

Atlantic States Marine Fisheries Commission

**DRAFT ADDENDUM IX TO THE HORSESHOE CRAB FISHERY
MANAGEMENT PLAN FOR PUBLIC COMMENT**

Multi-Year Specifications for Male-only Harvest in the Delaware Bay Region



February 2025



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

Horseshoe Crab Draft Addendum IX for Public Comment

Public Comment Process and Proposed Timeline

In October 2024, the Atlantic States Marine Fisheries Commission’s Horseshoe Crab Management Board initiated Draft Addendum IX to the Interstate Fishery Management Plan for Horseshoe Crabs to consider allowing for multi-year specifications for male-only harvest in the Delaware Bay region states of New Jersey, Delaware, Maryland, and Virginia. Additionally, Draft Addendum IX addresses seasonal harvest restrictions and harvest caps for Maryland and Virginia. This document presents background on the Commission’s management of horseshoe crab in the Delaware Bay region, the addendum process and timeline, a statement of the problem, and management measures for public consideration and comment.

The public is encouraged to submit comments regarding the proposed management options in this document at any time during the addendum process. The final date comments will be accepted is **March 31 at 11:59 p.m. EDT**. Comments may be submitted by mail, email or online via the [Horseshoe Crab Draft Addendum IX Action Tracker](#) webpage. If you have any questions or would like to submit comments, please use the contact information below.

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(Subject line: Horseshoe Crab
Draft Addendum IX)

Online: [Horseshoe Crab Draft Addendum IX Action Tracker](#)

October 2024

Board Initiated Draft Addendum IX

February 2025

Board Approved Draft Addendum IX for public comment.

March 2025

Public Comment Period Including Public Hearings

May 2025

Board Reviews Public Comment, Selects Management Measures, Final Approval of Addendum IX

TBD

Implementation of Addendum IX Provisions

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1.0 Introduction

The Atlantic States Marine Fisheries Commission's (ASMFC) Horseshoe Crab Management Board (Board) approved the Interstate Fishery Management Plan for Horseshoe Crabs (FMP) in October 1998. The goal of the FMP includes management of horseshoe crab populations for continued use by current and future generations of the fishing and non-fishing public, including the biomedical industry, scientific and educational researchers, migratory shorebirds, and other dependent fish and wildlife, including federally listed sea turtles. ASMFC maintains primary management authority for horseshoe crabs in state and federal waters. The management unit for horseshoe crabs extends from Maine through the east coast of Florida. Horseshoe crab are currently managed under the FMP and its eight addenda. The Delaware Bay region is the primary focus of this Draft Addendum. Bait harvest in the Delaware Bay region is managed using the Adaptive Resource Management (ARM) Framework. The ARM framework incorporates population models of horseshoe crabs and red knots and aims to balance harvest with maintaining the ecosystem and supporting shorebird migration.

In October 2024, the Board initiated Draft Addendum IX to consider adding an additional specifications tool for the Delaware Bay region that would allow the Board to set specifications for male-only harvest for multiple years. It also considers reestablishing seasonal harvest restrictions for the Delaware Bay region bait fishery. The Board initiated the draft via the following motion:

Move to initiate an addendum to consider the ability to set multi-year specifications for male-only horseshoe crab harvest of Delaware Bay-origin Horseshoe Crab based on the ARM Framework or an alternative male-only harvest specification setting method.

2.0 Overview

2.1 Statement of the Problem

The Board initiated Draft Addendum IX in October 2024 to consider allowing for multi-year specifications for male-only harvest in the Delaware Bay region states of New Jersey, Delaware, Maryland, and Virginia. Since 2013, the first year the Adaptive Resource Management (ARM) Framework was used to set specifications for harvest of Delaware Bay-origin horseshoe crabs, the Board has maintained zero female harvest. When the 2021 ARM Framework Revision was adopted for management use in 2022 through Addendum VIII (ASMFC 2024), the possibility of female harvest elicited widespread public concern. Acknowledging these concerns, the Board has continued to establish zero female harvest annually despite the ARM Framework output including a limited amount of female harvest since 2022.

