



# Atlantic States Marine Fisheries Commission

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## ASMFC Horseshoe Crab and Delaware Bay Ecosystem Technical Committees

### Meeting Summary

Arlington, VA  
October 5, 2016

**Attendees:** Kirby Rootes-Murdy (ASMFC), Kristen Anstead (ASMFC), Michael Schmidtke (ASMFC), Jeff Brust (NJ), Steve Doctor (MD), Greg Breese (USFWS), Derek Perry (MA), Amanda Dey (NJ), Eric Hallerman (Virginia Tech University), Wendy Walsh (USFWS), Rachel Sysak (NY), Adam Kenyon (VA), Audrey DeRose-Wilson (DE), Jeff Dobbs (NC), Jordan Zimmerman (DE)

**Conference Call attendees:** Tiffany Black (FL), Penny Howell (CT), Derek Orner (NOAA), Chris Wright (NOAA), John Sweka (USFWS), Jeff Brunson (SC), Scott Olszewski (RI)

### 1. ARM Framework Optimal Harvest Recommendation for 2017 Fishing Year

- ARM Model Review: Kristen Anstead presented a basic review of the Adaptive Resource Management (ARM) model that is used to set harvest levels in the Delaware Bay. The TCs reviewed the utility function that establishes the population thresholds for red knot (81,900) and horseshoe crabs (11.2 female crabs), as well as the 2 males to 1 female operational sex ratio on spawning beaches. If both population estimates are below threshold, there is likely to be no female horseshoe crab harvest recommended in the region. The five current harvest packages available to be selected by the model were reviewed, as well as the population estimates for 2015/2016.
- 2015 Horseshoe crab population estimates: In 2015, the ARM Subcommittee developed a horseshoe crab abundance index based on three trawl surveys in the Delaware Bay region: Delaware 30 foot trawl survey, the New Jersey Delaware Bay trawl survey, and the New Jersey Ocean trawl survey. This composite index was developed because the Virginia Tech trawl survey, which was used to estimate horseshoe crab abundance, lost funding and did not occur. The ARM workgroup showed that the composite index from the three other trawl surveys correlated well with the Virginia Tech Trawl survey for years in which data overlapped and could be used as a substitute for the Virginia Tech (VT) Trawl survey when estimating the abundance of male and female horseshoe crabs. The VT Trawl survey also did not run in 2015, so the composite index was used to estimate the 2015 population to be used in the ARM model. Population estimates of horseshoe crabs for 2015 are 16.4 million males and 8.1 million females. This is an increase from the 2014 estimates of 15.2 million males and 7.9 million females.
  - VT Trawl Survey Update: Eric Hallerman provided an update of the TV Trawl Survey for 2016. Despite some setbacks due to challenging weather this year, the

survey is currently underway and has completed 5 trips and 30 of the 53 coastal stations thus far and it has not yet started the 16 Delaware Bay stations. Anecdotally, the number of crabs is comparable to previous years, but any conclusions should be made after the survey and analysis is completed and made available in the spring of 2017. The gear and boat are the same as previous years. The survey spatial extent will not include NY APEX this year. The request for a gear efficiency study to determine how many crabs the survey may be missing by using a trawl instead of a dredge will not be completed this year; depending on remaining funds in the current grant the survey is using this year, the gear efficiency study could be performed in the summer 2017. The gear efficiency study could potentially lead to the development of a correction factor for crabs that may be buried in the mud and thus missed in the population estimates from the trawl survey. Additionally, there has been interest from other states and surveys in expanding current sampling programs to collect more data for horseshoe crabs- specifically the biological sampling that current done on the VT trawl survey. Having additional data from other surveys could provide more data for the years when the VT trawl survey does not run, as well as potentially support the development of a catch survey model in the region. Both Delaware and New Jersey have indicated that their surveys could be modified for the 2017 sampling year if requested.

- The group recommended that, in addition to Eric sharing his protocol for assigning crabs to age/sex classes with the group, other states or programs with sampling protocols for identifying males and females, age, maturity stage, presence/absence of eggs, and similar biological data, should share it with ASMFC staff so they can compile protocols and circulate them.
- 2016 Red Knot mark-resight population estimates: Kristen Anstead presented the mark-resight data and stop-over population estimate for red knots that Jim Lyons (ARM subcommittee member) developed for the ARM model. The stopover population for 2016 was estimated to be 47,254 birds (95% CI, 44,873-50,574), a decrease from the 2015 estimate (60,727) and a similar estimate as 2014 (44,010).
- Review of model output & Recommendation to Board/Discussion: Based on the red knot and horseshoe crab population estimates, the ARM model recommends harvest package #3 (500,000 male crabs and 0 female crabs). This is consistent with the last several years (2014-2017).

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

- Quota of horseshoe crab harvest for Delaware Bay region states. Allocation of allowable harvest under ARM package 3 (500K males, 0 females) was conducted in accordance with management board approved methodology in *Addendum VII to the Interstate Fishery Management Plan for Horseshoe Crabs*. Note: Maryland and Virginia total quota refer to that east of the COLREGS line.

State	Delaware Bay Origin HSC Quota		Total Quota	
	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

- The TCs were in agreement with maintaining these harvest levels and recommending harvest package #3.

