

Fishery Management Plans

May 2023 Business Meeting

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(FMP) Update Memo

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Marine Fisheries Commission 2023-2025 WORKPLAN

INCORPORATING ACTIVITY UNDERWAY AND UPCOMING ASSESSMENTS

General Timelines and Abbreviations							(See
"General Timelines" worksheet for details, Colored blocks below indicate MFC Action Point)							
Fishery Management Plans	(SA)	SAR	GO	(PD)	AC/Pub	PMO	A
Non-FMP Rule Development	Stock Assessment in Progress R	Stock Assessment Report Presented to MFC IP	Vote to Approve Goal and Objectives PR	Initial Plan Development by DMF/FMP AC RLO	Advisory Committee and Public Review PRL	Select Preferred Management Options	Vote on Final Approval
Rulemaking	Request Issue Development FA	Information Paper NOT	Decision to pursue rulemaking NCR/PH/PC	Issue paper with rule language options A	Select Preferred Rule Language		
MFC Committee Activity	Fiscal Analysis APR	Approve Notice of Text JUL	Publish in NC Register/Hold Public Hearing&Comment Period	MFC Review Public Comment & Vote on Approval			
	Meeting confirmed and scheduled	Meeting anticipated					

Quarterly Business Meeting

Topic	DMF Staff Lead(s)	May - 23	Aug - 23	Nov - 23	Feb - 24	May - 24	Aug - 24	Nov - 24	Feb - 25
Active Management Plans									
Estuarine Striped Bass Stock Assessment Update	Lee/Schlick	(SA)							
Striped Mullet FMP Amendment 1 Supplement	Zapf/Dobbs	A							
Striped Mullet FMP Amendment 2	Zapf/Dobbs	(PD)		AC/Pub	PMO	A			
Spotted Seatrout FMP Amendment 1	Behringer/Pensinger	G/O	(PD)	AC/Pub	PMO	A			
Hard Clam/Oyster	Dobbs/Facendola			G/O	(PD)		AC/Pub	PMO	A
Blue Crab FMP Amendment 2 Revision	Facendola/Corbett	Revision Update							
Blue Crab Stock Assessment Update	Lee/Schlick		(SA)	SAR					
Status of Commission Requests									
Delineation of Fishing Waters Issue	Rawls/Klibansky	In progress							
Update False Albacore Informaiton Paper	Seward/Markwith	Reviewing Available Data	Present Issue Paper with Rule language						
Federal Permits - Review Feasibility of State Requirements	Murphey/Batsavage/Witten/Poland/Klibansky	In progress							
Rulemaking									
Periodic Review and Expiration of Existing Rules, per G.S. 150B-21.3A									
Subchapter 18A - Shellfish Sanitation (about 79 rules)	Blum/Walsh	NOT	NCR/PH/PC	A					
Other MFC Rulemaking									
MFC Committees Activity Overview									
	(Meeting date(s) in cell)								
CRFL Advisory Committee	Botinovch/Klibansky	10-Mar							
Nominating Committee	Batsavage/Farnell			11-Oct					
Advisory Committees Activity Overview									
	(Meeting date(s) in cell)	In-Person	In-Person	In-Person	Virtual	In-Person	Virtual		
Northern Regional Advisory	Behringer/Paramore	11-Apr		10-Oct	JAN	APR	JUL		
Southern Regional Advisory	Moore/Stewart	12-Apr	10-Jul	11-Oct	JAN	APR	JUL		
Finfish Standing Advisory	Paramore/Rock	13-Apr	(Workshop)	12-Oct	JAN	APR	JUL		
Shellfish/Crustacean Standing Advisory	Moore/Deaton	18-Apr		17-Oct	JAN	APR	JUL		
Habitat and Water Quality Standing Advisory	Deaton/Harrison	19-Apr		18-Oct	JAN	APR	JUL		



ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

KATHY B. RAWLS
Director

April 28, 2023

MEMORANDUM

TO: N.C. Marine Fisheries Commission

FROM: Corrin Flora, Fishery Management Plan Coordinator
Fisheries Management Section

SUBJECT: Fishery Management Plan Update and Schedule Review

Issue

Update the N.C. Marine Fisheries Commission (MFC) on the status of North Carolina fishery management plans (FMPs).

Action Needed

For informational purposes only, **no action is needed at this time.**

Overview

This memo provides an overview on the status of four North Carolina FMPs for the May 2023 MFC business meeting.

Striped Mullet FMP

The peer reviewed benchmark stock assessment for striped mullet indicated the stock was overfished and experiencing overfishing in the terminal year of 2019. Due to overfishing concerns, the Secretary authorized the MFC to develop temporary management through a supplement. At its November 2022 business meeting, the MFC selected preferred management for Supplement A to the Striped Mullet FMP Amendment 1. At its May 2023 business meeting, the MFC requested additional management options with regional considerations be added to Supplement A. The MFC will have the opportunity to vote on final approval of Supplement A at its May 2023 business meeting.

Until new management is adopted, Striped Mullet are managed under the Striped Mullet FMP Amendment 1. At the November MFC business meeting, the MFC approved the Striped Mullet FMP Amendment 2 Goal and Objectives. Staff are currently drafting Amendment 2. A solicitation period calling for stakeholders to apply to serve on the Striped Mullet FMP Advisory Committee will occur from May 1-19, 2023. Advisors will be appointed by the MFC Chair. Advisory committee members and DMF staff will meet in late July for a workshop to further develop Amendment 2.

Spotted Seatrout FMP

The peer reviewed, benchmark stock assessment for spotted seatrout indicated the stock is not overfished but was experiencing overfishing in the terminal year of 2019. The DMF held scoping for the Spotted Seatrout FMP Amendment 1 from March 13-24, 2023. More than 700 stakeholders participated in scoping to inform the development of the draft plan. Amendment 1 will focus on ending overfishing and conservation measures to promote healthy spawning stock biomass. At its May 2023 business meeting, the MFC will receive a review of public scoping comment and have the opportunity to provide additional considerations and approve Amendment 1 Goal and Objectives.

Eastern Oyster and Hard Clam FMPs

The 2022 FMP Schedule includes reviews of the Eastern Oyster and Hard Clam FMPs. The Division Plan Development Team is identifying available data sources to assess the needs of the wild fisheries of North Carolina. Scoping will occur later in 2023.

Blue Crab FMP

The Blue Crab FMP Amendment 3 adaptive management framework included an update to the stock assessment at least once between full reviews of the FMP. The 2018 stock assessment indicated the stock was overfished and overfishing was occurring in the terminal year of 2016. Amendment 3 implemented management to address the stock status. A stock assessment update will begin in 2023 and will include data through 2022.

Amendment 3 adaptive management allows the Division, with Shellfish/Crustacean Advisory Committee consultation, to modify the Diamondback Terrapin Management Area allowed devices list. Based on research by the University of North Carolina Wilmington, the DMF is working to amend the approved devices list. The DMF consulted with the Shellfish/Crustacean Advisory Committee at its January 2023 meeting. The committee supported the modification to the device list and provided additional considerations to the DMF for implementation. Based on consultation, the DMF updated language in the 2023 Revision to the Blue Crab FMP Amendment 3 and is developing outreach materials. At its May business meeting, the DMF will present the 2023 Revision to the MFC.

Estuarine Striped Bass FMP

At its November 2022 meeting, the MFC adopted Amendment 2. The Division continues to implement management from Amendment 2.

Based on stock concerns identified during preparation of the 2022 Annual Review, specifically continued low juvenile abundance, the Division is updating the Albemarle-Roanoke stock assessment with data through 2022. Division and WRC staff consulted with a group of external experts to ensure the assessment continues to be the best available science. At its May business meeting, the MFC will receive an overview of the 2022 stock assessment update results.



ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

KATHY B. RAWLS
Director

April 24, 2023

MEMORANDUM

TO: N.C. Marine Fisheries Commission

FROM: Robert Corbett, Biologist NCDMF
Joe Facendola, Biologist NCDMF

SUBJECT: Blue Crab FMP Amendment 3 Adaptive Management Revision Update

Issue

Amendment 3 to the Blue Crab FMP allowed for additional or alternative devices and modified pot designs to be approved by NCDMF for use in Diamondback Terrapin Management Areas (DTMAs) in consultation with the Shellfish/Crustacean Advisory Committee, provided they have been shown to reduce impacts to blue crab catch or cost to fishers and maintain the level of diamondback terrapin protection offered by the previously approved excluder devices (see Attachment for DTMA framework step 1).

Action Needed

For informational purposes only, **no action is needed at this time.**

Overview

As an alternative to plastic or wire inserts, which reduce the dimensions of crab pot funnels to limit terrapin bycatch, North Carolina crabbers had proposed reducing the overall dimensions of crab pot funnels. This gear modification has an inner funnel opening with a circumference of 9 meshes (1.5 in. hexagon mesh) compared to a standard commercial crab pot funnel with an inner opening circumference of 12 meshes (Figure 1). In collaboration with NCDMF and a workgroup of commercial crabbing partners, researchers at the University of North Carolina Wilmington (funded via a North Carolina Commercial Fishing Resource Fund Grant) developed and extensively tested a narrow funnel design (NFD) in controlled field experiments and fisheries-dependent observations to assess effectiveness in reducing terrapin bycatch and determine any impacts to blue crab catch. The NFD significantly reduce bycatch of terrapins while having no impact on blue crab catch.

The fisheries-independent controlled experiment showed a significant reduction in the bycatch rate of terrapins per unit effort in NFD pots compared to standard crab pots, resulting in an overall 74% reduction in terrapin bycatch for NFD pots compared to standard crab pots. Results from the experimental field trials and fishery-dependent observer trips showed no significant

difference in blue crab catch per unit effort between NFD crab pots and standard crab pots (Figure 2). Results of the experimental trials also showed no significant difference in blue crab sizes captured between NFD and standard crab pots (Figure 3). The largest blue crabs captured during the field trials were also from NFD pots.

This gear modification can be done at the manufacturing stage of the crab pot and should not incur any additional cost or require increased gear handling time and maintenance.

Given the protection offered to terrapins by NFD pots, no negative impacts to blue crab catch, and the potential savings in cost to crabbers, the NFD meets all criteria in Amendment 3 for NCDMF approval for use in DTMAs. Therefore, NCDMF proposed changes to the approved devices for DTMAs, revised Amendment 3, and consulted with the Shellfish/Crustacean Advisory Committee. The 2023 Revision includes the NFD as an approved device, removes the 4x16 cm and 10-gauge wire devices, and removes “make rigid” language as it related to funnel dimensions. The Shellfish/Crustacean Advisory Committee supported the 2023 Revision and made recommendations to the NCDMF. Taking into consideration the recommendations, NCDMF developed a pattern for the construction of the NFD (Figure 4) and defined a maximum opening dimension 13.3 cm (5.25 in.) to ensure compliance and aid in enforcement.

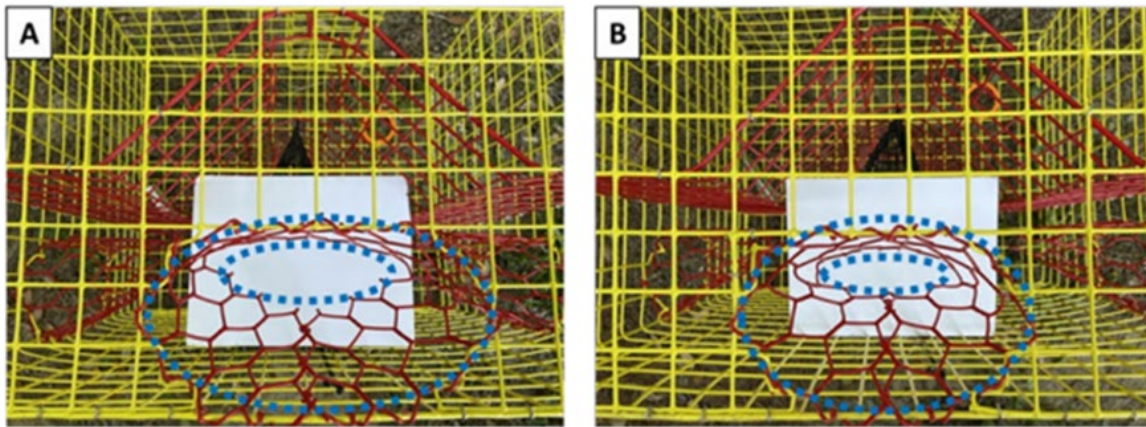


Figure 1. Crab pot funnels constructed out of 1.5 in. hexagon mesh. (A) “Standard Funnel” with an inner circumference of 12 meshes and an outer circumference of 14 meshes. (B) “Narrow Funnel Design” (NFD) with an inner circumference of 9 meshes and an outer circumference of 11 meshes.

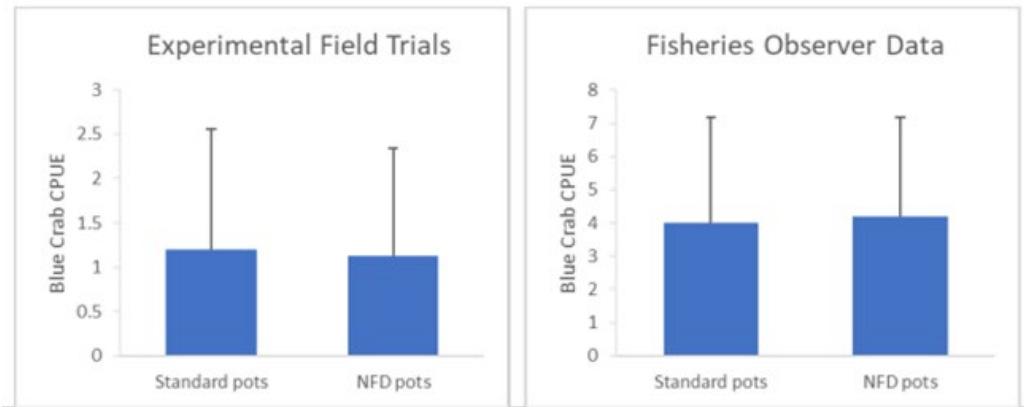


Figure 2. Blue crab CPUE for standard crab pots vs NFD pots for both fisheries-independent field trials, and fisheries-dependent observer trips. There was no significant difference in CPUE between standard and NFD pots in either data set.