In July 2024, the Commission held a stakeholder workshop including representatives from environmental non-governmental organizations (NGOs), fishing industry, biomedical industry, bird and horseshoe crab scientists, and resource managers to generate recommendations for Board consideration regarding horseshoe crab management in the Delaware Bay region. A key

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consensus recommendation developed at the workshop was to continue running the ARM Framework but prohibit female horseshoe crab harvest while several additional recommendations are considered and implemented. Multi-year specifications for male-only harvest in the Delaware Bay region states would alleviate concerns about female harvest while the Board considers possible changes to the Delaware Bay management program.

Additionally, it was recently identified that seasonal harvest restrictions established for the Delaware Bay states under Addenda IV-VI were not included in Addendum VII. Based on review of Board discussions during the development of Addendum VII, it appears the omission of the seasonal provisions, which prohibited the directed harvest of horseshoe crabs of Delaware Bay-origin from January 1 through June 7, was an oversight. Therefore, this Draft Addendum also considers whether to reestablish the provisions of Addendum IV-VI that would restrict directed harvest during the beginning of the year and the spawning season.

Addenda VII and VIII also include provisions that place a maximum limit on the total level of allowed harvest by Maryland and Virginia. The caps for each state were based on Addendum VI quota levels for Maryland and Virginia and are intended to provide protection to non-Delaware Bay-origin crabs when female harvest is allowed. The provision states that the harvest caps shall apply to these two states “except when the ARM Framework outputs an optimized harvest that prohibits harvest of female horseshoe crabs.” If the ARM Framework output prohibits female horseshoe crab harvest, then Maryland and Virginia are allocated additional male harvest. This Draft Addendum proposes options to clarify the language in Addendum VIII regarding the harvest caps and whether they would apply if the Board voluntarily implements zero female harvest of Delaware-origin horseshoe crabs.

2.2 Background

In response to public concern regarding the horseshoe crab population and its ecological role in Delaware Bay, the Board adopted a multi-species approach to managing the commercial horseshoe crab bait fishery in the region. Addendum VII was approved in February 2012, implementing the Adaptive Resource Management (ARM) Framework for use during the 2013 fishing season and beyond. The Framework considers the abundance levels of horseshoe crabs and shorebirds (specifically, the rufa red knot) in determining the appropriate harvest level for the Delaware Bay states of New Jersey, Delaware, Maryland, and Virginia (east of the COLREGS). Since 2013, the Board has annually reviewed the maximum bait harvest levels output by the ARM model to specify harvest levels for the following year in New Jersey, Delaware, Maryland, and Virginia.

In 2021, a revision to the ARM Framework was completed and peer-reviewed. The revision updated and improved the ARM model with an additional decade of data on shorebirds and horseshoe crabs in the Delaware Bay region, and advancements in modeling software and techniques, including recommendations from the original peer review. Addendum VIII was approved in 2022 to allow the use of the 2021 Revision of the ARM Framework in setting annual bait harvest specifications for horseshoe crabs of Delaware Bay-origin.

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During the public comment period on Addendum VIII, over 30,000 comments were submitted opposing the adoption of the ARM Revision in large part because the results of the revised model run for the 2023 fishing year allowed for a limited amount of female horseshoe crab by the bait fishery for the first time since ARM implementation. In response to the widespread concern, the Board chose to implement zero female horseshoe crab harvest for the 2023 season, despite the ARM model output including limited female harvest. Given the apparent differences in stakeholder opinions on female harvest, in 2023, the Board conducted a survey of stakeholders including bait harvesters and dealers, biomedical fishery and industry participants, and environmental groups to better understand their diverse perspectives and values, and whether changes to horseshoe crab management for the Delaware Bay region should be considered.

The results of the survey confirmed that the various stakeholder groups hold divergent values and perspectives related to horseshoe crab management. Commercial industry participants indicated they still value the harvest of female horseshoe crabs, though it has not been permitted in the Delaware Bay region since 2012. Environmental researchers and advocates tended to value the protection of female horseshoe crabs and the ecological role of horseshoe crabs as a food source for shorebirds over the fishery. Considering these conflicting values, ASMFC held a stakeholder workshop in July 2024 with participants from all stakeholder groups to discuss management objectives for the Delaware Bay region horseshoe crab fishery¹.

