



The Commonwealth of Massachusetts

Division of Marine Fisheries

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Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director 

DATE: December 14, 2023

SUBJECT: **Proposal Affecting Horseshoe Crab Management—Spawning Closures and Trip Limit Adjustments**

Proposal

For potential implementation this upcoming spring, DMF intends to go to public hearing this winter with the following proposals affecting horseshoe crab management:

- Replace the existing lunar-based spawning closures with a prohibition on all retention of horseshoe crabs during the spring spawning season. The closure period would not extend longer than April 15 – June 7.
- Amend the commercial bait trip limits. This proposal is multifaceted. First, I am proposing to adjust the hand harvest trip limit of 400 crabs per 24-hour period beginning at 12PM (noon) so that the trip limit is reduced to 300 crabs and applies per calendar day. This will establish a uniform commercial trip limit for all commercial fishers with a regulated fishery limited entry permit endorsement for horseshoe crabs. DMF then intends to adopt two trip limit triggers to manage the available bait quota for various users. The first trip limit trigger will increase the trip limits to 400 crabs per calendar day if less than 50% of the annual quota is taken on August 1. The second trip limit trigger will automatically reduce the trip limit to 200 crabs if 80% of the annual quota is taken before September 15. DMF is not proposing to adjust the open entry trip limit for mobile gear fishers of 75 crabs, nor the biomedical trip limit of 1,000 crabs.
- Complement federal prohibitions on horseshoe crab harvest within the Monomoy National Wildlife Refuge and the Cape Cod National Seashore.

Status of the Stock

The Atlantic States Marine Fisheries Commission's (ASMFC) most recent stock assessment (2019) for horseshoe crabs indicates the northern region (RI-ME) stock improved from poor condition to neutral condition compared to the 1998 baseline. This improvement was driven largely by increases in DMF trawl survey indices. The next ASMFC Horseshoe Crab Stock Assessment is scheduled to be released in 2024. Additionally, the 2022 Green List Report from the International Union for Conservation of Nature (IUCN) has also noted improvement in the abundance of crabs in the northeast region, which includes Massachusetts. For the northeast region, the IUCN Green List Report states "there appears to be a balance between loss of habitat and continued harvest pressure vs conservation measures. Thus, horseshoe crab populations appear to be fairly stable."

Data trends in Massachusetts since the 2019 ASMFC stock assessment and IUCN report are mixed. North of Cape Cod, DMF's spring and fall trawl surveys (Figure 1) were at or near time series highs in the late 2010's, but in more recent years declined to near time series median levels. All 2023 trawl survey data points north of Cape Cod were below their respective time series medians. South of Cape Cod, the DMF fall trawl survey is near time series median levels; however, the spring survey is still showing positive trends and remains above time series medians (Figure 2). The proportion of tows containing horseshoe crab is still generally showing positive signs in the Gulf of Maine in recent years, despite poor catch in 2023 (Figure 3). South of Cape Cod, the percentage of survey tows containing crabs remains above time series median for the spring survey but has declined in the fall survey (Figure 4). While most sites surveyed in the Massachusetts Spawning Beach Survey were below their time series medians in 2023, more than 70% of surveyed beaches show increasing trends over the last five and ten-year periods (Table 1).

The bait fishery for horseshoe crabs principally occurs south and west of Cape Cod with Nantucket Sound being the primary harvest area. In 2022, 85% of Massachusetts horseshoe crabs harvested for bait came from Nantucket Sound, with lesser amounts harvested from Cape Cod Bay (7%), Vineyard Sound (5.7%), Buzzards Bay (1.4%) (Figure 5), and less than 1% coming from all other areas combined. The biomedical fishery is similarly focused south and west of Cape Cod. However, Pleasant Bay—along the Outer Cape—has been an important site for the collection of biomedical crabs for nearly 50 years and has been closed to bait harvest since 2006.

Public Interest in a Spawning Closure

In January 2023, the Horseshoe Crab Conservation Association petitioned DMF to enact an annual horseshoe crab harvest closure through June 15 to protect spawning horseshoe crabs (Attachment 1). DMF considered this petition and proposed draft regulations to adopt a spawning closure through May 31. After reviewing public comment, DMF recommended the MFAC approve an April 21 – May 31 spawning closure. Ultimately, this recommendation was not approved by the MFAC due to prevailing concerns regarding the negative economic impact it may have on hand-harvesters, bait supply, and biomedical firms' business practices. Moreover, some MFAC members expressed skepticism about the lack of scientific evidence suggesting the horseshoe crab resource was declining and thus necessitating a management action.

The general public, including many in the conservation community, remain strongly committed to the enhanced conservation of the horseshoe crab resource. Specifically, they have argued that harvest should be substantially limited given the cultural and ecological value of horseshoe crabs. Some have expressed opinions that the horseshoe crab resource is depleted compared to historic levels and recent improvements in abundance trends are insufficient to support population recovery. Further, some insist the current management scheme serves only to maintain existing population levels sufficient for commercial harvest and does not address the ecological services provided by horseshoe crabs and horseshoe crab eggs¹.

These positions are evidenced in the public comment received during this past winter's rule making process and more recently in a letter from Massachusetts Audubon to the Department of Fish and Game (Attachment 2). Audubon's letter advocated² that the Department—and its Divisions—pursue horseshoe

¹ While it is difficult to quantify the benefits of horseshoe crab egg production on forage, shorebird advocates have long made arguments that spawning closures are necessary to increase the horseshoe crab eggs available on beaches to shorebirds. Similar forage arguments are now being extended to other species (e.g., sea turtles).

² Specifically, Massachusetts Audubon argued the Commonwealth should: (1) adopt a January 1 – June 30 spawning closure; (2) phase out all bait harvest; (3) improve performance standards and monitoring for the biomedical industry to reduce mortality and sub-lethal impacts; (4) increase interagency coordination to monitor the population status of horseshoe crabs in the context of their relationship to other species (e.g., shore birds); and (5) consider coastal resiliency in the context of climate change when developing strategies to restore horseshoe crab populations and other species (e.g., shorebirds).

crab population recovery initiatives as part of the Governor’s [Executive Order No. 618](#) on Biodiversity and Conservation in Massachusetts.

Rationale for a Spawning Closure

DMF has a long-standing history of constraining state-managed commercial fisheries from targeting known aggregations of spawning fish and has generally supported similar efforts at the federal and interstate level. As a general rule, it is advisable—and typically embraced by stakeholders—to provide animals protection from harvest during spawning events. This is particularly true for horseshoe crabs given they are exceptionally vulnerable to harvest during the spawning season because of their shallow subtidal staging behavior and easy access while on the spawning beaches. This is why DMF adopted the springtime lunar-based horseshoe crab harvest closures in 2010 and it is why I want to expand spawning horseshoe crab protections now.

Over the past decade, our survey data generally indicate improving population trends, but some recent data points are reverting towards time series medians. Additionally, we primarily observe animals that are three-to-four years away from maturity and older in our trawl survey, while only mature adults are observed in the spawning beach survey. At present, there is not a viable survey method available to us that can accurately enumerate young-of-the-year nor forecast future recruitment. Absent such an early warning system, DMF can only respond to trends observed in the adult or sub-adult segment of population. Moreover, horseshoe crabs are negatively impacted by the degradation of coastal beaches and consequent loss of spawning habitat. These conditions may accelerate in the coming decades given anticipated sea level rise and resulting erosion and shoreline armoring. For these reasons, I think it appropriate to manage this fishery with precaution and work to bolster the reproductive success of the current and future spawning stock biomass.

DMF’s spawning beach survey data (2015-2022) show that both north and south of Cape Cod horseshoe crab spawning activity typically begins in May and concludes by mid-to-late June (Figure 6 and Figure 7). These data demonstrate that the proposal will protect approximately 90% of spawning females by delaying the annual bait and biomedical harvest through June 7th. Having the spawning closure begin to apply in mid-April also enhances spawning protections. First, it protects horseshoe crabs from harvest as they stage in nearshore areas immediately prior to the spawning event. This is particularly important in the context of the primary harvest area—Nantucket Sound—as the nearshore mobile gear closures do not go into effect until May 1³ (Figure 8). Additionally, a mid-April closure would mitigate potential interannual variability in the timing of spawning, particularly should the spawning event begin earlier in the year (e.g., due to a warmer than usual spring).

This proposed action would also bring us in line with what is occurring in some other states. Massachusetts is one of four states—along with Rhode Island, Maryland, and Virginia—that currently have bait and biomedical fisheries. Each of these states provide spawning horseshoe crabs with more protections than they are currently afforded in Massachusetts. Rhode Island prohibits bait harvest in May and has lunar closures in May for its biomedical fishery; Maryland has a complex myriad of rules that prohibits directed bait fishing during the spawning season, prohibits the year round harvest of females for bait, and limits the biomedical harvest of females during the spawning season; and Virginia prohibits bait harvest within 1,000 feet of shore from May 1 – June 7 and bans the harvest of females in waters east of the COLREGS line (i.e., ocean zone). As for the rest of the northeast, Connecticut recently prohibited hand harvest in its bait fishery and does not have a biomedical fishery; New York features lunar closures

³ 322 CMR 4.06(2) annually closes those waters within a boundary that approximates the three nautical mile line from Eastham to Mashpee from May 1 – October 31 to mobile gear except surf clam and ocean quahog dredges and dredges used in municipal managed shellfish fisheries.

in May and June affecting its bait fishery and does not have a biomedical fishery; and New Jersey does not have a bait fishery and prohibits harvest in its biomedical fishery until June 1.