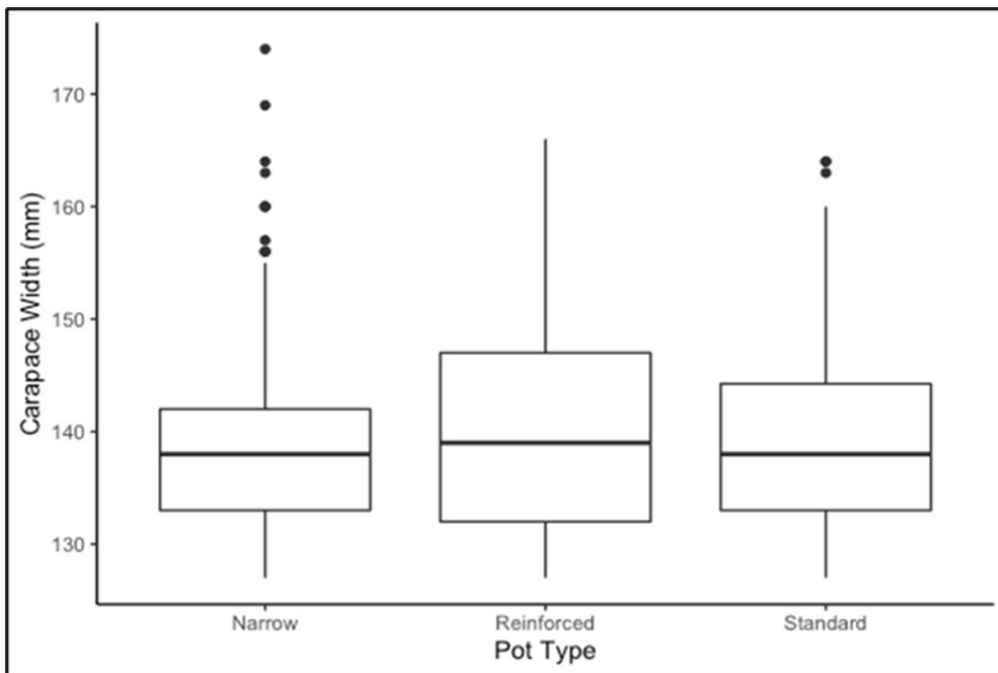


Figure 3. Carapace width of blue crabs caught in NFD, reinforced, and standard crab pots. There was no significant difference in carapace width between any of the pot types.

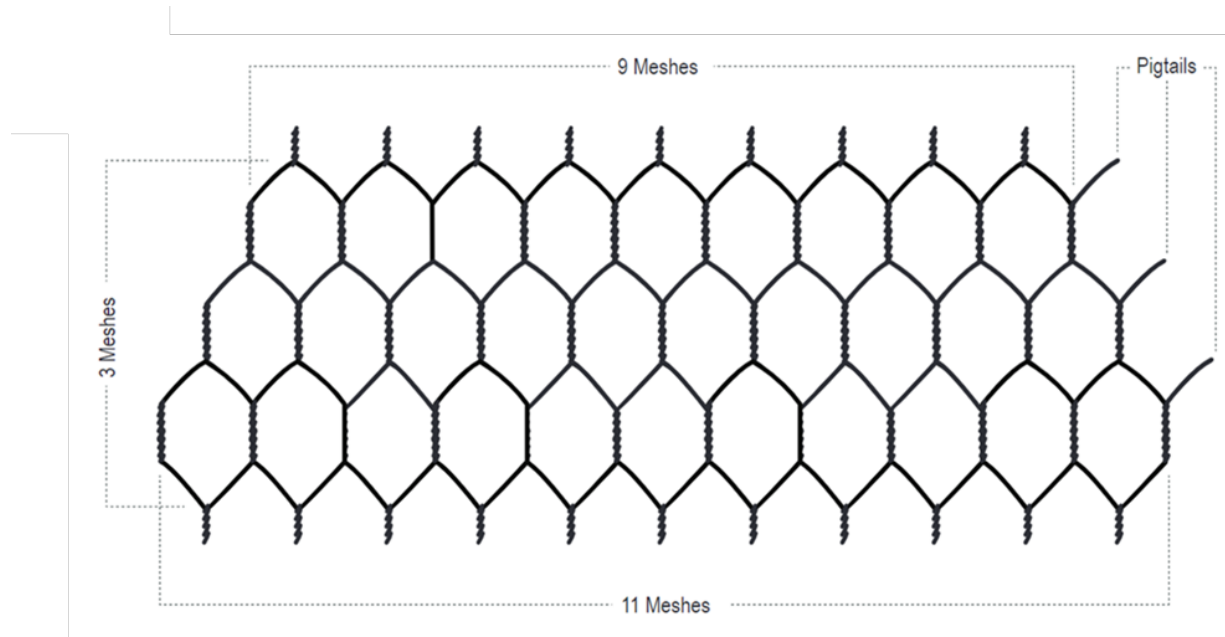


Figure 4. The pattern of 1.5 in. hexagon mesh used to construct the NFD showing the inner circumference of 9 meshes and an outer circumference of 11 meshes. Once the mesh is cut to these dimensions, it is rolled into a cylinder and secured to itself with the pigtails to form the tapered entrance funnel.

Attachment

Original Step 1 DTMA framework summary from Amendment 3:

Criteria defines the approved terrapin excluder device types and sizes required in crab pots fished within designated DTMA's. The following terrapin excluder devices shall be considered approved for use in DTMA's: any shell height limiting excluders made from at least 10-gauge galvanized wire and hog rings with an internal opening no larger than 4 x 16 cm (1.6 x 6.3 in.) height by width; any pre-made plastic shell height limiting excluder devices with an internal opening no larger than 4 x 16 cm (1.6 x 6.3 in.) height by width; or the pre-made plastic shell width limiting "SC design" measuring 5.1-6.4 x 7.7 cm (2-2.5 x 3.1 in.). Terrapin excluders will be securely affixed by at least each of the four corners of the device in each funnel opening of the crab pot, in a manner that restricts the maximum dimensions of any opening in the funnel. A separate terrapin excluder device would not be required in a crab pot fished within a DTMA if all funnel openings in that pot were modified to measure no larger than the maximum internal opening of an approved excluder device, and the funnel openings are made rigid in a manner to maintain these dimensions. A diamondback terrapin bycatch reduction workgroup of fishers, academic researchers, and managers will be created. Additional or alternative terrapin excluder devices or modified pot designs recommended through the workgroup may be approved by NCDMF, in consultation with the Shellfish/Crustacean Advisory Committee, provided they have been shown to reduce impacts to blue crab catch or cost to fishers and maintain the level of diamondback terrapin protection offered by the terrapin excluder devices initially approved and listed above. A revision to the current FMP Amendment will be developed as additional devices are approved.

New Step 1 DTMA framework summary from Amendment 3 adaptive management revision update:

Criteria defines the approved terrapin excluder device types and sizes required or gear modifications in crab pots fished within designated DTMA's. The following terrapin excluder device shall be considered approved for use in DTMA's: the pre-made plastic shell width limiting "SC design" measuring 5.1-6.4 x 7.7 cm (2-2.5 x 3.1 in.). Terrapin excluders will be securely affixed by at least each of the four corners of the device in each funnel opening of the crab pot, in a manner that restricts the maximum dimensions of any opening in the funnel. The following gear modification shall be considered for approved use as an alternative to excluder devices in DTMA's: "Narrow Funnel Design" (NFD) pots, where all funnel entrances of the pot are constructed out of 1.5 in. hexagon mesh, with each funnel having an inner opening of a circumference of 9 hexagon meshes and an outer opening of a circumference of 11 hexagon meshes, and maintained so the maximum inner opening dimension of all funnel entrances does not exceed 13.3 cm (5.25 in.). A diamondback terrapin bycatch reduction workgroup of fishers, academic researchers, and managers will be created. Additional or alternative terrapin excluder devices or modified pot designs recommended through the workgroup may be approved by NCDMF, in consultation with the Shellfish/Crustacean Advisory Committee, provided they have been shown to reduce impacts to blue crab catch or cost to fishers and maintain the level of diamondback terrapin protection offered by the terrapin excluder devices initially approved and listed above. A revision to the current FMP Amendment will be developed as additional devices are approved.



ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

KATHY B. RAWLS
Director

April 28, 2023

MEMORANDUM

TO: N.C. Marine Fisheries Commission

FROM: Laura Lee, Stock Assessment Program Manager
Nathaniel Hancock, Albemarle-Roanoke Striped Bass Species Lead, FMP Co-Lead
Fisheries Management Section

SUBJECT: Update on the Results of the Assessment of the Albemarle Sound-Roanoke River
Striped Bass Stock in North Carolina, 1991–2021

Issue

The stock assessment of the Albemarle Sound-Roanoke River (A-R) Striped Bass stock in North Carolina was updated with data through 2021. This memo provides a summary of the stock assessment update results and actions required under Amendment 2 to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP).

Action Needed

For informational purposes only, **no action is needed at this time.**

Findings

- The stock was modeled using data from 1991 to 2021.
- The stock is still undergoing overfishing.
- The stock is still overfished.
- An external peer review by a panel of experts and Division staff concluded the stock assessment is suitable for management use and is a credible representation of current stock status.
- The peer review panel recognized factors in addition to fishing mortality are likely responsible for the chronic poor recruitment observed since the early 2000s and the current low abundance of the stock. These factors may include river flow and/or blue catfish predation and competition.

	Target	Threshold	2021 Value	Status
Fishing Mortality	0.14	0.20	0.77	Overfishing
Female SSB	163.62 mt (360,720 lb)	124.87 mt (275,286 lb)	16.13 mt (35,566 lb)	Overfished

Overview

Results from the stock assessment update indicate the A-R striped bass stock is still undergoing overfishing and the stock is still overfished. The estimate of fishing mortality (*F*) in 2021 was 0.77, greater than the $F_{\text{Threshold}}$ of 0.20, indicating overfishing (Figure 1). The spawning stock biomass (SSB) was 35,566 pounds, less than the $SSB_{\text{Threshold}}$ of 275,286 pounds, indicating overfished status (Figure 2). Evaluation of the observed data and review of model predicted population trends indicate further concern for the stock. Both

observed and predicted recruitment of age-0 fish have been declining and are extremely low in recent years. Female SSB has been declining since 2004. Fisheries-dependent and fisheries-independent data indicate a recent decrease of both length at age and age structure of the stock and support the declining trend in overall population abundance observed since the mid-2000s.

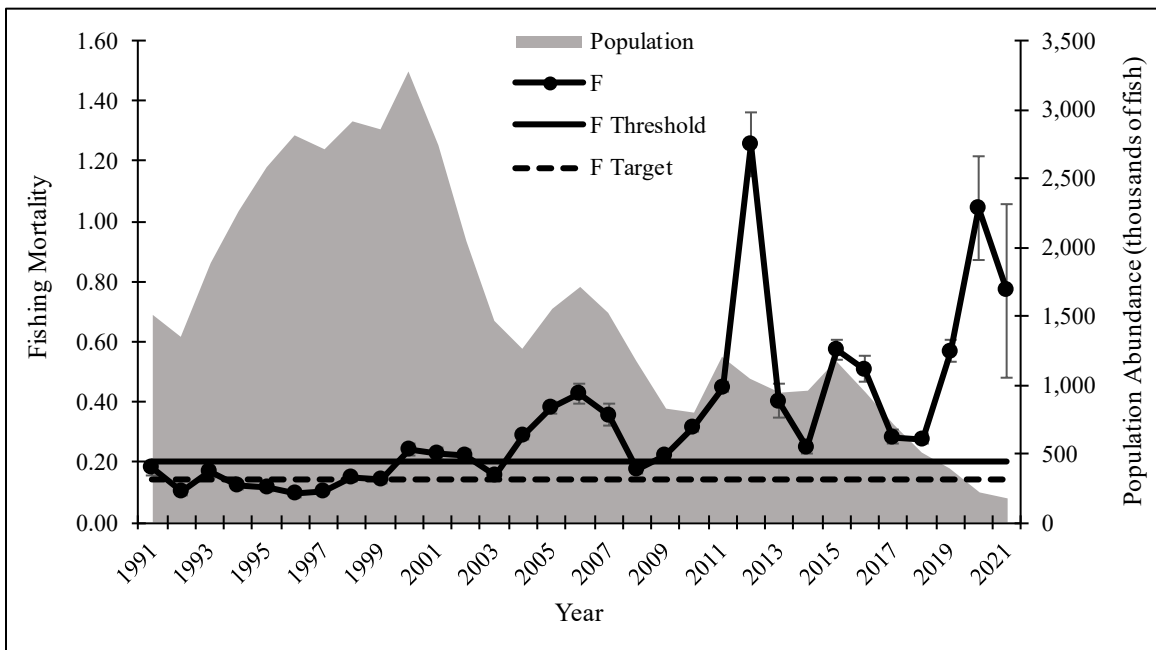


Figure 1. Estimates of fishing mortality (F) and population abundance for the Albemarle-Roanoke striped bass stock. Source: Update of the A-R striped bass stock assessment 2022.

