold harvest reduction (3 fish bag limit) or the 53.9% target harvest reduction (1 fish bag limit).

Bag Limit Reduction Examples		
Bag Limit	Rec Harvest Reduction	Total Harvest Reduction
3	11.8*	10.1*
2	27.7	23.7
1	52.7*	45.0*

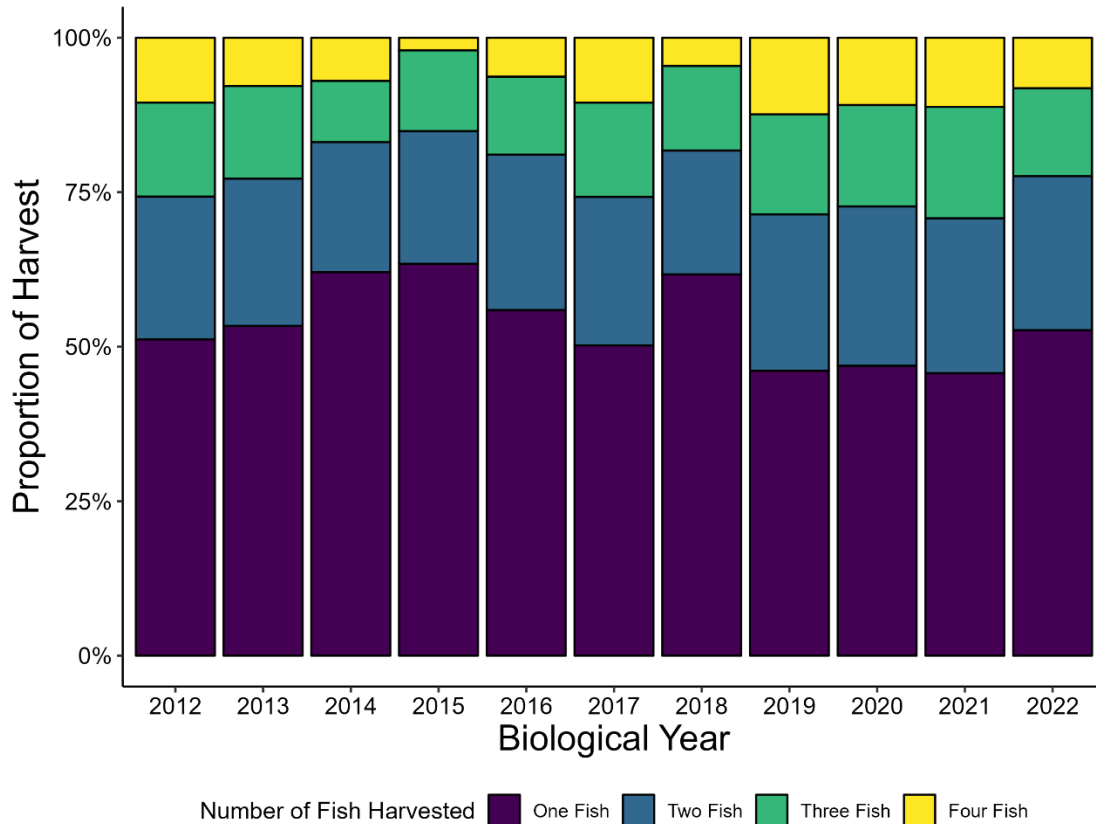


Figure 2.3. The proportion of total recreational Spotted Seatrout harvest where bar color refers to the number of fish harvested. Though the specific proportions of total harvest from each harvest bin vary year to year, approximately 75% of recreational anglers consistently harvest two or fewer Spotted Seatrout.

Currently there is a 75 fish commercial trip limit for Spotted Seatrout. Approximately 16% of commercial trips reach that limit with about half (52%) harvesting 30 or less Spotted Seatrout and over three quarters (84%) harvesting 70 or fewer fish. Reductions to the threshold in the commercial sector could be achieved through lowering the commercial trip limit as a standalone measure but, while technically possible, it is unlikely the necessary trip limit (<20 fish) to reach the target is realistic (Table 2.7). Regardless of whether commercial harvest is reduced to the threshold or the target level, management to reduce commercial harvest would not end overfishing in the combined Spotted Seatrout fishery. Like the recreational sector, there exists the potential for public misperception about harvest reductions stemming from changes to trip limits. For example, reducing the commercial trip limit to 45 fish results in a 21.5% reduction in commercial harvest (Table 2.7) but could be incorrectly perceived as a larger reduction if commercial fishers conflate the actual harvest reduction with the theoretical reduction in allowable harvest (40%).

