

**PROCEEDINGS OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
HORSESHOE CRAB MANAGEMENT BOARD**

The Westin Alexandria
Alexandria, Virginia
August 3, 2016

Approved October 25, 2016

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1. **Approval of Agenda** by Consent (Page 1).
2. **Approval of Proceedings of May 2016** by Consent (Page 1).
3. **Move to approve all ARM Subcommittee and Technical Committee recommendations except for the biomedical harvest Subcommittee packages** (Page 13). Motion by Brandon Muffley; second by Robert Boyles. Motion Substituted.

Motion to Amend

Move to amend to initiate an addendum to the HSC management plan to address the ARM Subcommittee's recommendation to the ARM framework regarding 1) mortality associated with the biomedical industry; and 2) bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review. Motion made by Michael Luisi; second by Craig Pugh.

Main Motion as Amended

4. **Move to initiate an addendum to the HSC management plan to address the ARM Subcommittee's recommendation to the ARM framework regarding 1) mortality associated with the biomedical industry; and 2) bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review.** Motion carried (Page 20).
5. **Move to task the Technical Committee with designing bait experiments to be completed in 2017 for those states that opt to participate—involving reduced amounts of horseshoe crab, relative to status quo, in the whelk and eel fisheries—to be developed for Board review and approval by October 2016** (Page 21). Motion made by Bob Ballou; second by Brandon Muffley. Motion carried (Page 21).
6. **Move to adjourn**, by Consent (Page 22).

ATTENDANCE

Board Members

Bill Adler, MA (GA)	David Blazer, MD (AA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Rachel Dean, MD (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Kyle Schick, VA, proxy for Sen. Stuart (LA)
Bob Ballou, RI, proxy for J. Coit (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
D. Simpson, CT (AA)	Michelle Duval, NC, proxy for B. Davis (AA)
Rep. Craig Miner, CT (LA)	Jerry Schill, NC, proxy for Rep. Steinburg (LA)
Rep. Melissa Ziobron, CT Legislative proxy	Robert Boyles, Jr., SC (AA)
James Gilmore, NY (AA)	Malcolm Rhodes, SC (GA)
Emerson Hasbrouck, NY (GA)	Spud Woodward, GA (AA)
John McMurray, NY, proxy for Sen. Boyle (LA)	Pat Geer, GA, proxy for Rep. Nimmer (LA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)	James Estes, FL, proxy for J. McCawley (AA)
Tom Fote, NJ (GA)	Mike Millard, USFWS
Stewart Michels, DE, proxy for D. Saveikis (AA)	Chris Wright, NMFS
Craig Pugh, DE, proxy for Rep. Carson (LA)	Martin Gary, PRFC
Roy Miller, DE (GA)	

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

Ex-Officio Members

Steve Doctor, Technical Committee Chair	Jim Lyons, ARM Subcommittee Chair
James Cooper, Advisory Panel Chair	

Staff

Robert Beal	Kristin Anstead
Toni Kerns	Kirby Rootes-Murdy

Guests

Dennis Abbott, NH Legislative proxy	Russ Allen, NJ DFW
Colleen Giannini, CT Administrative proxy	Andrew Shiels, PA F&B Commission
Sherry White, USFWS	Mike Luisi, MD DNR
Wilson Laney, USFWS	Lewis Gillingham VA MRC
Debra Lambert, NOAA	Jeff Deem, VMRC
Peter Aarrestad, CT DEEP	Allen Burgenson, Lonza Walkersville, Inc.
Justin David, CT DEEP	Benjie Swan, Limuli Labs
Cheri Patterson, NH F&H	Arnold Leo, E. Hampton, NY

The Horseshoe Crab Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2016, and was called to order at 2:40 o'clock p.m. by Chairman James J. Gilmore.

CALL TO ORDER

CHAIRMAN JAMES J. GILMORE: Good afternoon everyone. Welcome to the Horseshoe Crab Board meeting. I've been instructed by Bob and Toni that I have to get us back on schedule or I'm not getting paid. We've got to really be efficient in our deliberations today. My name is Jim Gilmore; I'm the administrative commissioner from New York, and I'll be chairing the meeting today.

Just a couple of introductions before we go, we've got obviously Kirby Rootes-Murdy; who everyone knows from the commission staff, is doing a fine job running this whole thing. Jim Lyons, who doesn't have a name tag today is going to be doing presentations. We've got Steve Doctor from the Technical Committee, and we've got Jim Cooper; who is on the Advisory Panel. With that, we'll just get right into the agenda.

APPROVAL OF AGENDA

CHAIRMAN GILMORE: The first order of business is approval of the agenda; it should be in your briefing materials. Are there any changes to the agenda? Seeing none; we'll adopt those by consensus.

APPROVAL OF PROCEEDINGS

CHAIRMAN GILMORE: Second, we have approval of the proceedings from the May, 2016 meeting. Michelle.

DR. DUVAL: In reviewing the proceedings, I just noted that Mr. Chris Batsavage's name is noted throughout the meeting, and he actually was not here that day. I was here that day representing North Carolina; so perhaps there was another Chris around the table who might have been speaking that day.

CHAIRMAN GILMORE: I believe that was from the federal government, so we apologize for that. We would never mistake you for Chris Batsavage,

Michelle. Thanks a lot; we'll make that change. Any other changes to the meeting minutes? Okay, we'll take those as adopted. Our next agenda item is for public comment.

PUBLIC COMMENT

CHAIRMAN GILMORE: Before every meeting we have a period for public comment on items not on the agenda. I know there are a bunch of people that would like to talk later on when we get into motions. But this is just a time for issues not on the agenda. Is there any public comment? Seeing none, we'll move on to our next item.

REVIEW OF RECOMMENDATIONS FROM THE ADAPTIVE RESOURCE MANAGEMENT SUBCOMMITTEE, AND REVISIONS TO THE ARM FRAMEWORK

CHAIRMAN GILMORE: Our first business item is going to be a review and consideration recommendation from the Adaptive Resource Management Subcommittee, and revisions to the ARM Framework. We're going to have a presentation from Jim Lyons.

MR. JAMES LYONS: Good afternoon everyone, my name is Jim Lyons; I am with USGS Patuxent Wildlife Research Center, and I am the Chairman of the Adaptive Resource Management Subcommittee, and I'm here to provide some recommendations from recent work reviewing the ARM Framework of the Subcommittee. I will start with a little bit of background about the ARM Framework and how we got here. The ARM Framework was established by Addendum 7, and as far as I know, is the first of its kind in a multispecies management approach; especially between a fishery and bird conservation.

But we have a multispecies approach to predict the optimal strategy for horseshoe crab harvest. The two main monitoring programs in this framework are the Virginia Tech Trawl Survey for the horseshoe crab population monitoring, and a mark-resight approach to monitoring the stopover population of red knots.

The entire adaptive management framework, like all adaptive management frameworks, is a two-

phase approach. We have an initial setup phase, where you identify the objectives of this decision, the options that are available to you, some models, some population models in this case of system dynamics and the monitoring that you need to make good decisions.

Once you have the setup phase complete, you can enter this iterative phase where you regularly make decisions; in this case an annual decision about the harvest decision. It is also customary in adaptive management frameworks to periodically revisit the setup phase and review those aspects of your decision framework that I just mentioned; the objectives, and your options and your models, and your monitoring, and see if you have those aspects specified correctly and if you require any changes.

That is what recent work has been about, is revisiting the setup phase and reviewing some of these aspects of the decision-making framework. In recent years the harvest recommendations have been 500,000 crabs; males only. I want to point out a couple of aspects of the mortality estimates in the horseshoe crab population dynamics model that will help us understand some of the options that I'm going to present.

In the population dynamics model, we have two sources of mortality. There is a natural mortality process, and then the harvest recommendation; the mortality associated with that harvest recommendation is subtracted from the crabs that have survived natural mortality. In this process of projecting the population, we have a natural mortality process; and then we subtract whatever the recommendation is.