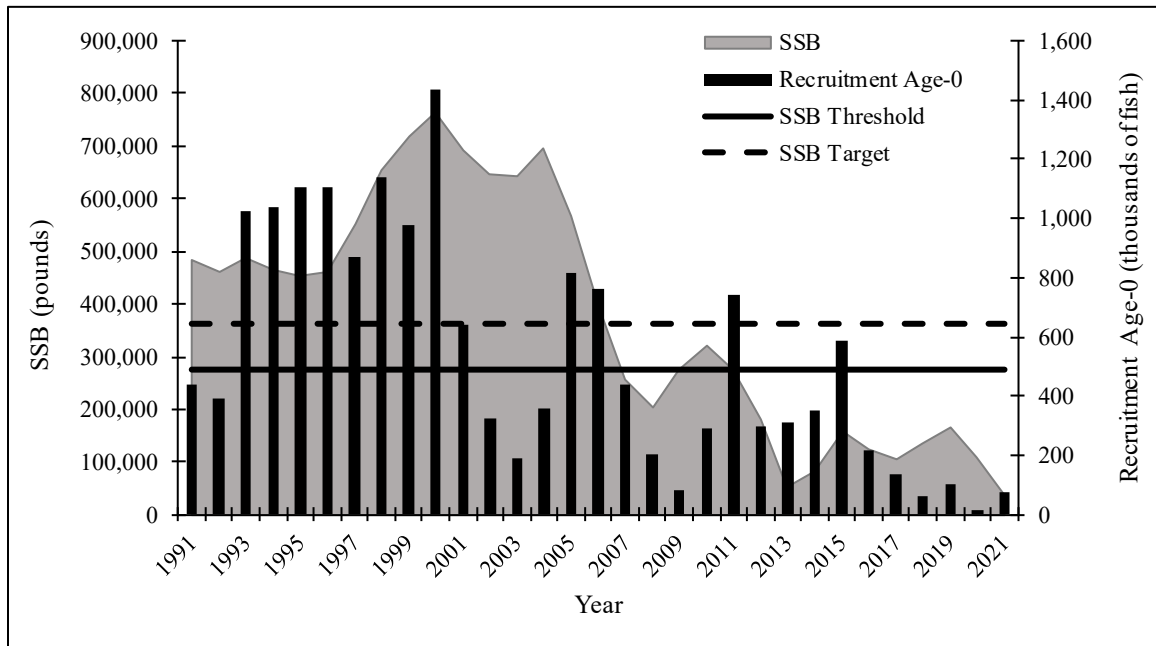


Figure 2. Estimates of spawning stock biomass (SSB) and recruitment of age-0 fish coming into the population each year for the Albemarle-Roanoke striped bass stock. Source: Update of the A-R striped bass stock assessment 2022.

Potential Causes for Recruitment Decline

While the peer review panel did recommend the updated stock assessment model for management use and were confident on the declining trend in recruitment based on assessment results and results from the Juvenile Abundance Survey (Figure 3), there was a great deal of uncertainty in the potential causes of the decline in recruitment. The benchmark review panel recognized that the decline in recruitment was not solely a result of reduced stock abundance due to harvest (i.e., overfishing). The review panel recommended that future assessments consider key abiotic and biotic drivers of recruitment. Spring flow conditions in the Roanoke River (the spawning grounds for A-R Striped Bass) are believed to influence recruitment and ultimately stock abundance and so was included as a high priority for further evaluation in the stock assessment's research recommendations. Another area of potential influence on the A-R striped bass stock is the prevalence of the non-native blue catfish. The population of blue catfish in the Roanoke River and western Albemarle Sound and tributaries has increased dramatically in recent years. The peer reviewers felt predation by blue catfishes could potentially impact recruitment of striped bass directly or could influence food resources for striped bass through competition for prey. The review panel recognized the degree to which this occurs is not known, but future assessments should consider this as a factor that may influence abundance but is not tied to striped bass harvest.

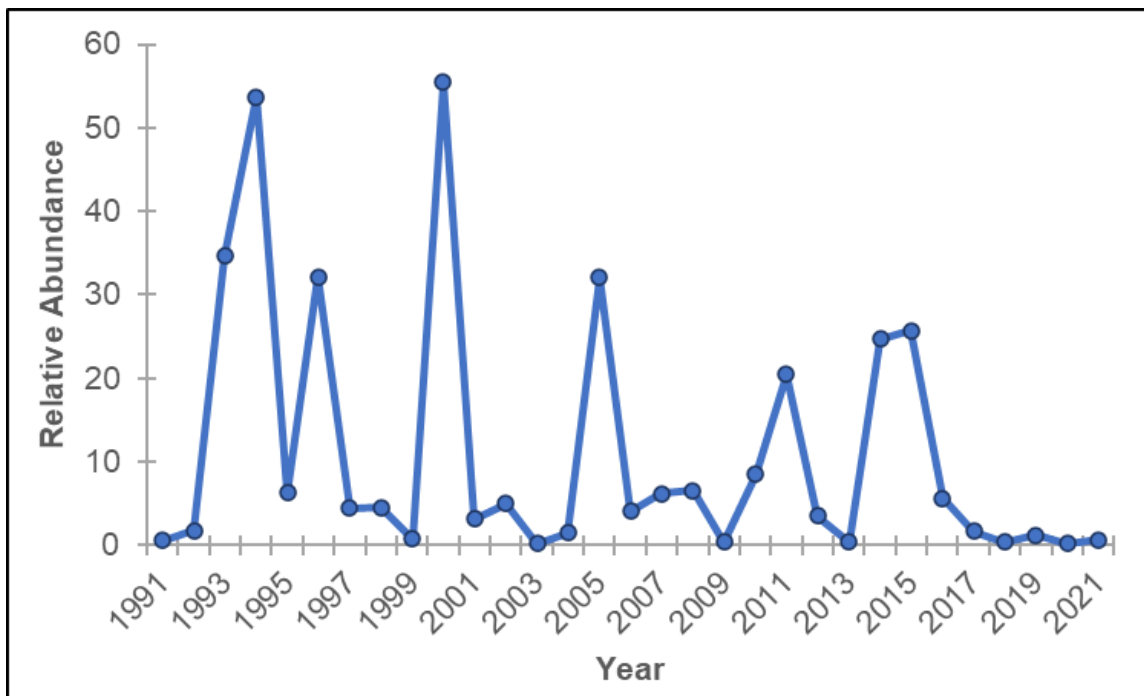


Figure 3. Annual index of relative age-0 abundance derived from the NCDMF Juvenile Abundance Survey, 1991–2017.

Traffic Light Analysis

A simple representation of the fisheries-independent survey indices that were input into the stock assessment model was developed using the Traffic Light approach. The Traffic Light assigns colors to data points based on the value relative to the time series. Green is used to indicate good or favorable conditions; yellow is used to represent uncertain or transitional conditions; and red is indicative of undesirable conditions. A Traffic Light was created for each of the fisheries-independent survey indices used in the stock assessment update as well as an overall combined Traffic Light that integrates the information from

all four of those indices (Figure 4). The Traffic Light analysis shows that the stock has exhibited undesirable conditions in all the survey indices since at least 2016.

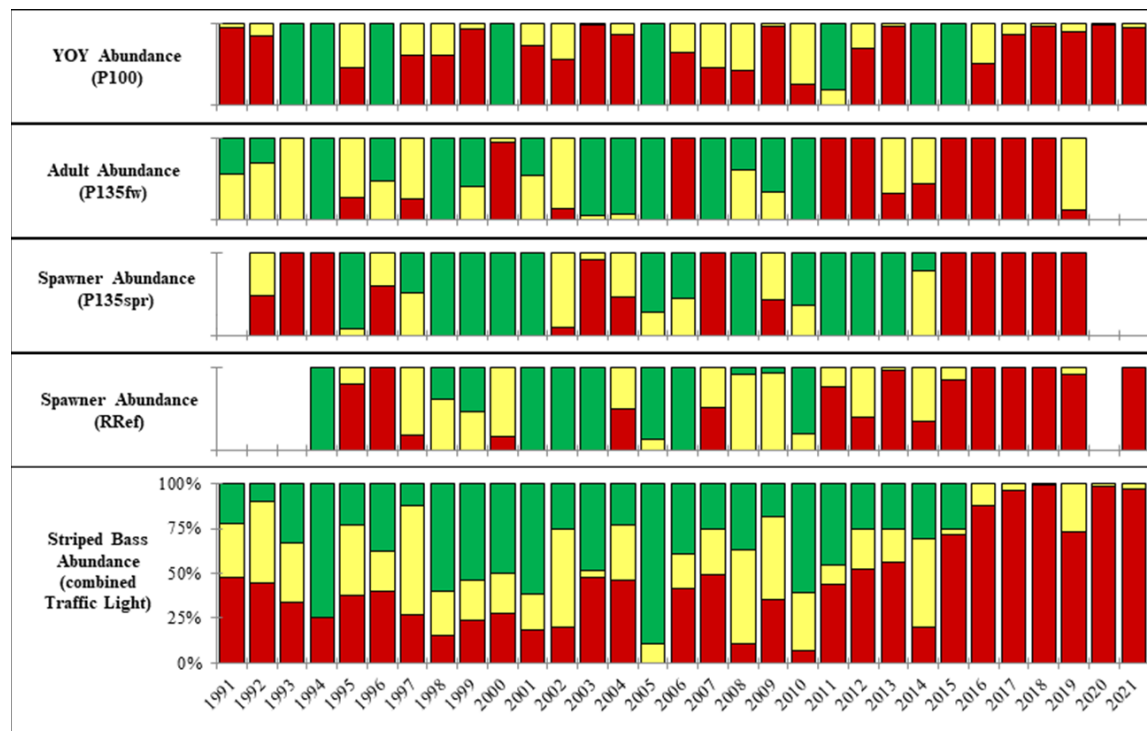


Figure 4. Traffic Light depiction of the fisheries-independent survey indices that were input into the A-R striped bass stock assessment update.

Adaptive Management actions required under Amendment 2 to lower fishing mortality to the target

Amendment 2 adaptive management states:

- Use peer reviewed stock assessments and updates to recalculate the BRPs and/or TAL. The current TAL of 51,216 lb remains in place until a new TAL is determined. Stock assessments will be updated at least once between benchmarks. Increases or decreases in the TAL will be implemented through Adaptive Management. A harvest moratorium could be necessary if stock assessment results calculate a TAL that is too low to effectively manage, and/or the stock continues to experience spawning failures.
- Use estimates of F from stock assessments to compare to the F BRP and if F exceeds the F_{Target} reduce the TAL to achieve the F_{Target} through Adaptive Management.

Implementing a new, lower harvest level accomplishes the adaptive management directive in Amendment 2 to the North Carolina Estuarine Striped Bass FMP. This management tool was used in the November 2020 Revision to Amendment 1 that reduced the TAL from 275,000 lb to 51,216 lb based on projections starting from the terminal year (2017) of the that stock assessment.

Based on this most recent stock assessment update, a TAL of 8,349 lb is necessary to reduce F to the F_{Target} .



ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

KATHY B. RAWLS
Director

May 24, 2023

MEMORANDUM

TO: North Carolina Marine Fisheries Commission

FROM: Lucas Pensinger and Jason Rock
Spotted Seatrout Fishery Management Plan Co-Leads

SUBJECT: Spotted Seatrout Fishery Management Plan Amendment 1

Issue

Review the Spotted Seatrout Fishery Management Plan (FMP) Amendment 1 draft goal and objectives and discuss potential management strategies.

Action Needed

Vote on approval of Spotted Seatrout FMP Amendment 1 Goal and Objectives

Background

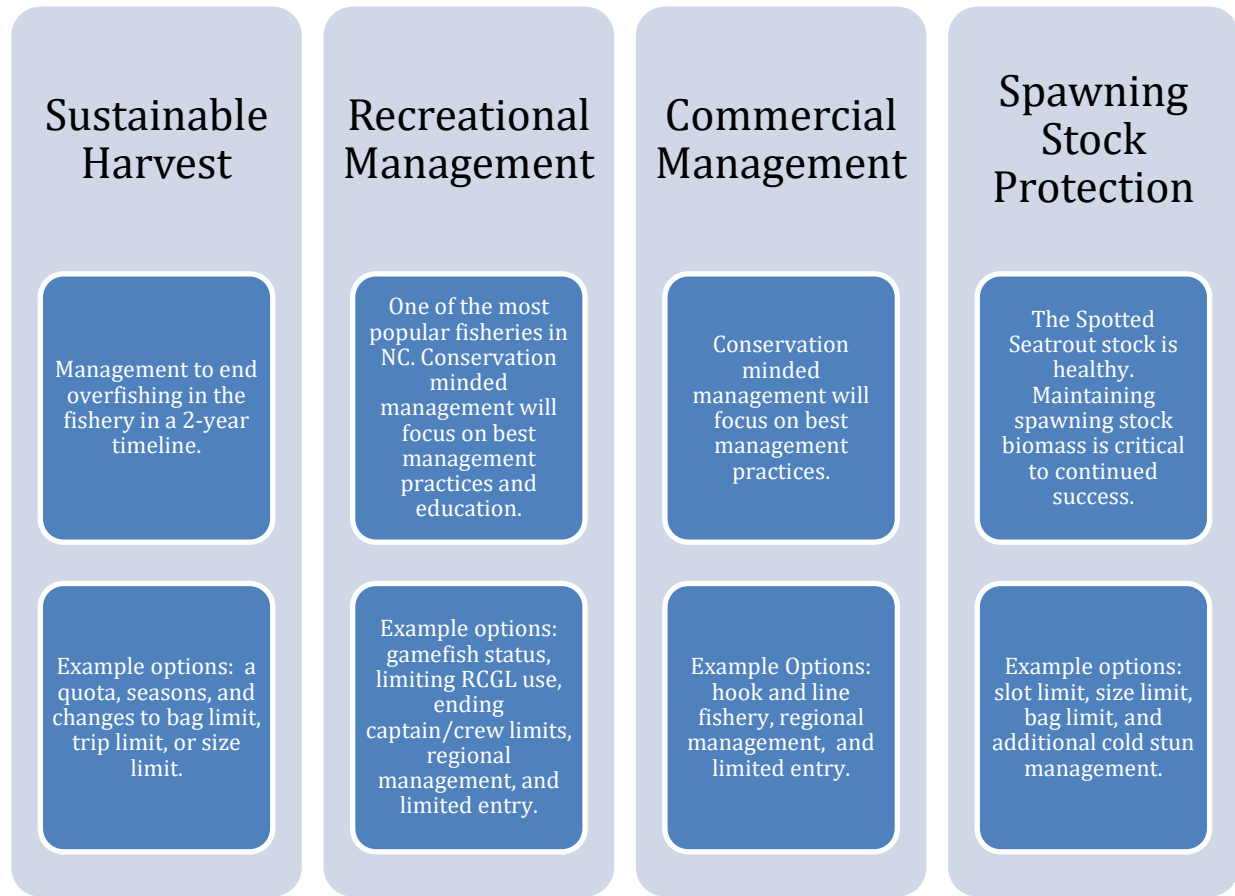
Results of the [2022 Spotted Seatrout Benchmark Stock Assessment](#) were presented to the Marine Fisheries Commission (MFC) at its November 2022 business meeting. The peer reviewed stock assessment was approved for management use and indicates the combined North Carolina and Virginia spotted seatrout stock is not overfished but overfishing was occurring in the terminal year of the assessment (2019). Management actions in Amendment 1 will focus on ending overfishing to provide sustainable harvest.

