

# Atlantic States Marine Fisheries Commission

## Horseshoe Crab Management Board

May 5, 2026  
1:00 – 2:30 p.m.

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*E. Reid*) 1:00 p.m.
2. Board Consent 1:00 p.m.
  - Approval of Agenda
  - Approval of Proceedings from October 2025
3. Public Comment 1:05 p.m.
4. Consider Stakeholder Engagement Process Report on the Adaptive Resource Management Framework Reward/Utility/Harvest Policy Functions (*B. Crawford, K. O'Donnell*) 1:15 p.m.
  - Consider Initiating an Addendum on Proposed Changes **Possible Action**
5. Discuss State Legislation on Horseshoe Crab Fisheries (*C. Starks*) 2:15 p.m.
6. Other Business/Adjourn 2:30 p.m.

The meeting will be held at The Westin Crystal City (1800 Richmond Highway, Arlington, VA; 703.486.1111) and via webinar; click [here](#) for details.

# MEETING OVERVIEW

## Horseshoe Crab Management Board

May 5, 2026

1:00 – 2:30 p.m.

Chair: Eric Reid (RI) Assumed Chairmanship: 2/25	Technical Committee Chair: Ethan Simpson (VA) Delaware Bay Ecosystem TC Chair: Wendy Walsh (USFWS)	Law Enforcement Committee Rep: Nick Couch (DE)
Vice Chair: Carrie Kennedy (MD)	Advisory Panel Chair: Brett Hoffmeister (MA)	Previous Board Meeting: October 28, 2025
Voting Members: MA, RI, CT, NY, NJ, DE, MD, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (15 votes)		

### 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from October 2025

**3. Public Comment** – At the beginning of the meeting, public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance, the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

### 4. Consider Stakeholder Engagement Process Report on the Adaptive Resource Management Framework Reward/Utility/Harvest Policy Functions (1:15-2:25 p.m.) Possible Action

#### Background

- The Commission held a stakeholder workshop on horseshoe crab management in the Delaware Bay region in July 2024, which produced a recommendation to refine the Adaptive Resource Management (ARM) Framework reward and utility functions with stakeholder input. Following recommendations from the workshop and the ARM Subcommittee (Subcommittee), the Board initiated a new stakeholder engagement process in 2025 to get input on changes to the reward, utility, and harvest policy functions of the ARM Framework to better reflect current stakeholder values.
- The Commission contracted Compass Resource Management as neutral third-party facilitators and analysts for this process. The process engaged a group of 14 participants from five stakeholder groups including bait fisheries, biomedical groups, bait dealers, ecosystem, shorebird, and horseshoe crab conservation and science planning groups.
- From November 2025 to April 2026, stakeholders participated in educational webinars, an in-person workshop, and a final virtual meeting to develop and review recommendations on changes to the reward, utility, and harvest policy functions of the ARM Framework (**Briefing Materials**).

- Compass developed a final report on the engagement process and recommendations for the Board's consideration (**Briefing Materials**).

**Presentations**

- Report on Stakeholder Engagement Process Report on the ARM Framework Reward/Utility/Harvest Policy Functions by B. Crawford and K. O'Donnell.

**Board actions for consideration at this meeting**

- Consider Initiating an Addendum on Proposed Changes

**5. Discuss State Legislation on Horseshoe Crab Fisheries (2:15-2:30 p.m.)**

**Background**

- The Board requested an overview of state statutes and regulations in Connecticut, New York, and New Jersey related to horseshoe crab fisheries (**Briefing Materials**).

**Presentations**

- Connecticut, New York, and New Jersey Horseshoe Crab Fishery Statutes and Regulations by C. Starks

**6. Other Business/Adjourn (2:30 p.m.)**

## Horseshoe Crab

Activity level: Medium

Committee Overlap Score: Low

### Committee Task List

- TC – July 1<sup>st</sup>: Annual compliance reports due
- ARM & DBETC:
  - Spring 2026: Consider recommendations from stakeholder workshop on reward, utility, and harvest reward functions of the ARM Framework
  - September: Annual ARM model to set Delaware Bay specifications, review red knot and VT trawl survey results

**TC Members:** Katie Rodrigue (RI, Chair), Jeff Brunson (SC), Derek Perry (MA), Kelli Mosca (CT), Jennifer Lander (NY), Danielle Dyson (NJ), Jordan Zimmerman (DE), Steve Doctor (MD), Ingrid Braun (PRFC), Ethan Simpson (VA), Jeffrey Dobbs (NC), Eddie Leonard (GA), Claire Crowley (FL), Chris Wright (NMFS), Joanna Burger (Rutgers), Wendy Walsh (USFWS), Samara Nehemiah (ASMFC), Caitlin Starks (ASMFC)

**Delaware Bay Ecosystem TC Members:** Wendy Walsh (USFWS, Chair), Danielle Dyson (NJ), Katherine Christie (DE), Jordan Zimmerman (DE), Steve Doctor (MD), Ethan Simpson (VA), Sarah Karpanty (VA Tech), Jim Fraser (VA Tech), Francesco Ferretti (VA Tech), Wendy Walsh (USFWS), Samara Nehemiah (ASMFC), Caitlin Starks (ASMFC)

**ARM Subcommittee Members:** John Sweka (USFWS, Chair), Danielle Dyson (NJ), Katherine Christie (DE), Margaret Conroy (DE), Steve Doctor (MD), Sarah Karpanty (VA Tech), Wendy Walsh (USFWS), Conor McGowan (USGS/Auburn), David Smith (USGS), Jim Lyons (USGS, ARM Vice Chair), Jim Nichols (USGS), Jason Boucher (NEFSC), Samara Nehemiah (ASMFC), Caitlin Starks (ASMFC)

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
HORSESHOE CRAB MANAGEMENT BOARD**

**Hyatt Place Dewey Beach  
Dewey Beach, Delaware  
Hybrid Meeting**

**October 28, 2025**

These minutes are draft and subject to approval by the Horseshoe Crab Management Board.  
The Board will review the minutes during its next meeting.

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## INDEX OF MOTIONS

1. **Approval of agenda** by consent (Page 1).
2. **Approval of Proceedings of May 8, 2025** by consent (Page 1).
3. **Main Motion**  
**Move to establish male-only harvest specifications for 2026 and 2027 based on the ARM Framework with 500,000 males and no female harvest of Delaware Bay-origin crabs. In addition, the 2:1 offset will be added to MD’s and VA’s allocations due to no female harvest** (Page 4). Motion by John Clark; second by Dave Borden. Motion amended.  
  
**Motion to Amend**  
**Move to amend to add 2028** (Page 6). Motion by Matt Gates; second by Dan McKiernan. Motion fails (Page 8).  
  
**Main Motion**  
**Move to establish male-only harvest specifications for 2025 and 2027 based on the ARM Framework with 500,000 males and no female harvest of Delaware Bay-origin crabs. In addition, the 2-1 offset will be added to MD’s and VA’s allocation due to no female harvest.** Motion passes (Page 8).
4. **Move to approve the FMP Review and state compliance reports for the 2024 fishing year, and *de minimis* status for SC, GA, and FL** (Page 13). Motion by Emerson Hasbrouck; second by Joe Grist. Motion passes by unanimous consent (Page 13).
5. **Move to approve the changes to the Advisory Panel membership as recommended in the Work Group memo dated October 10, 2025** (Page 15). Motion by Carrie Kennedy; second by Nicole Costa. Motion approved by unanimous consent (Page 15).
6. **Move to adjourn** by consent (Page 15).

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**ATTENDANCE**

**Board Members**

Dan McKiernan, MA (AA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Sarah Peake, MA, proxy for Rep. Peake (LA)	Carrie Kennedy, MD, proxy for L. Fegley (AA)
Raymond Kane, MA (GA)	Russel Dize, MD (LA)
Nicole Lengyel Costa, proxy for J. McNamee, RI (AA)	Joe Grist, VA, proxy for J. Green (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	James Minor, VA (LA)
David Borden, RI (GA)	Chris Batsavage, NC, proxy for K. Rawls (AA)
Matthew Gates, CT (AA)	Rep. Brian Turner, NC (LA)
Bill Hyatt, CT (GA)	Ben Dyar, SC, proxy for B. Keppler (AA)
Jesse Horstein, NY, proxy for M. Gary (AA)	Malcolm Rhodes, SC (GA)
Scott Curatolo-Wagemann, NY, proxy for E.	Mel Bell, SC, proxy for Sen. Cromer (LA)
Hasbrouck, NY (GA)	Doug Haymans, GA (AA)
Joe Cimino, NJ (AA)	Spud Woodward, GA (GA)
Jeff Kaelin, NJ (GA)	Erika Burgess, FL, proxy for J. McCawley (AA)
Adam Nowalsky, NJ, proxy for Sen. Gopal (LA)	Gary Jennings, FL (GA)
John Clark, DE (AA)	Ron Owens, PRFC
Roy Miller, DE (GA)	Rick Jacobsen, US FWS

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Ethan Simpson, Technical Committee Chair

Nicholas Couch, Law Enforcement Committee Rep.

**Staff**

Bob Beal	Caitlin Starks	Chelsea Tuohy
Toni Kerns	Tracey Bauer	Katie Drew
Tina Berger	James Boyle	Jeff Kipp
Madeline Musante	Emilie Franke	Samara Nehemiah

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The Horseshoe Crab Management Board of the Atlantic States Marine Fisheries Commission convened in the Ballroom East/West via hybrid meeting, in-person and webinar; Tuesday, October 28, 2025, and was called to order at 8:30 a.m. by Chair Eric Reid.

### **CALL TO ORDER**

CHAIR ERIC REID: Good morning, everyone. I would like to call the Horseshoe Crab Board to order. Before we get rolling, Ms. Kerns, do you have an announcement for us this morning?

MS. TONI KERNS: Thank you, Mr. Reid. I just wanted to let the Commissioners and the audience know that today we are being filmed, as well as Rick Jacobson is online for U.S. Fish and Wildlife Service. I don't believe there is anybody else, and that is it.

CHAIR REID: Good morning, everyone again. My name is Eric Reid. I have the honor of sitting up here with Captain Couch, Ms. Starks and Dr. Nehemiah to get us through Horseshoe crabs this morning.

### **APPROVAL OF AGENDA**

CHAIR REID: We've got some business items to do, some action items. First is approval of the agenda. Does anybody have any problems with the agenda? Seeing none; the agenda is approved by consent.

### **APPROVAL OF PROCEEDINGS**

CHAIR REID: As far as the proceedings from May 2025, is there any edits, changes or are we good where we are? Seeing none; approved by consent. Next, public comment.

### **PUBLIC COMMENT**

CHAIR REID: We don't have anybody signed up for public comment, but we always like to hear from our stakeholders in the public. Is there

any public comment this morning? Anybody online? Seeing none; okay.

Now, let's get to work. The first thing we're going to do is we're going to get a presentation from Dr. Nehemiah on the ARM model and then Ms. Starks is going to walk us through the Specs Package, and then once we get done with that, we have a few other action items. Ms. Nehemiah, whenever you're ready.

### **SET DELAWARE BAY BAIT HARVEST SPECIFICATIONS**

DR. SAMARA NEHEMIAH: Good morning, everyone. For folks I haven't met around the table my name is Sammy Nehemiah. I am a new Stock Assessment Scientist for the Commission, so I'll be presenting the results of the ARM Framework since John Sweka cannot be here this week.

### **REVIEW HORSESHOE CRAB AND RED KNOT ABUNDANCE ESTIMATES AND MODEL RESULTS FROM THE ADAPTIVE RESOURCE MANAGEMENT FRAMEWORK**

DR. NEHEMIAH: The Adaptive Resource Management Framework was revised and accepted by use for management by the Board in 2022. The Addendum VIII allowed for, I'll just back up and say, previously up until now Addendum VIII allowed for the ARM to be updated annually to set the recommendations for the Delaware Bay. Under the ARM Framework the maximum harvest that is allowed are 210,000 females and 500,000 males. Just a reminder of what the ARM recommended last year. The recommendation from the ARM were 175,000 females and 500,000 males. But the Board opted for 0 female harvest and a 2 to 1 offset. The objective statement of the ARM is to manage harvest of horseshoe crabs in the Delaware Bay to maximizes harvest.

But also, to maintain the system integrity, provide adequate stopover habitat for migrating shore birds, and ensure that the abundance of horseshoe crabs is not limiting the red knot stopover population or slowing recovery. Annual harvest

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specifications require a couple different population estimates, so first it required a red knot population estimate from a mark-resight analysis, which is conducted by Jim Lyons at USGS.

It also requires horseshoe crab population estimates that are for both males and female crabs from the Catch Multiple Survey Analysis or CMSA. Some of the data inputs that go into the CMSA are two different fishery independent surveys so it had the Delaware, and I'll also talk about the data that we use for this. I have the Delaware Adult Trawl, which we used through 2024, a New Jersey Ocean Trawl that we have through 2024.

It has two indices from the Virginia Tech Trawl, which are sampled through 2023, but we lagged these surveys forward to match some of the timing of the other surveys. It also includes discard estimates, state landings and biomedical mortality through 2023. Here on this slide, you can see estimates from the red knot population estimates from the mark-resight analysis.

These estimates are in the black and the confidence intervals are in the gray shaded lines. You can see a slight increase over the last couple years. The 2024 estimate were just over 46,000 red knots and then increased slightly in 2025 to 54,000 red knots. I'll note that in the ARM we use population estimates for two years prior.

In order to get recommendations for 2026 we're using the 2024 terminal year of red knot, but we wanted to show 2025 here for your reference. We can also see on this slide estimates of female harvest that are used in the CMSA. We have the bait landings and the white bars, which have decreased ever since 2012, but there is still some in 2023 and 2024 from Virginia, which some Virginia crabs are assumed to be from the Delaware Bay origin.

You can see the discards in black, and these are pretty variable from year to year, but in the last few years have been a pretty small component. Then the coastwide biomedical data is shown in the gray bars. We're showing coastwide because Delaware Bay is confidential and has been increasing over time.

Here we see the same process for the male harvest. In 2024 the bait landings declined slightly, but again discards in black are pretty variable, but a small component in the last three years. Then again, coastwide biomedical mortality has increased over the past years. Here are the indices of abundance that we use and put in the CMSA model.

Here are our indices of abundance for female horseshoe crab. We have the two Virginia Tech indices in black, so the Virginia Tech newly mature index in the dashed black line, the Virginia Tech mature index in the solid black line, and I'll point out that the axis for that is on the right-hand side. The Delaware Adult Trawl Adult Survey is in the solid gray line and the New Jersey Ocean Trawl is in the gray dashed line. You'll note that the New Jersey survey and the Virginia Tech newly mature index have a slight decline from 2023-2024. The Delaware had a slight increase. You'll note that Virginia Tech newly mature had a really strong increase from 2023 to 2024.

I'll also note that the Virginia Tech newly mature index for the females was corrected based off of recreation from last year's ARM, and I'll go into kind of that in the next few slides. Now we can look at the seine surveys for the male indices of abundance. Again, the Virginia Tech newly mature survey and the New Jersey index show that climb of 2023.

The increase from the Virginia Tech mature trawl, again on the axis on the right-hand side shows a really strong increase compared to the female index. As a reminder, there was a correction made for the female Virginia Tech newly mature index, and so I'll go over these a little bit quickly, since it was already agreed upon last year. But I'll just remind folks what we did this year.

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The Virginia Tech Trawl recorded zero female newly mature horseshoe crabs in 2022, and because the way the CMSA is set up, it has a hard time interpreting zeros in the indices, and so after further inspection it was noted that their low abundance of the newly mature females from 2020 to 2024.

There were two different hypotheses that went along with why that could be, but it was decided that maybe the likely cause was potentially misidentifying some of these female crabs in two other life stages. After talking with folks from Virginia Tech, it was assumed that the samplers were likely misclassifying newly mature females as immature females.

Because there was an increase in just the number of crabs during their sampling event, it made processing their samples difficult, and it was likely that they just weren't processing a representative subsample and weren't probing as many female crabs for eggs. In order to correct for this, it was hypothesized that males in a year  $t$  should have a positive correlation, a positive relationship with female newly mature crabs in year  $t + 1$ , because they are from the same cohort.

The different and newly mature females in year  $t + 1$  should be similar but lower than males in year  $t$  just due to natural mortality. They are experiencing the same natural mortality. When we plotted that relationship with the newly mature males on the X axis and the newly mature females in the Y axis, you see that relationship here.

A significant looking at positive living relationship where the slope is less than 1, suggesting that the natural mortality is the deciding factor. We corrected for the Virginia Tech female newly mature index with this kind of relationship, assuming they have relationship with newly mature males.

The good news is that the Virginia Tech crew corrected for this misidentification, and so the

report for what would be our 2025 year does show that new immature female crab back up to more reasonable levels, so we should not have to make this correction after this year. Now we can look at the results of the CMSA on the population estimates of the horseshoe crab. On this slide we're seeing female horseshoe crab abundance with zero biomedical data in the blue line and coastwide biomedical data in the red lines. Then those gray shaded areas are the 95% confidence intervals.

These results are very similar so they look like they are right on top of each other, but they aren't exactly the same. You'll note that in 2024 there was a slight decline in horseshoe crab abundance, just slightly under 20 million female crabs. But it was pretty stable in the last two years, and I'll note that the confidence interval on that are pretty wide. Then similarly we can look at the estimates of male horseshoe crab abundance in the Delaware Bay, and in 2024 saw more of a decline from 2023.

But overall, the population really has been increasing in the last few years. As a reminder, harvest recommendation is based on the results of the CMSA, so those horseshoe crab predation estimates and the mark-resight models for red knots. Per Addendum VIII, harvest is rounding down to the nearest 25,000 crabs, and so the ARM for 2026 recommended a harvest of 500,000 males and 175,000 females. I'll pass it off to Caitlin for this.

#### **SET SPECIFICATIONS FOR THE 2026 FISHING YEAR OR FOR UP TO THREE YEARS**

MS. CAITLIN STARKS: Thank you, Dr. Nehemiah. This year under Addendum IX, the Board has the option to set specifications for up to three years for male-only harvest using the ARM recommendation. The purpose of Addendum IX again, was to allow the Board to maintain male only harvest while considering changes to the Reward, Utility and Harvest Policy functions of the ARM, which was a recommendation from the July 2024 Stakeholder Workshop, and we'll talk about that next on the agenda.

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The options on the table for today are first, to adopt male and female harvest limits as recommended by the ARM Framework, or second, to adopt male only specifications for one to three years. If the Board chooses to establish male only specifications for multiple years, that would mean next year the ARM would not have to be run and there would be no action required to maintain the specifications for another year.

But the Board would still review the horseshoe crab and red knot survey data, and have the ability to set more conservative specifications without running the ARM framework next year. These are the state allocations for male and female horseshoe crab bait harvest, based on the ARM output for the 2026 fishing year.

The Delaware Bay origin harvest quotas are on the left, and the total quotas are on the right, and those include the non-Delaware Bay origin crabs for Maryland and Virginia. Then in the bottom table are the state quotas with male-only harvest of 500,000 crabs and the two-to-one offset for Maryland and Virginia given no female harvest.

Today the Board, again it's considering setting specifications for the bait harvest for the Delaware Bay states, giving the ARM framework outputs and the possibility of multiyear specifications under Addendum IX.

CHAIR REID: Thank you doctor, thank you Ms. Starks. Any questions from the Board? Anybody online? Anybody in the public? Okay, seeing none; what is the pleasure of the Board here? Mr. Clark.

MR. JOHN CLARK: Thank you, Mr. Chair, thank you for the presentations. I would like to make a motion. I believe the motion is available to be put up. I'll wait until it's up there so I can read it. Okay. **I move to establish male-only harvest specifications for 2026 and 2027 based on the ARM framework, with 500,000 male and no female harvest of Delaware Bay origin crabs.**

**In addition, the 2-1 offset will be added to Maryland and Virginia's allocations due to no female harvest.** If I can get a second, I will give the rationale.

CHAIR REID: Is there a second for this motion? Mr. Borden. Mr. Clark.

MR. CLARK: As has already been mentioned, one of the reasons that we are looking at these multi-year specifications is because we wanted to get more input from the entire gamut of stakeholders for horseshoe crabs. I believe that going with two-year specifications is the right balance here. Two years will give time for the new stakeholder input to the ARM that we will be discussing after this item, to be fully incorporated into the new utility functions for the ARM.

