North Carolina Blue Crab Fishery Management Plan Amendment 3 Adaptive Management Options

ISSUE

Implement management measures through the Blue Crab Fishery Management Plan (FMP) Amendment 3 adaptive management framework to end overfishing and achieve sustainable harvest in the North Carolina blue crab fishery.

ORIGINATION

Amendment 3 to the North Carolina Blue Crab Fishery Management Plan.

BACKGROUND

As part of Amendment 3 to the North Carolina Blue Crab FMP (NCDMF 2020), a benchmark stock assessment (NCDMF 2018) was conducted using data from 1995–2016. Assessment results indicated the blue crab stock was overfished and overfishing was occurring in 2016. North Carolina General Statute 113–182.1 states that fishery management plans shall: 1) specify a time period not to exceed two years from the date of adoption of the plan to end overfishing, 2) specify a time period not to exceed 10 years from the date of adoption of the plan for achieving sustainable harvest, and 3) must also include a standard of at least 50% probability of achieving sustainable harvest for the fishery. Sustainable harvest is defined in North Carolina General Statute 113–129 as "the amount of fish that can be taken from a fishery on a continuing basis without reducing the stock biomass of the fishery or causing the fishery to become overfished". A minimum commercial harvest reduction of 0.4% (in numbers of crabs) was projected to end overfishing and a minimum commercial 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).

The North Carolina Marine Fisheries Commission (MFC) adopted Amendment 3 to the Blue Crab FMP in February 2020 to rebuild the blue crab stock, and all Amendment 3 management measures have been in place since January 2021. Prior to adoption, the Division of Marine Fisheries (DMF) recommended that, at a minimum, the MFC should adopt a commercial harvest reduction of 2.2% (50% probability of success) but encouraged the MFC to consider a further reduction to at least 5.9% (90% probability of success). Further, the DMF encouraged the MFC to adopt a management strategy that included a prohibition on immature female hard crab harvest (established in 2016 Revision; NCDMF 2016), a 5-inch minimum size limit for mature females, and a continuous closure period resulting in a reduction of at least 4.6% to make up the remainder of the preferred reduction. A comprehensive list of Amendment 3 sustainable harvest options can be found in Table 4.1.12 and Table 4.1.14 of Amendment 3.

Table 1. Catch reduction projections for varying levels of fishing mortality (*F*), based on 2016 stock assessment data, and the probability of achieving sustainable harvest within the 10-year rebuilding period defined in statute. Bolded row indicates minimum requirement defined in statute.

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	

The MFC adopted Amendment 3 with the following management strategies to end overfishing and achieve sustainable harvest in the blue crab fishery:

- North of the Highway 58 Bridge: January 1 through January 31 blue crab harvest closure.
- South of the Highway 58 Bridge: March 1 through March 15 blue crab harvest closure.
- A 5-inch minimum size limit for mature female crabs statewide.
- Align the pot closure period with the regional season closures and remain closed in entirety (cannot be reopened early).
- Maintain the prohibition on harvest of immature female hard crabs statewide established in the 2016 Revision to Amendment 2.
- Maintain the 5% cull tolerance established in the 2016 Revision to Amendment 2.
- Adopt an adaptive management framework that allows measures to be relaxed if the assessment update indicated the stock was not overfished and overfishing was not occurring and recommends updating the stock assessment once 2019 data are available.

The adopted management provided an estimated 2.4% harvest reduction with a 50% probability of achieving sustainable harvest. This reduction was slightly over 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 also maintained all measures implemented by the May 2016 Revision to the Blue Crab FMP (NCDMF 2016). 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.

Amendment 3 Adaptive Management

In addition to management strategies to reduce harvest, Amendment 3 also includes the following adaptive management framework:

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 (Figure 1), coupled with continued low abundance of all blue crab life stages (Figures 2 and 3) based on fishery-independent sampling (e.g., male and female juveniles, male and female adults, mature females) through 2024.

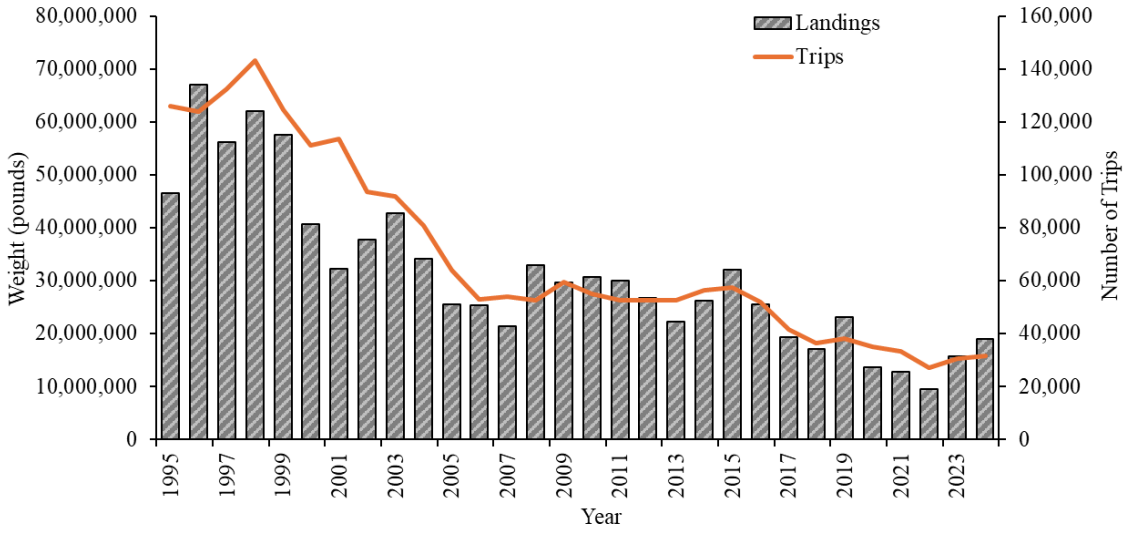

Figure 1. Annual blue crab commercial landings compared to number of trips recorded, 1995–2024. Landings include hard, soft, and peeler crabs. (Data sourced from the DMF Trip Ticket Program)

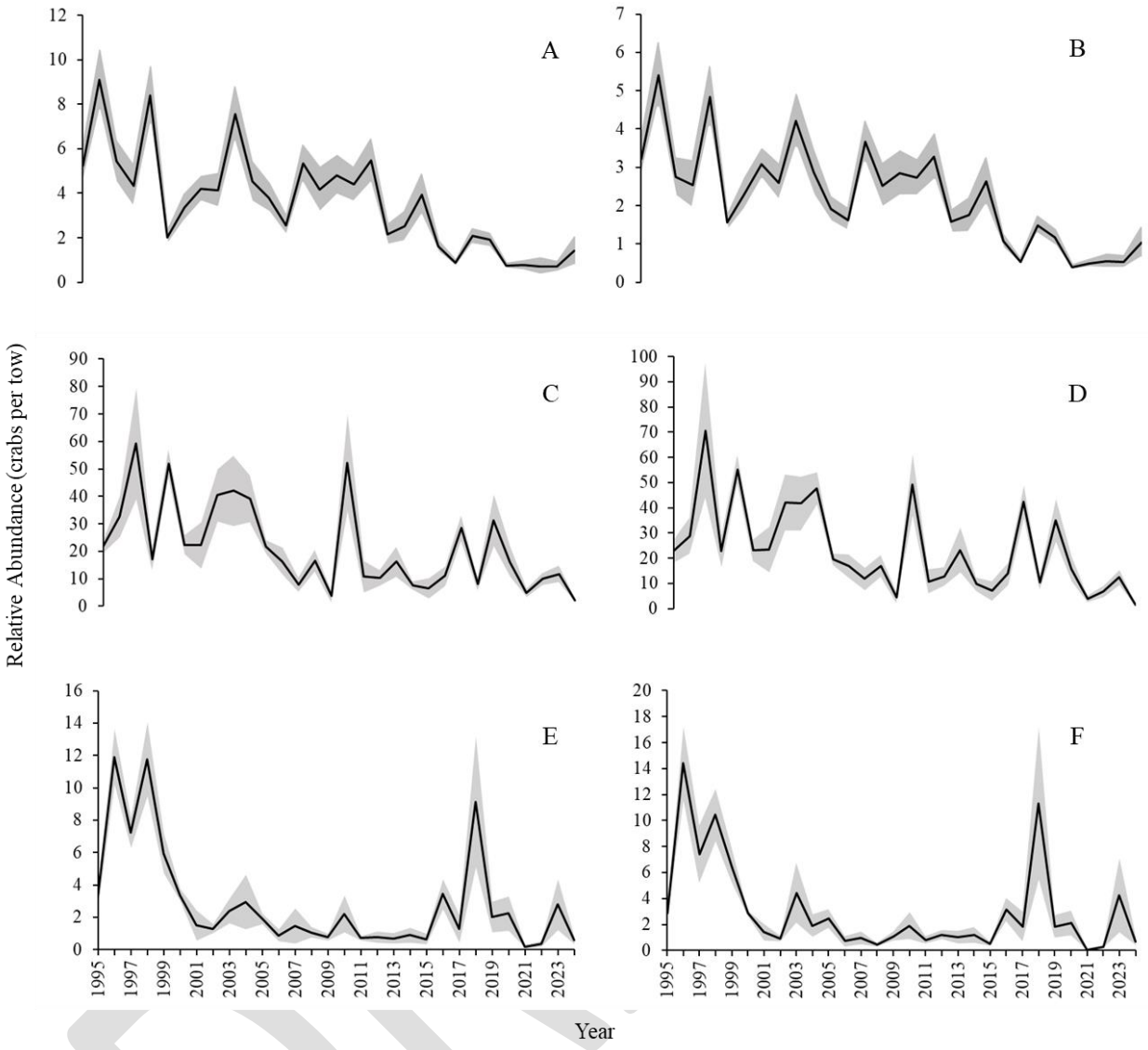

Figure 2. Relative abundance of recruit crabs (<127 mm, 5 inches Carapace Width, CW) from DMF independent sampling programs, Program 120 and Program 195, 1995–2024. (A) is Program 120 males, (B) is Program 120 females, (C) is June Program 195 males, (D) is June Program 195 females, (E) is September Program 195 males, (F) is September Program 195 females. Note differences in Y-axis scales.