It will be helpful to keep those two sources of mortality in mind. In the fall of 2015, the TCs and the ARM Subcommittee recommended revisiting the setup phase. In February of 2016, the ARM Subcommittee presented five potential review items to the board; some of them were considered short term review items that could be completed in six to eight months, some of them were longer term things that would require one to two years to complete. At the February meeting, the board tasked our subcommittee with completing the three short term review items.

Those are listed here at the bottom of this slide, and the things I am going to report on today. We're going to talk about the monitoring program and our evaluation of the current monitoring that is; is our monitoring effective and accurate, do we have the right data involved, are we using the best available data, and can we make some improvements to the monitoring program. We're also going to talk about the harvest packages and a review of those packages, and do we have them specified correctly. Are there new options we would like to consider or more options we would like to consider? Then finally, we have this objective function, which has several parts; and we evaluated different parts of the objective function to see if it was specifying our objectives correctly. I'm going to report on those three aspects of the ARM Framework. The first short term review item is evaluating the monitoring programs that we have.

The first aspect of that is an evaluation of the Virginia Tech Trawl Survey. The adaptive management framework was designed essentially around the Virginia Tech Trawl Survey. It is the most direct monitoring of the Delaware Bay horseshoe crab population and is the most appropriate monitoring of the horseshoe crab population for this decision making framework.

However, funding for the trawl survey, as you know, has been inconsistent and has lapsed in some years. But given our review of the benefits of the Virginia Tech Trawl Survey, our recommendation is to continue this Virginia Tech Trawl Survey in future years; since it supports the adaptive resource management model and provides substantial and important data for this assessment.

Additionally, we also recommend or support the recommendations to estimate the proportion of the Delaware Bay population that is available in time and space in this monitoring, and also assess the selectivity of gear used in the survey. These are two aspects of the Virginia Tech Trawl Survey that these two assessments might be improvements to this monitoring program, and

would be therefore improvements to the ARM Framework; and so we support that.

The second aspect of the monitoring review was to evaluate abundance indices from other surveys. You can see four surveys listed here that in the years when the Virginia Tech Trawl Survey wasn't available, we developed a composite index using all four of these surveys and correlating these surveys with the Virginia Tech Trawl Survey; essentially to predict what the Virginia Tech Trawl Survey would estimate if it had been run.

There was fairly good correspondence between this composite index, based on these other surveys, and the Virginia Tech Trawl Survey. In some ways, this was an effective work around when the Virginia Tech Trawl Survey was not available, and so our recommendation is that if the Virginia Tech Trawl Survey is not funded, a practical alternative is to continue to use this composite index of abundance based on data from these other surveys; although it is somewhat of an ad hoc approach and an indirect monitoring of the Delaware Bay population.

The third aspect of the monitoring review is to evaluate mark/recapture approaches to estimating the horseshoe crab population; and there have been two mark/recapture studies in evaluating or trying to develop ways to use mark/recapture to monitor horseshoe crabs in Delaware Bay. That is Smith et al in 2006 and Merritt on 2015.

Both of these studies were considered maybe partly successful, because of the large amount of tagging that seems to be required for mark/recapture approaches to be a viable way to monitor the horseshoe crab population around the Delaware Bay region. While there is some potential for these kinds of approaches, there is more work to be done here before this is ready for management decision making.

Our recommendation at this time is that mark/recapture is not a viable option for estimating the horseshoe crab abundance within the ARM Framework; therefore, it should not be incorporated into the model but should continue to be developed for future consideration. The

fourth aspect of the monitoring review was to look at the red knot population monitoring program. This evaluation essentially consisted of developing or documenting the study design and a mark/resight sampling plan for this mark/resight estimation; that is essentially, how do we go around to all the beaches around the Delaware Bay and collect this mark/resighting data in an effective way. We did not develop any new protocols, but implemented.

We took this documentation of the study design and the sampling plan, and we met with the shorebird monitoring teams from Delaware and New Jersey; and renewed our efforts to collect the data in a way that is consistent with the model. The mark/resight estimates are always larger than estimates that come from the aerial surveys that are conducted, and there is some disagreement among the subcommittee members of the source of these discrepancies, and those things are described in the report that we provided.

Our recommendation is to continue the mark/resight data collection program with renewed effort to collect the data according to the sampling plan; and in a way that is consistent with the modeling that's done. Our final aspect of evaluating the monitoring program was to evaluate, incorporation of biomedical data into the ARM Framework.

As you know, the biomedical data and biomedical mortality was not previously included in the ARM Framework, but current estimates suggest that biomedical mortality is 8 to 12 percent of coastwide mortality; and so it would be an improvement in the ARM Framework if we can include this known source of mortality in the decision making process.

Given the consideration of the biomedical data, and maintaining confidentiality, but using that data as part of the stock assessment, we also evaluated the potential to include biomedical data in the ARM Framework. We developed and evaluated five different options or five different ways that we could evaluate that use of biomedical data.

Our first general recommendation, and the subcommittee was in large and strong agreement about this, is that biomedical mortality should be accounted for in the ARM Framework. We did come to a consensus option; but I am going to present today a majority option and a minority option for your consideration.

This is a description of the majority option, which is; adjust the harvest packages to account for biomedical mortality of females. The harvest packages would be adjusted for mortality, but the subcommittee understands the importance of maintaining confidentiality and also the importance of not placing a cap on biomedical mortality.

What this option does with this change to the packages is create an allocation decision for the board between the biomedical mortality and the bait harvest. In this majority option, the packages would be changed every four to six years; and at that time we would calculate a running average, a three-to-five year average, a recent year average of the biomedical mortality and adjust the packages to reflect this biomedical mortality.

We created an example here in the table with the current harvest packages on the left hand side of this table; and you see the five packages there. Those are the packages that we have been using since the framework was adopted. On the right hand side of the table to the right of the dark heavy line, we see an example that was created using recent data; and it would show the total harvest under this example for the majority option. I've put them there close to each other so that you can see, and I would like to emphasize, the minimal amount of change that is occurring with the packages, given this option.

The biomedical mortality for females is included, and the packages change in a small way. To the right of the total harvest columns, for example, we see the biomedical data. These are example numbers that come from recent data. But this is an example of the amount of biomedical mortality and how those numbers are added to create the new packages.

Finally, on the right hand side of this table, we see the example bait harvest that would result. Under this option, if biomedical mortality increases over time, and horseshoe crab populations do not increase; then bait harvest does decline. But this is the preferred option, because first of all, it maintains confidentiality.

The way that the biomedical data are used would maintain confidentiality of that information. It does not place a cap on biomedical mortality. It minimizes the changes to the packages; the new packages would be fairly similar to the current packages. Then finally, it is the most transparent option; that is the harvest packages are an accessible, visible part of the ARM Framework, and it is very explicit and transparent here how the biomedical data would be incorporated.

The minority option is to account for biomedical harvest in the population dynamics equations only of the ARM Framework. Under this option we do not create any new packages or change any allocation. We continue with the same current packages, but we incorporate the biomedical mortality into the population dynamics equation.

That is, we do similar calculations periodically to estimate the running average of the biomedical mortality. In our population projections in making these decisions, we subtract not only the current packages mortality, but also the biomedical after natural mortality. The total harvest under this option is actually greater than the majority option.

There is one issue that the subcommittee would like to point out is that the mortality associated with crabs is variable and not fixed; but we could potentially update this value every four to six years. The other thing that I should point out is that because of the way biomedical mortality would be added to the current harvest packages, the total overall harvest is actually greater under this option; and there is the potential that this option could lead to more conservative harvest recommendations in the future if populations don't increase.

That concludes the first short term monitoring review item. The second review item was to

evaluate alternative harvest packages, and in recent years, Package 3 has been selected consistently at 500,000 male crabs and no female crabs. In considering the potential to add new packages or add more packages, or create new packages, we evaluated several alternatives.

