Horseshoe Crab Technical Committee Report

Bait Use Surveys of the American Eel and Channeled Whelk Fisheries

Presented to the ASMFC Horseshoe Crab Management Board

October 17, 2017

Survey Goals

- Discover how horseshoe crabs are used as bait in trap/pot gear for the eel and whelk fisheries.

- Provide information for future viability of manufactured or artificial baits.

Survey Methods

- January - February 2017

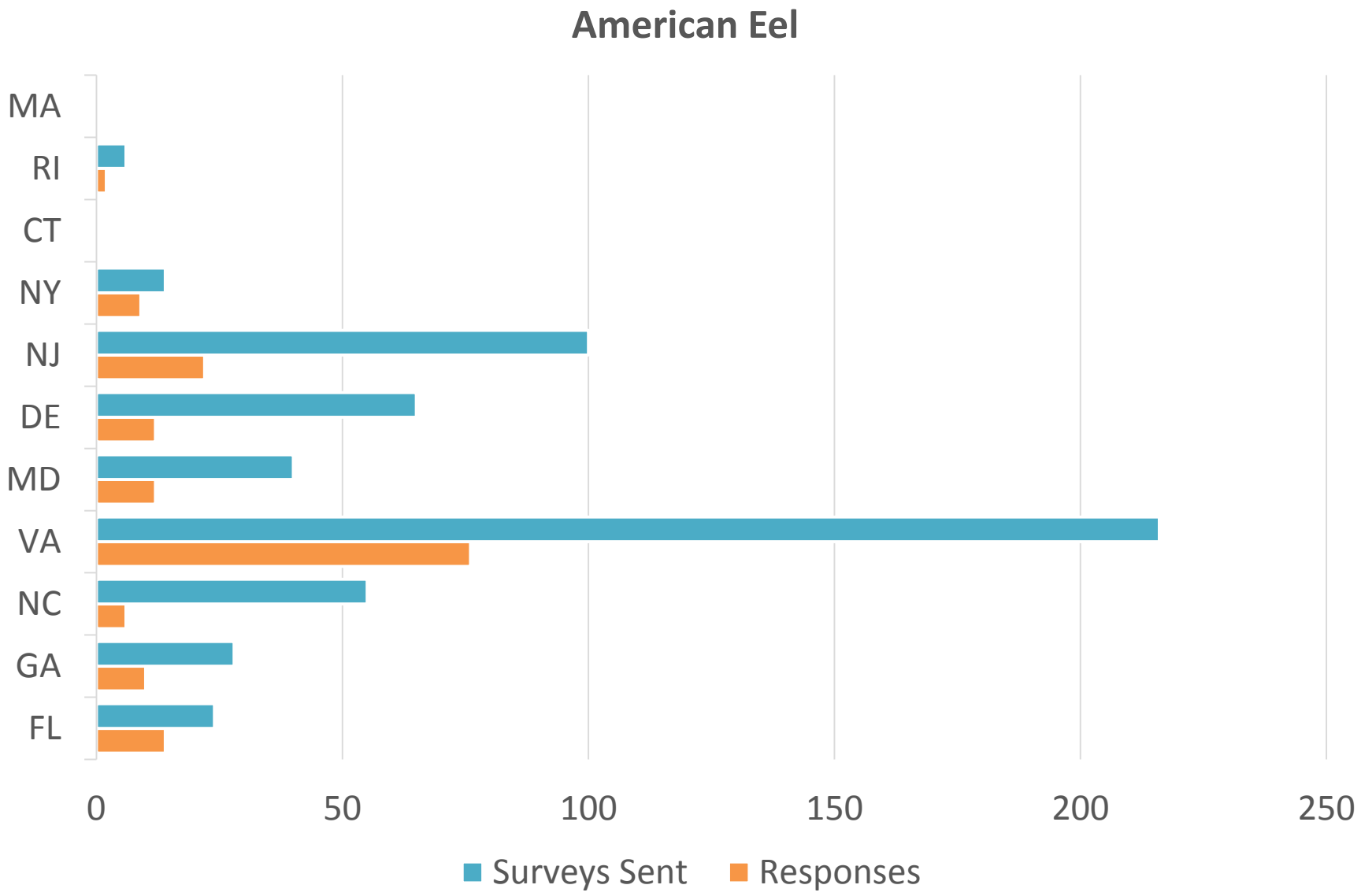
  Surveys were mailed to all current permit holders in the eel and whelk fisheries.

- Exceptions:

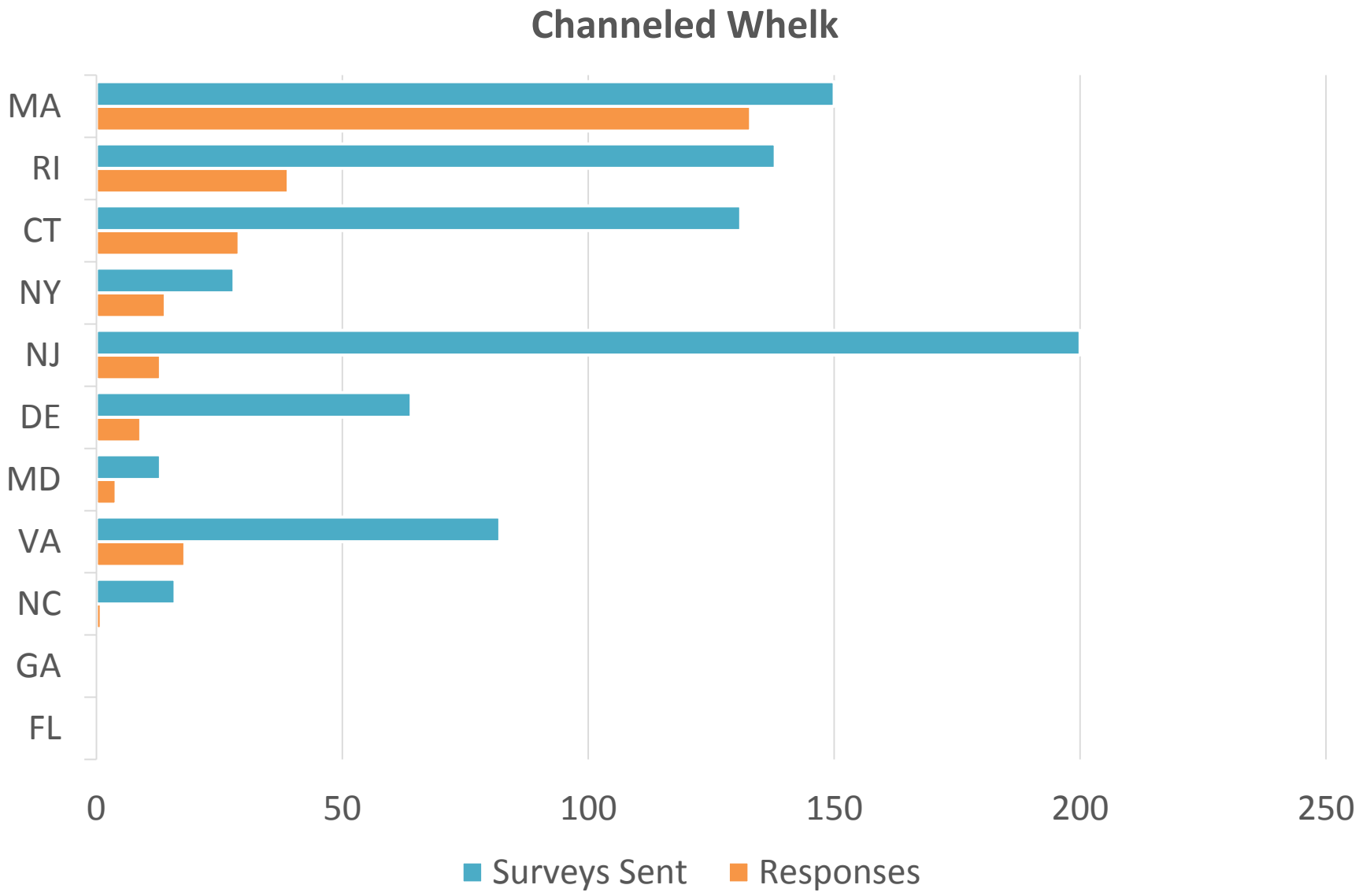
  NY only mailed the survey to fishers active in the previous 2 years.

  SC does not currently permit the use of horseshoe crabs as bait.