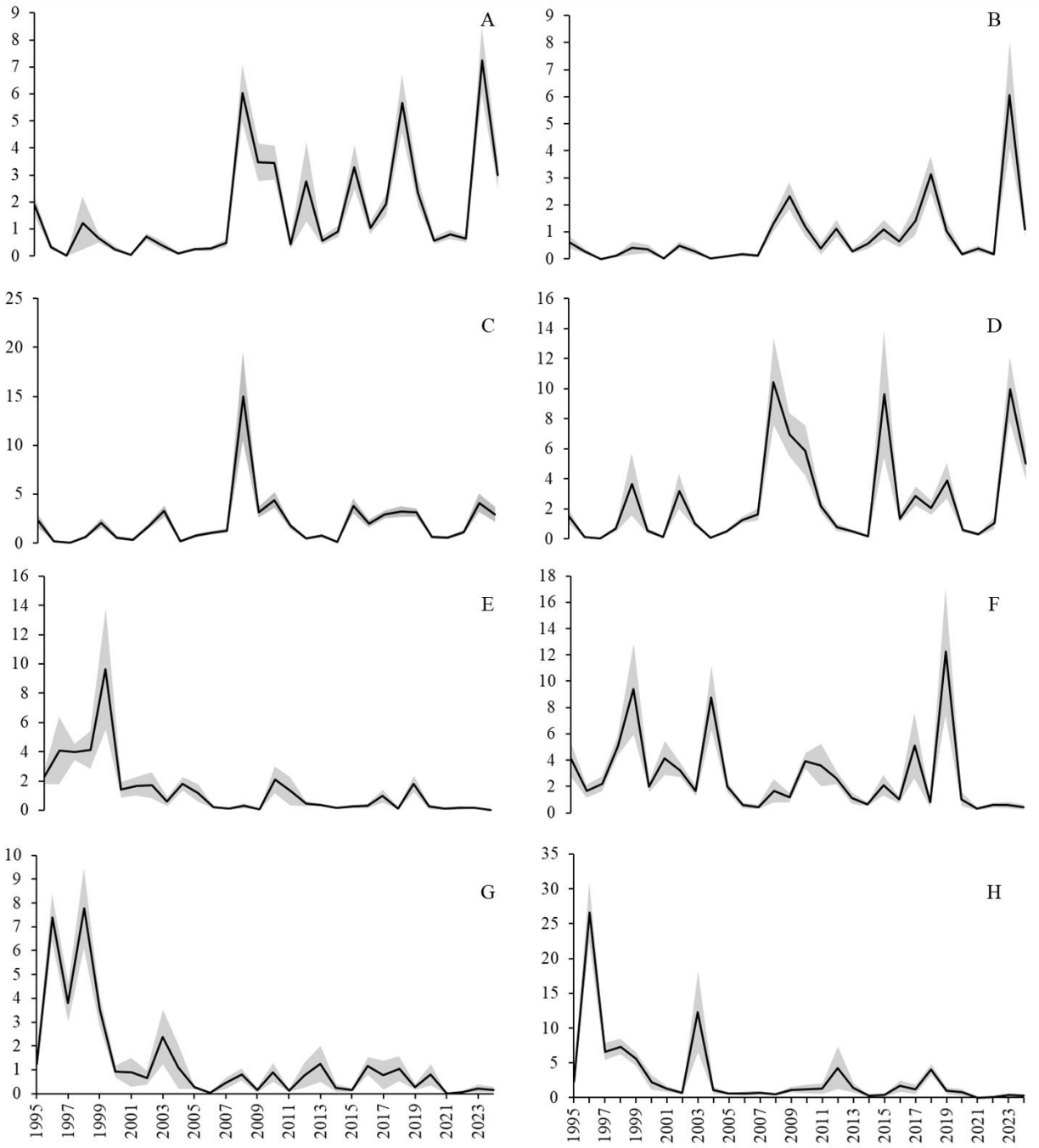

Figure 3 Relative abundance of fully recruited crabs (≥127 mm, 5 inches, Carapace Width, CW) from DMF independent sampling programs, Program 100 and Program 195, 1995–2024. (A) is Program 100 summer males, (B) is Program 100 summer females, (C) is Program 100 fall males, (D) is Program 100 fall females, (E) is Program 195 June males, (F) is Program 195 June females, (G) is Program 195 September males, and (H) is Program 195 September females. Note differences in Y-axis scales.

In response to stock concerns expressed by commercial crabbers and continued poor trends in abundance since adoption of Amendment 3, the DMF updated the stock assessment with data through 2022, adding six years of data to the benchmark assessment. As an assessment update, there were no changes to model parameters. Results of the update indicated the magnitude and trends for estimated recruitment, female spawner abundance, and fishing mortality were similar to the benchmark assessment (Figure 4); however, the

Maximum Sustainable Yield (MSY) based reference points used to determine stock status for both female spawner abundance and fishing mortality both drastically changed (Figure 5).

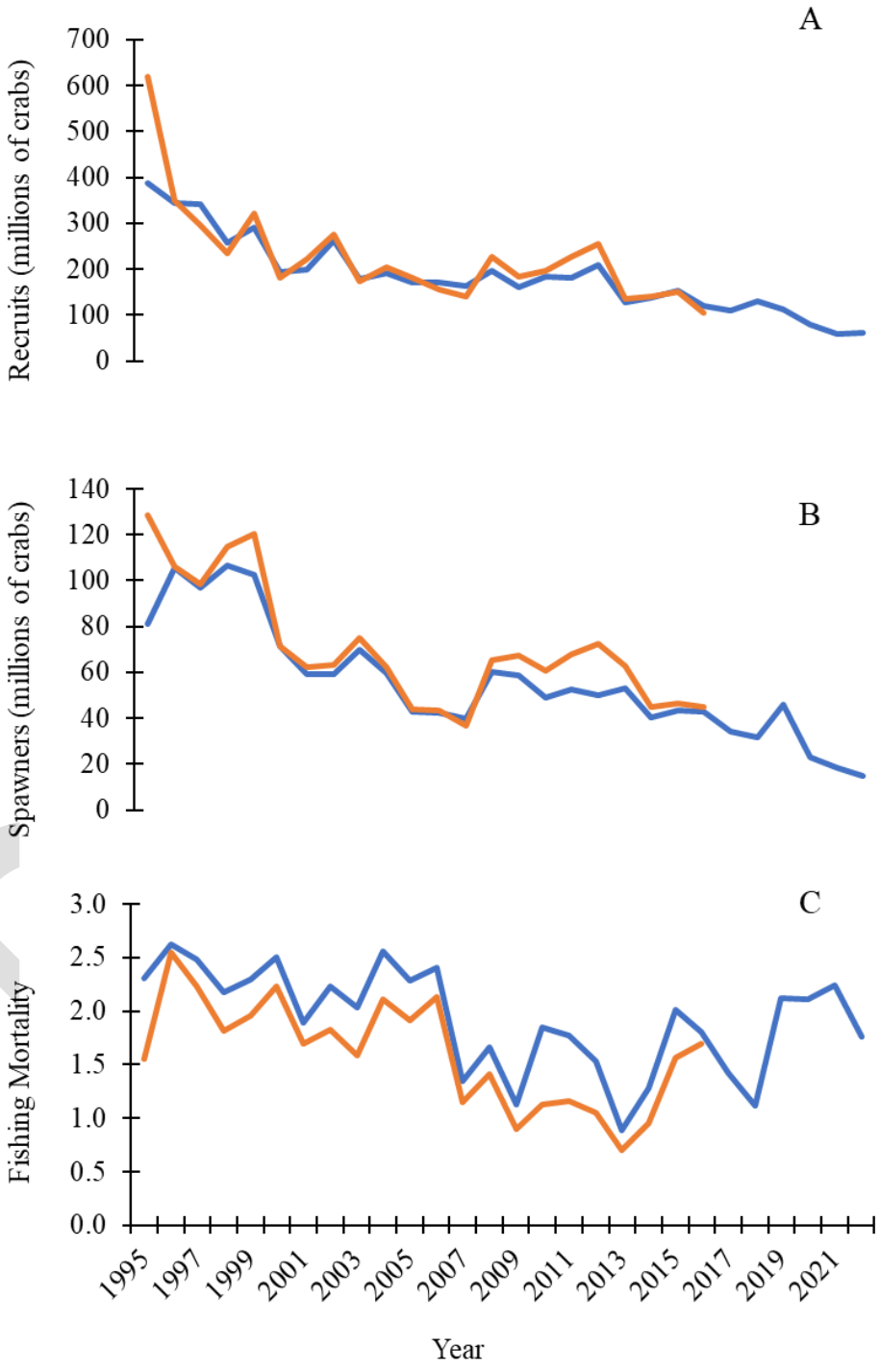

Figure 4. Comparison of estimates of (A) total recruitment, (B) female spawner abundance, and (C) fishing mortality between the 2023 stock assessment update (blue line) and the 2018 benchmark stock assessment (orange line).

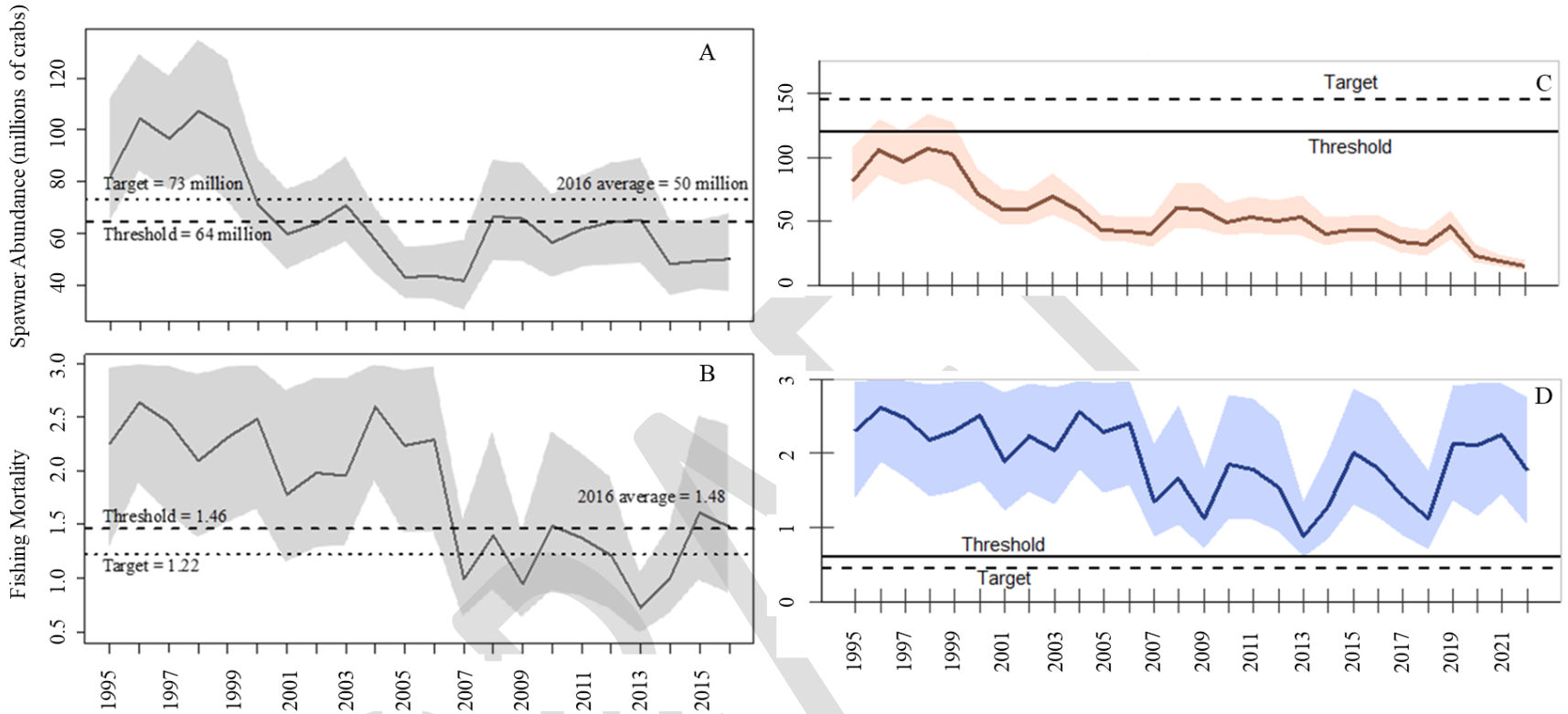

Figure 5. Annual estimates of (A) mature female spawner abundance and (B) fishing mortality relative to associated reference points from the 2018 benchmark stock assessment. Annual estimates of (C) mature female spawner abundance and (D) fishing mortality relative to associated reference points from the 2023 stock assessment update.

