SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

HABITAT PROTECTION AND ECOSYSTEM-BASED MANAGEMENT ADVISORY PANEL

Florida Fish and Wildlife Research Institute
St. Petersburg, Florida

October 22-23, 2019

SUMMARY MINUTES

Habitat Protection & Eco AP Members

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Thomas Jones
David Glenn
Jeff Soss
Brian Hooker
Dr. Steve Ross
Cynthia Cooksey, Vice Chair
David Webb
John Ellis
Rita Merritt
Dr. Lisa Havel
Dr. Wilson Laney
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Steve Poland

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Other observers and participants attached

The Habitat Protection and Ecosystem-Based Management Advisory Panel of the South Atlantic Fishery Management Council convened at the Florida Fish and Wildlife Research Institute, St. Petersburg, Florida, October 22, 2019, and was called to order by Chairman Anne Deaton.

MS. DEATON: Good morning, everybody. Welcome to our meeting in St. Petersburg. We're glad to have everybody here. We have an interesting agenda for the next three days, and so I will just get right into it. First, are there any changes needed to the agenda? Is everybody good with the agenda?

MR. PUGLIESE: Just a note that Wally Bubley will actually be doing the presentation on the SERFS fishery-independent surveys, combined surveys. Marcel wasn't able to join us, but he will be giving it via webinar.

MS. DEATON: All right, and so I hear consensus on the agenda. Next, we have Approval of the May 2019 Minutes. Does anybody have any changes they would like to see, after they reviewed them? If you find anything later, you can send it to Roger, and we'll take care of that, and so the agenda and minutes are approved.

Now we will go to introductions, and so why don't we just go around the table and start with Steve Poland, and if you could just say your name, who you're with, any special interests you might have related to the council work, and, also, I wanted to mention that the webinar is on, and so there is also folks listening.

MR. POLAND: Thanks, Anne. Good morning. I am Steve Poland, and I'm with the North Carolina Division of Marine Fisheries, and I'm a South Atlantic Council member and chair of the Habitat and Ecosystem Committee of the council.

MR. HOOKER: I'm Brian Hooker, and I'm a biologist with the Bureau of Ocean Energy Management, specifically in the Office of Renewable Energy Programs, where I work very closely on fisheries and fish habitat issues.

DR. BAUMSTARK: Good morning. I'm Rene Baumstark, and I am the Section Lead for the Information Science Management Section here in FWRI. Welcome to St. Petersburg. My interests are on the spatial side of the mapping, habitat mapping, and ecology.

MR. WEBB: Good morning. Dave Webb from Islamorada, Florida. I'm a recreational angler, and I'm on the Citizens Advisory Panel for Water Quality in the Village of Islamorada and a Board Director at the West Palm Beach Fishing Club.

MR. JONES: Tom Jones, the Georgia recreational fisherman representative, and I'm on the CCA Georgia Board and the Georgia Wildlife Federation Board, and I fish in St. Simons.

MR. SOSS: My name is Jeff Soss, and I am the South Carolina recreational fisherman seat, and I also conduct fishing charters in Savannah, Georgia and am very involved with Gray's Reef National Marine Sanctuary.

MS. HAVEL: I'm Lisa Havel, and I'm the Habitat Program Coordinator for the Atlantic States Marine Fisheries Commission and the Coordinator for the Atlantic Coastal Fish Habitat Partnership.

DR. LANEY: I am Wilson Laney, and my current affiliation, I guess, is the North Carolina State University Department of Applied Ecology, but I am also the -- They call me the Regional Habitat Liaison now from the Habitat AP to the South Atlantic Council, and I'm also still serving on the ASMFC Habitat Committee and the Atlantic Coastal Fish Habitat Partnership.

MR. PUGLIESE: Roger Pugliese, South Atlantic Council staff responsible for our habitat and ecosystem activities.

MS. DEATON: I'm Anne Deaton, and I'm with the North Carolina Division of Marine Fisheries, and I work on habitat protection and restoration issues, and, specifically, the coastal habitat protection plan and getting changes made across the division, across the different divisions and commissions in North Carolina to improve water quality and habitat.

MS. COOKSEY: Good morning. I am Cindy Cooksey, and I am with NOAA Fisheries Habitat Conservation Division, which I think my division name kind of explains what I mostly do, and I'm also serving as Vice Chair, currently.

MR. ELLIS: John Ellis, U.S. Fish and Wildlife Service in Raleigh, North Carolina. I do permit review type stuff.

MR. STAPLES: Shane Staples, Division of Coastal Management in North Carolina. I am writing those permits that he reviews.

MR. GLENN: I'm David Glenn, and I'm here on the North Carolina conservation seat. My day-to-day job is a meteorologist with the National Weather Service in Newport and Morehead City, North Carolina, and I also serve on the Habitat and Water Quality Advisory Panel for North Carolina.

DR. ROSS: I'm Steve Ross, and I'm a Research Professor with UNC Wilmington, and I'm also partly retired. I'm a fishery ecologist, and I work from estuaries to the deep sea, and I have been on this panel for a number of years, and I am also on the Coral AP.

MS. MERRITT: Good morning. I'm Rita Merritt. I represent the Onslow Bay Artificial Reef Association, which is in the southeast part of North Carolina, and I previously had been on the South Atlantic Fishery Management Council.

MS. DEATON: Thank you. We have a lot of expertise siting at this table, and so maybe we can solve some problems. The first thing on the agenda is a presentation from Todd Kellison remotely, and it will be about the NOAA Fisheries EBFM in the South Atlantic Region, an update on the activities they've been doing that relate to the FEP implementation plan, and his PowerPoint, I think, is one of the meeting handout materials.

MR. PUGLIESE: Todd is getting hooked up right now. He will be joining us shortly.

DR. KELLISON: This is Todd, and Mike Burton is here also, and so we've been listening in to the introductions, but it's pretty difficult to hear over the phone. Can you hear me?

MR. PUGLIESE: We can hear you fine, and so you're not able to hear it on the webinar?

DR. KELLISON: Maybe we're fine, as long as we're coming through on this end.

MR. PUGLIESE: Okay. You're good to go.

DR. KELLISON: All right. Good morning, everyone. Thanks for making some time on the agenda to let us provide a brief update on some NMFS Southeast Fisheries Science Center ecosystem-focused activities, particularly activities that are related to the South Atlantic Council's Fishery Ecosystem Plan II and the NMFS Southeast Fisheries Science Center Ecosystem-Based Fishery Management Plan. Mike Burton is here with me on this end, and Kevin Craig also helped to generate this presentation, but he's on travel today, and so he's not here.

In May, Kevin and I gave an update to the panel on the three activities that are highlighted there on the title slide, the development of a South Atlantic ecosystem status report -- I will focus on just ongoing developments with the ecosystem status report and the climate vulnerability assessment, and I will do those sequentially.

Jumping into the ecosystem status report, as background, ecosystem status reports are defined and directed for all NMFS regions under the NMFS Ecosystem-Based Fishery Management Policy and the associated roadmap to that policy. Ecosystem status reports are intended for use by fishery management councils in particular, but also the other management bodies, and they are intended to be updated periodically, and so perhaps every three to five years, if not more frequently, and ecosystem status reports have been developed for almost all of the NMFS regions, and I have a list of them there in that figure, showing some of the regions for which they have been completed, but that figure is actually not so up-to-date.

The ecosystem status reports have been completed for the Bering Sea, the Gulf of Alaska, and one is progress for the Arctic, and there is one here for the West Hawaii Islands, and the California Current is completed. The Northeast U.S. is completed, and the Gulf of Mexico was completed in 2013, and an update was issued in 2017, and so we're trying to fill in the gap here for the South Atlantic, and I think efforts have yet to be underway for the Caribbean.

Ecosystem status reports provide trends, or convey trends, over time in multiple ecosystem components, which are also referred to as indicators in these reports, and, typically, those components are regional in scale and have at least annual, if not sub-annual, like monthly or daily, values, and these reports allow us to make some inferences about how ecosystem components or indicators have changed over time and potentially whether there are relationships between some of those different components.

The example shown here, this is for the Atlantic Multidecadal Oscillation, and this will be included in the South Atlantic report, but I have this example here just to show you what most of the time series that are included in the ecosystem status report -- How they will be conveyed. They will be all in this format, and this format is actually used for all of the ecosystem status reports, and so, if

you look at the Gulf of Alaska or the Western Hawaiian Islands or the Northeast, predominantly the time series in all of those ecosystem status reports will be conveyed in this format.

The format is the time series is centered on a mean, which is shown here as this dashed line, which here is standardized at zero for the AMO. The lines above and below that dashed line are plus and minus one standard deviation, respectively, and the green and the red are parts of the time series that are above and below plus or minus one standard deviation, and then this shaded area here is the last five years of data, and that arrows shows whether or not there's a trend during the last five years of the data, and so, in this case, the trend would be upward, and the circle conveys whether the average of the mean of the data over that last five years is above, below, or within plus or minus one standard deviation. If it's above or below, it would have a white plus or a white minus inside of this black circle.

With some exceptions, and the exceptions are when the time series that we included don't really fit this format, or, for example, we might not have annual values, and so, with few exceptions, all of the time series in the ecosystem status report will be displayed in this format.

Typical indicator categories in all the NMFS ecosystem status reports are as listed in this bullet list, and so, typically, there is indicators or ecosystem components within each of these broader categories, and so there might be multiple climate indicators, multiple physical or chemical indicators, habitat, lower and upper trophic levels, fishery indicators, and human dimensions, and that's the case for the South Atlantic ecosystem status report, and, just as an example, I am showing here some of the physical, chemical, and human dimensions indicators that we plan to include in the South Atlantic report.

For physical or chemical, those might include sea surface and bottom temperatures, river input, nutrient loading, sea level rise, and human dimensions are things like human population density, coastal urban land use and development, commercial and recreational fishing engagement, and those are just some examples of the components or indicators that will be included in the South Atlantic ecosystem status report.

Then I'm just going to provide -- I will show you two specific examples here, one from physical/chemical and one from fishery indicators, and so here is the -- This figure on the top is sea surface temperature, and time series for this is from 1982 to 2018, and the bottom figure is bottom temperature, and so the data from the top is -- This is remotely-sensed data, and the data for the bottom temperatures is from our fishery-independent surveys, predominantly MARMAP and SEAMAP and from our SEFIS group here in Beaufort as well.

You can see that they are both displayed in this standardized format. There's a couple of take-aways here, and so the top figure -- This is this variability, because these are sub-annual values, and so the lower points are winter temperatures, and the highest points are summer temperatures, and so you can see the winter/summer variability over time.

A couple of take-aways from this slide is that, for both the sea surface temperature and bottom temperature, with variability, temperatures have been pretty stable over the last few decades, but I will note that the time series is different. It doesn't go back as far for the bottom temperatures, just based on when our surveys started, but no major trends over time, over the last couple of decades, but there is, for both sea surface temperature and bottom temperature, some indication of

increasing trends in recent years, and so it's more evident if you look here at the bottom temperatures, where temperatures have been increasing in recent years, and, actually, I should point out that these bottom temperatures are made during our surveys, which are typically during the late spring and summer, and so these don't include winter temperatures.

Sea surface temperature, you can see this arrow is trending upwards, and it's not really because the summer temperatures are getting a lot warmer, but it's because the winter temperatures have been less cold over the last five years, and so you can see, in previous years, there is some of these lower values, and those are lacking in the most recent years of the time series, and so, for both sea surface temperature and bottom temperature, it's relatively stable over the last few decades. We haven't seen the maybe broad increases that have been evident on the continental shelf in the Mid-Atlantic, but it does look like -- It's a relatively small sample size over the last four or five years, but there is some increasing trend that we are seeing now.

That's just a temperature example, and then this is an example from fishery indicators, which actually has clearly a number of examples on them, and so the figures on the right are from what we now call the Southeast Reef Fish Survey, the MARMAP and SEFIS trap video survey, and these are trap data, and this top figure on the left shows the mean total number of fish caught in our survey traps by year over time, and you can see, sort of overall, there's been a decline. The bottom figure here on the left is mean species richness per trap deployment over time, and also there's been a decline in that.

In the ecosystem status report, and I just showed this for the data from the trap survey, but we are also including, in the ecosystem status report, similar metrics from the SEAMAP Coastal Trawl Survey, and then there's a NMFS Southeast Fisheries Science Center led shark-focused longline survey that has a pretty long time series, and we'll include the same data, like total shark catch and species richness, for that survey as well.

Then, looking here at the middle, this is the ratio of recreational to commercial landings, and you can see that, in recent years, that's been increasing, and so the recreational catch relative to the commercial catch has been increasing, and that's based on a paper by Kyle Shertzer and colleagues that came out this year, and then other examples of things that are included include just tracking the number of stocks that are overfished or undergoing overfishing over time, and so just some examples of some different fishery indicator ecosystem components that will be included in the ecosystem status report.

Really, the core of this update is just what is our progress on the ecosystem status report, and so we continue to make progress. We are in the process of completing the compilation of the time series to include in the report, and so that's pretty close to being done, and then, once we do that, then we have to go through the steps of sort of taking a big-picture view of everything, and I put data synthesis and interpretation here, but part of that is when we look at all the time series and we do some statistical analysis and look for potential relationships between different ecosystem components, and so that has yet to be done.

The goal is we have to have a draft report completed, and so I hesitate about this, but I have still left on there 2019, and so it's possible that we're going to wrap this up and have a draft report online by the end of the calendar year, and that's getting close, and so I wasn't totally confident in that, and so I put that 2019/early 2020, but we are trying to keep our noses to the grindstone and

get a draft of this completed, so we can get it out for review and feedback, and we'll first do that internally from within our agency, but then, as quickly as we can, we'll reach out to partners, predominantly the council and its advisory panels and groups, but also other partners as well, to get feedback.

What I want to stress is that, regardless of what comes out of this first ecosystem status report, that these are meant to be updated at regular intervals, and so, if there's something that doesn't get included in this first report that our partners feel strongly should be included in future reports, then that's something that we can certainly address, and so we'll look forward to getting your feedback, once we do have a draft report for review.

With that, quickly, I will just thank -- Actually, this was a big and broad effort, and it's led from the Southeast Fisheries Science Center, and Kevin Craig is the real lead on this effort, but it involves a ton of input from many others, and I want to acknowledge and thank them for that, and then I will also just note that the development of this ecosystem status report touches on a few actions under the South Atlantic Council's Fishery Ecosystem Plan II, including developing ecosystem indicators for key species and environmental drivers and compiling time series of multiple physical metrics and developing or selecting previously-developed climate indicators, and so it is hinging on a number of actions in the FEP II, and it's also one of the five priority actions in the NMFS Southeast Fisheries Science Center EBFM Implementation Plan. I could stop there and take any questions, or I could go on to the climate vulnerability assessment and then take questions on both afterward.

MR. PUGLIESE: Why don't we get some questions before we move on, and so while everybody is thinking about this, and so if there's any specific questions to this.

DR. KELLISON: Roger, again, I'm having a difficult time hearing what you said.

MR. PUGLIESE: I was just saying we're going to go ahead and stay on this topic first and get some questions before we move on, so that, while it's still in focus, we can have any comments or thoughts about input as it evolves.

DR. KELLISON: Okay.

MS. DEATON: I am going to start off, and I don't see any hands up right now, but I have a question. Your one slide showed the reef fish, hard-bottom fish, abundance going down in species richness, and what about diversity? Thinking about, if temperature is changing, I was thinking we would see more of the tropical fish moving northward, and we might see increased diversity.

DR. KELLISON: Good morning, Anne. I'm not sure how best to do this, because I can hear some of what you were saying, but maybe not the majority of it. I don't know if it's worthwhile like trying to connect through my computer or calling in from my cellphone. Anne, I think you asked about -- Was it this slide that you were asking about?

MS. DEATON: My question was just how is reef fish diversity --

DR. KELLISON: Is your question on how reef fish diversity has changed over time?

MS. DEATON: Yes.

DR. KELLISON: We haven't done analyses specifically on diversity, and I think all we've done is the richness that are pictured in the bottom-left of the slide that is showing right now, and I guess I couldn't speak to what I would expect to be happening with diversity, but the number of species -- That's just per trap, and so we haven't done this with our video survey. We do tend to get more species on our videos than we do in traps, but the video time series only goes back to, at the regional scale, 2011, and so we don't have a very long time series for that, but, based on the trap catch data, I guess richness is a proxy for diversity, and it has shown some pretty considerable declines.

I have this citation here of Bacheler and Smart, and so that's Nate Bacheler and Tracey Smart, and they published a paper in *Marine Biology* in 2016, where they have these trends, but they also divided this into -- They divided the time series and looked separately at sort of targeted species and non-targeted species, and my recollection is that the declines were stronger in non-targeted than they were in targeted species, and so certainly some factors beyond maybe direct fishing pressure appear to be driving those trends.

MR. PUGLIESE: As a follow-up to that, I think the question she asked is really important, because one of the things that would be good to come out of this status report is the ability to see some of those shifts of species, whether it's lower trophic or up into the upper trophic levels, so that, as we're having discussions of shifting habitats and species and species moving north --

DR. KELLISON: You're pointing out something that's a challenge with these ecosystem status reports, because they are ambitious in the amount of information that they're trying to include, because there is such a broad array of ecosystem components or indicators, and, for that reason, they're pretty big reports already, and so it's -- Maybe I shouldn't say difficult, but, for that reason, we kind of constrained -- There's a limited amount of information about each ecosystem component or time series, and so, for the example that we've been talking about here, this trap catch time series, that could be informative or not informative.

Maybe it's informative to see that species richness in the traps has declined over time, but, without more information, it's hard to interpret what exactly that means, like what species are dropping out and what is driving that trend, and we could explore that and show more information in the status report, or maybe show some different like species-specific abundance trends, but then that widens the amount of -- It greatly expands the amount of information for that single ecosystem component, and, if we do that across the report, it makes the report just unwieldy in the amount of information that it contains. I think the challenge for these reports is trying to include information from a very broad array of indicators and including enough to be informative, but not too much to be overwhelming, and it's not an easy challenge to meet, sort of, I guess, for those reasons.

MR. PUGLIESE: Todd, not to belabor it, but I think the key though on this needs to be kind of flipped around. Just because you can create the most complex report and extensive report available on what's going on, it's not going to be useful unless it's meeting the needs of management and what we're trying to accomplish relative to understanding and the conservation of habitat, as well as understanding the ecosystems and the shifts in the population, et cetera, and so I would look to where, hopefully, other status reports have provided the foundation for councils to move forward with actions or the ability to address changing the way some of the monitoring is to capture any shifts in the population or understanding real changes in the environment.

I think that should be the driver on what ultimately ends up being the final product, and I think there are other things that are included, or you're already looking at, say the coastal trawl survey, and some of those things do have some analyses that show the populations and different levels of different species that may have -- Benthic shifts that really can kind of be things to look into the future, but I think that idea of looking from the other end of what is really needed to help guide the council and the SSC, in terms of what they're looking at and tools to be able to adjust assessments, et cetera. Things that are going to meet those kinds of needs for the long term are going to be the critical ones to really advance what we're needing, and so just a recommendation on how we move forward.

Maybe, as this gets -- The next step on this is that there is more direct interaction on here, these kind of layouts, so that you could get that input on, hey, will this address this and will this have the ability to inform say an ecosystem model or guide future direction on what's actually happening relative to the environments. Some of the things that I am seeing are leaning that way, but I think that needs to be the driver, ultimately, of what this is, and maybe, as I said, look to other regions that have taken this and used it as a tool or something, because then it's going to really be critical, because then your updates are going to be the tools that say, okay, this is the change that has happened, and do you need to address it, or what is really going on in the system that may be of concern for management.

DR. KELLISON: Roger, I feel really challenged on this end, because I feel like I'm getting the core of what you're saying, but I think Mike are listening with the greatest of focus and having a difficult time picking up everything, but I guess maybe I would say that the review process of this and getting feedback from partners is going to be an important part, and that's going to be critical. We can envision a lot of constructive feedback and making changes to the report following the completion of the initial draft. Was part of what you were speaking to, Roger, the need to have information on species distribution shifts in the report?

MR. PUGLIESE: I think some of it. I think that's one of the drivers that is happening right now, and I know there are tools that we've already looked at and are going to be using some of the same data systems you're talking about, using the information that's included in the existing surveys, and I know there's been work already done with some of the heat maps, et cetera, but then also the OCEANADAPT system and others that are available that have the ability to show some different things, and so that's one of the actions, I think, that is worth having something that provides what we know at least about what's going on, and I think working with the groups that are beginning to compile those now is going to be important, to make sure that that's done as it goes into future status reports or whatever, and so, yes. That's a long answer to a short question probably, but knowing exactly what's going to be included, or at least some of the specifics, is going to help to understand who we should make sure we're working with.

DR. KELLISON: Roger, I will look forward to -- We have emailed some about this, but having a follow-up conversation with you, and so anything that I missed on this, in terms of feedback, I can get from you then. Just in terms of species distribution, I guess, personally, I would say that my understanding is we don't have a lot of evidence that a lot is happening in the South Atlantic region, and I think that -- Maybe that's because of the bottom temperature data that we went over a little earlier in the presentation, and so we haven't really seen a lot of warming temperatures.

The best dataset that we have, in my opinion, to look at potential species distribution shifts within the South Atlantic region is the SEAMAP coastal trawl survey, just because it has been so consistent over time in its methodology, both in terms of what they do, but also where they do it, and so the trap and video survey also has a long time series, but their spatial distribution of sampling has changed over time, which confounds our ability to utilize those data to make inferences about what species are where when.

I would say that Jim Morley, who is at UNC right now, and he's moving to ECU soon, and he was working with Malin Pinsky up at Rutgers, and they analyzed that coastal trawl survey dataset, and they really didn't find indications of directional shifts in species distributions, and so there were some distributional biomass shifts for some species, but there weren't really any clear patterns that emerged, and I think most -- Maybe more of what we are probably seeing, and it's difficult, because of our lack of consistency of fishery-independent survey methodologies between regions, but maybe most of what we're seeing is an expansion into the Mid-Atlantic of some of our South Atlantic species, but that's just my personal viewpoint of what's happening.

DR. LANEY: Todd, I had a question for you relative to dead zones and oxygen levels. Is that something that you guys are going to include in the report, and in particular for estuarine areas in the South Atlantic?

DR. KELLISON: Wilson, is your question about whether we are including maybe dissolved oxygen or some hypoxia component?

DR. LANEY: Yes.

DR. KELLISON: I am making a note, and I'm not sure. I guess I would point back to -- I will check with Kevin Craig and follow back up, Wilson, but I would say like, if we did include a maybe oxygen component in this, it would probably be for offshore waters, or nearshore and offshore waters, where we have survey data.

One of the challenges -- I mentioned the components that get included in these status reports are ones, typically, that are regional in scale, and so we run into challenges with things that we know are important, and so you mentioned one there of hypoxia and estuaries, where there is so much juvenile fish production, and another would be, for example, seagrass coverage, but we run into a challenge where there's not like a regional-scale database that tracks all of that.

While it's probably possible to -- We looked into this some for seagrass, to try to pull together all the available data from the different states and agencies that are monitoring that in those areas, and so it might be possible to sort of sew together a bunch of different datasets and create an index, and it's something that, because of our bandwidth to work on this right now, that we haven't tackled, and that might be the case for estuarine dissolved oxygen or hypoxia data, but let me look into that, and I can follow back up.

DR. LANEY: All right. Thanks, Todd.

MR. PUGLIESE: We're looking at another question from online, and David Whitaker, the Vice Chairman of our Habitat and Ecosystem Committee, has posed a question that I wanted to get to.

MS. DEATON: Todd, here's a question. The question is one of the Snapper Grouper AP members has said that shallow-water groupers are moving offshore earlier now. Could this be related to earlier spring warming, and do we have good data on nearshore temperatures?

DR. KELLISON: The question is related to the timing of the offshore movement of shallow-water groupers and whether we have temperature data that we could explore related to that?

MS. DEATON: Yes.

DR. KELLISON: I guess we would have some. We might. I am not sure if the essence of the question is like whether the temperatures are colder or warmer in a certain time of year. Anne, may I ask who asked that question, and maybe I could follow-up with them?

MR. PUGLIESE: David Whitaker asked it.

DR. KELLISON: David, I can follow-up with you directly, and so that's something that we haven't explored in the report, and I am not sure that we would have information in our data to show distributional -- Like inshore-offshore movement of grouper, but, if there are data on the grouper distribution annually, we probably have temperature data that we could match up with that, to see if changes in temperature were related to changes in the timing of the grouper shifts.

MS. DEATON: Okay, and Steve Poland pointed out that there could be some other sources of this temperature data that could be used to support some analysis of that, and NC State might have some receivers out there, and I know that our division has had some, but they move them around, and I don't think there's any in the ocean right now. Anyhow, we have another question from David Webb.

MR. WEBB: Good morning, and thanks for the presentation. My question is along those lines. I guess two questions about the sea surface temperatures and the bottom temperatures. What is the average distance offshore that you are using to make those readings, and the five-year trend, upward trend, on both of those, how would you quantify five years, in terms of reliability of actually establishing a trend?

DR. KELLISON: Thanks for that. The first question was about where the temperature measurements were being made, and then the second question -- Would you mind repeating that? Was it about the statistical approach to identify whether the trend is increasing or not increasing over the last five years?

MR. WEBB: Yes, and my question is just what reliability index would you put on a five-year trend, and I know the data didn't go back -- I can't remember how far it went back, and that's a small period of time as well, but I was just curious as to your confidence factor in the trend established over five years.

DR. KELLISON: Sure, and so that's a great question. Let me address where the data are collected first, and so I think the sea surface temperature data are -- Those are data for the region as a whole, and I'm guessing that's probably the boundaries of the council management, and I'm not positive about that, but it's a broadscale SST measurement, and then there is some type of standardization that goes into create an overall mean, and I don't know the details of that, but I could find out.

The bottom temperature data are collected -- I think that's a combination of data from the SEAMAP coastal trawl survey, which is very nearshore, and it historically is out to forty-five feet of depth, and, in more recent years, it has been within thirty feet or shallower, and so it's very coastal, and that's Carolinas down to roughly Cape Canaveral.

The other data are continental shelf and shelf break, and so out to about maybe 110 meters, at the deepest, and that's regional scale, but excluding south Florida and the Keys, and so those data would be collected broadly across the continental shelf from the Carolinas down to just south of Cape Canaveral and a standardization approach, and so some type of generalized linear modeling approach, for example, would be used to standardize those data to correct for, for example, differences in depth of data collection over years or changes in the distribution of sampling over latitude, and so they're standardized in some way.

The sea surface and bottom temperature data, I would say, represent the continental shelf and nearshore, and then, to your question about what does the five years mean, I think that's an arbitrary value, and I mentioned that these figures were consistent across all the NMFS ecosystem status reports, and so just, when the sort of standard design of ecosystem status reports was being created within NMFS, they just decided to highlight, I think probably relatively arbitrarily, the last five years of the time series, just to give the reader a window into what's happening in more recent years, and so does a trend over five years, but not over six years, mean something?

I think it's open to interpretation, and that's just meant to really just say which way are the data pointing, if any direction, in recent years, and so I wouldn't put a tremendous amount of focus on a level of significance or lack of significance or trend in just a few years of data, particularly when we have really long time series. Does that address your question?

MR. WEBB: Yes. Thank you.

DR. KELLISON: Thank you.

MR. PUGLIESE: Todd, one quick comment is that one thing that would be really interesting to look at is, as this develops, is the ability to look back to the -- The group will get a chance to get some of the updates on where some of this is going, but the Ecopath model with Ecosim and the ability to look at that, as it translates into Ecospace, because the indicators you show -- Every one of those are ones that are outputs from the Ecosim capabilities, and so there may be a nice opportunity to look at what's coming out of these indicators and compare those with actually outputs and then maybe even take it one step further and look at potential biomass changes that that could predict over time, and so that opportunity to kind of crosswalk between the indicators that come out of this analysis and then how it fits into that, because, ultimately, that model capability is going to be available to the SSC and to be able to look at and be able to do these types of what-if scenarios based on it, and so, if it could feed into or provide layers that could ultimately update or expand that information in the spatial, that would be probably a really good thing to make those all kind of work together.

MS. DEATON: I don't see anybody with any more questions, Todd, and so thank you. If you want to move on to the next topic, the climate vulnerability analysis, that would be great. Hold on. We have one question from Steve Ross.

DR. ROSS: Sorry, Todd. I was hesitating to ask a question, but I think I will. Are you guys looking at the underlying oceanography when you try to interpret these temperature data? Do you have anybody doing that, for instance interpreting the Gulf Stream dynamics during any given time period when you're looking at trends?

DR. KELLISON: I am just trying to process it, but I couldn't hear all of that, Steve, and so thanks for your question. What I think you were asking is whether we were considering maybe other factors that could underly trends, or lack of trends, in the sea surface temperature, and is that correct, including the Gulf Stream behavior?

DR. ROSS: Not just looking at the temperature data, per se, in an isolated fashion, but looking at the underlying oceanography that may be driving those temperatures, which may or may not be related to climate change.

DR. KELLISON: I still didn't hear all of that, but I think maybe I will -- Let me try to respond, and then let me know if I miss the mark, but I don't know, offhand, of a suite of physical components or indicators that we're including, but we've been working closely with Ruoying He at NC State University, who is providing a lot of the physical indicators or components for the report, and he's generating a lot of the time series, and I know one that we have discussed with him including, and that we anticipate including, will be ones related to the Gulf Stream, and so I think probably Gulf Stream transport, and so maybe some measure of mean Gulf Stream speed. Another one, which is related to the Gulf Stream and continental shelf temperatures, is upwelling, which is kind of driven by the location of the Gulf Stream, and so I think we are planning on including an index of upwelling for the region over time too, based on the Gulf Stream position. Does that somewhat address your question, Steve?

DR. ROSS: Yes, it does, and that's good. I just wanted to make sure that that was happening with those data, and so that's great. Thanks, Todd.

DR. KELLISON: Thank you.

MS. DEATON: All right, Todd. Are you going to do the climate vulnerability?

DR. KELLISON: Sure. Let's jump to climate. Climate vulnerability assessments, what are they? It was hard for me to hear the introductions, but I know at least three people that are sitting in the room right now are painfully aware of what they are, and so thanks to Lauren and Wilson and Steve for contributing to our ongoing climate vulnerability assessment.

Climate vulnerability assessments, or CVAs, are tools that determine the likelihood that a species abundance, productivity, or distribution will be affected by a changing climate, and I have just listed a few documents or initiatives under which the South Atlantic CVA is a priority, and so that includes the NMFS National Climate Science Strategy, and housed under that is the South Atlantic Climate Science Regional Action Plan, and then the CVA is also one of the high-priority actions in the Southeast Fisheries Science Center South Atlantic EBFM Implementation Plan. I will just note that climate vulnerability assessments follow basically a recipe for how to proceed with them, and that recipe is --

MS. DEATON: We can't hear you now, Todd.

MR. PUGLIESE: Why don't we go ahead and take a ten-minute break and let him sort some things out and make sure we've got everything operational and just to get a breather and regroup. We're going to take a ten-minute break.

(Whereupon, a recess was taken.)

DR. KELLISON: Okay, and so climate vulnerability assessment, and so I'm not sure where we dropped off, but I think Roger said that it might have been like after this slide.

MR. PUGLIESE: Just go ahead and start from the beginning, because I think we heard like the first couple of words, and then it just died.

DR. KELLISON: Okay. Climate vulnerability assessments, first I wanted to point out that I'm not directly involved in the South Atlantic CVA. Mike Burton is the lead from within NMFS, but he's also working closely with Mark Nelson with the NMFS Office of Science and Technology and who has participated in all of the NMFS CVAs to date. also, I wanted to -- I couldn't hear everyone's name during the introductions at the beginning, but I know that Wilson and Steve are there, and all are contributing to this South Atlantic climate vulnerability assessment, and so thanks to you all for your efforts.

Climate vulnerability assessments, what are they? They are, I think most simply, a tool to determine the likelihood that species abundance and productivity and distribution will be affected by a change in climate. They are a priority under multiple NMFS initiatives, including the South Atlantic Climate Science Regional Action Plan and the South Atlantic EBFM Implementation Plan. They follow a basic recipe, which is defined in Morrison et al. 2015, which is a NOAA tech memo, which I have pictured there, and they are completed or underway for all the NMFS regions except for the Caribbean.

At the core of the climate vulnerability assessment, there is sort of two parts of the basic recipe. One is the sensitivity of a given species to changing climate, based on one of twelve different what are called sensitivity attributes, and these specific attributes are synced across all of the NMFS CVAs, and so they are a standardized part of the CVA recipe, and the regions use these same twelve sensitivity attributes, and so, basically, they can look, for a given species, based on its habitat specificity and prey specificity and -- How vulnerable is it to a changing climate.

Then the other main part of the recipe is this exposure part, which is I guess what degree of a changing climate do we anticipate that species to be experiencing, and so one part is how sensitive is it to the changing climate, and the other part is what do we expect it to experience, and those are the two core parts of the climate vulnerability assessment. You combine those two to get the overall, and it allows us to make inferences about the overall species vulnerability.

Mike just pointed out that, while these attributes are fixed across all regions and used in all of the climate vulnerability assessments, the exposure factors are region specific, and so, for each region -- Each region thinks, well, what are the most important physical and biological drivers that we anticipate each species experiencing, and so a little more in detail to the process. The first is identify the --

For us, it's the South Atlantic Council managed area, and so it's basically the Carolinas down to the Keys and the Tortugas, and then identify what species to include, and so, for the South Atlantic, we chose a number, and we wanted to -- There are logistic constraints, in terms of the time it takes and the effort it takes to create a CVA, and so we ended up with sixty-nine species included, which are housed within these broad groupings in the bulleted list. This is a suite of species that range from federally-managed to ASMFC-managed to non-managed species, or state-managed species, and so a broad array of species are included.

Once we determine the groups and what species to include, then we assess species-specific sensitivity to climate change across a suite of life history characteristics that I mentioned were standard across all the CVAs. We do that by first preparing detailed information on each species and what we call species profiles, and then we solicit input from a lot of people with expert knowledge of fish and their habitats and the ecology in the region, and that is both in and outside of NMFS, and so I would say that the CVA, like the ecosystem status report, has to be a broad effort, and a lot of people are contributing to the CVA. Then, of course, we go in and quantitatively score vulnerability of each species across those twelve sensitivity attributes.

Then there is the exposure part, and so the part about, well, do we expect a species to be exposed to, and so we have to identify and then compile time series of physical and biological drivers, and this bulleted list is ones that we anticipate including for the South Atlantic CVA, and, once we develop those and come up with a time series, we can assess that for each species, the exposure factor.

That allows us to get back to this schematic that I showed previously. At that point, we will have both of these. We will have scored the sensitivity of each species to changing climate, based on these twelve attributes, and we will have made inferences about each species' exposure, likely exposure, to a changing climate, and those combined will allow us to make inferences about those species' vulnerability.

In the next two slides -- We're not in the stage of output yet, but I wanted to show you what that would look like, and so these are slides from the first climate vulnerability assessment that was completed, and that's for the Northeast U.S. This and the following figure are from a paper by John Hare and colleagues from 2016.

This just shows the -- On the Y-axis is the sensitivity, from low to very high, and the X-axis is the exposure, what do we expect them to experience, from low to very high, and so, for species that have both high sensitivity and high exposure, those are the ones that the assessment would determine would be the most vulnerable, and so, for the Northeast, you can see it's Atlantic salmon and bay scallops, and you can see less mobile species are interpreted under this as having higher vulnerability, presumably just because of their ability to adapt, in terms of changing distribution, is less in that vulnerable species.

We would end up with having species that were highly vulnerable, and it's very high vulnerability, high vulnerability, moderate vulnerability, and low vulnerability, and, in the same way, we could generate inferences about the distribution of species -- Well, the potential for species to increase the -- The potential to change their distributions to species with relatively low potential to change their distribution, and you can see on this list -- This is from the Northeast, but these are some

species, like Atlantic sturgeon and Atlantic shortnose sturgeon that -- Those are species that are particularly low, but those are just some examples of output that we anticipate having for the South Atlantic CVA.

In terms of a timeline, the bulleted list there sort of re-summarizes the steps, and the underlined areas have been completed, and so not underlined is to be completed, and I don't have a specific timeline for completing those final steps, but I would say that completing the South Atlantic CVA is a priority for the Southeast Fisheries Science Center, and it's a priority from our headquarters, and it's something that we will keep our nose to the grindstone on and getting input from others, and we appreciate their ongoing assistance with the CVA. I would anticipate that sometime during 2020, and so optimistically next year, that we would be completed with this process and that we can have output that we can share with our partners.

I will quickly just note that the CVA addresses this Action 2 under the South Atlantic Fishery Ecosystem Plan II, and it's one of the five priorities listed in the Southeast Fisheries Science Center EBFM Implementation Plan. With that, and hopefully you're still there this time, I will stop and answer any questions.

MS. DEATON: Does anybody have any questions? I don't see any questions here, Todd, and thank you very much. We have a question from Brian Hooker.

MR. HOOKER: As a part of that analysis, do you know if there's going to be any indication, with different species groups or different individual species, about what their behavioral reaction will be and where will those species go if they are vulnerable to climate change? I know there's been several different studies that have tried to look at that issue, and it seems like it's just very species-dependent on whether they're moving further off the shelf or moving further north or what have you, and is that 2020 report going to get into that?

