SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

HABITAT PROTECTION AND ECOSYSTEM-BASED MANAGEMENT ADVISORY PANEL

Sirata Beach Resort
St. Petersburg Beach, Florida

November 6-8, 2018

SUMMARY MINUTES

Habitat Protection & Ecosystem Based Management Advisory Panel

Anne Deaton
Cynthia Cooksey
Dr. Rene Baumstark
Kevin Hart
Bill Parker
Bob Martore
James Geiger
Brian Hooker
David Webb
Dominic Guadognoli
Thomas Jones
Rita Merritt
Jeff Soss
Laura Busch
Lisa Havel

Council Members

Steve Poland

Council Staff

Mike Collins
Roger Pugliese

Observers/Participants

Kasey Cantell
Sandra Brooke
Craig Poff
Tom Okey
Tracey Smart
Tina Udouj
David Reed
Kathleen O'Keefe
Justin Grubich
John Reed
Heather Coleman
Hillary Morris
Howard Townsend
Dr. Marcel Reichert
Mitchell Roffer
Lauren Gentry
David Dale

Other Observers and Participants attached.

The Habitat Protection and Ecosystem-Based Management Advisory Panel of the South Atlantic Fishery Management Council convened at the Sirata Beach Resort, St. Petersburg Beach, Florida, November 6, 2018, and was called to order at 9:00 o'clock a.m. by Chairman Anne Deaton.

MS. DEATON: My name is Anne Deaton, and we're here for the November meeting of the Habitat Advisory Panel. I hope everybody is doing okay and their accommodations are good. I like this place. I feel like I'm on vacation a little bit and not just working. The first thing we need to do today is approve the agenda, and so did anybody -- There are few changes that really are about the speakers, but, other than that, the agenda is what you've seen. Are there any modifications requested to the agenda? Okay.

MR. JONES: Motion to approve the agenda.

MS. DEATON: We have a motion by Tom Jones, and we have a second. All those in favor of the agenda. All right. The agenda is approved. Next, we need to approve the minutes from our May meeting, and that was in Charleston. Does anybody have any comments, changes, or additions they would like to see to the minutes? Okay, and so we'll just approve those by consensus. Thank you.

We have a full meeting this next few days, and Roger has put together a lot of good information that we're starting to see everything tie back to our Fishery Ecosystem Plan Implementation Plan, and so there are some people here that weren't at the last meeting, and we have new members, and so, first, we'll do introductions. We will start with Kevin Hart.

MR. HART: Hi. I'm Kevin Hart, and I work for the North Carolina Division of Coastal Management.

MS. BUSCH: Good morning. I'm Laura Busch, and I work for the U.S. Navy as a Natural Resources Program Manager.

DR. BAUMSTARK: Good morning. Rene Baumstark, and I'm with Florida Fish and Wildlife Research Institute here in St. Petersburg, and I'm new to this panel. I took over for Amber Whittle, for those of you who knew her, and my background is really more on the habitat mapping, and ecosystem a bit, but really more on the habitat side.

MS. MERRITT: Good morning. Rita Merritt, North Carolina, and I'm representing the Artificial Reef Association in the southern part of North Carolina.

MR. GUADOGNOLI: I'm Dominic Guadognoli, and I am new to the panel as well, and I'm replacing Pat Geer with the Georgia Department of Natural Resources Coastal Resources Division.

MS. COOKSEY: Good morning. I am Cindy Cooksey, with NOAA Fisheries, and I'm the new Vice Chair.

MS. DEATON: I'm Anne Deaton, and I already said that.

MR. PUGLIESE: Roger Pugliese. For the new members, I have worked with the council on all of our habitat and ecosystem activities for a number of years, and have advanced it, and, as Anne had indicated, I think we're getting to a point where the convergence of a lot of these things, from the states to the council and beyond, are really moving forward fast, and I think the foundation of this agenda we have today is really kind of indicative of how many things are kind of converging at this time, and so hopefully we'll continue to provide and advance things for the council.

MR. MARTORE: Bob Martore, and I'm with the South Carolina Department of Natural Resources, and I'm with the Office of Fisheries Management.

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

MR. JONES: Tom Jones, a Georgia recreational fisherman representative.

MR. PARKER: Captain Bill Parker, and I used to be a charter boat captain, and I sold that business a few months ago, and I'm now I'm, I guess, a conservation/recreational, and this is my seventh year on this Habitat AP, and rolling. Thank you.

MR. SOSS: I'm Jeff Soss, and I am a recreational fisherman for-hire in Georgia and just recreational in South Carolina.

MR. GEIGER: Good morning. Jamie Geiger, retired Assistant Regional Director of Fisheries for the U.S. Fish and Wildlife Service, and now happily ensconced in Seabrook Island, South Carolina.

MR. WEBB: Good morning, everybody. Dave Webb, and I currently reside in Islamorada, and I'm a private recreational angler and on the board of directors of the West Palm Beach Fishing Club.

MR. COLLINS: I am Mike Collins, and I'm on the eve of my retirement, and this is the second-to-last meeting, council staff.

MS. DEATON: Would you like to introduce yourselves on the back wall there and in the back?