The division has completed the scoping period for Amendment 1. The next step in the FMP process is for the MFC to approve the Amendment 1 Goal and Objectives. The division will develop Amendment 1 to achieve the goal and objectives in collaboration with the Spotted Seatrout FMP Advisory Committee.

Scoping Period

The Division developed a [scoping document](#) identifying potential management strategies and held a public scoping period for Amendment 1, Mar. 13-Mar. 24, 2023. In addition to accepting comments through an online questionnaire and U.S. Mail, the Division held one hybrid meeting and three in-person meetings in Raleigh (hybrid), Barco, New Bern, and Wilmington. Over 700 stakeholders participated by attending in-person meetings or submitting comments online. The Division received input from meeting attendees, 36 written comments, and 352 online comments. The Division identified four potential management strategies for scoping including Sustainable Harvest, Reducing Recreational Release Mortality, Management for the Small Mesh Gill Net Fishery, and Protecting Spawning Stock Biomass. However, based on public input received during scoping, potential management strategies will include Sustainable Harvest, Recreational Management, Commercial Management, and Protecting Spawning Stock Biomass.

Potential Spotted Seatrout FMP Amendment 1 Management Strategies



The draft Goal and Objectives for the Spotted Seatrout FMP Amendment 1 are:

Goal:

The goal of this plan is to manage the Spotted Seatrout (*Cynoscion nebulosus*) fishery to maintain a self-sustaining population that provides sustainable harvest based on science-based decision-making processes. The following objectives will be used to achieve this goal.

Objectives:

- Implement management within North Carolina that ends overfishing and maintains the Spotted Seatrout spawning stock abundance and recruitment potential.
- Promote restoration, enhancement, and protection of critical habitat and environmental quality in a manner consistent with the Coastal Habitat Protection Plan, to maintain or increase growth, survival, and reproduction of the Spotted Seatrout stock.
- Monitor and manage the fishery in a manner that utilizes biological, socioeconomic, fishery, habitat, and environmental data.
- Promote outreach and interjurisdictional cooperation regarding the status and management of the Spotted Seatrout stock in North Carolina and Virginia waters, including practices that minimize bycatch and discard mortality.

DECISION DOCUMENT

Striped Mullet Fishery Management Plan

Supplement A to Amendment 1



This document was developed to help the MFC track previous activity and prepare for upcoming actions on the Striped Mullet Supplement A.

May 10, 2023

Summary of Need

The current striped mullet stock assessment, terminal year 2019, determined the stock is overfished and overfishing is occurring. There are no current management measures directly limiting harvest of striped mullet commercially and the recreational harvest is limited by a daily possession limit of 200 mullet (white and striped in aggregate). Management measures to address the stock status through Amendment 2 to the FMP will not be completed until at least 2024. A supplement to Amendment 1 will allow immediate implementation of temporary management measures to end overfishing of the striped mullet stock while the more long-term measures addressing sustainable harvest and stock rebuilding are explored and implemented through Amendment 2. Any supplemental management measures will remain in place until Amendment 2 is adopted unless they are adopted as part of that amendment.

Peak striped mullet commercial landings occur in October and November (approximately 55% of landings), with most landings occurring from approximately October 15-November 15. The increase in landings during this time period coincides with the migration of striped mullet from estuarine waters to offshore spawning areas. A season closure during this time extending through the end of the year would provide the greatest harvest reduction over the shortest period of time. In addition, an end of year season closure would ensure there is no recoupment of catch that year, increasing the probability of the management measure successfully reducing harvest and ending overfishing.

Regarding the development of a Supplement, General Statute 113-182.1 (e1) states:

“If the Secretary determines that it is in the interest of the long-term viability of a fishery, the Secretary may authorize the Commission to develop temporary management measures to supplement an existing Fishery Management Plan pursuant to this subsection. Development of temporary management measures pursuant to this subsection is exempt from subsections (c), (c1), and (e) of this section and the Priority List, Schedule and guidance criteria established by the Marine Fisheries Commission under G.S. 143B-289.52. During the next review period for a Fishery Management Plan supplemented pursuant to this subsection, the Commission shall either incorporate the temporary management measures into the revised Fishery Management Plan or the temporary management measures shall expire on the date the revised Fishery Management Plan is adopted.”

Supplement Timing (Grey indicates the step is complete.)

August 2022	DMF Director requests approval from MFC to request Secretarial approval for a supplement to Striped Mullet FMP Amendment 1
November 2022	Draft Supplement A presented to MFC including management options. MFC Selected Option 2.
December 2022-January 2023	Public Comment Period
May 2023	MFC Review Public Comment and Final Vote on Approval of Supplement A

Decisions Points

Decision to Request a Supplement – August 2022

At the August MFC Business Meeting the DMF Director Kathy Rawls gave an update on Striped Mullet management, and requested the Commission support a request to the DEQ Secretary for approval of supplemental management of striped mullet while Amendment 2 is developed. The Commission discussed the issue. Highlights from that discussion are included below:

- What type of management would be considered?

A seasonal closure is the only practical option that would be considered for supplemental management, however, the Division will consider other options brought by the Commission or members of the public. Additionally, all other options will be considered for Amendment 2 management.

- What is the impact of supplement development on timing of development of Amendment 2?

The Division does not anticipate any impact on the timing of Amendment 2.

- How long is the temporary management expected to remain in place?

Based on the expected timeline of Amendment 2, the Division expects the supplemental management measures will remain in place for one year, but possibly up to two years.

Following the discussion, the Chairman asked if any Commissioner objected to pursuing a supplement. There were no objections. The Chairman indicated the Division had the endorsement of the Commission to request the DEQ Secretary approve development of supplemental management.

Following the meeting a request was sent to the Secretary of DEQ for review and approval. The Secretary approved development of a supplement, after which the Division drafted the supplement document.

Management Options in Supplement A – November 2022

End of year season closures are considered the most effective and efficient management option that can be implemented through the supplement process and be expected to successfully limit striped mullet harvest. An end of year season closure would be implemented as no possession across both commercial and recreational sectors with no additional modification or prohibition of gears. An end of year season closure, if approved by the MFC would be implemented via proclamation.

At the November 2022 MFC business meeting Division staff presented the draft Striped Mullet Supplement A document including three season closure management scenarios that are estimated to end overfishing. These are shown below in Table 6 from the draft Supplement document.

DMF Recommended Management Strategy

The DMF recommended supplemental management measure of either option 1 or 2. To achieve a 20-33% reduction, any end of year season closure must begin no sooner than October 29 and no later than November 7 and continue through December 31. The Division supports a 20-33% reduction to exceed the threshold and either meet or approach the target. This reduction level increases the probability of, at a minimum, ending overfishing even if there is variability in fishing effort, market demand, striped mullet availability to the fishery, or recruitment fluctuations.

Table 6. Management options that satisfy the 9.9% commercial harvest reduction and 9.3% reduction overall to end overfishing. All reductions are calculated from 2019 commercial harvest levels (terminal year of stock assessment).

Single Management Measures that Satisfy Reduction	Management Measure	Estimated Commercial Harvest Reduction (%)
Season Closures		
1	October 29 – December 31	33.7
2	November 7 – December 31	22.1
3	November 13 - December 31	10.9

*All closures would apply to recreational and commercial sectors

Decision to Select Preferred Management Strategy

Following the presentation by staff, the Commission engaged with DMF staff in a lengthy discussion after which a number of motions were made, discussed and voted on. Below are highlights from that discussion:

- What is the estimated recreational harvest reduction?

We cannot calculate an estimate for recreational harvest reduction because the data available for the recreational harvest is not captured with enough precision to accurately calculate daily landings and the recreational mullet harvest, both white and striped, is for bait.

- Why is recreational harvest being closed?

To be equitable across all fisheries and to reduce management complexity to improve enforceability.

- Can the reductions be taken from the rest of the year instead of from the fall row season?

In the context of the biology of the fish and the dominant fishery, the Division does not believe reductions at other times of the year would be successful. The demand and effort is primarily focused during the spawning period, it is likely that even if we closed striped mullet for the rest of the year, we would expect any reductions achieved to be recouped during the fall row mullet fishery.

- Is commercial harvest used to determine abundance? Specifically, the commercial harvest has been up the last couple of years, doesn't that mean we should wait to see if that changes the need for this supplement?

Stock assessments, which use commercial harvest, Division survey data and life history data are used to estimate fishing mortality and stock abundance. Commercial harvest is not equivalent to stock abundance because it is impacted by factors including but not limited to fisherman effort and market demand. However, when compared, commercial landings and abundance trends from Division sampling programs do show a similar pattern over time.

*Regarding recent increases in harvest, we cannot tell if fishing mortality is lower or if spawning stock biomass is higher, that can only be determined through a stock assessment update. We can only say that abundance observed in the Division's sampling programs and harvest has increased over the last two years.**

- Is the Division confident in the current stock assessment?

Yes, we are confident in the assessment. The Division has observed an increase in landings over the last two years, however, this does not necessarily translate into a change in the stock status. The only way to determine if the stock status has changed is to update the stock assessment.*

* Striped mullet abundance in the independent gill net survey (Program 915) increased in 2021 but decreased in 2022. Commercial harvest increased in 2021 and increased again in 2022.

Motion

Delay Implementation of the Supplement A to Amendment 1 of the striped Mullet Fishery Management Plan.

Motion Failed

Motion

Approve supplement A to Amendment 1 of the Striped Mullet Fishery Management Plan with option 1, with the caveat that allows recreational possession in the whole year.

Motion fails for lack of second.

Motion

Approve Supplement A to Amendment 1 of the Striped Mullet Fishery Management Plan with Option 2.

Substitute Motion

Approve Supplement A to Amendment 1 of the Striped Mullet Fishery Management Plan with Option 1.

Motion failed.

→ Motion Approved Unanimously.

[Public Comment Review and Vote on Management Options – February 2023](#)

Following the selection of Option 2 (see Table 6 above) as their preferred management option in Supplement A, a 30-day public comment period was held. At their February 2023 business meeting the Commission reviewed the public comments and continued their discussion on the available management options for Supplement A.

Many of the public comments were not in favor of any of the supplemental management options, generally citing a good fishing year currently and a lack of confidence in the stock assessment. Following a brief discussion, motions were made, discussed and voted on. None of the Options presented by the Division were selected during the meeting, however, some members of the Commission requested additional options with seasonal closures by region be brought back to the Commission for further consideration. Below are highlights from the discussion:

- Is there more information the Division can provide to the Commission about the Striped Mullet fishery? Further data or information to help clarify some of the concerns?

We can provide specific sampling program information to look at trends in the fishery and have done so in the past, however, all of those pieces of information go into the stock assessment to determine the stock status of the fishery. Providing any of these pieces on their own will not provide better information to make this decision on. The stock assessment provides the most complete picture of the fishery at this time, and over time, and it is the measure of stock status that the Division and the Commission has at this point to use for development of this Supplement and for development of Amendment 2.

Motion

Vote down Supplement A to Amendment 1 of the Striped Mullet FMP and continue with the amendment process.

Substitute Motion

Accept Option 2 of Supplement A to Amendment 1 of the Striped Mullet FMP.

Motion failed.

▶ Motion failed by lack of super majority.

Motion

Approve Option 3 of Supplement A to Amendment 1 of the Striped Mullet FMP.

Motion failed.

Next Steps

The Chairman indicated the Commission will take up this discussion and a possible vote on Supplement A at their May 2023 meeting. In addition, some members of the Commission requested the Division develop additional regionally-specific management options for Supplement A. These will be reviewed during their May 2023 business meeting and a potential vote on final action taken.

Striped Mullet FMP Amendment 1 Supplement A

Complete List of Management Options

Table 6. Management options that satisfy the 9.9% commercial harvest reduction and 9.3% reduction overall to end overfishing. All reductions are calculated from 2019 commercial harvest levels (terminal year of stock assessment).

Option	Management Measure	Estimated Commercial Harvest Reduction (%)
Season Closures		
1	October 29 – December 31	33.7
2	November 7 – December 31	22.1
3	November 13 - December 31	10.9

*All closures would apply to recreational and commercial sectors

Table 7. Management options that satisfy the 9.9% commercial harvest reduction and 9.3% reduction overall to end overfishing by splitting the seasons between north and south. All reductions are calculated from 2019 commercial harvest levels (terminal year of stock assessment).