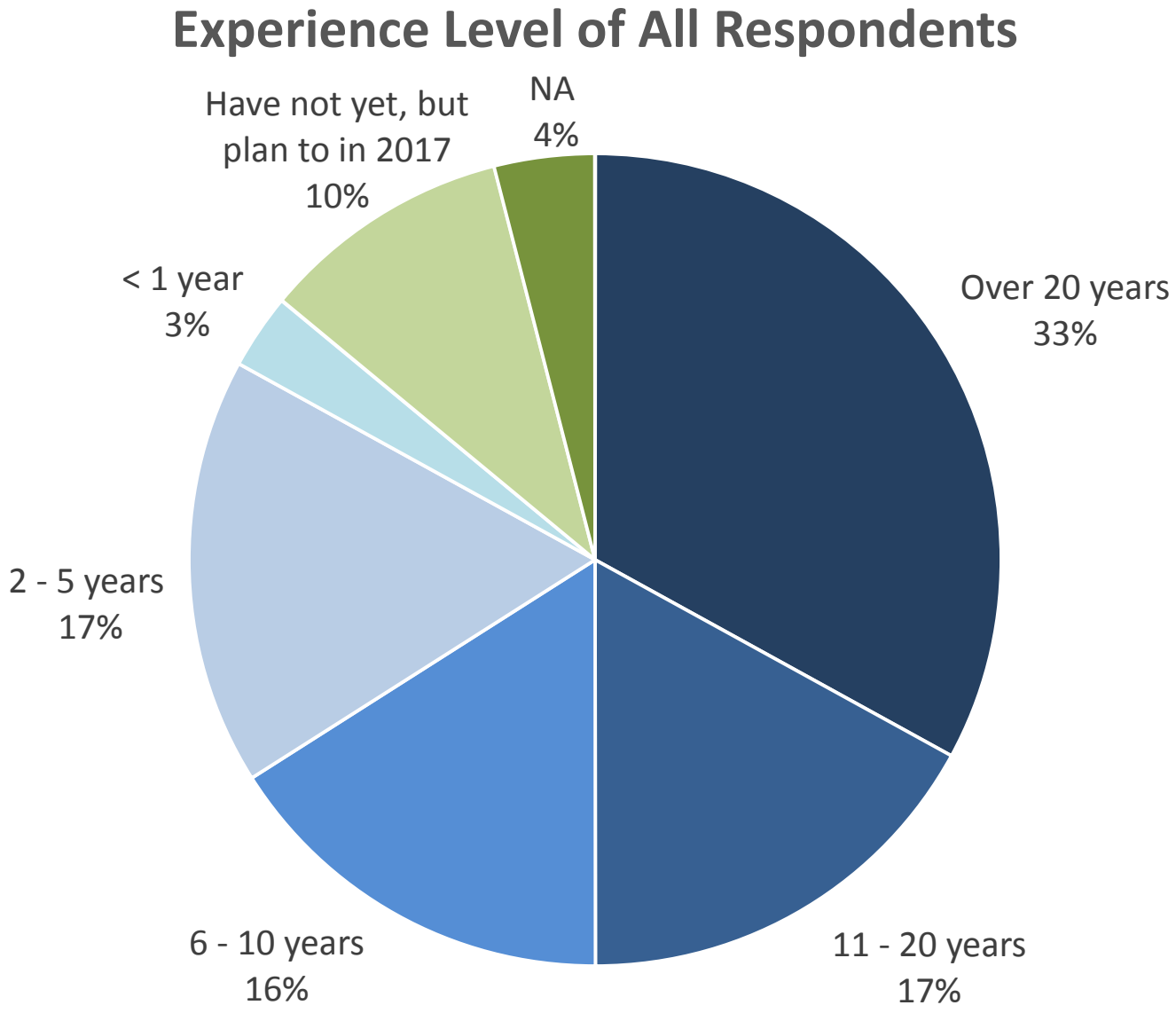
Survey Responses



Survey Responses



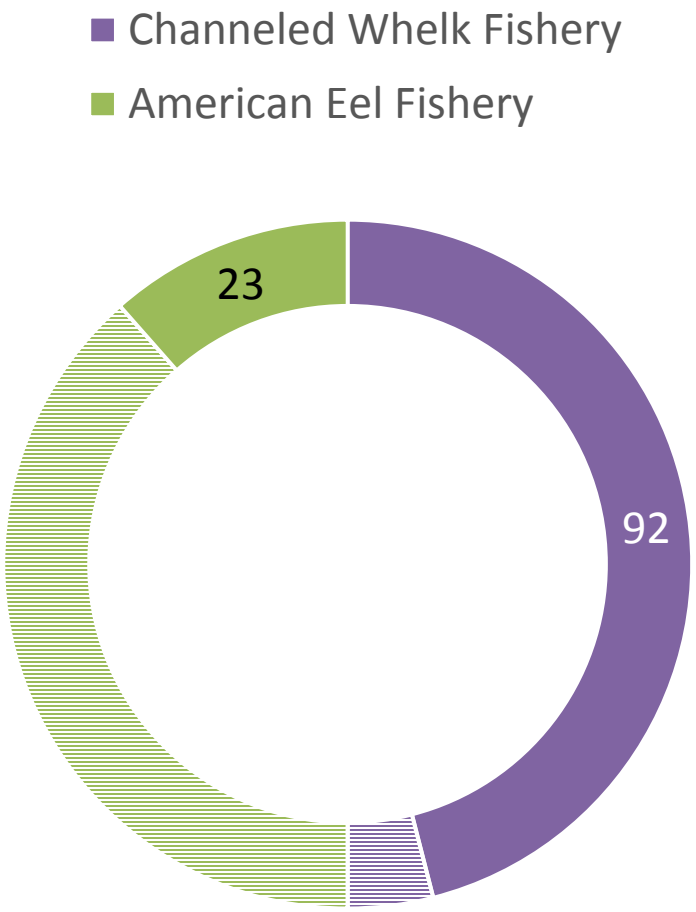
Results: Experience



Results: Bait Preference

Overall, the channeled whelk fishery is using more horseshoe crabs as bait than the American eel fishery.

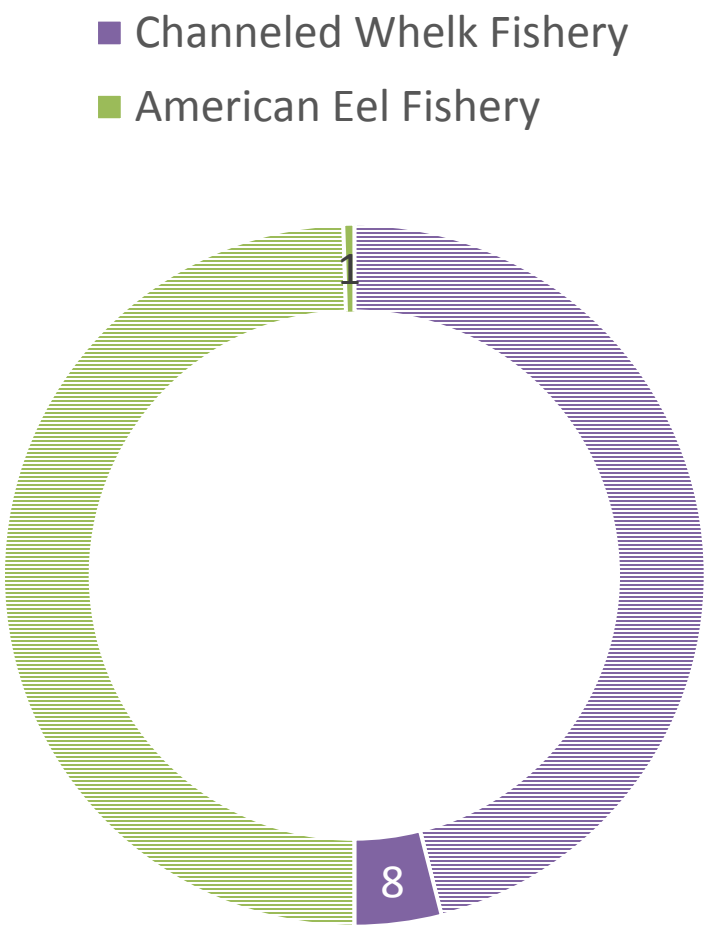
92% of channeled whelk fishers reported using horseshoe crabs as bait vs 23% of American eel fishers.



Results: Bait Preference cont.

In both fisheries, most fishers reported using multiple primary baits in their pots.

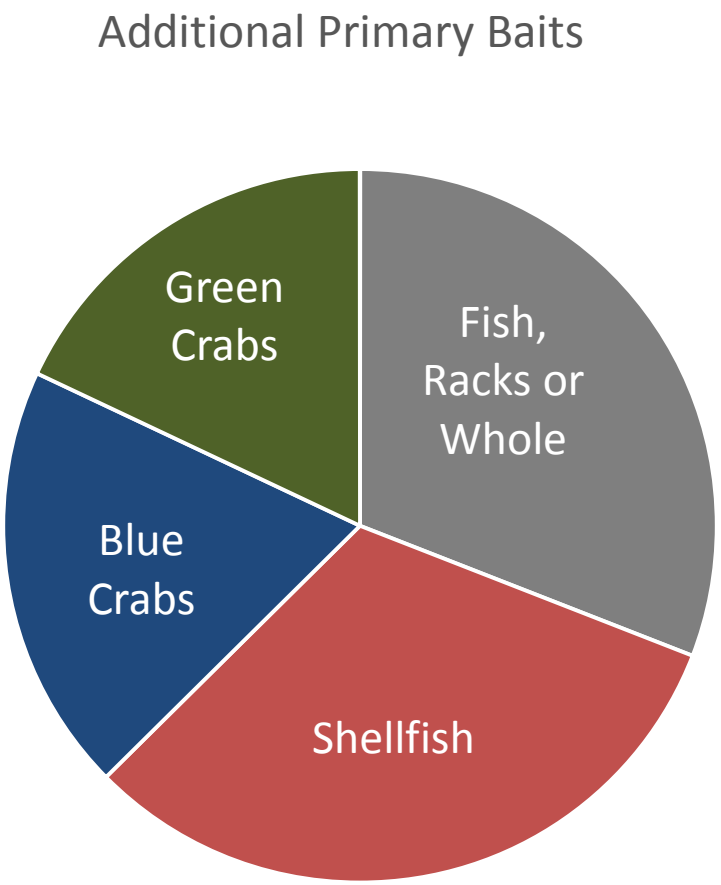
8% of channeled whelk fishers reported only using horseshoe crabs vs 1% of American eel fishers.