The main purpose of the workshop was to increase understanding of various stakeholder perspectives and identify essential concerns and areas of common ground for horseshoe crab management. An important finding from the workshop was that participants from all stakeholder groups affirmed a preference for adaptive management over other approaches. However, it is clear there is a need to engage stakeholders in a process to evaluate and reconsider aspects of the ARM Framework to better address stakeholder concerns and values. Following the workshop recommendations, the Board agreed to move forward with considering potential changes to the ARM Framework with stakeholder input.

The workshop discussions also emphasized the need for an interim management approach while the Board gathers information from stakeholders and considers modifying the ARM Framework. Although the workshop participants agreed the ARM should continue to be used while additional recommendations are addressed, they expressed a desire for more certainty around future harvest levels. Specifically, the participants agreed it would be preferable to set the female harvest quota to zero for the time needed to address other recommendations. The management program does not currently allow for horseshoe crab bait harvest specifications to be set for multiple years. Draft Addendum IX aims to address the workshop recommendations

¹ The final report on the July 2024 Horseshoe Crab Management Objectives Workshop can be found here: https://asmfc.org/wp-content/uploads/2024/10/HSCMgmtObjectivesWorkshopReport_Oct2024.pdf

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by allowing for male-only harvest of Delaware Bay-origin horseshoe crabs to be established for multiple years based on the ARM Framework.

3.0 Management Options

Draft Addendum IX considers three management issues:

1. Multi-year harvest specifications for male-only bait harvest
2. Seasonal harvest restrictions
3. Harvest caps for Maryland and Virginia

When the Board takes final action on the Addendum, there is the opportunity to select any measure within the range of options that went out for public comment, including combining options across issues.

3.1 Issue 1: Multi-year Specifications

The Board is seeking public input on whether to allow multi-year specification setting for male-only harvest of Delaware Bay-origin horseshoe crabs for bait. Status quo would not allow multi-year specification setting, while Option B does.

If Option B is selected, the Board would also have to select either sub option 1B-1 or 1B-2 to establish whether the maximum allowable male-only harvest would be managed based on the male:female sex ratio of horseshoe crabs on spawning beaches. This method would allow the Board to control male-only harvest based on annual fishery-independent surveys, without requiring the ARM Framework to be used.

Option 1A: Status Quo

This option would maintain the current management program for setting harvest specifications established under [Addendum VIII](#). The Board would continue to annually consider the output of the ARM Framework and set bait harvest specifications for the next year, as detailed in Section 3.0 of Addendum VIII.

Option 1B: Allow multi-year specifications for male-only bait harvest for horseshoe crabs of Delaware Bay-origin for a maximum of three years at a time.

This option would allow the Board to set harvest specifications based on the ARM Framework for male-only bait harvest of horseshoe crabs for the Delaware Bay states (New Jersey, Delaware, Maryland and Virginia) for multiple years at a time. Under this option, the Board could choose to set specifications for up to three years. Multi-year specifications would only be allowed for male-only harvest; if any female harvest were included, then specifications could only be established for a single year.

The process for setting specifications would remain similar to the current process established under Addendum VIII. Specifically, the Board would review the output of the ARM Framework in the fall of a given year and set harvest limits for the following year, or years. For example, in fall 2025, the Board would review the ARM Framework output for 2026 harvest. The Board

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would then consider whether to adopt the ARM Framework output for males and females for the following fishing year or set different harvest limits, such as adopting zero female harvest instead of the ARM-recommended female harvest limit. If the Board does not choose to allow any female harvest, then it could opt to set specifications for male-only harvest for either the 2026 fishing year only, the 2026 and 2027 fishing years, or the 2026-2028 fishing years based on the ARM Framework output.

If multi-year specifications are adopted, the process would differ in interim years. For example, if the Board sets specifications for three years, then in years one and two (i.e., interim years) no Board action would be required. However, during the interim years, the Board would review updated data from the Delaware Bay horseshoe crab and shorebird surveys (i.e., the Virginia Tech Trawl Survey, horseshoe crab spawning surveys, red knot aerial and ground surveys). The full ARM process would not occur, meaning the Board would not review a new horseshoe crab population estimate nor an ARM Framework output in interim years. Following a multi-year specifications period, the ARM Framework would be used to provide a new maximum harvest output, and the Board would need to establish new harvest specifications for the following year or years; this would include the option to implement female and male harvest or male-only harvest.