DR. KELLISON: Brian, I was kind of having a hard time hearing, and so I am wondering if you could restate it, or maybe, Anne -- I was hearing you so much more clearly, and maybe you could summarize what his question was.

MR. HOOKER: My question was just more about spatial change that may occur as a result of this climate vulnerability assessment, and will that report try to look at that issue at all?

DR. KELLISON: Brian, do you mean like will the report show like anticipated changes in distribution at the species level?

MR. HOOKER: Yes.

DR. KELLISON: I think the general answer is it will not go into that level of detail, and so we won't show -- Maybe we wouldn't be able to -- Right now, we don't have that level of information to predict distribution of species, based on the analysis that have been done, and I am just thinking now that that work -- I think basically it's been done at the species level by Jim Morley. He published a paper in 2017 that was an analysis of species -- Maybe it was cross all the continental U.S. marine regions, and I think that involved species-specific habitat modeling under different climate scenarios. I think that's a long answer, Brian, to getting to I don't think that species

distributions, predicted species distribution, would be something that would be included in those CVAs, but I do think that output has been generated using some different methodologies.

MR. HOOKER: Thank you.

MS. DEATON: Todd, I just want to thank you. I know it's kind of hard with the technical difficulties, and I would mention that -- I'm not sure if you're aware, but, in North Carolina, there is also a climate vulnerability assessment underway, as part of the E.O. 80 process, although their focus is going to be different than the focus you're having, which is more on the fish aspect itself, and so I'm going to share your information with them, and maybe there is something they have that would be of use to you, too.

DR. KELLISON: Anne, I didn't hear all of that, but I think I heard most of it, and so thank you so much for sharing this information with them, and I think one of the things that I missed was who them was, and I know you said it was within the state, but maybe I could get their information too and reach out to them.

MS. DEATON: Yes, and I will get you guys in touch.

DR. KELLISON: Okay. Thank you so much, and thanks again to everyone for letting us do this update, and I am sorry the audio was what it was from this end, but we could hear most of it from this end, and thanks for all your questions.

MS. DEATON: All right. With that, we're going to move on to the next topic of the day, which is Brian Hooker is going to give us an update on energy development activities in the South Atlantic.

MR. HOOKER: Hi, everyone. I'm glad to be with you here in person, and I think I missed a couple of meetings, and I think the last meeting of this advisory panel that you had Jen Bucatari, who recently joined us from our Marine Minerals Program, and she gave more of an update on a lot of the science initiatives and stuff that we have been doing, both across the Marine Minerals Program and the Office of Renewable Energy Programs.

Today, I am going to try to focus mostly on some actual development activities, in the South Atlantic in particular, and the Avangrid project off of Kitty Hawk I think is what I was primarily asked about, but I will touch on other things as well.

The slide in front of you right now is just the overview of where we are with leasing and development along the Atlantic and in the Pacific. There really hasn't been much change since the last time I briefed you. There are no new leases since the last time I briefed you, and we will have existing call areas, is what they call them, and so they're still early in the planning phase, where we have done notices trying to solicit nominations and interest in other areas of the ocean, but we haven't gotten to the point of actually identifying them as wind energy areas and beginning that proposed sale notice process.

I just do want to point out that, in the New England area, these kind of kind greenish areas in the New York Bight are -- I just want to stress that those are not lease areas. Those are call areas, and the same thing in the Hawaiian Islands and off the Pacific Coast. There is a lot of interest growing

in those areas, but they are still early in the planning and analysis phase, and also in the South Atlantic. We still have -- We have a couple of wind energy areas identified and then also the call areas off of South Carolina.

Where we are right now, we have fifteen commercial wind energy leases in the Atlantic, and, as I mentioned just a minute ago, those green areas off of New York -- We're still in the planning and analysis phase of that, and there is a -- At some point in the future, there will be a proposed sale notice for some part of those areas, and that upcoming lease sale is not -- I wouldn't say it's necessarily imminent. I think we've been saying upcoming for about a year now, and so just take it with that frame of reference.

The first part of, just to refresh everyone's memory, of the -- Once you actually are issued a lease, the first real plan that you have within the first five years of your lease is a site assessment plan, and this is the ability just to put floating LIDAR, light detection and ranging, buoys on the site, or a meteorological tower. To date, we have still only had one application, or one authorization, for a meteorological tower. Most developers have chosen to go with a much less expensive buoy system that uses the same buoy as NOAA's National Data Buoy Center uses, the NOMAD hull buoys, but with a LIDAR unit affixed on it.

We have seven of those approved off of Massachusetts, Rhode Island, Virginia, Maryland, Massachusetts, New Jersey, and New York. The next plan after that, after they conduct their site assessment work, and including geophysical surveys and biological surveys, is they can submit a construction and operations plan. We are currently processing five construction and operations plans.

The furthest along on those is the Vineyard Wind construction and operations plan, which we published a draft environmental impact statement, and we're now in the process of supplementing that with a supplemental EIS to further evaluate cumulative impacts. The Deepwater Wind Southfork Site and Bay State and Skipjack and Ocean Wind are all further behind that project, in terms of where they are in the EIS process, and we do expect four to six more within the next year, and so things are fairly busy in the Atlantic in regard to construction and operations plans.

As I mentioned, planning activities continue off of Hawaii and California and the Carolinas and the New York Bight and now the Gulf of Maine, although I'm not sure if it has actually been scheduled yet. There is a Gulf of Maine taskforce that is an intergovernmental taskforce made up of multiple states and federal agencies that will get together to investigate potential lease areas in the Gulf of Maine.

Skipping straight down the coast, a little closer to the South Atlantic, the first real federal -- The first project in federal waters that we've had -- As you're most likely aware, there was a project, the Block Island Wind Farm Project, that was constructed in about 2016 and 2017, or, actually, the 2015 and 2016 timeframe, and it's been operating now for a few years, but that is in state waters, and so now we've gotten to the point where we finally approved a revised research activity plan for two turbines off of Virginia Beach there, and this is this area right on the western edge of the larger commercial lease area.

We anticipate that one getting underway this year, this coming year, in 2020. They did do some preliminary work and doing some groundbreaking for the onshore components, for the cable

landing site, at Camp Pendleton off of Virginia Beach and so that's our biggest activity in federal waters right now, is that project actually getting built next year.

In that same image, you saw the Kitty Hawk site south of that, and this is now just another image of the Kitty Hawk site that Avangrid Renewables won at auction a few years ago. Where they are right now, they are continuing to do geophysical and biological surveys, and they did submit a site assessment plan for the deployment of meteorological buoys in the site, and we are currently reviewing that plan, and the next few slides, with the permission of Avangrid, are Avangrid slides, and so it's going to be their timeline and kind of highlighting some of the things that they are doing with their SAP.

Again, this is Avangrid's project milestone table of when they anticipate having information to BOEM, and so, right now, they are doing a lot of work on surveys, geophysical and benthic surveys, and they do anticipate employing that meteorological buoy in 2020, subject to the approval of the site assessment plan by BOEM, and we will post the non-confidential information from the site assessment plan on our website as soon as we determine that it is complete and sufficient, and so that will be a publicly-available document in the near future. Then they are hoping to submit a construction and operations plan in that 2021 timeframe, and so this is when they are anticipating actually construction, is in this 2021 and 2022 timeframe.

Again, here is the site, and those track lines are the reconnaissance level geophysical surveys that they've been doing to primarily survey -- Give a big picture of the overall site and what constraints they might have for future development, but also identifying and surveying the sites where they plan on potentially deploying one to two meteorological buoys.

Right now, these are the three sites that they are evaluating for the deployment of one to two buoys in the site, and they are fairly small areas. They are required to survey the entire area where the mooring system may contact the bottom, both from a benthic habitat perspective and from a cultural clearance perspective as well, and so shipwrecks and fish habitat are the main things that they are clearing for the purposes of that buoy deployment.

As I mentioned, they have done quite a few geophysical surveys to date, and they kicked that off much earlier in the summer, and one of the things they have identified is that there's a lot of turtles in the South Atlantic, and we have some protected species observer requirements and requirements for shutdowns and that kind of thing, and they have had a lot of bow-riding dolphins and that kind of thing, and those get reported to us, if there's any negative interaction, and we work closely with them on all of those things, but the PSO is protected species observer shutdowns, and that's to protect listed species, primarily.

Here is just an example of the kind of data that they're producing for the deployment sites. This is three different types of data for just one of the deployment sites, and this is one of the more interesting of the three, because it has this feature in it where it's kind of a little bit of deeper water with a crest that runs kind of in a northeast/southwest direction. It's not that high, and it's hard to read the -- I think it's just a couple of meters in difference, but, anyway, it just gives you an example of the different levels of data that they're getting.

They are using the side scan data, where you can get the shadows and be able to identify some features, and this is just the bathymetry data with a multibeam system, and then, also, this is more

for the cultural resource evaluation, but it's a magnetometer, and so detecting magnetic anomalies on the seafloor to avoid -- There may be slightly buried shipwrecks and that kind of thing, and that's what the purpose of the magnetometer is.

This is the buoy that they are deploying. Again, it's a simple NOMAD buoy, but there's lots of different sensors. These turbines are just for recharging the battery, along with the solar panel, and then the primary thing that they are interested in is the LIDAR system itself, which is right here, and that's -- I think we'll have a picture of the mooring design next. There's a picture of just the mooring design. We do -- Throughout all of the Northeast, we're very concerned about potential entanglement risks, and so we work very closely with the developers on having very rigid or chain mooring systems and no polypropylene lines.

In addition to the buoy, you also have acoustic doppler current profilers that are deployed on the seafloor. This one is supposed to be a TRBM trawl-resistant bottom mount for that acoustic doppler current profiler. Again, there is the mooring system for that, and so each one of those are in that postage stamp survey area that they include in their site assessment plan.

Not so much in support of the site assessment plan, because we really don't anticipate impacts to protected species or avian species with deployment of a buoy, but ongoing work that they are doing with APM and Normandeau are aerial surveys documenting marine wildlife in these areas. As you can see, they can get large pelagics, including whales, dolphins, sea turtles. Actually, sea turtle detection is really improved by a lot of this technology, in comparison to ship-board surveys, where it's much harder to see a sea turtle poking its head above the surface.

This is the type of information that we anticipate receiving with a construction and operations plan, and so we are not necessarily receiving this in support of the site assessment plan, but just an update on the type of work being underway to support the eventual construction and operations plan.

That is really it for the Avangrid update. I do want to mention that they have hired a fishery liaison officer, and many of you might know Rick Robbins, who used to be the Chair for the Mid-Atlantic Council. He is their fishery liaison, and he has been conducted a lot of interviews with commercial and recreational fishermen in North Carolina to understand how they use that area. In comparison to a lot of other areas that we have leased, this has a very low level of commercial and recreational fishing activity. Again, that's not to say that it doesn't exist there. It does, but it's a fairly low level.

I did want to update you again on just where we are with the environmental studies program, and so, this winter, you should see -- To get these emails, I highly encourage everyone to go to boem.gov and subscribe to our email updates, because, usually around -- In the next couple of months, we will do a solicitation for study ideas that get rolled into our studies development program. The next solicitation should be for like 2022, and so the winter of 2020 we're soliciting for projects in 2022, and so that's just something to keep in mind.

I do want to update you on where we are with some recent fisheries-related studies that are kicking off in 2019, which is Fiscal Year 2020, and that includes some new hydrodynamic modeling studies looking at water movement and larval movement through hypothetical offshore wind farms primarily targeting the Mid-Atlantic and southern New England areas.

We also kicked off a study looking at trying to identify cod spawning areas using a similar methodology that was used up in Massachusetts Bay using acoustics to listen for cod grunts, and then we're also -- We just kicked off a surf clam and ocean quahog fishery impact modeling study, and this was another study that the model of it was developed for a management strategy evaluation for the surf clam and ocean quahog fishery, and so they have very good information on behavior, and there's a limited number of participants in that fishery, where you can get really good information on how offshore wind projects may impact that particular fishery, depending on the layout and where effort might shift if, for some reason, access is limited.

Then, lastly, we're, right now, in the process of a pilot southern New England fisheries monitoring study, and I don't know how clued-in everyone is in the Southeast, but we do have the Responsible Offshore Science Alliance that recently kicked off, which is a collaboration between the Responsible Offshore Development Alliance and Offshore Wind Energy Developers.

Right now, the initial funding is provided by Offshore Wind Energy Developers to get this regional science program kicked off, and they have now an open solicitation for an executive director for the Responsible Offshore Science Alliance, and so, if you want that link, send me an email, and I will send it on. I know they want a real talented person to help get that important initiative off the ground, and it's not region-specific. I think it's concentrated in the Atlantic to start off with, but I think that model can be applied in other areas as well.

Why we're getting the Offshore Science Alliance off the ground is BOEM and the State of Massachusetts and the State of Rhode Island have kicked in a million dollars to do some pilot fisheries monitoring studies that can help inform future offshore wind projects in the southern New England area.

My last point, or second-to-last bullet there, is the collaborative long-term regional fisheries monitoring is really becoming now embodied through that Responsible Offshore Science Alliance initiative that I just mentioned, versus a -- It's a voluntary program, but it seems to have a lot of support, both from the fishing industry and the offshore wind industry.

Then, lastly, the other source of information that I want to include that I kind of walked through with Avangrid is there is -- In addition to this regional work, there is also site-specific studies that each of those construction and operations plans that I mentioned are doing site-specific studies on their cable routes and on their actual development sites, to learn about the biology and the seafloor morphology of those areas, and so I think that is -- Yes, that was my last slide, and so I'm happy to answer any questions and give you any updates that you might have.

MS. DEATON: Questions?

DR. BAUMSTARK: Brian, these projects end up collecting a massive amount of information, and I know, in Florida anyway, when we have opportunities to comment, we often get this data from the contractors, and we try to index it all and piece it together and fill in our data gaps. I mean, at the federal level, for these kind of projects, where does the data go?

MR. HOOKER: We do have an internal process of categorizing and storing and managing those immense datasets, because it's a lot of geophysical data that comes in with each one of these

construction and operations plans. I think where we are in the long term about release of that data and how we archive it -- I know we've been working a lot with the NOAA repository, and I think there is a plan to archive a lot of that data there eventually.

In our regulations, I think we have -- Three years after construction is I think the maximum time period where that data needs to be released to the public, and I think we don't necessarily have to wait until three years after construction is complete to do that, and it can be earlier, but that's generally in our regulations right now, is when that kind of geophysical data will be made publicly available, and so that entire process isn't fully fleshed out yet, but we are working through that to eventually have a data repository, or have that information available in a data repository for people to access.

MR. PUGLIESE: On the same line, Brian, it seems as if there was some indication, at least with Avangrid, that there would be an opportunity to get to some type of those information, say some of the geophysical information, earlier than what has been traditionally an issue with like oil and gas exploration and having that real long term, and I'm just curious.

In the Southeast, we don't have nearly some of the interactions with the big commercial fisheries that you do in the Northeast, and the sooner we can work with information, or collaborate on these, I think the better for all involved, because I think it's somewhat of a different perspective and opportunities to enhance fishing opportunities.

I mean, there's a lot of different perspectives, at least in the Southeast, as we've been moving forward, and a lot of buy-in from the states too about opportunities of how to work together and design, et cetera, and so, the more that can happen sooner, the better I think to just help it, because I think there's ideas of engaging the groups to be part of the ocean observing associations and some different perspectives, I think, in our region on opportunities, and so I'm just curious about is there some flexibility in the way that works, or is that going to be a standardized system on how information is available.

MR. HOOKER: I want to clarify that that is just what it is in the requirements from the BOEM side, and the developer, obviously, is free to release that information, as much information as they want at any time, and it's their data, and so a lot of developers have said -- Most of the geophysical data, like bathymetry and that type of thing, they have no problem releasing that right away. I think you get into some of the sub-bottom data that might be a little bit more proprietary, but, for most of our purposes for habitat and stuff, the sub-bottom isn't as important, and so a lot of developers have said they are more than willing to release that.

A lot of it is the products of it are released as part of that construction and operations plan. There's a ton of information, and, if you actually go to the Vineyard Wind construction and operations plan, there's a ton of information there, and it's in a finite product though, and you can't -- It's not spatially available yet, where you can manipulate it and zoom in and zoom out.

It's just tons of different map sets that are available, and so that gets made available. At that level, it gets made available as soon as the construction and operations plan is submitted and we determine that it's complete and sufficient. As I said, the developer can release whatever information at any time they want. If they feel like it's processed and ready to go, they might be able to move more quickly than BOEM on that.

DR. LANEY: Thanks, Brian. That was a good presentation, and I said this when Jen was here, and I just wanted to reiterate it when you're here, but I just appreciate tremendously how BOEM has put together a great website that makes a lot of the information that you all are generating through all of your RFPs and studies accessible and available, and it's tremendous, and I won't name names, but it would be nice if certain other federal agencies would follow BOEM's lead in conducting those kinds of studies and making those data available. It would really be good.

MR. HOOKER: Thanks, Wilson. I think that's one of the few times that I have heard people compliment BOEM's website, but I will take it. The studies one is fairly good, and I think it's sometimes hard navigating some of the other stuff, but I appreciate it. Thank you.

MS. DEATON: Brian, in your slides for the Kitty Hawk site, it looks like they are doing surveys for the cables to go into Virginia, and I had seen something earlier about they were still considering going in toward Corolla, and so does that mean that North Carolina is not an option anymore?

MR. HOOKER: I think all options are all on the table. I think a lot of things are driven by where the nearest substation is, more than anything else, to keep the cost down, and so I think that's probably the primary driver. This is what they're doing, I think, as their primary service corridor, but, obviously, power purchase agreements and the kind of thing can change things a lot, and so they don't have a customer yet, and so this is all in preparation for having an eventual customer.

MS. DEATON: All right. Well, thank you. Any other questions?

DR. LANEY: That whole area, Brian, at least along the shoreline, as you're well aware, historically anyway, has been part of the wintering habitat for Atlantic migratory striped bass, and one of the things that we were working on -- When I say "we" here, I mean the striped bass tagging sub-committee and the cooperative winter tagging cruise partners have, for a long time, intended to do a more in-depth analysis of all of the data that we have, and, in particular, the winter tagging cruise data for Atlantic sturgeon need to be updated.

You know, we published a paper in 2007, and we caught a lot more Atlantic sturgeon after that, and, so, to the extent those data would be useful, we will try and move along on that. Now that a certain party has retired, he may have more time to work on some of that stuff, and, you know, we've talked about it for years. Jody Callahan worked very closely with North Carolina, with Joe Hightower and with Julie Harris, and they analyzed all of their tag data for their striped bass, and Jody has indicated some interest in possibly working with us to do that with all the winter tagging cruise data, but then there's the larger database for the whole cooperative striped bass tagging program along the whole coast that somebody would really profit, I think, by doing an in-depth analysis of all of those data, to show where those fish go and how long they stay and what they do, and so hopefully some of that information will be forthcoming in the next couple of years, maybe.

MR. HOOKER: Thanks, Wilson. We will, of course, look forward to that, and you reminded me that I should say that we're nearing the end of our telemetry array that we've done cooperatively with the Navy and Carter Waterson over the last several years, and so a lot of those receivers that we have had put in place, all the way from Sandbridge Shoal all the way to the Virginia area, those are nearing the end of their life, and they're going to be coming out soon, out of the water soon. A lot of the Sandbridge Shoal array I know was influenced a lot by some of the winter survey work

that you guys had done with the striped bass and catching those sturgeon in that area, and so stay tuned for more reports.

MS. DEATON: All right. We're a little ahead of schedule, and so we're scheduled for lunch, but I think we're going to move forward with some other topics. We're going to skip the Florida Keys National Marine Sanctuary plan until later, but Roger and Steve can give us their status report on the dolphin wahoo fishery prey issue and the bullet and frigate mackerel as ecosystem components, and we talked about that at the last meeting, and I know they've had a council meeting since then, and so I'm not sure if that will be you, Steve, or Roger.

MR. PUGLIESE: I am going to jump in and then have Steve kind of clarify anything that I may not -- I just wanted to make sure that we followed up from previous AP discussions and recommendations and where the council stands. Attachment 8 of the materials provided is the revised options paper that went to the SSC, and it highlights the council's actions at the September meeting, and so that's what I was going to open up and just get to that.

What we have is the advancing, at the request of the council, development of an amendment to the Dolphin Wahoo Plan to specifically consider the issue of bullet and frigate mackerel, and an options paper was advanced to the council at the September meeting, and it had gone through discussions at the SSC meeting in advance of that, and what I wanted to do was to highlight where things stand and the council building on recommendations from groups such as the Habitat Advisory Panel.

They acknowledged the actions both at the fall meeting of the Habitat Advisory Panel, providing input on movement forward with bullet and frigate mackerel and addressing ecosystem species in an FMP, to the last iteration that came out of the spring meeting, with the specific recommendations on continuing to move forward and look at the potential for conservation as ecosystem species, as well as input from their Dolphin Wahoo Advisory Panel.

It's provided in this options paper, and it provides what is considered as a timing for consideration, where the options were addressed at the September meeting, and the council will be reviewing that consideration at the December meeting, going into scoping and then onward into public hearings after that, depending on where things advance, but what it came down to is essentially Action 1 of this option is to designate bullet mackerel and frigate mackerel as ecosystem component species in the Dolphin Wahoo FMP, and this is being advanced, and it was approved by the council for consideration to go into scoping following this meeting, and so that's what the present status is of development.

Other actions in the amendment may or may not consider -- There's been some specific requests made of National Marine Fisheries Service on different parameters and the ability to manage those species under this FMP, but, right now, the council is moving forward with that core consideration of advancing these as ecosystem species in the FMP, and remember that this FMP covers from Maine through Florida, and so it's the entire Atlantic fishery for dolphin and wahoo. The council is the lead on that, and we collaborate with the Mid-Atlantic and New England Councils in prosecution of its conservation.

With that, I will pass that over to Steve, as a council member, to clarify and elaborate on anything, because I wanted to make sure that the AP understood that the council is advancing and moving

forward and appreciated the work so far on -- Really, this group set up the stage for the scientific justifications, and then it's moving, and it got to this point now.

MR. POLAND: Thanks, Roger. I think you covered it pretty well, but just to provide a little bit more background on why the council decided to move forward with only Action 1 is the agency raised some -- I won't say concerns, but some legal hurdles moving forward, as far as regulating bullet and frigate mackerel in the dolphin wahoo fishery and in fisheries outside of the South Atlantic Council's region.

The South Atlantic Council is the lead council on dolphin and wahoo, and we manage dolphin and wahoo through the Mid-Atlantic and into New England, but there was some questions from NOAA GC, or some legal questions raised by NOAA GC, that need some clarification, as far as does that authority that we have extend to other species included in the dolphin wahoo plan, and they will be providing us feedback on that at the March meeting, as far as if we can restrict or regulate EC species outside of the council's managed area or outside of the dolphin wahoo fishery.

There is some questions about adding EC species to the permit and that kind of stuff, and so we're waiting to hear back from NOAA GC on if we could proceed or if there's some other options, as far as maybe considering bullet and frigate mackerel as a managed species, but, if we go that route, then we have to consider the ten guidelines that the agency has provided when determining if a species needs management under the MSA.

I will say that the council seems like they are in pretty full agreement that bullet and frigate mackerel are an important prey species for wahoo, and the SSC, last week, reviewed the same decision document, and this was the first time the SSC was able to weigh-in on the issue of bullet mackerel and EC species for dolphin and wahoo, and they were also in general agreement, and they even went as far as suggesting that the council consider other prey species that might be important to dolphin and wahoo, particularly flyingfish for dolphin, and so we are moving forward, and the council felt like, if we could just go ahead and move Action 1 forward, to keep the momentum forward, that hopefully, eventually, once we get feedback from the lawyers on this, maybe we can reconsider some of the other actions included.

AP MEMBER: Do you recall, or can you verbalize, what some of the obstacles or options the General Counsel elicited to accomplish that?

MR. POLAND: I can try to verbalize. Basically, when a council takes the lead on a species that extends through the jurisdiction of other councils, the Secretary has to provide an all-clear determination on that, that the South Atlantic Council is the lead on management of that species in the Mid-Atlantic and in those waters.

The legal question was really does that extend to species that could be added as EC species, or does it only extend to the species under management in that plan, and so dolphin and wahoo, and this question really came up when we were talking about permits and how to deal with permits, because some council members felt that an appropriate option would be to just require a dolphin wahoo permit when landing these EC species outside of South Atlantic waters, and there was also some discussion from the agency as far as what exactly is the dolphin fishery.

It's defined in the South Atlantic with gear and permit requirements, but they felt it would be very difficult to require that in other New England fisheries, especially in fisheries that aren't using approved gears for the dolphin wahoo fishery in those waters, and so, really, we're just waiting on NOAA GC to come back and provide us input on if some of the council members interpretation is correct or not, that we can manage EC species within the dolphin wahoo plan outside of South Atlantic waters.

AP MEMBER: When the South Atlantic Council was designated as the lead management council for dolphin wahoo, what practical effect did that have in the Mid-Atlantic and New England Councils? What does that mean, that they're the lead council, because what I'm driving at is, is there a roadmap there, whatever decisions were made and legal obstacles were overcome, and is there a roadmap there for the bullet and frigate?

MR. POLAND: I can let Roger speak to that real quick, but my understanding of that is we manage the fishery and the gears that can be used in that fishery that target dolphin and wahoo in those areas, and I think the real question from legal was does that extend to EC species within that plan or not, because there are fisheries up there in the Mid-Atlantic that do not target dolphin and wahoo, but they certainly can land bullet and frigate mackerel and other small scrombrids like that, or really any EC species that we designate within that plan, but here's Roger.

MR. PUGLIESE: The bottom line is that's a determination by the Secretary of Commerce. The Secretary of Commerce made the determination that there would be a true lead, and so the council has full management authority. They take action, and they put the regulations together and submit them and coordinate by having members of the Mid-Atlantic and New England on the committees, but the ultimate authority for the management of the species, and it would extend to habitats, et cetera, is the South Atlantic Council.

I think, if you're looking at there is a gauge, you have that determination made, and there is some apprehension, I think, from NOAA Fisheries to go beyond some of those, but I think the whole point is that this was a proactive plan intended to conserve a species throughout the core range that we can collaborate on, because, originally, this plan actually extended into the Caribbean and the Gulf of Mexico, and there were issues with their coordination, but, in the way it stands right now, the whole idea of moving this -- This is going into some new grounds, but it's also in the same vein of being proactive and advancing it, and so we'll see what types of recommendations -- I mean, I would say that, as long as the authority is already in the hands of the South Atlantic Council, that should extend to any aspect of managing the species effectively, and, again, the council is being proactive to try to make that as complete, and, by conserving the prey species, which the directive under Magnuson is very clear about looking at conserving the species in all aspects.

I think at least it sets the stage for them having to come up with some kind of justification to say that we couldn't go down that road, and I think it's important that it's clear that the intent there aligns with what the longer-term proactive nature of this plan is, and we just see if there are other things that GC raises that may be issues.

One thing that I thought was a -- It has actually been brought up in the past, and this may give it some additional justification, and I meant to talk to you, Steve, about this, is that, technically, another interesting aspect of prey falls under, in essential fish habitat, the designation and activity

that has never been really used in the other regions, and that is, under the way that essential fish habitat has been structured, and David might be able to clarify this, there is actually wording in there that talks about the opportunities to designate essential fish habitat for prey species if they are in conjunction with managed species distributions.

There is a little bit of precedence already, in terms of the importance -- If nothing else, the importance of understanding the value of those prey to managed species, and just that, right there, I think is a driver that says that's important enough to add that into those EFH -- The council has already directed for conservation on those, and so, if anything, it at least provides a very clear intent that that should be something that is considered as the council discusses that, but that's where we are. I mean, it was very clear on how this is managed, and both the Mid-Atlantic and New England had to sign-off on being -- The South Atlantic being the lead when we moved forward, and they're in full support of us moving forward and the council moving forward with this action.

MR. POLAND: Just to add that, Roger touched a little bit on the proactive approach of the dolphin wahoo plan, and the council is really in favor of moving forward with EC management for prey, not only dolphin wahoo, but potentially some other of our managed species, but we're aware that we're kind of forging a new path, or at least testing some new waters with this, and so, yes, we are moving a little slower than we might be with other actions, but at least my perspective on it is take a very deliberate approach to this and make sure that we get this right and we get these questions answered, so that, in the future, if we want to consider other prey species within dolphin wahoo, or any of the other managed complexes, the roadmap is already set.

MR. PUGLIESE: There is one other aspect, and kind of a bigger connection to the longer-term planning of the South Atlantic Council. Under the Fishery Ecosystem Plan, one of the actions, specifically under the food web and connectivity section, and under the two-year roadmap, is to advance our understanding of prey interactions with council-managed species, and so this is really getting toward that direction, and the whole idea is that, as we move forward, the science is going to advance.

One thing that we did do is -- You will get an update later this afternoon on the Ecopath modeling and the ecosystem activities, and that model is integrating as much as we know of many of the managed species, and we actually pulled out and set aside bullet and frigate as two specific individual species within that, so that, into the future, you can understand some of the interactions between these and other key species, in our region as well as outside of the area.

I think, as that model gets more sophisticated, even species like marlin and whatever are represented, and we may be able to look at all these different types of things together, and so I think we're setting the stage from which to build the science that goes even further in our understanding of the interaction of the species into the future, and it meets a number of actions that are identified in the Fishery Ecosystem Plan implementation plan.

DR. LANEY: Steve can help me remember here, because, at the SSC meeting last week -- I know, when we were discussing all of this, it was pointed out that it's not just wahoo that has a high dependence on bullet and frigate mackerel, but it's a number of the billfishes, too. I think marlin was specifically mentioned, and so it's important for more than just wahoo, and I don't know quite how that works. I guess, Roger, did NMFS have to define EFH for highly migratory species? If

there is designated EFH for those, then is the ecosystem component thing an option for those FMPs that are produced by NMFS as well? I am not quite sure how that works.

MR. PUGLIESE: I don't know if they've gone down the road of the HMS species or not, but they have designated EFH, but that's probably primarily a distributional designation on physical parameters and distribution and concentration, et cetera, versus prey components. However, it's probably addressed somewhere, and I'm not sure if they have considered that or not.

DR. LANEY: The other thing that came up during the discussions at the SSC meeting last week was the possibility for some of the data-poor, or unassessed, species in the snapper grouper plan to also be designated as ecosystem component species, or at least that was the recommendation that came from the ABC workgroup, I think, and we didn't take that very far, in terms of discussion last week, but at least it was raised as a possibility.

MR. POLAND: Wilson, to that last point, I think there was enough discussion that the council will probably discuss that in December, when we review the ABCs for the unassessed stocks, but back to your first point about HMS species, and I believe that the Mid-Atlantic did reach out to HMS during development of their forage fish plan, or the forage fish amendment, and their chub mackerel plan, and don't quote me on this, but I think the Mid-Atlantic reached out to HMS, as far as considering picking up those species as managed species, and not in the context of EC species, and I think HMS told the Mid-Atlantic that they don't have authority to manage those species under Magnuson, just given that HMS has a very specific species complex that they can manage, true tunas and billfish and such, but, to my knowledge, I don't think HMS has discussed EC species in the context of forage fish management.

DR. LANEY: Well, it would seem, if they have designated EFH for those species, then it logically would follow that maybe EC designations are a possibility for HMS FMPs as well, and I don't know, but it's worth asking the question, maybe.

MS. DEATON: All right. Thank you, Roger, and thank you, Steve. It's 11:30, and so I guess we'll take our lunch break now, and so we'll come back at 1:15.

(Whereupon, a recess was taken.)

MS. DEATON: Okay, everybody. I guess we'll get started, and I hope that everybody had a nice lunch. Next up on our exciting agenda is a presentation by Florida Keys National Marine Sanctuary staff. If you could just introduce yourselves and give a little background, and then it's all yours.

MS. DIEVENEY: My name is Beth Dieveney, and I am with the Florida Keys National Marine Sanctuary, and I have been there since 2013, with the main focus of my portfolio being to facilitate the public engagement on reviewing our management plan and then developing the draft environmental impact statement.

While I will be focusing on the content of the draft environmental impact statement and what is out for public comment right now and consultation with the fishery management councils, I will also give some background on some of the public process, the scientific presentations that are available for the public and for you guys to look at, if you're interested.

MR. WERNDLI: I'm Steve Werndli, and I've been at the sanctuary since about 2001. In addition to providing support for this process, my role at the sanctuary is to coordinate our enforcement activities with the other agencies that provide those services for us through FWC and NOAA's Office of Law Enforcement, and I also support our authorizations program, reviewing nearshore construction projects to authorize DEP and Corps permits, and I do a few other things as well, but that's my primary roles.

MS. DIEVENEY: I just spoke with Roger, and I'm going to give a little bit of background and then walk through each component of the proposal, and we'll sort of maybe have discussion and take any questions at each breaking points of the components and then general questions after. The Florida Keys National Marine Sanctuary, just by way of background, for those who may not be familiar, has been in place since 1990, and it was established by an Act of Congress, the Florida Keys National Marine Sanctuary Protection Act, and, in 1997, the first sanctuary-wide regulations, management plan, and marine zones were established and put in place.

In 2001, there was an additional action taken to establish the Tortugas Ecological Reserve, which is out here, these green zones, and those are essentially transit only without valid permits, and so protecting the whole ecosystem, habitats, and species. In 2007, our management plan was updated, and these are the non-regulatory activities that we undertake on a day-to-day basis, enforcement, research, education, our mooring buoy program, and the like.

It's been since 1997 that our entire suite of overall sanctuary boundary regulations and marine zones has really been comprehensively looked at and updated, and so this is a significant action for the sanctuary and for the public. The image here actually shows the existing boundary in red and all the various marine zones in the different colors, and I will highlight some of these as we go through the proposal.

Just by way of a little bit of background, as many of you probably know, the Florida Keys are a very popular destination, and lots of activities go on there, lots of tourist activity, local activity, recreational fishing, commercial fishing, diving, snorkeling, other ecotourism events. The ecosystem is really the underpinning of these activities, and a healthy ecosystem is important to support these activities.

Just to hit that a little stronger, 5.1 million visitors annually visit the Florida Keys. About 60 percent of the Monroe County economy is dependent upon these ecosystem services for the uses and the recreational activities, but the natural resources of the Florida Keys are at risk. The Office of National Marine Sanctuaries, and the Florida Keys in particular, do condition reports, and so these are condition reports to look at the water quality, the habitats, the living marine resources, and, in the case of the Florida Keys, also maritime heritage resources, what is the status, what are the trends, what are the impacts and threats to these resources and what management actions are taking place.

In 2011, the Florida Keys did their condition report, and it uses all available data, monitoring data, research data, and the like, and, mostly, the condition of resources was fair, fair to poor, to poor. Generally, either stable or trends in the declining direction, and so this really generated, amongst the sanctuary as well as our advisory council, the need to look at how are we managing these resources and take action.

Since that time, and 2011 is when the condition report was released, and starting really in 2014 and 2015, with warm-water events, bleaching events, elevated sea level, sargassum seaweed, seagrass die-off in the Florida Bay, Hurricane Irma, a lot of other impacts, regional and global, are impacting the resources of the entire Florida reef tract and the Florida Keys as well.

Many of our actions, much of what is proposed in the draft environmental impact statement are really focusing on local action, local activities, that can be implemented and take place to address and help enhance resilience of the ecosystem of the environment in the Florida Keys. This just shows a few examples of these types of activities. Research, we have great research partners with our FWC partners in the Florida Keys. Education, the bottom picture is showing our Team Ocean that has docents, volunteer docents, that go out on the water and educate boaters about where they are, the sanctuary, sanctuary regulations, and so sort of liaisons with the community and boaters.

A lot of coral restoration goes on, which is -- I will talk a little bit more about how the plan is designed to facilitate habitat restoration, and our mooring buoy program -- We have about 500 mooring buoys that are provided both in areas that are closed to fishing as well as areas open to fishing, and these are a tool to both facilitate use and access to the resources, but also help decrease impacts to the benthic habitat.

Why create a blueprint? We are referring to this draft environmental impact statement as the restoration blueprint, our plan for the future. The Florida Keys, the economy really depends on healthy environments. As you've just seen, and you know, I'm sure, the environments in the Florida Keys are impacted, and so how do we plan for the future, and what can we do as managers, as community members, to facilitate the health and restoration of these ecosystems.

We have a sanctuary advisory council, and all sanctuaries have sanctuary advisory councils. They are volunteer community members who sit on this advisory council. Ours has twenty members that have voting rights and twenty alternates, for each of those members, and then agency and municipal membership as well, and these individuals represent a whole host of sectors, recreational fishing, several recreational fishing seats, charter fishing, flats fishing, general recreational fishing, commercial marine tropical, commercial fin and scale, and we have diving, and we have citizen at-large, research, education, South Florida Ecosystem Restoration Taskforce, and so some of the regional aspects going on, and they really -- Their role is to serve as liaisons with the community and also providing advice and recommendation to the sanctuary superintendent for management of the sanctuary.

They, after the release of the condition report, led a process to provide the sanctuary recommendation. They engaged thirty-five additional community members in three working groups, and I will show you some of the information from those working groups that were focused on the marine zone aspects of our existing management and the proposals.

This is just a high-level summary of their main goals. They had many goals and objectives for each of their priority issues, but, really, their goals focused on the ecosystem, enhancing biological diversity, the health of the ecosystem, while also balancing that with public use of the resources.