## 2. Review draft Addenda VIII for Board Review

- ARM Model Review Process: Kristen gave a brief presentation to remind the TCs that the ARM model underwent an extensive review by the ARM subcommittee. The TCs previously received and reviewed a copy of the report summarizing the recommended changes and endorsed the review items for Board consideration. Among their recommended changes were two options for incorporating biomedical mortality into the ARM framework, a source of mortality that was formerly omitted from the model. The group reviewed the two options for including biomedical data, a preferred option that adjusts the harvest packages and a minority opinion which adjusts the population dynamics model.
- Addendum VIII: Kirby Rootes-Murdy gave a presentation regarding the proceedings of the August 2016 Board meeting. During that meeting, the Board tasked the ARM subcommittee with performing a sensitivity analysis around the proposed methods for incorporating biomedical mortality into the ARM framework, as well as consider alternative harvest packages that would provide for the possibility of female bait harvest in the region. This task initiated an Addendum because the preferred option for incorporating the biomedical data adjusts the harvest packages which were previously outlined in Addendum VII. The ARM subcommittee recently met to address these tasks, but expressed concern about the timetable for the sensitivity analysis, as well as formulating alternative harvest packages. The two TCs offered the following comments regarding this process:
  - While the TCs still endorse the preferred option for the incorporation of biomedical mortality in the ARM model, if the minority option is explored and

ultimately chosen, an addendum should not be needed since the harvest packages would not be altered.

- Wendy Walsh recommended that the Shorebird AP be re-engaged and invited to provide comment during the process to develop the Addendum, citing the need for non-agency shorebird scientists and the conservation sector to be involved as the ARM undergoes its first revisiting of the ARM process since 2012. Most members of the TC agreed.
- Some members of the group suggest that the Addendum be tabled until the benchmark stock assessment is completed in 2018. At that time, there may be revised biomedical mortality, a revised value for carrying capacity, or a more extensive modelling effort in the Delaware Bay that could affect the ARM model and necessitate further changes. Additionally, the earliest that any of these revisions in the ARM would be used for management is 2018, thus waiting for the benchmark or working in tandem would be the most beneficial and efficient.
- Other TC members suggested moving forward sooner. They felt that the ARM sensitivity runs could be completed by May 2017 and there would still be time to develop the Addendum and submit it to the Board by the annual meeting next year.
- Jeff Brust suggested that, in order to address the concerns that harvest package #2 and #4 are rarely chosen in simulation testing, the ARM subcommittee should perform simulations around multiple harvest packages and population estimates to determine more appropriate harvest packages. He stated that the harvest packages were not biologically based but rather the consensus of many stakeholders. Others agree that this should be considered in the future, recognizing that the task would be time consuming. It was also suggested that a simulation be done using the actual harvest (to reflect that NJ does not allow the harvest of their quota) of the Delaware Bay states in the population dynamics model, not the harvest package as the assumed level of harvest.

### **3. Review horseshoe crab surveys for report and summary to Board**

- Delaware Surveys: Jordan Zimmerman provided updates on the Delaware Bay spawning survey and Delaware 16' and 30' trawl surveys. For the Delaware Bay spawning survey, surveys were conducted in Delaware and New Jersey in May and June. The percent of females spawning on the beaches were 77% in Delaware and 81% in New Jersey, noting that New Jersey has had a higher proportion for 13 out of the 17 years. For the time series, the baywide index of spawning activity, males have a slightly positive slope, although it is not significant, and females have no increase or decrease over time (Figures 1-2). Additionally, the sex ratio was the same as it was in 2014. Jordy also presented the abundance indices for juveniles in the 16' trawl survey and the abundance indices for both the 16' and the 30' for adults (Figures 3-5).

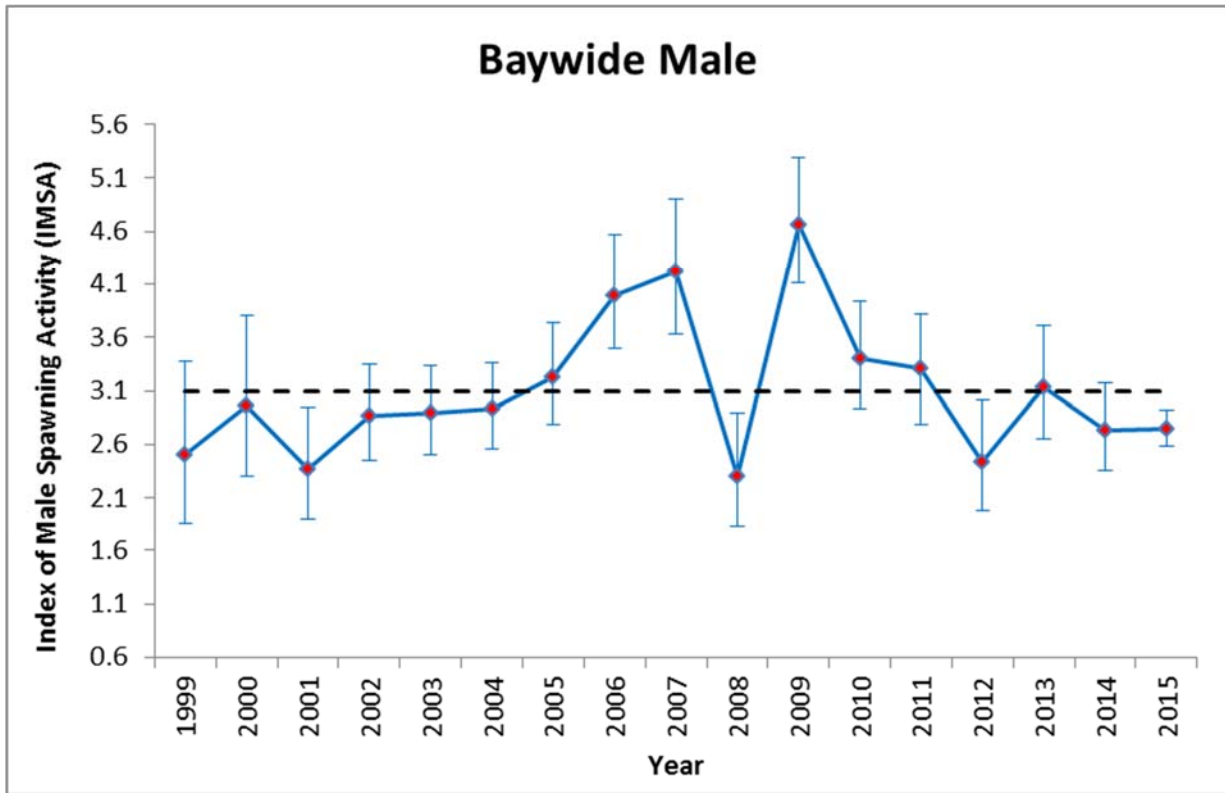


Figure 1. Index of male spawning activity in the Delaware Bay (New Jersey and Delaware combined).