(The introductions are not audible on the recording.)

MS. DEATON: Thank you, and welcome to everybody, especially our new folks. We have a lot of the state representatives that have turned over, and so Amber and Pat and Priscilla Wendt.

MR. PUGLIESE: Yes, and what we've done in the past is to, to maintain a little bit of direct connection, the chairs of -- The way the council's AP is, you have sub-panels, and then you have at-large membership, and the chairs of the sub-panels have traditionally been the state DNR representatives, and so individuals that have stepped forward I think we'll coordinate -- That's one thing, to be able to, when we have state-specific issues, maybe to kind of funnel and be able to coordinate some of those discussions, and so, some of the new members that have stepped forward, I think we're going to be working closer on making sure that some of those either individual state, or maybe two states at a time, we operate some of those panel discussions. It provides a little easier coordination, and that's how I've been working with Anne in the past, and so we'll continue

that as we move forward, in coordination with Cindy as the vice chair of the overall panel. That's just a heads-up.

MS. DEATON: I don't really have any opening statements, except welcome to everybody, and I am the North Carolina state rep, and I don't think that I mentioned that, for new folks. The first thing we have on our agenda is a discussion on the ecosystem-based fishery management activities that have been ongoing in the South Atlantic with NOAA Fisheries.

Unfortunately, some of the people that were going to talk today couldn't make it, and so Karla Gore won't be here, but Cindy Cooksey volunteered to do her best to go through the items on the agenda and give an update, and so the first is about progress that's been made on the implementation plan through ecosystem-based management and then an update on the South Atlantic ecosystem status report and an update on South Atlantic climate vulnerability analysis, which John Quinlan was going to do, but he isn't here, and so let's see. I will turn it over to Cindy and see what she can do. Jamie, do you have a question?

MR. GEIGER: I do, and I should have remembered first, but, while we have some NOAA and other folks here, can we, at some point in the agenda, and I apologize for bringing it up now, and my brain is a little slower with only one cup of coffee this morning, but could we have an overview of what the projections are for NOAA and National Marine Fisheries Service for the budget for this fiscal year as well as a spill-down on what the state agencies feel their state budget is to support fisheries management activities and habitat restoration activities, just to give us sort of a sense of where you all are, both on the federal and state level? Thank you.

MS. DEATON: Okay. We can fit that in somewhere on the agenda later.

MS. COOKSEY: Briefly, on the entire ecosystem-based fisheries management activities that Karla was going to give us some updates on, NMFS put out the draft EBFM for comments, and only about five comments were received from the general public, and all five of them were generally positive comments, and so Karla and others on her team are currently working on addressing those comments, and their plan is to send out the reviewed EBFM for an internal fisheries review next month, and so by December, and so they are still on time for release of the final EBFM plan in January of 2019.

She did let me know that both the Gulf and Caribbean EBFM plans are on the same general timeline, and we are going to try to bring Karla in for our next meeting, I guess around May, when all of those final plans are out, so that she can provide us a more extensive information update on what is included in those plans.

The EBFM plan, we did have comments come in from the council, and I believe the entire advisory panel should have been copied on those comments, and so you may have noticed that, as part of the EBFM plan, we have two main components, which are the South Atlantic ecosystems status report as well as a multispecies climate vulnerability analysis.

Kevin and Todd with the NOAA Fisheries Beaufort Lab provided me this update to give to you folks for the ecosystem status report for the South Atlantic, and this is, in essence, the same document that I provided an update on at the May meeting, and so we'll actually skim through it relatively quickly.

Just for folks who weren't here at the last meeting, the point of the ESR is to provide trends over time, using a multiple ecosystem analysis. Again, this is part of our EBFM overall, and so, as you can see here, it's actually a rather small group of folks from across NOAA, as well as universities and some state agencies throughout the Southeast that are contributing to the overall status report, which actually brings together quite a wide array of components.

You can see it's bringing in climate and benthos and different trophic levels and fisheries, and Todd provided me some updates on those indicators, and so, this small group of people, they are currently still bringing in all of these indicators into the model and the report that they're developing, and so these are all the same basic indicators that we presented back in May, and they haven't really added new indicators, but they are just finalizing, and so that's where you see "done" listed next to the different components, and they have actually acquired all the data that they need for that particular feature, versus the "in progress", where they're still working with their colleagues.

Here are some examples, and one of the interesting components that they're bringing in are trends in ocean acidification over time, as we're seeing increases in CO2 and concurrent decreases in pH across the South Atlantic, and that's all being incorporated into this report, as is a variety of fisheries ecosystem components. They have incorporated coastal birds as part of this analysis, and I know there was some feedback at the last meeting that that was something that folks wanted to see incorporated, and so they have moved forward with that.

This is, of course, the slide that they actually updated the most, and they are still on track to have a draft report completed in 2019, and they will be reaching out to all of the agencies listed for review and feedback at that stage. I hope that, when they reach that draft report stage, we'll actually be able to get Todd or Kevin here, onto the AP, to give a more detailed summary of what they've done and really get feedback from all of us at that point.