As I noted, they had three additional working groups that they created that had additional public community members, and these are the Shallow-Water Wildlife and Habitat Protection Working

Group, and their main objective was to look at our existing wildlife management areas, which are -- We have twenty-seven existing wildlife management areas, generally small, nearshore, shallow-water areas protecting habitat as well as mangrove islands for nesting birds, roosting birds, nesting sea turtles, and the shallow-water habitat adjacent to those islands.

The Coral Reef Ecosystem Restoration Workgroup was charged to look at potentially creating a new zone type to facilitate active coral reef restoration, and the proposals do include areas to facilitate habitat restoration, but they're encompassed in an existing zone type. Finally, the Ecosystem Protection Working Group, they were charged with looking at our existing sanctuary preservation areas and ecological reserves, the zones that are generally closed to extractive activities and designed to protect the habitats, separate conflicting uses, and protect larger contiguous habitats, and so they were charged with looking at the existing zones and also looking at additional areas that might need to be protected through this zone type.

Throughout the process, and continuing, we are working very closely with many of other federal agencies, state agencies, and the fishery agencies, FWC at the state level and the two councils, to solicit input as well as now, more formally, consult and get comment.

The National Marine Sanctuaries Act -- I just include this to provide the larger context of what the purpose and policies of the National Marine Sanctuaries are, as that provides a little bit of a foundation for the consultation that the councils do conduct, and, specifically, Section 304(a)(5) is the section of our act that outlines the process by which we work with the regional fishery management councils to consult on any potential fishing regulations that may need to be established.

Now I will walk through a little bit of the elements of the proposed action, and so, in our draft environmental impact statement, we have four alternatives, the no action, status quo, making no change to the existing boundary, marine zones, or sanctuary-wide regulations, and we have three alternatives that are each incrementally more protective of the environment, as well, in some cases, more restrictive in regulations applied throughout the sanctuary or in individual marine zones. We have identified Alternative 3 as the agency-preferred alternative.

Each of the alternatives includes proposals for a sanctuary boundary management plan, sanctuary-wide regulations, and marine zones and associated regulations, and so I will walk through each of these individually and pause for questions and any discussion at each component.

First, the sanctuary boundary. This image here shows the existing sanctuary boundary in red with the proposal that is consistent between Alternative 2 and 3, and so this is the agency's preferred alternative for the sanctuary boundary, and there are two areas that we are proposing to expand here along the north and south side of the sanctuary, and this is included as a proposal, and so this would take our existing geographic boundary in red and push it out and align it with a regulatory boundary, the area to be avoided, which has been in place since 1990, which is an area that prohibits vessels over fifty meters from entering.

That was initially put in place primarily because there were large ship groundings in that area, and so providing a little bit of extra protection and buffer for the habitats and the coral in that area, and so this proposal is aligning our geographic boundary with this regulatory boundary and to provide

a little bit more additional protection, because sanctuary-wide regulations would apply in that area, which I will review in a moment.

The second proposal is here in the Tortugas region to encompass Tortugas Ecological Reserve South in the overall boundary, providing additional habitat protections, and there is connectivity shown between the Tortugas region and the rest of the Florida Keys, and so providing a little bit more of additional protection there. In all of this area, sanctuary-wide regulations would apply, and so no discharge or impacts to the benthic habitat, no oil and gas development, and several others, but those are the most significant.

Sanctuary-wide regulations, in the proposed, we have several that are proposed to be either updated or proposed new, and none of them specifically would rise to the level of fishery management council consultation for fishing regulations, and so I have not highlighted them here, but I'm happy to discuss them and answer any questions about them.

What I have highlighted here is our existing definition for "traditional fishing", and the underlined text is proposed modified additional text to provide a little bit more clarification to this existing definition, and this applies throughout the sanctuary, and so our sanctuary-wide regulations allow fishing. It's more in the specific marine zones, which I will talk about next, where there are some fishing restrictions, and so, before I move on to the marine zones, any questions or comments on the sanctuary boundary or the sanctuary-wide regulations?

DR. LANEY: Not on that, Beth, but, if you could -- One of your earlier slides, you had an impact of sargassum strandings listed, and I wanted to ask you to elaborate on that just a little bit. From the South Atlantic Council's perspective, sargassum, at least when it's out in the ocean, is a good thing, and it's a key habitat for a lot of our species, and I am not sure that everybody around the table has heard a whole lot about what's been going on. That's a more recent phenomenon, I guess, in the last two years, and so would you elaborate on that just a little bit?

MS. DIEVENEY: Our research coordinator, and with other partners -- There has been a high level of sargassum presence in the Florida Keys, and I believe the thought is that it's coming off of South America and coming up through the Caribbean and through the region there, and a lot of sargassum in the Florida Keys and on the beaches and really impacting the nearshore environment. Maybe there's others on the Habitat Panel who might have more of the scientific background.

MR. WEBB: Not scientific, but anecdotally, and I live in Islamorada, and, for the last two years, as soon as the spring arrives, there is an ocean of sargassum that extends more than twenty miles offshore, and it's almost a continuous raft of weed, and I believe it's been that bad all way up the eastern seaboard, as far as North Carolina and South Carolina, primarily bayside, but there are some issues with the sargassum being created in the Gulf of Mexico.

It's to the point where charter boat captains that I spoke to at Bud & Mary's could not even get out of their slip without the sea chests being completely clogged up and the intakes being clogged up, and they would have to go a couple hundred yards out and put a mate in the water and get everything cleared out from under the boat before they could take their party out to charter, but one of the most debilitating things is, as it's dying on the ocean coast, it's piling up, and it's actually creating what would be considered a sandbar, but it's decaying sargassum, completely depleting

the nearshore waters of oxygen, driving any baitfish or other fish, up to and including tarpon, out of the area completely.

It's not as bad as red tide, and I'm not a scientist, and so I can't explain the degrees, but there are toxins that are being emitted that are going into the air that are causing respiratory issues and other things, and even to the point where there's a little small beach on Lower Matecumbe called Sea Oats Beach, which is a designated turtle nesting area, and, last year, we had turtles that died trying to get through the sargassum to get to the beach to spawn, and they just died in the weed, and so it's a very significant issue, and it has been a very significant issue over the last couple of years.

MS. DEATON: David, you said on the Florida bay side, and do you mean in the bay, or I was thinking that it was coming up on the ocean side.

MR. WEBB: The primary issue is on the ocean side, but, because of unknown factors, probably a little warmer temperature, maybe the level of nutrients coming out of the Mississippi Delta and the rivers along the west coast of Florida that are transporting agricultural materials, there seems to be more sargassum in the Gulf of Mexico than there is traditionally, but it's now where near what's happening on the ocean side, which I believe is coming off of the northern end, primarily the Amazon Delta, which is in the news because of the farming and everything. Well, all those nutrients are going into the river and going right down to the delta, and you add a degree of increased sea temperature, and the sargassum is out of control.

MR. MCEACHRON: I'm actually right next door, and Chuanmin Hu's lab produced a paper a couple of months ago in *Science* called "The Great Atlantic Sargassum Belt", and they proposed that, due to deforestation in the Amazon, there was some increased flow of the Amazon, and that was shifting ocean currents, causing this to be a Caribbean-wide problem. There's another issue they talk about in that paper that is what I think is happening, is there's a shift in the positive North Atlantic Oscillation, and so there's just this pressure differential that's been steadily getting more positive, and, when that happens, you can get these ocean current shifts, and so it could be both things, but a lot of this is spelled out in that paper.

MS. DIEVENEY: Our draft proposal does not really include any regulatory actions to address that issue, but this would be something that, in our management plan actions for research and for coordinating with our other agency and municipal partners, trying to understand the impacts and trying to understand any mitigation, that's where those types of activities would be found and could be commented on. Before I move on, are there any other questions? Okay.

One other thing that I just wanted to note for sanctuary-wide regulations is we -- As I noted, sanctuary-wide is a no-discharge zone, both in state and federal waters, and we do have a few exceptions for discharge, and one of those that is specific to fishing activity is an exception for fish, fish parts, chumming material, bait used or produced incidental to and while conducting traditional fishing activities, and that is not proposed to be changed.

Now for the bulk of the proposal, it's what we're proposing to update or modify or propose new marine zones. We have used marine zones, as I noted, since 1997, when the first regulations were put in place, and we do have five different types of marine zones, and each is designed to serve a different purpose. Wildlife management areas, we have twenty-seven, and they are designed to protect shallow-water habitat, dependent wildlife, generally small, and that zone type is generally

the largest in our alternatives, and it makes up the most of the proposed new zones. It's protecting nearshore, shallow habitats.

Sanctuary preservation areas, we have nineteen existing, and they are generally small and along the reef line, and they are designed primarily to separate conflicting uses, fishing and snorkeling and diving, and so those are generally no-take, with a few exceptions for bait fishing by permit, and four of the nineteen allow catch-and-release fishing by trolling.

Those, as I noted, we also have mooring buoys in those zones, and so providing a little bit of additional protection for the habitat, and we also have ecological reserves, large, protected areas to protect the whole range of ecosystems, the Tortugas South and North in the Tortugas region. Special use areas, we have four, and those are generally research-only areas, and so ecological reserves and special use areas are transit only without a permit, to provide additional protections for those areas, and then, finally, existing management areas, which were in place when the sanctuary was established, and so the National Wildlife Refuges as well as Key Large and Looe Key Existing Management Areas.

The next slides are -- These are the existing management areas with Great White Heron, Key West, and Key Dear National Wildlife Refuge, and there is Crocodile Lake National Wildlife Refuge up here. Key Largo and Looe Key were established in 1975 and 1980 as sanctuaries of themselves, incorporated into the larger sanctuary. Sanctuary preservation areas separate conflicting use and also, through regulations, provide additional habitat protections.

Conservation areas, this is a proposed new zone type, bringing the existing ecological reserves and special use areas, and they have the same regulations, transit only without a permit, making one zone type, to try and simplify a little bit, but still focused on protecting large habitats as well as facilitating research and restoration.

Finally, wildlife management areas are protecting shallow-water habitat and wildlife, and this image here is Tavernier Key no-motor zone, which shows, right after it was established and the high level of prop scar damage. Then, in 2014, an aerial image of the same place and how it has been able to recover, presumably by the no-motor regulations, and so wildlife management areas, really more so than anything, manage various vessel action and activity, and so anchoring, idle speed, no motor, and, in some cases, no entry.

Now I will turn to the actual maps with marine zones, and what's shown here is just the overall sanctuary-wide, showing status quo overlaid with Alternative 3, and I will walk through each of the regions and highlight a few specific areas of what we're doing for habitat protection.

Just real quick, to go over the legend, the state waters is shown with the white dotted line. Alternative 1 are the gray, and the full solid gray is complete no take, which are generally our sanctuary preservation areas, and the gray hatch-marked are where certain fishing is restricted, which is generally here in the Upper Keys, Key Largo, and Looe Key, and generally it's spearfishing, marine tropical fish collection, and certain gear types, fish traps and bottom dredges and the like, but other fishing is allowed, and then the preferred alternative is shown with blue, both solid blue and then the blue hatch marks, to show the changes between status quo and Alternative 3.

This is in the Upper Keys. Again, gray is existing, and blue is new, and so, in the Upper Keys, just to highlight here, here is Carysfort Reef Sanctuary Preservation Area. In the preferred alternative, there is an expansion to capture the deep-reef habitat, and so to about the ninety-foot contour line. Deep-reef habitats are not well protected through our current zoning scheme. Those areas are shown to be very healthy, and the same species as the shallow habitat, and the thinking is that they could serve as a resilient reef area.

This area, Turtle Shoals, while it's in state waters, I just want to highlight that's another habitat type that is not well represented in our current zoning scheme, and that's a proposed new zone to protect patch reef habitats, and it's in John Pennekamp Coral Reef State Park, and, through the managers and researchers there, our research coordinator told me, a few weeks ago, that they just did a recent monitoring event, where they found 3,000 while Acroporid samples, and so the proposal is to provide additional protections there.

In the Middle Keys, you can see this zone is a pretty significant new area, and it actually expands an existing research-only area, and it takes Long Key from Long Key State Park, at the shore to the deep reef to the ninety-foot contour line, and this is intended to protect interconnected habitats in the Middle Keys. Our advisory council had identified one of their goals to protect large, contiguous habitats in each of the regions, and so, in the Middle Keys, this is the location, the proposal, to do that. It would be no take.

Some of the research showing that lobster, juvenile lobster -- Some settle in the back bay side here and transit through, and this is an important area, and this could serve as an important refuge. We have also been receiving comments that this is an important area, the nearshore area, important for catch-and-release permit fishing, as well as lobster fishing.

In addition, these areas in the bay side -- While they are in state waters, they are new proposed areas as conservation areas, and so transit only without a valid permit, to protect hardbottom habitat, another habitat type that is not well protected through our marine zones, to facilitate research, restoration, and there's been a fair bit of research, and I know that FWC has some sponge restoration, and I think seagrass restoration activities, in these areas, and so it's underrepresented habitats protected in a no-take zone type.

This zone here, Turtle Rocks, is another habitat, another patch reef habitat, in the Middle Keys to provide additional protections for that habitat type in the Middle Keys. In the Lower Keys, the proposal takes Western Sambo, and this is an existing -- It's called Western Sambo Ecological Reserve. However, fishing is prohibited, but diving and snorkeling is allowed, and the proposal extends that existing zone to the deep reef, another zone to protect deep-reef habitat, and this area has also been shown, through our research partners at FWC, to be important habitat for the lobster life cycle, for female lobsters going out to spawn and transiting between shallow water and deep water.

Another area of interest is Western Dry Rocks, and so this is an area that is currently not included in our marine zoning scheme. It is proposed to be included, and, in our preferred alternative, it is proposed to be included as a trolling-only zone, and this is shown to be an important fish aggregation site and a potential important fish aggregation site for many different species at different times of year, and so the proposal is to protect that area, but still allow a certain level of fishing. Trolling only would be intended to protect fish while they are spawning, but still allow

some fishing. This is an important fishing location for many of the charter fishing guides in the Lower Keys.

This large no-fishing area that shows as a new no-fishing area, those are the islands in the Marquesas region, generally closed by the U.S. Fish and Wildlife Service through the Wilderness Act, and there are some inner lagoons and bays that would be captured that by that.

Finally, the Tortugas region, existing is in gray, and the blue, the proposal here, is to extend the Tortugas Ecological Reserve North to the west by one mile, to protect additional area up in this area that data from FWC has shown to be important buffer area, as well as additional spawning aggregation activity. Riley's Hump is an important area for fishing spawning activity that's been protected since 2001, and so a proposal to extend that slightly.

This proposal is referred to as the Tortugas Corridor, and the proposal is to protect that as a no-take area. Fish are shown, also through FWC data, to transit from the Dry Tortugas National Park to Riley's Hump during the full moon summer months to spawn, and so the intent of this zone is to provide additional protection for fish as they are transiting between their home range and their spawning range.

This slide, I'm just including this because it shows our existing regulations. Sanctuary preservation areas, as I noted, there are certain exceptions for fishing activity, and, in the Alternative 2, 3, and 4, consistently, the proposal is to eliminate bait fishing permits, and so we issue permits for bait fishing within these eighteen or nineteen sanctuary preservation areas, and the proposal is to stop issuing those permits in the SPAs, and bait fishing is not restricted throughout the rest of the sanctuary, and also, in the four zones where it is currently allowed, eliminate catch-and-release fishing by trolling.

The intent here is really for these zones -- The original intent of these zones was to separate conflicting use, and this would fully do that and be able to communicate more clearly to the public what you can do there and what you can't do there and enhance compliance and enforcement and just provide additional protections. Also, in those areas, idle speed and no wake and no anchor, to provide additional habitat protections. With the marine zones, do you want to pause and take questions or comments?

MS. DEATON: I have a question on that bait fishing, and is that hook-and-line for ballyhoo too and things like that, or is it just cast net type of things?

MS. DIEVENEY: It depends on where you are, but there is hair hook and cast net.

MR. WEBB: Could you go back to the Middle Keys? That area off of Long Key, the southern boundary of that, does that encompass Tennessee Light and the area there, and then how deep does that go?

MS. DIEVENEY: With all of our proposals to extend to the deeper reef, the ninety-foot contour, and it would encompass this existing -- It's hard to see here, but this existing gray, which is the existing Tennessee Reef Special Use Area.

MR. WEBB: Just for full disclosure, I'm a retired person, and I never made a living dive boating or commercial fishing or anything, and I understand the economic issues in the Keys, but I'm a native Floridian, and I grew up in Miami, and I'm looking at the totality of the area in the Sanctuary and the very infinitesimal amounts of area that you're trying to carve out there, and, if you don't want to answer this question, I understand why, but is there going to be a measurable improvement? Is the limited amount of the expansion that's proposed in this blueprint -- How much impact do you think it would have over the next ten or twenty years, and then I have a follow-up question or two.

MS. DIEVENEY: That is a difficult question to answer. The intent of these proposals, both the location and spatial protections, as well as the regulations applied, are intended to provide the additional protection for the habitats and the species and to provide the ability for resilience and recovery that the ultimate goal is to have that larger impact.

MR. WERNDLI: One of the things that you especially see on this slide, with that proposal off of Long Key, and Beth touched on it a little bit, was one of the advisory council goals of this process was to provide that shoreline to deep-reef protection in each region of the Florida Keys, and a lot of the science that we have right now is showing that those large protected areas, like we have in the Dry Tortugas and the North and South Ecological Reserve, like we have in Western Sambo in the Lower Keys, that those areas are generating larger fish, and they are protecting significant chunks of habitat, and they are generating larger lobsters, and those critters are spilling over into the adjacent areas and having a beneficial effect to the fishery, both commercial and recreational, in the Florida Keys, which goes back to that economy and driving to protect that ecosystem, to improve and keep that economy flowing the way it is.

When you look at what we've got proposed in the Middle Keys, that's the intent of that zone, and, although we've still got a patchwork of little things here and there, that's what we're hoping we'll happen here by protecting that large area, and we have tried to do the same thing in the Upper Keys, but, in the discussions with the working groups, there is just so much other management already in the Upper Keys, between Everglades National Park, Biscayne National Park, Pennekamp State Park, our individual zones that are there, the NMFS lobster protection areas, where they can't trap in the federal waters of the Upper Keys, and so it was really a challenge up there, and so we've sort of tried to, with the Turtle Rock zone expansion and Carysfort, tried to kind of piecemeal a patchwork of a bit area together in the Upper Keys, and so hopefully it will have that effect.

MR. WEBB: The reason for my question is I don't think the plan goes far enough. I look at just the six years that I've been a full-time resident in Lower Matecumbe, and the realization of the level of commercial and recreational activity that's going on in the Keys, and I think there's over 600,000 registered lobster traps in any given season, and I can only imagine, because I see them in seagrass areas, and I see them in coral bottom areas, and they have got to be doing significant damage.

I am not going to take up the whole time with my tirade, but is the county and the state aware -- Are they acting as if they understand that, while tourism is 60 percent of the Monroe County economy, if you lose this, you're going to lose 100 percent of the Monroe County economy, and so is there at least -- Again, if that's too sensitive or an incorrect question, I won't pester you about it, but I am curious, because I know the public outcry is pretty significant, with more restrictions,

but I also believe, anecdotally, that there is much more leverage over a commercial dive operation or a commercial fishing operation than there is over a tourist renting a boat, or a recreational angler, and so I think you're putting your eggs in the right basket, with the Blue Star diving restrictions to the Blue Star divers and stuff like that, because you know they can't afford to lose their license. They lose their livelihood if they violate something. The tourists might get a warning from FWC, and then they go away, and so if you could answer or address any of those without being in a problematic situation.

MS. DIEVENEY: I think we are trying to work really hard with our partners, locally and in the state, to protect these resources. Our state partners, primarily through Fish and Wildlife Conservation Commission and the Department of Environmental Protection, we -- A lot of the work, and, if we have time, I will highlight some of the places where you can look online to see the research, and a lot of the research that was used by the working groups and by the agency to design these proposals is through our state partners, recognizing the value of protecting these areas and the goals and the outcomes if you protect them, as Steve noted. Right now, we're working closely with the Department of Environmental Protection on the coral disease response, and so I can speak for our state partners, in that we are aiming to protect these resources for the long term.

MR. WERNDLI: I think that something that also gets lost during these presentations is, a lot of times, we're focusing on the marine zoning aspect, because that's what most everybody wants to know about, is where can I go and where can I not go, and so we don't -- I don't think we spend enough time on the management plan activities, and so a lot of those sort of get at how can we work with our partner agencies to better address the issues associated with water quality that can lead to improved habitat and fisheries and ecosystem, and so how can we better participate in the Everglades Restoration Taskforce and the South Florida Taskforce and how can we improve our education programs, so that those tourists that came down have a better understanding of what they are coming into.

We just put out a voluntary boater education course online that is -- Ours is not a requirement, like it is in the national park, but at least it's something out there that the public can go access if they feel the need and desire to go learn about it, and so there's other aspects of this plan that aren't really covered in that zoning that I think get at some of what you're asking about.

MR. HOOKER: You got my attention a lot when you were talking about the beneficial aspects of a marine protected area and spillover effects and accrued economic productivity outside of the protected area. Do you have quantitative studies on that that are included in the plan that document that?

MS. DIEVENEY: The quantitative studies are not -- They are referenced in the EIS, and I can show you the presentations that then refer to the papers, and they are largely our FWC partners doing both for reef fish and lobster in Western Sambo, and then the same in the Tortugas region, and they're done in partnership with the national park for some of that work. Also, and I don't know if Rene or Luke could speak to it, but I believe they redid -- I know they took all the data and looked at it across all the marine zones, all the sanctuary preservation areas and ecological reserves, to look at what is the size that actually has a reserve effect for fish, and, really, Carysfort was large enough, but, other than that, none of the SPAs really had that reserve effect for fish, and so I can get you those references.

MR. HOOKER: I can follow-up with you on that. That would be great.

MS. DEATON: Actually, Beth, if you could send those references to Roger, he will circulate it to everybody, because I think there's other people that would be very interested in that. One other question -- Well, I was going to say that I used to work in the state parks, when the sanctuary first came to be, and I remember the proposal for the Upper, Middle, and Lower, all the way from land out past the reef break, and I saw what happened with that proposal, but you mentioned Carysfort and that there's these other agencies that do manage, but they're not no-take, and they're not no-fishing, and so they really aren't the same thing, and that would be the one area that still doesn't have a mainland to offshore track, which I think would be a good thing to do.

MS. DIEVENEY: In these slides, I only show the comparison of status quo to our preferred, but, in Alternative 4, which is the most protective, in the Upper Keys, there is a shoreline to deep-reef at Carysfort, and it would be a sanctuary preservation area, still allowing use, diving and snorkeling, but no take.

MR. MCEACHRON: The papers that Beth is talking about is mostly going to be Jerry Ault's and Steve Smith, or their students, and so they did show that there's not really much of an effect of small MPAs within like the Keys proper, but, out by the Tortugas, you do see a bigger effect, but you have to keep in mind that these original small MPAs were not designed to really limit exploitation. They were designed to keep divers and fishermen from killing each other, but I don't know how much that worked.

MR. PUGLIESE: Just one comment. Going back to your comment about the bigger picture, the ecosystem considerations, I think one of the things that that also does is it addresses some of the crossover between what's going on in the sanctuary in this type of action and some of the bigger-picture perspectives that may be under the ecosystem and some of the ecosystem action items that are in our implementation plan, when we're talking about coordination with ongoing efforts to have restoration and understanding the ecosystem structure and functions, and so that kind of on-the-ground conservation and refinement and research, I think, is going to get us further down the road to meet some of these actions that have been put under our bigger picture for the South Atlantic region and our implementation plan.

MS. DIEVENEY: Specific to habitat restoration, I will just highlight -- As I noted, the Coral Reef Ecosystem Restoration Workgroup was put in place to potentially design a new zone type to facilitate active coral restoration. How the plan actually takes their input is five marine zones, and so, in the Upper Keys, it's this one here, Pickles Reef, a tiny little zone. In the Middle Keys, there are two, this one and this one, and one is referred to as Marathon and the other Delta Shoals. In the Lower Keys, this little zone here, referred to as Key West, and those are all active coral nursery sites.

Two of them, Pickles Reef and Delta Shoals, also have out-planting activities going on, and Delta Shoals, I know, is a site that FWC is using to actually do sort of demonstration projects and to understand the science of coral restoration and test different methods, and so those are included as sanctuary preservation areas, allowing snorkeling and diving, no fishing, no anchoring, to provide additional protections for those habitat types.

Those are the only marine zones. Two other areas, Carysfort and Looe Key, also have active nursery and out-planting sites, and so those provide additional protections already, but additional activity for habitat restoration, both for coral, hardbottom, and seagrass, are included in our management plan, and we've been doing a lot of work with other partners, National Marine Fisheries Service Restoration Center, to sort of look more system-wide for restoring the ecosystem, and so more to come on that, but, in this plan, that's how habitat restoration is addressed, through these five zones, and then, in the management plan activity, there's a lot of activities around restoration.

DR. LANEY: Beth, if I heard you right, the four National Wildlife Refuge areas are basically -- Are those like -- Were they established before the sanctuary or after the sanctuary? They are sort of overlays, I guess, within the sanctuary, and is the service responsible in these areas primarily for managing more of the terrestrial resources, or is there some level of engagement with respect to the subaqueous areas as well?

MS. DIEVENEY: Yes, the refuges were established long before the sanctuary, and I think one was in 1905 and one was in 1935, primarily each for different reasons, like key deer, migratory birds, great white heron, crocodile, and they are a cooperating agency on this environmental impact statement. Their staff participated and contributed a lot during the development process to look at the marine zones in the National Wildlife Refuges.

A lot of those are the shallow-water habitat areas, wildlife management areas, and twenty of our existing twenty-seven are within the Lower Keys National Wildlife Refuges, and, in the proposal, the bulk of the new wildlife management areas are within the National Wildlife Refuge. They are our zones that we manage in cooperation with them. Many of their trust resources, the migratory birds and nesting sea turtles, are the reason why some of these zones are proposed, and so we're very important partners.

In the overall boundary here, our regulations apply, our sanctuary-wide regulations apply, and we have a regulation that prohibits personal watercraft, water skiing, and airboats from operating in the National Wildlife Refuge, and that's one of our regulations.

For Department of Interior, the U.S. Fish and Wildlife Service, they also have a backcountry management plan that is done in partnership with Florida DEP, and so they manage through that as well as the islands in the Lower Keys refuges are generally wilderness areas managed through the Wilderness Act, and Steve may have more to add.

DR. LANEY: A follow-up. You anticipated my next question about the jurisdictional issues. If I wanted to do some research within the National Wildlife Refuge, would I still have to go to the refuge and ask for a special-use permit? Do they still control that aspect of it?

MR. WERNDLI: Yes, sir. They do, and then, if that activity would trigger -- If the activity you were proposing was also prohibited under our regulations, you would need to get authorization from us to do that as well.

DR. LANEY: I assume that, anybody who applied for a special-use permit for some sort of research activity, you all would be reviewing it as sanctuary staff as well.

MS. DIEVENEY: Yes, and we, I feel, have a really good relationship with all of our managing partners down in the Florida Keys.

DR. LANEY: Last one. With respect to that optimal area, if there is such a thing, for an MPA, and Gregg Waugh reminded us, last week at the SSC meeting, of the council's very first MPA proposal which was put out, and it sounds like the response to it was similar to the first sanctuary proposal, in that, at that point in time, I guess the scientific thinking was that, in order to have an effective MPA, you had to preserve 20 percent of a given area, and so, basically, what they did was they put together a proposal that had large rectangles that went from the shore all the way out to the 200 mile limit and proposed that as MPAs.

Needless to say, the public reaction to that was not particularly supportive, and so I appreciate the work that you all have done to try and build collaboration and cooperation with the local communities down there, and I would think -- I mean, given the fact that 60 percent of the revenue is coming from the sanctuary, you would think that there would be a whole lot more folks who would be in support of protecting the resource than there were people who were opposed to some of the proposed expansion.

The other thing is, when you look at the toxic soup, I guess is a good term to use, of threats that are facing the resources down there, especially given all the coral diseases and the increased temperature and all of those threats -- If you need a crisis to generate public action, I think we're in one, and so I would hope that maybe there would be some way to get that message across to people that action is needed now, and you can't wait another however many years it's been, and it was 2007 when you put the first plan out, and now it's 2019, and so we're twelve years down the road, and we need to do some more things, especially when you've got data that are showing you that the resource deterioration and decline is continuing, in some cases anyway.

MS. DIEVENEY: It was 1997 since the marine zones have been looked at. It was the management plan that was updated in 2007, and just, because you noted it, I will give some statistics of our existing status quo marine zones. They protect, overall, and this is all marine zones, whether they're no motor or idle speed or no take, and they are 6.25 percent of the entire sanctuary. Our preferred alternative is, knowing that the sanctuary is proposed overall to be expanded by about 740 square miles, the percentage is 10.69 percent that is proposed to be protected in additional marine zones within that overall sanctuary.

MS. DEATON: I think, with such large stressors going on, which a lot of the things that are killing these corals is not the fishing, and it's not the diving, but it's another stress, right, and so, if people know, the public down there that's affected, that you're working on these larger issues, I think that's what people want. They feel like, oh, I'm not the problem, but your impact may deal with the real problem of water quality or whatever, and so I would just encourage you to let them know all the other things that you're doing.

MS. DIEVENEY: Yes, and that is -- So, to turn to the management approach, as Steve noted, most of the public and what people really care about is what are you doing in the spatial aspect, and so where are you changing where I can go and how I can use the space, but we do have a pretty robust updated management plan in the document for public comment as well.

I have just highlighted the five main goals, but we have touched on a lot of the activities that are covered here, research, restoration, our mooring buoy program, education and outreach efforts to work with the Water Quality Protection Program, which was established through the Florida Keys National Marine Sanctuary Protection Act to address the water quality locally, and so strengthening and enhancing that body and working regionally with the South Florida Ecosystem Restoration Taskforce and working with our other agency partners to manage the resources. The management plan, a revised draft management plan, is in the document, where a lot of these other issues, non-regulatory issues, are highlighted and addressed.

This slide just shows an overall summary of the components that are in our preferred alternative and the approach for these proposals, and then the tools, where there is a devoted website on our website, floridakeys.noaa.gov, where you can see the document, and you can see static maps, and you can see an interactive map, which I am happy to show some of the features of here, if we have time, and then this shows all the various meetings that we are having with the South Atlantic and Gulf of Mexico, the council and different advisory and Science and Statistical Committees. There is one that is not on here, and we're also going to be meeting with the Spiny Lobster APs, both Gulf and South Atlantic together in the Florida Keys on November 13.

This is the suite of public meetings we're having, and so we are taking public comment through regulations.gov through January 31, and we have already done a series of information sessions throughout the Keys, and we had our first oral public comment in Key West last Tuesday, at our Sanctuary Advisory Council meeting, and we have another one coming up in Marathon on November 6, and then we'll have another one on December 10 in the Upper Keys, and so we're really trying to facilitate the public both learning about and understanding what's in the document and opportunities to provide oral and written comment. That's all.

MR. PUGLIESE: I was just going to jump in again on one of the reasons that it's really important that this come before this group, and that is the charge to the Habitat and Ecosystem Advisory Panel is really to look at the bigger picture in here and the opportunity to provide guidance to the council on the longer-term view on essential fish habitat and areas of particular concern, et cetera, and I think, in combination, when you're looking at addressing both the fishing impacts, but also really addressing a lot of the non-fishing activities that are going to both better understand the essential fish habitat distributions and impacts to those and how the area itself is designated as an area of particular concern, essential fish habitat area of particular concern.

Those are all going to expand that value for the managed fisheries and for the overall natural system and how it connects into the overall ecosystem in our region, and so I think that's the reason that this group is really important to understand and provide input and provide guidance and also acknowledge the fact that these are trying to get to those types of higher goals for the longer term for habitat and ecosystem conservation.

MS. DIEVENEY: With that, just because we redesigned this presentation to really focus on the fishing aspects, but there are two sanctuary-wide regulations. One is a proposed update, and we have an existing emergency regulation, which allows us to have an emergency regulation in place for sixty days with a sixty-day extension. The proposal is to update that to allow 180 days, with an additional 186 days, to make one full year. If a permanent regulation were needed, we would go through the entire public process for that, but that just gives the agency a little bit more time

and flexibility to, one, manage emergency impacts and assess the need for more permanent regulation or just have additional time to monitor and assess the situation.

We have only used that emergency regulation on a very few number of times, and one was a large vessel grounding, and we closed an area while the restoration activity was going on, for the restoration activity to go unimpeded and for public safety. On another occasion, there was a coral disease event, and so we closed two small areas of the reef from any other human impact, to provide additional protections to the reef, and so we've only used it on a few occasions, but that is an authority we have, and we have opportunity to use, to more adaptively and respond more flexibly.

Second, this is a new proposal to give us additional authority to address derelict and grounded vessels. We have authority, if a discharge has occurred or damage to the benthic habitat, but nothing explicit for derelict grounded vessels, and so it gives us a little bit more authority to address that threat, and so additional habitat impacts from vessel groundings.

AP MEMBER: I have to follow-up. Adaptive management is something that I always want to ask about, but I know you guys are very far down this process, and let me start by saying that I want to commend you all on the amount of work that's gone into this. As a Habitat Advisory Panel member, I must say that the status quo is really not an option, considering how much information and the science that stands behind the effectiveness of this kind of management, but would the coral disease be considered an emergency that could open this kind of -- I mean, I really like the idea of being able to manage adaptively, and we tend to be responsive, by nature. However, we don't always have the tools at our disposal for events like a coral disease, and is this ground that could even be considered for adaptive management, or maybe a spawning aggregation that we know is active at certain times of the year and allows us to, as things change, to adapt our approach?

MS. DIEVENEY: Yes, I believe so, and the adaptive management was something that the advisory council wanted to look at through this process, how can we respond more quickly to impacts, and some of the issues that they identified were bleaching events, disease events, storm events, new species nesting or roosting in a place that needs protection and how do you more rapidly respond, and so I think, yes, to this being a tool that could be used in the face of coral disease, and also potentially for fish spawning. However, also looking -- By nature, this is an emergency, and so using other regulatory measures, if needed, for longer-term protections.

MR. WEBB: How is the final decision going to be made on which option is going to be selected?

MS. DIEVENEY: We are taking public comment through January 31 and doing the consultation with both the South Atlantic and the Gulf of Mexico Fishery Management Councils, our state partners, Fish and Wildlife Service, and so all of that input will be brought in to develop one single draft proposal that will also include the draft rule that will then go out for public comment for a second time. Following that is when the final rule will be promulgated.

We are identifying and sort of inviting public comment on any aspect of the proposal, and so you don't have to -- One does not have to say that I like only Alternative 3, or I like only -- I like this aspect of Alternative 3 for this zone, for this area, for this issue, and I like this aspect of Alternative 4, or status quo, and so it adds complexity on the part of providing public comment and how the

agency looks at and addresses that public comment, but, really, looking at the specificity of how manage this location.

We wanted to give that opportunity, and so it's likely several years down the line before a final decision will be made, but trying to be as efficient as possible with getting that public comment and addressing it, so that we can turn around another draft single proposal for public comment.

MR. WEBB: But is the sanctuary -- Are you going to make the rule decision internal to the sanctuary staff itself?

MR. WERNDLI: Ultimately, the decision authority is the Superintendent, or the agency, based on input received through this entire process, and I think something else to point out with that is, because a large percentage of the sanctuary, 60 percent of the sanctuary, as it exists today, is in state waters, and so, for anything that is proposed to take place in state waters, we've got to have sign-off by the Governor as well, but, at the end of the day, it's an agency decision.

MS. DEATON: As the advisory panel here, Habitat and Ecosystem Protection, to the South Atlantic Council, what is it that you need from us? Are you asking this advisory panel to review this or just provide input to the council? Maybe that's a Roger question.

MR. PUGLIESE: Actually, this is the opportunity for the advisory panel to provide input on the bigger picture for council consideration, because they reached out to the other advisory panels. Originally, this was going to be the focus, and now they've reached out to some of the other panels, and the council will be submitting overall recommendations on behalf of the council, and so this is going to go all into the record on what their considerations and determinations are in the formal response to the council, and so it's going to be provided and the council is going to deliberate.

I think, if you haven't received the letter already, there's going to be a request for potentially an extension through -- Not potentially, but there is a request for an extension through March, so that the council can deliberate -- You're going to be providing the review at the December council meeting and get the input on the different advisory panels' input, and then I think there's been a desire, considering everything else that's going on, to have enough time that the council can review the rest of the information, probably at the March council meeting, because I think the extension comes right after the March council meeting, and so that's the avenue.

This is going back to the council, and it will be pulled into the overall council recommendations. What I think we're going to do is I have talked to Wilson already about -- I mean, that's your preference, on how you want to advance this, but Wilson was going to compile all of this and at least provide that part of what's going to be the overall AP report, so that can be considered in the overall discussion by the council. If you want to have a focused recommendation, that's fine too, but --

MS. DEATON: Well, does anybody else on the advisory panel we should -- How do you feel? Should we have a motion supporting one alternative or just comments? Does anybody feel strongly either way?

DR. LANEY: I was just going to suggest that I think it would be appropriate for the AP to have some further discussion. I mean, during the course of our questions to Beth and Steve here, the

only definitive thing I have heard, I think, is David said it doesn't go far enough, and I would tend to tilt in that direction, based on the science that I have read behind MPAs and the size that you need them to be to be effective, and I think, basically, that Steve and Beth conveyed that.