If selected, the provisions of this option would be in place through 2031, and a new addendum would be required to set multi-year specifications after 2031. However, the Board may choose to replace Addendum IX with another addendum or amendment to the FMP prior to 2031. If Addendum IX expires and the Board does not take management action to follow Addendum IX, then harvest specifications setting would revert to the process established in Addendum VIII and specifications would be set annually based on the ARM Framework.

The flowchart in Figure 1 outlines the process for setting harvest specifications if this option is adopted.

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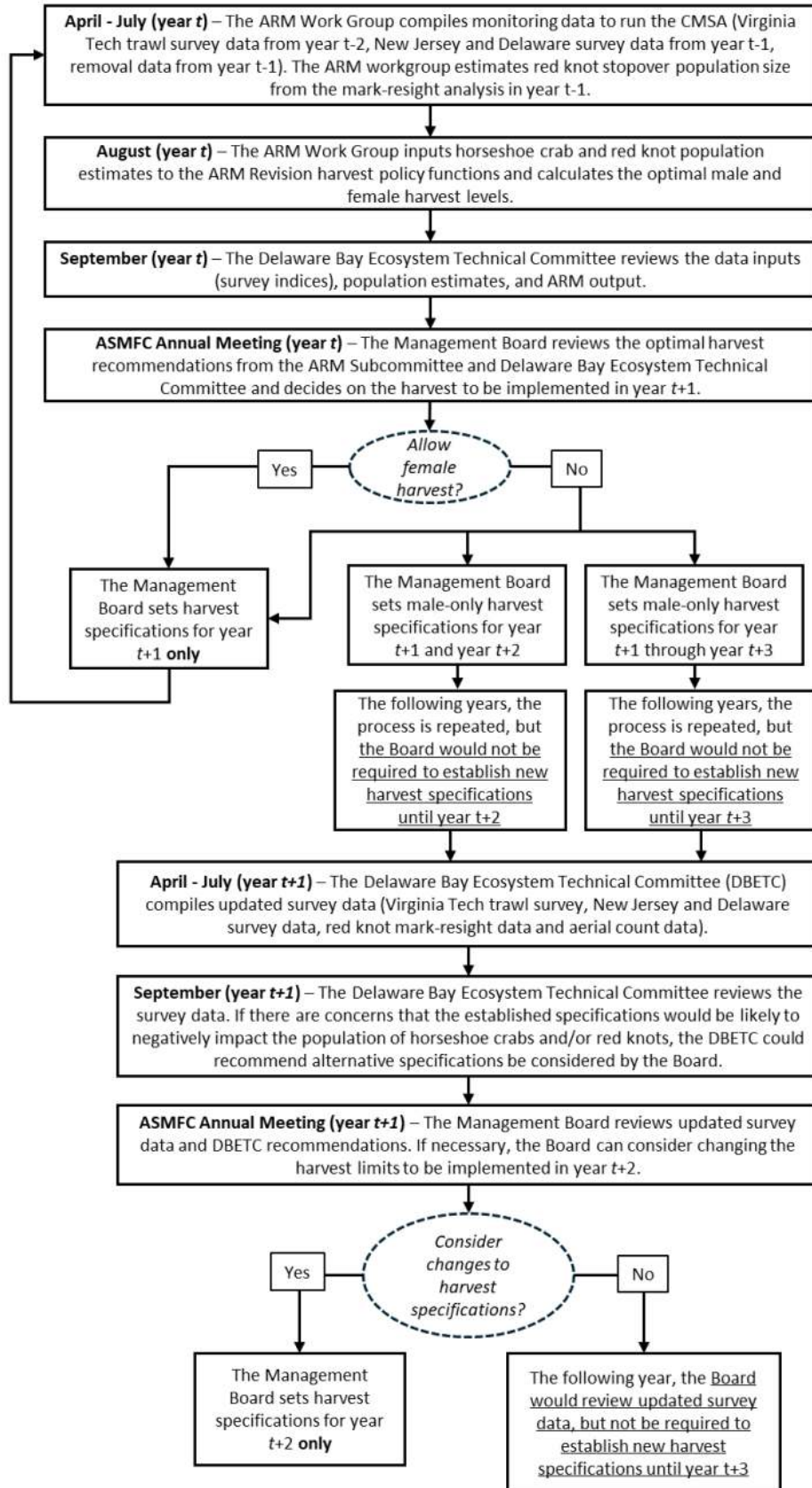


Figure 1. Proposed multi-year specifications setting process under Option B.

