

Atlantic States Marine Fisheries Commission

Horseshoe Crab Management Board

*October 30, 2014
8:00 a.m. – 9:00 a.m.
Mystic, Connecticut*

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*J. Gilmore*) 8:00 a.m.
2. Board Consent 8:00 a.m.
 - Approval of Agenda
 - Approval of Proceedings from February 2014
3. Public Comment 8:05 a.m.
4. Horseshoe Crab Technical Committee Report (*P. Howell*) 8:15 a.m.
 - Shorebird and Horseshoe Crab Survey Reports Summary
 - ARM Framework Harvest Output for 2015
5. Set specifications for 2015 Delaware Bay Fishery (*J. Gilmore*) 8:30 a.m.
Final Action
6. Consider 2014 FMP Review and State Compliance (*M. Hawk*) 8:45 a.m.
7. Elect Vice-chair (*J. Gilmore*) **Action** 8:55 a.m.
8. Other Business/Adjourn 9:00 a.m.

The meeting will be held at:
The Mystic Hilton, 20 Coogan Boulevard, Mystic, Connecticut (860) 572.0731

MEETING OVERVIEW

Horseshoe Crab Management Board Meeting
Thursday, October 30, 2014
8:00 a.m. – 9:00 a.m.
Mystic, Connecticut

Chair: Jim Gilmore (NY) Assumed Chairmanship: 10/14	Horseshoe Crab Technical Committee Chair: Penny Howell (CT)	Law Enforcement Committee Representative: Messeck
Vice Chair: Vacant	Horseshoe Crab Advisory Panel Chair: Dr. Jim Cooper (SC)	Previous Board Meeting: February 6, 2014
Shorebird Advisory Panel Chair: Dr. Sarah Karpanty (VA)	Delaware Bay Ecosystem Technical Committee Chair: Greg Breese (FWS)	
Voting Members: MA, RI, CT, NY, NJ, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (16 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from February 6, 2014

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Horseshoe Crab Technical Committees Report (8:15 – 8:45 a.m.) Final Action
Background <ul style="list-style-type: none"> • HSC TC and DBETC jointly met on September 16, 2014 • Reviewed ARM harvest output, horseshoe crab surveys and discussed a few other issues
Presentations <ul style="list-style-type: none"> • TC Report by P. Howell (Briefing CD)
Board actions for consideration at this meeting <ul style="list-style-type: none"> • Consider ARM harvest recommendations

5. Fishery Management Plan Review (8:45 -8:55 a.m.) Action

Background

- State Compliance Reports are due on March 1
- The Plan Review Team reviewed each state report and compiled the annual FMP Review.
- Massachusetts, New York, and South Carolina have requested and meet the requirements for *de minimis*.

Presentations

- Overview of the FMP Review Report by M. Hawk (**Briefing CD**)

Board actions for consideration at this meeting

- Accept 2014 FMP Review and State Compliance Report.
- Approve *de minimis* requests (*if any*)

6. Elect Vice Chair (8:55 -9:00 a.m.) Action

Background

- Dave Simpson chairmanship will ended February 2014
- The vice chair seat is now empty

Board actions for consideration at this meeting

- Elect Vice Chair

7. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

HORSESHOE CRAB MANAGEMENT BOARD

Crowne Plaza - Old Town
Alexandria, Virginia
February 6, 2014

These minutes are draft and subject to approval by the Horseshoe Crab Management Board
The Board will review the minutes during its next meeting

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INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).
2. **Approval of Proceedings of October, 2013** by Consent (Page 1).
3. **Move to approve the transfer request from Georgia to North Carolina** (Page 2). Motion by Louis Daniel; second by James Estes. Motion carried unanimously (Page 2)
4. **Motion to adjourn, by Consent** (Page 21).

ATTENDANCE

Board Members

Doug Grout, NH (AA)	Tom O'Connell, MD (AA)
Dan McKiernan, MA, proxy for P. Diodati (AA)	Bill Goldsborough, MD (GA)
Jocelyn Cary, MA, proxy for Rep. Peake (LA)	Russell Dize, MD, proxy for Sen. Colburn (LA)
Robert Ballou, RI (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
David Simpson, CT (AA)	Louis Daniel, NC (AA)
James Gilmore, NY (AA)	Bill Cole, NC (GA)
Pat Augustine, NY (GA)	Spud Woodward, GA (AA)
Russ Allen, NJ, proxy for D. Chanda (AA)	Pat Geer, GA, proxy for Rep. Burns (LA)
Chris Zeman, NJ, proxy for T. Fote (GA)	James Estes, FL, proxy for J. McCawley (AA)
Stewart Michels, DE, proxy for D. Saveikis (AA)	Mike Millard, USFWS
Bernie Pankowski, DE, proxy for Sen. Venables (LA)	Derek Orner, NMFS
Roy Miller, DE (GA)	Martin Gary, PRFC
Stew Michels, DE, proxy for D. Saveikis (AA)	

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

James Cooper, Advisory Panel Chair

Staff

Robert Beal	Marin Hawk
Toni Kerns	Kate Taylor

Guests

Mitchell Feigenbaum, Leg. Proxy, PA	B. Hoffmeister, Falmouth, MA
John Clark, DE DFW	Sheila Eyler, USFWS
Allen Bugenson, Lonza Walkersville	Wilson Laney, USFWS
Aaron Kornbluth, Pew Trusts	Gene Slowinski, Rutgers Univ.
Chris McDonough, SC DNR	Kelsey Rooks, VMRC
Benjie Swan, Limuli Labs	Joan Dize, Tilghman, MD
Katherine Swan, Cape May, NJ	Ron Berzofsky, WAKO USA
M. Dawson, Falmouth MA	Carl Thurston, Arlington, VA

The Horseshoe Crab Management Board of the Atlantic States Marine Fisheries Commission convened in the Presidential Ballroom of the Crown Plaza Hotel Old Town, Alexandria, Virginia, February 6, 2014, and was called to order at 1:20 o'clock p.m. by Chairman David Simpson.

CALL TO ORDER

CHAIRMAN DAVID SIMPSON: Okay, let's get going with horseshoe crabs. My name is Dave Simpson, and I'm the chair of the Horseshoe Crab Board. The first order of business is to approve the agenda. Are there any changes to the agenda? Seeing none; we will consider it accepted.

APPROVAL OF PROCEEDINGS

Approval of the proceedings from our annual meeting; are there any comments or issues with the proceedings? Seeing none; we will consider those approved.

PUBLIC COMMENT

The next item is public comment for items that are not on the agenda. Does anyone have a comment? Go ahead, please, items not on the agenda.

MS. BENJIE SWAN: Benjie Swan; and I wanted to make a comment on the biomedical aspect of it, so should I wait for the discussion?

CHAIRMAN SIMPSON: That would be great, thanks. Okay, is there anyone else for public comments for items not on the agenda? I don't see anyone; so the next agenda item is to review the transfer request from North Carolina. Marin.

DISCUSSION OF THE TRANSFER REQUEST FROM NORTH CAROLINA

MS. MARIN HAWK: This is a transfer request from North Carolina to Georgia. North Carolina exceeded its quota of 24,036 horseshoe crabs in 2013. Most of their horseshoe crabs are caught in the blue crab trawl fishery. The commercial horseshoe crab fishery closed on August 1st, but the preliminary trip estimates – they closed the

fishery on August 1st because preliminary trip estimates showed that the quota was close to being exceeded.

The quota was exceeded by approximately 2,247 crabs. North Carolina has requested the transfer of 3,000 crabs from Georgia. This request was reviewed by the Shorebird and Horseshoe Crab Advisory Panels, the Horseshoe Crab Technical Committee and the Plan Review Team.

The technical members that reviewed this plan just suggested a re-evaluation of the North Carolina quota due to the multiple overages that have occurred. There was a transfer request in 2009, 2011 and 2012. They just wanted to point out that the current quota of 24,036 crabs is based on the 1998 landings; so a directed fishery seems to be developing. They had no other concerns with this transfer request.

In conclusion, the plan review team does not oppose the transfer request given the small number of crabs and the previous transfer precedence; but they did suggest that perhaps North Carolina could return to the 2012 management approach, which was having a trip limit of zero crabs until April 1st and a trip limit of 50 crabs after April 1st. Thank you, Mr. Chairman.

CHAIRMAN SIMPSON: Are there any questions on the transfer request? Roy.

MR. ROY MILLER: Just so I understand the nature of the request, the Georgia crabs are available from what source in Georgia? Georgia is a de minimis state if memory serves, correct, so where do the crabs come from in Georgia?

MS. HAWK: From their quota. It is just a transfer of quota.

MR. MILLER: De minimis states have a quota; refresh my memory on that.

MS. HAWK: Georgia is not a de minimis state, I don't believe, so it does have a quota.

CHAIRMAN SIMPSON: With some other species there is a paperwork process of transfer

offers and acceptance; has all that paperwork been filed? That would demonstrate that they have sufficient quota to transfer. Are there any limitations on transfer between states; are there limitations geographically on transfer?

MS. HAWK: No; there are no such limitations.

CHAIRMAN SIMPSON: Okay, are there further questions? Louis, do you have anything to add on your request.

DR. LOUIS B. DANIEL, III: This has just been an ongoing problem; and we're doing our dead-level best to limit the fishery. We keep cutting back on the trip limits. We've think we've got a handle on it now. There had been discussion back several years ago where we had requested – and I can't remember who we requested the crabs from; but the technical committee did reject our request for some crabs out of I think it might have been Massachusetts.

I can't remember where; but they said we needed to look closer to home for a similar population. That is why we have been begging and pleading with Georgia; and they have been very helpful in granting our request. I would just ask you to – I think I've got it under control; so I would appreciate a favorable vote on my motion to accept the North Carolina transfer request.

CHAIRMAN SIMPSON: Okay; and that was your motion?

DR. DANIEL: Yes.

CHAIRMAN SIMPSON: Do we have a second to that motion; Jim Estes from Florida. Is there any discussion on the motion? **Okay, so the motion is to move to approve the transfer request from Georgia to North Carolina. Motion by Dr. Daniel and seconded by Mr. Estes.** Is there discussion on the motion? Do you need time to caucus? All those in favor please raise your hand, 14 in favor; any opposed; any abstentions or null votes. **The motion passes unanimously, 14-0.** The next agenda item is an update on New

England and New York stock trends. John is going to take that.

UPDATE ON NEW ENGLAND AND NEW YORK STOCK TRENDS

MR. JOHN SWEKA: In 2013 and at the last management board meeting Penny Howell, the technical committee chair, presented the 2013 Horseshoe Stock Assessment Update. The majority of that update used ARIMA modeling. That is auto regressive integrated moving average modeling to examine trends and abundance indices up and down the coast.

Ultimately it estimated the probability the terminal year of an index of being below either an index-based reference, which we chose the 25th percentile, or the 1998 index value. The reason why we used the 1998 level as an index was because that's when the first FMP was initiated. Okay, this tables shows the number of indices within a region where the terminal year of the index was below an index-based reference point both for the probability of being below the 1998 index point and then also the 25th percentile.

This compares the 2013 update to the 2009 stock assessment. In the Southeast Region and in the Delaware Bay Region things seemed to be either increasing or at least holding steady in those regions. However, New York and New England we see again a continued decline. We went from one out of five surveys to three out of five surveys, for example, in New York now being below the 1998 index-based reference point. Likewise, in New England things also appeared to be getting worse.

This caused the management board to charge the technical committee and stock assessment subcommittee with further examination of trends in the New York and New England regions. This was to include biomedical mortality from these regions. The question is could that be a possible reason why we see continued declines in New York and New England?

However, in trying to use biomedical data to assess mortality from that industry; we run into data confidentiality issues. Within the New York and New England regions, there is only one biomedical company harvesting and bleeding crabs, and the Associates at Cape Cod. So what we did, I got permission to use some of that biomedical data to help examine the trends in New York and New England a little more closely.

We looked at the survey indices from New York and New England. In New England we had eight fishery-independent surveys; in New York, six different indices. These were then combined to develop a composite index of New York and New England indices with linear mixed effects models.

Within these models, the random effect in these models was each survey; so each survey was allowed to fluctuate independently of the other surveys. Then before running this model, we scaled the surveys so that their values were within the same order of magnitude; basically just moved the decimal point on the yearly index from each survey.

For the bait harvest, for New England, this was ASMFC reported landings from Maine, New Hampshire, Massachusetts and Rhode Island; and likewise from New York it was landings from Connecticut and New York. For the biomedical harvest, as I said, we obtained data from Associates of Cape Cod. The kill from the biomedical industry equaled the released horseshoe crabs after bleeding multiplied by – the technical committee assumed a mortality rate of 15 percent mortality on bled crabs, plus any dead crabs that suffered mortality prior to the bleeding.

We did not include any horseshoe crabs that ultimately went into the bait industry; so there was no double counting in our assessment of biomedical harvest. From these data, then given the biomedical harvest, the bait harvest and our composite index of abundance, we calculated an index of relative F.

The relative F for the bait industry was just the bait harvest divided by the composite index for a

given year. The relative F for the biomedical industry was the biomedical kill divided by the composite index in a given year. Okay, this graph just shows the bait harvest that is reported to ASMFC and how it has changed through time since 1998.

You can see after 2000 both New York and New England bait harvest has greatly decreased and has bounced around at a much lower level over the past decade. Here we have the composite indices for New York and New England. We went back to 1990. There were a few surveys in the New England Region that went farther back in time than 1990; but we for this analysis just cut it off at 1990 and to the present.

As you can see in the New England Region, you see a big decline from about 1995 onward and the index has bounced around at low levels since the early 2000s. In the New York Region, the index bounced around early in the time series and it shows more variability than the New England index; but since about 1996 there is a general decline downward in the New York Region.

For the relative F, again this was just the bait and biomedical harvest divided by that composite index in each year. For New England, the bait industry has fluctuated through time; it has gone up and down. It was decreasing until about 2011 and then in 2012 went back up. For the New England biomedical relative F, it shows a fairly similar pattern to that of the bait industry with that peak there in about 2008, followed by a decline and then an increase again in 2012.

Now, one thing you will note on the bottom graph for the New England biomedical relative F, I have the Y axis labels off just because of those data confidentiality issues. At a minimum we can say from this is that the biomedical relative F seems to be tracking or showing the same similar trend up and down as the New England bait relative F.

In the New York Region, the relative F for the bait industry decreased in the early 2000's, which would be expected because of the big harvest decline; but it has generally shown a bit of an

upward trend since the early 2000's. In the New York Region, none of the crabs that are bled from the Associates of Cape Cod came from the New York Region or least what we're calling the New York Region; so the relative F for the biomedical industry in New York was essentially zero across the time series.

So some conclusions from this further analysis of New York and New England, the composite indices show declining trends, which this was a new analysis that we didn't have in the stock assessment update, but it is nice to see that it also agrees with the 2013 stock assessment update; that those regions are continuing to decline.

The bait harvest was reduced in both regions after 2000; and trends in relative F for the New England Region are similar between the bait harvest and biomedical mortality. Bait relative F shows some upward trend after 2003 in the New York Region. Again, there was no biomedical harvest from the New York Region.

However, we still have quite a few questions that remain in our assessment of horseshoe crabs. First, how does the biomedical mortality in the New England Region compare to the bait mortality? Like I said, I had to leave the scale in that Y-axis off because of those data confidentiality issues; so it is hard to really get a feeling for how the two compare.

Is total mortality, bait plus biomedical, still too high to allow population growth in both of those regions. Should the bait and/or biomedical take be reduced in those regions? The big question is how does assessment of horseshoe crabs advance given the data confidentiality issues? Coast-wide biomedical mortality in 2012 was estimated at 10 percent of the total harvest of all horseshoe crabs and with the bait and biomedical industries combined.

We're in a situation where there is not a whole lot more we can do in horseshoe crab assessments without having access to biomedical data. In our 2009 stock assessment for the Delaware Bay Region, it was the first year that we could start to

do a catch survey model to get some better benchmarks and better estimates of horseshoe crab mortality in that area.

However, we didn't include that in the 2013 update; and the reason why we didn't include it is because we realized the estimated biomedical harvest was approaching a point to where it wasn't negligible anymore. Therefore, since we couldn't include the biomedical harvest for the Delaware Bay Region, we didn't run that catch survey model again.

The confidentiality issue is not just an issue for New York and New England to try to figure out what is going on in those regions. It has implications for a coast-wide assessment of horseshoe crabs. Thank you.

MR. PATRICK AUGUSTINE: It is a great report. Okay, can I have that one back, the last shot up there with your conclusions on it, please? Okay, so let's go to the second point; is total mortality, bait plus biomedical, still too high to allow population growth in both of those regions? The question is does the technical committee see a trend as to how we can improve it?

If you can't see a trend and we continue to see it go down, without the confidentiality information being made available, it forces one to come to the conclusion we have to reduce them both. Now, that is a leap of faith, but that is based on the fact that we don't have adequate information.

The next line; should bait and biomedical take be reduced in those regions; and the answer would be yes. Unless you could answer those questions without more adequate information, I would wait to hear all the questions around the table. But, boy, it raises a real big red flag. If you can't get the information and we can't determine it is one or the other, then we have to reduce them both.

We have a high level of poaching in the state of New York; and I don't want to get off the main subject. Jim's staff is attacking that, but it is still very high. You have seen reports and our trend is continuing down because of the value of those

animals. If you can address those questions, I would appreciate it.

MR. SWEKA: Yes; that is a very difficult one. We know what the bait is because that is reported. We still have this declining trend. In the New York Region, given that there was – at least from Associates of Cape Cod there are no horseshoe crabs harvested for the biomedical industry from the New York Region. All the mortality is associated with the bait industry. But in the New England Region, because of that confidentiality issue, it is hard to tease apart – we can't say the relative effects of each.

CHAIRMAN SIMPSON: I had a quick question or two, and then I need to get to Mike. Did you report – I missed it if you did – the harvest in comparison to the quota for each state; what proportion of the quota are we taking?

MR. SWEKA: I didn't report that in this presentation. It is something we could easily look up. I don't know it off the top of my head.

CHAIRMAN SIMPSON: Okay, that would be a starting point. If our quota is too high to achieve rebuilding, then that is probably where we want to start is to address it through that approach. Marin.

MS. HAWK: Just off the top of my head; I don't think any of the states are that near to that quota, but I can easily look on my computer and let you know.

CHAIRMAN SIMPSON: The other observation I made from your presentation was that the relative F value was pretty volatile for the New England Region; and for a relative F that seemed a little bit surprising. I wondered if you felt that was more due to the variability in the survey indices or in the harvest removal side of the equation.

MR. SWEKA: I would say it is both; probably more the survey indices than the harvest. From that graph, the graph of the survey index went back to 1990, but our relative F calculations were only from 2004 onward. Because of that big reduction in the composite index, there is still

quite a bit of fluctuation that you don't really notice just because of the scale of that graph.

DR. MIKE MILLARD: I think Pat touched on most of my issues, but I guess I do have a question for John; a fairly simple question, but I would like to get it on the record. From the technical committee's standpoint were we not bumping up against this confidentiality issue; do you feel that we would in fact have a better management or we could move forward and manage the harvest better, in a more efficient or effective way?

MR. SWEKA: I would say yes at least from a more transparent perspective. Like I said, the biomedical harvest coastwide has gotten to the point where we can't ignore it any longer. It is upwards of 10 percent and it is showing an increasing trend through time. In order to do scientific management of horseshoe crab, we have to be able to account for that in any stock assessment models that we would like to run into the future.

For example, the catch survey model in the Delaware Bay, we didn't run it in the 2013 update because we knew we're missing a good portion of the total kill of horseshoe crabs. In the New York and New England Region, our data isn't quite as good as what it is in the Delaware Bay, but there are some other methods that we'd like to be able to run, but we still don't have that full harvest or full fishery mortality component to include.

CHAIRMAN SIMPSON: I will just observe that data confidentiality is something that we live with in every state and at the commission because the data are protected. We've run into this issue trying to examine alternative management strategies for lobster, for example, and we couldn't look at landings by state and month because the data might be confidential.

I think one of the particular aspects of horseshoe crabs is that we have a reported time series of bait landings and then a more recent introduction of this biomedical component; so even reporting the landings in a composite fashion, by simple subtraction from old documents you could

determine what someone's individual level of participation in the fishery will say was. That would violate our confidentiality rules both at the commission; and certainly if you were in Connecticut, I could release the data by state law. Are there other comments or questions? Tom.

MR. THOMAS O'CONNELL: I know that the next agenda item is on biomedical and confidentiality, but just an observation for a number of years now we've kind of seen this decreasing trend in the New York Region at least. I am wondering does the technical committee have some suggestions on what action should be needed.

We know that this species is long-lived, late maturing, low fecundity. The longer we wait and if it gets to a serious situation, it is going to be a long time to try to get that population to recover. I'm kind of curious are we looking for the next steps? Do we need to charge the technical committee with coming back and giving us some recommendations or are they looking for some guidance from us? What are you looking for today I guess my question is?

MR. SWEKA: Penny is actually the technical committee chair, but I guess on her behalf I would say the technical committee would probably be looking for some guidance on how to proceed from here on out. I know at least from a stock assessment subcommittee perspective, that is what we're looking for; what more can we do?

CHAIRMAN SIMPSON: And the greater decline was in the New York Region, wasn't it?

MR. SWEKA: The greatest decline is in the New England Region, but New York is also trending downward.

CHAIRMAN SIMPSON: So, yes, we are probably looking to provide the technical committee and the stock assessment subcommittee with some guidance on what we'd like to see so that we can make decisions about our quota management system. Having said that, I think Marin has some details now on how our harvest

has compared to the quota in the last year or in recent years.

MS. HAWK: Yes; Kate is hopefully going to help me here and put up just a very quickly put-together graph of the quota in Massachusetts and New York because are the two states with the highest bait landings versus their bait landings since 1998. Keep in mind both of these states have elected to have a quota that is lower than the commission put forth for them.

For Massachusetts the commission quota is 330,377 crabs and they have chosen to implement a quota of 165,000 crabs; and for New York, their quota is 366,272 crabs and they have chosen to implement a quota 150,000 crabs. These quotas that are on this graph are the state-chosen quotas, so they are about 200,000 crabs below what the commission plan indicates these states should have. Again, I put this together very quickly.

Massachusetts is the blue line and the Massachusetts quota is the green line. This graph kind of indicates that it is pretty much below that quota. New York is a little bit closer to New York's quota but still not really going over it. Again, they're very far below the FMP quotas for both of these states.

MR. JAMES GILMORE: Thanks, Marin; that was some of the things I was going to bring up. I want to make sure that John has got a notation on his harvest chart that we had voluntarily dropped our quota, so some of those harvests drops you see were just from a voluntary harvest reduction.

We've had a great deal of difficulty even managing that because of a couple of things. We did have a much higher harvest and actually we're concerned now because we're about to put regulations and limiting Asian horseshoe crabs to prevent them. The first thing we got back from our fishermen was that, well, you need to increase the quota back to 360, which we're reluctant to do because we've been watching this and we're concerned about it.

I don't know what all the reasons are, but one of them – and I will put this out and maybe following Tom O'Connell's idea before about maybe something the technical committee could look at – part of this is because of the moratorium to the west of us. We really have a poaching problem and it has driven the price up and we can't keep up with it.

Harvesting horseshoe crabs, you need a pickup truck and a freezer, and it is not really difficult to get into this fishery, and it is very difficult for our law enforcement guys to really stay on top of it. I know New Jersey has had their issues and I understand what they're doing, but it really gets down to that Fisheries Management 101.

It is like putting a moratorium on a healthy stock is a bad idea, and I think we're starting to see that. Is there any way that we could maybe from a technical standpoint evaluate that this moratorium could really be having part of the problem of the overharvest. It is actually backfiring. If you're doing a moratorium to the west that is actually increasing price to the east and that is causing more harvest, then you're having now an effect on the population. If there is anything that could be done on that; that would be great. Thanks.

MR. DAN McKIERNAN: We've done a number of things in Massachusetts that keep our landings constrained. We've adopted, similar to Rhode Island, the lunar closures; so we don't allow any harvest in the spring during the five days around the new and full moon. We're in the process of reducing the mobile gear limits down to 300 crabs a day. It is mostly a Nantucket Sound Fishery.

We've been aggressive, but by and large these are localized stocks. We have horseshoe crabs in Barnstable Harbor and Wellfleet Harbor. These are areas north of Cape Cod that have no relationship to those that are off Nantucket. We talk about a regional decline, but these are really localized stocks; so it really falls upon us to manage this not at the local level but more or less on the local scene. It is not a locally managed species in Massachusetts; it is something under our purview.

I did want to point out that the early years that keep being shown – and I brought this up at the last meeting – the 1998/2000 time series; that data is bogus. The information that was brought forward was back-of-the-envelope calculations. It was not based on any signed catch reports by individual fishermen. I hope that going forward we more focus on, say, the 2002 onward trends because that is when we really had valid catch reports.

As far as poaching goes – Pat mentions poaching – maybe it will be useful to ask the Law Enforcement Committee to address this or at least describe what efforts each of the state agencies has done. I don't think my state's law enforcement group has made this a priority because, frankly, it hasn't been.

Maybe that would be a worthwhile effort for the Law Enforcement Committee to bring forward some report as to how much effort they've put into that and recommendations to how to improve that. My last comment in response to Jim, two meetings ago we started talking about this whelk fishery that is proliferating, but most of us around the table don't have an aggressive effort control plan on the whelk pots.

That is where most of the demand is; so it makes sense if we're trying to control the harvest of horseshoe crabs, to try to look at the demand for this bait. I think that some of the rules or the lack of rules allowing the growth of in the whelk pot fishery is somewhat irresponsible and is probably going to collapse those stocks.

Maybe we don't have that far to go before the stocks have collapsed. The last point is I know Delaware has been working really hard and some of the manufacturers to come up with a substitute bait. Maybe we all ought to consider requiring either the pucks, the artificial bait, or put some limits on how much horseshoe crab you can put into a pot.

Granted, it is not an easy thing to regulate, but neither are a lot of the other rules we have. I think there are a whole lot of issues here that we should

be taking up. I think on the demand side, that is probably something we should address because I don't think horseshoe crabs are going to last. Of course, the ex-vessel price is going up so high, it is constraining. Those are my comments.

CHAIRMAN SIMPSON: I think it is a good suggestion that we get some feedback from the Law Enforcement Committee on what they're seeing and how high a priority there is and what their issues are; because as we know with every FMP it only as good as the enforcement that is applied. That is an important component not to be overlooked. Pat.

MR. AUGUSTINE: That was a good conversation and I'm glad you brought that up, Dan. Do you recall back in Philadelphia – I guess it was three or four years ago – when we talked about what the other options were that fishermen could do; and there were bait bags made available. That was a pitch to reduce the usage of horseshoe crabs. Instead of using the whole horseshoe crab, cut it in half or quarter it, we still have guys doing that.

But then there was also a bait on the market that was being developed, a piece of leather of some sort that seemed to last pretty well. We don't hear anymore about that; and it just seems as though those initiatives have kind of fallen by the wayside or maybe they're being used and we don't know it. It would seem to me we should bring some more attention back to that. Again, we can't let that slip through the cracks.

MS. HAWK: If you recall, I think it was back in the August meeting, we discussed the artificial bait from that study in Delaware. The technical committee has kind of been pursuing that to determine whether it is cost effective, so we are pursuing that.

MR. O'CONNELL: Maybe to just try to move us along here and maybe mostly for New York and New England but the entire board; given what we have seen for a while now, does anyone feel like we should just not be doing anything? If people have that opinion, I would like to hear it.

Otherwise, I think we need to figure out an approach to further evaluate some of the ideas that were put on the table and come back in May to look at those ideas more thoroughly.

CHAIRMAN SIMPSON: Yes, I would agree, Tom. I think one of the things is that my recollection of the history of this plan and adoption of quotas was we were taking our best guess – to Dan's point – of what the landings were and set a quota based on that. It wasn't a really rigorous process that we went through to set those quotas; and maybe in retrospect they were set too high.

I think the fundamentals are right now we're not hitting – our management would say we have no problem in overall harvest because we're staying under the quota. Maybe it is time to do a little bit of work to identify a more appropriate harvest cap and then restructure our management to that. Being a board chair, I can't make any motions. Bob.

MR. ROBERT BALLOU: I certainly do feel that we do need to move forward and respond to what we've been hearing both at this meeting – and thank you for the technical report just provided – as well as at the prior meeting. I remember now, having just looked back on the minutes as to what sort of prompted this report from the technical committee; and that was the sense that the assessment having just been duly adopted at the last meeting spoke in very specific and substantive ways to the status of the stock down south and only more vaguely spoke to the issues in the New England and New York area.

That prompted me to request the technical committee to report back on the issues of characterizing data collection, monitoring and assessment work needed to address the population declines in the two regions. Where I'm trying to figure out – what I'm trying to figure out now is are we still at the stage of trying to figure out what additional data and monitoring do we need to do to enable us to take the appropriate management actions or do we have what we need; is it as good as it is going to get; and are we now at the point

where we should start to develop some management options? It is either one or the other or both, but I do feel like we need to move forward given what we have been hearing. Thank you.

MR. SWEKA: I think we can always use more data. All the surveys that we have from the New England Region, none of them are specific to horseshoe crabs. The numbers that we get for crabs in those indices; they come from surveys that are targeted for other species. It would be nice to have horseshoe crab specific surveys. It would also be nice to have more biological data, sex ratios from within those surveys. Perhaps that data does exist in the raw data when it is actually collected, but it just hasn't come forward to the technical committee and the stock assessment subcommittee.

Ultimately, in the Delaware Bay Region with the Virginia Tech Trawl Survey, we are headed towards to the use of catch survey model where we had information by sex and also by primiparous and multi-parous maturity of crabs. It would be nice to have that information. But at the same time, the other thing, with what we have now we could do some simpler sorts of stock assessment models if we also had and could freely disseminate the biomedical harvest in that, too.

One method that I've had in mind for a while is to use within the Northeast Fisheries Center toolbox – it is called an Index Method. It is a relative F method that allows you to come up with some benchmark relative F values; and then you could manage according to those; but even something as simple as that we currently can't do.

CHAIRMAN SIMPSON: Okay, so at this point, as I understand it, you have the technical committee and the stock assessment subcommittee has been given access to all the data that we have, removals including biomedical estimates; so you do have all that data and it is a matter of how you conduct the assessment and report the results and still retain the required confidentiality?

MR. SWEKA: Yes.

MR. MILLER: The comment I have, Mr. Chairman, is not directly related to your discussion. If you want to come back to me, it is in regard to horseshoe crabs, of course.

CHAIRMAN SIMPSON: Well, I think along the lines of what we need to do, you're on a path of doing an assessment. I think we need to do that and hopefully the outcome of that ultimately will be a basis for evaluating our current quotas and what levels are appropriate. If we can't do that, then maybe as a board we need to think about a different kind of approach to management other than quotas. Again, as I said, in that process find a way to maintain the confidentiality we're required to maintain.

MR. SWEKA: Yes; I would just say that right now given the confidentiality issue right now, I don't see us being able to do anything better than the simple trend analysis that we've done. Like I said, coastwide we have acknowledged that the biomedical kill isn't negligible anymore; and without incorporating that into any real assessment, I don't know that we can get any farther than our simple trend analyses that we have been doing.

MR. GILMORE: Mr. Chairman, your suggestion on the Law Enforcement Committee; is that something that we would need – can you just include that or do we have to do a motion? I think that's a good idea to essentially have them take a look at this, because, again, it may not be the entire problem, but I'm sure it is a good part of it. If they could, for the May meeting, put together an evaluation of their efforts and their take on this, I think it would be helpful.

CHAIRMAN SIMPSON: I kind of just made eye contact with Bob and he sort of nodded at me that is a done deal when we were talking about it; so I think we will get that. We're getting the nod that that is a done deal. Yes; having come up against this confidentiality issue a few times, I think we do need to – you know, the technical people do have access to the data and I think can do work.

I would think, Bob, we could retain the confidentiality if we were to get that report back – Bob, I’m trying to run a concept by you of getting an assessment done from the technical folks and reviewing it internally first, perhaps with myself and Marin and yourself, Toni, internally for those results and how we can package those results to balance the need for full disclosure for peer review purposes but also retain confidentiality and then maybe find a path there to move it out to the more public arena for the board and the general public.

EXECUTIVE DIRECTOR ROBERT E. BEAL: There are two parts to that. One, are you requesting that the assessment schedule be increased? I think it is on 2016 now; is that what it is, John? Are you saying when that is finished to have sort of an internal group look at the results or something different?

CHAIRMAN SIMPSON: No; within its own scheduled timeframe, let’s do this work, share the results within the group to retain the confidentiality and try to figure out a report-out process that finds the balance between the competing needs for openness and retaining confidentiality. We would do that as a group, the five of us perhaps, to do that and develop a publicly accessible document.

EXECUTIVE DIRECTOR BEAL: I think that’s fine. If we have data confidentiality clearance, we can look at the data and then we can ensure that it is packaged in a way that doesn’t violate any of those provisions. Anyway, we’re going to have a discussion here in a little bit with the industry on those provisions.

Depending on what those results look like, maybe there is an opportunity to work with the industry on the packaging of moving forward. Maybe there is a comfort level of exposing more trends and different things to the general public rather than specific numbers. We might be able to have a little more description without – with the approval of the industry, we might be able to be a little bit more descriptive than we are under the current provisions I guess is what I’m trying to say.

CHAIRMAN SIMPSON: Okay; does that sound like a workable way forward for the group?

MS. HAWK: Can we clarify that this is just for the New York and New England Region still?

CHAIRMAN SIMPSON: Yes; I think that’s what we’re talking about right now. If there is nothing else on the stock trends – Bob.

MR. BALLOU: A clarification on the timeframe because I heard 2016 for the next assessment, but then I’m not sure that we’re talking about waiting until 2016 with this. Could you just clarify what we’re looking at in terms of rollout of the process that you just described?

CHAIRMAN SIMPSON: Well, I wasn’t suggesting changing the work plans that we’ve already laid out for the various stock assessments. Within that schedule, when we get to it, we want to see that work done on the schedule and then we will work to make sure that we balance the need for confidentiality and sufficient output results to base management on.

MR. BALLOU: I just would express concern that means we’re looking at a two-plus year timeframe, if I’m correct. I see different responses from Marin and you. I’m trying to get handle on whether we can do anything or should be doing anything sooner rather than later with regard to the New England and New York trend decline issue.

MS. HAWK: I think we can continue to pursue investigating the New England and New York Regions using this method in the upcoming year. It wouldn’t be a coast-wide assessment or a benchmark assessment by any means. It is just investigating trends further.

MR. ROB O’REILLY: Mr. Chairman, I heard John say the biomedical is about 10 percent and has been growing. Is that relative to changes in quotas for the bait as well or is that just relative to the way quotas are now; because we also heard a couple of states have taken lower quotas. Where does that start, that trend for the biomedical?

Then another thing is there are bait quotas; and there doesn't seem to be biomedical caps by region. One thing to think about – not very popular, I'm sure, but one thing to think about is there is a cap for a region. Does that help the analysis to go beyond what you can do now; because if you assume that the cap is being taken, then you use that value, and it is a conservative value. Does that move anything forward as far as you can see?

MR. SWEKA: Well, the first question about where the 10 percent came from; the 10 percent estimate for 2012 was just the estimated biomedical kill, assuming the number of crabs coastwide that were bled, assuming a 15 percent mortality on those, and then dividing that by the total kill from the biomedical plus whatever was killed in the bait industry.

That changing percentage, if the bait industry is declining, that is one thing that could make that percentage increase. At the same time, though, just for the absolute numbers of bled crabs has gone up through time as well. The second question, if we just assume – well, there isn't a quota for the biomedical industry coastwide.

In the original FMP there was a 57,000 coast-wide recommendation; and if that was exceeded, it was stipulated in the plan that the board may consider taking action. That has been exceeded for a number of years now. Now, from an assessment standpoint, if we just assumed – you know, if the board developed regional quotas and then we just assumed that the biomedical industry hit those quotas, personally I would say that is not very informative. That is not real scientific data to use in any sort of assessment model.

CHAIRMAN SIMPSON: I think more fundamentally than whether a sub-corner of the fishery hit really an arbitrary cap that we set on them, more fundamentally it sounds like the initial quotas that we set may not have been adequate to achieve the conservation you need for stock rebuilding.

I think we have a more fundamental problem of taking a closer look at what are sustainable harvests that would allow for the stock to grow to more healthy levels. I think we have pretty well transitioned into a discussion of the biomedical mortality and confidentiality, and Marin has a little bit on that and we have a couple of people here that want to speak to that.

BIOMEDICAL WORKING GROUP REPORT

MS. HAWK: This is the Biomedical Working Group Report. If you recall back in October of 2013 when we first discussed this, the board put together a working group because they were concerned with the increase in the number of dead crabs which are attributed to the biomedical sector and also the lack of ability to use these data in the stock assessment, as John has discussed.

The board formed this working group to facilitate the discussions. It consisted of representatives from each of the biomedical companies as well as the board members from each state with a biomedical company. That was Massachusetts, Virginia, Maryland, New Jersey and South Carolina. This working group held a conference call in December to provide solutions and recommendations to the board.

The topics of discussion were the confidentiality of data and the increased mortality in the biomedical sector. These are two separate issues. The confidentiality of data deals with the fact that we would like to look at the data by region; and if there are less than three biomedical companies in a region, it prevents that data from being included in the assessment.

The increased mortality is perhaps partially due to an increased harvest, but is not an increased mortality rate. I just wanted to make that very clear. The rate of mortality in the biomedical sector has stayed consistent; and it is just now it is a larger part of the coast-wide mortality. It used to be about 2 percent of the coast-wide mortality; now it is up to about 10 percent of the coast-wide mortality.

We first discussed the confidentiality of the biomedical data; and as I just mentioned, horseshoe crabs are assessed by region. There is the New England Region, the New York Region, the Delaware Bay Region and the Southeast Region. The confidentiality of these data prevents it from being used in the assessments.

Due to the increased contribution to the coast-wide mortality, the stock assessment subcommittee feels that excluding the biomedical data, harvest and mortality does not provide an accurate assessment, as John has discussed. We came up with two possible solutions. The first was to release all the biomedical data to the public; and the second was to release biomedical data to the stock assessment subcommittee but require that it remain confidential.

I'm just going to outline the pros and cons of each. The first is to release the data to the public. The benefits of that would be that the data are available to the stock assessment subcommittee and would be included in the assessment. The data would be published in a report which promotes transparency. However, the cons of this are that it could expose the data for misuse by interest groups. There are also some potential issues since the production could be determined among the different biomedical companies. The biomedical representatives strongly opposed this option.

The second is to release the data to the stock assessment subcommittee, but the data would remain confidential. The benefit of this would be the data would be available to included in the stock assessment; and it also avoids potential business complications from releasing those records.

The cons would be it is unclear how useful this information would be for management; and it clouds the transparency of the stock assessment process because the public would not understand how the stock status was obtained. The stock assessment subcommittee and the technical committee strongly oppose this option. I thought we might want to pause and discuss this first issue

before moving on to the increase in biomedical mortality.

CHAIRMAN SIMPSON: Are there any comments on this? Pat.

DISCUSSION OF BIOMEDICAL MORTALITY AND CONFIDENTIALITY

MR. AUGUSTINE: I'm going to be very bold and you may be very upset with me about what I'm going to say. If I had a monopoly on something, I wouldn't want anybody to know what I was doing either. Questions about confidentiality; we're managing horseshoe crab that has many, many values; and this biomedical value is absolutely essential. I'm alive because of it.

I also look at the status of the stock. The question is, are the states going to limit any use for horseshoe crabs other biomedical? If that's true and let's assume we will, then can we only assume that ASMFC will manage horseshoe crabs for the benefit of the biomedical industry only and there will be other purpose?

If there is no limit on how expansive the biomedical industry can be or get, what is to keep them or what is to prevent them from wiping out the status of the stock completely and put us in a depleted state? We're talking about a series of possible things that could happen. The real question here is who are we protecting the animals for and should a particular group or any individual group have total use of that animal?

Somewhere along the line in your report you did say that they preferred not to have this information made available. I thought the way you presented it or we presented it was the data would be confidential within the staff and be totally self-contained, to be combined together to show the board and have our stock assessment folks know what that total number was so we can make some better decisions as to what we're going to do. I just made some hard statements and I'm not sure you can respond to those; but taking the approach

they're taking, it doesn't give us as managers much of a choice; does it, Mr. Chairman?

CHAIRMAN SIMPSON: Well, Marin had some comments, but first I think the concerns about a complete flip-flop and who is approaching their exclusive use of the resource, I think we're a long way from that. In terms of confidentiality, I believe a hundred percent that a public resource, the information should be publicly available.

My income and the income of every state employee in Connecticut and every retired individual, that information is public knowledge; but the law on fisheries says it is confidential. The commission policy is it is confidential. What I believe in this case doesn't really matter; the law is different than we would like it to be.

The only way you're going – so we need to respect that aspect of our plans. I wish I had marked it. Preparing for the meeting, there was at least one table where I think it was state by state landings on another species, every state was reported except for one and that could not be provided because it was confidential. Now that could have been a hundred times what everyone else landed, I don't know, but that is the world that we live and we have to – so those are the constraints that we have to work in. Dan.

MR. McKIERNAN: I'm not sure that the problem is as bad as it is perceived, because these are really localized stocks; and I think we're going to wipe the Southern New England and East Coast stock of horseshoe crabs with rules or without rules. I just don't see it. Furthermore, the biomedical firms have a bleed-and-release policy; so obviously there is no way they're going to wipe out the stocks.

Presumably for every hundred animals they bleed, 85 are going to live; so I don't see it. Pat makes some good points but I think it is that drastic. I really think that we all have to go home and manage these things based on our local knowledge. That is a much bigger challenge. We all know what our fisheries need, but we also know the uniqueness of these embayments.

A lot of the biomedical crabs in Massachusetts are coming from a single embayment that wouldn't be detected through trawl surveys. It is one that is east of the Cape in Pleasant Bay. We have made it biomedical only. That particular industry is going to affect that embayment; and we haven't seen any crashes of that stock in that little embayment.

MS. HAWK: Just to address I think Pat was kind of suggesting that if you release the – that we could get a little bit further by investigating what is happening in the stock if you released the data to stock assessment subcommittee but have it remain confidential; but I just wanted to clarify that is what we've done with New England and New York. This is what we have gotten from that.

MR. STEWART MICHELS: Marin, I'm pretty naïve on this stuff. Can you try and help me understand how it is a competitive advantage to protect the number of crabs that you harvest for biomedical purposes?

MS. HAWK: I'm going to turn to the industry and perhaps someone would like to help me answer that.

CHAIRMAN SIMPSON: Does someone here from the industry want to take a stab at explaining that? I heard it in our workgroup that knowing the number of crabs tells you the size of your business and reveals the size of your business; and that is something that they feel is important to preserve what market share they have. This isn't one fisherman in 10,000.

This is one of a few companies in the world; so by quick subtraction and by the math of how many crabs, you know what your competitor is doing. That is one of their business concerns. I think this might be a good time – we have a couple of people from the industry who wanted to make some comments. I think I will go to them now and that may help us a lot to understand this business and this fishery. Okay, Jim, do you want to take the public mike.

DR. JAMES F. COOPER: Yes, thank you, Mr. Chairman. As a disclaimer, I'm usually here

representing the advisory panel for the horseshoe crab; but actually I'm here to give my own statements since I haven't gotten their approval or we haven't formally met for this purpose although I've discussed this matter with them.

I'm just here to provide hopefully some information that will help you understand the situation here. I do think the confidentiality issue has been overstated and that we've also then had some other comments particularly from Massachusetts that have put our considerations I think more into balance and perspective. Realize that from the very start the biomedical community has been in the business of conserving horseshoe crabs. It started in 1973.

Now, it is true that I founded one of the companies. I have retired now so I really can't speak for management, but I began this process in '69 and '70. It makes me look old, but actually I was only seven years old at the time, but, of course, that is not the case. From the start we have had the return-to-sea policy.

Secondly, we have educated the public and watermen as to the value of the horseshoe crab. It used to be treated as a nuisance and was destroyed. Of course, when we started the FMP initiated in 1998, the FMP continued to recognize the fact that there would be return-to-sea policy.

By the way, we have the fellow who led us on that FMP sitting over here, Tom O'Connell. It was 15 years ago that we got the FMP through; and Tom was able to manage this in two ways. First of all, he provided good leadership; and, secondly, just as we convened for the meeting, he called in a 20-inch snowstorm and we were confined to the hotel until we finished the FMP and then finally the snow melted. Yes, we did get it through.

This 57,000 mark that was written into this was not written to be a level where it was thought to be a threshold, where there would damage should that be considered, or nor to be a level that would be – if you exceeded that, it would be punitive. At that level we were supposed to re-evaluate the

possibilities as was discussed over here a few minutes ago.

The response has been to that is that a few years ago I suggested that we could come up with some best management plans, BMP, where the biomedical community could get together and communicate along with our state agencies that regulate us and come up with good management practices so that we could do all we could do to minimize the mortality in conducting our business.

As you can well imagine; we're not going to have a zero mortality in conducting this business. Even the 15 percent mark that we think represents what happens to crabs once they come into our possession, this is not really hard evidence. You see, it is very difficult to create an environment for the horseshoe crab and treat it as a laboratory animal.

You can do this with mice and rats and things like that, but this is a very difficult creature to manage in a laboratory or experimental evaluation setting; so this is not a hard number. I think I would like for you guys to ask yourself this question; is the LAL industry and the valuable product that we make available to the healthcare system; is it worth let's say 75,000 crabs sacrificed in the process of doing this business?

75,000 crabs; that is roughly 15 percent of what is being collected these days. I think we're making a valuable product. If you want the answer to that, don't ask me or just yourselves; ask physicians and surgeons, folks in the healthcare system, ask the pharmaceutical industry as they're making these drug products what is the value of that?

Let's say that the number is 75,000 a year. Carl Shuster, of course, is here today. We were talking about this a little bit earlier of how many horseshoe crabs are there out there on the Atlantic floor? Probably 50 million! Okay, so if we're taking 75,000 out of 50 million; is that about 1 in 500 or 1 in 1,000; so isn't that a valuable use of the resource to produce this reagent. I would like for you all to think about that and keep all this in perspective.

In response to exceeding the so-called threshold, I think let's realize that this threshold has sort of outgrown its usefulness. I would like to see you replace that with what we're already doing in the biomedical industry, and that is we adopt something that I would borrow from the radiation industry, the ALARA concept, which is we would keep the mortality as low as reasonably achievable and not be worried about caps or worried about limits.

Our goal is just to keep that number as low as possible. How do you do that? Well, in our industry it means that we have – because we're in the highly regulated drug industry, we have a lot of written procedures all throughout the industry. We have written procedures that are dedicated to the handling of horseshoe crab specimen.

We have procedures for how they would be handled, how they will be transported. We have procedures for training the people that bring them to them to try to make sure that they take the same care in bringing them to the facility and use the same care in taking them back to the ocean. Come up with practices where we try to not just dump on a beach but put them back into fast-moving waters where they can spread out begin to forage and live their normal life.

Also, I want you to appreciate the fact that the mortality in the horseshoe crab industry doesn't come from the bleeding. When the creatures come in, they're handled carefully. Only those that are very, very vigorous and show no signs of injury or illness; those are the only ones that go further on in the process.

When they come out, they have same kind of vigor associated with that. They're not like humans that often faint when they're being bled. We can tell that there is nothing wrong with them. What are the ones that die? Well, as you can imagine we capture a lot of creatures because they can't be culled. They're being captured night and we can't sort them out at that point in time.

We catch a lot of creatures that are injured, are ill, are near the end of their lifespan; and with the

stress of the capture and so forth, we're going to lose some creatures, but that is what becomes the mortality. It is not the bleeding itself. In fact, Carl Shuster told me one time that 10 percent of the females that come on the beach at spawning time would not make it back. They're either stranding or whatever.

So, yes, there is not zero mortality during spawning or collecting for the horseshoe crab industry; and we haven't gotten to some of those other things that cause sharp mortality. If you look at the riprap on many Delaware beaches, you will see thousands of crabs trapped, that come in with the high tide and can't get back out; so you have that issue.

You have the poaching issue; and some of the estimates are they may equal to the amounts that are being reported in harvest to the states. Just the last meeting; again you were introduced to the artificial bait; and can you just think how this discussion would change two years from now if indeed the scientific study showed that the – the efficacy study showed that there was no significant difference between the horseshoe crab bait and that from the artificial bait.

Wow; that needs to be followed up on. Can you imagine what a difference that would make here, potentially greatly reducing the harvest because of an ineffective artificial bait. I would like for you to accept the fact that our current mortality number – I don't want to mention rate because we don't know what that is, but total mortality; I hope you would feel that this is a good use of the resource and it is an acceptable one; and it is time to put away the 57K as a monitor.

By the way, the horseshoe crab collection is about 600,000 right now; and I really see nothing that would drive that up. As Marin has pointed out, that seems to have leveled off at about that point. Like I say, there is nothing on the horizon that would lead me to think that there would be a change at that.

I would hope that you would realize that we're going to continue doing the ALARA concept, so

to speak, doing our best to keep those numbers low. You know, there is a way for you to get an answer to how well we're doing. You can ask the representative state agency and you can try to get answers to two questions.

One; do they have written procedures in place that guide them toward low mortality; and, secondly, are they following those procedures. The state agencies know what is going on in these laboratories. They are a part of it; they're part of the team. They both have a vested interest. Thank you very much.

CHAIRMAN SIMPSON: I appreciate your input, Dr. Cooper. I think it was very helpful. Stew.

MR. MICHELS: Is it all right to go ahead and ask a question of Dr. Cooper? Do you have time for a question?

CHAIRMAN SIMPSON: Yes; go ahead.

MR. MICHELS: You made mention of the alternative bait; is there an alternative to LAL and where are we in that process?

DR. COOPER: There is a recombinant Factor C, which means this is a recombinant non-horseshoe crab source. In the industry it is not the same. Well, let's call it maybe the recombinant product doesn't behave the same way. One of the problems is that the FDA does not license it so that users in the pharmaceutical industry, which are really heavily, heavily handed when it comes to regulations, are reluctant to go forward and use the recombinant product because it is not regulated the same way that LAL is regulated.

I really don't want to say much more on that because I don't know a great deal about the recombinant product; but it has not made much headway into the industry. As I'm concerned for testing certain simple materials, I don't know why it wouldn't be as good as the LAL. The industry, for their reasons, has not elected to make that a great part of their usefulness.

In terms of artificial approaches, your artificial bait might be the best chance at this point. By the way, Allen Burgenson is here, and he is with the company that makes the recombinant product and he could give you I think perhaps a fairer explanation about the status of the recombinant product in the industry. You remember the pharmaceuticals are so heavily regulated, they're not going to make changes easily.

DR. MILLARD: Mr. Chairman, I have a question and a comment. I thank Dr. Cooper for that report. I would like to make clear, though, that I don't think anyone around this table is questioning the value of your product or the worth of your product to society. The question before us was the use of your data to help us make better decisions.

Now, Mr. Chairman has pointed out that is the law. We may not like it, but that is the way the law is written. I understood Bob's discussion to say that in fact it doesn't mandate that; that the industry can relax that or waive that if they care to to some intermediate level or fully. That is the frustration in front of us is I still haven't heard an answer to Stew's question what competitive advantage do they give us by sharing that data in a transparent way with us; and is there in fact any opportunity for them to move to the middle with their data to help us make better decisions?

DR. COOPER: I would give you an answer to that if I were in marketing, but I'm not and I'm no longer part of management of any one of the companies. I guess one of the things that strikes me is that the biomedical mortality is not a huge number. Let's say it is 60,000 – all right, make it 75,000 and you divide that by three and put 25 in the north and 25 in the middle and 25 in the south, you've basically got a number for your stock assessment. Again, that is a number that you calculate on the back of an envelope because we really don't know whether it is 8 percent or 12 percent or 5 percent or 15 percent mortality. You know what it is in the bait industry because they report it every month.

CHAIRMAN SIMPSON: I think that has been helpful, and I'm mindful of the time in large part

because I have to be on a plane fairly soon; so I think what we'll do is – Rob, go ahead because I did have you on my list, and then Marin has one more piece to report, and then there is another industry member that had some input for us.

MR. O'REILLY: My question is still on the issue of confidentiality. I guess there was a slide there on the pros and cons of if the data were made available and the stock assessment process – that the stock assessment subcommittee would feel the public would not know what was going on or the board or however that was looked at.

In fairness my question would be since data confidentiality surrounds with many different species; are we in that position with other assessments. I know there is a focus here right now on horseshoe crabs, but is that also part of what we face with other assessments or is this to an elevated degree?

CHAIRMAN SIMPSON: I think most of this group is on several boards; and I have shared a few times the personal frustration I had with lobster management, which was a pretty high-profile species for the commission, that we couldn't even look at data that would show effects of the season closure state by state.

Monthly landings state by state could not be shared in Addendum XVII because it might be confidential for someone. It has posed some obstacle even in the most abstract way. I have said at home to know who landed what that February 2011 Connecticut landing was, to know what somebody landed, you'd already have to know so much about the industry, you'd probably already know what the guy landed. I know what I landed and I know what you landed so I can figure out what Pat landed, that sort of thing. It is a common problem.

I know for menhaden that would be the extreme example. If Omega just decided they wouldn't share their landings with Virginia and the commission, we would be in quite a fix on menhaden management. It exists in some fisheries

and not in others. I do want to keep moving so Marin is going to help us do that.

MS. HAWK: This is just the second half of the Biomedical Working Group Report dealing with the increase in total number of crabs killed by the biomedical sector. As I mentioned, in 1998 this is approximately 2 percent of the coast-wide mortality; and in 2012 it is now about 10 percent of the coast-wide mortality.

This might be partially due to constraints on the bait harvest. As John has mentioned, this increased number of dead crabs may be having an effect on the population, which is why it has come to our attention. There are two possible solutions for this issue well that the working group discussed.

The first was to mandate the use of bled biomedical crabs in the bait industry. For example, Massachusetts harvests crabs for bait, gives them to the biomedical industry to bleed and then uses those same crabs in the bait industry; so all biomedical crabs would enter the bait industry under this option.

It would increase the mortality in the biomedical sector to a hundred percent, but it would reduce the overall mortality along the coast. The potential issues with this, as I'm sure you can imagine, the short seasons for harvesting horseshoe crabs commercially would impede the biomedical industry's ability to meet their demand. They need a steady flow of horseshoe crabs year-round.

It is unclear how the bleeding impacts the effectiveness in the bait industry, and so some further discussions and investigations will be needed for that. Using bait crabs in the biomedical industry may present challenges that need to be explored that we haven't even come up with yet. There are a couple of states, South Carolina and New Jersey, that do not have a bait harvest; so those biomedical companies would need to continue harvesting from the ocean. That's all I have for mortality. Thank you, Mr. Chairman.

CHAIRMAN SIMPSON: Are there questions for Marin? Seeing none; I did want to hear from Benjie, if you want to come up.

MS. SWAN: Benjie Swan from Limuli Laboratories. I work in the state of New Jersey. I passed around the letter so you can all follow along. I am actually going to read the letter so I don't make any mistakes; because my biggest critic is in the audience. That would be my 17-year-old daughter, Catherine.

Dear Members: I do not support the use of biomedical crabs for bait. I am proud to be an American manufacturer of Limulus Amebocyte Lysate, the only product other than the archaic rabbit test required by the United States Food and Drug Administration to test the safety of vital drugs, solutions and medical devices for humans.

I am equally proud to manufacture the product with a renewable resource, the horseshoe crab. Dr. Cooper, along with others, recognized the value of maintaining this renewable resource and protected the horseshoe crab with a return-to-sea policy at the onset of the industry in 1973, more than 40 years ago. I attached a short paper that I wrote in 2009 discussing the history of lysate and also the return-to-sea policy, which you may read at your leisure.

In the manufacturing process a huge majority of the horseshoe crabs survive, although a small number may perish. Biomedical companies continue to strive to keep this small number as low as possible. In fact, 15 years ago when the Horseshoe Crab Management Plan was enacted, a threshold number was inserted to address the number of horseshoe crabs that do not survive the process. This number ensured that the biomedical use of the horseshoe crabs was documented and monitored.

The number is calculated by assuming a 15 percent mortality of the total number of bled horseshoe crabs. Thus, the number increases as the biomedical collection of horseshoe crabs increases. For the last several years we have exceeded that threshold number, which is not

surprising as the health industry is advancing and expanding as our population grows and new drugs and medical implants and devices are discovered.

It should be mentioned that the increased demand is countered by technical improvements in the use of the product. The threshold number was not meant to limit the availability of horseshoe crabs to manufacture this critical human health product; but to trigger a closer look at the industry's effect on the ecology of the horseshoe crab population.

Since exceeding that number, biomedical companies have responded by discussing and formalizing best management practices to guarantee that the number of horseshoe crabs that perish remain as low as possible. Eradicating our renewable resource has the potential of destroying our industry and negatively impacting advances in human health and medicine.

Also as an aside, I just wanted to mention that what the biomedical companies are concerned about with the confidentiality issue is that the information can be published any which way; and it can be put out there for other groups to use to harm our market. I do want to say that all biomedical companies supply extensive data to their state, and it is forwarded to the Atlantic States Marine Fisheries Commission.

I took this off some of the information that I report to my state. The information supplied includes but is not limited to fishing collection data; name of the collector; the boat name; the date of collection; method of collection; area of collection; estimated number of horseshoe crabs rejected on board the vessel due to mortality, severe injury, minor injury, small size and other reasons; number of crabs collected and transported to bleeding location; number of males; number of females; number of trawls; duration of trawls; number of males each trawl; number of females each trawl; size of net; foot rope mesh size net; and cod-end.

The bleeding information includes number of horseshoe crabs transported to the bleeding location but not selected for bleeding due to mortality, severe injury, minor injuries, small size

and other reasons; number of horseshoe crabs accepted for bleeding; disposition of the crabs rejected at the bleeding facility; date of release; area of release; number of released horseshoe crabs which are dead or severely injured.

We supply extensive data and to think that we are not supplying data is just wrong. The different groups look at the information, and we have no problem with that. It is just where that information is going to be publicly put out and in what form. I would take any questions if you would like.

CHAIRMAN SIMPSON: I appreciate that. I will offer your daughter the first shot at critiquing your presentation. It looks like she is declining; so does anyone on the board have any questions for Benjie? Pat.

MR. AUGUSTINE: I do, and you will think I'm off the wall and being facetious, but rabbits grow a hell of a lot faster than horseshoe crabs and there is a byproduct. They taste good. I'm not being smart-alecky about it, but this advance from rabbit to horseshoe crabs is a great one. The product is great. I'm here because of that product, but we're back to reality.

If the other producers do exactly what you do and supply that information, then I have to ask our technical committee why do they not have it? Now, why don't you have access to it? If they don't have access to it, apparently that is the problem. We need the total number so that they can do what they have to do and we can make our hard decisions.

It is awful difficult for us sitting here around this table pulling numbers out of the air or guesstimating. Dr. Cooper, you're right, it could be 50, it could be 60, whatever that number is, and you could tell us that; but unless there is verification here, it is not that we don't trust your word. It is that they need verification; and we, the board, have to go back to our states and talk to our people and tell them we made a decision based on what.

Sometimes the data we have is very poor, but it is the best we have. When we have inadequate data, we try to get enough so that we can make an honest, reasonable decision. Again, one bad decision here, it rolls and it gets bigger and bigger; and the next thing you know you're making an addendum to an amendment to another addendum to another amendment and you've got a monster on your hands; and then you've got the public on you.

We've got 15 states around this table that are affected differently by every decision we make. I'm very passionate about the process. I'm very passionate about sharing with industry. Every person around this table is very passionate of our user groups; and we're very passionate about the impact that we have.

When we raise our hand or we take a no vote, it means we couldn't come to a consensus, but it is on the record forever. All we're asking here is a solid piece of information that the technical committee can get their arms around to do a great job with the stock assessment, which will be the driver probably for the next five or ten years.

I don't mean to pontificate, but I always do. I'm the old guy and I'm the oldest one in the room and I can do it. I would hope that you folks would supply that information. Whoever is withholding that information could help us and we want to help you.

DR. COOPER: Well, remember, that horseshoe crab number is a speculation, a very soft calculation. It is not a hard number like reporting a harvest.

CHAIRMAN SIMPSON: Okay, Pat, you've made your point and that was perfect; not at all vague or obtuse. Allen, did you want to comment? Then I think what I'll do is promise that we will continue to work with this issue of access to the data that clearly has been provided in great detail.

MR. ALLEN BURGENSEN: I will keep it very brief. My name is Allen Burgenson. I'm with Lonza Walkersville. I can confirm everything that

Benjie said regarding the numbers and types of data that we report to the state of Maryland. We report exactly the same thing even up to the coordinates to where the horseshoe crabs were dropped off the coast.

My company is the one that makes the alternative assay so if anybody has any questions about. What Jim said is pretty accurate; but it is not so much that it is not regulated by the FDA; it is that it is not in the United States Pharmacopoeia. Companies are required to use this assay because it is in the United States Pharmacopoeia to release their perennial drugs and implantable medical devices.

There is no choice; so companies choose to use what in the United States Pharmacopoeia. To use the recombinant product is an alternative assay; and there is additional validation and cost that goes into that. Unfortunately, the pharmaceutical industry is reluctant to spend that extra money to use an alternative test.

CHAIRMAN SIMPSON: I think that helps a lot. As I said, I think one of our issues to work on between this and the next meeting is to get input from the Law Enforcement Committee. As you acknowledged in your state, there may be a significant level of unreported harvest on the bait side. There are a lot of unknowns here.

Horseshoe crab management started at a time when we had very little data. In fact, I'm remembering that my agency didn't even have statutory authority to manage horseshoe crabs, and we had to get it to implement the commission plan and begin to collect data. When we started, we started where we were and I think we're looking to take that next step to a little higher level, more quantitative assessment and management.

If there aren't anymore comments, I think that is what I would say is the point we're at. We'll get more information from law enforcement. We will work on – myself as the chair and with staff – and talk with industry about how we manage this confidentiality thing and still get a really useable stock assessment that we can then roll into

management to make sure that we do turn this resource around as we're obligated to do. Pat.

MR. AUGUSTINE: Mr. Chairman, can they report back in May of what progress they made from this meeting to that meeting?

CHAIRMAN SIMPSON: Absolutely, yes. Dan.

MR. McKIERNAN: Could I ask Marin to maybe communicate to the technical committee a request to do some field trials with the artificial bait this year? Maybe we could make some progress on substitution.

MS. HAWK: Yes, I will communicate that.

MR. MILLER: Thanks to David for bringing up the very topic I was going to bring up; and that is just something to be thinking about in the future. Dr. Cooper alluded to the artificial bait and the potential utility of it. Maybe we ought to consider – and this may be a heretical suggestion, but just consider taking a more proactive step, you know, what if – and this is just theory; what if the states collectively decided that you couldn't use more than a fifth or a tenth of a horseshoe crab as bait.

In other words, almost mandating the use of the artificial bait which had a 12th to a 15th of a horseshoe crab, if my memory is correct, as one of the attractant components in the artificial bait. But thinking along those lines; what if we took that step proactively, if that is within our purview, and thereby driving the fishery towards the use of artificial bait, something of that nature. Maybe we could get around some of the problems associated with the New York and New England harvest and that kind of thing. Thank you.

CHAIRMAN SIMPSON: Yes; I think it is a good thought for when we get into that mode of responding to whatever we learn from a stock assessment, how many crabs are a safe level to remove. Dan was suggesting a different angle of managing the demand – a different angle of managing the demand, as you are, and that would be how many traps are being fished in the other fisheries we manage, whelk and eels, for example.

Those are two kind of innovative approaches to in this case horseshoe crab conservation. I think they will be on the table for that day. Tom.

MR. O'CONNELL: I will try to make it quick for you, Dave. I guess a couple of things. As we go forward, I think that the board should give some serious thought to Dr. Cooper's idea about that 57,000 may have outlived its life and whether or not it needs to be bumped up to another level so we evaluate in the future or just remove it and trying to accept the policy of trying to get the least amount of mortality, recognizing the world-wide benefit of this product.

With that, I'm not certain but it would be interesting to see if the PDT can identify any best management practices that the board may want to consider being mandatory. I'm not sure I would expect that most companies are doing the best they can. But if there are lessons learned, I know we have adopted some pretty stringent BMPs in Maryland; but if there are some standards that we should consider making mandatory and being enforced at the state level, that could help with this mortality issue as well. Thanks.

MS. HAWK: I wasn't really a part of the development of the best management practices; but from what I understand, they have been developed to their furthest extent. They have been recommended to each of the companies. Each company has such different practices that having mandatory practices would be a little bit too stringent on them. That is how I understand it.

CHAIRMAN SIMPSON: But from the information they have provided, it does seem that they have developed the best management practices and have implemented it, but I think it would be good for the board to see those and understand those clearly.

If you have those fisheries in your states, I'm guess states that do already are better tuned in; but it strikes me that in terms of proactive suggestions, that maybe it is time for us to send some stronger signals to our industry that you need to find ways to reduce your demand for horseshoe crabs

because it is becoming a concern and there are things that can be done and kind of put those ideas out to them and help them anticipate what the direction we might be going in here in management. Are there any other thoughts from the board on this? Is there any other business to come before the Horseshoe Crab Board? Pat.

MR. AUGUSTINE: Move to adjourn, Mr. Chairman, and that you all for the kind words. I'm going to miss you.

CHAIRMAN SIMPSON: Thanks, Pat. We stand adjourned.

(Whereupon, the meeting was adjourned at 3:00 o'clock p.m. February 6, 2014.)