But the subcommittee came to the conclusion that adding new packages is not likely to change any recommendations, because of the way there are utility thresholds for the horseshoe crab population and the red knot population. While we are below those abundance thresholds, the recommendations are unlikely to change no matter how many packages you have available. They are still unlikely to be picked. Our recommendation is that we do not recommend adding new harvest packages to the ARM Framework as part of this review item; although the packages should be altered to address biomedical harvest. Our third short term review item is to evaluate the objective function here; and there are four aspects of this. The first one, the suggestion was made that we should change the order of red knots and horseshoe crabs in this objective function.

You can see the objective function here in the box. This is how it is dated, where essentially the objective statement says to maximize the harvest of horseshoe crabs while being constrained by red knot populations; and that is how we achieve these two objectives. There was a suggestion that we should reverse these two things and have the objective be, maximize red knot recovery constrained by having a horseshoe crab harvest.

But this is clearly not a decision framework or an approach to decision making that ASMFC is the decision maker, and so this is really not an appropriate change for us. Our recommendation then is changing the order of red knots and horseshoe crabs, and the objective statement is not recommended.

The second part of the objective function was to evaluate this two times multiplier on the utility of female crab harvest that we have in the reward function. This was put into the ARM Framework to reflect the market value with females being twice as valuable as males. We considered whether this

multiplier should be part of the objective function, and is it still accurate?

Our conclusion is that it is accurate, and so our recommendation is that because the multiplier of utility of female crab harvest and the reward function reflects market value, it is recommended that it is left in the model. The third part of the objective function involved a sex ratio constraint on the utility of male crabs. This is an aspect of the objective function that actually is redundant with part of our population dynamics model for horseshoe crabs.

We evaluated removing it, and it resulted in only minor changes to the output of the model. Given its redundancy, our recommendation is that we remove the sex ratio constraint; because it is conceptually redundant with aspects of the horseshoe crab population dynamics model. Then finally, with revisiting the objective function, we evaluated the utility functions for female harvest and their shape.

Currently, we have a knife-edged-step function for utility, and we evaluated an alternative, which is a sloped utility function. We reviewed some simulation work by Smith et al, and found that the slope function did not demonstrate a significant difference than the current knife-edged function.

There was very little change in population trajectories, and no biological reasoning for changing the utility function here; so our recommendation is given the lack of change between the two approaches, and a lack of reasons to change the current approach, we recommend no change from the current knife-edged function. With that, I will turn it over to Kirby.

MR. KIRBY ROOTES-MURDY: Just for the board's clarity on the preferred option that the ARM Subcommittee put forward for including biomedical mortality into the ARM Framework, this would result in needing a new addendum to the FMP. What I have on this slide is just a breakdown of how that would proceed. If the board were to go forward with -- the best way to look at it would be two prongs -- the recommendations of the ARM Subcommittee and

wanting to go with the preferred option. Then leaving this meeting, we would have to have an addendum initiated. At which point staff would go back, work on this likely with the ARM Subcommittee and the Technical Committee; pull together that document, bring it before the board, likely via conference call at some point either at the end of August or the beginning of September.

Then the board would need to approve that document to go out to public comment, so that there would be 30-day public comment period where there would be public hearings. The AP, the TC would be able to chime in again, and then the board would consider the document for final approval at the annual meeting in October.

That is just one way this would go forward if the board's preference is to include biomedical mortality with the preferred option the ARM Subcommittee put forward. The other thing to just note is that the ARM Subcommittee is able to make all these other recommended changes to the ARM model for the 2017 fishing year.

Our normal specification process is still -- we're keeping that timetable, so at the annual meeting the board would consider 2017 harvest specs; either with options that come out of that addendum, or kind of a status quo approach. Just to clarify that for the board at this point. Are there are any questions or comments specifically on the ARM Framework recommendations that the subcommittee has put forward? If not, we can move on to the Technical Committee's report and then the APs report; whatever is the pleasure of the board.

CHAIRMAN GILMORE: Mike Luisi.

MR. MICHAEL LUISI: I am interested in the harvest package statement that was made during the presentation regarding the consideration for harvest packages that include some female harvest in the bait industry. This board tasked the work of the ARM Subcommittee to evaluate that and put forth to the board options for potential consideration on small levels of female harvest to help revitalize some of what the bait industry has lost.

I'm interested in your comments regarding why, by taking that one step further and perhaps including that in an addendum; it sounded like to me that we would be wasting our time, and that we would still find ourselves in the position only to have one option to select from when we were talking about the packages that have been selected over the last few years. I don't know if you can just elaborate a little bit on that.

MR. ROOTES-MURDY: Yes, just for the board's clarity. Again, I believe it was November when we first started talking about this. We heard from the board an interest in having female harvest options outside of what is already in the addendum. The ARM Subcommittee went back, looked at a number of possibilities. ARM Subcommittee members drew up a bunch of options, which are included in the report; they are in the appendix.

But the bottom line was that even if you wanted to add in these additional harvest packages, the thresholds that are set up in the ARM model currently, need to be exceeded; in terms of increasing the population above them, in order for any package to be selected that includes female harvest. That is why we're currently still at that 500 male crabs preferred pot package. Without any changes to the abundance estimate, then even adding a bunch more harvest packages wouldn't necessarily move the needle to select them.

CHAIRMAN GILMORE: Follow up, Mike?

MR. LUISI: Yes, please. Okay, I get it. Just another question, when would be the next time that we might get a peek at abundance; and then how were the thresholds ultimately established? Were they based on the assessment, or were they just selected as a number of horseshoe crabs that we ultimately want in the population?

MR. ROOTES-MURDY: I'll answer the process issue or question, and then I'll turn it over to Jim Lyons to talk about the threshold. The process would be, you know, this is this initial setup phase revisiting that we're doing right now. If the board were to move forward with the recommendations of the ARM Subcommittee, the next time would be four

to six years from now; kind of the same timetable that was laid out in Addendum VII. Four to six years from now is when they would be revisited.

MR. LYONS: Yes, and with respect to how these thresholds were developed, these were created during the setup phase that I mentioned and were developed in stakeholder meetings. There were several meetings back in the early years to identify these utility thresholds and set these population thresholds. I believe the current figure is 80 percent of estimated carrying capacity, and there was some literature and some research on estimating carrying capacity; and the stakeholder meetings chose that threshold.

MR. ROY MILLER: It appears that any accommodation for biomedical mortality will result in a decrease in the present 500,000 male crab harvest scenario. Am I correct in that assumption? In other words, if biomedical mortality is incorporated into the ARM model that 500,000 number of male crabs is going to decrease; am I right?

MR. LYONS: Yes, let me try to address this question. Yes, the biomedical -- the allocation to bait harvest is reduced as biomedical is incorporated under the preferred option. The important thing to point out is that under the preferred option, we've changed the packages very minimally, and so if the populations stay the same the ARM Framework should continue to operate as it currently is right now.

With the minority option, we don't change the packages and the implicit allocation to bait harvest remains the same. But in changing the population dynamics model the way that we will, under the minority option, you actually have a greater total harvest; and so a greater subtraction after natural mortality.

That has the potential to lead to more conservative packages. We don't have any simulations or any evidence of that; but I say that simply out of first principals and a population dynamics model. If you're subtracting more harvest mortality, it seems reasonable to think there is a potential to move to more conservative packages from say

500,000 males only to Package 2, or even Package 1.

MR. MILLER: If I may follow up, Mr. Chairman.

CHAIRMAN GILMORE: Go ahead, Roy.

MR. MILLER: Is there any compelling evidence that the present harvest rates are constraining the population recovery of horseshoe crabs? In other words, it seems to me if we're going to contemplate reducing say, the 500,000 male only horseshoe crab harvest, we would have to have compelling evidence that in fact that given level of harvest today is still constraining the recovery of this population. Is there evidence to that effect?