The work that Jerry Ault and Smith have done has shown that the larger ones are the ones that have been shown to have a positive impact, at least in terms of lobsters and fish, and so one of the things that the AP might wish to discuss is whether or not you think that the proposal goes far enough. Should it be bigger, or is it big enough?

I think some specifics like that would be good, to the extent that everybody has had an opportunity to review the thing, and I know it's a huge document, and I certainly haven't read every word of it, as yet. I will make every effort to try and do that, but I think some more discussion would be useful, especially in terms of being able to take something back to the council, but, as Roger said, the council is requesting an extension to March, and we won't meet again, I presume, until next April or May, and so we're not going to have another opportunity, at least in person, to talk about it.

We've talked about having sub-panel meetings in between meetings, and we could certainly have a -- We probably could have a webinar to discuss it further, but, again, I think, the more explicit we can get about supporting a particular alternative or supporting additional measures, that would be a good thing.

MS. DEATON: One thing is, Beth, could you give us some more details about that Alternative 4? You said there was an Alternative 4, or is there any other differences besides the larger area?

MR. PUGLIESE: We talked about this earlier, and I think this would be really useful, to jump into the interactive -- I put the link on your overview, if anybody had a chance to go through that, but this is really -- You should be able to just go straight to the internet and be able to access it. They did a really good job of really providing all the information in a very quickly and easily-accessible system, and I think it's a -- While presentations are great, these types of interactive capabilities really kind of go right to a very visual presentation of exactly what is on the table and what's potential.

MS. DIEVENEY: I will just walk through it, so that, if you haven't been there yet, you know where to go, and it's floridakeys.noaa.gov. Then you can click here, which will take you to the devoted page document, and here is where you could go and look at the individual zone maps, and I will show you that through another avenue, and then here's the interactive map. Alternative 4 -- Each of these panels shows the alternative just in and of itself, and so specific changes in Alternative 4 that may be of interest to you is that large shoreline to deep reef in the Upper Keys and a larger area here that encompasses -- You can click. This is Snapper Ledge, and it encompasses that small Pickles Reef area that I noted, as a larger protected area.

This Long Key Tennessee Reef, while it doesn't change, as far as regulations for fishing is concerned, it provides additional protection in Alternative 4 as a transit only without a valid sanctuary permit. There are slight changes here in Alternative 4 for this Looe Key complex, and so this would be the existing management area with certain fishing allowed, and no fishing, diving, snorkeling allowed, and transit only, and so an area that could become a comparison of impacts across uses. Also, there is a coral restoration activity going on in there.

The only change here at Western Sambo is it keeps the extension to the deep-reef shoreline and no entry. That Western Dry Rocks area that in our preferred alternative is proposed as trolling only, to allow a certain level of fishing, in Alternative 4, it would be transit only, and so closed to any activity without a valid permit, to provide additional protections.

This area -- I didn't touch on this, but this is a proposed new area to protect seagrass habitat, shown to support foraging, green sea turtles, and it's an important area regionally and internationally for sea turtle foraging, and then, in the Tortugas region, this area becomes transit only, where, in the previous version, diving and snorkeling were added, and so it's, for the marine zones within the sanctuary, providing, in some cases, slightly larger marine zones, but stronger protections, transit only, in some of the areas. Then, finally, overall, boundary expansion in Alternative 4 includes the Pulley Ridge Habitat Area of Particular Concern.

The existing habitat area of particular concern is sort of this odd shape, and this square addition is currently being considered. The Gulf of Mexico Fishery Management Council recommended that it be included, and it's going through the agency process right now, and so our proposal is to include this area overall sanctuary boundary regulations and the additional of no anchoring for all vessels. There is existing no anchoring for fishing vessels, but our proposal would be no anchoring for all vessels, to protect the mesophotic coral reef in that area.

One final, in Alternative 4, sanctuary-wide regulation that isn't visually shown here is we have an existing regulation that is idle speed, no wake within 100 yards of residential shorelines, and the proposal is to extend that to all shorelines, and so to provide additional protections for the shallow habitat and also any species that use the shallow habitat or associated land at that interface, and so that's another proposal that's included in Alternative 4.

DR. LANEY: Is it fair to say that Alternative 4 would provide a higher level of protection and conservation, generally, than Alternative 3?

MS. DIEVENEY: Yes. While I have this map up, I just do want to show you the explore zones tab, in case anyone hasn't played with it. This over here is where you can select any of the layers that you want to look at. Florida state waters always comes up automatically, but you can choose to look at an alternative in its entirety, just the boundary, and also just individual zone types. We can pull up and see what of that zone type, and, also, at the bottom, you can turn on the unified coral reef tract map, and it takes a little doing, but you can put that layer up as well. The way we're pulling that data in, it's in this layer list, instead of where, over here, you can change the background that you're using to look at, to make things simpler or more information or chart background, et cetera.

MR. WEBB: Is the designation of a no-trolling zone primarily an enforcement issue, or is there a specific impact that trolling in a designated area has?

MR. WERNDLI: Our purpose in using the Western Dry Rocks area specifically as a trolling-only zone was to try and, one, provide some protection for the habitat, and so the intent was to get away from sort of your bottom gear types and provide that protection to the habitat, but also still facilitate some use, through the ability to troll.

We do not specifically define what trolling is in our proposal, and so we would be looking for input from the public or whoever on that, and we've looked at some examples that National Marine Fisheries Service has in some of their HAPCs, and it will be -- It's been a point of discussion at a number of meetings of how would you actually define that and how would you enforce it if you did have that, because, if I just bump my boat in gear and I'm moving forward, is that trolling, and so we would definitely have to hash all of that out before we came out with a final rule on it.

MR. WEBB: But is the objective not to have fishing in that particular area or to restrict it to a certain type of non-intrusive fishing, as far as the bottom goes?

MR. WERNDLI: It's to get that non-intrusive to the bottom, although you could still catch those species by trolling, but you're going to limit what you are catching, and so it was -- In that instance, it's really looking at focusing more on facilitating that use than it is protecting the habitat and still allowing that use, or you get into Alternative 4, where it's a conservation area, and you have removed all human use of that area except for passing through without interruption.

MS. DIEVENEY: For Western Dry Rocks in particular, the intent of creating a marine zone there is to protect fish while they are spawning, and so the trolling only is a proposal, one way to potentially still allow use while protecting fish while they are spawning. Alternative 4 includes that as a transit-only area.

MS. DEATON: I would just say thank you for all the work that you've done. I am surprised that it hasn't been updated since -- Well, there have been small things, and I think most people have probably even been there, and, I mean, it's just a very unique part of the South Atlantic, and it's so ecologically rich in so many marine and terrestrial ways, and I think this group is supportive of some level of change, but I don't know if everybody would like the night to look at these alternatives.

MR. PUGLIESE: I think what ultimately I said is that Wilson will be compiling our input on here, and so people can, after having the opportunity to look at this, and if they even want to go on the site and look at the interactive sections, they can, and what we can do is we probably -- We can either raise this first thing in the morning, or we can see how to deal with it so that we don't get behind schedule, but be able to have a section to be able to come back, and, if there are some final thoughts that could go into a report out to the council, then we can kind of compile those. Either we could do it tomorrow, or we could even do it maybe Thursday morning, first thing, one of the two.

MR. WEBB: To that point, when we've had other issues that we've discussed, especially where we're going to make a recommendation to the South Atlantic Council, it seems to me that we would be better served to not delve down into the minutia of a specific protected area or zone definition or something like that and relate it more to our overreaching goal in its entirety, and I'm not suggesting that this should be the position of the AP, but making some kind of a statement or a judgment that strongly endorses the expansion of proven areas of protection, or such and such and such and such, because this is minimal, and I understand the socioeconomic obstacles, clearly, but to have a National Marine Sanctuary -- There are third-world countries that will not allow you to enter the water without a registered park guide, and, if you touch anything, you are put in jail.

In our National Marine Sanctuary, we have over three-quarters of a million lobster traps, and I don't know how many stone crab traps, and tens of thousands of tourists that come down for mini-season that are just throwing everything to try and get a couple of lobster, and so it just seems to me that, at some point, before we lose what's left of the Florida Keys, that we just start a macro recommendation of the entirety of the issue and not get bogged down in the details.

MR. PUGLIESE: Yes, and I think that's been very effective, and I think we saw how that type of messaging, say through our discussions on the bigger pictures on bullet and frigate were relayed to the council and really provided a good foundational discussion, and so I think, in that vein, how we accomplished that last time, there was opportunity for some members to think about this and craft something that gets to that bigger picture, and I think maybe between -- If you would like, between yourself, Wilson, and Rene, to come up with something that gives that bigger picture, because of the charge that you have and that, and I think that will give a good foundation from which this group can consider sending that up to the council.

MS. DEATON: So that's what you get for speaking up at these meetings, David. Rene and Wilson, are you all right with that?

DR. LANEY: Yes, Madam Chairman. I am, certainly.

DR. BAUMSTARK: Of course, the state will be making official comments digging in, and so this is good to have that big-picture recommendation.

MS. DEATON: Would the deadline be tomorrow?

MR. PUGLIESE: Thursday morning.

MS. DEATON: Thursday morning. All right. Are there any other comments on this?

DR. LANEY: Just to be absolutely clear that what you are asking David, Rene, and I to do is to put something down in writing that would be a consensus recommendation from the entire AP with regard to the Florida Keys National Marine Sanctuary proposal.

MS. DEATON: I would make sure that it doesn't just talk about the zoning changes, but, like we mentioned, the other stressors of dealing with the disease and the water quality, and I guess the sargassum is a problem now too, and I don't know.

MR. WERNDLI: I am happy to come back over Thursday morning to be here, if you guys have any questions on anything as well.

MR. PUGLIESE: Thank you for that. It's moving forward and that, and that would be good, to be able to, once it comes in there, if there are any issues that you see, that would be great, and we do appreciate all the effort in providing information in advance.

MS. DIEVENEY: While I'm here, I just wanted to show two more things, if that's -- If you are digging deeper into the maps and using the interactive map, if you click here, you can find more information, which includes the purpose and intent, the area, as well as you can click on that

hyperlink, and the actual four-panel map will come up, and so you can see a comparison across the alternatives, and that also includes the purpose and intent language down there.

One other item is, way at the bottom, there is this learn more and marine zoning and regulatory review, and, if you click on here, this is where all of the public process to date, which really was 2013 through 2014, to get to the recommendations, is here, and, primarily, the advisory council workplan and working groups, and so any of the issues -- The advisory council had nine priority issues that they looked at, and clicking on any of these issues pulls up information and any advisory council meeting where it was discussed, presentations that were given to the advisory council, and any decisions.

As well, those three working groups that I noted, their entire deliberations can be found here, what their objectives were, their members, and, at the notes, that's where you can go in and really see -- Benthic communities and zone performance, and so any of the -- Granted, these presentations were given to these community working groups in the 2013/2014 timeframe, but this is some of the data and information that was used, and so that's a place where the entire public record of this process can be found, and a lot of the scientific presentations are there.

MS. DEATON: All right. Thank you very much. Now we're going to move on, but, first, we're going to take a ten-minute break, and then we'll go on to our last agenda item.

(Whereupon, a recess was taken.)

MR. PUGLIESE: -- some of the bigger-picture activities in the Southeast on ecosystem modeling, and the advisory panel has been briefed in the past on the movement forward by the council and collaboration with our partners at FWRI and the modeling team to develop a South Atlantic ecosystem model, and we had a model, and the SSC has weighed-in on this, and is moving forward with a review of the preliminary, the initial, model, and we're also investigating the advancements on Ecospace and development of an Ecospace component.

We had a model working group meeting to discuss these two aspects, and what we wanted to do is we have Lauren Gentry, who is going to be discussing the model advancement and the diet composition development, some of the highest-end things in any model that's been developed to-date in this type of area, and the consideration of Ecospace, the spatial aspects, and the great side of this is that we have linkages, nice connections, directly with FWRI in development of first Ecosystem online system that we've been evolving for a number of years that fits directly into and is going to be fed by this information directly coming from this modeling effort and the diet composition development effort.

Then we can draw on all the spatial information that we've been building through the habitat and ecosystem web services and spatial information for EFH, habitat, et cetera, for years. With that, I think I'm going to go ahead and pass it on to Lauren and allow her to take it from here.

MS. GENTRY: Hi, everyone. I'm Lauren Gentry, and I'm with FWRI here in St. Pete, one hallway over. I have been working with the South Atlantic ecosystem model for about a year now, and so the model workgroup met in July to talk about my work polishing up the diet data that has been used in this model, and so I'm just here today to show you guys how that diet information is processed, what can be gleaned from the process itself and not just from the use of the model -- Or

the use of the diet in the model itself, but actually as a standalone sort of ecosystem service that we have, or rather a standalone service that we can provide, and some of the outcomes of that July workgroup meeting.

Just to give you an idea of the upgrades that have been made since this was last presented to the SSC back in April, we have gone from diets for about sixty species, representing forty groups inside the model, to now diets for about 220-some-odd species, representing 112 of our groups, and we used to use some species proxies, and we would say, well, these two species are very similar, and they can have the same diet, and we've gotten rid of that now. We were using data from a previous West Florida Shelf model for about fifty groups, and the only ones we use that for anymore are the invertebrate groups, because a polychaete is essentially a polychaete wherever it lives, and, last time that this model was presented, there was kind of best-guess expert opinion for about twenty groups, and that is completely gone.

With a fair amount of shuffling between then and now, some of which we'll go over near the end of the presentation, we have ended up with 140 groups inside the model, and so the model is made up of groups of organisms representing about 670 species in the South Atlantic area, and so, just to show you how these groups are structured, we've got six photosynthetic groups, and we have twenty-eight invertebrate groups, a handful of which are single species, like blue crab and spiny lobster, and a few are habitat-based, like offshore something and estuary something, and then we have a few sized-based catchalls for everything else, like mega-invertebrates, but, primarily, they are taxon-based groups, like all squids or all rock shrimp or all penaeid shrimps go together.

Vertebrates are similarly organized, by taxon or by species, by habitat, or by trophic association, and like pelagic planktivores can be all together, plus four groups of dead things there at the bottom, and that brings us up to 140, all of which are listed in the appendix of this PowerPoint, if anybody should happen to be very interested in that.

Our vertebrates, specifically, are organized thus. All of our non-fish groups are organized at higher taxa, and like all of our baleen whales are together. Managed species generally get their own groups, like black sea bass and gray snapper, et cetera. The rest are habitat-based or taxonomy-based, and then we also have our trophic groups. Now to show you what I actually do with these groups and what they eat.

First and foremost, don't pay attention to the numbers up here. This is for illustrative purposes only, and these numbers don't add up, and so, essentially, what I do is, for each species, I collect information about what they eat, stomach content information, generally from large databases, like FWRI's Gut Lab, NOAA, SEAMAP, et cetera. Most of them are from published literature, and, if all else fails, I can use lists from textbooks and field guides and things like that that list who eats what, and, if this information is in preferably percent weight or percent volume, then I take all of that data, and I put it in an Excel sheet, as such, and then, for every prey item, I decide which of our 140 groups it fits inside of.

Anthozoa, that would anemones or corals, and I call that an encrusting fauna, and that's our group that it would fit in, and the next one -- That's a lady crab, and so that would be mega-invertebrate predators, et cetera.

Once I have decided what each of the prey items are, as far as our grouping goes, then we can add that all together, all of the percentages for each of the groups, and that gives us a final diet list, and so this list represents all of our groups that are represented in that predator's diet and in what proportion. For groups that have multiple species, like pelagic sharks have eight or nine species in it, I just averaged together all of the diets to get sort of a group-wide diet idea.

Then all of these diets for all 140 groups go into a large matrix, and I am not going to show it here. Each of you guys can imagine a big matrix that is 140 columns and 140 rows with a whole bunch of numbers in between it, and that is the matrix, and that is sort of the end product of this diet process, and that is what is fed directly into the model to inform the decisions that the model makes about ecosystem interactions.

One of the other things that we can do in this model is specify a hierarchy of how much we trust each diet, and so a higher score means that I want the model to not mess with the diet too much to adjust it, to balance everything. A low score means that this diet might not be very trustworthy, in which case it can modify it pretty heavily, in order to make everything balance, and so, in order to make that hierarchy as quantitative as possible, for me to feed those scores into it, and also for me to keep track of the 300-plus diets that we have so far, I came up with a metadata process that you can see here at the bottom of the screen.

For each predator's diet, I score these categories that I came up with, and there is number of stomachs sampled, the number of prey in the diet, and so diet richness, the year that the diet information was published or collected, and each category gets a score from zero to six, and the average helps me track generally how strong or confident a species diet information is. If you're curious about those scoring details, that's also in the appendix at the end.

Lastly, I keep track of any kind of ecological role or anything else that sticks out to me. Is it an ecosystem engineer, or is it classically called a keystone species, or is this something that I see our fishermen commenting on on the FWC Facebook page or something like that? That just helps us keep track of any other trends or important species that stick out.

With all of this metadata at the bottom, what I can do is make lists like these. What you see here are just three species that ended up in the bottom rung of each of those metadata categories, and some make sense, and so, of course, manatee stomach up there in the right-hand corner, of course, everything in their stomachs is going to be green mush, and so that's just going to be unidentified green mush, and that make sense, whereas something like Nassau grouper being a low sample size, that indicates now that I need to go back and find some more Nassau grouper data, or maybe that the data doesn't exist and we need to go out and catch some Nassau and look in their stomachs.

What is important about this though is that I can see what animals are data poor and for what reason, and then I can combine these seven lists and come up with a final list, and this is the final list of cumulatively data-poor groups. Now, back in July, at that workgroup meeting, this list was much longer, but now we've actually whittled it down to just these four leftover, and these are the four species that are on multiple of those seven lists, and so at the bottom rung of that metadata.

Then I also keep track of what you might call my wish list, off to the side there, and those are species or animals or groups that I feel are not well represented as a predator in the diet, but perhaps they are not sticking out in the metadata. Their numbers look okay, but, somewhere inside, I feel

like something else is wrong about them, or that they showed up in the ecological role, and maybe they're an ecosystem engineer, or maybe I see a lot about them on the Facebook page or something like that. These are the kinds of lists of research needs that we can come up with using these by-hand analyses.

Further, we also have the option, on top of that basic kind of analysis, to use the built-in sensitivity analysis in Ecopath with Ecosim, the program that those whole model is built inside of, and so this function is a Monte Carlo simulation routine that tries to reduce sum of squares by adjusting the diets inside of the constraints of the matrix.

The first time you run this, it's very disconcerting, because the first thing it tells you is that all of your best diets are the ones that got adjusted the most, but, as it turns out, that correlates with my diet richness score of the items that had the most prey in their diets, and that makes sense. If you have more prey items, you have more things to be adjusted, even if the adjustment was only a quarter of a percent in one way or another.

Once you take out those correlating species that have the really good, huge diets, you have isolated groups with high adjustments that the model wanted to change, but they either have a normal or a low diet richness, and what we found, fortunately, was essentially the same thing from my meta-analysis scores, and so the results kind of segregated into these three sections. At the top, you have species without enough data, and we already knew that all of those groups that we don't have enough diet data for them.

The second group are species that have such a big impact as predators that their diets need an abnormal amount of detail to really capture how much impact they have on the ecosystem, and then those last two there are species with such a big impact as a predator that they were leaning too far on one diet item, and so I actually went into the data and started looking at those two and figuring out why they were being adjusted, and it turned out that the red drum paper that I was using -- Those red drum were taken in Chesapeake Bay during some kind of blue crab bonanza, and so 50 percent of their diet was blue crab. Well, obviously, that's not all blue crab for the entire South Atlantic, and I added some more data, and that evened out.

Then demersal coastal invertivores, the problem, according to the sensitivity analysis, was that they eat too many invertebrates. Well, that's their name, and so that one is not going to change. It just has to balance around that kind of problem, but at least we know that this function inside the model can alert us to those kinds of problems and that it's seeing the same issues that I am seeing by the by-hand meta-analyses, and so these two processes together can actually give us a pretty robust list of our diet-poor species that are out there.

Another thing that you can do with the model sensitivity analysis is isolate the specific interaction that the analysis thinks don't fit inside the balanced model, and, for that, the biggest adjustments made at the top there completely made sense to me. It wants red snapper and other mid-shelf snapper to eat more squid, and I'm fine with that, and it wants Syngnathids to eat more arthropods. All right. Sea horses eat arthropods, and that's cool. Those two adjustments were easy to make.

Then it also identified some interesting group interactions that warranted a closer look, and so it turns out that halfbeaks do not eat 10 percent seagrass. That was one study that was incidental ingestion. Hogfish do not eat 70 percent echinoderms. That was a low sample size. The same

with red snapper feeding on tomtate in the net, and so all of these were problems inside the data that this analysis recognized, and I was able to go in and fix, one-by-one.

Now, coastal bottlenose dolphin feeding on I think it was 40 percent weakfish, we need to do a little bit more research on that, but, from what I'm hearing from the experts, coastal bottlenose dolphins do in fact target weakfish and other drums when they are in murky water, and that may end up not being changed, and the model will just have to adjust around it, because we know that that is biologically sound.

Moving forward with this, in the July meeting, back in the July meeting, they saw essentially the same thing that you just saw, and, at that point, we started going over this huge list of data-deficient species, and we discussed, amongst each other, where can we find the diet information for some of these species, and can we find the diet information for some of these species, or, for something like a warsaw grouper, we're never going to get it. It's too deep, and it's too hard to get, and we'll just have to move on from that.

These were the outcomes from that discussion, at the end, and so some of the rarely-encountered, difficult-to-find species, like warsaw, they were added back into a larger group, like all deep groupers, and we put together a list of experts for manatees and tarpon and inverts and some of those specialty groups. Herring were pulled out of their trophic group, because of their importance, and they were given their own group, and so we can specifically look at them inside modeling runs.

A side note is the same thing was done with frigate and bullet mackerel earlier this year, in expectation of the discussion that we just had about treating them separately inside the management, and, lastly, queen triggerfish were added to the model, and they had just somehow been left out.

In addition to the value of this diet information, to the model itself and the accuracy of the results of that modeling project, there has been, and will continue to be, value in the process of building and refining this matrix. Members here who all attended that NOAA climate vulnerability analysis that Todd was telling us about, you all attest to the value and the utility of having all of this diet information in one, easy-to-access place.

I am also the coordinator of the SAFMC Ecospecies database, and so all of this diet information will end up there, in those species profiles, and, in the future, if anybody needs or wants for research purposes, a comprehensive prey list for a particular predator, the work will already have been done of essentially a literature review of going through and putting together everything that that animal is known to eat, including a lot of unpublished data that people are sending me from laboratories and from graduate students and everything.

Another benefit is that, once this model, and those of us working on it, have essentially expired all of the literature searching that we can do, we are going to have a pretty good idea of what's not out there. I just have two examples up here, and, obviously, we would want to spend a lot more time making sure that that information doesn't exist somewhere in the literature, but, once we have, then we can target a species for future research or future collection projects, to see if we really do need to know what's in their stomach contents, and, even though we haven't made any very specific recommendations, at the July meeting, SEAMAP said, hey, we get banded rudderfish

sometimes in our trawls, and we can go ahead and start taking them and looking at the diets, and so we already have the ball rolling on a few of those data gaps.

Finally, this process, most interestingly, to me at least, highlights particular pairs of predatory-prey interactions that could be important to spend real time looking into during management decisions, and these are a few examples that jumped out to me, or have been previously discussed in these meetings, and it looks like, according to multiple studies, shortfin mako really do consume 80 percent bluefish, or sometimes 90 percent bluefish, in some years, and so that could be something to discuss, if you're managing bluefish.

Obviously, we just heard about Auxis mackerels. Do red snapper eat that much black sea bass? That seems to be something that a lot of the recreational fisheries and commercial fisheries are interested in. The data that I have, which is pretty limited, from the east coast says that they do. They eat 25 percent black sea bass, but that was only a sample size of 200, and it was one study. Could they have been eating in the net, or could they have just had a black sea bass feast? We don't know, and we'll need to get more data, but those are the kinds of questions that this can answer.

Moving forward, we'll be filling in the last of those data gaps, and we can also add diet data to this model, even after it is, quote, unquote, finished. That can be an ongoing kind of living process that exists somewhere that other people can access and can send to somebody and add to. Then, once we clean up some of the estimates in there, that will wrap up Ecopath, and so Ecopath is the snapshot of the ecosystem in a single place in a single time, and then there's a process for determining predator-prey vulnerabilities, and we have to clean up our time series, and that wraps up Ecosim, and that is your ecosystem through movement through time. Then, last there, is movement through time and space, and you will hear about that in just a couple of minutes, and Luke will go over that.

There is many people to thank, but, before we start taking questions and everything, but, wait, there is more. I just want to show you guys, really quickly, the appendices, in case anyone needs them. Obviously, there are 140 groups, right here, and so you know who has their own group and who is grouped together with others. Those metadata scores and categories, if you're curious as to how the hierarchy works inside the model, and, last but not least, I kind of want everyone to take this home with you, or you have it on your computer now, I hope, and, if anything sticks out to you on this, if you see something on this and you go, oh, wait, I have a paper for that in my computer, or I know a guy who knows a guy kind of thing, send it to me. Just send in all of the data, all of your connections, all your experts, anything like that, and we'll be collecting this data for many, many years to come.

Thank you so much for coming, and I hope that this was interesting to you guys, and, most of all, I hope that you are all now comfortable with flooding my inbox with all of the diet data or names and contact information of people that you know, and, if my contact information isn't in the group email, I'm sure that Roger can send that around to everybody. Any questions?

MS. DEATON: Does anybody have any questions? I think Wilson would be a good source of papers.

MS. GENTRY: He is. It has happened a couple of times.

MR. PUGLIESE: Yes, and Wilson is already roped into this process, but I think Lauren is sincere about that, and I think we will probably have a little bit more formal reach-out to members or any of the experts within the states or other partners that we work with to continue to shore up the information system, and I think that might be able to get highlighted in, I anticipate, a future presentation say on Ecospecies, and that will probably help identify, in kind of even a bigger-picture view, beyond what Ecopath is doing too, and so more to come.

It's an amazing step from where we were, and I think what we'll do is pass it on over to Luke and advance into the spatial aspects, after you move through Ecopath to develop Ecosim and the simulation capabilities, anticipating what may be involved with trying to build an Ecospace system for a model that has 140 groups, which is something that has never been done, and so that was the first task at hand, was how do we start, and can this actually occur, and so, with that introduction, I would like to send it over to Luke and kind of give you a heads-up of exactly how the process is advancing and investigating what this means for that, because this software has evolved very significantly, to provide some real opportunities to integrate real and existing spatial information, and we've been spending so much time building that in the past, and he's a real opportunity to figure out what we have and what we can use and where we can go with this.

MR. MCEACHRON: Great. Thank you, Roger. I will just pick up right where Lauren left off, and I will give you a little bit of background on the Ecospace model and how it gets from a diet matrix to a spatial-temporal complicated thing, and I will talk a little bit about what we did in July to inform the model and propose a schedule, moving forward.

You will recall, from Lauren, that, really, when someone says Ecopath, or EwE, they are potentially talking about any one of these three components that are in the same model software suite, and so you start with Ecopath to establish your snapshot in time, your base trophic interactions, and you are trying to identify the most important interactions, the most important groups, in your food web, and you can make a model of that over time in Ecosim, by training that Ecopath model to a time series of biomass and catch or fishing mortality and things like that.

Then, in Ecospace, we're going to apply an Ecosim model basically on a cell-by-cell basis in a Raster framework, in monthly or weekly timesteps, to look at how those dynamics change over space and time, given some underlying spatially-explicit environmental drivers and other things.

Just quickly, a few examples of how this has been applied, and the first Ecopath model was used by the Western Pacific Fishery Management Council in the 1980s. They had a user conflict. They had a protected seal that was declining and a lobster fishery, and people were saying that we need to close the lobster fishery, because seals eat lobsters, and, just by going through the process of, one, making a diet matrix, they realized that, well, they eat more than just lobsters, and so maybe that's not as strong of a connection as we thought, and, two, when they went into the model, they realized that there was an overlying change in the physical ocean properties, the physical ocean production, that was really causing a decline in the fishery and the seal population.

Then, in Ecosim -- The last time you probably heard about this model was maybe when Dave Chagaris presented his model, or maybe not. Maybe there is too many new members on here, but Dave was looking at different gag grouper fishing mortality scenarios in Ecosim, and he wanted to see which scenario would line up with a single-species stock assessment, and his estimates for

catch and mortality were exactly within the range they needed to be, which was just developing that multi-model inference.

Then, in Ecospace, Kim de Mutsert, and this is a newer application, but she looked at hypoxia in the Mississippi river plume area, because there is this idea that -- On one hand, you have these increased nutrients and increased production that might actually inflate biomass and catch, but you have also this dissolved oxygen issue that might outweigh that, and she showed, with her Ecospace model, that, yes, in fact, the hypoxia really is the big driver there and not so much the increase in production you might expect from those nutrients.

In Ecospace, remember that we're talking about developing these habitat capacity functions, which you can think of as this black line as a model, to say, when I have a habitat capacity value of one, which is the most you can have, basically my trophic interactions and my vulnerable prey densities are unencumbered by any underlying preference for, in this case, a temperature range, and so, as that value goes down to zero, given some mapped value, in this case temperature, which is that histogram, my foraging arena, in terms of predator-prey interactions, gets smaller, so that, if predators occur in areas of the map, where say temperature is high, that trophic group is going to get eaten very quickly, and so what happens is there is very little biomass, or no biomass, in areas where the habitat capacity relationship has approached zero.

It's really important we inform these correctly. There is a variety of ways we can do that. In this case, in this example, in the Florida Keys model, we used existing occurrence data. We used the reef fish visual census data to inform a generalized additive model to make that line, and sometimes you don't have occurrence data, and you can just look at ranges of reported values for temperature preferences or depth preferences or whatever.

Another thing you can do is, instead of thinking about the X-axis as a continuous variable, you can think of it as a discreet variable and say, okay, for my areas of the map that I have classified as reef, I might say habitat capacity is one. For areas that are sand, I might say that habitat capacity is 0.5 or something like that, and so that's how it works in terms of a habitat map.

To define those drivers, the distribution of biomass in Ecospace is going to reflect those relationships, with few exceptions. If we just said there is no environmental driver, we basically are just letting the Ecosim trophic dynamics that we fit over time have their way in Ecospace, and so you just kind of see biomass evenly distributed, but we know that doesn't occur, right, and so we need to look at what are known environmental relationships and what data are available in a spatially-explicit framework to inform that and what resolution can we work with. There is a computational issue here that we identified that we need to think about.

In July, we got together, and there's a few papers here that I have cited that outline what different people have used specifically in marine species distribution models, which is a similar conceptual framework to what we're trying to do here, and so there's seventy possible covariates that you could use of existing spatial temporal data, and many of them are corelated with each other or derivative of each other, and so we kind of narrowed it down fairly quickly, and we just wanted to rank these by a list of importance, in terms of ecological importance, but also we need to start somewhere with just getting the extent right and exploring the resolution and exploring the initial relationships.

The team came up with six initial covariates of depth, temperature, current velocity, salinity, DO, pH, and we'll talk about some of the sources that we can use for that. We also have not listed on here chlorophyll A, and we'll add that in the model as a driver of primary production, but, the way that primary production works in Ecospace, you don't need to define an explicit functional response. It just acts like a direct multiplier on production.

We started looking into this list and where we might get it, and so we can probably come up with a pretty good depth map, based on what has been mapped and what we can do at FWC, depending on our resolution, and we have temperature, and that's a pretty accessible MODIS product. Current velocity and salinity, we're getting into model-derived products, and that's okay, as long as we can represent it in a Raster format, and that's fine. The NEMO model is a European model, but there is others. There is some at the University of Miami that we might consider.

DO and pH get a little more interesting. People that have used that are using this World Ocean Database, which is point pattern data from NOAA that they have interpolated, and so you could potentially do a few different resolutions with that. We started filling in a table that is fuzzy, but it's basically all the groups, trophic groups, in the model, and some representative species from each of those groups, and then it's columns of environmental abiotic factor values, and so what's the reported mean temperature that this species seems to prefer, what's the range in temperature that this species seems to prefer, and, just from that, we can explore different forcing functions. These twenty-seven groups, we have that filled in, and counting, and we'll probably be pinging people for additional sources if we start running dry.

The other thing we wanted to do, because, as Roger said, this is a 140-group model, and it's big. Most people don't make ecosystem models this big in the Ecopath framework, and I don't really know what a 140 model would look like in Ecospace, and I will explain a little bit about what that means, and you do hear -- Like, in older versions of Ecopath, they would limit the number of trophic groups you could include in the model, and they have since removed that limitation, but I didn't know if there was any kind of bugs or anything that I needed to know about.

Just to identify these issues and kind of establish some basic sense, we created just a totally artificial relationship to biomass and temperature, and we just ran it for one year at four-kilometer resolution and the extent of the study area, and we did this for just one year, in 2017. You can imagine that, in the values of temperature between fifteen and twenty degrees Celsius, we're going to have like our optimal foraging arena sizes, and then everything else is going to be pretty much restricted.

That immediately did not work in Ecospace. It just was too high of a resolution, which created too many rows and too many columns, which you can think of that as a matrix of Ecosim models that are running 140 groups at a time for every time step, and so it was a huge model to do at that resolution, and so we tried fifteen-kilometer, and that worked, but you can see that there is, obviously, a loss of resolution, but maybe, at this extent, this is useful, and we can still infer some oceanographic patterns, and what Ecospace is going to do is say, okay, well, this is my SST for January, and I am going to output a predicted biomass for every group of the 140 groups, based on the January SST, and then the February image is going to come in, and it's going to produce a new predication of biomass, based on the underlying changing in environmental factors, and so you can see how this is fundamentally different than a species distribution model, where you have

to say, well, what's my mean sea surface temperature for 2017 and make a mean prediction of biomass.

This is trying to really get at how biomass is moving around through the study area, given these underlying environmental constraints, and that's what it looks like when it spits out. That's 140 groups, and you can imagine, in Ecospace, that this screen is actually animated as it's running through time and reading in different monthly timesteps of SST or DO or salinity, or all of those things at once, but it's, obviously -- You can't really see anything, and so let's zoom in on one of those.

This is the predicted biomass at one timestep for a trophic group in the model at the fifteen-kilometer resolution, and so, for some applications, this could be fine. Like, if you want to explore what's the effect of shifting temperature regimes or a cold year in 2010 that happened throughout this region, but, if you have an MPA design, we can draw in different-sized MPAs and say there is no exploitation that can occur in here and what happens to the distribution of biomass for my exploited groups and all my unexploited groups that might have these like tertiary-level effects, and you're not going to really be able to do that unless your MPAs are bigger than fifteen kilometers, given this resolution, and so that's a limitation.

Moving forward, we are working basically in parallel with Lauren, and so she handed me a balanced Ecopath model and a rough Ecosim model, just so I could start looking at some of the things in Ecospace, but, at the end of the day, she needs to hand me a balanced model that the committee and everyone feels is complete, and the review panel signs-off on, and then we can really start plugging in the real models into Ecospace and see what happens, but we can develop all of these functional relationships in the meantime, because that can take a lot of time, and it's very important to do accurately.

Our plan is to build-out that spreadsheet that I showed you and explore different resolutions. There is probably some alternative solutions that we can get at a higher computational capacity, and we'll provide another Ecospace update in the April SSC meeting. Any questions?

MS. DEATON: I have a question. The output here was biomass, right, and you modeled biomass based on the diet?

MR. MCEACHRON: Right.

MS. DEATON: Where that species was found and what was in its stomach and what parameters? Temperature or more than that?

MR. MCEACHRON: In this case, you're looking at an Ecosim model that is being modified by this environmental relationship, and so, in Ecosim, the key innovation is fitting of a vulnerability parameter, which defines how your predators and prey interact and how much top-down control and bottom-up control there is in that relationship. You have to do that for all possible relationships that are identified in the diet matrix, and so, if you say, in the diet matrix, A eats 10 percent of B, I have to say, okay, for A and B, that's really a strong top-down relationship, and now I have a parameter that defines that.

Then, in Ecospace, I'm going to say, well, actually, when temperature is really warm, there is less prey there, and so that relationship gets even stronger, and so, if there's a predator that occurs there, the biomass of that prey is going to be wiped out very quickly, and so that's how they are interacting, and so, in Ecopath and Ecosim, you are building the model based on the diet, based on the landings, fishing mortalities, this thing called ecotrophic efficiencies, and that type of thing. It's a bathtub model. It's assuming that you're taking the average biomass per square kilometer and building a model of the food web.

In Ecospace, you're shrinking those models down into like cell-by-cell interactions, and there is other things that drive things to move around. There is a diffusion parameter, which is a proxy for movement, which means, between each monthly timestep, there is some rate at which biomass can fill in the surrounding cells, and so you can equate that to movement, and there is other things. There is fishing effort, which, by default, is a function of distance from shore, and so that directly translates into a spatially-explicit fishing mortality that varies, and so there are other things.

MS. DEATON: I know that was a dumb question, but it's just hard to get all of that in your head and how we can use this for management.