Atlantic States Marine Fisheries Commission

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Horseshoe Crab Technical Committees Meeting Summary

Arlington, VA
September 16, 2014

Technical Committee Members: Penny Howell (chair, CT DEEP), Greg Breese (US FWS), Mike Millard (US FWS), Steve Doctor (MD DNR), Joanna Burger (phone, Rutgers), Derek Perry (MA DMF), Jeff Brust (phone, NJ DFW), Tiffany Black (FL FWC), Amy Fowler (SC DNR), Rachael Mailorico (VMRC), Tina Moore (NC DMF), Jim Page (GA DNR), Derek Orner (phone, NOAA), Rachel Systak (NY DEC), Dr. Amanda Dey (NJ DFW), Eric Hallerman (Virginia Tech), Kevin Kalasz (DE FW), Jim Lyons (phone, US FWS), Conor McGowan (ARM WG chair, Auburn University), Dave Smith (USGS), Wendy Walsh (US FWS), Jordy Zimmerman (DE FW), Joanna Burger (phone, Rutgers), John Sweka (SAS chair, US FWS)

ASMFC Staff: Marin Hawk

Public: Dr. Gene Slowinski (phone, Rutgers)

The Horseshoe Crab Technical Committee and Delaware Bay Ecosystem Technical Committee (TCs) held a joint meeting on September 16, 2014 in Arlington, Virginia to review the Adaptive Resource Management (ARM) Framework harvest recommendations. The TCs also reviewed horseshoe crab and shorebird abundance data, and received a report on the artificial bait trials. Below is a summary of their discussion.

Proposal for *Limulus* hatchery

The TCs received a report by Dr. Gene Slowinski of Rutgers University concerning a proposal to establish a horseshoe crab hatchery. Due to late receipt of the proposal, the TCs agreed to hold a follow-up call to further discuss the proposal and their recommendations. A separate summary of that call will be developed and distributed.

Horseshoe Crab Abundance Estimate Calculation

The ARM Framework requires two data estimates on an annual basis: horseshoe crab abundance and red knot abundance. Since the framework was implemented, the Virginia Tech Trawl Survey has provided the estimates for horseshoe crab abundance. However, funding for 2013 was not received so the Virginia Tech Trawl Survey was not conducted in 2013 and will not be conducted in 2014. In the absence of the abundance estimates from the survey, the ARM WG considered using horseshoe crab data from the Northeast Area Monitoring Assessment Program (NEAMAP) to estimate abundance. Throughout the spring and summer, the ARM WG investigated the NEAMAP data and evaluated the best way to adapt the data to the ARM Framework to ensure consistency with the previous estimates. The ARM WG presented four different options to the TCs for their consideration (memorandum enclosed).

While the TC agreed that annual population estimates from monitoring data sets are the core of the ARM Framework, there was too much uncertainty at this point in time to have confidence with the correlation of the NEAMAP and VT Trawl Survey data to recommend Option 2 or 3 (using NEAMAP abundance estimates to calculate the equivalent VT Trawl Survey abundance estimate). The Virginia Tech Trawl Survey was designed specifically to obtain an estimate of horseshoe crab abundance, while the NEAMAP survey was not. In addition, the surveys are conducted during different times of the day and year and use different gear, so the data are not comparable. Finally, the correlation between the two surveys was not consistent between male and females. They also noted that the ARM Framework was developed specifically using data from the Virginia Tech Trawl Survey, so the NEAMAP data may not be compatible with the ARM Framework.

Option 4 based the abundance estimates on the most recent abundance data from the Virginia Tech Trawl Survey (2012) and used a forward-projecting model to estimate abundance in 2014. The TC discussed the point that this option uses the last reliable estimate of abundance. However, the TC agreed that recommending this option disconnects the ARM framework from monitoring data and may suggest that annual data sets are not important to the ARM framework.

The TC agreed that Option 1, status quo, is the best available option for use in this year's ARM Framework and specification-setting process. Addendum VII to the Interstate Fishery Management Plan for Horseshoe Crabs states that in the absence of the Virginia Tech Trawl Survey data, the Horseshoe Crab Management Board (Board) may set the next year's specifications based on the previous year's ARM Framework. The TC feels that given the continuing lack of the Virginia Tech Trawl Survey and the lack of confidence in population estimates from NEAMAP, this is the best option. However, the TC agreed that this option should only be used as a stop gap for 2014 and not extended into the future. The TC strongly feels that a monitoring program that provides suitable data is critical to using the ARM framework as intended. The TC strongly requested that an appropriate monitoring program be put in place or identified for the 2016 specifications. Some suggestions include:

- 1) Find funding for the VT trawl survey, either through government or biomedical company support (Preferred option)
- 2) Investigate use of abundance indices to estimate abundance
- 3) Continue working with the NEAMAP survey to better accommodate the ARM Framework data needs by either determining a way to analyze the data to achieve better correlations, or by working with the NEAMAP team to modify equipment/procedures to better sample horseshoe crabs

ARM Framework Recommendations

Based on status quo, the ARM Framework selected Harvest Package 3 as the optimal harvest package, which allows harvest of 500,000 Delaware Bay male horseshoe crabs and zero female horseshoe crabs. Based on the allocation mechanism set up in Addendum VII to the Horseshoe Crab Fishery Management Plan, the following quotas would be set for the Delaware Bay states of New Jersey, Delaware, Maryland, and Virginia:

Table 1: Harvest recommendations based on harvest package three of the ARM model. Virginia quota refers to harvest east of the COLREGS line.

State	Delaware Bay Origin HSC		Total State 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 accepted the ARM Subcommittee report and **recommends the Board accept Harvest Package #3, the optimal selected harvest package, for management of the 2015 horseshoe crab harvesting season.**

Review of Horseshoe Crab Surveys

The following reports were reviewed by the TCs:

- 1) Delaware Bay Trawl Surveys (Delaware 16 - foot and 30 - foot) Report
- 2) New Jersey Surveys (Ocean Trawl, Delaware Bay Trawl, Surf Clam) Report
- 3) Delaware Bay Horseshoe Crab Spawning Survey Report
- 4) Maryland Horseshoe Crab Spawning Survey Report
- 5) Delaware Bay Horseshoe Crab Egg Survey Evaluation and Report
- 6) Delaware Bay and Atlantic flyway Red Knot Survey Report

The TCs agreed that the surveys reflect little change in the status of horseshoe crabs in the Delaware Bay region (Table 2). The population has been relatively stable since 2009.

Table 2: Reviewed horseshoe crab surveys.

Survey	Demographic	Gear Used
Delaware Bay Spawning Survey	Male	Beach
Delaware Bay Spawning Survey	Females	Beach
Delaware Bay 16-ft Trawl	Adults	16-ft Trawl
Delaware Bay 16-ft Trawl	Juveniles	16-ft Trawl
Delaware Bay 30-ft Trawl	All (April – July)	30-ft Trawl
Delaware Bay 30-ft Trawl	All (All months)	30-ft Trawl
Maryland Coastal Bays 16-ft Trawl	All	16-ft Trawl
NJ Surf Clam Dredge	Males	Surf Clam Dredge
NJ Surf Clam Dredge	Females	Surf Clam Dredge
NJ Surf Clam Dredge	Juveniles	Surf Clam Dredge
NJ Delaware Bay Trawl	Males	Trawl
NJ Delaware Bay Trawl	Females	Trawl
NJ Delaware Bay Trawl	Juveniles	Trawl
NJ Ocean Trawl - April	All	Trawl

Review of Shorebird Surveys

The TCs reviewed red knot abundance in the Delaware Bay region and in Tierra del Fuego. Abundance of red knots on the main wintering ground in Tierra del Fuego has not increased during the period from 2004 to 2013. Abundance of red knots in the Delaware Bay has remained low but relatively stable over the last decade. Members of the TCs noted that a boost in crab productivity is needed to change this trend. The proportion of red knots reaching adequate weight (180 grams) has improved in four of the last five years over previous years. Lacking a rise in abundance, red knots may be listed as threatened in the near future.



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MEMORANDUM

September 19, 2014

To: Horseshoe Crab Technical Committees

From: Dr. Conor McGowan, Adaptive Resource Management Working Group Chair

RE: Adaptive Resource Management Model Recommendations

The Adaptive Resource Management Working Group (ARM WG) met in-person on August 28, 2014 to discuss data inputs to the ARM Framework for 2015 specifications. Since the ARM Framework was implemented in 2013, data from the Virginia Tech Trawl Survey (VT Trawl) provided abundance estimates for horseshoe crabs in the model. However, due to a lack of funding, the VT Trawl Survey was not conducted in 2013, so no data exist. The ARM WG decided to use Northeast Area Monitoring and Assessment Program (NEAMAP) data to estimate horseshoe crab abundance for 2013.

Due to differences in survey design, it was necessary to adapt the NEAMAP data for use in the ARM Framework. The ARM WG discussed different options to accomplish this. The ARM WG selected transects from NEAMAP regions that reflected the core and periphery areas of the discontinued VT Trawl, assessed covariates to reduce uncertainty in survey results and estimated abundance from NEAMAP's catch per tow data using the same statistical methodology as the VT Trawl. The ARM WG also used the 5 years of overlap between the VT Trawl and NEAMAP to draw comparisons between the survey results and potentially develop calibration methods between the two surveys.

Despite these efforts, there were substantial differences in the results from the two surveys, most notably that the VT Trawl results were consistently much higher than the NEAMAP results and that the estimate of adult male abundance was negatively correlated between the two surveys, meaning that in years where the VT Trawl was higher the NEAMAP trawl tended to be lower. Even so, the ARM WG still needed to recommend which data were best for assessing the state of the horseshoe crab population so that we could identify the optimal harvest action from the ARM decision analysis. The ARM WG devised four options for moving forward under the current sub-optimal monitoring conditions. The options listed below were presented to the HSC TC and the DBETC at a meeting on September 16, 2014 and discussed at length (please see enclosed memorandum).

Option 1) Status quo. Do not use NEAMAP data in the ARM decision analysis for 2015 harvest recommendations. Addendum VII to the Interstate Fishery Management Plan for Horseshoe Crabs states that in the absence of annually-collected data sets, and after consultation with the appropriate committees, the Board may set the next season's harvest on the previous year's ARM Framework harvest levels. The 2013 harvest level was 500,000 male-only

M14-81

horseshoe crabs for the Delaware Bay states. This option is based on the assumption that NEAMAP data are not compatible with the ARM Framework, due to the fact that the ARM Framework was designed around the VT Trawl Survey.

Option 2) Use the ratio of NEAMAP data to VT Trawl data from the six over-lapping survey years to directly convert the NEAMAP to VT Trawl equivalent for horseshoe crab abundance. This option assumes that male and female data from the NEAMAP and VT Trawl Survey data are comparable.

Option 3) Use NEAMAP to VT Trawl ratio for female only and derive male abundance based on sex ratio over the last 5 years in the VT Trawl survey. This option was included because the correlation in estimated female abundance between both surveys was positive, implying that even though NEAMAP estimates are lower than the VT Trawl they correspond well for females; male abundance correlation was negative between the two surveys so the ARM WG proposed using sex ratio from the recent years of the VT Trawl survey.

Option 4) Use the forward-projection model developed for the ARM to predict number of males and females most likely in the population given the last VT Trawl estimate in 2012 and harvest applied that year. This option uses past VT Trawl data in conjunction with the stochastic population dynamics model and the 2012 harvest allowance to estimate abundance for both adult male and female crabs for 2013.

Monitoring Data

Sources of data for horseshoe crab abundance are described above and mark-resight estimates were used for red knot abundance. Red knot abundance is estimated at 44,010 birds for 2014.

Harvest Recommendations

The candidate harvest packages used in the ARM framework are shown in Table 1.

Table 1: Harvest packages and associated harvest numbers.

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

The 2015 harvest recommendation was dependent on which option we used to derive estimates of male and female crab abundance. Option 1, using the 2012 abundance estimates and maintaining status quo, resulted in harvest package 3 (500,000 male-only harvest). Options 2 and 3 resulted in harvest package 1 (complete moratorium on horseshoe crab harvest). Under option 4, the recommendation was harvest package 2 (250,000 male- only harvest). Table 2 summarizes male and female crab abundance estimates and harvest recommendations for the options

contained in this memorandum. Harvest among the Delaware Bay states is allocated based on language contained in Addendum VII. Proposed quotas based on the recommended harvest package will be included in a subsequent memorandum to the Board.

Table 2: Horseshoe crab abundance based on options outlined above:

Option Number	Female Abundance (number of crabs)	Male Abundance (number of crabs)	Harvest Package Recommendation
1	3,183,411	5,981,455	3
2	1,091,935	1,930,124	1
3	1,091,935	1,943,939	1
4	3,758,489	4,886,022	2

None of the four options for identifying the optimal harvest package is ideal and the lack of funding for the VT Trawl survey in 2013 and into the future is a major impediment to the existing ARM framework. Adaptive management cannot be effective without reliable monitoring data. However, the four options presented above represent adequate use of best available data to inform the process. The ARM WG greatly supports any effort to reinstate funding for the VT Trawl or any trawl survey (i.e., not necessarily run by VT) that uses that same methodology in the core and peripheral areas to monitor horseshoe crab abundance and informs the ARM framework. At the same time, the ARM WG, will continue to explore available data streams (e.g., NEAMAP, NJ state off-shore trawl, mark-recapture) to estimate crab abundance for future decision points with respect to horseshoe crab harvest management.

Please contact myself or Marin Hawk (mhawk@asmfc.org; 703-842-0740) with any questions about ARM framework or specifications-setting process.

ATLANTIC STATES MARINE FISHERIES COMMISSION
Horseshoe Crab Compliance Reports for
State Reporting Requirements
Submitted by the State of New Hampshire

I. Introduction

New Hampshire did not conduct the annual Identification of Potential Horseshoe Crab Spawning and Nursery Habitat Survey in 2013 and will no longer conduct in the future. There were no significant changes in regulations or harvest in 2013.

II. Request for *de minimis*, where applicable.

- a. The State of New Hampshire requests *de minimis* status for the horseshoe crab (*Limulus polyphemus*) in 2014. No horseshoe crabs were harvested in 2012 or 2013, which constitutes less than one percent of the coast wide commercial landings for the same two year period. If the *de minimis* threshold was reached, New Hampshire Fish and Game Department has the ability to close the fishery.

III. Previous calendar year's fishery

- a. Three individuals were permitted to harvest horseshoe crabs in 2013. No harvest occurred under these permits.
- b. Approximately 60 horseshoe crabs were studied at Plymouth State University to determine the genetic basis of biological rhythms. Upon completion of that study the horseshoe crabs were sacrificed and their brains were removed to do RNA analysis. Another 40 horseshoe crabs were studied at the University of New Hampshire to determine their attraction or avoidance of changes in water salinity and temperature. These horseshoe crabs were released after the study. An additional 35 horseshoe crabs are currently being used in a long-term study which tests the response of the isolated brains to different hormones at the University of New Hampshire.
- c. No biomedical fishery exists in New Hampshire.
- d. Not applicable to New Hampshire.
- e. Not applicable to New Hampshire.
- f. Not applicable to New Hampshire.

IV. Planned management programs for the current calendar year

- a. The annual Identification of Potential Horseshoe Crab Spawning and Nursery Habitat Survey was discontinued in 2013 and will no longer be conduct in the future.
- b. No monitoring programs will occur in 2014. Mandatory monthly reporting of all harvested horseshoe crabs was initiated in 2000. The numbers landed, harvest method used, and approximate location of horseshoe crab harvest is reported. Twenty percent of the catch is characterized using prosomal width by sex.

VI. Law Enforcement Reporting Requirements

- a. No substantial issues occurred in New Hampshire in 2013.

**Massachusetts
Division of Marine Fisheries**



**Massachusetts 2013 Compliance Report to the
Atlantic States Marine Fisheries Commission –
Horseshoe Crab**

Submitted by:
Vin Malkoski, Sr. Marine Fisheries Biologist
Massachusetts Division of Marine Fisheries
South Shore Field Station
838 South Rodney French Blvd
New Bedford, MA 02744

I. Introduction

Summary of the year highlighting significant changes in monitoring, regulations or harvest.

The bait fishery harvested 128,774 crabs in 2013. This represents a 21% increase from the 2012 bait harvest (106,821) and 92% increase from the 2011 harvest (67,087). We continued market sampling of horseshoe crabs to obtain prosomal width measurements. We continued spawning surveys during the new and full moon periods in April (second lunar period), May, and June using a modified Delaware Bay survey protocol. Over 146 volunteers and staff from government agencies, environmental organizations, and local service groups conducted surveys on 13 beaches in Massachusetts.

II. *De minimis* status – not applicable

III. Previous calendar year's fishery and management program

Activity and results of fishery dependent monitoring.

Massachusetts requires persons harvesting more than six crabs per day to have a regulated fishery permit and participate in trip-level reporting. Reports include date of harvest, trip start time and duration, port, gear type, disposition, harvest location, harvest method, and sex of the crabs. Harvesters are required to report the dealer or person purchasing the crabs. The single biomedical company located in Massachusetts, Associates of Cape Cod (ACC), must file monthly catch reports listing the harvester they purchased crabs from, harvest in-state or out-of-state, the number and sex of crabs purchased, and how the crabs were used. ACC must also report the number of crabs received dead or rejected and the number of dead crabs returned to fishermen with a biomedical harvest permit. These harvesters must report monthly the number of dead crabs from the time of harvest to the time the crabs are returned to the water. Bait dealers are required to file electronic reports weekly under the SAFIS (Standard Atlantic Fisheries Information System) system.

In 2013, Massachusetts issued 241 horseshoe crab bait permits and 14 horseshoe crab biomedical permits. Of these, 79 Massachusetts bait permit holders reported harvesting 128,774 horseshoe crabs (Figure 1). Sixteen fishermen reported landing 8,601 crabs for personal use. Reported harvest crabs by sex and harvest type is shown in Table 1. MA dealers purchased 112,056 bait crabs from commercial harvesters in 2013 as reported to SAFIS. Harvest by method is shown in Table 2. Trends in monthly bait harvest by hand harvest and trawling for 2008-2013 are shown in (Figure 2).

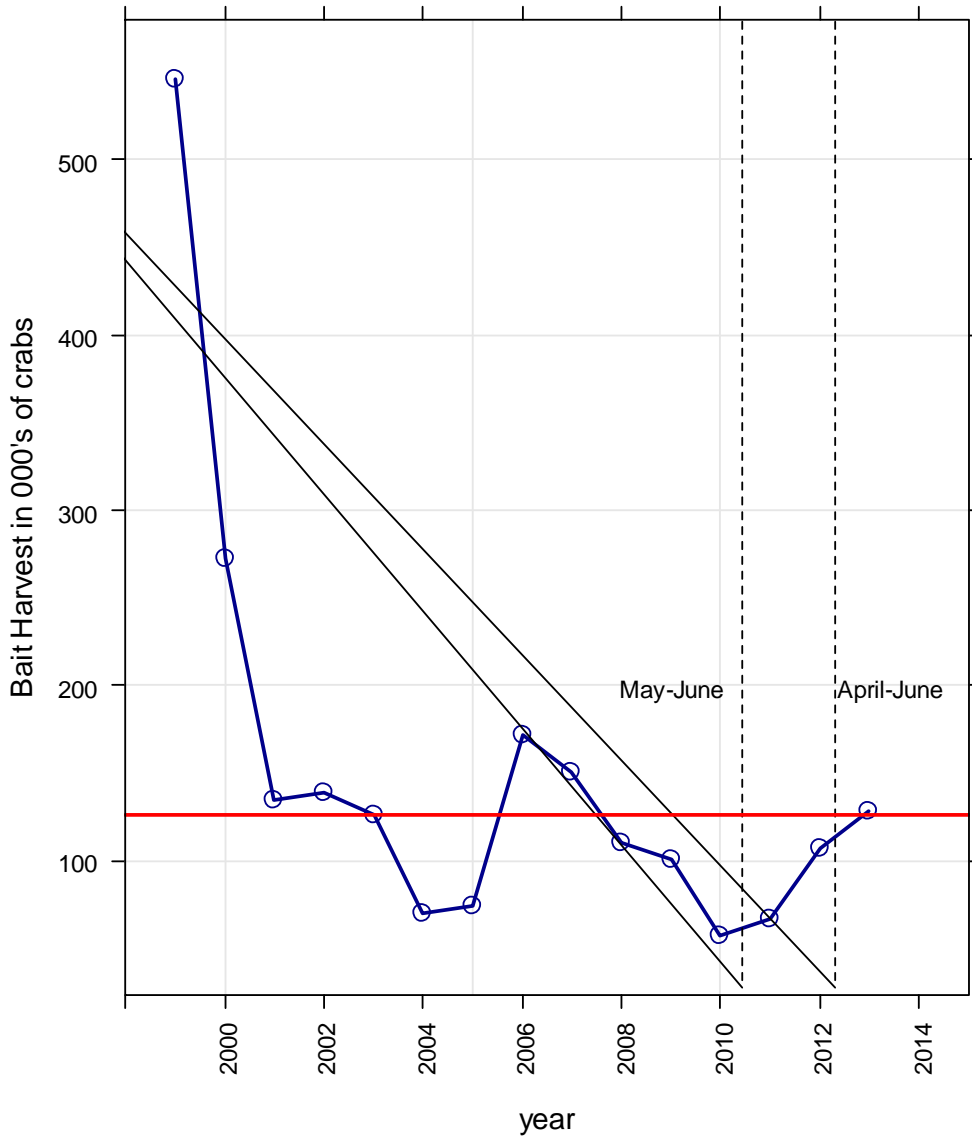


Figure 1. Massachusetts Horseshoe Crab Bait Harvester Landings 1999-2013. Horizontal red line is time series median. Dashed black lines indicate the implementation date of the May-June and April-June lunar harvest closures.

Table 2. Harvest (thousands of crabs) by fishing method in 2013 as reported by dealers to SAFIS.

Harvest method	Count 000's	Percentage of total
Hand & Rakes	40.7	36
Otter Trawl	28.8	26
Dredge	13.6	12
Pots, traps, hook and line, dipnet, and gillnet	18.0	16
Not coded	11.0	10

Total bait	112.1	100
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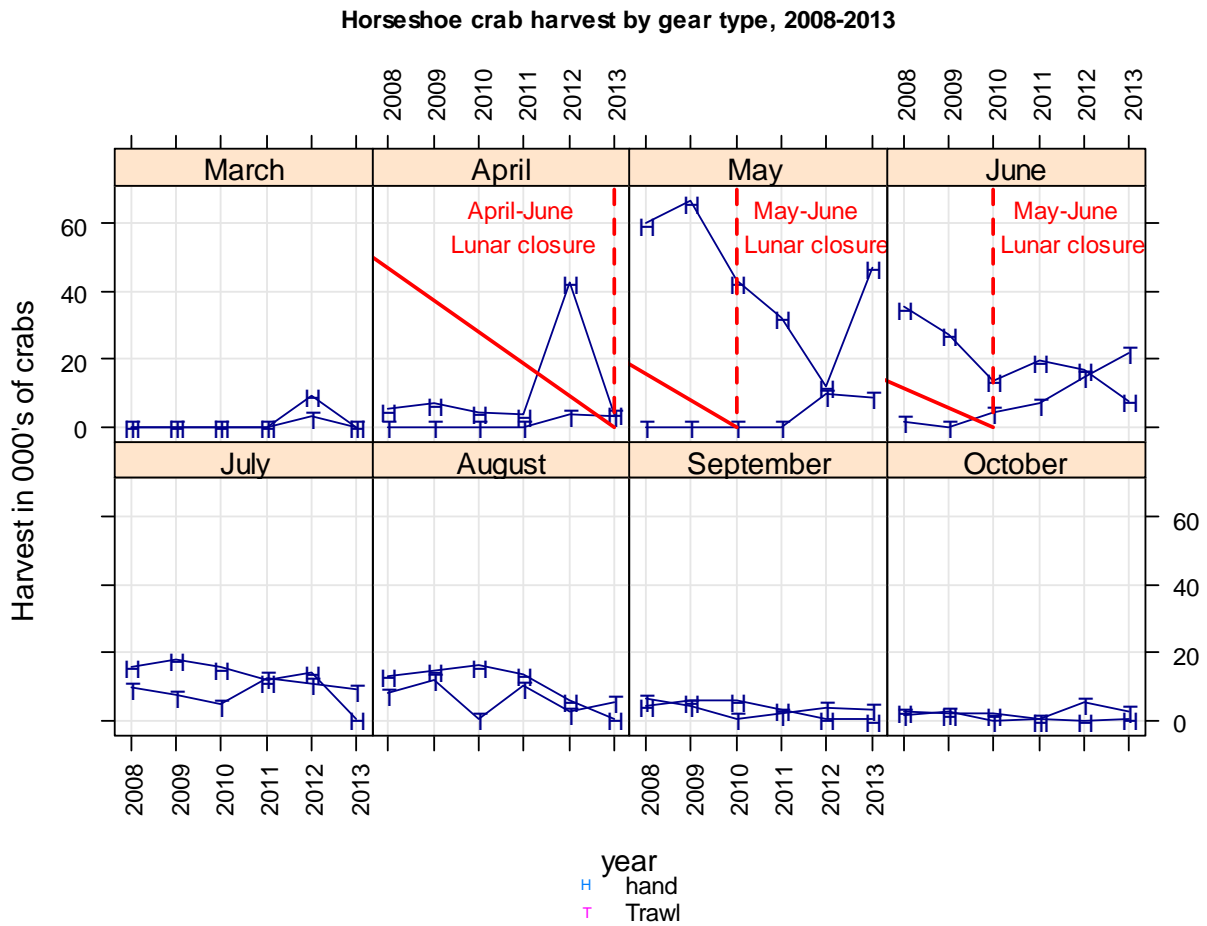


Figure 2. Massachusetts Horseshoe Crab Bait Landings by Gear Type, 2008-2013. Implementation dates of lunar closures indicated by red dashed vertical lines. Marine Fisheries implemented the May-June lunar closure in 2010 and an additional April-June lunar closure in 2013.

Total bait landings increased by 21% in 2013. Hand harvest was the highest since 2009, which was prior to implementation of the April/May/June lunar spawning closures. Mobile gear harvest increased in 2013, peaking in June. We believe that the higher overall beach harvest rates reflect adaptation to the lunar closure periods as well as the increased demand for bait for the whelk fishery. Similarly, increased mobile gear landings were influenced by demand and higher ex-vessel prices. In-season monitoring of these landings caused a review of the daily mobile gear harvest limits and MADMF has proposed reducing the mobile gear daily limit for 2014.

Scientific and research facilities reported collecting or purchasing fewer than 1,000 horseshoe crabs from fishermen. None of these crabs were returned to open water. The harvest of the Commonwealth’s two biomedical dealers cannot be released due to confidentiality protections (Massachusetts General Laws, Chapter 130, §21).

All crab harvesters are required to identify harvest by Massachusetts Shellfish Growing Areas or Reporting Areas on the trip-level catch reports. The regional break-down by percent of total crabs landed and gear type is shown in Table 3.

Table 3. Percentage of total bait harvest by regional areas and gear-type.

Region	% of total harvest	Gear-type
Cape Cod Bay	9% 4%	Hand Other
Southern Cape Cod	20% <1% <1%	Hand Mobile gear Other
Nantucket Sound	42% 5%	Mobile gear Other
Martha’s Vineyard	8% 1% <1%	Hand Mobile gear Other
Outer Cape	1%	Hand Other
Buzzards Bay	9% <1%	Hand Other

Marine Fisheries continues to characterize the commercial harvest of the crabs. DMF staff biologists sampled horseshoe crabs at local dealers, the biomedical processor, and aboard commercial fishing vessels to collect information on sex composition and prosomal width. The results are presented in Section V.

Activity and results of fishery independent monitoring.

Indices of Relative Abundance

Marine Fisheries' Resource Assessment Project has conducted seasonal spring (May) and fall (September) bottom trawl surveys in state waters since 1978. Approximately 100 tows are made in five bio-geographic areas, using a stratified random sampling design, with 22 strata. The net's design, (¾-sized two seam 39' x 51' otter trawl with 3 ½" cookies on a chain sweep) is appropriate for sampling horseshoe crabs, however, the vessel size precludes towing inside most embayments or in water depths less than approximately 8 m. These data are useful for illustrating trends within state waters (Figure 3).

We fitted GAMs to annual indices of stratified mean number crabs per tow for both spring and fall surveys to characterize trends in relative abundance. Spring relative abundance indices fluctuate widely with no discernible trend, but fall indices have generally decline through the time series and remain near a time series low.

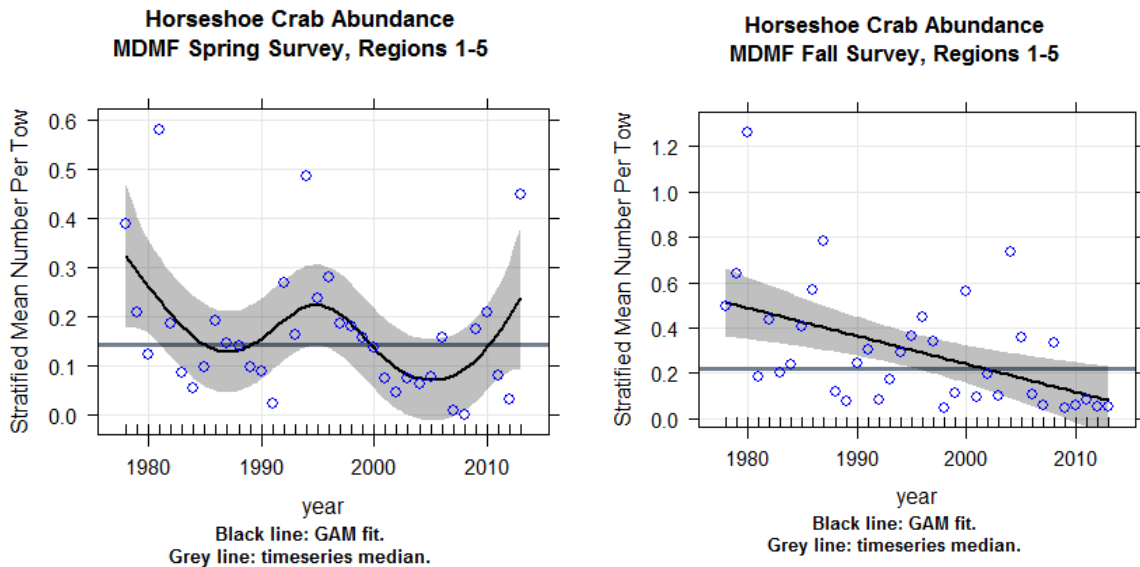


Figure 3. Results of the Massachusetts Resource Assessment spring and fall bottom trawl surveys 1978-2013

Spawning Surveys

Marine Fisheries, with the assistance of many volunteers from state agencies, organizations, and universities, conducts spring spawning surveys from which regional spawning indices are calculated. Since the inception of formalized spawning beach surveys in 2008, survey sites and sampling effort have varied greatly depending on available resources. Interpreting and making inferences from these data is difficult because of the sampling inconsistencies.

Consequently, we are auditing all data collected from the spawning surveys and changing the format to allow analytical methods that are better suited for these data. We intend to update this section after we complete the data audit and new analysis.

Regulations in effect for 2014

The Code of Massachusetts Regulations 322(CMR):

6.34 Horseshoe Crab Management

- (1) **Purpose.** The purpose of 322 CMR 6.34 is to comply with the Interstate Management Plan for horseshoe crabs to manage horseshoe crab populations for continued use by current and future generations of the fishing and non-fishing public including the biomedical industry, scientific and educational research; migratory shorebirds; and, other dependent fish and wildlife. The plan requires the Commonwealth to monitor and control harvest levels by all sectors and conserve crabs through a commercial quota for crabs harvested as bait.
- (2) **Permit.** It shall be unlawful for any person to take, land or possess more than six horseshoe crabs (*Limulus polyphemus*) per day for any purpose without a regulated fishery permit for horseshoe crabs issued by the Director. Licensed pot fishermen using horseshoe crabs as bait may possess more than six horseshoe crabs without a regulated permit, provided their documented source is a wholesale or bait dealer.
 - (a) **Special Biomedical Harvest Permit.** Harvesters collecting horseshoe crabs exclusively for use by the biomedical industry for the manufacture of limulus lysate or sale to a permitted scientific institution for research purposes must obtain a special permit limited to that purpose. The holder of the biomedical special permit shall not be allowed to obtain a Horseshoe Crab Permit.
 - (b) **Permit Moratorium.** As of March 28, 2008, the Director may not issue any new regulated fishery permit endorsements for horseshoe crabs. Failure to renew the horseshoe crab regulated fishery endorsement in any calendar year shall result in permit forfeiture to the Division.
- (3) **Bait Harvest Quota.** The annual quota for horseshoe crabs harvested for bait purposes shall be 165,000 crabs. Horseshoe crabs harvested solely for biomedical or research purposes by harvesters licensed under 322 CMR 6.34(2)(a) which are bled and released alive in the area of capture or used for display or research shall not be counted against the annual quota established by the Atlantic States Marine Fisheries Commission. When 100% of the annual quota is reached, the Division shall file a notice of the horseshoe crab bait fishery closure with the Massachusetts Register, email a notice via the Marine Fisheries Listserv and post a notice on the Division's website.
- (4) **Possession Limits.** Possession limits shall be vessel limits and shall apply regardless of the number of persons or permit holders aboard a vessel or working in conjunction with a vessel. It shall be unlawful for any person to harvest more than the possession limit in a day regardless of the number of permits held.
 - (a) **Bait crab harvesters** It shall be unlawful for any horseshoe crab harvester permitted to take crabs for bait purposes to take, land or possess:

1. more than 400 horseshoe crabs during any 24 hour period beginning at 12:00 P.M. (noon).

Exception: The daily limit on dragger harvest (any form of mobile gear) of horseshoe crabs is 300 crabs per 24 hour period beginning at 12:00 P.M. (noon) .

2. any horseshoe crabs once 100% of the horseshoe crab bait harvest quota has been taken.

(b) Biomedical crab harvesters. It shall be unlawful for any horseshoe crab harvester permitted to take crabs for biomedical purposes to take, land or possess more than 1,000 horseshoe crabs during any 24 hour period beginning at 12:00 P.M (noon).

(c) Exemption. Possession limits shall not apply to lawfully harvested horseshoe crabs held in storage by licensed conch pot or eel fishermen or dealers.

(5) Biomedical/Research Harvest.

(a) Authorization. Biomedical harvest permit holders must sell horseshoe crabs only to a dealer authorized by the Director to receive crabs harvested exclusively for biomedical purposes.

(b) Live Release.

1. Biomedical permit holders shall return all horseshoe crabs not used for display or research, other than bleeding, alive to the area of capture.

2. Dealers authorized by the Director to receive crabs harvested exclusively for biomedical purposes shall:

a. keep horseshoe crabs supplied by biomedical permit holders separate from horseshoe crabs supplied by bait permit holders; and

b. ensure horseshoe crabs supplied by biomedical permit holders are returned for live-release back into the same area of capture.

(c) Temporary Use of Horseshoe Crabs Harvested for Bait Purposes. If a biomedical company or permitted scientific institution chooses to purchase horseshoe crabs from bait dealers:

1. the company or institution shall keep records sufficient to show the number and source(s) of said horseshoe crabs;

2. horseshoe crabs purchased by a biomedical company from bait dealers may be returned to bait dealers to be sold as bait.

(d) Horseshoe Crabs Imported from Other States for Biomedical Purposes shall be counted against the quota of the producing state or returned to the producing state for release, according to established rules and regulations of the state of origin.

(6) Reporting.

(a) Harvesters. Each holder of a regulated fishery permit for horseshoe crabs, or a scientific collecting permit shall file a monthly catch report on forms supplied by the Division. Failure to report shall be grounds for suspension or non-renewal of the permit.

- (b) Dealers. Wholesale Dealers and Bait Dealers who purchase horseshoe crabs from licensed fishermen shall register with the Division and record purchases on forms supplied by the Division. Failure to report purchases by the fifth day of each successive month shall be grounds for administrative action.

(7) Closed Days.

- (a) Lunar Closures. It shall be unlawful to harvest horseshoe crabs within a series of five day periods coinciding with each new and full moon during the period of April 16 - June 30 as published by the US Naval Observatory and adjusted for Eastern Daylight Savings Time. Lunar closures shall commence at 12:00 AM two days prior to, and end at 11:59 PM two days after the date of the full or new moon.
- (b) Mobile gear no-fishing days. In addition to closures described in 6.34.8(a), permit holders using mobile gear shall be prohibited from fishing for horseshoe crabs on Fridays and Saturdays during the summer flounder season beginning on June 10th and ending when the summer-time summer flounder quota is reached.

(9) Closed Areas. The Director may close any area to the taking of horseshoe crabs provided:

- (a) A majority of the members of the Massachusetts Marine Fisheries Commission approve, and;
- (b) A notice of closure has been filed with the Massachusetts Register stating the rationale for the closure, the duration of the closure and a description of the area to be closed, and;
- (c) All permit holders and dealers are notified.

(10) Minimum Size. It is unlawful to possess horseshoe crabs for commercial purposes with a prosomal width of less than 7 inches.

(11) Fishery Limit Adjustments.

- (a) The Director may, by declaration, adjust the manner and times of taking horseshoe crabs, and the legal size limits, numbers and/or quantities of horseshoe crabs to be taken as prescribed by M.G.L. c. 130, § 17A and specified by the Atlantic States Marine Fisheries Commission (ASMFC).
- (b) Declaration Process
 1. a two-week comment period has been conducted by the Division;
 2. it has been approved by a majority of the members of the Massachusetts Marine Fisheries Advisory Commission;
 3. a notice has been filed with the Massachusetts Register;
 4. a notice has been published by at least one local newspaper; and
 5. a copy of the notice has been emailed via the Marine Fisheries Listserv and posted on the Division's website.

Closed areas

In addition to the above regulations, Monomoy National Wildlife Refuge (federal closure) and the National Season (NPS - federal) remain closed to all HSC harvest, and Pleasant Bay (state closure) remains closed to bait fishing only (Figure 4).

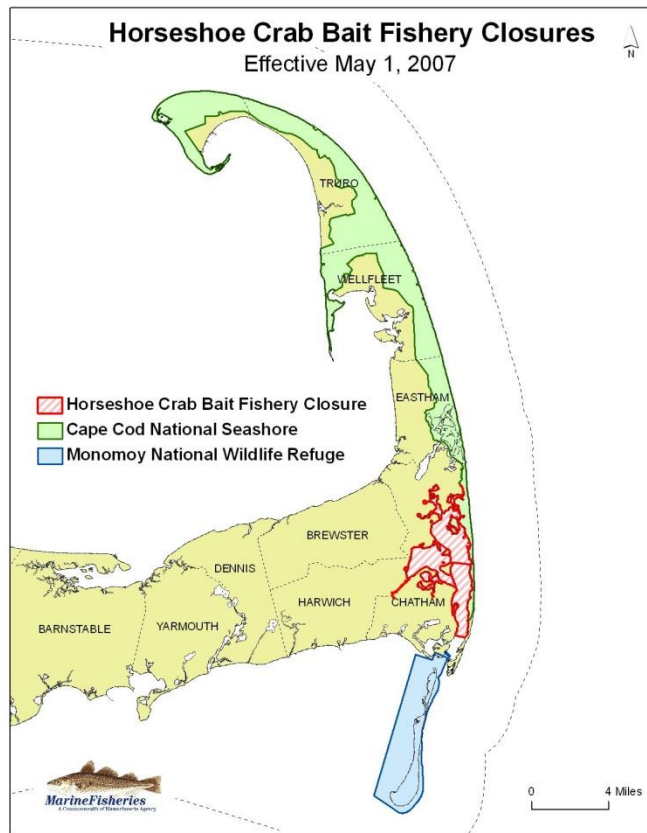


Figure 4. Areas closed to bait and/or biomedical harvest.

Review of progress in implementing habitat recommendations.

Marine Fisheries' Environmental Review Project makes recommendations on state and federal coastal alteration permits to protect horseshoe crab spawning and nursery areas. These typically take the form of recommendations to limit certain activities during the crab's May – July spawning season. Known spawning beaches have been entered into a GIS database to facilitate the environmental review process and a time-of-year guidance document authored by DMF is under review and will reiterate specific recommendations regarding dredging, beach fill, and construction projects vis à vis their potential impact on horseshoe crabs.

IV. Planned management programs for 2014

Summarize regulations that will be in effect (copy of current regulations if different from III c).
The daily limit on dragger harvest (any form of mobile gear) of horseshoe crabs is 300 crabs per 24 hour period.

Summarize monitoring program that will be performed.

- Spring spawning beach surveys will be continued.
- *Marine Fisheries* will continue collecting catch reports from all crab harvesters, dealers, and scientific permit holders. The biomedical company will submit monthly reports and an annual questionnaire. *Marine Fisheries* will also continue to identify horseshoe crab spawning and nursery habitat and to characterize the commercial fishery. The *Marine Fisheries* spring and fall trawl surveys will continue to monitor and record weight, number and prosomal width by sex of individuals collected.
- *Marine Fisheries* will continue to encourage ACC to bleed as many bait crabs as possible in order to reduce the demand for biomedical crabs, particularly in light of our bleeding mortality study results.

Highlight changes from previous year.

The lunar spawning closures were extended to cover the second lunar period in April to afford greater protection to spawning horseshoe crabs.

V. Monitoring Program Requirements – Including Addendums I-III

Component A₁: Addendum III requires monthly reporting of all harvest of horseshoe crabs (bait fisheries, biomedical, industry, by-catch, educational and scientific research) by number landed, by sex and harvest method. Continue characterization of the commercial catch based on prosomal width by sex. States will be required to characterize a portion of the commercial catch based on maturity once an appropriate technique is developed and approved by the Technical Committee.

Massachusetts' existing regulations comply with Addendum III of the FMP. The Code of Massachusetts Regulations 322(CMR) 6.34 requires any person harvesting, taking or landing more than six horseshoe crabs per day for any purpose to have a regulated fishery permit from the Director of the Division of Marine Fisheries. Permit holders are required to report at the trip-level the number of crabs harvested daily by sex, the beach or embayment of harvest, gear-type used and the intended use of the harvested crabs. If the crabs are sold, as a directed fishery or as by-catch, the permit holder must identify the dealer or individual buying the crabs. Failure to report shall be ground for suspension of the permit and non-renewal.

Wholesale or bait dealers purchasing horseshoe crabs from licensed fishermen are now required to submit weekly electronic SAFIS reports. Biomedical facilities must report the name of the harvester, number of crabs and the use of horseshoe crabs monthly.

Commercially harvested horseshoe crabs were sampled during the beach harvest season by *Marine Fisheries* biologists at bait dealer and the biomedical facilities. A total of 1,040 horseshoe crabs (514 female and 526 male crabs) were identified by sex and measured to determine prosomal width (Figure 5). The mean prosomal width for female crabs was 25.7 cm

and 19.9 cm for male crabs. The center of the distribution of prosomal widths for males remained stable in 2013, while females shifted slightly to larger sizes. (See Attachment 1.)

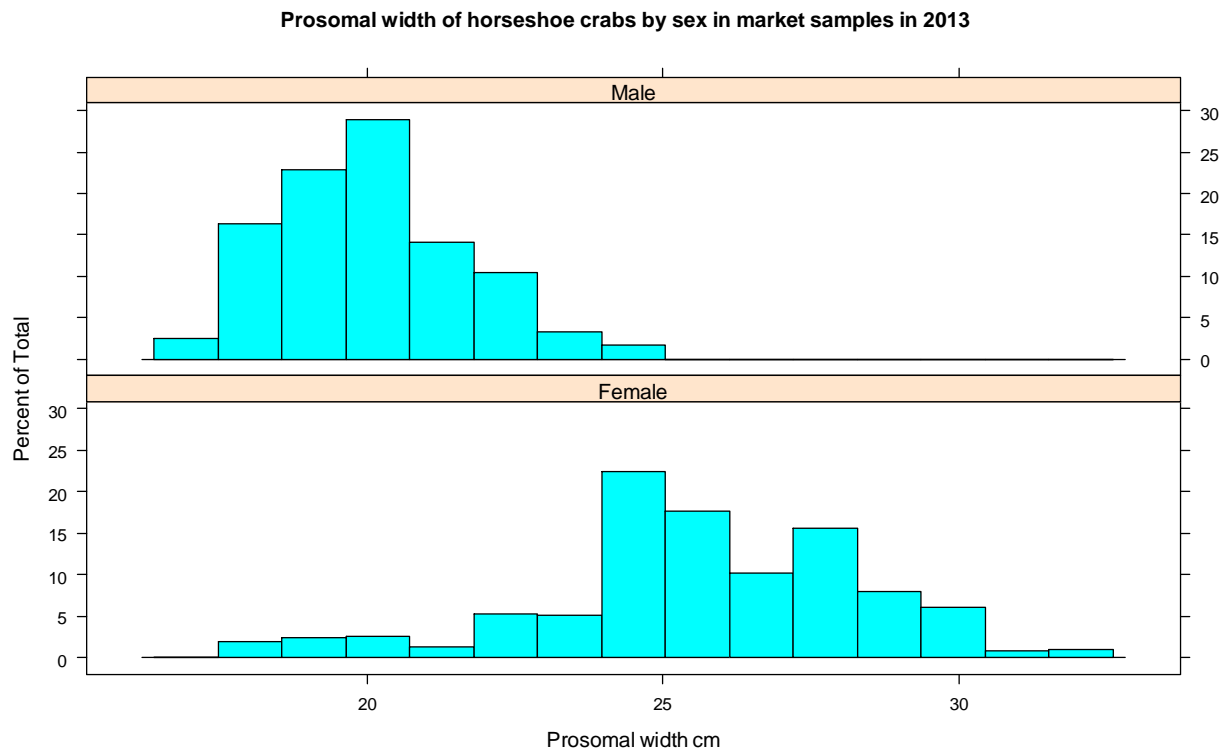


Figure 5. Distribution of prosomal widths (cm) for female and male horseshoe crabs sampled during market surveys.

Component A₂: To comply with Addendum III, states where horseshoe crabs are captured for biomedical use must monitor and report monthly and annual harvest of horseshoe crabs by biomedical facilities. All states must identify percent mortality from the point of harvest to release. States are required to use the HSC TC biomedical survey or some other means to obtain the required information.

The Massachusetts biomedical company, Associates of Cape Cod (ACC) obtained crabs from three licensed bait dealers, and one fisherman. Massachusetts regulations allow the biomedical company to purchase bait crabs for bleeding. Once bled, the crabs are returned to the bait dealers for sale as bait or to a biomedical harvester to be released at the site of capture. As nearly half of the crabs used by the biomedical company came from the bait dealers, fewer crabs are harvested by biomedical permit holders, reducing the total number of crabs harvested in the Commonwealth.

Addendum III requires the biomedical company to file monthly reports noting the number of crabs received from each dealer, the number of dead or rejected crabs and the number of dead crabs returned to the dealers. The biomedical company reported a rejection rate of approximately 5-6% for both the biomedical and bait dealers. Crabs from the biomedical dealer

rejected by the biomedical company because of injury, size, etc. were returned to the water near the harvest site. Rejected crabs obtained from bait dealers were sold as bait.

Component A₃: States must identify spawning and nursery habitat. States that have completed this work must report changes in spawning and nursery habitat over time. States must actively intervene to the extent of their authority to ensure that spawning and nursery habitat is conserved and the quality and productivity is maintained.

A comprehensive survey of horseshoe crab spawning and nursery habitat along the Commonwealth's 1,800 miles of coastline was completed in 2004 and partially updated in 2007 (Attachment 2). This assessment will be updated in the coming years as staffing allows. All crab harvesters are required to identify embayments on the catch reports. We did not update this map in 2013. Therefore the map in Attachment 2 is from 2004 and the tables are from 2007.

Marine Fisheries annually solicits public assistance by issuing postings on the website and in the *Marine Fisheries* newsletter. Anyone observing spawning horseshoe crabs is asked to contact *Marine Fisheries*.

Marine Fisheries' Environmental Review Project also recommends conditions to all coastal alteration projects to protect horseshoe crab habitat and requests time-of-year restriction on any activities on known horseshoe crab spawning beaches.

Monitoring Program Recommendations – Including Addendums I-III

Monitoring of Horseshoe Crab Populations and Habitat

Component B₁: Continue working towards expanding the annual coastwide benthic trawl survey following methods described in Hata and Berkson (2003).

Marine Fisheries does not have the resources to extend the annual coastwide benthic trawl survey into Massachusetts coastal waters. Our Coastal Resource Assessment Project currently records the number, and prosomal width by sex of all horseshoe crabs collected during the annual spring and fall bottom trawl surveys. Survey data is forwarded to the Stock Assessment Committee.

Component B₂: Continue existing benthic sampling programs.

As noted in Component B₁, *Marine Fisheries*' Resource Assessment Project currently records the number, and prosomal width by sex of all horseshoe crabs collected during the annual spring and fall bottom trawl surveys. Survey data are forwarded to the Stock Assessment Committee.

Component B₃: Continue monitoring spawning populations based upon standardized and statistically robust methodologies.

Massachusetts started annual spawning surveys in 2008 modeled after Delaware Bay's (with modification of quadrat size to 5 x 5 m² due to much lower populations in MA).

Component B₄: A coordinated tagging program should be implemented by the Tagging Subcommittee based upon the draft coast-wide framework developed in 2003.

Marine Fisheries did not undertake any tagging in 2013, although MA Audubon has continued some tagging effort in eastern Cape Cod embayments.

Joint Monitoring of Delaware Bay Horseshoe Crabs and Shorebirds

Component B₅ Continue existing state egg abundance surveys, particularly in the Delaware Bay region.

Marine Fisheries does not have the resources to conduct a comprehensive egg abundance survey. We are investigating the possibility of conducting a juvenile horseshoe crab survey.

Component B₆ Continue existing state shorebird monitoring programs.

Shorebird monitoring in Massachusetts is conducted by other agencies and organizations.

Component E: Evaluate the post-release mortality of horseshoe crabs used by the biomedical industry by initiating a tagging program.

*Marine Fisheries conducted a study in 2009 examining mortality in bled and unbled female crabs. The study results were published in 2010: Leschen, A. S. and Correia, S. J. (2010) 'Mortality in female horseshoe crabs (*Limulus polyphemus*) from biomedical bleeding and handling: implications for fisheries management', *Marine and Freshwater Behaviour and Physiology*, 43: 2, 135 — 147.*

Component F: Identify potential horseshoe crab spawning and nursery habitats.

See Component A₃.

Changes to Research Needs Section.

Section 6.1 Develop an effective and efficient field protocol to identify critical life history stages. At a minimum, the protocol should identify horseshoe crabs that have spawned previously, those that are within one year of spawning for the first time and those that are more than one year from spawning for the first time.

Once developed, Massachusetts will incorporate the protocol into the sampling design.

Section 6.2 In addition to investigating, encouraging and funding alternative bait sources, the Committee suggested focusing on alternative trap design (i.e. traps with bait bags).

In 2014, *Marine Fisheries* plans to participate in joint artificial bait studies with other states through the ASMFC HSC Technical Committee.

ATTACHMENT 1

HORSESHOE CRAB PROSOMAL WIDTHS

2000 – 2013

Prosomal width of horseshoe crabs by sex taken in market samples in 2000-2013

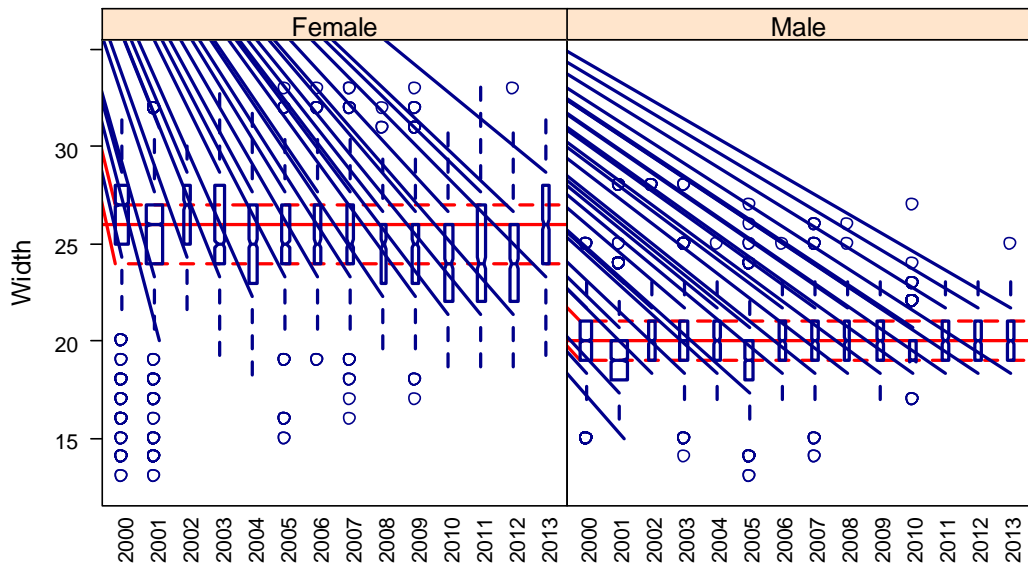


Figure 1. Box plots of prosomal widths taken in market sampling of horseshoe crabs for all areas combined (2000-2013). Solid red line is median, dashed lines are 25 and 75th quantiles (unweighted). Left panel: female horseshoe crabs. Right panel: male horseshoe crabs. Width of box is proportional to the square root of sample size.

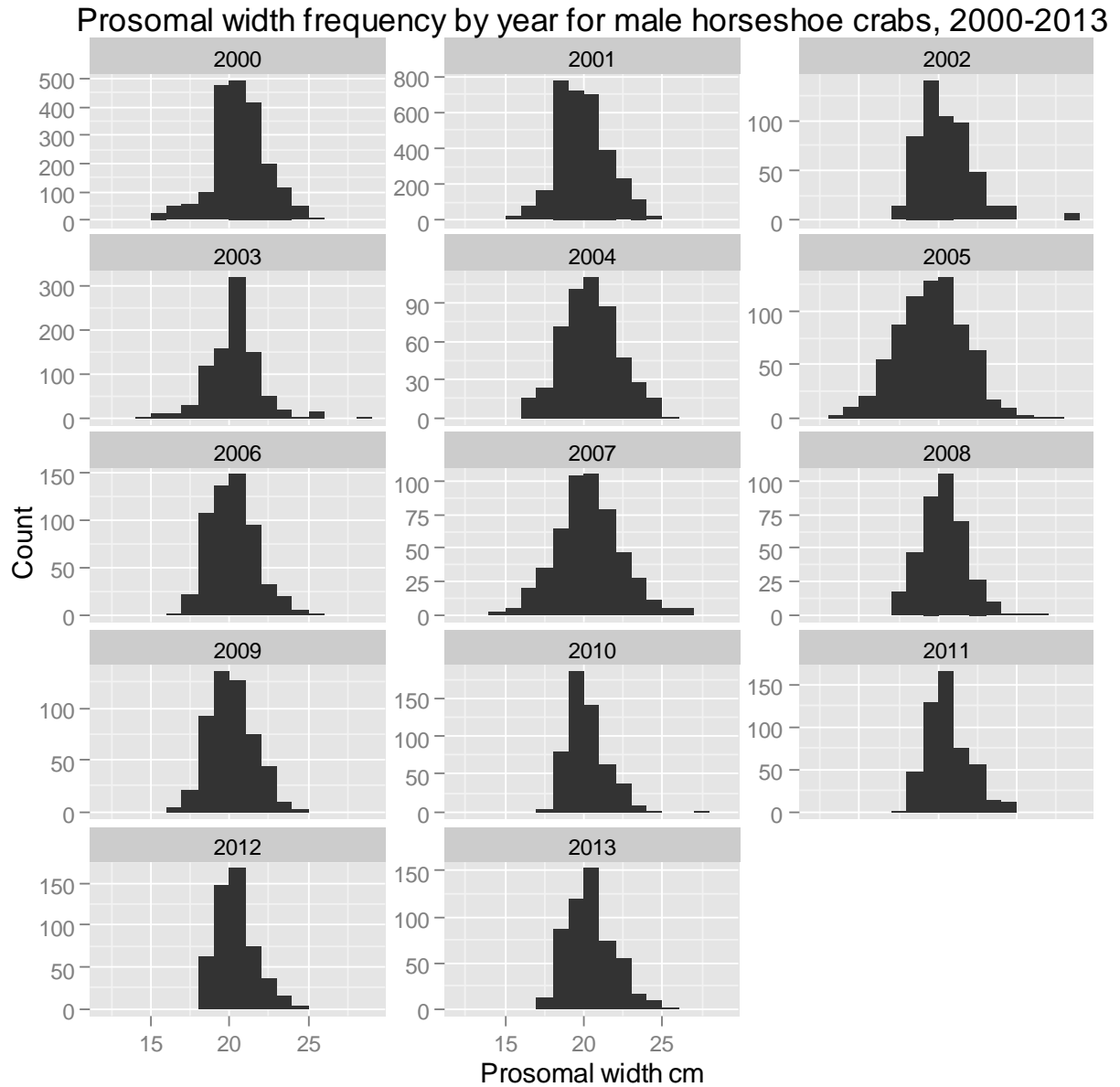


Figure 2. Prosomal width frequency from market sampling for male horseshoe crabs (2000-2013).

Prosomal width frequency by year for female horseshoe crabs, 2000-2013

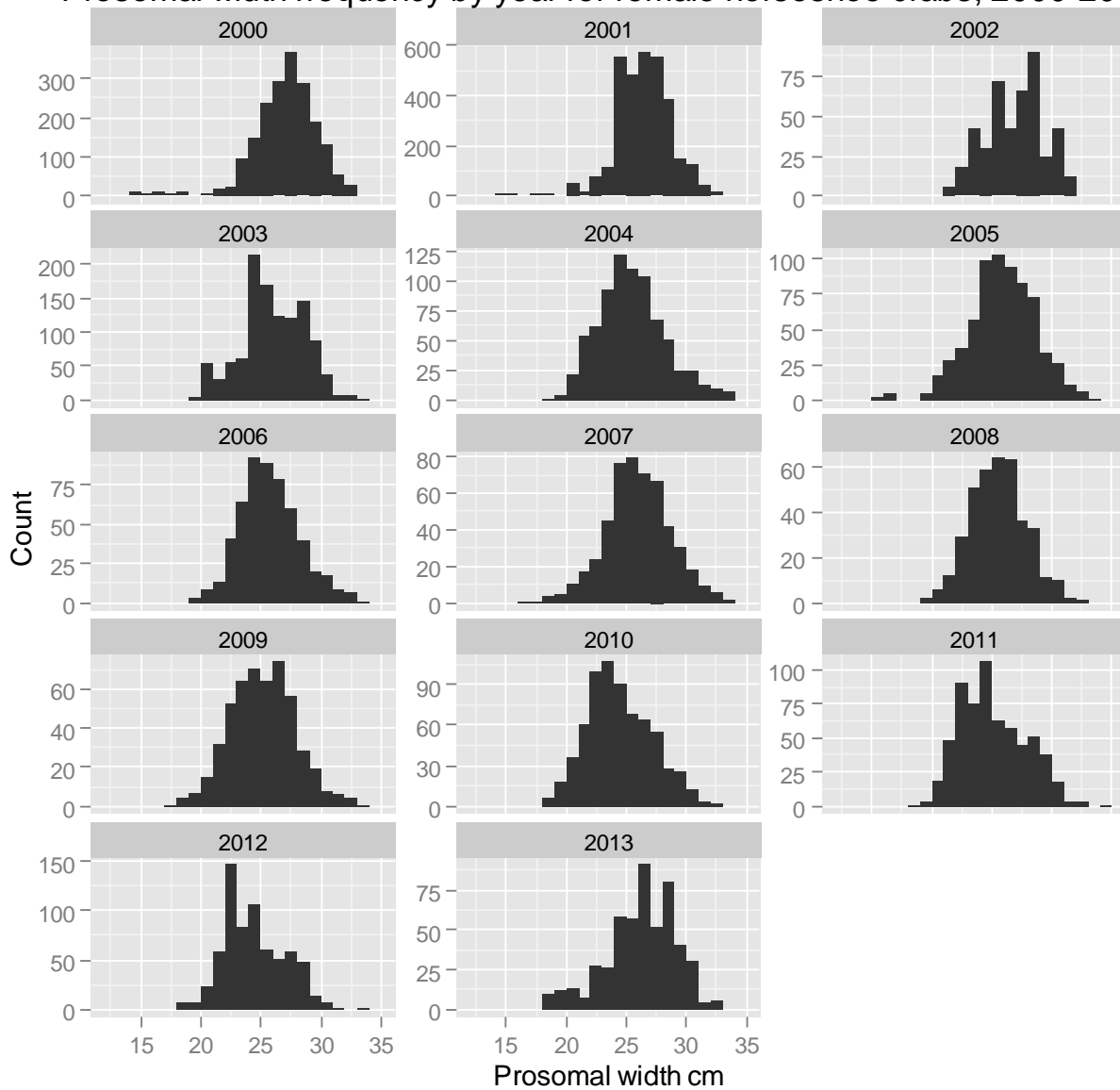
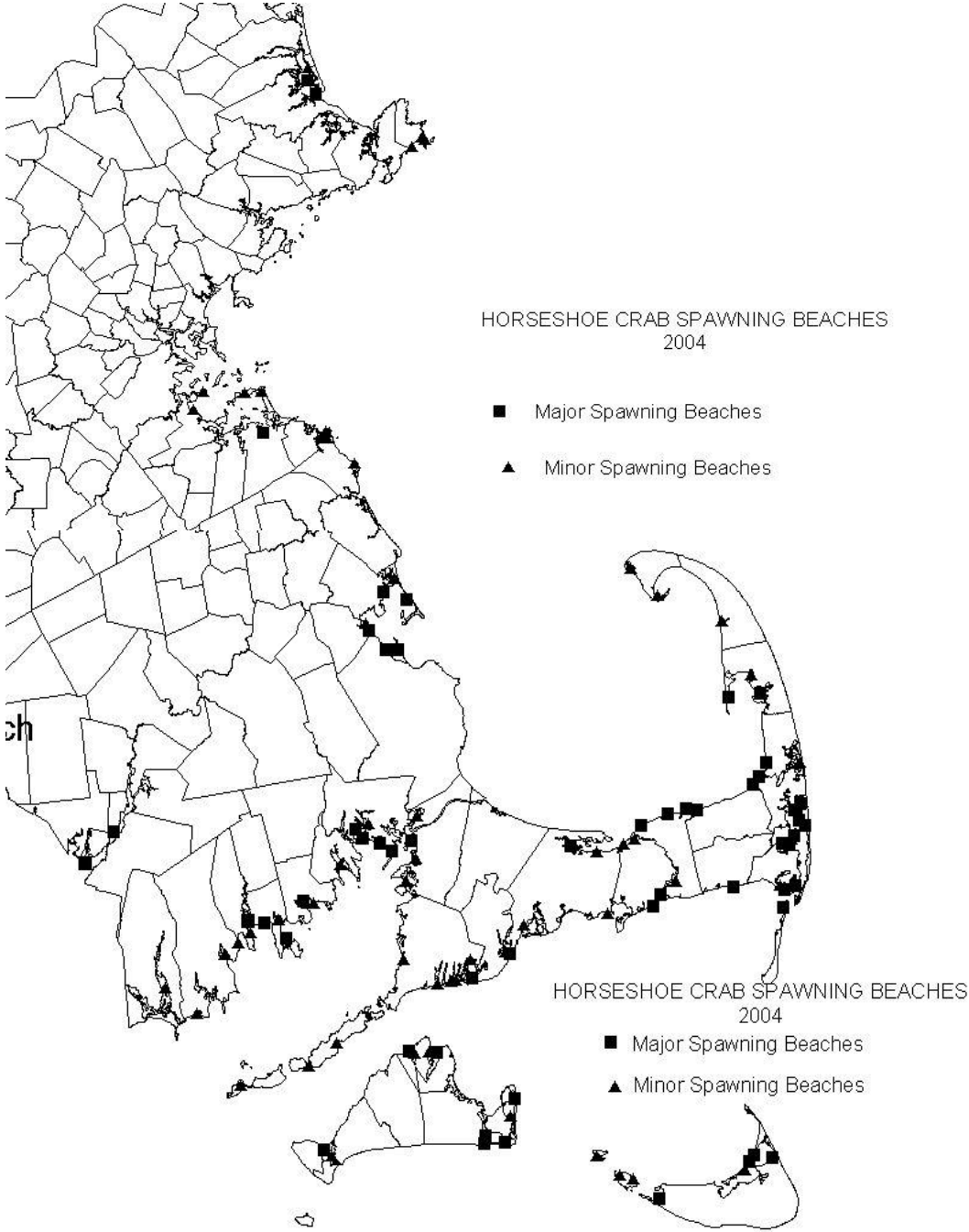


Figure 3. Prosomal width frequency from market sampling for female horseshoe crabs (2000-2013).

