Horseshoe Crab Adaptive Resource Management in the Delaware Bay Region

ASMFC Horseshoe Crab Management Board Meeting

May 5, 2026

compass

Stakeholder process participants & roles

- Stakeholder participants
- Technical / agency staff
- Public observers

Thank you for your insights, time, and commitment.

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

Planning & Facilitation Team

Caitlin Starks

Toni Kerns

Samara Nehemiah

ARM Subcommittee members

John Sweka – USFWS (*Chair*)
Jim Lyons – USGS (*Vice chair*)
Conor McGowan – USGS
Bryan Nuse – Bird Conservancy of the Rockies

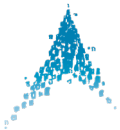
compass

Katie O'Donnell – Decision Analyst & Facilitator

Brian Crawford – Decision Analyst & Facilitator

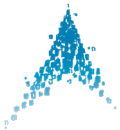
Process objectives

- Understand the ***Utility***, ***Reward***, and ***Harvest*** (**U/R/H**) functions in the Adaptive Resource Management (ARM) Framework that relate to stakeholder values
- Discuss and identify **broadly-supported recommendations** for revising the U/R/H functions, document different perspectives
- Discuss next steps and opportunities for improving the ARM Framework and process



Process roadmap

When	Step
Oct 2025	**Onboarding:** Establish group membership; hold small group interviews
Dec 2025 – Jan 2026	**Education sessions:** build shared understanding of technical ARM components (U/R/H functions)
Jan 2026	**Values workshop (in-person):** Discuss and elicit participants' values that influence ARM model functions; produce recommendations
Feb-May 2026	**Follow-up and report out:** • Review participant input and options with DBETC and ARM Technical Committees (tech committees) • Stakeholder meeting to finalize recommendations • Produce report describing process and outcomes; present to ASMFC Board



What decision are we focusing on?

Prior Decisions
out of scope for this process

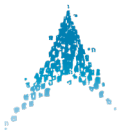
- The underlying population assessment science and the fundamental structure of the ARM Framework.
- Past management decisions.