MR. MCEACHRON: I would say that's exactly the point, right, because you have all these experts. You have teams that may study just one of those trophic groups, and we're trying to put all the species together, to identify what are really strong interactions that we didn't think about. Where are the seals that are eating more than just the lobsters that we didn't think about? In a way, in going through the process, as Lauren talked about, you are identifying what your limitations are, and what your strengths are too, because it's really hard, when you have all these interacting species, to say, okay, well, maybe I have this top-down relationship between these two guys, but I know that there is like a third or fourth order effect of their prey and their prey and their prey, these trophic cascades that you just wouldn't really even be able to quantify any other way.

DR. BAUMSTARK: I will follow-up to that, because, I mean, clearly, we're getting much better at this, and the understanding and the holistic picture is critical, but, when we have folks used to doing traditional stock assessments and making rules based on that, getting them to understand what we're doing is a challenge, and I'm sure this is something that, Roger and everyone, we thought about, but so where are we now with communicating these complicated models and getting -- I mean, can we give advice, as a panel, to how we can get this into a management realm and get our decision-makers to start using these models and going beyond traditional assessments?

MR. PUGLIESE: Just to respond, I think that's the whole plan that we have, is building the model, and the first iteration was highlighted at the original spring SSC meeting, and so the idea is that we are getting to a stage where the model is being developed at a point where we want to get the SSC involved directly in understanding what it is and advancing it, and I think having a complete model and seeing that was a real eye-opener, and, also, taking it one step further of beginning to do even very preliminary what-if scenarios and seeing that the model, even at that iteration, was showing a decline that actually occurred in black sea bass, and the model had the output and did it, and so, whatever is in it has either the environmental components or the prey-predator components that are driving that.

Some of the interactions that have been raised before between black sea bass and red snapper were investigated in there, and so the idea was to build the first iteration and to have -- The SSC has

named a review group to look at the Ecopath with Ecosim model and provide a review in through the next SSC meeting in April of next year, and so there are going to be a number of webinars and interactions to provide input on what the capabilities are and simultaneously investigating Ecospace.

The big jump from the last meeting to this meeting was, as Lauren indicated, there's a very significant advancement on the diet composition of what this latest balanced iteration is going to be, and so it really provides that direct engagement by the SSC, and it's going to be reported out to the SSC, and the intent there is then to inform the council, at the June council meeting, about where things stand, in terms of what the review is, to begin to open the door on what are the types of things that you would like to see beginning to be looked at in what-if scenarios and the capabilities and what can you do with this type of thing, and so it's kind of a nice progression into how you can take this and advance it and begin to investigate and answer questions, and that can be a tool for the SSC and for the council to get into things such as management strategy evaluations and the discussions we're having on species.

Even some of the core areas might be able to give even preliminary views of what we can anticipate with significant changes in temperature, and so, because of that beauty of having not just a species and a prey, but the whole complexity, and then being able to do that, and so that's the plan right now, and Steve may want to touch on that, because I think that's -- Just at least about that being a nice foundational way to integrate the SSC, because they're going to be the ones that are advancing this.

Then the other key is our partnership with FWRI, and we have established that as FWRI is going to be the foundational repository for this model, as it continues to advance, and the inputs are going to go into the Ecospecies system, and the outputs into the Ecospecies system, as well as the diet composition information, and even we're advancing things that are going to be coming out of the climate vulnerability, and so we have a very good partnership of advancing this into the future.

DR. BAUMSTARK: If I can add just one comment to that. One thing that I do see, in Florida anyway, is managers want to know how perturbations like a red tide impacts, and so that's something that we want to keep in mind.

MR. POLAND: I will say, as a decision-maker, that I'm aware of this, and I'm interested in this, and I think Roger certainly hit the nail on the head, as far as getting a completed model and getting it through the SSC and get them to review it, because, ultimately, the council takes advice on fishing level and allowable biological catch from the SSC, and I would really like the SSC to see how to integrate this into their deliberations on setting ABCs for not only assessed stocks, where it's a little bit more rigid, where you have maybe a traditional assessment, with biological reference points and that kind of stuff, and I don't know if we're to the point yet where outputs from a Ecosim and Ecospace model can be considered in the assessment, as far as reference points, but, for unassessed species, it can certainly be part of the consideration.

Also, part of that is we need a little bit more input from the agency, as far as how that input can be incorporated under current MSA guidelines for management of these species, and so I certainly feel like we are getting closer and closer to ecosystem-based management, but we're starting to run up against some of these hurdles, and I think the best way to clear those hurdles is doing what

we're doing right now, is getting a product and getting it to the managers and letting the SSC and letting us kind of forge ahead and figure out how to implement this.

DR. LANEY: Steve heard some of this last week, at the SSC meeting, and some of the issues we're running into from some of our SSC members were -- One question that was posed was, well, look how much time, energy, and resources we're pouring into this model, and we're already not cranking out enough assessments as it is, and so why shouldn't we divert those funds and put it into assessments, as opposed to working with something that is, to a lot of our SSC members, I guess, more of an unknown quantity.

My response to that is that I don't know that we should ever think about -- I would love, Steve, to see us get to the point where an Ecopath model can generate rigorous enough results that we would feel comfortable using those for management advice, and I'm not sure that we will ever get to that point though, but there are a lot of people who were sitting around the table last week that wouldn't have ever thought that we could get to an Ecopath model that has 140 functional groups in it either.

What I would like to say is I think it's a wonderful tool for providing management insight, is the term that I like to use, as opposed to management advice, per se, and I think one example that sticks out to me is from a number of years ago, when I was at the first AFS meeting in Quebec City, and a group, a team, that had done an Ecopath model for the St. Lawrence River estuary presented their results, and, in that case, it was similar to the case that Luke referred to.

There was an issue, and, in that case, I think it was gray seals, and I don't remember which species, pollack maybe, or cod, that were conflicting, and the fishermen's solution to the problem was let's go out and shoot all the gray seals, because they figured that, okay, that means we'll have more fish. If we get rid of the seals, and we get rid of that predator, we'll have more fish, but, when you run the model, what happens is, when you take those seals out of the equation, then all the mesopredators, the mid-level predators, jump in there and take advantage of the fact that the seals aren't there gobbling this stuff up, and so they gobble the stuff up.

You wind up not getting the outcome that you would have intuitively expected, maybe, by imposing predator control on the system, and the other thing that I said to the SSC last week was that sometimes we have unintended consequences when we pick our favorite species and we manage it to a high level of biomass, and the example I like to use is an ASMFC one, Lisa, with striped bass, where I have been saying for years and years and years that, look, guys, we created this huge SSB, and what we did was we created a huge eating machine, and those fish go out there and -- In Chesapeake Bay, everybody was complaining about them eating all the blue crabs, and, off of New England, Gary Nelson and his group did a great diet study for stripers up there that showed that they were eating a tremendous number of juvenile American lobsters.

The big benefit of having that Ecopath model is you don't have to wait ten years, or fifteen years, to build your striped bass SSB up to a high level and then see what's going to happen, in terms of their prey, and you can do it on paper, or in a computer, in this case, and it gives you a whole lot more insight than just trying something and seeing what the outcome is. In some cases, when you're dealing with a long-lived species, it takes a good while to see what the real outcome was.

To me, that's a big advantage of it, and I've been a big supporter of it for at least twenty years ago, I think when Roger and I started talking about Ecopath modeling and the potential that it has for

generating those management insights, and it may, in some cases, help you to avoid making some real serious errors.

MS. DEATON: I was just thinking, and, I mean, I guess you can incorporate habitat as one of those parameters, and can you?

MR. MCEACHRON: Yes, and so Ecospace was developed in 2000, like the first iteration, and, in that iteration, you couldn't bring in monthly SST data and things like that. You had to sketch out areas in your map that were reef or whatever, and, in that case, instead of like this functional response being just a habitat capacity value, it was more directly interpreted as proportion of a cell in which that biomass can occur, and so, if you had -- You would just go in and say, from reef cells, half of the biomass can occur in those cells for this group, and so you can still do things like that on top of these monthly time series, or weekly time series or whatever.

MS. DEATON: All right. That sounds like it could be useful to see, when habitat changes, how does your biomass change, and we've been trying to point it out, but we don't really have quantitative data to show that.

MR. PUGLIESE: I think that was the point that I was making, that we've been building a lot of this information and refining it, and I think this is the real opportunity we have, is that you're going to -- We are really testing the capabilities of Ecospace, because of some of these newer capabilities of integrating information, first on some of the model inputs, as the environmental or ecological model inputs, but now actually, in some of the layers on species distribution, potentially, or habitat distributions or whatever things that we are in the process of trying to refine now, and so that's a big --

It's going to be an interesting evolution, to see how far some of this testing -- The capability, because we are trying to refine those anyway, and that's where this group has been advancing that, is we've been working on better distributions of various -- At the state levels, providing the finest resolutions of the various state habitat distributions, and, at the offshore levels, integrating what we know on hard bottom and live bottom from multiple sources to get -- Tina has been merging in that distribution information then with species from the fishery-independent surveys and starting to merge all of these.

How all of these can inform or connect into that is exactly part of the investigation, but a pretty exciting and amazing next steps on what this might be able to do is far beyond anything that this type of effort has done in the past, and I think one of the things that I was going to ask is the limitation now -- We're talking about this thing actually just running on the laptop, which is pretty phenomenal, that it actually can do that with 140 groups, because this is a powerful capability. The opportunity we have though is, with the evolution down the road, and I guess I will let Luke talk about it, is where ultimately we could go with some of this, in terms of if you want to go to some of those finer-resolution levels.

MR. MCEACHRON: I think most people doing this think of models as hypotheses, and we don't necessarily expect that that red cell is going to be exactly five tons of biomass at any given timestep, but what we might do is say, well, I want to look at the effects of increasing temperature in this region, and how would I approach that problem.

Well, I could do one Ecospace run based on a monthly climatology of SST, just to kind of get my base time series, my base prediction, and then I could run another run, and let's say I feed it a slowly increasing SST climatology, and which one fits my data better, and that kind of lends support to one hypothesis over the other, and it allows you to quantify kind of the magnitude of difference, based on a mean condition, and so that type of thing.

We're not saying that one run in Ecospace and you're done and that's all it can do. This exists as a tool, so that you can address problems as they come up, because, like when we have a red tide event that envelopes our entire state, you kind of want a tool like this on hand. You don't have the luxury of years to develop it, and people want answers then, and so that's where the value is, is comparing really different iterations of it and seeing how it supports the data and supports one hypothesis or another.

MS. DEATON: Very cool. Thank you. We appreciate that explanation. Any other comments or questions? Last call. All right. We're over time, and we were supposed to be done at 4:30, and it's 4:36, and so the meeting is adjourned.

(Whereupon, the meeting recessed on October 22, 2019.)

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OCTOBER 23, 2019

WEDNESDAY MORNING SESSION

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The Habitat Protection and Ecosystem-Based Management Advisory Panel of the South Atlantic Fishery Management Council reconvened at the Florida Fish and Wildlife Research Institute, St. Petersburg, Florida, October 23, 2019, and was called to order by Chairman Anne Deaton.

MS. DEATON: We are going to be talking about the deep-sea research mapping characterization of South Atlantic deepwater ecosystems, and so we've got Heather Coleman and Kasey Cantwell here today, and, if you're looking at your materials, it's Attachments 12, 13, and 14, and there is associated information. I am just going to turn it over to you all, and thank you for being here.

MS. COLEMAN: Thank you very much for having us here. This is a two-part presentation, and so my name is Heather Coleman. Tom Hourigan and I coordinate the Deep-Sea Coral Research Technology Program, part of NOAA Fisheries, and, today, we would like to talk about our work in the Southeast over the last few years, but I will just give you a tiny bit of background about the program, and I talked more in general about it last year, but just to remind everybody that we conduct research, or we support research, and exploration that is very much planned in consultation with fishery management councils and information analyzed and made available to resource managers.

Those are two really pillars of our program and so the priorities of the council tend to be the priorities of our research, and then we come back to the councils, as we're doing right now with

the AP, to share those results, and our partners at Ocean Exploration and Research have played an enormous role in Southeast exploration over the past few years.

When we came to the South Atlantic, the Gulf, and the Caribbean Councils in 2015 and 2016 to start this four-year initiative, we were told that the top three management priorities were mapping unmapped areas, learning more about deep-sea coral distribution, condition, and human impacts, and learning more about the biology and ecology of deep-sea corals and relationships between habitat and managed species, and so we're primarily talking about the first area now, since that was our focus, and we didn't know where corals were, inside or outside of HAPCs, and we've done a lot of work to figure out what these habitats look like and who is living there.

This is a map from our science plan that kicked off the Southeast Deep-Sea Coral Initiative in 2016, and this came from the council, and it was a set of shapefiles showing where priority mapping areas were, just according to council priorities. You will see, in Kasey's maps, that a lot of these areas are much more known now.

A few things that this four-year initiative has accomplished are lots of research and a few publications, and we have partnered with BOEM and with USGS and with Woods Hole and with a number of academic institutions and with a lot of entities to learn more about this region, and we've also had a lot of student projects involved in the area. We have conducted or supported remote-operated vehicles, autonomous underwater vehicles, and human-occupied vehicle cruises. Kasey will talk a lot about the mapping that we have helped make happen.

A lot of the video that has been shot in the Southeast has been annotated, and we're still working on most of it, and we are just finishing 2018 annotations, and so we haven't yet gotten into 2019, and we have another cruise in 2020, and so it will be a while until all of these data are analyzed and annotated, but that will happen. We have also done a lot of analysis of Andy David and John Reed's past work, which is really valuable, and we don't want to lose that stuff.

We have lots of cruise reports, and we have site characterizations into a Story Map feature, and so I don't know if this link is live in the materials that you have. If not, I'm happy to send that around, but it's a great way of looking at all the site characterizations that are available in this region in a nice interactive, fun, clickable, searchable format. If you haven't ever looked at our deep-sea coral national database, it's pretty fascinating to go through where all the known deep-sea coral records are, to date. A lot of them are associated with images, and they have background information with them, but it's just awesome to see how much our knowledge base has been growing over the years.

We also have a geodatabase that I will show you on the next slide with predictive habitat models. I know a lot of you at the SSC heard about that last week, and so I won't repeat that, and we are actively developing a species guide for deep-sea corals in the Southeast.

This is a screenshot of our geodatabase for the region, and it's just showing right now -- The dots are not corals, and that's what I usually show, but, in this case, they are ROV and other submersible dives, and so it shows the location of where we've been looking over the past -- I think this shows back to the 1990s, and they are working right now on going back to the 1960s, to show where all of these submersible dives have taken place, and then the hatched lines are mapping areas, and so I encourage you guys to go check that out, and I will send a link. It's an interesting resource.

Then this is just a really preliminary take on some managed species that we've seen. This is EX1806, and so that dive was in May or June of last year, and it was the Blake Escarpment and Stetson Mesa and Richardson Ridge and that whole are, and Kasey will show more about where that was. This is just three managed species that we pulled out that were seen at least once. The following dives, or following cruises, from 2019 saw a lot more wreckfish, but, this particular cruise, it was just one dive where wreckfish were annotated.

On the left, you see the golden crab, and there were lots of times that golden crabs were annotated, and so this isn't the official data yet, and it hasn't been published on our database, but this is a good indication of the kind of things that we've been seeing, and so, with that, I will turn it over to Kasey.

MS. CANTWELL: What I'm going to talk to you guys today about is a little bit of the work that has been continuing since 2018. Last year, we gave an overview of the expeditions that had happened to date, and so, today, I'll talk about the two cruises that we had this year and a little bit about the one that is currently ongoing right now.

The Windows to the Deep 2019 Expedition was a thirty-eight-day ROV and mapping cruise, our two-legged expedition. We mapped just under 30,000 square kilometers and conducted nineteen ROV dives, and we saw corals and sponges on eighteen of those ROV dives. We also collected 159 biological specimens and seven geological samples, and we observed two brand new seep sites. My presentation has quite a bit of video, and so, if you can't hear it, we can try and turn the volume up, but it may take a minute.

(A video was presented, and the audio of the video was not transcribed.)

MS. CANTWELL: That was basically an overview of the expedition, the cruises over the last year, and I'm going to show you a few more of those videos, and so you may see a little bit of the footage again, but the goal here is to give you guys an overview of everything that we did, and so I'm going to dig a little deeper into each of those things that we talked about.

A lot of the work that we've been doing in the Southeast region has focused on the deepwater coral HAPC on the Stetson-Miami Terrace. This year, we mapped 14,000 square kilometers within the HAPC, and we conducted six ROV dives and revealed the first indication of an eastern border of the area that we call Million Mounds, and I'll show you some more pictures of that in a minute. We also found some new karstic slump and mounding features, and we observed species of Chaceon crabs, Alfonsino, wreckfish, and the Atlantic roughy.

To give you an idea of the scale of the mapping that we're talking about, we started surveying here in 2014, at the request of the council, and we have gathered over 34,000 square kilometers in the HAPC. As of October 2019, we have addressed Priorities 1 and 3 that were given to us by the council, and we have partly addressed Priorities 2, 4, 5, and 6, and those are shown here, and so each of these yellow boxes show the areas that we've been doing a lot of work in that were directly the result of council priorities, and that doesn't necessarily include the work that is currently ongoing today.

You can see here, in teal, the areas that we have mapped last week, and so the cruise that is currently out right now, and then part of the other things that we do in our office is we work with

other partners, like the Deep-Sea Coral Program and the Office of Coast Survey to transition partner priorities that we hear from the community and transition that out to them in areas that we may not be the right operation for, and so you see, in this tiny pink little box up there, the Office of Coast Survey came to us and said we have some extra ship time this year, and we are looking for the right place to map, and so we gave them the council boxes and said they're looking for data in this area as well, and they were able to, with their short cruise, fill in that little bit of the polygon up there just outside the HAPC.

Then, over the next basically six months or so, October included, we will have three more cruises that we know right now in the South Atlantic area, and, in addition to that, OER is working with Fugro, which is a hydrographic survey company, and has purchased two hydrographic surveys in the coming year, and those teal boxes that are there now are the locations of those, one of which directly meets the council priorities that Heather showed before that were originally identified.

To dive a little bit deeper into some of the results from this year, I am going to look at the pink box shown here. This is the data that was collected on our two expeditions. They are slightly differently color coded, so you can see the difference between the two, and this area in the southern portion of the HAPC -- You can see the HAPC boundary is sort of that straight up and down line, but this was the beginning of the first time that we've seen any of the edge of the Million Mounds area, and so the Million Mounds area is very similar to what you can see here.

This is the area that was originally mapped in 2014, which was the first of the systematic surveys to kind of join together a lot of the work that had been done in the Southeast that had kind of been patchwork in the past, and so we knew that coral existed in that area, but we just didn't know the extent of it, and what ended up happening was that, every time that we've been mapping, we've just found more and more and more and more of these mounds, and we have yet to find the edge of them, and so this survey this year was the first time that we actually began to see the edge of it, and, conveniently, it lines up pretty closely to the HAPC area, the HAPC boundary here.

The area is red are mounds that are about the same size and shape of the areas that we've seen high densities and high diversity of coral on in the past, and the areas that are in orange here are ones that are a little bit smaller, but they still are mounding features that are similar to those that do exist within the HAPC.

Then this year was the first time that we conducted systematic mapping in the central Blake Plateau. These two areas that you see in the area that is outside of the HAPC were largely picked based on a transit line. We had some logistical needs to be diving in those areas, getting back and forth from the two edges of the Blake Plateau, and so we did a lot of mapping in that area. As we're trying to sort of fill in the bathymetry gaps along the U.S. east coast, we've been surveying in areas that might be of potential interest to the scientific community, and this is an area that lacked enough data to conduct habitat suitability models, and so we got new data there and found some pretty amazing things when we conducted the dives.

An area that we thought was going to be flat and featureless and largely composed of soft sediment was clearly not, and it was a pretty exciting find that we found another couple thousand of these little mounds or knolls, and, when we dove on them, we found quite a bit of deep-sea coral, and so these mounds were a little bit different than what we had seen in the past.

These ones only had about 15 to 20 percent live lophelia pertusa and madrepora species, but there was a dense coverage of secondary colonialism, and so that was other octocorals, cup corals, and black corals had come and taken over the dead skeletal matrix of what had been left behind from the lophelia, and the mounds were largely the same in form and function as what we saw in Million Mounds, but they were a little more isolated, and what we could see is, every time that we zoomed in at every little piece of the skeletal matrix, we would see more and more small crabs or squat lobsters or little fish living inside the skeletal matrix of the corals.

What we also found to be really interesting with this area, since we did think it was going to be soft sediment and we were trying to groundtruth some of our backscatter data, and so we started fairly far off of the mound, for the first dive, because we had a very strong backscatter margin, where it looked like we were going from a hard to a soft substrate, and it turned out that the seafloor that was away from these mounds was actually a carbonate platform, and it was not soft sediment, as we had anticipated.

The other area in the Central Blake Plateau that we looked at can be seen here in the pink box, and this is another area where, again, we thought there might be something interesting here, because a transit line of data had what looked to be a little mound, and we needed to dive here, and so we mapped part of this last year and found a few of these, and then, overnight this year, we were able to fill in this box a little bit better, and there are still a lot of data gaps there, but we found that there still are quite a few of these large knolls that potentially could host deep-sea coral habitat. What we ended up finding was really amazing.

(A video was presented, and the audio of the video was not transcribed.)

MS. CANTWELL: Again, that video and those dives out in the sort of Central Blake Plateau area really highlight though that, again, we don't know the edge of where the Million Mounds area is, but areas that are outside the HAPC are also very quickly being shown to be suitable habitat for deep-sea coral and sponges.

To give you an idea of the size and scale of what we know to date about Million Mounds, this summer, we had an intern, Paolo Santiago from the University of Puerto Rico, and her summer project was to evaluate the area of Million Mounds and to sort of begin the classification process of it, and so, to date, and I do say to date, because, as you will see in a minute, we have just recently gotten new data from the ship, as of this morning, that shows potentially additional habitat beyond this, but, to date, we have found that Million Mounds encompasses just over 10,000 square kilometers, which is also equivalent to 2.5 million acres of potential deep-sea coral and sponge habitat.

At the furthest extent, it is, right now, the longest linear point is 380 kilometers, and the widest point is seventy-four kilometers. The average height of the mounds is about thirty to forty meters, is what we're seeing in different areas, depending on where you're looking and where you're starting. Within the Million Mounds area, it's really hard to determine where the actual start of a mound is and where the end of a mound is, because they kind of glommed on top of each other. If you look at any of dive tracks, a lot of times, we'll look at like three to five mounds, because you kind of can't just look at one. You kind of have to keep climbing until you get to the topographic high, and then the mounds range, generally, anywhere from ten meters to a hundred meters, in a couple of places.

Again, this is all to date as of July of this year, prior to our current cruise that is out, and this is data that just came in yesterday, or this morning, depending on which slide we're looking at, and so the current cruise that's out right now has identified potentially, and this is a rough estimate, another 1,500 square kilometers of additional mounding habitat. They have not been confirmed yet, and so I do say that is potential habitat, because the features look similar, though they are slightly different in morphology.

They are a little more ridge-like, but we have looked at other ridge features in this region that have shown to be deep-sea coral sponge habitat, but we're going to be conducting a series of ROV dives November 9 through 11, in this area in particular, that would groundtruth some of that data, to see if they are in fact suitable habitat, and, again, we're building evidence that we now are beginning to define that eastern edge of Million Mounds pretty conclusively in the southern area.

Then, when we look outside the HAPC boundary, this is an area of smaller mounds, and they are three to eight meters, in general, and they're a little bit lower density than Million Mounds, but it is a transition point. This area is just to the west of the Central Plateau area that we mapped last year, and so we're not entirely sure where that transition point happens from Million Mounds to these smaller mounds out to the Central Plateau, where they're a little bit bigger, but, again, it's an interesting feature, and we'll probably be conducting at least one ROV dive in this area.

Then, as of this morning, this is what the multibeam data that the Okeanos Explorer has collected to date on the Blake Plateau, it looks like, and this doesn't include the polygons for those Fugro surveys that will be happening in the next year or any of the projects from our partner projects with BOEM and USGS, but this is just from our one platform, but, again, you can see how much of the area that those original priorities that the council translated to us at the beginning of the process -- How much of those we have filled in, and, again, how much data there has been that's new within the HAPC and in the general area.

DR. ROSS: Kasey, a quick question. On that larger-scale map, since there are no lat/long on your zoom-ins, can you point, so that everybody knows where you're talking about for Million Mounds and those eastern boundary areas?

MS. CANTWELL: Yes. Million Mounds is generally described as the region that is just here, and this is the furthest south that we have seen that continuous habitat, and so from about here, and so just offshore of Cape Canaveral, which does link up to a lot of the work that John Reed did in the area, in the Canaveral deep area, as well as some of the work that you've done, Steve Ross, over the years in that area as well, and it goes basically -- All these mounding features go pretty much up through here right now.

Those littler mounds that I showed are right here, and the Central Plateau mounds that I showed are here and here, and then what we don't know is where this really dense habitat of Million Mounds is ending, because we have yet to -- This data is the new data that came in a couple of days ago, and that's right here, and it still shows the mounding features, and so we have yet to find the extent of where this transition point from really dense mounds that are sort of on top of each other to the more isolated, larger mounds that are in the middle of the Blake Plateau.

The area that I was showing before, where we can kind of see the edge of the extent, is down here, where we went from really dense habitat here to more -- A couple of ridge features in this sort of corner to a couple more mounds that then peter out pretty quickly, and then, if you follow that bathymetry line that is the edge of the U.S. EEZ that we did some mapping this morning on, you can see that -- If you looked at it very closely, you can actually see that there are no mounds along that entire line, the purple line.

This purple line here is largely flat and, based on the back scatter, we think it is soft sediment in that area as well, and so we're pretty comfortable saying that we have found -- In this tiny little portion, we have found the edge of Million Mounds, but the same is not true as we've worked north, and it just is going to take more surveys and building out the coverage here and connecting the areas that we have seen coral in.

MS. DEATON: Can you remind us -- Like what's the depth that we're looking at here? I'm sure it varies, but about?

MS. CANTWELL: Most of this habitat is anywhere from 500 to 600 meters, and so, up in this area, the red is going to be about 250 meters, down to the purple is about a thousand meters, out here. Most of the habitat we're looking at is between 500 and 800 meters. Any other questions?

DR. LANEY: Thank you, Kasey. A couple of questions. One is have you all, during the course of this work, been able to compare any of the earlier work that Andy and his colleague did and do any sort of an assessment or a change evaluation at all? Can you see any difference between what they found when they were doing their work and what you guys are finding more recently? That's question one.

MS. CANTWELL: That's actually not what our office does. Primarily, we are data collecting, and we don't really do a lot of the analysis. What we do though is make our data publicly available, and it is certainly possible for anyone that is interested to take our data and use it for those collections. John Reed and Andy David have been included as part of our community solicitation, and we have been working with them as we develop dive plans and mapping plans in the region, given their extensive experience in that area, but we aren't in the business of doing that data analysis.

Our job is really to collect data and to make it available as quickly as possible. All of our data is available about ninety days after a cruise, through public archives, and, in some cases, it's actually available within about twenty-four hours of collection onshore for folks, if they want to start using it, and so that's how we sort of try to transition this information to those that can use it, and most of the stuff that I am showing you here are the maps, because they are very easy to interpret. The changeover time in the communities is something that you do need to spend quite a bit of time and analysis on.

MS. COLEMAN: The Deep-Sea Coral Program could potentially look into that question if it is a priority of the council, and so that's one reason we're here, is to see what priorities might exist for either small projects in between initiatives or maybe part of our next Southeast Deep-Sea Coral Initiative, which I think it will be in about six years or so, and so no great rush on that one, but we would like to know what the priorities are of the council moving forward, once the large part of this area has been mapped.

DR. LANEY: Thank you, Heather, and, yes, I would say the council's priority is protecting the habitats that are out there, which are highly vulnerable, for sure, to any sort of bottom-tending gear, and I think the council would definitely be interested in knowing if you all have been able to document any impacts to those habitats that have occurred, especially since John and Andy documented them in the first place.

I do have one other question, and that is you alluded, Kasey, to a lot of dead coral present in some of those areas, but being colonized by new and different species, and is anybody trying to collect any of those dead ones? I know you can age lophelia, I believe, can't you, Steve? No, you can't. Okay. Never mind.

DR. ROSS: That's one of the hard corals that is not easily aged. Sometimes you can put a geologic age on the dead coral, but actually determining how old it is has been difficult. There are a few people working on that. They grow faster than people thought they did, and they are more widespread than people originally thought they were, but they are still difficult to age.

DR. LANEY: What would be interesting to me is having some sort of insight into why those colonies were killed off in the first place, you know why did they die, and what's behind that? I mean, was it some shift in subsurface currents that eliminated a food supply or change to temperature or what?

DR. ROSS: There are people working on that. There is a paper published for the coral bank that we worked out at Cape Lookout by some of my Dutch colleagues, and some of the issue seems to be changes in oceanography during the last glacial maximum, where there were refugia at certain depths for these corals, and then, when sea level came back up, the corals expanded from that, and so they leave behind sort of a, over thousands and thousands of years, a pulse of living and dead that grow up, and so we may be in a dead phase now, but, from a reef point of view, those dead corals are really diverse, in terms of biodiversity. In fact, sometimes they appear to be more biodiverse than the living coral areas.

DR. LANEY: I was going to say that, despite the fact that they are dead, the structure is still there, and so it's still a very important three-dimensional habitat for a lot of different critters that are coming in and using it after the corals die off.

DR. ROSS: Right, and, just to continue that thread, the threat there then becomes ocean acidification, as the aragonite saturation level comes up and threatens that matrix that is dead in a different way than it does the living corals and the whole framework.

MS. CANTWELL: What you're talking about, with the dead areas potentially having a higher biodiversity, was true for us as well. The area that we saw, and so this Central Plateau area, where we had the lowest amount of lophelia of any of these mounds that we surveyed, with only 15 to 20 percent being live lophelia, was the highest biodiversity, in terms of species number and just true diversity of species that we saw, hands down, anywhere throughout the entire cruise. It was definitely a very good habitat for other animals, and not necessarily lophelia, but we still saw some live colonies, but, as a whole, they were other colonies, largely Primnoa and the bamboo corals there.

AP MEMBER: This is probably outside the scope of your operations here, but is there any research on the geological origin of the mounds, and are they volcanic or plate created or --

MS. CANTWELL: Steve, please correct me if I'm wrong, but they are biogenic. For everything that we can see, it is that they are growing up from this buildup of the coral skeletal matrix, correct?

DR. ROSS: Yes, that's correct. There is no volcanic origin of any of these mounds, and so some of them that are in this area, up to 100 meters tall, are biologically formed. They have to have a hard substrate, in general, the theory is, to get a start, and that hard substrate may be quite large, like a rocky mountain that gets covered with corals, or it may be quite small, but there has to be also the appropriate delivery of sediments, and so it's a complex interaction between sediment delivery and oceanography and coral growth that allows the mounds to go up and down. The only one that I am familiar with that's been dated is still the mound, and I forget the name of it, in the northeastern Atlantic, and I think it was dated at taking 1.5 million years to grow to about 150 meters.

MS. CANTWELL: One more thing to add is, though people cannot currently date the lophelia, we did collect some of the lophelia skeleton as part of -- When we were collecting other samples, and we did keep it and preserve it, and so it is at the Smithsonian, as well as live coral that was attached or sort of had been growing on a dead portion of that same coral, and so that does exist at the Smithsonian, as with the rest of our biologic samples, so that, when we do figure out a way to do that, they are available and extensively dated with metadata records, so people can go back and use that at some later point.

DR. CHERUBIN: A quick question about -- When you're doing your measurements, is it right in the Gulf Stream or -- The current circulation is pretty significant, and I am wondering, when you go to those depths, do you have any idea what the current is like, and are there any actual measurements of what the current is in this type of habitat?\

MS. CANTWELL: This area is actually really interesting, from an oceanographic perspective. On the surface at any given day throughout basically -- If you kind of look at this as an arc, where we've been operating, and the current on the surface was anywhere from one knot to six knots one day, just depending on how the Gulf Stream was running and how close to the axis we were, but, particularly on the days that most of the conditions were behaving, even when we were seeing two to three knots of current on the surface, on the seafloor, the current was much less, and we were seeing anywhere from half-a-knot to a knot of current, and then, sometimes when you get in the lee of these mounds, the ROV would be experiencing no current, and so that was really interesting.

What we also were noticing, in a couple of areas, were small sort of edges of water masses sort of up against the edges of some of these features, particularly the areas that were not the mounding features, but the more karstic slopes and slumps, and we would see that, basically when we were descending along the feature, we would be maybe four to five degrees Celsius warmer than when we got the seafloor, and then there was like a pocket of cold that was sort of upwelling along some of those features, and that also corresponded with a high oxygen layer as well as a slightly lower salinity level, which we thought was a little odd, and we've passed that information on to some physical oceanographers to take a further look at, because that was not any of our specialties onboard, but we think that it has to do with water masses sort of converging over some of these features.

Some of these karstic features are about fifty to a hundred meters big, and so it certainly is an interesting area, and our colleagues at the University of Temple, under the Deep Search Project, have seen that in the Richardson Hills area, and so up here -- They have noticed that, when they are collecting coral from this Richardson Reef Complex that, again, on these steeper slopes where they found coral, there oftentimes is cold water cooling around some of the corals, and that has -- They have not figured out exactly what is happening with that, but there is some really interesting oceanographic things happening on the Blake Plateau that nobody really has an idea of yet, because there haven't been many dives out there, and so, between the Deep Search Project and us and some of the other work that's been going on with SEDCI, there has been sort of an influx of dives out in this sort of eastern area, where there hadn't been a lot of dives before, which is pretty interesting, and so we don't have answers, but more questions.

DR. ROSS: I can add a little bit to that. We have seen bottom currents at least up to two knots, and so a little bit higher than that, but the problem with these point observations is that they aren't really telling the story that the corals are experiencing, which is what's impacting them, and we have put down benthic landers in several places out there for up to a year, and so what we find is there is an amazing amount of oceanographic variability on a very short time scale, and there has been some speculation that some of those changes, especially in temperature, might be impacting the proportions of live and dead coral, but I'm not sure that's very clear.

If you look at the axis of the Gulf Stream, if you were in the south looking north, the axis is tilted, like that, and so, with warm water up here and slightly cooler water, but still warm down here -- When the Gulf Stream hits the Charleston Bump, it will move offshore and then swing back inshore, and, when, that bottom warm water impacts the slope, it's hitting the areas where those corals are, and it can provide bottom temperatures up to fifteen or eighteen degrees Centigrade, which is generally thought to be above the thermal tolerance of lophelia, and it can stay there for as much as a week, and that temperature can change as fast as over a few hours, and so a tremendous amount of energy being delivered and changing across that interface, and that doesn't occur where all the corals are, but, certainly where the Gulf Stream is, it's very dynamic.

DR. CHERUBIN: I think that's very important, to understand the circulation there as well, in terms of, for instance, larval transport from those coral systems, and I was wondering if the current itself can be used as a proxy to define the boundaries of the habitat that you use, because, as you move away from the current itself, there may not be enough connectivity in that region between coral mounds, and that may eliminate the opportunity for those mounds to develop further away from the Gulf Stream region itself, and it could explain why you see a lot of those mounds in an area where there is a lot of connectivity, due to the current, but I don't know if -- That's just a hypothesis, and I am not sure if it's the case.

DR. ROSS: The whole larval delivery and settlement process with lophelia is not particularly clear, although that's being worked on a lot. We've done one genetic study that's been published, ranging from the Gulf through the Southeastern U.S. and over to the eastern Atlantic, and there is a fair amount of genetic disconnect between the Gulf and the South Atlantic area, less so along the east coast, and there is disconnect with the northeastern Atlantic.

We now have a database that covers most of the Atlantic, including the northern part, and those data are being analyzed, and we're working on a second genetic connectivity paper, but the

problem with that is what we see now may have been established in the last glacial maximum, and so, when sea level was a hundred meters lower, connectivity was a lot different, and so it's kind of a difficult picture to use just the currents to create that.

DR. CHERUBIN: So you will need basically a model that accounts for sea level rise and assuming the circulation of the Gulf Stream was -- The sea level was much lower, but it's not something impossible, and I'm sure that can be done.

MS. CANTWELL: Along those lines, that's definitely something that, as we keep diving and finding more and more coral, it's something we've been talking a lot about. All of this work that we've been doing in the Southeast has been under NOAA's Campaign ASPIRE, the Atlantic Seafloor Integrated Partnership for Research and Exploration. One of the main themes of that is transatlantic connectivity, and even local connectivity, and so we have been collecting a series of a certain list of species that we know are being used for connectivity studies, and lophelia is one of them, and so, everywhere we go that we have seen lophelia, we have been collecting some, so that it can be used for general connectivity studies.

Between that and some of the connectivity work, and particularly genetic and population connectivity that's being done under Deep Search, we're hoping that that begins to answer some of those questions, or at least start down that path, but it is really interesting that, under arguably the most studied current in the entire world, you have this area that we don't know much about, and we keep finding more and more of these mounding features, and you have to start to wonder about the Gulf Stream's influence in this area, because it's the predominant driver. It's definitely a really interesting line of question.

MR. PUGLIESE: I know I've mentioned this before, but one thing I would like to see is, as you continue on, is, and I'm sure it's happening at higher levels, coordination with the IOOS program and with the partners in the Southeast, through SECOORA, so that, ultimately, a lot of the oceanographic information that's being collected can connect in and be working with partners to refine the temperature models and the current models and all those to even get better clarification, because, ultimately, it would be great to see some of these different types of distributional things also be included into even some of the ecosystem models, like the Ecospace, et cetera, and maybe we could get down the road, as Laurent mentioned, of being able to do these scenarios that kind of incorporate a vast amount of different types of understandings and different climate situations, et cetera.