MR. ROOTES-MURDY: I'll take a stab at this and then maybe turn it over to either Jim or our Technical Committee staff to provide further comment. We are still operating without a stock assessment to give us a stock status for the Delaware Bay region, so when we're looking at the ARM Framework, we're not considering the stock assessment right now. Our data inputs are the Virginia Tech Trawl Survey and in the absence of that, we have the composite index.

We have information on harvest rates over the last few years, and last year, in particular on the regional level, the Delaware Bay region states had lower bait harvest than they had in previous years; but there are a couple of factors that may be contributing to that in terms of stockpiling some crabs, carrying over from one year to the next. There are a couple of factors that may be influencing the Delaware Bay population currently, but we don't have an overall indicator of how the population is doing.

MR. LYONS: I might just add that the population monitoring that we have for crabs suggests maybe a stable or slightly increasing population, and so it may be that over time the population will continue to grow and then it is likely that the ARM Framework recommendation would change. But our evidence right now is that the smartest thing to do, given the objectives that we have and the monitoring information that we have, has been the 500,000 crabs.

MR. BRANDON MUFFLEY: I have a couple questions. One, a hopefully easy question. Jim, you had presented in the index the composite index that you all have created, the indices that you used in that index. You talk about the New Jersey/Delaware Bay Trawl Survey, and up on the slide you had indicated the Surf Clam Dredge Survey that we use.

But in the memo it says our New Jersey Ocean Trawl Survey is used in that index. I was just looking to see what indices are actually used; mostly because funding for one of them is more subject than the other one, so if we're relying on the Surf Clam Survey, which is more variable in terms of funding, versus our Ocean Trawl. I just wanted to clarify which surveys are actually used for the composite index first.

MR. LYONS: Yes, I believe it is the Ocean Trawl and not the Dredge, so there was a misprint there somewhere.

MR. MUFFLEY: Okay, thank you, and then on these sort of harvest packages. Can you give me a little bit more information in terms of -- you said that if we allocate under these harvest packages, some harvest to the biomedical industry, we're not putting a limit on that biomedical industry; although we're assigning a specific quota it seems like to them.

I'm trying to understand how we're not impacting the biomedical industry harvest by actually having a quota assigned to them; and how are we giving under Option 3, some mortality assigned to females when the option is for a 500,000 male-only harvest, so two questions on that?

MR. LYONS: The reason I say it is not a cap is that the new harvest packages are created from the biomedical data. What we're doing is simply accounting for the known mortality that we have from the biomedical industry. Periodically, we create this running average, and then we add that mortality to the current packages.

I say it is not a cap, because this is a limit; this is only what you can take; it is acknowledging what

has been taken and the harvest that has been going on. With the current set of packages, I should add that for it to be considered a cap, the biomedical mortality would have to increase by an order of magnitude.

With a small amount of time we can come up with the numbers of crabs that would have to be bled, before we would exceed the total package; and all of it going to biomedical. But it is an order of magnitude increase in the biomedical that would be required before this would actually be any kind of cap or limit. I've forgotten the second part of your question. I'm sorry, can you repeat that?

MR. MUFFLEY: It was just how are we allowing for mortality to females under the one scenario, which was a 500,000 male-only harvest and you're allocating some of that mortality to females?

MR. LYONS: Right, okay, thank you. One thing that we should point out with this preferred option is that it does create this allocation decision for the board; and those packages list a certain amount of female harvest, but the board would designate that that is female harvest for the biomedical industry only; and if we were to look at the table, you would see that the allocation debate would be zero females. The female harvest in the new packages is for biomedical only.

MR. ROB O'REILLY: I've been concentrating as I went through the materials on how challenging it is going to be and has been for an index of abundance. I guess I'm wondering two things; one, for the composite index when the trawl survey was not available, and using other surveys and going through a correlation and regression and a number of sort of permutations there. What kind of rigorous review has that methodology received? That is one question.

The second question is tied in. It indicates that the efficiency of the trawl survey was looked at in 2011, and certainly was not 100 percent; and so the composite index also suffers from underestimation of abundance. I'm just wondering, has that been addressed in any way, or is that something that is still just as left unknown?

MR. LYONS: I will take a stab at this. The composite index in that work was done by our subcommittee in response to the lack of funding for the trawl survey. I think we did go with the status quo for one year, but then we tried to develop an alternative approach based on other surveys.

We produced this approach, and I believe presented it to the board. But that as far as I know, has not undergone a peer review process beyond the subcommittee. With respect to the efficiency of the trawl survey, the subcommittee recognizes it is not 100 percent and that if we understood the catchability of that survey better, that would be an improvement to the monitoring program.

CHAIRMAN GILMORE: All right Rob, make it quick, because we've got two more presentations to go through, and we are going to run out of time.

MR. O'REILLY: Quick as lightning, Mr. Chairman. The question is; is that something that will be looked at this year, the catchability? Will that be further addressed?

MR. ROOTES-MURDY: Yes, we asked Eric Hellerman to consider this that gear selectivity in doing the survey this fall. These recommendations were made known to Eric Hellerman and he is receptive to conducting this study in the fall.

CHAIRMAN GILMORE: Okay, I have Stew Michels and then I've got Mike Millard; and then we're going to move on.

STEWART MICHELS: Thanks very much, Jim. This is a lot of work by the committee, and it is certainly appreciated by this board. Can you help me understand this biomedical mortality component a little bit better? I don't quite understand how it shouldn't be additive; instead of incorporating it into the overall mortality and essentially spitting out a quasi-quota for the biomedical fishery.

Was there any consideration that we just consider this biomedical aspect as additive incorporated into the model? I guess kind of the secondary option? Then just treat it as an additive

component to mortality and as not a portion in any further manner?

MR. LYONS: Yes, I'll take a stab at it, Stew and Kristen can perhaps help. Yes, I think what you are describing is close to the minority option. It is the additive in that sense. I mean, it is a little more clear that it is additive there under the minority option. But there is a feedback from the harvest recommendation to the population dynamics model in all cases.

Even with the majority opinion, the new packages and the total mortality associated with them is additive to natural mortality. Because there is feedback in all cases between what we recommend for harvest, and the population dynamics; the two approaches are similar in that way. It is the amount of change in the packages and the actual total harvest where the results are different.

CHAIRMAN GILMORE: Okay, Stew, go.

MR. MICHELS: But you also contend that the change is so slight, right; that the biomedical portion is so slight that it would take basically a doubling of the amount of biomedical harvest to really make a difference. Is that what I understood that you said earlier?

MR. LYONS: With respect to the cap part?

MR. MICHELS: Yes.

MR. LYONS: No. It is much more than doubling. The biomedical mortality would have to increase by an order of magnitude ten times what it is now, before the whole harvest package would be allocated to biomedical.

DR. MIKE MILLARD: I'll try and be quick. I did want to circle back to Roy's question about the inevitability of a reduction to the bait harvesters under either of these options. I'm going to ask, I guess, Jim. Tell me if I have this right. Under the preferred option the model remains ignorant of the biomed harvest; and that adjustment is made after the model gives us its answer.

That is clearly a reduction to the bait harvesters. Under the minority option then the biomed mortality is added into the front of the model. The model now sees more mortality, and goes through its optimization routine; and as you said, that compounds and ends up in a larger mortality seen at the end of the run and gives us the chance of it picking a more conservative harvest package.

Now I know, and Dr. Smith's simulations weren't exactly designed to get at this question, but he did run simulations with this model package to see how it behaves; how it performs. In his simulations the model optimization scheme never landed on Option 2, it always went from 3 to 1, which is total moratorium. I guess I'm asking you, if we were to do the minority option, you cannot discount that we would land on Package Number 1. That is a possibility if we go down that road, it seems to me; total moratorium.

MR. LYONS: I would agree with your assessment, Mike. I think everything you've said there is correct. Because of the way the minority option is implemented, and the tendency of the optimization routine, when it is seeking a more conservative recommendation, tends to skip over Package 2 and select Package 1 at times when reducing harvest is the optimal solution.