Table 2.7. Expected reductions in commercial harvest from trip limit changes. Reductions of at least 19.9% (threshold) up to 53.9% (target) are needed to end overfishing. *Reduction does not meet the 53.9% harvest reduction necessary to reach F_{Target} .

Trip Limit Reduction Examples

Trip Limit	Com Harvest Reduction (%)	Total Harvest Reduction (%)
45	21.5	3.1
20	53.0*	7.7

Lowering the Spotted Seatrout recreational bag limit or commercial trip limit would probably cause increased dead discards of Spotted Seatrout in both sectors of the fishery which can act to decrease the effectiveness of management changes. Changes to bag limits could be paired with gear requirements (see Appendix 3). Commercial trip limit changes should be accompanied by changes or limits to allowable gear (see Appendix 1) to mitigate dead discards in the commercial fishery.

Option 2: Bag and Trip Limit Options

- a. *Status Quo – manage fishery without current bag and trip limits*
 - + No changes to number of fish
 - + No discard increase
 - May be more difficult to reach threshold or target F reduction

- b. *Reduce recreational bag limit to 2 fish and commercial trip limit to 45 fish*
 - + Ends overfishing in both sectors
 - + Management is straightforward
 - Increased discards in both sectors
 - Perception of reducing recreational Spotted Seatrout access by 50% and commercial Spotted Seatrout access by 40%

Stop Nets

The stop net fishery is a modification of a traditional beach seine that primarily targets Striped Mullet and is unique to Bogue Banks. This fishery holds historic and cultural value in North Carolina and especially Carteret County (See [Striped Mullet FMP](#) and [Amendment 1](#) for review of historical significance of stop net fishery). Where traditional beach seine fisheries involve setting and hauling a net from the beach, the stop net fishery adds a stationary “stop net” set perpendicular to the beach in an L-shape (see Spotted Seatrout FMP for more detail on the execution of the stop net fishery). The 2012 Spotted Seatrout FMP implemented a 75 fish commercial trip limit, but it was noted in the plan there was the potential for dead discards to exceed harvest in high-volume fisheries like the stop net fishery (NCDMF 2012). The MFC tasked the DMF Director with addressing the stop net fishery outside of the 2012 FMP. Since 2013, the stop net fishery has opened and closed by proclamation and operates under an annual Memorandum of Agreement (MOA) signed by a party of the fishery and the DMF Fisheries Management Section Chief. The MOA sets a 4,595 lb. Spotted Seatrout season quota, requires a party to the stop net fishery to alert DMF prior to fishing the stop nets, and requires reporting of Spotted Seatrout landings in pounds the same day the stop nets are fished. In recent years the stop net fishery has opened around October 15 and closed on December 31. Additionally, stop nets are limited to a maximum of two crews in any one season. Each crew is allowed to set a maximum of two stop nets.

Since implementation of current management in 2013, the stop net fishery has never reached their 4,595 lb. quota. Stop net landings represent a very minor proportion of Spotted Seatrout commercial landings and an even smaller portion of total commercial and recreational landings. For example, the highest stop net landings from 2013 through 2022 were 3,700 lb. which accounted for 1.4% of commercial landings and 0.2% of total landings in that year. Most years the stop net fishery accounts for less than half a percent of commercial landings and less than a tenth of a percent of combined landings. Due to the strict existing management of the stop net fishery, the potential for additional restrictions to this fishery from Amendment 2 to the Striped Mullet FMP currently being developed, and the low contribution to Spotted Seatrout landings under the current stop net fishery management, additional harvest restrictions may not be necessary in the stop net fishery. However, formalizing current management of the stop net fishery should be considered in this amendment.