I think that's a real opportunity, and I would encourage -- We need to talk further, because we're in the discussions of the next five-year planning cycle and budgeting for the RCOOS program under the Ocean Observing Association in the Southeast, and so getting that inserted in as a priority for the collaboration will probably be really important to advance that now.

MS. CANTWELL: Absolutely. Okay. I will say that Derek Sowers, who was the one that pulled together this figure this morning with their most recent data, is going to be very excited that we spent so long discussing it.

MR. HOOKER: I don't know if this is really a question, more than a comment, but, in the first presentation, you showed potential manganese nodules and such, and I guess, more for this advisory panel more than anything, just something to keep aware of is there always continuing

interest in critical minerals, and you will hear that. There is an Executive Order on that and looking at -- Although ocean mining is still not quite there yet, it's just something to keep on folks' radar as more and more information becomes available about these mapping things, and we're finding a lot of great value in the biological activity, but there's also mineral resources that are revealed through the same type of activity, and so just to keep it on everybody's radar.

MS. CANTWELL: Yes, and this area, this little tiny postage stamp here, was actually mapped at the request of BOEM during this last expedition, and there will be a dive that's conducted on there now to look at the area for phosphate minerals, and so there is definitely -- Again, as we're finding that more of this area is hard bottom and not soft sediment, as we thought it had been, there is an interest to understand the chemical makeup and if there are any critical minerals that have been deposited in those areas, and we've been working closely with the Environmental Studies Program at BOEM to basically make sure that, everywhere we're going, we're collecting data that is useful for them as well. Any others?

MS. DEATON: Did you say that there were manganese nodules, or it hasn't been analyzed yet?

MS. CANTWELL: It hasn't been analyzed yet, and so we know for a fact that there was a manganese crust on them. We don't know how thick the manganese crust is or what the interior is, and we don't have a rock saw onboard the ship. Our policy is really to collect the specimens and then distribute them to the archive so that they can be processed

The biological samples take about six weeks or so to get curated by the Smithsonian and to get into their system, and then they can be accessed. The rock samples are available through Oregon State University, and they take about three to six months. They are a little bit slower, because they actually will cut them in half, and they will polish them, and they will thin section them, and then they do spectroscopy on them, so that, when people are requesting the rock samples, they actually have a better idea of what they're requesting, and so those ones aren't yet available. They should be sometime in the next month or so, from this last cruise, and so hopefully we'll have a better idea of exactly what they were soon.

Part of what we did this year, aside from what we have been doing in the past, where we've been working sort of east of the Gulf Stream -- This year we actually crossed and went to the western side of the Gulf Stream, and we started this dive thinking that it was going to be a shipwreck, and potentially the Bloody Marsh wreck, and it did not end up being the Bloody Marsh, but, by crossing the Gulf Stream axis and going a little bit further inshore, we saw very different habitat than what we had been seeing.

In particular, some of the rare finds that we had was this polyphyletic group of sea stars that were eating a sponge, which hadn't been seen before, according to our colleagues at the Smithsonian, and so this was a pretty interesting find, but, in general, we saw a lot of fish in this area, as well as you can see here a lot of very different corals and sponges than we had been seeing on the mounds, which really just shows the types of different habitat that you do have within the HAPC, and it potentially gives a little more evidence to that controlling factor of the Gulf Stream may be playing a little bit more into habitat distribution than we think.

We were only about seven miles from the last dive that we had done, which was on a lophelia mound, which had a lot of live lophelia, and, here, the lophelia colonies were about three to four

inches, if we saw them at all, and we only saw a handful of them, and so very different habitat makeup, and we were primarily diving on these little carbonate platforms.

One of the things that is always interesting when we are conducting our ROV dives are the observations of deep-sea life history, and so we oftentimes get the opportunity to observe events that may not be rare, but are rarely observed, such as predation events, and so the video that is playing here is a Chaceon crab that is eating a sculpin's eggs, which got people pretty excited, and what is not in the frame, because it would just be too said, is the sculpin that had laid them, just sitting off the screen watching the crab eat, but it's really interesting to see things like this, because you don't often get to see either mating pairs or predation events happen, and so, every time we do, we're gaining a little bit more knowledge about the deep sea and how these animals interact with each other.

Throughout the cruise, we also saw several instances of juveniles or young recruits of corals and sponges, as well as mating pairs, and we saw several range extensions, both geographically as well as depth-wise, and we had a couple of new records for the region, and we documented, again, several rarely-observed predation events, one of which is this one that you guys may have seen in the media.

(A video was presented, and the audio of the video was not transcribed.)

MS. CANTWELL: This swordfish, when we got to it, had probably only been dead for about five to ten minutes, because there had been so little eaten from it, and we just sat there and watched them eat the rest of it. These are genie's dogfish.

This was that same dive where we were sort of on the opposite edge of the Gulf Stream that we had been spending a lot of time on, and, like I said during the video, the swordfish had very recently died, because, when we got to it originally, the first footage that we had of it, they were maybe two to three bites into it, and it had very recently died, and this is sort of towards the end, as we were leaving, when the whole footage with the wreckfish happens, but you can see that they have pretty much cleaned half of it during that time that we sat there and watched, and we spent about an hour-and-a-half there, because it was so exciting.

MR. PUGLIESE: Kasey, that was amazing, when that first came up, and, of course, given some of the things we've been discussing the last couple of days, the first thing I did was looked at that, and I was wondering if there was any real chance that our Ecopath model -- If there was any real chance that our Ecopath model diet compositions already captured that, and so I got ahold of Lauren Gentry, and Lauren gets right in there, and, sure enough, George Sedberry had documented the dogfish as being eaten by wreckfish, and that was actually a wreckfish, and a big wreckfish, to be eating that size, and then she also tracked down that it was a genie's, named, after the founder of Mote Marine Lab, which was really cool, and so it's in there.

Then I further talked, at the last SSC meeting, to George, and this actually gave us really significant information, because while he identified it as being consumed, they had assumed that that was eaten as discards off of vessels, and so it wasn't actually documented as -- It was consumed, but not necessarily as live, and so this verified that they actually live-consumed them, and George said he thought it was just -- They found the vertebrae, and thought it was really just discards or whatever, and so that really did add a lot to it, but I was really pleased that Lauren had been able

to see it already and rooted out the connection to this, and so it was great. The more you look, the more you find.

MS. CANTWELL: Yes, it was definitely a really interesting and exciting experience. Unfortunately, we lost our satellite connection about ten or fifteen minutes into this happening, and so most of this was not actually broadcast. Particularly the wreckfish eating the shark wasn't live, and we did not have any fish experts on the ship at the time, which is why they called it a grouper instead of a wreckfish, and it was more them trying to provide some sort of narration to it beyond just awe, but you still get a lot of that, and, if you listen to the full hour that we were there, you get a lot of that from everyone on the ship.

What was really interesting about this is, when we did release the highlight video a couple of days later, it got picked up by about 200 news sources, and it just sort of shows how interested people are in this type of thing, and shark attacks are always media grabbers, but, really, what we saw trending in the media articles was, again, a fascination with the deep sea and how little we know about it, and we were able to get in touch with Peter Oster, who wrote a really great weblog about it, which answered a lot of people's questions about, well, what are they, what are they eating, and a surprising number of the news articles were actually pretty educational, which was really exciting to see, versus just look at this shark, which got people in, but then they actually were able to convey a little bit of information about that ecosystem as well, which was great.

Speaking of Peter, Peter is currently working on a paper about this observation, and we have heard rumors that there are some documentaries that are also being shopped around using this footage as well, and so you may see more and more of this in the coming years.

Sort of as we're leaving the HAPC area, one of the areas that is still within the council's jurisdiction that we spent quite a bit of time on during this cruise were the Carolina Canyons areas, where we found a new seep at Bodie Island, and this area had been originally mapped by the Okeanos Explorer in 2012 and 2014, and we found potential gas seeps, and then we were able to re-map them, and this is an image of the gas plumes that we saw the morning before we dove, and the red dots are indicating the areas where the plumes can be traced to on the seafloor, and then we went and dove on it, and this is at about 380 meters.

(A video was presented, and the audio of the video was not transcribed.)

MS. CANTWELL: With that site, another thing that was pretty notable was that it was one of the shallower communities of the two bathymodiolus mussels that we found that had been observed, and USGS is currently working on them, to sort of document that site and make more information publicly available about it.

In terms of next steps in the region, for us as a program, there is currently an expedition out, that I mentioned before, and we've seen a little bit of the data from the mapping cruise that's ongoing. The expedition runs from October 5 through November 11, and there are planned seven ROV dives and additional mapping in the HAPC that will continue to address those council priorities, the gaps that are left there, and then there will be three to five dives in the Central Blake Plateau area, potentially on some of that new data, as well as fleshing out what we know about some of the areas that we mapped last year that we didn't get to do many dives on, and then we anticipate having

another mapping cruise on the Blake Plateau on March 24 through April 14, and we are looking activity for input to identify those priority areas where we will be going again.

Then, to kind of sum up some of the key takeaways of what we've seen so far in this region as a whole over the last two years, there are certainly areas in the Blake Plateau that we had expected to find featureless, flat, soft sediment areas that we found that they contain extensive deep-sea coral habitat. Just in what we have seen on these ROV dives, there is a lot of coral there, but then, when you start to look at the areas where we haven't yet dove, but we do have mapping data on, and those mounds that potentially -- Until they are confirmed, they are sort of unknown, but we anticipate finding additional deep-sea coral and sponge habitat there as well.

Every time that we're going out on these mapping cruises, we're finding more and more potential habitat, and, from what we knew, just basically in 2010 through 2015 to now, the distribution of lophelia pertusa on the Blake Plateau is much greater than originally thought, from the work in the area where Deep Search has been doing, up in the Richardson Hills area, to that Central Blake Plateau, and as Million Mounds continues to sort of systematically march across the plateau, and it's definitely much greater than anything that we thought before, and that's it.

MS. DEATON: Thank you very much. It's very interesting, and it's kind of amazing.

DR. LANEY: Just one more question. I know, Kasey, you said earlier that you all collect the data and depend on other people to analyze them, and this is sort of directed to you and Heather and Steve. Is it possible -- Do you think that you have enough ROV footage now that we could begin to think about estimating production on a per-area basis from these lophelia mounds and biogenic features out there? Is that something that the -- I know the council has been interested in it, or at least Roger and I have been interested in that, for a very long time, and I am sure it would probably feed into the ecological modeling that's ongoing.

There are so few species for which we have like an area-production relationship, one of those being penaeid shrimp, looking at area and acreage of intertidal marsh and how much shrimp is produced, and I am hoping that, at some point in time, we might be able to also do that for other habitat types that are out there, and certainly it would seem that, maybe if you had enough footage to be able to quantify the biomass that's present, you might ultimately come up with some sort of an area-production relationship, and Luke may want to comment on that as well.

DR. ROSS: The short answer is yes, and that picture will change, the more data that are added to it, but we certainly have enough data, especially -- There are a number of areas out there that have fairly isolated mounds, and that's not going to change, because all we'll find is that there's more sound around that area, and some of the parts of the Middle Blake Plateau will continue to add to that, but there are lots of places that you could either take as an isolated area and do that kind of work, or you could attempt it for the whole of the database that is present now, and that's a question of research money, and I don't think it's a question of not having enough data at this point, because we've been out there now for twenty years, and there is a substantial amount of information.

DR. LANEY: The other coral area question to that is what's the relationship between what's going on there on the bottom and the pelagic resources up above, because, obviously, you get a dead swordfish that falls to the bottom, and it constitutes a large energetic subsidy to that bottom

community there, which is clearly the wreckfish is taking advantage of, and I'm sure that's not an isolated incident either. That probably happens all the time.

DR. ROSS: From a trophic point of view, even more than that are daily migrations of the mid-water community, and we have sampled the mid-water community, mostly in the northern part of this area, but it hasn't been extensively sampled, that I am aware of, in the southern part, especially closer inshore, and so we do know who the players are, but we're not sure exactly what they are eating, but there's a tremendous amount of energy transfer every day with those daily migrations, and those animals we do know impact the bottom in these depths, and so you get lantern fish that stay on the bottom, simply because they find food there, and they don't need to migrate to the surface. There is an odd relationship, where the mid-water community hits the upper slope, and it doesn't behave exactly like it does when it's in deeper water.

MS. CANTWELL: To add to that, as part of this cruise, we did also conduct five sets of mid-water transects, as well as we deployed our suction sampler for the first time this year, and we were actually able to do some selective sampling, nothing like the extensive like mid-water trawls that will really give you the good inventory, but we were able to target a number of species in the water column and collect them, and they're now at the Smithsonian for folks to analyze, largely potential new species or records, but they do exist now, as well as our mid-water work.

The other thing that I would urge you guys to consider, when you're thinking about sort of that connection between the biomass in the water column and the seafloor, is it's not within the HAPC, but, in the seeps areas, particularly the seeps that maybe don't always have as large of the mussel communities, but, in the Carolina Canyons, the last couple of years, we looked at several seeps, and some of them are more diffuse, and a couple of them are more established, like the one you saw here today, but the biomass in the water column over those seeps is incredible.

There are times that we can't get to the seafloor where we want to, because there is so much biomass, and part of that has to do with the canyon environment, and part of it has to do with the seeps, because sometimes we're on a canyon, or sometimes we're in it, or up on top, but the seeps do -- The more we're finding out about seeps, the more we're finding out that they seem to be drawing a lot of biomass to them.

AP MEMBER: I was wondering if you guys observed any direct human impacts, whether that be fishing gear, like pots or longlines or trawl evidence, as well as garbage and waste.

MS. COLEMAN: Good timing for that question. My summer intern did a project on that exact topic, and she followed South Atlantic, Mid-Atlantic, and New England area cruises, just Okeanos cruises, to find when people had annotated different sorts of trash and human debris, and I don't have it right here, but I could show you the results of her study.

She found a lot more than she expected, and quite a bit of fishing line, but really plastic was the winner, in terms of what you would find. She also found a lot of balloons, and that was the biggest category of just this is the one isolated thing, and so I can share those results with you, and she does plan to publish, along with someone at Woods Hole, combined datasets and get a bigger picture of the Atlantic.

MS. CANTWELL: Most of the east coast, we do see a lot of debris, in general, sort of anecdotally, and balloons is definitely something that we see a lot of on our cruises, I would say more than fishing gear as a whole, and balloons seem to be quite frequently found wrapped up in the corals. Occasionally we do see fishing gear, but not as much. Particularly in the HAPC, we didn't see as much as in other areas, like some of the canyons.

This particular cruise, we got pushed a little bit further north than we were planning, due to the location of the Gulf Stream and some weather systems that were developing, and so we had planned to not go any further north than Norfolk, and we ended up going up to Delaware, and one of the canyons up there had pretty extensive fishing gear and recreational fishing activity.

We had to move our dive site four times, because we just kept getting buzzed by recreational fishermen who weren't respecting our sort of closest point of contact requests, and so that does exist. We didn't see any of that kind of activity in the Southeast, but, when we got closer to shore in the canyons in sort of known recreational grounds and known commercial fishing grounds, we did begin to see that kind of thing, but not as much down here. Again, that's anecdotal, and that very much has to do with where we were spending time. I mean, a lot of the areas we were were seventy or eighty or a hundred or 200 miles offshore, compared to the canyon that I was talking about was fifteen miles offshore.

DR. LANEY: Kasey, by balloons, I presume you're talking about those mylar helium-filled variety?

MS. CANTWELL: Yes, and they mostly mylar helium balloons, although we do occasionally see the latex ones as well. A lot of those times, with those ones, the ribbon string is what is trapped around the corals, and like you just see a tiny little bit of the balloon, but the mylar ones are pretty persistent and pretty apparent.

MR. PUGLIESE: I think of the biggest things and the most important aspect of all this, in keeping this group abreast of exactly how far this is going, is the way the council manages the habitat areas of particular concern as being really the broader ecosystem, and so understanding -- The more we understand the entire complexity of the combinations of all the different habitats, and it's good to see that it even extends into beginning to get characterizations of some of the mid-water and all the connections and the currents and everything, because I think that complexity of all the different habitats as they are working together and what's being there is the driver for the conservation and the ability that the council can really advance any of their comments relative to impacts that are potentially going to affect these areas, and so it really -- The more that's being found, and I think the messaging that came out of especially this last round of live action was really pretty strong, and I think a lot of the council members actually saw a lot of this online, and I think that power was really important to focusing, again, on the fact that this was put in place for that broader conservation.

The more you're finding, it's really reinforcing that directive for conservation, and so I think everything that keeps on going, and this group, the advisory panel, has the ability to keep on encouraging and advancing and prioritizing and refining the way some of this information is coming forward or being used, and then I think -- Hopefully, maybe at the March council meeting, we can have a presentation of the next stage of a number of these different things for the council, during the council committee also, and so I think we're going to keep on adding this together.

Plus, some guidance on directions that we want to see into the future, from a broader conservation perspective, this group can bring forward, and so thank you, and I appreciate the ability to keep everything moving forward, and the fact that we have more to look forward to, and I think that's the exciting side of this, and I am just amazed, because I remember, when we first looked at some of these, and having that broader area as essentially a very limited distribution of what we knew, but there was enough understanding of what the potential was that you are verifying and validating, with really sound science, what is out there, and it's even more amazing than people thought, and so that's good.

One final point is on the discussions on the seeps, and we do have the Blake Ridge Diapir that was designated as an HAPC, and some of the discussions early on had to do with the values of these areas, and so many of them are so isolated, and the genetics associated with them are very unique, and I was curious to what degree some of that might be being looked at within those, because that was a big thing that came up when we first had discussions, was those areas are so isolated that basically the genetics are also unique to those, or also endemic to those, specific locations.

MS. CANTWELL: The Blake Ridge Diapir is an area that the Deep Search Project is actively looking at and has collected extensive samples to do just that, genetic connectivity. They have also got a couple of seep sites up in the canyons that are just south of the North Carolina canyons, south of Norfolk, that they have been collecting additional samples of the bathymodiolus mussels, in order to do just that, look at it, because the Blake Ridge Diapir is a little bit deeper than some of the other sites that are up there, and it is certainly -- I think they've been there now four times, with a couple of different vehicles, in the last two years, and it might be five times, and I think they have a lander there as well, and I'm not sure about the lander though, but they are certainly looking at that.

We, with the Okeanos, went to the diapir, not actually to look at the seep community there, but there's a shipwreck that is about 100 or 150 meters of the diapir, where the seep site is, that is believed to be a fifteenth-century shipwreck that we collected data on in 2016, and so that is there as well, but we didn't do any of the mussel sampling there, knowing that Deep Search was going to go into that area, and we figured it was better to sort of keep the two efforts a little separate, to sort of manage resources a little bit better.

MS. COLEMAN: Can I just add, quickly, before we lose it, to Roger's point about how exciting it is to follow along with the Okeanos dives? We really wanted to thank Roger for calling in and talking about the importance of habitat management, and, if anybody else on the AP, or anybody on the council, wants to call in while the ROV dives are going on, and it starts on Halloween, I think, is when the ROV part of the cruise sets off, and so, if anybody wants to call in and talk about any of these particular areas, or the management, or what the council is doing, or -- People don't know anything about that, and so it would be really valuable, if anybody would like to do that.

Just really quickly, the last thing I wanted to say was that we do very much welcome your research priorities in two forms, one in the smaller project realm and one in the bigger thinking, like, in May, I think, at the last meeting, people were talking about maybe creating sentinel sites, and that's an interesting idea, and a really big one, and so it would take a lot of thought on how to do that and how to get it funded, but also smaller projects or something that we can consider throughout the year.

DR. LANEY: Thank you, Heather, for mentioning the sentinel site suggestion, and that was something that I was going to ask you all about, whether you think that's a good idea, and, obviously, we would certainly come to you all, in terms of looking for recommendations, if the funding was forthcoming to be able to establish sentinel sites and then monitor them through time, and I will have just one last comment, and correct me if I misspeak.

You know, there's been a lot of discussion about the moon and the lunar landing lately, and, if I remember correctly, I seem to have read that we understand more and know more about the surface of the moon than we do about our own deep oceans, and so, again, many, many thanks to you all for the work that you're doing and for the education that you are providing about this very unique and special habitat that we're so fortunate to have off the South Atlantic coast.

MS. CANTWELL: You are certainly right. We have better maps of both the moon and Mars, compared to our own deep sea, and so I'm not sure if you guys are aware of Seabed 2030 and the initiative that's going on with that. Seabed 2030 is an initiative that is coordinated by GEBCO and the Nippon Foundation, and it is an international effort that the U.S. has signed onto to agree to provide data into, and the goal is, by 2030, to get high-resolution, which means one sounding per every hundred meters, and so hundred-meter resolution maps of the seafloor by the year 2030.

NOAA has committed to getting the entire U.S. EEZ mapped during that time period, and that is a joint effort that's happening between many different NOAA offices. It takes a little bit of change happening in the way that our grants processes are happening, where any multibeam bathymetry that is collected is going to need to be made publicly available, and it's kind of an ongoing process that NOAA has in order to comply with PARR, which is basically making all of our data public, and then we, OER, are going to be responsible for mapping and characterizing the U.S. EEZ deeper than 200 meters, which a lot of this area does fall within.

Our goal is, in the next couple of years, to finish the U.S. east coast, and that's part of the reason that we've been sort of actively pursuing these mapping cruises, those hydrographic survey buys, in order to get this area completed before we move on to the next area, and so I do anticipate that, before too long, that this area will be completely mapped to that hundred-meter resolution.

We are currently -- It's one of the things that we are being tracked on by Congress now, is how much of the U.S. EEZ is mapped and how much of it we are contributing to that, and so we are actively pretty aggressively pursuing that, as much as possible, and, of course, with our same data quality standards as well as our public data distribution models as well, and so you have that to look forward to, which is great.

MR. PUGLIESE: Yes, that's fantastic. I mean, I remember, when it was first announced, it was like are they really going to be able to map the entire world by 2030, and the motivation -- I am just very impressed that NOAA has really stepped forward and really made it happen that it's going to advance, and all of these are filling in those, and to know that that's actually going to happen is a pretty significant thing.

It's going to play a big role in our region, because especially with the work -- It will be interesting to discuss as you map, because we had gotten some of the earlier maps that were done outside of the EEZ area, because the whole discussion on the Law of the Sea is ongoing, and, ultimately, we

could end up with an EEZ that extends to the edge of this -- What do you call it, the true shelf, because that's technically what the Law of the Sea was providing, is that ability to, off of a country, you could go to the edge of the shelf, and, in our region, in some areas, it could go to 300 miles, eventually, the new EEZ in the future, and so that will be interesting, to see how that evolves and where that is happening.

I know that the mapping has already been going on, and the negotiations between the Bahamas and the U.S. has been just continually going on, and my guess is it's almost horse-trading about what ultimately the boundary between our countries is going to be, because it really, technically, isn't real right now. People don't realize that, but that's still kind of an under-negotiations issue. Then, really, more north of it, into the entire area, that's -- The more we have mapped in advance of that, that's going to be really important to know, and, if that does come to be, to be ahead of the curve on what we need to do for those deep systems.

MS. CANTWELL: You brought up a good point. The Seabed 2030 is a very lofty goal, and it will be very hard to get done, and, obviously, our commitments is budgets depending and government shutdowns permitting and research fleet status depending, and, like I said, we've begun to get pretty creative in figuring out how we can sort of maximize our resources here, but the deepwater area is, honestly, the easier portion.

The shallow-water areas take a lot more effort, and they are going to take a lot longer to get done, particularly because Coast Survey has much higher standards for data quality than we need in the deep sea, and there are no hazards to navigation in the deep sea, or none that we know of, really, but, whereas in the coastal shelf, they have to be much higher-quality data, for charting requirements and such, and so Coast Survey, which is responsible for the shallower waters, 200 meters and shallower, really does have a very, very lofty goal there, and, even if we don't succeed by 2030, I think that the maps in the areas that have the bathymetry gaps right now are going to definitely change, and, if nothing else, we'll be close. Even if we don't quite get to 2030, if it's 2035, it's still a very admirable goal to be heading towards.

MS. DEATON: All right. I think we're good with that. That was some great discussion and great information.

MS. COLEMAN: I just wanted to respond to Wilson's point about sentinel sites. We don't really have anything to add right now, but we would love to hear more development of that idea from the AP or wherever, and we would love to have more discussion in the future.

MR. PUGLIESE: I made sure that that was discussed, and it's actually in the queue for continued discussion, and I think there's a real opportunity, because what we want to do is look at the sentinel sites in the deepwater areas, but I think this group can also provide some foundation, and I think what we really need to do is the broader picture too of creating something that gives us some points along the shelf, so that we can have the whole perspective in the long term, especially when we're talking about how we look at species moving and temperature changes and different things.

Hopefully, again, maybe that collaboration with our Ocean Observing Association can provide at least the beginning of maybe a template that provides a sentinel deep, mid-shelf, nearshore, and then collaborations that I think this group could provide a lot of guidance on, especially with our

connections with the state partners, et cetera, on how we build to that, and then it would be great to have it so it's a transition across the entire shelf and into the deep ocean.

MS. CANTWELL: In the areas that we've been looking over the last couple of years, we have definitely seen differences between the areas that are sort of in the Million Mounds area to the Central Plateau, and today we talked about the mounds like in the Million Mounds area, which is where we did spend a lot of time this year, or that dense lophelia and some of the madrepora, but then, when we got out to the Central Plateau, it's sort of changing.

What we didn't talk about here, and we talked about last year, were some of the sites that we dove on in 2018 along the Blake Escarpment and some of the areas that Deep Search has been diving on, both along the Blake Escarpment and then in the Richardson Hills area, and there's a lot of black corals too, and some of the other different corals, and a lot of bamboo corals as well, and really the black corals are -- There is a high diversity of black corals, and it's a very different community out there, which is really interesting to know that these corals and this community exists with just an ever so slight depth variation, and it's a pretty incredible place, and so there definitely are areas that -- As much as the lophelia really is captivating, and they're structure forming, and those are the more traditional reef structure that we think about, there also are a lot of corals here that are sort of more towards the diverse side of that than just the lophelia, which is great.

MS. DEATON: All right. Thank you so much. Do you want to take a break before we do our next --

MS. CANTWELL: I have one more thing. Sorry.

MS. DEATON: Go ahead, Kasey.

MS. CANTWELL: I just wanted to say thank you as well, and I know that Heather said it earlier, but the input that we've been receiving from the council is fabulous, and it has made our work here a lot more meaningful, and it allows us this direct connection to management, which helps us sell our message of exploration, but we're also hopefully that you guys take this information and translate it into some management activity, because that's what it's here for.

To have the opportunity to directly relay this kind of information to you guys hours after it's collected is pretty cool, but it also -- It really helps us sort of sell the importance of exploration, and, when a council is actively pursuing that, and when it's actively interested and participating in the expedition and requesting areas and providing input, from the initial expedition conception to like, okay, where do we need to go next, it really is what makes our process work. We are a community-driven program, and we are responsive to what our community needs are, and so having you guys participate and be so vocal about that is really what has made this whole process work, and so I wanted to say thank you, and, as Heather said, please participate in the next expedition.

It starts next week, and the first ROV dive will be next Friday, and they will be starting in Miami, and so, if any of you are in Miami and want to come visit the ship, or if you want to come down and visit the ship, we will be there Monday, Tuesday, Wednesday, and probably the ship is going

to get underway early morning on Thursday, and so probably not on Thursday, but, if you wanted to come visit, just let me know.

MS. DEATON: We are going to be take a break.

(Whereupon, a recess was taken.)

MS. DEATON: We are working on the next item, and it's going to be the fishery-independent research and Southeast Reef Fish Surveys, SERFS, the 2018 update on sampling activities, and I think we've got Walter Bubley on the phone.

DR. BUBLEY: Thanks for having me here to provide an opportunity to present this data to you all, and it's an update of the Southeast Reef Fish Survey, and I thought it was probably a good opportunity to present this information, being that some of this information ends up being a part of some of the modeling efforts that are going on as well, and I so would like to thank co-authors Tracey Smart and Marcel Reichert for this, as well as some of our colleagues at the Science Center Beaufort, Christina Schobernd for providing the data for us as well, and I will get started.

First is the Southeast Reef Fish Survey, and it's a collaborative effort between three groups, MARMAP and SEAMAP South Atlantic Reef Fish Surveys, which are housed at South Carolina DNR in Charleston, and SEFIS, which is housed at the Science Center in Beaufort. Collectively, we are using the four vessels shown here to collect data. The number of sea days for our survey in 2019 was given under each of these vessel photos, and this is just the -- We finished our 2019 data, or survey season, but the 2018 data is stuff that's already been analyzed and looked at, and so that's what I will be presenting today.

You can see these vessels, and we have SEFIS vessels, the R/V Savannah, that's owned by the Skidaway Institute of Oceanography at UGA, and the NOAA Ship Pisces, and then MARMAP and SEAMAP South Atlantic are using the South-Carolina-DNR-owned vessels, the R/V Palmetto, which is primarily our sampling platform for the chevron traps, and the Lady Lisa, which is used for the reef fish survey for longline gear.

On each piece of gear that we put in the water, at least the chevron traps, we have -- We are deploying these on low to medium-relief habitats on live bottom, and so we're going to areas where we're expecting fish to potentially be, that has the proper habitat, and we're deploying them in depths up to about 110 meters, and this has been consistent in a standardized manner since 1990.

The soak time is about ninety minutes underneath the water, and they're all baited with clupeids, and each one of these traps has at least two cameras associated with it, and sometimes three, and you can see, with the circles on the bottom-right here, the two red circles are cameras that are always on, and those are external cameras.

We will also occasionally put a camera on the inside, which is this white circle, and that allows us to look at some of the behavior inside the trap or with the fish entering the trap, and then we also -- Obviously, this picture was taken from somewhere, and so this is another camera that we can deploy that's on the ascending line that can look downwards and see how the trap is behaving as well as fish around the outside of the trap. These video cameras have been utilized for almost ten years now that these have been on every single trap that we're putting in the water.

This gives you an idea of what we're seeing down there. We can use the camera to look at a lot of things, such as abundance and types of species that are down there, but also behavior, such as these hogfish, which are showing some sort of courtship behavior, and the male is the one that's more white, in the darker colors, and it shows some courtship behavior with some females that are there, and so this gives us some idea of behavior for reproduction or predatory-type issues, and so we've got the ability to use this data for a lot of different resources.

We also have a secondary gear that's not deployed nearly as much as the chevron traps, but it's the short bottom longline gear, and you can see a schematic of it in the right, and we use this to target high-relief live bottom that tends to be greater than ninety meters in depth. The reason we do this is because the chevron traps would probably -- If it's really high relief, it would probably just topple over sideways, or not fish correctly, and so we're using this gear to drape over these high-relief bottoms. We also soak it for ninety minutes, and we bait it with whole squid, and some of the species that we'll catch are snowy grouper, speckled hind, some of the jacks, or tilefish species as well.

To give you an idea of the scope of our work, we're a regional survey, and we're sampling from St. Lucie Inlet down in Florida up to Cape Hatteras, North Carolina, and we're deploying gear on these stations that are in our universe. We have roughly 4,300 sampling stations for the chevron trap, and, of those, we randomly select about 1,500 of them per year. The short bottom longline, which is the yellow Xs, are a lot less, and the range isn't quite as extensive, and so we have got funding for the next three years to expand the range of that and provide more sampling effort, and so, typically, we only have about 300 sampling stations a year, and 250 of those are randomly selected, but you can see they're mostly in the areas off of South to North Carolina, and we hope to expand that into the southern region.

What we do with the fish that we catch is we take a length measurement and identity and weight for every fish that we catch, and then certain species we're taking additional information for life history, such as otoliths for looking at age composition, and gonads for reproductive aspects, such as maturity and sex ratio, things like that, and then we also use that catch information to develop indices of abundance that are used for assessments, whether it's the trap or the longline.

Our partner, SEFIS, will do all of the processing of the video information, and they will, in turn, produce indices of abundance as well for those, for assessment purposes. We house all of this data in one location, and so we combine the datasets, even though we've got three different groups collecting it, and it's all together, and the same QA/QC methods and everything go along with each other, and so it's consistent across the area.

For 2018, we had 117 days at-sea between the groups, and there were over 2,200 gear deployments, with almost 1,800 of those being chevron video traps, and we had seventy-seven short bottom longlines, and then we took CTD -- Every location where we're deploying gear, which is typically about six traps or longlines at one time, we're taking a CTD deployment as well, and so it's getting the whole water column, bottom temperature, salinity, and some of them will have dissolved oxygen and other measurements as well, and, over that time period, we collected 47,000 fish of over eighty-two species, and, from those fish, we took -- We further processed for life history, as I mentioned before, over 11,000 fish of forty-one species.

This gives an idea of what we were seeing when we were out there. The species that we're taking more life history information from are in the black, and the ones that are in the blue are -- We're still getting estimates of abundance, but we're not doing any more information outside of the initial measurements. You can see that tomtate was the leader of the pack, by far, with black sea bass next. Interestingly enough, red snapper now is our fifth or sixth-most abundant species, depending on what you're looking at, but that has been a huge jump over the last ten years or so, and you'll see this when I actually get into the official trends, but these are the top sixteen species that we have encountered over the years, or over this past year.

Just an idea of the overview of the CPUE that I'm going to be showing you, it's based off of the chevron trap catches from 1990 through 2018, which is the time period that's been standardized. From the short bottom longline sets, we're looking at from 1996 to 2018, a similar means, and that's when the standardization process has occurred. We then take those catch data and run it through another standardization process called the zero-inflated negative binomial model to reduce some of the uncertainty that might be associated with things such as water temperature or areas that may differ from year to year, and we don't want our sampling artifacts to try to relay some information that might not be appropriate for the population.

We then summarize all of these data in an annual trends report that we produce, and this is the first time, I believe, we've presented it to this AP group, but this is something that we can do in the future as well. Just a couple of caveats with this. It's a summary overview, and so it's not an update of stock status or anything like that. The model inputs for the CPUE indices may be different from those used in stock assessments, and that's because of a couple of reasons.

Either the stock hasn't been assessed, which is the case with some of these species, but also for ease of use for us. We're looking at twenty-six species, I believe, that we're creating indices of abundance for, and so it's a lot easier to find some method that works pretty well for all of them, as opposed to having to individually tweak each single one of them, and so, for ease of use for us and for getting it out in a timely manner, we're utilizing just the one method across all of the species to look at it.

Let me just orient you to some of the figures that we're going to be seeing, and here's a standardized abundance index graph, and it's normalized to the long-term average, and so that dotted line at one just means that that's the mean over that time series from 1990 to 2018, and so, if there's a value of two, that means that it's twice the long-term average, or, if there's a value of 0.5, that means it's half the long-term average.

The black line is that zero-inflated negative binomial standardized index value for the year, and the gray areas are 95 percent confidence intervals, and the red dots are those nominal values that we received just from looking at the catch data and not doing any standardization. Sometimes you can see that it's pretty close to where the standardization is. Other times, you can see it's a little further, and so there was something that was driving that.

A second aspect of these that I will be showing you are some of these maps, and they are nominal CPUE, the catches, by area, with the warmer colors being higher nominal CPUEs, and so, essentially, it's in quarters, and so red is the highest, and green is the lowest, where we saw some catch, and then blue is where it's been absent, and so what we'll show you are a period earlier on

in the survey, from 1997 to 2011, of where the species distribution was, and then we'll show you a more recent five-year glimpse, snapshot, from 2014 to 2018.

Keep in mind that, in the earlier years, it's going to be a little more blocky, because we didn't have as many samples as we have now that we have collaborators, and so there is some more interpolation between these sampling points that we're doing to fill out these holes, and so you'll see higher resolution in the more recent data, as you can see on the right.

Now I can get into some of the trends that we saw for the last year. To start off with gray triggerfish, you can see that it's been around the long-term average the last few years, and it kind of goes up and down, but the distribution in the early time period is similar to what it was in the later time period, but just a little higher resolution, and, if you have any questions about any of these, just let me know. I am more than happy to go back, and just interrupt me, so we don't go way past it, and we can try to get into it.

Tomtate, we can see that we had a pretty big decline in about 2003 to 2005 of this species, but we've seen a steady increase of tomtate since then, and it's been above the long-term average for a couple of years now. You can see the distribution patterns, and it's pretty ubiquitous around, in relatively shallow water, from where our survey is sampling.

White grunt, once again, we see kind of a drop about 2006 or so and then a general increase over the last few years, and it's, once again, been above the long-term mean. White grunt are a species that we have that has a disjunct population, and so there's a lot of white grunt in southern Florida and the Caribbean, but we're not seeing it in that area outside of -- In the area around Georgia and north Florida, and so that gives you some idea of what's happening with the catches here, and you can see the most recent years.

Here is red snapper, and I mentioned this before, and this is probably one of the more dramatic ones that we're going to be seeing on this presentation. They tended to have pretty low catches for years and years, in the beginning of our survey, and, about 2010, the amount of red snapper that we're catching has drastically increased over this time period, to over four-times the long-term average this past year, and you can see that the average CPUE from 1997 to 2001 was 0.06 fish per trap, and now that number us is up to 0.8 fish per trap, and so it's almost one fish per trap now, which is a pretty dramatic jump from what we were having in the early years of the survey.