Due to the magnitude of the change in reference points, the DMF requested an external review of the assessment update, which was completed in late December 2023 (Appendix 1). Reviewers identified concerns with model specifications and results and 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 recommended against using results of the 2023 stock assessment update to inform management. Model specification issues in the update do not invalidate the benchmark stock assessment or the data sources used in the benchmark or the updated model.

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 (SCDNR 2023). 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. Beginning July 2025, South Carolina began requiring a limited commercial blue crab license to commercially harvest blue crabs in addition to a commercial saltwater license and a blue crab trap license. South Carolina also capped the number of traps an individual can use based on the number of traps an individual was licensed in previous years (Appendix 2). Concerns for the Chesapeake Bay blue crab stock have also persisted (Garvey 2025). 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. In addition, because the conservation trigger for male harvest has been exceeded several times, consideration of management to protect male crabs has been recommended.

Adaptive Management

While an updated stock assessment is not currently available to inform stock status, there is little evidence 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 level above the spawner abundance threshold 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.

AUTHORITY

North Carolina General Statutes
G.S. 113–134 RULES
G.S. 113–182 REGULATIONS 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

North Carolina Marine Fisheries Commission Rules
15A NCAC 03L .0201 CRAB HARVEST RESTRICTIONS
15A NCAC 03H .0103 PROCLAMATIONS, GENERAL

DISCUSSION

Even without an updated stock assessment there is little evidence overfishing has ended, or sustainability objectives of Amendment 3 will be met with the current management strategy as stock indicator data show long-term decline in all blue crab life stages and both sexes. In consideration of blue crab life history, blue crab fishery characteristics, and concerning trends in stock indicator data from fisheries-independent sampling management changes must be considered. While observed declines may not be entirely the result of fishing (Voigt et al. 2025), maintaining the spawning stock through management changes may be important to prevent further stock decline.

Management measures specific to recreational harvest and commercial peeler and soft blue crab harvest are not included in this discussion because the needed harvest reductions relate specifically to the hard blue crab fishery. The discussion includes quantifiable management measures projected to meet the necessary harvest reductions to end overfishing within two years and achieve sustainable harvest within 10 years with at least a 50% probability of success based on the terminal year of the stock assessment (2016). Amendment 3 is statutorily required to end overfishing of the blue crab stock by May 2022 and achieve sustainable harvest by May 2030. 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 considered. This revision includes management options projected to reduce *F* closer to the *F* target and rebuild the spawning stock closer to the spawner abundance target with greater than 50% probability of success (Table 1).

Several management tools are immediately available to increase the probability of achieving sustainable harvest by promoting increased recruitment and adult abundance. These include size limit changes, season and life stage closures, trip/bushel limits, or some combination of these measures.

The Amendment 3 adaptive management framework states "any quantifiable management measure…with the ability to achieve sustainable harvest (as defined in the stock assessment), either on its own or in combination, may be considered". Therefore, management measures where harvest reductions cannot be quantified such as gear modifications, and area closures are not discussed.

Unless otherwise specified all Amendment 3 management strategies will remain in place. These management strategies include but are not limited to the following:

Commercial

- 5-inch minimum size limit on male and mature female crabs
- No size limit on peeler crabs
- No possession of immature crabs
- No possession of dark sponge crabs April 1–30
- 5% cull tolerance
- Season closures (pot closure periods)
    - January 1–31 north of the Highway 58 bridge to Emerald Isle
    - March 1–15 south of the Highway 58 bridge to Emerald Isle
- Possession of blue crabs prohibited during season closures

Recreational

- Equivalent to commercial regulations
- Bag limit 50 crabs/day not to exceed 100 crabs/vessel/day

Economic Impact

Data from the NC TTP was used to determine the economic value and contribution of the commercial blue crab fishery. Economic contribution estimates represent the fishing activity of blue crab harvesters, dealers, and processors and are calculated using the DMF commercial fishing economic impact model (NCDMF 2024). These estimates are produced by market grade, which consists of hard crab, peeler crab, and soft crab. Estimates span the years 2014–2024.

Economic contribution estimates are calculated using ex-vessel value and participation counts. Ex-vessel value is the estimated dollar value of commercial harvest during the original transfer of a seafood product from the harvester to the dealer (NCDMF 2024). Some participants in the blue crab fishery may participate in other fisheries either independently or during the same trip. Output measures are not additive and may be over-estimating total contributions while still capturing the relative socioeconomic importance of the blue crab fisheries by market grade to North Carolina's economy.
The economic contribution of the commercial blue crab fishery is the highest of any commercial fishery in the state. The hard crab fishery has the highest contribution at over sixty million dollars in sales impact in 2024 (Table 2). In 2024 the blue crab fishery was the highest ranked fishery by ex-vessel value boasting 34% of total ex-vessel value, which is the highest percent of total ex-vessel value in the reported time frame (Figure 6).

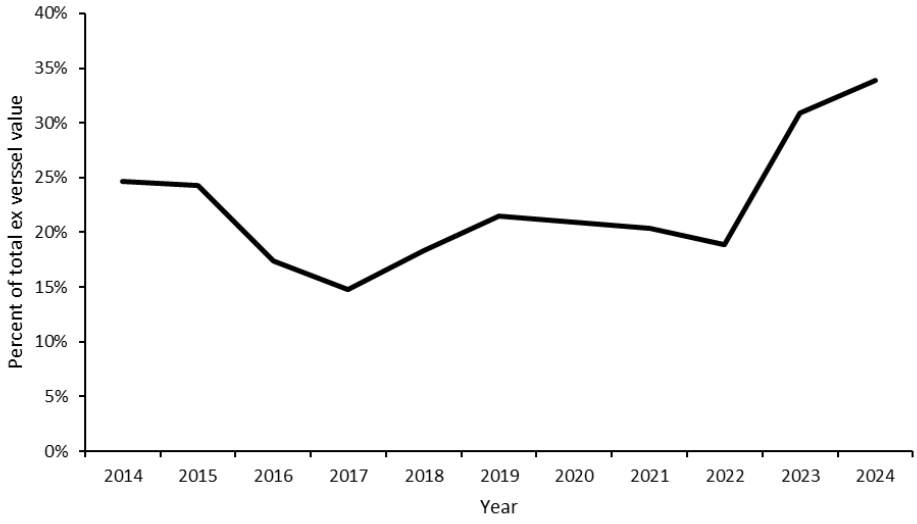

Figure 6. Commercial blue crab fishery value as a percentage of total ex-vessel value, 2014–2024. All data provided by the DMF Trip Ticket Program.

Table 2. Economic contribution of the hard crab fishery, peeler crab fishery, and soft crab fishery in 2023 dollars, 2014–2024.

Year	Pounds landed	Ex-vessel value ($)	Job impacts	Income impacts ($)	Value Added impacts ($)	Sales impacts ($)
			Hard blue crab			
2024	18,713,280	26,048,087	1,314	$28,245,903	$58,877,293	$61,633,254
2023	15,307,436	18,185,103	1,196	$23,131,071	$45,969,039	$50,867,437
2022	9,088,826	13,476,343	1,153	20,751,181	39,220,013	45,994,603
2021	12,052,138	20,553,734	1,398	31,036,700	55,161,991	70,315,728
2020	13,109,488	19,093,928	1,342	28,973,393	55,982,186	62,824,715
2019	22,377,971	22,221,353	1,705	38,130,806	60,813,677	89,355,961
2018	16,412,897	17,298,274	1,390	27,117,159	51,512,951	60,024,348
2017	18,059,855	17,767,075	1,514	30,668,395	50,993,565	70,099,109
2016	24,732,243	20,738,636	1,790	35,058,368	62,547,925	78,578,971
2015	31,019,406	29,607,419	2,170	49,541,126	89,166,922	110,372,047
2014	25,242,795	29,954,723	2,312	52,327,474	87,470,082	119,842,262
			Peeler blue crab			
2024	283,951	1,292,255	300	1,798,211	3,435,371	3,982,917
2023	313,905	1,038,757	298	1,555,246	2,929,303	3,451,522
2022	289,075	956,518	298	1,472,868	2,783,741	3,264,585
2021	531,179	1,644,073	367	2,482,595	4,412,354	5,624,486
2020	314,723	807,743	345	1,225,681	2,368,252	2,657,716
2019	465,091	1,247,065	406	2,128,129	3,395,389	4,992,667
2018	368,259	857,909	411	1,344,878	2,554,789	2,976,912
2017	776,161	1,649,472	460	2,847,214	4,734,176	6,507,909
2016	445,932	1,315,141	536	2,223,228	3,966,479	4,983,088
2015	704,354	2,099,220	625	3,512,556	6,322,097	7,825,580
2014	621,040	1,935,462	626	3,584,983	6,044,800	8,234,000
			Soft blue crab			
2024	83,633	938,568	219	2,239,625	3,675,947	4,646,463
2023	71,648	765,540	207	1,630,534	2,786,546	3,6722,642
2022	131,341	1,210,514	207	1,863,978	3,522,943	4,131,471
2021	236,523	1,753,965	218	2,648,535	4,707,281	6,000,434
2020	124,170	765,587	181	1,165,078	2,250,770	2,530,023
2019	183,946	1,199,842	217	2,058,874	3,283,636	4,824,776
2018	234,503	1,501,315	233	2,353,495	4,470,803	5,209,506
2017	427,742	2,791,960	330	4,819,305	8,013,250	11,015,540
2016	284,768	2,062,996	329	3,487,466	6,222,016	7,816,720
2015	375,874	2,221,331	338	3,716,881	6,689,852	8,280,791
2014	367,277	2,137,335	361	3,733,680	6,241,182	8,551,008

As is the case in many commercial fisheries in North Carolina, there has been a general decline in participants, ex-vessel value, trips, and landings in the last thirty years (NCDMF 2024). In the blue crab fishery, there has been an increase in ex-vessel value per participant over the same period. These trends could indicate there is

a quicker decline in participants than value, there is consolidation of fishing effort, and/or improved technology has allowed for more efficient fishing practices. Across the blue crab fisheries, the largest increase in value per participant from 2014–2024 was for hard blue crabs.

Value of the blue crab fishery varies throughout the year (Figure 7).