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Sub-option 1B-1: No requirement to reduce male harvest limit based on spawning sex ratio.

Under Sub-option B1, the Board would not be required to reduce male harvest in interim years of multi-year specifications based on the sex ratio of horseshoe crabs on the spawning beaches observed in the annual Delaware Bay spawning survey.

Sub-option 1B-2: In interim years, male horseshoe crab harvest must be reduced if spawning beach survey results indicate a male:female sex ratio below 3:1.

If this option is selected, in interim years of multi-year specifications (i.e., years when a new output is not provided by the ARM Framework), the Board would adjust male-only harvest specifications based on the male:female sex ratio of spawning horseshoe crabs on beaches observed in the bay-wide spawning survey. A target sex ratio would be set at 3 males to 1 female and a threshold sex ratio set at 2 males to 1 female. If the sex ratio is above 3:1, the maximum harvest of 500,000 Delaware Bay origin males would be permitted. If the sex ratio is between the target and threshold, the maximum allowable male harvest would be reduced as the ratio decreases and would be zero if the sex ratio were to decrease to 2:1 or less (Figure 2). Maximum male harvest levels based on the spawner sex ratio are defined in Table 1.

There is no direct link between male horseshoe crab abundance and red knot population dynamics. The only way male abundance could limit red knot population growth would be if the operational male:female sex ratio on the spawning beaches dropped to a point at which not all eggs were fertilized. Although satellite males (those that do not attach to a female) can fertilize as many eggs as attached males (Brockman et al. 2000), 96 – 100% of eggs are fertilized whether or not satellite males are present (Brockman 1990). Some males are not capable of amplexus (the mating position in which the male clasps the shell of the female) because of their condition (Brockman and Smith 2009) and females will tend not to nest unless they are in amplexus with a male. Therefore, an operational sex ratio skewed toward males is needed to ensure fertilization of eggs. If the spawning sex ratio should drop below 2:1, there is a chance of incomplete fertilization of the eggs deposited by females and future recruitment of horseshoe crabs could decline. As long as the sex ratio on the spawning beaches remains greater than 2:1, there is no biological mechanism for male abundance to limit red knot population growth. Given this effect of male crabs on the population dynamics of both species, a simple harvest control rule could be used to manage male-only harvest as a function of the spawning beach sex ratio.

Sex ratio data is collected and reported annually through the bay-wide horseshoe crab spawning survey. The average sex ratio on the spawning beaches was 4.2:1 from 1999 – 2019 (Figure 3). The lowest sex ratio over that period was 3.1 males to 1 female, and it has generally showed an increasing trend through time despite male-only harvest since 2013.

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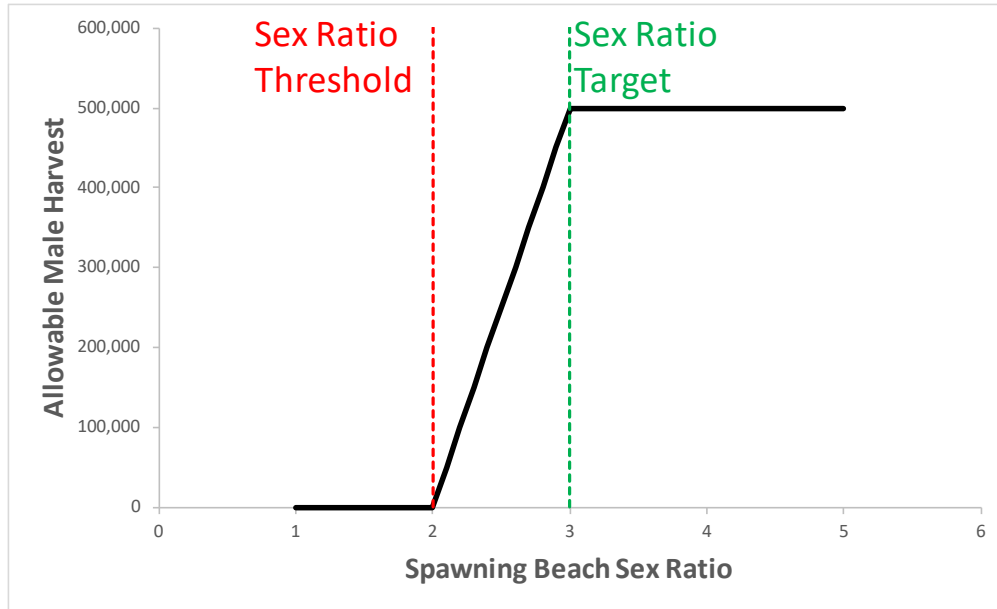