Understanding that has been one of the complaints about the ARM, which of course is peer reviewed, excellent science that we've been using to set these estimates. I figured, like I said, a good balance here. We have the estimates recommended by the ARM each year. Each year they have been recommending that we can take a small number of females in addition to the males.

We have not been doing so because of these concerns that have been raised. This will give ample time for those concerns to be incorporated into the model, and hopefully at the end of two years when the ARM is run again, we will be having results that come out that will be much more accepted by the entire range of stakeholders of horseshoe crab. That's my explanation.

CHAIR REID: Mr. Borden, any additional rationale.

MR. DAVID V.D. BORDEN: My only question, it's a question to John, the two years versus three years. If I understand it there is no downside in three years. In other words, let's say we do everything that John wants to get done in a two-year timeframe that we want to reconsider the numbers at the end of two years. There is nothing that prohibits us from doing that, and I would ask the

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staff to correct me, Caitlin or the staff to correct me if that is an erroneous interpretation.

CHAIR REID: You have two questions. Do you want John Clark or do you want Ms. Starks to respond?

MR. BORDEN: Well, I would like the staff to just make sure that that is correct and then I would like John to respond.

CHAIR REID: Ms. Starks.

MS. STARKS: Your limitation is that if the ARM is not run then you cannot establish female harvest in a year during a multiyear specification period that has already been set. You can establish more conservative male-only harvest. But if the Board tells us in advance, we do want to run ARM this year, we can do that. There is nothing preventing that from happening. There needs to be a new ARM run in order to change from a male only harvest specification to a female and male specification.

CHAIR REID: Mr. Clark.

MR. CLARK: Yes, to respond to David's question there. The reason I, as I said I went with two years. I think it's a good balance. As we know, if we go back to when the new ARM model was peer reviewed and accepted for management use, I believe that was 2022, 2023. Both the old ARM model and the new ARM model estimated that a small amount of female harvest could be allowed. The Board did not allow female harvest.

We heard from the certain stakeholders, particularly on the red knot conservation side that were very alarmed by the thought of any female harvest. We took those concerns into account, and we have not allowed female harvest. But at the same time, we do have a number of our people involved in the horseshoe crab fishery that of course would like to be able to harvest a small number of females again.

They have sacrificed for many years to allow the population of horseshoe crabs to rebuild to this point where some harvest could be allowed without having any impact on the red knot migrating population. I figure this will be the best way to allow the stakeholders that have concerns about this to have their concerns heard through the actual ARM process.

At the end of that if the ARM continues to recommend the small amount of female harvest, perhaps at that point that may be accepted. It may not be, but in any event two years should be ample time to allow this whole process to work out, and that was my rationale.

CHAIR REID: Discussion on the motion. Mr. Cimino.

MR. JOE CIMINO: Thank you to staff for the presentation. I'm not opposed to the motion, I am going to support it for the reasons, I agree with John, I think we have set something in motion here. We are going to be having further discussions on exactly what the ARM means and the utility functions. But with my support, as the seconder of the motion pointed out, that doesn't necessarily mean that we're moving into female harvest in two years, it's a reconsideration at that time. That's why I am happy to support.

CHAIR REID: Any further discussion? Ms. Costa.

MS. NICOLE LENGYELL COSTA: I just have a clarifying question for staff. I know it's the next agenda item, but is the two years, you know until we revisit 2028 specifications. Is that enough time to go through the stakeholder planning process and then we run the ARM?

MS. STARKS: Thanks for the question. I think as we all know it is pretty variable how long it can take to complete a process like this. Yes, in an ideal world it would be enough time. I think there are definitely, you know this is an issue that does require a lot of discussion.

Depending on the types of changes that would be considered and how much discussion the Board

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wants to have about those, and the public input that you all want to receive about it as well. It could take longer than that. I would say two years is most likely sufficient, but it's really not, I can't say for sure.

CHAIR REID: All set? Any other questions from the Board? Mr. Clark.

MR. CLARK: Not a question, but just along that line. I would just say, I think two years also helps give us a deadline to hopefully get through the stakeholder process, get everything set and revisit this. Sometimes it is good to have a date certain, where you want to get some results.

CHAIR REID: Mr. Gates.

MR. MATTHEW GATES: Another question sort of along these same lines. What are the consequences of if we don't get the stakeholder work done in the two years? Where does that leave us for that third year then?

MS. STARKS: Under Addendum IX you have the possibility of setting multiyear specifications for males only for a total of six years. If we were not through the stakeholder process and the Board wanted to set another multiyear set of specifications for males only, you would be able to do that for up to another, up through 2031. It wouldn't really affect your ability to set specifications is what I am trying to say.

CHAIR REID: Ms. Kerns.

MS. KERNS: You would run the ARM again to set your specifications, that would be what would happen, and if you set more than two years here and we finished the process in two years, the only difference would be you would need a two-thirds majority vote to undo your specification that you set.

CHAIR REID: Thank you, back to the Board. Any further discussion on the motion? Mr. Gates.

MR. GATES: Yes, I think with that explanation. I think I would be more comfortable with a three-year period. I think I would, for discussion purposes at least, I would like to make a **motion to amend to add for three years.**

MR. REID: Your motion to amend would read: **For 2026 through 2028.** That is the change. Is there a second to Mr. Gates motion? Mr. McKiernan, you second that motion? Mr. Gates.

MR. GATES: I think it is more or less the same justification as for the two-year specifications, but this gives us that third year to complete the work without having to run that ARM, possibly run the ARM again with sort of the status quo conditions.

CHAIR REID: Thank you. Mr. McKiernan.

MR. DANIEL MCKIERNAN: I would anticipate hearing from John Clark about the appropriateness of this, but that's all.

CHAIR REID: Mr. Clark.

MR. CLARK: Yes, thanks, and Dan, you anticipated correctly. Yes, I certainly understand we gave ourselves the options to set these specifications for three years. But as I pointed out, you know we now in, what is this year four already of having the new ARM. As you recall, even under the old arm we were at a point where the estimates were saying that they had recommended a small amount of female harvest, even under the old ARM.

I think the ARM, as the population estimates show from both horseshoe crabs and red knots, that the ARM has been successful. It has done just what it said it would do. I think as I said earlier, that two years is a good balance. I didn't want to imply that stakeholders had not had input into the old ARM or the new ARM.

I think the whole process has been very transparent, has gotten a lot of input from stakeholders across the spectrum for horseshoe crabs. At this point, as I said, I think it sends the wrong signal to our traditional harvest community

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that as a Board we're just kind of kicking this issue, you know we're just going to get another three years.

I mean we have; I would say a legitimate reason here to give it a couple years more of male-only to get this stakeholder input into this process. But I think that having that date certain is helpful, both to concentrate the attention of the Board and to let our entire public know that we're just revisiting this until we can get this additional input.

CHAIR REID: Ms. Starks.

MS. STARKS: I think the Chair just wanted me to clarify that just for everyone's knowledge. In a situation, if you were to set three years of 500,000 males today. If the stakeholder process were completed and we had the ability to run the ARM with the new changes that are hypothetically adopted in this scenario before the three years are over, and the Board wanted to use the results of that new ARM.

You could ask us to run the ARM in Year 2, or whatever point you want us to run the ARM with the new changes. Then you could use that to change the specifications before the three-year period is over. I just wanted to clarify that.

CHAIR REID: We have a motion and a motion to amend. Let's talk about them both so we can get that out of the way. Ms. Costa.

MS. COSTA: I just wanted to clarify. If we do revisit the specifications before the three years is up you need a two-thirds majority vote. But we can still do it.

CHAIR REID: Okay, thank you. Anybody else but Mr. Clark want to have a say here? Ms. Kennedy, go ahead.

MS. CARRIE KENNEDY: I prefer the three-year specifications, just because I think it give us more flexibility. While I am hopeful and optimistic that we can do it in two, and I would

like that to be our goal. I think it behooves us to have three years and not have to run the model before then just to extend it.

CHAIR REID: Thank you, Ms. Vice-Chair, appreciate it. Anybody else? Mr. Cimino.

MR. CIMINO: If you don't mind one more bite at the apple, Mr. Chair. I struggle with this. New Jersey has a moratorium in place, I expect that to stay in place. There is a lot at stake for some of the species. But I still support the main motion, because I feel like this is a discussion on what we consider.

You know we had this conversation when the ARM was approved. The best available science is out there and it's saying that there is some safe harvest level. I don't want to walk away from that discussion in best available science. I'm not saying that in a couple years I'm going to be willing to support female harvest. But I think that continued discussion is important.

CHAIR REID: Anybody else? Mr. Clark.

MR. CLARK: Thank you for your indulgence in letting me speak again. I mean after hearing Caitlin's explanation, both motions pretty much will have the same impact. As mentioned, if there was three years, yes you could revisit in two years with a two-thirds majority. But I still think the original motion, the signal it's sending out is that we want to get this process done in two years.

As we all know, a job will tend to take as long as it's allocated to it, just like a contract will cost as much as is allocated to it. I think that giving ourselves the two years is sending the right signal to the entire spectrum of the stakeholders interested in this is that we're taking this seriously. We want to get more input.

The ARM model has been peer reviewed; it's been shown to be one of the first and best ecological models. It's taking into account both the harvest of horseshoe crabs and its potential impact on the

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migrating shore birds. I really think we need to go with the original motion of two years.

CHAIR REID: Anybody in the public, anybody that would like to address the motions that are on the board? Yes, sir, please state your name and any affiliations you may have or have had in the past, and perhaps your recipe for cookies would be fine as well.

MR. PATRICK AUGUSTINE: Yes, I'm Pat Augustine, former member of this illustrious body for 16 years, and here we are kicking the can down the road, discussing something that was so clearly stated as being the right decision, and motion by Mr. Clark and Mr. Borden, and just wasting a bunch of time drawing away. I would make a motion to either table the substitute motion or amend the motion or table it forever, and pass judgment on the original motion.

CHAIR REID: Thank you, Mr. Augustine. Anybody else in the audience? Anybody online? Seeing none; back to the Board. Is there any further discussion on either of these motions before we go down the road of the vote? Okay, so first we're going to address the motion to amend. Is there any need to caucus? Okay, I believe there are two sides to this motion, so we will take a vote. Raise your hands. **All those in favor, please raise your hands, and keep them up so Ms. Kerns can count.**

**MS. KERNS: Rhode Island, Connecticut, North Carolina and U.S. Fish and Wildlife Service.**

**CHAIR REID: Put your hands down. All those opposed, raise your hands, please.**

**MS. KERNS: Massachusetts, New York, New Jersey, Florida, Georgia, South Carolina, Maryland, PRFC, Virginia and Delaware. I apologize, it's very hard to see faces at the other end of the table.**

**CHAIR REID: Any abstentions, any null votes? Motion fails 4 to 10 by my count.**

CHAIR REID: Now the underlying motion is now the main motion. Any further discussion? Seeing none; is there any need to caucus? Seeing none, **is there any opposition to the motion on the board? Seeing none; is there any null or abstentions? Seeing none; the motion passes by unanimous consent.**

Ms. Starks that's it for this item.

CHAIR REID: Okay, thank you very much. Let's move on to our next presentation, Ms. Starks two or three or four. She's only got another half a dozen to go after this, so Ms. Starks, Stakeholder Engagement.

**UPDATE ON STAKEHOLDER ENGAGEMENT PROCESS PLANNING FOR EVALUATING ADAPTIVE RESOURCE MANAGEMENT FRAMEWORK REWARD, UTILITY, AND HARVEST POLICY FUNCTIONS**

MS. STARKS: I just want to provide some updates on the stakeholder engagement process that we mentioned today. To start off with a quick review of the background. In July 2024 we held a Stakeholder Workshop and convened a small group of stakeholders representing the environmental NGO, fishing, biomedical, bird and horseshoe crab scientists and management and folks with an interest in this issue to discuss the Adaptive Resource Management Framework and objectives for the Delaware Bay Region state fishery.

One of the key consensus recommendations from that workshop was to refine the ARM Framework's reward and utility functions with stakeholder input. Now as a reminder, the Utility Reward and Harvest policy functions or URH functions as we're abbreviating them are equations in the ARM Framework that are reflective of the values of the stakeholders.

The Board tasked the ARM Subcommittee with discussing these functions and recommending a process for getting stakeholder input on them to

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inform possible changes. The ARM Subcommittee recommended a multistep process with engagement of various stakeholder groups, led by a third-party facilitator or facilitators with expertise in structured decision making. In May, 2025 the Board support pursuing this approach. After the May meeting the Commission put out a request for proposals for facilitators with the specific expertise of early today needed for this process, and we have contracted with Compass Resource Management. We did a press release a month or two ago requesting applications for participants in this process, and invitations were recently sent out to a group of stakeholders to participate in the full process and an in-person workshop.

We've also had already several planning meetings with the Compass Team to develop an overarching plan and schedule and content for stakeholder meeting. The process that we've outlined includes several steps, and the first in that is over the next few weeks Compass will be scheduling small group calls with each stakeholder group.

For the purposes of this process, the participant groups are the bait fishery, dealers, biomedical, shorebird conservation, horseshoe crab conservation and ecosystem conservation. However, we do recognize there is a lot of overlap in these groups, so we're hoping to dig into that during this process.

The purpose of these calls is for Compass to provide information to the participants about what the process is going to look like and expectations, and also to enhance their understanding of the different perspectives of each of these stakeholder groups ahead of the workshop. The next step will be a series of educational meetings or webinars, webinars, they will be virtual, in November or December.

These will be to establish the scope of the workshop discussions and goals, and increase the participants understanding of the Utility,

Reward and Harvest Policy Functions of the ARM Framework, and to review differences between the original and the revised ARM Framework, and generally allow for an open discussion between the technical experts and stakeholders to allow for more understanding of this entire system.

These webinars will also be opened to all stakeholders, not just the selected workshop participants, to broaden understanding outside of just this group. Then Step 3 will be the in-person stakeholder workshop, and we're aiming to schedule this for January. Federal shutdown has kind of complicated our planning process; we do have a lot of federal partners involved. But we're hoping to keep this on track for January.

This will be the core of the process where the selected active participants who represent these various groups within the Delaware Bay bait fishery will come together and participate in a structured process to illicit information about their values related to horseshoe crab management. The Compass Team is highly experienced in this type of process, so they will be running the show to make sure the ARM Subcommittee gets the information they need to inform any potential changes to the URH Function.

After that workshop the ARM Subcommittee and the Delaware Bay Ecosystem TC will have to meet to review all the information gathered at the stakeholder workshop, and translate that into possible changes to those functions to better align with current stakeholder values. The ARM Subcommittee will perform the technical work to develop alternative functions, review these with the Delaware Bay Ecosystem TC, and the two committees will make recommendations to the Board on how to move forward.

Then finally, the Board will meet most likely in May 2026 at the spring meeting, to review updated ARM runs and proposed alternative functions, developed based on the stakeholder input. If there is a desire to pursue those changes at that time, it would need to initiate an addendum to consider adopting the

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changes to the URH Functions. With that I can take any questions.

CHAIR REID: Any questions? Mr. Clark.

MR. CLARK: Thank you, Caitlin. I just wanted to check, is Compass the same group that did the workshop last year?

MS. STARKS: No, it is not. Last year's workshop was conducted by Christina Weaver and she is based in Virginia. Compass is actually a firm based out of the West Coast and Canada, Vancouver area. It is a new party that is new to this process, and I think that will bring some fresh eyes into the mix.

CHAIR REID: Any other questions from the Board? Go ahead, John.

MR. CLARK: Just a follow up question. The process you said should be ready for the Board to review by this next May. Just to follow up on the motion that we just approved, this should give the Board time to review what they've done and hopefully decide on specifications. You know, be ready, because we're not even talking about setting different specifications until 2028. This actually gives, I would say, a lot of time for the Board to consider this.

MS. STARKS: Yes, just to follow up. I think there is still more uncertainty around the time it would take to complete the addendum process, because if the Board initiates an addendum in May, the earliest it could be completed would be for October, which is when you all set specifications typically. You know given the complexity of these value-based functions; I think it might take more time than that to complete the addendum process.

CHAIR REID: Anybody else on the Board with a question? Anybody in the public? Anybody online? Okay, Ms. Starks, thank you very much. Let's move on to Ms. Starks. We're going to Consider Action.

### **CONSIDER APPROVAL OF FISHERY MANAGEMENT PLAN REVIEW AND STATE COMPLIANCE FOR THE 2024 FISHING YEAR**

MS. STARKS: All right, thank you, Mr. Chair. Next up is the FMP Review for the 2024 Fishing Year. I'm going to go over the status of the FMP, the fishery management plan, the status of the stock, the status of the fishery and the PRTs review of the state compliance with the FMP provision, and finally the recommendation.

This is a quick summary of the management for horseshoe crab at the Commission, our FMP was approved in 1998, it has been modified by 8 addenda, actually sorry, 9 most recently, is Addendum IX in 2025, which allows for the multiyear male only specs, and then before that in 2022 you all adopted Addendum VIII, which implements the new ARM revision. For stock status, horseshoe crab stock status is based on the 2019 Benchmark Assessment and the 2024 update to that assessment. The stock status is determined using the results of the ARIMA analysis in the assessment and its based on the number of surveys in each region or coastwide that are currently below the index level in 1998, and 1998 is the reference point because this represents the point in time when horseshoe crabs became actively managed by ASMFC, so status relative to that 1998 point gets an indication of the effective management on populations.

A 2024 update to the assessment indicates that the stock status of the northeast region remains neutral. The New York Region status continues to be poor, with three out of four surveys being below the 1998 reference point. Then the Delaware Bay and coastwise status have improved from neutral to good since the 2019 benchmark, and the southeast status has remained good as well.

The assessment also produced abundance estimates for the Delaware Bay population using the CMSA that Dr. Nehemiah went over, but that is not used for stock status. This figure is showing the annual values of reported horseshoe crab bait landings in orange, biomedical collections in light

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blue, and the estimated biomedical mortality in dark blue.

The values are in millions of crabs. Bait landings since about 2003 have fluctuated around the same level, and in the last eight years or so there has been an increasing trend in biomedical collection that's the light blue bars, and so mortality is updated with that. The total reported harvest in 2023 was 550,909 crabs, and that includes confidential landings.

This is a 25% decrease from the 2023 landings and 34.6 of the Commission's overall coastwide quota for horseshoe crab. The states of Massachusetts, New York, Virginia, Delaware and Maryland make up 99.9% of the total for 2024, with Massachusetts and New York harvesting the highest numbers.

States with greater than 5% of the coastwide landings are required to report sex-specific data for at least a portion of their bait harvest. For 2024 those states were Massachusetts, New York, Delaware, Maryland and Virginia. Within these states excluding Massachusetts, because their data were not yet available, 77% of the reported bait landings were male, 21% were female, and 2% were unclassified in 2024.

For biomedical in 2024 the number of crabs collected for the sole purpose of LAL collection in the biomedical industry was 1,073,329 crabs, and this is a 3% decrease from 2023. The estimated biomedical mortality was 184,693, and this is 15% of the total crabs that are bled, plus the observed mortality reported by each state.

The biomedical mortality represents about 25% of the total directed mortality, so that is state harvest plus biomedical mortality, which was about 735,000 crabs in 2024. Compared to 2023 there was a 20% decrease in the overall mortality, including bait harvest and biomedical mortality in 2024. Here you can see how those two pieces compared to each other, with this graph showing the overall mortality.

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The orange area is the bait harvest mortality and the blue area is the estimated biomedical mortality. The PRT, Plan Review Team, had a few notes to highlight from the Compliance Report Reviews. All states appear to be in compliance with the FMP measures. The only issue was that Massachusetts was not able to submit a compliance report by the deadline. Changes in state regulations include that Connecticut prohibited hand harvest of horseshoe crab and eggs as of October 2023, and New York had implemented additional lunar closure in May and June to protect spawning crabs.

For de minimis status, states can qualify if their combined average landings for the last two years are less than 1% of the coastwide bait landings for that two-year period and South Carolina, Georgia and Florida have requested and meet the de minimis criteria. Then the recommendations from the PRT are to continue to prioritize long term funding for the Virginia Tech Trawl Survey, as that is critical for our current management program.

