DECISION DOCUMENT

Blue Crab Fishery Management Plan

Amendment 3 Adaptive Management

This document was developed by the Division of Marine Fisheries to help the Marine Fisheries Commission track previous activity and prepare for upcoming actions for Blue Crab FMP Amendment 3 Adaptive Management.

February 2025

Summary

Amendment 3 to the N.C. Blue Crab Fishery Management Plan (FMP) was adopted in February 2020 and is nearly halfway through the legislatively mandated 10-year stock rebuilding period with little evidence suggesting management measures have been successful in ending overfishing or achieving sustainable harvest. The Amendment 3 adaptive management framework will be used to implement management measures projected to reduce fishing mortality (*F*) closer to the *F* target and rebuild the spawning stock closer to the spawner abundance target with greater than 50% probability of success.

Amendment 3 Background

As part of Amendment 3 to the North Carolina Blue Crab FMP a benchmark stock assessment was undertaken using data from 1995-2016. Based on assessment results, the N.C. Blue Crab stock was overfished, and overfishing was occurring in 2016.

The North Carolina Fishery Reform Act of 1997 requires the State specify a time period not to exceed two years to end overfishing and achieve a sustainable harvest within 10 years of the date of adoption of the plan. To meet this requirement, a minimum harvest reduction of 0.4% (in numbers of crabs) was projected to end overfishing and a harvest reduction of 2.2% was projected to achieve sustainable harvest and rebuild the Blue Crab spawning stock within 10 years with a 50% probability of success (Table 1).

Table 1. Catch reduction projections for varying levels of fishing mortality (*F*) and the probability of achieving sustainable harvest within the 10-year rebuilding period defined in statute. Bolded row is minimum required harvest reduction.

F (yr-1)	Catch Reduction (%)	Probability of achieving sustainable harvest within 10 years (%)	Comments
1.48	0.0	31	2016 average *F* from stock assessment
1.46	0.4	45	Catch reduction to meet *F* threshold and end overfishing
1.40	1.7	46	Catch reduction to meet spawner abundance threshold and end overfished status
1.38	**2.2**	**50**	**Catch reduction to meet minimum statutory requirement for achieving sustainable harvest**
1.30	3.8	67	
1.22	5.9	90	Catch reduction to meet *F* target
1.10	9.3	96	
1.00	12.3	100	
0.90	15.7	100	
0.80	19.8	100	Catch reduction to meet spawner abundance target
0.70	24.3	100	

At their February 2020 business meeting, the MFC adopted Amendment 3 to the FMP with the following management strategies to end overfishing and achieve sustainable harvest in the Blue Crab fishery:

- North of the Highway 58 Bridge: A January 1 through January 31 closed season.
- South of the Highway 58 Bridge: A March 1 through March 15 closed season.
- A 5-inch minimum size limit for mature female crabs statewide.
- Replacing the current pot closure period and remaining closed in entirety (could not be reopened early).
- Maintain the prohibition on harvest of immature female hard crabs statewide.
- Maintain the 5% cull tolerance established in the 2016 Revision to Amendment 2.
- Adopt proposed adaptive management framework and allow measures to be relaxed if the assessment update indicated the stock was not overfished and overfishing was not occurring and recommend updating the stock assessment once 2019 data is available.

The adopted management provided an estimated 2.4% harvest reduction with a 50% probability of achieving sustainable harvest. This reduction was just above the statutorily required minimum (2.2% reduction), but below the harvest reduction level needed to reduce *F* to the target (5.9% reduction) and the reduction needed to increase spawner abundance to the target (19.8% reduction).

Amendment 3 management strategies have been fully in place since January 2021. Amendment 3 also maintained all measures implemented with the May 2016 Revision to the Blue Crab FMP. A summary of all management measures in place through Amendment 3 can be found in Amendment 3, the annual FMP Update or in the Amendment 3 flyer. Included in the Amendment 3 management strategy is an adaptive management framework allowing for re-evaluation and revision of management measures if needed (see below).