Season Closure			
Option	North	South	Minimum Reduction
4	October 28 – December 31	October 30 – December 31	35.6
5	November 7 – December 31	November 10 – December 31	21.7
6	November 13 – December 31	November 21 – December 31	10.1

*All closures would apply to recreational and commercial sectors

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SUPPLEMENT A TO AMENDMENT 1 TO THE N.C. STRIPED MULLET FISHERY MANAGEMENT PLAN

May 2023

ISSUE

Consideration of Supplement A to Amendment 1 to the N.C. Striped Mullet Fishery Management Plan (FMP) to implement temporary management measures to immediately address overfishing of the striped mullet stock while Amendment 2 is developed.

ORIGINATION

The North Carolina Division of Marine Fisheries (DMF).

BACKGROUND

The North Carolina striped mullet stock is overfished and overfishing is occurring in 2019, the terminal year of the stock assessment (NCDMF 2022). As statutorily required, management measures will be developed through Amendment 2 to end overfishing and rebuild spawning stock biomass. Development of Amendment 2 is underway, with final adoption and implementation tentatively scheduled for 2024. Because of the timeline of FMP development, there will be four-years between the terminal year of the stock assessment and implementation of management measures to address the stock status. The supplement allows for implementation of temporary management measures to supplement Amendment 1 until Amendment 2 is adopted.

General Statute 113-182.1 provides a mechanism to supplement management under a Fishery Management Plan (FMP) between scheduled reviews when the Secretary of the Department of Environmental Quality (DEQ) determines it is in the interest of the long-term viability of the fishery. The draft supplement contains analysis of the proposed management change, projected outcomes, and proposed rules or proclamation measures necessary to implement the management change. The North Carolina Marine Fisheries Commission (MFC) may only consider a single management issue for each draft supplement. The supplement allows for implementation of temporary management measures to supplement Amendment 1 until Amendment 2 is adopted. NCMFC Rule 15A NCAC 03M .0502 provides the Director proclamation authority to implement restrictions in the taking of mullet. In accordance with the MFC FMP Guidelines, the MFC will review the draft supplement and reject (end of process), approve, or modify and approve it for public comment.

The North Carolina Striped Mullet FMP was adopted in April 2006 and established minimum and maximum commercial landings triggers of 1.3 and 3.1 million pounds (NCDMF 2006). If annual landings fall below the minimum trigger, the DMF would determine whether the decrease in landings is attributed to stock decline, decreased fishing effort, or both. If annual landings exceed the maximum trigger, DMF would determine whether harvest is sustainable and what factors are driving the increase in harvest. The Striped Mullet FMP established a daily possession limit of 200 mullets (white and striped combined) per person per day in the recreational fishery, through NCMFC Rule 15A NCAC 03M .0502.

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The Striped Mullet FMP Amendment 1 was adopted in November 2015. The associated rules from Amendment 1 were implemented in April 2016; to resolve issues with Newport River gill net attendance and mitigate known user group conflicts. Amendment 1 also updated the management framework and updated minimum and maximum commercial landings triggers to 1.13 and 2.76 million pounds (NCDMF 2015). Amendment 1 maintains the recreational fishery limit. Other than the recreational daily possession limit there are no management measures directly limiting harvest of striped mullet.

Stock assessments for the North Carolina striped mullet stock were conducted by the DMF in 2006 (NCDMF 2006), 2013 (NCDMF 2015), 2018 (NCDMF 2018), and 2022 (NCDMF 2022). In each assessment, a fishing mortality threshold of $F_{25\%}$ was used to determine if overfishing was occurring. The 2022 assessment also used a spawning stock biomass (SSB) threshold of $SSB_{25\%}$ to determine if the stock was overfished. Stock assessments in 2006, 2013, and 2017 determined overfishing was not occurring but could not determine whether the stock was overfished. While these assessments concluded overfishing was not occurring, each noted concerning trends, data uncertainty, and the potential impact of future poor recruitment events. Given this concern, the commercial landings triggers and adaptive management framework were approved in the Striped Mullet FMP and updated in Amendment 1.

Commercial landings in 2016 were 965,198 pounds, less than the minimum commercial landings trigger. As required under the FMP, the DMF initiated data analysis and ultimately recommended updating the 2013 stock assessment with data through 2017 prior to considering any management action. As an assessment update, there were no changes to model parameters and peer review was not required, as the configuration of the model that previously passed peer review was maintained. The 2018 stock assessment concluded overfishing was not occurring in 2017 but indicated declining spawning stock biomass, declining recruitment, and increasing fishing mortality. A major concern in the 2017 assessment was lack of contrast in commercial landings data and lack of contrast and high variability associated with fishery-independent indices including the Fishery-Independent Gill Net Survey (Program 915), the Striped Mullet Electrofishing Survey (Program 146), and the Striped Bass Independent Gill Net Survey (Program 135). Also of concern were the poor fits to survey data and length compositions.

At its August 2018 business meeting, the DMF presented its recommendation along with recommendations from the Northern, Southern, and Finfish Advisory Committees to the NCMFC that no management action be taken since the stock assessment update indicated overfishing was not occurring. The DMF would, however, continue to monitor trends in the commercial fishery and fishery-independent indices. The recommendation was approved by the MFC.

For the 2022 striped mullet stock assessment, a F threshold of $F_{25\%}$ and a target of $F_{35\%}$ were maintained from the prior assessment since the commercial fishery continues to target mature female fish during the spawning season and the ecological importance of striped mullet. Complementary reference points for stock size were adopted based on female SSB, with a threshold of $SSB_{25\%}$ and a target of $SSB_{35\%}$. The stock assessment model estimated a value of 0.37 for the $F_{25\%}$ threshold and a value of 0.26 for the $F_{35\%}$ target. In 2019, the terminal year of the assessment, F was 0.42, higher than the $F_{25\%}$ threshold, indicating overfishing is occurring (Figure 1). The model estimated a value of 1,364,895 pounds for the $SSB_{25\%}$ threshold and a value of 2,238,075 pounds for the $SSB_{35\%}$ target. Female SSB in 2019 was estimated at 579,915 pounds, smaller than the $SSB_{25\%}$ threshold, indicating the stock is overfished (Figure 2).

An external peer review workshop was held in April 2022. The panel concluded the assessment model and results are suitable for providing management advice for at least the next five years. The panel considers the current model a substantial improvement from the previous assessment, representing the best scientific information available for the stock.

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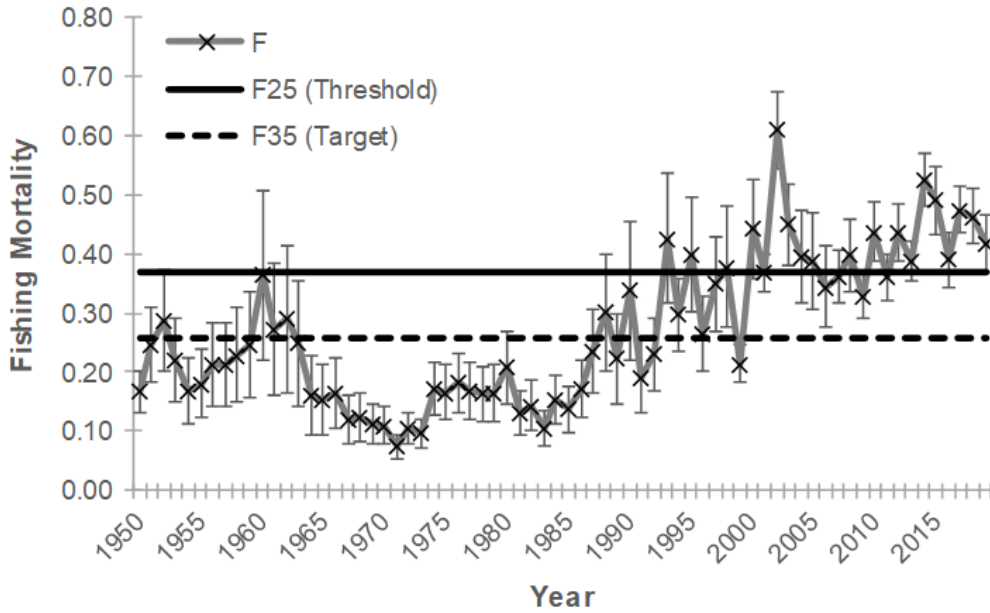


Figure 1. Comparison of annual estimates of fishing mortality (numbers weighted, ages 1-5) to the fishing mortality target (F35%) and threshold (F25%). Error bars represent ± 2 standard deviations.

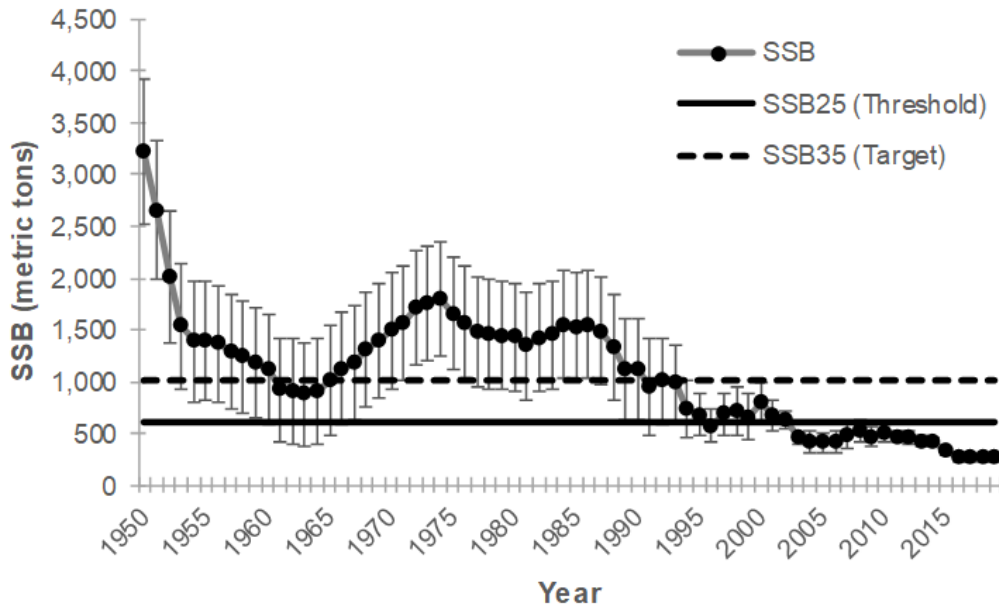


Figure 2. Comparison of annual estimates of female spawning stock biomass (SSB) to the SSB target (SSB35%) and threshold (SSB25%). Error bars represent ± 2 standard deviations.

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 03M .0502 MULLET
 15A NCAC 03H .0103 PROCLAMATIONS, GENERAL

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DISCUSSION

The 2022 stock assessment (NCDMF 2022) indicates recruitment has not only declined but has been below average since 2009 (Figure 3). The decline in recruitment coincides with declining spawning stock biomass while fishing mortality has increased (Figures 1-2).

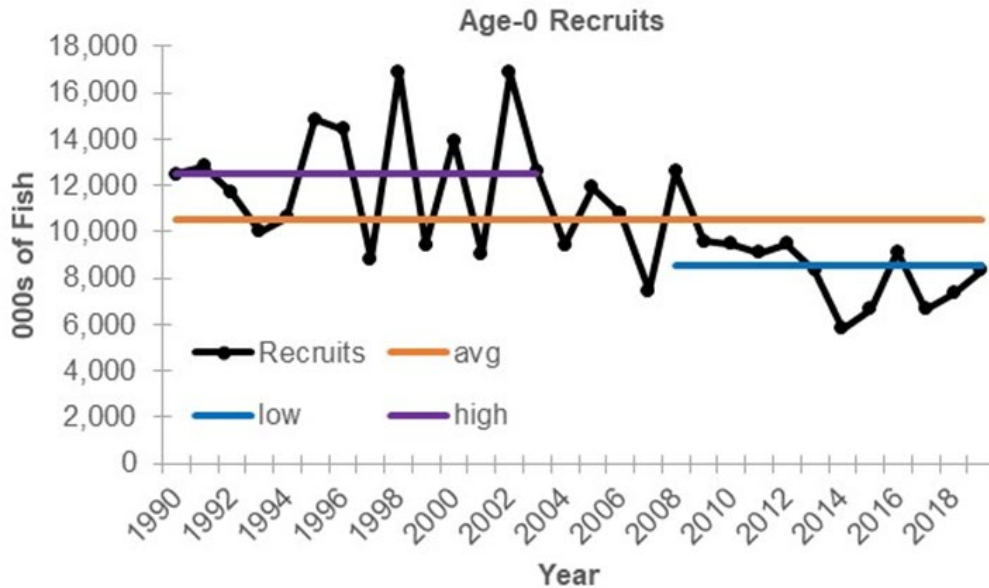


Figure 3. Estimates of striped mullet recruitment from the 2022 striped mullet stock assessment (NCDMF 2022). Average recruitment is the average number of recruits from 1990 to 2019, high recruitment is the average number of recruits from 1990 to 2003, and low recruitment is the average number of recruits from 2008 to 2019.

A 9.3% reduction in total removals relative to landings in 2019 is needed to reduce fishing mortality to the threshold and a 33% reduction is needed to reach the target. Amendment 1 to the Striped Mullet FMP included adaptive management allowing for implementation of management measures if commercial landings exceeded or fell below commercial landings triggers. Because neither the minimum or maximum commercial landings triggers were exceeded in 2022, adaptive management cannot be used to immediately implement management measures. A supplement to Amendment 1 is the only option to immediately implement management measures to end overfishing of the striped mullet stock. Given the stock is overfished and overfishing is occurring, ending overfishing immediately is in the long-term interest of the fishery because it begins rebuilding spawning stock biomass and meets the statutory requirement to end overfishing in two years. Measures addressing sustainable harvest and stock recovery will be explored and implemented through Amendment 2.