They also recommend working towards getting annual estimates of horseshoe crab discard removals from other fisheries. That wraps up the FMP Reviews and the Board action for consideration is to approve the FMP Review for the 2024 fishing year, state compliance reports and de minimis requests.

CHAIR REID: Okay, any questions from the Board? Mr. Hasbrouck.

MR. EMERSON C. HASBROUCK: I have two questions. On the slide for bait harvest that you had up earlier, if you could go back to that, please. Total 2024 coastwide harvest was 550,908 crabs. Then there is a bullet at the bottom that says Mass data not provided. Does that mean the Massachusetts data was not provided and is not included in that 550,000 or just of percent male and female were not provided? That's my first question.

MS. STARKS: I believe it's just the percent male and female, but I can check very quickly and make sure.

MR. HASBROUCK: Then my second question had to do with the funding for the survey. It's in place for 2026, where is that funding currently coming through?

EXECUTIVE DIRECTOR ROBERT E. BEAL: The funding for the Virginia Tech Trawl Survey comes through an appropriation line in the Federal budget, and it comes openly from the Science Center, the Northeast Fisheries Science Center. It's been consistent for close to a decade now, quite a while. Once funding is in the Federal budget for that long it is relatively easy to keep it going. It is a lot easier than getting new funding, so I think we're in a pretty good space there with consistent funding.

MR. HASBROUCK: Well, in the past it's been easy to keep it going, who knows what we're going to see going forward, right. But hopefully it stays in the budget. Thank you.

CHAIR REID: Mr. Miller then Mr. Clark.

MR. ROY W. MILLER: If I may follow up, Bob. Is that the funding something we need to work on at the Legislative Committee level, or not?

EXECUTIVE DIRECTOR BEAL: That is one of our funding priorities every year when we go to Capitol Hill with our funding priorities. We are working on that. Alexander and I reiterate that anytime we meet with appropriations staff, or anyone else that can help us out. Obviously, it is important. Emerson sort of eluded to it, the funding cycle that we're in right now probably has less certainty than some of the previous ones.

As it goes forward, we'll see what the President's budget looks like, you know is going to propose for next year and we can react to that. Individual states going to their individual offices does carry a lot of weight. We'll keep you all informed on how this is progressing and we can set up some meetings for folks around the table if they want us to.

CHAIR REID: Mr. Clark.

MR. CLARK: Thank you for the presentation, Caitlin. I just wanted to point out that at least for Delaware, I mean there has been a dissonance right here between what was actually landed last year, only 35% of the quota as opposed to what the population estimates show. I know for Delaware it was not for lack of horseshoe crabs; it was because of the market.

I think, Craig, you probably saw the same thing happen where the price. We only harvest male horseshoe crabs in Delaware; the price was low. I know one of our dealers told us that he was kind of limiting the number that you could get sold in any given time. Just wanted to point out, it was not because the crabs weren't there.

CHAIR REID: MR. CIMINO.

MR. CIMINO: Just going back to some of the comments on the Virginia Tech Trawl Survey. There have been enough kudos to Bob and Alexander. I know we're dealing with the government shutdown and we're uncertain on the budget. But from the drafts that we've seen from both House and Senate, Virginia Tech Trawl Survey is in there.

I think that is that tremendous effort that we've never let our foot off that pedal, and to Roy's question, I don't think we ever should. Whether or not year after year it helps. The fact is it is always something that we have to make a priority for us, and we'll talk about that later in the week as well. But I was very happy to see that in all the draft budgets so far.

CHAIR REID: It certainly doesn't hurt, and if any of you have the desire to go up to the Hill or find out who you have to contact to support that survey, Mr. Law would be more than happy to help you. Anybody else? Go ahead, sir. I can't see your name; you don't have a name tag. I'm blind, so it doesn't matter. Please state your affiliation and your name before you get going.

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MR. STUART POTTER: I'm from Delaware, my name is Stuart Potter. I see you say last year 184,000 crabs were killed through the biomedical industry. I just want to know why is that not considered a harvest and come off of each state's quota.

MS. STARKS: The FMP manages the bait quota and the biomedical collection separately. It is accounted for. Those mortalities that occur from the biomedical industry are accounted for in our population model for the Delaware Bay bait specifications that we just discussed. But we do not have a quota for biomedical, so that is why it's not taken of the bait quota.

CHAIR REID: Are you all set, Sir?

MR. POTTER: Maybe it should come off the Bay quota.

CHAIR REID: Okay, thank you. Anyone else in the audience? Anybody online? Okay, I'm looking for a motion to approve. Mr. Hasbrouck.

MR. HASBROUCK: I'll make that motion. Staff has it prepared.

CHAIR REID: Go ahead, Emerson.

MR. HASBROUCK: **Move to approve the FMP Review and state compliance reports for the 2024 fishing year, and de minimis status for South Carolina, Georgia and Florida.**

CHAIR REID: Thank you, is there a second to the motion? Mr. Grist are you seconding the motion? I don't think we need any rationale. Is there any discussion? **Is there any opposition? Seeing none; the motion passes by consent.** Thank you very much. Just one more piece of business.

We have some recommendations from the PRT. I don't think we have to have a motion. If there is any discussion on those recommendations we can have it now, and if there is no opposition I

would be happy to have nodding heads to approve that. Okay, it's approved. Our last item of business is, if you remember that last meeting, we held off on repopulating our AP to get the public another chance to get in the game.

What we did was we formed a working group to go through all the applications, and I want to thank Ms. Berger and Ms. Starks and the working group. There were a lot of qualified people, but the working group certainly, never mind, I'll let her talk.

### **REVIEW AND POPULATE ADVISORY PANEL MEMBERSHIP**

MS. STARKS: I didn't want to have to make you go through all of that when I have it on the slide. I'll go over the summary of what that work group worked on. Again, this came out of the July 2024 Stakeholder Workshop, which then evaluated the ARM Framework and thought about objectives. One of the recommendations they made was also to evaluate the Horseshoe Crab Advisory Panel to determine if it had adequate representation across stakeholder groups.

Earlier this year the Board reviewed the AP membership and agreed it would be beneficial to consider reshaping the panel to have a more even distribution of advisors from each region or more equitable distribution. Additionally, it decided to conduct an open solicitation process for additional nontraditional stakeholder seats.

### **BOARD WORK GROUP REPORT ON ADVISORY PANEL COMPOSITION**

MS. STARKS: The Board formed a workgroup to look at all of this and that workgroup consisted of several Commissioners. They reviewed new nominations and developed recommendations on appropriate distribution of advisors by region and user group, which that workgroup met over the summer. They reviewed a total of 14 nominations that were submitted for nontraditional stakeholders and 3 nominations for commercial fishery appointments. Regarding the overall distribution, these are the workgroup recommendations by

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region. For the northeast they recommended 3 advisors, including 1 individual from the commercial fishery, 1 from biomedical industry and 1 nontraditional stakeholder.

For the Connecticut and New York region they recommended 2 advisors, including 1 commercial fishery and 1 nontraditional stakeholder. For the Delaware Bay they recommended a total of 13 advisors, recognizing the focus of this area for horseshoe crab. That includes 5 commercial fishery advisors, 3 biomedical and 5 nontraditional stakeholders.

For the southeast the recommendation is 2 advisors, including 1 biomedical and 1 nontraditional stakeholder. Generally, these recommendations aim to balance the relative interests of each region, and represent various gear types in the commercial fisheries, as well as diverse expertise among the nontraditional stakeholders, and also to make sure the overall size of the AP would result in more productive discussions within the group.

After a thorough review of all of the nominations that were submitted, the workgroup recommended appointing the following individuals to the AP by region, in addition to the current advisors sitting on the panel. For commercial fishery appointees, Edwin Chiofolo is representing the Connecticut/New York Region and he is from New York, a second-generation fisherman with 40 years of on the water experience.

Stuart Potter from Delaware is a fourth-generation fisherman that's been fishing for conch and hand harvesting horseshoe crabs since 1994. Pete Bender from Virginia is a long-time participant in the commercial fishery and harvests horseshoe crab using dredge and trawl gear. The nontraditional appointees include Helen Cheng from Massachusetts, who has a Master of Science in horseshoe crab population dynamics and behavior, and served on the

Massachusetts Division of Marine Fisheries  
Horseshoe Crab Science Committee.

Jennifer Budai, I'm sorry if I am mispronouncing any names, is a citizen scientist from Connecticut with over 10 years of experience observing horseshoe crab and shorebird interactions, as well as watching horseshoe crabs, and was endorsed by Representative Gresko that sits on the Commission.

Susan Linder from New Jersey is a wildlife biologist with the Wildlife Restoration Partnership in New Jersey and assists with shorebird and horseshoe crab research. Tim Dillingham is from New Jersey was a former Executive Director of the American Littoral Society. Glen Gauvry from Delaware is the President of the Ecological Research and Development Group, which is a nonprofit focused on horseshoe crab conservation.

Carly Touran from Maryland is an environmental scientist for the Maryland Coastal Bays Program that assists with monitoring efforts related to horseshoe crabs and shorebirds. Jane Brockman from Florida is a professor emeritus of Biology at the University of Florida, and has conducted academic research on horseshoe crabs for 35 years. This is a very qualified group of individuals recommending to be added and there is one recommendation for removal, just based on lack of activity on the panel, which is John Turner from New York. Then additionally, the workgroups recommendations include that AP meeting attendance should be reviewed regularly to determine if additional changes to the panel are needed, to make sure it is continuing to be active.

For the nontraditional advisory appointments, the recommendation is that they would serve a four-year term consistent with the traditional commercial advisor's seat. Then after four years the Board could consider renewing those appointments. Then to wrap up, the Board action for consideration is to approve the recommendations to changes to the Advisory Panel membership today.

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CHAIR REID: Any questions from the Board?  
Seeing none; we need a motion to approve.  
Ms. Kennedy.

MS. KENNEDY: **Move to improve the changes to the Advisory Panel membership, as recommended in a workgroup memo dated October 10, 2025.**

CHAIR REID: Is there a second to this motion?  
Ms. Costa. Discussion, other than thank the working group for their effort. That is a discussion on my part. **Any opposition? Seeing none; the motion passes by consent**, and there are working group recommendations on how to move forward over time. Are there any issues with that recommendation? Can we accept that recommendation as well? Seems that we can. Is there any other business? Go ahead.

MS. STARKS: I just also wanted to express thanks for all of the applications that came in for Advisory Panel seats. There were a lot more applications than, well not a lot, but there was a large chunk of applications for this, so it was really encouraging to see the interest in the horseshoe crab management issues, and thanks to those who applied and were not approved today.

### OTHER BUSINESS

CHAIR REID: Okay, that brings us to Other Business. There is some other business from New York. Is there anybody else that has any other business for Horseshoe Crabs today? Mr. Hornstein.

### NEW YORK UPDATE

MR. JESSE HORNSTEIN: Just had a couple things I wanted to speak about and promise I'll keep it brief. First thing is related to the 2029 Benchmark Assessment. Really, really like to encourage the Horseshoe Crab Stock Assessment Subcommittee to prioritize the integration of all the best available science into that benchmark.

Datasets that begin after the 1990 reference year, including NEAMAP trawl data and statewide spawning surveys should be considered quantitatively alongside other longer-term surveys. These spawning surveys target adult horseshoe crabs, whereas most of the surveys that we utilize in the regional assessments catch horseshoe crabs as bycatch.

Mostly spawning surveys are fixed station, but so are many of the surveys that we use in these original assessments like New York's beach seine surveys. In the 1998 management plan, spawning survey data was recommended as the highest research priority for determining spawning stock biomass. Since then, many states have made significant investments in these surveys, including both financial, New York has spent over a million dollars on the survey since it started, and the staff time and citizen scientists as well to conduct these surveys. We just hope that all efforts can be made to incorporate that information into these regional assessments moving forward.

The other thing I want to just provide a quick update on is the bill that would ban horseshoe crab harvest in New York. Last year this bill was vetoed by Governor Hochul, and this year it was reintroduced and passed both legislative chambers again, and it's currently at the point where we're still waiting for the Governor to make a decision on it.

Just if the bill was to pass there would be regional implications for horseshoe crab bait markets and availability. For instance, New York's welk fishery would continue to not require horseshoe crabs as bait or have to look to other states to meet their needs. Impacts of this bill, you know would not only impact New York, but also reach broader regional impacts and across various fisheries as well. That's it, thank you.

### ADJOURNMENT

CHAIR REID: Thank you, Mr. Hornstein for your comments and your updates. Is there any other

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business? Motion to adjourn by everyone,  
opposed by no one. Thank you very much.

(Whereupon the meeting adjourned at 9:33a.m.  
on Tuesday, October 28, 2025)

# Delaware Bay Horseshoe Crab Adaptive Resource Management Framework

## Stakeholder Engagement Final Report

### Prepared for

Atlantic States Marine Fisheries Commission

### Prepared by

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### Date

20 April 2026

## Executive Summary

Building on feedback from a July 2024 workshop with Delaware Bay stakeholders, the Atlantic States Marine Fisheries Commission (ASMFC) conducted a structured stakeholder engagement process to inform updates to several values-based components of the Adaptive Resource Management (ARM) Framework for horseshoe crab harvest management in Delaware Bay. Compass Resource Management (Compass) was engaged by ASMFC to provide facilitation support for the process. This report documents the outcomes of the full engagement process and presents recommendations for the Horseshoe Crab Management Board's consideration.

The engagement was conducted in three phases: (1) virtual educational sessions held in December 2025 and January 2026; (2) a two-day in-person stakeholder workshop in Ocean City, MD, on January 29 and 30, 2026; and (3) post-workshop activities including a joint review session with the Delaware Bay Ecosystem Technical Committee (DBETC) and ARM Subcommittee on February 23, 2026 and a final meeting with the stakeholder group on April 14, 2026 to finalize recommendations and document any diverging perspectives. Fourteen stakeholder representatives from six broad interest groups participated in the process, alongside technical experts and ASMFC staff.

The process yielded actionable recommendations for updating the core values-based components of the ARM Framework — the Utility (U), Reward (R), and Harvest (H) policy functions. These recommendations reflect elicited stakeholder values and have been reviewed and generally supported by the stakeholder group, DBETC, and ARM Subcommittee. The key recommendations with broad agreement are summarized below:

- Update the horseshoe crab (HSC) harvest utility function to reflect a male-to-female bait harvest value ratio of 2.65 males per 1 female, based on values elicited from bait fishers and dealers.
- Retain the current sex-specific maximum harvest levels (500,000 males and 210,000 females), supporting potential market recovery and the incremental building of public acceptance for female harvest at ARM-recommended levels.
- Update the harvest policy functions to trigger zero female harvest if the CMSA-estimated female horseshoe crab population in Delaware Bay falls below 7 million crabs. Some stakeholders expressed support for a follow-up process to explore a higher threshold.
- Update the red knot (REKN) abundance utility function using values elicited from conservation stakeholders.

- Maintain the current reward function structure, which includes the sum of horseshoe crab harvest utility, red knot abundance utility, and their product. One stakeholder did not support the current reward function and suggested adding a term for horseshoe crab abundance or giving more weight to ecological terms in the function.

Updating the ARM Framework in the five ways described above may improve the level of trust in the ARM among stakeholder participants. Overall, stakeholders expressed broad agreement that the ARM should continue to be used and improved, despite varying levels of trust in the model. Most stakeholders support the use of its harvest recommendations, while others want to see improvements to the ARM's underlying science, or evidence of a stable and thriving ecosystem, before they would fully trust and accept the model's recommendations for allowing female harvest.

The engagement process also surfaced other recommendations regarding scientific uncertainty, process improvement, and public trust that are described in detail in this report.

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# 1 Background & Context

## The ARM Framework

The Horseshoe Crab (HSC) Adaptive Resource Management (ARM) Framework is a decision-support model used by ASMFC to set annual bait harvest levels for horseshoe crabs in Delaware Bay. The framework is designed to balance the commercial harvest of horseshoe crabs with the abundance of migratory shorebirds — in particular, the threatened rufa red knot (REKN) — which depend on horseshoe crab eggs as a critical food source during their migration stopover in Delaware Bay each spring.

At the core of the ARM Framework are three types of mathematical functions that capture stakeholder values and influence annual harvest recommendations (Figure 1):

1. The Utility (U) functions assign quantitative measures of value to different levels of horseshoe crab harvest and red knot stopover abundance, reflecting stakeholder preferences.
2. The Reward (R) function combines the utility values to determine the overall benefit of a given management action, balancing competing objectives.
3. The Harvest (H) policy functions translate long-term model-simulated population trajectories into optimal annual harvest recommendations.

The ARM Framework was last formally revised in 2021. Building on feedback from a July 2024 workshop with Delaware Bay stakeholders, ASMFC determined that several values-based components of the U/R/H functions warranted re-examination through a new structured stakeholder process.

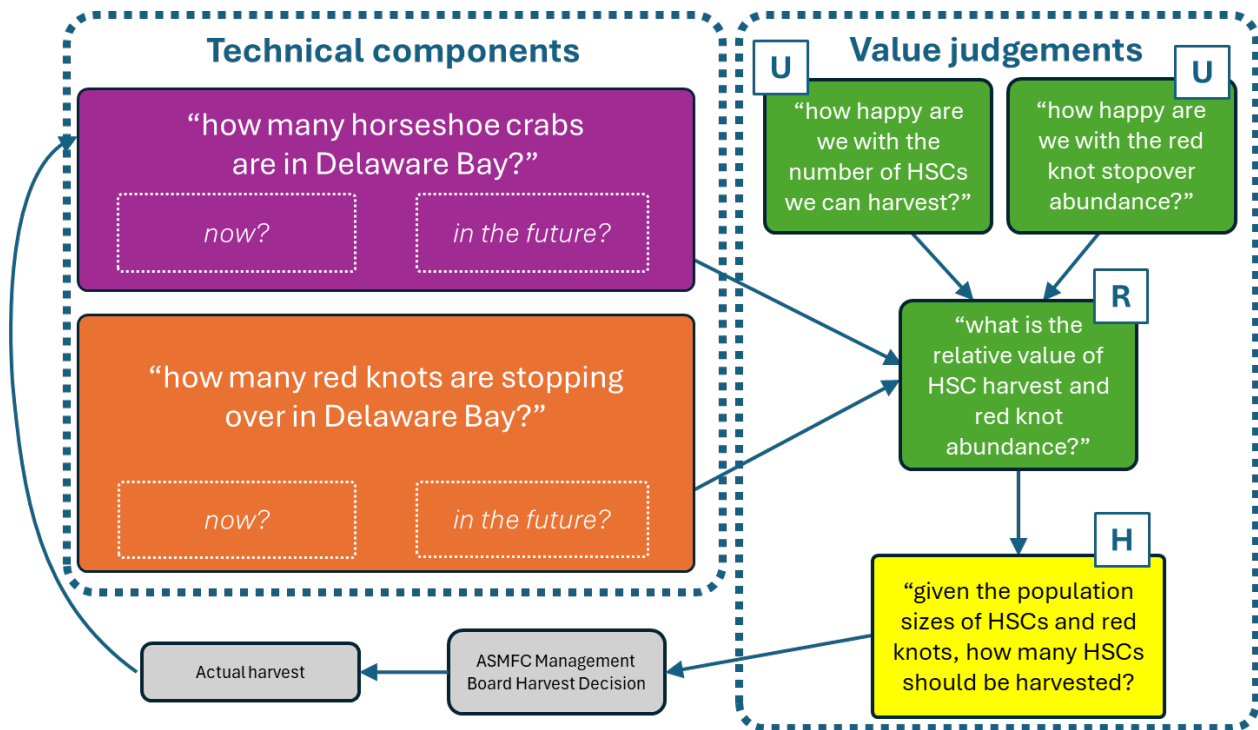
## Purpose of this Engagement

ASMFC engaged Compass Resource Management (Compass) to facilitate a structured stakeholder engagement process to develop recommended modifications to the U/R/H functions. The process was grounded in Structured Decision Making (SDM) principles, emphasizing transparency, inclusive participation, analytical rigor, and the integration of diverse values and knowledge systems.