MR. PUGLIESE: One of the comments, and I was going to touch at the end of this about the council comments on the roadmap, and one of them was, specifically, to again bring back the Southeast Fisheries Science Center back onto the AP, because they traditionally had been on this advisory panel, and so hopefully we get that formal seat re-added back in.

There was some internal discussions about that before, but that's actually integrated in our comments, and so hopefully that's going to happen, and then, formally, they can actually come and make sure that they update, but that this group provides the significant input on where to go with some of this, because that, I think -- Maybe I didn't emphasize that enough, but this advisory panel is the core foundational group that provides guidance on all the habitat, on ecosystem, on the ecosystem plan, and these recommendations, especially on a structure of a document or a facilitated tool as we move forward, and so that will be really important to make sure that that actually does happen.

MS. COOKSEY: Can we move on to the climate vulnerability? Again, I think being able to further that connection and have someone from the Southeast Fisheries Science Center as part of this would make sense, given the connectivity that we have on these larger projects.

John Quinlan with the Southeast Fisheries Science Center had hoped to be here, and he was not able to make it, but he also updated his presentation that I had given back in May, and he updated the last two slides on it, and so we'll go through it relatively quickly. He was part of a number of meetings last week where they are in the process right now of laying out who is going to be doing what and when and the how, and so, while there is not a lot of new information to provide on this right now, he did really want to highlight that they are deep into the planning of this, which we'll see when we get to the last couple of slides in his presentation.

Again, the climate vulnerability analysis is identified in our EBFM plan as a critical component to look at climate projection models for the region, and it's using a multi-species approach. They are looking at species vulnerability, and, again, this is the same information that we presented previously, and they are bringing that species vulnerability into this model development, where they are using pre-existing data and expert knowledge from across the region to develop species profiles as well as assess vulnerability. Again, this is just kind of going into what they've done in other regions.

This is where we're at kind of right now. He is continuing to want to get input from experts across the region, and this is one of the things that we had hoped that he would be able to talk about a little bit more extensively, and I am hoping that we'll be able to bring him back in May, so that he'll be able to reach out to us and look for experts to provide the information that they need for the development of this.

They are currently working on funding and staffing to support this initiative as well as, and this is the meetings that they were working on last week, developing their management structure to bring in the participants from throughout the region as well as working on software tools, and that is John's update, and so that is pretty much the latest that I have on the EBFM and these components.

MR. PUGLIESE: What I wanted to do is to kind of touch back to -- In response to those, to some of the council comments, and I had mentioned the one about making sure that we have representation, but one of the other key aspects of the way the council's comments, and everybody was copied on ours that were submitted, but it was strong, in terms of, if we're going to do ecosystem-based management and some of these foundational things, that we don't need just talking about them, but they need to be accomplished.

We need to have these climate vulnerability assessments accomplished, and they need to be advanced, and, that one specifically, one of the additional comments we had within that was very specifically, and this came out of our last meeting, is that we take advantage of work that had been done with our managed species group previously in building information that went into the Fishery Ecosystem Plan.

The second one, specifically out of this group, was to take advantage of the opportunity to work with the state DNR individuals to identify the species experts, and so that's something that we need to touch base back with John and the group, et cetera, to make sure that that happens well in advance of anything that may -- They need to get that kind of early on, and so there is a couple of things that were highlighted in our comments that I think are going to be really important, is to make sure that they build on a lot of the work that was done, species-specific work that was done, in the past, as well as coordinating directly with the state representatives, so that we can make sure that those species experts are brought to the table or identified so they can provide that.

That has a lot of cross-walking, because, if we do that, that can advance as we discuss advancements in the past on some of our tools that we're developing, Ecospecies online species information systems, and we could actually integrate vulnerabilities within that. I mean, there is a lot of things that can happen, but the first thing is that these different pieces of the tools that have been recommended and have been now identified in the roadmap just need to be accomplished and need to be accomplished in a timely manner to advance what we're doing, in addition to, if you go back to the implementation plan, Attachment 1, it very specifically highlights those, but it also highlights other things, such as modeling, connection to our Ecopath modeling activity, and we'll have an update at the end of this meeting on how far advanced we are.

A lot of them, again, are converging, but, again, that foundational capability really is with making sure that some of these tools are advanced, because some areas actually are in like second-generation climate analysis, and the Northeast is already in the second-generation, and so we need to get up-to-speed and be able to address that, and it will set the stage for understanding priority species and how those influence, and it really will also provide input as we do other things that are coming down the road, and we're having discussions on the whole issue of movement of species north and coordination of how we're going to need to coordinate with the Mid-Atlantic and New England Councils on species expanding ranges.

A lot of this, I think, will help, by understanding which species have information supporting the susceptibility or the potential that they may be the ones that are going to be advancing further, and so I think there is -- Again, going back to what our comments said, there just has to be more than just words now, and we need to make sure that these get accomplished and advance this process.

MS. DEATON: Are there questions and comments now?

MR. GEIGER: A quick question. Do we have a revised timeline for the accomplishment of some of these specific projects? We've talked about it, and we've talked about it, and it seems like, at some point in time, we have to come to an endpoint that we have a defined product that we could produce and generate and show folks what this means, both short-term and long-term. Again, do we have a revised timeline to get the necessary components done so that we can reach that point? Thank you.