Results: Bait Preference cont.

There were 4 main additional primary baits used by both fisheries.

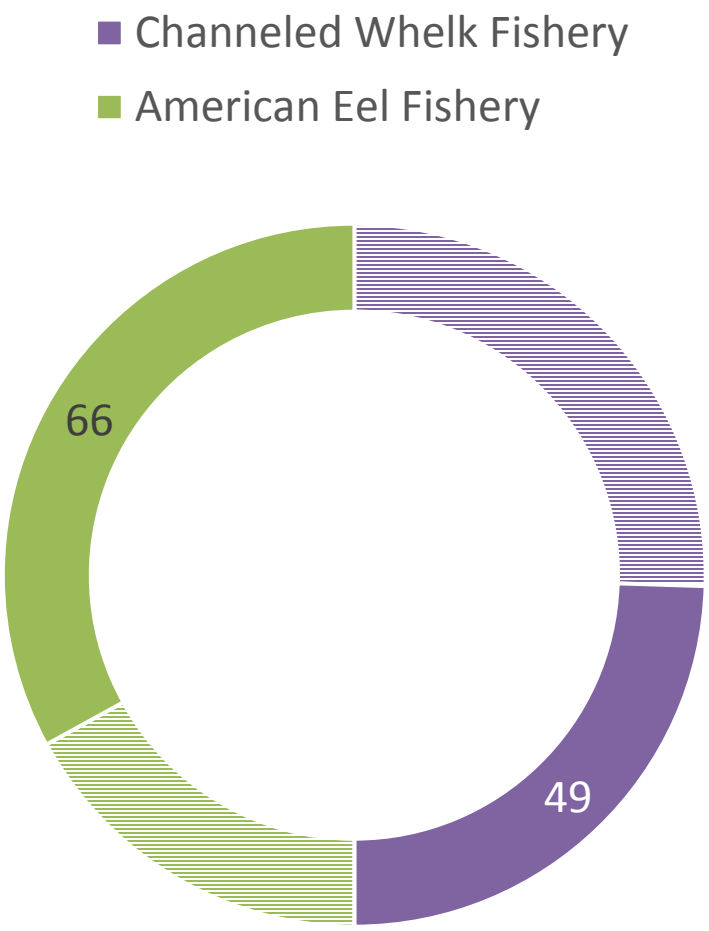
They include fish (racks or whole), shellfish, blue crabs, and green crabs.



Results: Bait Preference cont.

The American eel fishery uses more female crabs than male crabs.

66% of American eel fishers reported using female crabs vs 49% of channeled whelk fishers.

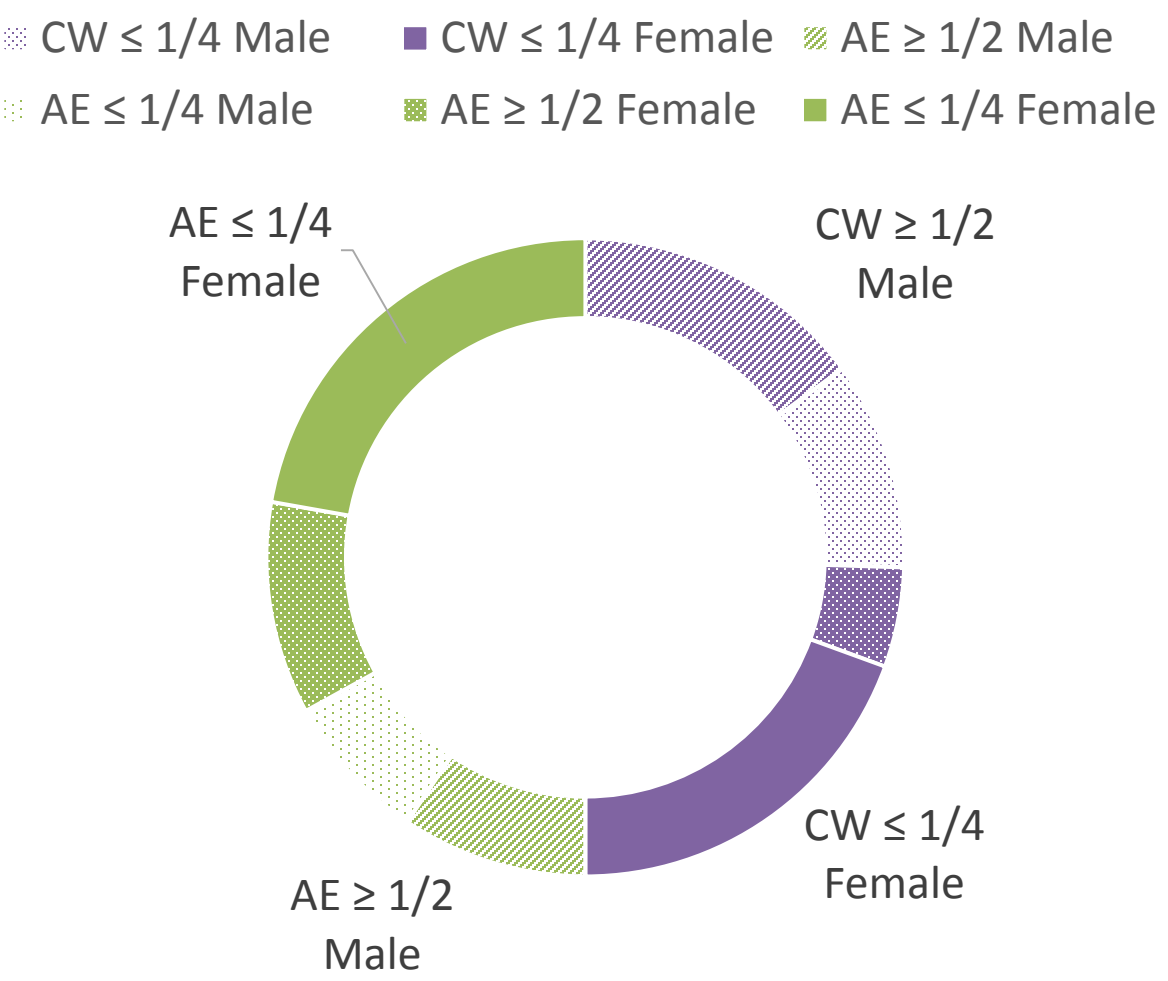


Results: Bait Preference cont.

Most fishers are not using whole crabs

Both fisheries use larger proportions of male crabs than female crabs.

This could be related to the fact that male crabs are smaller than female crabs.

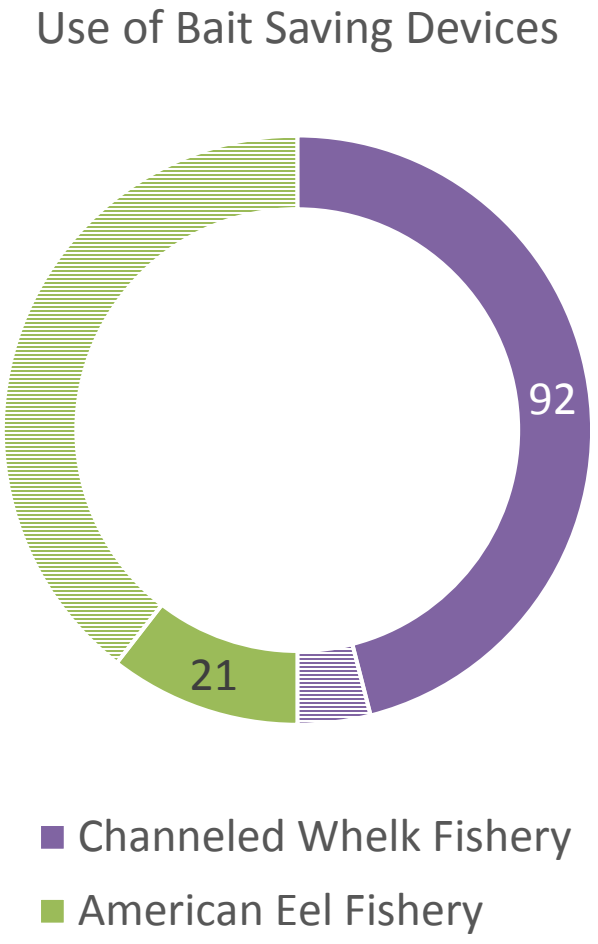


Results: Bait Saving Devices

Bait saving devices like bait bags are more common among channeled whelk fishers than with American eel fishers.