**ATTACHMENT 2
HORSESHOE CRAB SPAWNING BEACHES
AND NURSERY AREAS**



HORSESHOE CRAB SPAWNING BEACHES 2007

TOWN	EMBAYMENT	BEACH	DENSITY
MOUNT HOPE BAY			
Somerset	Mount Hope Bay	Brayton Pt Beach	High
	Taunton River	Pierce Town Beach	High
Fall River	Taunton River	Ark Bait Cove	High
Swansea	Coles River	Bluffs Beach	High
	Coles River	Ocean Grove	High
	Coles River	Cedar Cove	Moderate
BUZZARDS BAY			
Bourne	Buttermilk Bay	Hideaway Village	Moderate
	Phinney's Harbor	Monument Beach	High
	Phinney's Harbor	Mashnee Dike	High
	Phinney's Harbor	Toby Island	Moderate
	Pocasset Harbor	North Cove	Moderate
	Pocasset Harbor	Tahanto Beach	Moderate
Dartmouth	Allen's Pond	South Beaches	Moderate
	Clarks Cove	Anthony Beach	Moderate
	Apponagansett Bay	Apponagansett Park Beach	Moderate
	Little River	Beach at mouth	Reported
	Slocum River	Demarest Lloyd State Beach	Reported
	Clarks Cove	Jones Beach	Moderate
	Apponagansett Bay	Little Bridge Beach	Reported
Fairhaven	Nasketucket Bay	Deacon's Cove	High
	Nasketucket Bay	Edgewater Ramp Beach	Moderate
	Acushnet River	Fairhaven Common's Beach	High
	NB Outer Harbor	Fort Phoenix Beach	Reported
	Nasketucket Bay	Knomere Beach	Reported
	NB Outer Harbor	Priest Cove, Red Rock Beach	High
	Nasketucket Bay	Raymond Street Beach	Reported
	NB Outer Harbor	Silver Shell Beach	Reported
	Acushnet River	Tin Can Island	High
	Nasketucket Bay	Association Beach	Moderate
Falmouth	Great Sippewisset	Black Beach	Reported

	Buzzards Bay	Old Silver Beach	Reported
Gosnold	Cuttyhunk Pond	Church Beach	Reported
	Pasque Pond	Beach	Reported
	Vineyard Sound*	Tarpaulin Cove	Moderate
Mattapoissett	Aucoot Cove	Hollywood Beach	Moderate
	Mattapoissett Harbor	Ned's Point	Reported
	Mattapoissett Harbor	Shining Tides Beach	Moderate
	Buzzards Bay	Point Connett Beach	Reported
Marion	Sippican Harbor	Meadow Island	Moderate
	Sippican Harbor	Ram Island	Reported
	Sippican Harbor	Planting Island	Moderate
	Aucoot Cove	Converse Pt Beach	Reported
New Bedford	Acushnet River	Palmer Cove	High
	NB Outer Harbor	East Beach	Moderate
	NB Outer Harbor	Ebb Tide Beach	Moderate
	NB Outer Harbor	Davy's Locker Beach	Reported
Wareham	Buttermilk Bay	Jefferson Shores	Moderate
	Wareham River	Long Beach	High
	Little Harbor	Little Harbor Beach	High
	Wareham River	Pine Hurst Beach	Reported
	Wareham River	Swifts Beach	High
	Buzzards Bay	Stony Point Dike	Moderate
Westport	Westport Harbor	Cherry & Webb Beach	Moderate
	East Branch	Upper Islands	Reported
	West Branch	Sanford Flat Area	Reported
	Westport Harbor	Boat Ramp Beach	Reported
SOUTH CAPE			
Barnstable	Centerville Harbor	Craigville Beach(5 th Ave)	Reported
	Cotuit Bay	Ropes Beach	Reported
	East Bay	Dawes Beach	Moderate
	Hall Creek	Backside Beach	Reported
	Hyannis Harbor	Kalmus Beach	Reported
	Cotuit Bay	Sampson Island	High
	Cotuit Bay	Pirate Cove	High
Chatham	Nantucket Sound	Cockle Cove Beach	High

	Nantucket Sound	Monomoy Island	High
	Stage Harbor	Harding Beach	High
	Stage Harbor	Morris Island	High
	Oyster Pond	Beaches at mouth	Reported
	Oyster River	Sear's Point Beach	High
Dennis	Bass River	Opposite High Bank	Moderate
	Bass River	Old Field Point	Reported
	Bass River	W. Dennis Beach	High
	Bass River	Georgetown Flats	Reported
Falmouth	Bourne's Pond	Old Mouth	Reported
	Great Pond	Entrance Beaches	Moderate
	Green Pond	Entrance Beaches	Moderate
	Eel River	Washburn Island	Reported
	Waquoit Bay	WBNERR Beach	Reported
Mashpee	Waquoit Bay	Sage Lot Pond	High
	Nantucket Sound	South Cape Beach	Reported
	Popponesset Bay	Popponesset Beach	Reported
	Popponesset Bay	Daniel Island Beach	Reported
	Popponesset Bay	Pirates Cove Landing	Moderate
Yarmouth	Bass River	Wind Mill Beach	Moderate
	Nantucket Sound	Sea Gull Beach	Moderate
	Nantucket Sound	Lighthouse Beach	Moderate
	Parker River/ Lewis Pond	Landing Beach	Reported
MARTHA'S VINEYARD			
Aquinnah	Menemsha Pond	Red Beach	High
Chilmark	Menemsha Pond	Landing	Moderate
Edgartown	Cape Poge Bay	Simon Point	Moderate
	Katama Bay	SE Corner	High
	Katama Bay	South Side	High
	Salt Pond	Fuller Street Beach	Reported
Oak Bluffs	Lagoon Pond	Worcester St.	Reported
	Vineyard Haven	Eastville Point	Moderate
Tisbury	Lake Tashmoo	Flats at mouth	High
	Lagoon Pond	Cedar Neck	Reported
NANTUCKET			

Nantucket	Madaket Harbor	Hither Creek	Moderate
	Muskeget Island	Coves	Reported
	Nantucket Harbor	Backside Outer Beach	Reported
	Nantucket Harbor	Pocomo Point Beach	High
	Tuckernut Island	Coves	Reported
	Barnstable Harbor	The Cove	Reported
	Barnstable Harbor	Calves Pasture Point	High
	Barnstable Harbor	Bone Hill	Reported
	Barnstable Harbor	Eastern end	High
	Barnstable Harbor	Salten Point	High
OUTER CAPE			
Chatham	Bassing Harbor	Fox Hill	Moderate
	Crows Pond	Nickerson Neck	Moderate
	Chatham Harbor	North Beach	Reported
	Chatham Harbor	Outermost Marine Cove	High
	Pleasant Bay	Muddy Creek Landing	Reported
	Chatham Harbor	South Beach	Reported
	Pleasant Bay	Strong Island, East Side & Creeks	High
	Pleasant Bay	Ryders Cove	Reported
Eastham	Nauset Harbor	Stony Island	Reported
	Nauset Harbor	Outer Beach	Reported
Harwich	Round Cove	Landing	Reported
Orleans	The River	Barley Neck	High
	Little Pleasant Bay	Hog Island	High
	Little Pleasant Bay	Jack Knife Cove	High
	Kesczyogansett Pond	Town Landing	Moderate
	Town Cove	YC Landing	Moderate
	Little Pleasant Bay	National Seashore	High
	Little Pleasant Bay	Pochet Island	High
	Little Pleasant Bay	Sampson Island	High
	Little Pleasant Bay	Old Field Point	Reported
	Pleasant Bay	Strong Island	High
CAPE COD BAY			
Barnstable	Barnstable Harbor	Scudder Lane	High
	Barnstable Harbor	Sand Island	High

	Barnstable Harbor	The Cove	Reported
	Barnstable Harbor	Calves Pasture Point	High
	Barnstable Harbor	Bone Hill	Reported
	Barnstable Harbor	Eastern end	High
	Barnstable Harbor	Salten Point	High
Brewster	Cape Cod Bay	Brewster Flats	High
	Cape Cod Bay	Ellis Landing	High
	Cape Cod Bay	Namskaket Creek	High
	Cape Cod Bay	Paine's Creek	Moderate
Dennis	Cape Cod Bay	Chapin Beach	High
	Cape Cod Bay	Corporation Beach	High
	Cape Cod Bay	Cold Storage Beach	Moderate
	Cape Cod Bay	Quivett Creek	Moderate
	Cape Cod Bay	Chase Garden Creek	Reported
Duxbury	Duxbury Bay	Back River	High
	Duxbury Bay	Duxbury Beach	High
	Duxbury Bay	Ship Yard Lane	High
	Duxbury Bay	Bradford Street	High
Eastham	Cape Cod Bay	First Encounter	High
	Cape Cod Bay	Sunken Meadow	High
	Cape Cod Bay	Boat Meadow Sand Spit	Reported
Kingston	Kingston Bay	Gray's Beach	Reported
	Kingston Bay	Rocky Nook Association Beach	Reported
Orleans	Cape Cod Bay	Rock Harbor Beach	Moderate
	Cape Cod Bay	Skaket Beach	Reported
Plymouth	Plymouth Harbor	Plymouth Beach	High
	Duxbury Bay	Saquish Cove	Reported
	Plymouth Harbor	Steven's Field	High
Provincetown	Hatches Harbor	Entrance Beach	Reported
	Inner Harbor	Wood's End	Moderate
Truro	Pamet Harbor	Harbor Bar	Reported
	Pamet Harbor	Landing Beach	Reported
	Cape Cod Bay	Corn Hill Beach	Reported
Wellfleet	Wellfleet Harbor	Chipman Cove	High
	Wellfleet Harbor	Great Island	Moderate

	Wellfleet Harbor	Mayo Beach	Reported
	Wellfleet Harbor	WBWS	High
	Wellfleet Harbor	Indian Neck	Moderate
Yarmouth	Cape Cod Bay	Bass Creek	Moderate
	Chase Garden Creek	Gray's Beach	Moderate
	Cape Cod Bay	Quivett Creek	Moderate
	Cape Cod Bay	Chase Garden Creek	Reported
MASSACHUSETTS BAY			
Cohasset	Cohasset Harbor	Bassing Harbor Beach	Moderate
	Cohasset Harbor	Briggs Cove	Reported
Hingham	Hingham Harbor	Hingham Beach	Reported
Hull	Hull Bay	Pt Allerton Beach	Reported
	Hull Bay	Windmill Pt Beach	Reported
Scituate	Scituate Harbor	Jericho Landing Beach	Reported
NORTH SHORE			
Ipswich	Ipswich Bay	Cranes Beach	Reported
Newbury	Plum Island Sd.	Parker River Refuge	High
Quincy	Quincy Bay	Wollaston Beach	Reported
Rockport	Sandy Bay	Old Garden Beach	Moderate
		Back Beach	Reported
		Front Beach	Reported

HORSESHOE CRAB NURSERY AREAS 2007

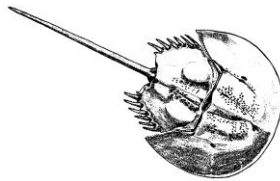
TOWN	EMBAYMENT	DENSITY
MOUNT HOPE BAY		
Somerset	Mount Hope Bay	High
	Taunton River	High
Swansea	Mount Hope Bay	High
	Coles River	High
BUZZARDS BAY		
Bourne	Buttermilk Bay	High
	Phinney's Harbor	High
Fairhaven	Nasketucket Bay	High
	Outer Harbor	Moderate

Mattapoissett	Mattapoissett Harbor	Reported
New Bedford	Outer Harbor	Moderate
Wareham	Buttermilk Bay	Reported
	Outer Wareham River	Moderate
Westport	Westport Rivers	Reported
SOUTH CAPE		
Barnstable	Lewis Bay	Reported
	Cotuit Bay	Moderate
Chatham	Cockle Cove Beach	High
	Stage Harbor	High
	Monomoy Island	High
Dennis	Bass River	High
Falmouth	Waquoit Bay	Reported
Mashpee	Waquoit Bay (Sage Lot Pond)	High
	Popponesset Bay	Moderate
Yarmouth	Bass River	High
MARTHA'S VINEYARD		
Aquinnah	Menemsha Pond	Moderate
Chilmark	Menemsha Pond	Moderate
Edgartown	Cape Poge Bay	Moderate
	Katama Bay	High
Oak Bluffs	Lagoon Pond	Reported
	Vineyard Haven Harbor	Reported
Tisbury	Lake Tashmoo	Moderate
NANTUCKET		
Nantucket	Madaket Harbor	Reported
	Muskeget Island	Reported
	Nantucket Harbor	High
	Tuckernuck Island	Reported
OUTER CAPE		
Chatham	Bassing Harbor	Reported
	Chatham Harbor	High
	Crowes Pond	Reported
	Pleasant Bay	High
Eastham	Nauset Marshes	Moderate

Harwich	Pleasant Bay	High
Orleans	Little Pleasant Bay	High
	Pleasant Bay	High
CAPE COD BAY		
Barnstable	Barnstable Harbor	High
Brewster	Brewster Flats	High
Dennis	Dennis Flats	High
Duxbury	Duxbury Bay	High
	Back River Marsh	High
Eastham	Eastham Flats	High
Kingston	Kingston Bay	Moderate
Orleans	Orleans Flats	High
Plymouth	Plymouth Harbor	High
Provincetown	Hatches Harbor	Reported
Truro	Pamet Harbor	Reported
Wellfleet	Wellfleet Harbor	High
Yarmouth	Yarmouth Flats	High
	Chase Garden Creek	Reported
MASSACHUSETTS BAY		
Cohasset	Cohasset Harbor	Reported
Hull	Hull Bay	Reported
Scituate	Scituate Harbor	Reported
NORTH SHORE		
Ipswich	Plum Island Sound	High
Newbury	Plum Island Sound	High

**Rhode Island Department of Environmental Management
Division of Fish and Wildlife Marine Fisheries
3 Ft. Wetherill Road
Jamestown, RI 02835**

**2013 Annual State of Rhode Island Compliance Report to the Atlantic States Marine Fisheries
Commission on the Interstate Horseshoe Crab Fishery Management Plan**



Report submitted to the ASMFC by:
Scott D. Olszewski
Rhode Island Fish and Wildlife
Marine Fisheries
Ft. Wetherhill Marine Lab
Jamestown, Rhode Island

March 1, 2014

I - Introduction Horseshoe Crab (*Limulus polyphemus*)
Rhode Island Horseshoe Crab Management 2013

The Rhode Island Horseshoe Crab fishery is comprised of individuals using a number of different harvest methods. Crabs are landed by beach harvest during their spring / summer spawning period focusing around the new and full moons during the months of May, June and July. Horseshoe crabs are also landed to a lesser extent by otter trawl, gill nets and floating fish traps.

In accordance with the Interstate Fishery Management Plan for Horseshoe Crab, the State of Rhode Island began management of the species in 1999. Insuring full compliance with the Commission's Management Plan, a number of management measures were implemented. The Plan called for a 25% reduction in the harvest of Horseshoe Crabs for the bait fishery known as the RPL or Reference Period Landings, as well as monitoring and reporting requirements. Biological data collection was a priority of the plan calling for stock characterization as well as spawning and essential habitat identification.

As a result, the State of Rhode Island instituted large scale monitoring and reporting of all horseshoe crab harvest by both dealers and fishermen.

Monitoring and reporting - Horseshoe Crab Permits were issued to all harvesters and dealers of horseshoe crabs in the year 2013. As a requirement of this permit, holders were required to submit monthly landing reports of all harvest and weekly call in reports. Those permit holders who did not comply with the reporting requirements were not issued permits the following year.

Thirty eight (38) active permits landed 18030 horseshoe crabs during the 2013 bait fishery.

Information supplied by harvesters and dealers:

- Reporting period
- Numbers and sex of crabs harvested
- Location of harvest
- Subsequent uses (i.e. biomedical and or bait)
- Location of release (if biomedical use)
- Catch reports are sent to and processed by the Division of Fish and Wildlife, Marine Fisheries Section

II - Request for *de minimus* status

N/A

III – Previous calendar year's fishery Harvest 2013

a. Report of monthly harvest

Horseshoe Crab Landings for 2013

Biomedical	Bait	Total
14938	18030	32968

Horseshoe Crab Quota for 2013

Biomedical	Bait	Total
34194	7694	41888

Horseshoe Crab Landings difference for 2013

Biomedical	Bait
+19256	-10336

Rhode Island Horseshoe Crab annual bait quota is based on the Rhode Island Stock Status Report (Gibson M. and Olszewski S. 2001) and in 2013 was 31% below the ASMFC FMP reference period landings.

2013 Bait units reported

	March	April	May	June	Total
Bait (male)	0	641	6597	0	7238
Bait(female)	0	683	6416	0	7099
Unknown	0	3683	10	0	3693

b. Educational uses of Horseshoe Crabs – During the 2012-2013 school year, RI’s Aquatic Resource Education (ARE) program piloted a horseshoe crab rearing program ‘Green Eggs and Sand,’ a program which originated in Delaware. Instructors were trained in how to care for the eggs and how to teach the multidisciplinary curricula. In May of 2013, eggs were taken from one of Rhode Island’s salt ponds and placed in an aquarium reared and released later in the summer.

c. Biomedical fishery – Primarily beach harvest but some harvest from bottom trawlers and gill nets. Breakdown of the bio-medical harvest by sex was not reliably reported.

2013 bio-medical units reported

	March	April	May	June	Total	Bleeding M
Bio (male)	0	0	45	0	45	7
Bio(female)	0	0	45	0	45	7
Unknown	0	0	14848	0	14848	2227

Rhode Island Marine Fisheries Regulation 15.24.3 requires that horseshoe crabs employed in the biomedical industry for the purpose of extracting bodily fluids shall be returned to the waters from which they came within 72 hours following the completion of the intended biomedical procedure.

Holding environments for bled crabs – Associates of Cape Cod is the sole buyer of Rhode Island bio-medical harvested horseshoe crabs and holds crabs in an temperature controlled environment following the bleeding process for up to 24 hours until the crabs are returned to the waters from which they came from.

d. N/A

e. Benthic Sampling

Fishery Independent Monitoring - RI Trawl Survey (Seasonal and Monthly Survey)

The Rhode Island Division of Fish and Wildlife conducts monthly and seasonal trawl surveys in Narragansett Bay, Rhode Island Sound and Block Island Sound in which size, sex composition and weight data is collected.

2013 CPUE of 0.21 crabs/tow increased 19 % from the 2012 CPUE of 0.17 crabs/tow but 54 % below the time series mean value of 0.46 crabs/tow.

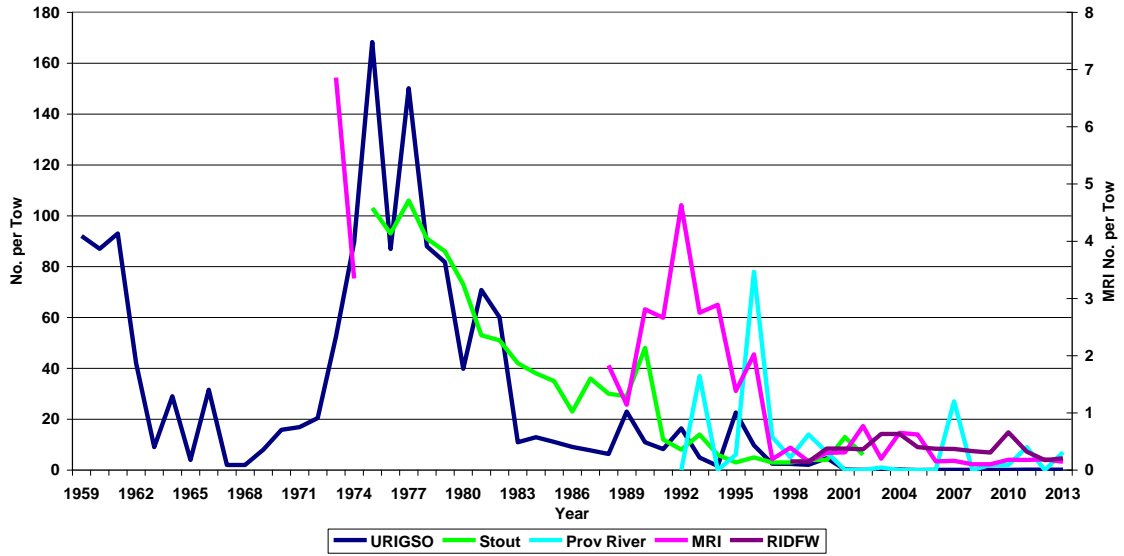
Additional abundance indices are shown:

The University of Rhode Island, Graduate School of Oceanography trawl survey.

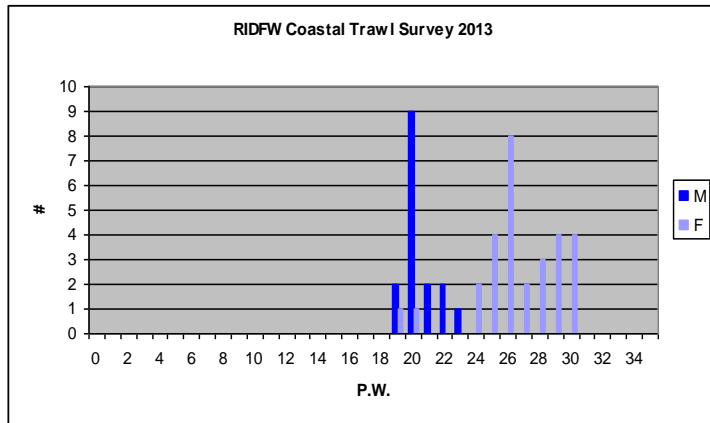
Marine Research monthly trawl survey in Mt Hope Bay in upper Narragansett Bay.

Monitoring of impingement grates at the Brayton Point and Manchester Street Power Plants.

Abundance Indices for Horseshoe Crabs in RI Waters



Rhode Island Division of Fish and Wildlife Coastal Trawl Survey



Male P.W. (cm)	Kg.	Female P.W. (cm)	Kg.
19.1	1.03	19.1	0.86
19.4	0.76	20.1	1.13
20	0.995	24.1	1.86
20	1.02	24.1	2.05
20.1	0.995	24.8	1.93
20.1	0.965	25.1	2.48
20.1	1.06	25.3	2.1
20.2	1.13	25.4	2.39
20.4	1.13	25.6	2.8
20.5	0.855	25.7	2.3
20.5	1.04	25.8	2.45
20.6	1.12	25.8	2.45
21.1	1.13	26.1	2.8
22	1.25	26.1	2.69
22.1	1.42	26.4	2.51
23.2	1.41	26.5	2.34
		26.8	2.72
		27.1	2.8
		27.6	2.8
		27.6	3.03
		28.1	3.12
		28.6	3.32
		28.9	3.3
		28.9	3.23
		29.1	3.32
		29.6	3.3
		29.7	3.72
		30	3.58
		30.1	3.63

IV. – Planned management programs for the current calendar year

a.

Regulations for the 2013-fishing season

There were regulatory changes made in 2013 regarding the importation and possession of Non-Native (Asian) Horseshoe Crabs.

Regulations adopted by the Rhode Island Department of Environmental Management for the 2013-fishing season.

Taken from: **State of Rhode Island Marine Fisheries Statutes and Regulations**

15.24 Horseshoe Crabs - It is illegal for any person to harvest horseshoe crabs, *Limulus polyphemus*, in Rhode Island for commercial purposes without a commercial marine license and a Horseshoe Crab Harvest Permit; or to harvest horseshoe crabs for recreational purposes without a Horseshoe Crab Harvest Permit.

15.24.1 Harvest Permit - Persons harvesting horseshoe crabs from the shoreline or waters in the State of Rhode Island must apply for a Horseshoe Crab Harvest Permit from the Division of Fish and Wildlife. A Horseshoe Crab Harvest Permit is required for all harvesters of horseshoe crabs.

The condition of the permit requires a weekly report of landings either by telephone or in writing. In addition, a monthly report in writing is required on forms furnished by the Division of Fish and Wildlife. This report must include the number of crabs taken, location of harvest, and use (bait, biomedical, or other reasons). These reports shall not be made public and shall be kept only for statistical purposes. Failure to report will result in forfeiture of the Harvest Permit and/or revocation of license and permit as provided for in RIGL 20-4-5.

15.24.2 Quota - A total allowable harvest (quota) of horseshoe crabs for the bait fishery and biomedical industry will be established annually. The quota will be the amount allocated to the State of Rhode Island by the Atlantic States Marine Fisheries Commission (ASMFC). The quota may only be harvested by licensed, permitted commercial fishermen in accordance with all rules and regulations promulgated by the Rhode Island Marine Fisheries Council or the Rhode Island Department of Environmental Management.

15.24.3 Possession

Commercial - Bait and biomedical fishery - Any person issued a multi-purpose commercial marine license Horseshoe Crab Harvest Permit may possess horseshoe crabs in numbers not exceed the established annual quota.

Horseshoe crabs employed in the biomedical industry for purposes of extracting bodily fluids shall be returned to the waters from which they came within 72 hours following the completion of the intended biomedical procedure. For the year 2013 the Department has established a quota of 14,655 crabs for the bait fishery and 34,194 crabs for the biomedical industry.

Recreational - Any Rhode Island resident with a Horseshoe Crab Harvest Permit may possess not more than (5) horseshoe crabs in any calendar day.

Prohibition on possession of non-indigenous horseshoe crab species – No person shall possess or attempt to possess in the cooked or un-cooked (frozen) state any non-indigenous (non-native) Horseshoe crab species within the State of Rhode Island without prior, written authorization by the Department. The only species of Horseshoe Crab which may be possessed within the jurisdictional limits of the State of Rhode Island is the Atlantic Horseshoe Crab *Limulus polyphemus*.

15.24.4 Harvesting Restriction

No person shall harvest horseshoe crabs for commercial or recreational purposes on or within 100 feet seaward of Patience and Prudence Islands in Narragansett Bay. No person shall harvest horseshoe crabs from waters or shoreline of the state during the period 48-hours preceding and 48-hours following the new and full moons during the months of May, June and July annually.

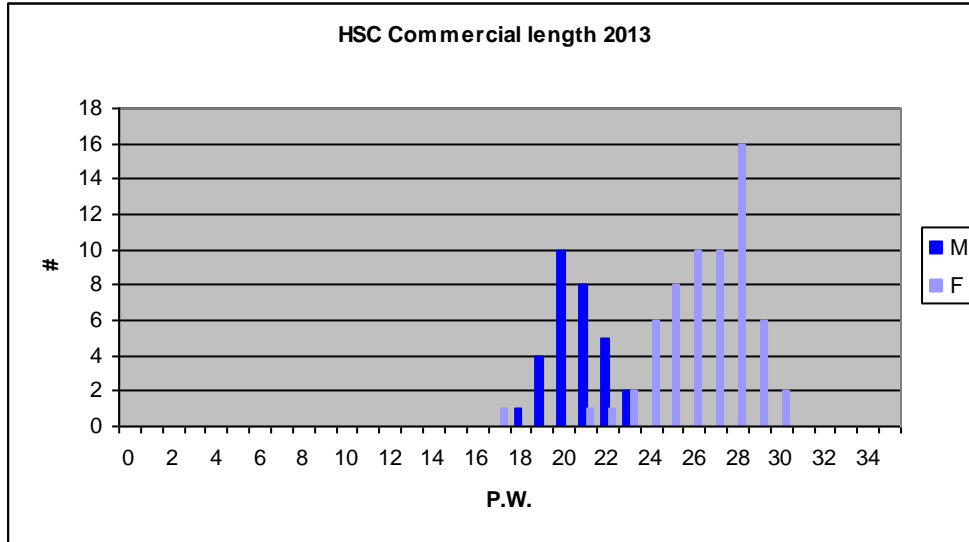
19.15 Importation of non-indigenous (non-native) Marine Species – No licensed fish/shellfish dealer shall import, attempt to import or possess in the cooked or un-cooked (frozen) state any non-indigenous (non-native) Horseshoe crab species within the State of Rhode Island without prior, written authorization by the Department. The only species of Horseshoe Crab which may be possessed within the jurisdictional limits of the State of Rhode Island is the Atlantic Horseshoe Crab *Limulus polyphemus*.

b. Summary of Monitoring Programs 2013

The following monitoring efforts will continue in 2014

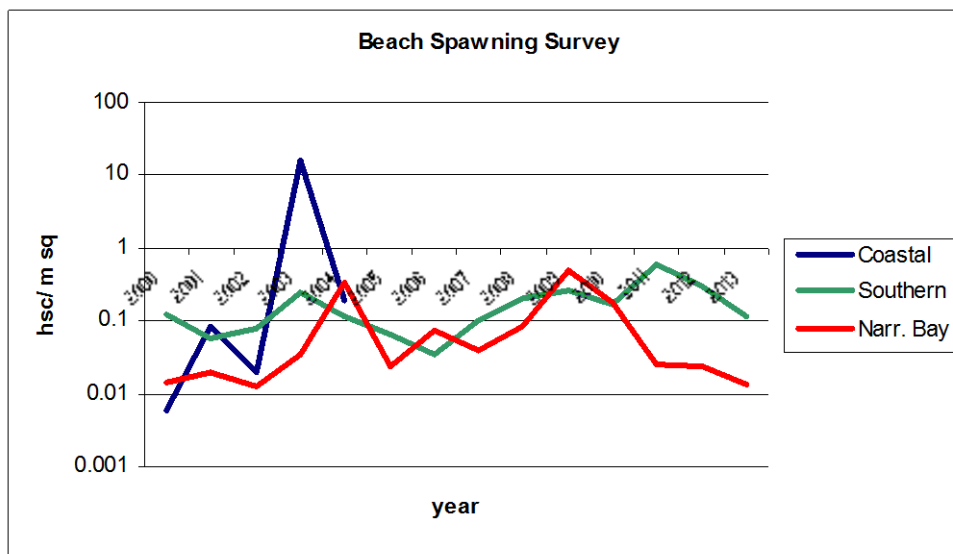
2013 Commercial Catch Horseshoe Crab sampling -

Biological data was gathered from commercial horseshoe crab fishermen via otter trawl in 2013. Date reflects 2013 length information on 93 individuals. Data collected comprised of size prosomal width (P.W.) and sex. Mean (P.W.) of both commercial harvest for males and females was 20.6 cm and 26.3 cm respectively.



Spawning Beach Survey -

An extensive spawning beach survey was conducted during the new and full moons during the months of May, June and July in Narragansett Bay and the south shore coastal salt ponds. With the help of volunteer organizations, Rhode Island Fish and Wildlife was able to monitor approximately seventy potential horseshoe crab spawning beaches and collected data on beach area coverage, bottom type, numbers of crabs present, spawning activity, presence of shorebird activity and fishing activity.



V. Law Enforcement Reporting Requirements

Verification of returned bled horseshoe crabs to the waters in which they came is problematic and ways to better track this practice should be explored.

CONNECTICUT COMPLIANCE REPORT FOR HORSESHOE CRAB

March 2014

I. Introduction

a. Summary of the year highlighting significant changes in monitoring, regulations, or harvest

No changes were made in 2013 to the Connecticut horseshoe crab monitoring program established in 1999.

Harvest levels and locations continue to be recorded in state logbook reports. Horseshoe crab harvest in 2013 (19,645 crabs) was below the average (22,792 crabs) for the state's recent historical range (2000-present). The number of participating license holders (13) was near the average (15) of the recent range.

II. de minimis status - not applicable

III. Previous calendar year's fishery and management program

a. Activity and results of fishery dependent monitoring

Since 2000, all commercial license holders have been required to report horseshoe crab landings monthly. In 2013 19,645 horseshoe crabs were landed in the state (see table below), which is less than half of the Addendum IV quota (48,689) set for CT in 2001. Over 99% of the harvest was taken by hand by 13 license-holders.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Crabs Landed	15921	12175	32080	15186	23723	15311	26889	25098	32535	27065	30036	24466	18958	19645
License holders	11	12	17	8	20	13	18	19	16	14	13	18	16	13

b. Activity and results of fishery independent monitoring

Spawning activity in 2013 was recorded by volunteers participating directly in the CT Spawning Survey and in a larger program titled Project Limulus (see component A3). Horseshoe crab abundance is also monitored through the DEEP Long Island Sound Trawl Survey. The DEEP Trawl Survey began recording horseshoe crab biomass in 1992. Counts per tow were added in 1997. Measurement of prosomal width by sex began in 1998 in response to ASMFC's development of the horseshoe crab FMP. The survey consists of stratified random sampling conducted April-June and September-October throughout Long Island Sound (total scheduled tows = 200), and abundance indices are the geometric mean kg/tow. Note that the Survey was suspended for fall 2010 due to breakdown of the research vessel in late spring of that year. The Survey resumed its normal schedule in April 2011.

The Millstone Power Station Trawl Monitoring Program (Dominion Nuclear Connecticut) trend is examined for comparative purposes because of its longevity. The Millstone survey began in 1976 and is conducted bi-weekly year round at fixed stations (total scheduled tows = 234-243) in the vicinity of the power station (Niantic River, Niantic Bay, and Jordon Cove) in eastern Long Island Sound (LIS). This survey records count per tow.

The Millstone time-series shows an increase in abundance in eastern LIS from 1987 to 1994 followed by a decline from 1995 to 2002 (Figure 1). Abundance has fluctuated below the time series median (0.20 crabs /tow) since 2001. The 2013 index (0.10 crabs /tow) is higher than the 2011 and 2012 indices (0.047, 0.43 respectively), but still well below the series median. The NYS DEC Peconic Bay Trawl Survey indices, reflecting abundance in

waters off eastern Long Island, also declined steadily from 1991 to 2002 and then also leveled off at very low values through 2012. Correlation between the NY DEC Peconic Bay index and the Millstone index is strong (1987-2012, $R=0.776$, $df=24$, $p<0.01$).

The CT DEEP spring Survey index, reflecting mostly central and western LIS, shows variable abundance from 1992 to 1997 and increasing abundance from 1998 through 2004. Abundance declined in 2005-2006, however 2007- 2009 indices were above the time series median (0.62 kg/tow). The 2010-2013 indices (0.52, 0.81, 0.55 and 0.70 kg/tow, respectively) are near or above median levels. The 2013 fall index (1.21kg/tow) is also equal to the time series median. Trends in NYS DEC Western Long Island Seine Survey indices (Little Neck Bay and Manhasset Bay) correlated between the two sites ($R=0.595$, $df=24$, $p<0.01$), but differ somewhat from CT trawl indices: seine indices fluctuated in the 1990s, declined in 2004-2005, and increased in 2006-2008; the near median values seen in the CT DEEP trawl index in 2009-2013 were only seen in 2011 NY seine catches, with the other recent years well below the time series median (2.48 crabs/haul).

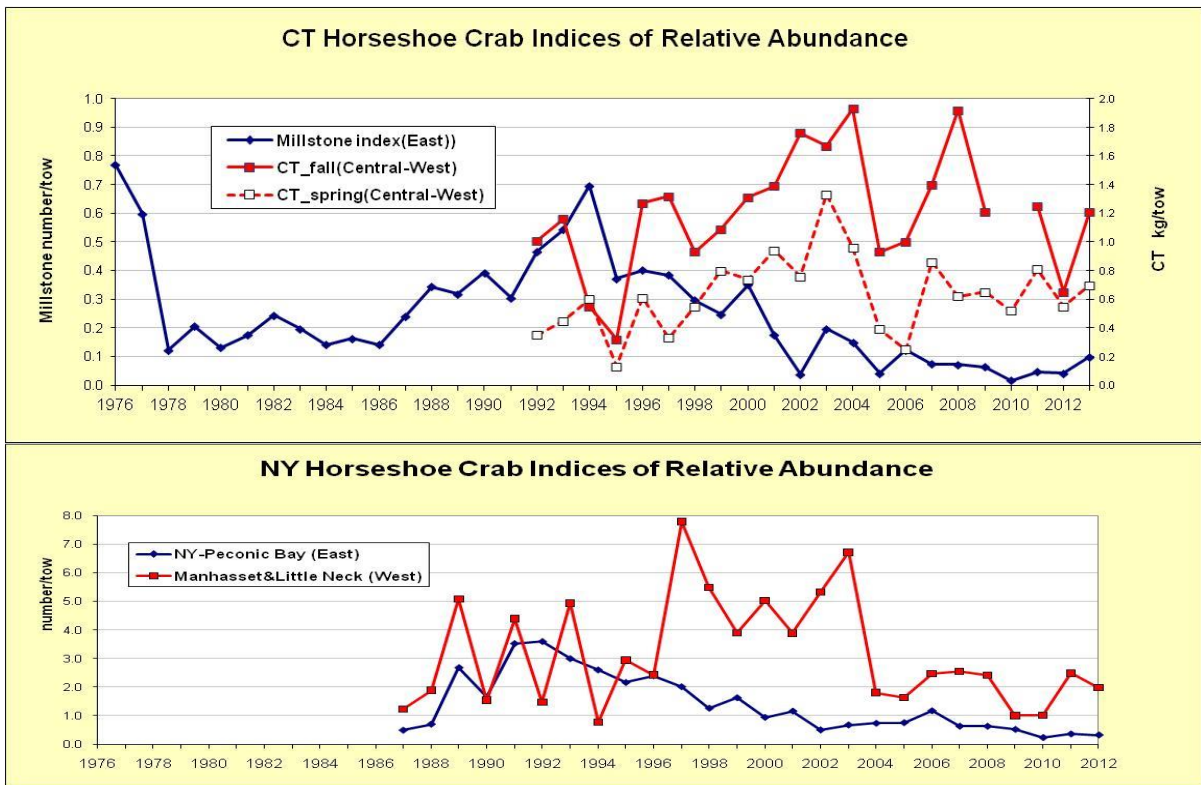


Figure 1: Connecticut and New York indices of horseshoe crab abundance in Long Island Sound. CT DEEP trawl and NYS DEC seine indices reflect abundance in the central and western basins. Millstone trawl indices and NYS DEC Peconic Bay trawl indices reflect abundance in the eastern basin.

c. Regulations in effect for 2013

No changes were made to regulations in effect in 2013 (Appendix 1) from those in effect since 2008.

The most recent changes to horseshoe crab regulations were made in 2007 and included creation of a limited entry program for license holders with a history of horseshoe crab harvest, establishment of possession limits and alteration of existing season closures for the commercial fishery. Additionally, three protected areas were established which are closed to commercial harvest.

d. *Reported 2013 horseshoe crab harvest from commercial and recreational fishery, and non-harvest losses*

1. Commercial harvest: All but a small fraction (0.1%) of the crabs landed in 2013 were hand-harvested in state waters. The distribution of harvest (34% east of the CT River to the RI border and 66% west of the CT River to the NY border) was more heavily weighted toward the east, where survey indices are very low, than seen historically but within the range seen in previous years.

Year	2000-2009			2010	2011	2012	2013
	Mean	Min	Max				
East	30%	20%	48%	29%	20%	23%	34%
West	70%	52%	80%	71%	80%	77%	66%

2. Recreational harvest: All harvest requires a commercial license and is recorded as commercial landings regardless of whether it is sold or kept for personal use.
3. Scientific/Educational harvest: In 2013 three CT DEEP Scientific Collector's Permits were issued for on-going collection of horseshoe crabs. Completion reports filed by these collectors indicated that all horseshoe crabs taken for scientific or educational purposes were returned alive to the water, with several thousand tagged and immediately released.

e. *Review of progress in implementing habitat recommendations*

See Spawning Survey results (Part V, Component A3) below.

IV. Planned management programs for 2013

a. *Summary of regulations that will be in effect*

See Appendix 1 for existing regulations.

b. *Summary of monitoring programs that will be performed*

The Long Island Sound Trawl Survey is scheduled to be performed in 2014 in its standard format. It is anticipated that Millstone Power Station personnel will continue their monitoring program in 2014. The volunteer Horseshoe Crab Spawning Survey has been merged with the larger Project Limulus and its continuation depends on volunteer participation (see Part V, component A3 below).

c. *Highlight regulation changes from previous year*

No changes were made in the regulations pertaining to horseshoe crab harvest in 2013.

V. Plan specific requirements – Horseshoe Crab

Program Requirements

Component A1. Monthly Reporting of Commercial Landings by Sex and Width

Monthly reporting was initiated in the fall of 1999. Total harvest (in numbers of crabs) is reported by gear type and fishing area. Following Addendum III of the ASMFC plan, states with less than 5% of the coastwide total landings are exempt from monitoring the sex and prosomal width frequencies for commercial landings.

Connecticut landings in 2012 (18,958 crabs) equaled 2.6% of the 2012 reported coastwide total (729,100 crabs) a decrease from 3.1% in 2011.

Component A2. Monthly Reporting of Harvest by Biomedical Facilities

No harvest by biomedical facilities occurred in Connecticut waters.

Component A3. Identification of Horseshoe Crab Spawning and Nursery Habitat

Following habitat descriptions given in the ASMFC Management Plan, all beach areas designated as intertidal sand flats in the Connecticut Resource Database were tabulated in 1999 and mapped using Geographical Information System (GIS) software. A total of 5,545 acres were mapped, excluding offshore islands. In 2009, GIS coastal segments were reconfigured to be compatible with the grid system used in the CT DEEP Long Island Sound Trawl Survey (LISTS) for the purpose of future analyses joining the two data sets. Using the LISTS grid system, 37 of 45 2-mile grids have been surveyed at least once and 29 have been surveyed two or more times since 1999.

The CT DEEP Horseshoe Crab Spawning Survey was merged in 2008 with the larger Project Limulus involving 14 academic and non-governmental environmental groups throughout the state including CT DEEP staff.

In 2009-2010, CT DEEP funded a graduate researcher who completed a study which described coastal habitat characteristics at a landscape scale and followed a geospatial modeling approach to predict the probability of habitat use by the population of horseshoe crabs in Long Island Sound. Geospatial data layers were created within which beach slope, wave exposure, surface substrate type, and distance from offshore aggregations of crabs (i.e. hotspots) were summarized for beaches in the western, central, and eastern regions of the Connecticut coast. A single best model for predicting the probability of habitat use by spawning horseshoe crabs was selected using an information-theoretic approach. The parameter estimates predicted a greater probability of habitat use with increasing slope, decreasing wave exposure, and decreasing distance from offshore hotspots. Small 'pocket' beaches surrounded by rocky headlands, marshes, and developed areas are the typical habitat available to support horseshoe crab spawning in Long Island Sound. Details of this study are published in:

Landi, A., J. Vokoun, P. Howell, and P. Auster, 2014. Predicting use of habitat patches by spawning horseshoe crabs (Limulus polyphemus) along a complex coastline with field surveys and geospatial analyses. Aquatic Conservation: Marine and Freshwater Ecosystems, J. Wiley & Sons Ltd, 16 pages.

Program Recommendations

Component B1. Continue working toward expanding the annual coastwide benthic trawl survey.

Component B2. Continue existing benthic sampling programs.

Existing benthic sampling programs will continue as described in section III b.

Component B3. Continue monitoring spawning populations.

Existing monitoring programs will continue as described in section V A3.

Component B4. Continue to explore funding and implementation options for a coast-wide tagging program.

In 2013 CT DEEP staff again assisted with horseshoe crab tagging programs carried out by students and faculty at Sacred Heart University (SHU), volunteers and staff from 11 other groups including the Audubon Society, The Nature Conservancy, Norwalk Aquarium, and Avalonia Land Trust. Recapture data generated from these studies are being used to estimate local spawning population size and movements.

Appendix 1: CONNECTICUT REGULATIONS CONCERNING HORSESHOE CRABS

26-159A-17. HORSESHOE CRAB (LIMULUS POLYPHEMUS)

26-159a-17. Horseshoe Crab (*Limulus polyphemus*)

(a) Definitions.

(1) "Commercial horseshoe crab hand-harvest license" means a license that authorizes the taking of horseshoe crabs by hand for sale or personal use issued under section 26-142a of the Connecticut General Statutes.

(2) "Commercial horseshoe crab landing license" means a license that authorizes the landing of horseshoe crabs for sale or personal use issued under section 26-142a of the Connecticut General Statutes.

(3) "Commercial horseshoe crab trawl license" means a license that authorizes the taking of horseshoe crabs by otter trawls, balloon trawl, beam trawl, scallop dredges or similar devices for commercial purposes issued under section 26-142a of the Connecticut General Statutes.

(4) A "Horseshoe Crab Hand-Harvest Endorsement Letter" means a letter that is required to engage in the hand-harvest of horseshoe crabs and that is issued according to subsection (b) of this section.

(b) Endorsement Letters.

(1) The Commissioner shall issue an annual Horseshoe Crab Hand-Harvest Endorsement Letter to persons that:

(A) possessed a commercial horseshoe crab hand-harvest license during the horseshoe crab open season of at least one year from 1999 through 2006, inclusive, and reported the hand-harvest and landings of horseshoe crabs during such open season or seasons to the Department of Environmental Protection in accordance with the provisions of section 26-157b-1 of the Regulations of Connecticut State Agencies; or

(B) received a Horseshoe Crab Hand-Harvest Endorsement Letter during the transfer of a commercial horseshoe crab hand-harvest license as provided in subdivision (4) of this subsection.

(2) Horseshoe Crab Hand-Harvest Endorsement Letters will be automatically issued annually without application to qualified persons. Any person who does not receive a Horseshoe Crab Hand-Harvest Endorsement Letter, or who is denied said letter, may request reconsideration in writing to the Commissioner. Such written request for reconsideration shall be delivered to the Department or postmarked by July 1, 2007. The only cause for reconsideration is that the Commissioner erred in concluding that the license holder did not meet the criteria in subdivision (1) of this subsection.

(3) The Commissioner shall not issue an annual Horseshoe Crab Hand-Harvest Endorsement Letter to any licensee who has not met the reporting requirements pursuant to the provisions of section 26-157b-1 of the Regulations of Connecticut State Agencies.

(4) The Commissioner shall authorize the transfer of a Horseshoe Crab Hand-Harvest Endorsement Letter in conjunction with a commercial horseshoe crab hand-harvest license transferred pursuant to the provisions of section 26-142b of the Connecticut General Statutes, provided the transferor of said license and endorsement letter has reported, in accordance with the provisions of section 26-157b-1 of the

Regulations of Connecticut State Agencies, the hand-harvest and landings of horseshoe crabs during at least two of the three open horseshoe crab seasons preceding the transfer of said license.

(5) No person who has transferred a commercial horseshoe crab hand-harvest license according to the provisions of section 26-142b of the Connecticut General Statutes, with an endorsement letter issued under this section, shall qualify for a Horseshoe Crab Hand-Harvest Endorsement Letter based on the landings history for which the transferred endorsement letter was issued.

(c) Possession.

(1) No person shall take, possess or land horseshoe crabs unless such person:

(A) possesses a commercial horseshoe crab hand-harvest license and is in immediate possession of a current year Horseshoe Crab Hand-Harvest Endorsement Letter issued to said license holder under this section; or

(B) possesses a commercial horseshoe crab trawl license and is engaged in, or is returning from a commercial fishing trip in which said license holder was engaged in, the use of any of the gears listed in subsection (a)(3) of this section; or

(C) possesses a commercial horseshoe crab landing license and is landing horseshoe crabs legally caught in another state or in federal waters; or

(D) has a valid license to harvest shellfish issued by the Department of Agriculture pursuant to section 26-192c of the Connecticut General Statutes and:

(i) is engaged in the active harvest of shellfish using shellfish gear in a designated shellfishing area; and

(ii) holds any horseshoe crabs on the harvesting vessel in a container with running seawater; and

(iii) maintains onboard the vessel a daily log of the number of horseshoe crabs possessed and the locations in which they were released; and

(iv) releases all said horseshoe crabs, without avoidable injury, to the waters of Long Island Sound on the same day that they were taken, provided that no such horseshoe crabs may be released onto any shellfish ground leased by another shellfisherman under section 26-149 of the Connecticut General Statutes and designated under the provisions of section 26-227 or the Connecticut General Statutes.

(2) No holder of any commercial fishing or landing license or registration permitted to take horseshoe crabs from the waters of this state or to land horseshoe crabs in Connecticut regardless of where such horseshoe crabs are taken, shall take, land or possess horseshoe crabs in excess of the following possession limits:

(A) when taken under a commercial horseshoe crab hand-harvest license, 500 crabs per license holder per 24-hour period that begins at 12:00 noon; or

(B) when taken under a commercial horseshoe crab trawl license or landed under a commercial horseshoe crab landing license, 25 crabs. Said limit shall apply to the vessel, regardless of how many license holders are on board and shall apply per trip or per day, whichever is the longer period of time. No person shall transfer horseshoe crabs between vessels at sea.

(3) Any horseshoe crabs taken contrary to the provisions of this section shall, without avoidable injury, be returned immediately to the waters from which taken.

(4) The provisions of this section shall not be construed to restrict the possession of legally acquired dead horseshoe crabs for use as bait.

(d) Restrictions.

(1) No person taking horseshoe crabs under a commercial horseshoe crab hand-harvest license shall use any tool, including, but not limited to, nets, rakes, tongs, hooks, poles, gaffs or spears to take horseshoe crabs, except that gloves may be worn by the license holder.

(2) Any person that does not hold a commercial horseshoe crab hand-harvest license and a Horseshoe Crab Hand-Harvest Endorsement Letter is prohibited from entering the water to assist a person so licensed and endorsed. Such unlicensed or unendorsed persons are not prohibited from carrying crabs that have been placed on the beach by the license holder to a storage container or vehicle or taking crabs from a license holder for storage while remaining in a boat.

(e) Commercial Fishery Closure. When 100% of the Connecticut annual horseshoe crab quota specified by the Atlantic States Marine Fisheries Commission's Horseshoe Crab Fishery Management Plan is landed, no person shall possess any live horseshoe crab on the waters of this state or on any parcel of land, structure, or portion of a roadway abutting tidal waters of this state.

(f) Commercial Fishery Season. Except as provided in subsection (c)(1)(D), no person shall take horseshoe crabs from the waters of this state or, regardless of where such animals are taken, possess live horseshoe crabs on the waters of this state or on any parcel of land, structure, or portion of a roadway abutting tidal waters of this state from July 8 of any year through May 21 of the next year, inclusive. During the period May 22 through July 7, inclusive, no person shall take horseshoe crabs on the waters or shores of this state or on any parcel of land, structure, or portion of a roadway abutting tidal waters of this state from 06:00 pm on any Friday through 06:00 pm on the following Sunday, inclusive.

(g) Closed Areas. No person shall engage in the hand-harvest of horseshoe crabs from the following areas:

(1) Menunketesuck Island in Westbrook; and

(2) the region known as Sandy Point in West Haven from the West Haven boat ramp on Beach Street south to, and clockwise around said point, including the breakwater, tidal flats and embayment and southeastern facing barrier beach to the groin adjacent to the intersection of Beach Street and Morse Avenue; and

(3) the region known as Milford Point in Milford, Connecticut, including all beaches and adjacent sand bars and tidal flats to the west of, and including, the spit that lies south-southeast of the southern terminus of Francis Street.

Effective December 19, 2000 to implement closed season; amended March 31, 2003 to add subsections (e) & (f) shellfish harvesters possessing horseshoe crabs while harvesting. 12/2006 change season and closed days. March 1, 2007 added endorsement letter, modified closed season and added closed areas.

Effective 3/1/2007.

**New York State Department of Environmental Conservation
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Joe Martens
Acting Commissioner

March 14, 2014

**NEW YORK'S 2012 REPORT TO THE ATLANTIC STATES MARINE FISHERIES
COMMISSION ON THE INTERSTATE HORSESHOE CRAB FISHERY
MANAGEMENT PLAN**

I. Introduction

The Atlantic States Marine Fisheries Commission requires states to file an annual report summarizing landings and describing the current regulations and management measures applicable to horseshoe crabs. The following report is submitted in compliance with the requirements described in the Fishery Management Plan for Horseshoe Crabs and includes a description of New York's regulations (Appendix A).

II. Request for *de minimus* status

N/A

III. Previous calendar year's fishery and management options

1. Harvest Level Threshold

In accordance with the guidelines set forth in Addendum I, New York had operated under a quota of 366,272 horseshoe crabs per year for 2000 through 2003. In 2004, in response to a growing concern about the population of Horseshoe Crabs and the potential impact on shorebirds utilizing eggs as food in New York, a risk averse stance was taken and the quota was voluntarily cut to 150,000. In 2008 New York increased its voluntary quota to 170,000 to account for increased pressure upon the fishery, but was reduced back to 150,000 for 2009 through 2013. New York operates under this quota according to the schedule established yearly in consultation with industry (Appendix B: Table 1). Trip limits and closures are implemented in accordance with this schedule. In previous years due to increased demand and restrictions along the coast on horseshoe crabs, New York had reached its yearly quota by early June. Consequently the fishery was restricted to a 5 crab bycatch effective June 15th, in accordance with the regulations. In 2005, 2006, 2007, 2012, and 2013 New York exceeded its voluntary quota by 5,544; 22,381; 148,222; 28,899; and 11,623 crabs respectively (Appendix B: Table 2). As this is a voluntary quota and the harvest did not exceed NY's ASMFC quota, the overage will not be deducted from 2014's harvest. In 2008 the reduced daily limit (200 down from 500) helped prevent New York State from going over its voluntary quota. The same harvest limits used in 2008 remained in effect in 2009 through 2013. Fisherman asked for the right to harvest remaining quota during the winter months, and this was granted in January 2011 contingent upon 90% reporting compliance. Due to the overharvest of NY's voluntary quota during the spring of 2012, there was no winter fishery in 2013. The 2014/2015 harvest year opens on March 17, 2014.

West Meadow Beach (Stony Brook, NY) was closed to horseshoe crab harvest in 2008 following the implementation of new regulations (Appendix A: § 44.7f). Cedar Beach (Mt Sinai, NY) and

Fire Island National Seashore (Great South Bay, NY) were closed to horseshoe crab harvest in 2009. The state of NY maintains the regulatory authority to approach town representatives about implementing further area closures in order to protect HSC at beaches known for their HSC-shorebird interactions.

IV. Planned management programs for the current calendar year.

The quota management plan for the 2014 harvest can be found in Table 3 of Appendix B. Staff met with industry late January to discuss management measures for the 2014/2015 quota year. Overages in 2013 were the result of several factors. NY's whelk fishery has been growing extremely quickly and horseshoe crab is the primary bait in this fishery. This increased demand for horseshoe crab bait combined with high harvest numbers the week of 5/6/2013 caused the spring quota to be reached extremely quickly. Also, the average lag between actual harvest and when our office receives the data is approximately 3 weeks. We try to account for this lag when decreasing daily trip limits and closing the fishery. These factors made it difficult for our limited number of staff to keep up with vessel trip report data entry. In an effort to decrease this lag time, we are actively promoting fishermen to sign up for electronic reporting through the Atlantic Coastal Cooperative Statistics Program's (ACCSP) website. Having the fishermen enter their own data will provide us with the most accurate and timely data to better manage the fishery. In addition, weekend harvest closures will now be in effect from May 1st through August 31st, 2014 from 6pm Friday through 6pm Sunday.

V. Plan specific requirements

Monitoring Program Requirements

Component A:

A1: Monthly reporting of all harvest (bait fisheries, bycatch, biomedical industry, and scientific and educational research).

Bait Fishery: As of 2001, when New York established a commercial horseshoe crab permit, fishermen were required to report landings. Monthly reporting was required during March, April, and August - November and weekly reporting was required during the spawning season May - July. Due to overages in 2005 and 2006, the 2007 reporting schedule was altered. Weekly reporting was required during April to keep better track of harvest during the spawning season. In addition, weekly reporting was required during the fall for one year. The fall reporting was switched back to monthly since the rate of harvesting had not increased during that season. Since 2008, New York State has instituted trip level reporting. The information required on these forms include the number of males and females caught, area fished, number of days fished, gear used and whether they plan to sell the crabs. These report forms are used to track the landings in order to adjust the trip limits according to the preset schedule (Appendix B: Table 1). In 2013 New York's reported commercial horseshoe crab harvest was 161,623 (Appendix B: Table 2). During 2013, horseshoe crab harvest exceeded NY's voluntary quota by 11,623 crabs. The 50% threshold for Quota Period 2 was reached and daily harvest limits were decreased to 100 crabs on May 18th. On May 20th, it was projected that the fishery would reach the 75% threshold of the Period 2 Quota so daily harvest limits were reduced to 30 crabs. The spring fishery was closed on 6/15/2013 when the harvest reached 131,609. NY manages its spring and fall quota separately therefore, the fall opened at 250 crabs a day until the end of the Quota period. On 10/6/2013 the daily trip limit was reduced to 100 crabs per day to in anticipation of reaching the 50% Period 3

threshold. The majority of the harvest occurred during quota period 2 (4/16 – 8/31) (Appendix B: Table 4) and peaked in May (Appendix B: Fig. 1, Table 5). Weekly harvest of HSC was greater than 20,000 crabs for 3 weeks from April 29th through May 19th (Appendix B: Table 6). The South Shore Bays of Long Island continue to supply the bulk of the harvest, 57.1% (Appendix B: Table 7a). Moriches/ Shinnecock Bay had the largest reported harvest out of all south shore bays in 2013 (Appendix B: Table 7b). Hand harvest continues to be the primary method of harvest, making up 79% of the total (Appendix B: Table 8). Appendix B Table 9 indicates that slightly more males were reported harvested than females, 52.8% during 2013.

Biomedical: No Biomedical licenses were issued in 2013.

Scientific and/or educational: In 2013 there were 15 scientific collectors permits that specifically collect horseshoe crabs, and 112 scientific collectors permits that authorize marine invertebrate collection. Exact collection information and number is unavailable at this time.

Characterize a portion of the commercial catch based on prosomal width (PW) by sex.

In 2004 NYS DEC initiated a program in cooperation with Cornell Cooperative Extension to collect information on horseshoe crabs harvested by the commercial fishery. This entailed going out with commercial fishermen or intercepting them at the dock and measuring a portion of the catch. Due to delays in contract development, the program was not conducted from 2009 through 2011. NYSDEC staff was able to sample a single catch from two commercial fishermen in 2013. Forty one horseshoe crabs were sampled, 20 females and 21 males. Appendix B Table 10 presents the prosomal width information for the samples.

A2: Identify horseshoe crab mortality associated with the biomedical industry up to the point of release.

N/A

A3. Identify potential horseshoe crab spawning and nursery habitat.

A State Wildlife Grant project in conjunction with Cornell Cooperative Extension (CCE) developed a horseshoe crab spawning survey. As part of this work, horseshoe crab spawning habitat was identified and mapped. A final report on this project can be found at <http://www.nyhorseshoecrab.org/>.

New York currently has another State Wildlife Grant project in conjunction with Cornell Cooperative Extension (CCE) to continue monitoring spawning horseshoe crabs and monitor shorebirds in association with horseshoe crabs, (Migratory Shorebird Foraging and Horseshoe Crab Spawning Surveys for the New York State Marine District: A Look at Species Interactions). The horseshoe crab survey sites provide important information on horseshoe crab spawning habitat and are useful as a platform to develop a monitoring program for migratory shorebirds that may forage at these locations. The principal goal of this survey is to study the interaction between migrating shorebirds and spawning horseshoe crabs. Specifically, through shoreline surveys and beach core sampling, it will examine spawning activity and the importance of horseshoe crab egg abundance to migratory shorebird foraging. The final report for this survey should be available during the fall 2014.

New York also has a habitat mapping project in progress where potential horseshoe crab spawning areas are being mapped through the use of aerial photos and LIDAR. The project is currently in the data acquisition stage.

Component B:

B1: Continue expanding the annual benthic trawl survey following methods described in Hata and Berkson (2003).

New York has contributed funds in the past.

B2: Continue existing benthic sampling programs. Record numbers, weight and prosomal width by sex of adult horseshoe crabs and numbers and prosomal width of juvenile crabs.

Peconic Trawl Survey: NYS DEC has conducted a small mesh trawl survey in Peconic Bay since 1987. This survey utilizes a 4.8m semi-balloon shrimp trawl with 3.8cm mesh in the body, 3.2cm mesh in the codend, and 1.3cm mesh in the liner. Sampling is conducted from May through October. The survey is a random stratified design based on a block grid design. There are 77 sampling blocks, 16 of these are selected at random weekly to sample. During Technical Committee discussions in 2006, it was recommended that surveys conducted in embayments be subset to the spawning period, since they are reflective of spawning aggregations. An examination of temporal subsets of the data was conducted in 2006 and reported in the compliance report. The May-July geometric mean index was selected since it had similar trends to the other temporal subsets and had tighter confidence limits. The New York dataset has many zeroes, making the use of a geometric mean inappropriate. The data presented in Table 11 and Figure 3 of Appendix B consists of the delta distribution mean catch per tow \pm 1 SD for each year from 1987 – 2013. This survey has shown a general decrease in horseshoe crabs since 1992 until 2002 where it leveled out. There was some concern about the decline in 2010, which only sampled June – July, but the mean CPUE increased somewhat in 2011. Since 2011, the mean CPUE has decreased slightly but the upper and lower confidence intervals are greater than 2010. The prosomal width (PW) frequency and mean width by sex for horseshoe crabs caught during the survey are presented in Appendix B Table 12. During 2013 seventy nine females were sampled and their mean prosomal width increased from 2012.

Western Long Island Beach Seine Survey: NYS DEC has conducted a Beach Seine Survey in Western Long Island since 1984. A 61m by 3.1m beach seine with 0.64cm square mesh in the wings, and 0.48cm square mesh in the bunt is set at standard stations by boat. The survey has also used a 152.4m by 3.66m beach seine with 7.62cm stretch mesh in the wings and 5.1cm stretch mesh in the bag for one round in the spring from 1984 to 1997. The HSC data was standardized to a 61m seine. The survey samples Little Neck Bay (LNB) and Manhasset Bay (MAN) on the north shore of Long Island and Jamaica Bay (Jam) on the south shore. Sampling is conducted from May through October. Since HSC's were captured mainly in May and June, relative abundance indices were developed from these months. Generally five to ten seine sites were sampled in each bay on each sampling trip. Bays were sampled bi-weekly in May and June. HSC's were counted consistently starting in 1987 and have been measured (PW) and sexed since 1998. The May – June geometric mean index was calculated, 90% lower and upper confidence limits were calculated in log space and re-transformed. There does not seem to be any significant long term trend in the data (Appendix B: Table 13, Figures 4-6). During 2013 HSC catch increased from 2012 for all bays. Seventy seven crabs were measured during the NYS DEC Western Long Island beach seine survey in May and June of 2013 (Appendix B: Table 14). Females ranged from 200mm to 364mm and averaged 241mm PW. Males ranged from 174 to

230mm and averaged 198mm. Three of the 77 crabs were juveniles with sex unknown and all measuring less than 100mm (Appendix B: Table 14).

Ocean Surf clam Dredge Survey: Since 1992, NYS DEC has conducted an Ocean Surfclam Dredge Survey. This survey was conducted during 1992, 1993, 1994, 1996, 1999, 2002, 2005, 2006, 2008, and 2012. Since 1999, horseshoe crabs were counted, measured and sexed. The survey uses a hydraulic dredge (lined with a 2.54x7.62cm wire mesh) with a 2.29m blade and was conducted using a 24.38m stern rigged commercial surfclam fishing vessel. The survey is a random stratified design. Survey area is divided into 10 strata from Rockaway inlet to Montauk Point and offshore to 4.83km. Two hundred and thirty eight stations are sampled in the annual survey. The number of sampling stations per stratum is based on the area of the strata. The standardized catch per unit of effort (CPUE) for all survey years is presented in Appendix B: Table 16. The overall CPUE increased from 1999 to 2002 (0.7 vs 1.13) and has been decreasing since 2005 (0.81 vs 0.62). However, in general the 2012 CPUE in the inshore strata (stratum 1) increased compared to 2008, particularly in the western most strata (RJ). Females generally make up a larger proportion of the catch for all years the survey was conducted. It is important to note that the sampling months for this survey have changed over time (Appendix B: Table 15), which could account for some of the variations in CPUE across years.

B3: Continue monitoring spawning populations based upon standardized and statistically robust methodologies.

As mentioned previously, New York had a State Wildlife Grant project in conjunction with Cornell Cooperative Extension (CCE) which developed our horseshoe crab spawning survey. This survey is being continued through a new State Wildlife Grant project with Cornell Cooperative Extension (CCE). In addition to continuing the horseshoe crab spawning survey, this survey will develop a program to monitor shore birds and their interactions with horseshoe crabs (Migratory Shorebird Foraging and Horseshoe Crab Spawning Surveys for the New York State Marine District: A Look at Species Interactions).

The horseshoe crab spawning survey was run on a small test scale in 2004 in which 15 different bays around Long Island were surveyed. Using this information and adapting the methodologies from Smith et al. (2002), to the local conditions, NYS DEC and CCE developed a spawning survey for New York. This survey consisted of several locations which were surveyed for the day of, two days prior, and after the new and full moons. These locations each had a predetermined 100m stretch of beach, which was walked by staff and volunteers at the highest high tide of the day. Information on numbers of crabs by sex, location with reference to shoreline, and prosomal widths (instituted during the 2006 season) were taken during these walks. In addition, environmental data was also taken (air temperature, water temperature, wind speed and direction, tide and wave height). In 2008, the number of sites was reduced to the two locations representing one north shore and one south shore location. Instead of a single 100m transect, 7 and 5 100m transects were surveyed at Pike's Beach and West Meadow respectively. In 2009 and 2010, Delaware Bay style quadrat sampling was used at a number of south shore beaches. Spawning densities are too low on the north shore of Long Island to make this method effective there. The survey protocols can be viewed at <http://www.nyhorseshoecrab.org/>. Due to great volunteer coverage, New York expanded the number of sites in 2009, 2010, 2011, and 2012. Figure 7 (Appendix B) presents the Index of Spawning Activities (ISA) since 2007. The 2006 data was excluded from this graph because the 2007 – 2012 dataset was the most statistically rigorous. The ISA is developed from the number of females per square meter. Spawning activity is highest in Plum and Pikes Beach, both of which are located in south shore bays. The ISA at

Plum Beach declined in 2011 compared to previous years but stabilized in 2012. The ISA for Pikes Beach increased during 2009 and then declined to previous levels in 2010 through 2012. The West Meadow ISA increased somewhat during 2009 and 2010 but declined to previous levels during 2011 and 2012. Data for 2013 is still in the process of QA/QC.

B4: A coordinated tagging program should be implemented by the Tagging Subcommittee.

Horseshoe crabs were tagged as part of NY's spawning survey since 2007 using USFWS button tags. In addition, horseshoe crabs were tagged as part of NY's Atlantic Sturgeon Ocean Trawl Survey and Striped Bass Trawl Survey. NYDEC and Cornell Cooperative Extension tagged 3,419 horseshoe crabs in 2012 (Appendix B, Table 15). The majority of the horseshoe crabs were tagged at West Meadow beach in the north shore of Long Island and Jamaica Bay, and Pikes beach in the south shore of Long Island. Two hundred Twenty-two of NY's tagged crabs were recaptured during 2011 (Appendix B, Table 16). On the north shore of Long Island, eighty-nine tags were recovered, the majority at or around two of our sampling sites, West Meadow beach, Stony Brook and in Mount Sinai harbor. While on the south shore, ninety-nine tags were recovered, most near our release sites in Jamaica Bay and Pike's beach, West Hampton. Twenty-four recaptures were from the Atlantic Ocean or the inlets into the South Shore Bays. In addition, there were three recapture in New Jersey in the Raritan Bay area, and three recoveries from Long Island Sound in Connecticut. Only two horseshoe crabs tagged in NY have been captured in Delaware Bay, one in 2008 and another in 2010.

Tag release data through 2012 is included in Appendix B: Table 16. During 2012 NY coordinated large batch releases of tags at West Meadow (North Shore) and Pike's beach (South Shore) in an effort to develop more statistically robust abundance estimates. Large batch releases were also conducted in 2013. Data for 2013 is still being entered and reviewed and will be included in the next report.

Joint monitoring of Delaware Bay Horseshoe Crab & Shorebirds

B5: Continue existing state egg abundance surveys.

One more year of funding is available through State Wildlife Grants for NY's joint HSC-shorebird monitoring project which will include egg counts. The most recent progress report for this work is included in Appendix C. We are investigating sources for continued funding.

B6: Continue state shorebird monitoring surveys.

Funding through State Wildlife Grants has been awarded for a joint HSC-shorebird monitoring project which will include shorebird surveys. The most recent progress report for this work is included in Appendix C.