MS. COOKSEY: The final EBFM plan is going to be out in January of 2019. The ecosystem status report is also to be completed in 2019. It's a little bit more vague on the climate vulnerability analysis, when we expect to see a final product out, just because of the complexity and the need of having so many different kind of parts and pieces brought in, which is why they are right now trying to get that hammered out, so that, very soon, we will have firmer updates on the timeline.

AP MEMBER: Who is spearheading that?

MS. COOKSEY: The climate vulnerability analysis? John Quinlan out of the Southeast Fisheries Science Center.

MS. DEATON: Any other questions?

MR. GEIGER: How can I phrase this? During the last couple of weeks, we've had a lot of people looking for elected offices, and there has been a lot of interaction and meeting with various candidates on both sides of the aisle on issues affecting the coast, and climate change, and the effects of climate change, are high priority among a lot of those candidates that presented opinions.

I guess I would ask, on the climate variability, at some point in time, rather than try to produce as close to perfect a document as we can, can we look at just getting what we have now, with the best available information, and putting something on the table? The longer we wait, the longer we wait, the less valuable and important the information will be, and I think we missed one election cycle that we could have educated the general public as well as elected officials, and we have another two years to do it again, and I'm a little concerned that seeking perfection is not the best objective in this exercise. Thank you.

MR. PUGLIESE: I understand, Jamie, and absolutely, and that's why I have pushed the fact that we have actually had some efforts in the past that we've been working, and Mitch Roffer is here, and some of the different things we've worked in the past on have tried to advance what we know, and there is a specific format and structure that was done in the Northeast, and they provided that format and template.

A lot of it is based on informed input from experts, and so, I mean, you can ramp that up, and that's why I go back to let's build on some of the people we already have and advance it to some of the states and get the ducks in a row and get something moving forward, but I think the messaging is there, and I think hopefully that that's going to be driven further with our comments and with other ones, and I think that we're at that point that it really does have to move faster.

The good thing about our discussions right here is we have some of our partners here that are working on things that will both inform other aspects, and we'll see some presentations in the future that have direct application on climate change and issues that are affecting both the habitats and the species, and so I think the messaging from what is going on in our region and the information will advance that even further with how we do it, and we're going to be building the capability in-house to advance those things, regardless, on that, and so I think that message is pretty strong on what we need to get accomplished in the short-term, and hopefully the lion's share of what needs to be accomplished gets done well in advance of the next meeting, if not at least the foundation of exactly how it's going to get accomplished by the end of the year, so we know we have an endpoint where this is going to be a product that can be looked at and refined.

MS. DEATON: I would just like to add that I feel like progress is being made, and we've got due dates when these products will be done, and that's a good thing, and, also, the implementation plan for the council, for the Fishery Ecosystem Plan, requires working with other agencies, and so we're working with other agencies that have staff limitations, and all those things are real, and so it's hard to push someone else that you don't have authority over. However, I think there is a good working relationship among all the agencies, and they all understand the importance of these documents. I mean, this is one of the hardest things to address for fishery management long-term.

MR. WEBB: Just for clarification in my own mind, with the end product of this research and putting together the plan, is it not going to be focused, if I understand correctly, on mitigating the causes of climate change, but dealing with the consequences, from a fisheries management standpoint? I mean, isn't that our mandate, is to identify the things that are happening and decide

what advice we need to give to the management bodies to deal with the consequences, and isn't that the primary goal, or is there a larger scheme?

MR. PUGLIESE: I think the first thing is to identify the species and habitats that are -- I think we need to get out of the cart first, and then that sets the stage for how do we then get other things working, like ecosystem models that are going to evolve with incorporation of environmental parameters, temperature and current systems and everything, and how do we then translate that into affecting maybe management strategy evaluation creation, and so I think there is -- You've got to have some of the foundational information, so that then we can begin to figure out how do we translate that into things that can affect recommendations on -- I mean, I could see us going down the road to have recommendations at watershed levels, on habitat, and, once we refine information that we're getting from others, projected change that's going to affect essential fish habitat distributions, what that may mean, in terms of loss of those habitats for those species, and so I think there are things that are going to be resulting after we really get some of these down.

I think that it's all going to get there if we get the first base, and a lot of the other ones are already in process, and then it's going to be a convergence, and then it's going to be translating this, and that's going to be a big challenge, and we've already seen that with some of the SSC discussions on when you go to the higher-level discussions on ecosystem. Unless you've got all the ducks in a row on those, it's going to be hard, because you're trying to really translate it into real recommendations or other guiding principles, and so that's going to be the next real effort.

MR. WEBB: I'm just trying to clarify the scope of our mission here and the end of what we're trying to raise, and I'm not even suggesting that I disagree with what Jamie's concerns are, but, from the Habitat and Environment Committee and the management structure that we're advising, if we happen to produce information that's documented scientifically that gets somebody that's running for public office to take interest in whatever that might be a causal factor in climate change, but that's not our primary mission.

MR. PUGLIESE: No.

