2018 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR

HORSESHOE CRAB

(*Limulus polyphemus)*

2017 Fishing Year

Horseshoe Crab Plan Review Team:

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I. Status of the Fishery Management Plan

Date of FMP Approval:	December 1998
Amendments	None
Addenda	Addendum I (April 2000) Addendum II (May 2001) Addendum III (May 2004) Addendum IV (June 2006) Addendum V (September 2008) Addendum VI (August 2010) Addendum VII (February 2012)
Management Unit:	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
States With Declared Interest:	Massachusetts - Florida
Active Boards/Committees:	Horseshoe Crab Management Board, Advisory Panel, Technical Committee, and Plan Review Team; Delaware Bay Ecosystem Technical Committee

a) Goals and Objectives

The Interstate Fishery Management Plan for Horseshoe Crabs (FMP) established the following goals and objectives.

2.0. Goals and Objectives

The goal of this Plan is to conserve and protect the horseshoe crab resource to maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of the coastal ecosystem, while providing for continued use over time. Specifically, the goal includes management of horseshoe crab populations for continued use by:

1) *current and future generations of the fishing and non-fishing public (including the biomedical industry, scientific and educational research);*
2) *migrating shorebirds; and,*
3) *other dependent fish and wildlife, including federally listed (threatened) sea turtles.*

To achieve this goal, the following objectives must be met:

(a) prevent overfishing and establish a sustainable population;

(b) achieve compatible and equitable management measures among jurisdictions throughout the fishery management unit;

(c) establish the appropriate target mortality rates that prevent overfishing and maintain adequate spawning stocks to supply the needs of migratory shorebirds;

(d) coordinate and promote cooperative interstate research, monitoring, and law enforcement;

(e) identify and protect, to the extent practicable, critical habitats and environmental factors that limit long-term productivity of horseshoe crabs;

(f) adopt and promote standards of environmental quality necessary for the long-term maintenance and productivity of horseshoe crabs throughout their range; and,

(g) establish standards and procedures for implementing the Plan and criteria for determining compliance with Plan provisions.

b) Fishery Management Plan Summary

The framework for managing horseshoe crabs along the Atlantic coast was approved in October 1998 with the adoption of the Interstate Fishery Management Plan for Horseshoe Crabs (FMP). The goal of this plan is to conserve and protect the horseshoe crab resource to maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of coastal ecosystems, while providing for continued use over time.

In 2000, the Horseshoe Crab Management Board approved Addendum I to the FMP. Addendum I established a state-by-state cap on horseshoe crab bait landings at 25 percent below the reference period landings (RPL's), and *de minimis* criteria for those states with a limited horseshoe crab fishery. Those states with more restrictive harvest levels (Maryland and New Jersey) were encouraged to maintain those restrictions to provide further protection to the Delaware Bay horseshoe crab population, recognizing its importance to migratory shorebirds. Addendum I also recommended that the National Marine Fisheries Service (NMFS) prohibit the harvest of horseshoe crabs in federal waters (3-200 miles offshore) within a 30 nautical mile radius of the mouth of Delaware Bay, as well as prohibit the transfer of horseshoe crabs in federal waters. A horseshoe crab reserve was established on March 7, 2001 by NMFS in the area recommended by ASMFC. This area is now known as the Carl N. Shuster Jr. Horseshoe Crab Reserve.

In 2001, the Horseshoe Crab Management Board approved Addendum II to the FMP. The purpose of Addendum II was to provide for the voluntary transfer of harvest quotas between states to alleviate concerns over potential bait shortages on a biologically responsible basis. Voluntary quota transfers require Technical Committee review and Management Board approval.

In 2004, the Board approved Addendum III to the FMP. The addendum sought to further the conservation of horseshoe crab and migratory shorebird populations in and around the Delaware Bay. It reduced harvest quotas and implemented seasonal bait harvest closures in New Jersey, Delaware, and Maryland, and revised monitoring components for all jurisdictions.

Addendum IV was approved in 2006. It further limited bait harvest in New Jersey and Delaware to 100,000 crabs (male only) and required a delayed harvest in Maryland and Virginia. Addendum V, adopted in 2008, extends the provisions of Addendum IV through October 31, 2010. In early 2010, the Board initiated Draft Addendum VI to consider management options

that would follow expiration of Addendum V. The Board voted in August 2010 to extend the Addendum V provisions, via Addendum VI, through April 30, 2013. The Board also chose to include language, allowing them to replace Addendum VI with another Addendum during that time, in anticipation of implementing an adaptive resource management (ARM) framework.

The Board approved Addendum VII in February 2012. This addendum implemented an ARM framework for use during the 2013 fishing season. The framework considers the abundance levels of horseshoe crabs and shorebirds in determining the optimized bait harvest level for the Delaware Bay states of New Jersey, Delaware, Maryland, and Virginia (east of the COLREGS).