This proposal is not without negative impacts. If adopted, it will disproportionately impact hand-harvesters who capture horseshoe crabs as they stage in shallow waters and come up on the beaches to spawn. Nearly all annual hand harvest has historically occurred between the last week of April and the first week of June (Table 2). Over the past three years we have had roughly 50 active hand harvesters with about 30 individuals participating in the fishery in any given year. While there may be some continued opportunity for hand harvest after the first week of June⁴, I suspect effort and landings will be limited during this period because harvesters will likely pursue other work due to the loss of the peak season and because crab availability is more limited.

The loss of the springtime hand harvest fishery will also likely impact the bait supply for the spring channeled whelk (“conch”) pot fishery, particularly in the first year of implementation. These impacts may be particularly acute in 2024 given the performance of the horseshoe crab fishery in 2023. In most years, it is common for bait dealers to have a surplus of horseshoe crabs at the end of the fall season that can be stored and made available to supplement bait demand when the conch pot fishery re-opens in the spring. However, it is my understanding that this is generally not the case at present. The early season (August 6) quota closure in 2023 of the horseshoe crab bait fishery limited the local bait available to the fall conch pot fishery requiring dealers to import additional bait from other states to meet demand. However, the economics of the conch pot fishery⁵, coupled with the cost of bait, may have had a limiting impact on the volume of bait crabs being imported. Undoubtedly, the changing market conditions for channeled whelk complicate our understanding of impacts relative to the bait market and increases uncertainty moving forward. That said, I do suspect there may be a horseshoe crab bait shortage to start the spring conch pot season in 2024 regardless of my spawning closure proposal. Also, there are alternative—but purportedly less favorable—baits available to conch pot fishers⁶ and they may be forced to switch over to those alternatives. Note that should poor market conditions persist for whelk there may also be much reduced conch pot fishing effort and subsequent demand for bait.

To address both the displacement of hand harvesters and potential bait shortages, I am interested in enhancing green crab fishing opportunities. Green crabs are an invasive species commonly found throughout nearshore marine habitats in Massachusetts, particularly our estuaries, saltmarshes, and mudflats. While industry feedback generally suggests horseshoe crabs are the most effective whelk bait, green crabs are also commonly used to supplement bait demand. It is worth exploring the potential for green crabs to become a more substantial part of the bait mix to offset the impacts of horseshoe crab conservation and to create market-based incentives to fish down this invasive species. To wit, I am interested in creating a more robust fishery for green crabs and will work with staff to streamline permit conditions and permit availability for commercial green crab trapping. Funding to outfit displaced horseshoe crab hand harvesters with green crab trap gear would be a creative legislative solution to help mitigate the impacts of these proposals.

Prior public comment would also suggest the biomedical industry may be concerned that spawning closures will limit their access to horseshoe crabs for *Limulus Amebocyte Lysate* (“LAL”) production by seasonally eliminating the biomedical harvest of horseshoe crabs, as well as crabs available through the

⁴ Based on our spawning beach survey data, some low level of spawning activity continues throughout June and post-spawning crabs may remain in shallow embayments where they are accessible by hand.

⁵ Conch dealers informed DMF staff that the ex-vessel value of channeled whelk was depressed coastwide this fall. This is reportedly a product of economic conditions affecting the Chinese live market. SAFIS dealer data for Massachusetts shows ex-vessel value was about \$3 per pound in November and early-December of this year, which is about 25% less than the average ex-vessel value in 2021 and 2022.

⁶ These alternative baits include green crabs, molluscan shellfish, fish or fish racks, and other fish waste from processors.

rent-a-crab program. Given the critical importance of LAL production to global public health and safety, I am willing to consider potentially exempting some biomedical harvest from the proposed spawning closure to ensure Massachusetts' biomedical firms can obtain locally sourced horseshoe crabs to create this lifesaving product. Such an exemption—if adopted—would likely include certain conditions, such as a total cap on harvest during the spawning season (e.g., a capped percentage of the biomedical quota) and limitations on where harvest can occur (e.g., no harvest near spawning beaches or in nearshore areas where crabs may be staging to spawn). In the end, it would be my preferred outcome that the harvesters, dealers, and biomedical processors all amend their business plans to work around the spawning closure without such an exemption that could weaken the closure's enforceability and overall compliance.

Rationale for Bait Fishery Trip Limit Adjustment

The first aspect of this proposal is to adopt a uniform bait fishery trip limit of 300 horseshoe crabs per day for all limited entry permit endorsement holders. This will eliminate the higher trip limit of 400 crabs which applies per 24-hour period beginning at 12PM (noon) and enables fishers to fish two tides in a single calendar day. I perceive this as having several benefits. I anticipate this will reduce the potential harvest at the tail end of the spawning season once the proposed spawning closure has ended. In doing so, the potential for front loading the bait quota to meet rent-a-crab demand will also be reduced. This may help uniformly distribute bait landings across the year, with the intention of ensuring that supply and demand are well-linked in time. Lastly, a single trip limit for all bait permit holders would improve enforcement and compliance.

The second aspect of my proposal is to establish two triggers to automatically adjust trip limits at a certain date based on quota usage. For instance, should more than 50% of the quota remain available on August 1, I propose increasing the trip limit to at least 400 crabs per calendar day. This will allow mobile gear fishers to better access available quota later in the season to meet bait demand for the fall conch pot fishery and supplement biomedical demand through the rent-a-crab program. Additionally, I propose a trigger be adopted so that if 80% of the annual quota is taken before September 15, the trip limit is automatically reduced to no more than 200 crabs per calendar day. This may help the fishery postpone or avoid a quota closure. In turn, this would maintain a steady supply of bait to the market; reduce regulatory discarding in mobile gear fisheries—particularly the clam dredge fishery—that may occur into the late fall and early winter; and serve as a signal to biomedical firms to rely more on other sources of crabs (e.g., biomedical quota) to meet their annual production needs.

Rationale for Complementing Federal Harvest Closures

Federal rules affecting both the Cape Cod National Seashore and the Monomoy National Wildlife Refuge prohibit the harvest of horseshoe crabs within the park and refuge boundaries (Figure 9 and Figure 10). I intend to adopt complementary closures as part of DMF's horseshoe crab management regulations to enhance enforcement and compliance by allowing the Massachusetts Environmental Police to enforce harvest ban in specific geographic areas.

Additional Discussion

Performance of the 2023 Fishery

This year, the bait fishery closed on August 6 with 99.8% of the quota being taken⁷. This is only the second time ever that the annual bait quota was achieved, and the fishery was closed. In 2019, the fishery closed on August 31, about three-and-a-half weeks later than this year's closure. This year's early closure restricted the ability for mobile gear fishers to retain and land horseshoe crabs throughout the end of the summer and fall. This likely had a negative economic impact on our state waters mixed trawl fishery in

⁷ To prevent an even earlier closure, DMF and the MFAC made an in-season adjustment on July 10 to reduce the bait crab trip limit for mobile gear fishers from 300 crabs to 200 crabs for limited entry endorsement holders and from 75 crabs to 50 crabs for open access fishers.

Nantucket Sound and quahog dredge fisheries. However, the negative economic impacts for some trawlers were mitigated by their ability to participate in the biomedical fishery⁸. Note, in 2023 DMF voluntarily reduced its annual horseshoe crab quota by 25,000 crabs (from 165,000 crabs to 140,000 crabs annually) to offset growth in the biomedical fishery and cap total mortality at near 2022 levels.

The early quota closure in 2023 was driven in part by an unprecedented spike in early season bait harvest. Landings during the proposed closure period (April 15 – June 7) approached 85,000 crabs⁹, which is substantially higher than what we have experienced in recent years (Figure 11). There are several likely reasons as to why this occurred. Uncertainty regarding the future of the hand-harvest fishery may have driven an increase in fishing effort and activity, particularly as final rules were not approved by the MFAC until mid-May and did not go into effect until mid-July. Additionally, the early season bait quota usage was likely artificially inflated by biomedical demand from firms seeking to utilize bait crabs that they bled and returned to the bait market (“rent-a-crab”); this harvest is counted toward the 140,000-crab bait quota. It was also reported that the elevated early season crab harvest caused market gluts that may have in turn reduced bait availability during this fall’s conch pot fishery and contributed to the at-sea releases of crabs in May, of which many ultimately washed ashore dead near Stage Harbor. The spawning closure and trip limit proposals outlined above should result in the quota being spread out over the fishing season thereby avoiding market gluts and early season closures. In the biomedical fishery, landings are still being tallied, but DMF expects the biomedical annual quota to be essentially taken. Note that in 2024 we will have enhanced reporting, as all commercial horseshoe crab fishers—both bait and biomedical—will be required to report the landings electronically on a daily basis.