MR. WEBB: Our primary mission is to identify what's going on and identify the vulnerabilities and make recommendations to the managers and hope that they take those recommendations seriously, and is that --

MR. PUGLIESE: Yes, you're correct, and that was not intended to mean that -- No, we're not intending that -- This is supposed to be kind of neutral and address the issues and address what the guiding principles of this group are to the council and to our region, and so that's the real thing, yes.

MS. DEATON: All right. Well, it sounds like there is progress being made, which is a good thing, and we're going to keep at it, and I feel like our role as the advisory panel is to -- We're learning all of this information, and we're taking it back to our constituents, whether that's our agency or other staff, and get that word out of what is being done, so that they can provide input as needed to make the product better or look for that product, so that they, in turn, can take action.

MR. PUGLIESE: To that directly, in finalizing the Fishery Ecosystem Plan and then the implementation plan and now the two-year roadmap, the charge of this group is to advance

discussions on those, and so, at the next meeting, we're going to get a lot deeper into the advancements on addressing especially the two-year roadmap, and, if you go back, and I included that with our briefing material, under I think it's Attachment 2, some of those are specific to these different products that we're talking about here.

The idea is that, hopefully when we get to that point, we have pretty significant advancements on accomplishing some of what are critical actions under the two-year roadmap, and that's why they were included in there, and so I think there are some hooks to ecosystem that tie to a lot of what we've been discussing from NOAA Fisheries, but, also, there are partners that are developing things that are fitting directly in under those things, and then I think what we also will do is we will have the ability of this group to guide then what are the other partners that need to be engaged to get the rest of those different actions addressed in the short-term, and so that's really ramping up how we advance those activities into the future.

I think there's going to be definitely a more direct effort that we can engage this AP in addressing that and highlighting what's been accomplished and what still needs to be done, and then that can be a fairly forceful statement as we come out of the next generation, as we really go into using these tools that the council has put into place and based on what this panel has created.

MS. DEATON: Okay. Thank you, Roger. If there is no other comments or questions, I think we'll move on to the next item on the agenda.

MR. PUGLIESE: I think we're flipping around these two. Lisa Havel will do the first presentation, and then Jessica -- Mike can check to see if Jessica Graham is online, because it will be a remote presentation. Lisa is going to first, and I will let her open it.

MS. HAVEL: Thank you. I think this is my first official presentation on ACFHP, and so I'm going to take a little bit of time at the beginning to explain who we are. The National Fish Habitat Action Plan was developed in 2001, and it attempts to address loss and degradation of fish habitat around the country, and it's trying to accomplish this through twenty regional partnerships under a national umbrella.

The Atlantic Coastal Fish Habitat Partnership, or ACFHP, is one of those twenty fish habitat partnerships, and our mission is to accelerate the conservation, protection, restoration, and enhancement of habitat for native Atlantic coastal, estuarine-dependent, and diadromous fishes through partnerships between federal, tribal, state, local, and other entities, and so it's a long one. We work from Maine to the Florida Keys and from the headwaters out to the continental shelf.

The ACFHP region includes over 25 percent of the U.S. population and nine of the ten most densely-populated states, and it has the largest city in the United States, New York, and the most urban estuary in the U.S., which is New York Harbor, the largest estuary in the world, the Chesapeake Bay, and the only barrier coral reef in the continental U.S., off of Florida, the largest cruise ship port in the world, Miami, and the only U.S. city bordered by two national parks, also Miami.

It has fish communities residing in climates ranging from cold temperate to tropical Atlantic. It has four National Marine Sanctuaries and one National Monument, and it has the most marine

habitat of any fish habitat partnership and one of the most rapidly warming areas in the world, the Gulf of Maine.

Overall, there is a lot of people in close proximity to a lot of special, unique fish habitats in our fish habitat partnership, strong interactions between people and fish, and what ACFHP is trying to do is to make a better connection, and that's from the headwaters to the continental shelf, a better connection between fish and people and a better connection among partners. You can see Wilson in that photo there.

We do this through on-the-ground conservation, outreach and communication, and science and data. Some of accomplishments over the past five years are we have coordinated the development of the estuarine and diadromous portions of the fish habitat decision support tool, and it's fishhabitattool.org, and we have helped to open seventy-five river miles and restore over twenty-five acres of SAV, tidal vegetation, and oyster reefs, and we have increased communication and collaboration among over sixty different federal, state, county, local, academic, tribal, non-profit, private, and conservation entities.

We have contributed over $400,000 directly to conservation projects, leveraging over four-dollars for each ACFHP restoration dollar that we have contributed. We have added an estimated $41 million in economic value to the Atlantic coast, and this was calculated through a Fish and Wildlife Service calculation tool, and we also published the species habitat matrix, and I will go into more details about that now.

The species habitat matrix is a tool for evaluating the relative importance of a specific habitat type to a given life history stage for an individual species. It assesses the importance of habitat in terms of shelter, direct trophic links, spawning, and nurseries, and this was completed in 2009, and it was kept in an Excel spreadsheet format, and it was available if you emailed me for that spreadsheet.