Vermilion snapper, we had some recent years where it's right around the long-term average, but we had a drop in some previous years. You can see the distribution is slightly more offshore than those tomtate, but it's pretty ubiquitous, still. Black sea bass is a pretty dramatic change in the opposite direction from red snapper. From about 2012 on, we've had a pretty sharp decline in the number of black sea bass that we've seen. They're a relatively shallow-water species, and you can see the distribution pattern hasn't really changed, but it's going to be the numbers of animals that we're seeing in the survey for previous years.

Bank sea bass is another species that's shown a decline, right around the same timeframe of black sea bass. They will have a kind of similar habitat as black sea bass, and we can see, from about a peak in 2011, there's been a pretty consistent decline, with this past year being one of the lowest ones we've had on record.

Gag grouper is one of the larger species that we'll catch in the trap. You can see that there is -- Very early on, we have larger numbers of them, but it's been pretty consistent, I guess. There's some bouncing around, but it's been below the long-term average for the last five or six years. Once again, the distribution is just we have higher resolution for the more recent years, and so that's why the map looks a little bit different from the earlier years.

Red grouper, that's, once again, another species that we've seen a big decline. There's an uptick of them in the middle period of our survey, from about the mid-1990s to about 2007 or so, 2008, before we saw a decline below the long-term average, and now that number has been pretty low for the last five or six years, to where we're only catching a handful of fish every year.

This is another species that has a disjunct population in our survey area, where most of the catch is appearing either off of North Carolina or off of Florida, and we don't see a lot of catch in between. There are some spots, but not a ton. One thing to note too with some of this is, while the blue indicates that there's an absence of fish there, or absence of our catch there, that doesn't necessarily mean that there's an absence of fish there, but it just means that we weren't catching them there, and so the video survey versus the chevron trap survey may show some differences with some of these species that may not be as prone to go inside of the trap.

Scamp grouper is another one where we've seen a decline since the early 2000s, and it has stayed relatively low over that time period. This is a short bottom longline for snowy grouper, which is a deeper-water species, and you can see that it's relatively consistent. There's a lot of error around there, but it's around the long-term mean for pretty much the length of the survey, from 1996 through 2018.

One thing that I wanted to mention with this too, and I just talked about it before, but I mentioned that the short bottom longline doesn't have -- We don't have a lot of stations south of South Carolina, and so that doesn't necessarily mean there are not snowy groupers down there, but it's just that we don't have samples to sample down there, which is why this distribution looks the way that it does.

Here is knobbed porgy, and this is one of the species that has shown the most gradual decline, I guess, over the survey period, and so the first couple of years were its highest, and, nearly every year since then, it has just slowly declined to the level that it's at now. This is another species that we tend to catch more in the northerly part of the range, and I believe it has a disjunct population as well, and so it shows up in the Caribbean or south Florida, but not in the area in between.

Red porgy is another species that we have that has shown a decline the last few years, and I know it seems like every one that I have been talking about recently, outside of red snapper, has been showing a declining trend, but this is the distribution pattern from the earlier time period through the later time period, and this is a slightly deeper-water species that we're catching more towards the shelf edge.

Then, for blueline tilefish, short bottom longline catches have -- They are above the long-term mean recently, and they have been for the last few years, but, for the most part, they have hovered relatively close to it. This is showing a similar distribution pattern over the time period.

Then, for this most recent sampling season, we have finished it. We had planned to have eleven to fourteen cruises and about a hundred days, and we did a pretty good job of that. We completed thirteen cruises and had 101 days at-sea, and that information that was provided this year is going to be utilized for the trends report next year.

I would like to acknowledge all of the MARMAP and SEAMAP and SEFIS staff and students and research vessel crews and volunteers, and we've got a lot of people that have gone onboard these vessels with us and helped us out, whether that's out at-sea or back here, and this program has been going on for quite a while, and so there's a lot of people actually that have come and produced the information that's utilized for these resources. I am more than happy to answer any of the questions that you have while I show a quick video of us deploying some of the chevron traps.

MS. DEATON: Does anybody have any questions? I have one question. I was just looking at that last slide that you had, Walter, and did you say you planned eleven to fourteen cruises, but only did three?

DR. BUBLEY: Thirteen.

MS. DEATON: You did thirteen. Okay, and so that's a typo on your slide. I was just wondering what happened.

MR. PUGLIESE: Thank you, Walter. I think it's pretty critical to keep seeing the advancements and the collections that are going on, and this is, of course, the foundations for the stock assessments, but also the deliberation we had recently on the advancement on the Ecopath model, et cetera. Understanding species inputs into that are going to be critical too, and I think all the diet information that is being collected through these different programs that have been used to-date, plus the opportunity to guide other species that may not have the information that we need to fill in is going to be critical, and it also serves as the foundation for expansion of our understanding of the distribution of hard live-bottom systems in the region, and so the continued work just refines how we're going to advance our broader management actions that we need to take with this data, and so thank you. Any other questions?

MS. DEATON: All right, and I think doing those annual updates is just really helpful for us to see.

MR. PUGLIESE: Yes, and getting the heat maps and the distribution shifts and all those are really going to be also critical in our discussions and advancements on how we look at species movement within here and discussions across boundaries with the Mid-Atlantic, et cetera, and so I think that's going to help, but, also, it really fits directly into, again, some of the inputs say for advancing Ecospace into the future.

DR. BUBLEY: Right, and, if there's anything in the future -- If we present this again to this advisory panel, if there's something that you would be interested in that we might be able to provide, just let us know, and we'll see what we can do for that.

DR. CHERUBIN: I just want to add that this data can be used actually to like validate the Ecospace model, by showing if the model is able to reproduce those shifts that we have seen over the years, based on the fisheries effort and habitat changes.

DR. BUBLEY: Right, and I know some of this data went into the Ecopath model that's being put together now.

MS. DEATON: All right. Thank you very much. We're going to move on to the next agenda item then, which is also a remote presentation, and so Julia Byrd -- We're going to contact her, and she's going to talk about the South Atlantic Council's Citizen Science Program research prioritization, and so, if you are looking at your materials, that's Attachments 16 through 19.

MR. PUGLIESE: Just quickly, you have been provided information that set the stage for the discussion today. What's going on is -- Julia will get into the details, but I wanted to provide you the council's research priorities and then also, to date, what has been identified as citizen science priorities, and this is an opportunity for the Habitat and Ecosystem Advisory Panel to weigh-in on what some of those priorities under that program may be or some expanded discussion on those.

What also needs to happen is that there is a review group that will be -- An advisory panel review group that has actually already met, and met in advance of this, and a document based on all the advisors' input is going to be created for the December council meeting, and what we need to do is select two individuals on that review of that document, as it gets advanced here, and so input through here and then identification of members to participate is I think the charge today, and so, with that, I'm going to pass it over to Julia.

MS. BYRD: Good morning, everyone. I know I am between you all and lunch, and so I have a few slides to go over as a presentation to give you guys some background on the citizen science research prioritization process, and some of this information I presented to you guys in the spring as well, but I wanted to quickly go over it again, to make sure that everyone was on the same page.

Then what we're really hoping to do, as Roger kind of already mentioned, is to get you guys' feedback on the citizen science research priorities and for you to recommend kind of updates, as appropriate, and then, again, to identify one or two Habitat AP members to serve on the Citizen Science Projects Advisory Committee, and that group will be responsible for kind of reviewing the updated citizen science research priorities document before it goes to the council for their review in December.

Again, some of this information is a repeat from your spring meeting, from the information that I shared with you guys there, and so I will kind of breeze through it quickly. If anyone has any questions, please feel free to kind of stop me along the way.

On the screen now, you can see kind of a summarized view of the citizen science research priorities, and they were also provided to you guys as Attachment 18, and so the plan is for these citizen science research priorities to be updated every two years, in conjunction with the council updating their overall research and monitoring plan. Updating these research priorities is important, because it really drives the projects that the Citizen Science Program will go after, and so providing input on these priorities helps kind of steer the direction of the program.

I quickly wanted to mention kind of the process that is going to be used to update these citizen science research priorities, and so the first step in that process is for folks to review and provide input on the council's overall research and monitoring plan, and input from that is kind of informed

by the SSC, by issues that come up at APs, or at SEDAR stock assessments, and so the council actually reviewed and adopted their research and monitoring plan at their June meeting this year, and so the next step, which is where we are right now, is to then develop an updated citizen science research priorities document.

There are two groups that are responsible for providing feedback on this, and one is the Citizen Science Projects Advisory Team, and this is a group that's made up of representatives from the council's APs. When I came to chat with you guys about the Citizen Science Program in the spring, you guys were more comfortable having kind of a discussion with the full AP to provide feedback, but, then again, we're hoping that we can get kind of two volunteers from this group to serve on this advisory team to help review the final document that will go to the council.

The second group that will be providing input on the citizen science research priorities is the Citizen Science Operations Committee, and that's a group that is responsible for oversight of the policies and procedures for the program, and so what will happen is the input from all of these groups will be incorporated into a revised or updated document that will then go to the council for their review and consideration in December.

There is one step in this process that has yet to be developed, and we're hoping to do this before the research priorities need to be updated again in two years, and what this is, is we're hoping to develop kind of an online citizen science project portal, where members of the public can submit potential project ideas, and then that information can be shared with the Citizen Science Projects Advisory Team and Operations Committee that they can consider when they are providing feedback on the research priorities.

I wanted to give you a little bit more information about the Projects Advisory Team. This group is made up of one to two representatives from many of the council APs, and one of their primary goals is to try to kind of identify citizen science research and data needs across all of the council management plans and then also to help with developing volunteer engagement strategies. They meet via webinar one or two times per year, and so it's not a huge time commitment, and this is a new group that was formed this year, and it met for the first time in October.

The last thing I quickly wanted to run through before we actually start talking about the research priorities, and hopefully we'll start getting feedback from you guys, is I wanted to talk about the timeline for developing this updated citizen science research priorities document, and so we got feedback from the Citizen Science Projects Advisory Team on October 3, and the Citizen Science Operations Team will be meeting this Friday, and so they will be providing feedback then.

You guys are meeting this week, and will be providing feedback this week, and so what I'm planning to do is to take feedback from these groups and incorporate them into an updated document by October 30, and then that will be sent to the Citizen Science Projects Advisory Team and Operations Team for their review.

Folks will have about a week to provide feedback, and feedback needs to come to me by November 6, and then I will incorporate those edits, and then I hope to have a draft updated citizen science research priorities document finalized for the December council meeting review by November 8, and so that's the general timeline.

Before I actually kind of start getting into the research priorities, I wanted to pause for a minute, to see if anybody has any questions about the process that's being used, what we're hoping to accomplish during the meeting today, or kind of the timeline that we're hoping to get this information together.

MS. DEATON: I think we're good.

MS. BYRD: Okay. Great. Thank you. What I did for the next slides is the plan is to try to get feedback from you guys on our current citizen science research priorities. They are organized kind of topically, and so we're hoping to get feedback from you guys on these, and then, once we kind of walk through -- There are eleven of these.

Once we walk through these, we want to get feedback from you guys of any kind of additional topics that should be included to this list, that sort of thing, and so I'm planning to walk through this, like I did on the Projects Advisory webinar that was held earlier this October, and so things that would be helpful to get input on are do you feel like this topic should remain on the citizen science research priority list.

For the fishermen on the panel, or others who may participate in citizen science projects, do you think this type of kind of data collection for a particular topic is feasible to do while you're out fishing? Are there any kind of additions or deletions to the species list, that sort of thing, and that's the information that we're interested in getting from you guys.

I think Roger provided these slides to you. One thing that I have added to them since I think he sent them out is here in red, and I have provided just a brief summary of what the Citizen Science Projects Advisory Committee thoughts were, or their feedback was, on a particular topic, and I can kind of highlight some of the additional information that they provided as well, if that would be helpful, and I have a webinar summary from their webinar that I can share as well, if that would be of assistance to the group. Now I am planning to kind of walk through the slides and hopefully have a discussion, or a conversation, with you guys about these different priorities.

The first priority is with age sampling, and it's targeting kind of recreational fisheries. We need otoliths, and the target species are listed, and the anticipated outcome is to try to characterize the age of the catches. On each of these slides, I also included like an example of what our project could look like, and this is just one example of a project, and I did this to try to give folks a better idea of what kind of participating in a project could potentially entail. A lot of these topics are very broad, and so this isn't meant to say that this is the only type of project that could be done, but it's just meant to serve as an example to help discussion.

The example project for kind of age sampling is that fishermen would be trained to remove otoliths, and the otoliths would be removed, placed in an envelope, and additional data would be collected, and then the otoliths and the data would need to be sent to the partner ageing group for analysis, and so the Projects Advisory Committee supported keeping this as a research priority, and some additional feedback they gave was that it would be kind of difficult for the commercial fishery, and so they thought it was appropriate to target kind of the recreational fisheries here and that it may be helpful to have kind of a two-pronged approach, if a project were to be kind of followed for this.

Some of the for-hire captains noted that captains and mates could potentially collect otoliths while they are cleaning fish for folks and that it could be helpful for the private recreational sector to get kind of a citizen science volunteer kind of port sampling team together, and that would need to be kind of a smaller, targeted group of folks that could go to fish cleaning stations at different locations, things like that, to try to collect otoliths. I guess I will pause here for a second, to try to get feedback from you guys on whether or not you think this would be -- If you support this keeping this as a research priority or if you have any additional feedback on this particular priority.

DR. LANEY: I definitely think it ought to stay on the list, and I have already been trying to do it myself, with what little recreational fishing I manage to engage in, but Steve knows that I've been pulling otoliths from speckled trout, and he also knows that some training would be appropriate, in my case, because the heads were not too terribly intact when I got through butchering them.

I thought -- I even sought advice from some of the NC DMF staff, and I thought I had cut in the right place, but I wound up having to basically section the head, inch-by-inch, before I actually got the otoliths out of there, and so definitely training would be highly beneficial, and I am thinking that you also would be collecting the date, the species, obviously, the size, and so length, and it would be useful for the fishermen to know whether we need fork length or total length or both, and I suppose, in some cases, if they could collect weights as well, that would be nice, to have that additional piece of information, and so I definitely support keeping it on here, and I would look to Jeff, maybe, and other fishermen on the council here, to weigh-in on whether they think it's a good idea or not.

MR. SOSS: I'm a recreational fisherman, and I do recreational charters. I also did the MREP class in this same room, years ago, where we talked about otoliths and pulling out otoliths, and I would like -- There is a pretty steep learning curve, when it comes to pulling out otoliths in a condition that can be analyzed, and I have tried to do it many times, and I've taken some good ones out, and I have really butchered a few.

Something I would think, rather than mailing them in, or maybe in addition to, is Georgia DNR, and I think South Carolina DNR, they collect carcasses at various marinas and locations, and maybe you could piggyback their freezer locations, or even bring in some new freezers to marinas and places that maybe don't have them, and, instead of using the whole carcass, because that's usually what they are wanting, maybe just have the heads or something like that, so that it can be extracted by someone who maybe has a little bit more expertise and the tools, and so there you go.

MS. DEATON: Jeff, thank you. I was also going to mention that North Carolina also has that same carcass collection program and freezers located throughout the coast, and so that's a good idea.

MS. BYRD: Great. Thanks, guys. That's great feedback.

MR. HOOKER: Mine is more curious about -- I know that otolith processing is backlogged in a lot of places and that there's a cost to it. Has this been thought through on the backend all the way? Again, I support everything that has everyone else has said thus far, but has it been thought through all the way, to know if it would even be funded or if there's a capacity to take in that higher level of otoliths? I don't know.

MS. DEATON: I think that maybe Julia could answer that question, but I would say, the more the citizen does, the less work it is for the state agencies, and so, if they can be trained to do the otoliths, that would be great, but then maybe an alternative, but, Julia, do you have an answer to that?

MS. BYRD: Well, I think that's a great point, and what I will start off with is -- Because these are kind of research needs or research priorities, and so we don't have funding for specific projects for kind of most of these. If we do, I will mention it as we kind of walk through the topics, and I think you would definitely -- If you're going to do something like this, you would definitely need to think about kind of the processing stage, and who is actually going to get -- What ageing lab is going to get the otoliths and process them and then read them, because the goal would be for the otoliths to be collected and used and not just collected and kind of stored, and so there are a lot of labs that are kind of at their limits, as far as ageing species, but, if a project like this were developed, that could be considered, and perhaps some money could be included in a proposal to make that available.

I think it could be challenging to get citizen scientists reading kind of the otoliths, and perhaps they could help, maybe, with sectioning and things like that, but I know that reading otoliths is an art, and so I think that could be challenging, to get someone trained to do that, and that's not to say that it's not possible, and so does that sort of answer the question?

MR. HOOKER: Yes, it does, and I didn't mean to imply that I was expecting citizen scientists to read otoliths, but I was just thinking through -- I don't know how much this could be used, but just trying to think through, if this were adopted, would there be the capacity to process these, and that's all I was trying to get at.

MS. BYRD: I think that's a very fair point.

MR. POLAND: To your question, Brian, I've got a fair amount of experience in otolith processing and ageing studies, because I started out at the state in our age and growth lab, but, as far as processing of these otoliths, I look at these target species, and I think a lot of these are otoliths that will have to be embedded in thin sections, and the processing time and costs are a little bit higher, compared to something simple like a lot of our cyaneids and stuff, that you can just section -- You can sometimes read them whole or just section on a saw and look at it on a mount, but, as far as the utility of this, or the cataloging of these, and, Julia, I will have some more comments at the council on this project, because I think it's a great idea, but I see a lot of benefit to this project, because one of the data limitations we have in a lot of assessments is characterizing the recreational fishery, not only length comps, but age comps, because we do a really good job of collecting ageing structures from commercial fisheries and from fishery-independent sources, but we have a hard time getting those structures from recreational fisheries.

There is also some issues with perceived biases in collecting donated otoliths from the recreational fishery, and so, Julia, I guess it's kind of a precursor to my comments at the council, and that would be one thing that I would like to see addressed in this also, is addressing some of those biases, some of those prestige biases, as far as recreational anglers, and they may only donate carcasses that are considered exceptional, and so they're biasing the length and age comps a little higher, and that's something that I hear at a lot of SEDARs, when the discussion of recreational ages come up, but, back to Brian's comment about processing costs and this kind of stuff, storage costs and storage space of otoliths is pretty minimal.

We don't have to process every single otolith from every single year, and so certainly, if we could get good, comprehensive samples of otoliths, to the point that we could sub-sample, that can defray some of those costs for that, and certainly we have more than enough age samples from other data sources, and so we can certainly supplement processing with more of these recreational samples and maybe not do so many fishery-independent samples, or fishery-dependent samples from commercial fisheries, where we typically have more structures on-hand.

MS. BYRD: Thanks, Steve. I think those are lots of really good points, and I appreciate the feedback, and I think a lot of what you said about kind of biases that need to be thought about when collecting volunteer data is really important, and I know a lot of those discussions happen at SEDARs, when you're talking about things like the information collected from carcass programs, and so I think it's something that really needs to be thought about and maybe kind of think about it as you're putting together kind of a sampling design, and so do you want use freezers or carcass collections, or do you want to have scheduled days and times where this information -- You try to get a kind of group of volunteers to go out and collect this information from certain locations, and I think those are good points, and they will need to be thought if we're able to get funding, or, if we apply for funding like this, when we're writing out a proposal, because I think those are concerns that a lot of people would have.

MR. SOSS: Just one more point. As someone who has participated in some citizen science projects, like external anchor tags for redfish and tripletail and things like that, I really like to see the data when they're recaptured, and so it may be nice, and a good incentive, for the citizens who participate in this to include some information, or send it back to them, and I know that could be a logistical nightmare, but, if I were to send a huge spotted seatrout otolith in, I would really like to know the age, and maybe some of the other information, and so that could be a nice incentive to get some participants.

MS. BYRD: That's a great point, and that is something that we've certainly heard from other people as we've been talking about the program, is one of the things that folks who volunteer for citizen science programs really want to know is information about if the fish -- If you're collecting a fish, the age of the fish, kind of how that data was actually used, or if it was used, and so you need to have that kind of feedback loop, that full feedback loop, so that people who are providing data get information on kind of how their data are used or details of their fish, in this kind of example, and so I think that's a great point.

DR. LANEY: I certainly agree with Jeff on that point, and those two spotted seatrout that I talked about butchering the heads, but getting the otoliths out intact, both had tissue deposited in the North Carolina State Museum of Natural Sciences also, because they're trying to build their genetic tissue collection up, and I will certainly report the ages back to the museum as well, as soon as I get them from NC DMF, and I provided all the collection data to Randy Gregory at DMF, and I haven't been in touch with Randy since, but hopefully I will get those ages back.

The other point that I wanted to make was, the otoliths that Steve pointed out, the storage costs are very low, and they don't take up much space, and the value is, in addition to providing the estimated age of the fish, the value goes far beyond that, because those otoliths are a little time capsule, and there's so much work going on these days with laser oblation across an otolith to determine the chemical signature and determine, in some cases, the stock ID and the location of

where the fish was when it was in its nursery area in the otolith's origin, and so a tremendous amount of information that can be mined from those things, and that can only happen if we archive them and put them in storage somewhere, so they are accessible for future generations. You never know what additional new research methodology is going to come along that will allow you to derive additional information from them, well beyond just the age of the animal.

MR. WEBB: I may be stating the obvious, but I don't think it can be overemphasized that, due to some of the pragmatic limitations of some of the tasks that are going to be embarked upon here, that the core of the citizen science, their commitment to the program, fully understanding what's going to be involved, so that the data that's collected is not looked at with less credibility, as some of the citizen science projects in the past.

This is a pretty significant task, especially when you're talking about the maturity data with gonads and the otoliths, and some of it is not quite that difficult, but the key to making this thing work is to have a core of credible volunteers that are committed for a certain period of time, because, if you asked a recreational angler just to do this incidental to a trip, then you're going to get those significant biases and everything else, and so it's got to be more than just a voluntary data collection thing.

There have to be targets, like the first cobia you catch is the one, because there is bag limits too for recreational anglers, and so you can't just keep throwing them back and get the real big one. There has to be a program of protocols that goes along with this that's got to be complied with, I think, more stringently than might happen just by happenstance.

MS. DEATON: Quality over quantity, right?

DR. BAUMSTARK: A brief suggestion, and this would apply to any citizen science effort, and it has worked well for us here in Florida, is that positive feedback loop and getting folks to have access to the data, depending on how you collect the data. It would be unreasonable to try to send individuals results, but what works well for us is having a data service, some sort of a website, a web tool, where folks can go in and query and find their data and then also see the big picture of everything else that's collected, and so that's something to consider as these kind of tools are designed.

MS. BYRD: That's great feedback, and so this is great discussion, and I'm not trying to kind of stop it, but we do have eleven to go through, and I know it's noon, and so do you all want me to keep going, or do you want me to come back after lunch?

MR. PUGLIESE: Let's go ahead and go. The way we're structured today, we've got breakout sessions and training this afternoon, and so I think it's better to stay on task, and I would hope that the members, since you're thinking about it right now, that we just stay on mode and walk through these, because you're getting, I think, really good, significant input right now, and so, while everybody is thinking about the topic, let's just keep moving.

MS. BYRD: That sounds good, but I just know what it's like to be hungry, and so I'm going to go ahead and move on to the next priority, and this is maturity data, and target volunteers are recreational and commercial and tournaments, and data needed is gonad collection, and they could be actual biological samples, or potentially pictures, and target species are there, and the

anticipated outcome is you would have improved reproductive information, and so just an example project is that fishermen would be trained to remove and store gonads for analysis.

Then the gonad would be sampled and stored, and additional data would be collected, and I know that gonads can only be put on ice for a short period of time. Otherwise, there is more complicated storage that is likely needed, and then that gonad sample and the relevant data that went along with it would need to be sent to a kind of partner reproductive lab for analysis.

The Citizen Science Project Advisory Team, again, supported keeping this as a research recommendation, and they supported potentially adding spiny lobster as one of the target species, particularly the fishery up in North Carolina. There is very limited information available, and so some folks on the Spiny Lobster AP noted that that could be helpful, and then, in general, the commercial fishermen who participated in the call thought that collecting kind of gonad samples during their regular activities would be kind of easy to do, but the storage on ice for multiple days would be something that they would -- That's how they would need to store them, and so that would have to be discussed, and, if gonads couldn't be on ice for a long period of time, perhaps photos is something they could do.

For-hire folks said this may be feasible to do if there's like a specific day that's scheduled for this to be done, and, again, they could kind of do this as they are kind of cleaning fish, and then, again, for the kind of private rec, folks noted that potentially you could have kind of state-by-state volunteer teams, and then I couldn't tell who was saying this, but someone mentioned having kind of a dedicated group of volunteers that are committed to doing this, that could collect kind of these biological samples, whether they could be gonads or otoliths, and they would be trained by a state agency or federal agency or port samplers, those sorts of folks, and so that's kind of, in general, the feedback that the Projects Advisory Team gave, and so asking the same sorts of questions. Do you guys kind of support keeping this as a research priority and any other feedback you may have?

MS. DEATON: Wilson supports it. I don't think anybody is speaking up that they think it's a bad idea.

DR. LANEY: Again, Julia, training would be even more critical here, probably, than it would be for the otolith collection.

MS. BYRD: That is something that the Project Advisory Team noted as well.

MS. DEATON: Can't you put those gonads in like formaldehyde or some kind of preservative?

DR. LANEY: Steve Ross may know more than me, but don't they use like Lugol's solution or something like that for gonad storage?

DR. ROSS: There are a number of different things, but it kind of depends on your question and what you are going to do with them. I've used formalin, because it's easy and cheap and quick, but, if I'm only looking at something like gonad weights and fecundity, that's fine. If you're going to do histology, it would be a little more complex.

MS. BYRD: The point of some of the kind of fishermen who provided feedback is, if they're going to do this within their normal fishing activities, the storage needs to be an easy thing, and having lots of bottles of formaldehyde on boats and things like that may be challenging.

All right. I'm going to keep moving through, unless -- It's hard, because I can't see anyone, and so stop me if folks have any kind of additional information to provide here. I am guessing that a lot of the feedback that you provided on ages may also kind of be relevant here for maturity.

Next is kind of discard information, and so target volunteers would be recreational and commercial fishermen, and data needed is length of fish, the depth caught or released, number of fish, the reason for the discard, the use of barotrauma reduction devices, and you can see the target species there, and then the anticipated outcome would be kind of improved discard removal estimates and the ability to characterize the size composition of discards.

The Citizen Science Projects Advisory Committee supported keeping this as a research priority, and the spiny lobster guys from North Carolina recommended potentially adding spiny lobster as a target species. They said that little was known about discards in that fishery, although I guess that I need to follow-up with them on that, because I thought it was mainly kind of a diving fishery, but, anyhow, an example project for this is actually the first pilot project that we have underway now through the program, and we have fishermen collecting information on released fish using a mobile app on their phones, and the data that they're collecting are -- That's what is shown on the screen, and then data can be kind of uploaded for analysis, and this discard information is a very broad topic, and so this is just one kind of example project, and it happens to be kind of the pilot project that we're testing with scamp grouper now. Again, the same sorts of questions. Do you guys kind of support this recommendation, this priority, and do you have any kind of additional feedback for things that should be considered?

MS. COOKSEY: I would just raise one point of consideration, to ensure that none of your requested information is going to increase the likelihood of mortality of your released specimens from handling.

MS. BYRD: Good point. Are people supportive of this priority?

MS. DEATON: I mean, that was a really good point that Cindy made, and it seems like, to get that information, you're not just like quickly releasing the fish, but maybe if the fish was already dead, and you're going to throw it over because it's dead, and I don't know. Does anybody else have a comment? Does anybody want to support it or not support it?

MS. BYRD: I guess what I can say, with our current project, is the information they are collecting -- At least is kind of some of the feedback that we got from some of the fishermen, and so we're collecting things like date, type of trip, and so commercial or recreational, the length of the fish, the depth the fish was caught, general location, and then whether you used barotrauma reduction devices.

Then you can also take a photo of the fish, and the photo is not required, and so they have generally said that sort of information is information they could kind of easily collect and generally write down anyway after they release the fish, because they keep in their kind of logs, and so I just provide that to you guys for consideration, and I think some of the data that at least we're collecting

through our project isn't really increasing handling time that much, but I think that's a very fair point.

MS. DEATON: I don't think there's any more comments on that one then.

MS. BYRD: So support as long as you consider this?

MS. DEATON: Yes.

MS. BYRD: Okay. The next one is genetic sampling, and it's, again, the target volunteers are recreational and commercial, bait and tackle shops, and tournaments, and the data needed is fin clips, and you can see the target species and the anticipated outcome. It can help with kind of stock ID decisions or information that could feed into a stock assessment, and the Citizen Science Projects Advisory Committee supported keeping this as a research recommendation, and they basically said that the coordination and submission of samples needs to be easy and streamlined and that this may be easier with, again, a smaller, targeted, committed group of volunteers.

Then the example project is that kind of fishermen could be trained to collect fin clips, and the fin clips could be taken and placed in a vial and additional data collected, and then those fin clips and data would be sent to a partner genetics lab for analysis, and so do you guys have any kind of thoughts on this one? Do you support the idea? Do you think it's feasible for kind of fishermen to collect this sort of information? Do you think the target species --

DR. LANEY: Julia, yes, I definitely support it. Once again, training is essential here, so that you avoid cross-contamination between samples, especially if you are taking multiple samples from the same species on the same trip. You need to make sure that whatever you're using to remove the sample is cleaned well, and not necessarily sterilized, but just certainly cleaned in between samples, to make sure that you don't cross-contaminate, if you're using the tissue samples to do genetic analysis with.

AP MEMBER: I might not be aware, but how much genetic collection is being used currently, and would a citizen science effort produce enough to support answering a research question or a management question?

MS. BYRD: I will provide a little bit of information, and I'm sure that others there may know more than me, and so I used to be one of the SEDAR coordinators, and, for the cobia assessment that is going on now, I know that a lot of the genetic samples were collected through fishery-dependent means, and so I am more familiar with South Carolina, just because I used to work for South Carolina DNR, but I know that they provided kind of a lot of sampling done at tournaments, or provided kind of kits to folks, to charter captains or things like that who collected samples, and I know that genetic data was very helpful in trying to answer the cobia stock ID question for the recent assessment, but others may have kind of more information or additional or other thoughts on that.

MR. POLAND: I was going to bring up the cobia example, because that's one of those where there is still some questions out there about stock structuring and sub-structuring and that kind of stuff with cobia, and I know South Carolina and North Carolina and Virginia all have programs where they reach out to fishermen to collect genetic samples for cobia, and, real quick, since I've

got the mic again, because public service is so important to the North Carolina Division of Marine Fisheries, Wilson, I reached out to Randy, and both of your trout were age-one.

DR. LANEY: Really? Age-one, both of them? Holy cow. One of them was like four-and-a-half pounds, and so that's a rapid growth rate, if those are age-one fish. Wow.

MS. BYRD: Any other thoughts on genetic sampling before I move ahead?

MS. DEATON: Nope. We're good.

MS. BYRD: All right. Next is monitoring in managed areas, and so target volunteers would be recreational and commercial fishermen, and the data needed is the species, length, and depth. You can see the target species, and the Citizen Science Projects Advisory Team supported keeping this as a research priority, but some of their feedback suggested that it could be better suited for cooperative research than citizen science.

They noted that the fishermen were really interested in knowing what is happening in these managed areas, and so there would likely be a lot of kind of interested fishermen who may be willing to help collect data. Some of the commercial folks noted that they had done research with folks in the past, but they generally needed to have kind of compensation of some sort, to make participating in those projects more feasible. Some folks noted that it is helpful to have kind of direct involvement from scientists when kind of data is being collected in some projects that have been done in the past.

Then the example project there -- Again, this is a very broad topic, and so this was just one kind of simple example, is that a fisherman would sample kind of fish kind of inside and outside of a managed area. If you're fishing in a managed area, that may require kind of an exempted fishing permit, and sampling would likely to be more structured, if you're trying to look at changes in abundance over time or things like that, and then you can see kind of what data could potentially be collected, and then it would be sent to kind of partner scientists, perhaps, for analysis.

It would be helpful to get some feedback from you guys on this, whether you think citizen science is an appropriate approach to help with monitoring of managed areas and would support keeping this as a research priority or if you think it's better suited for cooperative research, or, kind of fishermen on the panel, if you think it's feasible for you to kind of -- Would you be willing to kind of participate in a project like this, if you were compensated or if you weren't compensated, and just to get some feedback on that would be helpful.

MS. COOKSEY: Just a couple of comments. One is a concern about the skill level of the volunteers, to ensure no damage from bottom gear when in potentially very sensitive areas, and also the phenomenon of fishermen flocking to fishermen when you see someone fishing and catching somewhere, and just the concern of this being an attractant for closed areas for others to come in and fish.

MR. WEBB: I would speak against this. The pragmatic complications and possible conflicts and on and on and on, and that might be one thing that's too ambitious, even for a well-trained citizen science core.

MS. DEATON: Also, would like a volunteer want to go outside the managed area, to a place where he's not expected -- You know, they're going to catch fish, and they want to catch fish, and so they're going to target better areas, and so how random would it be or whatnot? It does seem problematic to me, and so maybe it would be better as a cooperative research program with -- What would that be with, with university staff or agency staff? How would that work?

MR. HOOKER: I don't have an answer to your question, Anne, but this discussion reminds me of some analogies with the research set-aside program in the commercial sector, more up in the Northeast, where you -- Who is allowed in the managed area and who is not? With the research set-aside, it was like you can fish out of season, a lot of times in the research set-aside, and it was creating conflicts with who gets the authority to fish out of season to collect, and how do you then say who gets it and who doesn't get it? Then enforcement is a huge headache, as Cindy was alluding to as well, and so good intentions, but it might not work out.

AP MEMBER: Just real quick, this really kind of screams fishery-independent kind of stuff, and so I think, if you were to have citizen involvement here, you would almost have to have them have someone onboard that probably would carry the permit, whether it be a university or part of the department, and they would just provide maybe the vessel, as the means to get there. Other than that, I think, as far as funding goes, this sounds kind of like it might end up getting kind of expensive, with trying to get permitting and taking all these people's time up and training people, and the juice, I guess, wouldn't be worth the squeeze, because the juice isn't as reliable as if it were fisheries-independent, and so it's kind of where you want to put your money.

MS. BYRD: Basically, I think what I'm hearing is you guys would recommend kind of removing this from the citizen science research priorities, and it seems more appropriate for cooperative research, for the cooperative research program, and, when a scientist is directly working with a fisherman, a lot of times, they are out on the vessel together and that sort of thing. That is for a lot of the reasons that you kind of just stated, and is that the consensus of the group?

MS. DEATON: Yes, I think so, and I don't see anybody indicating that they are opposed to that, and so yes.

MS. BYRD: Next is bottom mapping, and this kind of target volunteers would be recreational and for-hire captains, and the data needed would be mapping data using multibeam or side-scan sonar equipment of fishing vessels, and the anticipated outcome would be improved habitat maps or improved resolution of those maps, and this is not my kind of forte, and so the example project is pretty general, and the Citizen Science Projects Advisory Team discussed this, and they thought that it may be difficult or challenging for fishermen to have any of this equipment on their boat or be trained to use it and that sort of thing, and it just may be too challenging, and so they recommended removing it from the research priorities

They thought it may be better, again, for maybe cooperative research or something like that, or fishery-independent work, and so I think it would be helpful to get feedback from you guys on this, because I know that you all certainly know more about this than I do, and you may have a better sense of whether this is appropriate for citizen science or not.

MR. WEBB: As a recreational angler, I am not aware that most -- That the equipment that most recreational anglers would have onboard would have storage capability, and so I think you would

have to have an additional piece of equipment to have the mapping be stored and retrievable, which would -- I think, again, that's getting kind of far afield, from a citizen science project.

MR. PUGLIESE: I don't want to get too far in, and this is an AP discussion, but one of the thoughts -- I have raised before this say under our collaboration with the Ocean Observing group, and that's opportunities to look at say larger vessels, where you could actually outfit -- Get funded and outfit putting on like a Teledyne BAT system, and that is something that would collect the information and transmit it.

I mean, there is opportunities that, if the -- I guess that's the way to put it, is that, if the resources become available to test-bed maybe a larger vessel as part of this, to be able to fill in other information, and those are some of the ways that I look at it into the future that you could expand the coverage of areas beyond that, because, of course, my priority right now is to get the fishery-independent surveys doing this on a routine basis beyond what's already being collected, and so that may be the test-bed, is to get those vessels doing it with those type of capabilities and then see if there are crosswalks with other vessels that can collect it, and then, as technology gets advanced even further, then you kind of expand the range of expanding the fleet that might be able to collect information.

The biggest thing that I think has happened over the years is these systems that do not have to have an individual on the vessel, where most of those multibeam in the past -- You had to be monitoring it and collecting and making sure it was doing everything, and some of the newer systems really truly are autonomous and collecting the information and literally transmitting it, and so it's going to an outside source, and so you don't have to have onboard storage, but it's a lot more sophisticated than any of the other types of things we're talking about, and a lot more resources involved than anything else, and this is supposed to also be for the next two years.

MR. ELLIS: I was going to say, in regard to the mapping features, getting the data in would definitely be a challenging thing, how to collect it, but even $300 and $400 GPS sounders now have mapping features, and they're becoming more and more popular, and so maybe at some time in the future, but, again, how to feed that data back in.