Figure 2. Harvest level of male horseshoe crabs as a function of the sex ratio (M:F) on the spawning beaches, as proposed under sub-option 1B-2. When the sex ratio is >3:1, the maximum allowable harvest of males is 500,000 Delaware Bay-origin crabs. As the sex ratio decreases below 3:1, the maximum allowable male harvest would decrease. If the sex ratio declines to 2:1 or less, no male harvest would be permitted.

Table 1. Maximum harvest level of male horseshoe crabs based on the sex ratio (M:F) on the Delaware Bay spawning beaches, as proposed under Sub-option 1B-2.

Observed Male:Female Sex Ratio	Maximum Allowable Male Harvest
≤2.0:1	0
2.1:1	50,000
2.2:1	100,000
2.3:1	150,000
2.4:1	200,000
2.5:1	250,000
2.6:1	300,000
2.7:1	350,000
2.8:1	400,000
2.9:1	450,000
≥3.0:1	500,000

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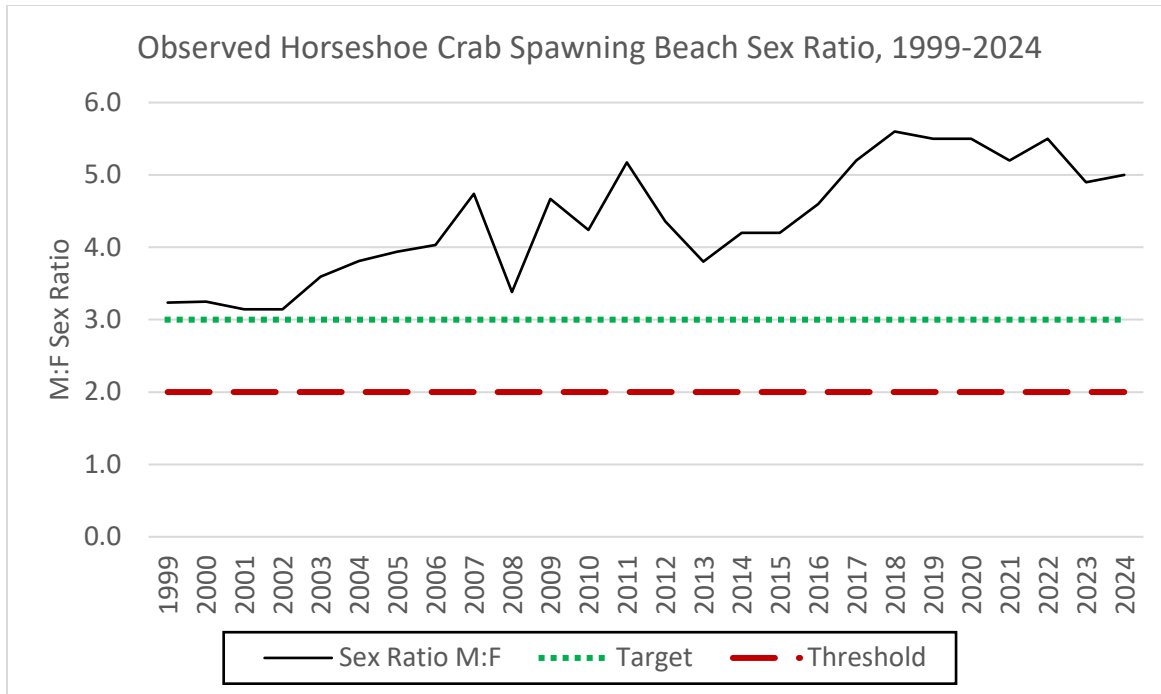


Figure 3. Average annual spawning sex ratio observed during Delaware Bay horseshoe crab spawning beach survey from 1999-2024.