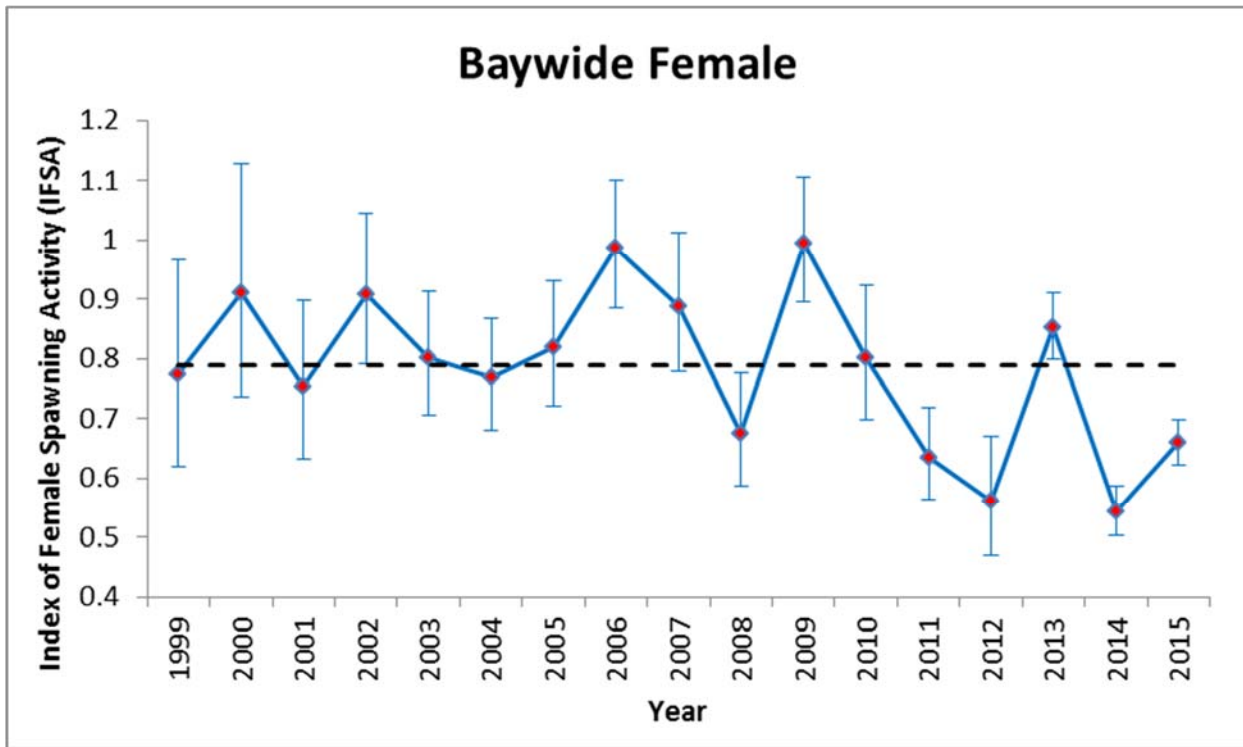


Figure 2. Index of female spawning activity in the Delaware Bay (New Jersey and Delaware combined).

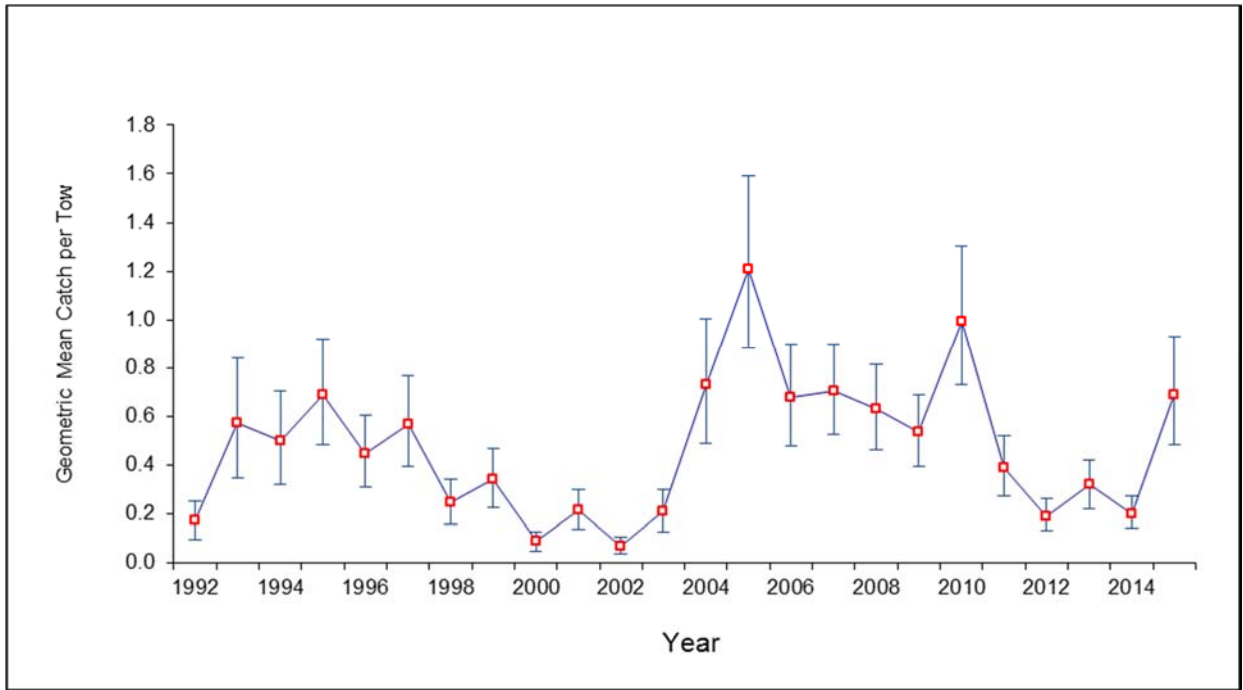


Figure 3. Index of juvenile horseshoe crab relative abundance from Delaware's 16ft trawl survey (all months sampled)