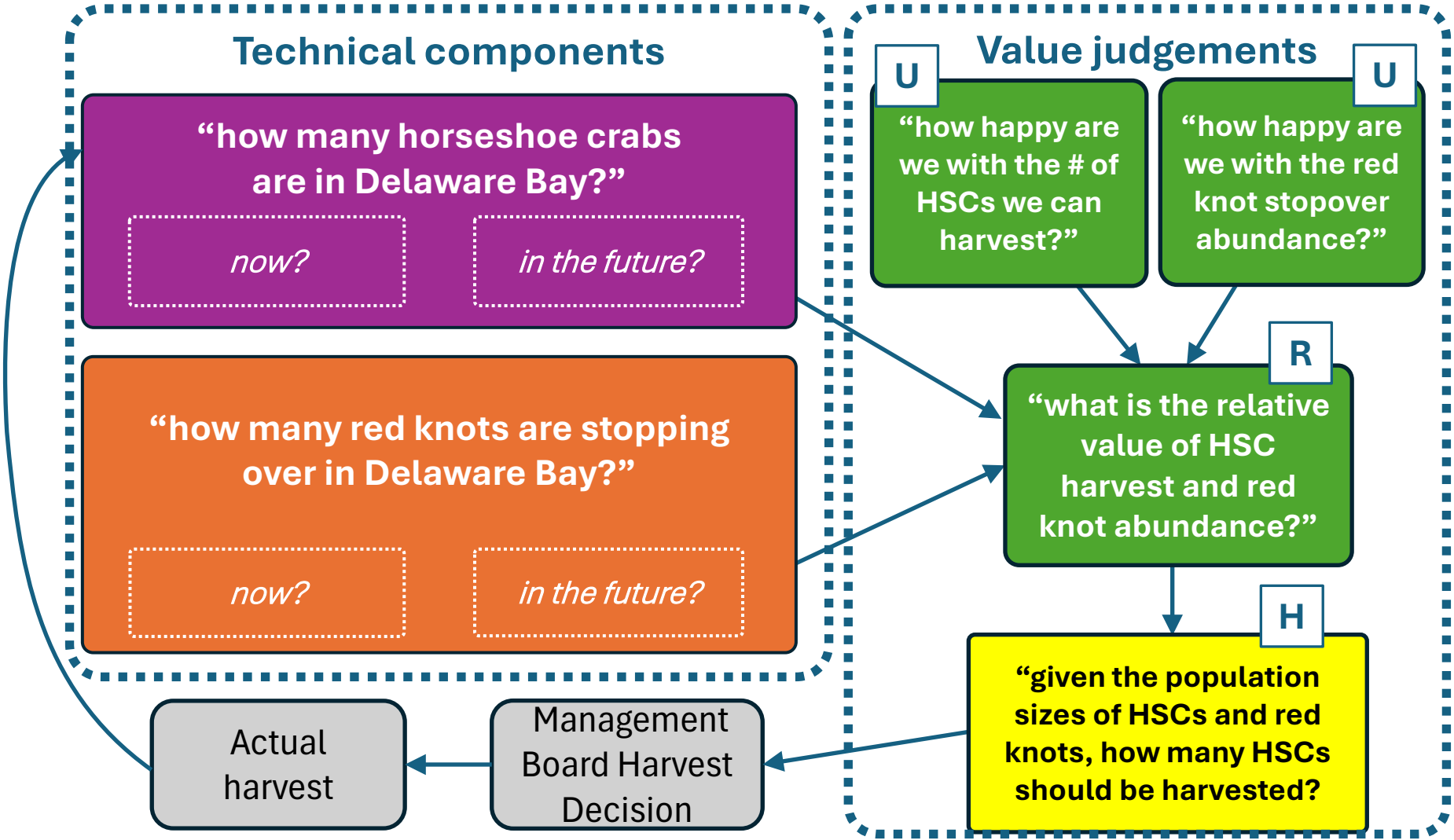
Decisions to Focus On

- **How should stakeholders' priorities and values be better represented in the ARM model (U/R/H functions)?**

Decisions to decide later or separately

- Ways to update the next ARM Revision (including science components)




Technical components
"how many horseshoe crabs are in Delaware Bay?"
now?
in the future?
"how many red knots are stopping over in Delaware Bay?"
now?
in the future?
Value judgements
U
"how happy are we with the # of HSCs we can harvest?"
U
"how happy are we with the red knot stopover abundance?"
R
"what is the relative value of HSC harvest and red knot abundance?"
H
"given the population sizes of HSCs and red knots, how many HSCs should be harvested?"
Management Board Harvest Decision
Actual harvest

Stakeholder process outcomes: ARM recommendations with broad agreement

U

HSC harvest utility

Change female-to-male value ratio

H

Max HSC harvest levels

Maintain current levels for males and females

H

Zero-harvest threshold

Add threshold for no harvest under low female HSC abundance

U

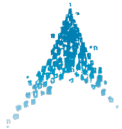
REKN utility

Change utility curve using elicited values from stakeholders

R

Reward function

Maintain current reward function (HSC harvest and REKN abundance)

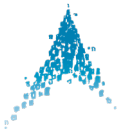


Documenting group support for recommendations

Levels of preference:

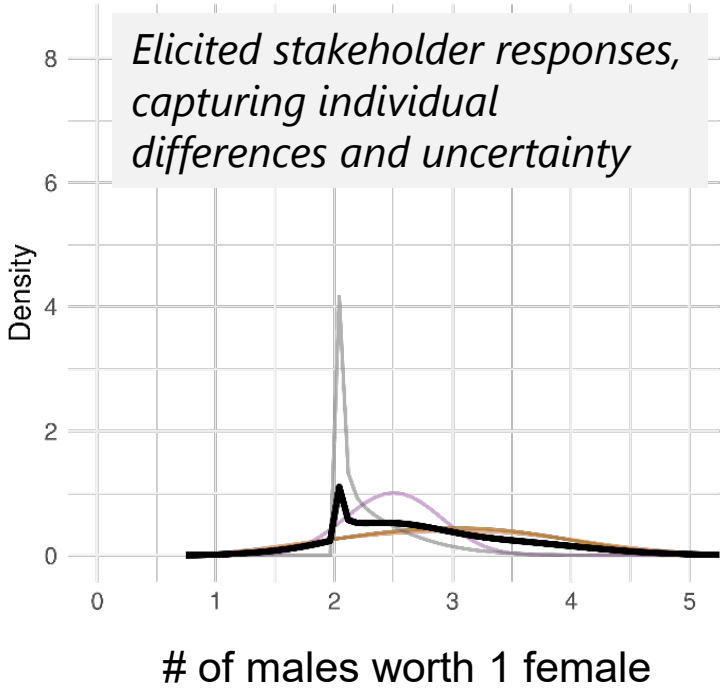
- **Endorse** - I fully support this
- **Accept** - I can live with this; it may not be my first choice, but I will support it here and outside of this group
- **Oppose** - I can't support it