A central objective of the process was to advance the ARM Framework from a perceived "black box" into a more transparent, values-reflective tool — one that stakeholders across a range of interests can trust as a credible basis for management decisions. The process was also explicitly

designed to build understanding among stakeholder groups, technical experts, and ASMFC over the course of the engagement.

**Figure 1. Simplified illustration of the Adaptive Resource Management (ARM) Framework and how the technical/science-based and values-based components relate. This engagement process focused on the Utility (U), Reward (R), and Harvest (H) functions.**



## Participating Groups

The stakeholder engagement process convened representatives from six groups with interests in horseshoe crab harvest management in Delaware Bay: (1) bait fishers, (2) bait dealers, (3) the biomedical industry, (4) ecosystem conservation organizations, (5) horseshoe crab conservation organizations, and (6) shorebird conservation scientists and organizations. Technical experts from the ARM Subcommittee, members of the Delaware Bay Ecosystem Technical Committee (DBETC), and ASMFC staff also participated throughout the process in a technical advisory and facilitative capacity. A full list of participants is provided in Appendix A.

## 2 Engagement Process

The engagement followed a phased approach, designed to move participants from a shared technical understanding of the ARM Framework toward informed, values-based recommendations for model updates.

### Phase 1: Education & Preparation

In October 2025, Compass conducted a series of small group interviews with representatives from each of the six stakeholder interest groups. The purpose of these conversations was to understand each group's key concerns and perspectives on the ARM Framework before designing the educational sessions and in-person workshop. These smaller group settings allowed participants to speak openly among their peers. The insights gathered directly informed both the content of the educational sessions and the structure of the workshop agenda.

Two virtual educational sessions were held in December 2025 and January 2026 to ensure all participants had a foundational understanding of the ARM Framework and the values-based components they would be asked to inform. ASMFC technical staff and ARM Subcommittee members provided background presentations that included the following topics:

- The current structure of the U/R/H functions within the ARM model.
- Key differences between the 2009 and 2021 ARM Framework versions.
- Historical context for why certain thresholds and parameter values were chosen.
- How different function shapes affect harvest recommendations and management outcomes.
- How uncertainty is incorporated in the ARM model and how the model learns over time through an adaptive management cycle.

Each session was recorded for participants unable to attend live. Dedicated time was provided for participants to ask questions of technical experts, promoting open dialogue between stakeholders and the scientific staff.

### Phase 2: Stakeholder Values Workshop

A two-day, in-person stakeholder values workshop was held January 29 and 30, 2026, in Ocean City, MD. The agenda was structured around sequential discussions of each U/R/H function component, with structured elicitation exercises embedded throughout.

The elicitation exercises followed best practices for structured expert elicitation: participants responded individually to elicitation questions using an online tool; the facilitator displayed group averages and individual responses; rationale for divergent responses was discussed openly; participants were given the opportunity to revise their responses in light of the discussion; and the group reviewed and confirmed the final group average. This iterative process is designed to reduce anchoring bias, encourage consideration of diverse perspectives, and produce group estimates that genuinely represent the breadth of stakeholder values.

### **Phase 3: Post-Workshop Activities**

The DBETC and ARM Subcommittee met jointly via webinar on February 23, 2026, to review the January 2026 workshop outcomes and develop formal recommendations for the Management Board. The meeting covered each of the major ARM components addressed at the workshop. A summary of the Committee meeting discussions and recommendations was sent to the stakeholder group for review prior to their final meeting, which was held on April 14, 2026, to present draft model updates, collect structured feedback and final recommendations, and document any conflicting perspectives.

## **3 Stakeholder Engagement Outcomes**

The stakeholder engagement process focused on gathering input and recommendations for updating the U/R/H harvest functions within the ARM model. Through these conversations, participants also discussed several topics overarching or intersecting with the ARM Framework. These broader discussions, viewpoints, and possible next steps are summarized below.

### **3.1 General Views on the ARM Framework**

At the stakeholder workshop, there was broad agreement among participants that the ARM Framework should continue to be used and improved as the primary tool for guiding horseshoe crab harvest management in Delaware Bay. However, participants expressed a range of views on the trustworthiness of the current science underpinning the model. Most participants expressed confidence in the current ARM Framework and its recommended harvest policies, while others expressed uncertainty or distrust regarding specific data inputs and model predictions, noting they would not accept ARM Framework recommendations until outstanding scientific disagreements are addressed. This divergence in scientific trust was a recurring theme throughout the workshop.

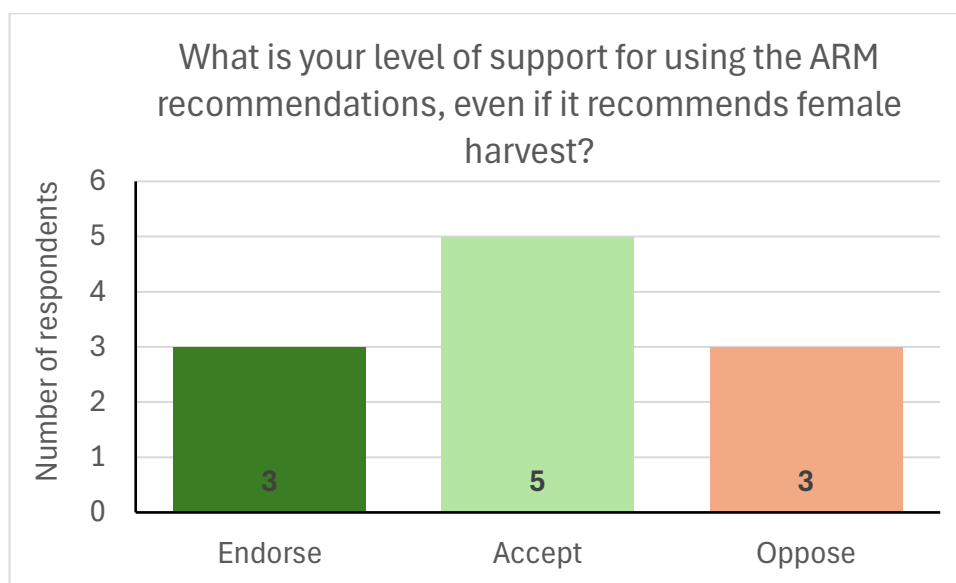
At the final stakeholder meeting, participants completed a poll around their relative level of support for using the ARM Framework recommendations, even if it recommends female harvest. Levels of support were defined as:

- **Endorse** - I fully support this
- **Accept** - I can live with it; it may not be my first choice, but I will support it here and outside of this group
- **Oppose** - I can't support it

Most participants either accepted or endorsed using ARM Framework recommendations, even if it recommends female harvest, while 3 of 11 respondents opposed this (Figure 2). None of the 3 people who “opposed” using ARM Framework recommendations shared their rationale, but it was likely captured above (e.g., needing to resolve scientific disagreements) or in the next section pertaining to when female harvest would be acceptable. Some participants in support of using the ARM Framework recommendations noted that management under the ARM Framework has resulted in a strong increase in horseshoe crab populations as well as a stable or increased red knot population. Multiple participants mentioned the amount of previous effort and discussion that has gone into building the ARM Framework by modelers and individual stakeholders, and that without using the ARM Framework for management as intended, these efforts are not seen as a valuable use of time and resources.

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**Figure 2. Stakeholder level of support expressed at the final meeting for accepting ARM recommendations, including female harvest.**



## 3.2 Acceptability of Female Harvest

A portion of the workshop was devoted to discussion of female horseshoe crab harvest, which the ASMFC Board has declined to implement since November 2022 despite the ARM Framework output recommending a limited female harvest. Compass facilitated a structured “debate” exercise in which all participants — regardless of their actual views — were asked to brainstorm arguments for two positions: that female harvest should never be allowed, and that female harvest is acceptable under certain conditions. This exercise was designed to build mutual understanding before moving into values elicitation.

Arguments raised for allowing female harvest included: the potential for harvest displacement to other regions if Delaware Bay remains closed; the operational burden on fishers of discarding females at sea; the fact that recommended harvest levels represent a small proportion of the total horseshoe crab population; and the broader economic value for fishing families and associated businesses.

Arguments raised against allowing female harvest included: the value of a precautionary approach given habitat loss and climate change pressures; the importance of unharvested females’ egg production for supporting broader fish communities in Delaware Bay; and the desire for greater certainty in a harvest policy to support long-term business planning.

Participants suggested several conditions under which female harvest might be considered acceptable, including consistent and sustained population increases for both horseshoe crabs and red knots, and meeting Endangered Species Act recovery criteria for the red knot. This discussion provided important context for the subsequent elicitation of U/R/H recommendations.

## 3.3 Scientific Considerations

Although the workshop focused primarily on the values-based components of the ARM Framework, participants also discussed the scientific foundations of the model. Some participants expressed concern that the ARM Framework does not fully capture the best available science, particularly regarding the mechanistic relationship between horseshoe crab abundance, egg density on Delaware Bay beaches, and red knot population dynamics.

At the workshop and final meeting, the group identified several potential steps to address scientific topics. These included a working session between ARM modelers and interested parties to discuss horseshoe crab egg density data and model mechanisms; an educational session focused on how uncertainty is incorporated in the model; and increased research and

monitoring on the relationship between horseshoe crab abundance and beach egg density. Participants also suggested exploring how habitat quality and quantity in the Delaware Bay could be better assessed, predicted, and incorporated into the underlying population models in the ARM Framework. Participants recognized that this may be difficult and management decisions surrounding habitat may be outside of the formal scope of the ASMFC; however, they felt that habitat is an important driver to both horseshoe crab and red knot outcomes, as well as the broader ecological system, that should be better understood. Participants noted that some of these activities may not need to be incorporated into the ARM model itself, but would nonetheless contribute to building scientific trust across stakeholder groups.

### 3.4 Process & Communication

At the workshop and final meeting, participants highlighted opportunities to improve how the ARM process is communicated to the broader public. ASMFC was encouraged to communicate more clearly about its data inclusion policies and the process for updating the science underpinning the ARM Framework. Participants also noted that ASMFC's existing "Stock Assessment Overview" document — designed as accessible public-facing material — could be promoted more proactively to ensure stakeholders and interested members of the public are aware of it. Participants also asked ASMFC to produce and disseminate documents for broader audiences with clear, concise consistent descriptions of the ARM Framework and the decision support process, which would help participants communicate consistently across groups and prevent the spread of misinformation. Participants recognized that all stakeholder group members have a role to play in communicating the ARM process and its outcomes to their own constituents, and that building public trust in the management framework is a shared responsibility.

## 4 ARM Component Discussions & Recommendations

The sections below summarize the outcomes and perspectives for each topic discussed in this process relating to potential updates to value-based components of the ARM Framework. Each section generally describes outcomes of conversations in the order they occurred: the January stakeholder values workshop; the February 23 joint meeting of the DBETC and ARM Subcommittee; and the April 14 final stakeholder meeting. Section 5 then summarizes final recommendations and rationales.

## 4.1 Horseshoe Crab Utility Function

At the workshop, participants from the bait fisher, dealer, and biomedical groups completed an elicitation exercise to update the male-to-female economic harvest value ratio in the horseshoe crab utility function (see Appendix B). The exercise asked participants to estimate how many male horseshoe crabs would be equivalent in value to catching one female, in the context of the bait market over the next five years.

Biomedical participants estimated a 1:1 ratio because there is no difference in the volume or value of blood they take from a female or male and both are needed for LAL production. Fisher and dealer participants estimated a higher ratio, with a group median of 2.65 males per one female. Fishers and dealers cited three reasons for this higher valuation: female crabs are larger, a single female can bait more traps, and the conch and eel fisheries — the primary markets for horseshoe crab bait — are more effective when baited with females.

The group then considered that in the specific context of the ARM Framework, the horseshoe crab utility function is focused on the value associated with bait harvest rather than the biomedical industry. On this basis, all participants — including the biomedical representatives — agreed that the fisher and dealer median response of 2.65 males per one female was the appropriate value for updating the horseshoe crab utility function. The current ARM Framework uses a 2:1 ratio.

The DBETC and ARM Subcommittee supported updating the male-to-female value ratio in the horseshoe crab utility function from the current 2:1 to 2.65 males per one female.

At the final stakeholder meeting, the group also affirmed this update.

## 4.2 Maximum Harvest Limits

At the workshop, the group explored whether there was interest in updating the current sex-specific maximum harvest limits in the ARM Framework (500,000 males and 210,000 females). Fisher and dealer representatives argued that the current limits should be maintained at a minimum (i.e., not reduced), given that actual harvest has been well below these limits since approximately 2020 due to a bait market downturn, and that maintaining the current limits would allow for sufficient harvest if and when the market recovers. They also noted that the limits represent a small fraction of the total horseshoe crab population size. Fishers and dealers further suggested that limits could be increased to a scientifically defensible level, noting that historical harvest was significantly higher and that growth of the fishery would benefit their livelihoods.

Other participants did not support increasing the harvest limits, citing the absence of broad public acceptance for female harvest even within current limits. They suggested that public trust in current harvest levels should be established before any increase is considered.

Given the absence of group consensus on changing the limits, the facilitation team recommended retaining the current maximum harvest limits. This approach accommodates potential recovery of the bait market while providing a measured pathway toward public acceptance of female harvest at ARM-recommended levels.

The DBETC and ARM Subcommittee supported retaining the current limits of 500,000 males and 210,000 females, recognizing that the absence of stakeholder consensus on this topic argues for maintaining the status quo at this time.

At the final stakeholder meeting, the group agreed to retain the current limits.

### 4.3 Harvest Policy Functions

At the workshop, participants discussed a structural concern with the current ARM harvest policy functions, which was raised in public comments on the 2021 ARM Framework Revision: these functions do not pass through zero, meaning the model cannot technically recommend zero harvest even at very low horseshoe crab or red knot population levels. Although the modelers described the technical reasons for this (namely that the model is fit to historical data and never predicts near-zero population sizes), some participants wanted an additional precautionary mechanism in the model that triggers no harvest if populations reach some low threshold. Three options for addressing this were presented and discussed:

1. A user-defined abundance threshold within the model, below which zero harvest would be recommended. The harvest policy functions would be updated to reflect this threshold while retaining the ARM model's ability to fit function shapes to observed data.
2. A threshold defined by the model predictions, where the range of ARM-simulated future horseshoe crab abundances (generated from thousands of model simulations) would define a lower population bound. If observed horseshoe crab abundance fell below this range, zero harvest would be recommended.
3. A Board-based harvest control rule, established outside the ARM model (e.g., through an Addendum to the management plan), requiring zero harvest if the horseshoe crab abundance estimate falls below a specified threshold.

Participants expressed a preference for the first two options, which preserve the ARM Framework's adaptive management learning process — a key structural advantage over simpler

rule-based approaches — and are more data-driven and technically defensible. The group recommended that the ARM modelers explore the feasibility of these options and return with proposals at the virtual follow-up session.

The DBETC and ARM Subcommittee recommended updating the harvest policy function to include an explicit zero-harvest threshold for female crabs. This approach was preferred over a model-defined threshold because it connects more directly to stakeholder input in the form of a numeric threshold. This method was also seen as promoting confidence in the ARM harvest recommendations, since it is easier to understand and communicate. Specifically, if the Delaware Bay population of female horseshoe crabs, as estimated by the Catch Multiple Survey Analysis (CMSA), falls below 7 million females, the ARM Framework will recommend zero female harvest for the upcoming year. This threshold was established through an elicitation of DBETC and ARM Subcommittee members and represents the median of the values provided (see Appendix B). This change directly addresses the stakeholder-identified concern that the current harvest policy functions do not technically permit a recommendation of zero harvest, even at critically low population levels. The ARM Subcommittee explained how the 7 million threshold will be incorporated into the next optimization of the ARM to revise harvest policy functions. The DBETC discussion focused on setting a female harvest threshold given female harvest has been the primary concern for stakeholders versus male harvest; the group did not discuss a method for setting a threshold for male crabs, but this could be addressed later if desired.

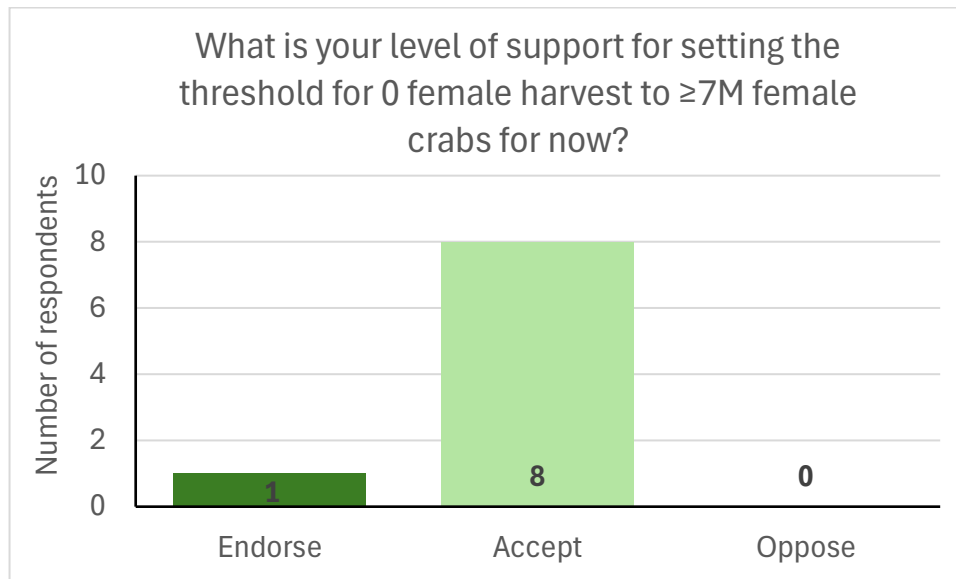
At the final stakeholder meeting, participants completed a poll around their relative level of support (endorse, accept, or oppose) for updating the ARM Framework to include a threshold for zero female harvest of 7 million female horseshoe crabs. Two participants initially “opposed” this update, explaining that they wanted to explore setting a threshold higher than 7 million females that would better account for uncertainty of population estimates and year-to-year variability, the need to maintain a thriving horseshoe crab population, and prevent major declines from current abundance – noting that a threshold of 7 million females is roughly a 63% decline from the current estimated population of ~19 million.

Participants were reminded that the ARM harvest policy function currently does not have any threshold that would trigger zero harvest, and a new question was asked to explore near-term recommendations. Specifically, participants were asked about their level of support for updating the ARM in the near-term to include a threshold for zero female harvest below a population of 7 million female crabs.

All respondents either accepted or endorsed this update (Figure 3). For at least two participants, they only accepted this as a short-term change and requested a process to explore a zero-harvest threshold higher than 7 million females that is more precautionary against uncertainty.

They recommended this process to happen soon, but could accept a threshold of 7 million females in the near-term.

**Figure 3. Stakeholder level of support expressed at the final meeting for updating the ARM in the near-term with a threshold of at least 7 million female horseshoe crabs that would trigger 0 female harvest.**



#### 4.4 Red Knot Utility Function

At the workshop, the group reviewed the current red knot utility curve, which gives “0” utility for low abundances, rises quickly at 90% of a threshold abundance, and reaches “1” at the threshold abundance of 81,900 birds. Seven participants from the horseshoe crab conservation, shorebird conservation, and ecosystem conservation groups completed two elicitation exercises to update the red knot abundance utility curve (see Appendix B). Both exercises asked participants to rate their level of satisfaction — on a scale of 0 to 100 — at a range of red knot Delaware Bay stopover population sizes, from zero (total extirpation) to 152,900 birds (the highest published population estimate).