II. Status of the Stock and Assessment Advice

No definitions for overfishing or overfished status have been adopted by the Management Board. However, the majority of evidence in the most recent stock assessment, the 2013 Stock Assessment Update (available at http://www.asmfc.org/species/horseshoe-crab#stock), indicates abundance has increased in the Southeast region. In the Delaware Bay Region, increasing trends were most evident in juvenile indices, followed by indices of adult males. Over the time series of the survey, no trend in the abundance of female crabs is evident.

In contrast, continued declines in abundance were evident in the New York and New England regions. Decreased harvest quotas in Delaware Bay have potentially redirected harvest to nearby regions. Current harvest within the New England and New York Regions may not be sustainable. Continued precautionary management is therefore recommended coastwide to anticipate effects of redirecting harvest from Delaware Bay to outlying populations.

A benchmark stock assessment is in progress and scheduled for completion in 2019. New components of this assessment include data on mortality resulting from biomedical use of horseshoe crabs and a catch-survey analysis model for the Delaware Bay region, based on population estimates derived primarily from the Virginia Tech Horseshoe Crab Trawl Survey (VT Survey).

III. Status of the Fishery

Bait Fishery

For most states, the bait fishery is open year round. However, because of seasonal horseshoe crab movements (to the beaches in the spring; deeper waters and offshore in the winter), the fishery operates at different times. New Jersey has prohibited commercial harvest of horseshoe crabs in state waters since 2006. State waters of Delaware are closed to horseshoe crab harvest and landing from January 1st through June 7th each year, and other state horseshoe crab fisheries are regulated with various seasonal/area closures.

Reported coastwide bait landings in 2017 remained well below the coastwide quota (Table 1, Figure 1). Bait landings increased 26% from the previous year, due primarily to landings increases in Maryland (43% increase from 2017), Delaware (26%), Massachusetts (33%), and

Virginia (20%). North Carolina harvested 1,125 crabs over their 24,036 crab quota, and received a 1,200 crab quota transfer from Georgia, approved in March 2018. Delaware harvested 38,996 crabs above their quota over a two-week period in 2017, and will reduce their quota for 2019 to 123,140 male crabs.

Table 1. Reported commercial horseshoe crab bait landings by jurisdiction.

Jurisdiction	ASMFC Quota 2017	State Quota 2017	2017	2016	2015	2014	2013
MA	330,377	165,000	134,707	101,642	108,054	106,645	128,774
RI	26,053	8,398	3,358	20,917	6,255	13,319	18,030
CT	48,689	48,689	19,778	12,135	19,632	20,634	21,503
NY	366,272	150,000	195,717	176,632	145,324	134,370	169,739
NJ*	162,136	0	0	0	0	0	0
DE*	162,136	162,136	201,132	159,545	151,262	168,044	163,582
MD*	255,980	255,980	224,832	157,013	27,494	148,269	240,688
PRFC	0	-	0	0	0	0	0
DC	0	-	0	0	0	0	0
VA**	172,828	172,828	160,331	133,453	102,235	145,266	156,761
NC***	24,036	25,236	25,161	25,197	24,948	21,196	26,559
SC	0	0	0	0	0	0	0
GA	29,312	28,112	0	0	0	0	5,745
FL****	9,455	9,455	1,394	689	264	2,046	0
TOTAL	1,587,274	1,028,280	994,491	787,223	585,468	759,789	931,381