Citations:

Smith, D. R., P. S. Pooler, B. L. Swan, S. F. Michels, W. R. Hall, P. J. Himchak, and M. J. Millard. 2002. Spatial and temporal distribution of horseshoe crab (*Limulus polyphemus*) spawning in Delaware Bay: Implication for Monitoring. *Estuaries* 25:115-125.

Appendix A.

New York State Regulations Regarding Horseshoe Crabs

§ 44.3 Horseshoe Crabs.

(a) *Definitions.*

- (1) *Horseshoe crabs* are members of the arthropod infra order chelicerata, *Limulus polyphemus*.
- (2) *Prosomal width* means the widest straight line width of the body.
- (3) *Land* means the bringing of horseshoe crabs to any shore or the transfer of the catch of horseshoe crabs taken from a vessel to any other vessel or in-water storage facility or to the land or to any pier, wharf, dock or other similar structure. When a vessel bearing horseshoe crabs has been tied, moored, or made fast to land, to another vessel, to an in-water storage facility or to any pier, wharf, dock or similar structure, such crabs shall be deemed as landed.
- (4) *Harvest limit* means the maximum number of horseshoe crabs that can be harvested and/or landed by a vessel during a period of time, not less than 24 hours, in which fishing is conducted. If a vessel is not used in the harvest of horseshoe crabs, the harvest limit means the maximum number of horseshoe crabs that can be harvested and possessed per licensed individual, during a period of time, not less than 24 hours, in which fishing is conducted. Harvesters may not at any time possess live horseshoe crabs aboard their vessel in excess of the number permitted under the harvest limit.

(b) *Horseshoe crab fishing - general provisions.*

- (1) The total annual commercial fisheries bait harvest of horseshoe crabs may not exceed the amount annually allocated to New York State by the Atlantic States Marine Fisheries Commission pursuant to the Interstate Fishery Management Plan for Horseshoe Crabs for the period January 1 through December 31.
- (2) Following consultation with industry, the department may establish quota periods and harvest limits such that the harvest does not exceed the commercial fisheries bait quota assigned to New York.
- (3) When the department determines that harvest limits are necessary, such harvest limits will be required and enforceable upon 72 hours notice to permit holders. Such harvest limits may be further reduced or increased by written direction by the department.
- (4) If the department determines based on harvester reporting pursuant to this section that the commercial fisheries bait horseshoe crab quota allocation will have been harvested before the end of the year, harvesting for commercial will be prohibited by the department and such closure shall be enforceable upon 72 hours written notice to permit holders.
- (5) A person may only apply for and hold one horseshoe crab permit type issued under this section in a calendar year.
- (6) It is the responsibility of the holder of a Horseshoe Crab Bio-medical Users Permit to ensure all horseshoe crab which are used in the production of amebocyte lysate shall either be returned to

the location of harvest as approved by the department as soon as possible after the bleeding process, or be sold as bait and reported as bait harvest in compliance with subdivision (d) of this section.

(c) *Permits.*

(1) No person shall take or possess horseshoe crabs for commercial purposes without first applying and obtaining a horseshoe crab commercial bait harvesters permit from the department. For purposes of this section, a person shall be presumed to be taking or possessing horseshoe crabs for "commercial purposes" where that individual has in excess of 5 individual horseshoe crabs in possession, or sells, trades, barter or offers for sale any horseshoe crabs. A permit to take horseshoe crabs for commercial purposes will be issued at no cost to individuals who possess a valid commercial crab license. No crabs harvested under this permit may be legally sold, traded, and/or bartered for use in any industry other than the commercial fishing industry.

(2) No person shall take or possess horseshoe crabs for bio- medical purposes without first applying and obtaining a horseshoe crab bio-medical harvesters permit from the department. For purposes of this section, a person shall be presumed to be taking or possessing horseshoe crabs for bio-medical purposes where that person sells, trades, barter and/or offers for sale any horseshoe crab which is used in the production of amebocyte lysate. A permit to take horseshoe crabs for bio-medical purposes will be issued at no cost to persons who possess a valid commercial crab license. Crabs harvested under this permit may only be legally sold, traded, and/or bartered to the holders of a valid horseshoe crab bio-medical users permit.

(3) No person shall purchase or possess horseshoe crabs for bio- medical purposes without first applying and obtaining a horseshoe crab bio-medical users permit from the department. For purposes of this section, a person shall be presumed to be purchasing horseshoe crabs for bio-medical use where that person purchases any horseshoe crab which is used in the production of amebocyte lysate. Horseshoe crabs may only be purchased from the holders of a valid horseshoe crab bio-medical harvesters permit. Permits will only be issued at no cost to persons who have been approved by the United States Federal Food and Drug Administration (USFDA) to produce amebocyte lysate.

(4) Permits issued under this section shall be nontransferable and shall expire on the last day of December in the year issued.

(5) Permit modification, suspension, or revocation shall be pursuant to Part 175 of this title.

(6) The holder of a horseshoe crab commercial bait harvesters permit or a horseshoe crab bio-medical harvesters permit issued pursuant to this section shall carry on his or her person or post on his or her vessel such permit at all times when fishing under the authority of such permit.

(d) *Reporting.*

(1) All horseshoe crab commercial bait harvesters permit holders shall file accurate and complete harvesting reports of their horseshoe crab fishing activities, regardless whether or not the permittee has exercised the privilege of his or her permit, on forms to be provided by the department. Failure to comply with harvest reporting requirements may result in the suspension of the current horseshoe crab commercial bait harvester permit and/or the denial of future Horseshoe Crab Commercial Bait Harvester Permits issued pursuant to this section.

(i) During the months of January, February, March, April, August, September, October, November, and December, all horseshoe crab commercial bait permittees will be required to submit harvesting reports to the department on a monthly basis. Reports for each month shall be submitted to the department by the 5th business day of the following month. However the department reserves the right to institute weekly reporting during this period should it be deemed necessary.

(ii) During the months of May, June and July permittees will be required to submit harvesting reports to the department on a weekly basis to ensure that quota period allocations and annual quotas are not exceeded. Such weekly harvesting reports shall be received by the department by the 5th business day of the subsequent week.

(2) All horseshoe crab bio-medical harvester permit holders shall file accurate and complete monthly harvesting reports of their horseshoe crab fishing activities, on forms to be provided by the department. Reports for each month shall be submitted to the department by the 5th business day of the following month. Additionally all horseshoe crab bio-medical harvester Permit holders shall notify the department 24 prior to the commencement of harvesting activities and report number of horseshoe crabs intended to be harvested, intended harvest location, place and approximate time of landing and horseshoe crab bio-medical users permit number. In addition the department may elect accompany the horseshoe crab bio-medical harvester permit holder to monitor such activities granted under the permit. Failure to comply with harvest reporting requirements may result in the suspension of the current horseshoe crab bio-medical harvester permit and/or the denial of future horseshoe crab bio-medical harvester permit issued pursuant to this section.

(3) All horseshoe crab bio-medical user permit holders shall file accurate and complete monthly reports of their activities, on forms to be provided by the department. Reports for each month shall be submitted to the department by the 5th business day of the following month. The holder of a horseshoe crab bio-medical user permit shall notify the department 24 hours prior to the return of horseshoe crabs to the approved harvest location. In addition the department may elect accompany the horseshoe crab bio-medical user permit holder to monitor such activities granted under the permit. Failure to comply with reporting requirements may result in the suspension of the current horseshoe crab bio-medical user permit holders horseshoe crab bio-medical user permit and/or the denial of future horseshoe crab bio-medical user permit holders permit issued pursuant to this section.

(e) Manner of Taking.

(1) Horseshoe crabs may only be taken for commercial and biomedical purposes by the following methods: hand harvest, pound net, trap net, gill net, otter trawl, seine or dredge.

(2) Dredges used to harvest horseshoe crabs shall not be greater than six feet in width (seventy two inches), except that if an individual submits a notarized written affirmation to the Department by December, 2001 certifying that he or she used a dredge with a bottom bar or scrape larger than 72 inches to harvest horseshoe crabs during the year 2000 in New York's Marine and Coastal District, and reported the use of such dredge to harvest horseshoe crabs on his or her 2000 New York State horseshoe crab harvester report, the Department may permit him or her to continue to use such dredge until March 31, 2004.

(3) Except during the months of September and October, dredges as defined in 44.1(n) may not be used to harvest horseshoe crabs in the Atlantic Ocean. The possession or landing of horseshoe crabs from any vessel having a dredge onboard is also prohibited.

(f) *Closed Areas.*

(1) The Department, following consultation with horseshoe crab permit holders and other interested parties, may establish, by directive, closed areas for commercial hand-harvest of horseshoe crabs if the Department determines that:

(i) there is documented evidence, verified by the Department, that the area receives significant use by: (a) spawning horseshoe crabs during the horseshoe crab spawning season; and (b) the following shorebird species for which horseshoe crab eggs are an important food source: dunlin, semipalmated sandpiper, sanderling, ruddy turnstone, greater yellowlegs, American golden-plover, black-bellied plover, buff-breasted sandpiper, short-billed dowitcher, red knot, purple sandpiper, marbled godwit, Hudsonian godwit, and whimbrel; or

(ii) the area is managed by a local, state, or federal agency or governing body as a Public Recreation Area, and such agency or governing body has requested that the Department restrict horseshoe crab hand-harvesting.

(2) In the event that the Department directs that an area be closed pursuant to paragraph 1 of this subdivision, the Department shall notify commercial harvesters of such directive not less than 30 days prior to the effective date of such closure.

(g) The Chief of the Bureau of Marine Resources is authorized to make determinations and issue directives pursuant to this subdivision.

Appendix B

Tables and Figures
Attached

Appendix C

State Wildlife Grant: Migratory Shorebird Foraging and Horseshoe Crab Spawning Surveys for the New York State Marine District: A Look at Species Interactions (Progress Report Attached)

Table 1. Quota Allocation Breakdown for 2013

2013 Quota Periods and Harvest Limits

2011 Periods	Dates	Quota Allocation	Quota 150,000	Harvest Limit	Threshold	Threshold Values	Bycatch Limit	Overages
1	3/16 – 4/15	4%	6,000	30		6,000	30	deducted from period 2
2	4/16 – 8/31	87%	130,500	100	50% 75%	65,250 97,875	30	
3	9/1 – 11/30	9%	13,500	100	50% 75%	6,750 10,125	5	
4	12/1 – 12/31	TBD ¹	TBD ¹	75 30	50% 75%		5	
5	1/1 – 3/15	TBD ²	TBD ²	75 30	50% 75%		5	

1 – Period 4 fishery if there is quota remaining, and have 90% compliance, 75 harvest limit contingent on quota ≥10,000 crabs
 2 – Period 5 fishery if there is quota remaining, and have 90% compliance, 75 harvest limit contingent on quota ≥10,000 crabs

Table 2. Annual Horseshoe Crab Harvest

Year	ASMFC Quota	Adjusted Quota	Harvest (#'s)	Overage	Resident Permits	Non-Resident Permits
1995			181,717			
1996			608,670			
1997			368,053			
1998			352,462			
1999			394,026			
2000	366,272		628,442	262,170		
2001	366,272	104,102	129,074	24,972	333	11
2002	366,272	341,300	177,271		343	13
2003	366,272		134,264		307	10
2004	366,272	150,000	142,279		314	10
2005	366,272	150,000	155,544	5,544	329	10
2006	366,272	150,000	172,381	22,381	337	10
2007	366,272	150,000	298,222	148,222	348	12
2008	366,272	170,000	148,719		353	12
2009	366,272	150,000	123,653		359	12
2010	366,272	150,000	124,808		368	12
2011	366,272	150,000	146,995		370	11
2012	366,272	150,000	178,899	28,899	391	11
2013**	366,272	150,000	161,623	11,623	410	13

* - As of 2004 New York State voluntarily reduced its quota
 ** Data is preliminary as of 2/21/2014

Table 3. Proposed Quota Allocation Breakdown for 2014

2014 Quota Periods and Harvest Limits*

2011 Periods	Dates	Quota Allocation	Quota 150,000	Harvest Limit	Threshold	Threshold Values	Bycatch Limit	Overages
1	3/17 – 4/15	4%	6,000	30		6,000	30	deducted from period 2
2	4/16 – 8/31	87%	130,500	100	50% 75%	65,250 97,875	30	
3	9/1 – 11/30	9%	13,500	100	50% 75%	6,750 10,125	5	
4	12/1 – 12/31	TBD ¹	TBD ¹	75 30	50% 75%		5	
5	1/1 – 3/16	TBD ²	TBD ²	75 30	50% 75%		5	

1 – Period 4 fishery if there is quota remaining, and have 90% compliance, 75 harvest limit contingent on quota ≥10,000 crabs
 2 – Period 5 fishery if there is quota remaining, and have 90% compliance, 75 harvest limit contingent on quota ≥10,000 crabs
 *Weekend harvest closures are instituted for 2014. From May 1 through August 31, 2014 no horseshoe crab shall be harvested from Friday at 6:00 pm through Sunday at 6:00 pm.

Table 4. Harvest By Quota Period

Quota Period	# 2001	2001%	# 2002	2002%	# 2003	2003%	# 2004	2004%	# 2005	2005%	# 2006	2006%
1/1 - 3/15	1,125	0.9%										
3/16 - 4/15	8,726	6.8%	23,943	13.5%	1,046	0.8%	7,028	4.9%	5,063	3.3%	12,079	7.0%
4/16 - 8/31	110,920	85.9%	136,031	76.7%	114,781	85.5%	118,162	83.0%	149,924	96.4%	158,883	92.2%
9/1 - 11/30	7,793	6.0%	16,940	9.6%	18,437	13.7%	17,089	12.0%	557	0.4%	1,419	0.8%
12/1 - 12/31	510	0.4%	357	0.2%	0		0		0		0	
TOTAL	129,074		177,271		134,264		142,279		155,544		172,381	

Quota Period	# 2007	2007%	#2008	2008%	#2009	2009%	#2010/2011	2010/2011%	# 2011/2012	2011/2012%	# 2012/2013	2012/2013%	#2013/2014	2013/2013%
1/1 - 3/15*							0		0		0	0.0%	0	0.0%
3/16 - 4/15	9,057	3.0%	3,926	2.6%	379	0.3%	1,169	0.9%	415	0.3%	1,040	0.6%	601	0.4%
4/16 - 8/31	276,615	92.8%	137,023	92.1%	117,745	95.2%	113,147	90.7%	137,686	93.7%	175,880	98.3%	156,485	96.8%
9/1 - 11/30	12,550	4.2%	7,770	5.2%	5,529	4.5%	10,492	8.4%	8,744	5.9%	1,979	1.1%	4,537	2.8%
12/1 - 12/31	0		0		0		0		150	0.1%	0	0.0%	0	0.0%
TOTAL	298,222		148,719		123,653		124,808		146,995		178,899		161,623	

* Starting in 2010, 1/1 - 3/15 harvest is from the following year (t + 1)

Table 5. Horseshoe Crab Harvest by Month

Month	# 2001	2001%	# 2002	2002%	# 2003	2003%	# 2004	2004%	# 2005	2005%	# 2006	2006%
January	600	0.5%	0		0		0		0		0	
February	525	0.4%	0		0		0		0		0	
March	961	0.7%	1,525	0.9%	105	0.1%	760	0.5%	333	0.2%	258	0.1%
April	7,765	6.0%	22,418	12.6%	941	0.7%	6,268	4.4%	4,730	3.0%	11,821	6.9%
May	52,710	40.8%	85,612	48.3%	45,164	33.6%	60,685	42.7%	60,380	38.8%	127,553	74.0%
June	54,174	42.0%	36,823	20.8%	52,687	39.2%	51,152	36.0%	87,917	56.5%	29,201	16.9%
July	2,645	2.0%	10,283	5.8%	13,298	9.9%	5,666	4.0%	1,324	0.9%	1,302	0.8%
August	1,391	1.1%	3,313	1.9%	3,632	2.7%	659	0.5%	303	0.2%	827	0.5%
September	2,705	2.1%	9,509	5.4%	5,219	3.9%	13,757	9.7%	311	0.2%	621	0.4%
October	3,361	2.6%	5,173	2.9%	7,451	5.5%	1,969	1.4%	146	0.1%	419	0.2%
November	1,727	1.3%	2,258	1.3%	5,767	4.3%	1,363	1.0%	100	0.1%	379	0.2%
December	510	0.4%	357	0.2%	0		0		0		0	
TOTAL	129,074		177,271		134,264		142,279		155,544		172,381	

Month	# 2007	2007%	# 2008	2008%	# 2009	2009%	# 2010	2010%	# 2011	2011%	# 2012*	2012%	2013	2013%
January			0		0									
February			0		0									
March	482	0.2%	324	0.2%	78	0.1%			0	0.0%	7	0.0%	330	0.2%
April	8,575	2.9%	13,356	9.0%	11,695	9.5%	3,936	3.2%	3,467	2.4%	29,543	16.5%	9,914	6.1%
May	271,533	91.1%	86,565	58.2%	83,973	67.9%	76,928	61.6%	92,437	62.9%	133,148	74.4%	133,867	82.8%
June	2,316	0.8%	38,003	25.6%	17,514	14.2%	29,894	24.0%	39,044	26.6%	14,020	7.8%	12,910	8.0%
July	2,318	0.8%	2,078	1.4%	3,137	2.5%	2,114	1.7%	2,320	1.6%	165	0.1%	16	0.0%
August	448	0.2%	623	0.4%	1,647	1.3%	1,444	1.2%	833	0.6%	37	0.0%	49	0.0%
September	7,070	2.4%	3,776	2.5%	3,031	2.5%	5,802	4.6%	5,086	3.5%	1,508	0.8%	3,652	2.3%
October	2,641	0.9%	1,361	0.9%	2,443	2.0%	1,039	0.8%	2,514	1.7%	467	0.3%	572	0.4%
November	2,839	1.0%	2,633	1.8%	135	0.1%	3,651	2.9%	1,144	0.8%	4	0.0%	313	0.2%
December			0		0		0		150	0.1%	0	0.0%		0.0%
TOTAL	298,222		148,719		123,653		124,808		146,995		178,899		161,623	

* Data is preliminary as of 1/15/2013

Table 6. 2005 - 2011 Horseshoe Crab Harvest Breakdown by Week.

2005					2006					2007				
REPORT PERIOD	DATE START	DATE END	Total (#)	% of Quota	REPORT PERIOD	DATE START	DATE END	Total (#)	% of Quota	REPORT PERIOD	DATE START	DATE END	Total (#)	% of Quota
2005-M03	3/15/2005	3/31/2005	333	0.2%	2006-M03	3/15/2006	3/31/2006	258	0.2%	2007-M03	3/15/2007	3/31/2007	482	0.3%
2005-M04	4/1/2005	4/30/2005	4,730	3.2%	2006-M04	4/1/2006	4/30/2006	11,821	7.9%	2007-WA	4/2/2007	4/8/2007	182	0.1%
										2007-WB	4/9/2007	4/15/2007	228	0.2%
										2007-WC	4/16/2007	4/22/2007	2,305	1.5%
										2007-WD	4/23/2007	4/29/2007	5,860	3.9%
2005-W01	5/2/2005	5/8/2005	6,325	4.2%	2006-W01	5/1/2006	5/7/2006	15,912	10.6%	2007-W01	4/30/2007	5/6/2007	17,974	10.8%
2005-W02	5/9/2005	5/15/2005	7,257	4.8%	2006-W02	5/8/2006	5/14/2006	25,742	17.2%	2007-W02	5/7/2007	5/13/2007	35,859	22.5%
2005-W03	5/16/2005	5/22/2005	23,528	15.7%	2006-W03	5/15/2006	5/21/2006	35,400	23.6%	2007-W03	5/14/2007	5/20/2007	69,474	45.9%
2005-W04	5/23/2005	5/29/2005	23,270	15.5%	2006-W04	5/22/2006	5/28/2006	50,499	33.7%	2007-W04	5/21/2007	5/27/2007	79,949	49.6%
2005-W05	5/30/2005	6/5/2005	29,135	19.4%	2006-W05	5/29/2006	6/4/1945	26,310	17.5%	2007-W05	5/28/2007	6/3/2007	68,277	45.4%
2005-W06	6/6/2005	6/12/2005	37,748	25.2%	2006-W06	6/5/2006	6/11/2006	2,051	1.4%	2007-W06	6/4/2007	6/10/2007	903	0.6%
2005-W07	6/13/2005	6/19/2005	18,855	12.6%	2006-W07	6/12/2006	6/18/2006	535	0.4%	2007-W07	6/11/2007	6/17/2007	1,156	0.8%
2005-W08	6/20/2005	6/26/2005	2,114	1.4%	2006-W08	6/19/2006	6/25/2006	305	0.2%	2007-W08	6/18/2007	6/24/2007	152	0.1%
2005-W09	6/27/2005	7/3/2005	416	0.3%	2006-W09	6/26/2006	7/2/2006	362	0.2%	2007-W09	6/25/2007	7/1/2007	105	0.0%
2005-W10	7/4/2005	7/10/2005	308	0.2%	2006-W10	7/3/2006	7/9/2006	373	0.2%	2007-W10	7/2/2007	7/8/2007	127	0.1%
2005-W11	7/11/2005	7/17/2005	302	0.2%	2006-W11	7/10/2006	7/16/2006	268	0.2%	2007-W11	7/9/2007	7/15/2007	770	0.0%
2005-W12	7/18/2005	7/24/2005	115	0.1%	2006-W12	7/17/2006	7/23/2006	122	0.1%	2007-W12	7/16/2007	7/22/2007	759	0.0%
2005-W13	7/25/2005	7/31/2005	166	0.1%	2006-W13	7/24/2006	7/31/2006	177	0.1%	2007-W13	7/23/2007	7/29/2007	662	0.0%
2005-M08	8/1/2005	8/31/2005	303	0.2%	2006-M08	8/1/2006	8/31/2006	827	0.6%	2007-M08	7/30/2007	8/31/2007	448	0.3%
2005-M09	9/1/2005	9/30/2005	311	0.2%	2006-M09	9/1/2006	9/30/2006	621	0.4%	2007-M09	9/1/2007	9/30/2007	7,070	4.7%
2005-M10	10/1/2005	10/31/2005	146	0.1%	2006-M10	10/1/2006	10/31/2006	419	0.3%	2007-M10	10/1/2007	10/31/2007	2,641	1.8%
2005-M11	11/1/2005	11/30/2005	100	0.1%	2006-M11	11/1/2006	11/30/2006	379	0.3%	2007-M11	11/1/2007	11/7/1931	2,839	1.9%
TOTAL			155,462		TOTAL			172,381		TOTAL			298,222	

2008					2009					2010				
REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA	REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA	REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA
2008-M03	3/16/2008	3/31/2008	324	0.2%	2009-M03	3/16/2009	3/31/2009	78	0.1%	2010-M03	3/16/2010	3/31/2010	90	0.1%
2008-W01	4/1/2008	4/6/2008	293	0.2%	2009-W01	4/1/2009	4/5/2009	87	0.1%	2010-W01	4/1/2010	4/4/2010	98	0.1%
2008-W02	4/7/2008	4/13/2008	234	0.1%	2009-W02	4/6/2009	4/12/2009	214	0.1%	2010-W02	4/5/2010	4/11/2010	90	0.1%
2008-W03	4/14/2008	4/20/2008	3,075	1.8%	2009-W03	4/13/2009	4/19/2009	1,290	0.9%	2010-W03	4/12/2010	4/18/2010	981	0.7%
2008-W04	4/21/2008	4/27/2008	5,206	3.1%	2009-W04	4/20/2009	4/26/2009	3,176	2.1%	2010-W04	4/19/2010	4/25/2010	2,084	1.4%
2008-W05	4/28/2008	5/4/2008	4,548	2.7%	2009-W05	4/27/2009	5/3/2009	979	0.5%	2010-W05	4/28/2010	5/2/2010	1,257	0.8%
2008-W06	5/5/2008	5/11/2008	22,381	13.2%	2009-W06	5/4/2009	5/10/2009	11,315	7.5%	2010-W06	5/3/2010	5/9/2010	7,741	5.2%
2008-W07	5/12/2008	5/18/2008	14,911	8.8%	2009-W07	5/11/2009	5/17/2009	18,925	12.6%	2010-W07	5/10/2010	5/16/2010	13,394	8.9%
2008-W08	5/19/2008	5/25/2008	22,478	13.2%	2009-W08	5/18/2009	5/24/2009	26,946	18.0%	2010-W08	5/17/2010	5/23/2010	18,805	12.5%
2008-W09	5/26/2008	6/1/2008	26,795	15.8%	2009-W09	5/25/2009	5/31/2009	23,988	16.0%	2010-W09	5/24/2010	5/30/2010	32,756	21.8%
2008-W10	6/2/2008	6/8/2008	23,272	13.7%	2009-W10	6/1/2009	6/7/2009	12,090	8.1%	2010-W10	5/31/2010	6/6/2010	18,555	12.4%
2008-W11	6/9/2008	6/15/2008	8,203	4.8%	2009-W11	6/8/2009	6/14/2009	3,325	2.2%	2010-W11	6/7/2010	6/13/2010	7,817	5.2%
2008-W12	6/16/2008	6/22/2008	5,131	3.0%	2009-W12	6/15/2009	6/21/2009	1,176	0.8%	2010-W12	6/14/2010	6/20/2010	6,020	4.0%
2008-W13	6/23/2008	6/29/2008	945	0.6%	2009-W13	6/22/2009	6/28/2009	699	0.5%	2010-W13	6/21/2010	6/27/2010	918	0.6%
2008-W14	6/30/2008	7/6/2008	452	0.3%	2009-W14	6/29/2009	7/5/2009	845	0.6%	2010-W14	6/28/2010	7/4/2010	695	0.5%
2008-W15	7/7/2008	7/13/2008	684	0.4%	2009-W15	7/6/2009	7/12/2009	838	0.6%	2010-W15	7/6/2010	7/11/2010	403	0.3%
2008-W16	7/14/2008	7/20/2008	389	0.2%	2009-W16	7/13/2009	7/19/2009	535	0.4%	2010-W16	7/12/2010	7/18/2010	478	0.3%
2008-W17	7/21/2008	7/27/2008	594	0.3%	2009-W17	7/20/2009	7/26/2009	685	0.5%	2010-W17	7/19/2010	7/25/2010	505	0.3%
2008-W18	7/28/2008	7/31/2008	411	0.2%	2009-W18	7/27/2009	7/31/2009	405	0.3%	2010-W18	7/26/2010	7/31/2010	275	0.2%
2008-M08	8/1/2008	8/31/2008	623	0.4%	2009-M08	8/1/2009	8/31/2009	1,727	1.2%	2010-M08	8/1/2010	8/31/2010	1,444	1.0%
2008-M09	9/1/2008	9/30/2008	3,776	2.2%	2009-M09	9/1/2009	9/30/2009	2,951	2.0%	2010-M09	9/1/2010	9/30/2010	5,802	3.9%
2008-M10	10/1/2008	10/31/2008	1,361	0.8%	2009-M10	10/1/2009	10/31/2009	2,443	1.6%	2010-M10	10/1/2010	10/31/2010	1,039	0.7%
2008-M11	11/1/2008	11/30/2008	2,633	1.5%	2009-M11	11/1/2009	11/30/2009	135	0.1%	2010-M11	11/1/2010	11/30/2010	3,651	2.4%
TOTAL			148,719		TOTAL			123,653		TOTAL			124,808	

2011					2012*					2013*				
REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA	REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA	REPORT PERIOD	DATE START	DATE END	TOTAL (#)	% OF QUOTA
2011-M03	3/16/2011	3/31/2011	0	0.0%	2012-M03	3/16/2012	3/31/2012	7	0.0%	2013-M03	3/16/2013	3/31/2013	330	0.2%
2011-W01	4/1/2011	4/7/2011	230	0.2%	2012-W01	4/1/2012	4/8/2012	174	0.1%	2013-W01	4/1/2013	4/7/2013	101	0.1%
2011-W02	4/8/2011	4/10/2011	60	0.0%	2012-W02	4/9/2012	4/15/2012	859	0.6%	2013-W02	4/8/2013	4/14/2013	170	0.1%
2011-W03	4/11/2011	4/17/2011	125	0.1%	2012-W03	4/16/2012	4/22/2012	14,828	9.9%	2013-W03	4/15/2013	4/21/2013	2,169	1.4%
2011-W04	4/18/2011	4/24/2011	1,232	0.8%	2012-W04	4/23/2012	4/29/2012	11,425	7.6%	2013-W04	4/22/2013	4/28/2013	4,178	2.8%
2011-W05	4/25/2011	5/1/2011	2,348	1.6%	2012-W05	4/30/2012	5/6/2012	29,502	19.7%	2013-W05	4/29/2013	5/5/2013	22,442	15.0%
2011-W06	5/2/2011	5/8/2011	8,511	5.7%	2012-W06	5/7/2012	5/13/2012	46,914	31.3%	2013-W06	5/6/2013	5/12/2013	59,689	39.8%
2011-W07	5/9/2011	5/15/2011	16,780	11.2%	2012-W07	5/14/2012	5/20/2012	36,994	24.7%	2013-W07	5/13/2013	5/19/2013	37,394	24.9%
2011-W08	5/16/2011	5/22/2011	24,786	16.5%	2012-W08	5/21/2012	5/27/2012	18,047	12.0%	2013-W08	5/20/2013	5/26/2013	9,981	6.7%
2011-W09	5/23/2011	5/29/2011	32,851	21.8%	2012-W09	5/28/2012	6/3/2012	6,849	4.6%	2013-W09	5/27/2013	6/2/2013	10,863	7.2%
2011-W10	5/30/2011	6/5/2011	27,884	18.6%	2012-W10	6/4/2012	6/10/2012	4,919	3.3%	2013-W10	6/3/2013	6/9/2013	9,523	6.3%
2011-W11	6/6/2011	6/12/2011	13,660	9.1%	2012-W11	6/11/2012	6/17/2012	3,101	2.1%	2013-W11	6/10/2013	6/16/2013	152	0.1%
2011-W12	6/13/2011	6/19/2011	5,131	3.4%	2012-W12	6/18/2012	6/24/2012	2,916	1.9%	2013-W12	6/17/2013	6/23/2013	9	0.0%
2011-W13	6/20/2011	6/26/2011	1,013	0.7%	2012-W13	6/25/2012	7/1/2012	240	0.2%	2013-W13	6/24/2013	6/30/2013	20	0.0%
2011-W14	6/27/2011	7/3/2011	881	0.6%	2012-W14	7/2/2012	7/8/2012	69	0.0%	2013-W14	7/1/2013	7/7/2013	4	0.0%
2011-W15	7/4/2011	7/10/2011	470	0.3%	2012-W15	7/9/2012	7/15/2012	9	0.0%	2013-W15	7/8/2013	7/14/2013	0	0.0%
2011-W16	7/11/2011	7/17/2011	517	0.3%	2012-W16	7/16/2012	7/22/2012	3	0.0%	2013-W16	7/15/2013	7/21/2013	1	0.0%
2011-W17	7/18/2011	7/24/2011	499	0.3%	2012-W17	7/23/2012	7/29/2012	23	0.0%	2013-W17	7/22/2013	7/28/2013	11	0.0%
2011-W18	7/25/2011	7/31/2011	490	0.3%	2012-W18	7/30/2012	7/31/2012	4	0.0%	2013-W18	7/29/2013	7/31/2013	0	0.0%
2011-M08	8/1/2011	8/31/2011	833	0.6%	2012-M08	8/1/2012	8/31/2012	37	0.0%	2013-M08</				

Table 7a. Horseshoe Crab Harvest by Area

AREA	# 2001	% 2001	# 2002	% 2002	# 2003	% 2003	# 2004	% 2004	# 2005	% 2005	# 2006	% 2006
Western LIS	4,550	3.5%	7,245	4.1%	7,418	5.5%	9,956	7.0%	4,659	3.0%	11,231	6.5%
Eastern LIS	873	0.7%	1,136	0.6%	2,214	1.6%	7,299	5.1%	9,842	6.3%	9,813	5.7%
Atl Ocean Offshore	2,360	1.8%	5,000	2.8%	3,210	2.4%	2,376	1.7%	1,170	0.8%	1,846	1.1%
Atl Ocean Inshore	8,433	6.5%	22,293	12.6%	11,827	8.8%	25,283	17.8%	6,486	4.2%	6,243	3.6%
South Shore Bays	65,763	50.9%	104,747	59.1%	67,666	50.4%	60,722	42.7%	82,482	53.0%	98,431	57.1%
Block Island Sound	10,067	7.8%	5,362	3.0%	7,468	5.6%	11	0.0%	0	0.0%	115	0.1%
Peconic/Gardiners	36,492	28.3%	27,360	15.4%	24,740	18.4%	20,875	14.7%	37,017	23.8%	23,933	13.9%
New York Harbor	536	0.4%	1,716	1.0%	111	0.1%	40	0.0%	0	0.0%	605	0.4%
other	0		2,184	1.2%	80	0.1%	221	0.2%	25	0.5%	9,572	85.2%
not reported	0		229	0.1%	9,489	7.1%	15,467	10.9%	13,865	8.9%	10,579	6.1%
TOTAL	129,074		177,270		134,223		142,249		155,544		172,368	

AREA	# 2007	% 2007	# 2008	2008%	# 2009	2009%	# 2010	2010%	# 2011	2011%	# 2012	2012%	# 2013*	2013%
Western LIS	16,464	5.5%	17,836	12.0%	14,443	11.7%	11,464	9.2%	10,004	7.0%	24,112	13.5%	21,065	13.0%
Eastern LIS	9,321	3.1%	8,653	5.8%	7,793	6.3%	9,789	7.8%	9,819	6.9%	4,974	2.8%	10,027	6.2%
Atl Ocean Offshore	6,070	2.0%	919	0.6%	2,579	2.1%	2,703	2.2%	4,087	3.6%	4,300	2.4%	5,713	3.5%
Atl Ocean Inshore	5,394	1.8%	23,338	15.7%	4,662	3.8%	5,846	4.7%	12,979	9.9%	27,786	15.5%	20,033	12.4%
South Shore Bays	176,558	59.2%	61,252	41.2%	61,926	50.1%	57,934	46.4%	79,818	53.7%	92,070	51.5%	78,065	48.3%
Block Island Sound	35	0.0%	0	0.0%	30	0.0%	0	0.0%	0	0.0%		0.0%		0.0%
Peconic/Gardiners	48,305	16.2%	18,106	12.2%	21,514	17.4%	23,585	18.9%	19,269	12.5%	20,083	11.2%	19,026	11.8%
New York Harbor	2,446	0.8%	6,275	4.2%	10,282	8.3%	13,427	10.8%	10,933	6.3%	4,734	2.6%	7,251	4.5%
other	9,185	3.1%	707	0.5%	185	0.1%	60	0.0%	86	0.0%	818	0.5%	443	0.3%
not reported	24,444	8.2%	11,633	7.8%	239	0.2%	0	0.0%	0	0.3%	22	0.0%		0.0%
TOTAL	298,222		148,719		123,653		124,808		146,995		178,899		161,623	

* Data is preliminary as of 1/15/2013

7b

AREA	# 2008	#2009	#2010	#2011	#2012	#2013*
WLIS CT	300	1	2,505		4,771	4,137
WLIS NY	17,536	13,756	8,959	10,004	19,186	16,928
ELIS CT		10				
ELIS NY	8,653	7,584	9,779	9,819	4,839	10,027
EE CT					30	400
GARDINERS/PECONIC BAY	18,106	20,591	23,585	19,269	17,572	19,026
BLOCK ISLAND SOUND		30				
BLOCK CHANNEL					1,400	25
LIS UNSPECIFIED	707	176	60	86	180	18
RARITAN/HUDSON	6,275	10,267	13,427	10,933	5,459	7,251
SS WEST INSHORE	11,355	787	4,246	12,979	23,533	10,508
HEMPSTEAD BAY	16,611	22,115	17,203	43,778	35,380	34,944
GREAT SOUTH BAY	5,377	5,807	9,968	4,999	7,968	5,751
SS GREAT SOUTH BAY BAYS	7,232			815	677	3,158
MORICHES/SHINNECOCK	39,264	28,914	30,763	28,624	40,811	37,370
SS WESTHAMPTON BEACH	4,424	1,135	1,170	1,602	766	2,035
SS HAMPTONS INSHORE	327	2,380	430		1,808	4,332
SS WEST OFFSHORE	188	951	1,972	3,450	2,351	3,467
SS EAST OFFSHORE	731		731	637	372	2,246
NOTRPT	11,633	5,030			620	
TOTAL	148,719	119,524	124,808	146,995	167,723	161,623

* Data is preliminary as of 1/15/2013

Table 8. Horseshoe Crab Harvest by Gear

GEAR	# 2001	% 2001	# 2002	% 2002	# 2003	% 2003	# 2004	% 2004	# 2005	% 2005	# 2006	% 2006
Hand	74,106	57.4%	100,224	56.5%	57,259	42.6%	87,778	61.7%	102,686	66.1%	117,870	68.4%
Trawl	4,301	3.3%	12,902	7.3%	7,045	5.2%	6,155	4.3%	4,393	2.8%	4,884	2.8%
Dredge	18,644	14.4%	41,799	23.6%	20,525	15.3%	4,838	3.4%	2,930	1.9%	13,282	7.7%
Pound/Trap	27,058	21.0%	18,721	10.6%	24,423	18.2%	23,314	16.4%	27,712	17.8%	26,569	15.4%
Other	1,244	1.0%	3,365	1.9%	2,351	1.8%	3,492	2.5%	3,808	2.4%	3,258	1.9%
not reported	3,718	2.9%	250	0.1%	22,662	16.9%	16,702	11.7%	13,904	8.9%	6,518	3.8%
TOTAL	129,071		177,262		134,264		142,279		155,433		172,381	

GEAR	# 2007	% 2007	#2008	2008%	#2009	2009%	#2010	2010%	#2011	2011%	#2012	2012%	#2013*	2013%
Hand	215,813	72.4%	106,511	71.6%	95,887	77.5%	86,500	69.3%	116,462	79.4%	161,487	90.3%	127,751	79.0%
Trawl	4,354	1.5%	3,097	2.1%	3,396	2.7%	8,051	6.5%	10,577	7.6%	3,744	2.1%	3,279	2.0%
Dredge	9,575	3.2%	4,163	2.8%	6,848	5.5%	10,419	8.3%	5,053	2.6%	0	0.0%	3,373	2.1%
Pound/Trap	28,195	9.5%	14,113	9.5%	12,169	9.8%	12,217	9.8%	9,638	5.9%	9,524	5.3%	9,322	5.8%
Other	11,432	3.8%	4,081	2.7%	5,153	4.2%	7,621	6.1%	5,265	4.5%	4,144	2.3%	7,467	4.6%
not reported	28,853	9.7%	16,754	11.3%	200	0.2%	0	0.0%	0	0.0%	0	0.0%	10,431	6.5%
TOTAL	298,222		148,719		123,653		124,808		146,995		178,899		161,623	

* Data is preliminary as of 1/15/2013

Table 9. Horseshoe Crab Harvest By Sex

SEX	# 2001	% 2001	# 2002	% 2002	# 2003	% 2003	# 2004	% 2004	# 2005	% 2005	# 2006	% 2006
Females	80,743	62.8%	99,262	56.0%	67,847	50.5%	73,004	51.3%	71,608	46.1%	82,389	47.8%
Males	48,331	37.2%	78,009	44.0%	66,417	49.5%	69,275	48.7%	83,936	54.0%	89,992	52.2%
Unknown												
TOTAL	129,074		177,271		134,264		142,279		155,544		172,381	

SEX	# 2007	% 2007	#2008	2008%	#2009	2009%	#2010	2010%	#2011	2011%	#2012	2012%	#2013*	2013%
Females	136,116	45.6%	67,353	45.3%	60,670	49.1%	65,518	52.5%	69,594	47.7%	85,833	48.0%	76,105	47.1%
Males	162,206	54.4%	78,581	52.8%	60,961	49.3%	59,270	47.5%	76,144	52.1%	93,066	52.0%	85,309	52.8%
Unknown			2,785	1.9%	2,022	1.6%	20	0.0%	1,257	0.1%	0	0.0%	209	0.1%
TOTAL	298,322		148,719		123,653		124,808		146,995		178,899		161,623	

* Data is preliminary as of 1/15/2013

Table 10. 2004 - 2013 Commercial Fishery Prosomal Width Frequency*

PW	2004				2005				2006				2007				2008			
	Females	Males	Total	Percent	Females	Males	Total	Percent	Females	Males	Total	Percent	Females	Males	Total	Percent	Females	Males	Total	Percent
150	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
160	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
170	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
180	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
190	0	1	1	1.3%	0	0	0	0.0%	0	0	0	0.0%	3	2	5	6.8%	0	0	0	0.0%
200	0	1	1	1.3%	0	0	0	0.0%	0	0	0	0.0%	1	0	1	1.4%	0	1	1	1.4%
210	0	3	3	4.0%	0	0	0	0.0%	0	0	0	0.0%	9	3	12	16.4%	0	2	2	2.9%
220	0	6	6	8.0%	2	0	2	25.0%	0	0	0	0.0%	9	3	12	16.4%	5	1	6	8.7%
230	0	5	5	6.7%	0	0	0	0.0%	0	0	0	0.0%	7	0	7	9.6%	5	0	5	7.2%
240	4	1	5	6.7%	0	0	0	0.0%	2	0	2	10.0%	11	0	11	15.1%	11	0	11	15.9%
250	2	0	2	2.7%	1	0	1	12.5%	2	0	2	10.0%	12	0	12	16.4%	13	0	13	18.8%
260	4	0	4	5.3%	1	0	1	12.5%	4	0	4	20.0%	7	1	8	11.0%	11	0	11	15.9%
270	12	0	12	16.0%	2	0	2	25.0%	3	0	3	15.0%	3	0	3	4.1%	8	0	8	11.6%
280	8	0	8	10.7%	0	0	0	0.0%	5	0	5	25.0%	1	0	1	1.4%	6	0	6	8.7%
290	12	0	12	16.0%	1	0	1	12.5%	1	0	1	5.0%	0	0	0	0.0%	5	0	5	7.2%
300	6	0	6	8.0%	1	0	1	12.5%	3	0	3	15.0%	0	0	0	0.0%	1	0	1	1.4%
310	4	0	4	5.3%	0	0	0	0.0%	0	0	0	0.0%	1	0	1	1.4%	0	0	0	0.0%
320	3	0	3	4.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
330	1	0	1	1.3%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
340	2	0	2	2.7%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
350	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
Total	58	17	75		8	0	8		20	0	20		64	9	73		65	4	69	

PW	2009				2011				2012				2013			
	Females	Males	Total	Percent	Females	Males	Total	Percent	Females	Males	Total	Percent	Females	Males	Total	Percent
150	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
160	0	1	1	1.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
170	0	2	2	2.0%	0	4	4	4.3%	0	2	2	1.9%	0	4	4	9.8%
180	0	7	7	7.0%	0	8	8	8.5%	0	11	11	10.7%	0	2	2	4.9%
190	0	18	18	18.0%	0	11	11	11.7%	0	7	7	6.8%	0	7	7	17.1%
200	0	19	19	19.0%	0	10	10	10.6%	0	11	11	10.7%	0	5	5	12.2%
210	0	15	15	15.0%	0	12	12	12.8%	0	10	10	9.7%	0	2	2	4.9%
220	1	5	6	6.0%	3	4	7	7.4%	3	0	3	2.9%	2	1	3	7.3%
230	2	2	4	4.0%	3	2	5	5.3%	12	0	12	11.7%	1	0	1	2.4%
240	9	0	9	9.0%	4	0	4	4.3%	13	0	13	12.6%	4	0	4	9.8%
250	4	0	4	4.0%	10	0	10	10.6%	16	0	16	15.5%	4	0	4	9.8%
260	6	0	6	6.0%	8	0	8	8.5%	11	0	11	10.7%	5	0	5	12.2%
270	6	0	6	6.0%	10	0	10	10.6%	6	0	6	5.8%	1	0	1	2.4%
280	3	0	3	3.0%	1	0	1	1.1%	1	0	1	1.0%	2	0	2	4.9%
290	0	0	0	0.0%	4	0	4	4.3%	0	0	0	0.0%	1	0	1	2.4%
300	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
310	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
320	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
330	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
340	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
350	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%	0	0	0	0.0%
Total	31	69	100		43	51	94		62	41	103		20	21	41	

*No data collected in 2010

Table 11. NYSDEC Peconic Bay Small Mesh Trawl Survey

Year	Delta Mean CPUE	± StDev	n
1987	0.49	0.09	153
1988	0.70	0.09	203
1989	2.68	0.69	206
1990	1.66	0.26	224
1991	3.52	0.59	206
1992	3.60	0.78	206
1993	2.99	0.57	206
1994	2.60	0.39	208
1995	2.16	0.36	176
1996	2.40	0.54	198
1997	2.01	0.24	192
1998	1.26	0.14	203
1999	1.63	0.23	205
2000	0.94	0.11	204
2001	1.16	0.15	201
2002	0.50	0.06	207
2003	0.68	0.08	208
2004	0.73	0.12	207
2005	0.75	0.09	183
*2006	1.17	0.28	54
2007	0.63	0.08	185
**2008	0.63	0.09	170
2009	0.52	0.11	195
***2010	0.23	0.06	143
2011	0.36	0.09	192
2012	0.33	0.06	208
2013	0.29	0.05	362

* 2006 based on July sampling
 ** 2008 based on Aug - Oct sampling
 *** 2010 based on June - July sampling

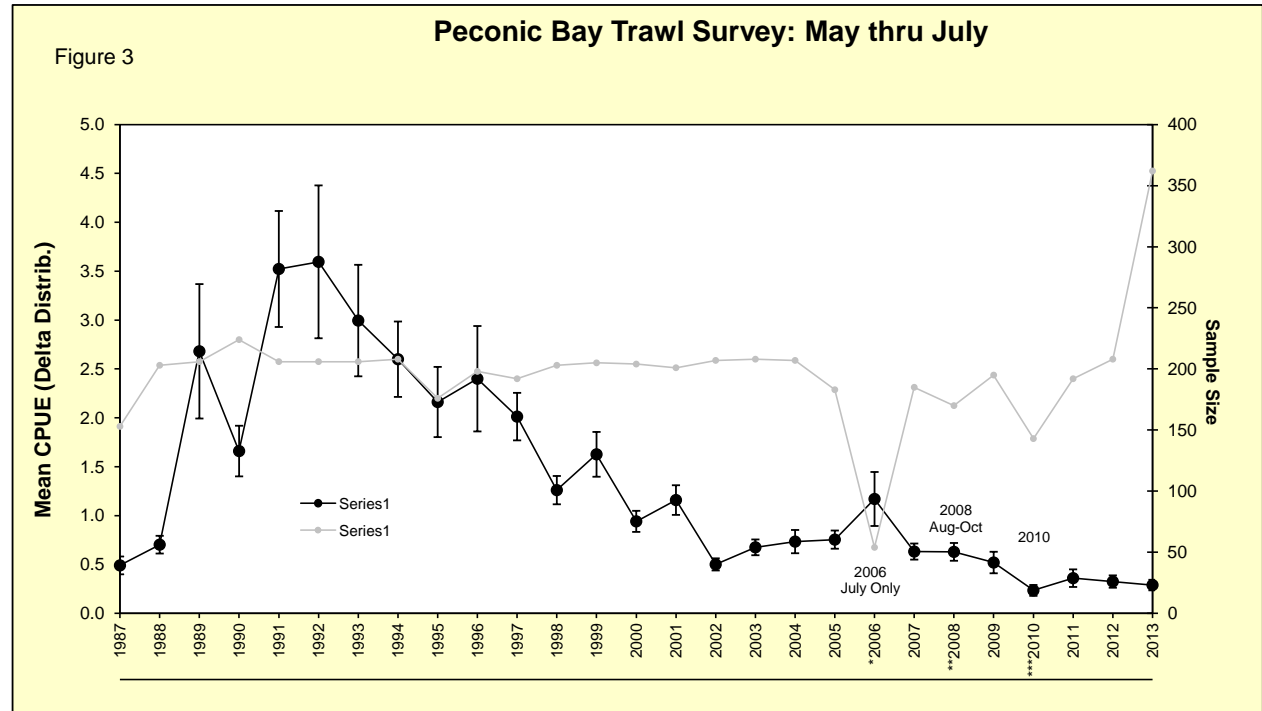


Table 12. 2003 - 2011 Peconic Bay Trawl Survey - Horseshoe Crab Prosomal Width

Females (includes unsexed juveniles)

Period	May-July	May-July	May-July	July	May-July	Aug-Oct	May-July	Jun-July	May-July	May-July	May-July	Total	Percent
PW (mm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Percent
100	0	0	0	0	0	2	0	0	0	0	0	2	0.3
110	0	0	0	0	0	0	0	0	0	0	0	0	0.0
120	0	0	0	0	0	0	0	0	0	0	0	0	0.0
130	0	0	0	0	0	0	0	0	0	0	0	0	0.0
140	0	0	0	0	0	0	0	0	0	0	0	0	0.0
150	0	0	0	1	0	0	1	0	0	0	0	2	0.3
160	0	0	1	0	0	0	0	0	0	0	0	1	0.1
170	0	0	0	0	0	0	1	0	0	0	0	1	0.1
180	1	2	1	0	1	0	1	0	1	1	0	8	1.0
190	0	0	2	0	2	0	0	0	0	0	0	4	0.5
200	1	0	0	0	0	1	0	1	2	2	1	8	1.0
210	2	1	1	0	1	0	0	0	2	2	0	9	1.2
220	1	1	2	0	1	0	1	1	1	1	1	10	1.3
230	3	7	5	0	3	2	3	0	3	3	4	33	4.3
240	3	4	5	1	6	2	2	0	3	3	2	31	4.0
250	2	4	3	4	6	4	11	3	1	1	4	43	5.6
260	5	12	5	3	14	8	2	5	0	0	9	63	8.2
270	10	12	15	1	21	7	10	6	0	0	6	88	11.5
280	10	13	12	14	30	13	16	12	0	0	23	143	18.7
290	9	26	15	6	26	12	12	8	0	0	16	130	17.0
300	18	7	16	2	18	7	8	5	0	0	5	86	11.2
310	9	7	10	4	13	3	10	3	0	0	4	63	8.2
320	3	4	2	1	7	1	0	1	0	0	2	21	2.7
330	1	2	1	0	3	0	0	1	0	0	1	9	1.2
340	0	0	0	0	1	0	0	1	0	0	1	3	0.4
350	0	0	0	0	2	0	0	0	0	0	0	2	0.3
360	0	0	0	0	0	0	0	0	0	0	0	0	0.0
370	0	0	0	0	0	1	0	1	0	0	0	2	0.3
380	0	0	0	0	1	0	0	0	0	0	0	1	0.1
390	0	2	0	0	0	0	0	0	0	0	0	2	0.3
400	0	0	0	0	0	0	0	0	0	0	0	0	0.0
410	0	0	0	0	0	0	0	0	0	0	0	0	0.0
420	0	0	0	0	0	0	0	0	0	0	0	0	0.0
430	0	0	0	0	0	0	0	0	0	0	0	0	0.0
440	0	0	0	0	0	0	0	0	0	0	0	0	0.0
450	0	0	0	0	0	0	0	0	0	0	0	0	0.0
460	0	0	0	0	0	0	0	0	0	0	0	0	0.0
470	0	0	0	0	0	0	0	0	0	0	0	0	0.0
480	1	0	0	0	0	0	0	0	0	0	0	1	0.1
490	0	0	0	0	0	0	0	0	0	0	0	0	0.0
500	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	79	104	96	37	156	63	78	48	13	13	79	766	
Mean PW	278.0	274.2	271.2	274.3	277.0	274.1	270.0	278.4	224.5	276.8	281.7		
std PW	37.5	32.6	32.3	28.1	28.5	25.4	32.0	28.5	20.7	27.6	24.6		
Min PW	171	174	158	147	179	196	142	195	180	180	207		
Max PW	476	390	326	367	372	369	310	370	250	367	345		

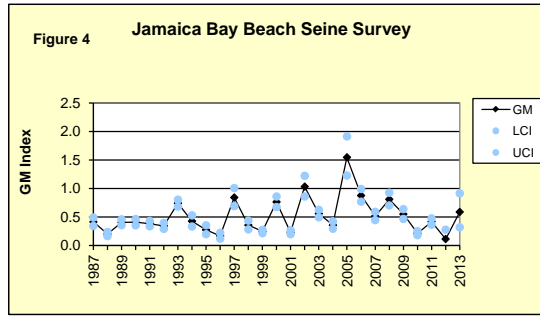
Males

Period	May-July	May-July	May-July	July	May-July	Aug-Oct	May-July	Jun-July	May-July	May-July	May-July	Total	Percent
PW (mm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Percent
100	0	0	0	0	0	0	0	0	0	0	0	0	0.0
110	0	0	0	0	0	0	0	0	0	0	0	0	0.0
120	0	0	0	0	0	0	0	0	0	0	0	0	0.0
130	0	0	0	0	0	0	0	0	0	0	0	0	0.0
140	0	0	0	0	0	0	0	0	0	0	0	0	0.0
150	0	0	0	0	0	0	0	0	0	0	0	0	0.0
160	0	0	0	0	0	0	0	0	0	1	0	1	0.0
170	1	0	0	1	0	1	0	0	1	0	0	4	0.5
180	0	1	1	1	0	1	2	1	0	3	3	12	1.5
190	3	5	1	4	5	2	5	4	3	8	8	45	5.8
200	4	4	8	1	9	6	3	5	13	13	7	73	9.4
210	9	8	11	3	11	9	3	7	11	11	8	91	11.7
220	7	16	11	6	17	8	6	6	9	9	2	97	12.5
230	8	13	5	8	17	10	3	7	7	7	3	88	11.3
240	6	5	3	1	11	6	5	0	4	4	1	46	5.9
250	2	2	2	1	2	1	0	0	0	0	1	11	1.4
260	0	1	0	0	0	0	0	0	0	0	1	2	0.3
270	1	0	1	0	0	0	0	0	0	0	0	2	0.3
280	0	0	1	0	0	0	2	0	0	0	0	3	0.4
290	1	0	0	0	1	0	0	0	0	0	0	2	0.3
300	0	0	0	0	1	0	0	0	0	0	0	1	0.1
310	0	0	0	0	0	0	0	0	0	0	0	0	0.0
320	0	0	0	0	0	0	0	0	0	0	0	0	0.0
330	0	0	0	0	0	0	0	0	0	0	0	0	0.0
340	0	0	0	0	0	0	0	0	0	0	0	0	0.0
350	0	0	0	0	0	0	0	0	0	0	0	0	0.0
360	0	0	0	0	0	0	0	0	0	0	0	0	0.0
370	0	0	0	0	0	0	0	0	0	0	0	0	0.0
380	0	0	0	0	0	0	0	0	0	0	0	0	0.0
390	0	0	0	0	0	0	0	0	0	0	0	0	0.0
400	0	0	0	0	0	0	0	0	0	0	0	0	0.0
410	0	0	0	0	0	0	0	0	0	0	0	0	0.0
420	0	0	0	0	0	0	0	0	0	0	0	0	0.0
430	0	0	0	0	0	0	0	0	0	0	0	0	0.0
440	0	0	0	0	0	0	0	0	0	0	0	0	0.0
450	0	0	0	0	0	0	0	0	0	0	0	0	0.0
460	0	0	0	0	0	0	0	0	0	0	0	0	0.0
470	0	0	0	0	0	0	0	0	0	0	0	0	0.0
480	0	0	0	0	0	0	0	0	0	0	0	0	0.0
490	0	0	0	0	0	0	0	0	0	0	0	0	0.0
500	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	42	55	44	25	75	47	26	28	56	56	26	479	
Mean PW	217.4	216.6	214.9	214.5	217.1	215.9	209.0	209.9	212.7	214.8	216.3		
std PW	21.8	16.9	20.1	18.2	20.0	21.9	20.0	13.5	17.0	15.6	19.3		
Min PW	170	180	177	164	179	167	160	185	171	178	176		
Max PW	281	257	280	282	296	277	238	230	248	250	263		

Table 13. NYSDEC WLI Beach Seine Survey

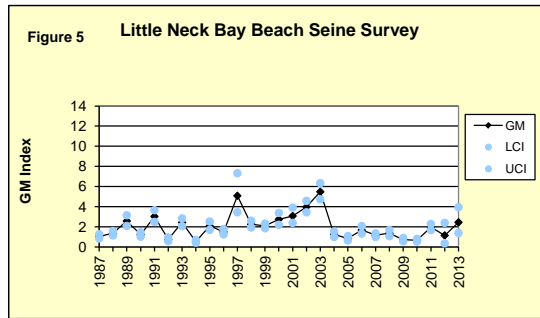
Jamaica Bay

YEAR	GM	LCI	UCI
1987	0.41	0.34	0.49
1988	0.20	0.16	0.24
1989	0.41	0.35	0.46
1990	0.41	0.35	0.46
1991	0.38	0.34	0.43
1992	0.34	0.29	0.40
1993	0.74	0.68	0.80
1994	0.43	0.33	0.53
1995	0.27	0.20	0.35
1996	0.17	0.12	0.22
1997	0.84	0.69	1.01
1998	0.36	0.28	0.43
1999	0.24	0.21	0.27
2000	0.76	0.67	0.86
2001	0.23	0.20	0.27
2002	1.03	0.86	1.22
2003	0.56	0.49	0.63
2004	0.36	0.29	0.42
2005	1.55	1.23	1.91
2006	0.88	0.77	0.99
2007	0.51	0.44	0.59
2008	0.81	0.70	0.93
2009	0.55	0.47	0.64
2010	0.21	0.18	0.25
2011	0.42	0.36	0.47
2012	0.11	-0.03	0.28
2013	0.59	0.32	0.91
mean	0.51		



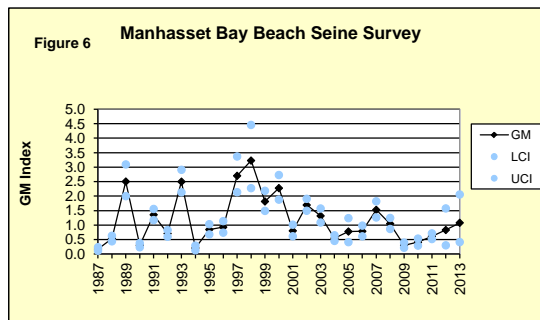
Little Neck Bay

YEAR	GM	LCI	UCI
1987	1.05	0.85	1.26
1988	1.36	1.15	1.58
1989	2.59	2.09	3.16
1990	1.23	1.03	1.46
1991	3.04	2.50	3.66
1992	0.76	0.58	0.96
1993	2.44	2.07	2.84
1994	0.55	0.43	0.69
1995	2.10	1.71	2.53
1996	1.50	1.25	1.78
1997	5.09	3.45	7.33
1998	2.26	1.94	2.61
1999	2.09	1.86	2.33
2000	2.75	2.21	3.39
2001	3.08	2.39	3.91
2002	3.98	3.44	4.59
2003	5.49	4.73	6.34
2004	1.26	1.00	1.54
2005	0.86	0.66	1.09
2006	1.68	1.33	2.08
2007	1.17	1.00	1.36
2008	1.37	1.08	1.69
2009	0.73	0.57	0.90
2010	0.67	0.54	0.81
2011	1.97	1.68	2.29
2012	1.15	0.37	2.40
2013	2.45	1.40	3.95
mean	2.02		



Manhasset Bay

YEAR	GM	LCI	UCI
1987	0.17	0.11	0.24
1988	0.53	0.44	0.63
1989	2.50	2.00	3.09
1990	0.30	0.23	0.38
1991	1.36	1.17	1.56
1992	0.71	0.60	0.83
1993	2.50	2.13	2.91
1994	0.21	0.13	0.29
1995	0.85	0.68	1.03
1996	0.93	0.74	1.14
1997	2.70	2.14	3.37
1998	3.23	2.27	4.46
1999	1.81	1.49	2.18
2000	2.28	1.88	2.73
2001	0.80	0.61	1.01
2002	1.69	1.49	1.91
2003	1.32	1.09	1.57
2004	0.55	0.45	0.65
2005	0.78	0.41	1.24
2006	0.79	0.61	0.98
2007	1.53	1.26	1.82
2008	1.05	0.87	1.25
2009	0.30	0.22	0.40
2010	0.41	0.29	0.53
2011	0.61	0.52	0.71
2012	0.83	0.30	1.57
2013	1.08	0.41	2.06
mean	1.18		



Based on catches in May and June with 90% confidence

Table 14. 1998 - 2011 May - June Western Long Island Beach Seine - Horseshoe Crab Prosomal Width

Females																		
PW (mm)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Percent
<100(sex?)*	0	0	0	1	0	0	0	0	0	0	1	7	2	4	1	3	19	4.1%
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
170	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0.4%
180	0	0	0	0	1	2	1	1	0	1	0	0	0	0	0	0	6	1.3%
190	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0.7%
200	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	3	0.7%
210	0	0	7	1	4	1	0	0	1	0	0	0	0	0	0	1	15	3.3%
220	2	1	1	4	4	1	4	0	1	1	0	0	0	1	0	2	22	4.8%
230	3	5	9	5	15	7	5	0	7	1	1	1	1	1	1	62	13.5%	
240	5	7	8	4	9	10	5	0	6	12	7	4	0	3	3	4	87	19.0%
250	6	4	12	1	15	7	2	0	4	5	7	2	1	3	1	4	74	16.1%
260	4	1	5	1	6	14	2	3	6	5	6	5	3	5	5	1	72	15.7%
270	2	4	5	1	5	5	2	4	1	5	5	4	4	9	7	68	14.8%	
280	0	3	2	1	0	1	0	0	0	7	1	0	3	2	5	25	5.4%	
290	0	0	1	1	0	1	1	0	1	0	2	4	0	0	1	1	13	2.8%
300	0	0	0	0	0	0	0	0	1	0	0	2	0	1	1	0	5	1.1%
310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
360	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0.4%
370	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
460	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
490	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	22	25	50	19	61	55	22	8	28	30	35	24	10	25	24	31	459	

Mean PW	249.4	252.8	247.5	232.6	245.2	244.3	242.4	258.9	250.0	253.8	250.7	262.4	259.0	263.9	260.7	241.4
std PW	15.2	17.9	20.2	52.8	25.7	27.7	22.3	29.0	19.1	17.9	39	20.3	9.3	18.1	16.1	71.3
Min PW	220	226	211	26	170	174	180	189	215	189	44	22	37	226	221	39
Max PW	271	285	292	295	365	295	290	278	300	280	290	298	268	305	293	364

* Mean and std PW do not include HSC <100 mm

Males																		
PW (mm)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Percent
<100	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1%
100	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0.2%
110	0	1	1	0	1	2	0	0	0	0	0	0	0	0	0	0	5	0.5%
120	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0.2%
130	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1%
140	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1%
150	1	1	1	1	2	0	0	0	0	0	0	0	0	0	2	0	8	0.7%
160	1	3	3	1	9	3	1	0	1	2	0	1	0	1	0	0	26	2.4%
170	5	4	13	9	17	5	6	1	7	5	3	6	1	4	0	1	87	7.9%
180	10	24	26	12	33	14	10	4	10	18	5	11	0	13	9	12	211	19.2%
190	8	24	45	12	30	24	15	13	20	31	9	17	3	17	9	9	286	26.0%
200	15	22	31	12	23	17	12	9	12	10	19	8	4	7	10	15	226	20.6%
210	8	13	12	5	15	12	10	9	11	6	21	5	4	7	12	5	155	14.1%
220	3	4	2	3	9	5	4	2	1	2	9	1	2	3	8	3	61	5.6%
230	0	1	3	2	1	4	0	1	0	1	3	0	1	1	2	1	21	1.9%
240	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0.2%
250	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	3	0.3%
260	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1%
270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
370	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
460	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
490	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total	52	97	138	57	142	89	58	39	62	75	72	50	15	56	50	46	1098	

Mean PW	195.2	194.7	194.1	190.5	192.5	193.4	195.7	201.1	195.2	196.4	200.9	196.8	198.6</
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Table. 15 NY Ocean Surf Clam Survey Sampling Months

Year	Months Sampled										
	1	2	3	4	5	6	7	8	9	10	11
1999							x				
2002								x	x		x
2005								x	x		
2006											x
2008											x
2012							x	x			

Table 16. Horseshoe Crab data from NYSDEC Ocean Surf Clam Survey

1999 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	5.46	0.47	0.14	1.93
JF	1.89	0.37	0.18	0.77
FM	0.63	0.12	0.00	0.25
MM	0.00			0.00
Stratum Totals	1.37	0.29	0.09	0.70

1999 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.77	0.66	0.40	0.75
JF	0.62	0.80	0.76	0.66
FM	0.84	1.00		0.86
MM				
Stratum Totals	0.75	0.77	0.60	0.75

2002 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	5.64	2.00	0.79	2.72
JF	1.65	1.98	0.34	1.28
FM	1.16	0.26	0.17	0.54
MM	0.16			0.16
Stratum Totals	1.59	1.25	0.38	1.13

2002 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.62	0.56	0.79	0.62
JF	0.54	0.64	0.24	0.56
FM	0.76	0.65	0.54	0.72
MM	0.83			0.83
Stratum Totals	0.65	0.60	0.60	0.63

2005 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	2.31	0.69	0.24	1.06
JF	1.35	0.74	0.38	0.80
FM	1.10	0.31	0.10	0.52
MM	1.18			1.18
Stratum Totals	1.37	0.55	0.21	0.81

2005 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.88	0.69	1.00	0.84
JF	0.77	0.78	0.89	0.80
FM	0.67	0.60	0.52	0.64
MM	0.69			0.69
Stratum Totals	0.75	0.70	0.84	0.75

2006 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	1.65	2.16	0.96	1.62
JF	0.19	0.73	1.22	0.75
FM	0.97	0.32	0.64	0.66
MM	0.11			0.11
Stratum Totals	0.63	1.01	0.87	0.81

2006 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.70	0.66	0.65	0.67
JF	0.71	0.46	0.45	0.47
FM	0.87	0.47	0.52	0.69
MM	0.76			0.76
Stratum Totals	0.78	0.60	0.53	0.64

2008 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	1.27	1.22	2.44	1.67
JF	0.75	0.88	1.42	1.06
FM	0.31	0.46	0.41	0.39
MM	0.03			0.03
Stratum Totals	0.41	0.82	1.20	0.75