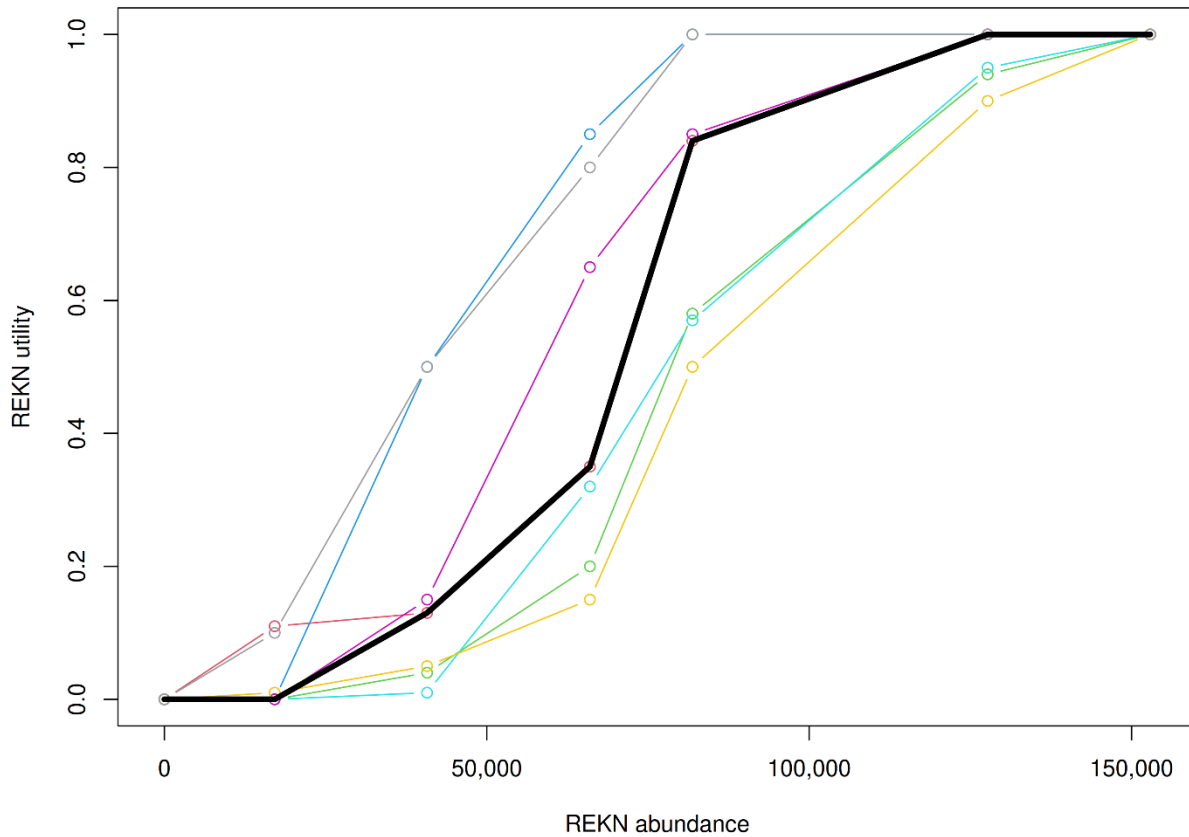
The first exercise asked participants to rate their satisfaction at different red knot population levels in general terms. A second, refined exercise asked: “What is your level of satisfaction at different levels of red knot stopover abundance in 2050?” This question was framed relative to the current estimate of approximately 40,000 to 50,000 birds (relatively stable over the past ten years) and was designed to better capture participants’ risk attitudes about long-term population losses or gains.

Participants felt the second exercise more accurately reflected their values, including a desire to avoid red knot abundances lower than current estimates. The group also supported a more gradual increase in utility as abundance increases from current estimates. After reviewing individual and group average responses and discussing rationales, the group confirmed they were comfortable using the average of responses from the second exercise to update the red knot utility curve in the ARM Framework.

The DBETC and ARM Subcommittee also supported updating the red knot abundance utility function to be more representative of stakeholder values elicited in this process.

Following the DBETC and ARM Subcommittee meeting, the ARM modeling team developed a revised utility curve using the median utility values from participants – which were elicited at 5 stopover abundances – and connected these values to represent utility (satisfaction) across the full range of possible red knot abundances (Figure 4). The revised curve appeared to better reflect stakeholder values for avoiding low abundance and increasing utility more gradually as abundance increases from current estimates.

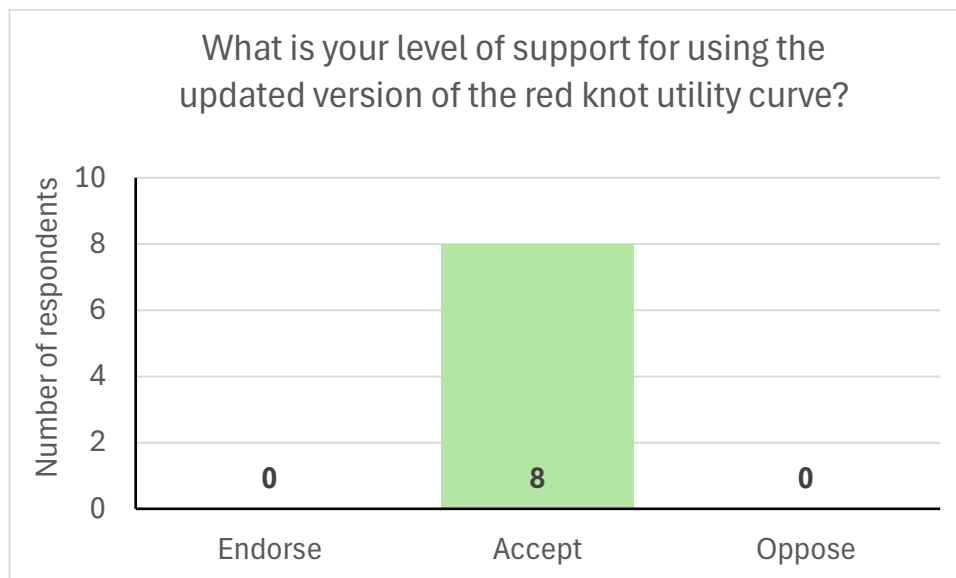
**Figure 4. Utility curve (black line) updated by the ARM modeling team and reviewed and approved by the stakeholder group. The curve relates utility (level of satisfaction) with future red knot stopover abundance. The black line shows the median of individual stakeholder responses (colored lines).**



At the final stakeholder meeting, participants reviewed the updated utility curve and how it was constructed. The group completed a poll around the level of support for using this updated curve in the ARM Framework.

All respondents accepted this update (Figure 5) and noted that it captured their interest in avoiding red knot stopover abundances decreasing from current estimates.

**Figure 5. Stakeholder level of support expressed at the final meeting for using the updated version of the red knot utility curve in the ARM.**



## 4.5 Reward Function

At the workshop, participants discussed options for restructuring the reward function. The current reward function is: Annual Reward = HSC harvest utility + red knot abundance utility + (HSC harvest utility × red knot abundance utility). The multiplicative term gives additional value to management actions that simultaneously achieve both objectives and ensures that maximum reward cannot be gained solely from HSC harvest or red knot abundance.

Some participants were satisfied with the current reward function structure. Other participants proposed adding terms reflecting broader ecosystem values, including habitat quality, horseshoe crab abundance, other shorebird species, and other metrics of ecosystem integrity. One suggestion was to add a term for uncaught female horseshoe crabs as an indicator of egg availability supporting fish communities and other fisheries in Delaware Bay. As an alternative, some participants suggested adjusting the existing utility weights (currently 1:1 for horseshoe crab harvest and red knot utility) to give greater weight to red knot utility as a proxy for broader ecosystem values not directly captured in the model.

ASMFC and technical staff noted that any new terms to the reward function would need to be measurable (with available data), predictable (with a model capable of forecasting the response to management actions), and within the current scope of the ARM Framework. Facilitators posed questions to the group when considering adding new terms, including: Does the new term represent a value already captured in the reward function or another part of the ARM? Is it fair

to put more weight on the ecological outcomes, and could everyone agree? And if we made these changes, would everyone agree to accept the ARM Framework recommendations even if it still recommended female harvest in some years?

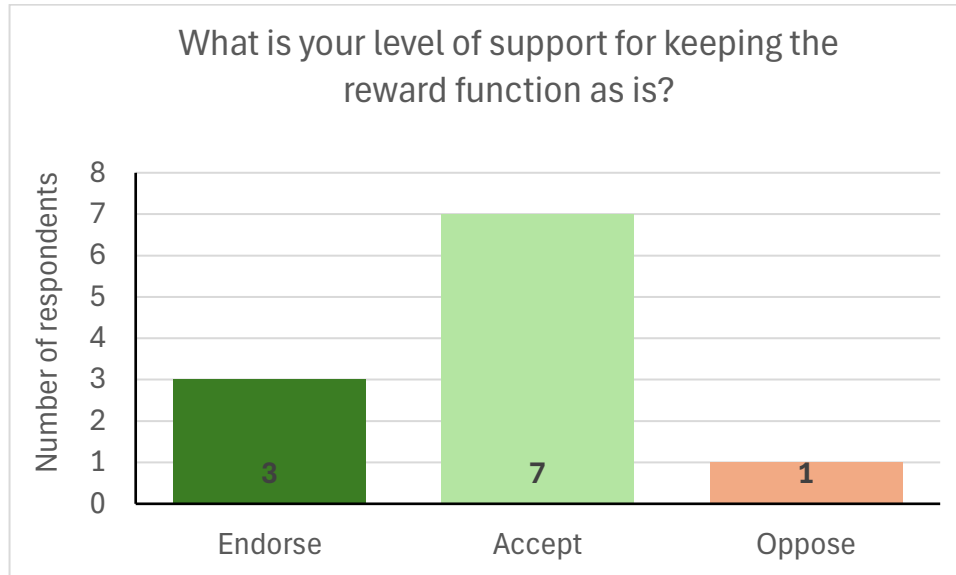
After discussing the technical and philosophical challenges of adding other terms or reweighting them, most participants were satisfied with the current reward function structure. Some were still interested in exploring additional ecological terms but acknowledged the substantial technical requirements.

The DBETC and ARM Subcommittee recommended maintaining the current reward function structure. The Committees reached near consensus on this recommendation. While some members expressed interest in restructuring the function to incorporate additional ecosystem values, it was noted that adding new factors beyond horseshoe crab harvest and red knot abundance would require additional data sources, modeling work, and a formal peer review process. Such changes may be considered in future ARM Framework revisions.

At the final stakeholder meeting, the group reviewed the DBETC and ARM Subcommittee recommendation and rationales. The group completed a poll around the level of support for maintaining the current reward function.

The group showed near consensus, with all but one respondent either accepting or endorsing to keep the current structure of the reward function (Figure 6). The one participant who opposed this expressed interest in adding a term for horseshoe crab abundance and/or giving more weight to ecological terms in the function (i.e., red knot abundance).

**Figure 6. Stakeholder level of support expressed at the final meeting for keeping the current structure of the reward function in the ARM Framework.**



## 5 Recommendations to the Horseshoe Crab Management Board

Based on the stakeholder engagement process and the subsequent technical review by the DBETC and ARM Subcommittee, the following recommendations for updates to values-based components of the ARM should be considered by the Horseshoe Crab Management Board. These recommendations reflect areas of stakeholder consensus as well as the Committees' technical judgments where stakeholder consensus was not fully achieved.

**Table 1. Recommendations and basis for updating values-based ARM Framework components from the stakeholder engagement process.**

ARM Component	Status	Recommendation	Basis
<b>HSC Harvest Utility Function</b>	Update recommended	Change female-to-male value ratio from 2:1 to 2.65:1	Stakeholder elicitation (fishers/dealers); confirmed acceptance by DBETC/ARMSC and stakeholders
<b>Maximum Harvest Levels</b>	No change	Maintain current maximum levels:	No consensus to increase or decrease at stakeholder workshop; confirmed

		500,000 males and 210,000 females	stakeholder acceptance of no change at final meeting; topic not formally reviewed by DBETC/ARMSC
<b>Harvest Policy — Female HSC Threshold for Zero Harvest</b>	Update recommended	Add zero-harvest threshold: no female harvest when estimated female HSC abundance < 7 million crabs	DBETC/ARMSC elicitation (median value); informed by stakeholder workshop discussion; confirmed stakeholder acceptance at final meeting as a near-term update to the ARM, with some participants requesting a process to explore higher abundance thresholds to trigger zero harvest
<b>Red Knot Abundance Utility Function</b>	Update recommended	Replace current curve using median values elicited from stakeholders	Stakeholder elicitation (conservation groups); confirmed acceptance by DBETC/ARMSC and stakeholders
<b>Reward Function</b>	No change	Maintain current reward function (HSC utility + REKN utility + HSC × REKN utility)	Near consensus at stakeholder workshop, DBETC/ARMSC meeting, and final stakeholder meeting; one participant requested adding a term for horseshoe crab abundance and/or giving more weight to ecological terms in the function

### **Additional recommendations to improve the ARM’s science, process, and buy-in**

This section describes additional recommendations about the ARM Framework, science, and process from the stakeholder engagement process.

- Consider facilitating additional engagement to address scientific concerns about the ARM model, including a working session on horseshoe crab egg density data and model

mechanisms and an educational session on how the model handles uncertainty around current estimates and future predictions. Building scientific credibility with all stakeholder groups is essential for the long-term legitimacy and effectiveness of the ARM Framework.

- Consider facilitating an additional working session to explore how habitat quality and quantity in Delaware Bay could be better assessed, predicted, and incorporated into the ARM's underlying population models, recognizing that habitat is an important driver of both horseshoe crab and red knot outcomes even where direct model integration may be outside the ARM's formal scope.
- Consider developing clearer ASMFC messaging and broader dissemination of data inclusion policies and science update procedures.
- For existing public-facing documents such as the "Stock Assessment Overview," consider improving methods to promote and disseminate them to increase the awareness of interested parties.
- Develop concise, consistent plain-language materials describing the ARM and its decision support process to help stakeholders communicate accurately with their own constituents and prevent the spread of misinformation. ASMFC could also work with stakeholder groups to develop or review public-facing documents.

## Appendix A: Workshop Participants

**Table A-1. Stakeholder participants at the January 29–30, 2026 stakeholder values workshop.**

Stakeholder Group	Name	Organization
Bait Fishers	Stuart Potter	Independent
	Jeff Eutsler	Independent
	David Trader	Independent
Dealers	Peter Hughes	Martin Fish Company
	Danielle To	Sea King
Biomedical	Allen Burgenson	Lonza
	Nora Blair	Charles River Laboratories
Ecosystem Conservation	Danielle McCulloch	American Littoral Society
	Lisa Ferguson	The Wetlands Institute
	Carly Toulan	Maryland Coastal Bays Program
HSC Conservation	Glenn Gauvry	ERDG
	Susan Linder	Wildlife Restoration Partnerships
Shorebird Conservation	Joanna Burger	Rutgers University
	David Mizrahi	NJ Audubon

**Table A-2. Technical participants and ASMFC staff who attended the January 2026 workshop.**

Group	Name	Organization
DBETC	Wendy Walsh	USFWS
	Jordan Zimmerman	DNREC
ARM Subcommittee	John Sweka	USFWS
	Jim Lyons	USGS
	Bryan Nuse	Bird Conservancy of the Rockies



<b>Group</b>	<b>Name</b>	<b>Organization</b>
	Conor McGowan (virtual)	USGS
ASMFC Staff	Caitlin Starks	ASMFC
	Toni Kerns	ASMFC
	Samara Nehemiah	ASMFC
	Madeline Musante	ASMFC

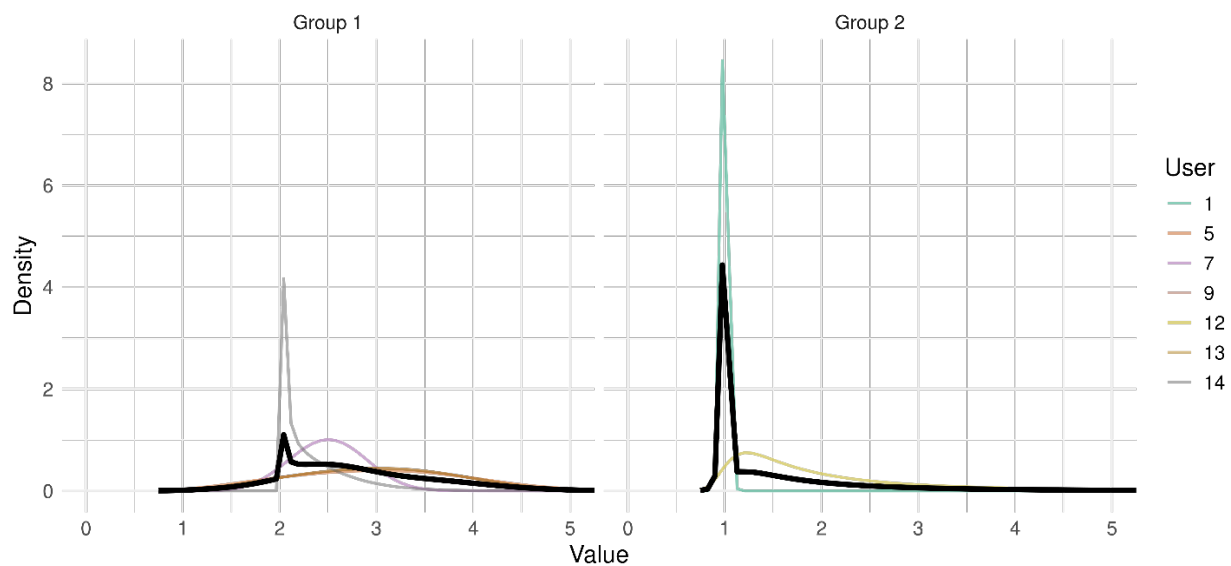
## Appendix B: Elicitation Details

### Horseshoe Crab Utility Elicitation

Seven participants from the bait fisher, dealer, and biomedical groups completed the horseshoe crab harvest value elicitation exercise. The exercise asked: "Considering the horseshoe crab bait market over the next five years, catching one female is worth catching how many males?" To capture uncertainty, participants provided four responses for each estimate: the lowest plausible value, the highest plausible value, the best estimate, and their level of confidence that the true value lies between their lowest and highest values.

Results showed a clear divergence between groups. Biomedical participants estimated a 1:1 ratio (median: 1.0), reflecting equivalent blood yield from male and female crabs for LAL production. Fisher and dealer participants estimated a median best estimate of 2.65, with individual best estimates ranging approximately from 2 to 3. The group consensus was to use the fisher and dealer median best estimate of 2.65 to update the horseshoe crab utility function, given that this function specifically addresses the bait harvest context.

**Figure B-1. Group mean (black lines) and individual participants' responses (other lines) representing the number of males expected to be of equivalent value to catching one female horseshoe crab. Each line shows the distribution of each person's responses (fit to their low, best, and high estimates). Group 1 is fisher and dealer participants (n = 5); Group 2 is biomedical participants (n = 2).**



## Harvest Policy Function Discussion & Threshold Elicitation

Three options for ensuring zero harvest is recommended at critically low population levels were presented and discussed at the workshop (described in Section 3.4 of this report). Participants expressed a preference for the first two options — a user-defined threshold or a model policy-based threshold — over a Board-based harvest control rule, on the grounds that the first two preserve the adaptive learning properties of the ARM Framework. These options were referred to the ARM modelers for feasibility analysis.

Following the workshop, the DBETC and ARM Subcommittee conducted an elicitation among their members to identify an appropriate threshold value for the zero-harvest policy.

**Table B-1. Benchmark abundances of CMSA female horseshoe crab abundance estimate (millions) in the Delaware Bay presented at the DBETC and ARM Subcommittee meeting for elicitation.**

<b>CMSA Female Abundance (millions)</b>	<b>Description</b>
0	Extirpation
3.75	Recruitment Declines
3.77	Lowest CMSA estimate (2006)
4.04	Lowest extrapolation from Sweka et al. 2025
6.25	2003 mark-recap estimate (Smith et al. 2006)
6.90	Max harvest within M error
7.80	Current predicted equilibrium size (no bait)
11.20	Original ARM threshold
12.66	Recent CMSA average (2017 – 2024)
17.48	Highest extrapolation from Sweka et al. 2025
19.38	Most recent (2024) CMSA estimate
20.65	Highest (2023) CMSA estimate

The median of the elicited values was 7 million female horseshoe crabs, and this value was adopted as the recommended threshold. If implemented, this threshold would mean that if the CMSA-estimated Delaware Bay female horseshoe crab population falls below 7 million, the ARM would recommend zero female harvest for the upcoming year.