MS. DEATON: I was just going to add that it depends on what you're talking about with mapping, and so we've been talking all about the ocean, but, if you are talking about inside waters, we have talked, in North Carolina, about possibly using citizen science for SAV mapping. In the low-salinity areas where the water quality is poor, the only way -- The method, the protocol, we've developed is you run transects up and down with your basic sonar, and you have a little thing that you stick in there, and it doesn't take a lot of memory. Then they could turn that over, and then there's a company that does the actual analysis that can interpret what was seagrass and what was not, and so, for seagrass in a shallow-water environment, it might work. Out in the ocean, maybe not.

MR. SOSS: I have a Garmin unit on my bay boat that has side-scan, and it does have the ability to record your information, and then you can go back into Garmin and overlay it on one of their maps, and then you can export it to Google Earth and all these other formats, and so I do think it would be feasible, but what kind of detail you're going to get and what areas that you haven't already mapped is the biggest question, for me, and so, to get this off the ground, you almost --

You would need really specific areas, but, at that point, a lot of these organizations, whether it be a resource commission or something like that, they're already kind of focusing on that.

DR. LANEY: I mean, the idea is appealing, especially in view of what Jeff just said, and so, if the capability is out there, but I think the challenge would be, as John noted, in getting the data into some database somewhere and organizing your mapping so that you targeted the areas that were high priority for management agencies, and I think that would be the big thing.

DR. CHERUBIN: To follow-up on what Jeff said, most recreational boats have a fish finder, and it comes with a spot for an SD card that you can put in, and you can choose to record the data that you want anywhere where you go, and so I think it's a matter of maybe for a company to collect all this data and to create maps, which some companies do already, I know, and the only thing is it's bathymetric data, and it's not water column data, and so you cannot -- It's not like an echosounder that you have on the big ships, and so it's purely bathymetric, and there is no specification about habitat type, whether it's rocky or -- Maybe some companies can do the work, but you need the original processing from the manufacturer to be able to get that information, and so, if those companies collaborate, it's possible, but you need to work with the manufacturers, but, yes, there is a lot of data out there. Every day people are collecting it, and very high resolution data is what we need, and so it's a matter of being able to get that data. It all comes in the same format, and so most of the job is already done for that, and so it's a matter of collecting it and hosting it in the right place for some company or someone to come and make maps out of it.

MR. HOOKER: It seems to me that we're moving one of the other ones into cooperative research, and this one, I think, as Laurent aptly said, is probably more of a public/private partnership type of situation, where you are working with like a larger company, who might be aggregating data, and they get to say, hey, we're working with the federal government on it, but anyway.

MS. COOKSEY: I just wanted to indicate that I find it very intriguing, in that this can allow us to get good nearshore, shallow-bottom and hardbottom habitat information, in areas where we don't have our large mapping initiatives going into, and it is outside where a lot of our state agencies are doing work in the estuary, and so, if some of the issues can be worked out, I think this would actually have a lot of potential to fill a data void.

MS. DEATON: I will just add that I am just thinking -- Everybody is thinking underwater, but I'm thinking what about wetlands and using drones, citizens with drones. We're starting to use that for intertidal oyster reefs in North Carolina, and so I think this has got potential, but it would be more involved and maybe like a Phase 2.

DR. BAUMSTARK: I will tie this really briefly together with what Roger said. Multibeam is very different than side-scan. We get a relative depth from side-scan, and we can get an idea of what the bottom type is, and I would say don't drop it, but it's probably not something that needs to be a priority for citizen science.

MS. BYRD: I am having a hard time -- This is great discussion, but I'm not sure what the consensus of the group is. I will say that we're going to be revisiting these research priorities every two years, and so some of the feedback notes is that this may be more feasible in shallower waters, but not the ocean, and I know the council is focusing on collecting information on the areas that we manage, I think, and so that would be in federal waters.

It sounds like a lot of you all think that this could be kind of challenging work and that some work needs to be done to be able to see kind of what's out there and what manufacturers are collecting already and that sort of thing, and it's not completely unfeasible, but it would take a lot of legwork to maybe get this up and running, and so is this something that you guys feel should stay on this priority list now, or should it be revisited again in two years, when this list is updated, and perhaps more of this legwork could be looked into and that sort of thing? Then I'm just not sure kind of -- What is the group thinking?

MS. COOKSEY: I just want to clarify, very quickly, that, through our fisheries management plans, we have essential fish habitat designated all the way up to the tidal freshwater portions of our coastal rivers, throughout our estuaries and our coastal zones, and so shallow-water mapping would address EFH designations.

MS. BYRD: Thanks for that clarification.

MS. DEATON: I am looking around the room and trying to decide what the group is thinking, but they have poker faces on, and so I'm going to say -- What I hear is maybe later is valuable, and I think, as the habitat advisory group, I can tell you that I see the need. We need assistance with that, and it's time consuming and expensive, just like all the fish data that we've been talking about, and so some help would be good, but why don't I just take a show of hands.

If you think it should be kept for the future, so they can work out the bugs, knowing it's needed, but complicated, raise your hand. The other option would be to cut it all the way, and then the other option would be to go forward right now. Totally cut it, let's do that first. Nobody. All right. How about save it for later? We have a lot of hands. Now the last option is pursue it now. Raise your hand. The save it for later had the most hands, but there are two people that wanted to just go for it right now. Nobody wanted to just cut it.

MS. BYRD: Does that mean the consensus would be that everybody thinks it's valuable, but it's complicated, and so recommend removing it from the research priorities now, but revisiting this idea when they are updated again in two years?

DR. CHERUBIN: It's really how do you get the data aggregated in one space, and so you need a host, and then who is going to process the data, and so you need someone who is going to do the job, and it could be a private company or a university or a private partnership, and then that's all you need to do, and then the data from there can be distributed, and so it's just a little bit of planning, and it could be done easily.

Then it's basically also finding who is going to participate in that, and so are they going to be commercial fishermen, or are they going to be recreational fishermen, or a mix of both, based on whatever the criteria is that we want to use, how often they go out and where they go out, et cetera, and so do we make a selection of the data providers based on where they fish and what type of fishing they do? That could also be a question to be asked or a criteria to --

MS. DEATON: But all those same questions apply to like collecting otoliths, and so it's a process of somebody has got to --

DR. CHERUBIN: For all of them. Okay.

MS. DEATON: Right. For all these things, they all kind of need more details worked out, but it doesn't mean that they should be cut.

MS. BYRD: These are just kind of ideas. The details of a specific project -- I guess I'm echoing what you just said, Anne. The details of a specific project don't need to be worked out for it to be on this list, and so is this stuff in green -- I guess green is a bad color to use, but, anyhow, this that's highlighted right now, is this what you guys are thinking, that this idea is very valuable, but it's complicated, and, because of many of the reasons why you said, that it's kind of challenging, that you think it should be removed from the kind of current citizen science research priorities, but this topic should be revisited when the citizen science priorities are updated again in two years?

MS. DEATON: I think, with the discussion we've just had, we see that, yes, it's complicated, but all the other ones are complicated too, and I would just add that we are the Habitat and Ecosystem Advisory Panel, and I have heard that there is a need for this from at least -- Well, everybody agrees there is a need for this, and so should we re-vote? I really just hate saying let's cut it, and so do we have consensus to just say leave it in here, because the details will be worked out, knowing the details will be worked out? Yes. Okay. We've got consensus to keep it.

MS. BYRD: Then what I will say is this is different than what the Citizen Science Projects Advisory Team said, and so this will be something that will be resolved when I am integrating everybody's comments at that group, and so, again, we need to make sure we have one or two people from this group participating kind of in the review of the updated document and helping with those discussions. Okay.

The next one is about fishing infrastructure, and this is for kind of recreational or commercial fishermen or community members or general citizens, and the idea is to get GPS location of fishing infrastructure, and it could serve as a baseline for fishing-related infrastructure, to help document potential impacts from regulations or as a baseline of what fishing infrastructure is available over time.

The Citizen Science Projects Advisory Committee supported keeping this as a research priority. They recommended even kind of adjusting the data needed to include not just GPS locations of existing infrastructure, but, if there are fishermen who know of areas where like a fish house used to exist, but now it's closed, or there used to be old commercial dock areas, but now they're closed, it could be helpful, because there's been a lot of fishing infrastructure that's been lost over the recent years and so it would be helpful to try to document that as well.

The example project is just you could use an app, an existing app maybe, or build an app where you would collect kind of GPS locations and dates and photos with descriptions over a set period of time, and then that information could then be updated to a database or Google Maps or something like that, and so that was their thoughts. Do you guys have any thoughts on this one? Do you support keeping it, or do you have any additional feedback?

MS. DEATON: One question I have is has anybody checked to see if this has already been done, because, I know in North Carolina, it was done, although it will change with time, and so I don't know if anyone else here at the table or if you would know if other states have already done this.

MS. BYRD: Brian Cheuvront, who is one of our Deputy Directors for the council, he used to be in North Carolina, and I'm sure all of you know him, but he just said that North Carolina had done something like this a while ago, and so, if something like this is done, that could be a good comparison. I don't know if other states have done this. I know that this sort of idea came up with when had our Citizens Science Program Design Workshop in January of 2019, and one of the social scientists with SERO kind of mentioned that this sort of information would be useful, because it's not readily available, but, again, this is not my field, and so I don't know if other folks are doing this or if this exists in other states.

DR. LANEY: Julia, my sense is, and I seem to have some vague recollection that Sea Grant may have done some work on this in the past, and, also, the National Estuary Partnership in North Carolina, Anne -- It seems to me that that has had some interest in this and may have done some work on it. It might be a good group to ask would be the socioeconomic component of the SSC folks, because they would be more likely to know about this kind of information than the Habitat AP would, I think.

MS. BYRD: I think that is a great idea, Wilson.

DR. LANEY: Roger was just saying, Julia, that checking with the state Coastal Zone Management Programs would be another good source of possible information as well. I know there's been a lot of emphasis on coastal community resiliency and trying to maintain existing traditional sources of income, which certainly includes fishing infrastructure, and there's been a lot of work, Anne, and I know in North Carolina -- Now, when you say "fishing infrastructure" here, reading what you have on the screen, it seems like the focus is more on commercial docks, piers, fish houses, that kind of thing, and do you consider coastal fishing piers fishing infrastructure?

I mean, that's recreational fishing infrastructure, and those have become, to some extent, sort of an endangered species in North Carolina. I mean, we traditionally had a whole lot more fishing piers than we do now, I think, and, as they have been wiped out by hurricanes, or, in some cases, marital discord, the piers have been lost. They have gone away, and they haven't been rebuilt, and so is that part of the definition?

Would fishing piers, public fishing piers, be included in the definition of fishing infrastructure, and, if so, then there are lots of publications, at least for North Carolina, and I know Bob Goldstein has written multiple books on pier fishing in North Carolina, and those have been published at some fairly widely-spaced intervals, and so you should be able to almost track the history of fishing piers in North Carolina through books that have been written by different folks in the past.

MS. BYRD: Wilson, thanks for that kind of information and feedback, and I would say yes. fishing piers would definitely be included in infrastructure. I mean, it could be anything from fishing piers to bait and tackle shops to marinas to boat landings to fish houses to commercial docks to charter docks, and it could be anything like that, and so I know, when this idea was kind of raised at the Citizen Science Design Workshop, and I don't know if you guys are familiar or have heard of like bioblitzes, where people go out -- It's like the Christmas bird count, and everybody goes out on the same day to collect information on the birds that are available that time in December, and so you could do something like this, like an infrastructure bioblitz, where, over a certain time period, people could go kind of mark the kind of fishing infrastructure that is in their

area or that they use or things like that, and it's good to know that there are some publications that exist that could be informative.

What I am hearing from folks is, in general, there may be some information available, and so it would be good to check to see what information is available on this, and then do you, in general, support this idea though of keeping it as a research priority and to kind of ask the SEP if they know if something like this has been done, but, in general, is this something that you guys support, or do you feel like you would need to have that question answered before you could say one way or the other?

DR. LANEY: No, I would definitely support it, and the socioeconomic folks are always telling us that we need more socioeconomic data for fishery evaluations of various sorts, and, also, John Hadley and I have been talking about the fact that, in a lot of cases, economic analyses of impacts from management, proposed management, measures on the fishing industry don't go far enough.

For example, they don't include things like impacts to advertisers, and I don't know whether Jeff does this or not, but I know a lot of guides spend a lot of money on brochures that they put at welcome stations for the different South Atlantic states, and I have been collecting those for a number of years, and I have a whole stack of them, and so somebody is spending a lot of money on advertising revenue. If your fishery goes away, that advertising revenue goes away, and we have also talked about the fact that there is a lot of fish art out there, and that may not have a direct connection to the health of a fishery, and another aspect of -- This is really a stretch for fishing infrastructure, but are all of the celebrations that occur that are built around fish or fishing, and I'm thinking about things like the Grifton Shad Festival in North Carolina.

When ASMFC was redoing the shad and river herring plan a number of years ago, there was like one paragraph in there on the cultural significance of American shad, and I got to thinking about the fact that, wait a minute, what about all these festivals that used to be focused on American shad up and down the coast, and a little bit of internet research revealed that there were shad festivals all the way from Maine down to the St. Johns River Basin in Florida, and so there's a big economic boost and benefit to local communities there just by virtue of all these celebrations, these events, that are held, a lot of times on an annual basis, and that's not exactly infrastructure, but it's sort of a related socioeconomic topic though, and so you might even want to design a separate citizen science project for that, because it's something that undergrads could do as special class projects, or certainly interns could do. All you have to do is spend time on the internet.

Then, if you wanted to really get into the details of it, it would be nice to know how much these festivals have generated, in terms of past income and what the longevity of them was and how many people were involved and all that kind of stuff.

MS. DEATON: Okay, and so I guess there is consensus to keep it, and I would say let's do the next one.

MS. BYRD: I know you all must be starving, and next is historic fishing photos, and target volunteers are recreational and for-hire fisheries, and the data needed are digitized images or photos and some metadata, and the anticipated outcome is that it could help improve or build a better picture of historical information on these fisheries, prior to when fishery-dependent

sampling programs started, or you can maybe estimate kind of the length of species from time periods prior to data collection as well.

The Citizen Science Projects Advisory Team supported keeping this as a research priority, and we have a pilot project right now that's looking into this, and we have fishermen that are helping kind of scan and archive historic photos, and then we're using an online crowdsourcing platform called Zooniverse to build a project online called FISHstory that will kind of train members of the public to help identify the species in these photos, and then we are having kind of a team of species ID experts that are scientists and fishermen that will help validate the species ID made from the citizen scientists. Again, the project advisory team supported keeping this, and this is -- Again, I'm not sure if you guys have thoughts on this, as far as supporting, or any additional feedback.

MS. DEATON: I have one thumbs-up, and Wilson wants to say something.

DR. LANEY: This is the Rusty Hudson project, and, basically, Rusty provided all these historical family photos, and my point is there is a whole lot of other photos out there, and I know, for example, there are some photographers on the Outer Banks of North Carolina who have been photographing anglers and their catches for decades, probably, and I am guessing that they have big, extensive files, especially of photographs that were not subsequently purchased by the anglers who were the subject of those photographs, and so it might be productive to try and contact some of those photographers and see if we couldn't uncover some additional archives of photos from elsewhere in the South Atlantic. I guess Rusty's are mostly from the east coast of Florida.

MS. BYRD: They are from his family's headboat fleet there, and so I think that is a great idea, Wilson, and I think you're right that there's -- We're using kind of Rusty's photos as a pilot project, to see if this citizen science kind of crowdsourcing approach works, and I have already -- We have been kind of presenting information on this project to many of the advisory panels, and many of -- I think it was two weeks ago that we had the Mackerel Cobia AP and the Snapper Grouper AP, and many of those guys already were able to name the names of captains or museums in their area, or restaurants in their area, that have a lot of photos like this, but I think reaching out to photographers is another great idea, the photographers that used to take all these photos.

MS. DEATON: Great.

MS. HAVEL: This sounds like a really easy and cheap way to get students involved, too. You could have an in-classroom activity, especially for those not on the coast, that don't get the chance to see fish in their natural habitat, and you could link it up with like a K-12 program, and it would be really, really cheap.

MS. BYRD: I think that's an awesome idea and great feedback. The coordinator of this project is actually going to talk to the South Carolina Marine Educators Association. They have a conference in a couple of weeks, and she's going to talk there, but reaching out to kind of classrooms and teachers and students is definitely on our list of things to do once this project launches early next year, and so that's a great suggestion, and thank you.

Okay. I'm going to keep on moving on. The next one is fishing oral histories, and this would be for-hire and commercial captains and kind of interviewing fishermen to learn about the history of their fishery, and it could be possible to pair this with some of the historic photo work being done,

and it's to try to document how fisheries are operated over time, another kind of observational data.

The Citizen Science Projects Advisory Team supported keeping this as a priority, and they recommended adjusting the data needed to include kind of interviewing fishermen about the current state of the fishery and not just the history of the fishery, because there have been lots of changes in many of our fisheries, and so those interviews could be an opportunity to kind of help showcase some of those changes, and so, again, we're looking for feedback on this from you guys, whether you support this or if you have any additional thoughts.

MR. WEBB: I am going to go out on a limb here and say that, as opposed to the photographic historical data, this could be fraught with biases, either somebody that thinks that the fishing regulations put them out of business, and I used to catch all this, so much before, and I don't know if there's going to be a way to do this and present credible information that you could document, and so, if that's not important, then we should do this, but, if we're looking for credible, reliable information, this might be difficult.

AP MEMBER: I was thinking that you might be able to supplement this with like fish reports and things like that, because that goes back so far, and there is several companies in the towns that I frequent that are always posting fish reports, and they like to supplement them with pictures too, so that there could be a little bit of proof, and so that might be a way to just get a lot more data on that.

DR. ROSS: I think Dave brought up an important point, but I think the process could be directed so that you could minimize those biases or flag them, if they come up. For instance, what are you looking for from the oral histories? Is it just everything the person has to say, or are you interested in their opinions about management, or are you just interested in how they and their ancestors fished? One thing could be more factual than the other, but, no matter what you do with this topic, there's going to be a how good is your memory sort of thing, and there will be natural biases and not just opinions about management, but just things that people forgot or enhanced.

All of this is -- I think this is very valuable, because almost every history I read, particularly the further back you go, one of the great comments is nobody wrote that down, and so nobody has the ability to even judge whether it might be accurate or not, or biased, because it's not even there, and so this is something that has to be looked at pretty quickly, because people are dying all the time that have valuable knowledge.

MS. MERRITT: The town that I live in is a small area, and, just from what little I know about around the Wrightsville Beach and Carolina Beach and Topsail and Currie, that southeastern part of North Carolina, there is just a plethora of interviews that have already been done with recreational and commercial fishermen and charter boat fishermen that are just fabulous reading. The history is wonderful, and it's already there, and I think that you could probably glean some wonderful historical information, while you may be wanting to search in addition for current interview information, from a lot of the clubs that are no longer in existence, and I'm sure they would be happy to have their interviews reprinted. Then, of course, there are a lot of publications that are like news magazines for recreational or commercial fishermen that have a lot of personal interviews that I'm sure they would also love to share and have reprinted, as long as you give them credit. Thank you.

DR. LANEY: Thanks for that, Rita, and you're thinking about like those weekly or monthly publications? Everybody knows me well, and I have those stacked up in the house, too. I pick one up every time I am at the coast, but they have great photographs in there, and, a lot of times, I shoot that stuff over to the State Museum of Natural Sciences, because they get size data from the articles about those fish, and so I think that's very important.

I will give you a very practical example of why this is also important. We had a grad student at NC State, a number of years ago, who was attempting to follow the NMFS protocol for shortnose sturgeon sampling on certain North Carolina rivers, and he was having issues catching sturgeon. He just simply could not find any, and so I said, well, why don't you talk to the guys that are out there running gillnets, and I imagine they can tell you where the sturgeon are likely to be, and he did that, and, sure enough -- He didn't ever catch any shortnose, but he did start catching juvenile Atlantic sturgeon.

I think I understand what David is saying about a bias, and I certainly concur that that can be an issue, but I think you can set up your interview questions, as Steve pointed out, to minimize that bias and collect the very valuable information that is fading away rapidly, as a lot of our commercial guys age out and either retire and quit actively fishing or pass away and we lose the information, and it's just not recoverable after that, unless they happen to have kept a journal or something.

I will throw out one more piece of information, and that is I was at the North Carolina Wildlife Federation annual meeting, a month or two ago, and a young lady came up to me afterwards, because I had happened to mention river herring in one of my talks, and she indicated that she was from the Perry family, and she was one of the granddaughters, I think, of the person who established that original river herring fishery at Colerain, which is like the largest river herring fishery on the east coast at one time.

She wasn't aware that I guess one of the principals in that fishery had donated the entire records of that fishery to NC State University, and so they're there in the archives at NC State, a time series that runs from 1947 all the way up to 2008 or something like that, I think, and so that's another thing, Julia, that you might want to add to this particular project, or make a separate project, would be the effort to collect and archive data from some of these fisheries, the commercial fisheries especially, who are willing to share all of that information with universities, that could then archive it and properly curate it, because you never know what will be useful in conducting a stock assessment, in terms of trying to push your time series back in time and capture the changing paradigm.

MS. BYRD: Thanks, Wilson, for all of that information. Based on what everybody is saying, you all support keeping this, it sounds like. Speak up if that's not the case. I am going to go ahead and move on. I swear we're getting close. We have two more. The next one is oceanographic, environmental, and weather conditions.

The target volunteers would be recreational and commercial, and the data needed would be a variety of different kind of -- It would be bottom temperature, weather impacts to fishing, presence/absence of sargassum, movement of forage fish and shifts in the pattern of a fishery, and

this could help build a database on climate conditions or the distribution of sargassum or whatever kind of information that you would be wanting folks to collect.

The Citizen Science Projects Advisory Team noted that collecting a lot of this information they thought would be feasible during their normal fishing activities, and they thought that fishermen would be interested in collecting this sort of information, and they supported keeping it as a research priority. Do you all have any thoughts on this one?

MR. GLENN: As the resident weather nerd, I'm supposed to speak now, right? All right. So there's a program called CoCoRaHS and there may be a few people that know about this, and it stands for Community Collaborative Rain, Hail, and Snow Network. You use a four-inch plastic rain gauge, and you just take twenty-four-hour measurements. You take it once in the morning, and then you go on about your day.

They are absolutely vital, especially along the coast, and so we use it a lot in North Carolina, and it's part of the Shellfish Sanitation and Water Quality Division -- When they determine whether to close down a section for shellfish harvest or whatnot, and so it's used quite a bit. That is a great program, and it has a comments section, and so, if you have additional information -- Like, if you're in the Keys, and there is a bunch of sargassum that has washed up, you can use the notes section to put any sort of information you want to in there. It's available online, and it's free. Right after you hit "submit", it's all there, and so it's a great place that already has an existing way to aggregate data and whatnot, and so I just wanted to speak up about CoCoRaHS.

MS. DEATON: Could they -- CoCoRaHS has its purpose, and so it's rain, but it could be a model for how they could do it for bottom water temperature, right?

MR. GLENN: Certainly, and, if it's a location that's adjacent to somebody who is already a CoCoRaHS observer, that's where you could go ahead and put in that data and have that repository that's there.

MR. HOOKER: I mean, it seems like a no-brainer, as far as like a priority, but I am agreeing with David, in that I think there are a lot of platforms and a lot of apps already out there, and maybe just focusing folks on highlighting what apps to use, so that we know that that's going to be collected in the marine environment, or to keep an eye out for that, because I know BOEM has developed an app as well that I think does collect some environmental data, and it's called Sea Scribe, and so I don't know if us developing a separate data logger is -- If that's just another app, then I think it needs to be just some kind of survey of what apps are out there and highlighting what those are and then really promoting the heck out of using it and then accessing that data, because we don't need to reinvent the wheel here, but, as far as the usefulness of promoting this type of data collection, I think that's 100 percent positive, yes.

MS. DEATON: So I guess like step-one for like getting the details worked out is to find out what existing programs are out there that people could enter the water temperature or the fish data, and then Julia could get her volunteers to just use that and direct them to that, and then some staff is going to have to retrieve all that information and use it, and so it would be fairly simple.

MS. BYRD: Sounds great. I'm going to go ahead and move on. Kind of the last one that's on the current research priorities is rare species observations, and it's with kind of recreational and

commercial fishermen, or divers or other folks who are on the water. Data needed would be point observations or unusual or rarely-encountered species, and this information could hopefully potentially serve as kind of an indicator of species shift, or serve as a baseline for species shift, if you kind of have that information over a long period of time.

Our program has been talking with folks that kind of know fisheries and a couple of the universities and SECOORA about this kind of general idea, and the Citizen Science Projects Advisory Team supported keeping this as a research priority. They thought it would be something that fishermen may be interested in contributing to.

MR. WEBB: On a positive note, I think there are states -- I believe FWC has a sawfish reporting program already, and so there may be some in other states that could either serve as a model or actually get the data from that, in addition to what other new data might be collected.

AP MEMBER: I would also suggest maybe recruiting some people who are involved in online forums and maybe large Facebook pages, because people post pictures of fish that they don't know what they are all the time, a lot of offshore fishermen, and so, if you have someone monitoring those boards and they see that, that might be useful for you, too.

DR. ROSS: I think this information could be useful, but the problem I see is I get pictures of fish all the time, and they are usually pretty bad pictures, and I can't tell what it is, and a lot of fish are difficult, especially if they are rare, and they're difficult to identify anyway visually, and so there has to be a lot of guidance, I think, toward this activity, as to how to take a good picture and what angles or other information you need to take. Otherwise, the data are equivocal.

MS. DEATON: Or I would see certain species. Like say only if you encounter sawfish, and, I mean, sawfish is nice, because it's like kind of obvious what it is, and sturgeon, and so certain species, but I don't know.

DR. ROSS: Actually, even in sturgeon, I've had a lot of people turn in small Atlantic sturgeon, saying that they thought they were shortnose, and sometimes it's not clear from the picture they take exactly what it is, and they're not the easiest things to identify.

MS. DEATON: Plus, they're not supposed to touch it, if it's a listed species.

DR. ROSS: You can't help it if it's in your net.

DR. LANEY: Or if it gets spit up by a striped bass in your live well too, which -- Seriously. We had one recently, and the angler in question was going to toss it, because he knew he wasn't supposed to have it in his possession, but we said, wait, no, please don't do that, and he stuck in his freezer, and we still haven't picked it up yet, but we hope to get that one, and it's from the Roanoke River.

I was going to say though, Julia, that the existing NOAA Sturgeon Salvage Program could be a good example of how to proceed with this, and they have a form that people can fill out any time that they encounter a stranded sturgeon on the beach, and usually what happens is the citizen will notify an agency staff person, who then goes out there and evaluated the carcass and takes measurements and fills the form out, but I don't see why -- I mean, I will defer to the Endangered

Species folks about the legal aspects of it, but I don't see why citizens couldn't be empowered to fill the form out, and the same thing is true for all these other species.

David mentioned sawfish, and that would certainly be one, and all the marine mammal folks, I know, have these big archives of photos that they use to identify individual marine mammal species, and so, to the extent that some training could be provided, as to how to take those photos, and I know dorsal fins, in particular, for bottlenose dolphins are diagnostic, and markings on the tails and pectoral fins of humpback whales, for example, and so, again, some kind of training would probably be required and provide the information on what sort of format a photo would have to be in, but I think this one would be very useful.

MS. BYRD: I know that it's 1:10 and you all are probably starving, and those are all of the current species priorities. I did want to take a minute and say, if you have additional priorities or topics that you think should be priorities, it would be great for you to share them with me now or to share them with Roger, who can pass them on to me, after you kind of eat and have a chance to think more about it.

One thing that I did want to do, before letting you guys go, is I wanted to kind of show the timeline again on the screen and then try to identify the two -- If there is one or two folks from the Habitat AP that may be willing to serve on this Projects Advisory Committee, and that would -- Those two, one or two, people would be kind of responsible for helping kind of review, along with the rest of the Citizen Science Projects Advisory Team, on reviewing this draft citizen science research priorities document and kind of incorporating the feedback from all these groups. I would love to get one or two volunteers for this, if possible, or, if you all want to think about it and let me know, but, ideally, I would like to have those names this week, because I'm hopefully going to be sending out a draft updated document for folks to review next week.

MS. DEATON: Brian, do you still want to make your comment before we talk about that volunteer stuff?

MR. HOOKER: Just very, very quickly, and, I mean, the one thing that seems to be missing from here, from my perspective, is, and it must be captured elsewhere, is the actual fishing effort and fishing activity, where they're going, or is that something that's already been tabled, because no one wants to give that up, even in an aggregated form, or -- I mean, we can talk about that after lunch, but it just seems to be the big one that's not there.

MS. BYRD: That hasn't been something that's been brought up, and, if you're talking about specific kind of fishing location effort, I know there are a lot of fishermen probably in the room who can speak to this better than I can, but I know specific locations can be -- People may not be willing to give that up, and so, when that information is collected, it often is provided in kind of those commercial grids, or there's a headboat kind of grid, or that information is kind of summarized, so that no confidential locations are shared, whenever that kind of information is shown publicly. Is the idea here to get just better information on where people are actually kind of fishing, and so what locations are important to the fisheries, and is that kind of the general idea?

MR. HOOKER: I think getting spatial and temporal fishing effort is very valuable, a dataset, and I guess that's what I was trying to get at.

MS. DEATON: I was just going to say that I think you've got NMFS that does the recreational survey, the MRIP, and you've got states that do creel surveys, and so it might be that it's just covered.

MR. HOOKER: I mean, you're not getting spatial data.

MS. BYRD: Like for MRIP, at least, they are reporting whether they caught their kind of catch in kind of zero to three miles offshore, greater than three miles, or kind of like inshore, and so, if you're looking for kind of high-resolution spatial and temporal data, I don't know -- I think some of the programs may be able to provide some of this information, but, if that's something that you guys kind of recommend as an addition to the list, that's something we can definitely can add to the list for folks to consider.

MS. HAVEL: I think MRIP just added an artificial reef question, too. The fishermen don't have to answer whether or not they fished an artificial reef and which one, but that was added, and so that is location spatial data.

MS. DEATON: I mean, you're right that it's not GPS coordinates of where they actually were, but usually this all gets categorized into some water body level, and some are broader than others. In North Carolina, we have like north and south and less than zero to three and more than three miles.

MR. HOOKER: Maybe this is one to table until after lunch. I don't know.

DR. LANEY: Julia, a new one that Roger and I came up with is targeting collection by citizen scientists or volunteer anglers of species for which we need diet data to feed the Ecopath model, and Lauren has already put together a list, I think, of the ones for which data are deficient, and so that is something that I think might be fairly easily done, just putting a notice out there to request anglers to bring these in, and it could be that that could be piggybacked on top of the existing carcass collection program, and so you just toss them in the freezer, and they would have to be labeled, hopefully with the location and date, at a minimum, but that would then hopefully provide us with some diet information, as long as those animals -- I guess they would have to be iced, and, I mean, you want to try and keep the stomach contents in good enough condition so you can do the analysis on them. Again, some training and requirements, or some guidance, would probably be needed, in that case, to tell them how to process the samples and bring those in.

MS. BYRD: Wilson, if you all have target species for that, that would be great to get a list of those, so I could include it.

DR. LANEY: Yes, and we can ask Lauren, and I think Lauren would be willing to provide that to you, Lauren Gentry.

MS. BYRD: So it sounds like diet data, yes. Fishing effort, we're not sure yet?

DR. LANEY: Well, you know, we're always talking about effort, a lot, and one area I know where we talk about effort a lot especially is the amount of effort that is associated with departure from private access points, and so I would say that would be one that we could stick in the category of not immediate, but certainly explore for future citizen science projects, for sure. I mean, the

problem with -- I think it's easy for us to go out there and find highly-avid anglers who are willing to keep logbooks and willing to share all their information, but the problem is that "highly-avid" part, because they don't necessarily reflect the success rate of your average angler.

As David pointed out earlier, David Webb pointed out earlier, it biases the information that you get if you are only sampling from the most avid anglers, who spend a lot of time out there, who know what they are doing, and they have a much higher CPUE rate than the run-of-the-mill person like myself, who may go twice a year, unfortunately, woefully unfortunately.

MS. BYRD: Someone else has actually brought up this. Dick Brame actually brought up this idea of public versus private kind of access points and fishing effort involved in them too, Wilson, and so I think there are other folks who think that would be a -- That's something that is needed, and so is this something that you all think needs to -- Is this something that you all think should be considered for updating the research priorities now, or something that should be kind of added to the list to revisit when we update this in two years?

DR. LANEY: I guess I would throw it in there, just to see what sort of feedback you get on it.

MS. BYRD: I know you all want to eat, but would you be willing to share things like locations or kind of information on your effort if you leave from public or private access points?

DR. CHERUBIN: If I may say, a quick way for some of the fishing vessels, particularly the commercial fleet, they have an AIS system onboard, and that would be basically an easy source to access fishing effort, but just looking at where they are and how much time they spend, et cetera, and so there's a lot of data and a lot of boats, and a lot of boats have those systems, even recreational boats, and that could be, I think, the first place to start, looking for locations, and, in that case, you don't have to worry about private or commercial or recreational, and it's everyone together.

MS. BYRD: I didn't mean to -- Are there other ideas? I am sorry that I kind of rushed you through, but I was just trying to get through everything, so you all could go eat, but any other kind of topics that you think are not on the priority list that should be added or considered for adding to the list?

MS. DEATON: I think we're good here.

MS. BYRD: Okay. Great. Then any volunteers from the Habitat AP to serve on this Citizen Science Projects Advisory Team and help review the updated document, or, if you all want to think about that over lunch and kind of let Roger know, or you all can talk about it before you kind of leave the meeting, and then those names could be provided to me, potentially.

MR. PUGLIESE: I actually think we do have two volunteers that are willing to step forward to serve for the panel, and it's going to be Jeff Soss and David Glenn, if that sounds fine with you all.

MS. BYRD: Awesome. Thank you, Jeff and David. I really appreciate you guys' willingness to serve on that group, and so I will kind of -- I have been taking notes on the screen, and so I think I have kind of general input, you all's general input, together, and I will probably write-up just a quick summary of that, so that it can be shared with all of you guys, and then, Jeff and David, be

on the lookout for an updated citizen science research priority document coming from me next week, and so thank you, guys. Again, sorry that I hijacked your lunch hour, but I really appreciate it, and I think you guys provided some really great feedback, and so thank you so much. I really appreciate your input and time.

MS. DEATON: Thank you, Julia, and, also, could you send out your presentation with those notes back to Roger, so we can -- So the committee can see it? Thank you. I guess we're all going to go to lunch now. Rita has one more comment.

MS. MERRITT: It's a suggestion. Why don't we do like a break with a working lunch, and maybe order Subway or something? We've got a lot to go.

MR. PUGLIESE: I think what we can do is we can extend a little further into the day, versus that. We'll just go to five instead of -- Right now, we were supposed to break at 4:30, I think, to make sure we do it, and we're going into breakout sessions, and so I think we can -- We'll be able to address it. If we had planned that, I think it would take probably more to go get stuff and bring it back. You all just relax a little bit, because we've got a whole other section to go into, and so --

MS. DEATON: What time do we have to be back?

MR. PUGLIESE: I just think we have to give everybody time and be back at like 2:20, if that works for everybody. I appreciate all the effort though, because that was really critical for Julia. Thank you. Quickly, as everybody is walking off, you all have received a draft of the consensus statement, and you will get a new version of it, on the Florida Keys National Marine Sanctuary discussion that we had.

(Whereupon, a recess was taken.)

DR. LANEY: Everybody here should have a copy of the draft consensus statement, or I should say proposed consensus statement, that David and Rene and I crafted last night and this morning, and I will stress that it is a very rough draft, and it is not cast in concrete, and we went ahead and said that the AP supports Alternative 4, which the AP may or may not support, and that's up to you guys, after further discussion, and so take a look at it and see what you think.

We can talk about it more in the morning, after we reconvene, and the other thing to think about is that, if you have specific comments on different parts of the DEIS, just provide those to us, and we will work those in as an attachment to the consensus statement, which is kind of the way, at least when I was still with the Fish and Wildlife Service, the way we did DEIS reviews is we would have an upfront general summary statement, and then we would put the nuts-and-bolts and the specificities in a different attachment. Take a look at it and see what you think, and tell us if you think we are too far out on a limb.

MR. WEBB: It's supposed to represent the AP's recommendation to the South Atlantic Council.

MR. PUGLIESE: Today, the afternoon session, is basically two parts. One is going to be a breakout to discuss -- It's going to be held in this room to discuss the climate issues, and it's kind of a build-up from what we had started at the last AP meeting, to look at what the states are doing relative to climate change and the opportunity to highlight those and then also, potentially, build

enough information that you could look at potentially an addendum or an amendment, an addendum probably, to the existing climate policy of the council.

What we want to do is split -- I think this will work if South Carolina and North Carolina can stay in the room and start the discussion on that, and then what we're going to have is a training session on accessing both Ecospecies and the web services, kind of an integrated session that Tina Udouj and Lauren Gentry are going to provide, and kind of a nice, connected one, where they're talking about how you look at a species and actually go from the Ecospecies information to actually look at the products and capabilities that can come out of web services, and so, as soon as they get back here, I guess we can get the group together.

(Whereupon, the group went into breakout sessions.)

(Whereupon, the meeting adjourned on October 23, 2019.)

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Certified By: _____ Date: _____

Transcribed By:
Amanda Thomas
December 16, 2019

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