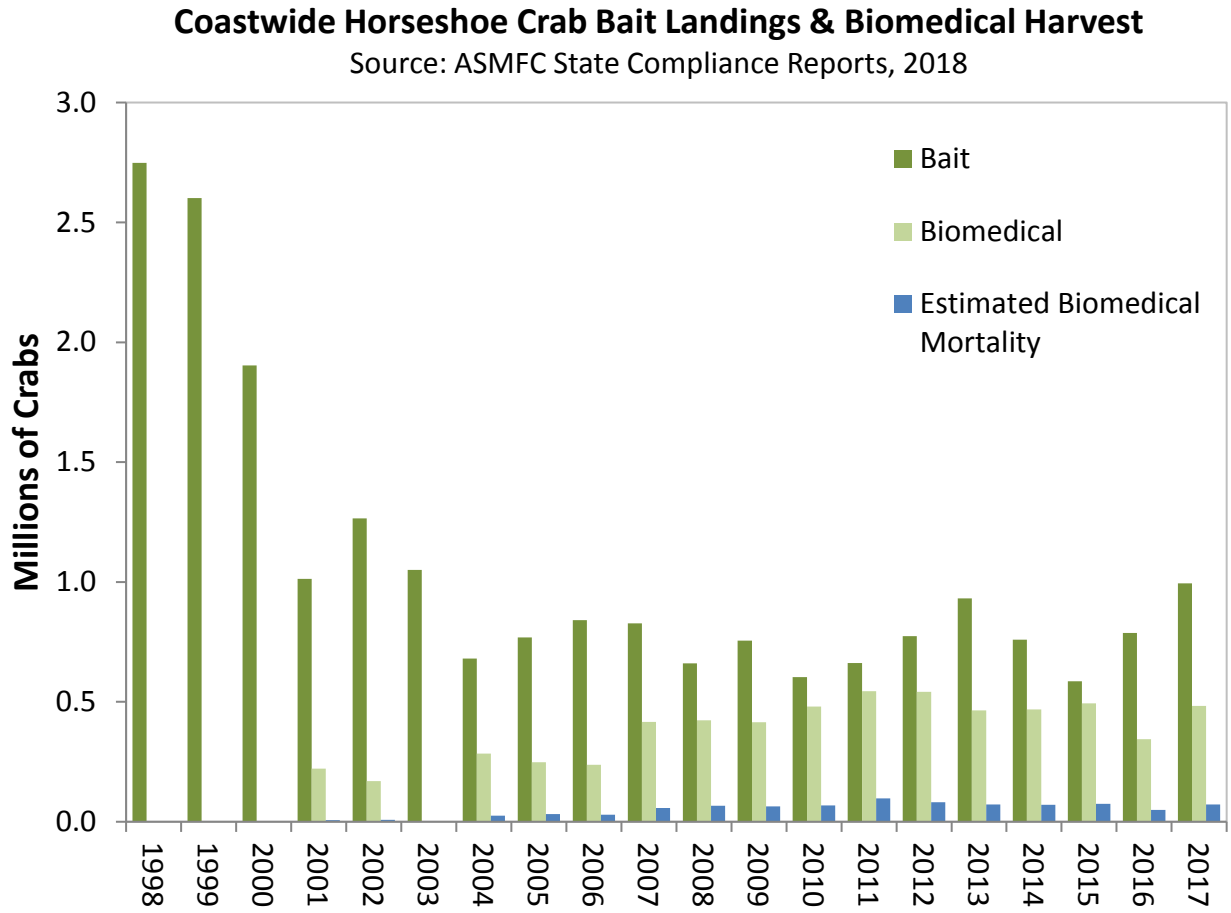
***Male-only harvest**

****Virginia harvest east of the COLREGS line is limited to 81,331 male-only crabs under the ARM harvest package #3. Virginia data shown are preliminary. Virginia harvest east of the COLREGS in 2017 was 52,657 crabs. The total above represents harvest on both sides of the COLREGS line.**

*****A quota transfer of 1,200 crabs from Georgia to North Carolina was approved in March 2018 to cover their quota overage of 1,125 horseshoe crabs in 2017.**

******Bait landings do not include 976 marine life landings in 2017.**

Figure 1: Number of horseshoe crabs harvested for bait and biomedical purposes, 1998-2017.



*** Biomedical collection numbers, which are annually reported to the Commission, include all horseshoe crabs brought to bleeding facilities except those that were harvested as bait and counted against state quotas.**

*** Most of the biomedical crabs collected are returned to the water after bleeding; a 15% mortality rate is assumed for all bled crabs that are released. This number plus observed mortality reported annually by bleeding facilities via state compliance reports is noted in the above graph as 'Estimated Biomedical Mortality.'**

Reported coastwide landings since 1998 show more male than female horseshoe crabs were harvested annually. Several states presently have sex-specific restrictions in place which limit or ban the harvest of females. The American eel pot fishery prefers egg-laden female horseshoe crabs as bait, while the whelk (conch) pot fishery is less dependent on females. States with greater than 5% of coastal landings are required to report sex for at least a portion of their bait harvest, and within these states, 7.5% of landings were unclassified.

The hand, trawl, and dredge fisheries typically account for the majority of reported commercial horseshoe crab bait landings. Other methods that account for the remainder of the harvest include gill nets, pound nets, and traps.

Biomedical Use

The horseshoe crab is an important resource for research and manufacture of materials used for human health. There are five companies along the Atlantic Coast that process horseshoe crab blood for use in manufacturing Limulus Amebocyte Lysate (LAL): Associates of Cape Cod, Massachusetts; Lonza (formerly Cambrex Bioscience), Limuli Laboratories, New Jersey; Wako Chemicals, Virginia; and Charles River Endosafe, South Carolina. Addendum III requires states where horseshoe crabs are collected for biomedical bleeding to collect and report total collection numbers, crabs rejected, crabs bled (by sex) and to characterize mortality.