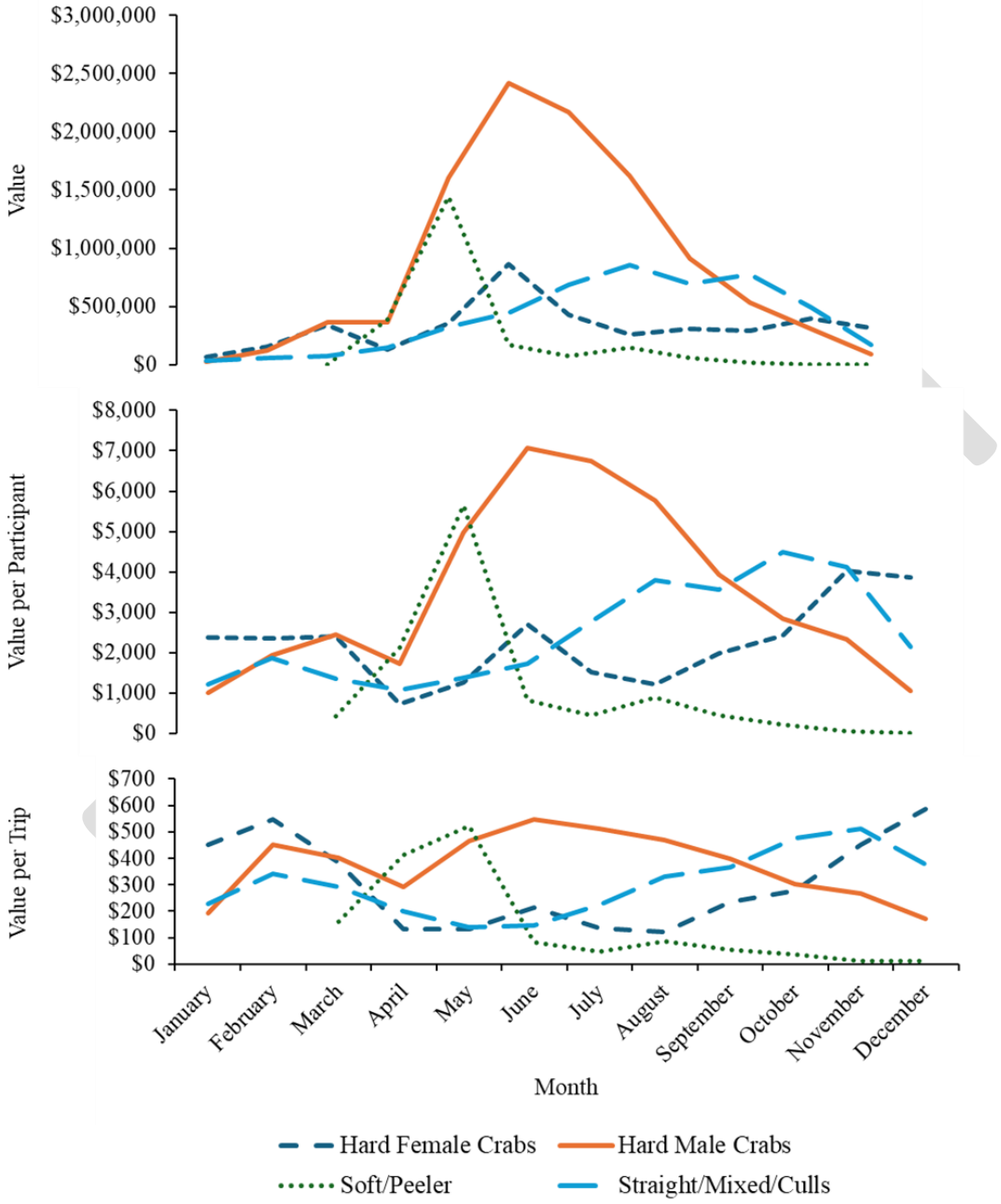

Figure 7. Ex-vessel value per participant by month (A), ex-vessel value per trip by month (B), Ex-vessel value by month (C), averaged from 2014–2024. Note differences in Y-axis.

May has the highest ex-vessel value, and value per participant for the soft and peeler crab fisheries. The highest ex-vessel value, and value per participant for the hard blue crab fishery occurs in June, July and August. Management changes that limit blue crab harvest may decrease ex-vessel value. However, effort and supply are not easily projected and, therefore, the response of blue crab prices to management are unknown.

MANAGEMENT STRATEGIES

Size Limits

Size limits are used to rebuild or protect a portion of the 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; maturity stage of male blue crabs cannot be differentiated visually).

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. Advantages and disadvantages of increasing minimum size limits or establishing maximum size limits are briefly discussed below.

Increase Minimum Size Limit

Minimum size limits are implemented so some portion of the stock can spawn at least once before being harvested; they are uncomplicated and easily enforced. In addition, increasing minimum size limits ensures smaller, less valuable crabs are left to grow and contribute to the population, potentially leading to higher overall yield and economic value. Increasing minimum size limits may help reduce the number of "lay days," where commercial crabbers stop fishing due to an oversupply of low-value crabs in the market, promoting a more stable and predictable fishery. Changes to minimum size limits can be applied evenly statewide or tailored to specific regions, providing flexibility to adapt to region specific fishery and stock characteristics.

Increasing minimum size limits for blue crabs also presents challenges. Crabbers will face increased culling effort, requiring more time and resources to sort crabs leading to added labor costs or costs to install larger cull rings. Updated measuring tools will be needed by law enforcement and the time it takes for their construction, verification and distribution can be prohibitive if management is enacted quickly. In addition, the intended harvest reduction may not be met if harvest is delayed, as undersize crabs quickly reach legal size and become susceptible to harvest. Finally, region specific stock characteristics will create uneven reductions across different areas that will create inequity and impact market prices leading to economic uncertainty for crabbers.

Establish a Maximum Size Limit

Maximum size limits allow for flexibility to adapt to region specific fishery and stock characteristics; they are uncomplicated and easily enforced. Protecting the largest crabs preserves the portion of the spawning stock that survives past the legal maximum size, potentially providing greater reproductive potential to the stock, which is crucial for long-term sustainability. Unlike minimum size limits, maximum size limits do not have the same concerns of delayed harvest not resulting in actual harvest reductions.

While seemingly straightforward, there are drawbacks to implementing maximum size limits for blue crab. Because cull ring changes are unlikely to exclude larger crabs, maximum size limits are likely to increase the time and effort required for crabbers to cull their catch, as oversized crabs will need to be identified and released. This strategy will be particularly burdensome during periods of high catch volume if the catch includes crabs from many size classes. Enforcement may also be complicated by the time it takes to manufacture, validate, and distribute new measuring devices to law enforcement officers. It is important to note that increasing maximum size limits alone will have minimal impact on overall harvest reductions. To achieve significant conservation benefits, this strategy would likely need to be combined with other

management measures, such as minimum size limits (creating a slot limit), gear restrictions, and/or seasonal closures to prevent overharvest of crabs under the maximum size limit. Maximum size limits are likely to be unpopular with crabbers because larger crabs are often the most valuable.

Seasonal female maximum size limits have been implemented for the N.C. blue crab fishery in the past through adaptive management action. However, compliance was marginal and largely ineffective at protecting large mature females. Even when the size limit was complied with, released females may have been captured multiple times and injured, or ultimately harvested after the seasonal maximum size limit was removed.

Prohibit Crab Trawling

Crab trawling in North Carolina primarily occurs in the late winter and early spring with catches composed primarily of female crabs prior to the spawning season (~80% based on fishery-dependent sampling). For example, of 382,495 pounds of blue crab harvested by trawls in 2024, an estimated 305,996 pounds were female crabs (Table 3). Prohibiting crab trawling would protect female crabs during a critical time of year, increasing the spawning stock biomass to promote increased recruitment.

Although crab trawling makes up a small portion of the total harvest (2.0% in 2024; 0.7% from 2019–2024), recent growth could become a threat to the crab stock over time (Table 3). Prohibiting crab trawling is simple to enforce and would eliminate conflicts between fishermen using crab trawls and those using crab pots.

Table 3. Total blue crab landings (pounds; hard, soft, peeler crabs), blue crab landings from crab trawls, estimated landings of female crabs from trawls, and percent of total landings from crab trawls, 2019–2024.

Year	Total landings	Crab trawl landings	Female crab landings from trawls	% Trawl landings
2019	23,027,008	76,759	61,407	0.3%
2020	13,548,381	82,505	66,004	0.6%
2021	12,819,840	23,617	18,894	0.2%
2022	9,509,242	21,447	17,158	0.2%
2023	15,738,994	87,488	69,990	0.6%
2024	18,943,488	382,495	305,996	2.0%
Total	93,724,448	674,311	539,449	0.7%

Because crab trawls accounts for a small part of the total catch, a crab trawl prohibition on its own is unlikely to increase recruitment and the overall crab population but could be effective as part of a more comprehensive management strategy. A year-round, statewide prohibition on crab trawling is Option 1.

Life Stage and Seasonal Closures or Limits

In N.C., blue crab mating peaks in April–June and August–September and occurs in brackish areas of the estuary and lower portions of rivers (Darnell et al. 2009). After mating, females migrate throughout the spawning season to high salinity waters (>10 ppt) near ocean inlets to spawn from early summer to fall (Forward et al. 2003; Hench et al. 2004; Forward et al. 2005; Whitaker 2006; Darnell et al. 2009). Females that mate late in the summer begin migrating toward the closest inlet in late September–October and spawning

occurs the following spring (Medici et al. 2006). These female crabs overwinter in the mud along their migration route or near the inlets. Females that mate in early spring, migrate sooner, rather than waiting for fall (Darnell et al. 2009). Commercial crab sampling indicates sponge crabs (egg bearing females) are most abundant from March through May but are typically present from March through August. Males prefer lower salinity water (3 to 15 ppt) and do not migrate regularly as adults (NCDMF 2008).

Current management of the N.C. blue crab fishery recognizes the conservation value of protecting mature female crabs by establishing crab spawning sanctuaries (CSS) at all coastal inlets (NCDMF 2020). The purpose of the CSS is to protect mature females in these areas prior to and during the spawning season allowing them access to ocean waters to release their fertilized eggs. The CSS are closed to the use of pots, and mechanical methods for oysters or clams and to the taking of blue crabs with any commercial fishing equipment from March 1 through August 31 in areas from Barden Inlet north and from March 1 through October 31 in areas from Beaufort Inlet west and south (NCMFC Rule 15A NCAC 03L .0205). The CSS are also permanently closed to trawling (NCDMF 2022).

Migration distance, tidal regime, harvest effort along the migration route, and the proportion of post-mating mature female crabs protected in the sanctuaries influence the overall success of the sanctuaries. The CSS protect a portion of egg bearing females, but designation of migration corridors or expanded sanctuary boundaries could protect more of the spawning stock (Ballance and Ballance 2004; Ballance 2008; Ballance 2009; Eggleston et al. 2009). Life stage limits or season closures can be used to enhance the efficacy of the existing CSS by providing broader protection for the blue crab stock.

In consideration of Amendment 3 adaptive management framework requirements, existing management, and effectiveness, options for season closures, life-stage closures, bushel/trip limits, and sex-specific bushel/trip limits or combinations of management measures were developed (Tables 7a and 7b). After reviewing all potential strategies, these were identified as the most likely to meet sustainability objectives of Amendment 3 within the legislatively mandated 10-year rebuilding period.

Commercial catch of hard blue crabs begins increasing in May, as crabs become more active and market value increases. Landings peak in August remaining relatively high through November (Figure 8). Early in the year (February–May), catch is low but value is high, largely due to blue crab harvest restrictions during this time of year in other blue crab producing states (see Appendix 2). During the summer (June–August), catch and value is high. Later in the year (primarily after Labor Day), catch is high but value is low as the availability of female crabs increases but markets begin to decline. Limiting harvest early in the year is unlikely to result in large harvest reductions but would offer protection to the blue crab stock during the mating season and prior to spawning. Limiting harvest late in the season would result in higher harvest reductions and provides protection to the stock during part of the mating and spawning seasons.

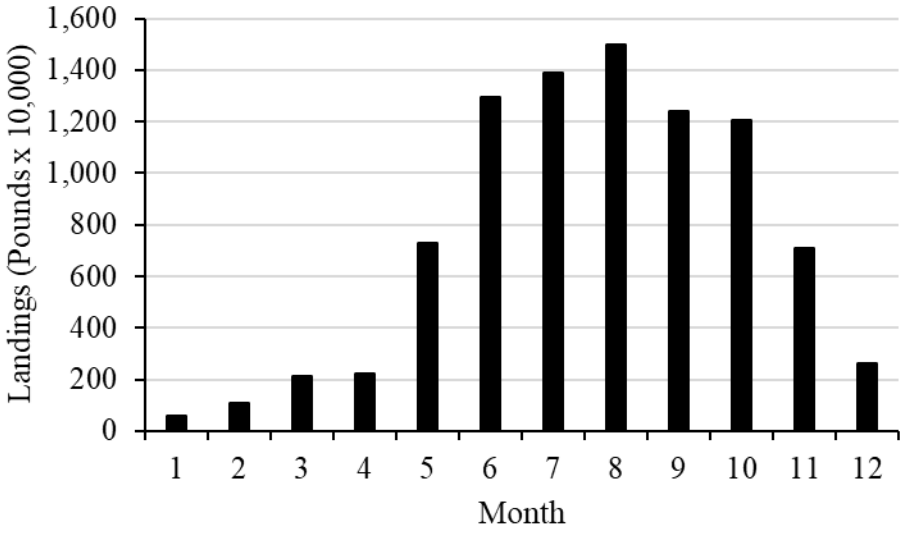

Figure 8. Commercial landings (pounds) of all hard blue crabs by month, 2019–2024.