2008 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.74	0.77	0.64	0.69
JF	0.58	0.40	0.59	0.54
FM	0.40	0.83	0.50	0.58
MM	1.00			1.00
Stratum Totals	0.62	0.67	0.60	0.63

2012 Standardized HSC CPUE				
Area	Stratum			Area Totals
	1	2	3	
RJ	3.95	1.09	0.22	1.68
JF	0.34	0.67	0.00	0.32
FM	0.72	0.00	0.07	0.28
MM	0.36			0.36
Stratum Totals	1.05	0.51	0.09	0.62

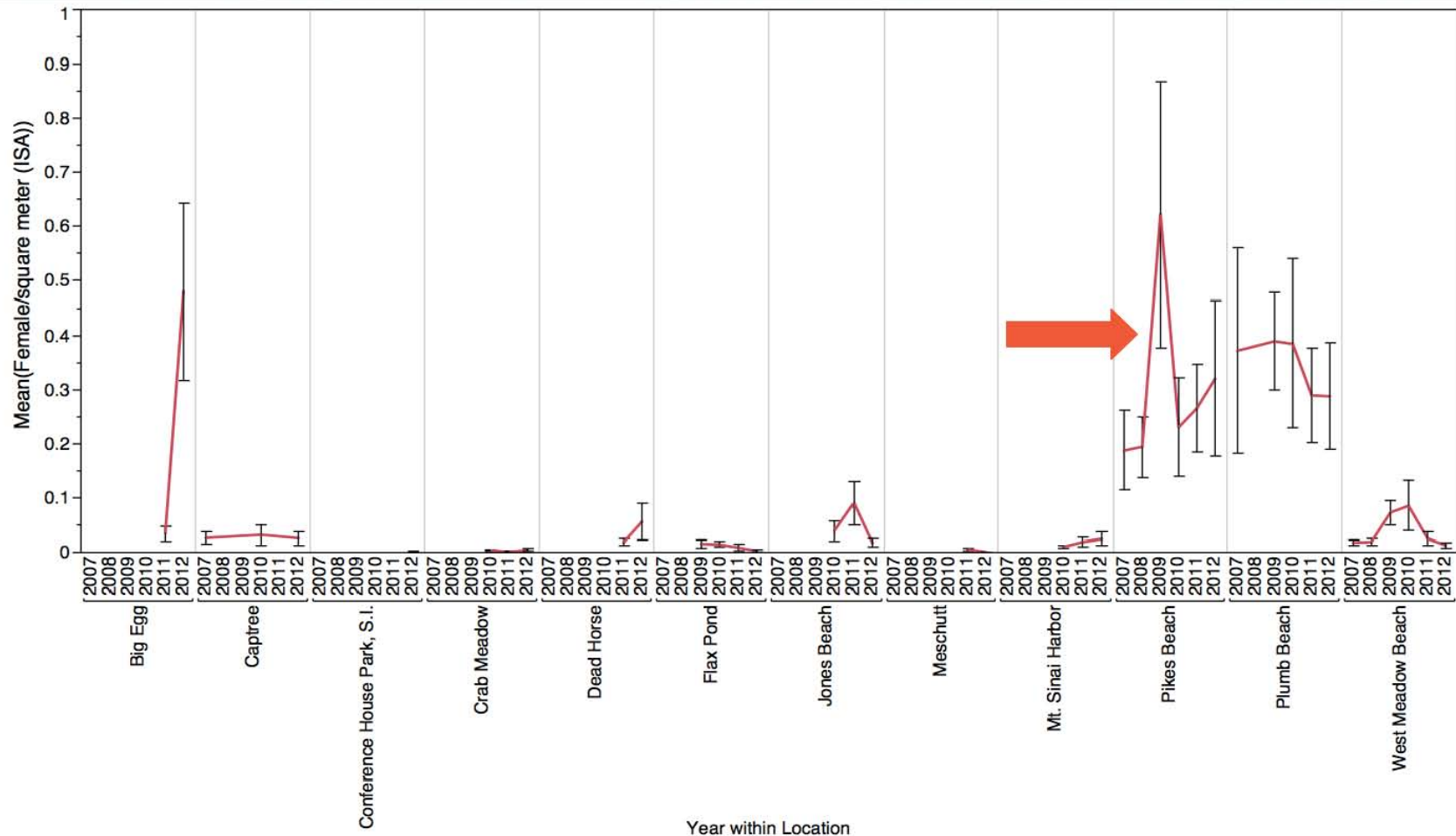
2012 Proportion of females				
Area	Stratum			Area Totals
	1	2	3	
RJ	0.75	0.81	1.00	0.77
JF	0.72	0.76		0.75
FM	0.63		1.00	0.67
MM	0.70			0.70
Stratum Totals	0.72	0.79	1.00	0.75

Area
 RJ= South shore from Rockaway Inlet to Jones Inlet
 JF= Jones Inlet to Fire Island Inlet
 FM= Fire Island Inlet to Moriches Inlet
 MM= Moriches Inlet to Montauk Point

Stratum
 1 = 0 - 1 mile offshore
 2 = 1 - 2 miles offshore
 3 = 2 - 3 miles offshore

Figure 7. New York Index of Spawning Potential

Index of Spawning Activity



Tables 16. NY DEC and Cornell Cooperative Extension Horseshoe Crab Tag Releases

Location	2007	2008	2009	2010	2011	2012	Totals
Long Island Sound							
Crab Meadow (Northport)				22	1	16	23
West Meadow (Stony Brook)	32	187	318	315	273	980	2,105
Flax Pond (Long Island Sound)			63	65	60	70	258
Cedar Beach (Mount Sinai)	14			400	258	97	769
Great Peconic Bay						9	
Jamesport (Peconic)				11			11
Meschutt Beach (Shinnecock)					26		26
South Shore Bays							
Jamaica Bay						831	0
Plum Beach (Brooklyn)	70		111	85	200		466
Big Egg					44		44
Dead Horse					25		25
Dubos Point					6		6
Jones Inlet							
Jones Beach (Short Beach)				165	172	108	337
Great South Bay							
Captree (Islip)	50			23		12	73
Smith Point (Fire Island)			63				63
Moriches / Shinnecock Bays							
Moriches Inlet (Westhampton Dunes)	33						33
Pikes Beach (Westhampton)	158	439	212	184	145	1,180	2,318
Little Neck Rd Beach (Shinnecock Bay)			24				24
New York Harbor							
Crescent Beach, Staten Island					15	12	15
Atlantic Ocean							
Offshore Long Island, NY	977	258	15	27			1,277
Other						104	
Total	1,334	884	806	1,297	1,225	3,419	7,873

Table 17. Horseshoe Crab Tag Recaptures From New York Releases

Location	2007	2008	2009	2010	2011	Total
NY	31	85	115	244	222	697
LONG ISLAND SOUND						89
OYSTER BAY					1	1
HUNTINGTON BAY				1		1
NORTHPORT					2	2
SMITHTOWN BAY	1		4	13	3	21
SMITHTOWN BAY (WEST MEADOW BEACH)					39	39
HEAD OF THE HARBOR					1	1
SETAUKET HARBOR					1	1
OLD FIELD					1	1
PORT JEFFERSON					8	8
MOUNT SINAI HARBOR (CEDAR BEACH)					5	5
MOUNT SINAI HARBOR				1	17	18
ROCKY POINT					4	4
WADING RIVER					1	1
BAITING HOLLOW					1	1
FISHERS ISLAND					1	1
UNKNOWN LONG ISLAND SOUND	1	20	65	140	4	230
NY HARBOR AND SURROUNDS						
HUDSON RIVER		1				1
NY HARBOR					2	2
RARITAN BAY	2	1				3
BREEZY POINT					2	2
SOUTH SHORE BAYS						99
JAMAICA BAY (PLUM BEACH)					43	43
JAMAICA BAY	2	3	10	26	23	64
BALDWIN BAY					1	1
HEMPSTEAD BAY				2		2
SOUTH OYSTER BAY		1	1		1	3
GREAT SOUTH BAY	2	3	5	5	4	19
MORICHES BAY		3	12	7	3	25
MORICHES BAY (PIKES BEACH)					18	18
SHINNECOCK BAY					6	6
PECONIC BAYS						
LITTLE PECONIC BAY			2	1		3
ATLANTIC OCEAN						24
ROCKAWAY INLET			2			2
ROCKAWAY BEACH					4	4
LONG BEACH					4	4
JONES INLET	1	1	1			3
JONES BEACH					7	7
GILGO BEACH					1	1
FIRE ISLAND INLET			2			2
ROBERT MOSES BEACH					1	1
FIRE ISLAND					5	5
MORICHES INLET			1			1
SOUTH HAMPTON					1	1
UNKNOWN ATLANTIC OCEAN	22	52	10	48	1	133
DE	0	1	0	1	0	2
DELAWARE BAY		1		1		2
NJ	4	7	3	2	3	19
ATLANTIC OCEAN	2	3	1	2		8
SANDY HOOK					2	2
RARITAN BAY	2	4	2		1	9
CT	0	2	8	15	3	28
LONG ISLAND SOUND		2	8	15		25
BRIDGEPORT					1	1
GREENWICH					1	1
STONINGTON					1	1
RI	0	0	0	1	0	1
LITTLE NARRAGANSETT BAY				1		1
MA	0	0	0	1	0	1
CAPE COD BAY				1		1
Grand Total*	35	95	126	264	222	742

* - The table includes recaptures from other release programs in NY State

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF FISH AND WILDLIFE
MARINE FISHERIES ADMINISTRATION
BUREAU OF MARINE FISHERIES

NEW JERSEY HORSESHOE CRAB
MANAGEMENT AND MONITORING PROGRAM 2013
AND
MANAGEMENT AND MONITORING PROGRAM
PLANNED FOR 2014

Report By: Jeffrey Brust

Submitted to the Atlantic States Marine Fisheries Commission
as a Requirement to Addendum IV to the
Interstate Fishery Management Plan for Horseshoe Crab

March 2014

I. Introduction

In May 2006, the New Jersey Department of Environmental Protection (Department) implemented Amendments to N.J.A.C. 7:25-18.16, Horseshoe Crab, *Limulus polyphemus*, requiring a two year moratorium on the harvesting of horseshoe crabs in the commercial bait fishery. The moratorium was scheduled to lapse prior to the 2008 fishing season. In February 2008, the New Jersey Marine Fisheries Council failed to approve an indefinite extension of the moratorium proposed by the Department. However, prior to the June harvesting season, the State of New Jersey took legislative action (NJ P.L. 2008, Title 23:2B-20) to indefinitely prohibit the harvest and possession of horseshoe crabs from New Jersey waters. Repeal of these statutes will take further legislative action by the State of New Jersey.

II. De Minimus

Based on recent year's harvest, New Jersey would qualify for *de minimus* status. However, given the level of importance of New Jersey's waters to the life cycle of horseshoe crabs, New Jersey is not requesting *de minimus* status.

III. Horseshoe Crab Monitoring Program 2013

A. Fishery Dependent Monitoring

As a result of a moratorium on commercial harvest of horseshoe crabs for bait enacted in 2008, there were no landings of horseshoe crabs in New Jersey for 2013. No fishery dependent monitoring was therefore conducted.

B. Fishery Independent Monitoring

In 2013, the Division continued to monitor horseshoe crab abundance in New Jersey waters through a variety of established surveys.

The Ocean Trawl Survey began in 1988 and is conducted five times per year between Cape Henlopen Channel and Ambrose Channel (entrances to Delaware Bay and New York Harbor, respectively). Historically, total number per tow and total weight per tow were collected along with individual lengths (prosomal widths). Since 1996, crabs have been enumerated and weighed by sex.

A monthly juvenile finfish trawl survey in New Jersey portions of the Delaware Bay has been ongoing since 1991. Historically, only presence/absence was recorded. Since 1998, crabs have been enumerated, measured, and weighed by sex. Data for 2013 have not been compiled yet, but results through 2012 are shown in Figure 1 (frequency distributions of size by sex) and Figure 2 (CPUE by sex).

New Jersey continues to cooperate in the Delaware Bay Spawner Survey to estimate spawning densities on Delaware Bay beaches. In 2013, Division personnel assumed responsibility for sampling the horseshoe crab spawning population on Gandy's Beach on the New Jersey side of Delaware Bay. In addition, Division personnel received all field data sheets for all beaches sampled on both sides of the bay, photocopied and entered all

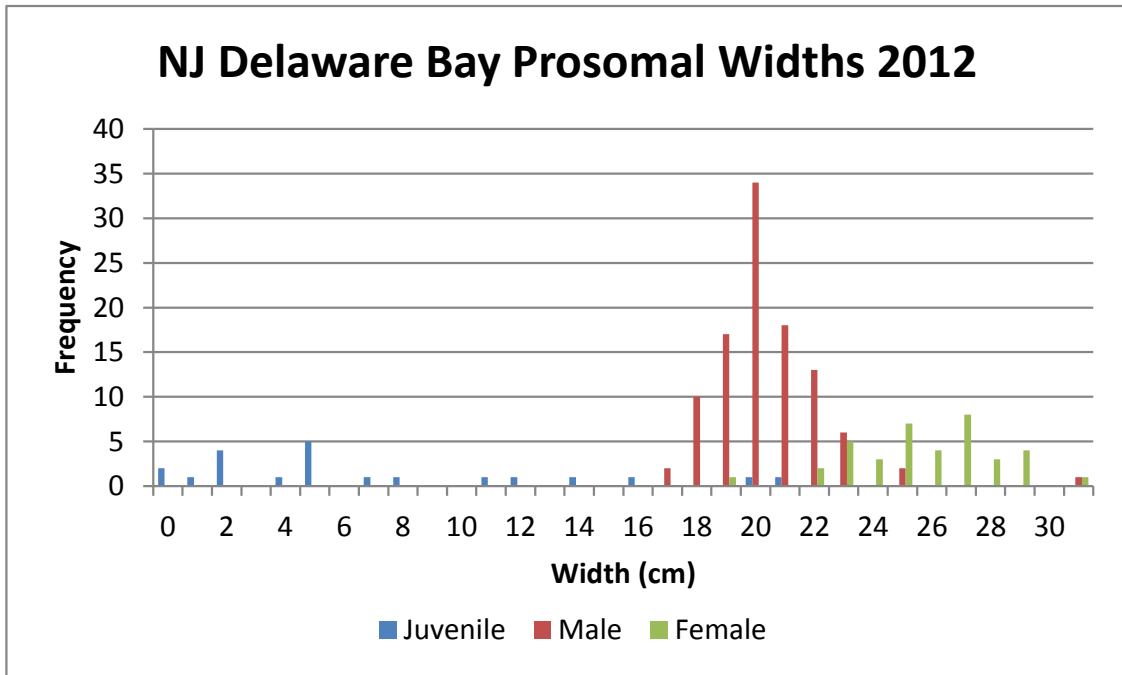


Figure 1. Horseshoe crab length frequencies by sex for 2012 Delaware Bay trawl survey.

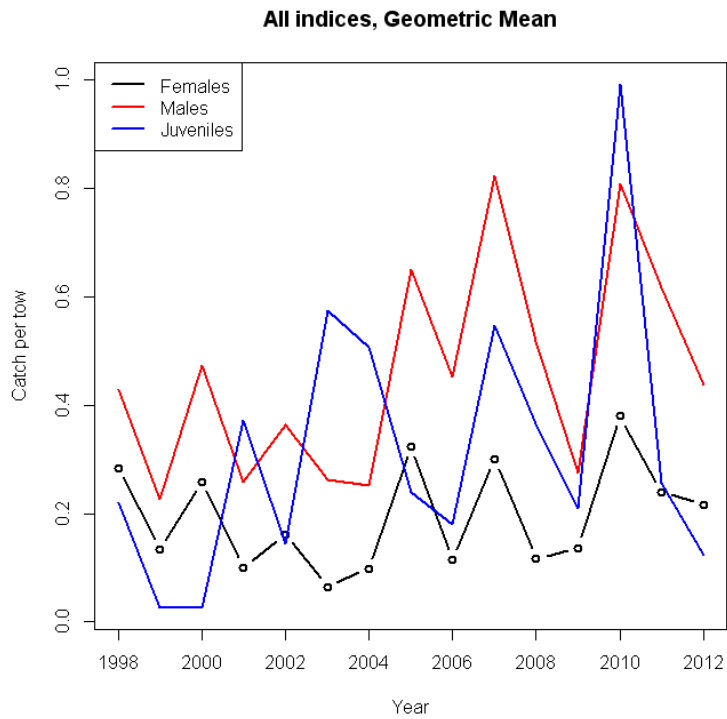


Figure 2. Geometric mean number of horseshoe crabs caught per tow in the New Jersey Delaware Bay Trawl Survey.

data in electronic format, and worked with the U.S. Geological Service and the State of Delaware to calculate the 2013 horseshoe crab spawner index.

Every summer, the Bureau of Shellfisheries conducts an inventory of surf clam resources in New Jersey state waters using a commercial clam vessel equipped with hydraulic dredge gear. Since 1998, crabs have been enumerated by sex. CPUE by sex from stations south of Great Egg Harbor has been presented in NJ compliance reports in previous years. Due to loss of funding after the 2012 survey, no stations were conducted south of Great Egg Harbor in 2013, so no update is available. Results of the survey through 2012 are shown in Figure 3. Alternative sources of funding are being sought to continue this survey. If/when the survey resumes in the southern region, updated indices will be presented.

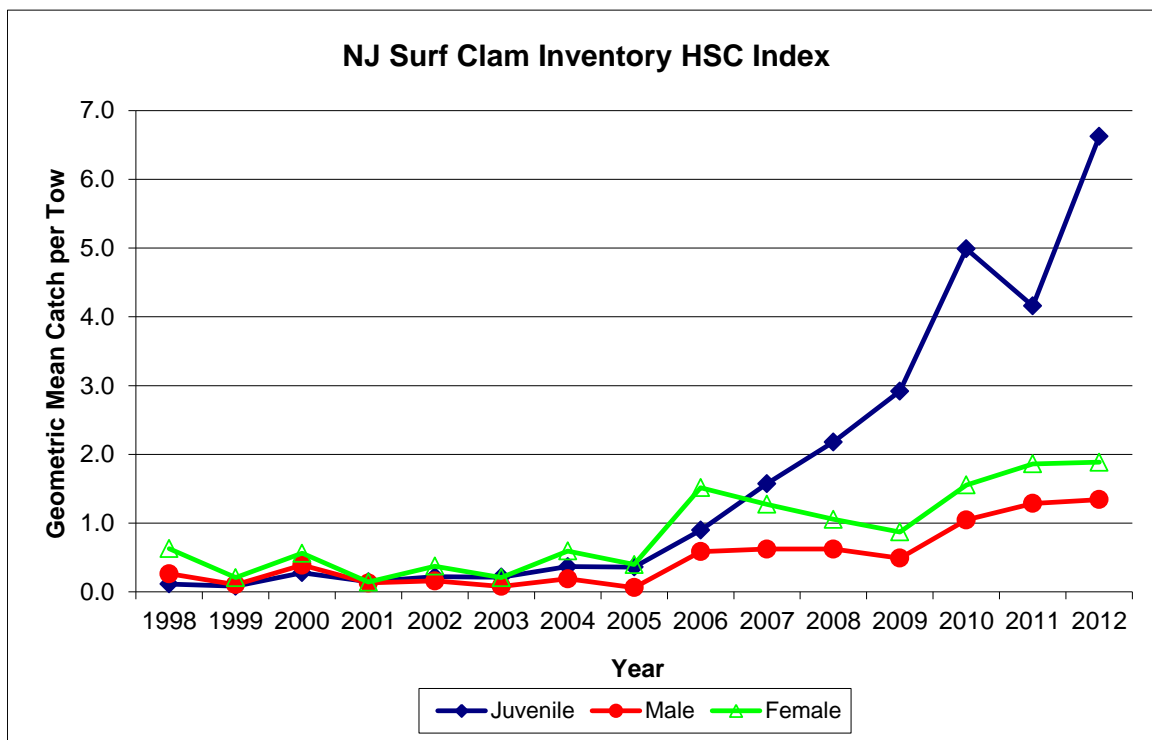


Figure 3. Geometric mean number of horseshoe crabs caught per tow in the New Jersey Surf Clam Survey.

C. Regulations

In 2008, legislative action was taken in which statutes were passed that supersede the Department’s regulatory authority. The language of the statutes has not been modified since implementation, and is provided as Attachment 1.

D. Harvest breakdown

As a result of a moratorium on commercial harvest of horseshoe crabs for bait enacted in 2008, there were no reported landings of horseshoe crabs in New Jersey for 2013. No harvest breakdown is available.

E. Habitat recommendations

Horseshoe crab spawning beaches in Delaware Bay are well known and have been mapped by the U.S. Fish and Wildlife Service. Harvest reports from horseshoe crab permittees over many years have specified many locations where hand harvesting occurs during the spawning season both in Delaware Bay and along the Atlantic coast.

Nursery habitat is being identified through a New Jersey 16 foot trawl survey in Delaware Bay that primarily collects young of year and juvenile horseshoe crabs in the nearshore shallow waters of Delaware Bay.

New Jersey continues to work towards protection and improvement of horseshoe crab spawning habitat. Activities that occurred in 2008 include planning demolition of remaining structures on Thompson's Beach, ongoing efforts to raise funds to protect other Delaware Bay beaches, and access restrictions and beach closures to protect spawning crabs and feeding shorebirds.

IV. Management strategies for 2014

The moratorium on commercial bait harvest in New Jersey, enacted in 2006, ended as of December 31, 2007. The New Jersey Department of Environmental Protection (Department) proposed a rule to extend the moratorium indefinitely, beginning before the commercial season in 2008. This proposal, however, was vetoed by the New Jersey Marine Fisheries Council (Council), and the Department was unable to implement any management measure. Subsequently, bills to prohibit the harvest and possession of horseshoe crabs from New Jersey waters were passed in both the New Jersey Senate and Assembly. These bills were signed into action by the Governor of New Jersey in May 2008 (NJ P.L. 2008, Title 23:2B-20). The control of horseshoe crab management is therefore above the jurisdiction of the Department. Harvest and possession of horseshoe crabs from New Jersey waters is prohibited until further legislative action is taken to amend or repeal the current statutes. Bills have recently been introduced in both the NJ Senate and NJ Assembly to lift the horseshoe crab moratorium, but both are still in committee. Marine Fisheries staff will inform ASMFC of the outcome of these bills.

New Jersey will continue to conduct the most of the fishery independent monitoring programs during 2014. The one exception is the surf clam inventory. This project was funded through the State-Federal Interjurisdictional (IJ) program which is no longer being funded. The State does not have any dedicated funds to continue the survey, so 2012 was the last year of the survey. If sufficient IJ funding becomes available in the future, or other sources of funding are identified, it is likely that this survey would be reinstated. In the event of a commercial fishing season, New Jersey will resume appropriate fishery dependent monitoring measures.

V. Plan Specific Requirements

Under Addendum III to the Interstate Fishery Management Plan for Horseshoe Crab required monitoring programs for non-*de minimus* states include Components A₁ through A₃.

COMPONENT A₁: Report monthly harvest (of any type) of horseshoe crabs.

1. Commercial Harvest of Horseshoe Crabs for Bait Fisheries

As a result of a moratorium on commercial harvest of horseshoe crabs for bait enacted in 2008, there were no landings of horseshoe crabs in New Jersey for 2013. No fishery dependent monitoring was therefore conducted.

2. Scientific and Education Research Harvest

Any individual or organization intending to collect horseshoe crabs in New Jersey for research or educational purposes must obtain a scientific collecting permit. The New Jersey Marine Fisheries Administration issued a few dozen scientific collecting permits in 2013, only a few of which could possibly have collected horseshoe crabs.

Scientific collecting permits that allowed for the collection of horseshoe crabs were issued in 2013 to the following types of organizations:

- Aquariums and science centers, for educational displays
- Federal agencies (NMFS, USFWS), for research and educational purposes
- Colleges and universities, for research and education purposes
- Public educational organizations, for educational displays, teaching programs
- County science and technology vocational-technical schools, for teaching programs
- Environmental consultants, for resource monitoring and environmental assessments
- A watershed advocacy group to conduct a spawning survey in portions of Raritan Bay

All Scientific Collecting Permit holders must submit an annual report identifying all organisms collected and the final disposition of those organisms. It is estimated that only a few hundred horseshoe crabs were collected under scientific collecting permits for research, educational purposes or environmental assessments. The greatest majority of these horseshoe crabs were returned to the water, with no more than a few retained for aquarium display.

COMPONENT A₂: Monitoring of biomedical company's utilization of horseshoe crabs within the State.

Limuli Laboratories in Cape May Court House, NJ on Delaware Bay, operating under a Division of Fish and Wildlife (Division) Scientific Collecting Permit, utilizes horseshoe crabs for the production of Limulus Amoebocyte Lysate (LAL). This biomedical company may collect, by hand or trawl, limited numbers of horseshoe crabs in defined

locations and at defined time periods. Limuli Laboratories is also in possession of an Exempted Fishing Permit issued by the National Marine Fisheries Service (NMFS) to collect limited numbers of horseshoe crabs by trawl from the Carl N. Schuster, Jr. Horseshoe Crab Reserve near the mouth of Delaware Bay. Under the terms of the Scientific Collecting Permit issued by the Division, Limuli Laboratories must complete biomedical collection forms (following the questionnaire format suggested in Addendum III for the utilization of horseshoe crabs by the biomedical industry) documenting the collection, handling, transportation, and bleeding of all horseshoe crabs captured. Limuli Laboratories completed and returned 42 questionnaires to the Division. These completed questionnaires contain the business records of Limuli Laboratories. In accordance with State law, N.J.S.A. 23:2B-9e, **these records must remain confidential information, not for public distribution.** Copies of all collection forms have been sent to the ASMFC for compilation with the confidential records of the other Atlantic coast biomedical companies to assess the mortality on the horseshoe crab resource resulting from the biomedical industry in the production of LAL.

COMPONENT A3: Identification and conservation of horseshoe crab spawning and nursery habitat.

Information on habitat conservation efforts in New Jersey are described in section III E above.

ADDITIONAL MONITORING PROGRAM RECOMMENDATIONS FROM ADDENDUM III

COMPONENT B2: Continue working toward expanding coastwide trawl survey.

New Jersey continues to support the expansion of the ocean trawl survey for horseshoe crabs. Representatives on the Technical Committee and Management Board have provided comments on survey methodology and possible funding sources. However, due to fiscal and manpower limits, the State is unable at this time to provide staff or funding to conduct an expanded survey.

COMPONENT B2: Continue existing state benthic sampling programs.

As noted in section III B above, New Jersey conducts three benthic sampling programs that collect information on horseshoe crabs. There are no plans to the New Jersey Ocean Trawl Survey and Delaware Bay Trawl Survey, but the Surf Clam Inventory has been discontinued due to loss of IJ funding. Results of the continuing surveys will be provided in annual compliance reports at a minimum, and can be provided upon request from the Technical Committee or other ASMFC body.

COMPONENT B3: Continue monitoring spawning populations.

As noted in section III B above, Division personnel again assumed responsibility for sampling the horseshoe crab spawning population on Gandy's Beach on the New Jersey side of Delaware Bay, and compiled datasheets from all sampled beaches. New Jersey will continue to provide this support.

COMPONENT B5: Continue existing state egg abundance surveys.

In 2012 horseshoe crab egg density surveys were conducted by the New Jersey Endangered and Non-game Species Program (ENSP). Transect surveys were conducted according to standardized methodology during May and June with a representative number of beaches sampled once a week during the survey period. The ENSP also conducted surface egg sampling in 2013 in accordance with sampling methodology developed for a Delaware Bay-wide horseshoe crab sampling program designed to assess the availability of horseshoe crab eggs to migratory shorebirds.

COMPONENT B6: Continue existing state shorebird monitoring programs.

The Division's Endangered and Non-game Species Program participates in the USFWS Shorebird Technical Committee and conducts the required shorebird monitoring programs.

Attachment 1

(UPDATED THROUGH P.L. 2009, ch. 3)

TITLE 23 FISH AND GAME, WILD BIRDS AND ANIMALS

23:2B-19 Taking, processing of fish on certain vessels in marine waters prohibited.

23:2B-20 Findings, declarations, determinations relative to horseshoe crab and shorebird conservation.

1. The Legislature finds and declares that each spring more than a million shorebirds of six species, including the red knot, ruddy turnstone, sanderling, semipalmated sandpiper, short-billed dowitcher, and dunlin, stop at Delaware Bay beaches and feed upon horseshoe crab eggs; that the red knot was once considered one of New Jersey's most abundant shorebirds; that this critical food source of horseshoe crab eggs consumed during the stopover of the red knot in New Jersey and Delaware is needed for the birds to gain sufficient weight to continue their migration north to breeding grounds in the Canadian Arctic, survive until food becomes available, and successfully reproduce ; that surveys have shown that red knots migrating through the bay region have declined by more than 75 percent since 2000; and that state and international biologists fear that the red knot will become extinct as soon as 2010.

The Legislature further finds and declares that the numbers of shorebirds other than the red knots that feed on horseshoe crab eggs on the Delaware Bay have declined by a highly significant 64 percent during the period of 1998 through 2007.

The Legislature further finds and declares that shorebird populations have continued to decline, despite the fact that over the past two decades more than \$3 million in public funds have been spent on the protection and restoration of shorebird populations and their habitats on New Jersey's Delaware Bay shore.

The Legislature therefore determines that a moratorium on the harvest, landing and possession of horseshoe crabs is critical to ensure that more horseshoe crab eggs will be available as a food source, thus increasing the likelihood of survival of these shorebirds.

L.2008, c.1, s.1.

23:2B-21 Moratorium on taking of horseshoe crabs, exceptions; shorebird management plan.

2. a. Except as provided pursuant to subsection b. or c. of this section, there shall be a moratorium on the taking in the State of horseshoe crabs or the eggs of horseshoe crabs, on the landing in the State of such crabs or the eggs of horseshoe crabs taken from outside of the State, and on the possession of horseshoe crabs or the eggs of horseshoe crabs regardless of their origin, until such time as: (1) the recovery targets for the population of the red knot shorebird, identified pursuant to the United States Fish and Wildlife Service

2007 status assessment, entitled "Status of the Red Knot (*Calidris canutus rufa*) in the Western Hemisphere," are met ; and (2) a shorebird management plan, which, based upon scientific study and evidence, demonstrates to the satisfaction of the Department of Environmental Protection that a more than adequate food supply from horseshoe crab eggs for shorebirds and population viability for both shorebirds and horseshoe crabs exist. The plan shall be subject to public comment and to review and approval by a peer-review panel which shall include qualified shorebird and horseshoe crab ecologists, and the Endangered and Nongame Species Advisory Committee created pursuant to subsection e. of section 7 of P.L.1973, c.309 (C.23:2A-7). The plan must indicate that the shorebirds species including the red knot rufa subspecies have fully recovered, pursuant to the United States Fish and Wildlife Service recovery targets, before the reestablishment of a limited harvest season may be considered.

b. Notwithstanding the provisions of this section to the contrary, the Department of Environmental Protection may issue a permit for:

(1) the taking, landing and possession of horseshoe crabs or the eggs of horseshoe crabs for scientific or educational purposes only, provided that the department determines that the collection of the horseshoe crabs or the eggs of horseshoe crabs for these purposes will not cause harm to the red knot, other shorebirds, or horseshoe crab populations; or

(2) the collection of blood from horseshoe crabs for biomedical purposes, provided that the horseshoe crabs are released otherwise unharmed to the same waters from which they were collected.

c. The moratorium established in subsection a. of this section shall not apply to the possession and use of horseshoe crabs harvested outside of the State, provided that the person found in possession of, or using, the horseshoe crabs has documentation which shows that the horseshoe crabs were not harvested in New Jersey. The documentation shall include a receipt or bill of lading that provides:

(1) the name, address, and phone number of the person or company that provided the horseshoe crabs;

(2) the permit or license number of the person or company named pursuant to paragraph (1) of this subsection; and

(3) the state and, if possible, the location, where the horseshoe crabs were harvested.

d. Any person possessing or using horseshoe crabs in violation of this section shall be liable to a penalty of \$10,000 for the first offense, and \$25,000 for the second and subsequent offenses, in addition to any applicable penalties prescribed pursuant to subsections b. through d. of section 73 of P.L.1979, c.199 (C.23:2B-14).

L.2008, c.1, s.2.

23:3-1 License for hunting, fishing or trapping; penalty; exemptions.

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Delaware's 2013 ASMFC Horseshoe Crab Compliance Report

I. Introduction

The State of Delaware met the requirements of the Horseshoe Crab Fishery Management Plan for 2013. This includes implementation and enforcement of Addendum VII, monitoring activities, and a review of the commercial fishery. The State of Delaware made several regulatory changes pertaining to horseshoe crabs in 2013:

- The possession and use of Asian horseshoe crabs as bait was prohibited.
- Measures were adopted to establish Delaware's annual quota according to Addendum VII.
- A mechanism to preemptively close the fishery prior to reaching quota was established.

Delaware fishermen harvested a combined 163,582 male horseshoe crabs via dredge and beach collection in 2013, slightly exceeding the 161,881 male horseshoe crab quota.

II. Request for *de minimus*

Not applicable

III. Previous calendar year's fishery

- a) Reported monthly harvest of horseshoe crabs for bait; numbers landed by sex and harvest method.**

Delaware's 2013 quota was 161,881 male horseshoe crabs. Delaware's reported 2013 landings were 163,582 male horseshoe crabs. Delaware's allocation under the recently accepted Addendum VII is 162,136 male horseshoe crabs. Accounting for Delaware's 2013 overage of 1,701 horseshoe crabs, the 2014 quota will be 160,435 male horseshoe crabs under the existing allocation of Addendum VII to the Horseshoe Crab Management Plan.

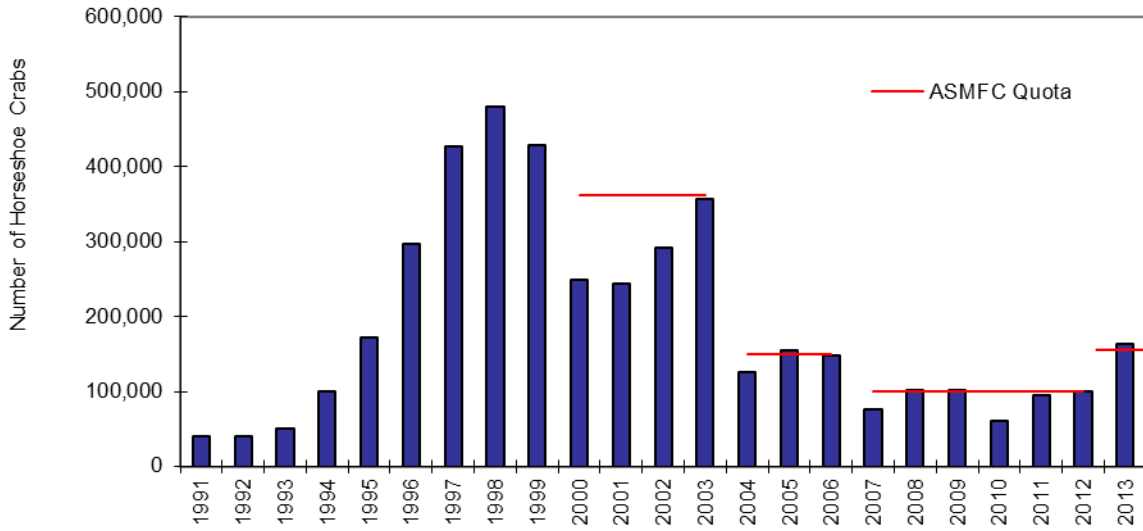


Figure a-1. Delaware's reported commercial horseshoe crab landings and ASMFC quota.

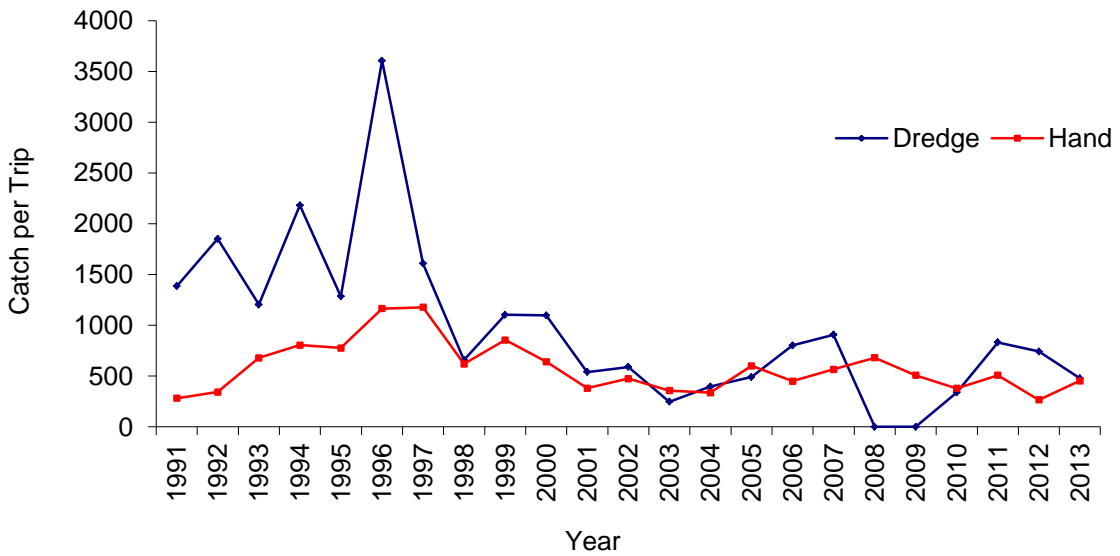


Figure a-2. Delaware's commercial horseshoe crab catch rates.

Table a-2. Delaware's horseshoe crab commercial catch rates for the hand and dredge fisheries.

Year	Hand Harvest	Hand Trips	CPUE	Dredge Harvest	Dredge Trips	CPUE
1991	17,457	62	281.6	22,158	16	1384.9
1992	24,355	71	343.0	16,665	9	1851.7
1993	29,867	44	678.8	20,466	17	1203.9
1994	74,899	93	805.4	26,173	12	2181.1
1995	133,586	172	776.7	38,515	30	1283.8
1996	245,889	211	1165.4	50,470	14	3605.0
1997	374,379	318	1177.3	53,052	33	1607.6
1998	389,566	629	619.3	90,068	137	657.4
1999	336,232	393	855.6	92,748	84	1104.1
2000	192,993	301	641.2	55,945	51	1097.0
2001	160,028	420	381.0	84,785	157	540.0
2002	191,343	403	474.8	101,387	172	589.5
2003	302,101	845	357.5	54,279	220	246.7
2004	66,210	197	336.1	60,244	152	396.3
2005	96,832	161	601.4	57,437	117	490.9
2006	72,477	160	450.5	75,336	94	801.4
2007	59,429	124	566.0	17,234	19	907.1
2008	102,113	150	680.8	0	0	0.0
2009	102,659	202	508.2	0	0	0.0
2010	55,329	146	379.0	6,422	19	338.0
2011	78,204	154	507.8	17,459	21	831.4
2012	45,274	170	266.3	54,981	74	743.0
2013	104,657	231	453.1	58,925	123	479.1

Table a-3. Summary of horseshoe crab prosomal widths collected from Delaware's commercial fishery in ~~2012~~2013.

	Hand Fishery				Dredge Fishery		
	Prosomal Width (mm)				Prosomal Width (mm)		
	Female	Male	Undtrmnd	Female	Male	Undtrmnd	
Mean	*	203	*	*	198	*	
St.Dev.	*	15	*	*	15	*	
Median	*	200	*	*	195	*	
N	*	1819	*	*	163	*	
Mode	*	200	*	*	200	*	

Table a-4. Annual summary of horseshoe crab prosomal widths collected from Delaware's commercial fishery for the years 1999 through 2013.

Year	Hand Fishery						Year	Dredge Fishery					
	Prosomal Width (mm)			Number Sampled				Prosomal Width (mm)			Number Sampled		
	Male	Female	Undtrmnd	Male	Female	Undtrmnd		Male	Female	Undtrmnd	Male	Female	Undtrmnd
1999	227	265	*	3	155	*	1999	*	*	*	*	*	*
2000	227	260	*	5	287	*	2000	*	*	*	*	*	*
2001	208	267	*	206	262	*	2001	*	*	*	*	*	*
2002	206	266	*	137	70	*	2002	*	265	*	*	50	*
2003	206	269	*	71	89	*	2003	*	*	*	*	*	*
2004	207	266	*	13	17	*	2004	*	*	*	*	*	*
2005	208	262	*	91	110	*	2005	*	*	*	*	*	*
2006	207	264	*	2443	473	*	2006	*	*	*	*	*	*
2007	207	231	226	1122	2	*	2007	*	*	*	*	*	*
2008	207	*	*	486	*	*	2008	*	*	*	*	*	*
2009	205	*	*	1127	*	*	2009	*	*	*	*	*	*
2010	206	*	*	317	*	*	2010	*	*	*	*	*	*
2011	203	*	*	391	*	*	2011	159	*	*	100	*	*
2012	204	*	*	326	*	*	2012	198	*	*	106	*	*
2013	203	*	*	1819	*	*	2013	198	*	*	163	*	*

b.) Reported harvest for scientific and research use.

Table b-1. Delaware's scientific horseshoe crab collecting permits issued in 2013.

Record	Description	Permit No.
1	Authorized to take 20 adult female horseshoe crabs – USFWS/MFRO	2013-003F
2	Authorized to collect 200 -300 horseshoe crab eggs - DE AREC	2013-005F
3	Authorized to collect up to 5 horseshoe crabs for display/education - Univ. DE - Lewes, DE	2013-011F
4	Authorized to collect up to 12 horseshoe crabs for display/education - Univ. DE - Lewes, DE	2013-013F
5	Authorized to collect up to 12 horseshoe crabs for display/education - Univ. DE - Lewes, DE	2013-014F
6	Authorized to sample horseshoe crabs - none retained - Univ. of Rochester, NY	2013-020F
7	Authorized to collect up to 240 female horseshoe crabs for research from the near shore waters of the Atlantic Ocean - DSU - Dover, DE	2013-023F
8	Authorized to collect up to 10 clutches of horseshoe crab eggs - Univ. DE - Lewes, DE	2013-030F

c.) Biomedical harvest

Not Applicable

d.) Shorebird monitoring data

See Appendix 1

e.) Fishery-independent sampling

Table e-1. Horseshoe crab index from Delaware's 30-foot trawl survey for the months April through July.

year	n	cpue	catch	uplim	lowlim	geomn
1990	34	21.88	744	12.54	3.46	6.77
1991	36	20.14	725	9.97	2.97	5.60
1992	36	8.92	321	6.22	2.09	3.72
1993	35	6.20	217	4.99	1.81	3.10
1994	36	4.22	152	2.11	0.46	1.13
1995	36	2.39	86	1.83	0.55	1.10
1996	35	9.43	330	6.04	2.00	3.59
1997	35	3.83	134	2.88	1.01	1.79
1998	26	1.77	46	1.59	0.29	0.83
1999	33	2.55	84	1.78	0.45	1.01
2000	36	3.08	111	2.13	0.59	1.23
2001	36	2.97	107	2.46	0.85	1.53
2002	36	0.33	12	0.34	-0.01	0.15
2003	18	4.06	73	3.20	0.35	1.38
2004	36	0.08	3	0.13	-0.01	0.06
2005	36	0.28	10	0.35	0.08	0.20
2006	36	3.17	114	2.33	0.69	1.37
2007	36	4.83	174	3.05	0.82	1.72
2008	36	1.36	49	1.27	0.38	0.77
2009	36	1.64	59	1.61	0.63	1.06
2010	36	1.36	49	1.24	0.37	0.75
2011	36	2.17	78	1.81	0.64	1.15
2012	36	0.94	34	0.95	0.30	0.59
2013	36	0.58	21	0.58	0.11	0.32

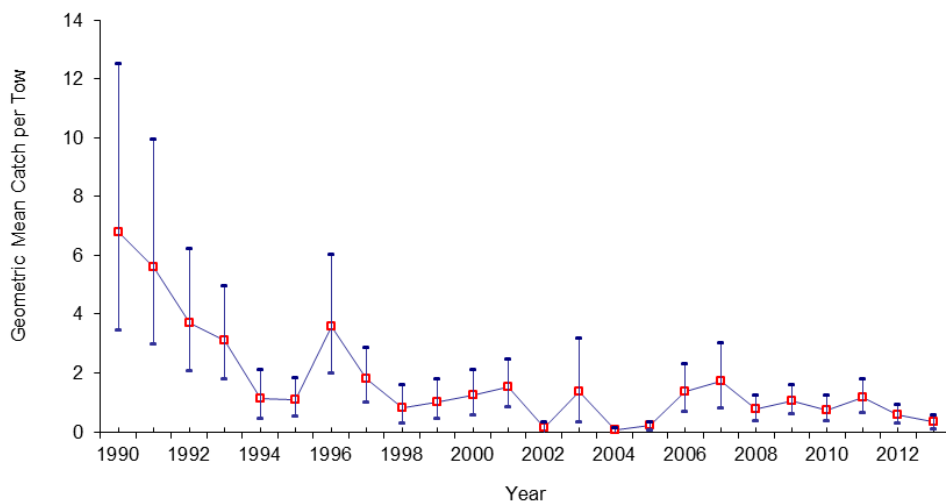


Figure e-1. Index of horseshoe crab relative abundance from Delaware's 30-foot trawl survey for the months April through July.

Table e-2. Horseshoe crab index from Delaware's 30-foot trawl survey for the all months sampled.

year	n	cpue	catch	uplim	lowlim	geomn
1990	61	17.20	1049	8.26	3.28	5.29
1991	72	14.68	1057	6.81	3.11	4.66
1992	89	4.64	413	2.36	1.11	1.67
1993	83	5.48	455	2.96	1.41	2.09
1994	71	2.72	193	1.29	0.47	0.84
1995	88	2.99	263	1.88	0.91	1.34
1996	76	6.97	530	3.45	1.56	2.38
1997	89	3.55	316	2.03	1.01	1.47
1998	80	1.61	129	1.18	0.54	0.83
1999	87	4.13	359	2.50	1.23	1.80
2000	90	2.56	230	1.33	0.59	0.92
2001	90	1.60	144	1.03	0.46	0.72
2002	68	0.71	48	0.54	0.16	0.33
2003	63	2.10	132	1.29	0.47	0.83
2004	90	0.10	9	0.11	0.01	0.06
2005	90	0.30	27	0.27	0.09	0.17
2006	90	7.82	704	2.65	1.16	1.81
2007	90	2.89	260	1.64	0.76	1.15
2008	90	0.82	74	0.64	0.27	0.44
2009	90	1.47	132	0.97	0.45	0.69
2010	90	1.00	90	0.70	0.28	0.47
2011	90	1.51	136	1.09	0.54	0.79
2012	90	1.07	96	0.73	0.31	0.51
2013	90	1.67	150	0.94	0.39	0.64

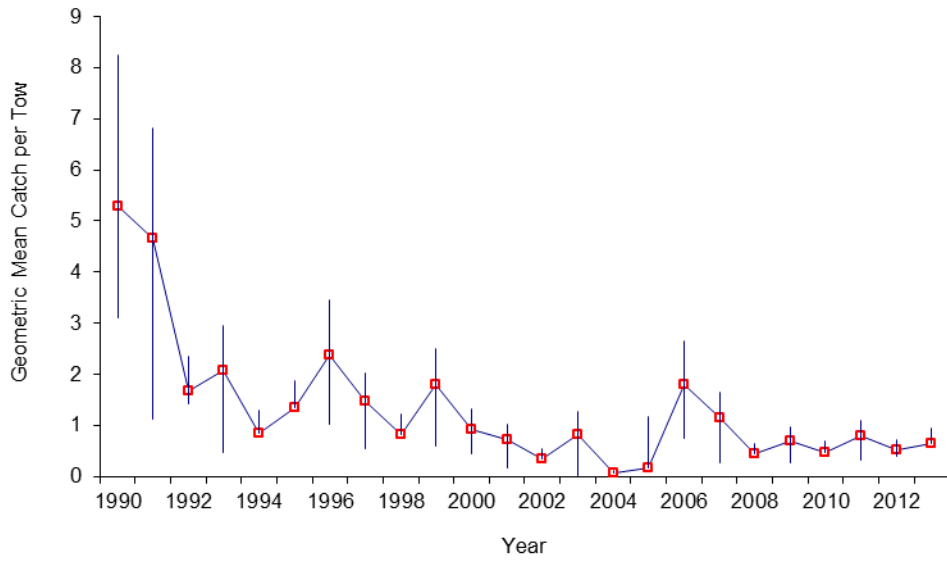


Figure e-2. Index of horseshoe crab relative abundance from Delaware's 30-foot trawl survey for all months sampled.

Table e-3. Index of adult (>160mm) relative abundance from 16-foot trawl sampling in the Delaware Bay.

Year	n	catch	cpue	gmup95	gmlow95	geomn
1992	237	226	0.95	0.47	0.25	0.35
1993	236	163	0.69	0.38	0.19	0.29
1994	238	16	0.07	0.06	0.00	0.03
1995	238	181	0.76	0.41	0.21	0.31
1996	238	61	0.26	0.19	0.09	0.14
1997	238	276	1.16	0.47	0.24	0.35
1998	238	57	0.24	0.17	0.07	0.12
1999	238	99	0.42	0.24	0.11	0.17
2000	231	53	0.23	0.17	0.07	0.12
2001	238	215	0.90	0.36	0.16	0.26
2002	238	58	0.24	0.18	0.08	0.13
2003	233	36	0.16	0.14	0.06	0.10
2004	231	24	0.10	0.10	0.03	0.06
2005	231	49	0.21	0.17	0.08	0.13
2006	231	21	0.09	0.09	0.03	0.06
2007	231	30	0.13	0.11	0.04	0.08
2008	231	32	0.14	0.13	0.05	0.09
2009	231	29	0.13	0.11	0.04	0.08
2010	231	21	0.09	0.09	0.03	0.06
2011	231	11	0.05	0.05	0.01	0.03
2012	231	13	0.06	0.06	0.01	0.03
2013	231	26	0.11	0.11	0.04	0.07

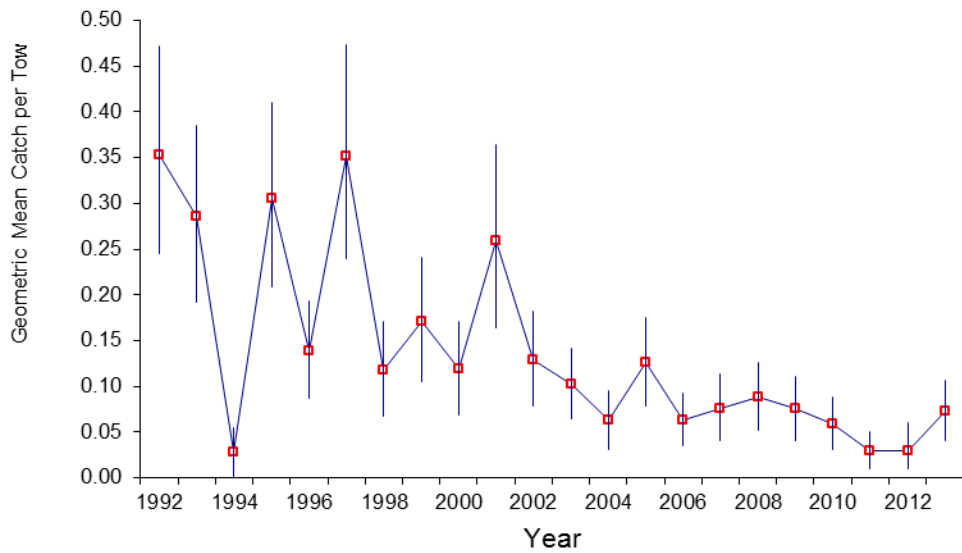


Figure e-3. Index of adult (>160mm) relative abundance from 16-foot trawl sampling in the Delaware Bay.

Table e-4. Juvenile (<160mm) index for horseshoe crabs from Delaware's 16-foot trawl survey.

Year	n	catch	cpue	gmup95	gmlow95	geomn
1992	237	173	0.73	0.25	0.09	0.17
1993	236	2928	12.41	0.84	0.34	0.57
1994	238	937	3.94	0.70	0.32	0.50
1995	238	782	3.29	0.92	0.48	0.69
1996	239	461	1.93	0.60	0.31	0.45
1997	238	597	2.51	0.77	0.39	0.57
1998	238	162	0.68	0.34	0.16	0.24
1999	238	298	1.25	0.47	0.22	0.34
2000	231	35	0.15	0.13	0.05	0.09
2001	238	133	0.56	0.30	0.13	0.21
2002	238	30	0.13	0.11	0.03	0.07
2003	233	182	0.78	0.30	0.12	0.21
2004	231	1598	6.92	1.00	0.49	0.73
2005	231	1523	6.59	1.59	0.88	1.21
2006	231	828	3.59	0.90	0.48	0.67
2007	231	402	1.74	0.90	0.53	0.70
2008	231	433	1.88	0.81	0.46	0.63
2009	231	287	1.24	0.69	0.39	0.53
2010	231	1,213	5.25	1.30	0.73	1.00
2011	231	256	1.11	0.52	0.27	0.39
2012	231	77	0.33	0.26	0.13	0.19
2013	231	153	0.66	0.42	0.22	0.32

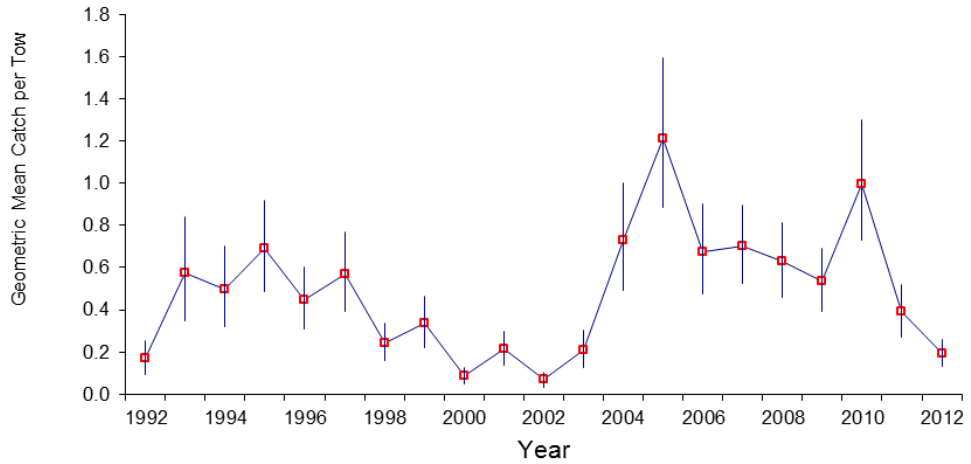


Figure e-4. Juvenile (<160mm) index for horseshoe crabs from Delaware's 16-foot trawl survey.

IV. Planned management programs for the current calendar year

The State of Delaware made three changes to regulations governing horseshoe crab harvest in 2013. On April 11, Delaware amended 7, DE Admin Code 3214 to comply with the ASMFC Horseshoe Crab FMP. Additionally, Delaware horseshoe crab fishery managers will be able to utilize the most recent landings data to predictively close the fishery upon reaching 95% of the predetermined annual quota. This will minimize the risk of harvest overages. On October 11, Delaware amended Title 7, DE Admin Code. These changes will define the term “Asian Horseshoe Crab” and will prevent the lawful possession and use of these animals in State waters. Delaware’s regulations governing horseshoe crabs can be found in Appendix 2.

Delaware will continue with all horseshoe crab monitoring programs in 2014. These include fishery independent benthic sampling data acquisition (trawl survey), commercial fishery harvest monitoring, and shorebird monitoring. Despite reduced funding and hiring constraints, Delaware anticipates conducting horseshoe crab egg sampling in 2014,

V. Law Enforcement Reporting Requirements

No law enforcement actions were performed pertaining to horseshoe crab in 2013.

Appendix 1. Shorebird Monitoring Data

2013 Delaware Horseshoe Crab (*Limulus polyphemus*) Egg Survey Project Final Report

Submitted by Kevin S. Kalasz
Delaware Species Conservation and Research Program
Division of Fish and Wildlife

15 March 2014

Introduction

Delaware Bay is one of the most important stopover sites in North America for long distance migratory shorebirds. Species like the red knot (*Calidris canutus rufa*) migrate from wintering grounds as far away as the southern tip of South America to breeding grounds in the Arctic, covering a distance of more than 10,000 mi (12,000 km). Their arrival in the Bay in late April and early May coincides with the spawning period of horseshoe crabs (*Limulus polyphemus*). Horseshoe crab eggs produced during this time are ideal prey for migrating shorebirds. The eggs are high in energy and are easily assimilated allowing shorebirds to rapidly gain weight¹. Weight gained in Delaware Bay provides the energy needed for the last leg of their migration to the Arctic. Shorebirds are time-restricted during their spring migration and need to gain weight rapidly to make it to breeding grounds in enough time to initiate nesting and fledge young during the short Arctic summer. The successful migration and nesting of shorebirds is highly dependent on the number and distribution of horseshoe crab eggs available on Delaware Bay.

Several factors contribute to the number and distribution of eggs available to shorebirds. Horseshoe crabs lay their eggs at the high tide line to a depth of up to 20 cm². However, only eggs within the first five cm of the surface are accessible to most shorebird species. Wave action and beach characteristics bring eggs to the surface making them more accessible to birds³. A process referred to as “bioturbation” also brings eggs closer to the surface⁴. Bioturbation occurs when previously laid eggs are disturbed and brought to the surface by other spawning female crabs; this process is particularly effective when the density of spawning crabs is high. In addition, ruddy turnstones (*Arenaria interpres*) dig into the sand expose eggs that are otherwise buried too deep for other shorebirds.

Monitoring the availability of horseshoe crab eggs throughout the Bay is critical for targeting conservation measures for shorebirds (e.g., regulations affecting horseshoe crab harvest, beach nourishment)⁵. The complexity of the system that affects egg availability limits

¹ Tsipoura, N. and J. Burger. 1999. Shorebird diet during spring migration stopover on Delaware Bay. *Condor* 101:635-644.

² Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1992. Overwintering by trilobite larvae of the horseshoe crab, *limulus polyphemus*, on a sandy beach of Delaware Bay (New Jersey, USA). *Mar. Ecol. Prog. Ser.* 88:289-292.

³ Jackson, N.L., K.F. Nordstrom, and D.R. Smith. 2002. Geomorphic-biotic interactions on beach foreshores in estuaries. *J. Coast. Res.* 36:414-424.

⁴ Kraeuter, J.N. and S.R. Fegley. 1994. Vertical disturbance of sediments by horseshoe crabs (*Limulus polyphemus*) during their spawning season. *Estuaries* 17:288-294.

⁵ Andres, B.A. 2003. Delaware Bay Shorebird-Horseshoe Crab Assessment Report: Biological Assessment. Shorebird Technical Committee. 85pp.

the applicability of indirect measures of horseshoe crab egg abundance (e.g., horseshoe crab population indices derived from horseshoe crab trawl surveys and/or spawning surveys)⁶. Only a study specifically designed to measure horseshoe crab egg abundance directly will be useful for long-term monitoring efforts that guide conservation and management decisions.

The goals of this study are: 1) to provide an index of horseshoe crab egg abundance, which can be used to determine if sufficient eggs are available to support the energetic requirements of shorebirds during migration and Arctic breeding; and 2) to monitor shifts in egg distribution and trends in egg density in relation to shorebird habitat use among years. The objective is to quantify horseshoe crab eggs potentially available to shorebirds (i.e., in top 5 cm) on Delaware Bay beaches during the spring migratory period for shorebirds. It is anticipated that the results of this work will be used by the State of Delaware (in coordination with the State of New Jersey) and the Atlantic States Marine Fisheries Commission to make sound management decisions regarding horseshoe crab harvest relative to migratory shorebird needs.

Methods

Beach Selection

Seventeen beaches in Delaware were identified as potential horseshoe crab spawning sites (Table 1). Beaches were stratified based on known shorebird use. Seven of the beaches that have had consistently high shorebird use and are centered within the current distribution of the horseshoe crab spawning area will be *permanently* sampled each year. Six of the remaining nine beaches are categorized to have *minimal shorebird use* and the remaining three as *unlikely shorebird use*. The *minimal use* beaches were assigned probabilities of being randomly selected based on shorebird survey data and three will be chosen at random each year. Those selected for 2013 are indicated in bold (Table 1). The *unlikely shorebird use* beaches will be added to the random sample every third year to accommodate changes in horseshoe crab spawning and shorebird foraging distribution over the long term. A total of ten beaches are sampled each year. In 2007, a second beach in Mispillion Harbor, Osprey Beach, was sampled to provide perspective to the original Mispillion Harbor site. In 2008, the Cedar Creek site was moved south to the north end of Slaughter Beach due to the large accumulation of peat that is not representative of beaches in Delaware.

Segment Selection

Each beach will have at least one segment selected for permanent sampling. Additional segments may be selected in unique habitat types to assess potential variations in horseshoe crab spawning and shorebird foraging. Additional segments were added to South Bowers beach to assess egg abundance at protected coves where birds tend to congregate and at Mispillion Harbor to determine if another frequently used beach within the Harbor has egg densities similar to the first site (Table 1). Sample segments for each beach were randomly located from the beach access points and serve as the permanent sampling locations. The coordinates of each segment was recorded using a GPS receiver. Pictures of the segments in relation to permanent landmarks were also taken to help guide sampling in future years.

⁶ Smith., D.R., P.S. Pooler, R.E. Loveland, M.L. Botton, S.F. Michels, R.G. Weber, and D.B. Carter. 2002. Horseshoe crab (*Limulus polyphemus*) reproductive activity on Delaware Bay beaches: Interactions with beach characteristics. *J. Coast. Res.* 18:730-740.

Sample Timing

Sampling occurred from 24 April and continued through 7 June. Sampling was timed to begin prior to the arrival of the majority of shorebirds and extended until the peak spawning activity for horseshoe crabs had likely passed. In addition, early warm weather prompted horseshoe crabs to spawn earlier therefore beaches were sampled a week earlier than previous years detect the early spawning. Each selected beach was sampled once per week and sampling was conducted within two hours of low tide.

Sediment Sampling

Sample segments were 10 m in length along the beach. Each beach segment was stratified across the beach by elevation / habitat zones (Fig. 1a). The number of strata depended on the width of the beach and habitat complexity. Strata were three m wide and extended from the maximum high tide line to the toe of the beach or approximately 80% of the beach width. If the beach segment included complex habitat types, such as tidal deltas or intertidal sand bars, then strata included all accessible habitat types. For example, if there were intertidal sand bars where spawning was taking place and these sand bars were accessible to surveyors, then strata were added to include the sand bars.

Sediment was collected by taking 20 five-cm core samples systematically throughout each stratum. Core samples were placed at regular intervals within strata (e.g., Figure 1b). Collecting samples systematically ensures sufficient spatial coverage, meets statistical analysis requirements, and allows for rapid field implementation. Sediments from all cores taken within a stratum were pooled and combined into a bucket and processed together.

Sediment Processing and Egg Enumeration

All samples from this study were processed at the St. Jones Center, of the Delaware National Estuarine Research Reserve, during April, May and June, 2013.

Pooled core samples from transects were concentrated by flushing them through a series of screens with running water to separate eggs and embryos from most of the beach sediment material. Mesh size of the first screen was 6.4 mm (1/4"); of the second, 3.2 mm (1/8"). Eggs, etc., were captured on a third screen with a mesh size of 1.4 mm (0.0550"), which retained all eggs, etc., encountered, plus beach sediment particles and organic materials in the same size range. Eggs, etc., were separated from the remaining sediment, and most other materials retained on the third screen, by elutriation with running tap water. All water leaving the elutriation system passed through a sieve having a 1.3 mm mesh, and everything retained in the sieve was examined. Any eggs, or embryos present in the outflow sieve were counted and recorded. Following separation to this stage, eggs, embryos and residual peat were covered with habitat water and frozen until they were separated and quantified. All residual sediment from each pooled sample was examined for possible eggs adhering to sand particles, then discarded. Any eggs or embryos found during this examination were recorded.

For samples with small quantities of eggs and embryos, I made direct counts. When numbers were too great for direct counting to be efficient, I measured the extracted eggs and embryos volumetrically, using standard graduated cylinders. Before this was done, all peat particles were removed from egg and embryo samples by hand. Volumes were measured by pouring the eggs, in tap water, through a funnel into a graduated cylinder (50, 100, 250 and 500 ml, as appropriate to sample size). The cylinder was then stoppered, inverted several times to

distribute the eggs or embryos evenly in the water column, then set upright and allowed to settle. After settling, excess water was decanted to minimize any buoyancy effect, the cylinder was bumped against the towel-covered benchtop 15 times to further consolidate the eggs or embryos, then volume was read and recorded.

By counting measured volumes of eggs and embryos taken from pooled material, after making volumetric measurements of the samples, I found there was an average of 186 eggs per ml (n=190 subsamples), and 80 embryos per ml (n=54 subsamples). Eggs and embryos used for several of these subsample counts were taken from pooled eggs extracted from several samples, examined on the same date. Subsamples were not taken from single samples, unless the sample was larger than ca. 100 ml. In all cases subsamples were taken from individual samples at the rate of about one 2.5ml subsample per 50 ml of eggs. I used the values of 186 eggs/ml, and 80 embryos/ml, to convert egg and embryo volumes to the final numbers used in the spreadsheet. Note that Shuster and Botton found an average of 176 eggs per ml in 9 subsamples they took from a *single* cluster, collected in New Jersey⁷. The values from which they obtained this average ranged from 144 to 209 eggs-per-ml, and those eggs had not been frozen, but had been preserved in 10% buffered formalin.

Analysis

Egg density (number of eggs/m²) was calculated for each sample stratum. Average egg density was then calculated for each beach and summarized by year. Horseshoe crab egg density, particularly in the top five cm of sand, is highly variable both within and between beaches⁸. Horseshoe crab spawning is concentrated along the mid-section of beach⁷. The region of spawning can vary across the width of the beach depending on variations in the height of high tide, which is affected predictably by lunar phase and unpredictably by wind. In addition, eggs tend to be patchily distributed along the beach length⁹. A reasonable approach to decrease variances would be to examine just the middle three strata where spawning is concentrated. However, this might provide an inflated average density. Therefore, all strata sampled were included in the analyses. The resulting average densities have high variances but best represent the availability of horseshoe crab eggs to shorebirds.