The species habitat matrix is not an assessment of either the status or the full ecological importance of these habitats, in terms of nutrient processing, securing sediments, maintaining water quality, or broader trophic links, and it does not address all species or habitats, the natural rarity of a habitat type, habitat trends, or pelagic habitats.

We created four separate matrices for our four different sub-regions: the North Atlantic, Mid-Atlantic, South Atlantic, and south Florida. This is because there are different geographical assemblages of fishes in those sub-regions, and, also, there is geographic variation in habitat use and availability among the four different sub-regions. Regional leads assemble teams of experts, and each were assigned a set of species. We used the expertise of over a hundred different individuals for this matrix.

The matrix includes 131 different species across all four sub-regions, and this includes all Atlantic States Marine Fisheries Commission managed species, all council-managed species, all native diadromous species, and select state-managed and unmanaged species, but it does not include bivalves and species without a marine or estuarine life stage.

We looked at four different life stages: the egg-larval, juvenile/young of year, adults, and spawning adults. Only spawning adults if they were fundamentally different from the adult non-spawning

habitats. We also looked at a variety of different habitats, and these include marine and estuarine shellfish beds, which include oyster aggregations and reefs, dead shell accumulations, scallop beds, hard clam beds, coral and live hard bottom, which includes coral reef, patch reef, soft corals or anemone, and live rock and macroalgae.

We looked at SAV, both tidal, fresh, and oligohaline, and then mesohaline and polyhaline. We looked at tidal vegetation, which were estuarine emergent marsh, tidal freshwater marsh, and mangrove. We looked at unvegetated coastal bottom, which included loose fine bottom, loose coarse bottom, firm hard bottom, and structured sand habitat, and, finally, riverine bottom, which included higher-gradient headwater tributaries, lower-gradient tributaries, higher-gradient large mainstem rivers, lower-gradient large mainstem rivers, low-order coastal streams, non-tidal freshwater mussel beds, coastal headwater ponds, and non-tidal freshwater marsh.

For the scoring and analysis, there was one team lead, plus team members, for each region, as I said, and each finding was cited at least once, and the team lead compiled and combined the results to create one matrix per sub-region, and this was -- We used a set of rankings, and so a very high ranking was given a score of 4, and that meant that that habitat was an essential contributor for that particular species in that particular sub-region for a particular life stage.

A high was given a score of 3.5, which meant that it was a primary habitat, but it was not the sole habitat that that species at that life stage used. Moderate was a 2, which meant that it was one of many habitats used, and low was given a 1, which meant the habitat was used incidentally, and there was also U, for unknown to science, and a blank meant that that species did not use that habitat.

The results were published in *BioScience* in April of 2016, and this was led by Jake Kritzer from the Environmental Defense Fund and a bunch of other authors. I am telling you all of this because we did the matrix, but we're now putting it into an online query database, and this will be available next month. ACFHP is currently updating our website, and this will be part of our website update.

This database will populate in real-time, and you can use any combination of categories, and you can sort the database using arrows, and it's easy to remove any categories that you add, and there is a little "X" to them, and so it's just very user-friendly, and you can download your results or the entire database as a CSV file.

Moving on, based on the species habitat matrix, ACFHP developed priority habitats that we focus on as a partnership within each of our four sub-regions, and so, from the matrix, we decided that riverine bottoms, shellfish beds, and SAV were our most important habitats for the North Atlantic. Riverine bottom, shellfish beds, SAV, and tidal vegetation were our focal areas for the Mid and South Atlantic, and then SAV, tidal vegetation, and coral and live/hard bottom were our most important habitats for south Florida, and this was based both on the use of the habitats by the fishes in those regions, but also what we could accomplish as a partnership, and so, for example, deepwater corals in the North Atlantic are very important, but we as ACFHP don't think that we can do much about protecting them or restoring them, and so we didn't include them as a priority habitat.

From these priority habitats, we then wanted to prioritize areas for conservation, and so we started working on a southeast fish habitat conservation mapping project, and this was funded through

NOAA, and the objective is to spatially prioritize fish habitat protection and restoration sites through GIS mapping and analyses for the southeast region of the U.S., from North Carolina to Florida, and the expected outcome is to help ACFHP primarily, but also help partners identify where best to invest efforts and future project funds.

This is a pilot project, and I want to emphasize that, and it's primarily to help ACFHP in future project selection. We worked closely with Jessica Graham and Kat Hoenke from the Southeast Aquatic Resources Partnership, and Jessica will be talking after me. Kat is the GIS master for this project, and so, if you have any in-depth methodology questions, I can get you in contact with Kat.

First, we compiled an existing GIS layers and map list, and this list included over a hundred different data layers covering the southeast, and it included habitats and indicators, such as marsh extent, coastal condition, threats, such as impervious surface, 303(d) sites, fish presence, like trawl data and acoustic tagging, and these layers came from a variety of sources, such as Marine Cadastre, EPA, the council, USGS, TNC, et cetera.

For the scope of this project, we broke it down into two different sub-regions, and the first includes part of the Mid and South Atlantic, and it's a little bit of the Mid, and so North Carolina has two of our priority habitats in it, and the Mid and South Atlantic have four priority habitats, and they're the same. It's riverine bottom, shellfish beds, SAV, and tidal vegetation. Then south Florida, like I said before, has SAV, tidal vegetation, and coral and live/hard bottom as their priority habitats.