Yes, I think it is accurate to say, without knowing the answer right now, that just on first principals of this modeling approach, when you have a greater total mortality there is a greater change that you would end up with a more conservative package; and in this case, perhaps a moratorium.

DR. MILLARD: A quick follow up if I may, Mr. Chair.

CHAIRMAN GILMORE: Go ahead.

DR. MILLARD: If it doesn't change, if it still lands on Package Number 3, then we are left right where we are now. We have the same harvest package, the bait people get it all, and with a known up to 10 percent removal by the biomedical people that again is essentially ignored, or not accounted for by us; it seems to me under that minority option.

TECHNICAL COMMITTEE REPORT

CHAIRMAN GILMORE: Okay, we're going to go on to Steve Doctor, who is going to give us a report from the Technical Committee.

MR. STEVE DOCTOR: Hi, I'm Steve Doctor from Maryland Fisheries Service; and today I'll be acting in the capacity of the Chairman of the Horseshoe Crab Technical Committee, and also representing the Delaware Bay Ecosystem Technical Committee. The Technical Committee was given this information just as you have, and we've come up with some recommendations. We met by conference call on July 28. The ASMFC staff presented the ARM Subcommittee review and recommendations. We evaluated the subcommittee recommendations and considered the biomedical mortality estimate inclusion, and discussed biomedical mortality threshold exceedance; which is another word for the standards for the biomedical companies.

The Technical Committee was in agreement that the ARM Subcommittee review is acceptable. Some of the comments that came from the committee were further exploration of alternative harvest packages with the female harvest. There was kind of disappointment that that wasn't pursued further.

They also had a recommendation that further work be done to reconcile the red knot mark/recapture abundance estimate with the aerial estimate. There seems to be some things that need to be worked out between those two. As far as including the biomedical mortality in the ARM Framework, the Technical Committees agreed that the ARM Framework, to be properly run, should incorporate biomedical mortality.

The majority of both technical committees were in favor of the ARM Subcommittees preferred option; the reason cited that by using an average, it does not violate confidentiality rules, it is transparent and explicit of mortality estimates, and it treats harvest types similarly as removals. There was also minority support for the ARM Subcommittee secondary opinion.

The reason cited that it accounts for biomedical mortality without changing harvest packages,

would not require an addendum, and is a transparent inclusion in the ARM Framework. Biomedical mortality in the ARM Framework continued. If the addendum is developed, sensitivity analysis should be done to see how both options would be implemented.

That means like we're discussing that if you did the method where the mortality was taken out of the model, it would be nice to do some sensitivity analysis to see actually if it would choose 1, 2, 3 or 4, whether that would actually change; because the mortality has already been experienced and we would like to see if it changes the reaction of the model.

Also, try the preferred alternative too, to see if it would change the outputs. Also, those in the Option 4 that is presented, the preferred alternative, they have recommendations on the amount of female and male removals. Because this process is going to happen every four years and there is growth in the biomedical industry, it was a recommendation that there be a buffer; maybe 10, 20 percent on the amount that is given to the biomedical industry for growth, so that we wouldn't maybe hit a trigger that overruns the biomedical allocation.

Then there was also some confusion over jurisdiction and ability of the board to limit biomedical harvest. Both technical committees requested that the board determine jurisdiction for possibility of limiting biomedical collection and harvest. Then the biomedical threshold exceedance recommendations were basically our recommendations for the biomedical industry.

Some of the Technical Committee members requested requiring biomedical companies to contribute to funding to the Virginia Tech Trawl Survey and other studies of biomedical mortality. There was not a lot of public support for the ARM Model; and I think that is all I've got. Are there any questions?

ADVISORY PANEL REPORT

CHAIRMAN GILMORE: Questions for Steve. Well good, we'll move right along then. We're going to go to the Advisory Panel report. Just give us a

second here to get set up. Okay, Jim Cooper is going to give us a report from the advisory panel.

DR. JAMES COOPER: Yes, the advisory panel received the discussions of the ARM proposals, as you've just heard; and I won't elaborate on that. Going directly to the Advisory Panel report, let's go to the comments with a panel that begin on the bottom of Page 1; where we point out that the AP members were not in favor of the ARM proposal to include any biomedical mortality.

We felt that this was inadequately supported at this time and perhaps premature; we were only given ten days to even study this matter. Some of the problems that they did have that started with the fact that the preferred option would potentially bring the bait and biomedical harvest industries in conflict with one another, and actually we don't think that is in the best interest of everyone.

Obviously, we're very different industries, but we would rather try to accommodate each other whenever possible. The mortality estimates from bleeding, we think, are insignificant with respect to bait fishery harvest; in fact, we think really insignificant with respect to the number of horseshoe crabs that are in the ocean, so that including the ARM models would actually, we think, go against the intention of the ARM Framework as previously identified.

There was concern that neither of the options has been tested through simulations and perhaps premature for the board to consider at this time. Also we're concerned that the biomedical data being introduced at this point would be the first step in creating limits to collecting horseshoe crabs for the biomedical production of LAL reagent.

We think that limiting LAL would have significant impacts, certainly on the biomedical community; and I will point out a little bit later that that the FDA of course has no impact in this area, other than to require biomed companies to return them to the sea. They have nothing to do with collection.

However, they will be very interested should there be any threat to the availability of reagent for the industry. We feel like we weren't given much time,

and also the fact that these committees, once they got around to biomedical discussions, would have benefitted from the presence of a biomedical expert to help them deal with some issues; misinformation and things like that.

We certainly felt that we had not been consulted by subcommittee in the development of these options. The AP did indeed take exception to most of the ARM recommendations. We feel that this could be revisited over the next two years. I'll take questions at this point. I don't want to belabor this issue; time is running short.

CHAIRMAN GILMORE: Do we have any questions for Jim Cooper? Okay, seeing none; I think what we're going to try to do is maybe break this into two pieces. We essentially need a motion to adopt some of these recommendations. The biomedical package seems to be the one that is going to get a lot more discussion.

With the pleasure of the board, if somebody put up a motion, actually, for the other points or whatever, it would be helpful to move this along. Well, the other option is we put this all in one package one way or the other, and we could get bogged down. Brandon.

MR. MUFFLEY: Following that vein, delay this putting this all together; I agree let's try to separate it out. **Move to approve all ARM Subcommittee and Technical Committee recommendations except for the biomedical harvest Subcommittee packages.**

CHAIRMAN GILMORE: I have a second from Robert Boyles. Do we have discussion on the motion? Seeing none; is there any public comment on the motion? Seeing none from the public; Mike Luisi.

MR. LUISI: I was prepared to take a little bit of a different approach and also include in this addendum some analysis on the alternative harvest packages, which include female harvest; as part of the bait industry. Going back to what Brandon said earlier about the harvest package as it is selected now with 500 male crabs, and then the allowance of female harvest at the biomedical facilities.

I just think it is a difficult explanation to make as to why a small level of 25,000 or 30,000 crab harvest can't happen. I don't understand why it can't. I can't explain it to my public, who have asked me to support them, and asked our commission to support them on their interests. I absolutely agree that this biomedical industry issue on mortality needs to go out to the public; and we need to get feedback. **But I would like to incorporate another piece to this, so if I may, Mr. Chairman I have a motion to substitute.**

CHAIRMAN GILMORE: Go ahead, Mike.

MR. LUISI: **Move to initiate an addendum to the horseshoe crab fishery management plan; to address the Adaptive Resources Management Subcommittee's recommendations to the ARM Framework regarding one, mortality associated with the biomedical industry and two, bait harvest packages which allow female horseshoe crab harvest as presented in Appendix C of the framework review.**

CHAIRMAN GILMORE: While we're getting it up there, do we have a second to this motion; or do you want to see it first? Craig, are you seconding the motion? Okay. While we're getting it up, do we have questions, comments, or discussion on the motion? Mike, do you want to take first comment crack at this?