Amendment 3 Adaptive Management

1. Update the stock assessment at least once in between full reviews of the FMP, timing at the discretion of the division
    a. If the stock is overfished and/or overfishing is occurring or it is not projected to meet the sustainability requirements, then management measures shall be adjusted using the director's proclamation authority
    b. If the stock is not overfished and overfishing is not occurring, then management measures may be relaxed provided it will not jeopardize the sustainability of the Blue Crab stock
2. Any quantifiable management measure, including those not explored in this paper, with the ability to achieve sustainable harvest (as defined in the stock assessment), either on its own or in combination, may be considered
3. Use of the director's proclamation authority for adaptive management is contingent on:

a. Consultation with the Northern, Southern, and Shellfish/Crustacean advisory committees
b. Approval by the Marine Fisheries Commission

Upon evaluation by the division, if a management measure adopted to achieve sustainable harvest (either through Amendment 3 or a subsequent Revision) is not working as intended, then it may be revisited and either: 1) revised or 2) removed and replaced as needed provided it conforms to steps 2 and 3 above.

Post Amendment 3 Stock Assessment Update

Following full implementation of Amendment 3 management measures in 2021, DMF monitoring programs continued to observe historically low commercial landings, coupled with continued low abundance of all Blue Crab life stages (e.g., male and female juveniles, male and female adults, mature females). In response to stock concerns expressed by commercial crabbers and continued poor trends in abundance since adoption of Amendment 3, the DMF began updating the stock assessment with data through 2022. Results of the model update indicate the magnitude and trends for estimated recruitment, female spawner abundance, and fishing mortality were similar to the benchmark assessment (Figure 1); however, the Maximum Sustainable Yield (MSY) based reference points used to determine stock status for both female spawner abundance and fishing mortality changed drastically (spawner reference points increased, *F* reference points decreased indicating the stock has been overfished and overfishing has been occurring throughout the entire times series; Figures 2-3).

Due to the magnitude of the change in reference points, an external review of the assessment update was completed in late December 2023. The reviewers identified concerns with model specifications and results, and they strongly recommended resolving these issues before basing any management decisions solely on the assessment update. Suggestions provided by reviewers can only be incorporated with a new benchmark stock assessment. Given concerns with the assessment update identified by the DMF and external peer reviewers, **the DMF does not recommend using results of the 2023 stock assessment update to inform management**.

Declines in the North Carolina Blue Crab stock are not unique, as Blue Crab stocks in other Atlantic coast states have declined similarly. In January 2023 the South Carolina Department of Natural Resources released a status report for the South Carolina Blue Crab fishery. The report concluded the South Carolina Blue Crab stock has been in decline for nearly two decades and provided recommendations to prevent overharvesting, gradually reduce fishing pressure, prevent overexploitation, and strengthen enforcement capabilities. Concerns for the Chesapeake Bay Blue Crab stock have also persisted. While the Chesapeake Bay Blue Crab stock is not depleted and overfishing is not occurring, juvenile abundance remains low. Precautionary management, focusing on protecting mature females and juveniles, has been recommended for the Chesapeake Bay stock and a benchmark stock assessment has been started to better understand the population.