DMF has monitored horseshoe crab fisheries since 2000, including collection of size and sex data from both the bait and biomedical harvest streams. This includes sampling within Associates of Cape Cod, which was the only biomedical firm in the state from 1974 to 2022. The addition of Charles River Laboratories in 2022 brought more attention from the public. Some members of the public were frustrated by a lack of transparency in the biomedical fishery due to confidentiality laws and requested DMF increase observation of the fishery. The biomedical industry, frustrated by misinformation being spread about their operations, also requested DMF conduct more sampling trips. In addition to continuing to collect biological data within the biomedical facilities, DMF began observing biomedical collection trips, holding areas, and biomedical release trips, conducting 50 trips in total (Table 3). Eleven different DMF scientists collected data on over 11,000 crabs. Information collected included mortalities, biomedical recaptures, size, and sex. The data have not been completely analyzed yet, but the number of observed mortalities from collection to release was very low.

Right-sizing Bait Harvest

I am interested in managing the bait fishery for horseshoe crabs in a manner that considers local demand for bait. Based on bait usage surveys and reported pot haul data, DMF estimates the Massachusetts’ conch pot fishery likely required about 136,000¹⁰ horseshoe crabs per season during the ten-year period from 2013 – 2022. However, during the most recent five-year stanza (2018 – 2022), the mean number of horseshoe crabs needed was about 107,000. This usage is generally in-line with the current horseshoe

⁸ Out of abundant precaution, DMF does not currently allow shellfish dredge boats to participate in the biomedical fishery as there are concerns that are not currently well understood about how this rigid, metal gear may impact the overall health, fitness, and survivability of horseshoe crabs.

⁹ DMF obtains gear type data through harvester reports and 2023 harvester data will not be available until the spring of 2024. However, given our understanding of how this fishery functions, the increase in landings during the spring of 2023 is likely attributable to hand harvest.

¹⁰ Estimated number of crabs needed to supply bait for Massachusetts whelk pot hauls was derived by multiplying the number of annual whelk pot hauls by 0.33 (a third of a crab). Most respondents to a 2016 survey by DMF and ASMFC of commercial whelk harvesters claimed they used a quarter of a female crab, or half a male. Using sex data provided by bait harvesters, there are 2 females harvested for every male. Using a weighted mean by sex, the average bait use is estimated to be 0.33 crabs per trap.

crab quota. However, the declining trend in pot hauls (Figure 12), declining channeled whelk stock conditions, and international market issues likely portend further declines in the pot fishery. Should this bear out over the next few years, I may consider proposing further reductions to the bait quota.

Attachments

1. January 9, 2023 Petition from Horseshoe Crab Conservation Association to DMF
2. October 26, 2023 Letter from Massachusetts Audubon to Commissioner O'Shea

Table 1. Massachusetts Spawning Beach Survey trends by survey site, region, and survey period (day or night).

Beach	Region	Time of Day	2023 vs Median	10-year trend	5-year trend
Duxbury	Cape Cod Bay	Day	below	decreasing	increasing
Duxbury	Cape Cod Bay	Night	above	decreasing	increasing
Long Beach	Cape Cod Bay	Day	below	NA	decreasing
Long Beach	Cape Cod Bay	Night	below	NA	increasing
Millway	Cape Cod Bay	Day	below	increasing	increasing
Millway	Cape Cod Bay	Night	above	increasing	increasing
Long Pasture	Cape Cod Bay	Day	above	increasing	increasing
Sanctuary Beach	Cape Cod Bay	Day	below	increasing	increasing
Indian Neck	Cape Cod Bay	Day	below	decreasing	decreasing
Indian Neck	Cape Cod Bay	Night	below	increasing	decreasing
Great Island	Cape Cod Bay	Day	below	increasing	increasing
Priscillas Landing	Outer Cape Cod	Day	above	increasing	decreasing
Marsh 2-3	Outer Cape Cod	Day	above	increasing	increasing
Erica's Beach	Outer Cape Cod	Day	below	increasing	decreasing
Stage Harbor	Nantucket Sound	Day	NA	NA	NA
Stage Harbor	Nantucket Sound	Night	NA	NA	NA
Bass River	Nantucket Sound	Day	below	NA	increasing
Bass River	Nantucket Sound	Night	above	NA	increasing
Monomoy	Nantucket Sound	Day	equal	increasing	NA
Monomoy	Nantucket Sound	Night	below	increasing	NA
Warrens Landing	Nantucket Sound	Day	above	increasing	increasing
Warrens Landing	Nantucket Sound	Night	above	increasing	increasing
Tashmoo	Nantucket Sound	Day	NA	increasing	NA
Tashmoo	Nantucket Sound	Night	NA	increasing	NA
Tahanto	Buzzards Bay	Day	NA	increasing	increasing
Tahanto	Buzzards Bay	Night	NA	increasing	NA
Swifts Beach	Buzzards Bay	Day	below	decreasing	decreasing
Swifts Beach	Buzzards Bay	Night	below	decreasing	increasing

*The fourth column indicates whether the 2023 survey data point was above or below the time series median for that site. The fifth and sixth columns indicate whether the survey linear trends are increasing or decreasing over the last ten or five years. Positive trends (above time series medians or increasing survey trends) are shaded green. Negative trends (below time series medians, decreasing trends) are shaded red. Unshaded areas are either equal to the time series median, or inadequately sampled.

Table 2. Hand harvest landings (in number of horseshoe crabs) by season 2010 - 2023

MA HSC Bait Hand Fishery Annual Landings (# of Crabs)		
YEAR	JAN 1 - MAY 31	JUN 1 - DEC 31
2010	43,815	5,612
2011	28,882	6,303
2012	50,030	3,049
2013	59,716	10,681
2014	49,640	27,395
2015	55,168	12,898
2016	54,554	9,381
2017	46,113	22,441
2018	43,149	27,494
2019	52,044	27,142
2020	54,833	12,019
2021	39,525	13,421
2022	30,342	10,069
2023	77,000*	N/A

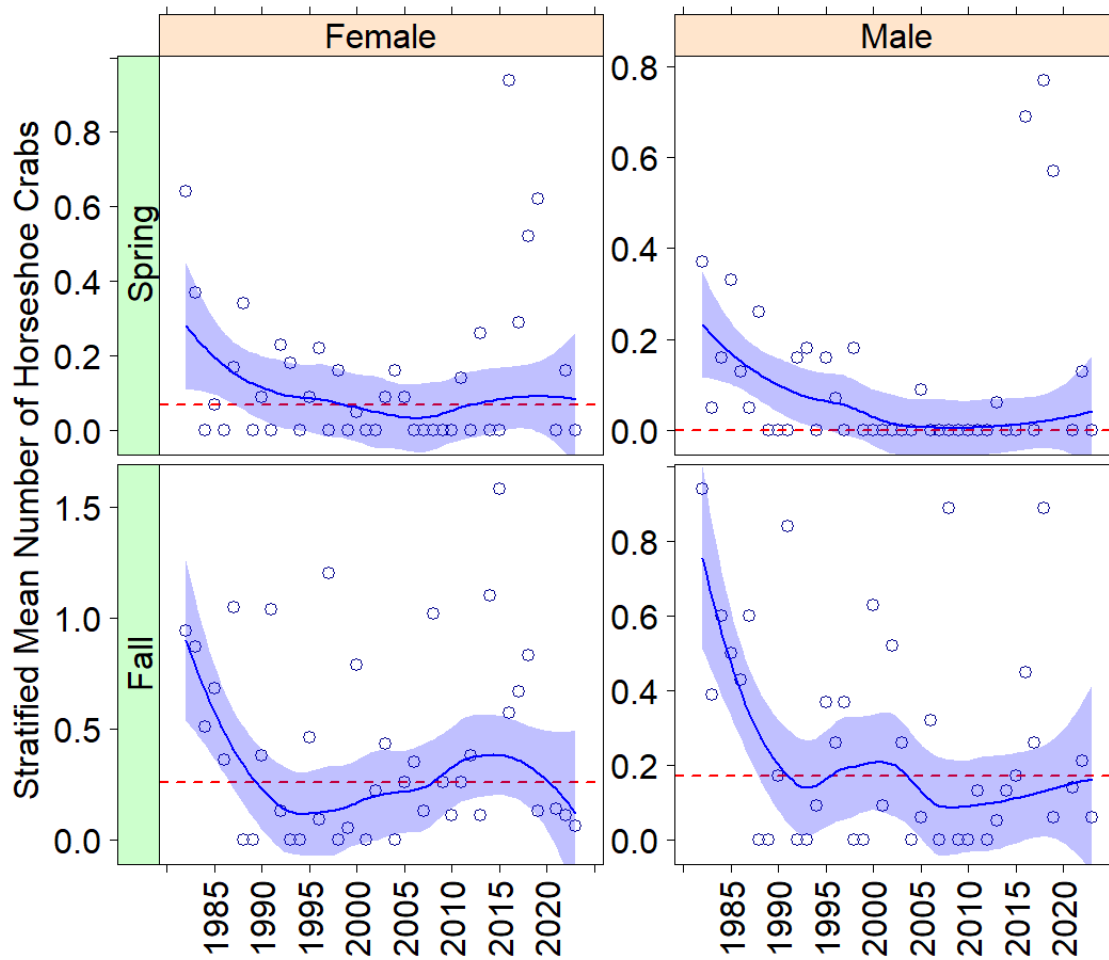
Data Source: MA Trip-Level Reports and NMFS VTRs, as of 10/2/2023, *except for 2023 which is estimated from SAFIS eDR reports and historical gear types of the harvesters named in the dealer reports.

