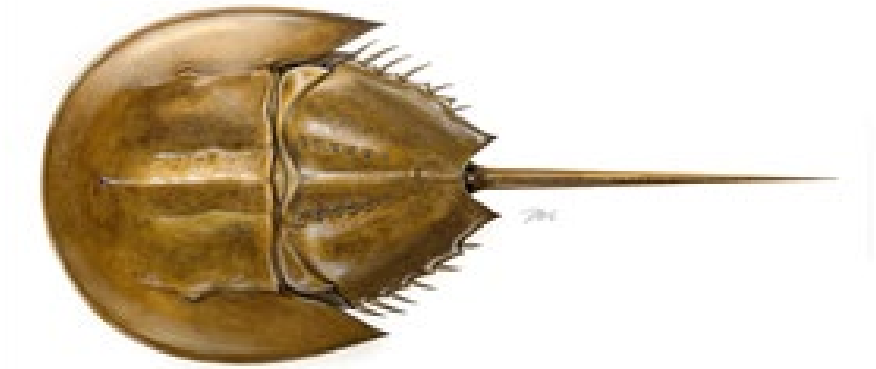
2021 Harvest Specifications for the Delaware Bay



Adaptive Resource Management (ARM)

Manage harvest of horseshoe crabs in the Delaware Bay to maximize harvest but also to maintain ecosystem integrity and provide adequate stopover habitat for migrating shorebirds

- Red knot and HSC population thresholds
- Red knot and HSC abundance estimates
- 5 harvest packages
- Harvest recommendations

Harvest Packages

- 5 harvest policies range from full moratorium to a max harvest of 420,000 males and 210,000 females, including two male only harvest options

Harvest package	Male harvest (1,000)	Female harvest (1,000)
1	0	0
2	250	0
3	500	0
4	280	140
5	420	210

Thresholds in ARM

Population thresholds

Female HSC:

80% carrying capacity

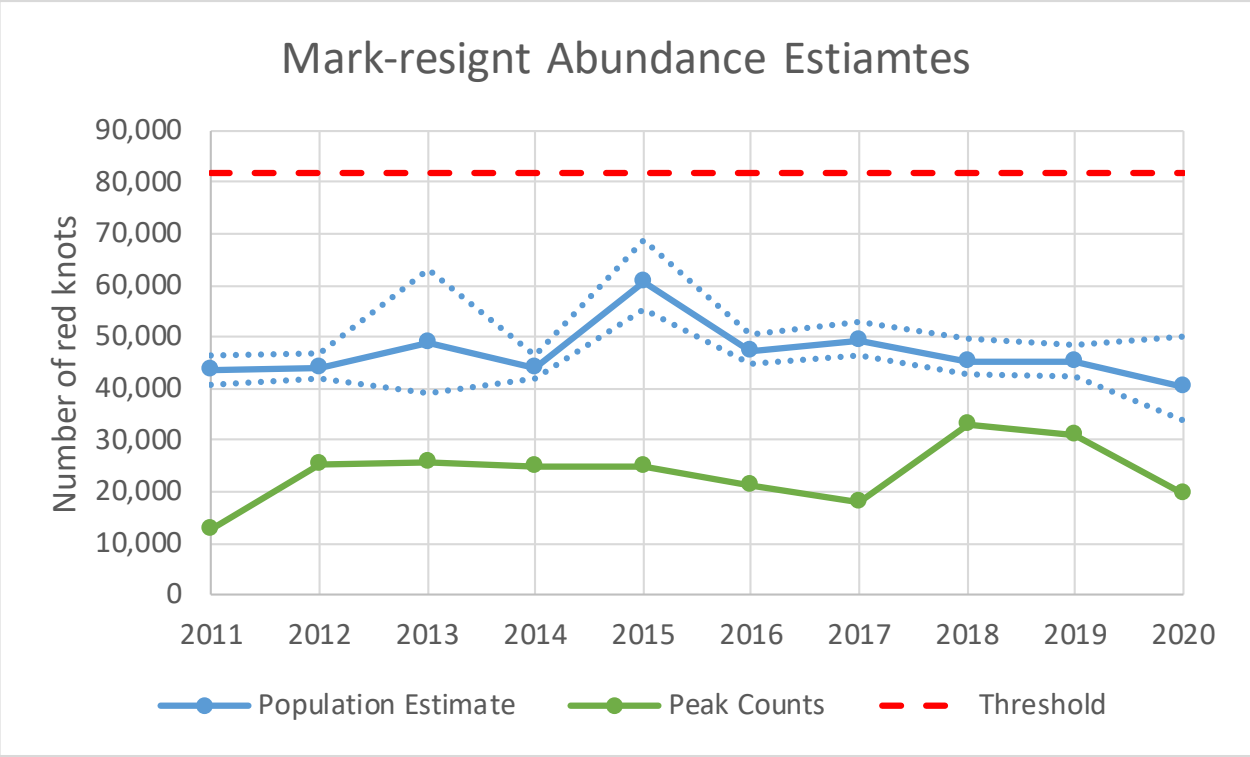
(or 11.2 million F crabs)