Results and Discussion

The average density of horseshoe crab eggs for the 2013 migratory season was 161,017 eggs/m² (Fig. 2). This represents a substantial increase in the average density of eggs compared to 2012 and is similar to the previous high count in 2010. The 2010 season had markedly optimal conditions for crab spawning though additional analyses will be conducted to confirm

⁷ Shuster, C. N., Jr. and Botton, M. L. (1985). A contribution to the population biology of horseshoe crabs, *Limulus polyphemus* (L.) in Delaware Bay. *Estuaries* 8:363–372.

⁸ Pooler, P.S., D.R. Smith, R.E. Loveland, M.L. Botton, and S.F. Michels. 2003. Assessment of sampling methods to estimate horseshoe crab (*Limulus polyphemus* L.) egg density in Delaware Bay. *Fish. Bull.* 101:690-703.

⁹ Andres, B.A. 2003. Delaware Bay Shorebird-Horseshoe Crab Assessment Report: Biological Assessment. Shorebird Technical Committee. 85pp.

this particularly looking at climatological factors such as wind speed, duration, and direction as well as depletion effects from shorebird foraging. 2013 climatological conditions seemed to be ideal as well. There may be significant interaction of bird foraging and egg density particularly in some locations.

The main part of the shorebird migration when most birds have arrived in Delaware Bay is the key yearly time period to evaluate for HSC egg densities as this has the most impact on the conditions in the bay for shorebirds. This time period roughly corresponds to weeks two through four of the survey period. Evaluating egg densities though this period reveals an increasing trend in the number of eggs available to shorebirds in DE since 2005. Clearly, much of this trend is based on weather conditions. Also, egg densities in NJ are influential as to whether shorebirds are able to gain weight which is the primary factor in evaluating the condition birds face while in Delaware Bay.

This work should be continued but improved based on recommendations from the Atlantic States Marine Fisheries Commission's Delaware Bay Ecosystem Technical Committee to better understand the dynamics associated with surface egg densities as well as observed differences in egg densities between States. Preliminary plans are being developed to more accurately correlate overall egg abundances with spawning activity by continuing to sample surface eggs but also conduct sub-sampling of eggs in the 5-10 cm horizon that are less susceptible to being washed away by wave action. It is also recommended that if this survey is improved, a threshold density needed to support shorebird migration across the bay should be established and should be proportional to the number of birds in any given year. This will allow for more accurate determination of whether shorebirds have enough food available to them and will lend corroboration to evaluations of weight gain in shorebirds.

Table 1. Delaware beaches sampled during study period 2005-2011.

Selection Category	DE beaches (abbreviation)	Number of Segments
<u>Permanent</u>	Port Mahon (PORT)	1
	Pickering Beach (PICK)	1
	St. Jones Mouth (STJO)	1
	North Bowers (NBOW)	1
	South Bowers (SBOW)	2
	Misphillion Harbor (MISP)	2
	Slaughter Beach (SSLA)	1
<u>Minimal shorebird use</u> Randomly selected each year and weighted base on relative shorebird use.	Kitts Hummock (KITT)	1
	Brockenbridge (BROC1)	
	Bennetts Pier (BROC2)	
	Big Stone (BIGS)	1
	North Ted Harvey (NTED)	1
	Prime Hook Beach* (PRIM)	
	Lewes (LEWE)	
<u>Unlikely shorebird use</u> Randomly selected every third year	Woodland (WOOD)	
	Fowlers Beach* (FOWL)	
	Broadkill Beach (BRKB)	

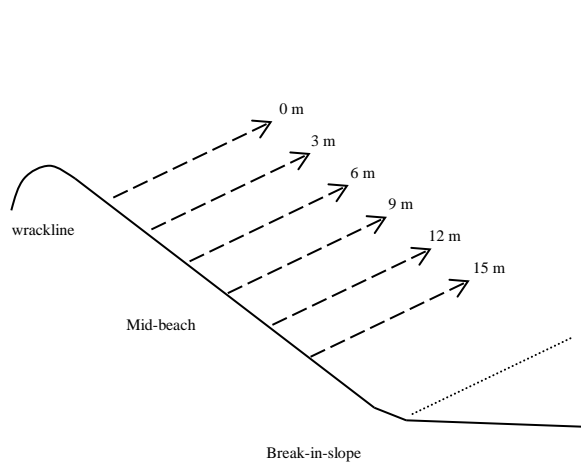


Figure 1a

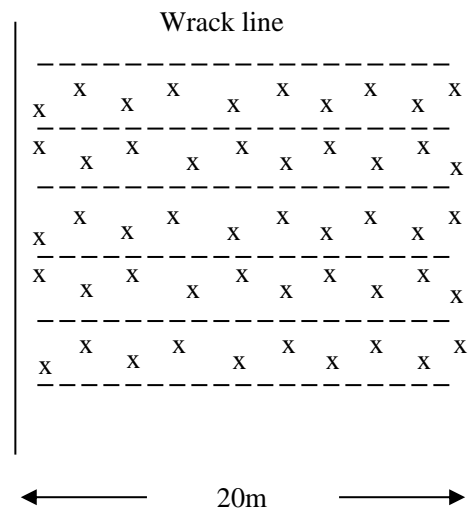
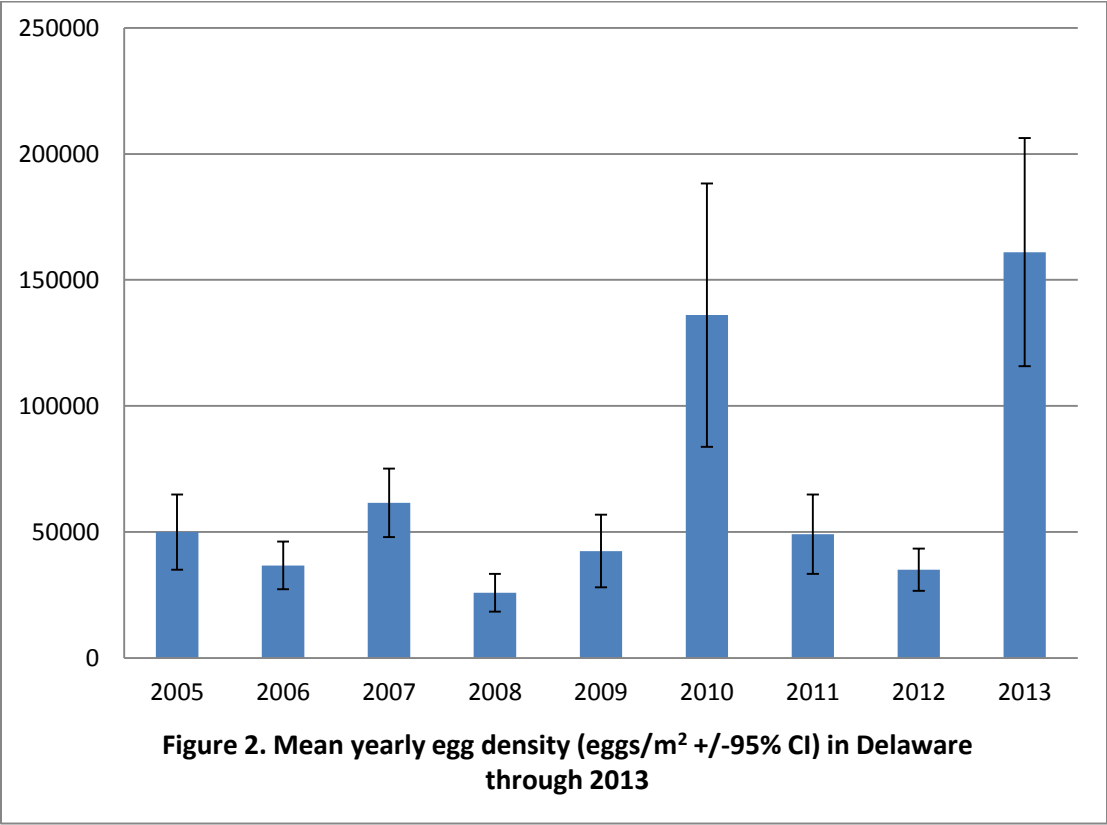
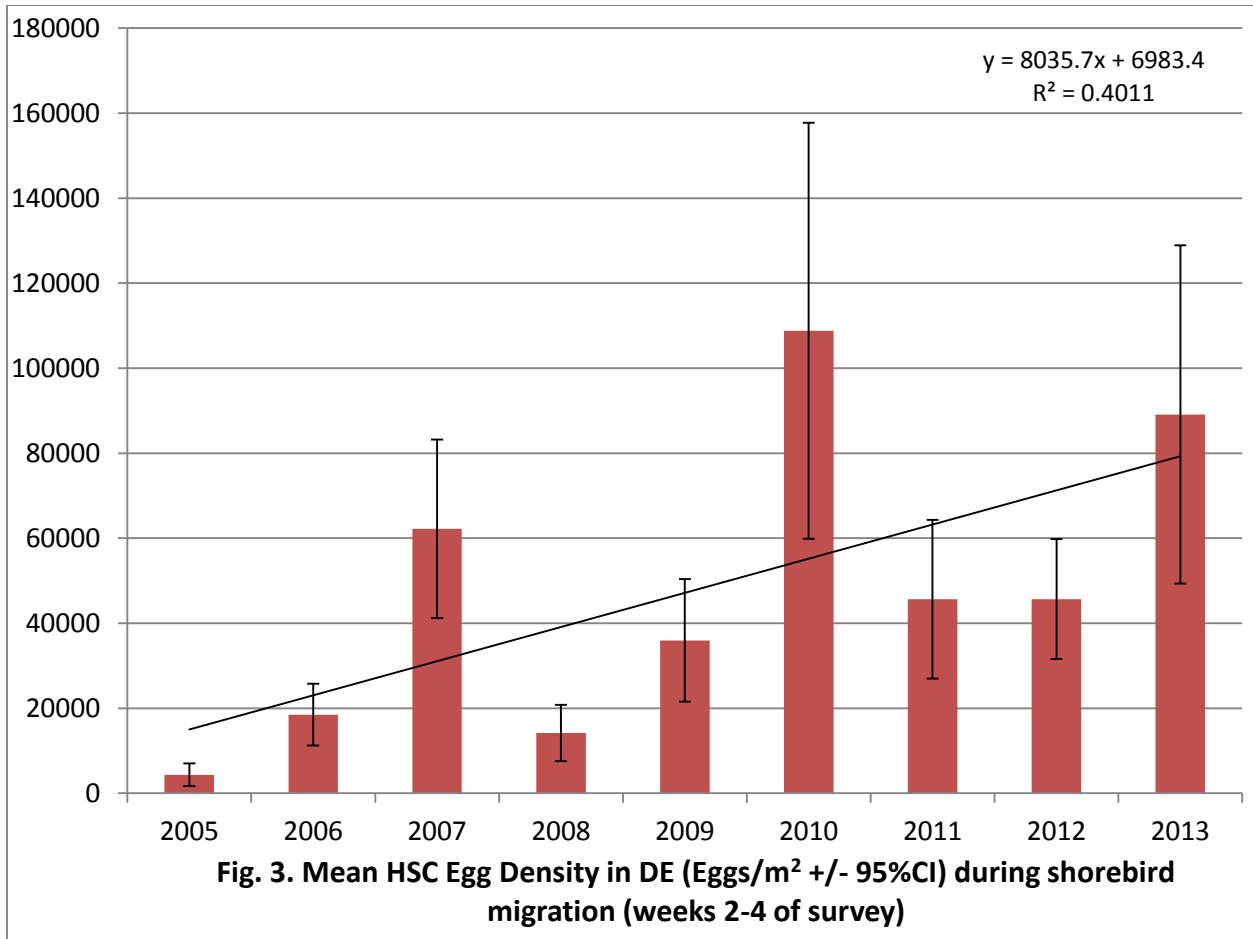


Figure 1b

Figure 1. Schematics showing the stratification of a segment of open beach habitat by elevational zones (figure 1a) and systematic distribution of cores within the strata (marked by X's) for the sediment sampling (only 10 cores per stratum shown) (D.R. Smith).





Appendix 2. Delaware Horseshoe Crab Regulations

TITLE 7 NATURAL RESOURCES & ENVIRONMENTAL CONTROL

DELAWARE ADMINISTRATIVE CODE

1

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

DIVISION OF FISH AND WILDLIFE

Division of Fish and Wildlife

3200 Horseshoe Crabs

3201 Definitions

(Penalty Section 7 Del.C. §2705(b))

1.0 The following definitions shall apply to terms in 7 Del.C. Ch. 27 relative to horseshoe crabs.

1.1 "**Asian Horseshoe Crabs**" shall mean any of the following species *Carcinoscorpius rotundicauda*, *Tachypleus gigas*, and *Tachypleus tridentatus*.

1.2 "**Bait Saving Device**" shall mean any device that when so deployed in or on a pot reduces either the rate at which bait, meaning horseshoe crabs or parts thereof, must be replenished or reduces the number or quantity of horseshoe crabs used as bait.

1.3 "**Collect**" shall mean to take live horseshoe crabs by any means other than by dredge.

1.4 "**Dispose of said Crabs Properly**" shall mean bury on the beach, incorporate into soil as fertilizer or any other method approved by the Department.

1.5 "**Dredge**" shall mean to use any device to gather, scrape, scoop, fish for or otherwise take bottom dwelling horseshoe crabs.

1.6 "**Personal, Non-Commercial Use**" shall mean to be used as food, fertilizer or bait or otherwise properly disposed without trading, bartering, or selling by one individual to another, or without transporting, shipping, or causing to be transported or shipped, out of state.

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

17 DE Reg. 441 (10/01/13)

3202 Horseshoe Crabs As Bait In Pots; Conch Pots

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person to place more than one-half of a female horseshoe crab or one male horseshoe crab as bait in any type of pot on any one day in the waters of this State.

2.0 It shall be unlawful for any person to fish with a conch pot that is not equipped with a bait saving device, provided that a horseshoe crab or parts thereof are used as bait.

7 DE Reg. 220 (8/1/03)

3203 Seasons And Area Closed To Taking Horseshoe Crabs

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person to dredge or attempt to collect by means of a dredge horseshoe crabs or parts thereof from any state or federal land owned in fee simple or the tidal waters of this state during a period beginning at 12:01 am on January 1 and continuing through midnight, June 30, next ensuing. After June 30 in any given calendar year, it shall be unlawful to dredge or attempt to collect by means of a dredge female horseshoe crabs.

2.0 It shall be lawful for persons with valid horseshoe crab collecting permits and eel licensees and their alternates to collect adult male horseshoe crabs on Monday through Friday from state owned lands to the east of state road No. 89 (Port Mahon Road) from 12:01 a.m. on June 8 and continuing through midnight on July 31.

3.0 It shall be unlawful for any person to collect or attempt to collect, any horseshoe crabs or parts thereof from any land not owned by the state or federal government during the period beginning at 12:01 a.m. on

January 1 and continuing through midnight, June 7, next ensuing. It shall be lawful, during a period beginning at 12:01 a.m. on June 8 and continuing through midnight on July 31, for persons with valid horseshoe crab collecting permits and eel licensees and their alternates to collect male horseshoe crab adults on Mondays through Fridays from such private lands.

4.0 It shall be unlawful for any person to collect or attempt to collect any horseshoe crabs from any land not owned by the State or federal government unless said person has on his or her person written permission, signed by the owner of said land with the owner's address and phone number, indicating the individual to whom permission to collect horseshoe crabs is granted.

1 DE Reg 1412 (4/1/98)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

12 DE Reg. 975 (01/01/09)

3204 Requirement For Collecting Horseshoe Crabs For Persons Under 16

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person with a valid horseshoe crab collecting permit to collect any horseshoe crabs as an alternate to a person with a valid commercial eel fishing license.

2.0 It shall be unlawful for any person under the age of sixteen (16) years to possess any horseshoe crabs unless accompanied by a person who has been issued a valid horseshoe crab scientific collecting, commercial collecting or dredge permit.

3 DE Reg 1092 (2/1/00)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3205 Number Of Persons Accompanying A Person With A Valid Horseshoe Crab Collecting Permit

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person with a valid horseshoe crab commercial collecting permit when collecting horseshoe crabs to be assisted by more than three (3) persons under the age of 16 who are not required to have valid horseshoe crab commercial collecting permits.

2.0 It shall be unlawful for any person 16 years of age or older who does not have a valid commercial horseshoe crab collecting permit, to assist any person with a valid commercial horseshoe crab collecting permit in the handling, loading or driving a vehicle used to transport horseshoe crabs collected by said horseshoe crab collecting permittee while within 300 feet of the shoreline of the water from which said horseshoe crabs are collected or the point on shore where said horseshoe crabs are landed from a vessel.

3 DE Reg 1092 (2/1/00)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3206 Possession Limit Of Horseshoe Crabs, Exceptions

(Penalty Section 7 Del.C. §2705(b))

1.0 Unless otherwise authorized, it shall be unlawful for any person to possess a horseshoe crab, except a person with a validated receipt from a person with a valid horseshoe crab commercial collecting or dredge permit for the number of horseshoe crabs in said person's possession. A receipt shall contain the name, address and signature of the supplier, the date and the number of horseshoe crabs obtained.

2.0 Any person who has been issued a valid commercial eel fishing license by the Department or said person's alternate while in the presence of the licensee, is exempt from the prohibition on the possession of horseshoe crabs, provided said commercial eel fishing licensee has submitted all required reports of his/her and his/her alternate's previous week's harvest of horseshoe crabs with the Department in accordance with Regulation 3210. Any person who has been issued a commercial eel fishing license and said person's alternate while in the presence of the licensee, may collect horseshoe crabs by hand without a horseshoe crab commercial collecting permit provided all horseshoe crabs taken are for personal, non-commercial use, as bait for the licensee's eel pots fished in this state.

3.0 It shall be unlawful for any person with a valid commercial eel fishing license to be assisted in collecting horseshoe crabs by any person who is not listed on his commercial eel fishing license as the alternate.

4.0 Any person with both a valid commercial eel fishing license and a valid commercial horseshoe crab collecting permit shall be considered as a commercial horseshoe crab collecting permittee for purposes of enforcing the provisions of 7 Del.C. Ch. 27 and/or shellfish regulations pertaining to horseshoe crabs.

5.0 It shall be unlawful for any person with a valid commercial eel fishing license to commingle any horseshoe crabs collected either by said commercial eel fishing licensee or by his or her alternate with horseshoe crabs either collected by a person with a valid horseshoe crab dredge permit or by a person with a valid commercial horseshoe crab collecting permit.

6.0 It shall be unlawful for any person with a valid horseshoe crab dredge permit or with a valid commercial horseshoe crab collecting permit to commingle any horseshoe crab dredged or collected by said horseshoe crab dredge permittee or horseshoe crab collecting permittee with horseshoe crabs collected by any person with a valid commercial eel fishing license.

7.0 It shall be unlawful for any person to possess more than 300 cubic feet of horseshoe crabs except in a stationary cold storage or freezer facility.

8.0 It shall be unlawful for any person to collect or attempt to collect more than 300 cubic feet of horseshoe crabs during any 24 hour period beginning at 12:01 AM and continuing through midnight next ensuing.

1 DE Reg. 1412 (4/1/98)

3 DE Reg. 1567 (5/1/00)

3 DE Reg. 1092 (2/1/00)

3 DE Reg. 1567 (5/1/00)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3207 Horseshoe Crab Dredging Restrictions

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person to dredge horseshoe crabs in the area in Delaware Bay designated as leased shellfish grounds except on one's own leased shellfish grounds or with permission from the owner of leased shellfish grounds. The area in Delaware Bay designated as leased shellfish grounds is within the boundaries that delineate leasable shellfish grounds and is described as follows: Starting at a point on the "East Line" in Delaware at Loran-C coordinates 27314.50/42894.25 and continuing due east to a point at Loran-C coordinates 27294.08/42895.60 and then 27270.80/42852.83 and then continuing southwest to a point at Loran-C coordinates 27281.31/42803.48 and then continuing west to a point at Loran-C coordinates 27280.75/42795.50 and then in a northerly direction on a line 1000' offshore, coterminous with the existing shoreline to the point of beginning on the "East Line."

2.0 It shall be unlawful for any person, who operates a vessel and has on board said vessel a dredge of any kind, to have on board or to land more than 1500 horseshoe crabs during any 24 hour period beginning at 12:01 a.m. and continuing through midnight next ensuing.

3.0 It shall be unlawful for any person, who operates a vessel and has on board said vessel a dredge of any kind, to have or possess on board said vessel any horseshoe crabs at any time during the period beginning 12:01 a.m. on January 1 and continuing through midnight, June 30, next ensuing.

4.0 It shall be unlawful for any person to land horseshoe crabs taken from the Exclusive Economic Zone unless said person has a valid horseshoe crab dredge permit.

1 DE Reg. 354 (10/1/97)

1 DE Reg. 1412 (4/1/98)

3 DE Reg. 1567 (5/1/00)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3208 Horseshoe Crab Dredge Permit Lottery

(Penalty Section 7 Del.C. §2705(b))

1.0 The Department of Natural Resources and Environmental Control shall hold an annual lottery to select eligible individuals for the five horseshoe crab dredge permits authorized to be issued each year if more than five applications are received by the Department. Applications for an annual commercial horseshoe crab permit shall be accepted by the Department until 4:30 PM December 31 or 4:30 PM on the Friday preceding if December 31 is a Saturday or Sunday. If an annual lottery is necessary it shall be conducted at 1:00 PM on January 1, or the first work day thereafter, in the Richardson and Robbins Building, 89 Kings Highway, Dover, Delaware.

2.0 To be eligible an applicant for a horseshoe crab dredge permit shall be the current holder of an oyster harvesting license issued by the Department.

2 DE Reg. 1055 (1/1/99)

3 DE Reg. 652 (11/1/99)

5 DE Reg. 1128 (11/1/01)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3209 Horseshoe Crab Sanctuaries

(Penalty Section 7 Del.C. §2705(b))

1.0 All state and federal lands owned in fee simple are horseshoe crab sanctuaries during the period beginning 12:01 a.m. on May 1 through midnight June 30.

2.0 Any land owner(s) may register their land with the Department to be designated as a horseshoe crab sanctuary for a period to be specified by the land owner(s).

3.0 It shall be unlawful to collect any horseshoe crabs at any time from a horseshoe crab sanctuary except as provided in Regulation 3203 section 2.0.

1 DE Reg. 354 (10/1/97)

1 DE Reg. 1412 (4/1/98)

7 DE Reg. 220 (8/1/03)

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3210 Horseshoe Crab Reporting Requirements

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person who has been issued a horseshoe crab dredge permit, a horseshoe crab commercial collecting permit or a commercial eel pot license to not report his/her harvest of horseshoe crabs to the Department on a daily basis. Said daily reports shall not be required to be submitted to the Department during any month said person indicates previously in writing to the Department that he/she will not be harvesting horseshoe crabs. Any person required to submit a daily report on his/her harvest of horseshoe crabs to the Department shall phone in said report within 24 hours of said harvesting. For purposes of this section, a week shall commence at 12:01AM on Monday and conclude at midnight on Sunday, next ensuing. Said report shall include but not be limited to said person's unique identification number assigned by the Department, the dates and location horseshoe crabs were harvested, the number of horseshoe crabs harvested and the method of harvest of horseshoe crabs. Said report shall be submitted to the Department by telephone by calling a phone number, dedicated by the Department for the reporting of harvested horseshoe crabs, and entering the required data by code or voice as indicated.

2.0 Any person who fails to submit a daily report on his/her harvest of horseshoe crabs to the Department on time shall have his/her permit to dredge or his/her permit or authority to collect horseshoe crabs suspended until all delinquent reports on harvested horseshoe crabs are received by the Department.

3.0 In addition to the requirement to phone in daily catch reports, horseshoe crab collectors and harvesters and commercial eel fishermen are required to compile and file monthly log sheets detailing daily landings of horseshoe crabs on forms supplied by the Department. These forms must be submitted by the 10th day of the month next ensuing. Failure to submit these monthly reports on a timely basis may be cause for horseshoe crab collecting or horseshoe crab dredge permit revocation or non-renewal of said permit the following year; or in the case of a commercial eel licensee, forfeiture of permission to possess or use horseshoe crabs as bait for the remainder of the year.

1 DE Reg. 1413 (4/1/98)

3 DE Reg. 1567 (5/1/00)
7 DE Reg. 220 (8/1/03)
10 DE Reg. 1029 (12/01/06)
11 DE Reg. 685 (11/01/07)

3211 Horseshoe Crab Commercial Collecting Permit Eligibility And Renewal Requirements

(Penalty Section 7 Del.C. §2705(b))

1.0 The Department may only issue a horseshoe crab commercial collecting permit to a person who makes application for such a permit in calendar year 1998, and who, prior to July 1, 1997, had applied for and secured from the Department at least 2 valid horseshoe crab commercial collecting permits. Any person holding a horseshoe crab commercial collecting permit in 1998 may apply for renewal of their horseshoe crab commercial collecting permit by December 31 each year. If any person holding a horseshoe crab commercial collecting permit from the previous year fails to apply for renewal of their horseshoe crab commercial collecting permit by December 31 in any given calendar year, they forfeit their eligibility to obtain a horseshoe crab commercial collecting permit in subsequent years.

1 DE Reg. 1413 (4/1/98)
7 DE Reg. 220 (8/1/03)
10 DE Reg. 1029 (12/01/06)
11 DE Reg. 685 (11/01/07)

3212 Prohibitions; Sale Of Horseshoe Crabs

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person who collects or dredges horseshoe crabs, except a person with a valid horseshoe crab commercial collecting permit or a person with a valid horseshoe crab dredge permit, to sell, trade and/or barter or to attempt to sell, trade and/or barter any horseshoe crab.

1 DE Reg. 1413 (4/1/98)
7 DE Reg. 220 (8/1/03)
10 DE Reg. 1029 (12/01/06)
11 DE Reg. 685 (11/01/07)

3213 Collecting Horseshoe Crabs At Night, Prohibited

(Penalty Section 7 Del.C. §2705(b))

1.0 It shall be unlawful for any person with a valid commercial eel fishing license to collect horseshoe crabs between sunset and sunrise.

3 DE Reg. 1092 (2/1/00)
7 DE Reg. 220 (8/1/03)
10 DE Reg. 1029 (12/01/06)
11 DE Reg. 685 (11/01/07)

3214 Horseshoe Crab Annual Harvest Limit

(Penalty Section 7 Del.C. §2705(b))

1.0 The annual harvest limits for horseshoe crabs taken or landed in the State shall be determined in accordance with the annual sex-specific allocations identified in Addendum VII to the Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan for Horseshoe Crab.

2.0 When the Department has determined that 95% of an annual sex-specific horseshoe crab quota allocation has been landed, the Department shall establish, based on recent fishery performance and landings, a date and time to order that component of the horseshoe crab fishery closed. Horseshoe crabs of the component specified may not be taken during the remainder of the calendar year once closed by the Department.

3.0 Any overage in the State's annual horseshoe crab quota will be subtracted from the following year's horseshoe crab quota allocation.

7 DE Reg. 220 (8/1/03)
10 DE Reg. 1029 (12/01/06)
11 DE Reg. 685 (11/01/07)
12 DE Reg. 975 (01/01/09)
14 DE Reg. 904 (03/01/11)

16 DE Reg. 1082 (04/01/13)

3215 Horseshoe Crab Harvest Moratorium

Repealed

10 DE Reg. 1029 (12/01/06)

11 DE Reg. 685 (11/01/07)

3216 Prohibition on Possession or Use of Asian Horseshoe Crabs

(Penalty Section 7 Del.C. §2705(b))

1.0 It is unlawful to possess or use as bait Asian horseshoe crabs or parts thereof without written authorization from the Director of the Division of Fish and Wildlife.

17 DE Reg. 441 (10/01/13)



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENTAL CONTROL
DIVISION OF FISH & WILDLIFE
FISHERIES BUILDING
3002 Bayside Drive
P.O. Box 330
Little Creek, DE 19961
(302) 739-4782

OFFICE OF THE
DIRECTOR

18 March 2014

Ms. Marin Hawk
Horseshoe Crab Plan Coordinator
Atlantic States Marine Fisheries Commission
1050 N. Highland St, Suite 200A-N
Arlington, VA 22201

Dear Ms. Hawk:

This letter is to inform you of Delaware's planned horseshoe crab management program for 2014. Delaware amended its horseshoe regulations (Attached) to be consistent with Addendum VII to the Fishery Management Plan for Horseshoe Crab. Effective April 11, 2013, Delaware adopted measures that establish the annual bait quota according to Addendum VII and allows for quota reductions when overages occur. Further, the measures established criteria for closing the horseshoe crab fishery in a manner that minimizes the likelihood of exceeding annual quotas. Effective October 11, 2013, Delaware prohibited the possession or use of Asian horseshoe crabs, or parts thereof, as bait. Delaware intends to enforce an annual male horseshoe crab quota of 160, 435 (ASFMC quota – 2013 overage) for the 2014 harvest season (no female harvest is authorized). It is anticipated that current laws and regulations pertaining to horseshoe crabs will remain in place.

Delaware will maintain its existing monitoring programs consistent with the management plan and its subsequent addenda. Despite the removal of the horseshoe crab egg survey as a monitoring requirement, Delaware intends to proceed with this work for 2014 as staff and funding allows.

Sincerely,

Stewart Michels,
Program Manager

Maryland's 2013 Horseshoe Crab (*Limulus polyphemus*) Compliance Report to the Atlantic States Marine Fisheries Commission

I. Introduction

The Interstate Horseshoe Crab Fishery Management Plan (FMP) was approved and adopted by the Atlantic States Marine Fisheries Commission (ASMFC) on October 22, 1998. The goal of the FMP is to conserve and protect the horseshoe crab resource for continued use over time by maintaining sustainable levels of spawning stock biomass to ensure its continued role in the ecology of coastal ecosystems. The FMP contains a monitoring program aimed at providing the necessary data to guide future management decisions on the horseshoe crab fishery. Section 4.2 of the FMP addressed horseshoe crab fishery closures, and established *de minimis* criteria for those states with a limited horseshoe crab bait fishery.

Addendum I to the FMP, approved in April 2000, set forth changes to the harvest level threshold for horseshoe crab bait fisheries. Addendum I required all states to: (1) establish a cap on their horseshoe crab bait fishery landings; and (2) close their respective fisheries once the state's cap was reached. Each state's cap was calculated at 25 percent below the reference period landings (RPL). Maryland's reference period landings were 613,225 horseshoe crabs. Addendum I further encouraged those states (Maryland and New Jersey) that had already achieved harvest reductions in excess of 25 percent below the RPL, to maintain their current harvest restrictions until a plan for adjusting their harvest has been reviewed by the ASMFC Horseshoe Crab Technical Committee and approved by the Management Board.

In May 2001, the Management Board approved Addendum II which established criteria for voluntary quota transfers between states. Addendum III, approved in May 2004, addressed the need for changes regarding the reporting requirements for biomedical companies and states, and voiced concern about the bait fishery's impact on the horseshoe crab population in the Delaware Bay area. Addendum III further reduced the horseshoe crab bait fishery harvest in and around the Delaware Bay. New Jersey and Delaware are restricted from harvesting more than 150,000 horseshoe crabs annually and Maryland must not exceed an annual harvest of 170,653 horseshoe crabs (2001 landings). All other states are restricted from harvesting greater than their respective quotas on bait landings as established by Addendum I. The new harvest limit for Maryland was established by public notice on April 22, 2004.

Addendum IV passed June of 2006, Addendum V passed September 2008, and Addendum VI was passed in August 2010. All these addenda maintained the Maryland harvest limit at 170,653 horseshoe crabs for bait harvest. Maryland also put an additional restriction of at least two males for every one female harvested in effect for the 2009, 2010, and 2011 harvest seasons. In 2012 the harvest limit under addendum VI remained at 170,653 horseshoe crabs. The 2013 harvest limit under addendum VII was 255,980 male only horseshoe crabs.

II. Request for *de minimis* status

Not Applicable.

III. Previous Year's Fishery and Management Program

A. Fishery Dependent Monitoring

B. Fishery Independent Monitoring

Please refer to section V(B) for independent monitoring results.

C. Previous Year's Fishery and Management Program

Maryland's horseshoe crab fishery has been governed by the Code of Maryland Regulations (COMAR) 08.02.10.01 since its adoption on April 9, 1998. The online COMAR pertaining to horseshoe crabs is available at <http://www.dsd.state.md.us/comar/08/08.02.10.01.htm>.

Maryland regulations close all waters of the state to the harvest of horseshoe crabs from May 1 to June 7 of each year. In an effort to protect female horseshoe crabs during the spawning season, Maryland enacted a policy in 2004 that limited the collection of horseshoe crabs to *males only* (May 1 to June 7) for use in the biomedical processing industry. In April of 2004, those regulations were amended to reflect the new harvest limit of 170,653 horseshoe crabs (Appendix A). Regulations were passed in 2012 that delayed the start of general harvest until July 13 from July 1. On June 8, 2013 the regulations were changed by public notice to reflect a new harvest limit of 255,980 male only horseshoe crabs.

Harvest by Gear Type

1. Commercial Landings

In 2013 Maryland's horseshoe crab bait fishery reported a harvest total of 240,688 horseshoe crabs (Table 1). Horseshoe crabs are mostly harvested by bottom trawls. Landings data are compiled from Maryland commercial finfish logbook data and Maryland horseshoe crab permit data. Data reported are the highest combined landings from those sources, as of January 27, 2014. The horseshoe crab landing limit was reduced to 150 horseshoe crabs per day on August 9, 2013.

Table 1. Summary of Maryland's 2007 - 2013 Horseshoe Crab Bait Fishery Landings, n=total number horseshoe crabs.

Harvest Category	Year						
	2007	2008	2009	2010	2011	2012	2013
# Males	70,768	97,237	114,134	114,134	131,375	114,306	240,688
# Females	101,349	66,258	50,698	50,698	35,568	54,760	0
# Unsexed	0	0	602	602	110	21	0
Total #	172,117	163,495	165,344	165,344	167,053	169,087	240,688
Total lbs.	653,732	535,444	496,040	496,040	455,309	503,441	529,513
% Females	59	40	31	31	21	32	0

2. Recreational Landings

There are no recreational landings of horseshoe crabs.

D. Progress in Implementing Habitat Recommendations

There were no habitat recommendations for the plan. Maryland Department of Natural Resources staff, working with the Coastal Bays Program staff and Worcester County, continues to work on cooperative projects that display how shore stabilization can be achieved with soft shorelines, creating or protecting horseshoe crabs spawning habitat.

IV. Planned management programs for the current calendar year.

Regulations regarding horseshoe crab management in Maryland will change for 2013; the

current proposed harvest limit will be 255,000 male horseshoe crabs, with no female harvest. Additionally, regulations will change to reflect the Maryland Department of Natural Resources authority to set harvest limits, and seasons through public notice rather than the extended, standard regulatory process. Regulations and monitoring activities are in compliance with Addendum III and are detailed in the plan specific monitoring program requirements.

V. Plan specific requirements (components A, B, D, E, and F are required for Maryland).

A1. Monthly reporting of all harvest (including, but not limited to: bait fisheries, bycatch, biomedical industry, and scientific and educational research).

Bait Fisheries

It is required that all persons who catch or land horseshoe crabs in Maryland report their catch and landing information on the forms provided by the MDNR. In 1998, MDNR established a horseshoe crab landing permit and issued permits to individuals who landed horseshoe crabs in Maryland during 1996 (Appendix B). A total of 10 permits were issued in 2012. Permit holders are required to report weekly numbers landed by gender, area of harvest and gear type. Non-permit holders are restricted to no more than 25 horseshoe crabs per day during an open season and area, and are required to report this information using MDNR monthly commercial logbooks.

In 2013, Maryland's horseshoe crab bait fishery reported a harvest total of 240,688 horseshoe crabs (Appendix C). Beginning June 8 and continuing through July 12 the fishery was only open more than one mile off the Maryland's Atlantic coast, and only harvesters possessing a Maryland Horseshoe Crab Harvester's Permit were allowed to harvest and possess 100 crabs per day. Those fishermen without a permit were limited to harvesting and possessing 25 crabs per day. Regulations were passed in 2013 that delayed the start of non-permitted until July 13 from July 1. July 15 through August 8, 2013 permitted harvesters were allowed to harvest the number of horseshoe crabs on their permit daily. It was subsequently reopened on August 9, 2013 at 150 crabs per day.

Bycatch

Horseshoe Crabs are sometimes caught as bycatch in the ocean trawl and Chesapeake Bay pound net fisheries. Due to the resilient nature and hard carapaces of horseshoe crabs, the crabs which are not retained for harvest are most often released alive with little injury. Mortality associated with capture and release of horseshoe crabs in other fisheries is assumed to be small.

Calvert Cliffs nuclear power plant impinges horseshoe crabs in their water intakes. They are now required to report these impingements to MD DNR. In 2012, the power plant recorded 322 horseshoe crab mortalities in their intake areas. On April 2012 they installed a new horseshoe crab barrier that subsequently reduced the number of impinged horseshoe crabs from 1,755 in 2011 to 430 in 2012. A similar low number was impinged in 2013.

Biomedical Industry

Maryland requires all persons who collect horseshoe crabs for scientific research, including the biomedical industry, to obtain a scientific collection permit and report the number of animals collected annually. In 2013, three companies obtained a scientific collection permit for the purpose of collecting horseshoe crabs within Maryland for *Limulus Amoebocyte Lysate* (LAL) production.

Scientific And Educational Research

The Maryland Department of Natural Resources (MDNR), working through the state school system, conducts an educational program entitled "Green Eggs and Sand."

Participation in this program involves the collection and hatching of a small number of horseshoe crab eggs (hundreds) in the classroom. Live adult horseshoe crabs are sometimes used for demonstrations in conjunction with this program, but all specimens have been returned live to the wild after their use. The total number of horseshoe crabs used for demonstration purposes for this program throughout the state in any year is around ten. This program will continue in 2013. Various school projects and aquariums within the state sometimes use a few horseshoe crabs for exhibits throughout the year. The total number of horseshoe crabs used for these venues does not exceed 50 horseshoe crabs in any one year. The effect on the horseshoe crab stock is positive, as the programs raises awareness of horseshoe crab ecology and the need to protect habitat and nesting beaches.

A2. Characterize a portion of the commercial catch based on prosomal width by sex.

Maryland’s horseshoe crab landing permit holders are required to report the gender of horseshoe crabs landed. Permitted horseshoe crab fishermen accounted for almost 100 percent of Maryland’s total horseshoe crab landings in 2013. Of these reported landings, 32 percent were females.

In 2013, biomedical processing lab Lonza Biomedical working with Virginia Tech measured prosomal width on a large subsample of the horseshoe crabs that were delivered to their processing facility (Table 2). These samples were taken through the harvest season, and the lengths of the animals are representative of horseshoe crabs taken in the bait harvest, with a very large sample size (4,350 horseshoe crabs). Horseshoe crabs for the biomedical and bait industries were harvested by the commercially permitted watermen using the same gear. Lonza provided length and weight data on horseshoe crabs used in the biomedical industry and it is summarized below. These data are submitted as a proxy to characterize a portion of the commercial catch based on prosomal width by sex, as we have done in recent years (Table 2).

Table 2. Proxomal widths of sampled Horseshoe Crabs

Sex	N	Mean Width (mm)	Maximum	Minimum
Female	2080	256	357	173
Male	2270	206	287	172

Mean weight by sex is used to calculate the total poundage of horseshoe crabs harvested each year (Table 3). Historically, a value of 4.97 pounds for females and 2.12 pounds for males was used for these calculations in Maryland. In 2013 the horseshoe crabs mean weights were smaller than we typically see, which may indicate a large amount of new recruitment into the population. These numbers are close to the values we have been using to estimate the total poundage of catch per year.

Table 3. Weights of sampled Horseshoe Crabs

Sex	N	Mean Weight (kg)	Maximum	Minimum
Female	2080	2.04	5.3	0.6
Male	2270	0.87	2.9	0.5

A3. Identify horseshoe crab mortality associated with the biomedical industry up to the point of release.

Three companies were issued Maryland Scientific Collecting Permits for the biomedical collection of horseshoe crabs in 2012. As part of Maryland’s scientific

collection permit, the collectors are required to submit an annual report of the number of animals collected, method of collection, and percent mortality to the point of release.

A4. Certify that horseshoe crabs collected for biomedical use are not used for other purposes.

The Limulus Ameobocyte Lysate (LAL) production permit issued to the biomedical companies from the Food and Drug Administration, as well as the Maryland scientific collecting permit, requires all horseshoe crabs collected for LAL production to be returned alive to the waters from which they were collected within 48 hours of collection. In 2004, new regulations allowed the use of bait crabs for blood collection and the return of these crabs to the bait fishery.

B. Continue existing benthic sampling programs (record weight, number, and prosomal width by sex). States with juvenile trawl surveys should include these data in annual monitoring reports.

MDNR continues to collect the required horseshoe crab data from the Maryland Coastal Bays Trawl Survey. An index of horseshoe crab relative abundance is produced annually from those data (Figure 1). Data are collected monthly with a 16 ft otter trawl from April to October. The index shows an encouraging trend in recent years.

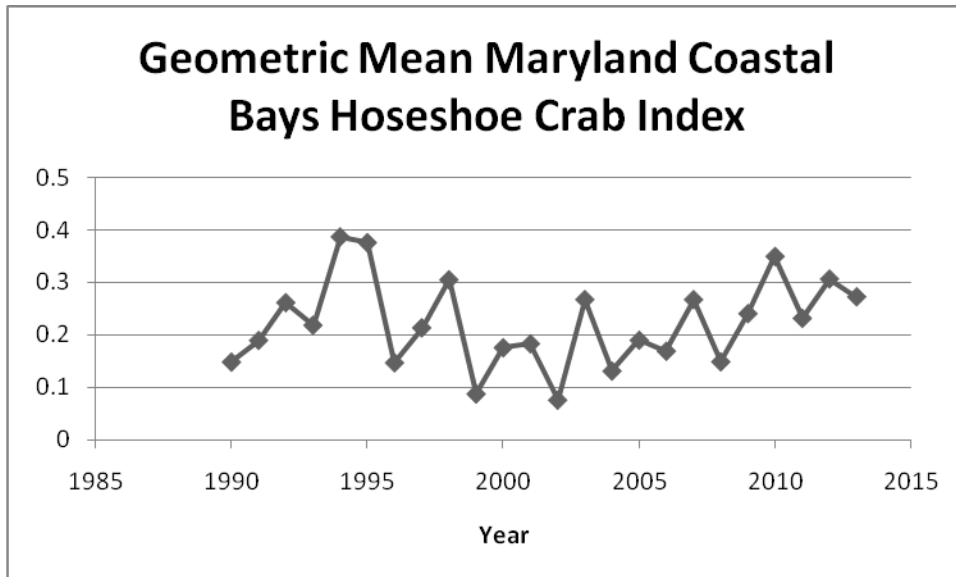


Figure 1. Horseshoe crab trawl index of relative abundance (geometric mean) (1990-2013).

C. Implement a pilot program to survey horseshoe crab eggs in New Jersey and Delaware by the 1999 spawning season.

This component is not mandatory for Maryland.

D. Implement a pilot program to survey horseshoe crab spawning in New Jersey, Delaware, and Maryland by the 1999 horseshoe crab spawning season.

Please reference section V, F of this report.

E. A coordinated tagging program should be implemented by the Tagging Subcommittee.

Both Lonza and Limuli Laboratories participate in the U.S Fish and Wildlife Service Coast-wide Tagging Program using horseshoe crabs collected and released in Maryland waters.

F. Identify potential horseshoe crab spawning and nursery habitat.

Since 2002 the Maryland Coastal Bays Program (MCBP), part of the National Estuary Program, has coordinated a volunteer horseshoe crab spawning survey in the Maryland Coastal Bays. MDNR has assisted MCBP in conducting the survey, which is a continuation of preliminary work done by the state beginning in 1998. The survey is beginning to show some trends in areas where the horseshoe crabs spawn, and the timing of the spawn. Volunteers have also begun taking temperatures during the surveys to better understand the horseshoe crab spawning behavior in the Maryland Coastal Bays.

VI. Law Enforcement Requirements

None

APPENDIX A

2013 Maryland's Horseshoe Crab Regulations

In effect January 1 through August 4th

08.02.10.01

.01 Horseshoe Crabs.

A. Quota.

(1) The annual total allowable landings of horseshoe crabs for the commercial fishery is 170,653 horseshoe crabs.

(2) Any annual overages in the fishery will be deducted from the total fishery allotment for the following year.

B. Seasons.

(1) A person may not catch or land horseshoe crabs in Maryland from December 1 through June 7, inclusive.

(2) From June 8 through July 12, inclusive, a person:

(a) May not catch or land horseshoe crabs from:

(i) The Chesapeake Bay and its tidal tributaries, or

(ii) Within 1 mile of the Atlantic coast or its coastal bays; and

(b) May catch and land horseshoe crabs outside of 1 mile of the Atlantic coast on Monday through Friday in accordance with the catch limits in §D of this regulation.

(3) From July 13 through November 30, inclusive, a person may catch or land horseshoe crabs from the tidal waters of the State on Monday through Friday in accordance with the catch limits in §D of this regulation.

C. Time Restrictions. A person may not catch or land horseshoe crabs on Saturday or Sunday.

D. Catch Limits.

(1) A person that does not possess a valid Maryland horseshoe crab landing permit may not catch, possess, or land more than 25 horseshoe crabs per day.

(2) From June 8 through July 12, inclusive, an individual in possession of a valid horseshoe crab landing permit may not land more than 100 horseshoe crabs per day.

(3) From July 13 through November 30 inclusive, an individual in possession of a valid horseshoe crab landing permit may not land more than the daily catch limit specified on the permit and regardless of the statewide catch limit specified on the permit, no more than 150

horseshoe crabs per permit per day may be harvested from the Chesapeake Bay and its tidal tributaries.

E. Horseshoe Crab Landing Permit.

(1) No more than ten horseshoe crab landing permits may be issued by the Department. The number of horseshoe crab landing permits is based on the reported catch and landing records of horseshoe crabs in Maryland during 1996.

(2) The Department may issue a permit to catch and land horseshoe crabs in Maryland to a person who is licensed in accordance with Natural Resources Article, §4-701, Annotated Code of Maryland, and:

(a) Declared or was eligible to declare, in the previous year, an intent to fish for horseshoe crabs in accordance with this section and has not transferred the permit; or

(b) Received a horseshoe crab landing permit through a permanent business transfer in accordance with §E(6) of this regulation.

(3) Declaration.

(a) Tidal fish licensees shall declare their intent to fish for horseshoe crabs by May 1 of each year.

(b) A tidal fish licensee who has not declared by May 1 of the current year, and who has not declared by the May 1 deadline in any of the 3 preceding years, may apply until May 14 of the current year, or the next business day if May 14 occurs on a weekend, to the Director of Fisheries Service, provided the licensee shows good reason why the application should be processed.

(c) An exception to the May 14 deadline will be considered only for an individual who can provide satisfactory documentation of a physical or mental incapacity that prevented that individual from meeting the registration time period established in this subsection.

(4) The daily catch limits shall be printed on the horseshoe crab landing permit.

(5) A permittee shall possess the horseshoe crab landing permit when engaged in permitted activities.

(6) Transfer of a Landing Permit.

(a) The Department may approve the permanent or temporary transfer of a landing permit to a person who applies to the Department requesting the transfer on forms provided by the Department.

(b) At the end of the specified temporary transfer time period the permit automatically returns to the original permittee.

(7) A horseshoe crab landing permit may only be transferred to a person who:

(a) Is licensed in accordance with Natural Resources Article, §4-701, Annotated Code of Maryland; and

(b) Is not currently a permit holder.

(8) Regardless of the number of authorized individuals with Maryland horseshoe crab permits on board any one vessel, no more than two horseshoe crab quotas may be harvested from one vessel per trip.

F. Reporting and Penalties.

(1) In addition to the requirements of Natural Resources Article, §4-206, Annotated Code of Maryland, an individual in possession of a horseshoe crab landing permit shall record the harvest of horseshoe crabs on the permit daily and submit the completed permit to the Department in the time frame specified on the form.

(2) The Department may deny an application for a horseshoe crab landing permit §F(1) of this regulation during the previous season.

G. General.

(1) A person authorized to catch and release horseshoe crabs for purposes of scientific research:

(a) Shall return within 48 hours the live horseshoe crabs to the waters from which the horseshoe crabs were taken; and

(b) Is exempt from §§A—E of this regulation.

(2) A person who purchases horseshoe crabs for purposes of scientific research may:

(a) Return the horseshoe crabs to the harvester for use or sale as bait;

(b) Return or sell the horseshoe crabs to a bait dealer; or

(c) Return the horseshoe crabs live to tidal waters.

(3) The Secretary may modify catch limits or quotas, or open or close a season as required by the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab by publishing notice on the Fisheries Service website at least 48 hours in advance, stating the effective hour and date.

(4) The Secretary shall make a reasonable effort to disseminate public notice through various other media so that an affected person has reasonable opportunity to be informed.

2013 Draft Proposed Maryland's Horseshoe Crab Regulations

In effect August 5th through December 31

08.02.10.01

.01 Horseshoe Crabs.

A. Quota.

(1) The annual total allowable landings of horseshoe crabs for the commercial fishery shall be established and may be modified through a public notice issued in accordance with §G of this regulation.

(2) Any annual overages in the fishery will be deducted from the total fishery allotment for the following year.

B. Seasons. The season for harvesting horseshoe crabs shall be established and may be modified through a public notice issued in accordance with §G of this regulation.

C. Time Restrictions. A person may not catch or land horseshoe crabs on Saturday or Sunday.

D. Catch Limits.

(1) A person that does not possess a valid Maryland horseshoe crab landing permit may not catch, possess, or land more than 25 horseshoe crabs per day.

(2) An individual may not catch or possess female horseshoe crabs.

(3) The catch limit for individuals in possession of a valid horseshoe crab landing permit shall be established and may be modified through a public notice issued in accordance with §G of this regulation.

E. Horseshoe Crab Landing Permit.

(1) No more than ten horseshoe crab landing permits may be issued by the Department. The number of horseshoe crab landing permits is based on the reported catch and landing records of horseshoe crabs in Maryland during 1996.

(2) The Department may issue a permit to catch and land horseshoe crabs in Maryland to a person who is licensed in accordance with Natural Resources Article, §4-701, Annotated Code of Maryland, and:

(a) Declared or was eligible to declare, in the previous year, an intent to fish for horseshoe crabs in accordance with this section and has not transferred the permit; or

(b) Received a horseshoe crab landing permit through a permanent business transfer in accordance with §E(6) of this regulation.

(3) Declaration.

(a) Tidal fish licensees shall declare their intent to fish for horseshoe crabs by May 1 of each year.

(b) A tidal fish licensee who has not declared by May 1 of the current year, and who has not declared by the May 1 deadline in any of the 3 preceding years, may apply until May 14 of the current year, or the next business day if May 14 occurs on a weekend, to the Director of Fisheries Service, provided the licensee shows good reason why the application should be processed.

(c) An exception to the May 14 deadline will be considered only for an individual who can provide satisfactory documentation of a physical or mental incapacity that prevented that individual from meeting the registration time period established in this subsection.

(4) The daily catch limits shall be printed on the horseshoe crab landing permit.

(5) A permittee shall possess the horseshoe crab landing permit when engaged in permitted activities.

(6) Transfer of a Landing Permit.

(a) The Department may approve the permanent or temporary transfer of a landing permit to a person who applies to the Department requesting the transfer on forms provided by the Department.

(b) At the end of the specified temporary transfer time period the permit automatically returns to the original permittee.

(7) A horseshoe crab landing permit may only be transferred to a person who:

(a) Is licensed in accordance with Natural Resources Article, §4-701, Annotated Code of Maryland; and

(b) Is not currently a permit holder.

(8) Regardless of the number of authorized individuals with Maryland horseshoe crab permits on board any one vessel, no more than two horseshoe crab quotas may be harvested from one vessel per trip.

F. Reporting and Penalties.

(1) In addition to the requirements of Natural Resources Article, §4-206, Annotated Code of Maryland, an individual in possession of a horseshoe crab landing permit shall record the harvest of horseshoe crabs on the permit daily and submit the completed permit to the Department in the time frame specified on the form.

(2) The Department may deny an application for a horseshoe crab landing permit for failing to comply with §F(1) of this regulation during the previous season.

G. General.

(1) A person authorized to catch and release horseshoe crabs for purposes of scientific research:

(a) Shall return within 48 hours the live horseshoe crabs to the waters from which the horseshoe crabs were taken; and

(b) Is exempt from §§A—E of this regulation.

(2) A person who purchases horseshoe crabs for purposes of scientific research may:

(a) Return the horseshoe crabs to the harvester for use or sale as bait;

(b) Return or sell the horseshoe crabs to a bait dealer; or

(c) Return the horseshoe crabs live to tidal waters.

(3) The Secretary may establish or modify catch limits, quotas, and seasons for horseshoe crabs in order to implement the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab by issuing a public notice on the Fisheries Service website.

(4) The public notice shall state its effective hour and date and shall be published on the Fisheries Service website at least 48 hours in advance of the effective hour and date.

(5) The Secretary shall make a reasonable effort to disseminate a public notice issued under this section through various other media so that an affected individual has a reasonable opportunity to be informed.

(6) A violation of the restrictions set by the Secretary in accordance with §G of this regulation is a violation of this regulation.

APPENDIX B



WEEK 1

(6/10/13 TO 6/14/13)

MARYLAND DEPARTMENT OF NATURAL RESOURCES

FISHERIES SERVICES

2013 HORSESHOE CRAB LANDING PERMIT

MAXIMUM DAILY ALLOWABLE LANDING LIMIT: 100 HORSESHOE CRABS

FISHERIES SERVICES

Permit Name and Address

HSC PERMIT #

LICENSE #

AREAS OF HARVEST

GEAR USED

A = Chesapeake Bay	D = Ocean, 1 – 3 Miles	1 = Trawl	4 = Pound/Fyke Net
B = Coastal Bays	E = Ocean, 3 – 12 Miles	2 = Gill Net, Drift	5 = Hand
C = Ocean, < 1 Mile	F = Ocean, 12+ Miles	3 = Gill Net, Anchor	6 = Other, Specify

DATE	# OF FEMALES	# OF MALES	# NOT SEXED	AREA OF HARVEST	GEAR USED	SEAFOOD DEALER #
06/08/2013	CLOSED					
06/09/2013						
06/10/2013	/					
06/11/2013	/					
06/12/2013	/					
06/13/2013	/					
06/14/2013	/					
06/15/2013	CLOSED					
06/16/2013						

RETURN WITHIN 3 DAYS AFTER THE WEEK IS OVER TO:

Maryland Department of Natural Resources
Fisheries Service B-2
Attn: Horseshoe Crab Monitoring
580 Taylor Avenue Annapolis, MD 21401
Fax #: 410.260.8279 Attn: Allison Luettel, Horseshoe Crab Monitoring

[PLEASE READ REVERSE SIDE FOR IMPORTANT INFORMATION](#)

INSTRUCTIONS TO PERMITTEE

- 1) Your name, address, license number, permit number, and daily maximum allowable landing limit appears in the top section of this permit.
- 2) Write the number of female and male horseshoe crabs in the **NUMBER OF FEMALE** and **NUMBER OF MALE** space.
- 3) Write the number of horseshoe crabs, which were not sexed in the **NUMBER NOT SEXED** space.
- 4) Write the area of harvest using the letter codes on top of the permit in the **AREA OF HARVEST** space.
- 5) Write the gear used to harvest the horseshoe crabs using the numeric codes on the top of the permit in the **GEAR USED** space.
- 6) If horseshoe crabs are sold to a seafood dealer write the dealer's ID number in the **SEAFOOD DEALER'S ID NUMBER** space.
- 7) You are responsible for the accuracy of any and all information recorded on this permit.
- 8) You must return this permit to the Department of Natural Resources (address and fax number below) within 3 days after the week is over. Failure to do so, **even if "0" horseshoe crabs are landed**, could result in the revoking of your permit.

HORSESHOE CRAB TAG RECAPTURES

Tag Number	Date Recovered	HSC Kept/Released	Tag Kept/Mailed/Disposed

**If you need additional information or have questions please call:
Allison Luettel 410.260.8343 or 800.620.8DNR x.8343**

Maryland's 2014 Management Proposal

This report outlines Maryland's horseshoe crab management actions for 2014 as required by the Atlantic States Marine Fisheries Commission Interstate Horseshoe Crab Fishery Management Plan.

Harvest Level Threshold

Addendum I required all states to: (1) establish a cap on their horseshoe crab bait fishery landings; and (2) close their respective fisheries once the state's cap was reached. Each state's cap was calculated at 25 percent below the reference period landings (RPL). Maryland reference period landings were 613,225 horseshoe crabs. Addendum I further encouraged those states (Maryland and New Jersey) that had already achieved harvest reductions in excess of 25 percent below the RPL, to maintain their current harvest restrictions until a plan for adjusting their harvest has been reviewed by the Atlantic States Marine Fisheries Commission (ASMFC) Horseshoe Crab Technical Committee and approved by the Management Board.

Addendum III further reduced the horseshoe crab bait fishery harvest in and around the Delaware Bay. It was established that Maryland must not exceed an annual harvest of 170,653 horseshoe crabs (2001 landings). This landing limit was maintained through addendum IV and VI from 2001 through 2012. The limit for Maryland in 2013 was 255,000 male horseshoe crabs under addendum VII, and will remain the same in 2014.

FMP Monitoring Components (Section 3.5)

Component A:

A1. Monthly reporting of all harvest (bait fisheries, bycatch, biomedical industry, and scientific and educational research).

MDNR will continue its reporting requirements in 2014.

Bait Harvest:

It is required that all persons who catch or land horseshoe crabs in Maryland report their catch and landing information on the forms provided by the MDNR. In 1998, MDNR established a horseshoe crab landing permit and issued this permit to those individuals who landed horseshoe crabs in Maryland during 1996. Permit holders are required to report weekly numbers landed by gender, area of harvest and gear type. Non-permit holders are restricted to no more than 25 horseshoe crabs per day during an open season and area, and are required to report this information on MDNR's monthly commercial fishing report.

Biomedical Collection:

Maryland requires all persons who collect horseshoe crabs for scientific research, including the biomedical industry, to obtain a scientific collection permit and report the number of animals collected annually.

Characterize a portion of the commercial catch based on prosomal width by sex.

MDNR will continue to obtain prosomal width and gender data from its horseshoe crab bait fishery by subsampling landings, and requiring landing permit holders to report landings by gender.

A2. Identify horseshoe crab mortality associated with the biomedical industry up to the point of release.

MDNR will continue monitoring mortality associated with the biomedical industry. As part of Maryland's scientific collection permit, the collectors are required to submit an annual report of the number of animals collected, method of collection, and percent mortality to the point of release. Maryland requires that a Chain of Custody Form follow each batch of horseshoe crabs collected for biomedical use from the time of capture through the time of release.

Certify that horseshoe crabs collected for biomedical use are not used for other purposes.

MDNR will aid in the monitoring effort to certify that horseshoe crabs collected for Limulus Amoebocyte Lysate (LAL) production be returned to the waters from which they were collected or to the bait fishery from which they were purchased. (In 2004 ASMFC regulations allowed the use of bait crabs for blood collection and the return of these crabs to the bait fishery).

A3: Identify potential horseshoe crab spawning and nursery habitat.

Data on juvenile horseshoe crabs will continue to be collected by MDNR from our existing sampling programs to better delineate horseshoe crab nursery habitats. MDNR will obtain additional information on horseshoe crab spawning and nursery habitats by continuing or implementing the following projects in 2011:

1. Inform the public about the importance of horseshoe crab spawning habitat and encourage them to report observations of horseshoe crab spawning activity and participate in Maryland's volunteer spawning survey program coordinated by the Maryland Coastal Bays Program.
2. Review aerial shoreline survey maps to identify sandy beach habitats.
3. Coordinate volunteer surveys to quantify spawning intensity.

Component B:

B1: Continue expanding the annual benthic trawl survey following methods described in Hata and Berkson (2003).

Since the survey will be discontinued in 2014 due to lack of funding the NEMAP survey data will be mined for suitability as a substitute for the coast wide annual benthic trawl survey.

B2: Continue existing benthic sampling programs. Record numbers, weight and prosomal width by sex of adult horseshoe crabs and numbers and prosomal width of juveniles horseshoe crabs.

MDNR will continue to collect the required information from the following benthic sampling programs:

1. Maryland's Coastal Bays Fisheries Investigation Trawl and Seine survey.
2. MDNR will continue to subsample commercial harvest of horseshoe crabs for prosomal width data.

B3: Continue monitoring spawning populations based upon standardized and statistically robust methodologies.

Maryland will continue to identify spawning habitat. MDNR will continue to support the MCBP efforts to coordinate spawning surveys that rely on volunteer observations on the coastal bays and use the standardized methodology used in the Delaware Bay spawning surveys.

The Maryland Coastal Bays Program has been coordinating spawning surveys in the coastal bays since 2002. After several years of intensive surveying, understanding of where the majority of the spawning activity occurs has progressed. In 2014, the survey activity in these areas will be maintained, and the intensity of spawning will be modeled into estimates of total activity, and total numbers of animals spawning in these locations. The relationship between temperature and spawning activity will also be explored further.

B4: A coordinated tagging program should be implemented by the Tagging Subcommittee.

Both Lonza Walkersville and Limuli Laboratories participate in the U.S Fish and Wildlife Service Coast-wide Tagging Program using horseshoe crabs collected and released in Maryland waters.

B5: Continue existing state egg abundance surveys.

N/A. Delaware Bay only

B6: Continue state shorebird monitoring surveys.

N/A. Delaware Bay only



MARYLAND - VIRGINIA
"Potomac River Compact of 1958"

Potomac River Fisheries Commission

222 Taylor Street

P.O. BOX 9

Colonial Beach, Virginia 22443

TELEPHONE: (804) 224-7148 · (800) 266-3904 · FAX: (804) 224-2712



February 28, 2014

Marin Hawk
ASMFC
1050 N. Highland St., Suite 200A-N
Arlington, VA 22201

Re: ASMFC Horseshoe Crab FMP Annual Report for 2013 and Management Proposal for 2014

Dear Ms. Hawk:

In 2013 there was no directed fishery, either commercial, recreational, bait or for biomedical uses, for horseshoe crabs in the Potomac River. Nor were we aware of any use or harvest of horseshoe crabs for scientific and/or educational research from the Potomac. Monitoring components B, C, D and E are not applicable to the Potomac River, as well as component F as we do not believe any potential horseshoe crab habitat, either spawning or nursery, exists within the Potomac River Fisheries Commission's jurisdiction.

This letter also serves as Potomac River Fisheries Commission's request for *de minimis* status, as our Reference Period Landings (0 horseshoe crabs) is below the *de minimis* threshold of less than 1 percent of coast-wide landings. Jurisdictions that qualify for *de minimis* are required to implement components A, B, E and F of the monitoring program. Given the absence of horseshoe crab spawning and nursery habitat, as mentioned above, component A is our only compliance requirement. Our mandatory weekly reporting system, currently in place, requires all commercial licensees to report the harvest or by-catch of horseshoe crabs, and therefore we are in compliance with component A.

We believe this information fulfills the Potomac River Fisheries Commission's reporting and management requirements of the Horseshoe Crab FMP and Addendum 1.

Sincerely,

Ellen B. Cosby
Assistant Executive Secretary



COMMONWEALTH of VIRGINIA

Marine Resources Commission

2600 Washington Avenue
Third Floor
Newport News, Virginia 23607

March 1, 2014

MEMORANDUM

TO: Marin Hawk, Horseshoe Crab Fisheries Management Plan Coordinator
Atlantic States Marine Fisheries Commission

FROM: Adam B. Kenyon, Fisheries Management Specialist Senior
Virginia Marine Resources Commission, Fisheries Management Division

SUBJECT: Virginia's 2013 Compliance Report for Horseshoe Crab

I. Introduction

Throughout the 2013 season, Virginia maintained its regulatory provisions to prevent horseshoe crab harvest quota overages. It is unlawful for any harvester to take any horseshoe crabs from any shore or tidal waters within 1,000 feet, in any direction, of the mean low water line, from May 1 through June 7. It is unlawful to land horseshoe crabs in Virginia that were harvested from federal waters, from January 1 through June 7. Additionally, only male horseshoe crabs can be landed from waters east of the COLREGS line. Permits were required of anyone harvesting or landing horseshoe crabs in Virginia.

II. Request for *de minimis*, where applicable

N/A

III. Previous calendar year's fishery and management program

A. Activity and results of fishery-dependent monitoring (provide general results and references to technical documentation).

In 2013, the Virginia Marine Resources Commission (VMRC) Biological Sampling Program collected prosomal width, weight, and sex data from

An Agency of the Natural Resources Secretariat

www.mrc.virginia.gov

Telephone (757) 247-2200 (757) 247-2292 V/TDD Information and Emergency Hotline 1-800-541-4646 V/TDD

representative commercial horseshoe crab landings. The program sampled 85 males ranging in size from 169 to 248 mm, averaging 207 mm in prosomal width and 2.07 lbs in weight. Of the 91 females sampled, prosomal width ranged from 180 to 339 mm, the average prosomal width was 274 mm, and the average weight was 5.96 lbs. The program sampled 1 unsexed crab which was 160 mm, and 1.14 lbs in weight.

Of the 177 total horseshoe crabs sampled, 27 were from gill nets, 127 from pound nets, and 23 from the hand harvest fishery.

B. Activity and results of fishery-independent monitoring (provide general results and references to technical documentation).

N/A

C. Copy of regulations that were in effect, including a reference to the specific compliance criteria as mandated in the FMP.

Attachment A provides a copy of Chapter 4VAC20-900-10 et seq. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 season. It was modified in 2006 to reduce the potential capture of Delaware-origin horseshoe crabs. From January 1 through June 7 of each year, it was unlawful for any person to land in Virginia any horseshoe crab harvested from federal waters. During each calendar year, no more than forty percent of Virginia's horseshoe crab quota could be harvested from waters east of the COLREGS Line (Table 1). All horseshoe crabs harvested east of the COLREGS Line must have comprised only male horseshoe crabs. The 2013 quota was 172,828 horseshoe crabs.