In this process…
"**Broad agreement**" means all or most stakeholders **endorsed** or **accepted** the recommendation, and rationales for any **opposed** were documented



HSC harvest : Male-to-female harvest utility

- **Current ARM:** HSC harvest utility function assumes 1 female = 2 males
- **Approach:** Elicited values from bait and biomedical stakeholders: "Considering the horseshoe crab bait market over the next 5 years, catching 1 female is worth catching how many males?"
- **Recommendation from stakeholders, approved by Tech Committees:** **Update value to 1 female = 2.65 males, based on median response from fishers/dealers**



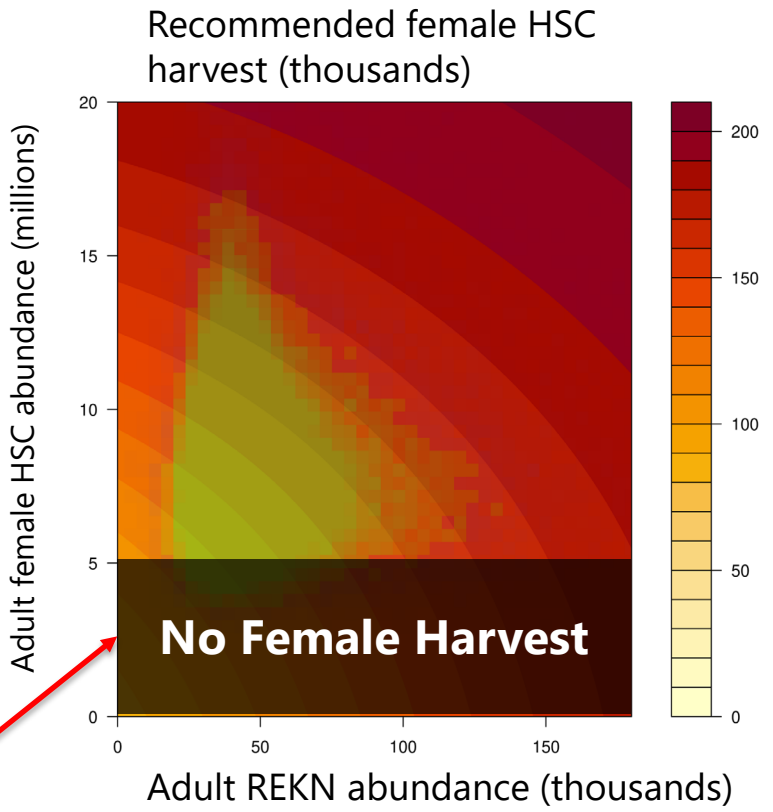
HSC harvest: Maximum bait harvest levels

- **Current ARM:** Maximum HSC harvest levels that can be recommended are set to 500K males and 210K females
- **Approach:** Group discussed, rationales were shared why it should be kept the same or increased
- **Outcome:** Group did not agree on clear direction, agreed to default to current values
- **Recommendation from stakeholders:** **No change to the max harvest levels, which still allows space for bait market to recover and opportunity for acceptance of female harvest (before raising these levels)**

HSC harvest: Threshold for zero harvest

- **Current ARM:** no formal threshold where a low HSC abundance would trigger 0 harvest.
- **Approach:** Group discussed concerns of not having a threshold in the ARM and possible options

  DBETC and ARM Subcommittee reviewed historical abundance benchmarks and did elicitation of minimum female abundance threshold for 0 harvest