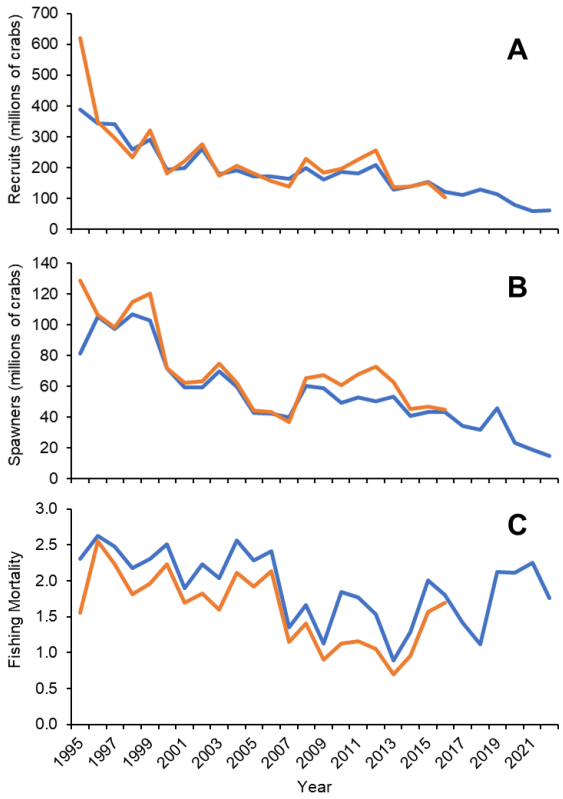

Figure 1. Comparison of estimates of (A) total recruitment, (B) female spawner abundance, and (C) fishing mortality between the 2023 stock assessment update (blue line) and the 2018 benchmark stock assessment (orange line).

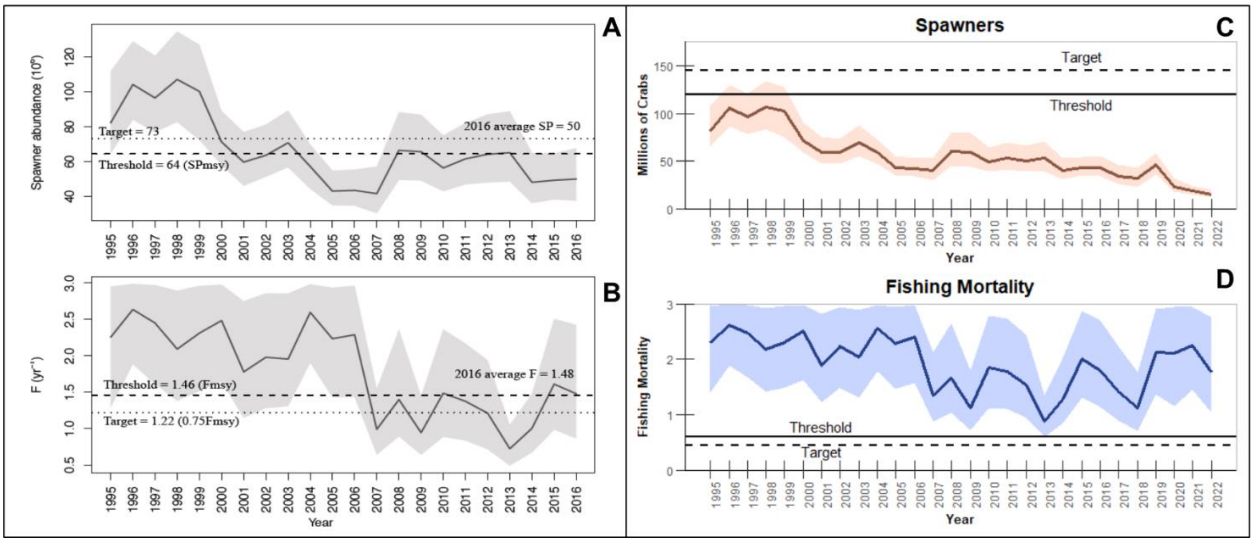

Figure 2. Annual estimates of (A) mature female spawner abundance and (B) fishing mortality relative to associated reference points from the 2018 benchmark stock assessment. Annual estimates of (C) mature female spawner abundance and (D) fishing mortality relative to associated reference points from the 2023 stock assessment update.

Amendment 3 Adaptive Management and Timeline

(gray indicates completed step)

While an updated stock assessment is not currently available to inform stock status, there is little evidence suggesting overfishing has ended or sustainability objectives of Amendment 3 will be met. Because Amendment 3 is nearly halfway through the required rebuilding timeline, management measures projected to rebuild spawner abundance to a higher level with a much higher probability of success must be implemented (Table 1). The Amendment 3 adaptive management framework will be used to immediately address the overall declining trends in the Blue Crab stock. This action is appropriate given the Amendment 3 adaptive management framework states: "*upon evaluation by the division, if a management measure adopted to achieve sustainable harvest is not working as intended, then it may be revisited and either 1) revised or 2) removed and replaced as needed…*".