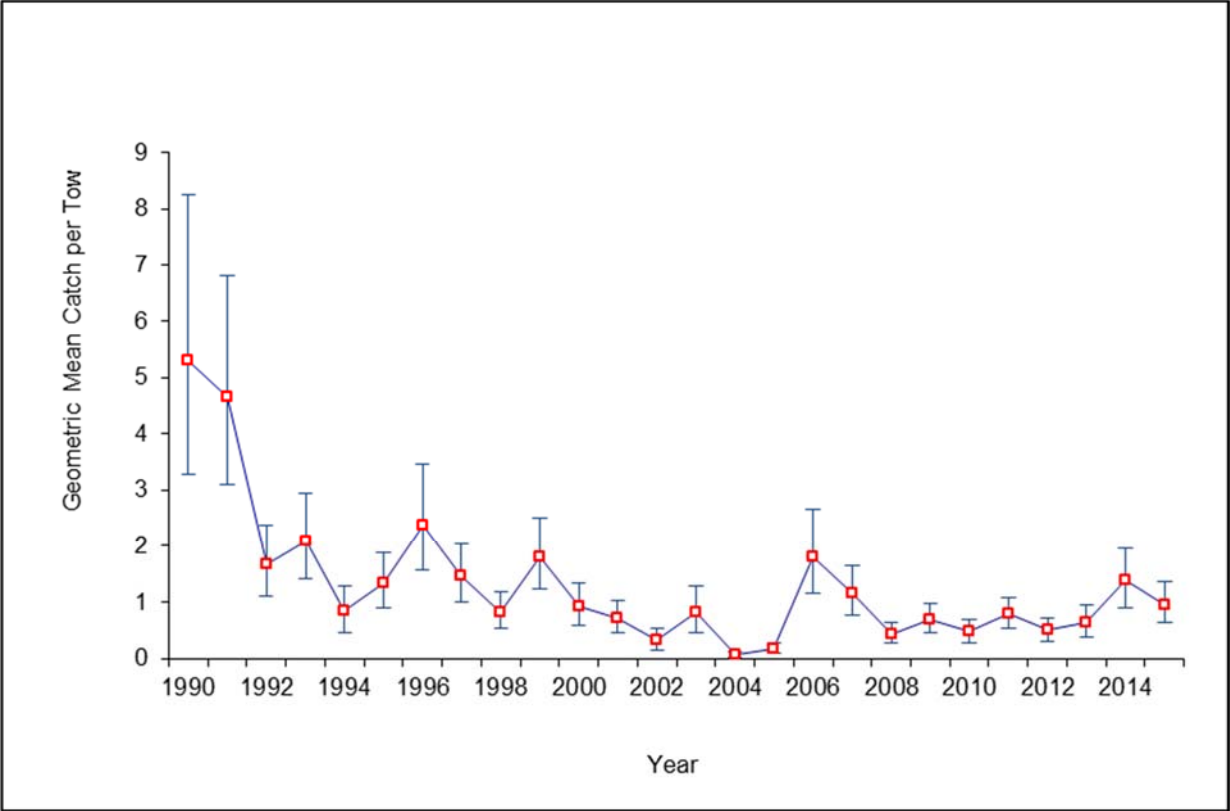


Figure 4. Index of adult horseshoe crab relative abundance from Delaware’s 30ft trawl survey (all months sampled)

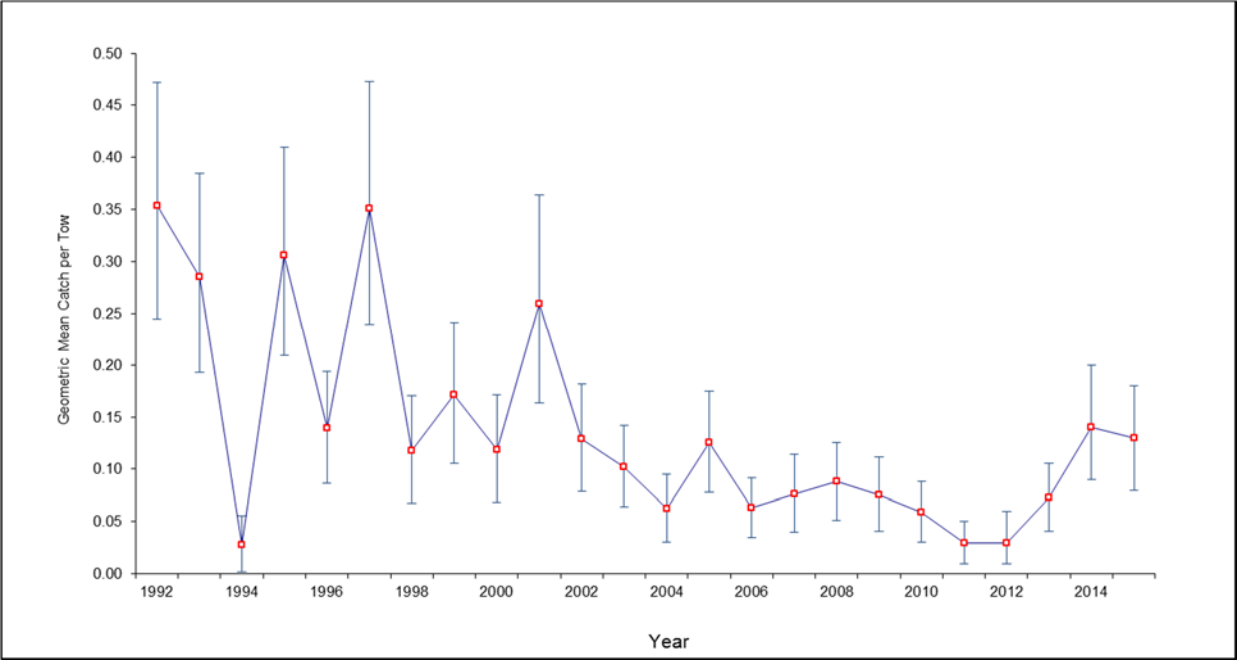


Figure 5. Index of adult horseshoe crab relative abundance from Delaware’s 16ft trawl survey (all months sampled)