92% of channeled whelk fishers reported some type of bait saver use vs 21% of American eel fishers.

Most states, with the exception of DE, do not currently require the use of bait saving devices in these fisheries.

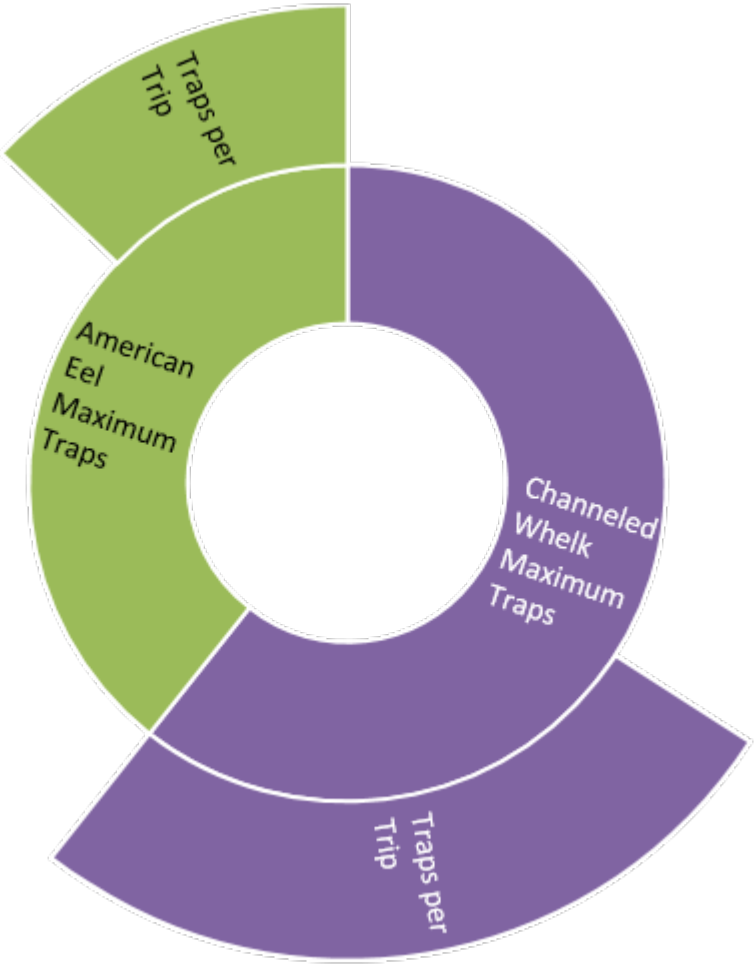


Results: Baited Gear

Coast wide, the channeled whelk fishery has more fishing gear to bait on average.

There was an average reported maximum of 212 pots in the water for channeled whelk fishers vs 165 pots for American eel fishers.

Channeled whelk fishers also fished more pots per trip with an average of 147 pots vs 80 pots for American eel fishers.



Results: Baited Gear cont.

Regional Differences in Gear Composition

Channeled Whelk Fishery

MA – NY fish less pots on average than NJ – VA.

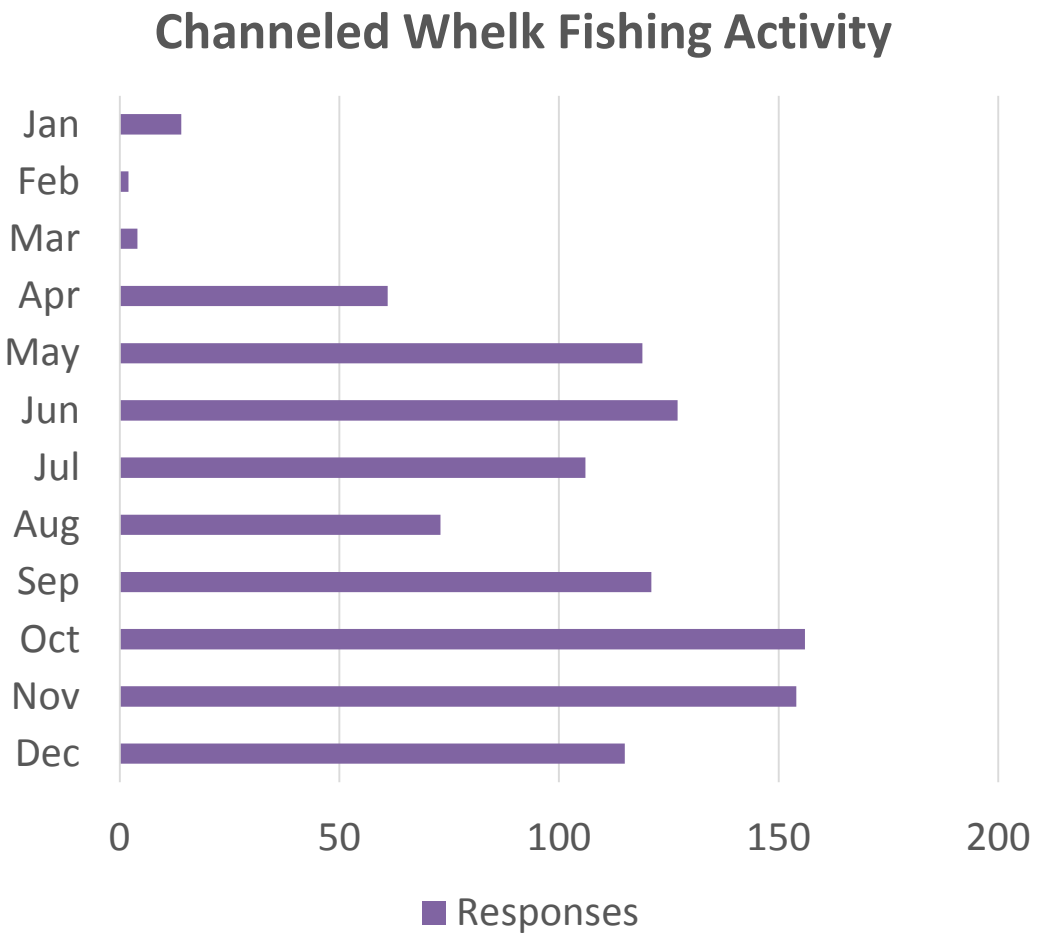
American Eel Fishery

MD had several fishers that reported extremely high maximum pots in the water and pots used per trip.

Results: Seasonal Bait Needs

The coast wide channeled whelk fishery has 2 peaks and a defined season that begins in April and ends after December.

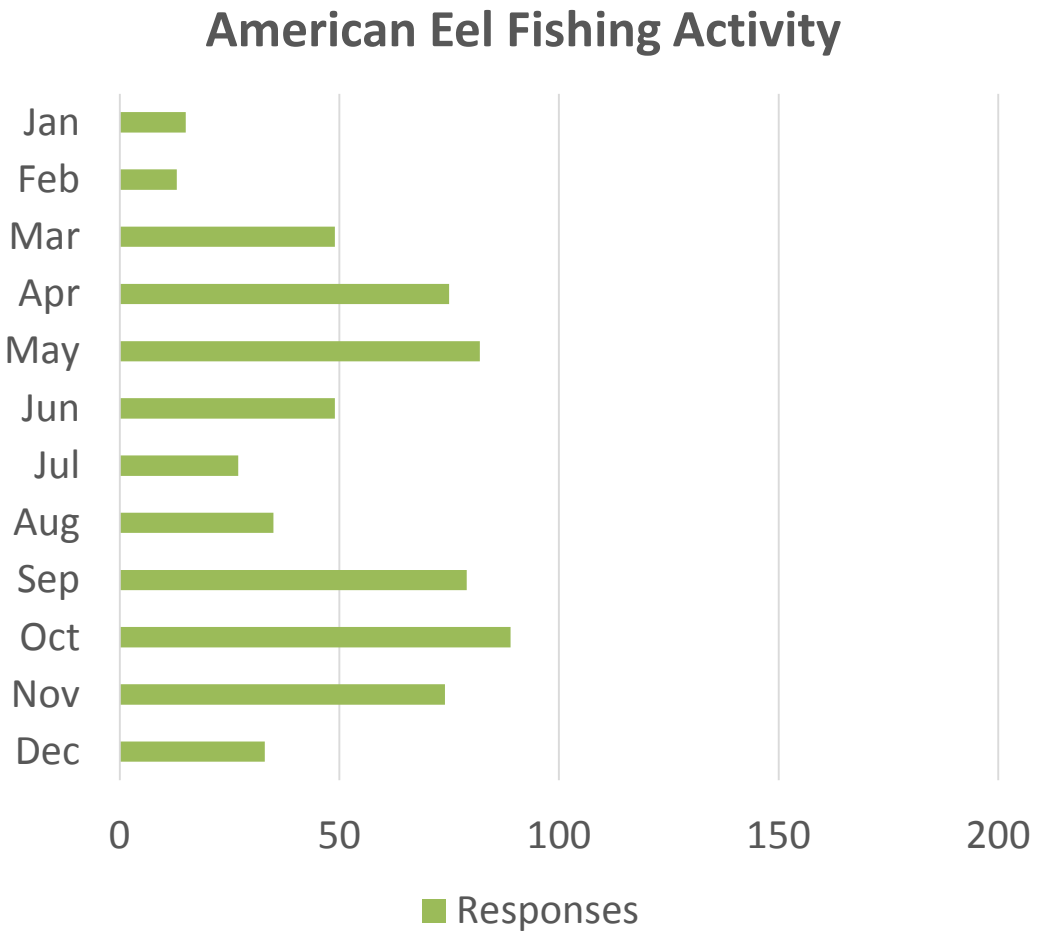
Peak fishing activity occurs between May - July and September - December.