The Amendment 3 adaptive management framework allows any quantifiable management measure, including those not discussed in Amendment 3, with the ability to achieve sustainable harvest either on its own or in combination to be considered. The timeline for revision development is outlined in the table below.

May 2024	DMF presents results of stock assessment update and adaptive management plan to MFC
May 2024 – August 2024	Outreach and analysis
August 2024	DMF updates the MFC on progress
September 2024	DMF updates Northern, Southern, and Shellfish/Crustacean advisory committees
September 2024 – December 2024	Additional outreach and analysis. DMF drafts Revision to Amendment 3
February 2025	Update MFC on draft Revision **NO MFC ACTION**
March 2025	Public and MFC AC (Northern, Southern, Shellfish/Crustacean) review draft
May 2025	MFC approves Revision to Amendment 3

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Management Measures

Management Options, Ordered by Issue

Size limits are used to rebuild or protect a portion of the spawning stock. Currently, male and mature female hard crabs are subject to a 5-inch minimum carapace width (CW) statewide (harvest of immature females is prohibited).

Because a minimum size limit is already in place for Blue Crabs, and because achieving necessary harvest reductions through size limit changes alone is unlikely, management options for increasing the minimum size limit or establishing a maximum size limit were not developed.

Seasonal Closures can be used to reduce overall harvest by restricting harvest during specific times of the year. Amendment 3 implemented a January 1-31 closure in areas north of the Highway 58 bridge to Emerald Isle and March 1-15 closure in areas south of the Highway 58 bridge to Emerald Isle. **Option 3** (Table 2a) **and Option 6** (Table 2b) include statewide season closures in combination with other measures.

Trip or Bushel Limits limit catch while continuing to allow harvest opportunities. Maryland and Virginia each manage Blue Crab harvest with some form of a trip limit in combination with other measures. **Option 1** is a year-round trip limit on all hard blue crabs (Table 2a). **Option 2** is a seasonal trip limit on all hard blue crabs. **Option 3** is a seasonal trip limit on all hard blue crabs combined with a season closure.

Life Stage Closures and Limits are used to limit harvest of specific life stages (e.g., immature females, sponge crabs, etc.). Amendment 3 maintained the prohibition on harvest of immature female hard Blue Crabs and harvest of dark sponge crabs from April 1-30. The intent of prohibiting harvest of immature female Blue Crabs is to allow immature females the opportunity to mature and spawn before being subject to harvest. Prioritizing the reproductive potential of female crabs through life-stage closures serves as a proactive investment to the sustainability of the Blue Crab population. This strategy not only fosters increased abundance within the crab population but likely contributes to higher recruitment. **Options 4, 5, 7, and 8** include seasonal closures or trip limits on the harvest of mature female hard blue crabs (Table 2b). **Option 6** includes a seasonal closure for the harvest of mature female crabs with a seasonal trip limit for mature female crabs and a seasonal closure for the harvest or all hard blue crabs.

Table 2a. Season closure and trip limit management options. Unless stated otherwise all options are in addition to existing management including existing season closures. Estimated harvest reductions are calculated from 2016, 2023, and 2019-2023 commercial hard Blue Crab landings.

Option #	Measures	2016	2023	2019-2023
1	a. 10-bushel hard crab trip limit year-round	48.3	51.6	45.6
	b. 15-bushel hard crab trip limit year-round	34.5	38.3	31.9
	c. 20-bushel hard crab trip limit year-round	25.2	28.5	22.6
2	a. 10-bushel hard crab trip limit Sept-Dec	25.1	32.0	21.6
	b. 15-bushel hard crab trip limit Sept-Dec	20.4	25.2	16.4
	c. 20-bushel hard crab trip limit Sept-Dec	16.6	19.7	12.4
3	a. 10-bushel hard crab trip limit Sept-Nov, closed Dec-Mar	32.8	36.3	27.0
	b. 15-bushel hard crab trip limit Sept-Nov, closed Dec-Mar	28.5	30.2	22.3
	c. 20-bushel hard crab trip limit Sept-Nov, closed Dec-Mar	25.0	25.2	18.6
	d. 10-bushel hard crab trip limit Sept-Nov, closed Dec-Jan	27.4	34.5	24.0
	e. 15-bushel hard crab trip limit Sept-Nov, closed Dec-Jan	23.1	28.4	19.3
	f. 20-bushel hard crab trip limit Sept-Nov, closed Dec-Jan	19.6	23.4	15.6