MR. LUISI: Sure I'll say it again, and I've said it before. These are the two big issues that came out of the subcommittees recommendations. I absolutely appreciate all the hard work and effort that goes into those recommendations. The work that has happened since last year, I've been getting feedback from staff.

It is a tremendous amount of work, and I do appreciate it. However, I think there needs to be more public involvement in the understanding and the decision making that happens as a result of these two issues. I feel that the addendum process through the commission is just that process, and that by us selecting here today one of the recommendations; we heard a minority and a majority opinion on the biomedical industry. We also heard that with the female harvest packages

in the bait industry that it is very likely that the model will select the current package. But I would like to see what happened as a result of running the model through those different options, and then be able to make the decision at the end of the day as to the path we take. I think it brings the two big issues that we've been talking about for years to the table; and it brings it to the board so that we could ultimately make those policy decisions, and that is the purpose for me moving forward in this direction.

CHAIRMAN GILMORE: Other questions or comments?

MR. ROBERT BOYLES: Clearly, South Carolina has got strong interest in horseshoe crabs, and even horseshoe crabs in the Delaware Bay region. I just wanted to point out that we had an opportunity to brief our board a couple weeks ago about this fishery, the unique fishery that we've got in South Carolina.

Thanks to some good work by a number of our forbearers, I think we've got a really good program in South Carolina. I recall that some time ago there were conversations about, well maybe some options would include, let's turn every crab that is bled into bait. I think I made some strong comments against that at the time, because that is not consistent with the way we manage this fishery in South Carolina.

I was talking to my colleague from New Jersey about their fishery, and I would just, for my edification, for the board to know that we do get good data from industry on reported mortality. We think it is a well-managed fishery, we think it is very, very important. We place a high value on that biomedical fishery; to the extent that we don't allow horseshoe crabs to be used for bait. I just wanted to make those comments for the benefit of the board as we move into this discussion and try to sort out how we best manage this fishery.

MR. DAN McKIERNAN: Yes, I would be more comfortable with this motion if I had a Law Enforcement representative telling me that opening the female harvest was something they could control effectively.

CHAIRMAN GILMORE: Other comments. Do we have any comments from the public on this? No, okay seeing none; oh, Brandon.

MR. MUFFLEY: I'm still struggling with it from the biomedical industry; not even to my friend over in Maryland's perspective. I'm interested in evaluating what their options may be for female horseshoe crab harvest. I'm still struggling whether or not we really need; I think we need to account for the biomedical industry mortality, so that we have a complete picture of what is going on.

I don't think it is that significant, but I think we need to account for it; and I think we can do that with the alternative option that was presented that would not require us to go out to an addendum to evaluate that. When we talk about increasing in mortality, you know, when you're showing an increasing mortality, we may result in more restrictive measures.

That may be, but now you're accounting for new mortality; which isn't necessarily new, but it's new in terms of accounting for it through the modeling process. What may also happen is if we're showing increasing trends and to some regards in the Delaware Bay population, this mortality is already taking place.

What may happen by accounting for it, you just may scale up the amount of horseshoe crabs that are available in the population. It may not be a negative response to the bait industry by accounting for this mortality. We don't know what the response is going to be just yet, but again, I'm still apprehensive to go down that road of assigning quotas to the biomedical industry and reducing it on the bait side of things, where I think we can account for the mortality under the alternative package; which would not require an addendum.

CHAIRMAN GILMORE: Go ahead, Mike.

MR. LUISI: I'm just, Brandon I didn't intend in this motion to change from what I read your motion to be. I believe that what we would end up with here

are alternatives in the addendum that would expand upon the work that has been done by the subcommittee and give the public that information.

If what I heard from Mike earlier indicated that by selecting the minority opinion, we could potential find ourselves at a moratorium. I think that information needs to be well vetted. I would expect that by going forward with the amended motion that we would be looking at both opinions as well as the additional bait packages as a further expansion from what we've already heard from the subcommittee.

MR. O'REILLY: I also think that the mortality from the biomedical can be accounted for in the alternative approach, and I heard Steve Doctor representing both technical committees, indicating that a sensitivity analysis or something along those lines could be done to see what happens with these two alternatives; and I don't think anyone wants to just come to another meeting and find out, well the conservative nature of the model ended up on Package 1.

I think that needs to be short circuited, and we need to know about that; but all in all, I expect based on the comments earlier that this is a small amount of mortality relative to the whole stock, so I, too, think the second alternative is probably the way to look at this, get it in the model itself, and go from there.

CHAIRMAN GILMORE: Any other comments? Emerson.

MR. EMERSON C. HASBROUCK: In reviewing the main motion and the substitute motion, I'm not clear really what we would be approving in the main motion. It says to approve all adaptive resource management and subcommittee and technical committee recommendations except for biomedical. What are all the other recommendations?

CHAIRMAN GILMORE: Well, they were the ones that were gone over in the first place, but there were five of them or whatever, so essentially what we're going to do is trying to approve the four and handle the biomedical issue separately. I think

Mike has now combined them back together, and that might be a better solution to it.

Those earlier pieces, I think, would be part of this process. Are there any other questions before we caucus? Do we need a minute to caucus? All right, take a minute and we'll call the question. All right, the meter is running and Toni is giving me the high sign. All those in favor of the motion, well, first off, remember this is a motion to amend; so first we have to vote this one up and then we'll put it up as the main motion. **All those in favor of the motion to amend, please raise your hand, all those opposed; null votes, abstentions; motion passes 10 to 5 to 0 to 0. This becomes the main motion now.** Are there any comments on this from the board before we vote?

PUBLIC COMMENT

CHAIRMAN GILMORE: Okay, anything from the public? Okay we'll take some brief public comments on this. Benji, do you want to go to the public microphone?

Benji, I'm going to let Jim Cooper go first. Jim is the AP Chair, but he actually wants to make some comments, not as the AP Chair, which he would normally go back to the public microphone but because it is so far away, we're going to let him do it from here. This is individual comments from Jim.

DR. COOPER: I think you have a document that has my comments, and it is misleading in the sense that I signed it off as Chair of the AP, but these comments are not representative of AP comment; although many would agree with me. I am going to try to cut this as much as I can. I think the ARM proposal starts out by reminding everyone that about 2011 or 2010 the so called mortality threshold was exceeded and the board was supposed to do something. It suggests that nothing was done; and that actually is not true.

In 2011, the board asked that the commission enable a study of best management practices to try to harmonize the way that crabs are protected in the biomedical facilities; and recognizing that the FDAs good manufacturing practices really dominate what goes on in our industry. We thought well, we'll set up procedures that mimic that and help us with our training of waterman,

training of handlers, and of course writing appropriate procedures to protect the crabs would be a good way to do that.

This was accepted by the board and not any other action was taken. Danielle Brzezinski was running things at that time, and actually I don't know that the board actually voted on anything at that time; in fact I don't think they did. But nevertheless, in discussing some of the ARM issues, we think they may have been influenced by misleading information while preparing the documents that we've discussed.

For example, it has been discussed that there is concern that the collapsing TAL industry in China will eventually pressure U.S. LAL market if we have to supply them with reagent. Actually, I've looked at the marketing analyses, and it shows that Chinese firms do less than 20 percent of the worlds endotoxins tests; therefore, we could absorb that should it be necessary.

In considering the growth of endotoxin testing, there is an only modest increase anticipated over the next few years. Now what happened in the first decade, the previous decade was that there was a big increase that occurred, because FDA suddenly required the drug industry to greatly expand testing of in-process samples and starting materials to make sure that they never got to the final product with any potential contamination, so you see this was FDA's regulatory expectation that caused a jump in LAL consumption at that time.