- Maryland Surveys:** Steve Doctor presented the abundance index developed from Maryland’s offshore commercial trawlers (Figure 6). These data are collected from cooperating commercial trawlers from April to December. He noted that in 2008 the fleet started fishing at night to reduce the stress on the horseshoe crabs and because they catch better at night. A change in the catch rate is evident in the data and if this index is used going forward, a split in the index at 2008 should be considered. The TCs discussed whether this could be used as an abundance index for the region, expressing concerns when using fishery dependent data, but agreed that it should be considered more thoroughly in the future. Steve also noted that the Maryland spawner survey had a slight uptick in 2015 from the year before but that 2016 has not been added to the dataset yet.

**Horseshoe Crab Logmean Catch per Tow  
Offshore Ocean City, Maryland**

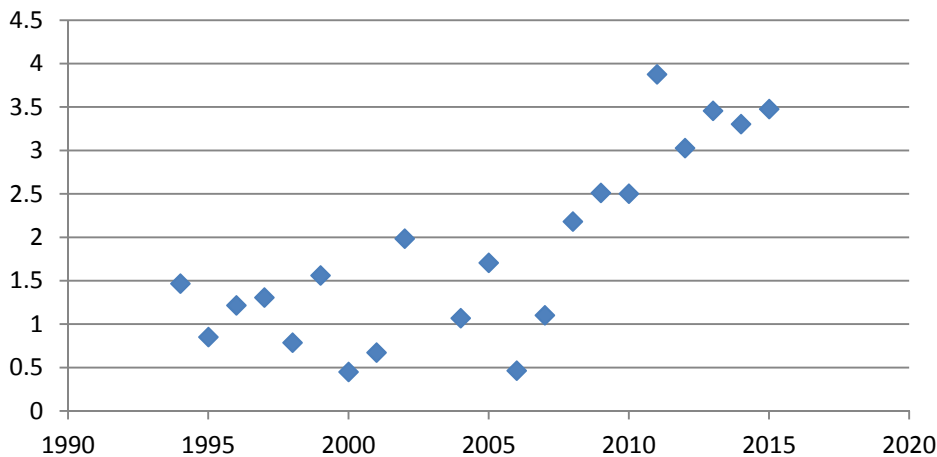


Figure 6. Horseshoe crab index developed from Maryland’s offshore commercial trawlers. The data are log transformed and the values are equivalent to a range of one to 60 horseshoe crabs per minute. Note that due to the change from day to night sampling, indices from 2008 forward are not comparable to the previous indices.

- New Jersey Surveys:** Jeff Brust presented the results from NJ’s Delaware Bay trawl survey and the NJ ocean trawl survey. For the Delaware Bay trawl survey, the female, male, and juvenile indices appear to be increasing since the early 2000s, although all are variable (Figures 7-9). For the ocean trawl survey, NJ started counting crabs (sexing them) in 1999 and have done so through the present. He showed the indices for male and female horseshoe crabs which appear to have a slight uptick in 2015 (Figures 10-11), but noted that there is no juvenile index since they are not caught in this survey. Jeff also noted that NJ lost funding for the surf clam dredge survey from 2012-2014, but got funding to do it in 2015 and 2016. A gear change occurred in 2015, when the survey transitioned from using a 6 ft knife to a 10 ft knife. A new index for the 2015 data has not yet been developed due to need to create conversion factors for different gear and vessel.