Prohibit Sponge Crab Harvest

Amendment 3 maintained the prohibition on harvest of dark (brown and black) sponge crabs from April 1–30. Sponge crabs are present year-round; however, they begin to appear in significant numbers in March, peaking in April or May, and persisting at lower levels through the summer as observed in fishery-dependent blue crab harvest sampling programs (Figure 9).

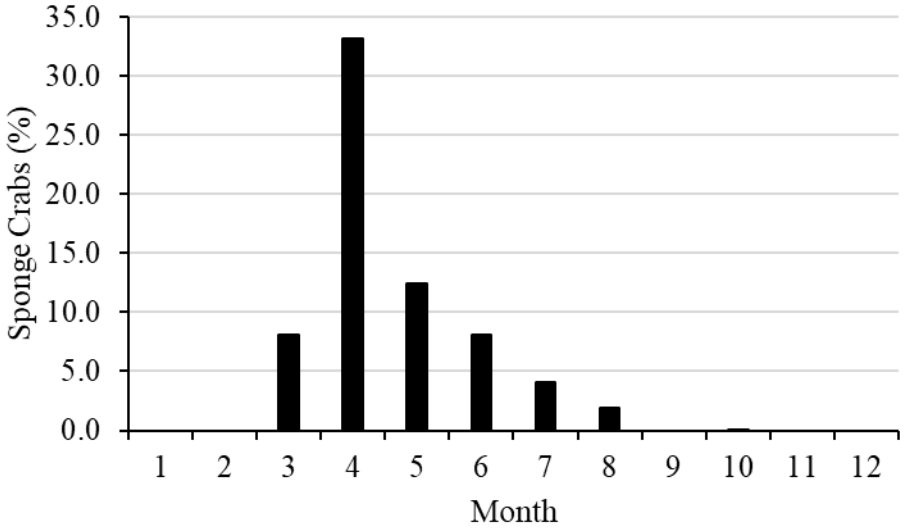

Figure 9. Percentage of commercial female crab samples (Program 436) recorded as sponge crabs by month, 2019–2024 (n = 55,082 total samples; 18,979 recorded as female).

Prohibiting sponge crab harvest year-round would give mature females the opportunity to spawn and possibly spawn more than once prior to being harvested. All east and Gulf coast states have some protections for sponge crabs, including year-round prohibitions on sponge crab harvest in most states (Appendix 2). A sponge crab harvest closure in North Carolina would mostly restrict harvest during the spring and early summer months, would minimally reduce removals from the stock, and potentially increase recruitment.

Fishing gear interactions may negatively affect the spawning potential of female blue crabs even if they are released. Dickinson et al. (2010) reported most sponge crabs caught in pots in the Newport and North rivers of North Carolina had damage to 30-50% of the egg mass. Damage may have been from the gear, capture stress, or interactions with other crabs while in pots. Survival of sponge crabs after pot interactions was not affected by sponge damage; however, the likelihood of crabs producing a second clutch was significantly less if previous sponge damage had occurred (Darnell et al. 2010).

Because sponge presence was not recorded on trip tickets, fishery-dependent data were used to estimate reductions if sponge crab harvest were prohibited. Estimates were developed by applying the percentage of sponge crabs sampled to the landings by month, area, and market grade. However, these data have notable limitations. First trip ticket and fishery-dependent data were not collected at a fine enough scale to estimate sponge crab harvest separately in eastern Pamlico Sound where more female crabs occur and western Pamlico Sound. In addition, blue crab harvest from the ocean was generally low and few fishery-dependent samples were collected from this area making estimating ocean sponge crab harvest difficult.

Based on fishery-dependent sampling, sponge crab harvest occurred from March through August and peaked in April (Table 4). Most sponge crab harvest was from the Pamlico Sound and to a lesser degree southern (south of Core Sound) regions. A year-round, statewide prohibition on sponge crab harvest is estimated to reduce harvest by 1.4% when compared to landings from 2019–2024 (this is Option 2). Based on available data, these reductions would come exclusively from the Pamlico Sound and southern regions of the state.

Table 4. Estimated harvest reduction if sponge crab harvest were prohibited by month and region, 2019–2024. Regions include Albemarle (the sound and its tributaries), Pamlico (the sound and its tributaries), South (areas south of Core Sound), and Ocean waters.

		Estimated harvest reduction				
Month	Estimated sponge landings (pounds)	Albemarle	Pamlico	South	Ocean	Total
January	0	0.0	0.0	0.0	0.0	0.0
February	0	0.0	0.0	0.0	0.0	0.0
March	85,982	0.0	0.1	0.0	0.0	0.1
April	354,420	0.0	0.3	0.1	0.0	0.4
May	281,795	0.0	0.2	0.1	0.0	0.3
June	334,914	0.0	0.3	0.1	0.0	0.4
July	122,926	0.0	0.1	0.0	0.0	0.1
August	45,106	0.0	0.1	0.0	0.0	0.1
September	0	0.0	0.0	0.0	0.0	0.0
October	0	0.0	0.0	0.0	0.0	0.0
November	0	0.0	0.0	0.0	0.0	0.0
December	0	0.0	0.0	0.0	0.0	0.0
Annual	1,225,145	0.0	1.0	0.4	0.0	1.4

Season Closures

A season closure 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 a March 1–15 closure in areas south of the Highway 58 bridge to Emerald Isle. During these times, all pots must be removed from the water.

Because effort can be increased during open periods to offset losses during the closed season, it is best to have seasonal closures lasting a minimum of two weeks. Late season closures tend to be more effective in achieving harvest reductions because there is less opportunity for recoupment. Season closures implemented prior to or during the spawning season may be effective in protecting the spawning stock and promoting recruitment. However, a possible result of season closures is increased discards, particularly in fisheries that land, but do not target blue crabs. Discards may be less of a concern in the blue crab fishery because most blue crab landings occur in the pot fishery, which targets blue crabs.

Unless otherwise stated all options discussed in this paper maintain the current Amendment 3 season closures. Options 5, 6, and 9 (Tables 7a and 7b) replace the existing season closures with a December–March season closure (Option 5) or a December-January closure (Option 6 and 9) in combination with trip/bushel limits during other times of the year.

Life Stage Closures

Amendment 3 maintained the prohibition on harvest of immature female hard blue crabs. 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.

While intended to promote long-term sustainability, life-stage closures can present challenges. Crabbers may experience immediate economic hardship due to reduced fishing opportunities. In addition, life-stage closures will lead to increased culling time on the water. Furthermore, life stage closures specific to females pose the risk of shifting fishing pressure towards male crabs disrupting the population's current sex ratio and are likely disproportionately effect segments of the blue crab fishery that occur in higher salinity area, where female crabs are more common.

Harvest of mature female hard blue crabs begins increasing in May and remains relatively stable throughout the summer before peaking in October (Figure 10). During most of the year (March through August), harvest of mature female hard blue crabs makes up less than 50% of the commercial catch in each month (Figure 11). Beginning in September, harvest of mature female crabs makes up an increasing proportion of the catch peaking in December at over 70% and continuing into January. Options 7, 8, 9, 10 and 11 (Table 7b) prohibit harvest of mature female crabs during specific times of year in combination with harvest limits during other times of the year. Option 7 prohibits harvest of mature females from January–March, Options 8, 10 and 11 prohibit harvest of mature females from January–May, Option 9 prohibits harvest of mature females from February–May.

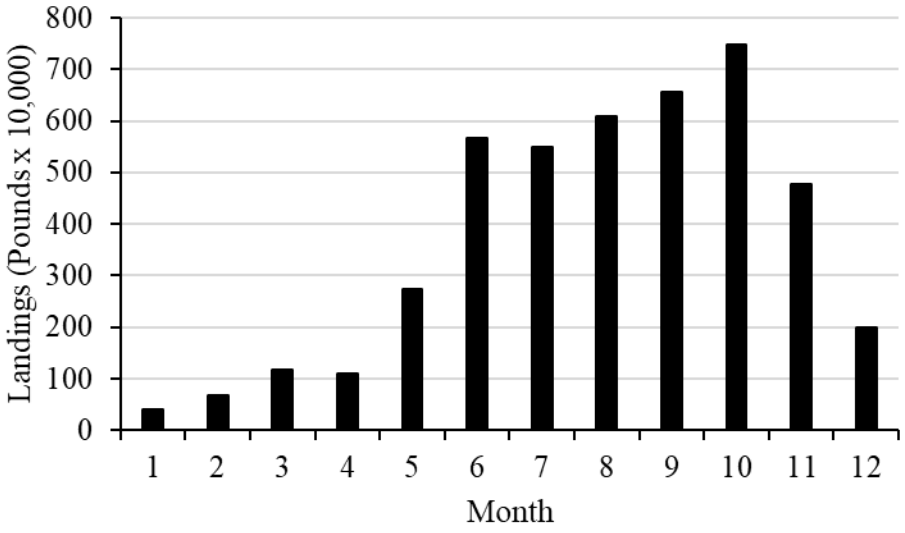

Figure 10. Commercial landings of mature female hard blue crabs by month, 2019–2024.

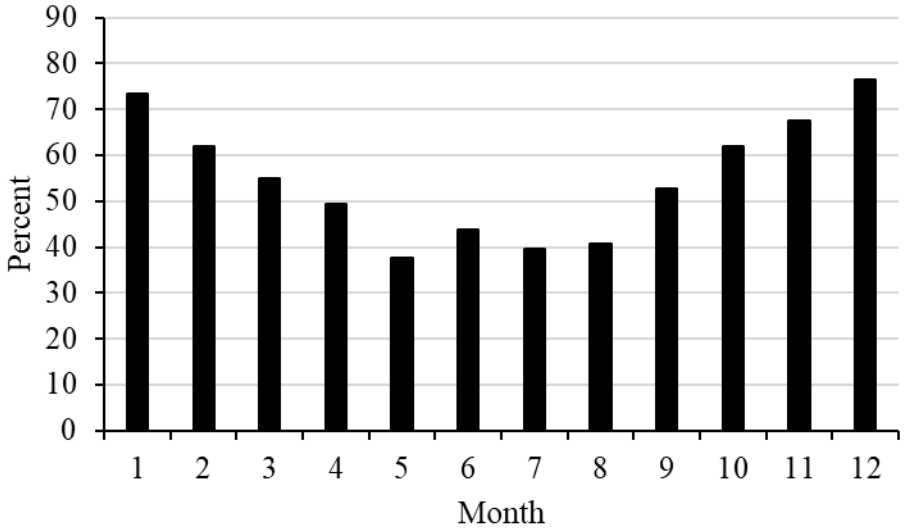

Figure 11. Percent of hard blue crab commercial landings that are mature females in each month, 2019–2024.