## Red Knot Utility Elicitation

Seven participants from the horseshoe crab conservation, shorebird conservation, and ecosystem conservation groups completed the red knot utility elicitation exercises. The exercises asked participants to rate their level of satisfaction (on a scale of 0 to 100) at a range of red knot Delaware Bay stopover population sizes. The following population benchmarks were presented as reference points during the elicitation:

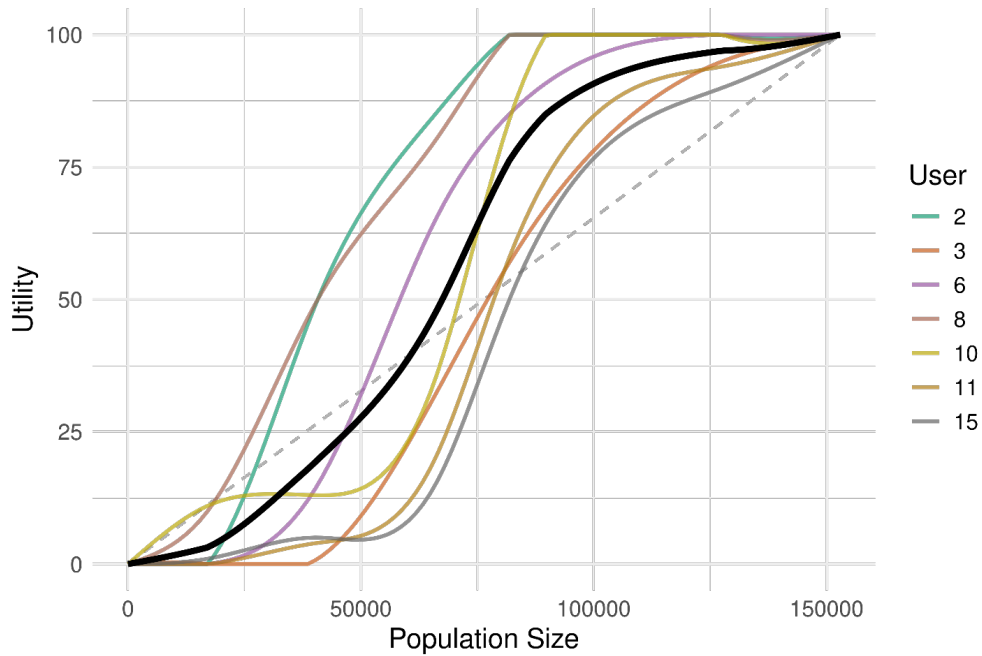
**Table B-2. Benchmark abundances of the total rufa red knot stopover population in Delaware Bay presented at the stakeholder workshop. Abundances in yellow were used in the red knot utility elicitation exercise.**

Stopover abundance	Description
0	Extirpated from Delaware Bay; inconsistent with the objective of the ARM and incompatible with rufa red knot recovery.
12,800	Lower bound (95% CI) of any published value for stopover population size (Gillings <i>et al.</i> 2009 reporting on 2004 data).
17,108	Lowest published value for stopover population size (Cohen <i>et al.</i> 2009 reporting on 2004 data).
40,750	Low estimate of minimum stopover population size that would be compatible with USFWS (2023) recovery criteria.
46,028	Average of 2011-2024 stopover population sizes estimates (Lyons 2025).
66,000	High estimate of minimum stopover population size that would be compatible with USFWS (2023) recovery criteria.
81,900	Threshold set by stakeholders for valuing female crab harvest in the previous ARM Framework (adjusted for turnover using 2013 conversion factor).
127,685	Earliest population estimate (1981-1983 average, adjusted for turnover using 2024 conversion factor).
152,900	Highest published value for stopover population size (Harrington 2001 reporting on 1989 data).
203,200	Upper bound (SD) of any published value for stopover population size (Harrington 2001 reporting on 1989 data).

Two elicitation exercises were conducted. The first asked participants to rate their satisfaction at different population levels in general terms. The second, refined exercise asked: "What is your level of satisfaction at different levels of red knot stopover abundance in 2050?" This exercise

was anchored to the current population estimate of approximately 40,000 to 50,000 birds and was designed to better capture participants' values toward long-term population recovery. Participants confirmed that the second exercise better reflected their values, and the group average responses from this exercise will be used to update the red knot utility curve.

**Figure B-2. Utility curve elicited during the stakeholder workshop relating utility (level of satisfaction) with red knot stopover abundance. Curves are shown for seven individual participants (colored lines) and the group average (black line).**





# Delaware Bay Horseshoe Crab Adaptive Resource Management (ARM) Framework Stakeholder Workshop

January 29 & 30, 2026 – Ocean City, MD

## Workshop Summary

The Horseshoe Crab Adaptive Resource Management (ARM) Framework is a model used by the Atlantic States Marine Fisheries Commission (ASMFC) to set annual harvest levels for horseshoe crabs in the Delaware Bay region. The framework is designed to balance the needs of the horseshoe crab (sometimes abbreviated as HSC in this document) fishery with the ecological needs of migratory shorebirds, particularly the rufa red knot (sometimes abbreviated REKN), which depends on horseshoe crab eggs as a food source.

Building on previous stakeholder feedback and technical recommendations about the ARM Framework, we conducted a stakeholder engagement process to develop potential modifications to several core mathematical functions of the ARM model – specifically the Utility, Reward, and Harvest (U/R/H) functions. The U/R/H functions represent stakeholder values placed on horseshoe crabs and red knots, and associate harvest levels with population abundances of both species.

The current stakeholder engagement process has followed a phased approach where we **(1)** held two virtual **educational sessions** in December 2025 and January 2026 to build a shared understanding of the ARM models and the role of the U/R/H functions, **(2)** held a two-day in-person **stakeholder values workshop** in January 2026 to have structured dialogue among participating groups, elicit quantitative values that represent groups’ interests that can be integrated into the model, and strive for consensus recommendations for model updates, and **(3)** will advance **model updates and communication** following the workshop to integrate participant values and input into the next iteration of the ARM Framework.

Fourteen stakeholder participants from six broad interest groups participated in the workshop, along with technical experts from the ARM Subcommittee and agency staff involved with the DBETC (**Table 1**). This document summarizes key discussions, emerging recommendations, and possible next steps from the stakeholder workshop. A final report summarizing the entire stakeholder engagement process will be developed after additional Delaware Bay Ecosystem Technical Committee (DBETC) and ARM subcommittee meetings.

**Table 1. Stakeholders and additional technical/agency staff who attended the January ASMFC workshop.**

Broad group	Name	Organization
<i>Stakeholders</i>		
Bait Fishers	Stuart Potter	Independent
	Jeff Eutsler	Independent
	David Trader	Independent
Dealers	Peter Hughes	Martin Fish Company
	Danielle To	Sea King
Biomedical	Allen Burgenson	Lonza
	Nora Blair	Charles River Laboratories
	Lisa Ferguson	The Wetlands Institute

Ecosystem Conservation	Danielle McCulloch	American Littoral Society
	Carly Toulan	Maryland Coastal Bays Program
Horseshoe Crab (HSC) Conservation	Glenn Gauvry	ERDG
	Susan Linder	Wildlife Restoration Partnerships
Shorebird Conservation	Joanna Burger	Rutgers University
	David Mizrahi	NJ Audubon
<i>Additional technical participants &amp; ASMFC staff</i>		
DBETC members	Wendy Walsh	USFWS
	Jordan Zimmerman	DNREC
ARM Subcommittee members	John Sweka	USFWS
	Jim Lyons	USGS
	Bryan Nuse	Bird Conservancy of the Rockies
	Conor McGowan	USGS
ASMFC staff members	Caitlin Starks	ASMFC
	Toni Kerns	ASMFC
	Samara Nehemiah	ASMFC
	Madeline Musante	ASMFC

## Summary of workshop discussions & possible next steps

**Table 2. Summary of key workshop discussions and possible next steps, organized by discussion topic.**

Topic	Discussion outcomes and possible next steps
<b>General</b>	<ul style="list-style-type: none"> <li>○ Broad agreement that we should continue using and improving the ARM framework.</li> <li>○ Some participants trust the current science in the ARM and its recommended harvest policies; other participants distrust or are uncertain about the current science and data inputs in the ARM, even expressing that they will not accept the ARM recommendations until scientific disagreements are settled.</li> </ul>
<b>Female horseshoe crab harvest</b>	<p>The group participated in a “debate” exercise where all participants (regardless of their actual perspectives) were asked to brainstorm arguments for <i>both</i> sides of a two-sided debate: “Female HSC harvest should never be allowed” and “Female HSC harvest is OK under certain conditions.”</p> <p>Arguments for allowing female HSC harvest in Delaware Bay included:</p> <ul style="list-style-type: none"> <li>○ If no harvest is allowed, female harvest could increase in other regions and shift economic gains to other states</li> <li>○ Females are still caught and handled by fishers, which can stress females and increases the effort (e.g., number of tows) fishers need to meet their quotas because they have to throw females back</li> <li>○ Harvest levels being considered in the ARM are a small proportion of the HSC population size</li> <li>○ Best-available science is being used in the ARM, which recommends female harvest</li> </ul>

Topic	Discussion outcomes and possible next steps
	<ul style="list-style-type: none"> <li>○ Fishers and dealers also described how not allowing female HSC harvest impacts their businesses, including the secondary/indirect effects on their families, infrastructure, and other related businesses</li> </ul> <p>Arguments for <i>not</i> allowing female HSC harvest included:</p> <ul style="list-style-type: none"> <li>○ Desire for a cautionary approach to ensure the horseshoe crab population thrives and supports the broader Delaware Bay ecosystem, recognizing other effects like habitat loss and climate change may be harder to mitigate in the future.</li> <li>○ Importance of eggs from uncaught female horseshoe crabs for supporting broader fish communities in the Delaware Bay and, therefore, also broader economic viability of other fisheries.</li> <li>○ Desire to have more certainty about the harvest policy so fishers/dealers can make more informed business decisions</li> </ul> <p>Members of the group suggested a variety of conditions to determine when female harvest would be acceptable, including: when we see less year-to-year variability in HSC numbers, see consistent increased and sustained populations of HSC and REKN (including meeting recovery criteria of REKN), and see a thriving ecosystem.</p> <p>The group also suggested potential “safeguards” that could be incorporated into the ARM; several of these ideas were addressed through other workshop discussions and elicitations summarized below.</p>
<b>Red knot utility</b>	<p>Participants from the HSC, shorebird, and ecosystem conservation groups completed two elicitation exercises rating their level of satisfaction, given red knot stopover abundances from 0 (total extirpation) to 152,900 birds (highest published value for stopover population size from Harrington 2001, reporting on 1989 data).</p> <p>The second exercise asked, “What is your level of satisfaction at different levels of red knot stopover abundance in 2050?” Relative to the first exercise, participants felt this wording better captured their values toward preserving and growing the red knot population over time. The group reviewed their responses and was comfortable using the average responses from that exercise to update the red knot utility curve in the ARM (see <b>Figure 1</b>).</p> <p>See “Additional discussion &amp; elicitation details” section below for more information.</p> <p><b>Next step:</b> update the ARM red knot utility function using the elicited values.</p>
<b>Horseshoe crab utility</b>	<p>Participants from the bait fishers, dealers, and biomedical groups completed an elicitation exercise related to updating the male-to-female HSC harvest values in the HSC utility function. The question asked, “Considering the horseshoe crab bait market over the next 5 years, catching one female is worth catching how many males?”</p> <p>The group reviewed their responses and saw a clear difference across groups (see <b>Figure 2</b>). Biomedical participants estimated that one female was worth one male, because there is no difference in the volume or value of blood they take from a female or male (and that both are needed for LAL production). Fishers/dealers estimated that</p>

Topic	Discussion outcomes and possible next steps
	<p>one female was worth between 2 and 3 males (median of 2.65), because females are larger, one female can be used to bait more traps, and the conch and eel fisheries are more successful using female crabs.</p> <p>The group discussed that in the specific context of the ARM, the HSC utility function was focused on the value toward bait harvest (and not the biomedical industry). Therefore, the group (including the biomedical participants) was comfortable with using the median response from the fishers/dealers (1 female to 2.65 males) to update the HSC utility function.</p> <p>See “Additional discussion &amp; elicitation details” section below for more information.</p> <p><b>Next step:</b> update the ARM HSC utility function using the elicited value.</p>
<p><b>Harvest policy functions</b></p>	<p>The group discussed a concern that the current harvest functions do not intercept zero, which means that the resulting harvest policy does not technically allow for a recommendation of zero HSC harvest. The group considered several options for ensuring zero harvest at low HSC or REKN abundances, and some participants expressed a preference for options that would change the functions to capture low abundance thresholds based on historical data, model predictions, and stakeholder input.</p> <p>See “Additional discussion &amp; elicitation details” section below for more information.</p> <p><b>Next step:</b> The ARM modelers can explore the feasibility of these options and come back to the group with proposals at the virtual follow-up session.</p>
<p><b>Maximum harvest levels</b></p>	<p>The group explored if there was interest in updating the sex-specific maximum harvest levels in the ARM (currently set at 500,000 males and 210,000 females). Participants from fishers/dealers shared reasons why these limits should be maintained (i.e., not reduced), including: fishers are harvesting less than current quotas due to bait market downswing since ~2020; maintaining current limits would allow for sufficient harvest if/when the market recovers; the maximum limits still represent a small portion of the total population size; and the fishers’ experience is that when quotas are reduced or taken away, they never come back.</p> <p>After further discussion, fishers/dealers recommended that limits could be increased to a scientifically defensible number (i.e., one that would still ensure a sustainable HSC population). Their rationale included that the current limits are much smaller than what was historically harvested (especially since the maximum limits are divided up across four states), the market would respond to higher limits and resuming female harvest, and this would grow the industry and benefit their livelihoods.</p> <p>Participants from other groups did not support increasing the harvest limits, noting the lack of public acceptance of harvesting females even within the current limits, and suggested we should ensure public support for current levels before considering an increase.</p> <p><b>Next step:</b> The group did not agree on a clear direction. Based on the rationales shared, we recommend keeping the current maximum harvest limits, which still allows space</p>

Topic	Discussion outcomes and possible next steps
	for the horseshoe crab bait market to recover as well as the opportunity to strive for acceptance of female harvest at these lower levels recommended by the ARM.
<b>Reward function</b>	<p>The group discussed ways to restructure the reward function in the ARM to better capture a broader set of values related to the Delaware Bay system. Currently, the ARM reward function includes utilities of (1) horseshoe crab harvest, (2) red knot abundance, and (3) a term that multiplies HSC harvest and red knot abundance utilities to give more value to management actions that balance both goals.</p> <p>Participants proposed adding terms to the reward function that reflect broader ecosystem values, such as habitat quality, horseshoe crab abundance, other shorebirds, and other metrics of ecosystem integrity to be defined further. It was also suggested to add a term for uncaught female horseshoe crabs as an indicator of egg abundance that supports fish communities and other fisheries in the Delaware Bay that were not involved in this process. ASMFC and technical staff reminded participants that any new terms to the reward function would need to (a) be measurable (i.e., have available data) and predictable (i.e., a model could forecast how the value would respond to management actions), and (b) be in scope of the ARM Framework.</p> <p>Some participants were satisfied with the current structure of the reward function, while others were interested in exploring ways to add another term related to the broader integrity of the ecosystem (e.g., horseshoe crab abundance). Some participants recognized the challenges in restructuring the ARM to include additional terms related to HSC abundance or other indicators of ecosystem integrity; as an alternative, some participants suggested changing the weights (currently set at 1:1 for HSC harvest and red knot utility), giving more weight to the red knot utility term to represent additional ecosystem values not directly captured in the model.</p> <p><b>Next step:</b> The ARM Subcommittee could develop possible options for updating (or not updating) the reward function with additional terms to reflect ecosystem values. They can provide rationale based on the degree each option is within the ARM’s current scope and feasible to implement with available data. These can be discussed with the group at the virtual follow-up session.</p>
<b>Science</b>	<p>Although the workshop focused on values-based ARM components, participants also discussed the underlying science in the ARM framework. Some participants expressed doubts that the ARM captures best available science, as well as its predictions of how horseshoe crab and red knot populations would behave in the future under different harvest management.</p> <p><b>Next steps beyond the current values-focused process:</b> With the intention to build understanding of the Delaware Bay ecosystem, build understanding and trust in the ARM model, and collaboratively improve the ARM, the following possible next steps could be explored:</p> <ul style="list-style-type: none"> <li>○ Working Session (short workshop) with ARM modelers and few interested parties to discuss HSC egg density data and mechanisms in model that could</li> </ul>

Topic	Discussion outcomes and possible next steps
	<p>better link HSC abundance, egg density, and red knot (and other ecosystem) outcomes.</p> <ul style="list-style-type: none"> <li>○ A participant also suggested the need for better understanding the relationship between HSC abundance and egg density on the beach. There could be increased research and monitoring toward this, and that would not necessarily need to be in the model itself.</li> <li>○ Educational Session on how uncertainty is incorporated in the model, with a focus on “how do we know if HSC and REKN is stable or increasing over time, even with some harvest?”</li> </ul>
<b>Process</b>	<p>Throughout the workshop, participants also highlighted opportunities to improve the process of communicating and updating the ARM. Additionally, a participant suggested that to increase public understanding and trust in the ARM, ASMFC could develop simpler, digestible outreach material describing the key aspects of the ARM process, science, and recommendations.</p> <p><b>Next steps could include:</b></p> <ul style="list-style-type: none"> <li>○ Follow-up meeting with ARM Subcommittee and DBETC to identify options for incorporating stakeholder values into ARM.</li> <li>○ ASMFC should better communicate to interested parties the process and policies surrounding data inclusion in any update or revision of the science underpinning the ARM.</li> <li>○ ASMFC does provide a "Stock Assessment Overview" for the ARM on its website that is intended as digestible material for the public. However, ASMFC could improve communication about this document to ensure stakeholders are aware and understanding of the information.</li> </ul>
<b>Other</b>	<p>Some participants raised the question: if/when female horseshoe crab harvest is implemented, how do we improve public trust in this decision? The group discussed that it seems trust is building for at least some members of the stakeholder group with each other and the ARM process. However, participants raised that all group members need to play a role in communicating to their constituents to build trust in the process.</p>

## Additional discussion & elicitation details

### Red knot utility

Wendy Walsh presented on red knot stopover abundance estimates from historical data and minimum criteria for recovery (**Table 3**). These were used as benchmarks in an elicitation exercise, which ranged from 0 (total extirpation) to 152,900 birds (highest published value for stopover population size from Harrington 2001, reporting on 1989 data).

**Table 3. Benchmark abundances of the total rufa red knot stopover population in Delaware Bay presented at the stakeholder workshop. Abundances in green were used in the red knot utility elicitation exercise.**

Stopover abundance	Description
0	Extirpated from Delaware Bay; inconsistent with the objective of the ARM and incompatible with rufa red knot recovery.
12,800	Lower bound (95% CI) of any published value for stopover population size (Gillings <i>et al.</i> 2009 reporting on 2004 data).
17,108	Lowest published value for stopover population size (Cohen <i>et al.</i> 2009 reporting on 2004 data).
40,750	Low estimate of minimum stopover population size that would be compatible with USFWS (2023) recovery criteria.
46,028	Average of 2011-2024 stopover population sizes estimates (Lyons 2025).
66,000	High estimate of minimum stopover population size that would be compatible with USFWS (2023) recovery criteria.
81,900	Threshold set by stakeholders for valuing female crab harvest in the previous ARM Framework (adjusted for turnover using 2013 conversion factor).
127,685	Earliest population estimate (1981-1983 average, adjusted for turnover using 2024 conversion factor).
152,900	Highest published value for stopover population size (Harrington 2001 reporting on 1989 data).
203,200	Upper bound (SD) of any published value for stopover population size (Harrington 2001 reporting on 1989 data).