3.2 Issue 2: Seasonal Harvest Restrictions

The Board is seeking public input on whether to reestablish seasonal harvest restrictions for directed harvest of Delaware Bay-origin horseshoe crabs. Addenda IV-VI included provisions to restrict horseshoe crab harvest in the Delaware Bay states during the beginning of the year and the spawning season. Specifically, the provision prohibited directed harvest from January 1 through June 7, inclusive, for New Jersey, Delaware, and Maryland, and prohibited the landing of horseshoe crabs in Virginia from federal waters from January 1 through June 7. These seasonal provisions expired after April 30, 2013, and were not included in Addendum VII. However, based on Board discussions during the development of Addendum VII, it appears there was intent to include the same seasonal harvest provisions in Addendum VII, but they were inadvertently omitted. Currently, the harvest season for the directed bait fishery in the Delaware Bay region is as established in Addendum III, which states, “New Jersey, Delaware and Maryland shall prohibit the harvest and landing of horseshoe crabs for bait from May 1 through June 7, inclusive” (ASMFC 2004).

Status quo would not change the current requirements, while Option B would prohibit directed harvest in of Delaware Bay-origin horseshoe crabs from January 1 through June 7, as was specified in Addenda IV-VI.

Option 2A: Status Quo

Under this option, there would be no change to the current regulations regarding seasonal restrictions. Therefore, if adopted, this option would maintain a closed season for bait harvest

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of horseshoe crabs in and around Delaware Bay during peak horseshoe crab spawning. New Jersey, Delaware, and Maryland would be required to prohibit the harvest and landing of horseshoe crabs for bait from May 1 through June 7, inclusive. This includes all landings for bait, whether directed or as bycatch.

Option 2B: Reestablish seasonal harvest restrictions of Addendum IV-VI.

If adopted, this option would prohibit directed harvest and landing of all horseshoe crabs for bait in New Jersey, Delaware, and Maryland from January 1 through June 7. It would also prohibit the landing of horseshoe crabs in Virginia from federal waters from January 1 through June 7.

3.3 Issue 3: Application of Harvest Caps for Maryland and Virginia

The Board is seeking public input on whether to modify the policy established in Addendum VIII to provide additional clarity on when the harvest caps for Maryland and Virginia would be applied. Status quo would not change the current requirements, while Option B would clarify that the harvest caps would not apply whenever harvest is limited to males only.

Option 3A: Status Quo

Under this option, there would be no change to the language in Addendum VIII. Addendum VIII states that the harvest caps for Maryland and Virginia (170,653 and 60,998 crabs, respectively) “apply except when the ARM Framework outputs an optimized harvest that prohibits harvest of female horseshoe crabs. In this situation, female horseshoe crab harvest in Maryland and Virginia are prohibited but a 2:1 offset of males:females applies and allows the total male harvest of Maryland and Virginia to rise above the cap level.”

This language could be interpreted such that if the ARM Framework output included any female harvest, these harvest caps would apply. This means in a situation where the ARM Framework output allows for any female harvest, total harvest for Maryland and Virginia could be restricted to the harvest caps, even if the Board chooses to set female harvest at zero voluntarily.

Option 3B: Modify language for the application of harvest caps.

If adopted, this option would change the language establishing the policy for when the Maryland and Virginia harvest caps would apply. Instead of stating the “caps apply except when the ARM Framework outputs an optimized harvest that prohibits harvest of female horseshoe crabs,” this proposed option would change the language to “these caps apply only when female harvest is implemented. The harvest caps for Maryland and Virginia would not apply whenever male-only harvest is implemented.”

This change clarifies that the harvest caps would not apply in a situation in which the ARM Framework output includes female harvest, but the Board chooses to implement male-only harvest voluntarily.

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4.0 Compliance

TBD

5.0 Literature Cited

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