Trip/Bushel Limit

Trip or bushel limits for harvesting blue crabs offer several advantages. Trip or bushel limits allow opportunities for crabbers to continue fishing unlike complete season closures. Bushel limits are adaptable; can be implemented seasonally or incrementally accounting for market conditions and stock characteristics to evenly distribute harvest reductions across the fishery. Maryland and Virginia manage blue crab harvest with some form of a trip limit in combination with other measures (e.g., seasons, size limits, gear limits, closed areas; Appendix 2). While the blue crab stock in Chesapeake Bay has declined, the stock is no longer depleted, and overfishing is not occurring like it was throughout most of the 2000's (Garvey 2025). Current management practices, implemented in 2008, aimed at increasing stock size have allowed the Chesapeake Bay blue crab

fishery to consistently land in the range of 40 million pounds, or greater, of blue crab every year since 1990 even as the stock has declined recently.

While bushel limits offer a straightforward approach to managing blue crab harvest, there are drawbacks. One concern is crabbers, driven by high demand and prices, may increase fishing effort (e.g., set more pots, fish more often) beyond pre-regulation levels to meet demand, despite the bushel limit. This could lead to steady or increased pressure on the crab population, even if the daily bushel limits are adhered to. Furthermore, crabbers may fish pots less frequently, holding catch in unfished pots to avoid exceeding the daily bushel limit. Bushel limits will also increase time to sort and cull the catch and lead to discarding of smaller (legal size) and lower value (likely female) crabs, as crabbers prioritize keeping the largest, crabs to maximize the value of their catch within the limit.

A review of TTP data showed that most commercial trips during 2019–2024 landed between one and 15 bushels of hard blue crabs (Table 5). Implementing a hard crab bushel limit of 15 bushels or less would limit harvest while continuing to allow crabbers to operate. Additionally, seasonal bushel limits implemented early or late in the season limit harvest during biologically important periods of the blue crab life cycle, specifically for already mated overwintering females that are first to spawn when temperatures rise in the spring. Limiting harvest of these females will likely contribute to higher recruitment.

Table 5. Percent of commercial trips landing a given number of bushels (bu.) of hard blue crabs per trip by month including the maximum bushels landed per trip, 2019–2024. Includes hard blue crabs landed in pot gear only.

Month	<1	1–5	6–10	11–15	16–20	21–25	26–30	>30	Max bu./trip	# of Trips
January	4%	45%	22%	12%	6%	3%	2%	5%	90	1,559
February	6%	44%	21%	12%	8%	3%	2%	4%	95	2,223
March	9%	48%	21%	10%	5%	3%	1%	2%	204	6,523
April	16%	55%	15%	7%	3%	2%	1%	2%	205	9,372
May	6%	47%	23%	11%	6%	3%	2%	3%	116	21,985
June	3%	37%	23%	14%	9%	5%	3%	5%	208	29,790
July	3%	36%	22%	13%	8%	6%	4%	8%	207	28,942
August	3%	32%	18%	12%	9%	7%	5%	14%	173	24,309
September	2%	30%	18%	12%	9%	7%	5%	17%	290	18,109
October	3%	26%	16%	11%	9%	7%	6%	22%	250	15,253
November	2%	25%	17%	12%	10%	8%	6%	20%	135	9,337
December	4%	38%	20%	12%	8%	6%	4%	9%	155	5,035

Options 3, 4, 5 and 6 implement bushel limits ranging from 10- to 50-bushels on all hard blue crabs year-round (Option 3), from September–December (Option 4), or from September-November (Options 5 and 6; Table 7a). Options 5 and 6 implement seasonal bushel limits in combination with statewide season closures.

Sex-specific Trip/Bushel Limits

Another variation of trip/bushel limits is for the limits to be sex specific, specifically limits for female crabs. Blue crab sex, and maturity stage of female blue crabs is easily differentiated with external examination of the crab (NCDMF 2020). In addition, culling of crabs by sex already occurs in some segments of the blue

crab fishery; harvest of immature female crabs is prohibited and harvest of dark sponge crabs is prohibited from April 1–30, which necessitates onboard culling of specific life stages.

Comprehensive management of the Chesapeake Bay blue crab stock is focused on limiting harvest of 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 (Appendix 2). The blue crab management program in Chesapeake Bay, which preferentially protects mature female blue crabs, has recovered 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 (Garvey 2025).

Sex-specific bushel limits focused on mature female crabs provides a targeted approach to conservation, aiming to protect the reproductive potential of the blue crab population and promoting increased recruitment leading to a healthier more sustainable crab population. This targeted approach may have similar population benefits as more restrictive regulations with the benefit of continuing to allow some blue crab harvest. Sex-specific bushel limits allow greater flexibility in managing the fishery based on blue crab life history, specifically reproductive cycles, and fishery preferences. Because female blue crabs, particularly those carrying eggs, are often less commercially valuable, sex-specific bushel limits may result in less economic impact compared to broader restrictions while still resulting in conservation benefits. An advantage of this strategy is that it does not impact the harvest of peeler crabs since female crabs undergo a terminal molt when they reach maturity, meaning they do not molt again (no longer grow) after this stage, so they have no value as peeler crabs.

Depending on implementation specifics, female bushel limits are likely to distribute the burden of catch reductions unevenly, disproportionately impacting crabbers who primarily target females or those fishing in areas with a higher abundance of female crabs. Because female crabs are primarily found in higher salinity waters near coastal inlets, crabbers fishing on the eastern side of Pamlico Sound and in the southern part of the state (south of Pamlico Sound) are likely to be more affected by mature female bushel limits. This strategy would also severely curtail certain components of the blue crab fishery, specifically the crab trawl fishery, which catches a high volume of mature female crabs prior to the spawning season. This strategy requires additional culling effort, as crabbers sort and release female crabs while fishing, potentially slowing down fishing operations and increasing associated costs. Unless a crate limit is also implemented, crabbers who historically harvest crabs by combining both sexes of crabs together as culls or straights will need to purchase bushel baskets (or other gear dependent on specific management) to accommodate the separation of catch, increasing the overall burden on crabbers and adding to the operation cost. Limiting crab catch during times of historically high harvest will reduce the amount available to picking houses, which are already limited in number, to meet industry demand. As a result, to stay competitive, picking houses will likely need to increase reliance on crabs sourced from out of state.

Most commercial trips landing mature female blue crabs land between one and 10 bushels (Table 6). Implementing a mature female crab bushel limit of 10 bushels or less would limit harvest while allowing harvest of male crabs providing opportunity for crabbers to continue fishing. Additionally, seasonal mature female bushel limits implemented early or late in the season limit harvest during biologically important periods of the blue crab life cycle, specifically during or prior to the mating and spawning seasons. Estimated harvest reductions were calculated for Options 7–11 which include combinations of season closures and mature females limits (Table 7b).

Table 6. Percent of commercial trips landing a given number of bushels (bu.) of mature female hard blue crabs per trip by month including the maximum bushels landed per trip, 2019–2024. Includes mature female hard blue crabs landed in pot gear only.

Month	<1	1–5	6–10	11–15	16–20	21–25	26–30	>30	Max bu./trip	# of Trips
January	12%	52%	21%	7%	3%	2%	1%	2%	69	1,521
February	19%	53%	17%	6%	3%	1%	0%	1%	75	2,037
March	37%	44%	9%	4%	3%	1%	1%	1%	140	6,131
April	47%	38%	7%	3%	2%	1%	1%	1%	200	8,147
May	30%	55%	10%	3%	1%	1%	0%	1%	78	20,022
June	18%	55%	16%	6%	3%	1%	1%	1%	124	28,795
July	19%	55%	13%	6%	3%	2%	1%	1%	202	27,553
August	18%	49%	14%	8%	4%	3%	2%	3%	124	22,653
September	11%	43%	17%	10%	6%	4%	3%	6%	197	17,040
October	9%	36%	16%	10%	7%	6%	5%	11%	122	14,678
November	7%	35%	17%	11%	8%	6%	5%	11%	120	9,123
December	8%	45%	18%	10%	6%	4%	3%	6%	108	4,899

Regional Management

Current blue crab season closures are broken up regionally north and south of the Highway 58 bridge to Emerald Isle. North of the Highway 58 bridge the season is closed January 1–31 and south of the Highway 58 bridge the season is closed March 1–15. Season closures are implemented regionally to account for fishery differences between regions.

In consideration of the discrepancy in landings north and south of the Highway 58 (from 2019–2024 91.8% were from north of the Highway 58 bridge compared to 8.2% south of the bridge) and regional fishery characteristics, Table 8 shows the regional impacts of the reductions for options 3, 4, 5 and 6. Estimated harvest reductions were calculated at the regional level relative to landings within the given region and relative to statewide landings. For example, if a 10-bushel trip limit (Option 3a) were implemented year-round in only the northern area (north of Highway 58 bridge), northern landings would be reduced by an estimated 49.4% relative to the 2019–2024 northern landings (Table 8). However, if Option 3a was only implemented in the northern region, statewide landings would be reduced by an estimated 45.4%. If a year-round 10-bushel trip limit were implemented in the southern area (south of Highway 58 bridge), southern landings would be reduced by an estimated 26.4% relative to the 2019–2024 southern landings. If Option 3a was only implemented in the southern region, statewide landings would be reduced by an estimated 2.2%.

PROPOSED MANAGEMENT OPTIONS

All proposed options aim to balance conservation objectives with needs of the blue crab fishery by considering existing management, blue crab life history, and available information about the blue crab fishery and market value. All options in Tables 7a and 7b are estimated to result in a greater than 2.2% harvest reduction (the minimum to meet sustainable harvest requirement) and options to meet the sustainable harvest target or greater are included (≥19.8% harvest reduction). Options with estimated reductions higher than 12.3% are projected to increase the number of spawners closer to the spawner abundance target, increase the probability of achieving sustainable harvest to 100 percent, and reduce *F* closer to the *F* target (see Table 1).

Trip or bushel limits rather than season closures allow for continued use of the blue crab resource while providing protection for the blue crab stock. Blue crab catch is low early in the year, but value is high, while late in the year catch is high and value is low. In addition, bushel or trip limits specific to mature female crabs, limit harvest of female blue crabs, which are often lower value, while continuing to allow harvest of higher value male crabs.

Management Options

Option 1 – **Prohibit Crab Trawling** (year-round, statewide; estimated 0.7% harvest reduction relative to 2019–2024 landings)

Option 2 – **Prohibit Sponge Crab Harvest** (year-round, statewide; estimated 1.4% harvest reduction relative to 2019–2024 landings)

Options 3 and 4 - **Trip Limits** (see Table 7a for statewide option details and estimated harvest reduction and Table 8 for regional option details and estimated harvest reduction)

Option 5 and 6 - **Trip Limits and Season Closures** (see Table 7a for statewide option details and estimated harvest reduction and Table 8 for regional option details and estimated harvest reduction)

Options 7, 8, 9, 10, and 11 – **Life Stage Specific Trip Limits, and Season Closures** (see Table 7b for option details and estimated harvest reduction)

Table 7a. Estimated percent harvest reductions from season closure and trip limit management options compared to annual commercial hard blue crab landings, 2019-2024. Unless stated otherwise all options are in addition to existing management including season closures and apply statewide. One bushel is estimated to be 40 pounds.