In the northern scenario, to address our priority habitat of riverine bottom, we created a diadromous assessment, and, for our priority habitats of shellfish beds, SAV, and tidal vegetation, we created an estuarine assessment. For south Florida, we also have an estuarine assessment to address our priority habitats of SAV and tidal vegetation, and then we have a coastal assessment to address coral and live hard bottom.

As far as the scope for the northern diadromous scenario, we worked on an NHD catchment scale in watersheds with diadromous fish, and we decided whether or not the catchments had diadromous fish based on the Nature Conservancy's fish habitat decision support tool alosine prioritization as well as the Southeast Aquatic connectivity project, SEACAP, results and expert knowledge from the ACFHP steering committee.

For the northern and southern estuarine assessments, we used one-kilometer-square hexagons, and the hexagons covered the NOAA medium resolution shoreline designation. Then, for the southern coastal scenario, we worked in ten-minute squares.

For the process, the Science and Data Committee met via webinar in June of 2017 to introduce them to the project, and then we met in person in September of 2017 to go over the -- To prioritize the metrics that we wanted to use in the analyses and then how we wanted to score those metrics, and we considered metrics that cover the entire region, which really helped narrow in on which metrics we could consider, and there are a lot of variables out there, but they don't cover the entire region, and so we couldn't consider those for our analysis. We also considered metrics that had the most impact to fish habitat, and we tried not to be redundant, and so we didn't want five different metrics that considered urban development or five different metrics that considered fishing.

The progress was presented to the ACFHP Steering Committee both in October and in May, and we received feedback from them, and so it's been a back-and-forth process, and then we've presented the results so far to the Science and Data Committee via webinar in June of 2018, and they also provided feedback on that, and so it's been an iterative process.

Getting into the methods and the results for the diadromous assessment, these are the variables that we ended up putting into the assessment, and they include impervious surface, point source pollution, non-point source pollution, riparian buffers, potential for species access, water usage or water storage, fragmentation, and sturgeon critical habitat. We wanted to include more fish data than we did, but we just found that, for a lot of the data that's been collected for fish, they don't go all the way into the habitats that we were looking at, and so we have a lot of great trawl data offshore, or within an estuary, but you don't get into the SAV, the oyster reefs, on a coast-wide scale that we were looking at, and so we really struggled with including fish data in that, but maybe, in the next version of this, that's something to consider.

For each metric, we had a scoring system applied to it. For example, impervious surface, we assigned that catchment ten points if that catchment had less than 5 percent impervious surface in that catchment or above it in the watershed. For fragmentation, we considered density of road crossings and dams within that catchment, and the catchment received ten points if it ranked in the lowest 25 percent out of all the catchments in the analysis.

Here is an example of a metric, and this is the water usage or water storage metric, just to show what it looked like. If there was a big dam down-river, you're going to have a lower score for that entire river. If there is good connectivity throughout, you're going to have a higher score.

Here are the results of the diadromous assessment, and so red has a higher score, and is probably better to be considered for protection, whereas an orange or a yellow is a medium score, and so that might be a better site to consider a restoration project, and, as you go farther up in the scoring, green and blue have the lowest scores, and so that's the diadromous assessment.

Moving on to estuarine, the variables that we considered were seagrass and oyster reef habitat as well as wetland habitat, and those were our priority habitats for the estuarine assessment. Estuarine-marsh-water-edge, this was included only for the northern scenario, and that was, I believe, an LCC variable that we included, and it didn't go all the way down into south Florida. Proximity to protected habitats, in this case, we used distance to the inlet, which is an HAPC, and then proximity to development, which was distance from marinas and ports. Then water quality, hardened shoreline, and habitat fragmentation, and, again, the metrics were very similar to diadromous, and they received a certain amount of points if it ranked in the top 25 or lowest 25, depending on the metric. Here is an example zoomed-in on North Carolina of what the wetlands metric ended up looking like.

Here are the result of the northern portion for the estuarine assessment. Again, red is probably a better place to consider for a protection project, whereas a yellow or an orange square might be better suited for a restoration. High scores tended to concentrate around undeveloped marshland containing oysters, seagrass, or wetland habitats, which makes sense. It's pretty intuitive. Then the southern assessment, here are the results of that same thing.

Then, finally, the coastal assessment, this one we had some difficulty with, but, for the coastal assessment, our priority habitat was corals, and we decided that all corals and habitat were in need of conservation, regardless of the quality of the corals at this point, and this is due to their slow growth and the immediate threats facing the corals off of south Florida, which includes bleaching, pollution, disease, and burial sedimentation.

What we ended up doing is we just mapped where the corals are. We used the Fish and Wildlife's unified reef map as well as the HAPCs for corals, and we just combined them. If you go to the next slide, you can see that it's just red, but that's kind of what we were going for here, is this whole area needs protection, and the restoration work that ACFHP can do is going to be a drop in the bucket, and we really just need to do larger-scale projects and legislation or whatever we need to protect the corals off of south Florida, and so it's not that informative, but it's kind of what we were going for, is just red.