Table 3. Summary of sampling conducted and horseshoe crabs observed by DMF (2023).

	# of 2023 Trips	# of Crabs Observed
Bait market sampling	4	984
Biomedical market sampling	9	3,009
Collection Trips	9	>1,685*
Pen Checks	14	2,645
Release Trips	14	2,898
Total	50	>11,221*

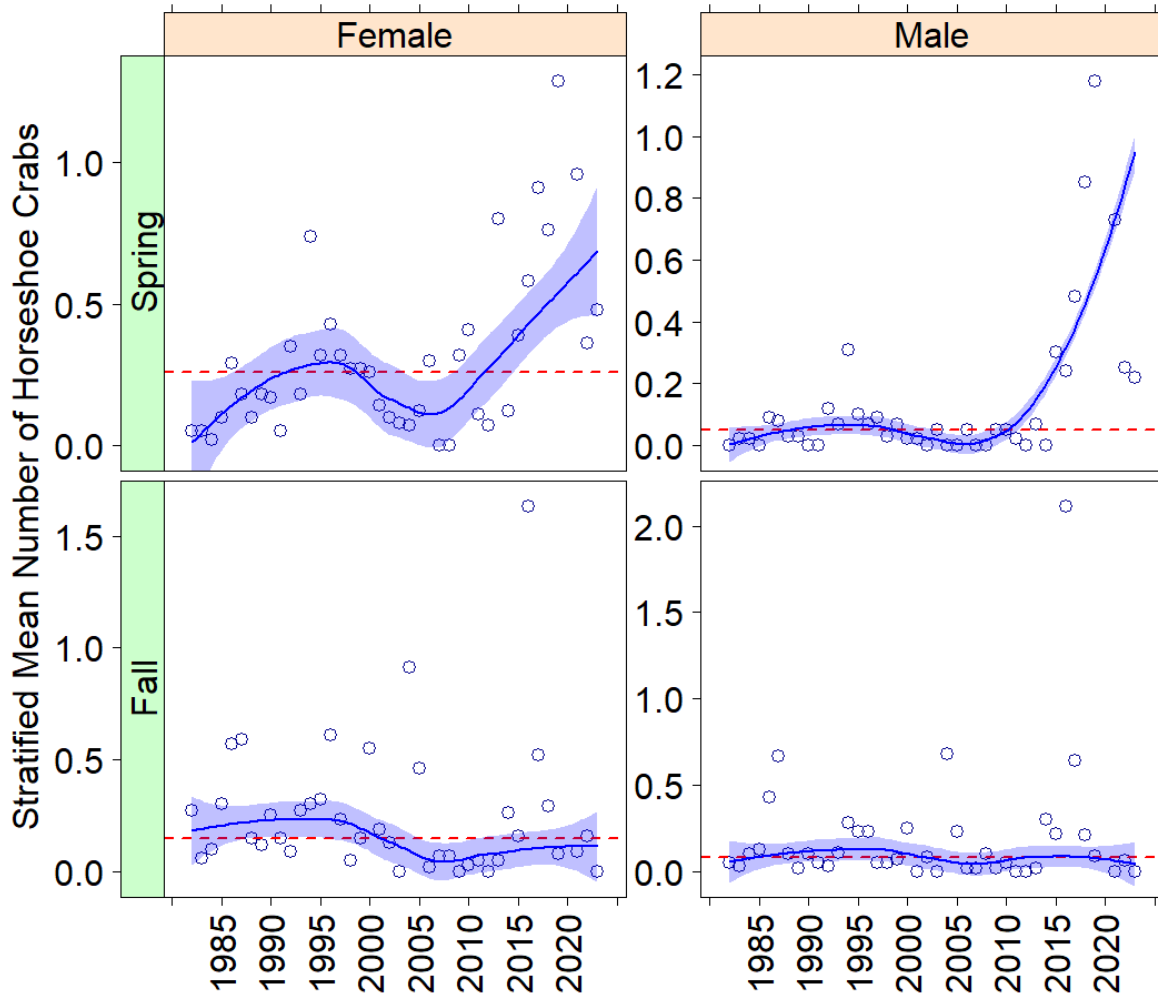
* Most 2023 sea sampling trips (collection trips) have not been transcribed yet, so the number of crabs observed is expected to increase substantially once audio recordings of trips are transcribed.

Figure 1. Stratified mean number of horseshoe crabs per tow 1982-2023 – North of Cape Cod



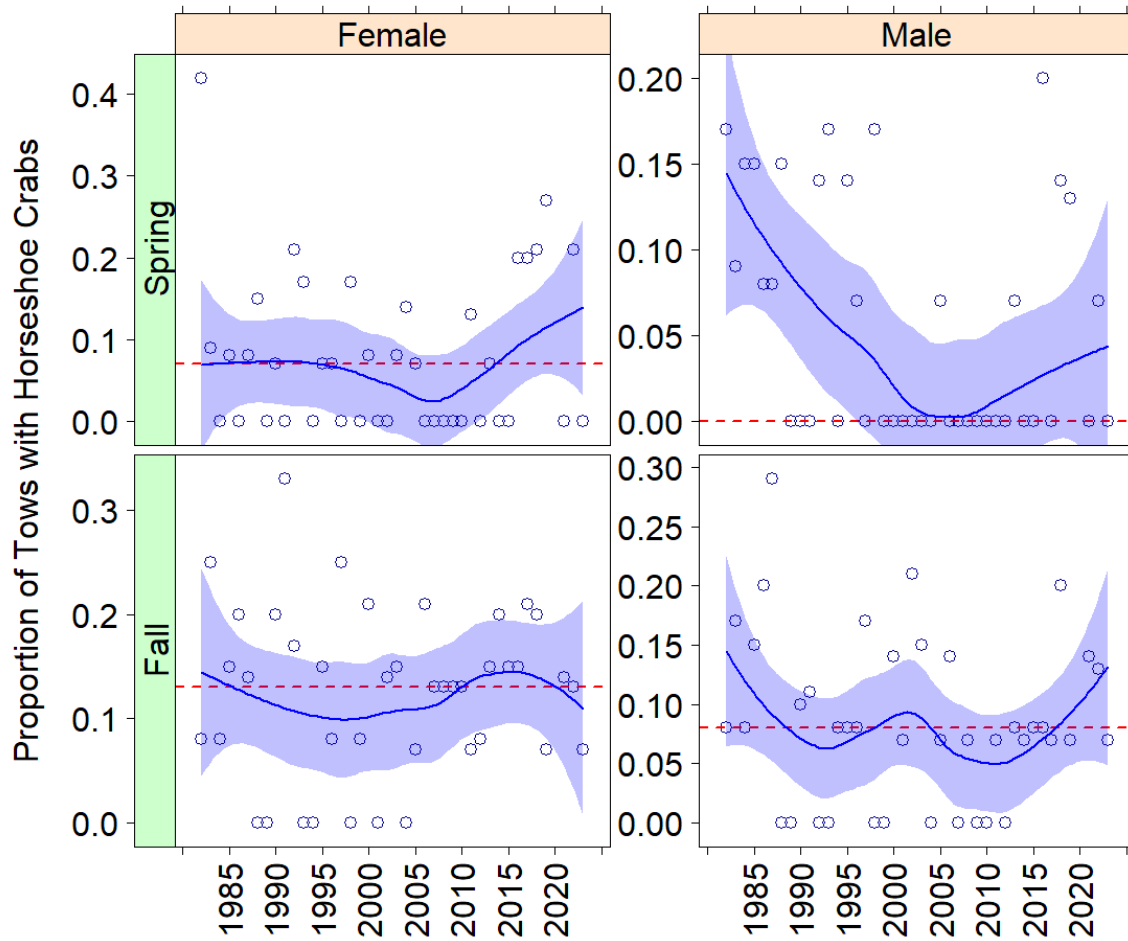
DMF Trawl Survey North of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 2. Stratified mean number of horseshoe crabs per tow 1982-2023 – South of Cape Cod