Red knot:

81,900 birds

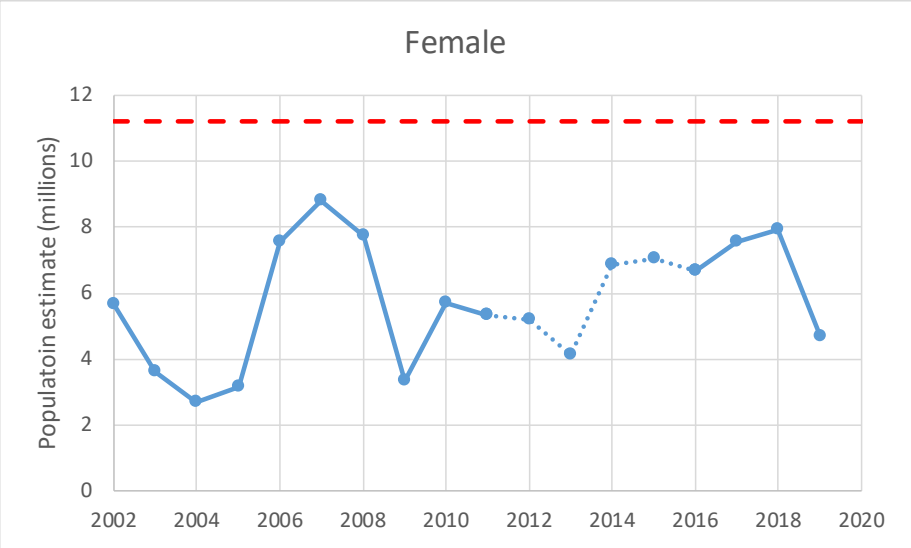
- There is value in female HSC harvest if these thresholds are met.