Implementation of quotas, seasons, size limits, area closures, gear restrictions, and harvest limits were discussed in Amendment 1 (NCDMF 2015). However, because management measures implemented through a supplement are intended to address a single issue, in this case ending overfishing, size limits, area closures, and gear restrictions are not considered viable options, and are not recommended, because they are unlikely to result in necessary harvest reductions without other measures in being place. A harvest quota would result in necessary harvest reductions and should be considered as a practical long-term option for management of the striped mullet fishery. However, because of the time needed to develop a quota monitoring framework and update infrastructure it is not considered a practical option through the supplement process and is not recommended. Trip limits, in conjunction with other options, could result in necessary reductions but given the high-volume nature of the striped mullet fishery may result in excessive

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dead discards. Trip limits should be explored during Amendment 2 but are not recommended for the supplement.

Given the inherent seasonality of the striped mullet fishery and life history characteristics that make striped mullet more vulnerable to the fishery during certain times of year, season closures are considered the most effective and efficient method to achieve the necessary reductions that can be implemented immediately through a supplement. Striped mullet are highly fecund (upwards of 4 million eggs for a large female; Bichy 2000) and spawn in large groups near inlets and in offshore areas (Collins and Stender 1989). Spawning individuals have been reported from September to March; however, peak spawning activity occurs from October to early December (Bichy 2000). Prior to spawning, striped mullet form large schools in estuaries and can be easily spotted near the surface making them particularly vulnerable to harvest. Closing a portion of the fall season to possession of striped mullet would reduce landings in the targeted striped mullet fishery, where most effort occurs. Targeting a season closure to the period of peak striped mullet harvest minimizes the length of the closure and the numbers of discards that might occur in other fisheries.

Characterization of the Fishery

Recreational Fishery

The federal Marine Recreational Information Program (MRIP) is primarily designed to sample anglers who use rod and reel as the mode of capture. Since most striped mullet are caught with cast nets for bait, striped mullet recreational harvest data are imprecise. In addition, angler misidentification between striped mullet and white mullet is common, and bait mullet are usually released by anglers before visual verification by creel clerks is possible. As such, mullets are not identified to the species level in MRIP data (Catch Type B). Beginning in 2002, MRIP began deferring to mullet genus to classify unobserved type B1 (harvested/unavailable catch) and B2 (released/unavailable catch) catch. As a result, the magnitude of recreational mullet genus harvest far exceeds that of both striped mullet and white mullet. This methodological improvement increased the precision of mullet harvest estimates albeit without species level resolution. As such, estimates of recreational harvest for mullet prior to 2002 are considered unreliable.

The 2022 striped mullet stock assessment used the sum of recreational striped mullet harvest and a proportion of the recreational harvest of mullet genus to estimate removals by the recreational fleet (NCDMF 2022). The proportion of mullet genus assumed to be striped mullet in the recreational harvest was 29%, a value derived from a DMF striped mullet recreational cast net harvest study (NCDMF 2006).

Recreational harvest peaked in 2002 and 2003 at greater than four million fish harvested (Table 1). From 2004 to 2017 recreational harvest remained stable at around one million fish before declining in 2018, 2019 and 2020 to around 500,000 fish. This decline was likely related to decreased abundance of striped mullet and regulations that drastically shortened the recreational fishing season for southern flounder, a fishery where live mullet is a popular bait. Recreational harvest in 2021 was 1,484,850 fish.

Generally, most recreational striped mullet harvest occurs during the late summer and early fall. From 2017 to 2021 most recreational harvest occurred during September/October with some harvest during July/August (Figure 4). Based on MRIP harvest estimates very few, if any, striped mullet are harvested recreationally during the January/February or March/April waves (Table 2).

Striped mullet harvest data from the Recreational Commercial Gear License (RCGL) were collected from 2002 to 2008. The program was discontinued in 2009 due to a lack of funding and the minimal contributions

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from RCGL to overall harvest. From 2002 through 2008, an average of 41,512 pounds of striped mullet were harvested per year using a RCGL (Table 3).

Table 1. Recreational harvest (number of fish landed) of striped mullet and mullet genus estimated from MRIP sampling, 2002-2021. Based on results of a DMF cast net study (NCDMF 2006), 29% of the mullet genus harvested are assumed to be striped mullet.

Year	Striped Mullet		Mullet Genus		Striped Mullet from Mullet Genus (29%)	Striped Mullet + Mullet Genus
	Harvest		Harvest (B1)		Harvest (B1)	Striped Mullet Total Harvest
	(A+B1)	PSE		PSE		
2002	4,668,427	18.0	4,480,197	36.3	1,299,257	5,967,684
2003	3,368,881	29.6	2,487,885	20.4	721,487	4,090,368
2004	5,496	101.7	4,790,382	16.1	1,389,211	1,394,707
2005	10,795	61.5	4,487,719	21.4	1,301,439	1,312,234
2006	15,706	63.5	3,599,098	21.4	1,043,738	1,059,444
2007	301,004	81.3	5,052,995	22.3	1,465,369	1,766,373
2008	3,458	65.0	4,097,156	14.4	1,188,175	1,191,633
2009	83,480	90.6	3,736,571	14.3	1,083,606	1,167,086
2010	126,250	44.7	4,113,171	14.3	1,192,820	1,319,070
2011	80,267	28.6	3,653,514	14.3	1,059,519	1,139,786
2012	351,960	79.5	3,510,395	16.3	1,018,015	1,369,975
2013	150,020	53.9	4,493,166	20.5	1,303,018	1,453,038
2014	50,381	67.0	4,490,722	26.2	1,302,309	1,352,690
2015	142,696	64.5	4,405,800	21.5	1,277,682	1,420,378
2016	29,965	50.6	5,039,891	55.6	1,461,568	1,491,533
2017	37,791	43.9	5,170,318	55.2	1,499,392	1,537,183
2018	35,565	59.3	1,564,676	31.7	453,756	489,321
2019	324,986	52.0	817,596	25.3	237,103	562,089
2020	323,102	43.2	719,908	23.2	208,773	531,875
2021	1,194,213	73.6	1,002,195	31.6	290,637	1,484,850

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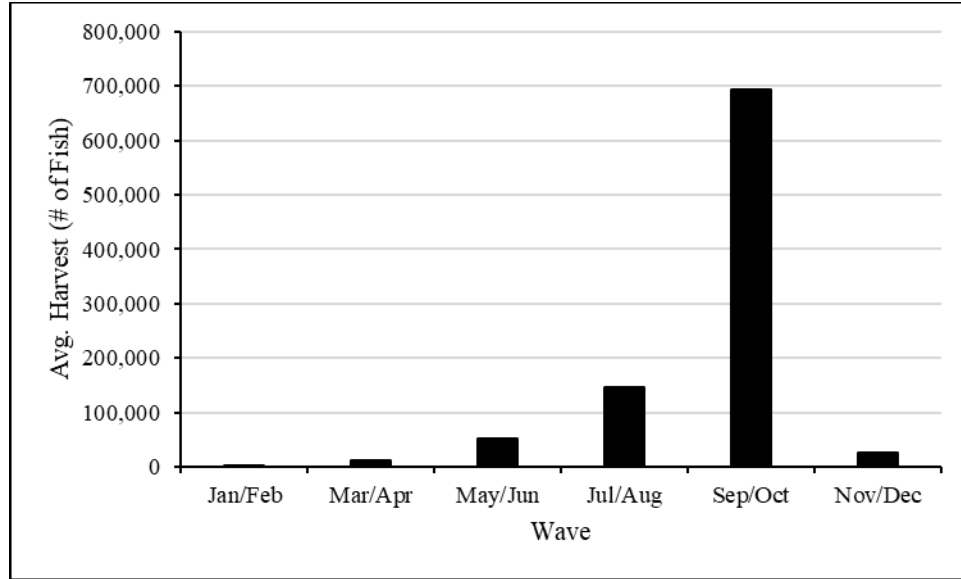


Figure 4. Average number of striped mullet harvested by the recreational fishery by wave based on MRIP estimates, 2017-2021.

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Table 2. Recreational harvest (number of fish landed) of striped mullet and mullet genus by wave estimated from MRIP sampling, 2002-2021. Striped mullet assumed as 29% of mullet genus.

Year	Wave	Striped Mullet	Mullet Genus	Striped Mullet from Mullet Genus (29%)	Striped Mullet + Mullet Genus
		Harvest (A+B1)	Harvest (B1)	Harvest (B1)	Striped Mullet Total Harvest
2017	January/February	.	.	.	.
2017	March/April	.	82,931	24,050	24,050
2017	May/June	27,708	284,430	82,485	110,193
2017	July/August	8,505	354,629	102,842	111,347
2017	September/October	1,579	4,432,737	1,285,494	1,287,073
2017	November/December	.	15,590	4,521	4,521
2018	January/February	.	.	.	.
2018	March/April	.	.	.	.
2018	May/June	2,239	136,595	39,613	41,852
2018	July/August	18,993	750,891	217,758	236,751
2018	September/October	13,505	457,709	132,736	146,241
2018	November/December	828	219,480	63,649	64,477
2019	January/February	.	.	.	.
2019	March/April	.	32,700	9,483	9,483
2019	May/June	11,773	86,637	25,125	36,898
2019	July/August	82,801	280,921	81,467	164,268
2019	September/October	217,317	367,020	106,436	323,753
2019	November/December	13,096	50,318	14,592	27,688
2020	January/February	1,648	1,540	447	2,095
2020	March/April	.	21,050	6,105	6,105
2020	May/June	6,308	78,303	22,708	29,016
2020	July/August	40,470	239,694	69,511	109,981
2020	September/October	274,675	370,617	107,479	382,154
2020	November/December	.	8,704	2,524	2,524
2021	January/February	.	6,340	1,839	1,839
2021	March/April	7,087	.	.	7,087
2021	May/June	1,336	144,319	41,853	43,189
2021	July/August	21,670	292,846	84,925	106,595
2021	September/October	1,164,119	558,690	162,020	1,326,139
2021	November/December

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Table 3. North Carolina Recreational Commercial Gear License (RCGL) survey estimates of the number of striped mullet harvested, pounds harvested, number released, and total number caught. The survey was discontinued in 2009.

Year	Number Harvested	Pounds Harvested	Number Released	Total Number
2002	66,305	64,213	6,549	72,854
2003	28,757	24,774	3,514	32,270
2004	34,736	35,947	2,875	37,611
2005	35,888	36,314	3,492	39,380
2006	38,175	37,385	5,352	43,527
2007	35,472	40,168	7,449	42,921
2008	51,465	51,785	9,207	60,672

Commercial Fishery

Since 1972, striped mullet commercial landings have ranged from a low of 965,198 pounds in 2016 to a high of 3,063,853 pounds in 1993 (Figure 5). From 2003 to 2009, landings were stable between 1,598,617 and 1,728,607 pounds before increasing to 2,082,832 pounds in 2010. Landings fluctuated annually between 1.5 and 2.0 million pounds from 2010 to 2014 before declining in 2015 and again in 2016, dropping below the minimum commercial landings trigger established by Amendment 1. Commercial landings in 2021 increased to 2,135,952 pounds, which is 1,005,952 pounds above the minimum commercial landings trigger.

Historically, beach seines and gill nets were the two primary gear types used in the striped mullet commercial fishery, with most commercial landings prior to 1978 coming from the beach seine fishery. Gill nets (runaround, set, and drift) replaced seines as the dominant commercial gear type in 1979 and since 2017 runaround gill nets have accounted for most (>70%) striped mullet commercial landings (Figure 6).

Because the commercial fishery primarily targets striped mullet for roe, the fishery is seasonal with the highest demand and landings occurring in October and November when large schools form during their spawning migration to the ocean and females are ripe with eggs (Figures 7-8). Striped mullet are primarily targeted commercially using runaround gill nets in the estuarine and ocean waters of North Carolina. The striped mullet beach seine fishery primarily occurs in conjunction with the Bogue Banks stop net fishery. The stop net fishery has operated under fixed seasons and net and area restrictions since 1993. Currently, stop nets are limited in number (four), length (400 yards), and mesh sizes (minimum eight inches outside panels, six inches middle section). Stop nets have typically been permitted along Bogue Banks (Carteret County) in the Atlantic Ocean from October 1 to November 30. However, the stop net season was extended to include December 3 to December 17 in 2015 due to minimal landings of striped mullet (Proclamation M-28-2015). In 2020 and 2021, the stop net fishery was open from October 15 through December 31 (Proclamations M-17-2020 and M-21-2021). Due to the schooling nature of striped mullet, the beach seine fishery has the potential to be, and historically has been, a high-volume fishery with thousands of pounds landed during a single trip. In addition, the use of cast nets in the striped mullet commercial fishery has been increasing since around 2003.