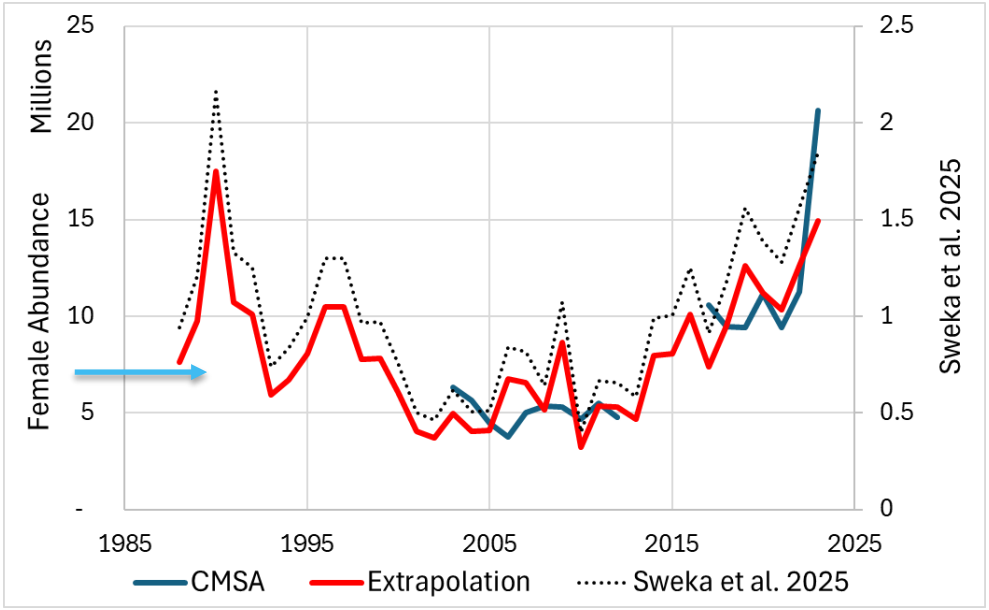


HSC harvest: Threshold for zero harvest

- **Recommendation from stakeholders and Tech Committees:** **Set threshold for 0 harvest to 7M female crabs, based on median of Tech Committee responses**

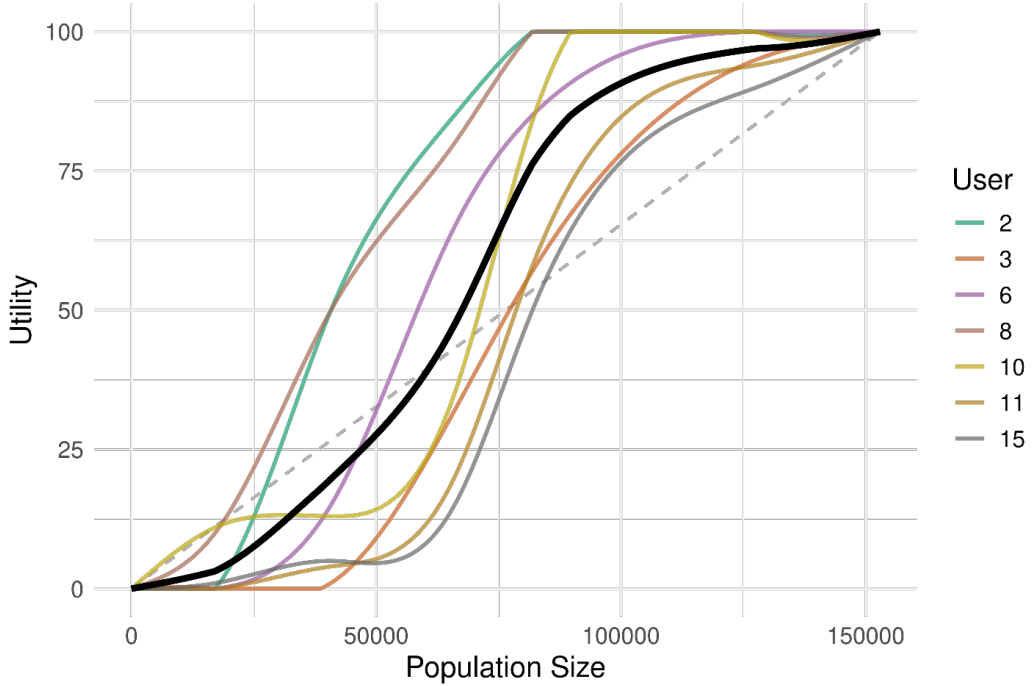
- **Rationale & caveats:**
  Provides evidence-based threshold for 0 harvest; still allows for learning within ARM