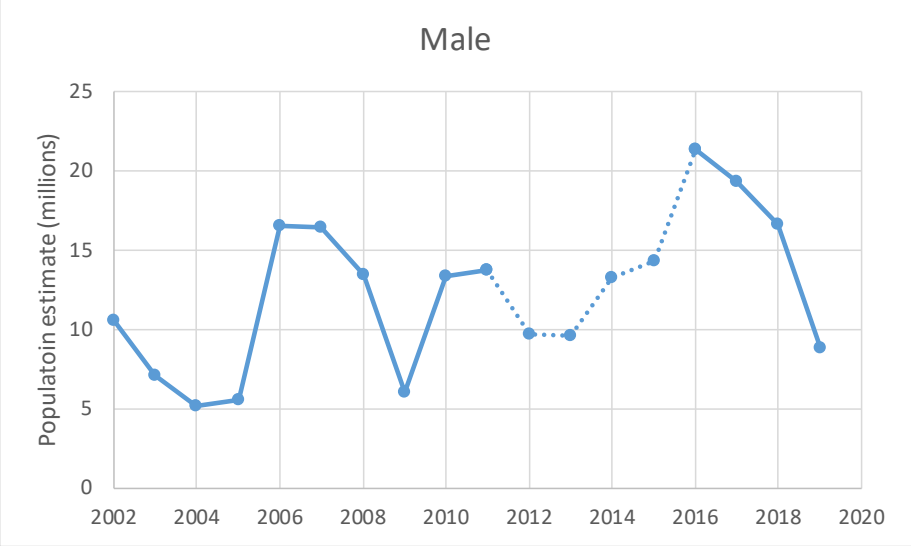
Red Knot Abundance



- 2020 estimates are slightly lower than 2016-2019 (greater uncertainty)
- 2019 estimated stopover duration was 10.7 days, less than 2019 estimate of 12.1 days
- 2019 estimate of 40,444 is below threshold of 81,900 birds

Horseshoe Crab Abundance





- **Composite index values for 2013 - 2015**

- HSC abundance estimates are based on VT trawl survey
- VT trawl survey not funded every year, so **composite index** was developed
  - Uses DE 30' trawl, NJ DB trawl, and NJ ocean trawl surveys
- 2019 estimate of 4.7 million females is under the 11.2 threshold
- 2019 had 4.7 million females, 8.9 million males

2020 Harvest Recommendation

HSC and red knot abundance estimates:

Horseshoe crab abundance (millions)			Red knot abundance (1,000)	
Year	Male	Female	Year	Male and female
2019 (Fall)	8.9	4.7	2020 (Spring)	40.44

Harvest package recommendation:

Recommended harvest package	Male harvest (1,000)	Female harvest (1,000)
3	500	0

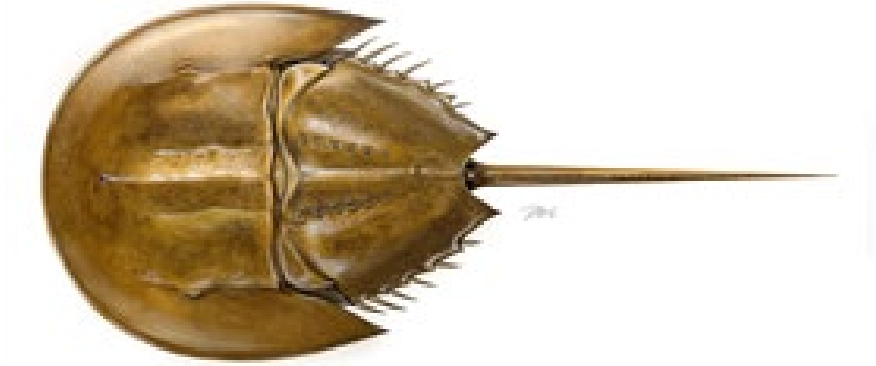
- Both red knots and female HSC are below threshold, therefore no female harvest is recommended

2020 Harvest Recommendation

	Delaware Bay Origin HSC Quota		Total Quota	
State	**Male**	**Female**	**Male**	**Female**
Delaware	162,136	0	162,136	0
New Jersey	162,136	0	162,136	0
Maryland	141,112	0	255,980	0
Virginia	34,615	0	81,331	0

Questions?

Horseshoe Crab/Red Knot Adaptive Resource Management (ARM) Updates and Revisions



Adaptive Resource Management (ARM)

October 2019 Mgt. Board meeting – approved moving forward with a revision of the ARM models

- 2019 Stock Assessment was approved – Catch Multiple Survey Analysis for HSC abundance
- More than 2X the amount of Red Knot Data available since ARM was initiated
- We know more now!