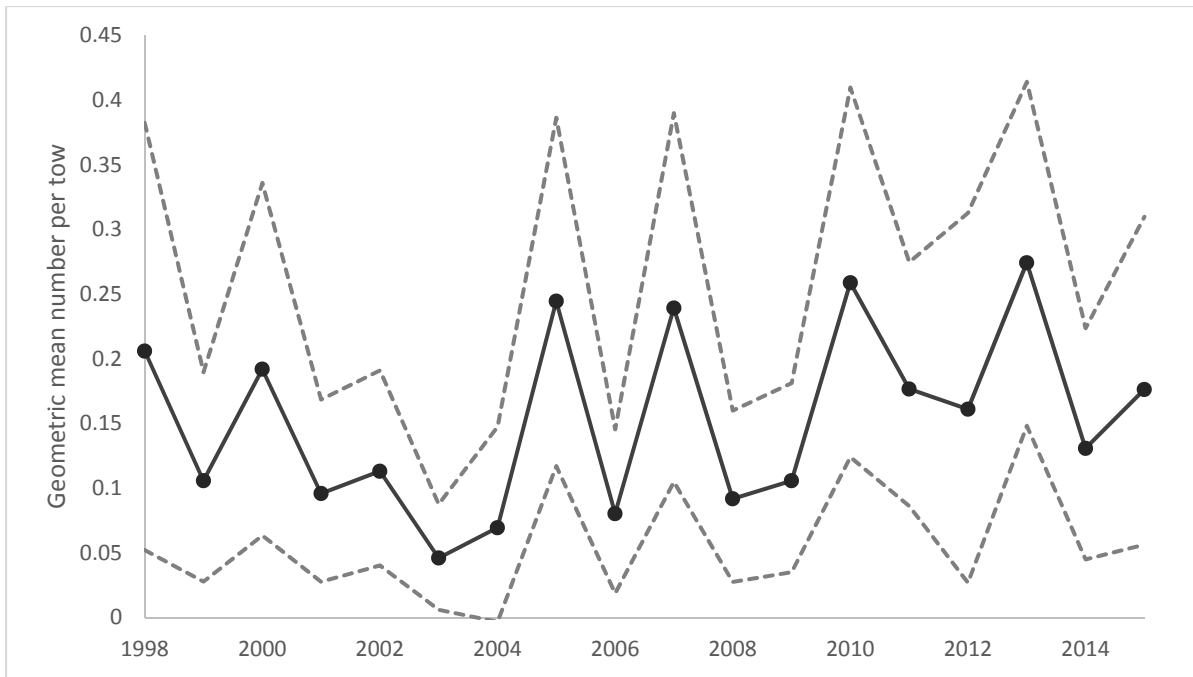


Figure 7. Female horseshoe crab index developed from New Jersey's Delaware Bay trawl survey with 95% confidence intervals.

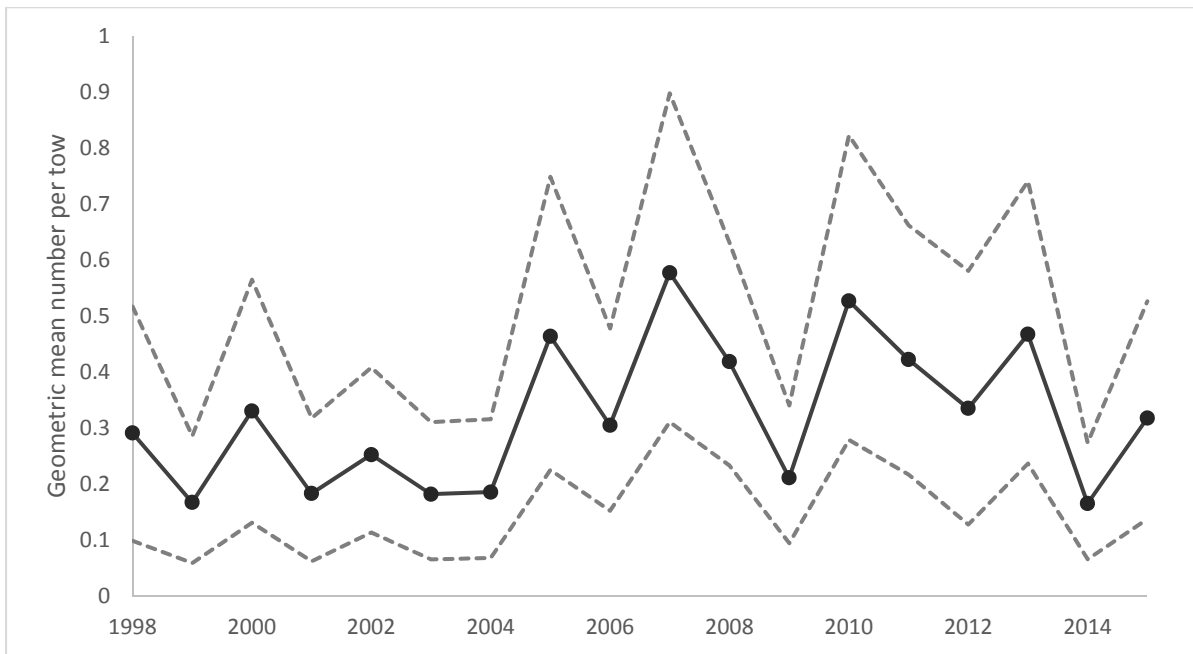


Figure 8. Male horseshoe crab index developed from New Jersey's Delaware Bay trawl survey with 95% confidence intervals.

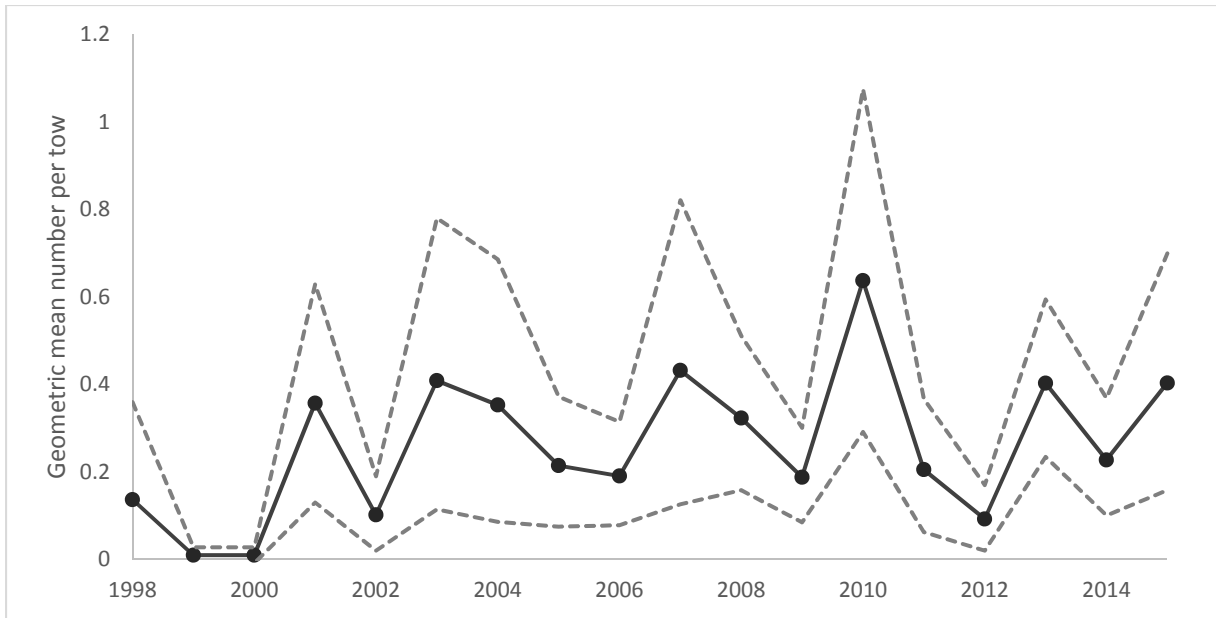


Figure 9. Juvenile horseshoe crab index developed from New Jersey's Delaware Bay trawl survey with 95% confidence intervals.