The Plan Review Team annually calculates total coastwide collections and estimates mortality associated with biomedical use. In 2017, 575,760 crabs (including crabs harvested as bait) coastwide were brought to biomedical companies for bleeding (Table 2). This represents an increase from the average of the previous five years (534,477 crabs). Of this total, 95,231 crabs were reported as harvested for bait and counted against state quotas, representing a 33% increase from the average of the previous five years (Table 2: row B). These crabs were not included in the mortality estimates (Rows D, F, and G) below. In 2017, 483,245 crabs were collected solely for biomedical use. Males accounted for 55% of total biomedical collections, females comprised 34%, and 11% of collections were of unknown sex. Crabs were rejected prior to bleeding due to mortality, injuries, slow movement, and size (mortality observed while crabs were going through the biomedical process is included in Row D below). Approximately 1% of crabs collected solely for biomedical purposes were observed and reported as dead from the time of collection up to the point of bleeding. Several studies have investigated mortality rates attributable to the biomedical collection and bleeding process after release, with a wide range of estimated values. An approximate midpoint of these values, 15%, is applied to bled individuals to estimate post-bleeding mortality and added to the number of crabs reported as dead during the process to estimate total biomedical mortality. The currently assumed mortality rate is being further evaluated by the ongoing benchmark stock assessment. Total mortality of biomedical crabs for 2017 was estimated as 72,674 crabs. This represents approximately 7% of coastwide removals from both bait and biomedical uses of horseshoe crabs.

Table 2. Numbers of horseshoe crabs collected, bled, and estimated mortality for the biomedical industry.

	2013	*2014*	*2015*	*2016**	*2017*
A. Number of crabs brought to biomedical facilities (bait and biomedical crabs)	525,667	534,702	563,631	426,286	575,760
B. Number of bait crabs bled	61,297	67,143	69,731	77,946	95,231
C. Number of biomedical-only crabs collected (not counted against state bait quotas)	464,657	467,897	494,123	344,495	483,245
D. Reported observed mortality of biomedical-only crabs from collection to release	5,447	5,658	5,362	1,004	6,057
E. Number of biomedical-only crabs bled	440,402	432,340	464,506	318,523	444,115
F. Estimated post-bleeding mortality of bled biomedical-only crabs (15% est. mortality)	66,060	64,851	69,676	47,778	66,617
G. Total estimated mortality on biomedical crabs not counted against state bait quotas (15% est. mortality)	71,507	70,509	75,038	48,782	72,674

***Some biomedical collections were reduced in 2016 due to temporary changes in production.**

The 1998 FMP establishes a mortality threshold of 57,500 crabs that, if exceeded, requires the Board to consider management action. Based on an estimated total mortality of 72,674 crabs, this threshold was exceeded in 2017. The PRT notes that estimated mortality from biomedical use is approximately 7% of the total horseshoe crab mortality (bait and biomedical) coastwide for 2016, up from approximately 6% in 2015 but below the previous 5-year average of 8%. Biomedical mortality is being incorporated into the ongoing benchmark stock assessment.

IV. Status of Research and Monitoring

The Horseshoe Crab FMP set forth an ambitious research and monitoring strategy in 1999 and again in 2004 to facilitate future management decisions. Despite limited time and funding there are many accomplishments since 1999. These accomplishments were largely made possible by forming partnerships between state, federal and private organizations, and the support of hundreds of public volunteers.

Addendum III Monitoring Program

Addendum III requires affected states to carry out three monitoring components:

All states who do not qualify for *de minimis* status report monthly harvest numbers and subsample a portion of the catch for sex and harvest method. In addition, those states with annual landings above 5% of the coastwide harvest report all landings by sex and harvest method. Although states with annual landings less than 5% of annual coastwide harvest are not required to report landings by sex, the PRT recommends all states require gender reporting for horseshoe crab harvest.

States with biomedical collections are required to monitor and report collection numbers and mortality associated with the transportation and bleeding of the crabs.

States must identify spawning and nursery habitat along their coasts. All states have completed this requirement, and a few continue active monitoring programs**.**

Virginia Tech Research Projects

The Virginia Tech Horseshoe Crab Trawl Survey (VT Survey) was not conducted in 2013 - 2015, due to a lack of funding, but was conducted in 2016 and 2017, and is in progress for 2018. The 2017 survey results indicate increases in mature females (to the highest level since the survey began) but decreases to immature, newly mature, mature male, and overall population levels from 2016. No long-term trends in abundance of immature, newly mature, or mature female crabs are evident, but mature male crabs have shown an increasing trend across the time series (2002-2017). The Adaptive Resource Management (ARM) Working Group will use the indices from this survey to estimate horseshoe crab abundance for the ARM model, which specifies harvest limits for the upcoming year. The VT Survey for 2018 is currently in progress and is funded for 2019. Funding sources beyond 2019 continue to be explored.

Spawning Surveys

The redesigned Delaware Bay spawning survey was completed for the 19th year in 2017. No trend was detected in the baywide indices of spawning activity (both male and female) for the time series. No trends were detected in male spawning activity for Delaware or New Jersey. A significant decrease in female spawning activity was detected for Delaware, but no trend was detected for female activity in New Jersey. Female spawning activity in 2017 peaked between June 7 and June 11, later than the timeframe of previous years. The annual baywide sex ratio was 5.2:1 (Male: Female) equaling the highest ratio in the time series. The range of annual observed sex ratios on the Delaware Bay spawning beaches over the time series has ranged as low as 3.1:1.