ARM Revision

- Incorporate stock assessment model (CMSA) into the ARM framework and account for sources of mortality (bait, dead discards, biomedical, natural mortality)
- Reevaluate definition of Delaware Bay crabs
- Update red knot model
- Move model into new software platform
- Sensitivity runs to compare platforms and model configurations

Adaptive Resource Management (ARM)

Progress to date:

- Collaboration with Bryan Nuse (UGA post doc) and Paul Fackler (NC State) to convert optimization model from ASDP to MDPSolve

- April 2020: Data workshop

- July 2020: 1st Assessment workshop
  - Replacement of HSC stage-structured model with CMSA based model
  - Refined dead discard estimation methods
  - Refined natural mortality estimates

- Biweekly meetings of modeling sub-workgroup

Adaptive Resource Management (ARM)

Future activities:

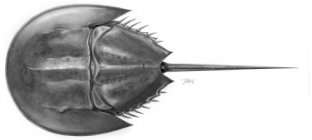
- Reanalysis of red knot tagging data is ongoing
- January/February 2021: 2nd Assessment Workshop
- April 2021: Preliminary Report Completed
- May 2021: DE Bay Ecosystem TC and HSC TC Review
- July 2021: Peer-Review Workshop
- August or October 2021: Presentation to Mgt. Board

Questions?