Option 3: Stop Net Management

- a) Status quo – 4,595 lb. season quota with terms and conditions of stop net fishery and responsibilities of the stop net crew outlined in Memorandum of Agreement.
 - + No changes to stop net fishery
 - +/- No reduction to stop net quota
 - Burden to draft MOA and obtain signatures remains on Fisheries Management section
 - Management is less transparent

- b) 4,595 lb. season quota, season opens October 15 and closes December 31, fishers active in the fishery report Spotted Seatrout harvest daily to DMF, fishery closes once quota is reached.
 - + Formalizes management of Bogue Banks stop net fishery
 - + Reduces MOA administrative burden
 - +/- Burden of knowledge of fishery shifts to participants
 - Changes management structure of stop net fishery

Combination Management Measures

Combining multiple management strategies to achieve management goals is common in fisheries management including in the original Spotted Seatrout Fishery Management Plan which combines size limits with trip and bag limits and weekend prohibitions on commercial harvest or possession of Spotted Seatrout in joint waters. Multiple management measures rather than a single, standalone management measure allow for more specific, targeted management to account for a variety of factors including species life history and biology, differences in the fishery (e.g., industry, regional, etc.), or competing interests in the fishery. As there are few realistic, standalone management measures to end overfishing in the Spotted Seatrout fishery, combination measures will help ensure management is realistic and management objectives more likely to be achieved. Additionally, a management strategy comprised of more than one management measure can allow for increased or more consistent access to the fishery (Tables 2.8 and 2.9). For example, implementing a slot limit along with a seasonal closure in the Spotted

Seatrout recreational fishery would allow for a shortened closure period when compared to a seasonal closure as a standalone measure.

Table 2.8. Combination and standalone management measures to end overfishing and achieve sustainable harvest. The Total % Reduction column shows the total percent reduction if no changes to commercial management are implemented. Unless otherwise noted, season closures or bag limit reductions include the entirety of the month. *Total reduction does not meet the 19.9% threshold (options 1.a, 1.d, and 1.i).

Option #	Season Closure	Bag Limit (number of fish)	Slot Limit	Recreational % Reduction	Total % Reduction
4.a	Jan-Feb	Oct-Dec 3 fish	-	22.1	18.9*
4.b	Dec 16-Feb	-	-	22.1	18.9*
4.c	-	Oct-Feb 3 fish	14-20", 1 over 24"	22.2	19.0*
4.d	Jan 16-Feb	-	14-20", 1 over 24"	25.5	21.8
4.e	-	2 fish	-	27.8	23.8
4.f	Jan-Feb	-	14-20", 1 over 24"	30.0	25.6
4.g	Dec 16-Feb	3 fish	-	30.4	26.0
4.h	Jan-Feb	Oct-Dec 3 fish	14-20", 1 over 24"	33.9	29.0
4.i	Jan-Feb	3 fish	14-20", 1 over 24"	38.3	32.7
4.j	Dec 16-Feb	3 fish	14-20", 1 over 24"	41.0	35.0
4.k	Dec-Feb	2 fish	14-20", 1 over 24"	56.2	48.0

Table 2.9 Combination and standalone management measures to end overfishing and achieve sustainable harvest. The Total % Reduction column shows the total percent reduction if no recreational management changes are implemented. Unless otherwise noted, seasonal closures include the entirety of the month.

Option #	Season Closure	Trip Limit (number of fish)	Commercial % Reduction	Total Percent Reduction
5.a	Jan-Feb	-	21.6	3.1
5.b	-	45	21.5	3.1
5.c	Jan 16-Feb	60	23.1	3.4
5.d	Jan-Feb	65	25.7	3.7
5.e	Feb	45	28.9	4.2
5.f	Jan 16-Feb	45	34.0	4.9
5.g	Jan-Feb	50	34.7	5.0
5.h	Dec 16-Feb	60	35.7	5.2
5.i	Dec-Feb	40	55.3	8.0

Multiple strategies to manage a fishery can be especially helpful when considering different and potentially competing objectives from stakeholders in the fishery as well as ensuring management objectives are realistic for different sectors and therefore more likely to be achieved.

Combination management options with associated positives (+) and negatives (-)
Insert management options when we settle on them

+
-

Adaptive Management

The current Spotted Seatrout adaptive management framework needs to be updated. Adaptive management is a structured decision-making process when uncertainty exists, with the objective of reducing uncertainty through time with monitoring. Adaptive management provides flexibility to incorporate new information and accommodate alternative and/or additional actions. The original FMP included adaptive management to “achieve one half of the reductions necessary and to reassess after three years to evaluate the effectiveness of the measures to reduce harvest” and for the Director to “intervene in the event of a catastrophic” cold stun event (NCDMF 2012).