Tagging Studies

The USFWS continues to maintain a toll-free telephone number as well as a website for reporting horseshoe crab tag returns and assists interested parties in obtaining tags. Tagging work continues to be conducted by biomedical companies, research organizations, and other parties involved in outreach and spawning surveys. Beginning with the 2013 tagging season, additional efforts were implemented to ensure that current tagging programs are providing data that benefits the management of the coast-wide horseshoe crab population. All existing and new tagging programs are required to submit an annual application to be considered for the tagging program and all participants must submit an annual report along with their tagging and resight data to indicate how their tagging program addresses at least one of the following objectives: determine horseshoe crab sub-population structure, estimate horseshoe crab movement and migration rates, and/or estimate survival and mortality of horseshoe crabs. The PRT recommends all tagging programs approved by the states coordinate with the USFWS tagging program, in order to ensure a consistent coastwide program for providing management input.

Since 1999, over 300,000 crabs have been tagged and released through the USFWS tagging program along the Atlantic coast. Crabs have been tagged and released from every state on the Atlantic Coast from Florida to New Hampshire. In the early years of the program, tagging was centered around Delaware Bay; however, in recent years, tagging has expanded and increased in the Long Island Sound and Southeast. The Technical Committee noted that recapture rates inside and outside Delaware Bay are likely not directly comparable due to increased re-sighting effort and spawning concentration in Delaware Bay compared to other areas along the coast. There may be data in the USFWS tagging database to determine differences in effort and recapture rates. This tagging information is being incorporated into the ongoing benchmark stock assessment.

V. Status of Management Measures and Issues

ASMFC

Initial state-by-state harvest quotas were established through Addendum I. Addendum III outlined the monitoring requirements and recommendations for the states. Addendum IV set harvest closures and quotas, and other restrictions for New Jersey, Delaware, Maryland, and Virginia, which were continued in Addendums V and VI.

The Board approved Addendum VII, implementation of the ARM Framework, in February 2012 for implementation in 2013. Addendum VII includes an allocation mechanism to divide the Delaware Bay optimized harvest output from the ARM Framework among the four Delaware Bay states (New Jersey, Delaware, Maryland, and Virginia east of the COLREGS). Season closures and restrictions, present within Addendum VI, remain in effect as part of Addendum VII.

Included in this report are state-by-state charts outlining compliance and monitoring measures. The PRT recommends all jurisdictions were in compliance with the FMP and subsequent Addenda in 2017.

MASSACHUSETTS		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	330,377 (165,000)	330,377 (165,000)
- Other Restrictions	Bait: 300 crab daily limit year round; limited entry; Biomedical: 1,000 crab daily limit; Conch pot and eel fishermen: no possession limit All: May and June 5-day lunar closures; No mobile gear harvest Fri-Sat during summer flounder season; 7" PW minimum size; Pleasant Bay Closed Area	Bait: 300 crab daily limit year round; Biomedical: 1,000 crab daily limit; Conch pot and eel fishermen: no possession limit All: May and June 5-day lunar closures; No mobile gear harvest Fri-Sat during summer flounder season; 7" PW minimum size; Pleasant Bay Closed Area
- Landings	134,707	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes, plus weekly dealer reporting through SAFIS	Yes, plus weekly dealer reporting through SAFIS
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes	Yes
Monitoring Component B_4 Tagging program	Yes – w/NPS and USFWS; Pleasant Bay, Monomy NWR, Waquoit Bay	Yes – w/NPS and USFWS; Pleasant Bay, Monomy NWR, Waquoit Bay

RHODE ISLAND		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de minimis*	Does not qualify for *de minimis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	26,053 (8,398)	26,053 (8,398)
- Other Restrictions	State Restrictions: - Bait Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May, June, and July - Biomedical Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May, June, and July	State Restrictions: - Daily possession limit: 60 crabs per permit - Bait Fishery Closure: May 1-May 31 - Biomedical Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May
- Landings	3,358	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes, weekly call in and monthly on paper	Yes, weekly call in and monthly on paper
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes, details within Massachusetts' reports	Captured in Massachusetts' reports
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes, since 2000 (methods unspecified)	Yes
Monitoring Component B_4 Tagging program	RI DEM 2001-2004 only, No current state program	No

CONNECTICUT		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota	48,689	48,689
- Other Restrictions	Limited entry program, possession limits, and seasonal and area closures	Limited entry program, possession limits, and seasonal and area closures
- Landings	19,778	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No – exempt under Addendum III because landings are < 5% of coastwide total	No – exempt under Addendum III because landings are < 5% of coastwide total
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes, since 1999 (methods differ from DE Bay survey)	Yes
Monitoring Component B_4 Tagging program	Yes, in collaboration with local universities (Sacred Heart University since 2015)	Yes