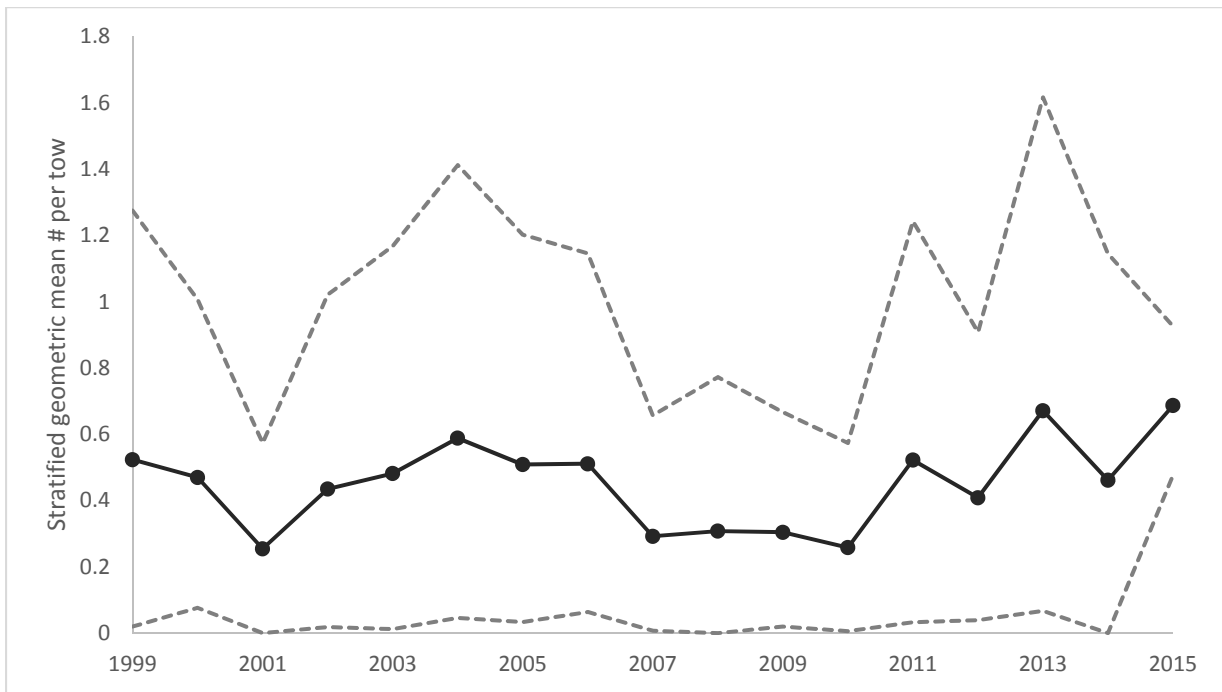


Figure 10. Female horseshoe crab index developed from New Jersey's ocean trawl survey with 95% confidence intervals, all months combined.

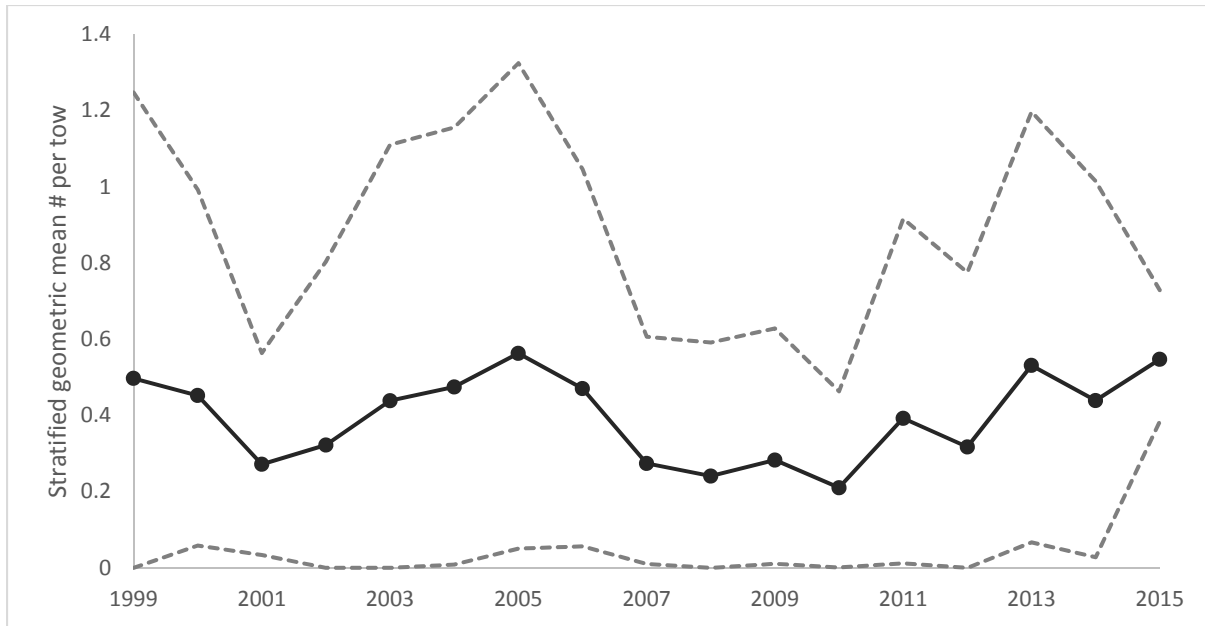


Figure 11. Male horseshoe crab index developed from New Jersey's ocean trawl survey with 95% confidence intervals, all months combined.