Horseshoe Crab FMP Review for the 2019 Fishing Year

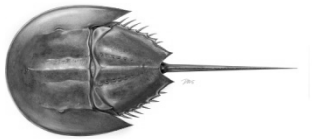
Horseshoe Crab Management Board

October, 2020



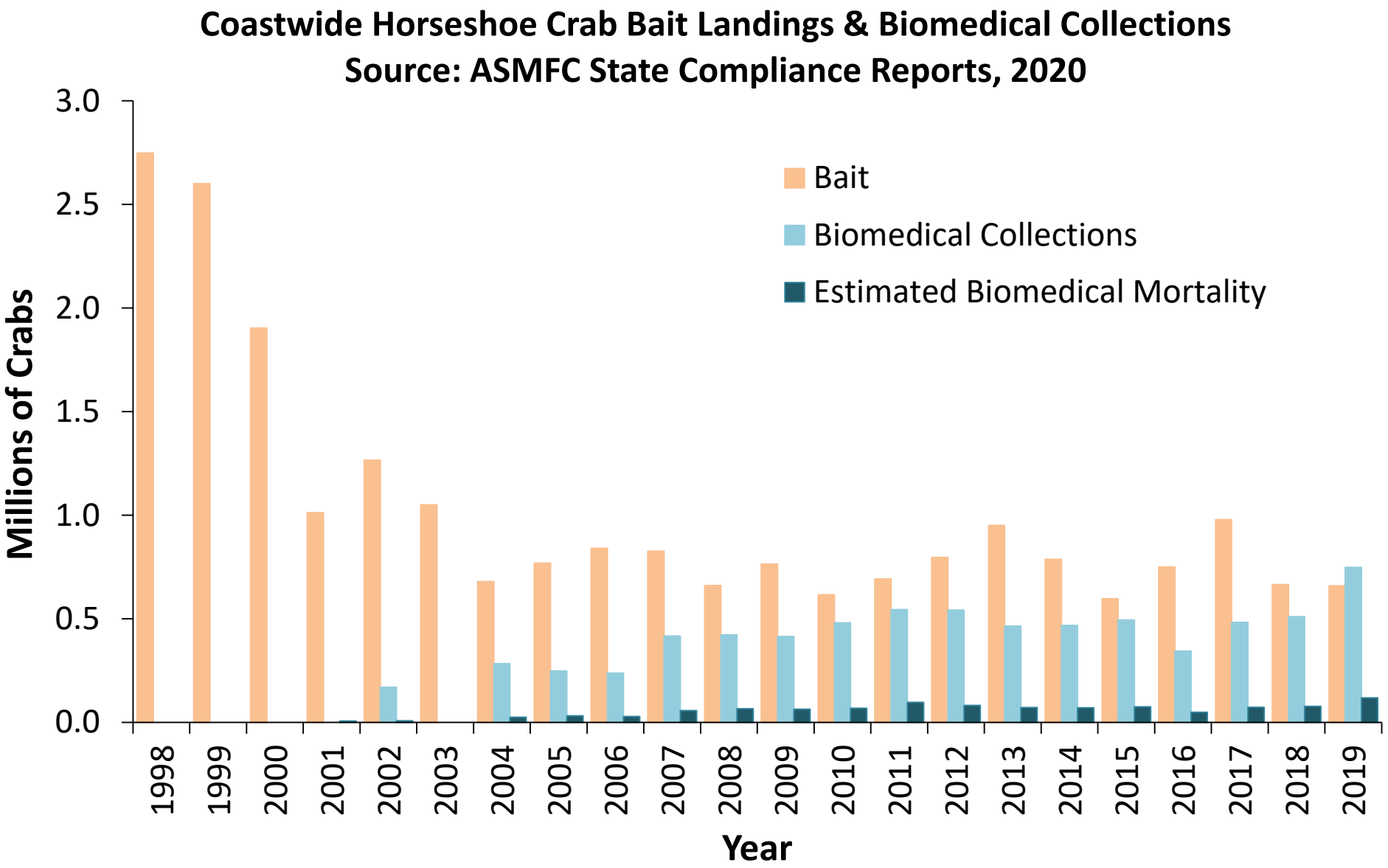
Management History

- **FMP Approved (1998)**
- **Addendum I (2000) –** State bait harvest quotas and *de minimis*
- **Addendum II (2001) –** Quota transfers
- **Addendum III (2004) –** DE Bay state bait quotas and seasonal closures
- **Addendum IV (2006) –** DE Bay state bait quotas and seasons
- **Addendum V (2008) –** Extension of Add IV
- **Addendum VI (2010) –** Extension of Add V
- **Addendum VII (2012) –** DE Bay ARM Framework



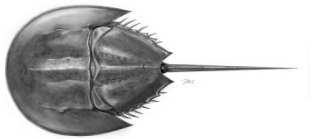
Descriptions in Section I of FMP Review

Annual Total Harvest



2019 Bait Fishery

- Total coastwide harvest was 660,091 crabs (excluding MA landings)
  - Majority from NY, DE, and VA (combined for 73% of coastwide harvest)
- Approximately 42% of the coastwide quota (1.59 million lbs) was landed (excluding MA)
- DE overage of reduced quota: 5,014 crabs (reduced quota for 2020)

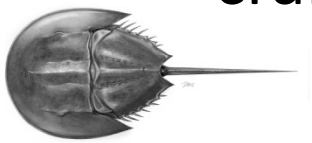


637,029
637,029
637,029
761,284
761,284

Biomedical Use

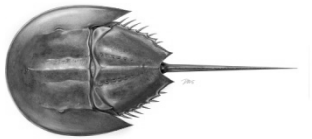
Corrected Values 10/21/2020

- Biomedical-only crabs collected: 637,029
  - 25% increase from 2018
- Biomedical-only mortality estimate: 101,193
  - Biomed Mortality = # Observed Dead Before Bleeding + 15% x # Biomed-Only Bled
  - 15% of total directed removals; biomedical mortality + bait harvest (761,284 crabs)
  - Exceeds biomedical mortality threshold of 57,000 crabs



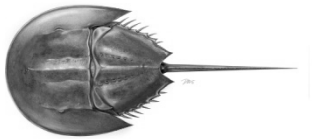
De Minimis

- Combined average bait landings (by numbers) for last two years < 1% of coastwide bait landings for the same two-year period
- PRFC, SC, GA, and FL all requested and qualify for *de minimis* status for 2020
- NJ qualified but did not request



PRT Recommendations

- Continue seeking long-term funding for VT trawl survey
  - Funded through 2021
- Approve the 2019 FMP Review, state compliance reports, and *de minimis* status for PRFC, SC, GA, and FL.
- PRT notes that NY bait harvest increased by 25% from 2018 to 2019. Board should encourage and monitor actions to reverse negative population trends in NY region.
- Biomed mortality threshold exceeded; Board required to consider management action
- Consider annual characterization of discard removals




Questions?