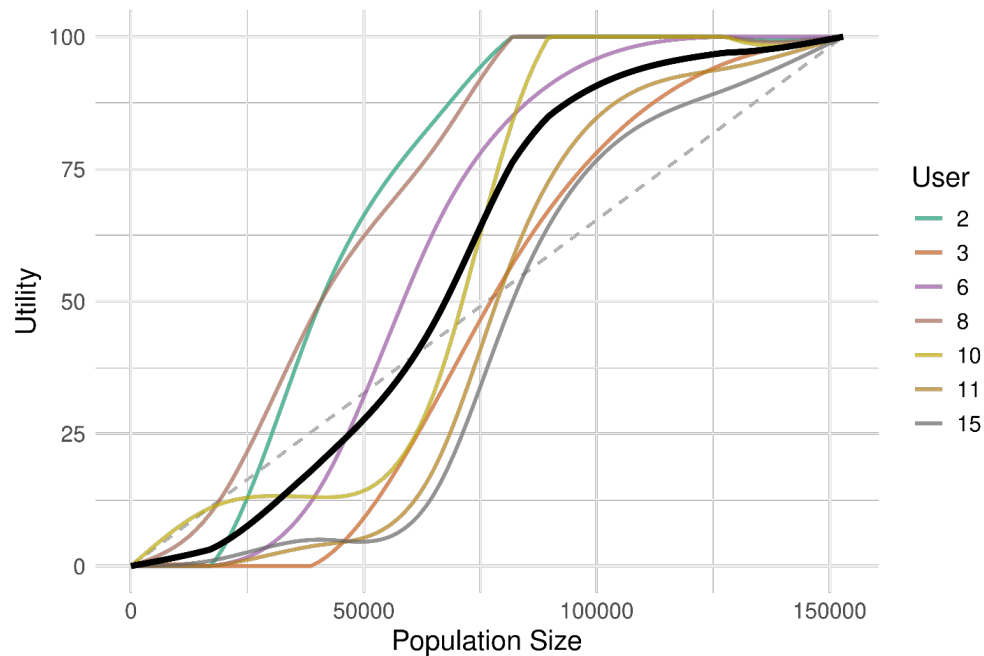
We elicited values from stakeholders through two exercises with slightly different questions. The first exercise asked participants, “What is your level of satisfaction at different levels of red knot stopover abundance?” They were instructed to think of these abundances in a vacuum without considering what management actions or other conditions resulted in achieving those abundances. A second exercise was conducted to better capture participants’ attitudes toward risking losing red knots or achieving an increased population over time. It asked, “What is your level of satisfaction at different levels of red knot stopover abundance in 2050?” and instructed participants to consider that the best current estimates of red knot abundance have been relatively stable around 40,000 – 50,000 birds for the last ~10 years. For both exercises, we followed best practices for expert elicitation using the following steps:

1. Completed one round where participants responded to the questions individually using an online tool.
2. Showed the group the individual responses and group averages.
3. Discussed rationale for distinctly different responses.

4. Allowed participants to adjust their responses, based on the discussion.
5. Reviewed the final responses and confirmed the group was comfortable using the group average.

**Discussion outcome:** Because the second exercise better captured participants' values toward preserving and growing the red knot population over time, the group was comfortable using the average responses from that exercise to update the red knot utility curve in the ARM (see **Figure 1**). We can revisit this curve with the stakeholder group in a follow-up meeting to confirm it represents their values or if any modifications are needed.

**Figure 1. Group mean (black line) and individual participants' responses (other lines) for a red knot utility function showing level of satisfaction (utility) to red knot stopover abundances from 0 to 152,900 birds. Responses were from the HSC, shorebird, and ecosystem conservation group participants (n = 7).**



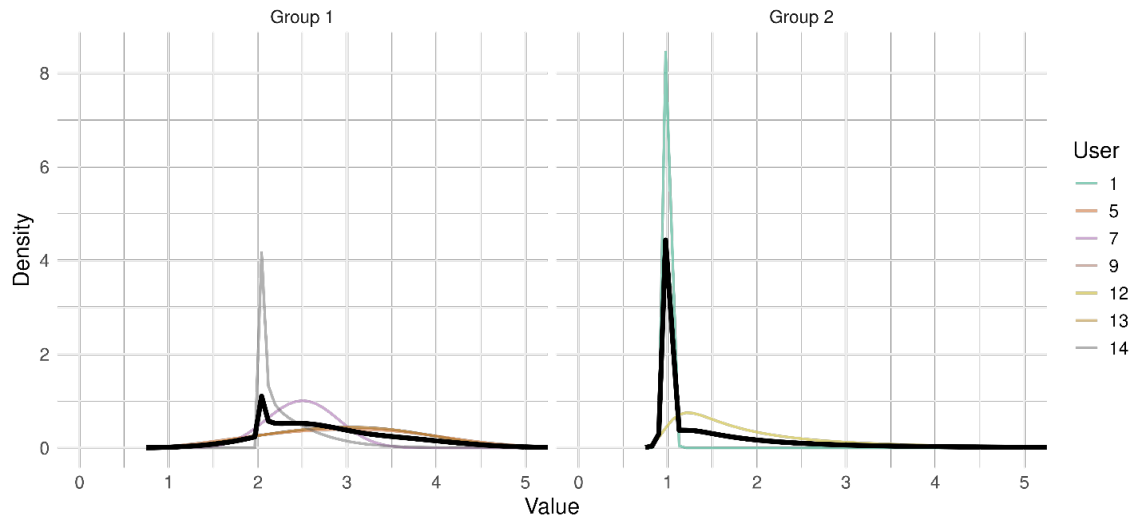
### Horseshoe crab utility: male-to-female harvest value

Participants from the bait fishers, dealers, and biomedical groups completed an elicitation exercise that asked, “Considering the horseshoe crab bait market over the next 5 years, catching one female is worth catching how many males?” The elicitation followed the same basic steps as the red knot utility exercise (see above). A key difference was that participants were asked to consider the question and provide four responses to capture their uncertainty around this value:

1. The lowest plausible value
2. The highest plausible value
3. Realistically, the best estimate
4. The level of confidence that the true value is between the lowest and highest values provided.

**Figure 2. Group mean (black lines) and individual participants' responses (other lines) representing the number of males expected to be of equivalent value to catching one female horseshoe crab. Each line shows the**

distribution of each person's responses (fit to their low, best, and high estimates). Group 1 is fisher and dealer participants (n = 5); Group 2 is biomedical participants (n = 2).



## Horseshoe crab harvest policy functions

The group discussed the concern that the current harvest functions do not go through zero, which means that the resulting harvest policy does not technically allow for a recommendation of zero HSC harvest, even at very low HSC or REKN population levels. Several options for defining conditions where zero HSC harvest would be implemented were discussed:

1. User-defined threshold: a minimum threshold for HSC abundance could be chosen based on historical data and other stakeholder inputs, and the harvest policy functions could be updated so that zero harvest would be recommended if the HSC population fell below this threshold. This approach would still allow the ARM to fit the shape of these functions to data.
2. Model policy-based: the ARM simulates HSC abundance in the future (given annual harvest decisions) using 1000s of simulations to capture uncertainty of what the population is expected to be. It was suggested that this range of predicted abundances could be used to define a lower abundance threshold, where if we actually observed a HSC abundance dropping below the range of the ARM's predictions, zero harvest would be recommended. Likewise, if the observed HSC abundance was within the ARM's predictions, we could use the ARM's harvest recommendations.
3. Board-based harvest control rule: In the HSC management program outside of the ARM model (e.g., in an Addendum) a harvest control rule would require that "if the HSC abundance estimate is below a certain threshold, there will be zero harvest for the upcoming year."

**Discussion outcome:** The group expressed some preference toward the first two options that would still allow learning to occur within the model, as that is one of the key advantages of adaptive management relative to a simple harvest control rule. Those options were also seen as more data-driven and defensible. These approaches would still allow for assurances that the ARM would recommend 0 harvest under extreme low abundances of HSC. The group suggested that the ARM modelers explore the feasibility of these options and come back to the group with proposals at the virtual follow-up session.



# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

**TO:** Horseshoe Crab Management Board  
**FROM:** Caitlin Starks, Senior Fishery Management Plan Coordinator  
**DATE:** April 20, 2026  
**SUBJECT:** Summary of State Horseshoe Crab Fishery Legislation in CT-NJ

As requested by members of the Horseshoe Crab Management Board (Board), this memo summarizes legislation that has been enacted by the states of Connecticut, New York, and New Jersey to restrict horseshoe crab (HSC) fisheries beyond the regulations in the Commission’s Horseshoe Crab Fishery Management Plan. In recent years, some state legislatures have experienced increased pressure to implement laws regarding HSC fishery management outside of the interstate fishery management process. Concerns have also been raised by the Board that restrictions on harvest in one region may have impacts on demand and harvest levels in other regions.

Table 1 provides summary information by state on current laws governing bait harvest, biomedical collections, and possession of HSC. In addition, relevant state statutory and regulatory language is provided in the enclosed document titled “HSC Statutes and Regulations.”

**Table 1. Summary of State Statutes and Regulations Regarding Horseshoe Crab Fisheries**

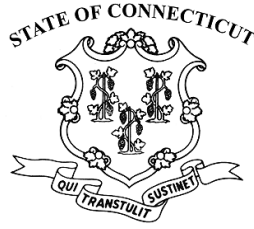
	<b>Connecticut</b>	<b>New York</b>	<b>New Jersey</b>
<i>Bait Harvest Laws</i>	CT law prohibits hand harvest of HSC, effective October 1, 2023. Hand harvest may be authorized for scientific or educational purposes. HSC may be taken by otter trawl with a limit of 25 HSC per day. Persons may also possess legally-acquired dead horseshoe crabs being used for bait.	The NY Horseshoe Crab Protection Act phases out the commercial and biomedical harvest of HSC, reducing the state quota from the current level to 75% in 2026, 50% in 2027, 25% in 2028, with a complete ban taking effect on January 1, 2029. Until 2029, current regulations remain in place.	A moratorium on commercial harvest of HSC for bait was enacted in 2008. NJ DEP may issue a permit for take of HSC or eggs for scientific and educational purposes.
<i>Possession and Use as Bait</i>	Statute suggests it is still legal to possess and use HSC as bait with a trawl license, landing license (allows possession of	The legislation enacted only addresses take of HSC, not possession. Those holding a horseshoe crab	Statute allows commercial fishermen to possess and use HSC as bait, but must provide documentation that the HSC in their

	horseshoe crabs legally caught in another state or in federal waters), or shellfish harvesting license.	commercial bait harvesters permit will still be allowed to possess and use HSC as bait after January 1, 2029.	possession were not harvested in NJ, including a receipt or bill of landing with the name, address, and phone number of the person or company that provided the horseshoe crabs, the permit or license number of the person or company named, and the state and harvest location, if possible.
<i>Importing HSC</i>	CT allows imports of HSC from other states.	Those holding a HSC commercial bait harvesters permit are allowed to possess HSC sourced from inside or outside of the state.	Statute only allows possession and use as bait of HSC harvested outside NJ.
<i>Biomedical Fisheries</i>	There are no biomedical HSC collections in CT at this time, and no previous biomedical take on record in CT. The law is not clear on whether the law prohibits it or if it just has not happened yet.	Biomedical take of HSC will also be banned effective January 1, 2029. Until then, a biomedical harvest and/or users permit issued by NY DEC is required for take, possession, and sale/purchase of biomedical HSC.	State statute allows NJ DEP to issue a permit for the collection of blood from HSC for biomedical purposes, provided that the HSC are released otherwise unharmed to the same waters from which they were collected.

Connecticut, New York, and New Jersey  
Statutes and Regulations  
Pertaining to Horseshoe Crabs

Compiled for the ASMFC Horseshoe Crab Management Board

April 2026



**House Bill No. 6484**

**Public Act No. 23-6**

***AN ACT CONCERNING CERTAIN HARVESTING OF HORSESHOE CRABS.***

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (NEW) (*Effective October 1, 2023*) (a) Notwithstanding the provisions of title 26 of the general statutes, no person shall engage in the hand-harvesting of horseshoe crabs or the eggs of horseshoe crabs from the waters of this state.

(b) Notwithstanding the provisions of subsection (a) of this section, the Commissioner of Energy and Environmental Protection may authorize the hand-harvesting of horseshoe crabs by permit for educational or scientific purposes provided the commissioner determines that such harvesting will not cause harm to the horseshoe crab population in this state.

(c) Any person who violates the provisions of this section shall be fined twenty-five dollars for each specimen taken in violation of this section.

(d) The Commissioner of Energy and Environmental Protection shall enforce the provisions of this section.

Approved June 7, 2023

***House Bill No. 6484***

## Connecticut Horseshoe Crab Regulations

Marine Information Circular – CT DEEP: <https://portal.ct.gov/-/media/deep/fishing/commercial/marinecircpdf.pdf?rev=aaa8f80c23f24a5697b246c4909bfc21&hash=E001CD81B1DE0CC88E543A243D0FF580>

### **Horseshoe Crabs (*Limulus polyphemus*)**

1. Effective October 1, 2023, no person shall engage in the hand-harvesting of horseshoe crabs or the eggs of horseshoe crabs from the waters of this state.
2. Horseshoe crabs may be taken by otter trawl fishing without a Horseshoe Crab Hand-Harvest Quota-Managed Species Endorsement. Persons may also possess legally acquired dead horseshoe crabs being used for bait.
3. Commercial fishery possession limit:
  - In the trawl fishery, 25 crabs.

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Connecticut Department of Energy and Environmental Protection

4. The taking of horseshoe crabs is restricted to holders of the Principal Commercial Fishing License (by trawl). See Horseshoe Crabs (*Limulus polyphemus*) on page 28 for details.
5. The open season for the taking of horseshoe crabs begins on the third day following the last full or new moon, whichever occurs later, in May and ends after July 7.
6. During the open season, no horseshoe crab shall be taken from Friday at 6:00 PM through Sunday at 6:00 PM.
7. Lunar Closure: No person shall engage in the harvest of horseshoe crabs during the period beginning two days prior to the date of the first full or new moon in June of each year, whichever occurs earlier, and ending two days after the date of said moon.

## **Appendix IV: Bait Species**

The following species listed here, to the exclusion of all other species, may be taken commercially in the inland district under an inland commercial bait license, or in the marine district under a marine commercial bait license. These species may also be offered for sale as bait species under a bait dealer's license. These species can also be taken for personal use using approved gears under recreational fishing licenses.

(1) Golden shiner or "pond shiner" (*Notemigonus crysoleucas*); (2) common shiner (*Luxilus cornutus*); (3) fallfish (*Semotilus corporalis*); (4) creek chub (*Semotilus atromaculatus*); (5) spottail shiner or "river bait" (*Notropis hudsonius*); (6) bridle shiner (*Notropis bifrenatus*); (7) blacknose dace (*Rhinichthys atratulus*); (8) longnose dace (*Rhinichthys cataractae*); (9) pearl dace (*Margariscus margarita*); (10) bluntnose minnow (*Pimephales notatus*); (11) fathead minnow (*Pimephales promelas*); (12) cutlips minnow (*Exoglossum maxillingua*); (13) chub sucker (*Erimyzon oblongus*); (14) banded killifish (*Fundulus diaphanus*); (15) mummichog (*Fundulus heteroclitus*); (16) striped killifish (*Fundulus majalis*); (17) tidewater silverside<sup>2</sup> (*Menidia beryllina*); (18) Atlantic silverside<sup>2</sup> (*Menidia menidia*); (19) sand lance<sup>2</sup> or "sand eels<sup>2</sup>" (*Ammodytes* spp.); (20) bay anchovy<sup>2</sup> (*Anchoa mitchilli*); (21) sheepshead minnow (*Cyprinodon variegatus*); (22) mullet species (*mugil* spp.); (23) frogs (except northern leopard frogs); (24) perch bugs; (25) helgramites; (26) mayfly nymphs; (27) other aquatic insects; (28) crayfish; (29) green crabs (*Carcinus maenas*); (30) fiddler crabs (*Uca* spp.); (31) hermit crabs (*Pagurus* spp.); (32) Asian (Japanese) shore crab (*Hemigrapsus sanguineus*); and (33) shrimp (families Crangonidae, Palaemonidae and Penaeidae).

In addition to the bait species listed above, the following species, **if legally taken under the appropriate commercial license** and meeting the minimum legal length requirements specified in this information circular, may be offered for sale as bait under a bait dealer's license: (1) menhaden (*Brevoortia tyrannus*); (2) alewives<sup>1</sup> (*Alosa pseudoharengus*); (3) blueback or "glut" herring<sup>1</sup> (*Alosa aestivalis*); (4) American eel (*Anguilla rostrata*); (5) butterfish (*Peprilus triacanthus*); (6) Atlantic mackerel (*Scomber scombrus*); (7) Silver Hake (Whiting) (*Merluccius bilinearis*); (8) Atlantic Longfin squid (*Loligo* sp.); (9) Atlantic herring (*Clupea harengus*); (10) hickory shad (*Alosa mediocris*); and (11) **horseshoe crab** (*Limulus polyphemus*).

# STATE OF NEW YORK

4997

2025-2026 Regular Sessions

## IN ASSEMBLY

February 10, 2025

Introduced by M. of A. GLICK, BURDICK, SIMON, WEPRIN -- read once and referred to the Committee on Environmental Conservation

AN ACT to amend the environmental conservation law, in relation to extending certain provisions relating to the department of environmental conservation's regulation of crabs, and to prohibiting the taking of horseshoe crabs for commercial and biomedical purposes

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

1 Section 1. Subdivision 7 of section 13-0331 of the environmental  
2 conservation law, as amended by chapter 243 of the laws of 2022, is  
3 amended to read as follows:

4 7. The department may, until December thirty-first, two thousand  
5 [~~twenty-four~~] twenty-seven, fix by regulation measures for the manage-  
6 ment of crabs of any kind including horseshoe crabs (*Limulus* sp.),  
7 including minimum and maximum size limits, catch and possession limits,  
8 open and closed seasons including lunar closures, closed areas,  
9 restrictions on the manner of taking and landing including a prohibition  
10 on the harvest of crabs in amplexus, requirements for permits and eligi-  
11 bility therefor, recordkeeping requirements, requirements on the amount  
12 and type of fishing effort and gear, and requirements relating to trans-  
13 portation, possession and sale, provided that such regulations are no  
14 less restrictive than requirements set forth in this chapter and  
15 provided further that such regulations are consistent with the compli-  
16 ance requirements of applicable fishery management plans adopted by the  
17 Atlantic States Marine Fisheries Commission and with applicable  
18 provisions of fishery management plans adopted pursuant to the Federal  
19 Fishery Conservation and Management Act (16 U.S.C. § 1800 et seq.).

20 § 2. Subdivisions 1, 7 and 8 of section 13-0331 of the environmental  
21 conservation law, subdivision 1 as amended by chapter 447 of the laws of  
22 2017, subdivision 7 as amended by section one of this act, and subdivi-

EXPLANATION--Matter in italics (underscored) is new; matter in brackets  
[-] is old law to be omitted.

LBD07626-03-5

1 sion 8 as amended by chapter 21 of the laws of 2018, are amended to read  
2 as follows:

3 1. No person shall take crabs[~~, including horseshoe crabs (Limulus~~  
4 ~~sp.)~~] for commercial purposes without first obtaining a permit from the  
5 department. For purposes of this subdivision, a presumption of "commer-  
6 cial purposes" shall be made wherein one takes or lands more than fifty  
7 crabs in any one day or sells or barterers or offers for sale or barter  
8 any crabs [~~he or she~~] such person has taken. Permits shall be issued to  
9 individuals only but may be endorsed for use on a vessel, in which case  
10 it shall cover all persons on board such vessel.

11 7. The department may, until December thirty-first, two thousand twenty-  
12 seven, fix by regulation measures for the management of crabs of any  
13 kind [~~including~~], excluding horseshoe crabs (Limulus sp.), including  
14 minimum and maximum size limits, catch and possession limits, open and  
15 closed seasons including lunar closures, closed areas, restrictions on  
16 the manner of taking and landing including a prohibition on the harvest  
17 of crabs in amplexus, requirements for permits and eligibility therefor,  
18 recordkeeping requirements, requirements on the amount and type of fish-  
19 ing effort and gear, and requirements relating to transportation,  
20 possession and sale, provided that such regulations are no less restric-  
21 tive than requirements set forth in this chapter and provided further  
22 that such regulations are consistent with the compliance requirements of  
23 applicable fishery management plans adopted by the Atlantic States  
24 Marine Fisheries Commission and with applicable provisions of fishery  
25 management plans adopted pursuant to the Federal Fishery Conservation  
26 and Management Act (16 U.S.C. § 1800 et seq.).