Table 2b. Mature female season closure and trip limits management options. Unless stated otherwise all option are in addition to existing management including existing season closures. Estimated harvest reductions are calculated from 2016, 2023, and 2019-2023 commercial hard Blue Crab landings.

Option #	Measures	2016	2023	2019-2023
4	a. 10-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	17.5	19.4	14.4
	b. 15-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	15.7	16.9	12.3
	c. 20-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	14.3	15.1	10.9
5	a. 10-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	22.1	21.8	18.8
	b. 15-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	20.2	19.2	16.7
	c. 20-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	18.9	17.5	15.3
6	a. 10-bushel hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	34.8	37.8	29.9
	b. 15-bushel hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	30.3	31.6	24.2
	c. 20-bushel hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	26.7	26.4	19.8
7	a. 10-bushel mature females Sept-Dec, no mature females Jan-May	20.6	19.4	17.1
	b. 15-bushel mature females Sept-Dec, no mature females Jan-May	17.6	15.1	13.9
	c. 20-bushel mature females Sept-Dec, no mature females Jan-May	15.3	12.0	11.6
8	**a. 10-bushel mature females June-Dec, no mature females Jan-May (DMF Recommendation)**	**25.0**	**23.1**	**21.7**
	b. 15-bushel mature females June-Dec, no mature females Jan-May	19.8	17.2	16.4
	c. 20-bushel mature females June-Dec, no mature females Jan-May	16.5	13.2	13.0

Division of Marine Fisheries Recommendations

Current management of the North Carolina Blue Crab fishery recognizes the conservation value of protecting mature female crabs by prohibiting harvest of dark sponge crabs from April 1-30 and by establishing crab spawning sanctuaries (CSS) at all coastal inlets. The purpose of the CSS is to protect mature females in these areas prior to and during the spawning season, though limited sanctuary size and other factors limit their effectiveness. Season closures and life stage harvest limits can be used to enhance the effectiveness of the existing CSS by providing broader protections.

The comprehensive Blue Crab management program in Chesapeake Bay is focused on protecting mature female Blue Crabs. Virginia has implemented extensive Blue Crab spawning sanctuaries where the harvest of Blue Crab is seasonally prohibited, and Maryland has implemented seasonal bushel limits for mature female crabs. Preferentially protecting mature female Blue Crabs in the Chesapeake Bay allowed for recovery of the Blue Crab stock from low levels in the 2000's while allowing for consistent commercial harvest. While the Chesapeake Bay Blue Crab stock has declined recently, it is not depleted, and overfishing is not occurring, though continued protection of mature females as well as immature Blue Crabs has been recommended.

Given these considerations, the DMF recommends management measures focus on limiting harvest of Blue Crabs during biologically important times of year (e.g., mating and spawning seasons), and specifically limiting harvest of mature females. Only management measures projected to rebuild spawner abundance to a higher level with a much higher probability of success are considered (Table 1).

In consideration of Blue Crab life history and Blue Crab fishery the **DMF initially recommends Option 8.a, a 10-bushel limit for mature female Blue Crabs from June-December and no harvest of mature female Blue Crabs from January-May** (Table 2b). The DMF also recommends maintaining existing season closures and all other Blue Crab management measures currently in place. In combination, these management measures would effectively reduce harvest by an estimated 21.7 percent compared to average landings from 2019-2023, which should increase the spawning stock biomass, and promote increased recruitment.