But it has pretty much leveled off now, and indeed, the FDA would react to anything that looked like a curtailment of the reagent. There is also the notion that LAL can be immediately replaced by a recombinant product. That is not true. The R factor C only contains one of the enzymes as part of this system; LAL reagent has a three enzyme reagent. It is certainly more robust, but the big issue is that using the recombinant will require expensive fluorescent readers, rather than the standard inexpensive right readers. That is a cost issue that would profoundly limit this matter. I am sure there are other issues that might have come up like this. I think the presence of a biomedical expert at the time of these discussions could have

avoided some of these things. Now our interest in the biomedical research regarding post release mortality, we've been discussing this to some extent, even today.

Now mortality estimates in the biomed industry is really difficult to study, because horseshoe crabs aren't laboratory animals, they are arthropods. It is really almost impossible to adequately reproduce post release environments for these kinds of studies, and that is the reason we see publications suggesting that the post release mortality may be very high; 30 or 40 percent.

It is the inability to study these in a laboratory situation that brings about these kinds of overestimates. I would like to remind you that horseshoe crabs are hardy; they've survived for millions of years and they are resilient. I was associated with Cavanaugh Laboratories about 40 years ago, and they maintained a big tank of horseshoe crabs in order to study their coagulation systems.

One night salt water leaked from the tank. They filled it up with tap water, just fresh water; and the next morning the staff found 50 or so horseshoe crabs floating lifelessly on top of the water. They picked them up and carted them off to disposal area very reluctantly, all despondently. Then the following Monday morning they get a call that says, would you come down here and pick up these crabs, they're crawling all over the place.

This is just a story that helps you understand that the crabs are resilient enough to even recover from a fresh water shock that made all of them look dead. This exemplifies the uncertainty of trying to reproduce a return-to-sea environment. Elegant research continues in South Carolina. DNR scientists there have been doing some elegant studies on the genetic diversity of the crabs in that state.

Their study concluded that genetic diversity was high. There was little to no evidence of inbreeding, evidence of a huge population offshore, she couldn't tell how big it was, but it is very, very large; certainly a positive indicator for adaptive potential, and this is Walsh and so forth. The

fellers from South Carolina can tell you how to access that document.

By the way, a marketing specialist told me that there are approximately 60 million endotoxins tests done annually, and if we assume a loss of 60,000 crabs; that means that we're getting about a thousand tests for each crab that might be lost, and I think this is a tremendous bargain. Loss of a small proportion through the biomedical industry really is inconsequential and justified by immense value of the reagent.

If the board members believe that local marine resources are properly managing biomedical firms, and that the BMP document minimizes harm to the crabs, and that there is no value added to creating a third level of bureaucracy, certainly one that leads to limiting the horseshoe crabs in the biomedical area.

We think that the expenditures could be used more widely. Rather than pay for an addendum; we could probably pay for a Virginia Tech Trawl. I strongly urge the board to categorically reject the proposal ARM document with respect to the biomedical community. I think we could take a two year moratorium on this issue and allow us to update the BMP document, continue review and research to better understand post release mortality; and hopefully have a better working relationship with any technical committee or whatever that would be considering biomedical issues. Thank you very much.

CHAIRMAN GILMORE: Thanks Jim, we've got Benji and Dr. Schuster. Benji, do you want Dr. Schuster to go first? Is that okay? Okay, go ahead, doctor. Please keep your comments to about three minutes. We're really running short on time.

DR. CARL SHUSTER: I received a telephone call last night alerting me to the fact that I might be interested in attending this session; primarily because there was some concern about lumping together bait and LAL resources or mortalities. True that the bait is 100 percent mortality, and LAL, as Dr. Cooper has explained, is not as well understood.

For this reason I would not lump the two together, but actually if you wanted to learn something more scientifically, I would learn more about the reproductive system of the female horseshoe crab. As far as I know, there is no one today who knows much about the functional anatomy of the crab, the physiological aspects.

If you were going to form a baseline against which to compare what you're observing in experiments today on the impact of bleeding on horseshoe crabs, you would certainly want to know something about the physiology of the normal. The natural horseshoe crab female; is lacking. If I were going to do this thing, I would think in terms basically about the biology of reproduction in the females.

The second point I have, which is outlined here is that hearing that bait and LA were going to be lumped together, I thought, well, I can think of many other ways that you could lump things together; and certainly if you do that, you can come up with a list as I have, and there are many more things that should be added that indicate the scope of the mortalities that we're dealing with in understanding the horseshoe crab.

I went through and listed them, and then I drew a line and ascribed certain numbers to them. If I am anywhere near the ballpark, the loss of horseshoe crabs from both LAL and bait would be less than probably 2 percent of the total population. If you expanded that to 10 percent, you would lose 2.68 million crabs, and that doesn't seem like an overly heavy impact upon the population since that occurs sometimes in some of the natural phenomena; where crabs are destroyed.

That, I think, summarizes in effect the scope of what I just thought about in that short period from last night to now. My recommendation that you have someone who sincerely looks at the ecosystem approach to horseshoe crabs, and think in terms of the impact on crabs on, for instance, the surf clam industry, things of this nature; that you're not dealing just with horseshoe crabs, you're dealing with ecosystems, and there doesn't seem to be much concern about that, which I feel is probably the key to much of what you should be learning. Thank you.

CHAIRMAN GILMORE: Thank you, Dr. Shuster. Benji.

MS. BENJI SWANN: Okay, I'll try to be quick. I don't know if I can do that. My comments are --

CHAIRMAN GILMORE: Benji, could you just identify yourself.

MS. BENJI SWANN: Benji Swann, Lysate manufacturer in the state of New Jersey, and I have been since actually 1985. Adhering to the Atlantic States Marine Fishery Commission Interstate Horseshoe Crab Management Plan, the collection of horseshoe crabs for *Limulus Amoebocyte* Lysate is monitored by state agencies in the Atlantic States Marine Fishery Commission, but not part of the ARM Harvest Package.

This is due to one fact. LAL is a life-saving, critical, essential vital product for human health without any present alternative. Some suggest that a synthetic product can replace LAL. However, the synthetic product is not there yet, and perhaps never will be completely or at all. We cannot drive the market by constraining the biomedical companies. The market will drive itself.

A perfect example is the new LAL application developed by a biomedical company that uses 120th of the raw lysate. Point two, biomedical collection is separate from bait harvest and should be, as its activities are essential to human health and pose no threat to the horseshoe crab population. On average, eight to nine horseshoe crabs out of ten survive the process and can be found spawning years after bleeding.

The Delaware Bay horseshoe crab population has remained stable, slightly increasing for years, and estimated to be 20 million horseshoe crabs. If the entire mortality of 60,000 crabs associated with biomedical use is attributed to the Delaware Bay region, the impact is 0.3 percent. A quote from the ARM Subcommittee report July 16, 2016, refers to biomedical companies killing the horseshoe crabs.

Any small mortality is unintentional, and may be out of our control. I find it offensive that any

member would accuse us of intentionally killing horseshoe crabs. Number three, when considering the adoption of the ARM modeling and the harvest package in 2010, the biomedical numbers were not included, and no substantial change in the biomedical numbers have occurred to warrant inclusion.

The biomedical numbers reported in 2014 are similar to the numbers from the year 2010; prior to the ARM adoption. As an aside, when I prepared a table for illustration, the 2014 numbers regarding biomedical collection were reported incorrectly. More biomedical crabs were bled than collected; this isn't possible.

This emphasizes a point; that numbers are good to refer to, but sometimes logic has to prevail. Point four, a reason given for the inclusion in the ARM was to make biomedical mortality more explicit. Right now the biomedical numbers are explicit, and listed in their own table. When I view the proposed ARM table with biomedical mortality included, the table begs more questions than it answers.

It is also misleading, giving one the impression that biomedical collection is limited. This is not the case, nor should it ever be. Another quote I read was, two stakeholders exploiting the resource; and again I find this offensive. We are managing the horseshoe crab population to be sustainable, and to prevent exploitation. Number five, comments on the proposed addition, first and foremost the introduction contains mortality from the biomedical harvest to date hit a high of 90,440 crabs in 2012, an increase of nearly 100 percent since reporting began in 2004. Similar to the 2014 numbers, the 2012 numbers were erroneous as well. More crabs were bled than were collected. Okay quickly reviewing the biomedical tables.