  A few stakeholders only accepted this as a near-term measure



Red knot utility function

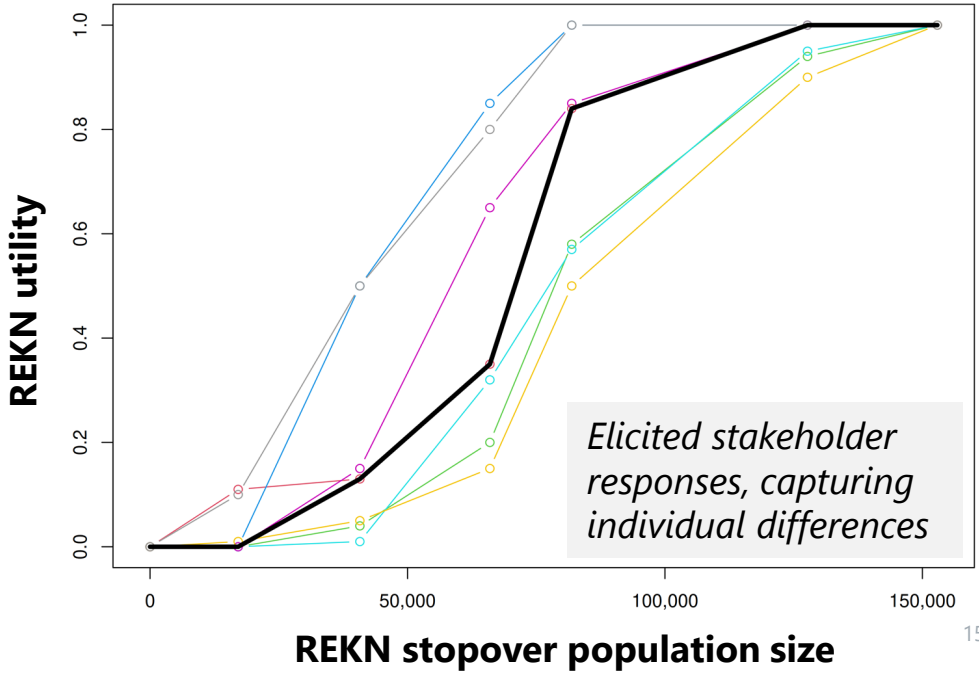
- **Current ARM:** REKN utility function rapidly goes from 0 to 1 around 81,900 birds
- **Approach:** Elicited values from stakeholders: "What is your level of satisfaction at different levels of red knot stopover abundance in 2050?"



Elicited stakeholder responses, capturing individual differences

Red knot utility function

- **Recommendation from stakeholders and Tech Committees: Change REKN utility curve, based on median response from conservation groups (see figure)**
- **Rationale:** This curve captures lower satisfaction with lower REKN abundances (risk aversion)



Reward function

- **Current ARM:** Annual Reward = HSC bait harvest utility + red knot abundance utility + (HSC bait harvest utility X red knot abundance utility)

- **Approach:** Group discussed ways to restructure

1. Keep it as is

2. Add a term

Habitat quality	HSC abundance
Other shorebirds	Ecosystem indicators

3. Reweight terms

=

change to

<

Reward function: Tech Committee recommendations

- **Recommendation from stakeholders and Tech Committees:**
  Near consensus for maintaining current reward function (see table)

- **Rationale for support:**
  - Red knots are indicator
  - Difficulty in measuring ecosystem values
  - Other terms are partially correlated with current terms

- **Rationale for oppose:**
  - Function does not represent full stakeholder values
  - Proposal for adding HSC abundance term and/or giving more weight to ecological terms

	Stakeholders	Tech Committees
Endorse	**3**	**9**
Accept	**7**	
Oppose	**1**	**1**

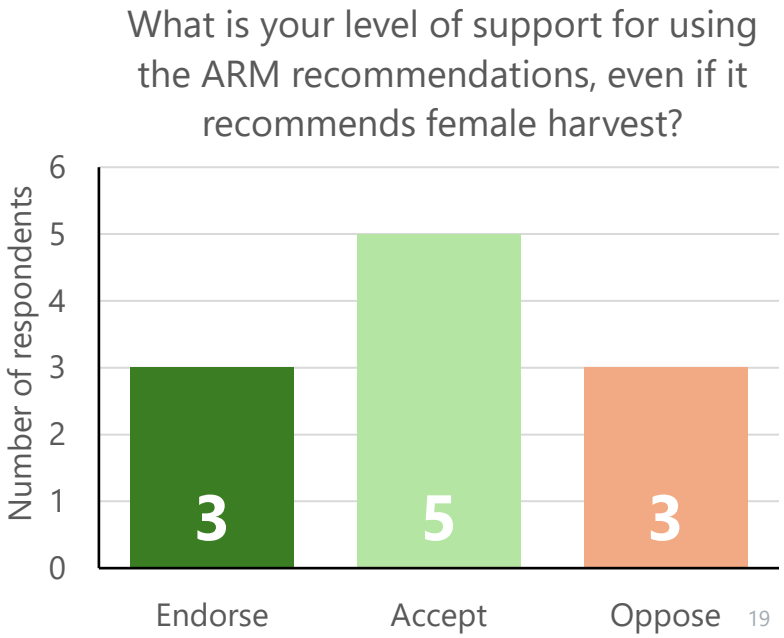
Stakeholder process outcomes: ARM recommendations with broad agreement