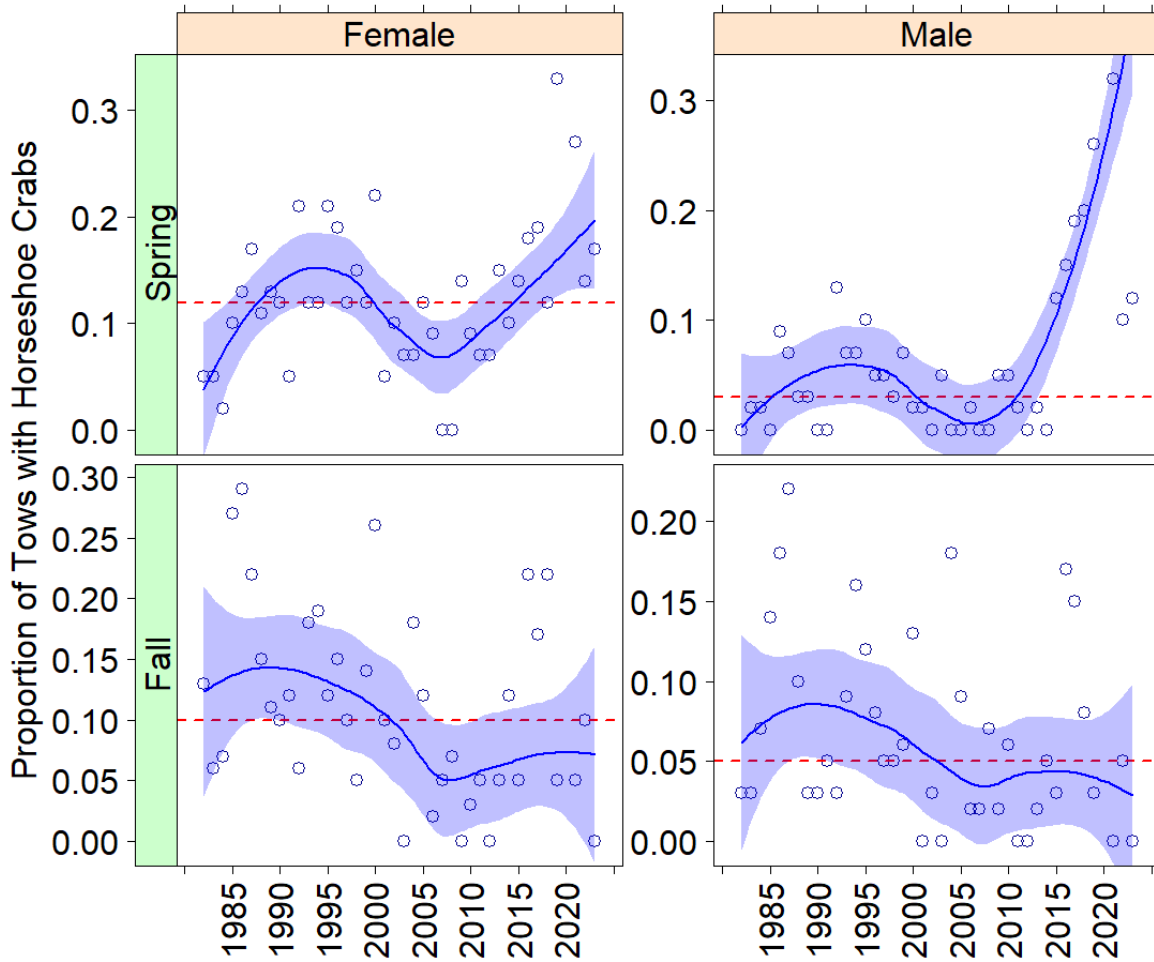
DMF Trawl Survey South and East of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 3. Proportion of tows with horseshoe crabs present 1982-2023 – North of Cape Cod



DMF Trawl Survey North of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 4. Proportion of tows with horseshoe crabs present 1982-2023 – South of Cape Cod



DMF Trawl Survey South and East of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 5. Proportion of 2022 horseshoe crab landings in bait fishery by region

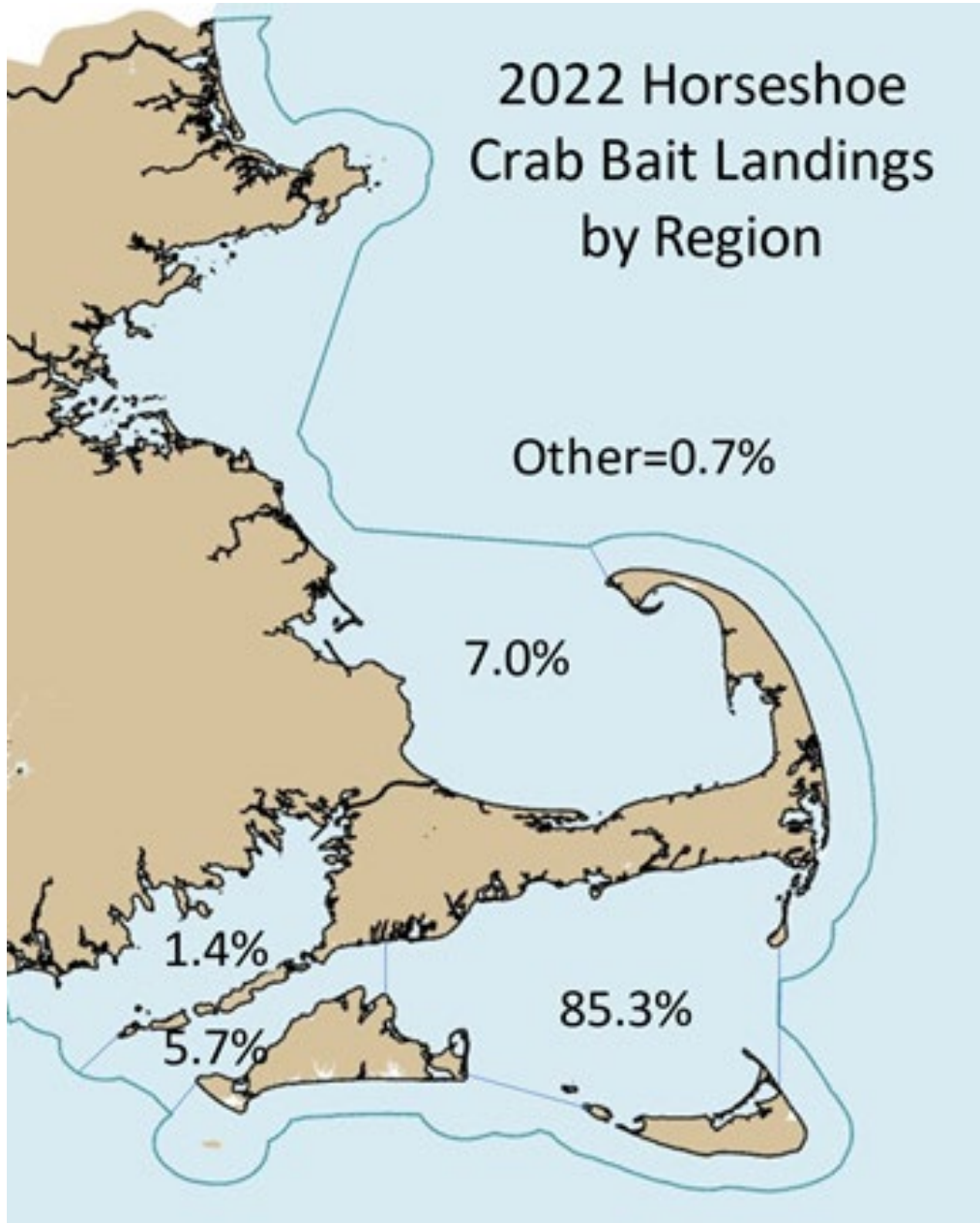


Figure 6. Cumulative percent of spawning females observed by date during spawning beach surveys North of Cape Cod, 2015-2022

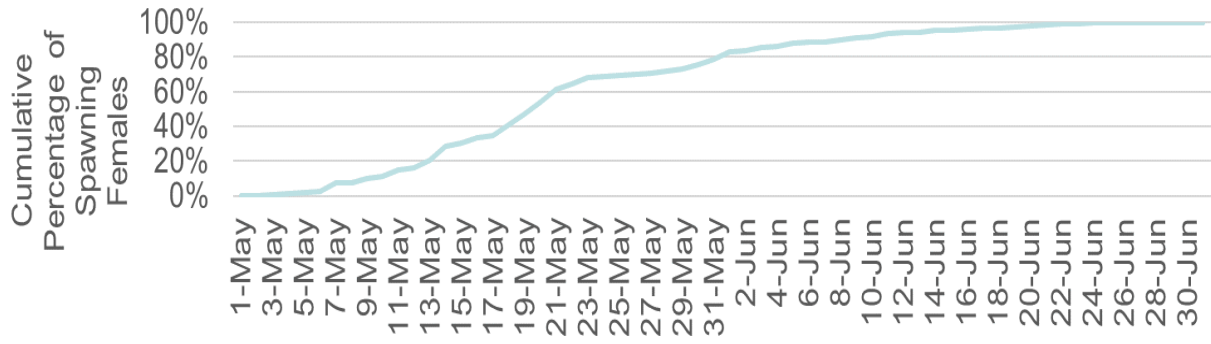


Figure 7. Cumulative percent of spawning females observed by date during spawning beach surveys in Southern Massachusetts and Outer Cape Cod, 2015-2022