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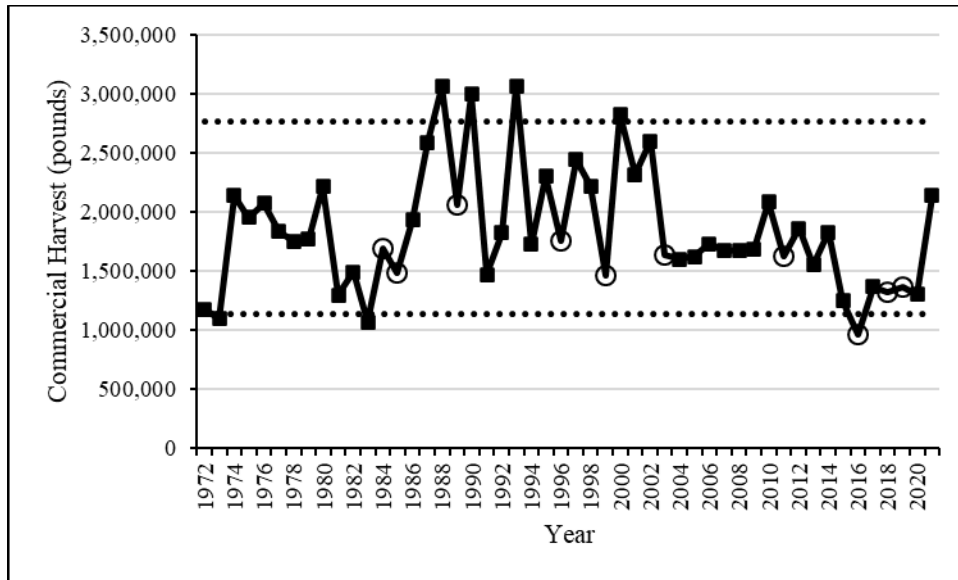


Figure 5. Striped mullet commercial landings (pounds) reported through the North Carolina Trip Ticket Program, 1972–2021 Lower dashed line (1.13 million lb.) and upper dashed line (2.76 million lb.) represent landings limits that trigger closer examination of data. Open circles represent years with significant hurricanes of storms.

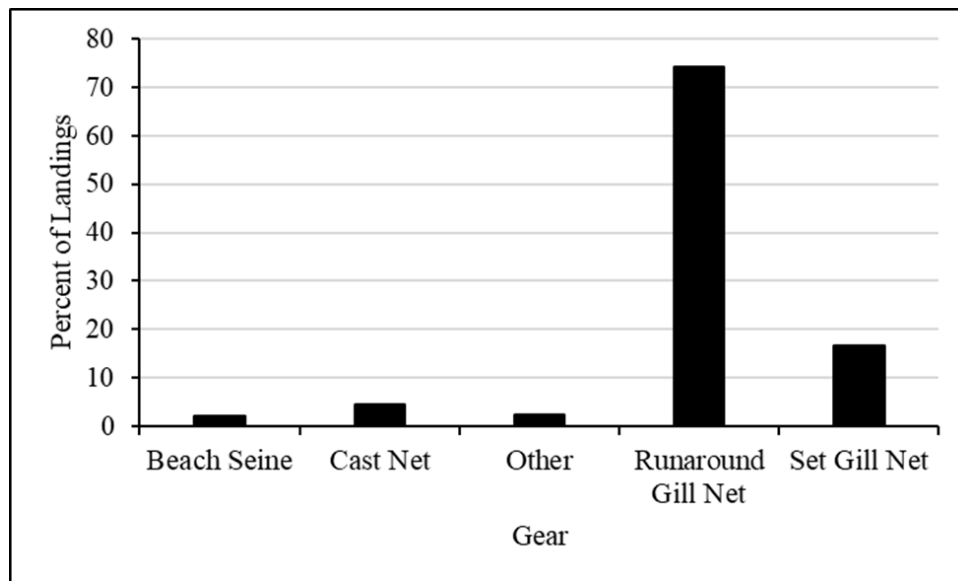


Figure 6. Percent of striped mullet commercial landings reported through the North Carolina Trip Ticket Program by gear, 2017–2021.

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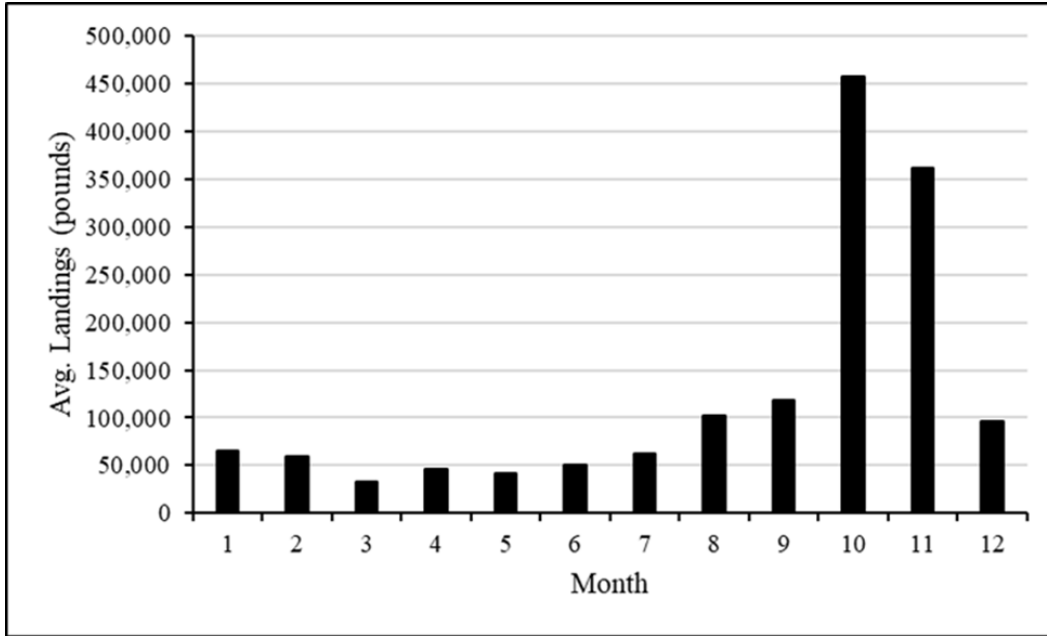


Figure 7. Average commercial landings of striped mullet by month, 2017-2021.

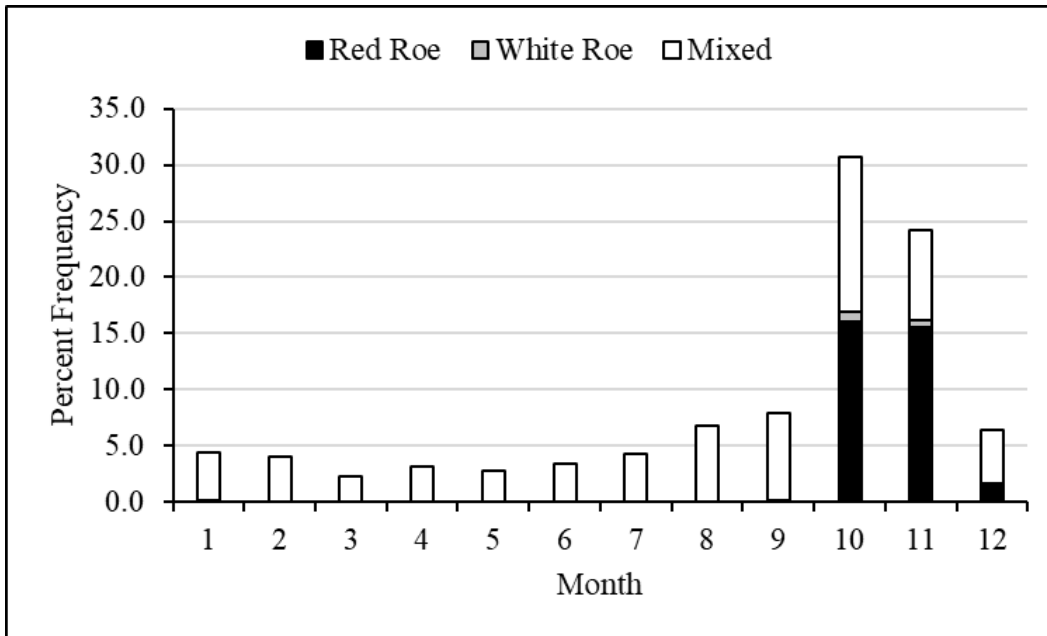


Figure 8. Percent frequency of striped mullet commercial landings by market grade and month, 2017-2021. Red Roe includes striped mullet graded as Red Roe and Roe. White Roe includes striped mullet graded as White Roe. Mixed includes striped mullet graded as Jumbo, Large, Medium, Mixed, Small, and X-Small.

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PROPOSED MANAGEMENT OPTIONS

The goal of this supplement is to reduce fishing mortality and end overfishing with simple quantifiable measures as quickly as possible. A 9.3% reduction in total removals relative to landings in 2019 is needed to reduce fishing mortality to the threshold and a 33% reduction is needed to reach the target. The Division recommends harvest reductions of 20-33% to exceed the F threshold and either reach or approach the F target. This level of reduction increases the probability of, at a minimum, ending overfishing even if there is variability in fishing effort, market demand, striped mullet availability to the fishery, or recruitment.

Non-quantifiable measures such as gear restrictions, area closures, size limits, and recreational specific measures were not considered because they may not quantifiably reduce harvest. A quota system was not considered because the infrastructure is not in place to quickly implement this type of management. Management strategies such as daily trip limits, day of the week closures, and early or mid-season closures were not considered because the risk of recouped catches would likely limit the realized reductions of these management measures. Rather than reduce harvest, measures like early season closures would likely just act to delay harvest.

End of year season closures are considered the most effective and efficient management option that can be implemented through the supplement process and be expected to successfully limit striped mullet harvest. An end of year season closure would be implemented as no possession across both commercial and recreational sectors with no additional modification or prohibition of gears. Despite the closure occurring across all sectors, reductions cannot be quantified for the recreational sector due to data limitations. Therefore, overall reduction calculations are based solely on striped mullet landings from the commercial fishery. A 9.3% overall reduction equates to a 9.9% reduction in commercial harvest, and a 20-33% overall reduction equates to a 21.3-35.4% reduction in commercial harvest. All management options are presented as percent reductions to the commercial harvest relative to commercial landings in 2019 (terminal year of the stock assessment).

End of Year Closures

Historically, peak striped mullet roe landings have occurred in October-November, with most landings occurring from approximately October 15-November 15. An end of year season closure during this time provides the greatest reduction over the shortest period. The closure occurring at the end of the year, does not allow for recouping of catch that year, increasing the probability of successfully reducing harvest, and ending overfishing. The closure must occur during the peak fall roe harvest season, which impacts the most economically valuable segment of the striped mullet fishery. An end of year closure also creates regulatory discards associated with fisheries that do not target striped mullet during the closed period. However, much of the striped mullet harvest during this time comes from directed trips where runaround gill nets are used to capture visible, schooling striped mullet so discards in other fisheries are unlikely to be excessive. A wrap-around end of year closure extending into January was not considered because of the minimal benefit to striped mullet and to avoid creating striped mullet discards in other fisheries. A closure extending into January would not yield any significant extension to the fall striped mullet season and would likely increase pressure on other fisheries, like spotted seatrout. An end of year closure is most likely to achieve the necessary reductions because recouping would be less significant than other management options not considered in this supplement.

Summary of Economic Impacts

Modeling software, IMPLAN, is used to estimate the economic impacts of an industry to the state at-large, accounting for revenues and participation. For a detailed explanation of the methodology used to estimate

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the economic impacts please refer to DMF’s License and Statistics Section Annual Report on the Fisheries Statistics page (NCDMF 2021). Due to the management options being considered, this analysis focuses on the commercial industry.

Commercial landings and effort data collected through the DMF Trip Ticket Program are used to estimate the economic impact of the commercial fishing industry. For commercial fishing output, total impacts are estimated by incorporating modifiers from NOAA’s Fisheries Economics of the United States report (NMFS 2022), which account for proportional expenditures and spillover impacts from related industries. By assuming the striped mullet fishery’s contribution to expenditure categories at a proportion equal to its contribution to total commercial ex-vessel values, it is possible to generate an estimate of the total economic impact of striped mullet statewide.

From 2011 to 2021 striped mullet ex-vessel value has been about \$1 million dollars and impacts about 800 jobs annually (Table 4). Annual sales impacts have varied but averaged \$3.6 million from 2011 to 2021. In general, these estimates demonstrate the striped mullet fishery contributes to about 1% of commercial fishing sales impact statewide.

Table 4. Annual commercial estimates of annual economic impact to the state of North Carolina from striped mullet harvest, 2011-2021. Economic impacts are reported in 2020 dollars.

Year	Pounds Landed	Ex-Vessel Value	Job Impacts	Income Impacts	Value-Added Impacts	Sales Impacts
2021	2,135,952	\$ 1,333,475	714	\$ 1,860,564	\$ 3,503,122	\$ 4,004,336
2020	1,299,464	\$ 651,104	658	\$ 1,330,677	\$ 2,257,282	\$ 2,912,396
2019	1,362,212	\$ 929,282	673	\$ 1,502,372	\$ 2,344,706	\$ 3,475,378
2018	1,312,121	\$ 953,667	731	\$ 1,502,185	\$ 2,686,226	\$ 3,303,076
2017	1,366,338	\$ 1,037,526	802	\$ 1,571,518	\$ 2,564,816	\$ 3,559,251
2016	965,337	\$ 669,843	716	\$ 1,006,728	\$ 1,739,854	\$ 2,240,287
2015	1,247,044	\$ 804,675	784	\$ 1,203,068	\$ 2,086,467	\$ 2,663,251
2014	1,828,351	\$ 1,112,465	912	\$ 1,735,047	\$ 3,293,379	\$ 3,936,322
2013	1,549,157	\$ 1,402,914	1,042	\$ 2,318,409	\$ 3,902,777	\$ 5,173,187
2012	1,859,587	\$ 1,041,659	948	\$ 1,957,469	\$ 3,167,843	\$ 4,390,261
2011	1,627,894	\$ 1,015,852	885	\$ 1,890,316	\$ 3,371,858	\$ 4,175,332
Average	1,504,860	\$ 995,678	806	\$ 1,625,305	\$ 2,810,757	\$ 3,621,189

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Table 5. Monthly commercial estimates of annual economic impact to the state of North Carolina from striped mullet harvest over five years, 2017-2021. Economic impacts are reported in 2020 dollars.