As of May 1, 2011, the issuance of commercial licenses or permits for horseshoe crab hand harvest, horseshoe crab bycatch, unrestricted horseshoe crab endorsement (HCEL), and restricted horseshoe crab endorsement (RHCEL) was restricted by a license moratorium. Only those registered commercial fisherman who were determined by the VMRC to have been issued a license or permit prior to May 1, 2011, for horseshoe crab hand harvest, horseshoe crab bycatch, HCEL, or RHCEL were eligible to purchase that license or permit after May 1, 2011.

A control date of December 31, 2010 remained in effect for the management of all horseshoe crab licenses and fisheries in Virginia should any horseshoe crab limited entry criteria be established.

All registered commercial fishermen and holders of seafood landing licenses are required to report daily harvest from Virginia tidal and federal waters to the VMRC (Chapter 4 VAC 20-610-10 et seq.).

Beginning in 2010, a bycatch permit was established that allowed a commercial fisherman to harvest up to 500 horseshoe crabs per day, and provided the VMRC information on the number of individuals in the fishery, contact information, and tracking ability. All horseshoe crab permits stipulate the possession limit shall be reduced by 50% when it is projected and announced that 80% of the calendar year quota of horseshoe crabs has been taken. In 2013, all permit holders were

required to contact the VMRC Interactive-Voice-Response System (IVRS) within 24 hours of landing and provide the identification number, time, date, number of horseshoe crabs landed, gear type, and location of harvest.

Any person, firm or corporation that bought horseshoe crabs in Virginia must have a Horseshoe Crab Buying Permit from the VMRC. Horseshoe crab buyers were required to report weekly beginning in 2010. In 2012 VMRC required all buyers to provide daily buyer reports once 85% of the commercial quota of horseshoe crab had been landed or 34% of the commercial quota of horseshoe crab established for the horseshoe crab harvest east of the COLREGS Line had been landed. Virginia continued to maintain a possession limit of five horseshoe crabs for personal use which cannot be sold.

D. Harvest broken down by commercial (by gear type where applicable) and recreational and non-harvest losses (when available).

The VMRC Mandatory Harvest Reporting Program requires daily landings to be reported monthly to the Commission by registered commercial fishermen. According to the Mandatory Harvest Reporting database, a preliminary total of 132,668 horseshoe crabs were landed in 2013 (preliminary data, Table 1). The offshore landings (NMFS data) are not yet available, so only preliminary in-state data is presented. The hand harvest fishery closed on June 14, 2013; the dredge fishery closed on May 27, 2013; the pound net fishery closed on July 4, 2013; the trawl fishery closed on August 3, 2013; and the all other gears closed on June 25, 2013.

Virginia collects landings information from permitted horseshoe crab buyers, and this information is used to track harvest and audit mandatory harvest reports. In 2013 (preliminary data), 7,860 horseshoe crabs were harvested from the waters east of the COLREGS demarcation lines. These account for 5.9% of the total quota (Table 1).

In 2013, dredge gear dominated the harvest (44%), followed by pound net gear (25%), hand harvest (24%), and a small number of crabs were harvested by gill net (7%) (preliminary data, Table 2). A total of 50,082 female horseshoe crabs and 82,586 male horseshoe crabs were harvested in 2013 (preliminary data, Table 3).

E. Review of progress in implementing habitat recommendations.

N/A

IV. Planned management programs for the current calendar year

A. Summarize regulations that will be in effect. (copy of current regulations if different from III c).

Attachment B provides a copy of Chapter 4VAC20-900-10 et seq. that will be in effect for 2014.

Virginia will continue a ban on all trawling in state waters (implemented in 1989), including coastal waters out to the 3-mile line (Code of Virginia § 28.2-315); however, experimental permits allow for collection of horseshoe crabs for biomedical purposes by trawl gear but require these horseshoe crabs be returned to the water within 24 hours after bleeding.

Virginia will continue to require mandatory monthly reporting, by gear and sex, of all horseshoe crab harvests in 2014. Fishermen who harvest by dredge or trawl gears must contact the VMRC Operation Station and provide the total number of horseshoe crabs landed, gear type, and location of harvest. Any other fisherman harvesting horseshoe crabs is required to call in their harvest data to the VMRC IVRS within 24 hours of offloading and provide their identification number, the time, date and location of offloading, and the number of horseshoe crabs landed.

B. Summarize monitoring programs that will be performed.

Monitoring programs are described in Section V (Plan Specific Requirements).

C. Highlight any changes from the previous year.

In addition to the current management measures, the Virginia Marine Resources Commission established a new category-specific permitting system to better monitor quotas. This new system established limited entry qualifications and daily landing limits for individuals harvesting horseshoe crabs by all gears including trawl gear, dredge gear, pound net, by hand, as well as any gear that may harvest horseshoe crabs as a bycatch.

The new permitting system was developed to reduce latent effort and overcapacity in the horseshoe crab fishery as well as prevent potential quota overages. To be eligible for a horseshoe crab permit, fishermen must have been issued a horseshoe crab hand harvester permit prior to the license moratorium of May 1, and, have documented a minimum harvest of one horseshoe crab by that gear prior to the control date of December 31, 2010, in the Virginia Marine Resources Commission's mandatory harvest reporting system or in the federal dealer reports to the Standard Atlantic Fisheries Information System (SAFIS). The exact gear-specific permit eligibility requirements can be found in Attachment B, on page 2 through 3 (Subsections 4VAC20-900-21C through G).

To prevent user group conflicts in the Toms Cove area, located on the seaside of the eastern shore, the VMRC also established time of day restrictions on the setting and fishing of gill nets during the month of June after sunset and before sunrise.

The VMRC prohibited the harvest of any horseshoe crabs by dredge gear within the historic 1942 Virginia Blue Crab Sanctuary located in the main stem Chesapeake Bay, as a result of a study that indicated incidental mortality caused by dredge gear was occurring in this area.

V. Plan Specific Requirements

A. Monitoring Program Requirements

1. *Component A1 States are required to report monthly harvest (of any type) of horseshoe crabs.*

The highest landings in 2013 of horseshoe crabs, by month, were in April (57,088 horseshoe crabs, 38% of the total landings). The 2013 offshore landings (NMFS data) are not yet available. Most of the quota was landed by dredge, hand harvest, pound nets, trawl, and gill net gears. No landings were reported in February and March, and the fishery was closed to all gears by August 3, 2013.

2. *Component A2 States must monitor and report monthly and annual harvest of horseshoe crabs by biomedical facilities if horseshoe crabs are captured for biomedical use in that state.*

Wako Chemicals, located in Cape Charles, is the only biomedical horseshoe crab bleeding facility operating in Virginia. Wako currently uses horseshoe crabs from harvesters using special collection permits and from harvesters collecting horseshoe crabs for the bait market.

In 2012 the Wako Chemicals switched from using their facility in Chincoteague, Virginia to a new facility in Ocean City, Maryland. Because of the change in location the facility only bled 220 crabs from the bait market in 2013. This facility does not record sex of horseshoe crabs that have been bled from the bait market. All horseshoe crabs from the bait market were returned to the fishermen after they were bled and were included in the bait fishermen's harvest totals.

3. *Component A3 Identify spawning and nursery habitat if not yet completed.*

Identification of potential horseshoe crab spawning beaches began in 1999 and continued through 2002 as part of a study conducted by the Virginia Institute of Marine Science (VIMS) entitled "Chesapeake Bay Dune Systems: Evolution and Status." The focus of this study was to incorporate the habitat suitability index (HSI) developed in Delaware Bay (Brady and Shrading 1998) and to assess the beaches in the Chesapeake Bay, that are contiguous with coastal primary sand dunes.

Because of significant differences in sediment moisture and beach slope between the two spawning areas, the HSI developed for the Delaware Bay region was determined to not be applicable to beaches of the Chesapeake Bay region. Sediment moisture levels over 18% force the HSI to zero. Therefore, all beaches measured in this study would be determined unsuitable spawning habitat. High sediment moisture may be a factor that precludes the lower Chesapeake Bay from being an area of spawning activity similar to the documented levels in Delaware Bay.

This study was expanded, and sampling was completed in early 2003. The additional sampling focused on dune/beach complexes in Chesapeake Bay localities not previously sampled. The final report was presented to the

Coastal Resources Policy Team. The Policy Team recommended that no further action specific to horseshoe crabs was warranted. The Team did recommend additional protection of beach/dune complexes for localities that are non-jurisdictional. Such changes will require modification of Virginia code by the Virginia Legislature. For further information, contact the Department of Environmental Quality (DEQ) Coastal Programs or Lyle Varnell, at the Virginia Institute of Marine Science, Gloucester Point, VA.

B. Monitoring Program Recommendations

It is recommended that states implement the monitoring components outlined below. The Horseshoe Crab Technical and Stock Assessment Committees identified the components as valuable to the stock assessment and for understanding the importance of horseshoe crab eggs to migratory shorebird populations. Because state fiscal and human resources are limited, the following components are recommendations. However, states must report the information, if it is obtained.

1. *Monitoring of Horseshoe Crab Populations and Habitat*

- a. *Component B1 Continue expanding annual coastwide benthic trawl survey.*

The VIMS has conducted an extensive annual demersal trawl survey since 1955. Horseshoe crabs were inconsistently collected until 1999. In 1999, the VIMS began recording prosomal widths and sex for mature horseshoe crabs and continued this data recording through 2013. For the 2013 season, a total of 1,224 tows were evaluated and yielded 36 horseshoe crabs. The horseshoe crabs ranged in size from 123 to 335 mm and averaged 219 mm in the 2013 survey.

- b. *Component B2 Continue existing state benthic sampling programs.*

N/A

- c. *Component B3 Continue monitoring spawning populations.*

N/A

- d. *Component B4 Coordinated tagging program.*

Bio-Whittaker, Inc. initiated a tagging program for horseshoe crabs in 1999 and continued these efforts through the 2002 season. As of 2003, Bio-Whittaker no longer has a facility in Virginia.

2. *Joint Monitoring of Delaware Bay Horseshoe Crabs and Shorebirds*

- a. *Component B5 Continue existing state egg abundance surveys.*

N/A

- b. *Component B6 Continue existing state shorebird monitoring programs.*

N/A

VI. Law Enforcement Reporting Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing the jurisdiction's horseshoe crab regulations.

In 2013, a total of 322,264 inspections, requiring 94,146 hours, were conducted. Of these, 105 inspections, requiring 71.25 hours, involved horseshoe crabs. One summons was issued in 2013 related to horseshoe crab which resulted in a guilty ruling.

Table 1 Virginia's commercial landings of horseshoe crabs (number) harvested from state and federal waters, 1996 through 2013.

Year	Landings (number)	% of Quota Harvested East of the COLREGS (Area System 1)
1996	41,440	34.7
1997	24,179	42.6
1998	252,845	93.8
1999	651,992	96.0
2000	128,377	95.2
2001	59,686	69.5
2002	42,578	46.5
2003	102,184	78.2
2004	95,064	65.9
2005	87,599	64.6
2006	180,378	78.0
2007	89,903	15.3
2008	68,338	22.3
2009	187,546	64.6
2010	146,857	38.5
2011	121,650	33.6
2012	151,887	47.6
2013*	132,668	5.9

*2013 Offshore landings (NMFS data) are not yet available, in-state data for 2013 is preliminary

Table 2. Virginia's commercial landings of horseshoe crabs (numbers) by gear, 2013.

Gear	Total
By Hand	31,929
Dredge, Conch, Other	58,260
Gill Net, Sink/Anchor	8,866
Pound Net, Fish	33,613
Trawl, Otter, Bottom*	0
Total	132,668

*2013 Offshore landings (NMFS data) are not yet available, in-state data for 2013 is preliminary

Table 3. Virginia's commercial landings of horseshoe crabs (number), by sex, 1999 through 2013.

Year	Sex			Total
	Males	Females	Unknown	
1999	.	.	651,992	651,992
2000	.	.	128,377	128,377
2001	162	70	59,454	59,686
2002	987	1,364	40,227	42,578
2003	1,268	8,586	92,330	102,184
2004	6,092	33,927	55,045	95,064
2005	10,582	22,130	54,887	87,599
2006	67,719	88,800	23,859	180,378
2007	39,394	40,156	10,353	89,903
2008	29,915	23,559	14,864	68,338
2009	122,654	64,892	.	187,546
2010	88,160	55,208	3,489	146,857
2011	76,721	44,259	670	121,650
2012	71,363	80,506	18	151,887
2013*	50,082	82,586	.	132,668

*2013 Offshore landings (NMFS data) are not yet available, in-state data for 2013 is preliminary

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

VIRGINIA MARINE RESOURCES COMMISSION PERTAINING TO HORSESHOE CRAB CHAPTER 4VAC20-900-10 ET SEQ.

PREAMBLE

This chapter establishes licensing requirements and exemptions for the harvesting of horseshoe crabs. This chapter also establishes commercial fisheries management measures for horseshoe crabs, including an annual commercial quota, gear specific quotas, and monitoring requirements for horseshoe crabs, that comply with the provisions of the Interstate Fishery Management Plan for Horseshoe Crab.

This chapter is promulgated pursuant to the authority contained in § 28.2-201 of the Code of Virginia. This chapter amends and re-adopts, as amended, previous Chapter 4 VAC 20-900-10 et seq. which was promulgated April 23, 2013 and made effective on May 1, 2013. The effective date of this chapter, as amended, is August 1, 2013.

4VAC20-900-10. PURPOSE.

The purpose of this chapter is to establish commercial fisheries management measures and monitoring requirements in accordance with the Interstate Fishery Management Plan for Horseshoe Crab.

4VAC20-900-20. DEFINITION.

The following words or terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"COLREGS Line" means the COLREGS Demarcation Line, as defined in the Code of Federal Regulations (33 CFR 80.510 Chesapeake Bay Entrance, VA).

"Horseshoe crab" means any crab of the species *Limulus polyphemus*.

"Land" or "landing" means to enter port with horseshoe crabs on board any boat or vessel, to begin offloading horseshoe crabs, or to offload horseshoe crabs.

"Toms Cove Area" means all waters of Toms Cove and Little Toms Cove located east of a line from the western most point of Assateague Point to the western most point of Fishing Point and extending to the mean low water line of Assateague Island.

4VAC20-900-21. LICENSE REQUIREMENTS AND EXEMPTION.

- A. The taking by hand of as many as five horseshoe crabs in any one day for personal use only shall be exempt from the licensing requirements.

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

- B. Except as provided for in 4VAC20-900-25 G 3, it shall be unlawful for any boat or vessel to land horseshoe crabs in Virginia for commercial purposes without first obtaining either type of horseshoe crab endorsement license as described in this section. The horseshoe crab endorsement license shall be required of each boat or vessel used to land horseshoe crabs for commercial purposes. Possession of any quantity of horseshoe crabs that exceeds the limit described in subsection A of this section shall be presumed for commercial purposes. There shall be no fee for the license.
- C. To be eligible for an unrestricted horseshoe crab endorsement license, the boat or vessel shall have landed and sold at least 500 horseshoe crabs in Virginia in at least one year during the period 1998 through 2000.
 - 1. The owner shall complete an application for each boat or vessel by providing to the Marine Resources Commission a notarized and signed statement of applicant's name, address, and telephone number, and boat or vessel name and its registration or documentation number.
 - 2. The owner shall complete a notarized authorization to allow the Marine Resources Commission to obtain copies of landings data from the National Marine Fisheries Service.
- D. To be eligible for a restricted horseshoe crab endorsement license that is limited to using a crab dredge to harvest horseshoe crabs, a Virginia registered commercial fisherman's boat or vessel shall have landed at least 10,000 pounds of whelk in any one year from 2002 through 2005.
 - 1. The Virginia registered commercial fisherman shall complete an application for each boat or vessel by providing to the Marine Resources Commission a notarized and signed statement of applicant's name, address, and telephone number, and boat or vessel name and its registration or documentation number.
 - 2. The Virginia registered commercial fisherman shall complete a notarized authorization to allow the Marine Resources Commission to obtain copies of whelk landings data from the National Marine Fisheries Service.
- E. To be eligible for a horseshoe crab hand harvester permit, the individual shall have been issued a horseshoe crab hand harvester permit, prior to the license moratorium of May 1, 2011, and shall have documented on Virginia mandatory harvest reporting forms a minimum harvest of one horseshoe crab by hand harvest methods, at any time from 1993 through 2010.
- F. It shall be unlawful for any registered commercial fisherman or seafood landing licensee who does not possess any type of a valid horseshoe crab endorsement license or

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

horseshoe crab hand harvester permit to possess horseshoe crabs, without first obtaining a valid horseshoe crab bycatch permit from the Marine Resources Commission.

4VAC20-900-25. COMMERCIAL FISHERIES MANAGEMENT MEASURES.

- A. It shall be unlawful for any person to harvest horseshoe crabs from any shore or tidal waters of Virginia within 1,000 feet in any direction of the mean low water line from May 1 through June 7. The harvests of horseshoe crabs for biomedical use shall not be subject to this limitation.
- B. From January 1 through June 7 of each year, it shall be unlawful for any person to land, in Virginia, any horseshoe crab harvested from federal waters.
- C. Harvests for biomedical purposes shall require a special permit issued by the Commissioner of Marine Resources, and all crabs taken pursuant to such permit shall be returned to the same waters from which they were collected.
- D. The commercial quota of horseshoe crab for 2013 shall be 172,828 horseshoe crabs. Additional quantities of horseshoe crab may be transferred to Virginia by other jurisdictions, in accordance with the provisions of Addendum I to the Atlantic States Marine Fisheries Commission Fishery Management Plan for Horseshoe Crab, April 2000, provided that the combined total of the commercial quota and transfer from other jurisdictions shall not exceed 355,000 horseshoe crabs. It shall be unlawful for any person to harvest from Virginia waters, or to land in Virginia, any horseshoe crab for commercial purposes after any calendar-year commercial quota of horseshoe crab has been attained and announced as such.
- E. It shall be unlawful for any person to harvest or land horseshoe crabs during any calendar year from waters east of the COLREGS line by any gear after 81,331 male horseshoe crabs have been landed and announced as such, and the following provisions shall also apply:
 - 1. It shall be unlawful for any person to harvest or land any female horseshoe crabs from waters east of the COLREGS line.
 - 2. It shall be unlawful for any person to harvest or land any amount of horseshoe crabs from waters east of the COLREGS line by any gear, except trawl or dredge gear.
- F. For the purposes of this regulation, no horseshoe crab shall be considered a male horseshoe crab unless it possesses at least one modified, hook-like appendage as its first pair of walking legs.
- G. Limitations on the daily harvest and possession of horseshoe crabs for any vessel described below are as follows:

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

1. It shall be unlawful for any person who holds a valid unrestricted horseshoe crab endorsement license, as described in 4VAC20-900-21 C, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 2,500, except that when it is projected and announced that 80% of the commercial quota is taken, it shall be unlawful for any person who meets the requirements of 4VAC20-900-21 C and holds a valid horseshoe crab endorsement license to possess aboard any vessel in Virginia any number of horseshoe crabs in excess of 1,250.
2. It shall be unlawful for any person who holds a valid restricted horseshoe crab endorsement license, as described in 4VAC20-900-21 D, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 1,000, except that when it is projected and announced that 80% of the commercial quota is taken, it shall be unlawful for any person who meets the requirements of 4VAC20-900-21 D, and holds a valid horseshoe crab endorsement license to possess aboard any vessel in Virginia any number of horseshoe crabs in excess of 500. The harvest of horseshoe crabs, described in this subdivision, shall be restricted to using only crab dredge.
3. It shall be unlawful for a horseshoe crab bycatch permittee to possess aboard any vessel more than 500 horseshoe crabs or for any vessel to land any number of horseshoe crabs in excess of 500 per day except as described in subdivision 4 of this subsection. When it is projected and announced that 80% of the commercial quota is taken, it shall be unlawful for any person with a horseshoe crab bycatch permit to possess aboard any vessel more than 250 horseshoe crabs or for any vessel to land any number of horseshoe crabs in excess of 250 per day except as described in subdivision 4 of this subsection.
4. It shall be unlawful for any two horseshoe crab bycatch permittees fishing from the same boat or vessel to possess or land more than 1,000 horseshoe crabs per day. When it is projected and announced that 80% of the commercial quota is taken, it shall be unlawful for any two horseshoe crab bycatch permittees fishing from the same boat or vessel to possess or land more than 500 horseshoe crabs per day.
5. It shall be unlawful for any registered commercial fisherman or seafood landing licensee who does not possess a horseshoe crab endorsement license or a horseshoe crab bycatch permit to possess any horseshoe crabs.
6. It shall be unlawful for any person who possesses a horseshoe crab endorsement license or a horseshoe crab bycatch permit to harvest horseshoe crabs by gill net, except as described in this subdivision.
 - a. Horseshoe crabs shall only be harvested from a gill net, daily, after sunrise and before sunset.

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

4VAC20-900-30. (Repealed.)

4VAC20-900-35. MONITORING REQUIREMENTS.

- A. Any person harvesting or landing horseshoe crabs in Virginia shall report monthly on forms provided by the Marine Resources Commission all harvests of horseshoe crabs including, but not limited to, bait fisheries, bycatch, biomedical industry, and scientific and educational research harvests. Reporting requirements shall consist of numbers and pounds landed by sex, harvest method and harvest location.
- B. It shall be unlawful for a restricted or unrestricted horseshoe crab endorsement license holder to fail to contact the Marine Resources Operations Station prior to the vessel issued a horseshoe crab endorsement license offloading horseshoe crabs. The horseshoe crab endorsement license holder shall provide the Marine Resources Commission the name of the vessel and its captain and the anticipated or approximate offloading time and site. Following offloading, the horseshoe crab endorsement license holder shall contact the Marine Resources Operation Station and provide the total number of horseshoe crabs landed, gear type, and location of harvest.
- C. It shall be unlawful for any horseshoe crab bycatch permittee or horseshoe crab hand harvester permittee to fail to contact the Virginia Marine Resources Commission Interactive-Voice-Response (IVR) System within 24 hours of landing and provide his Commercial Fisherman Registration License number, and the time, date, number of horseshoe crabs landed, gear type, and location of harvest.
- D. It shall be unlawful for any person, firm or corporation to buy any horseshoe crabs from any lawful harvester on or after July 1, 2007, without first having obtained a Horseshoe Crab Buying Permit from the Marine Resources Commission. The permit application shall be completed in full by the licensed seafood buyer, and a copy of the permit shall be kept in possession of the licensed buyer while buying or possessing horseshoe crabs.
- E. Any licensed seafood buyer permitted to purchase horseshoe crabs shall provide written reports to the Marine Resources Commission of daily purchases and harvest information on forms provided by the Marine Resources Commission. Such information shall include the date of the purchase, the buyer's horseshoe crab permit number and harvester's Commercial Fisherman Registration License number, gear type used, water area fished, city or county of landing, and number of female horseshoe crabs and male horseshoe crabs purchased. These reports of any current weekly purchases shall be completed in full and submitted to the Marine Resources Commission no later than Thursday of the following week. In addition, once it has been projected and announced that 85% of the commercial quota of horseshoe crab has been landed or 69,131 of the commercial quota of horseshoe crab established for the horseshoe crab harvest east of the COLREGS Line has been landed each permitted buyer shall call the Marine Resources Commission's IVR on a daily basis to report his name and permit number, date, number of female horseshoe

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

crabs and number of male horseshoe crabs purchased, gear used and water area fished by the harvester.

- F. Persons harvesting horseshoe crabs for biomedical use and owners of facilities using horseshoe crabs for biomedical purposes shall monitor and report monthly to the Marine Resources Commission all harvests or purchases of horseshoe crabs and the percentage of mortality up to the point of release including that mortality which occurs during harvest, shipping, handling, and bleeding.
- G. Owners of biomedical facilities using horseshoe crabs shall participate in the tagging program of the Marine Resources Commission to evaluate the post-release mortality of horseshoe crabs.
- H. Monthly reports shall be due to the Marine Resources Commission no later than the fifth day of the following month.

4VAC20-900-36. QUOTA ALLOCATION.

- A. When it has been projected and announced that 40.348% of the commercial quota, as described in 4VAC20-900-25 D, has been landed by dredge gears, it shall be unlawful for any person to harvest or land horseshoe crabs caught by dredge gears.
- B. When it has been projected and announced that 12.488% of the commercial quota, as described in 4VAC20-900-25 D, has been landed by trawl gears, it shall be unlawful for any person to harvest or land horseshoe crabs caught by trawl gears.
- C. When it has been projected and announced that 22.095% of the commercial quota, as described in 4VAC20-900-25 D, has been landed by horseshoe crab hand harvester permittees, it shall be unlawful for any person to harvest or land horseshoe crabs caught by hand harvesting.
- D. When it has been projected and announced that 18.142% of the commercial quota, as described in 4VAC20-900-25 D, has been landed by pound nets, it shall be unlawful for any person to harvest or land horseshoe crabs caught by pound net.
- E. When it has been projected and announced that 6.927% of the commercial quota, as described in 4VAC20-900-25 D, has been landed by gears not described in subsections A through D of this section, it shall be unlawful for any person to harvest or land horseshoe crabs by gears not described in subsection A through D of this section.

4VAC20-900-37. LICENSE MORATORIUM

APPENDIX A.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that was in effect for the 2013 fishing year.

As of May 1, 2011, the issuance of commercial licenses or permits for horseshoe crab hand harvest, horseshoe crab bycatch, unrestricted horseshoe crab endorsement, and restricted horseshoe crab endorsement shall be prohibited except as described in this section. Only those registered commercial fisherman who have been determined by the Marine Resources Commission to have been issued a license or permit prior to May 1, 2011, for horseshoe crab hand harvest, horseshoe crab bycatch, unrestricted horseshoe crab endorsement, or restricted horseshoe crab endorsement shall be eligible to purchase that license or permit after May 1, 2011.

4VAC20-900-38. CONTROL DATE.

The Marine Resources Commission hereby establishes December 31, 2010, as the control date for management of all horseshoe crab licenses and fisheries in Virginia. Participation by any individual in a horseshoe crab fishery after the control date will not be considered in the calculation of horseshoe crabbing rights should further entry limitations be established. Any individual entering the horseshoe crab fishery after the control date will forfeit any right to future participation in the horseshoe crab fishery should further entry limitation be established.

4VAC20-900-39. PERMIT TRANSFERS.

The Commissioner or his designee may approve transfers of a horseshoe crab license or permit, as described in 4VAC20-900-21, to any individual who meets any of the following criteria:

1. Demonstrates a significant hardship on the basis of health and provides the commissioner documentation, by an attending physician, of the medical condition.
2. Demonstrates a significant hardship on the basis of a call to active military duty and provides the commissioner an explanation, in writing, and copy of the military orders for active duty.
3. Documents the death of an immediate family member currently eligible for a horseshoe crab license or permit and possesses a legal Commercial Fisherman Registration License.

4VAC20-900-40. (Repealed.)

4VAC20-900-45. REQUIREMENTS OF AUTHORIZED AGENTS.

- A. It shall be unlawful for any person to serve as an agent for a horseshoe crab hand harvest permittee.

APPENDIX A.

Copy of the Virginia Marine Resources Commission’s Chapter 4VAC-20-900-10 ET SEQ.
“Pertaining to Horseshoe Crabs” that was in effect for the 2013 fishing year.

- B. Any person serving as an agent to harvest horseshoe crabs for any lawfully licensed or permitted horseshoe crab fisherman, except as described in subsection A of this section, shall be limited to the use of only one registered commercial fisherman’s horseshoe crab license or permit.

4VAC20-900-50. PENALTY.

As set forth in § 28.2-903 of the Code of Virginia, any person violating any provision of this chapter shall be guilty of a Class 3 misdemeanor, and a second or subsequent violation of any provision of this chapter committed by the same person within twelve months of a prior violation is a Class 1 misdemeanor.

* * * * *

APPENDIX B.

Copy of the Virginia Marine Resources Commission's Chapter 4VAC-20-900-10 ET SEQ. "Pertaining to Horseshoe Crabs" that will be in effect for the 2014 fishing year.

VIRGINIA MARINE RESOURCES COMMISSION PERTAINING TO HORSESHOE CRAB CHAPTER 4VAC20-900-10 ET SEQ.

PREAMBLE

This chapter establishes licensing requirements and exemptions for the harvesting of horseshoe crabs. This chapter also establishes commercial fisheries management measures for horseshoe crabs, including an annual commercial quota, gear specific quotas, and monitoring requirements for horseshoe crabs, that comply with the provisions of the Interstate Fishery Management Plan for Horseshoe Crab.

This chapter is promulgated pursuant to the authority contained in § 28.2-201 of the Code of Virginia. This chapter amends and re-adopts, as amended, previous Chapter 4 VAC 20-900-10 et seq. which was promulgated July 23, 2013 and made effective on August 1, 2013. The effective date of this chapter, as amended, is January 1, 2014.

4VAC20-900-10. PURPOSE.

The purpose of this chapter is to establish commercial fisheries management measures and monitoring requirements in accordance with the Interstate Fishery Management Plan for Horseshoe Crab.

4VAC20-900-20. DEFINITION.

The following words or terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"COLREGS Line" means the COLREGS Demarcation Line, as defined in the Code of Federal Regulations (33 CFR 80.510 Chesapeake Bay Entrance, VA).

"Horseshoe crab" means any crab of the species *Limulus polyphemus*.

"Land" or "landing" means to enter port with horseshoe crabs on board any boat or vessel, to begin offloading horseshoe crabs, or to offload horseshoe crabs.

"Toms Cove Area" means all waters of Toms Cove and Little Toms Cove located east of a line from the western most point of Assateague Point to the western most point of Fishing Point and extending to the mean low water line of Assateague Island.

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4VAC20-900-21. PERMIT REQUIREMENTS AND EXEMPTION.

- A. The taking by hand of as many as five horseshoe crabs in any one day only for noncommercial use shall be exempt from the licensing requirements.
- B. It shall be unlawful for any individual to land horseshoe crabs in Virginia for commercial purposes without first obtaining a horseshoe crab permit as described in this section. A valid horseshoe crab permit shall be required of each individual to land horseshoe crabs for commercial purposes. Possession of any quantity of horseshoe crabs that exceeds the limit described in subsection A of this section shall be presumed for commercial purposes.
- C. It shall be unlawful for any individual to take, catch, possess, or land any horseshoe crab by trawl gear without first having obtained a Horseshoe Crab Trawl Permit. The Horseshoe Crab Trawl Permit shall only be issued to a Virginia registered commercial fisherman who was issued an unrestricted horseshoe crab endorsement license or horseshoe crab bycatch permit prior to the license moratorium of May 1, 2011, and meets either of the criteria in subdivision 1 or 2 of this subsection:
 - 1. Shall have documentation of a minimum harvest amount of one horseshoe crab at any time from January 1, 1993, through December 31, 2010, by trawl gear in the commission's mandatory harvest reporting system; or,
 - 2. Shall have documentation of a minimum harvest amount of one horseshoe crab at any time from January 1, 2004, through December 31, 2010, by trawl gear in the federal dealer reports to the Standard Atlantic Fisheries Information System.
- D. It shall be unlawful for any individual to take, catch, possess, or land any horseshoe crab by dredge gear without first having obtained either and only one of the following two available horseshoe crab dredge permits: a Horseshoe Crab Class A Dredge Permit or a Horseshoe Crab Class B Dredge Permit. The Horseshoe Crab Class A Dredge Permit shall only be issued to a Virginia registered commercial fisherman who was issued an unrestricted horseshoe crab endorsement license prior to the license moratorium of May 1, 2011, and meets either of the criteria in subdivision 1 or 2 of this subsection. The Horseshoe Crab Class B Dredge Permit shall only be issued to a Virginia registered commercial fisherman who was issued a restricted horseshoe crab endorsement license or

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a horseshoe crab bycatch permit prior to the license moratorium of May 1, 2011, and meets either of the criteria in subdivision 1 or 2 of this subsection.

1. Shall have documentation of a minimum harvest amount of one horseshoe crab at any time from January 1, 1993, through December 31, 2010, by dredge gear in the Commission's mandatory harvest reporting system; or,
 2. Shall have documentation of a minimum harvest amount of one horseshoe crab at any time from January 1, 2004, through December 31, 2010, by dredge gear in the federal dealer reports to the Standard Atlantic Fisheries Information System.
- E. It shall be unlawful for any individual to take, catch, possess, or land any horseshoe crab by hand harvest without first having obtained a Horseshoe Crab Hand Harvest Permit. The Horseshoe Crab Hand Harvest Permit shall only be issued to a Virginia registered commercial fisherman who was issued a horseshoe crab hand harvester permit prior to the license moratorium of May 1, 2011, and shall have documentation of a minimum harvest amount of one horseshoe crab at any time from January 1, 1993, through December 31, 2010, by hand harvest in the commission's mandatory harvest reporting system.
- F. It shall be unlawful for any individual to take, catch, possess, or land any horseshoe crab, by pound net, without first having obtained a Horseshoe Crab Pound Net Permit. The Horseshoe Crab Pound Net Permit shall only be issued to a Virginia registered commercial fisherman who was issued an unrestricted horseshoe crab endorsement license or horseshoe crab bycatch permit, prior to the license moratorium of May 1, 2011, and meets either of the criteria in subdivision 1 or 2 of this subsection:
1. Shall have documentation of a minimum harvest amount of one horseshoe crab, at any time, from January 1, 1993 through December 31, 2010, by pound net, in the Commission's mandatory harvest reporting system; or,
 2. Shall have documentation of a minimum harvest amount of one horseshoe crab, at any time, from January 1, 2004 through December 31, 2010, by pound net, in the federal dealer reports to the Standard Atlantic Fisheries Information System.

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- G. It shall be unlawful, for any individual, to take, catch, possess, or land any horseshoe crab by any method other than trawl, dredge, pound net or hand harvest, without first having obtained a Horseshoe Crab General Category Permit. The Horseshoe Crab General Category Permit shall only be issued to a Virginia registered commercial fisherman who was issued an unrestricted horseshoe crab endorsement license or horseshoe crab bycatch permit, prior to the license moratorium of May 1, 2011.

4VAC20-900-25. COMMERCIAL FISHERIES MANAGEMENT MEASURES.

- A. It shall be unlawful for any individual to harvest horseshoe crabs from any shore or tidal waters of Virginia within 1,000 feet in any direction of the mean low water line from May 1 through June 7. The harvests of horseshoe crabs for biomedical use shall not be subject to this limitation.
- B. From January 1 through June 7 of each year, it shall be unlawful for any individual to land, in Virginia, any horseshoe crab harvested from federal waters.
- C. Harvests for biomedical purposes shall require a special permit issued by the Commissioner of Marine Resources, and all crabs taken pursuant to such permit shall be returned to the same waters from which they were collected.
- D. The commercial quota of horseshoe crab for 2014 shall be 172,828 horseshoe crabs. Additional quantities of horseshoe crab may be transferred to Virginia by other jurisdictions, in accordance with the provisions of Addendum I to the Atlantic States Marine Fisheries Commission Fishery Management Plan for Horseshoe Crab, April 2000, provided that the combined total of the commercial quota and transfer from other jurisdictions shall not exceed 355,000 horseshoe crabs. It shall be unlawful for any individual to harvest from Virginia waters, or to land in Virginia, any horseshoe crab for commercial purposes after any calendar-year commercial quota of horseshoe crab has been attained and announced as such.
 - 1. The horseshoe crab commercial trawl gear quota is equal to 12.488% of the commercial quota of horseshoe crabs, described in this subsection, or 21,583 horseshoe crabs.
 - 2. The horseshoe crab commercial dredge gear quota is equal to 40.348% of the commercial quota of horseshoe crabs, described in this subsection, or 69,733 horseshoe crabs.

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3. The horseshoe crab commercial hand harvest quota is equal to 22.095% of the commercial quota of horseshoe crabs, described in this subsection, or 38,186 horseshoe crabs.
 4. The horseshoe crab commercial pound net quota is equal to 18.142% of the commercial quota of horseshoe crabs, described in this subsection, or 31,354 horseshoe crabs.
 5. The horseshoe crab commercial general category quota is equal to 6.927% of the commercial quota of horseshoe crabs, described in this subsection, or 11,972 horseshoe crabs.
- E. It shall be unlawful for any individual to harvest or land horseshoe crabs during any calendar year from waters east of the COLREGS line by any gear after 81,331 male horseshoe crabs have been landed and announced as such, and the following provisions shall also apply:
1. It shall be unlawful for any individual to harvest or land any female horseshoe crabs from waters east of the COLREGS line.
 2. It shall be unlawful for any individual to harvest or land any amount of horseshoe crabs from waters east of the COLREGS line by any gear, except trawl or dredge gear.
 3. It shall be unlawful for any valid Horseshoe Crab Trawl Permittee or Horseshoe Crab Class A Dredge Permittee to take, catch, possess, or land more than 1,250 male horseshoe crabs, from waters east of the COLREGS line, when it is projected and announced that 65,065 male horseshoe crabs have been landed from waters east of the COLREGS line.
 4. It shall be unlawful for any valid Horseshoe Crab Class B Dredge Permittee to take, catch, possess, or land more than 500 male horseshoe crabs, from waters east of the COLREGS line, when it is projected and announced that 65,065 male horseshoe crabs have been landed from waters east of the COLREGS line.
- F. For the purposes of this regulation, no horseshoe crab shall be considered a male horseshoe crab unless it possesses at least one modified, hook-like appendage as its first pair of walking legs.
- G. Limitations on the daily harvest and possession of horseshoe crabs for any vessel described below are as follows:

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1. It shall be unlawful for any valid Horseshoe Crab Trawl Permittee, as described in 4VAC20-900-21 C, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 2,500, per day. When it is projected and announced that 80% of the horseshoe crab commercial trawl gear quota ~~is~~ has been taken, it shall be unlawful for any valid Horseshoe Crab Trawl Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 1,250, per day. When it is projected and announced that 100% of the horseshoe crab commercial trawl quota is taken, it shall be unlawful for any valid Horseshoe Crab Trawl Permittee to possess or land any horseshoe crab taken by trawl gear.
2. It shall be unlawful for any valid Horseshoe Crab Class A Dredge Permittee, as described in 4VAC20-900-21 D, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 2,500, per day. When it is projected and announced that 80% of the horseshoe crab commercial dredge gear quota has been taken, it shall be unlawful for any valid Horseshoe Crab Class A Dredge Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 1,250, per day. When it is projected and announced that 100% of the horseshoe crab commercial dredge gear quota has been taken, it shall be unlawful for any valid Horseshoe Crab Class A Dredge Permittee to possess or land any horseshoe crab taken by dredge gear.
3. It shall be unlawful for any valid Horseshoe Crab Class B Dredge Permittee, as described in 4VAC20-900-21 D, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 1,000, per day. When it is projected and announced that 80% of the horseshoe crab commercial dredge gear quota ~~is~~ has been taken, it shall be unlawful for any valid Horseshoe Crab Class B Dredge Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 500, per day. When it is projected and announced that 100% of the horseshoe crab commercial dredge gear quota has been taken, it shall be unlawful for any valid Horseshoe Crab Class B Dredge Permittee to possess or land any horseshoe crab taken by dredge gear.
4. It shall be unlawful for any valid Horseshoe Crab Hand Harvest Permittee, as described in 4VAC20-900-21 E, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 500, per day. When it is projected and announced that 80% of the horseshoe crab commercial hand harvest quota has been taken, it shall be unlawful for any valid Horseshoe Crab Hand Harvest Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 250, per day. When it is projected and announced that 100% of the horseshoe crab commercial hand harvest quota has been taken, it shall be unlawful for any valid Horseshoe Crab Hand Harvest Permittee to possess or land any horseshoe crab taken by hand.

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5. It shall be unlawful for any valid Horseshoe Crab Pound Net Permittee, as described in 4VAC20-900-21 F, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 500, per day. When it is projected and announced that 80% of the horseshoe crab commercial pound net quota has been taken, it shall be unlawful for any valid Horseshoe Crab Pound Net Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 250, per day. When it is projected and announced that 100% of the horseshoe crab commercial pound net quota has been taken, it shall be unlawful for any valid Horseshoe Crab Pound Net Permittee to possess or land any horseshoe crab taken by pound net.
6. It shall be unlawful for any valid Horseshoe Crab General Category Permittee, as described in 4VAC20-900-21 G, to possess aboard any vessel or to land any number of horseshoe crabs in excess of 250, per day. When it is projected and announced that 80% of the horseshoe crab commercial general category quota has been taken, it shall be unlawful for any valid Horseshoe Crab General Category Permittee to possess aboard any vessel or to land any number of horseshoe crabs in excess of 125, per day. When it is projected and announced that 100% of the horseshoe crab commercial general category quota has been taken, it shall be unlawful for any valid Horseshoe Crab General Category Permittee to possess or land any horseshoe crab taken by gear other than trawl, dredge, pound net, or by hand.
7. It shall be unlawful for any two valid Horseshoe Crab Hand Harvest Permittees, when fishing from the same boat or vessel, to possess or land more than 1,000 horseshoe crabs per day. When it is projected and announced that 80% of the horseshoe crab commercial hand harvest quota ~~is~~ has been taken, it shall be unlawful for any two valid Horseshoe Crab Hand Harvest Permittees fishing from the same boat or vessel to possess or land more than 500 horseshoe crabs per day.
8. It shall be unlawful for any valid Horseshoe Crab General Category Permittee to harvest horseshoe crabs by gill net, except as described in this subdivision.
 - a. Horseshoe crabs shall only be harvested from a gill net, daily, after sunrise and before sunset.
 - b. It shall be unlawful for any individual to harvest or possess horseshoe crabs taken by any gill net that has a stretched mesh measure equal to or greater than six inches, unless the twine size of that gill net is equal to or greater than 0.81 millimeters in diameter (0.031 inches), and that individual possesses his own valid commercial striped bass permit or his own Black Drum Harvesting and Selling Permit, as well as either a horseshoe crab endorsement license or horseshoe crab bycatch permit.

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- H. From April 1 through June 30, in the Toms Cove Area, it shall be unlawful for any individual to place, set, or fish any gill net, except as described in this subsection.
1. From April 1 through May 31, any gill net licensed as over 600 feet and up to 1,200 feet in length, shall have at least one anchored end 800 feet from the mean low water line.
 2. From June 1 through June 30, it shall be unlawful to place, set, or fish any gill net after sunset or before sunrise.
- I. It shall be unlawful for any valid Horseshoe Crab Trawl Permittee, Horseshoe Crab Class A Dredge Permittee, or Horseshoe Crab Class B Dredge Permittee to offload any horseshoe crabs between the hours of 10 p.m. and 7 a.m.

4VAC20-900-26. COMMERCIAL GEAR RESTRICTED AREA.

It shall be unlawful for any person to harvest any horseshoe crabs by dredge gear within Virginia Blue Crab Sanctuary Area 2 as described in 4VAC20-752-20. The Virginia Blue Crab Sanctuary Area 2 consists of all tidal waters of the Chesapeake Bay that are bounded by a line beginning at the mean low water line of Willoughby Spit at its intersection with the center line of the Hampton Roads Bridge Tunnel facility, Latitude 36° 58.0456514' N., Longitude 76° 17.8459721' W.; thence in a northwesterly direction to a point 200 feet offshore of mean low water, Latitude 36° 58.0637717' N., Longitude 76° 17.8812821' W.; thence and following a line in a general easterly direction, said line being 200 feet offshore of the mean low water line, to a point on Ocean View Fishing Pier (formerly Harrison's Fishing Pier), Latitude 36° 57.6985477' N., Longitude 76° 15.5855211' W.; thence northeasterly to Thimble Shoal Light, Latitude 37° 00.8708333' N., Longitude 76° 14.3970000' W.; thence northeasterly to Cape Charles Lighthouse, Latitude 37° 07.3743333' N., Longitude 75° 54.3898333' W.; thence southwesterly along the COLREGS Line to its intersection with the mean low water line of Cape Henry, Latitude 36° 55.6885268' N., Longitude 76° 00.3772955' W.; thence, in a general westerly direction, following the mean low water line of the Chesapeake Bay, crossing the mouth of the Lynnhaven River along the north side of the Lesner Bridge and the Mouth of Little Creek at the offshore ends of the stone breakwaters and continuing along said mean low water line to a point at its intersection with the center line of the Hampton Roads Bridge Tunnel facility, said point being the point of beginning.

4VAC20-900-30. (Repealed.)

4VAC20-900-35. MONITORING REQUIREMENTS.

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- A. Any individual harvesting or landing horseshoe crabs in Virginia shall report monthly on forms provided by the Marine Resources Commission all harvests of horseshoe crabs including, but not limited to, bait fisheries, bycatch, biomedical industry, and scientific and educational research harvests. Reporting requirements shall consist of numbers and pounds landed by sex, harvest method and harvest location.
- B. It shall be unlawful for any valid Horseshoe Crab Trawl Permittee, Horseshoe Crab Class A Dredge Permittee, or Horseshoe Crab Class B Dredge Permittee to fail to contact the Marine Resources Operations Station prior to offloading horseshoe crabs. The horseshoe crab permittee shall provide the Marine Resources Commission the name of the vessel and its captain and the anticipated or approximate offloading time and site. Following offloading, the horseshoe crab permittee shall contact the Marine Resources Operation Station and provide the total number of horseshoe crabs landed, gear type, and location of harvest.
- C. It shall be unlawful for any valid Horseshoe Crab Pound Net Permittee, Horseshoe Crab Hand Harvest Permittee, or Horseshoe Crab General Category Permittee to fail to contact the Virginia Marine Resources Commission Interactive-Voice-Response (IVR) System within 24 hours of landing and provide his Commercial Fisherman Registration License number, and the time, date, number of horseshoe crabs landed, gear type, and location of harvest.
- D. It shall be unlawful for any individual, firm or corporation to buy any horseshoe crabs from any lawful harvester on or after July 1, 2007, without first having obtained a Horseshoe Crab Buying Permit from the Marine Resources Commission. The permit application shall be completed in full by the licensed seafood buyer, and a copy of the permit shall be kept in possession of the licensed buyer while buying or possessing horseshoe crabs.
- E. Any licensed seafood buyer permitted to purchase horseshoe crabs shall provide written reports to the Marine Resources Commission of daily purchases and harvest information on forms provided by the Marine Resources Commission. Such information shall include the date of the purchase, the buyer's horseshoe crab permit number and harvester's Commercial Fisherman Registration License number, gear type used, water area fished, city or county of landing, and number of female horseshoe crabs and male horseshoe crabs purchased. These reports of any current weekly purchases shall be completed in full and submitted to the Marine Resources Commission no later than Thursday of the following week. In addition, once it has been projected and announced 65,065 male horseshoe crabs have been landed from waters east of the COLREGS Line each permitted buyer shall call the Marine Resources Commission's IVR on a daily basis to report his name and permit number, date, number of female horseshoe crabs and number of male horseshoe crabs purchased, gear used and water area fished by the harvester.
- F. Individuals harvesting horseshoe crabs for biomedical use and owners of facilities using horseshoe crabs for biomedical purposes shall monitor and report monthly to the Marine

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Resources Commission all harvests or purchases of horseshoe crabs and the percentage of mortality up to the point of release including that mortality which occurs during harvest, shipping, handling, and bleeding.

- G. Owners of biomedical facilities using horseshoe crabs shall participate in the tagging program of the Marine Resources Commission to evaluate the post-release mortality of horseshoe crabs.
- H. Monthly reports shall be due to the Marine Resources Commission no later than the fifth day of the following month.

4VAC20-900-36. (Repealed.)

4VAC20-900-37. LICENSE MORATORIUM

As of May 1, 2011, the issuance of commercial licenses or permits for horseshoe crab hand harvest, horseshoe crab bycatch, unrestricted horseshoe crab endorsement, and restricted horseshoe crab endorsement shall be prohibited except as described in this section. Only those registered commercial fisherman who have been determined by the Marine Resources Commission to have been issued a license or permit prior to May 1, 2011, for horseshoe crab hand harvest, horseshoe crab bycatch, unrestricted horseshoe crab endorsement, or restricted horseshoe crab endorsement shall be eligible to purchase that license or permit after May 1, 2011.

4VAC20-900-38. CONTROL DATE.

The Marine Resources Commission hereby establishes December 31, 2010, as the control date for management of all horseshoe crab licenses and fisheries in Virginia. Participation by any individual in a horseshoe crab fishery after the control date will not be considered in the calculation of horseshoe crabbing rights should further entry limitations be established. Any individual entering the horseshoe crab fishery after the control date will forfeit any right to future participation in the horseshoe crab fishery should further entry limitation be established.

4VAC20-900-39. PERMIT TRANSFERS.

- A. The Commissioner or his designee may approve transfers of a horseshoe crab permit, as described in 4VAC20-900-21, to any individual who meets any of the following criteria:
 - 1. Demonstrates a significant hardship on the basis of health and provides the commissioner documentation, by an attending physician, of the medical condition.

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- 2. Demonstrates a significant hardship on the basis of a call to active military duty and provides the commissioner an explanation, in writing, and copy of the military orders for active duty.
 - 3. Documents the death of an immediate family member currently eligible for a horseshoe crab license or permit and possesses a legal Commercial Fisherman Registration License.
- B. The documented harvest history of a former horseshoe crab licensee or permittee, in the Commission’s mandatory harvest reporting system, whose horseshoe crab license or permit has been transferred in accordance with subsection A of this section, from May 1, 2011 through December 10, 2013, shall be considered when determining permit requirements of any individual receiving the transferred license or permit.

4VAC20-900-40. (Repealed.)

4VAC20-900-45. REQUIREMENTS OF AUTHORIZED AGENTS.

- A. It shall be unlawful for any individual to serve as an agent for a horseshoe crab hand harvest permittee.
- B. Any individual serving as an agent to harvest horseshoe crabs for any lawfully licensed or permitted horseshoe crab fisherman, except as described in subsection A of this section, shall be limited to the use of only one registered commercial fisherman’s horseshoe crab license or permit.

4VAC20-900-50. PENALTY.

As set forth in § 28.2-903 of the Code of Virginia, any individual violating any provision of this chapter shall be guilty of a Class 3 misdemeanor, and a second or subsequent violation of any provision of this chapter committed by the same individual within twelve months of a prior violation is a Class 1 misdemeanor.

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2/27/2014

North Carolina Annual Compliance Report for the Horseshoe Crab Plan Review Team

North Carolina Department of Environment and
Natural Resources

North Carolina Division of Marine Fisheries
P.O. Box 769
Morehead City, NC
28557



February 2014

I. Introduction

Horseshoe crab landings in North Carolina are taken as incidental catch in multiple fisheries. All landings estimates in 2013 are preliminary at this time. Gears listed for this report are from the first instance on the trip ticket and may not be exactly to the gear used to harvest horseshoe crabs if more than one gear is indicated for the trip. A total of 97% of the preliminary landings for 2013 occurred in estuarine waters, caught as bycatch from estuarine gill nets (66%) and pound nets (21%)(Table 1). Other fisheries harvesting horseshoe crabs in estuarine waters included: by hand, crab pots, crab trawls, and shrimp trawls (less than 12% combined). The three ocean fisheries landing horseshoe crabs included ocean gill nets, conch pot, and beach seines (less than 6% combined).

Table 1. North Carolina horseshoe crab landings (numbers) and trips by gear for 2013⁺. Data provided by the NCDMF Trip Ticket Program.

Gear	Number of horseshoe crabs	Number of trips with horseshoe crabs	Percent number	Percent trips
Beach Seine			<1%	<1%
By Hand			<1%	<1%
Conch Pot			<1%	<1%
Crab Pot	507	44	2%	3%
Crab Trawl		<75*	<10%	<4%
Estuarine gill net	17,447	1,255	66%	76%
Ocean gill net	430	73	2%	4%
Pound Net	5,493	157	21%	10%
Shrimp Trawl			<1%	<4%
Total	26,559	1,651	100%	100%

⁺ 2013 landings preliminary, final numbers available in April 2014.

II. Request for *de Minimis*

North Carolina does not request *de minimis* status in the horseshoe crab fishery for 2014.

III. Previous Calendar Year's Fishery and Management Program

a. ASMFC Quota

Preliminary total landings in 2013 were 26,559 horseshoe crabs through August (Table 1 and Figure 1). The rule authority prior to April 2011, allowed the Fisheries Director to either open or close the fishery, and if open, a daily trip limit of 500 horseshoe crabs per trip was in place. The rule underwent revision, to broaden the proclamation authority on horseshoe crabs which was not finalized until April 2011. The Fisheries Director now has more flexibility to maintain the annual harvest quota with other management measures besides just opening with a 500 daily harvest limit or closing to harvest. This broadening of the proclamation authority provides more flexibility to stay in compliance with the ASMFC FMP because it now includes seasons, areas,

quantity, mean and methods, and size limits that can be implemented within 48 hours.

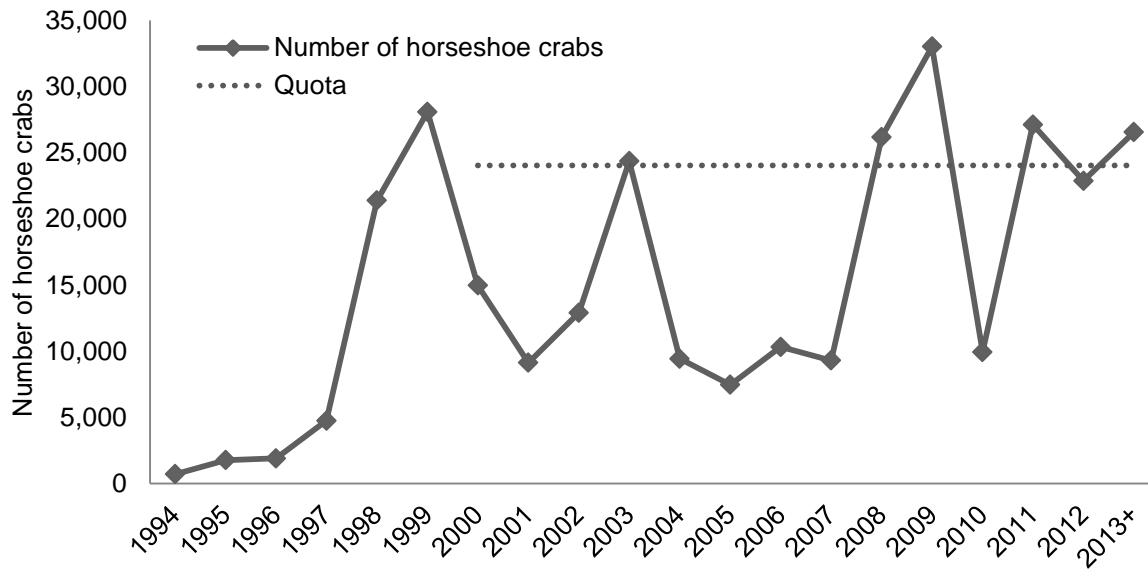


Figure 1. North Carolina annual horseshoe crab landings (numbers, 1994-2013⁺), including the harvest quota starting in 2000. ⁺ Landings for 2013 are preliminary at this time

The North Carolina Trip Ticket Program captures all seafood harvested and sold within North Carolina but there is at least a two-month time delay for the verification process to accurately capture this information. In 2013, the harvest season was opened on January 23, 2013 (Proclamation M-1-2013) and closed on August 1, 2013 (Proclamation M-22-2013) because landings through July, but verified only through April, showed 84% of the quota was taken. Once the landings caught up further in the verification process it was determined in September that North Carolina did exceed the quota of 24,036 crabs established in Addendum I (ASMFC 2000).

The intent of the development of Addendum II to the ASMFC Interstate Fishery Management Plan for Horseshoe Crabs was to provide an opportunity to better address the bait needs of whelk and eel pot fishermen without impacting horseshoe crab populations or its competing uses (ASMFC 2001). Addendum II of the ASMFC Interstate Fishery Management Plan for Horseshoe Crabs indicates that quota transfers are allowed between states so long as the transfer is based on a biologically responsible basis. To be biologically responsible the quota transfer should occur within a population and must be predicated on stock delineation and estimates of stock size. Horseshoe crabs found in North Carolina are considered a small subpopulation in the southeast. From past quota overages (2008, 2009, and 2011) and transfers the ASMFC Horseshoe Crab Technical Committee recommended the closest state for a transfer would come from Georgia.

A quota transfer for 3,000 horseshoe crabs for the overage in 2013 is agreeable between Georgia and North Carolina, and ASMFC staff was notified to distribute the transfer request to the Board, Plan Review Team, Horseshoe Crab Technical Committee, and Advisory Panels in November 2013. The Horseshoe Crab Management Board approved the transfer at their meeting in February 2014.

b. Additional Restrictions to Bait Harvest and Landings

The data verification time lag will likely continue to be an issue for horseshoe crabs in North Carolina because the majority of the trips (75%, based on 2013 preliminary landings) land 25 horseshoe crabs or less and occur year round. Horseshoe crab landings will continue to be monitored through the trip ticket program, and monthly updates will be provided to the lead biologist to keep up with the harvest. The fishery in 2014 will be closed on May 31, 2014 to allow time to verify the landings before determining whether to continue harvest, dependent what remains of the annual quota. The Fisheries Director of the NCDMF will continue to have proclamation authority to adjust management measures within 48 hours.

c. Required Monitoring

i. Component A₁ – Monthly monitoring and characterize the commercial bait fishery

Fishery dependent monitoring

Bait pound net fishery (Program 431)

The bait pound net fishery is a very small multispecies fishery to provide bait for the crab pot fishery. In the past decade the bait pound net fishery has become very minor and fishermen set only a few pounds at a time. This fishery occurs from May through October and only occurs in a few areas along the Outer Banks of Dare and Hyde counties (Ross and Moye 1989). The primary species traditionally targeted by this fishery are Atlantic croaker (*Micropogonias undulatus*), menhaden (*Brevoortia tyrannus*), spot (*Leiostomus xanthurus*), weakfish (*Cynoscion regalis*), and butterfish (*Preprilus triacanthus*). The nets are made of nylon and dipped in copper solution each year to prevent fouling and extend the use of the nets. Most leads are 300 to 500 yards in length with pounds between 30 to 40 feet/side and the tunnel 18 to 21 feet in length. Stakes are usually made of gum or pine and replaced each year. Mesh sizes for the leads are usually 6 inches stretched mesh, 2 inches stretched mesh in the tunnel and heart, and 1 ¾ inch stretched mesh in the pound (Ross and Moye 1989). Thirty horseshoe crabs were measured in the bait pound net fishery in 2013.

Estuarine flounder gill net fishery (Program 461)

Another North Carolina fishery that has a incidental catch component of horseshoe crabs is the estuarine gill net fishery. This fishery is a year round multispecies fishery comprised of set gill nets, runaround gill nets, and drift gill nets in inside waters. Horseshoe crabs are taken in large mesh sink gill nets, a type of set gill net used to target flounder (*Paralichthys* sp.) in the fall. The lengths of these gill nets vary from 300 to 2,000 yards in Albemarle and Roanoke Sounds and from 800 to 2,000 yards in Pamlico Sound. Soak times for gill nets in most areas are from sunset to sunrise.

Sea turtle strandings in the southeastern portion of Pamlico Sound increased significantly in November 1999. Deep-water large mesh gill nets were suspected of being responsible for most of the strandings. The National Marine Fisheries Service (NMFS) issued an emergency rule closing that portion of Pamlico Sound to the use of gill nets larger than five-inch stretch mesh to protect endangered and threatened sea turtles. In 2000, the NCDMF required permits for all fishermen who participated in this fishery and allowed them to set a maximum of 2,000 yd

of large ($\geq 5 \frac{1}{2}$ inch stretch) mesh gill net in what is now known as the Pamlico Sound Gill Net Restricted Area (PSGNRA). This restriction represented a 37% reduction in the amount of gill net set by fishermen in this area.

This past year, NCDMF closed multiple areas of internal coastal waters in the summer and fall to reduce interactions with sea turtles. These areas and closures included all areas of Pamlico Sound from July 24 through September 30, 2013 and all waters south of the Highway 58 Bridge from July 14 through September 30, 2013. Additionally, there is an annual closure in lower Core Sound from May 8 through October 14 for large mesh gill nets. Stricter regulations were also imposed on North Carolina's inshore large mesh gill net fishery on May 15, 2010 for all internal waters except in the Albemarle and Currituck sounds under a lawsuit settlement agreement between the state and the Karen Beasley Sea Turtle Rescue and Rehabilitation Center. The measures were further relaxed for large mesh gill nets in the Albemarle Sound and the Neuse, Bay, and Pamlico rivers on September 12, 2011 through the settlement agreement. As part of the agreement, the NCDMF observed large mesh gill net fishing in inshore waters to track interactions with sea turtles. Due to turtle interactions, some areas in the state were closed to gill nets throughout different times of the year. A total of 93 horseshoe crabs were measured from estuarine gill nets in 2013.

Protected species bycatch monitoring (Program 466)

NCDMF has conducted annual at-sea observer monitoring of commercial large (> 5 inch stretch) and small (< 5 inch stretch) gill nets throughout the Pamlico Sound from September to December since 2000. In addition, NCDMF established a comprehensive commercial observer program throughout all estuarine waters of North Carolina in 2004. This program concluded in December 2006, but data collections resumed later in 2007 and continued in 2008.

In 2002, NMFS reviewed NCDMF monitoring data and chose to issue a final rule that would implement the Pamlico Sound large mesh ($> 4 \frac{1}{4}$ inch) gill net closure each year from September 1 through December 15 (67 FR 56,931, September 6, 2002). NCDMF has applied for and received Section 10 Incidental Take Permits (ITPs, ESA 1973) since 2001. The ITP authorizes a set number of sea turtle takes each year and requires a comprehensive Habitat Conservation Plan designed to maintain protection of endangered and threatened species, and allow a limited, shallow water gill net fishery throughout Pamlico Sound. This area is referred to as the PSGNRA, and requires all participants to obtain a state PSGNRA permit.

The PSGNRA permit established mandatory observer coverage for the estuarine large mesh gill net fishery. Permit holders were required to allow NCDMF fishery observers aboard their vessels to monitor catches. Failure to comply with this permit provision resulted in permit suspension. Observer coverage was proportionally allocated based on the 2000 and 2001 PSGNRA trip distribution among ports. The goal of the at-sea observer program was to provide 10% coverage of both the large and small mesh gill net fisheries from September 1 through December 15. As part of a lawsuit settlement agreement NCDMF expanded at-sea observation of gill net fishing in inshore waters to track interactions with sea turtles in 2010. The PSGNRA now falls under the provisions of the new statewide Sea Turtle Incidental Take Permit with the same area closures and fishing areas as before.

For each of these monitoring programs, observers counted, measured, and weighed all species aboard or discarded back to sea during operations. Observers were trained (in conjunction with NMFS) to identify, measure, resuscitate, and tag sea turtles. Date, time, tag numbers, location

(latitude and longitude, when possible), condition (i.e. no apparent harm, injury including a description of the nature of the injury, or mortality), species, sex (if determinable), and curved carapace length were recorded for each turtle observed. Dead sea turtles were brought to shore when feasible. All live, debilitated sea turtles were brought to shore for examination and treatment. Carcasses not brought in for post-mortem examinations were marked with external flipper tags or spray-painted before disposal overboard.

Observers collected data on location, gear parameters, catch, and bycatch for each haul. The landed catch was sampled throughout each trip and total flounder weights were obtained. Horseshoe crabs were encountered (n=695) but not measured in all the at-sea monitoring programs in 2013.

Ocean gill net fishery (Program 434)

The ocean gill net fishery is a multi-species gill net fishery that harvests fish in the ocean off North Carolina from October through May, with effort shifting depending on species availability and markets. The primary species traditionally targeted by this fishery are bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), Atlantic croaker, and weakfish. Effort was directed toward spiny dogfish (*Squalus acanthias*) and monkfish (*Lophius americanus*) in the 1990s, but this effort was significantly reduced because of regulations (MAFMC and NEFMC 1998; NEFMC and MAFMC 1998; ASMFC 2002; Department of Commerce (DOC) 1998; and DOC 2002).

“Traditional” sink nets are heavily weighted monofilament gill nets designed to fish just above the bottom and anchors are not generally employed, as vessels remain in the general vicinity while the nets are fishing, and the nets are retrieved at the end of the day (Ross and Moye 1989). Most nets are 12 to 15 feet deep. Large buoys or “high flyers” are attached to both ends of the net by enough line to allow the net to sink freely.

The small mesh anchored gill net fishery uses 2½ to 3 inch stretched mesh gill nets that are left overnight and fished daily for a variety of species including kingfishes (*Menticirrhus* sp.), weakfish, butterfish, spot, bluefish and Spanish mackerel (*Scomberomorus maculatus*). Small mesh anchored gill net fishing historically occurred southwest of Morehead City to the South Carolina border, but effort has increased from Oregon Inlet to Ocracoke Inlet. Anchored gill net catches differ from sink net catches in that they are not as common, the catch composition is more diverse and fishing typically occurs during the earliest and latest months of the traditional sink net season. Net sizes most prevalent in the fishery are 2½ to 3 inch stretched mesh for spot and kingfishes, 2 7/8- 3½ inch stretched mesh for weakfish and medium bluefish, 4 to 4³/₈ inch stretched mesh for Atlantic croaker, and 4½ to 6 inch stretched mesh for large bluefish and weakfish.

The monkfish fishery uses large mesh gill nets that are predominantly 12 inch stretched mesh from Currituck Beach to Wimble Shoals. Vessels targeting monkfish historically fished from offshore Oregon Inlet to offshore Currituck Beach in depths up to 70 m. However large mesh gill net restrictions in federal waters restricted fishing to near shore waters from March 15 to April 15 in depths from 15 m to 20 m (DOC 2002). These restrictions have resulted in significant decreases in monkfish landings. Five horseshoe crabs were counted and combined in weight for two trips in the ocean gill net fishery in 2013.

Commercial landings 2013

The North Carolina Trip Ticket Program has mandatory trip level reporting of all commercial fishing trips by water body and gear. The Trip Ticket Program was designed to collect all commercial fishing trips through the licensing of seafood dealers and commercial fishermen. Seafood dealers are required by NC law to report individual trip landings of all fish and shellfish (including horseshoe crabs) made by commercial fishermen with commercial fishing licenses. Dealers are required to buy seafood only from licensed fishermen. The dealer reports each trip on individual trip tickets provided by the NCDMF. Data provided on each trip ticket include amount landed by species, gear type, water body, and date landed. NCDMF also follows a strict confidentiality policy regarding individual dealer and fisherman landings information. Therefore, NCDMF does not release any data summaries that involve less than three dealers and/or fishermen. In addition to data collected on trip tickets, value data are collected from dealers on a voluntary basis (Watterson 1999).