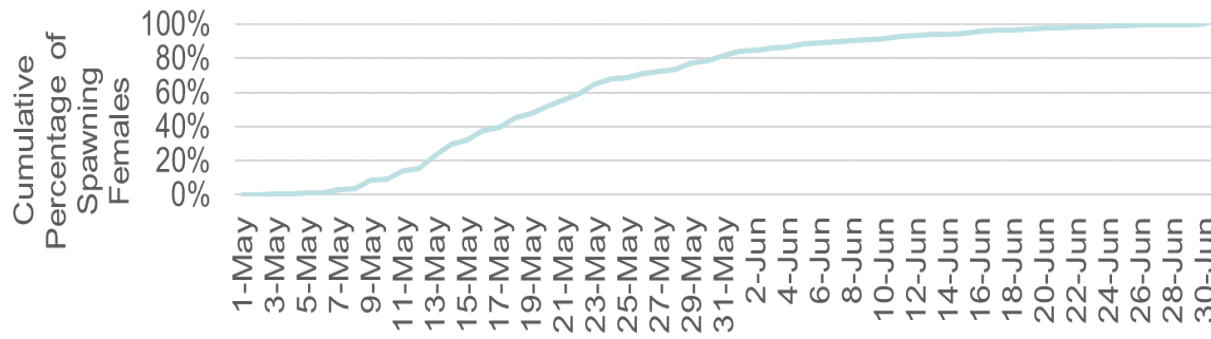


Figure 8. Eastham to Mashpee Mobile Gear Closure, May 1 – October 31 (322 CMR 4.06)

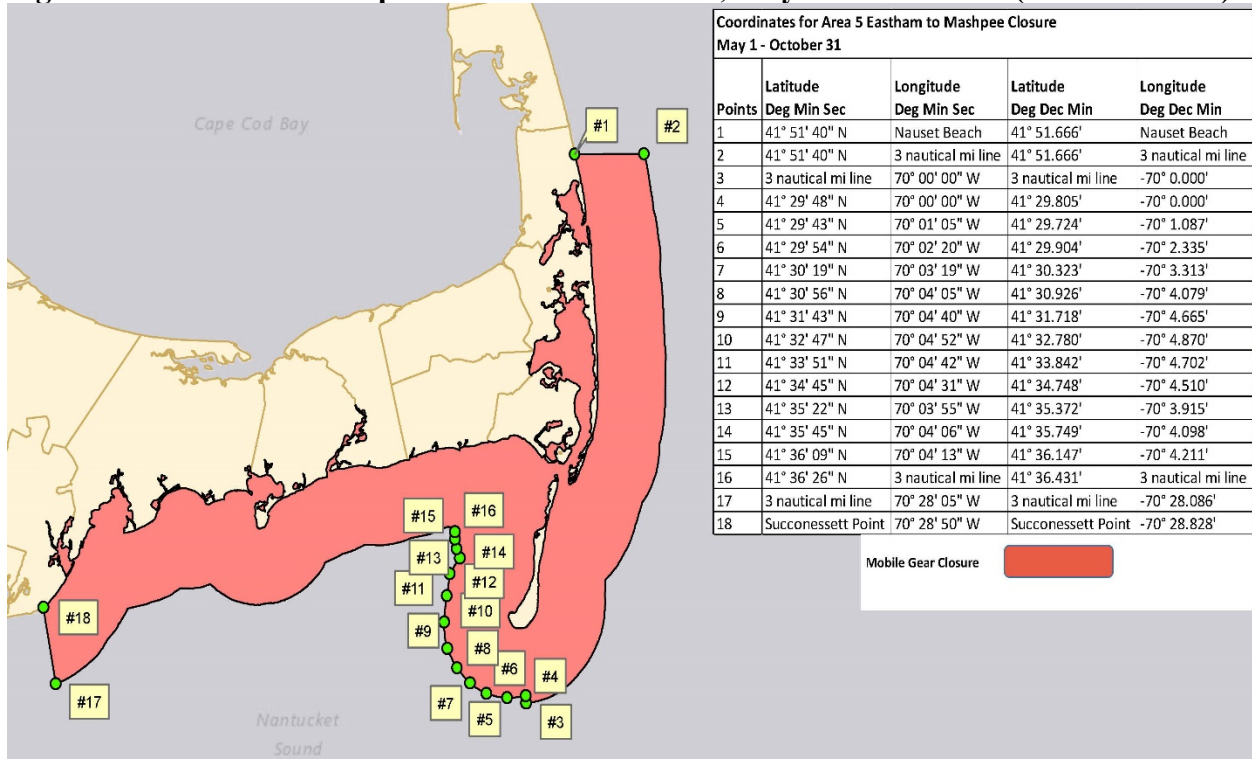
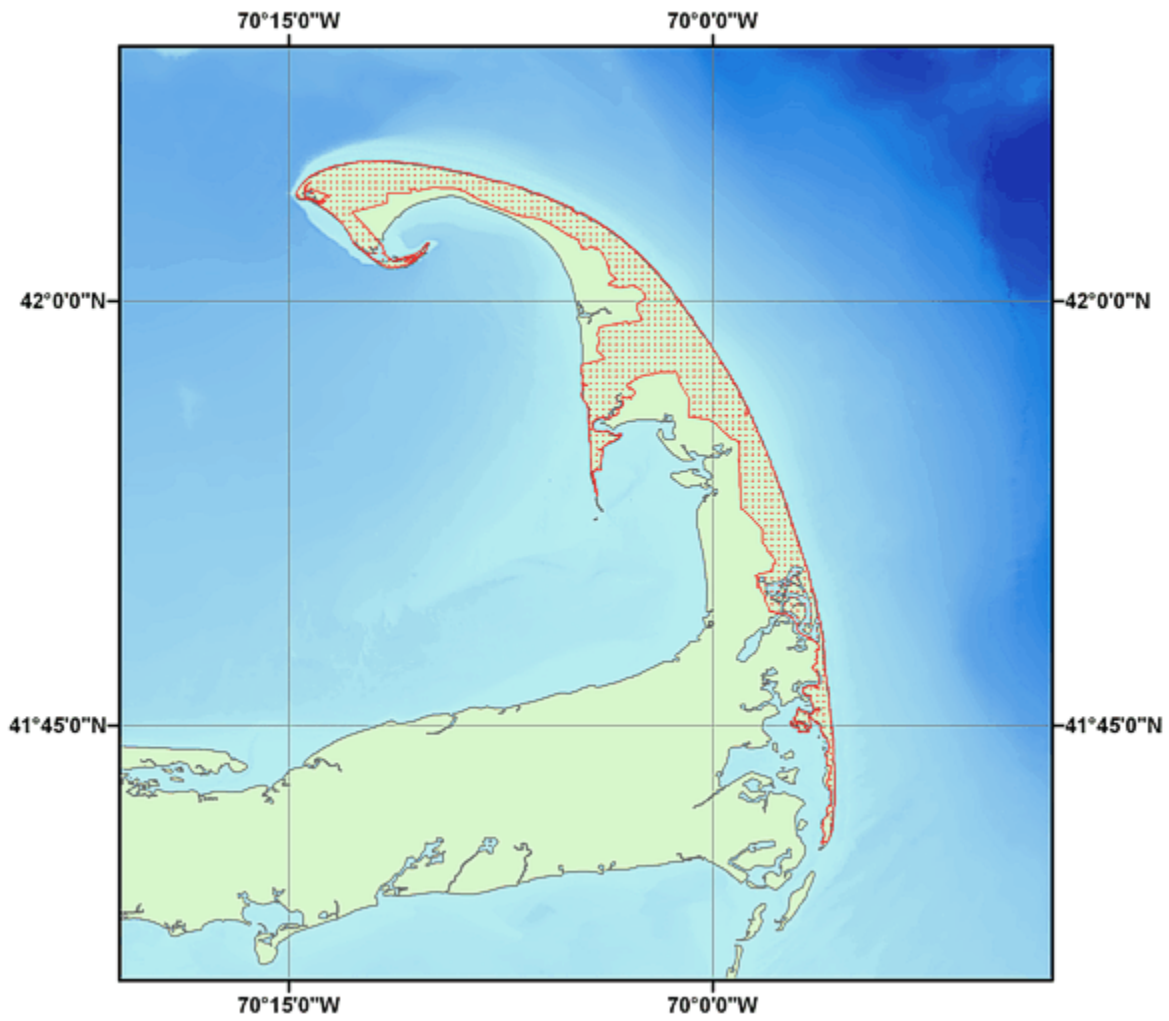
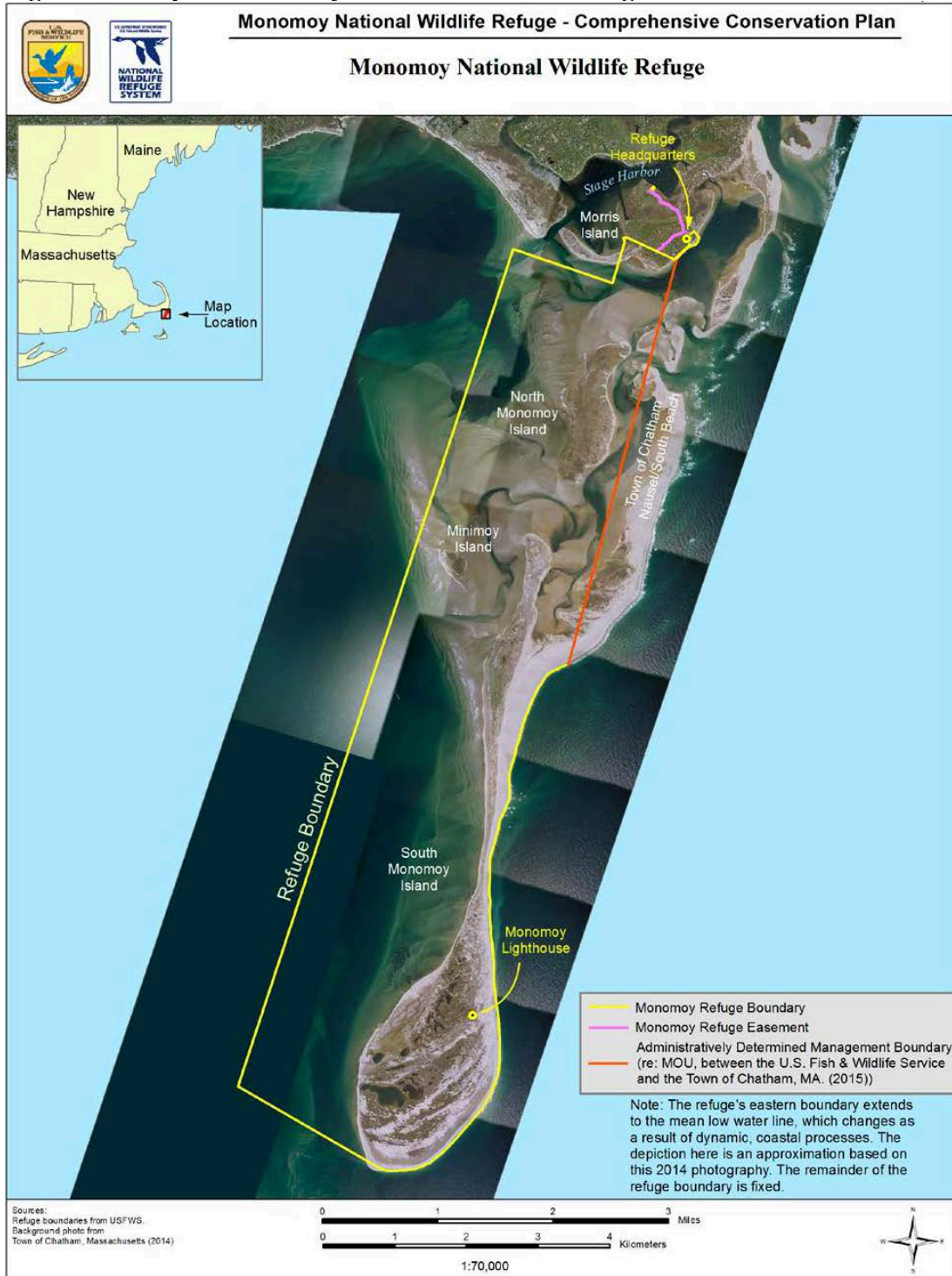