- Other states:
  - Virginia and North Carolina have no updates, as there are no state surveys that specifically target horseshoe crabs currently.
  - Rachel Sysak reported that New York has 3 sites for their spawning surveys that have been performed with the same methodology since 2007 and that they have recently expanded to 16 sites. New York also has fishery independent surveys, all of which have trends that bounce around except for one which consistently experiences declines.
  - Derek Perry reported that surveys in Massachusetts indicate an upward trend.
  - Tiffany Black in Florida informed the TCs that the state is trying to develop more citizen-based surveys in the region, but in the meantime they have an improvement from last year regarding the power plant that was capturing and dumping crabs in a landfill. Since last year, the plant now has to submit data and release the crabs alive.
  - Penny Howell from Connecticut reported that CT indices from the Long Island Sound trawl survey and NY seine survey are flat with no trend or change in the central and western basins, however, two indices for the eastern region (CT Millstone Power Station Trawl Survey and NY Peconic Bay trawl survey) have plummeted. Additionally, there have been several reports of large numbers of dead crabs over the last 5 years at spawning sites in the east and thus far the state has not been able to identify the cause. Note that the bait harvest occurs primarily in the central basin of the Sound.
  - Scott Olszewski reported that the 5 abundance indices from Rhode Island and the one spawning survey all indicate that the population is at low levels.

- Jeff Brunson in South Carolina reported that the state does not have a targeted horseshoe crab survey but that there is shrimp trawl survey that samples horseshoe crabs and that there is a lot of variability in the data.

#### **4. Update from US Fish and Wildlife on Red Knot ESA Listing Response**

- Wendy Walsh updated the group on the USFWS's efforts to address the 2015 listing of red knots as threatened. She explained that USFWS is currently undergoing an overhaul in their recovery planning and moving toward a new paradigm called a species status assessment (SSA). For new listing, the SSA will be written as part of the listing and carry forward into the recovery plan, but this was not done for red knots because SSA was still too new at the time of the listing. The USFWS is considering how to adapt the SSA paradigm for red knot. Wendy will be receiving training on the SSA process and will update the TCs on how this will effect red knots in the future. In the meantime, there is a critical habitat proposal in progress, but that is a lengthy process; a proposed rule is expected in 2017 with a final rule 1 year later. Wendy also reminded the TCs that any discretionary federal action that affects the red knot is subject to consultation with the USFWS. The ASMFC management of horseshoe crabs is not subject to Section 7 review since it is not a federal body, but is still subject to Section 9 that prohibits "incidental take". In the listing, USFWS concluded they did not expect ASMFC's horseshoe crab management to cause incidental take of red knots as long as the ARM Framework is in place and functioning as intended.

#### **5. Draft Alternative Bait Trials Proposal**

- Kirby updated the TCs that at the August 2016 Board meeting, the Board tasked the TCs with designing alternative bait trials for 2017. TC members discussed their many concerns with the previous attempt at alternative bait trials using product from LaMonica Foods. Future trials will need to address issues concerning the availability of the bait, cost, location of delivery, fishermen participation and incentives, and whether or not the TC should be involved in testing a product for a single company which at the moment is the only commercial source of this bait. Kirby reminded the group that the current action does not necessarily involve LaMonica Foods. After Derek outlined a successful survey program in MA where fishermen provided information on baiting practices and costs in the whelk fishery, the TCs made the following recommendations:
  - Each member state should modify MA's survey to reflect the fisheries in their area and circulate to (whelk, eel, and others if appropriate) fishermen to obtain information about current practices. This will inform the TC about what type of bait mixtures the fishermen are currently using, cost per unit, amount of horseshoe crab in current bait, etc. as a context for any alternative bait practices.
  - The development of a project testing alternative baits may be better suited to a research facility, such as Sea Grant's resource advisory group or a university.

## 6. Election of TC Vice-Chairs

- Currently, the Horseshoe crab TC chair is Steve Doctor and the Delaware Bay Ecosystem TC chair is Greg Breese and neither TC has a vice-chair.
  - Rachel Sysak (NY) will serve as vice-chair for the Horseshoe crab TC.
  - Audrey DeRose-Wilson (DE) will serve as vice-chair for the Delaware Bay Ecosystem TC.

## 7. Other Business

- Kristen polled the group to see if there were any ongoing telemetry studies for horseshoe crab for the potential development of a multispecies, multilocation database in the future. Only NY (through Cornell and Stony Brook) and MA (a project out of Wellfleet Bay) said they had ongoing telemetry projects. All other known projects were small-scale or one-time studies.
- Mandy Dey provided the group with some tagging data from Limuli that was conducted when they were granted an exempted fishing permit in the Shuster Reserve. These data provide the potential to update the current lambda values (in Addendum VII) for the percent of Delaware Bay origin crabs is in each state. Limuli's tagging study indicates that Maryland's proportion of Delaware Bay crabs is closer to 87%, not the currently used 51%. Eric offered that this is what would be expected when sampling exclusively in the Carl Shuster Reserve and others agree. The current lambda values are based on genetics and previously the tagging data from USFWS database was previously rejected for use in developing the lambda values. More data would be needed to revise the current lambda values, although the use of Limuli's data for other purposes in the benchmark stock assessment should be explored. Additionally, it is agreed that all states need more outreach to improve tag returns.
- Mandy also presented a report regarding the status of red knots that she provided to the TCs. The peak abundance of red knots stopping in Delaware Bay, as determined from aerial and ground surveys, has remained stable but low over the last decade. The proportion of red knots reaching 180 grams by late May declined in 2016 to 56% from 77% in 2015, but it was commensurate with the proportions observed in 2012-2014.