NCDMF requires trip tickets to be submitted by the 10th of the month following the landing of the fish. Once trip tickets are submitted, they are screened for quality control, and entered into a master database. Edits are then run to identify potential errors. Data are then available by the 10th of the month following submittal by the dealer. This is the reason for a two-month lag time in availability of landing data. The quantity and quality of trip tickets being reported also affects the availability of the data creating times when complete monthly data are not available within those two months after submittal of tickets from dealers (Watterson 1999).

Preliminary total landings in 2013 were 26,559 horseshoe crabs (Table 1). Horseshoe crab landings in North Carolina have remained well below the harvest quota nine of fourteen years since its inception in 2000 (Figure 1). There were an unexpectedly large amount of horseshoe crabs landed in the Pamlico Sound blue crab trawl fishery, causing North Carolina to exceed the harvest cap in 2003, 2008, 2009, and 2011 when the trip limit could only be set at 500 horseshoe crabs per trip. In 2013, half the landings occurred in one month (May) from 585 trips (35% total trips for the year). Quota transfers for the overages were completed with Georgia in 2008, 2009, 2011, and 2013.

Horseshoe crabs were landed February through May in less than 75 trips from blue crab trawls, which accounted for less than ten percent of the total harvest in 2013 (Table 1).

Horseshoe crabs were landed in 5% of the total estuarine gill net trips in 2013 in the preliminary landings (Table 2). The estuarine gill net fishery harvested the most horseshoe crabs, representing 66% (n=17,467) of the total horseshoe crab harvest in 2013 (Table 1). Horseshoe crabs landings were highest during the months of May and June from the estuarine gill net fishery (Table 2).

Table 2. Total number of trips and horseshoe crabs from estuarine gill nets (2010-2013⁺). Data provided by the NCDMF Trip Ticket Program.

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Year	Month	Total number of trips	Number of trips with horseshoe crabs	Number of horseshoe crabs	
2010	3	3,977			
	4	3,190	74	1,173	
	5	1,572	84	1,731	
	6	1,785	121	1,105	
	7	1,600			
	8	2,187	14	46	
	9	2,929	27	254	
	10	4,138	30	157	
	11	2,243			
	2011	3	2,499		
		4	2,326	67	765
5		1,924	204	4,001	
6		1,984	228	2,628	
7		2,021	105	905	
8		1,997	13	108	
2012	4	1,901	123	1234	
	5	1,929	277	4793	
	6	2,479	420	5256	
	7	1,825	171	1872	
	8	3,168	147	959	
2013 ⁺	9	3,405			
	2	1,355			
	3	2,520			
	4	2,961	147	1,088	
	5	2,424	411	8,575	
	6	2,338	364	5,343	
	7	2,856	320	2,379	
	8	2,630			
	9	2,984			
	10	3,847			
	11	2,060			
	12	575			

⁺ 2013 landings preliminary, final numbers available in April 2014.

Horseshoe crabs caught in bait pound nets accounted for 21% of the overall preliminary landings for horseshoe crabs in 2013 (Table 1). The majority of the horseshoe crabs were caught in May and June in bait pound nets (Table 3).

Table 3. Total number of trips and horseshoe crabs from bait pound nets (2010-2013⁺). Data provided by the NCDMF Trip Ticket Program.

Year	Month	Total number of trips	Number of trips with horseshoe crabs	Number of horseshoe crabs
2010	5	131		
	6	159		
	7	128		
	10	643		
2011	5	143	55	2,183
	6	213	58	1,756
	7	150	23	301
	8	77		
2012	4	224	23	540
	5	173	80	2,396
	6	209	95	2,898
	7	185	60	1,315
	8	93	25	588
2013 ⁺	4	94		
	5	104	62	2,359
	6	131	58	2,197
	7	103	35	874

⁺ 2013 landings preliminary, final numbers available in April 2014.

Horseshoe crab catches in the ocean gill net fishery represented four percent of the total horseshoe crab preliminary harvest in 2013 (Table 1). Horseshoe crabs were landed from January through July in ocean gill nets (Table 4).

Table 4. Total number of trips and horseshoe crabs from ocean gill nets (2010-2013⁺). Data provided by the NCDMF Trip Ticket Program.

Year	Month	Total number of trips	Number of trips with horseshoe crabs	Number of horseshoe crabs
2010	4	478		
	5	251		
2011	4	433		
	6	131		
	7	115		
2012	4	358		
	5	259	17	138
	6	176		
	7	92		
2013 ⁺	8	236		
	1	635		
	2	412		
	3	588		
	4	410	8	26
	5	291	37	324
	6	127	10	33
7	127	9	34	

⁺ 2013 landings preliminary, final numbers available in April 2014.

Recreational and non-harvest

No data available.

ii. Component A₂ – Biomedical harvest reporting and required information

North Carolina has implemented a horseshoe crab biomedical use permit. The North Carolina Marine Fisheries Commission (NCMFC) adopted this permit and the temporary rules governing the permit on February 18, 2000. This rule became permanent April 1, 2001. No biomedical permits were issued in 2013.

No data have been collected on the post-release mortality in the biomedical industry since no biomedical permits have been issued in North Carolina for several years, although a permit tracking mechanism does exist in North Carolina rules.

iii. Component A₃ - Potential horseshoe crab spawning and nursery habitat

Very little information is currently available on horseshoe crab spawning and nursery habitat in North Carolina. NCDMF Marine Patrol officers, U.S. Park Service rangers, N.C. Aquariums personnel, Rachael Carson Estuarine Reserve personnel and commercial fishermen suggest that the sound side of the Outer Banks from Portsmouth Island to Cape Lookout may be spawning habitat (Table 5).

Table 5. Horseshoe crab habitat in North Carolina.

Area	Spawning	Nursery
Masonboro Island	Yes	?
Rachael Carson Reserve	Yes	Yes
Shackleford Banks	Yes	Yes
Core Banks	Yes	?
Portsmouth Island	Yes	?

The Northeast Fisheries Science Center bottom trawl surveys conducted from 1975 through 1983 found horseshoe crabs on the edge of the continental shelf, off Cape Hatteras at depths to 290 m (Botton and Ropes 1987). The North Carolina Aquarium at Fort Fisher and the Rachael Carson Estuarine Research Reserve in Beaufort, NC conducted a volunteer horseshoe crab spawning area survey program from 2002 to 2004. The aquarium adopted a program modeled after Connecticut's volunteer program. The research reserve set up a sampling program based on sampling protocol developed by United States Geodetic Survey. Both surveys were discontinued in 2004 because of very few horseshoe crabs recorded.

The North Carolina Division of Coastal Management reviews all coastal development permits submitted to the North Carolina Coastal Resources Commission and comments on those that may have a negative effect on fishery habitat as well as on individual species such as horseshoe crabs. A Coastal Habitat Protection Plan (CHPP) was finalized in 2005 and has identified gaps in the protection provided for important habitats in North Carolina. The CHPP focuses on the activities regulated by three agencies within the state. The CHPP identifies threats to habitats and makes recommendations to address those threats, and will improve coordination among the agencies, which will include individual species and their specialized habitat needs. The CHPP was updated in 2010.

d. Recommended Monitoring

i. Component B₁ – Coastwide benthic trawl survey

North Carolina does not have a coastwide benthic trawl survey, but plans to continue existing localized benthic fishery independent programs in internal waters (Component B₂).

ii. Component B₂ – Continue existing benthic sampling programs

Fishery independent monitoring

Pamlico Sound survey (Program 195)

The Pamlico Sound survey is conducted during the second and third weeks of June and September aboard the R/V Carolina Coast, a 13.4-m double-rigged trawler. Two 9.1-meter mongoose trawls with 60.9 cm by 71.1-cm doors, 22.2 mm bar mesh body, and 19.1 mm bar mesh codends are towed for 20 minutes (2.5 knots) at 50 to 53 randomly selected one-minute grids. There are seven strata based on depth and location, identified as: the Neuse, Pungo, and Pamlico Rivers, Pamlico Sound west (shallow (<3.7 m) and deep (≥3.7 m)) and Pamlico Sound east (shallow and deep). Each stratum has a minimum of three stations towed in each season. Horseshoe crabs captured in this trawl survey are weighed, the prosomal width measured to the nearest mm, and sex identified. One horseshoe crab was caught in 2013.

Fishery independent assessment gill net survey (Program 915)

The fishery independent assessment was initiated on March 2001 with field sampling beginning in May 2001 in the Pamlico Sound region only. Sampling was expanded in 2003 to include the Pamlico, Pungo, and Neuse rivers. Floating gill nets are used to sample shallow water strata (depths ≤ 1.8 m) while sink nets are fished in deep strata (depths >1.8 m). Each net gang consists of 9.1 m segments of 76.2 mm, 88.9 mm, 101.6 mm, 114.3 mm, 127.0 mm, 139.7 mm, 152.4 mm, and 165.1 mm stretched mesh, for a total of 146.3 m of nets combined. Nets are deployed parallel or perpendicular to the shore based on the strata and common fishing techniques for the area. Soak times and set times vary with soak times not exceeding 12 hours. A stratified random sampling design is used. There are eight main sampling areas in Pamlico Sound and eight main sampling areas in the rivers delineated into shallow and deep strata using bathymetric data from NOAA navigational charts. Two random samples (one shallow and one deep) are completed in each area every other week. The average prosomal widths and weights by sex for each month from February through November 2013 are listed below (Table 6). A total of 254 horseshoe crabs were measured in this survey.

Table 6. Monthly average prosomal width (mm) and average weight (kg) of male and female horseshoe crabs collected from the fishery independent assessment gill net survey (February to December 2013). Data provided from the NCDMF Biological Database.

Month	Sex	n	Prosomal		Average weight (kg)	Average weight (lb)	Weight range (kg)
			Average prosomal width (mm)	width range (mm)			
February	Female	2	214	205-223	-	-	N/A
March	Female	6	290	212-334	-	-	N/A
	Male	4	221	218-230	-	-	N/A
April	Female	13	259	143-320	2.6	1.2	0.4-3.9
	Male	35	212	187-238	1.0	0.5	0.7-1.6
May	Female	44	266	151-337	2.6	1.2	0.4-4.6
	Male	38	208	166-240	1.0	0.4	0.5-1.73
June	Female	22	266	136-346	2.6	1.2	0.4-5.6
	Male	18	204	170-232	1.0	0.4	0.6-1.5
July	Female	22	281	187-324	2.8	1.3	0.8-4.1
	Male	21	216	177-299	1.1	0.5	0.6-1.7
August	Female	2	276	272-280	2.7	1.2	2.6-2.8
	Male	3	217	204-232	1.1	0.5	0.9-1.2
September	Female	6	267	190-298	2.6	1.2	1.8-3.4
	Male	8	197	148-248	0.8	0.4	0.4-1.7
October	Female	5	250	159-321	2.5	1.1	0.5-4.7
	Male	1	215	-	0.8	0.4	-
November	Female	2	148	138-157	0.3	0.1	0.3-0.4
	Male	2	187	177-196	0.7	0.3	0.6-0.8

North Carolina does not plan to implement a horseshoe crab spawning survey or a horseshoe crab tagging program at this time.

iv. Component B₄ – Coordinated tagging program

North Carolina does not plan to implement a horseshoe crab tagging program at this time.

v. Component B₅ – Egg abundance survey

This does not apply to North Carolina. Restrictions on harvest of horseshoe crabs from the Delaware Bay region, the epicenter of horseshoe crab production along the coast, has been the prime area of focus in regards to the impacts to egg availability to shorebird migratory productivity.

vi. Component B₆ – Shorebird monitoring program

Whether North Carolina is considered a critical stopover area for migratory shorebirds including the red knot is undetermined

e. Regulations in Effect in 2013

North Carolina Fisheries Rules for Coastal Waters:

15A NCAC 030.0503 PERMIT CONDITIONS; SPECIFIC

(a) Horseshoe Crab Biomedical Use Permit:

- (1) It is unlawful to use horseshoe crabs for biomedical purposes without first obtaining a permit.
- (2) It is unlawful for persons who have been issued a Horseshoe Crab Biomedical Use Permit to fail to submit a report on the use of horseshoe crabs to the Division of Marine Fisheries due on February 1 of each year unless otherwise specified on the permit. Such reports shall be filed on forms provided by the Division and shall include a monthly account of the number of crabs harvested, statement of percent mortality up to the point of release, and a certification that harvested horseshoe crabs are solely used by the biomedical facility and not for other purposes.
- (3) It is unlawful for persons who have been issued a Horseshoe Crab Biomedical Use Permit to fail to comply with the Atlantic States Marine Fisheries Commission Horseshoe Crab Fisheries Management Plan monitoring and tagging requirements for horseshoe crabs. Copies of this plan are available from the Atlantic States Marine Fisheries Commission, 1444 Eye Street, NW, 6th Floor, Washington, DC 20005, (202) 289-6400, or the Division of Marine Fisheries' Morehead City Office.

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(g) Scientific or Educational Collection Permit:

- (1) It is unlawful for individuals or agencies seeking exemptions from license, rule, proclamation or statutory requirements to collect for scientific or educational purposes as approved by the Division of Marine Fisheries any marine and estuarine species without first securing a Scientific or Educational Collection Permit.
- (2) It is unlawful for persons who have been issued a Scientific or Educational Collection Permit to fail to submit a report on collections to the Division of Marine Fisheries due on December 1 of each year unless otherwise specified on the

- permit. Such reports shall be filed on forms provided by the Division. Scientific or Educational Collection Permits shall be issued on a calendar year basis.
- (3) It is unlawful to sell marine and estuarine species taken under a Scientific or Educational Collection Permit:
 - (A) without the required license(s) for such sale;
 - (B) to anyone other than a licensed North Carolina fish dealer; and
 - (C) without authorization stated on the permit for such sale.
 - (4) It is unlawful to fail to provide the Division of Marine Fisheries a listing of all designees who shall be acting under Scientific or Educational Collection Permits at the time of application.
 - (5) The permittee or designees utilizing the permit must call or fax the Division of Marine Fisheries Communications Center not later than 24 hours prior to use of the permit, specifying activities and location.

History Note: Authority G.S. 113-134; 113-169.1; 113-169.3; 113-182; 143B-289.52; Temporary Adoption Eff. May 1, 2000; Eff. April 1, 2001; Amended Eff. September 1, 2005.

15A NCAC 03L .0207 HORSESHOE CRABS

- (a) The annual (January through December) commercial quota for North Carolina for horseshoe crabs is established by the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab.
- (b) The Fisheries Director may, by proclamation, impose any or all of the following restrictions on the taking of horseshoe crabs to maintain compliance with the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab:
 - (1) Specify season;
 - (2) Specify areas;
 - (3) Specify quantity;
 - (4) Specify means and methods; and
 - (5) Specify size.
- (c) Horseshoe crabs taken for biomedical use under a Horseshoe Crab Biomedical Use Permit are subject to this Rule.

History Note: Authority G.S. 113-134; 113-182; 113-221.1; 143B-289.52; Temporary Adoption Eff. August 1, 2000; Codifier determined that findings did not meet criteria for temporary rule on October 31, 2000; Temporary Adoption Eff. December 6, 2000; Eff. August 1, 2002; Amended Eff. April 1, 2011.

By proclamation the daily trip limit for the bycatch fisheries was set at 50 horseshoe crabs per day January 23, 2013 (proclamation M-1-2013: <http://portal.ncdenr.org/web/mf/proclamation-M-01-2013>) and closed on August 1, 2013 (proclamation M-22-2013: <http://portal.ncdenr.org/web/mf/proclamation-m-22-2013>).

f. Additional Monitoring Programs

North Carolina developed a scientific or educational collecting permit as well as permit conditions

and procedures in 2001. This scientific or educational collection permit specifies that the number of horseshoe crabs taken monthly be reported to the NCDMF on an annual basis. The Marine Fisheries Commission approved the scientific and educational collection permit in rule April 1, 2001. Seventy-one scientific and educational collection permits were issued in 2013. Seven permits confirmed the take of 218 horseshoe crabs. All horseshoe crabs were released alive.

g. Law Enforcement Capabilities or Concerns

NCDMF law enforcement officer have the capabilities to maintain the limits set into rules and proclamations specific to horseshoe crabs within state waters.

IV. Planned Management Programs for 2014

Rule changes that began on April 1, 2011 have broadened the Fisheries Director's proclamation authority of the NCDMF to provide more flexibility to stay in compliance with the ASMFC FMP. Horseshoe crab landings will continue to be monitored through the trip ticket program, and monthly updates will be provided to the lead biologist to keep up with the harvest. For 2014, the Director will open the bycatch fishery on January 1 through May 31, 2014 and then allow some time for verification of the landings to determine if a short re-opening period should occur or continue to keep harvest closed for the remainder of the year. The Fisheries Director of the NCDMF will continue to have proclamation authority to adjust management measures within 48 hours. The harvest season was opened January 1, 2014 with a daily trip limit of 50 horseshoe crabs.

a. North Carolina Regulations for Horseshoe Crabs

15A NCAC 03L .0207 HORSESHOE CRABS

(a) The annual (January through December) commercial quota for North Carolina for horseshoe crabs is established by the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab.

(b) The Fisheries Director may, by proclamation, impose any or all of the following restrictions on the taking of horseshoe crabs to maintain compliance with the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Horseshoe Crab:

- (1) Specify season;
- (2) Specify areas;
- (3) Specify quantity;
- (4) Specify means and methods; and
- (5) Specify size.

(c) Horseshoe crabs taken for biomedical use under a Horseshoe Crab Biomedical Use Permit are subject to this Rule.

*History Note: Authority G.S. 113-134; 113-182; 113-221.1; 143B-289.52;
Temporary Adoption Eff. August 1, 2000;
Codifier determined that findings did not meet criteria for temporary rule on
October 31, 2000;
Temporary Adoption Eff. December 6, 2000;
Eff. August 1, 2002;
Amended Eff. April 1, 2011.*

All other rules pertaining to the Scientific Collection and Biomedical Use permits are the same

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as shown in Section III.e.

b. Monitoring Programs

All monitoring programs will be maintained in 2014 as reported in Section III.

c. Highlighted Changes from Previous Year

No changes from previous year.

d. Sufficiency of Law Enforcement Capabilities

NCDMF law enforcement officer have the capabilities to maintain the limits set into rules and proclamations specific to horseshoe crabs within state waters.

V. Literature Cited

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South Carolina
Horseshoe Crab Fishery and Management Program
Compliance Report for the Year 2013



DNR

March 1, 2014

Prepared by: Brad Floyd, Larry DeLancey and Amy Fowler PhD
Marine Resources Division

I. Introduction

South Carolina's management program to conserve and protect horseshoe crabs (HSC), *Limulus polyphemus*, began in the late 1980's. In 1991 state law (Code of Laws of South Carolina, Title 50, Chapter 5, Article and Section 1330) stopped the commercial harvest of HSC for bait use in South Carolina. The South Carolina Department of Natural Resource's Marine Resources Division (MRD) issues permits which are required to collect or possess live HSC for commercial, educational, or private purposes. All HSC landed in South Carolina waters by licensed commercial saltwater fishermen are hand harvested and utilized exclusively for *Limulus* Amebocyte Lysate (LAL) production. Not only are those utilized returned promptly to state waters, but any taken incidentally during other commercial fishing operations must be released immediately without further harm. By law, only five HSC per permit can be taken for research and science instruction; consequently, extremely small numbers have been sacrificed for these purposes since 1991.

The MRD's Office of Fisheries Management (OFM) monitors annual processing of horseshoe crabs by the sole biomedical facility presently operating in state, Charles River Endosafe (CRE) of Charleston. This facility has only three contracted and permitted suppliers who coordinate, receive, and deliver the crabs harvested by individuals permitted to hand harvest from the wild; consequently, constraints in both Federal and South Carolina law prohibit the harvest information provided below from being made public except when required by order of a court of competent jurisdiction.

II. Request for *de minimis*

According to Addendum 1 to the Horseshoe Crab Fishery Management Plan, a state may apply for *de minimis* status if for the last two years the combined average commercial landings (by numbers) constitute less than one percent of coastwide commercial landings for the same two year period. Since South Carolina has no commercial harvest of HSC for purposes other than the biomedical use in LAL production, *de minimis* status is requested for the South Carolina HSC fishery.

III. 2011 Fishery and Management Program

The ASMFC management plan requires that HSC used commercially be characterized yearly. OFM sampled at CRE seven times from April to June of 2013. After cleaning and preparation for bleeding, randomly selected individuals were measured and weighed. Females averaged 305.9 mm prosoma width and 3.48 kg total weight (N=175) (Table 1). Males averaged 241.0 mm prosoma width and 1.44 kg total weight (N=175) (Table 1). These averages are very similar to previous years. The SCDNR/MRD's Crustacean Monitoring Section (CMS) continues to collect fishery independent data on HSC in year-round trawl surveys. Females in 2013 averaged 281.9 (± 35.01) mm prosoma width and 2.68 (± 0.96) kg total weight (N=29), while males averaged 236.8 (± 16.67) mm prosoma width and 1.22 (± 0.23) kg total weight (N=33). Juveniles averaged 116.7 (± 67.89) mm prosoma width and 0.26 (± 0.12) kg total weight (N=3).

Catch per tow in the trawl survey was similar to other recent years and did exceed 2012, the lowest observed in the survey (Figure 1). In this survey, a few large collections skew the CPUE to a higher number. If large collections are not made in a given year, the CPUE will be lower, as has been the case in the last four years. We assume the lower

CPUE taken recently does not reflect lower abundance of HSC. The interim ASMFC stock assessment completed in 2012 indicated an increasing trend in HSC abundance along the southeast coast, while no trend was observed for South Carolina. The Southeast Area Monitoring and Assessment Program – South Atlantic (SEAMAP-SA) Coastal Survey funded by the NMFS and conducted by the SCDNR-MRD reported that although the density of horseshoe crabs declined somewhat in 2012-13 from the highest level observed in 2011; the recent densities still represent a high level for the coastal survey (Appendix A).

The commercial hand harvest by the three business entities who supply CRE had 24 permitted participants in 2013. As before, no commercial trawl permits were issued because CRE refuses to accept animals caught by trawls due to the overall extent of injury. This year permits were issued for educational purposes to 20 schools (Appendix B), Ripley's Aquarium, and South Carolina Aquarium.

IV. Planned Management Programs

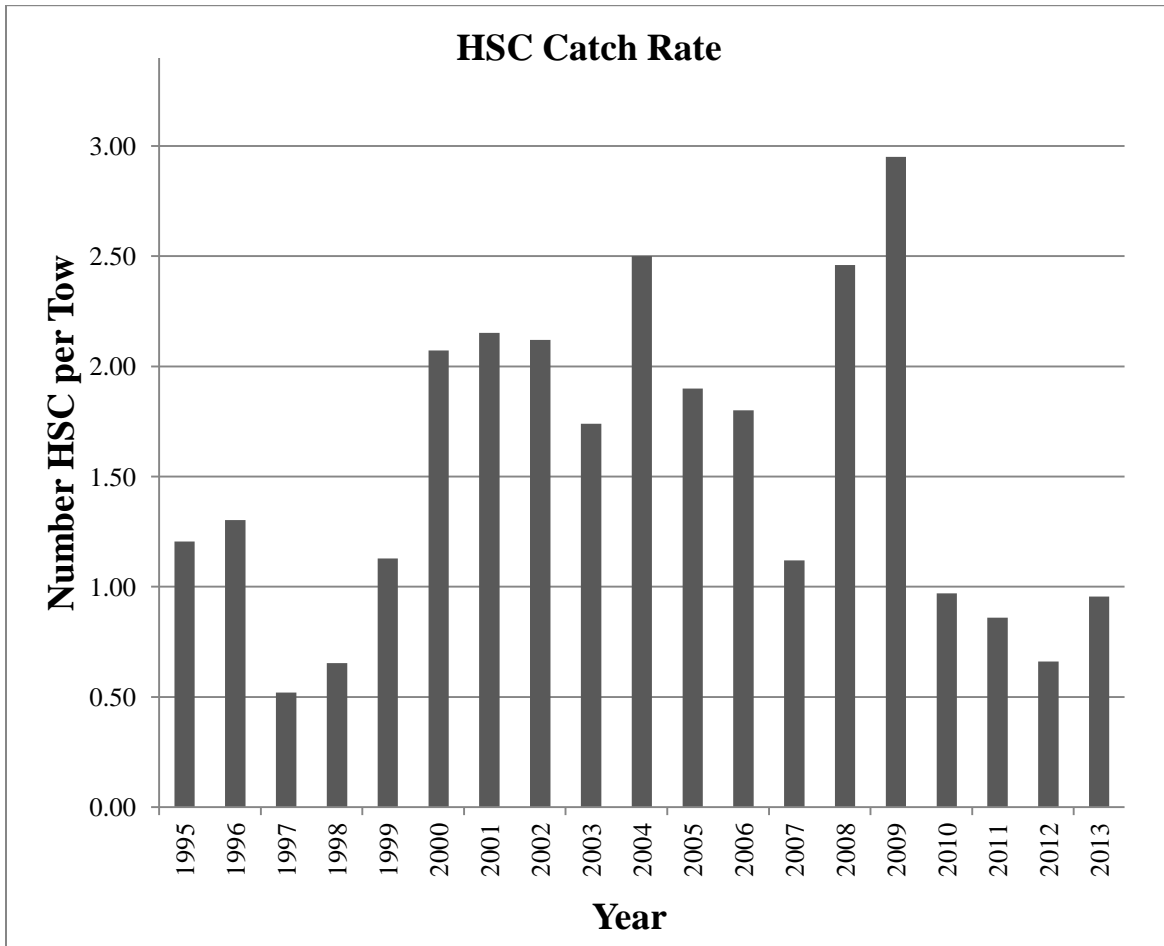
There are no plans to modify the existing state law as it pertains to the horseshoe crab fishery. Permitting will continue to be necessary for any collecting and reporting requirements for those permitted commercial fishermen are mandatory. MRD will continue to collect prosomal width, weight, and sex data on horseshoe crabs caught in both the CMS trawl survey of estuaries and the OFM fishery dependent survey. Trawl data has been collected in five estuaries since 1995 and biomedical facility data from 6,430 crabs since 2000.

V. Plan Specific Requirements

Table 1. Summary of prosoma width (PW), weight, and sex data recorded from subsamples of horseshoe crabs delivered to Charles River Lab in Charleston, SC between April and June 2013.

All Data									
PW									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	272.2444	37.24355	1.962908	266	250	205	365	360	7
M	241.0114	15.30419	1.156888	241	250	205	280	175	7
F	305.8743	19.90339	1.504555	305	302	255	365	175	7
Wt. kg									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	2.432778	1.134018	0.059768	1.9	1.5	0.9	5.3	360	7
M	1.443429	0.258087	0.01951	1.4	1.5	0.9	2.2	175	7
F	3.484	0.647698	0.048961	3.5	3.5	2	5.3	175	7
April Data									
PW									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	272.28	36.58094	5.173326	255	241	216	334	50	1
M	239.12	10.15021	2.030041	241	241	216	255	25	1
F	305.44	18.39176	3.678351	305	302	255	334	25	1
Wt. kg									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	2.51	1.208009	0.170838	2.15	1.5	1	4.5	50	1
M	1.392	0.189121	0.037824	1.4	1.5	1	1.8	25	1
F	3.628	0.582752	0.11655	3.7	3.8	2.5	4.5	25	1
May Data									
PW									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	272.4179	37.71769	2.660401	270	250	205	365	201	4
M	239.19	15.7382	1.57382	239	250	205	270	100	4
F	305.3168	20.06935	1.996974	305	314	256	365	101	4
Wt. kg									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	2.452736	1.135211	0.080072	2.3	1.5	1	5.3	201	4
M	1.432	0.256188	0.025619	1.4	1.5	1	1.9	100	4
F	3.463366	0.662529	0.065924	3.5	3.5	2.3	5.3	101	4
June Data									
PW									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	276.1111	35.96112	3.614228	276	302	208	355	99	2
M	245.6	15.8346	2.239351	243	235	208	280	50	2
F	307.2449	20.61809	2.945441	308	302	255	355	49	2
Wt. kg									
Sex	Mean	StDev	SE	Median	Mode	Min	Max	Count	Days Sampled
All	2.462626	1.104498	0.111006	2.2	1.4	0.9	5.1	99	2
M	1.492	0.287026	0.040592	1.5	1.4	0.9	2.2	50	2
F	3.453061	0.650993	0.092999	3.3	3.3	2	5.1	49	2

Figure 1. SCDNR-MRD Crustacean Monitoring section horseshoe crab catch rate from trawl survey. Sampling changes beginning in 2002 required standardized rates.



Appendix A. SEAMAP-SA Coastal Survey horseshoe crab results from trawling efforts 2013 report (report available upon request).

Distribution and Abundance of Horseshoe Crabs

Limulus polyphemus

A total of 723 Horseshoe Crabs, *Limulus polyphemus*, (CV= 3.3; 0.7 individuals/ha) weighing 1,712.5 kg (1.6 kg/ha) were collected by the SEAMAP-SA Coastal Survey in 2013. The density of horseshoe crabs decreased for the second year in a row, yet remains well above the mean estimated annual density of 0.2 individuals/ha (figure 71). The highest densities were recorded in spring, and in waters off Georgia (Table 38). Prosoma width ranged from 11.3 cm to 35.8 cm, with a mean of 26.3 cm.

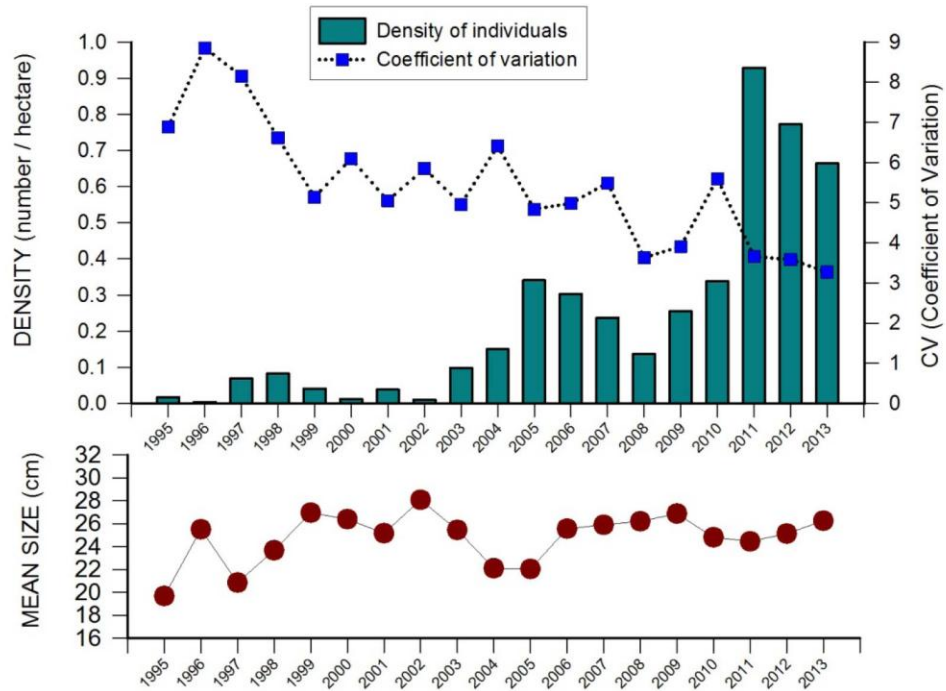


Figure 71. Annual density, variability, and mean size of *Limulus polyphemus*

Table 38. Estimates of density (number of individuals/hectare) in 2013.

	<i>Limulus polyphemus</i>			Region
	Spring	Summer	Fall	
Raleigh Bay	0.0	0.0	0.0	0.0
Onslow Bay	0.9	0.1	0.02	0.3
Long Bay	0.9	0.0	0.4	0.4
South Carolina	0.7	0.1	0.2	0.3
Georgia	4.1	0.2	1.1	1.8
Florida	0.1	0.6	0.1	0.3
Season	1.5	0.2	0.4	0.7

Appendix B. South Carolina schools issued permits to possess HSC for educational purposes.

Crabs in the Classroom 2012-13 Teacher List

Last Name	First Name	School	Address
Beasley	Robin	Beaufort-Jasper Academy for Career Excellence	81 Lowcountry Drive Ridgeland, SC 29936
Dee	Susan	H E McCracken Middle School	250 HE McCracken Circle Bluffton, SC 299210
Geib	Laura	Hilton Head Middle School	55 Wilborn Road Hilton Head Island, SC 29926
Ginn	Raven	Beaufort-Jasper Academy for Career Excellence	81 Lowcountry Drive Ridgeland, SC 29936
Johnson	Aracely	Beaufort Elementary School/AMES	1800 Prince Street Beaufort, SC 29902
Rhoden	Meredith	Beaufort Middle School	2501 Mossy Oaks Road Beaufort, SC 29902
Westphal	Lynn	Bluffton Middle School	30 New Mustang Drive Bluffton, SC 29910
Burke	Elizabeth	M C Riley Elementary School	200 Burnt Church Road Bluffton, SC 29910
Hey	Donna	Robert Smalls Middle School	43 W.K. Alston Drive Beaufort, SC 29906
Hummel	Jennifer	M C Riley Elementary School	200 Burnt Church Road Bluffton, SC 29910
Carlton	Lisa	Joseph Shanklin Elementary School	121 Morrall Drive Beaufort, SC 29906
Holloway	Betsy	RiverView Charter School	81 Savannah Highway Beaufort, SC 29902
Moore	Donna	RiverView Charter School	81 Savannah Highway Beaufort, SC 29902
Goodman	Helen	Okatie Elementary School	53 Cherry Point Road Bluffton, SC 29909
Beck	Colleen	DESC	2900 Mink Point Boulevard Bluffton, SC 29902
Bausher	Kelly	Hilton Head Island Elementary School	30 School Road Hilton Head Island, SC 29926
Tressler	Amy	Coastal Discovery Museum	70 Honey Horn Drive Hilton Head Island, SC 29926
Silver	Barbara	Bluffton Middle School	30 New Mustang Drive Bluffton, SC 29910
Taylor	Angela	Hilton Head Preparatory School	8 Foxgrape Road Hilton Head Island, SC 29928
Wipper	Kathy	MC Riley Early Childhood Center	172 Burnt Church Road Bluffton, SC 29910

ATLANTIC STATES MARINE FISHERIES COMMISSION
Horseshoe Crab Compliance Report for Georgia

I. Introduction

The following is the State of Georgia's compliance report for horseshoe crabs (HSC's) for calendar year 2013. There were no changes in monitoring, regulations, or harvest as compared to 2012 during the reporting period.

II. Request for *de minimis*, where applicable.

- a. Landings of HSC's in Georgia for the 2013 calendar year totaled 5,745 individuals and represent less than 1% of the coastwide bait landings. As such, Georgia requests that *de minimis* status be granted.

III. Previous calendar year's fishery

- a. Of the 5,745 individuals harvested in 2013, 650 were captured in March; 2,300 in June; 22 in July; 2,231 in October; and 542 in November. All HSC's were harvested for use as bait. Methods used to capture HSC's included hand harvest; bycatch in the commercial blue crab pot fishery; and bycatch in the shrimp trawl fishery.
- b. There was no harvest for scientific and research use in 2013.
- c. N/A
- d. N/A
- e. Georgia continues to monitor HSC's as part of its ongoing fishery-independent shrimp and crab assessment trawl activities, discussed in greater detail in previous reports. Sampling is conducted monthly at 42 fixed locations in six estuarine systems. In 2013, 610 HSC's weighing a total of 1,225.5 kg were observed in trawl activities. Of the total HSC's observed, detailed measurements were recorded on 595 individuals. Of these, 293 were female and 302 were male. The 2013 average prosomal width for males was 220.98 mm (54 to 333 mm). Females had a mean width of 276.74 mm (29 to 345 mm). Overall catch per unit effort (measured as crabs per standard 15 minute trawl) was 1.29 crabs/tow in 2013, slightly above that observed in 2012 (1.00 crabs/tow).
- f. N/A

IV. Planned management programs for the current calendar year

- a. A major legislative initiative was undertaken by the Coastal Resources Division (CRD) in 2012, the result of which was a reformation of Georgia's marine fisheries statutes. House Bill 869, as passed in 2012 and effective January 1, 2013, authorizes the Board of Natural Resources, and to some degree, the Commissioner of the Department of Natural Resources, to regulate several marine species harvested in Georgia, including HSC's. Previously, this authority was under legislative control, and this new reform promotes greater efficiency and public involvement in the fishery management process.

- b. Monitoring programs identified in previous reports will continue in 2014.

VI. Law Enforcement Reporting Requirements

- a. N/A

ATLANTIC STATES MARINE FISHERIES COMMISSION
2013 Horseshoe Crab Compliance Report for
State Reporting Requirements for Florida's Horseshoe Crab Fishery

Justin Lerner
Biological Scientist
Florida Fish and Wildlife Conservation Commission
Division of Marine Fisheries Management

I. Introduction

Florida's horseshoe crab fisheries have traditionally harvested crabs for bait and marine life purposes. Horseshoe crabs are used for bait in Florida's freshwater American eel fishery, which mainly operates in the St. John's river basin. The marine life industry harvests live crabs for the aquarium trade throughout the state. During 2013, there were no horseshoe crab bait landings reported by commercial saltwater fishermen on the Atlantic coast, with all reported harvest in the region occurring for the marine life industry. Monthly marine life landings ranged from a low of 67 individual crabs in October to a high of 972 in July.

Freshwater commercial eel fishermen possessing an American Eel *Anguilla rostrata* Commercial Harvest Permit and a Saltwater Products License are allowed to harvest or possess up to 100 horseshoe crabs per day. FWC's Division of Marine Fisheries Management is currently working with our partners at the Division of Freshwater Fisheries Management to amend the trip ticket associated with the fishery to quantify the number of horseshoe crabs being harvested for personal use as bait.

Regulations were implemented in 2002 to address a potential biomedical fishery for horseshoe crabs in Florida. To date, there have been no biomedical permits issued and the fishery has remained inactive.

II. Request for *de minimis*, where applicable.

The fisheries-dependent monitoring data gathered on horseshoe crabs in Florida consist of reported commercial landings for the bait fishery and the marine-life industry. However, at this time, marine-life landings are not included in the qualification for *de minimus* status.

Mandatory trip ticket reports from commercial saltwater fishermen showed zero horseshoe crabs were harvested on the Atlantic coast of Florida for the bait industry during 2012 and 2013. Therefore, Florida's Atlantic coast bait landings constitute less than 1% of the coastwide bait landings for that time period.

Thus, in accordance with Addendums I and III to the Atlantic States Marine Fisheries Commission Horseshoe Crab Fishery Management Plan, Florida qualifies for *de minimis* status. Horseshoe crabs have their own trip ticket monitoring; therefore it would be possible to close the fishery if Florida's *de minimus* quota is reached. Accordingly, Florida is requesting *de minimis* status for the horseshoe crab fishery.

III. Previous calendar year's fishery

- a. Report monthly harvest of horseshoe crabs for bait; numbers landed by sex and harvest method for a portion of the catch.

From January to December of 2013, there were zero reported horseshoe crab bait landings. Monthly marine life harvest ranged from 67 to 972 crabs during that time period.

Table 1. 2013 Monthly Landings by Fishery

Month	Bait Landings	Marine Life Landings
Jan	0	88
Feb	0	396
Mar	0	102
Apr	0	200
May	0	367
Jun	0	585
Jul	0	972
Aug	0	293
Sep	0	350
Oct	0	67
Nov	0	371
Dec*	0	699

*Preliminary data

- b. Report harvest for scientific and research use.

In Florida, the Marine Special Activity License (SAL) program issues licenses for a variety of activities (including science, research and education) that require an exception to fishery regulations. Typically, harvest reports are submitted to the FWC at the end of the license cycle, which is up to three years.

In 2013, ten horseshoe crab SAL reports were submitted. The reported harvest was very minimal, with one educational license holder reporting the temporary collection of 18 horseshoe crabs (all were released after 14 days) and one education license holder reporting the harvest of two horseshoe crabs. The remaining eight reports reported zero harvest.

- c. Spawning Survey

Public reporting of horseshoe crab spawning beach locations is accomplished via an on-line survey, toll-free phone line, or by emailing a specific horseshoe crab email address at the Fish and Wildlife Research Institute (FWRI). Survey forms, maps (showing survey responses from around the state) and several articles with information on horseshoe crabs are posted on the FWRI website. In 2013, the survey had 183 online responses, 7 reports via telephone and 37 email reports. Numbers of reports had decreased from 2012 for all reporting methods. It is unclear at this time whether the decrease in reports is indicative of decreased stakeholder participation in the survey or reduced numbers of spawning aggregations.

d. Fisheries Independent Monitoring

The Fisheries-Independent Monitoring (FIM) program began measuring and recording horseshoe crabs as part of routine sampling with 21.3-m seines, 183-m haul seines, and 6.1-m otter trawls on October 1, 1999. This preliminary summary includes data from Florida's east and west coast from 2013. Horseshoe crabs were measured in millimeters at the widest part of the prosoma (the front dome shaped part of the carapace). Sex was determined and recorded for all specimens greater than 150mm. If males had identifiable "boxing gloves" then they were classified as male regardless of size.

A total of 173 horseshoe crabs were collected along Florida's east and west coast between January and December 2013. Horseshoe crabs were collected in all estuaries sampled along Florida's coastline except in the southern Indian River Lagoon. Along Florida's east coast, a total of 47 horseshoe crabs were captured, with the majority of the horseshoe crabs captured in the northern Indian River Lagoon (n=41). Additionally, no horseshoe crabs were collected during February and June on the east coast. Along the west coast 126 horseshoe crabs were captured with the majority of horseshoe crabs being captured in Tampa Bay (n=49) and Charlotte Harbor (n=41). The sampling effort between the two estuaries was not equal and the data have not been through all QA/QC procedures. The total numbers of horseshoe crabs collected in 2013 by field laboratory, month, and sex are listed in Table 2. The mean size (mm) for each sex is also listed. Horseshoe crabs that were not sexed were categorized as unsexed.

IV. Planned management programs for the current calendar year

a. Summarize any changes from previous years.

None.

b. Summarize monitoring programs that will occur.

Data on size and sex of horseshoe crabs will be gathered through the fisheries-independent monitoring program and also through data received from commercial trip tickets. Public reporting of horseshoe crab spawning beach locations via an online survey, toll-free phone call, and email will continue.

In 2012 FWC staff discussed opportunities for obtaining data from new studies to be conducted by Florida State Park Service personnel in northeast Florida and at the National Park Service area of Cape Canaveral. In an effort to increase communication on horseshoe crab activity in Florida, a group of interested parties from federal and state parks, FDEP, USFWS, University of Florida staff and scientists with expertise in horseshoe crabs formed The Southeast Horseshoe Crab Task Force, which provides a forum whereby information about Florida's horseshoe crabs can be shared. FWC researchers are hopeful that through organized sampling efforts in Florida's east coast parks, more structured and consistent data can be generated for the spawning beach survey. **In addition, modifications to the American Eel *Anguilla rostrata* Commercial Harvest Permit will allow crabs harvested by freshwater eel fishermen to be monitored.**

Table 2. Total numbers and mean carapace width of horseshoe crabs collected in 2013 by field laboratory, month, and sex.

Mean sizes, by sex, are given in millimeters.

Month		East Coast			Total	West Coast				Total	Grand Total
		Northeast Florida (Jacksonville)	Northern Indian River Lagoon (Indian River)	Southern Indian River Lagoon (Tequesta)		Apalachicola	Cedar Key	Charlotte Harbor	Tampa Bay		
Jan	Female	0	1	0	1	0	0	0	1	1	2
	Mean size	--	184	--		--	--	--	172		
	Male	0	1	0	1	0	0	0	1	1	2
	Mean Size	--	154	--		--	--	--	142		
	Unsexed	0	0	0	0	0	0	0	0	0	0
	Mean size	--	--	--		--	--	--	--		
Feb	Female	0	0	0	0	0	0	1	1	2	2
	Mean size	--	--	--		--	--	180	165		
	Male	0	0	0	0	0	0	1	4	5	5
	Mean Size	--	--	--		--	--	134	129		
	Unsexed	0	0	0	0	0	2	1	1	4	4
	Mean size	--	--	--		--	39	123	130		
Mar	Female	0	2	0	2	0	0	3	1	4	6
	Mean size	--	192	--		--	--	173	183		
	Male	0	3	0	3	0	1	5	1	7	10
	Mean Size	--	155	--		--	125	120	138		
	Unsexed	0	0	0	0	0	0	3	1	4	4
	Mean size	--	--	--		--	--	--	--		

	Mean size	--	--	--		--	--	89	148		
Apr	Female Mean size	0	1	0	1	0	1	0	5	6	7
	Male Mean Size	1	1	0	2	0	1	1	6	8	10
	Unsexed Mean size	245	135	--	0	--	157	135	138	3	3
		0	0	0	0	0	0	0	3	3	3
		--	--	--		--	--	--	128		
May	Female Mean size	0	0	0	0	0	6	1	0	7	7
	Male Mean Size	0	1	0	1	0	17	1	0	18	19
	Unsexed Mean size	0	1	0	1	0	0	1	0	1	2
		--	8	--		--	--	142	--		
Jun	Female Mean size	0	0	0	0	0	0	0	0	0	0
	Male Mean Size	0	0	0	0	0	1	3	2	6	6
	Unsexed Mean size	0	0	0	0	0	0	0	0	0	0
		--	--	--		--	--	--	--		
Jul	Female Mean size	0	0	0	0	0	1	0	1	2	2
	Male Mean Size	0	0	0	0	1	0	1	0	2	2
	Unsexed Mean size	--	--	--		169	--	142	--		

	Size										
	Unsexed	0	7	0	7	0	0	1	3	4	11
	Mean										
	size	--	33	--		--	--	138	55		
Aug	Female	0	0	0	0	0	0	2	0	2	2
	Mean										
	size	--	--	--		--	--	172	--		
	Male	0	1	0	1	0	0	2	1	3	4
	Mean										
	Size	--	159	--		--	--	134	133		
	Unsexed	0	1	0	1	0	0	3	2	5	6
	Mean										
	size	--	53	--		--	--	131	15		
Sep	Female	1	0	0	1	0	1	1	0	2	3
	Mean										
	size	290	--	--		--	250	180	--		
	Male	1	0	0	1	0	1	0	1	2	3
	Mean										
	Size	217	--	--		--	141	--	148		
	Unsexed	0	1	0	1	0	0	0	4	4	5
	Mean										
	size	--	135	--		--	--	--	13		
Oct	Female	0	0	0	0	0	0	0	2	2	2
	Mean										
	size	--	--	--		--	--	--	167		
	Male	0	0	0	0	1	0	0	4	5	5
	Mean										
	Size	--	--	--		169	--	--	147		
	Unsexed	0	6	0	6	0	0	2	0	2	8
	Mean										
	size	--	22	--		--	--	129	--		
Nov	Female	1	4	0	5	0	0	3	1	4	9
	Mean										
	size	170	186	--		--	--	177	187		

	Male Mean Size	0	5	0	5	0	0	4	3	7	12
	Unsexed Mean size	--	144	--	3	--	--	136	140	1	4
		0	3	0	3	0	1	0	0	1	4
		--	39	--		--	17	--	--		
Dec	Female Mean size	1	1	0	2	0	1	0	0	1	3
		314	180	--		--	206	--	--		
	Male Mean Size	1	1	0	2	0	0	0	0	0	2
	Unsexed Mean size	240	126	--		--	--	--	--		
		0	0	0	0	0	0	1	0	1	1
		--	--	--		--	--	18	--		
Total		6	41	0	47	2	34	41	49	126	173

**2014 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR**

HORSESHOE CRAB
(Limulus polyphemus)

2013 Fishing Year



Horseshoe Crab Plan Review Team:
Sheila Eyler, U.S. Fish and Wildlife Service
Stewart Michels, Delaware Department of Natural Resources and Environmental Control
Marin Hawk, Chair, Atlantic States Marine Fisheries Commission

September 2014

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- I. Status of the Fishery Management Plan
- II. Status of the Stock and Assessment Advice
- III. Status of the Fishery
- IV. Status of Research and Monitoring
- V. Status of Management Measures and Issues
- VI. Recommendations of the Plan Review Team

DRAFT

I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	December 1998
<u>Amendments</u>	None
<u>Addenda</u>	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)
<u>Management Unit:</u>	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
<u>States With Declared Interest:</u>	New Hampshire - Florida
<u>Active Boards/Committees:</u>	Horseshoe Crab Management Board, Advisory Panel, Technical Committee, and Plan Review Team; Shorebird Advisory Panel; 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.

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 will 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 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.

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. State waters of New Jersey and 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 2013 remained well below the coastwide quota (Table 1, Figure 1). Bait landings increased 23% from the previous year, due to increased landings in Massachusetts, Delaware, Maryland and Georgia. Delaware harvested 1,701 crabs over their 161,881 quota, and this will be accounted for in 2014.

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

Jurisdiction	ASMFC Quota 2013	State Quota 2013	2009	2010	2011	2012	2013
NH*	350	350	41	0	0	0	0
MA	330,377	165,000	98,332	54,782	67,087	106,821	128,774
RI	26,053	14,348	18,729	12,502	12,632	19,306	18,030
CT	48,689	48,689	27,065	30,036	24,466	18,958	19,645
NY	366,272	150,000	123,653	124,808	146,995	167,723	161,623
NJ	100,000	0	0	0	0	0	0
PA	0	-	-	-	-	-	-
DE	161,881	161,881	102,659	61,751	95,663	100,255	163,582
MD	255,980	255,980	165,434	165,344	167,053	169,087	240,688
PRFC	0	-	0	0	0	0	0
DC	0	-	0	0	0	0	0
VA**	81,331	81,331	121,155	56,540	40,874	72,298	32,293
NC	24,036	24,036	33,025	9,938	27,076	22,902	26,559
SC	0	0	0	0	0	0	0
GA	29,312	29,312	0	0	0	0	5,745
FL	9,455	9,455	0	993	0	0	0
TOTAL	940,637	1,421,438	690,093	516,694	581,846	677,350	796,939

Figure 1: Number of horseshoe crabs harvested in the bait industry, 2009-2013. *New Hampshire will be removed from the Horseshoe Crab Board for 2014 and beyond.****Virginia harvest is east of the COLREGS line, only.**

Reported coastwide landings since 1998 show more male than female horseshoe crabs were harvested annually. Several states presently have sex-specific restrictions in place to limit 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. Unclassified landings have generally accounted for around 10% of the reported landings since 2000. In 2013, unclassified landings accounted for approximately 9.9% of total bait landings.

The hand, trawl, and dredge fisheries typically account for over 85% of the reported commercial horseshoe crab bait landings. In 2013, these gears accounted for slightly more with 85.7% of commercial landings. Other methods that account for the remainder of the harvest include gill nets, pound nets, and traps.

Biomedical Fishery

The horseshoe crab is an important resource for research and manufacture of materials used for human health. There are four 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) and Wako Chemicals, Virginia; and Charles River Endosafe, South Carolina. There is one company that bleeds horseshoe crabs but

does not manufacture LAL: Limuli Labs, New Jersey. Addendum III requires states where horseshoe crabs are collected for biomedical use to collect and report harvest data and characterize mortality.

The Plan Review Team annually calculates total coastwide harvest and estimates mortality. It was reported that 545,973 crabs (including crabs harvested as bait) coastwide were brought to biomedical companies for bleeding in 2013 (Table 2). This represents a slight decrease from the average of the previous five years (562,617 crabs). Of this total, 55,393 crabs were reported as harvested for bait and counted against state quotas, representing a marked decrease over 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. It was reported for 2013 that 490,580 crabs were harvested for biomedical purposes only. Males accounted for 61% of total biomedical harvest; females comprised 36%; 3% of the harvest was unknown. Crabs were rejected prior to bleeding due to mortality, injuries, slow movement, and size (any mortality prior to bleeding is included in Row D below). Based on state reports for 2013, approximately 11% of crabs (or 61,053 crabs) harvested and brought to bleeding facilities were rejected. Approximately 1% of crabs, collected solely for biomedical purposes, suffered mortality from harvest up to the point of release. Total estimated mortality of biomedical crabs for 2013 was 78,007 crabs (at 15% post-release estimated mortality), with a range of 29,515 to 150,745 crabs (5-30% post-release estimated mortality).

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

		2008	2009	2010	2011	2012	2013
A	Number of crabs brought to biomedical facilities (bait and biomedical crabs)	511,478	512,552	548,751	628,476	611,827	545,973
B	Number of bait crabs bled	87,864	110,350	66,047	83,312	73,580	55,393
C	Number of biomedical-only crabs harvested (not counted against state bait quotas)	423,614	402,202	482,704	545,164	538,247	490,580
D	Reported mortality of biomedical-only from harvest to release	2,973	6,298	9,665	6,917	6,891	5,269
E	Number of biomedical-only crabs bled	402,080	362,291	438,417	492,734	556,995	484,920
F	Estimated mortality of bled biomedical-only crabs post-release (15% est. mortality)	60,312	54,344	65,763	73,910	83,549	72,738
G	Total estimated mortality on biomedical crabs not counted against state bait quotas (15% est. mortality)	63,285	60,642	75,428	80,827	90,440	78,007

The 1998 FMP establishes a mortality threshold of 57,500 crabs, where if exceeded the Board is required to consider action. Based on an estimated total mortality of 78,007 crabs for 2013, this threshold has been exceeded. The PRT notes that estimated mortality from biomedical use is approximately 8% (3-14%) of the total horseshoe crab mortality (bait and biomedical) coastwide for 2013, down from 10% in 2012. Nevertheless, this represents 10% of coastwide mortality and the PRT recommends including biomedical mortality in the next 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 over a hundred 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 of portion of the catch for gender 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 between 1 and 5% of annual coastwide harvest are not required to report landings by gender, the PRT recommends all states require gender reporting for horseshoe crab harvest.

States with biomedical fisheries landings are required to monitor and report harvest 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 VT benthic survey was not conducted in 2013, due to a lack of funding. The Adaptive Resource Management (ARM) Working Group will use Northeast Area Monitoring and Assessment Program's (NEAMAP) data to estimate horseshoe crab abundance for the ARM model. Funding sources for 2015 and beyond are being explored.

Spawning Surveys

The redesigned spawning survey was completed for the fifteenth year in 2013. No trend was detected in the state-specific or baywide indices of spawning activity (both male and female) for the time series. Most spawning activity was observed in May in 2013, coinciding with a period especially important for migratory shorebirds. The annual baywide sex ratio was 3.8:1, favoring males. The range of annual observed sex ratios on the Delaware Bay spawning beaches over the time series has varied from 3.1:1 to 5.2:1.

Egg Studies

Delaware includes a report on their egg sampling efforts in their annual compliance report. Results from Delaware indicated an average surface egg density of 161,017 eggs/m² for 2013, a substantial increase from 2012, but comparable to 2010 egg count.

For 2014 and beyond, the egg survey will no longer be a mandatory monitoring requirement for Delaware and New Jersey. The states are free to continue the survey, and any data will be included in future FMP Reviews.

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 state, coordinate with the USFWS tagging program, in order to ensure a consistent coastwide program for providing management input.

Since 1999, over 254,000 crabs have been tagged and released through the USFWS tagging program along the Atlantic coast. Over 12% of tagged crabs have been recaptured and reported. 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, more tagging has occurred in the Long Island Sound and in the 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.

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 2013.

NEW HAMPSHIRE		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	<i>De minimis</i> status granted.	NA
- Ability to close fishery if <i>de minimis</i> threshold is reached	Yes	NA
- Daily possession limit <25 for <i>de minimis</i> state	Yes – 10/day	NA
- HSC landing permit	Permit required, but not limited to historical participation.	NA.
Bait Harvest Restrictions and Landings		
- ASMFC Quota	350	NA
- Other Restrictions	None	NA
- Landings	0	NA
Monitoring Component A₁		
- Mandatory monthly reporting	Yes	NA
- Characterize commercial bait fishery	Not Required	NA
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	NA
- Required information for biomedical use of crabs	Not Applicable	NA
Monitoring Component A₃ Identify spawning and nursery habitat	Discontinued	NA
Monitoring Component B₁ Coastwide benthic trawl survey	No	NA
Monitoring Component B₂ Continue existing benthic sampling programs	Not Applicable	NA
Monitoring Component B₃ Implement spawning survey	Discontinued	NA
Monitoring Component B₄ Tagging program	No	NA

Note: In New Hampshire, three permits were open for horseshoe crab harvesting in 2013. As of the 2014 fishing season, NH has been removed from the Horseshoe Crab Board.

MASSACHUSETTS		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	330,377 (165,000)	330,377 (165,000)
- Other Restrictions	Bait: 400 crab daily limit through Jan 1- June 30; 600 crab daily limit after June 30- Dec 31; 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: 400 crab daily limit through Jan 1- June 30; 600 crab daily limit after June 30- Dec 31; 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
- Landings	128,774	--
Monitoring Component A₁		
- 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 A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	Yes	Yes
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes, began in 2008 and adapted from DE Bay survey	Yes
Monitoring Component B₄ 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		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	26,053 (12,345)	26,053 (12,545)
- Other Restrictions	None	None
- Landings	18,030	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes, though exempt, with weekly call in and monthly on paper.	Yes, though exempt, with weekly call in and monthly on paper.
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes, details within Massachusetts' reports	Captured in Massachusetts' reports
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes, since 2000 (methods unspecified)	Yes
Monitoring Component B₄ Tagging program	RI DEM 2001-2004 only Outside, independent groups currently	No

CONNECTICUT		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota	48,689	48,689
- Other Restrictions	Limited entry program, possession limits, and seasonal and areas closures	Limited entry program, possession limits, and seasonal and area closures
- Landings	19,645	--
Monitoring Component A₁		
- 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 A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes, since 1999 (methods differ from DE Bay survey)	Yes
Monitoring Component B₄ Tagging program	Yes, in collaboration with local universities	Yes

NEW YORK		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
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 trip limits; 200 crab/harvester daily quota; W. Meadow Beach, Cedar Beach, and Fire Island National Seashore harvest closures	Ability to close areas to harvest; seasonal quotas and trip limits; 200 crab/harvester daily quota; W. Meadow Beach, Cedar Beach, and Fire Island National Seashore harvest closures
- Landings	161,623	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes (weekly April – July)	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	No	Dependent on survey funding
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes – adapted from DE Bay survey	Yes
Monitoring Component B₄ Tagging program	Yes, since 2007	Yes

Note: New York exceeded the state's horseshoe crab quota of 150,000, but was well within the Commission's quota. There is a lag of three weeks between when the harvest occurs and when the data is received. New York is actively promoting ACCSP electronic reporting to its fishermen.

NEW JERSEY		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Qualified for <i>de minimis</i>	Qualifies but not requesting <i>de minimis</i>
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 A₁		
- Mandatory monthly reporting	N/A	N/A
- Characterize commercial bait fishery	N/A	N/A
Monitoring Component A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	Yes	Yes
Monitoring Component B₂ Continue existing benthic sampling programs	Yes – lost funding for surf clam survey which was an indicator of HSC abundance	Yes
Monitoring Component B₃ Implement spawning survey	Yes – since 1999	Yes
Monitoring Component B₄ Tagging program	No	No
Monitoring Component B₅ Egg abundance survey	Yes	Yes
Monitoring Component B₆ Shorebird monitoring program	Yes	Yes

DELAWARE		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (State-reduced quota for overage)	162,136 [male only] (161,881)	162,136 [male only] (160, 435)
- Other Restrictions	Closed season (January 1 – June 7)	Closed season (January 1 – June 7)
- Landings	163,582 males	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes (daily call-in reports & monthly logbooks)	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ 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 B₁ Coastwide benthic trawl survey	Yes	Yes
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes	Yes
Monitoring Component B₄ Tagging program	No state program but has assisted in the past with various Delaware Bay horseshoe crab tagging initiatives	No
Monitoring Component B₅ Egg abundance survey	Yes	Removed as component
Monitoring Component B₆ 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. Delaware slightly exceeded its quota in 2013 and will pay it back in 2014.

MARYLAND		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
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
- Landings	240,688	--
Monitoring Component A₁		
- 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 A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	Yes	Discontinued due to lack of funding. NEAMAP Survey data will be mined for use.
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	Yes (Counts)	Yes
Monitoring Component B₄ Tagging program	Yes – through biomedical harvest	Yes – through biomedical harvest

POTOMAC RIVER FISHERIES COMMISSION		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis</i> status	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	No horseshoe crab fishery	No horseshoe crab fishery
- Daily possession limit <25 for <i>de minimis</i> state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	0
Monitoring Component A₁		
- Mandatory monthly reporting	Yes - weekly /	Yes - weekly
- Characterize commercial bait fishery	Not Applicable	Not Applicable
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ Identify spawning and nursery habitat	Not Applicable	Not Applicable
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Not Applicable	Not Applicable
Monitoring Component B₃ Implement spawning survey	Not Applicable	Not Applicable
Monitoring Component B₄ Tagging program	Not Applicable	Not Applicable

DISTRICT OF COLUMBIA – NO REPORT SUBMITTED		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>		
- Ability to close fishery if <i>de minimis</i> threshold is reached		
- Daily possession limit <25 for <i>de minimis</i> state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions		
- Landings		
Monitoring Component A₁		
- Mandatory monthly reporting		
- Characterize commercial bait fishery		
Monitoring Component A₂		
- Biomedical harvest reporting		
- Required information for biomedical use of crabs		
Monitoring Component A₃ Identify spawning and nursery habitat		
Monitoring Component B₁ Coastwide benthic trawl survey		
Monitoring Component B₂ Continue existing benthic sampling programs		
Monitoring Component B₃ Implement spawning survey		
Monitoring Component B₄ Tagging program		

Note: DC was added to the HSC Management Board to close a landings loophole that existed in the late 1990s. Since then DC has adopted regulations that prohibit landings of horseshoe crabs, thereby closing the loophole. In order to free DC of the requirement to submit compliance reports, the PRT recommends DC request removal from the HSC Board. Pennsylvania was in this same situation and was removed from the Board in 2006.

VIRGINIA		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
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. Harvest east of COLREGS line must comprise 2 to 1 male to female ratio and make up no more than 40% of total landings.	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	156,761 (32,293)	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes – daily call in required for HCEL permit holders	Yes – new permit system; limited entry to fishery and individual quotas established
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A₃ Identify spawning and nursery habitat	Yes – completed	No
Monitoring Component B₁ Coastwide benthic trawl survey	Yes	Yes
Monitoring Component B₂ Continue existing benthic sampling programs	No	No
Monitoring Component B₃ Implement spawning survey	No	No
Monitoring Component B₄ Tagging program	No	No

Note: Virginia's delayed receipt of the NMFS landings from federal waters has been a great concern of the PRT. Adjustments in last year's FMP Review resulted in a PRT recommendation that Virginia's bait quota be set at no more than 143,426 crabs. Since landings in 2013 were under this number, the PRT is satisfied that this issue has been resolved and there is no residual overharvest from past years.

NORTH CAROLINA		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis status</i>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota	27,036	24,036
- 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	26,559	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes – trip level reporting each month	Yes – trip level reporting each month
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ 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 B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	No	No
Monitoring Component B₄ Tagging program	No	No

Note: North Carolina received a quota transfer of 3,000 crabs from Georgia, resulting in the 27,036 crab quota for 2013.

SOUTH CAROLINA		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis</i> status	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	No horseshoe crab bait fishery	No horseshoe crab bait fishery
- Daily possession limit <25 for <i>de minimis</i> state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes (Biomedical) /	Yes (Biomedical)
- Characterize commercial bait fishery	Yes (Biomedical)	Yes (Biomedical)
Monitoring Component A₂		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
Monitoring Component A₃ Identify spawning and nursery habitat	Completed	No
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	No	No
Monitoring Component B₄ Tagging program	No	No

GEORGIA		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis</i> status	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	Yes	Yes
- Daily possession limit <25 for <i>de minimis</i> 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	Must have commercial shrimp, crab, or whelk license
Bait Harvest Restrictions and Landings		
- ASMFC Quota	29,312(-3,000 transfer to NC)	29,312
- Other Restrictions	None	None
- Landings	5,745	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No bait landings	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ Identify spawning and nursery habitat	Completed	Not Applicable
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	Yes	Yes
Monitoring Component B₃ Implement spawning survey	No	No
Monitoring Component B₄ Tagging program	No	No

FLORIDA		
	2013 Compliance Report	2014 Management Proposal
<i>De minimis</i> status	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	Yes	Yes
- Daily possession limit <25 for <i>de minimis</i> 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	0	--
Monitoring Component A₁		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No	Yes
Monitoring Component A₂		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
Monitoring Component A₃ Identify spawning and nursery habitat	Yes	Yes
Monitoring Component B₁ Coastwide benthic trawl survey	No	No
Monitoring Component B₂ Continue existing benthic sampling programs	No	No
Monitoring Component B₃ Implement spawning survey	No	Yes
Monitoring Component B₄ Tagging program	No	Yes

Note: Florida reported an additional 4,490 crabs harvested along the east coast for ‘marine life’ use in 2013.

Alternative Baits

Connecticut, Rhode Island and Massachusetts are participating in field trials with the Ecobait, available from LaMonica Fine Foods in New Jersey. Results of these trials will be presented to the Horseshoe Crab Board in February 2015.

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. The comment period has been reopened several times, and no final decision has been made as of the writing of this document.

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). 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.

New Hampshire, Potomac River Fisheries Commission, South Carolina, Georgia, and Florida were granted *de minimis* status for the 2012 fishing year. Pennsylvania was removed from the Horseshoe Crab Management Board in 2007, and Maine was removed from the Board in 2011. New Hampshire will be removed for 2014 and beyond. New Hampshire, South Carolina, Georgia, Florida and the Potomac River Fisheries Commission are requesting *de minimis* status

for the 2013 fishing season and meet the FMP requirements for achieving this status (Table 1). The PRT recommends granting these jurisdictions *de minimis* status.

Funding for Research and Monitoring Activities

The PRT strongly recommends the continuation of the VT benthic trawl survey in order to provide the critical information for stock assessments and the ARM model. The survey is a necessity to continue ARM implementation. This effort provides a statistically reliable estimate of horseshoe crab relative abundance at a relatively low cost.