Month	Pounds Landed	Ex-Vessel Value	Job Impacts	Income Impacts	Value Added Impacts	Sales Impacts
1	65,170	\$ 36,107.03	130	\$ 53,057.71	\$ 98,355.14	\$ 114,549.45
2	59,618	\$ 33,227.53	129	\$ 49,108.96	\$ 90,877.25	\$ 106,053.22
3	32,731	\$ 18,569.84	122	\$ 28,460.61	\$ 52,101.53	\$ 61,568.49
4	45,885	\$ 25,851.76	141	\$ 39,856.46	\$ 72,837.04	\$ 86,245.48
5	41,826	\$ 23,508.17	121	\$ 35,221.68	\$ 64,912.23	\$ 76,114.04
6	50,157	\$ 28,058.94	131	\$ 43,466.77	\$ 79,323.84	\$ 94,077.95
7	62,675	\$ 36,047.32	139	\$ 54,151.74	\$ 99,720.97	\$ 117,036.20
8	101,967	\$ 60,393.25	179	\$ 91,585.84	\$ 168,184.68	\$ 198,027.77
9	118,860	\$ 69,487.04	210	\$ 103,726.30	\$ 191,374.87	\$ 224,109.33
10	458,246	\$ 328,837.30	361	\$ 485,746.18	\$ 899,026.44	\$ 1,048,966.80
11	362,172	\$ 261,014.19	297	\$ 357,945.86	\$ 688,459.22	\$ 766,383.96
12	95,910	\$ 59,908.44	176	\$ 83,266.89	\$ 157,024.20	\$ 179,263.56

To further understand the dynamics of the striped mullet fishery the monthly economic impacts over the last five years are reported in Table 5. The striped mullet commercial fishery is driven by seasonal changes in population availability. The estimated change in job impacts and sales impacts reflect the availability of striped mullet throughout the year. Most of the harvest and economic impacts are concentrated in October and November of each year.

Management Option Scenarios

Management options for consideration include end of year closures that end December 31 (Table 6). All options provided in Table 6 meet the statutory requirement to end overfishing.

Table 6. Management options that satisfy the 9.9% commercial harvest reduction to end overfishing. All reductions are calculated from 2019 commercial harvest levels (terminal year of stock assessment).

Single Management Measures that Satisfy Reduction	Management Measure	Estimated Commercial Harvest Reduction (%)
Season Closures		
1	October 29 – December 31	33.7
2	November 7 – December 31	22.1
3	November 13 - December 31	10.9

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End of Year Season Closure (options 1 and 2)

(+ potential positive impact of action)

(- potential negative impact of action)

- + No additional resources required to implement
- + No additional reporting burden on fishermen or dealers
- + Reduces effort from current level
- + High likelihood of ending overfishing
- + Increases probability of ending overfishing stock or fishery conditions are variable
- Weather may prevent fishing during open periods
- Effort may increase during the open period reducing the effectiveness of the closure
- Reduction in fishing mortality may not be achieved
- Overfishing may still occur if recruitment is low
- May adversely impact some fisheries and fishermen more than others
- Create regulatory discards in the closed period

End of Year Season Closure (option 3)

(+ potential positive impact of action)

(- potential negative impact of action)

- + No additional resources required to implement
- + No additional reporting burden on fishermen or dealers
- + Reduces effort from current level
- + Could potentially end overfishing
- No buffer to increase probability of ending overfishing if stock or fishery conditions are variable
- Weather may prevent fishing during open periods
- Effort may increase during the open period reducing the effectiveness of the closure
- Reduction in fishing mortality may not be achieved
- Overfishing may still occur if recruitment is low
- May adversely impact some fisheries and fishermen more than others
- Create regulatory discards in the closed period

Based on public comment received prior to and during the February 2023 MFC business meeting, additional management options accommodating regional end of season closures were examined and added. Regional splits were examined using two methods:

1. Using the “waterbody fished” field from the trip ticket and assigning all trips in internal waters south of Bogue Sound and the ocean south of Cape Hatteras as “Southern Region”, and everywhere else as “Northern Region”.
2. Using the “county of landing” field to assign every coastal county south of Carteret (Brunswick, New Hanover, Onslow, Pender) as “Southern Region” and all other counties as “Northern Region”.

Generally, the split between north and south was considered to be the Highway 58 Bridge to Emerald Isle. The two methods of splitting regions produced similar results for overall commercial landings. However,

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the method of splitting using “county of landings” was considered a more accurate representation because assigning all commercial landings south of Cape Hatteras to the “southern region”, if the regional split is the Highway 58 Bridge, likely overestimates commercial landings for the Southern Region. Because of similarity between methods and concerns about waterbody assignments, the county of landing method was used to split landings between regions and calculate regional seasons. From 2017-2021 the northern region accounted for 92.8% of commercial landings and the southern region accounted for 7.2% of commercial landings. In 2019, the northern region accounted for 94.1% of commercial landings and the south accounted for 6.0%. Essentially, even if all striped mullet commercial fishing in the south was closed, the minimum 9.9% reduction needed to end overfishing would not be met.

In every month, commercial landings in the north far exceed commercial landings in the south (Figure 9). However, peak striped mullet commercial landings in the north occur in October whereas peak landings in the south occur in November (Figure 10). Despite peak commercial landings in the south occurring in November, the north landed 1,628,282 pounds compared to 182,579 in the south during November from 2017-2021.

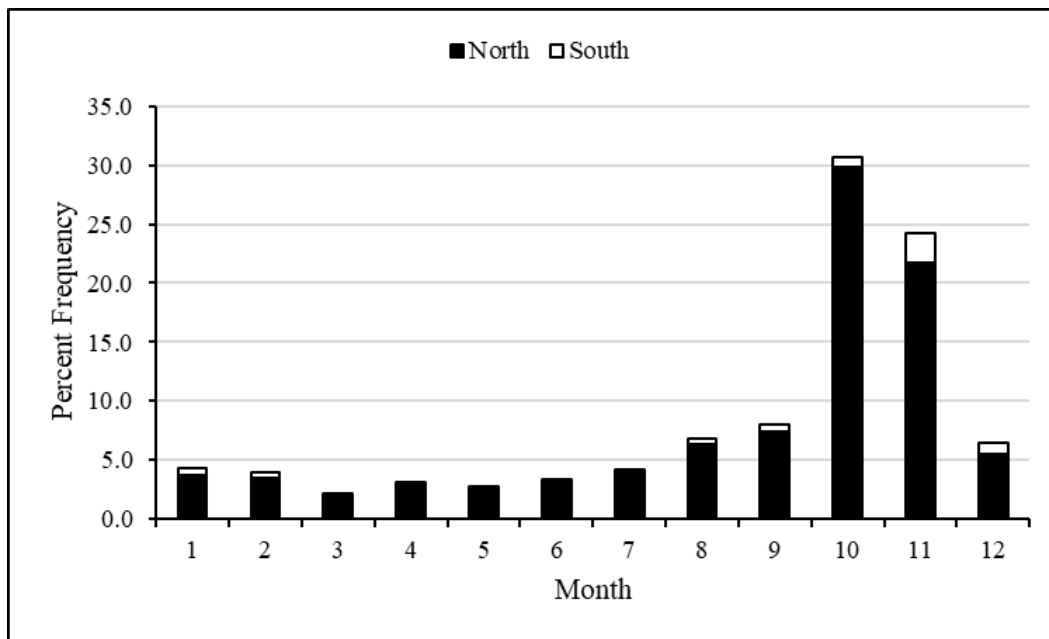


Figure 9. Percent frequency of striped mullet commercial landings by region (north and south) and month, 2017-2021.

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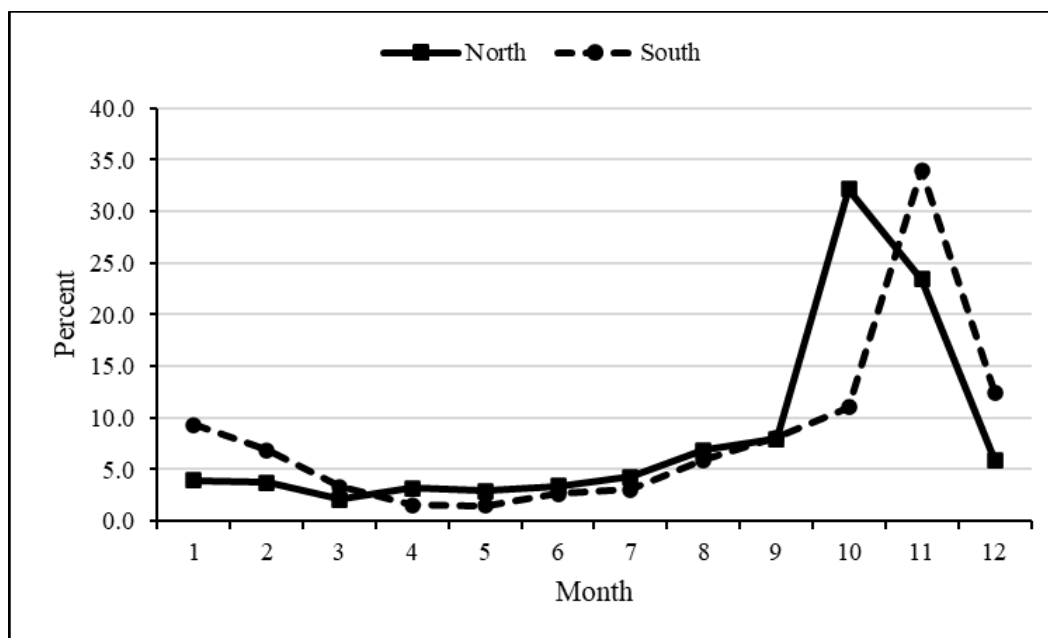


Figure 10. Percent of striped mullet commercial landings by region (north and south) and month, 2017-2021.

To better account for the perceived discrepancy in management impact between the two regions, options for region specific season closures were developed. In November 2022 the MFC passed a motion selecting a statewide season closure from November 7 – December 31 as the preferred strategy to end overfishing. Options for region specific season are shown in Table 7.

Table 7. Management options that satisfy the 9.9% commercial harvest reduction to end overfishing by splitting the seasons between north and south. All reductions are calculated from 2019 commercial harvest levels (terminal year of stock assessment).

Option	Season Closure		Minimum Reduction
	North	South	
4	October 28 – December 31	October 30 – December 31	35.6
5	November 7 – December 31	November 10 – December 31	21.7
6	November 13 – December 31	November 21 – December 31	10.1

Participation in the two regions is strongly skewed toward the north with 269 unique participants in the north compared to 60 in the south during November and December 2019. There were 325 total unique participants during that time, meaning there were only four participants who landed striped mullet in both regions (Table 8). Total value lost and value lost per participant at different reduction levels is also strongly skewed toward the north.

Under all reduction scenarios, splitting the season regionally could allow for as many as eight additional fishing days in the south. Under a split season, effort could shift from north to south and expected harvest reductions may not be realized.

Table 8. Striped mullet commercial fishery participants and value lost by region at various commercial reduction levels based on 2019 data.

Reduction	9.9%		21.3%		35.4%	
	North	South	North	South	North	South
Distinct Count of PID	269	60	269	60	269	60

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Value lost per person	\$342	\$85	\$742	\$241	\$1,278	\$342
Total Value lost	\$92,059	\$5,125	\$199,701	\$14,466	\$343,829	\$20,491

Region Specific End of Year Season Closure (Options 1-3)

(+ potential positive impact of action)

(- potential negative impact of action)

- + No additional resources required to implement
- + No additional reporting burden on fishermen or dealers
- + Reduces effort from current level
- + High likelihood of ending overfishing
- + Increases probability of ending overfishing stock or fishery conditions are variable
- Weather may prevent fishing during open periods
- Effort may increase during the open period or open regions reducing the effectiveness of the closure
- Reduction in fishing mortality may not be achieved
- Overfishing may still occur if recruitment is low
- May adversely impact some fisheries and fishermen more than others
- Create regulatory discards in the closed period
- Depending on option, no buffer to increase probability of ending overfishing if stock or fishery conditions are variable

RECOMMENDATION

DMF Recommended Management Strategy:

The DMF recommends approval of Supplement A to implement either option 1, 2, 4, or 5. To achieve a 20-33% reduction, any statewide end of year season closure must begin no sooner than October 29 and no later than November 7 and continue through December 31. Any end of year split season closure would need to begin no sooner than October 28 in the north and October 30 in the south and no later than November 13 in the north and November 21 in the south.

The Division recommends a 20-33% reduction to exceed the threshold and either meet or approach the target. This reduction level increases the probability of, at a minimum, ending overfishing even if there is variability in fishing effort, market demand, striped mullet availability to the fishery, or recruitment fluctuations.

MFC Selected Management Strategy:

At its November 2022 business meeting, the MFC voted to approve Supplement A and selected the preferred management option. At that time, the MFC unanimously (9-0) passed a motion to “approve Supplement A to Amendment 1 of the Striped Mullet Fishery Management Plan with Option 2”. Option two would end overfishing by implementing a season closure from November 7-December 31 to achieve a 22.1% commercial harvest reduction. Following the November 2022 business meeting, the Division

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received public comment from December 19, 2022 through January 19, 2023 pertaining to Supplement A and the MFC preferred management option.

At its February 2023 business meeting, the MFC were presented with a summary of public comment and given the opportunity to vote on adoption of Supplement A to Amendment 1 of the Striped Mullet FMP. A motion to vote down Supplement A failed by lack of supermajority (5-4). A substitute motion to accept Supplement A with option 2 failed by a 4-5 vote. A motion to approve Supplement A with option 3 (season closure from November 13-December 31 to achieve a 10.9% commercial harvest reduction) failed by a 4-5 vote. No additional motions were made, and Supplement A was not adopted. Within the absence of a majority vote, the matter remains in front of the commission. Therefore, the MFC chair placed consideration of Supplement A to the agenda for the May 2023 business meeting.

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