NEW YORK		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	366,272 (150,000)	366,272 (150,000)
- Other Restrictions	Ability to close areas to harvest; seasonal quotas and daily harvest limits	Ability to close areas to harvest; seasonal quotas and daily harvest limits
- Landings	195,717	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes – adapted from DE Bay survey	Yes
Monitoring Component B_4 Tagging program	Yes, since 2007	Yes

NEW JERSEY		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Qualified for *de miminis*	Qualifies but not requesting *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary state quota)	162,136 [male only] (0)	162,136 [male only] (0)
- Other Restrictions	Bait harvest moratorium	Bait harvest moratorium
- Landings	0	--
Monitoring Component A_1		
- Mandatory monthly reporting	N/A	N/A
- Characterize commercial bait fishery	N/A	N/A
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes –NJ Ocean Trawl Survey, DE Bay Trawl Survey, and Surf Clam Survey (see note below).	Yes, though funding for Surf Clam Survey uncertain past 2018
Monitoring Component B_3 Implement spawning survey	Yes – since 1999	Yes
Monitoring Component B_4 Tagging program	Outside, independent groups currently	No
Monitoring Component B_5 Egg abundance survey	Yes, but removed as a mandatory component	Yes
Monitoring Component B_6 Shorebird monitoring program	Yes	Yes

Note: the Surf Clam Dredge survey lost its funding source in 2012. The state has since continued the survey with available funds, but full implementation is not consistent across years. There appears to be sufficient funding in 2018 for a full survey, but there is no guarantee this funding will remain.

DELAWARE		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota	162,136 [male only]	123,140 [male only]
- Other Restrictions	Closed season (January 1 – June 7); Open season closed on June 22	Closed season (January 1 – June 7)
- Landings	201,132 males	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes (daily call-in reports & monthly logbooks)	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Yes –updates once every 5 years or as needed	Yes – updates once every 5 years or as needed
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes	Yes
Monitoring Component B_4 Tagging program	No state program but has assisted in the past with various Delaware Bay horseshoe crab tagging initiatives	No
Monitoring Component B_5 Egg abundance survey	Removed as component	Removed as component
Monitoring Component B_6 Shorebird monitoring program	Yes	Yes

Note: The egg abundance survey has been discontinued as a mandatory monitoring element. Delaware will include information on the survey if it continues, but is no longer required to perform the survey.

MARYLAND		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota	255,980 (male only)	255,980 (male only)
- Other Restrictions	Delayed harvest and closed season/area combinations	Delayed harvest and closed season/area combinations; shore harvest prohibited
- Landings	224,832	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes (weekly reports for permit holders; monthly for non-permit holders)	Yes (weekly reports for permit holders; monthly for non-permit holders)
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes	Yes
Monitoring Component B_4 Tagging program	Yes – through biomedical harvest	Yes – through biomedical harvest

POTOMAC RIVER FISHERIES COMMISSION		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	*De minimis* status granted for 2017.	*De minimis* requested and meets criteria.
- Ability to close fishery if *de minimis* threshold is reached	No horseshoe crab fishery	No horseshoe crab fishery
- Daily possession limit <25 for *de minimis* state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	0
Monitoring Component A_1		
- Mandatory monthly reporting	Yes - weekly	Yes - weekly
- Characterize commercial bait fishery	Not Applicable	Not Applicable
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Not Applicable	Not Applicable
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Not Applicable	Not Applicable
Monitoring Component B_3 Implement spawning survey	Not Applicable	Not Applicable
Monitoring Component B_4 Tagging program	Not Applicable	Not Applicable

VIRGINIA		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de miminis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota (State-reduced quota for overage)	172,828 (81,331 male-only east of COLREGS line)	172,828 (81,331 male-only east of COLREGS line)
- Other Restrictions	Closed season (January 1 – June 7) for federal waters. Effective January 1, 2013 harvest of horseshoe crabs, from east of the COLREGS line, is limited to trawl gear and dredge gear only.	Closed season (January 1 – June 7) for federal waters. Effective January 1, 2013 harvest of horseshoe crabs, from east of the COLREGS line, is limited to trawl gear and dredge gear only.
- Landings	160,331 (52,657)	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes – new permit system; limited entry to fishery and individual quotas established	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A_3 Identify spawning and nursery habitat	Yes – completed	No
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	No	No
Monitoring Component B_3 Implement spawning survey	No	No
Monitoring Component B_4 Tagging program	No	No

NORTH CAROLINA		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	Did not qualify for *de miminis*	Does not qualify for *de minimis*
Bait Harvest Restrictions and Landings		
- ASMFC Quota	24,036	24,036
- Adjusted Quota	25,236*	--
- Other Restrictions	Trip limit of 50 crabs; Proclamation authority to adjust trip limits, seasons, etc.	Trip limit of 50 crabs; Proclamation authority to adjust trip limits, seasons, etc.
- Landings	25,161	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes – trip level reporting each month	Yes – trip level reporting each month
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Little information available Survey discontinued after 2002 and 2003 due to low levels of crabs recorded	Not specified
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	No	No
Monitoring Component B_4 Tagging program	No	No

*Note: there was quota transfer of 1,200 crabs from Georgia to North Carolina to cover their quota overage of 1,125 horseshoe crabs in 2017.