Option #	Measures	2019-2024
3	a. 10-bushel hard crab trip limit year-round	47.6
	b. 15-bushel hard crab trip limit year-round	34.1
	c. 20-bushel hard crab trip limit year-round	24.6
	d. 25-bushel hard crab trip limit year-round	18.0
	e. 30-bushel hard crab trip limit year-round	13.2
	f. 35-bushel hard crab trip limit year-round	9.7
	g. 40-bushel hard crab trip limit year-round	7.1
	h. 45-bushel hard crab trip limit year-round	5.2
	i. 50-bushel hard crab trip limit year-round	3.9
4	a. 10-bushel hard crab trip limit Sept–Dec	22.2
	b. 15-bushel hard crab trip limit Sept–Dec	17.1
	c. 20-bushel hard crab trip limit Sept–Dec	13.1
	d. 25-bushel hard crab trip limit Sept–Dec	10.1
	e. 30-bushel hard crab trip limit Sept–Dec	7.7
	f. 35-bushel hard crab trip limit Sept–Dec	5.9
	g. 40-bushel hard crab trip limit Sept–Dec	4.5
	h. 45-bushel hard crab trip limit Sept–Dec	3.4
	i. 50-bushel hard crab trip limit Sept–Dec	2.5
5	a. 10-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	28.0
	b. 15-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	22.9
	c. 20-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	18.9
	d. 25-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	15.4
	e. 30-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	12.6
	f. 35-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	10.4
	g. 40-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	8.6
	h. 45-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	6.1
	i. 50-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	4.3
6	a. 10-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	24.4
	b. 15-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	19.5
	c. 20-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	15.7
	d. 25-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	12.5
	e. 30-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	10.1
	f. 35-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	8.1
	g. 40-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	6.6
	h. 45-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	4.8
	i. 50-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	3.5

Table 7b. Estimated percent harvest reductions from season closure, trip limit, and mature female season closure and trip limit management options compared to annual commercial hard blue crab landings, 2019-2024. Unless stated otherwise all options are in addition to existing management including season closures and apply statewide. One bushel is estimated to be 40 pounds. *Initial DMF recommendation presented to Northern, Southern, and Shellfish/Crustacean Advisory Committees in March 2025

Option #	Measures	2019-2024
7	a. 10-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	14.9
	b. 15-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	12.8
	c. 20-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-Mar	11.3
8	a. 10-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	19.2
	b. 15-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	17.1
	c. 20-bushel mature females Sept-Oct, 5-bushel mature females Nov-Dec, no mature females Jan-May	15.5
9	a. 10-bushel all hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	30.7
	b. 15-bushel all hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	26.0
	c. 20-bushel all hard crabs limit Sept-Nov, complete closure Dec-Jan, no mature females Feb-May	22.3
10	a. 10-bushel mature females Sept-Dec, no mature females Jan-May	17.7
	b. 15-bushel mature females Sept-Dec, no mature females Jan-May	14.5
	c. 20-bushel mature females Sept-Dec, no mature females Jan-May	12.2
11	a. 10-bushel mature females June-Dec, no mature females Jan-May*	22.5
	b. 15-bushel mature females June-Dec, no mature females Jan-May	17.3
	c. 20-bushel mature females June-Dec, no mature females Jan-May	13.9

Table 8. Region-specific estimated percent harvest reductions from season closure and trip limit management options 3–6 (see Table 7a) compared to annual commercial hard blue crab landings, 2019-2024. The Highway 58 Bridge to Emerald Isle separates the northern and southern regions. For each option and region, estimated percent reductions were calculated relative to landings within the given region and relative to statewide landings. Unless stated otherwise, all options are in addition to existing management including season closures. One bushel is estimated to be 40 pounds. NOTE: Ocean landings and some landings from 2023 and 2024 were excluded from regional calculations because they cannot be assigned as north or south of the Highway 58 Bridge; therefore, reductions will not be equal to reductions in Table 7a. DMF recommendations presented to MFC in November 2025 are bolded and denoted by # for the southern region and * for the northern region.

		Northern landings		Southern landings	
Option #	Measures	Region	Statewide	Region	Statewide
3	a. 10-bushel hard crab trip limit year-round	49.4	45.4	26.4	2.2
	b. 15-bushel hard crab trip limit year-round	35.8	32.9	14.6	1.2
	c. 20-bushel hard crab trip limit year-round	26.1	24.0	8.4	0.7
	d. 25-bushel hard crab trip limit year-round	19.1	17.6	5.3	0.4
	e. 30-bushel hard crab trip limit year-round	14.0	12.9	3.6	0.3
	f. 35-bushel hard crab trip limit year-round	10.3	9.5	2.6	0.2
	g. 40-bushel hard crab trip limit year-round	7.6	6.9	2.0	0.2
	h. 45-bushel hard crab trip limit year-round	5.6	5.1	1.5	0.1
	i. 50-bushel hard crab trip limit year-round	4.1	3.8	1.2	0.1
4	a. 10-bushel hard crab trip limit Sept–Dec	23.3	21.4	9.5	0.8
	b. 15-bushel hard crab trip limit Sept–Dec#	18.2	16.7	**5.4**	**0.4**
	c. 20-bushel hard crab trip limit Sept–Dec	14.1	12.9	3.0	0.2
	d. 25-bushel hard crab trip limit Sept–Dec	10.8	9.9	1.7	0.1
	e. 30-bushel hard crab trip limit Sept–Dec*	**8.3**	**7.6**	1.1	0.1
	f. 35-bushel hard crab trip limit Sept–Dec	6.4	5.8	0.7	0.1
	g. 40-bushel hard crab trip limit Sept–Dec	4.8	4.4	0.6	<0.1
	h. 45-bushel hard crab trip limit Sept–Dec	3.6	3.3	0.5	<0.1
	i. 50-bushel hard crab trip limit Sept–Dec	2.7	2.5	0.4	<0.1

Table 8 continued.

		Northern landings		Southern landings	
		Region	Statewide	Region	Statewide
5	a. 10-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	28.4	26.1	23.0	1.9
	b. 15-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	23.6	21.6	19.9	1.6
	c. 20-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	19.7	18.1	18.0	1.5
	d. 25-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	16.7	15.3	17.1	1.4
	e. 30-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	14.3	13.1	16.7	1.4
	f. 35-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	12.4	11.4	16.5	1.4
	g. 40-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	11.0	10.1	16.4	1.3
	h. 45-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	9.8	9.0	16.3	1.3
	i. 50-bushel hard crab trip limit Sept–Nov, closed Dec–Mar	8.9	8.2	16.3	1.3
6	a. 10-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	24.9	22.9	17.7	1.5
	b. 15-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	20.1	18.5	14.5	1.2
	c. 20-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	16.3	14.9	12.7	1.0
	d. 25-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	13.2	12.1	11.8	1.0
	e. 30-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	10.8	10.0	11.4	0.9
	f. 35-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	9.0	8.2	11.2	0.9
	g. 40-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	7.5	6.9	11.1	0.9
	h. 45-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	6.4	5.8	11.0	0.9
	i. 50-bushel hard crab trip limit Sept–Nov, closed Dec–Jan	5.5	5.0	10.9	0.9

RECOMMENDATION

In consideration of blue crab life history, blue crab fishery characteristics, and concerning trends in stock indicator data from fisheries-independent sampling, the initial DMF recommendation presented to the Northern, Southern and Shellfish/Crustacean Advisory Committees (ACs) in March 2025 was Option 11a (was labeled as Option 8.a when it was presented to the ACs in March 2025), a 10-bushel trip limit for mature females from June–December and no harvest of mature females from January–May. The DMF also recommended all other blue crab management measures, including existing season closures remain in place. In combination, these measures were estimated to reduce harvest by 22.5 percent relative to landings from 2019–2024 (21.7% from 2019–2023 landings, reduction presented to Advisory Committees), which approximates the catch reduction needed to meet the spawner abundance target with 100% probability of success (see Table 1) and promote increased recruitment through protection of females.

The Amendment 3 adaptive management framework requires "consultation" with the Northern, Southern, and Shellfish/Crustacean advisory committees before management changes can be approved by the MFC. To fulfill this requirement, the ACs met the week of March 18–20, 2025 to discuss adaptive management and provide recommendations. DMF staff provided background information and the preliminary DMF recommendation. In addition, DMF staff were available prior to each meeting to answer questions and discuss blue crab science and management with the public.

Key takeaways from all meetings included:

- Concern about the economic impact of the preliminary DMF recommendation
- Concern about how the preliminary recommendation would disproportionately impact certain fishery segments and areas and the need for fair management between regions
- Distrust of stock assessment results and data
- Concern about the effects of water quality and predation on the blue crab stock
- Questions about authority to make management changes without an updated stock assessment
- Landings declines are the result of market conditions and participation declines, not a declining blue crab stock
- The need for cooperation with industry for data collection and formulating management
- Some acknowledgement the stock has declined since the 1990s even if it is not because of fishing
- Some concern about long-term declining trends

Advisory Committee Recommendations

<u>Northern</u>
Motion for the Marine Fisheries Commission to not take final action on Blue Crab Amendment 3 Adaptive Management until August 2025, instead of May 2023 (motion passes 10-0)

Motion for the Marine Fisheries Commission to remain status quo regarding the Blue Crab FMP Amendment 3 Adaptive Management (motion passes 7-2, with 1 abstention)

<u>Southern</u>
Motion to recommend the Marine Fisheries Commission to remain status quo regarding Blue Crab FMP Amendment 3 Adaptive Management and to move the Marine Fisheries Commission action on Blue Crab to the August 2025 meeting (motion passes 6-1, with 1 abstention)

<u>Shellfish/Crustacean</u>
Motion for the Marine Fisheries Commission to not take final action on Blue Crab Amendment 3 Adaptive Management until August 2025, instead of May 2025 (motion passes, 5-0, with 2 abstentions)

Motion to recommend to the Marine Fisheries Commission to remain status quo regarding Blue Crab FMP Amendment 3 (motion passes 4-0, with 3 abstentions)

Final DMF Recommendations

Following the March Advisory Committee meetings, the DMF further evaluated potential management options and stock indicators were updated with data from 2024. The stock indicator trends continue to show long-term decline in all blue crab life stages and both sexes. Even without an updated stock assessment, there is little evidence overfishing has ended, or sustainability objectives of Amendment 3 will be met with the current management strategy. Therefore, the DMF recommends that some action be taken immediately through Amendment 3 Adaptive Management to address continued declines in the stock. In consideration of Advisory Committee recommendations and public comment, the DMF revised the recommendations to reduce harvest to a level that approximates the reduction needed to meet the *F* target (5.9%) and increases the probability of meeting the spawner threshold from 50% (current strategy) to 90% (see Table 1). The final DMF recommendations are as follows:

- Maintain all blue crab management measures including existing season closures.
- **Option 1**, prohibit crab trawling statewide year-round (estimated 0.7% harvest reduction relative to 2019–2024 landings)
- **Option 4e** (North of the Highway 58 Bridge), 30-bushel hard crab trip limit from September–December (estimated 8.3% harvest reduction relative to 2019–2024 northern landings and 7.6% harvest reduction from statewide landings)
- **Option 4b** (South of the Highway 58 Bridge), 15-bushel hard crab trip limit from September – December (estimated 5.4% harvest reduction relative to 2019–2024 southern landings and 0.4% harvest reduction from statewide landings)

These recommendations should be viewed as a first step rather than a comprehensive solution. Recommendations are based on a stock assessment that indicated the stock was overfished and overfishing was occurring but has a terminal year of 2016. Fishery-independent stock indicators suggest stock status has not improved since then. The DMF has begun the process of developing a new benchmark stock assessment which should provide an updated stock status. If the assessment indicates additional management is necessary, it will be important to implement additional measures through adaptive management to ensure stock sustainability. Review of the Blue Crab FMP is scheduled to begin in 2026, at which time comprehensive management will be explored. Until then, Amendment 3 management, including adaptive management and changes made through adaptive management will remain in place.