Figure 9 Map of Cape Cod National Seashore Boundary



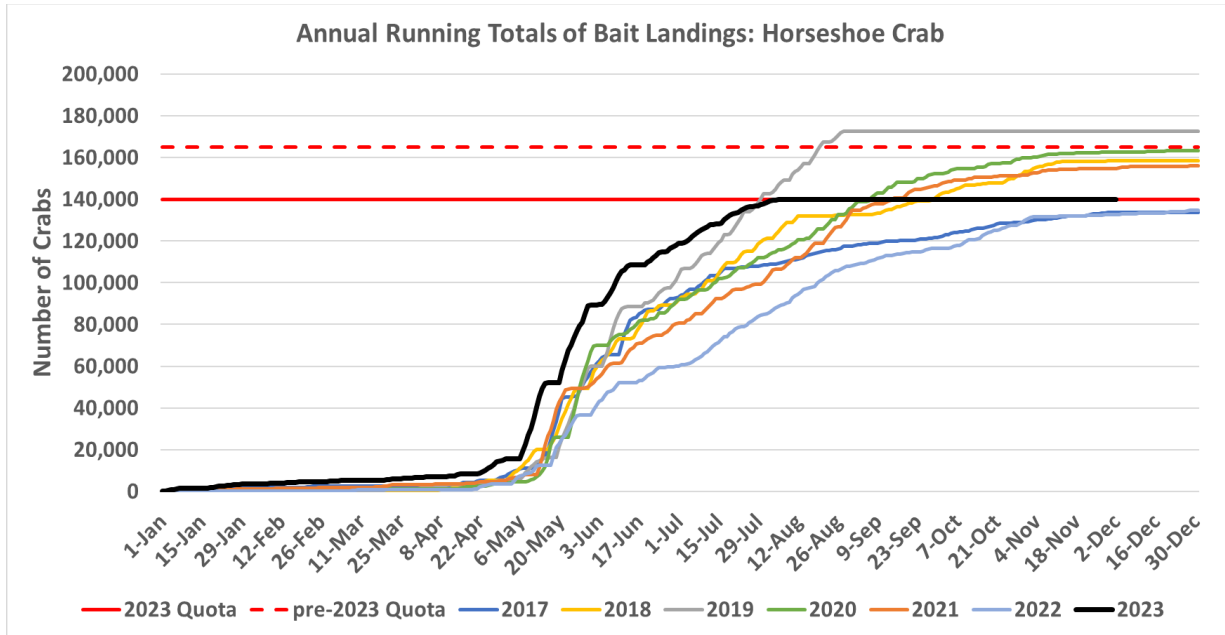
Source: USGS Publications Warehouse

Figure 10. Map of Monomoy National Wildlife Refuge



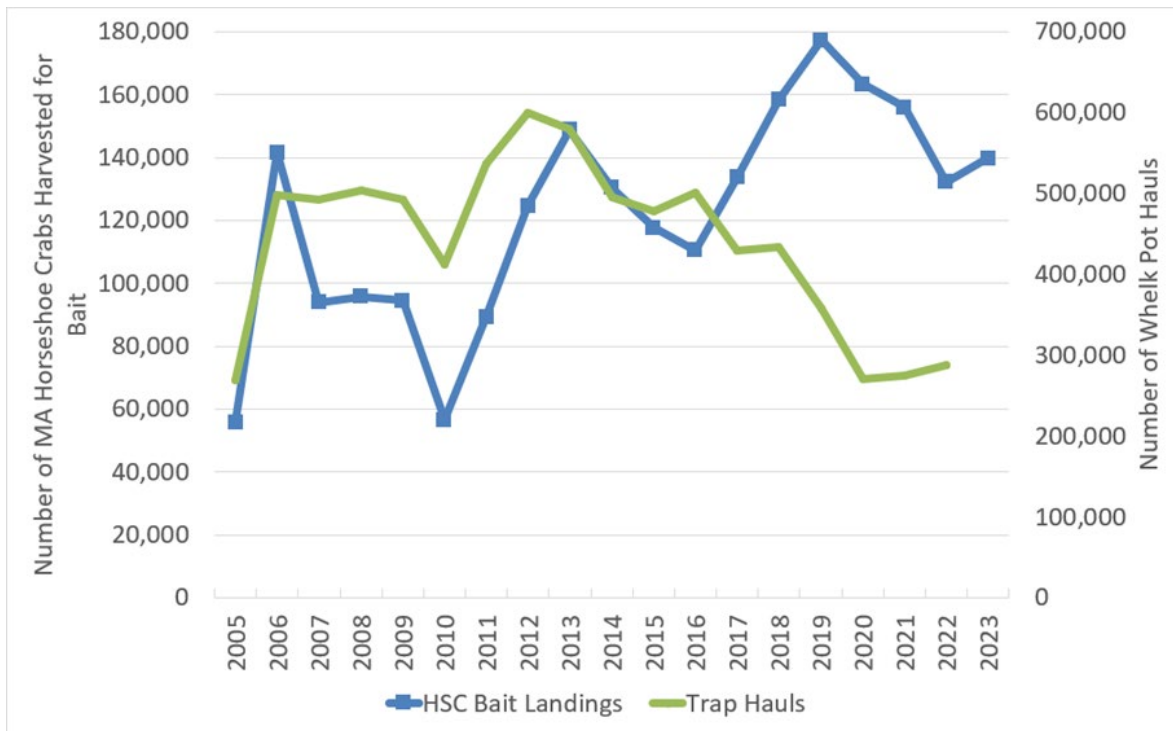
Source: Map 1.1, Monomoy Wildlife Refuge Comprehensive Conservation Plan

Figure 11. Running total of horseshoe crab bait landings (2017-2023).