Results: Seasonal Bait Needs cont.

The coast wide American eel fishery also has 2 peaks, but occurs more continuously through the year.

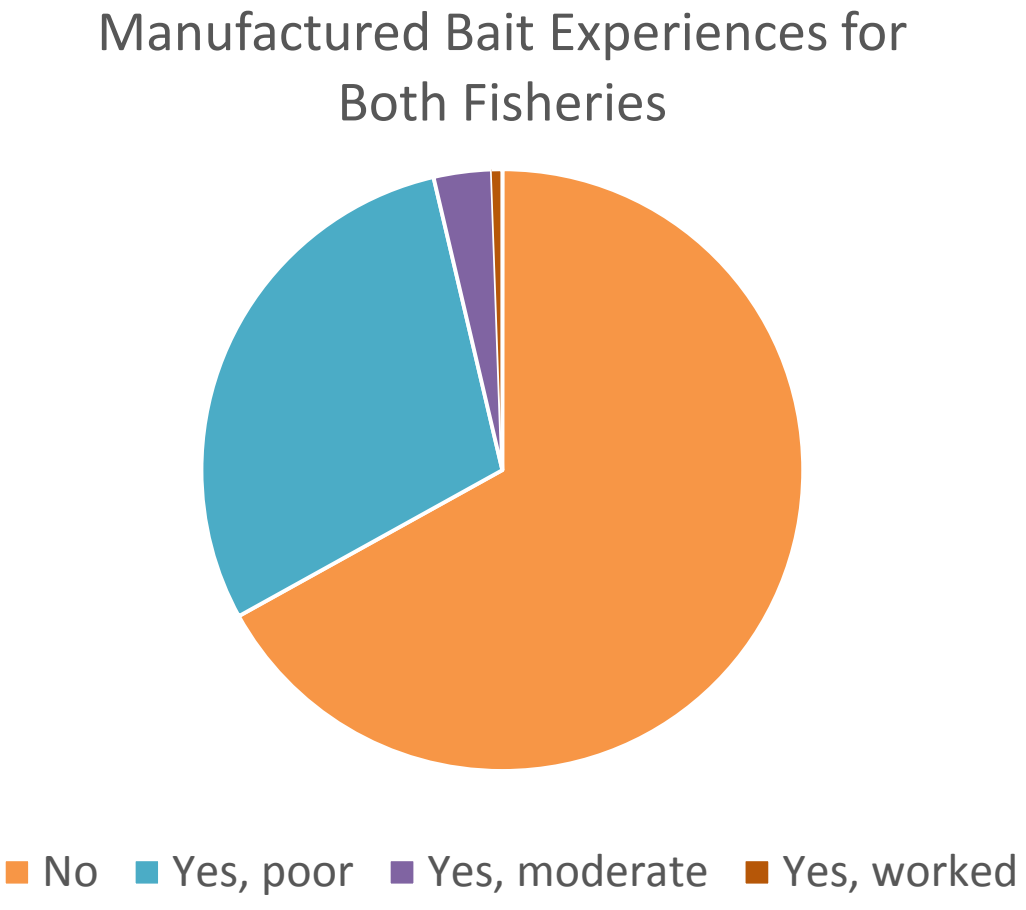
Peak fishing activity occurs between March – June and September - November.



Results: Manufactured Bait Use

Both fisheries had low percentages of participants who had tried manufactured or artificial baits.

For the fishers that tried the baits, most reported poor results.



Results: Manufactured Bait Use cont.

Based on Technical Committee discussions of previous manufactured bait trials[1]:

Poor results might not have been based only on bad performance. Fishers reported issues of cost and availability as well.

[1] ASMFC Horseshoe Crab Alternative Bait Working Group Call Summary. March 2016

Results: Manufactured Bait Viability

For both fisheries and all current bait practices, the bait typically lasts for 2 days and costs $1.50 or less per pot.

Overall, the price per pot was generally more expensive in the whelk fishery than the eel fishery.

Manufactured Bait Viability

Based on these results:

Manufactured bait would need to last at least 2 days and cost $1.50 or less to have a chance of success.

It would also need to use either less than 1/8 of a female horseshoe crab or less than 1/4 of a male crab to use less horseshoe crabs per trap than current bait practices.

Questions?

2018 Benchmark Stock Assessment Terms of Reference

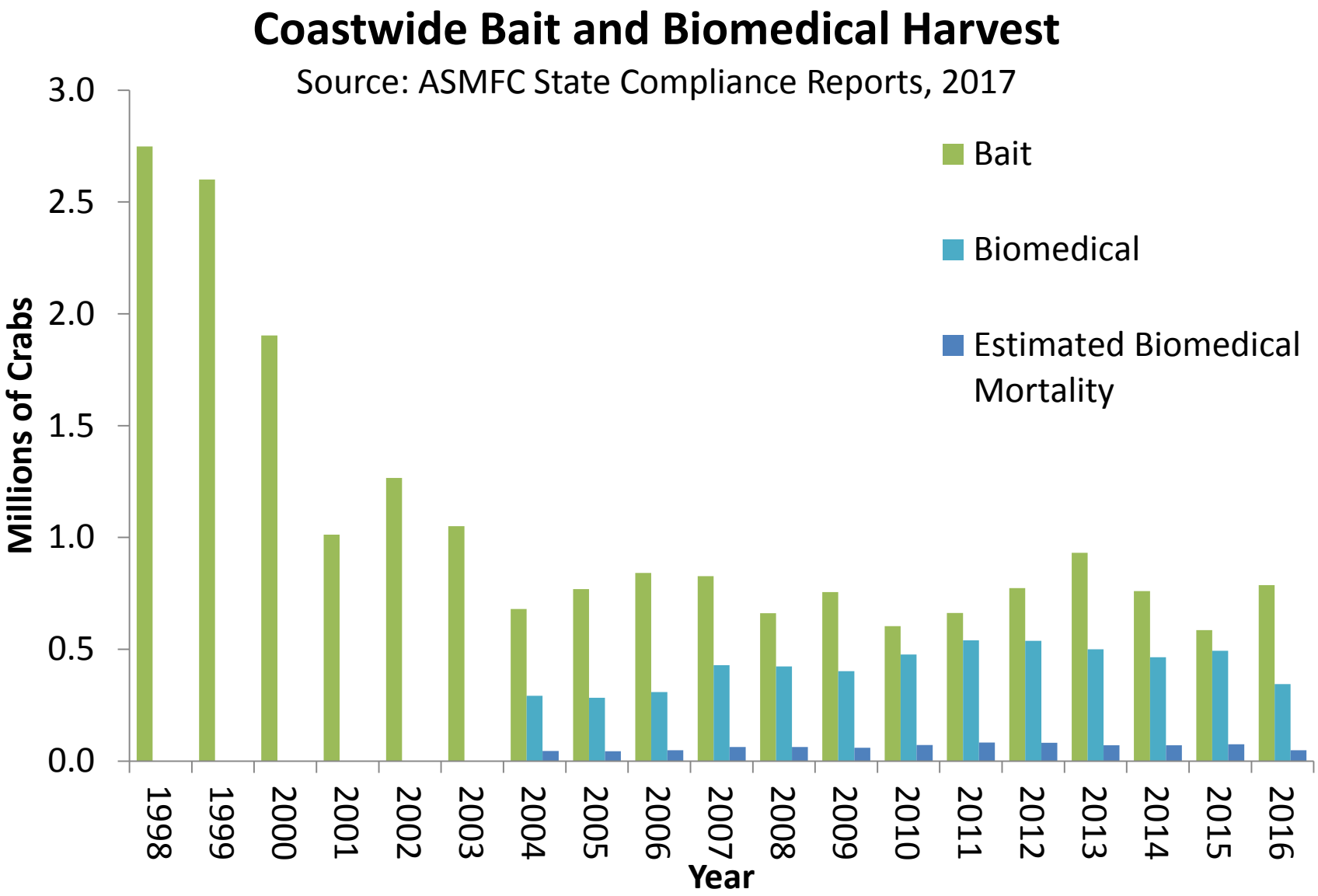
Previous Assessments

- 2009 Benchmark
  - A formal set of reference points not adopted by HSC Board
  - Increased abundance in SE and DB regions
  - Declining abundance in NY and NE regions

Regional Trends in Horseshoe Crab Abundance		
Region	**Time series duration**	**Conclusion about population change**
New England	1978-2008	Declined
New York	1987-2008	Declined
Delaware Bay	1988-2008	Increased
Southeast	1993-2009	Increased