MFC Selected Management Options

TBD

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October 29, 2025

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Appendix 1

Review Report
for the
2023 Update Stock Assessment
of
Blue Crab in the North Carolina

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Center for Marine Sciences and Technology (CMAST), North Carolina State University

Dr. Yan Li, Lead Analyst for 2018 Stock Assessment

Current Institution: Duke Cancer Institute Biostatistics Shared Resource, Duke University

January 3, 2024

A desk review of the update stock assessment of North Carolina blue crab (*Callinectes sapidus*) was conducted in November-December 2023. The reviewers evaluated the data sources, the model configuration, and model diagnostics. The reviewers also compared the results of this update assessment with those from the 2018 benchmark assessment. The reviewers appreciate all the hard work by the Assessment Team (AT) and are impressed with the quantity and quality of research and analysis conducted by the AT. The reviewers also thank Steve Poland, the Chief of Fisheries Management for providing an assessment report and additional support throughout the review.

Based on the information provided in the assessment report the reviewers believe the AT did an excellent job of summarizing and analyzing a large number of complex data sets that went into the assessment model. However, the reviewers feel the current model results are concerning due to (1) the strong residual pattens in the model fit to survey indices, especially Program 100 indices, (2) the extremely high estimates of fishing mortality over the entire assessment period, and (3) the constantly overfishing/overfished stock status over the entire assessment period. The following report provides detailed comments and recommendations from the reviewers:

1. Strong residual patterns were shown in the model fits to Program 100 indices (i.e., female fully recruit summer index, male fully recruit summer index, female fully recruit fall index, and male fully recruit fall index). Almost all residuals are negative before 2008 and positive afterwards (Figs. 3.6 and 3.7). Also, the model does not fit the high and variable indices after 2007/2008. This indicates potential model misspecifications. These strong residual patterns and lack of fit would undermine the validity and credibility of the overall results and conclusions, and thus, the reviewers strongly recommend resolving this issue before basing any management decisions on this update assessment. The reviewers recommend the following:
    a. Investigate the Program 100, especially any changes before and after 2008 in fisheries management, environmental conditions or fishing behaviors
    b. Consider time-block catchability when fitting these indices, with one catchability before and one after 2008
    c. Reviewers did not find the CVs used for these indices (therefore, not sure about how they were weighted in the model fitting process). Suggest investigating the uncertainty associate with each index and weight them accordingly.
    d. Run a sensitivity analysis with Program 100 indices removed
    e. There are multiple surveys included in the assessment. Given the nature of these surveys (e.g., spatial coverages, survey timing), they may measure different portions of the blue crab population. The reviewers understand that catch rates were standardized using GLM for each index. However, the potential issue of sampling representativeness may remain. Therefore, the reviewers strongly recommend

future studies should explore combining all the survey and develop an integrated single index which may be more representative of the population.

2. The estimated fishing mortality is extremely/unrealistically high (Fig. 4.1). The estimated fishing mortality of the early time period was above 2, which suggests that about 90% of the population was removed by the fishery. The estimated natural mortality had an upper bound as twice as the one in the 2018 benchmark assessment (Fig. 3.32). The reviewers recommend the following:
    a. Compared to the 2018 benchmark assessment, the estimated initial population size was low (Figs. 3.23-3.25). Setting a reasonable prior for the initial population is critical to regulate the overall scale of the estimation of parameters including fishing mortality.

3. The stock status of overfishing and overfished over the entire assessment period seems uncommon and concerning (Fig. 4.1). Addressing the above issues may potentially help resolve this issue.

4. The reviewers finally recommend investigating an integrated seasonal size-structured assessment model, which is often used for crustacean, in future. Such a model can potentially better describe the life history of blue crab and account for seasonality.

Appendix 2

East Coast and Gulf of Mexico blue crab effort regulations by state as of September 2025.

	Harvest restrictions			
State	Season	Catch Limit	Time	Days
New Jersey	Delaware Bay open Apr. 6 – Dec 4 Other Waters open Mar. 15 – Nov. 30	None	Delaware Bay 4am-9pm Other Waters 24-hrs	None
Delaware	Open Mar. 1-Nov 30	None	1 hr. before sunrise-sunset for trotlines	None
Maryland	Males open Apr. 1-Nov 30 Mature female open Apr. 1-June 30	No more than 6 females/bushel/lug or 13 females/barrel of males*	½ hr. before sunrise – 7 ½ hrs. after sunrise	Prohibited either Sun. or Mon.
Virginia	Open Mar. 17-Nov 30 Dark sponge crabs prohibited Mar. 17-June 15**	47 bushels May 16-Oct.31 36 bushels for 425 pot license March 17-May 15 and Nov. 1-Dec. 16 for 425 pot license***	3am-5pm	Prohibited Sunday except peeler pots
North Carolina	No pots Jan. 1–31 in Northern Region No pots March 1–1 5 in Southern Region	None	1 hr. before sunrise- 1hr. after sunset	None
South Carolina	None	None	5am-9pm Apr. 1-Sept 15 6am-7pm Sept 16-Mar.31	None
Georgia	None	None	None	None
Florida	10 day closure for derelict trap removal	200 pounds as bycatch w/ permit (from trawls)	1 hr. before sunrise- 1hr. after sunset	None
Alabama	Periodic derelict trap removal with no set closure period	None	1 hr. before sunrise-sunset	None
Mississippi	Possible 10–30 day closure for abandoned trap removal	None	½ hr. before sunrise – ½ hr. after sunset	None
Louisiana	Possible 14 day closure for abandoned trap removal	None	½ hr. before sunrise – ½ hr. after sunset	None
Texas	No pots Feb. 16–2 5	None	½ hr. before sunrise – ½ hr. after sunset	None

*daily limit varies by license type and season,
**no more than 10 dark sponge crabs per bushel may be possessed from March 17-June 15
***varies by license type (i.e. 85, 127, 170, 255, 425 pot license), sex-specific possession in Potomac River 8-30 bu. (varies by season and license type)

East Coast and Gulf of Mexico blue crab pot gear regulations by state as of September 2025.

State	Gear restrictions				
	Pots (max)	Escape Rings	Degradable Panels	Terrapin Excluders	Buoys
New Jersey	Delaware Bay 600 Other Waters 400	None	Yes	Some areas	Reflective I.D. Sink line
Delaware	200/vessel 500/vessel	None	None	None	I.D. Color coded
Maryland	50 up to 900/vessel w/ 2 crew	1 (2–3 /16”) 1 (2–5 /16”) May close for peelers	None	None But limited pot area	I.D.
Virginia	Chesapeake Bay 85 up to 425 Tributaries and Potomac Tribs. in VA 255 Peeler 210	Seaside Eastern Shore 1 (2–3 /16”) 1 (2–5 /16”) Bay & Tribs. 2 (2–3 /8”) May close for peelers	None	None	I.D.
North Carolina	None Newport River only 150	3 (2–5 /16”)* May be closed in some areas	None	Some areas	I.D. Sink line
South Carolina	200 or highest number of pots fished in 3 previous years	2 (2–3 /8”)*	None	None	I.D. With colors
Georgia	200 including peeler pots	2 (2–3 /8”)*	None	None	I.D. No green
Florida	Inshore 600 Offshore 400 Non-transfer 100 Peeler 400	3 (2–3 /8”) May close for peelers	Yes	None	I.D. Sink line
Alabama	None	2 (2–5 /16”) May be closed for peelers Apr. 1- Oct. 30	None	None	I.D. ½ white Sink line
Mississippi	None	2 (2–3 /8”) Can be closed Apr. 1-Jun. 30 Sept. 1-Oct. 31	None	None	I.D. or Color code Sink line
Louisiana	None	3 (2–3 8/”)* Can be closed Apr. 1-Jun. 30 Sept. 1-Oct. 31	None	None	I.D. on metal trap tag/plastic bait cover Sink line
Texas	200	2 (2–3 /8”)	Yes	None	I.D. White Gear tag

*Special placement required

East Coast and Gulf of Mexico blue crab life stage regulations by state as of September 2025.

State	Minimum size limits (inches)				
	Hard	Soft	Peeler	Culling Tolerance	Sponge Crab Protection
New Jersey	4.75” 4.5” mature female	3.5”	3”	Zero	Prohibited
Delaware	5”	3.5”	3”	5% by number	Prohibited
Maryland	5” Apr. 1- July 14 5.25” July 15- Dec 15	3.5” Males	3.25” Apr. 1- July 14 3.5” July 15- Dec 15 Separated from catch	6 hard crabs/ bushel or 13/barrel 10 peelers	Prohibited to take but may import from another state May 11-July 20
Virginia	5”	3.5”	3.25” Mar. 17-Jul. 15 3.5” Jul. 16-Nov. 30	10 hard crabs/ bushel or 35/barrel 10 peelers/bushel or 5% in other containers	Prohibit brown/black sponge March 17-June 15 Crabbing prohibited in sanctuary zones May 16-Sept. 15
North Carolina	5” Prohibit immature female	None	None Separated. White-lines no sale	5% by number/container	Prohibit brown/black sponge Spawning sanctuaries
South Carolina	5” Includes mature female	5” Includes mature female	None with peeler permit	Zero	Prohibited to take but may import from another state
Georgia	5” Mature female exempt	5”	3”	Zero	Prohibited to take but may import from another state
Florida	5” Includes mature female	5”	None Separated from catch	5% by number/ container except bait	Prohibited
Alabama	5” Includes mature female Bait Dealer exempt	None Separate from catch	None Separated from catch No white-lines	Zero except bait and work box	Prohibited May 16-Jan 14
Mississippi	5” Includes mature female	None	None	Zero	Prohibited Crab sanctuaries
Louisiana	5” Includes mature female Prohibit immature female	None	None Separated from catch	10% undersized in 50 crab random sample 2% immature female crabs in 50 crab random sample	Prohibited Crab sanctuaries
Texas	5” Includes mature female	5”	5”	5% by number in separate container for bait only	Prohibited

East Coast and Gulf of Mexico blue crab trawl regulations as of September 2025.

State	Regulations				
	Crab Trawls allowed	Season	Area	Catch Limit	Gear Restrictions
New Jersey	No	N/A	N/A	N/A	N/A
Delaware	No	N/A	Permitted in Delaware Bay and Delaware River only	N/A	N/A
Maryland	No	N/A	N/A	N/A	N/A
Virginia	No	N/A	N/A	N/A	N/A
North Carolina	Yes	Set by proclamation	Specified in proclamation	None	3–4 in. minimum mesh for hard crabs Headrope<25 ft and 2 in. minimum mesh for peelers and softshell
South Carolina	Yes	Open Dec. 1-Mar. 31 and in shrimp trawls during shrimp season	General Trawling Zone	None	4 in minimum mesh Chafing gear no more than ½ tailbag circumference
Georgia	Yes	May be open year-round in ocean Some sounds may open Jan.-Mar.*	Seaward side of sounds and sounds when authorized	No limit w/ crab endorsement	4 in minimum mesh TEDs
Florida	Yes**	Subject to shrimp trawl regulations	Subject to shrimp trawl regulations	Up to 200 pounds as bycatch in shrimp trawl	Subject to shrimp trawl regulations
Alabama	Yes***	Subject to shrimp trawl regulations	Subject to shrimp trawl regulations	No limit w/ crab license 5 gal. bucket w/o crab license	Subject to shrimp trawl regulations
Mississippi	Yes***	Subject to shrimp trawl regulations	Subject to shrimp trawl regulations	No limit w/ crab license	Subject to shrimp trawl regulations
Louisiana	Yes	Subject to shrimp trawl regulations	Subject to shrimp trawl regulations	None	Subject to shrimp trawl regulations
Texas	Yes	Subject to shrimp trawl regulations	Subject to shrimp trawl regulations	No limit w/ crab license	Subject to shrimp trawl regulations

*Opening and closing dates determined by Commissioner
**Allowed with incidental take endorsement
***Allowed as bycatch in shrimp trawls