Success or failure of any given management strategy to sustain the stock is best determined through a quantitative stock assessment. For example, failure to achieve projected harvest reductions does not necessarily indicate failure of a management measure but could conversely indicate improving stock conditions. Peer reviewed stock assessments and stock assessment updates should continue to be used to guide management decisions for the Spotted Seatrout stock. The 2022 peer reviewed stock assessment (NCDMF 2022) should be updated, at least once between full reviews of the plan to gauge success in maintaining sustainable harvest and to monitor changes in *F*. The 2022 stock assessment had a terminal year of 2019 and Amendment 1 management measures will be implemented, at the earliest, in 2025. Given this timeline, the earliest a stock assessment update should be completed is during 2026 with the inclusion of data from 2025. The timing of a stock assessment update is at the discretion of the Division and will consider stock trends and the timing of prior management when determining the appropriate schedule. An assessment update will determine if management goals are being met and allow for any adjustments to management measures via adaptive management if needed.

The existing Spotted Seatrout rule, 15A NCAC 03M .0522, provides the Fisheries Director proclamation authority pursuant to 15A NCAC 03H .0103 to impose any of the following restrictions on the taking of Spotted Seatrout:

- 1) Specify time;
- 2) Specify area;
- 3) Specify means and methods;
- 4) Specify season;
- 5) Specify size; and
- 6) Specify quantity.

Upon adoption of Amendment 1, the adaptive management framework will consist of the following:

Option 6: Adaptive Management Framework

Parts 1-2 of the adaptive management framework are explicitly tied to an updated stock assessment and implementation of management measures intended to reduce or allow for additional harvest to achieve or maintain sustainable harvest in the Spotted Seatrout fishery (as defined in part 1.a).

- 1) Update the stock assessment at least once in between full reviews of the FMP, timing at discretion of the division
 - a. If current management is not projected to achieve sustainable harvest (sustainable harvest is F at a level projected to maintain SSB between the $SSB_{\text{Threshold}}$ and SSB_{Target} , and F is between the $F_{\text{Threshold}}$ and F_{Target}), then management measures shall be adjusted using adaptive management to reduce harvest to a level that is projected to achieve sustainable harvest.
 - b. If sustainable harvest (as defined in 1.a above) is being met, then new management measures will not be needed, or current management measures may be relaxed provided projections show increased harvest is sustainable.
- 2) Management measures that may be adjusted using adaptive management include:
 - a. Season closures
 - b. Day of week closures
 - c. Trip limits
 - d. Size limits
 - e. Bag limits
 - f. Gear restrictions in support of the measures listed in a-e

Part 3 of the adaptive management framework allows for adjusting management measures outside of an updated stock assessment to ensure compliance with and effectiveness of management strategies adopted in Amendment 1 and is a tool to respond to concerns with stock conditions and fishery trends.

- a. Upon evaluation by the division, if management measures implemented to achieve sustainable harvest (either through Amendment 1 or a subsequent revision) are not achieving their intended purpose, they may be revised or removed and replaced using adaptive management; provided it conforms to part 2 above and provides similar protections to the Spotted Seatrout stock. If a revised management measure is anticipated to significantly reduce or increase harvest compared to management measures implemented through Amendment 1, it must conform to part 2 and be approved by the Marine Fisheries Commission

MANAGEMENT OPTIONS

Table 2.10. Management options to achieve sustainable harvest in the Spotted Seatrout fishery.

Topic	Option	Description
Season closure	1.a	Status quo – no season closure
	1.b	Statewide season closure Dec 16 – Feb 28/29 (both sectors)
	1.c	Statewide season closure. Rec Dec 16 – Feb. Com Jan 1 - Feb
	1.d	Statewide season closure Nov 1 – Feb (both sectors)
Bag and trip limits	2.a	Status quo – no bag/trip limit changes
	2.b	Reduce recreational bag limit to 2 fish and commercial trip limit to 45 fish
Stop net	3.a	Status quo – no change
	3.b	No change to quota but formalize management in FMP

Topic	Option	Description
Combinations	4.a-k & 5.a-i	See tables 1.1 and 1.2
Adaptive management	6	

RECOMMENDATIONS

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