The number of horseshoe crabs brought to the biomedical companies, Row A, jumped between the years 2006 to 2007. One reason could be more males began to be used for bleeding, and more males are needed to be equivalent to a female. Furthermore, this use of males may have been perpetuated by the adoption of Addendum IV in 2006.

I didn't have time to review this. Since then biomedical numbers remained in the low 500,000s, with the exception of the years 2011 and 2012; increasing to the low 600,000s. Specifically, when I looked at the recommendations and conclusions for the proposed addition, Number 1, I disagree with for the above reasons. Biomedical numbers should not be incorporated into the ARM model.

Number 2, since 2005, 11 years ago, confidential data is submitted detailing mortality at each stage. This information can be located within the biomedical table, Line D, reported mortality of biomedical only crabs from harvest to release. Numbers 3 and 5, years go by too fast. A three-to-five year review of BMPs would be sufficient.

Number 4, many of the companies have funded and are currently funding research to enrich the knowledge and understanding of the horseshoe crabs in the LAL product. To continually study the mortality of bled horseshoe crabs to get that perfect number that everyone will agree on, will never happen.

Each study has its own imperfections, but one consistent thread is found. The horseshoe crab's survival can be assured at a high level if the horseshoe crabs are handled with care and concern. Number 6, my last point, timing is fishy. The ARM Subcommittee's task was to review the ARM model, which is specific to bait harvest, review its assumptions and utilities and its usefulness in managing and advancing the horseshoe crab population.

Instead, it focused on biomedical activities and shorebird studies. The ARM Subcommittee document was 47 percent shorebird activities and shorebird studies, 15.5 pages of 33, 32 percent of biomedical related, which was 10.5 pages of the 33 pages; 6 percent was two pages of references and introduction, and 15 percent was a review of the ARM model and tagging, which was 5 pages.

Combined with its arrival in the ninth hour, something is very fishy. I urge you to vote not to include or list the biomedical numbers in the ARM

package, and continue your good work in managing the horseshoe crab populations. I'll take any questions if anybody has any.

CHAIRMAN GILMORE: Thank you, Benji. We're going to come back to Kirby, and we're going to go a little bit over the schedule first; so before we call the question.

MR. ROOTES-MURDY: I just wanted to outline to the board, I outlined earlier a timetable moving forward with an addendum that was based on the ARM Subcommittees recommendations. Under this motion, I just wanted to make sure folks were aware that this addendum initiated at this meeting would then likely be taken up to go out for public comment at the annual meeting; and then final action would be taken on it at the February 2017 meeting. In terms of the 2017 specification process, this addendum from what staff understands, would be separate to the 2017 specification process.

Then the last point is that this motion outlines specifically that the second item, there are two parts to this addendum, lists options that are included from the ARM Subcommittee's review. I just want to make clear that the first part is that also biomedical mortality; in terms of the decision point there. Would that be drawing from the ARM Subcommittee's review items, or additional work? Those are just some points to consider and clarify for staff.

MR. LUISI: On your last point, Kirby. It was my intention when making the motion that the first issue on biomedical mortality, there would be a range of alternatives to include the status quo; and then the two minority and majority opinions from the ARM presentation.

MS. KERNS: I just wanted to clarify. I think best case scenario is we can get you a document for review to go out for public comment at the meeting in October. But there is also a chance that it might not be available until February. It depends on how much work it will entail for the TC, because don't forget they still have to pull together the ARM packages for the board approval in October.

CHAIRMAN GILMORE: Good point, thanks Toni. All right, back to the board. Bill Adler.

MR. ADLER: Can I make a motion to postpone until the next meeting, this whole motion.

CHAIRMAN GILMORE: You can, but you need a second.

MR. ADLER: Guess not.

CHAIRMAN GILMORE: Motion fails for lack of a second, so back to the board. Are there any comments on the motion? Okay, do you need any time to caucus? Okay, I give one minute to caucus. Everybody ready for the question? **All those in favor of the motion, please raise your hand; all those opposed, null votes, abstentions; motion passes 13, 2, 0 and 0.**

DISCUSSION OF ADDITIONAL BAIT TRIALS

CHAIRMAN GILMORE: Thanks, everyone. We have one more order of business, which is on the bait trials, and I think we're going to turn this over to Bob Ballou; who is going to just make this so efficient and intro it, and get a motion and just get this thing going. Bob.

MR. BOB BALLOU: Yes, I am prepared to collapse a 30 minute agenda item into what might be just a two or three minute item; of course, that depends on the board's response. But I'll just say in brief, we've had some good discussion at our last few board meetings regarding alternative bait; which to clarify involves a composite or some other variation that uses less horseshoe crab relative to current levels, while continuing to meet the needs of whelk and eel fishermen.

With a view to maintaining momentum on the issues, I would like to suggest moving ahead with another round of alternative bait trials involving those states interested in participating, whoever they may be. But instead of trying to pull this off this fall, which I think was an initial idea. It now seems evident that a better approach would be to suggest doing this next year in 2017. That would give the board time to design the study, really through the TC of course. Design the study, determine participation, determine cost and

available funding sources; and bring the whole package back before the board for review and approval prior to implementation.

In chatting to Kirby about it he brought up the very good point that this might actually sync well with the assessment, so that it would be reported out in 2018, which is when the assessment is going to be undertaken as well. With that I did prepare a motion to just sort of move forward along the lines of what I just indicated; and I think staff will bring that up.

Again the point being to try to move forward, but not to do it until 2017, the key caveat as I think you'll see reflected is that Toni reminded me that this would need to be folded in. If the board agrees to do this, to task the TC, it would need to be folded into the action plan for next year; that is an October, 2016 issue. I would therefore, and I will read this motion now into the record.

Move to task the Technical Committee with designing bait experiments to be completed in 2017, for those states that opt to participate, involving reduced amounts of horseshoe crab relative to status quo in the whelk and eel fisheries, to be developed for board review and approval by October, 2016.

CHAIRMAN GILMORE: Second to the motion; Brandon Muffley. Discussions on the motion. Adam Nowalsky.

MR. ADAM NOWALSKY: I am guessing that with this motion we have a firm commitment from at least Rhode Island to go through with those trials, asking the TC to design something for those states that opt to participate, would it be helpful to the TC to know how many states they're looking at. I would think that would be part of the design process. That would be the one concern I have with this is giving them some direction here in who those states might be.

CHAIRMAN GILMORE: That is a good point, Adam. Assuming Rhode Island would be interested; how about by a show of hands how many states would consider this. We've got at least five states that

are interested in doing this. I think that would be a worthwhile endeavor. Do you agree, Adam?

MR. NOWALSKY: It's up to the board.

CHAIRMAN GILMORE: Any other questions before we vote on this motion, or comments? Go ahead, Toni.

MS. KERNS: You know, I think that the main reason for wanting to know the states is that way it will help us develop a budget a little bit better, in order to include that into the action plan; depending on location, et cetera, will help us get information from the bait supplier and how much it would cost to get bait down to the different states.

CHAIRMAN GILMORE: You want to get the specific states, go that way?

MS. KERNS: We'll reach out in an e-mail to determine to the full board, and get at least commitment that you are interested in participating, so that we can develop a budget based on that.

CHAIRMAN GILMORE: Any other comments? **Okay, all those in favor of the motion please raise your hand; opposed, null votes, abstentions; passes unanimously.** That is the last item we have. Is there any other business to come before the Horseshoe Crab Board?

ADJOURNMENT

CHAIRMAN GILMORE: Seeing none; I will exercise my right as a chair to adjourn us. We are adjourned.

(Whereupon, the meeting was adjourned at 4:25 o'clock p.m., August 2, 2016.)