SOUTH CAROLINA		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	*De minimis* status granted in 2017.	*De minimis* requested for 2019 and meets criteria.
- Ability to close fishery if *de minimis* threshold is reached	No horseshoe crab bait fishery	No horseshoe crab bait fishery
- Daily possession limit <25 for *de minimis* state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes (Biomedical)	Yes (Biomedical)
- Characterize commercial bait fishery	Not Applicable	Not Applicable
Monitoring Component A_2		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A_3 Identify spawning and nursery habitat	Completed	No
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	Yes	Yes
Monitoring Component B_4 Tagging program	Yes	Yes

GEORGIA		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	*De minimis* status granted in 2017.	*De minimis* requested for 2019 and meets criteria.
- Ability to close fishery if *de minimis* threshold is reached	Yes	Yes
- Daily possession limit <25 for *de minimis* state	25/person; 75/vessel with 3 licensees	25/person; 75/vessel with 3 licensees
- HSC landing permit	Must have commercial shrimp, crab, or whelk license; LOA permit required	Must have commercial shrimp, crab, or whelk license; LOA permit required
Bait Harvest Restrictions and Landings		
- ASMFC Quota	29,312	29,312
(State Quota)	28,112*	29,312
- Other Restrictions	None	None
- Landings	0	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No bait landings	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Completed	Not Applicable
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B_3 Implement spawning survey	No	No
Monitoring Component B_4 Tagging program	No	No

*Note there was quota transfer of 1,200 crabs from Georgia to North Carolina to cover their quota overage of 1,161 horseshoe crabs in 2016.

FLORIDA		
	2018 Compliance Report	**2019 Management Proposal**
***De minimis* status**	*De minimis* status granted in 2017.	*De minimis* requested for 2019 and meets criteria.
- Ability to close fishery if *de minimis* threshold is reached	Yes	Yes
- Daily possession limit <25 for *de minimis* state	25/person w/ valid saltwater products license; 100/person with marine life endorsement	25/person w/ valid saltwater products license; 100/person with marine life endorsement
- HSC landing permit	See above	See above
Bait Harvest Restrictions and Landings		
- ASMFC Quota	9,455	9,455
- Other Restrictions	None	None
- Landings	1,394	--
Monitoring Component A_1		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No	Yes
Monitoring Component A_2		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A_3 Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B_1 Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2017	Yes, VT Trawl Survey will be conducted in 2018 & 2019; future years and spatial scope unknown at this time
Monitoring Component B_2 Continue existing benthic sampling programs	No	No
Monitoring Component B_3 Implement spawning survey	No	Yes
Monitoring Component B_4 Tagging program	No	Yes

Note: Florida reported an additional 976 crabs harvested along the east coast for 'marine life' use in 2017.

Alternative Baits

Delaware, Connecticut, Rhode Island and Massachusetts attempted to participate in field trials with Ecobait, available from LaMonica Fine Foods in New Jersey. Massachusetts and Delaware were unable to conduct the trials due to difficulties in securing the Ecobait samples from LaMonica; Connecticut and Rhode Island were able to conduct trials in fall 2014. The results of the study were presented to the Horseshoe Crab Technical Committee and Delaware Bay Ecosystem Technical Committee in October 2015. The results demonstrated that the Ecobait produced by LaMonica Fine Foods performed comparable to conventional bait used by conch fishermen in Rhode Island and Connecticut. The results were presented to Board at the 2016 ASMFC Winter Meeting. Subsequently, the Board requested that a survey of current bait usage in the eel and whelk fisheries be conducted. This survey is available at: http://www.asmfc.org/uploads/file/5a04b785HSC_BaitSurveyTCReport_Oct2017.pdf.

Shorebird

The USFWS received petitions in 2004 and 2005 to emergency list the red knot under the Endangered Species Act. In fall 2005, it determined that emergency listing was not warranted at the time. As part of a court settlement, the USFWS agreed to initiate proposed listings of over 200 species, including the red knot. In fall 2013, the USFWS released a proposal for listing the red knot as threatened. In January 2015 the USFWS determined that red knot be designated as threatened under the Endangered Species Act.

The red knot remains listed as an endangered species in the state of New Jersey (since 2012).

VI. Research Needs/PRT Recommendations

De Minimis

States may apply for *de minimis* status if, for the last two years, their combined average horseshoe crab bait landings (by numbers) constitute less than one percent of coastwide horseshoe crab bait landings for the same two-year period. States may petition the Board at any time for *de minimis* status, if their fishery falls below the threshold level. Once *de minimis* status is granted, designated States must submit annual reports to the Board justifying the continuance of *de minimis* status.