- 2013 Update
  - NE, NY declining abundance
  - Positive trends in SE, some of DB
  - Need for biomedical inclusion, regional

Coast-wide Data



Current Biomedical Facilities (6)

- Massachusetts
  - Associates of Cape Cod (Harvest from MA & RI waters)
- New Jersey
  - Limuli Laboratories (Harvest from DE & MD waters)
- Maryland
  - Lonza (Harvest from MD waters)
- Virginia
  - Wako Chemicals (Harvest from MD waters)
  - Heptest Laboratories (Harvest from EEZ; land in VA)
- South Carolina
  - Charles River Endosafe (Harvest from SC waters)

Numbers of horseshoe crabs harvested, bled and estimated mortality for the biomedical industry

	2008	2009	2010	2011	2012	2013	2014	2015	2016
# crabs brought to biomedical facilities (bait and biomedical crabs)	511,478	512,853	552,083	623,680	624,440	554,419	536,798	564,526	426,195
# bait crabs bled	87,864	106,740	66,047	78,128	82,684	61,613	68,643	67,687	77,946
# biomedical-only crabs collected (not counted against state bait quotas)	423,614	402,503	476,962	540,323	537,514	500,565	464,709	493,144	344,467
Reported observed mortality of biomedical-only crabs from collection to release	2,973	6,523	6,447	8,485	7,396	5,485	5,658	5,250	1,015
# biomedical-only crabs bled	402,080	355,011	435,458	500,781	499,214	436,902	432,306	467,455	318,432
Estimated post-bleeding mortality of bled biomedical-only crabs (15% est. mortality)	60,312	53,252	65,319	75,117	74,882	65,535	64,846	70,118	47,765
Total estimated mortality on biomedical crabs not counted against state bait quotas (15% est. mortality)	63,285	59,775	71,766	83,602	82,278	71,020	70,504	75,369	48,780*

*Temporary changes in production occurred in 2016

2018 Assessment

- Concerns over population trends in NE and NY regions and the proportional increase of removals from biomedical
- Initiated a benchmark stock assessment at the Spring 2016 HSC Board meeting
- Motion: *Move to add Horseshoe Crab to the stock assessment schedule in 2018 and to task the Stock Assessment Subcommittee and Technical Committee to complete a regional 'black box' benchmark stock assessment.*

2018 Benchmark ToRs

- Full ToRs in meeting materials (pg 58)
- **ToR 1:** Define & justify use of population structure
- **ToR 2:** Characterize precision and accuracy of FI and FD data, including biomedical data
- **ToR 3:** Develop models used to estimate population parameters (F, biomass) and BRP
  - H. Incorporate biomedical data into the models used. Reassess associated mortality of bled crabs coast-wide or regionally.
- **ToRs 4 & 5:** Characterize uncertainty in model & reference points, perform retrospective

2018 Benchmark ToRs

- **ToR 6:** Recommend a stock status, reference points
- **ToR 7:** Other potential scientific issues:
  - A. Compare trends, BRP, model output from assessment with the results of the ARM model for the Delaware Bay
- **ToRs 8-10:** Minority report, research recommendations, and timing of next assessments

- ToRs for the Peer Review

AP Recommendations for Assessment Process

- Re-evaluate 15% estimated mortality rate using appropriate studies and literature
- Assessment process should include HSC peer-reviewed papers, marine resource studies, and historical data from biomedical facilities
- Include a biomedical scientist to help evaluate methodology of HSC survival studies
- Review of SAS findings by HSC Advisory Panel before final submission
- Meaningful dialogue will produce the best outcomes!


Questions?

2018 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
- 2017 harvest recommendations

Thresholds in ARM

1. Population thresholds

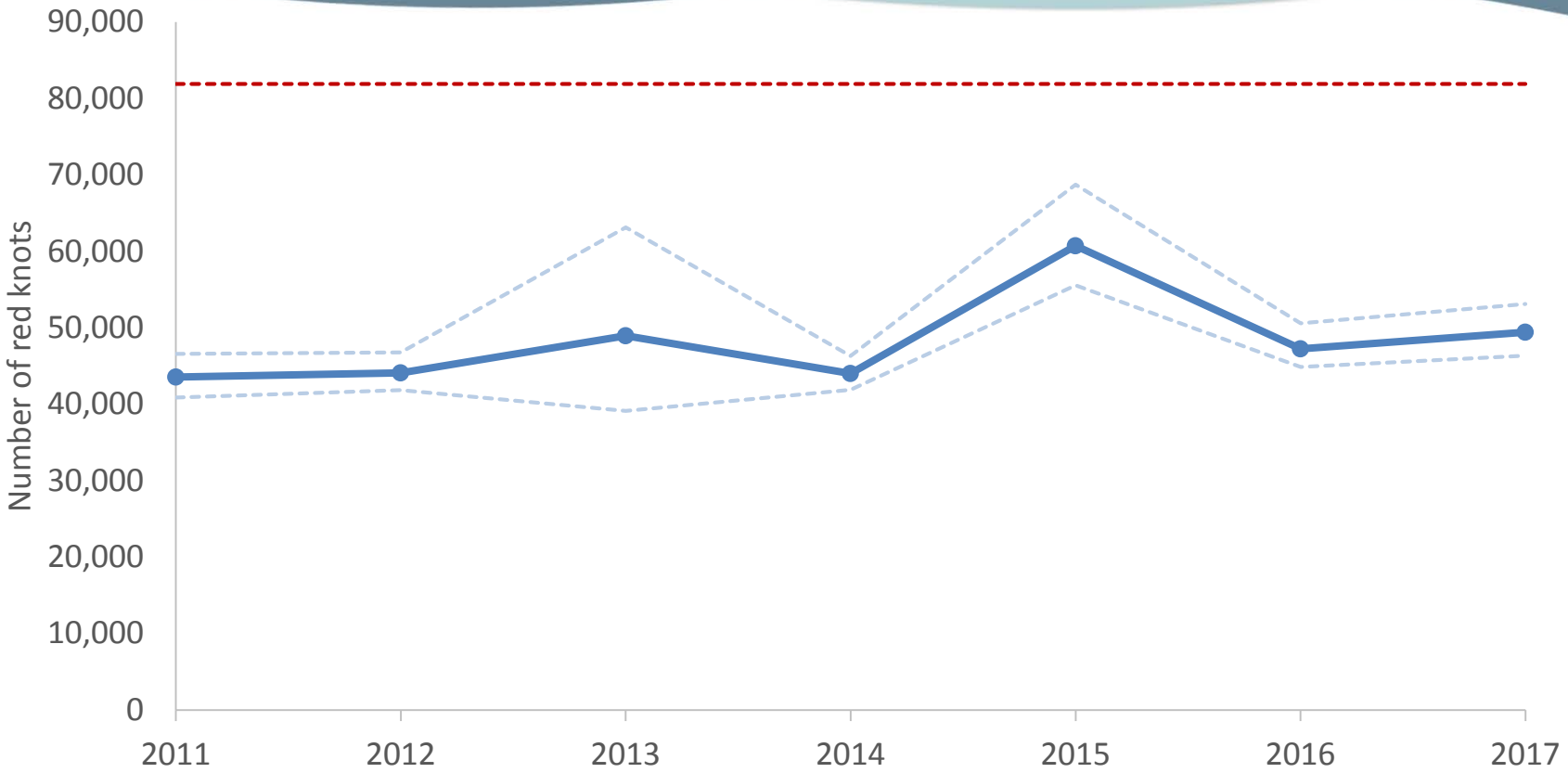
Female HSC:
80% carrying capacity
(or 11.2 million F crabs)

Red knot:
81,900 birds

2. Maintain a spawning beach sex ratio of 2M:1F

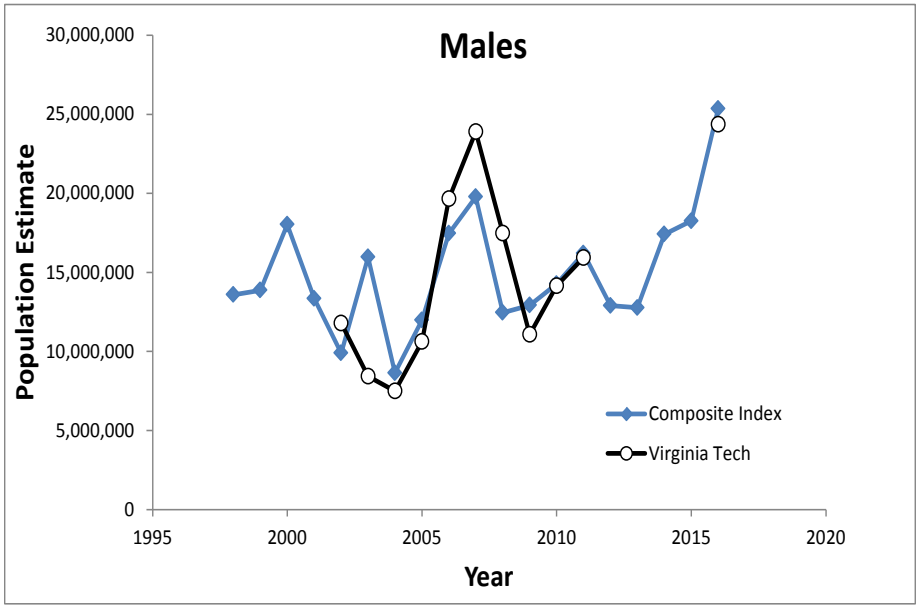
- If both population estimates are below threshold, *no female HSC harvest*
- If sex ratio falls below 2M:1F, *no male HSC harvest*