27 8. [~~The department shall, when adopting regulation measures for the~~  
28 ~~management of~~] No person shall take horseshoe crabs (Limulus sp.)  
29 [~~pursuant to subdivision seven of this section, consult with any town,~~  
30 ~~village or county that requests any municipal property be subject to a~~  
31 ~~harvest closure~~], including for commercial or biomedical purposes, from  
32 the waters of this state. Provided however that this section shall not  
33 apply to the taking of horseshoe crabs (Limulus sp.) for bona fide  
34 scientific or educational purposes including, but not limited to, public  
35 or not-for-profit zoos and aquaria, as determined by the commissioner  
36 pursuant to rules and regulations.

37 § 3. This act shall take effect immediately; provided, however, that  
38 the provisions of section two of this act shall take effect January 1,  
39 2026.

DRAFT LBDC

AN ACT to amend the environmental conservation law, in relation to the department of environmental conservation's regulation of crabs; and to amend a chapter of the laws of 2025, amending the environmental conservation law relating to extending certain provisions relating to the department of environmental conservation's regulation of crabs, and to prohibiting the taking of horseshoe crabs for commercial and biomedical purposes, as proposed in legislative bills numbers S. 4289 and A. 4997, in relation to the effectiveness thereof; and providing for the repeal of certain provisions upon expiration thereof

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

1 Section 1. Subdivision 7 of section 13-0331 of the environmental  
2 conservation law, as amended by section 1 of a chapter of the laws of  
3 2025, amending the environmental conservation law relating to extending  
4 certain provisions relating to the department of environmental conserva-  
5 tion's regulation of crabs, and to prohibiting the taking of horseshoe  
6 crabs for commercial and biomedical purposes, as proposed in legislative  
7 bills numbers S. 4289 and A. 4997, is amended to read as follows:

8 7. The department may, until December thirty-first, two thousand  
9 [twenty-seven] twenty-nine, fix by regulation measures for the manage-  
10 ment of crabs of any kind including horseshoe crabs (*Limulus* sp.),  
11 including minimum and maximum size limits, catch and possession limits,  
12 open and closed seasons including lunar closures, closed areas,  
13 restrictions on the manner of taking and landing including a prohibition  
14 on the harvest of crabs in amplexus, requirements for permits and eligi-  
15 bility therefor, recordkeeping requirements, requirements on the amount  
16 and type of fishing effort and gear, and requirements relating to trans-  
17 portation, possession and sale, provided that such regulations are no  
18 less restrictive than requirements set forth in this chapter and

1 provided further that such regulations are consistent with the compli-  
2 ance requirements of applicable fishery management plans adopted by the  
3 Atlantic States Marine Fisheries Commission and with applicable  
4 provisions of fishery management plans adopted pursuant to the Federal  
5 Fishery Conservation and Management Act (16 U.S.C. § 1800 et seq.).

6 § 2. Subdivision 7 of section 13-0331 of the environmental conserva-  
7 tion law, as amended by section 2 of a chapter of the laws of 2025,  
8 amending the environmental conservation law relating to extending  
9 certain provisions relating to the department of environmental conserva-  
10 tion's regulation of crabs, and to prohibiting the taking of horseshoe  
11 crabs for commercial and biomedical purposes, as proposed in legislative  
12 bills numbers S. 4289 and A. 4997, is amended to read as follows:

13 7. The department may, until December thirty-first, two thousand  
14 [twenty-seven] twenty-nine, fix by regulation measures for the manage-  
15 ment of crabs of any kind, excluding horseshoe crabs (*Limulus* sp.),  
16 including minimum and maximum size limits, catch and possession limits,  
17 open and closed seasons including lunar closures, closed areas,  
18 restrictions on the manner of taking and landing including a prohibition  
19 on the harvest of crabs in amplexus, requirements for permits and eligi-  
20 bility therefor, recordkeeping requirements, requirements on the amount  
21 and type of fishing effort and gear, and requirements relating to trans-  
22 portation, possession and sale, provided that such regulations are no  
23 less restrictive than requirements set forth in this chapter and  
24 provided further that such regulations are consistent with the compli-  
25 ance requirements of applicable fishery management plans adopted by the  
26 Atlantic States Marine Fisheries Commission and with applicable  
27 provisions of fishery management plans adopted pursuant to the Federal  
28 Fishery Conservation and Management Act (16 U.S.C. § 1800 et seq.).

1 § 3. The department of environmental conservation is hereby authorized  
2 and directed to take any actions necessary to ensure that any quota  
3 limiting the taking of horseshoe crabs (*Limulus* sp.) pursuant to section  
4 13-0331 of the environmental conservation law shall:

5 (1) in 2026, not exceed seventy-five percent of the annual commercial  
6 horseshoe crab quota established by the department of environmental  
7 conservation in the 2025 Horseshoe Crab Quota Distribution Plan, devel-  
8 oped pursuant to 6 NYCRR 44.3 (b);

9 (2) in 2027, not exceed fifty percent of the annual commercial  
10 horseshoe crab quota established by the department of environmental  
11 conservation in the 2025 Horseshoe Crab Quota Distribution Plan devel-  
12 oped pursuant to 6 NYCRR 44.3 (b); and

13 (3) in 2028, not exceed twenty-five percent of the annual commercial  
14 horseshoe crab quota established by the department of environmental  
15 conservation in the 2025 Horseshoe Crab Quota Distribution Plan, devel-  
16 oped pursuant to 6 NYCRR 44.3 (b).

17 § 4. Section 3 of a chapter of the laws of 2025, amending the environ-  
18 mental conservation law relating to extending certain provisions relat-  
19 ing to the department of environmental conservation's regulation of  
20 crabs, and to prohibiting the taking of horseshoe crabs for commercial  
21 and biomedical purposes, as proposed in legislative bills numbers S.  
22 4289 and A. 4997, is amended to read as follows:

23 § 3. This act shall take effect immediately; provided, however, that  
24 the provisions of section two of this act shall take effect January 1,  
25 [2026] 2029.

26 § 5. This act shall take effect immediately; provided, however, that  
27 the provisions of sections one and two of this act shall take effect on  
28 the same date and in the same manner as a chapter of the laws of 2025,

1 amending the environmental conservation law relating to extending  
2 certain provisions relating to the department of environmental conserva-  
3 tion's regulation of crabs, and to prohibiting the taking of horseshoe  
4 crabs for commercial and biomedical purposes, as proposed in legislative  
5 bills numbers S. 4289 and A. 4997, takes effect; and provided, however,  
6 that the provisions of section three of this act shall expire and be  
7 deemed repealed January 1, 2029.

## 6 NYCRR 44.3

### Section 44.3. Horseshoe crabs

#### (a) Definitions.

(1) Horseshoe crabs are members of the arthropod infra order chelicerata, *Limulus polyphemus*.

(2) Prosomal width means the widest straight line width of the body.

(3) Land or landed means the bringing of horseshoe crabs to any shore or the transfer of the catch of horseshoe crabs taken from a vessel to any other vessel or in-water storage facility or to the land or to any pier, wharf, dock or other similar structure. When a vessel bearing horseshoe crabs has been tied, moored, or made fast to land, to another vessel, to an in-water storage facility or to any pier, wharf, dock or similar structure, any crabs on board such vessel are deemed to have been landed.

(4) 'Harvest limit' means the maximum number of horseshoe crabs that can be taken or possessed by a permit holder in a 24 hour period. No more than two harvest limits may be possessed aboard a vessel or in a vehicle, provided that at least two permit holders are on board the vessel or in the vehicle.

#### (b) Horseshoe crab fishing--general provisions.

(1) The total annual commercial fisheries bait harvest of horseshoe crabs may not exceed the amount annually allocated to New York State by the Atlantic States Marine Fisheries Commission pursuant to the Interstate Fishery Management Plan for horseshoe crabs for the period January 1st through December 31st.

(2) Following consultation with industry, the department may establish quota periods and harvest limits such that the harvest does not exceed the commercial fisheries bait quota assigned to New York.

(3) When the department determines that harvest limits are necessary, such harvest limits will be effective and enforceable upon 72 hours written notice to permit holders. Such harvest limits may be further reduced or increased by written direction by the department.

(4) If the department determines based on harvester reporting pursuant to this section that the commercial fisheries bait horseshoe crab quota allocation will have been harvested before the end of the year, harvesting for commercial purposes will be prohibited by the

department and such closure shall be enforceable upon 72 hours written notice to permit holders.

(5) A person may only apply for and hold one horseshoe crab permit type issued under this section in a calendar year.

(6) It is the responsibility of the holder of a horseshoe crab bio-medical users permit to ensure all horseshoe crab which are used in the production of ambocyte lysate shall either be returned to the location of harvest as approved by the department as soon as possible after the bleeding process, or be sold as bait and reported as bait harvest in compliance with Part 38.2(b) (2)(iii) of this Title.

(c) Permits.

(1) No person shall take or possess horseshoe crabs for commercial purposes without first applying and obtaining a horseshoe crab commercial bait harvesters permit from the department. For purposes of this section, a person shall be presumed to be taking or possessing horseshoe crabs for commercial purposes where that individual has in excess of five individual horseshoe crabs in possession, or sells, trades, barter or offers for sale any horseshoe crabs. A permit to take horseshoe crabs for commercial purposes will be issued at no cost to individuals who possess a valid commercial crab license. No crabs harvested under this permit may be legally sold, traded, and/or bartered for use in any industry other than the commercial fishing industry.

(2) No person shall take or possess horseshoe crabs for bio-medical purposes without first applying and obtaining a horseshoe crab bio-medial harvesters permit from the department. For purposes of this section, a person shall be presumed to be taking or possessing horseshoe crabs for bio-medical purposes where that person sells, trades, barter and/or offers for sale any horseshoe crab which is used in the production of amebocyte lysate. A permit to take horseshoe crabs for bio-medical purposes will be issued at no cost to persons who possess a valid commercial crab license. Crabs harvested under this permit may only be legally sold, traded, and/or bartered to the holders of a valid horseshoe crab bio-medical users permit.

(3) No person shall purchase or possess horseshoe crabs for bio-medical purposes without first applying and obtaining a horseshoe crab bio-medical users permit from the department. For purposes of this section, a person shall be presumed to be purchasing horseshoe crabs for bio-medical use where that person purchases any horseshoe crab which is used in the production of amebocyte lysate. Horseshoe crabs may only be purchased from the holders of a valid horseshoe crab biomedical harvesters permit.

Permits will only be issued at no cost to persons who have been approved by the United States Federal Food and Drug Administration (USFDA) to produce amebocyte lysate.

(4) Permits issued under this section shall be nontransferable and shall expire on the last day of December in the year issued.

(5) Permit modification, suspension, or revocation shall be pursuant to Part 39 of this Title.

(6) The holder of a horseshoe crab commercial bait harvesters permit or a horseshoe crab bio-medical harvesters permit issued pursuant to this section shall carry on his or her person or post on his or her vessel such permit at all times when fishing under the authority of such permit.

(d) Manner of taking.

(1) Horseshoe crabs may only be taken for commercial and bio- medical purposes by the following methods: hand harvest, pound net, trap net, gill net, otter trawl, seine or dredge.

(2) Dredges used to harvest horseshoe crabs shall not be greater than six feet in width (72 inches), except that if an individual submits a notarized written affirmation to the department by December, 2001 certifying that he or she used a dredge with a bottom bar or scrape larger than 72 inches to harvest horseshoe crabs during the year 2000 in New York's Marine and Coastal District, and reported the use of such dredge to harvest horseshoe crabs on his or her 2000 New York State horseshoe crab harvester report, the department may permit him or her to continue to use such dredge until March 31, 2004.

(3) Except during the months of September and October, dredges as defined in section 44.1(a)(14) of this Part may not be used to harvest horseshoe crabs in the Atlantic Ocean. The possession or landing of horseshoe crabs from any vessel having a dredge onboard is also prohibited.

(e) Closed areas.

(1) The department, following consultation with horseshoe crab permit holders and other interested parties, may establish, by directive, closed areas for commercial hand-harvest of horseshoe crabs if the department determines that:

(i) there is documented evidence, verified by the department, that the area receives significant use by:

(a) spawning horseshoe crabs during the horseshoe crab spawning season; and

(b) the following shorebird species for which horseshoe crab eggs are an important food source: dunlin, semipalmated sandpiper, sanderling, ruddy turnstone, greater yellowlegs, American golden-plover, black-bellied plover, buffbreasted sandpiper, short-billed dowitcher, red knot, purple sandpiper, marbled godwit, Hudsonian godwit, and whimbrel; or

(ii) the area is managed by a local, State or Federal agency or governing body as a public recreation area, and such agency or governing body has requested that the department restrict horseshoe crab hand-harvesting.

(2) In the event that the department directs that an area be closed pursuant to paragraph (1) of this subdivision, the department shall notify commercial harvesters of such directive not less than 30 days prior to the effective date of such closure.

(f) The Director of the Division of Marine Resources is authorized to make determinations and issue directives pursuant to this subdivision.

Credits Sec. filed Nov. 5, 2002; renum. 44.10, new filed May 30, 2006; renum. 44.9, new added by renum. 44.7, filed: July 1, 2008 as emergency measure; Sept. 9, 2008 eff. Sept. 24, 2008; rep. and renumbered from § 44.8 by emergency rulemaking eff. Jan. 31, 2013, expired April 30, 2013; rep. and renumbered from § 44.8 amd. filed May 24, 2013 eff. June 12, 2013; amd. filed March 12, 2018 eff. March 28, 2018; amd. filed June 24, 2024 eff. July 10, 2024 (Register dated July 10, 2024); rep. and new added filed April 22, 2025 eff. May 7, 2025 (Register dated May 7, 2025).

Current with amendments included in the New York State Register, Volume XLVII, Issue 28, dated July 16, 2025. Some sections may be more current, see credits for details.

N.Y. Comp. Codes R. & Regs. tit. 6, § 44.3, 6 NY ADC 44.3

[N.J. Stat. § 23:2B-21](#)

Current through New Jersey 221st First Annual Session, L. 2024, c. 16 and J.R. 1

**LexisNexis® New Jersey Annotated Statutes > Title 23. Fish and Game, Wild Birds and Animals (Ch. 1) > Chapter 2B. Marine Fisheries (§§ 23:2B-1 — 23:2B-25)**

## **§ 23:2B-21. Moratorium on taking of horseshoe crabs, exceptions; shorebird management plan**

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**a.** Except as provided pursuant to subsection b. or c. of this section, there shall be a moratorium on the taking in the State of horseshoe crabs or the eggs of horseshoe crabs, on the landing in the State of such crabs or the eggs of horseshoe crabs taken from outside of the State, and on the possession of horseshoe crabs or the eggs of horseshoe crabs regardless of their origin, until such time as: (1) the recovery targets for the population of the red knot shorebird, identified pursuant to the United States Fish and Wildlife Service 2007 status assessment, entitled "Status of the Red Knot (*Calidris canutus rufa*) in the Western Hemisphere," are met; and (2) a shorebird management plan, which, based upon scientific study and evidence, demonstrates to the satisfaction of the Department of Environmental Protection that a more than adequate food supply from horseshoe crab eggs for shorebirds and population viability for both shorebirds and horseshoe crabs exist. The plan shall be subject to public comment and to review and approval by a peer-review panel which shall include qualified shorebird and horseshoe crab ecologists, and the Endangered and Nongame Species Advisory Committee created pursuant to subsection e. of section 7 of P.L.1973, c.309 ([C.23:2A-7](#)). The plan must indicate that the shorebirds species including the red knot *rufa* subspecies have fully recovered, pursuant to the United States Fish and Wildlife Service recovery targets, before the reestablishment of a limited harvest season may be considered.

**b.** Notwithstanding the provisions of this section to the contrary, the Department of Environmental Protection may issue a permit for:

- (1)** the taking, landing and possession of horseshoe crabs or the eggs of horseshoe crabs for scientific or educational purposes only, provided that the department determines that the collection of the horseshoe crabs or the eggs of horseshoe crabs for these purposes will not cause harm to the red knot, other shorebirds, or horseshoe crab populations; or
- (2)** the collection of blood from horseshoe crabs for biomedical purposes, provided that the horseshoe crabs are released otherwise unharmed to the same waters from which they were collected.

**c.** The moratorium established in subsection a. of this section shall not apply to the possession and use of horseshoe crabs harvested outside of the State, provided that the person found in possession of, or using, the horseshoe crabs has documentation which shows that the horseshoe crabs were not harvested in New Jersey. The documentation shall include a receipt or bill of lading that provides:

- (1)** the name, address, and phone number of the person or company that provided the horseshoe crabs;
- (2)** the permit or license number of the person or company named pursuant to paragraph (1) of this subsection; and
- (3)** the state and, if possible, the location, where the horseshoe crabs were harvested.

d. Any person possessing or using horseshoe crabs in violation of this section shall be liable to a penalty of \$10,000 for the first offense, and \$25,000 for the second and subsequent offenses, in addition to any applicable penalties prescribed pursuant to subsections b. through d. of section 73 of P.L.1979, c.199 ([C.23:2B-14](#)).

## History

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L. [2008, c. 1](#), § 2, eff. Mar. 25, 2008.

Annotations

## Notes

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### OLS Corrections:

Pursuant to [R.S.1:3-1](#), the Office of Legislative Services, through its Legislative Counsel and with the concurrence of the Attorney General, corrected a technical error in L. [2008, c. 1](#), § 2.

### Editor's Notes

For the 2007 status assessment referred to in subsection a., see <http://www.state.nj.us/dep/fqw/ensp/redknot.htm>.

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## [N.J. Stat. § 23:4-52](#)

\*\*\* Current through New Jersey 221st First Annual Session, L. 2024, c. 95 and J.R. 3 \*\*\*

**LexisNexis® New Jersey Annotated Statutes > Title 23. Fish and Game, Wild Birds and Animals (Ch. 1) > Chapter 4. Game; Wild Birds; Animals Generally (Arts. 1 — 10) > Article 8. Birds and Animals Protected (§§ 23:4-49 — 23:4-56)**

### **§ 23:4-52. Collecting mammals, reptiles, amphibians, fish and birds, and their nests and eggs for scientific purposes; certificate**

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The Division of Fish, Game and Shellfisheries may grant to a properly accredited person, 18 years of age or over, a certificate permitting him to collect mammals, reptiles, amphibians, fish, and birds and their nests or eggs, for strictly scientific purposes only. In order to obtain the certificate the applicant therefor shall (a) present to the division, written testimonials from two well-known scientists, certifying to the good character and fitness of the applicant to be intrusted with the privilege, (b) pay to the division the fee of \$20.00 for the scientific collectors certificate. The certificate shall be in force for 1 year only, from the date of its issuance, and shall not be transferable without approval of the director. The foregoing sections of this article shall not apply to a person holding such certificate, except as provided for in The Endangered and Nongame Species Conservation Act, P.L.1973, c. 309 ([C. 23:2A-1](#) et seq.).

Upon proof that a holder of the certificate has collected a mammal, reptile, amphibian, fish, bird or taken the nest or eggs of a bird, mammal, reptile, amphibian or fish for any purposes other than those named in this section, the certificate shall become void and the holder shall be further subject to the penalties provided therefor in this article.

### **History**

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Amended by L. 1975, c. 116, 11, eff. June 3, 1975.

Annotations

### **Research References & Practice Aids**

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#### **Cross References:**

Possession, release of certain animals, prohibited; terms defined, see [23:4-63.3](#).

#### **Administrative Code:**

[N.J.A.C. 7:12-9.13](#) (2013), CHAPTER SHELLFISH GROWING WATER CLASSIFICATION, Scientific Collection and Non-Human Consumption Program.

[N.J.A.C. 7:25-5.32](#) (2013), CHAPTER DIVISION OF FISH AND WILDLIFE RULES, Special Wildlife Management Permits.

N.J. Stat. § 23:4-52

[N.J.A.C. 7:25-12.6](#) (2013), CHAPTER DIVISION OF FISH AND WILDLIFE RULES, Applicability.

[N.J.A.C. 7:25-18.16](#) (2013), CHAPTER DIVISION OF FISH AND WILDLIFE RULES, Horseshoe crab (*Limulus polyphemus*).

[N.J.A.C. 7:25A-2.2](#) (2013), CHAPTER OYSTERS, Applicability.

[N.J.A.C. 7:25A-3.2](#) (2013), CHAPTER OYSTERS, Applicability.

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