States that qualify for *de minimis* status are not required to implement any horseshoe crab harvest restriction measures, but are required to implement components A, B, E and F of the monitoring program (Section 3.5 of the FMP; further modified by Addendum III). Since *de minimis* states are exempt from a harvest cap, there is potential for horseshoe crab landings to shift to *de minimis* states and become substantial, before adequate action can be taken. To control shifts in horseshoe crab landings, *de minimis* states are encouraged to implement one of the following management measures:

1. Close their respective horseshoe crab bait fishery when landings exceed the *de minimis* threshold;

2. Establish a state horseshoe crab landing permit, making it only available to individuals with a history of landing horseshoe crabs in that state; or

3. Establish a maximum daily harvest limit of up to 25 horseshoe crabs per person per day. States which implement this measure can be relieved of mandatory monthly reporting, but must report all horseshoe crabs harvests on an annual basis.

The following states have been removed from the Management Board in recent years: Pennsylvania (2007), Maine (2011), and New Hampshire (2014). The Potomac River Fisheries Commission, South Carolina, Georgia, and Florida are requesting *de minimis* status for the 2018 fishing season based on the 2016-17 season landings and meet the FMP requirements for being granted this status (Table 1). The PRT recommends granting these jurisdictions *de minimis* status with the provision that marine life landings from Florida be considered in determining future *de minimis* status. Regarding the transfer requests from Georgia to North Carolina, the PRT finds that the quota transfer does not pose concerns for the regional horseshoe crab population or migratory shorebirds at this time, due to the size of the transfer.

Funding for Research and Monitoring Activities

The PRT strongly recommends the funding and continuation of the VT benthic trawl survey. This effort provides a statistically reliable estimate of horseshoe crab relative abundance that is essential to continued ARM implementation and use of more advanced stock assessment models, such as catch-survey analysis, than the data-poor trend analyses of previous assessments.

Limuli Laboratories
5 Bay Avenue
Cape May Court House, NJ 08210

Atlantic States Marine Fisheries Commission
Robert Beal, Executive Director, ASMFC Staff and Horseshoe Crab Management Board
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201 July 16, 2018

Dear Executive Director Beal, ASMFC Staff and Horseshoe Crab Board Members,

Last year, biomedical use of horseshoe crabs was discussed at great length by the Atlantic States Marine Fisheries Commission (ASMFC). The ASMFC staff pushed to eliminate biomedical confidentiality and to incorporate our estimated mortality into the Adaptive Resource Management (ARM) model. Although, the biomedical companies voiced their concerns regarding both issues, the ASMFC continued to press forward. After much discussion, the Board decided to revisit these issues after completion of the 2018 Horseshoe Crab Stock Assessment. Recently, I read two articles in local newspapers (Atlantic City Press May 12, 2018 and Cape May Star and Wave June 6, 2018) that provided the answers as to why the ASMFC pushed these policies so hard; it wasn't due to the science, the facts or a legitimate concern for horseshoe crabs.

A Deal was made between the ASMFC and the "Red Knot" Group. The one article contained a quote from Larry Niles, "We made an agreement with the fisheries and state agencies to control the harvest down to 500,000 male crabs every year." With this policy, the "Red Knot" group would have limited my collection of horseshoe crabs to males only. This would have affected the quality and quantity of the lysate that is produced at my New Jersey facility and drive my company out of business.

Confidentiality. The other article is a prime example of why biomedical confidentiality is so important. Larry Niles singles out a "New Jersey lab" and cites the number of horseshoe crabs that are taken. The article encourages the readers to rally against the one company and to support limitations on their collection. His message is that biomedical collection in the Delaware Bay is adversely affecting the Red Knots. However, the fact is that even if all the biomedical collection occurred in Delaware Bay, which is not the case, only 1.5% of the Delaware Bay horseshoe crabs (estimated to be 34 million) would be blood donors. And of the 1.5 %, a much smaller percentage may die.

Forcing the Use of Synthetic Lysate. The latest scheme involves shaming pharmaceutical companies into using an inferior product that is not sanctioned by the United States Food and Drug Administration (FDA). Synthetic lysate is not equivalent to LAL nor is its use a proven replacement for LAL. And although synthetic lysate is discussed, the development of a technique that reduces the amount of LAL needed for a test by 1/20th is not mentioned nor is credit given to the biomedical industry for its development.

Last year's meetings were a prelude to this scheming. Without biomedical's continued insistence, the ASMFC would have followed this path and I would have been put out of business. The ASMFC should manage the fishery relying on the valuable data that they acquire and as part of their mission, they should distribute material that educates fisheries stakeholders and the general public, and most of all, use its standing to promote sustainable fishing practices for all.

Sincerely,
Benjie Swan