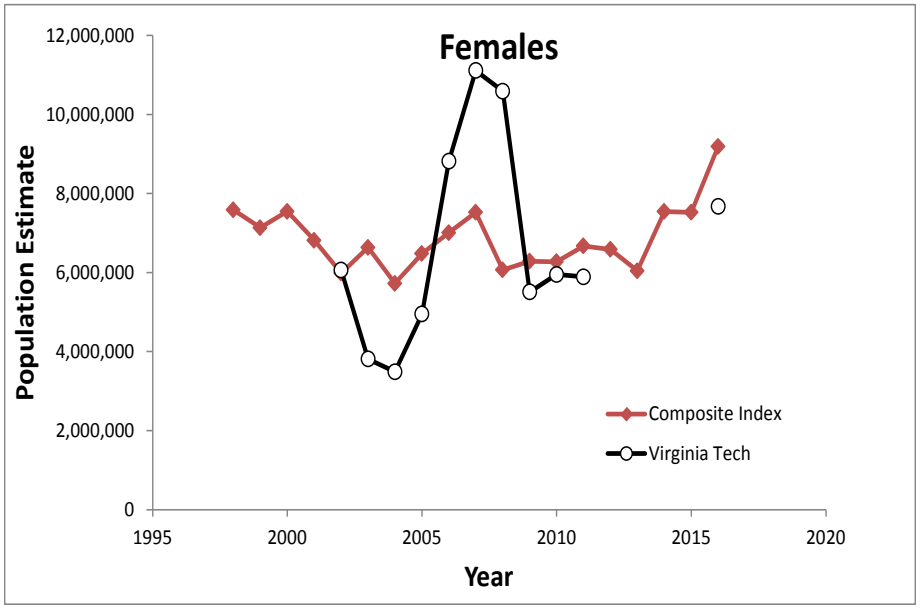
Red Knot Abundance



- Red knot abundance from mark-resight investigations
- 2017 estimates are similar to 2016
- 2017 estimated stopover duration was 9.5 days, shorter than 2016 estimate of 12.3 days
- 2017 estimate of 49,405 is below threshold of 81,900 birds

Horseshoe Crab Abundance





- 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
- VT trawl ran in 2016
- 2016 estimate of 7.7 million females is under the 11.2 threshold

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

2017 Harvest Recommendation

HSC and red knot abundance estimates:

Horseshoe crab abundance (millions)			Red knot abundance (×1,000)	
Year	Male	Female	Year	Male and female
2016 (Fall)	25.4	7.7	2017 (Spring)	49.405

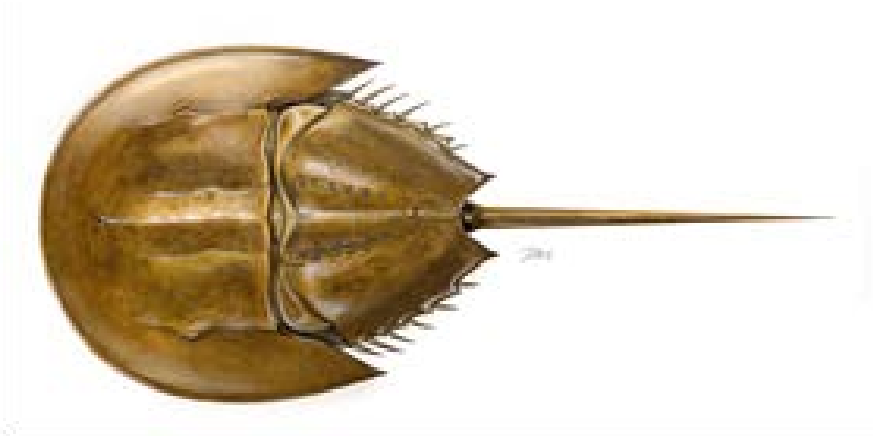
Harvest package recommendation for 2017:

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


Questions?

ARM Model Runs



Biomedical Mortality in the ARM

- ARM model underwent a review during 2016
- ARM subcommittee put forward a preferred option and a minority opinion for including biomedical data
- Board tasked ARM with exploring how adding in the biomedical data would change harvest package selection

"Preferred" Option

- Biomedical mortality incorporated into harvest packages
- Uses 3-5 year average (data confidentiality issues)
- Model runs the same way, but with adjusted packages: (example)

Current Harvest Packages			Revised Harvest Packages			
Harvest Package	Bait Harvest		Bait Harvest		Biomedical Mortality	
	Males	Females	Males	Females	Males	Females
1	0	0	0	0	36,000	18,000
2	250,000	0	214,000	0	36,000	18,000
3	500,000	0	464,000	0	36,000	18,000
4	280,000	140,000	244,000	122,000	36,000	18,000
5	420,000	210,000	384,000	192,000	36,000	18,000

- The biomedical is NOT a quota, rather an estimation of annual mortality attributed to the industry

Harvest Package Selection

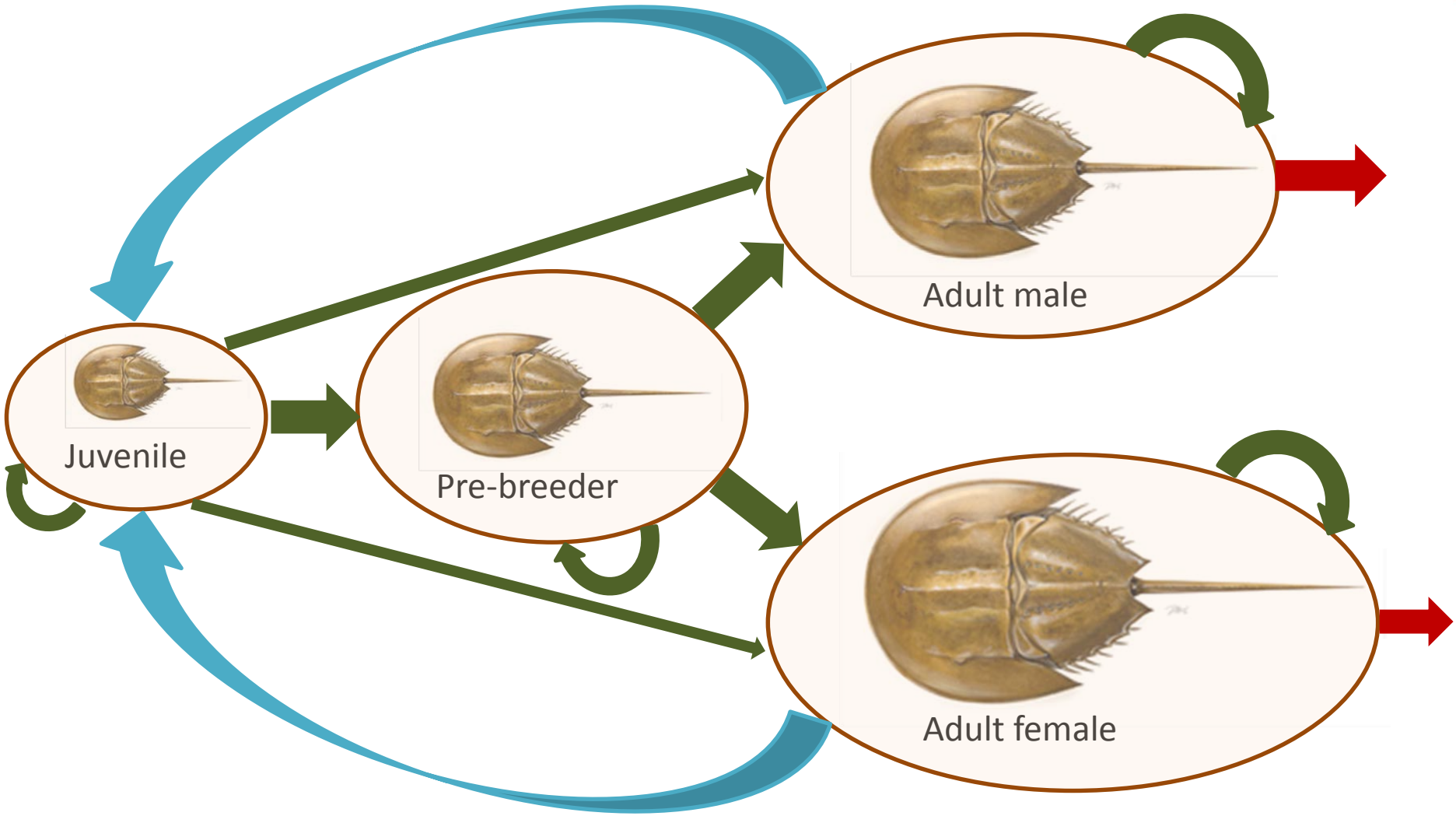
Current Harvest Packages	Frequency Selected
1	16%
2	<1%
3	30%
4	1%
5	52%