Data Source: SAFIS eDR as of 12/7/2023.

Figure 12. Annual trends (2005-2023) in pot hauls in the conch pot fishery compared to landings in the horseshoe crab bait fishery.



Source: MA commercial catch reports and NMFS VTRs (whelk trap hauls) and SAFIS dealer reports (horseshoe crab landings).

Horseshoe Crab Conservation Association

*P.O. Box 2334
Orleans, MA 02653-2334*



Brenda J. Boleyn
Duxbury

January 9, 2023

Hillary Cressey, DA
Barnstable

Denise Ellis-
Hibbett
Boston

Dan McKiernan, Director
Derek Perry, Invertebrate Fisheries
Mass. Division Marine Fisheries
836 Rodney French Blvd.
New Bedford, MA 02744

Mark Faherty
Harwich

Daniel G. Gibson
III, PhD
Falmouth

Dear Dan and Derek,

Charles "Stormy"
Mayo III, PhD
Provincetown


Thank you for welcoming a petition from the Horseshoe Crab Conservation Association.
We appreciate the complexity of your task and the opportunity to participate.

Thomas J.
Novitsky, PhD
Falmouth

Sincerely,

Sarah Martinez
Barnstable

Erik J. Paus
Brewster



Brenda J. Boleyn
for the HCCA

Robert L. Prescott
Orleans

Maureen A. Ward
Barnstable

Paul J. Ward
Barnstable

The goal of the Horseshoe Crab Conservation Association is to ensure long-term sustainable populations of horseshoe crabs in the coastal estuaries and embayments of Massachusetts through increased regulatory attention and broadened public education.

Horseshoe Crab Conservation Association

P.O. Box 2334
Orleans, MA 02653-2334



Petition to MA DMF to Protect HSC Spawning

09 Jan 2023

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The Horseshoe Crab Conservation Association proposes the Massachusetts Division of Marine Fisheries (MA DMF), under their authority to regulate the harvest of the American Horseshoe Crab, *Limulus polyphemus*, modify the current rule by designating June 15 as the earliest start date of each year for both bait and biomedical harvest with exceptions granted only for approved research studies.

On 17 Feb 2016, the International Union for Conservation of Nature and Natural Resources (IUCN) listed the American Horseshoe Crab as "Vulnerable", one level from "Endangered", in their [Red List Assessment of Threatened Species](#). Their report noted, "Continuing decreases were found in... the New England... areas... Thus, *Limulus* is Vulnerable at the species level with potential for assignment to a higher risk category at the regional and sub-regional levels, particularly the... New England area... Specifically, population reductions over 40 years were projected to be... 92% in New England..." In addition, the IUCN 21 July 2022 Green List Assessment of species recovery and the impact of conservation designates *Limulus* as 'Moderately Depleted' and indicates the Population Trend as 'Decreasing'.

With the implementation of this start date, selected as a consensus date where essentially most horseshoe crab spawning in Massachusetts waters is complete, some current MA DMF rules, i.e., the 'lunar closure' and vessel quotas, could be dropped. MA DMF bait harvest quotas, as well as continued monitoring and enforcement of industry Best Management Practices, should be retained.

The proposed rule change aligns with current harvest moratoria and post-spawning start dates in New Jersey, Delaware, Maryland, and Virginia. The abundant spawning activity and successful population on the Monomoy National Wildlife Refuge, where no harvest is allowed, provides an indication of the expected results if this rule change is implemented.

DMF trawl survey data for Nantucket Sound support that commercial fisheries (bait and biomedical) will not be harmed by this change. Since horseshoe crabs harvested for bait are often frozen, collection following a June 15 start date will have no impact on bait availability.

This rule change will, over time, rebuild the diminished stock and ensure the sustainability of horseshoe crabs for all stakeholders.

Supporting Information:

Horseshoe crabs are a public asset and have economic value for biomedical stakeholders and fisheries stakeholders. Just as important, horseshoe crabs have intrinsic value as an essential part of our history, our stories, and as a distinct part of Massachusetts' natural and cultural heritage.

A more robust horseshoe crab population will support endangered birds and various marine species that depend on horseshoe crab eggs and juveniles for food.

This rule change recognizes that horseshoe crab spawning is not rigidly linked to the lunar cycle but is moderated by weather and will occur throughout the spawning season. After 12 years of lunar closures there has been no consistent sign of improved spawning data.

Bait species should be abundant and quick to reproduce. Horseshoe crabs are neither which makes spawning protection even more imperative.



October 26, 2023

Commissioner Thomas O'Shea
Department of Fish and Game
100 Cambridge Street, 6th Floor
Boston, MA 02114

Re: Biodiversity Goals and Horseshoe Crab Population Recovery

Dear Commissioner O'Shea:

We were deeply appreciative last month when Governor Healey signed [Executive Order No. 618 on Biodiversity Conservation in Massachusetts](#), which sets the stage for the Commonwealth to lead the nation in addressing the biodiversity crisis. Full implementation and the realization of the goals envisioned by E.O. 618 will be a generational challenge, and will involve all the agencies under your purview, and many outside of it as well.

Mass Audubon and our 160,000 members and supporters will be reliable allies for this work. Meanwhile, we have established a shorter-term goal for the recovery of the horseshoe crab. We now look to your leadership as we chart out immediate steps to set the population on an upward trend, and hope you will connect that goal with your broader coastal and marine ecosystem biodiversity goals.

As you know, horseshoe crabs are a valuable and widely-recognized element of our rich natural heritage, and they play a vital role in our marine ecosystems, by bringing important nutrients into the water column, and supporting many other species in severe decline, such as the federally-threatened Red Knot and the endangered Loggerhead Sea Turtle. In addition, in states with larger populations, they are the center of a multi-million-dollar ecotourism industry, and there is potential for a similar industry here in Massachusetts. And, as you know, their blood is used to make the only FDA-approved test for endotoxin contamination of certain drugs and medical devices, and as of yet, the U.S. has not approved synthetic alternatives to the lysate derived from horseshoe crab blood for these tests.

For all of these reasons, we recommend and request that you empower and order the Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP), and the Division of Marine Fisheries (DMF) to advance the population recovery of the horseshoe crab.

First steps toward that recovery should include:

- Prohibition on harvesting horseshoe crabs during the spawning season (Jan 1 through June 30)
- Phasing out of the bait harvest¹

¹ Horseshoe crabs are used as an optional bait in the channeled whelk fishery, which DMF has determined is depleted and overfished. <https://www.mass.gov/info-details/whelks-and-whelk-management>

- Improved performance standards and monitoring for the lysate bleeding industry to reduce mortality and sublethal impacts on horseshoe crabs
- Interagency coordination and increased funding for monitoring horseshoe crabs' status, relationship to other species including shorebirds, and progress toward recovery goals
- Inclusion of plans for protecting and restoring horseshoe crabs' habitats including breeding beaches in the context of climate impacts (sea level rise and coastal erosion), in addition to the importance of these habitats for other species like coastal nesting birds

Today, the population in Massachusetts is a fraction of naturally occurring levels. While precise data on historic populations is not known, it is clear that this species has declined considerably since the mid-1900s due to historical eradication programs, and more recently from coastal development, sea level rise, loss of critical beach and salt marsh habitats, and nitrogen pollution, in addition to direct harvest for the bait and biomedical fisheries.

Maintenance of the existing, artificially-low population level has been the goal of fisheries regulations in Massachusetts. This goal needs to be substantially revised and replaced with a goal for recovery of the species. Moreover, the declining size of females and low presence of juveniles in many locations, in a species that takes a decade to reach reproductive maturity, indicates that even the current population level is likely at risk. The trawl data are not reliable indicators of the overall population, as they are subject to several sampling factors that have not been considered in application of this information.

As you also know, many wildlife activists and advocacy organizations in Massachusetts are supporting a listing under the Massachusetts Endangered Species Act of the horseshoe crab by the NHESP. While we recognize that the horseshoe crab likely does not meet the regulatory criteria for listing, Mass Audubon nonetheless urges the agencies to act decisively to put the species on track toward recovery of populations levels.

We seek partnership with you, your office, and your sister agencies on the realization of what we hope are shared goals for this important and remarkable species.

Sincerely,

Michelle Manion



VP of Policy and Advocacy

Jocelyn Forbush



Chief Conservation Officer