U	H	H	U	R
HSC harvest utility	**Max HSC harvest levels**	**Zero-harvest threshold**	**REKN utility**	**Reward function**
Change female-to-male value ratio to 2.65:1 (was 2:1)	Maintain current levels (500K males, 210K females)	Add threshold: No female harvest when female abundance < 7M*	Change utility curve using elicited values from stakeholders	Maintain current reward function (HSC harvest and REKN abundance)*

* A few participants had reservations about or opposed these recommendations

Improving the ARM & buy-in

- Addressing/modifying these big 5 items could improve the ARM and the level of buy-in among stakeholders
- However…
- **Rationale for support:**
  - Evidence-based, peer-reviewed,
  - Increased and stable populations under ARM mgmt
- **Rationale for oppose:**
  - Desire for precautionary approach and to see a "thriving ecosystem"
  - Disagreements on the ARM's underlying science



Additional ideas for ARM improvements

How can we build on the ARM foundation and the multi-party process of horseshoe crab harvest decisions?

ARM science

Hold workshop around egg density data & mechanisms

Explore incorporating habitat dynamics in ARM

Education

Educational sessions (e.g., on prediction, uncertainty in ARM)

Could continue to engage stakeholder group & others

Communication

Advertise existing reports & input processes

Develop concise ARM products for broad audiences to prevent spread of misinformation

Thanks!

Brian Crawford (bcrawford@compassrm.com)

Katie O'Donnell (kodonnell@compassrm.com)

www.compassrm.com

compass

What comes next?

Possible Next Steps, Pending Board Action
ARM SC to make changes and run the ARM model (3-4 months)
ARM/DBETC Meeting to discuss results
Presentation to Board, consider initiating Draft Addendum X
Develop Draft Addendum X including ARM Revision 2.0 (1-3 months)
Present Draft Addendum X to Board for consideration
Public comment on draft Addendum X (30 days)
Board final action on draft Addendum X

Atlantic States Marine Fisheries COMMISSION

Overview of Legislation and Regulations for Horseshoe Crab Fisheries in CT, NY, and NJ

Horseshoe Crab Management Board

May 5, 2026

Atlantic States Marine Fisheries COMMISSION

Background

- Board member request:
  - Summary of legislation that has been enacted by the states of Connecticut, New York, and New Jersey to restrict HSC fisheries (additional to FMP Provisions)
- States provided information on:
  - Legal language (statutes) enacted
  - Regulations the agency has in addition to the statutes
  - Rules governing possession/bait use
  - Biomedical use in the state

Atlantic States Marine Fisheries COMMISSION

Bait Harvest

Connecticut	New York	New Jersey
• 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, and 25% in 2028 • A complete ban will take effect on January 1, 2029. • Until 2029, current regulations remain in place.	• Commercial harvest moratorium 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.

Atlantic States Marine Fisheries COMMISSION

Possession and Bait Use

Connecticut	New York	New Jersey
• It is still legal to possess and use HSC as bait • Requires a trawl license, landing license (allows possession of horseshoe crabs legally caught in another state or in federal waters), or shellfish harvesting license.	• The NY Horseshoe Crab Protection Act only addresses take of HSC, not possession • Those holding a horseshoe crab commercial bait harvesters permit will still be allowed to possess and use HSC as bait after January 1, 2029.	• Statute allows commercial fishermen to possess and use HSC as bait • They must provide documentation that HSC were not harvested in NJ, including a receipt or bill of landing with contact info for 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.

Atlantic States Marine Fisheries COMMISSION

Importing Bait from Other States

Connecticut	New York	New Jersey
• Import of HSC from other states is allowed	• 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.

Atlantic States Marine Fisheries COMMISSION

Biomedical Fisheries

Connecticut	New York	New Jersey
• There are no biomedical HSC collections in CT at this time. • No previous biomedical take on record in CT. • The law is not clear on whether it is prohibited.	• 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.

Atlantic States
Marine Fisheries
COMMISSION

Questions?