“Minority” Opinion Option

- To incorporate biomedical, add an additional mortality to account for the bled crabs die into the population dynamics model

- Used the 15% mortality for bled crabs

ARM Population Dynamics



HSC = # juvs to adult + # pre-bdr to adult + # adults - # bait harvest

Harvest Package Selection

Current Harvest Packages	Frequency Selected	Under Preferred Option		Under Minority Opinion	
		Remained the same	Changed to harvest package	Remained the same	Changed to harvest package
1	16%	99%	3 (<1%) 5 (<1%)	97%	3 (2%) 4 (1%)
2	<1%	100%		0%	1 (73%) 3 (27%)
3	30%	100%		100%	
4	1%	85%	1 (15%)	88%	5 (12%)
5	52%	100%		100%	

Alternative Runs Conclusion

- Little change in harvest packages due to incorporation of biomed mortality
- "Preferred" Option
  - Transparency: Obvious subtraction of estimated biomed mortality from bait quota
  - Drawbacks: bait vs biomedical, requires addendum
    - DB bait harvests have not exceeded "Preferred" Option adjusted quotas during 2009-2016
    - Changes to HPs are small & NJ bait quota gives "buffer"
- "Minority" Opinion
  - No addendum, maintains harvest packages
  - Less transparent

Alternative Run Conclusions

- ARM Subcommittee, DBE TC, and HSC TC:
  - If biomed mortality incorporated into ARM, "Preferred" Option is recommended
  - "Preferred" Option has benefits:
    - Accuracy: Accounts for biomed as mortality source
    - Transparency: Obvious subtraction of estimated biomed mortality from bait quota

Alternative Run Conclusions

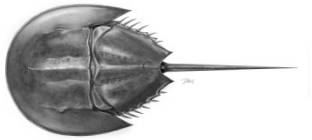
- Advisory Panel:
  - Recommend no biomed mortality in annual ARM model
    - VERY little change in HPs due to incorporation of biomed mortality
  - If biomed mortality incorporated into ARM, "Minority" Option is recommended
  - "Minority" Option benefits:
    - Protects confidentiality
    - Doesn't lower quotas


Questions?

Horseshoe Crab 2017 FMP Review

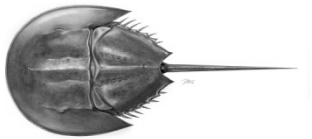
Presented to Horseshoe Crab Management Board

October 17, 2017



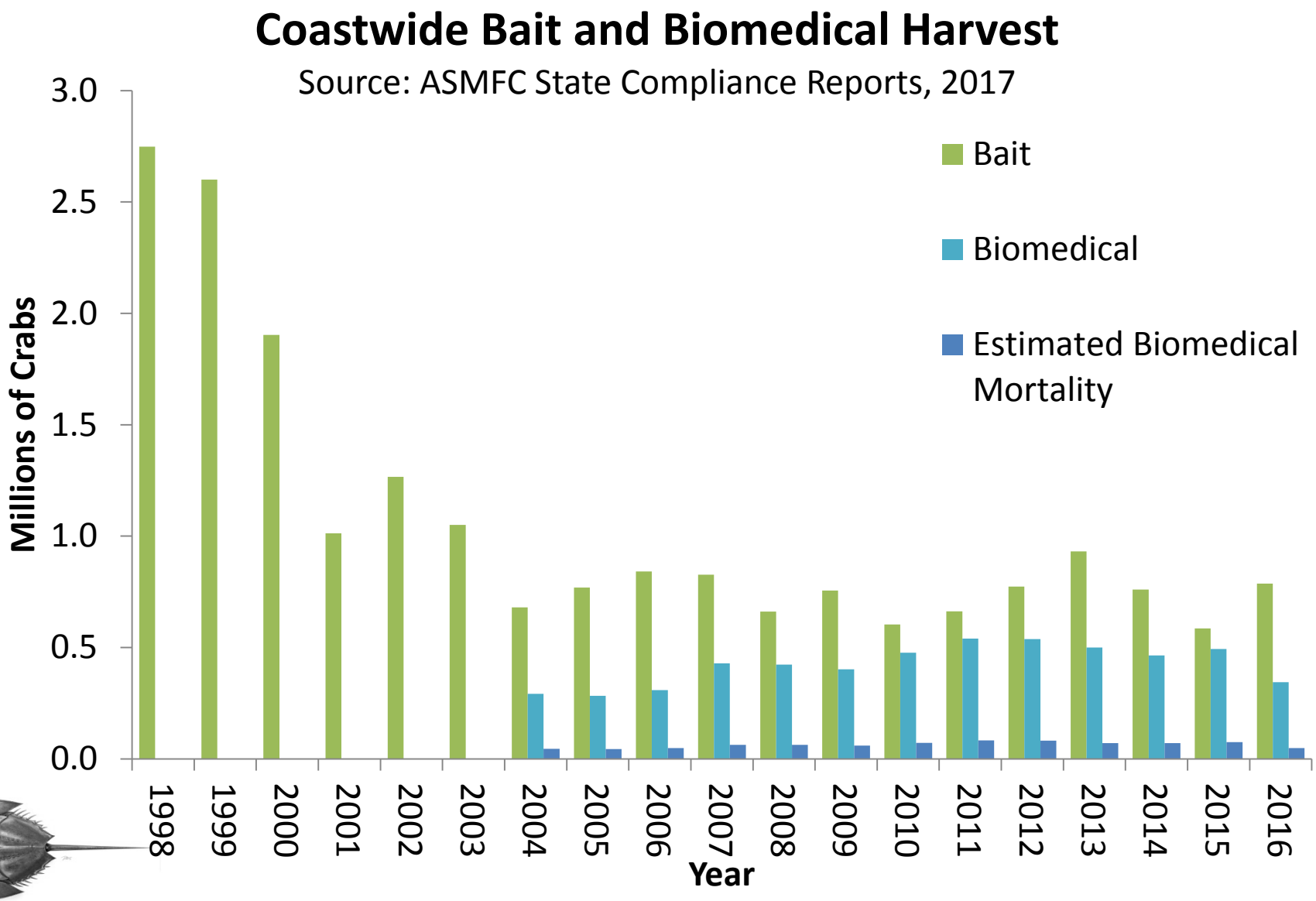
Management History

- **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



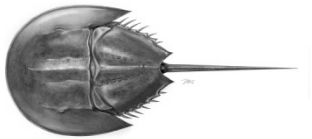
Descriptions in Section I of FMP Review

Annual Total Harvest



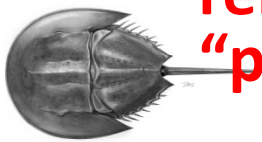
2016 Bait Fishery

- **Total coastwide harvest was 787,223 crabs**
  - Majority from NY, DE, and MD (combined for 63% of coastwide harvest)
- **35% increase from 2015**
  - Increased landings from 2015 in RI, NY, DE-NC, FL
- **Approximately 65% of the coastwide quota (1.59 million lbs) was landed**



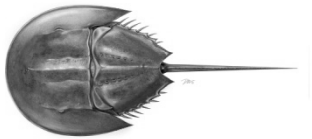
Biomedical Harvest

- **Reported number of crabs brought to biomedical facilities: 426,195**
  - 21% decrease from previous 5-year average
  - Temporary changes in production in 2016
- **Crabs used as bait and bled: 77,946**
  - 9% increase from past 5-year average
- **Biomedical-only mortality estimate: 48,780 (15%); ranging from 16,937 (5%) to 96,545 (30%)**
  - Biomed Mortality = Reported # Observed Dead Before Bleeding + 15% x Reported # Biomed-Only Bled
  - **Text Edit: Last 2 sentences of p. 6, "up to the point of release" should be "up to the point of bleeding", and "post-release" should be "post-bleeding"**



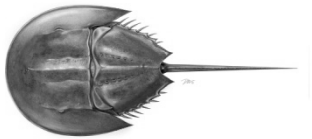
De Minimis

- **Criteria:** Combined average bait landings (by numbers) for last two years less than 1% of coastwide bait landings for the same two-year period
- **Measures:** Not required to implement any harvest restriction measures, but are required to implement monitoring components A, B, E, and F (Sec. 3.5 of FMP)
- **PRFC, SC, GA, and FL all requested and qualify for *de minimis* status for 2017**
  - NJ qualified but did not request



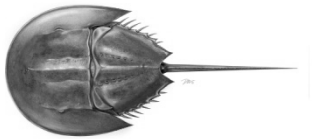
PRT Review

- **Concerns on number of crabs unidentified by sex from biomedical bleeding**
  - Reporting format developed by HSC TC (no new info, format only); will be included in CR template for 2018
- **Recommend continue seeking funding for VT trawl survey**
  - Funded for 2017, 2018 (?)
- **PRT found all states management measures to be consistent with the FMP**
  - DC did not submit a report – has not submitted for 15+ years



PRT Recommendations

- **All states in compliance with the requirements of FMP, with the exception of DC**
- **Approve *de minimis* for PRFC, SC, GA, and FL**




Questions?