These maps are available online in Databasin, and here are all of the maps combined, and I took screenshots instead of directing us to the actual website, because I wasn't sure how the internet connectivity would be here, and we also, in addition to the results, we added in a couple of other layers. For example, we have a layer for secured lands on here, and so, if you were interested in doing a project on secured lands or next to secured lands, that information is available, if that's of interest.

Here is a zoomed-in example of the northern estuarine assessment. You can select different layers and toggle them on or off, and you can change the transparency, and so here's just an example of the results there. You can also download the data for use in GIS as well.

The next steps for this assessment are to finalize the report, and I sent around the draft, which includes a lot of the methodology, but I want to add in a better introduction, conclusions, caveats, all of that, to the final report before getting it out, and we also want to create maps for each metric, and so, right now, we have the combined maps, but we want one for each metric, and we will announce when it's completed, and we also want to start work on the northeast assessment, and so a similar thing, but just pull it all the way up the coast to include all of the ACFHP region. If we can find more funding, we can improve on the southeast assessment as well.

I just want to reiterate that the goal of this is to start a conversation on identifying places for protection and restoration, and it's not the end-all-be-all, and the results are just to point to something and to say, well, it's red, but I think we should do a restoration project here because, or this is green, but I think we should do a protection project here because, and we're not saying you should take this map and then say these lands need to be protected.

For example, in the estuarine assessment, a lot of the deeper water scored high for protection, and that's because it's away from the coast, and so it's away from the impervious surface and away from the development, and so it looks like it's doing really well, but those are probably the best trawling grounds, and so we're not going to go tell fishermen that you can't trawl there anymore. That's not the point of this assessment, but it's just to start a conversation. It does not contain all metrics. For example, it does not contain fishing, and so this is a pilot project, and I just want to urge caution when using it, but I think it's a good starting point, and, with that, I'm happy to take any questions.

MS. DEATON: Lisa, I will start. It's very similar to what we've done in North Carolina with strategic habitat areas, and I was wondering, one, did they look at what other states have done, and, also, I noticed hexagons on one of your -- Did they use Marxan software, because Marxan uses hexagons, and I'm just curious if you know.

MS. HAVEL: I am not sure, but I know it's in the methodology on how the hexagons were created, and I believe it's a GIS layer that can be applied, but I'm not a GIS expert, and so I'm not sure, and we did -- We had Tim Ellis from North Carolina that was the representative on our steering committee for this project, and, actually, I believe North Carolina might be one of the layers in the Databasin, and I know we have a North Carolina layer in there, and so what you're discussing might be included, but we did consider what each state has done, because I think a lot of the states can go into more detail than we can, because they have better data for that state, but we just can't translate it up to a larger scale, and so we tried to look at what they've done and then apply it more broadly, which you lose some of that refinement, but we're such a broad area that we have to.

MS. DEATON: It's also sort of like what TNC did for the habitat compilation.

MS. HAVEL: Was it the SABMA? Was it that one? Yes, and we didn't want to reinvent the wheel here, but we just needed something that worked for ACFHP's purposes, and so we know that there are a lot of assessments out there, but we needed something that met our needs, which is why we created this, and hopefully it's helpful for others as well.

DR. BAUMSTARK: First off, this obviously is -- Clearly, a great amount of effort went into developing a tool like this, and it's very useful, prioritizing restoration efforts, and I guess the question I have might be more -- It's probably been asked before, and it might be more to Roger or other members of the panel, but, in this case, I'm sure there is some overlap with our managed species, and there is data that we may or may not have, but the question is, when these new products come up, what method, or is there a method, for us to evaluate them and maybe look for opportunities to integrate things like your matrix, or maybe even your habitat maps, and the matrix may be in Ecospecies or the habitat data and maybe web mapping applications, and is there a process for evaluating these new efforts, datasets?

MR. PUGLIESE: To that, I was going to respond, because one of the first things that I was going to say is that's the issue that we've had in the past, especially with trying to link these with the essential fish habitat, where, a lot of times, what we will usually do, especially translating this to the GIS layers, is deferring to the highest resolution, and so we'll use -- It may be patchwork in our GIS presentations online, which we work very closely with -- Our FWRI partners are the ones that are really providing these, and so the process, basically, getting to that now, is, as things are developed like this, what we want to do is be able to work with our web services and GIS services at the council and that FWRI is serving for us and figure out where some of these may inform or expand, and so I think the formal process, once we do have access to that, is to basically work with Tina and work with FWRI and work with Shaw to determine where the intersections of these different systems are.

That has been one of the things that I had problems with some of the TNC, where, if you -- Just to get a regional perspective, you end up losing some of that resolution, and that gets away from trying to get finer resolution, and what we're trying to do is to work with partners to get some, but, in certain aspects, in threats or different things, I think there may be tools, and so I think this is

exactly why we're doing this, is to have the discussions, so that we can figure, because you've got that going, and you've got some of the work that Jessica is going to get into, and then the Landscape Conservation Cooperative's conservation blueprints, and a lot of these things are still evolving, and each one has very powerful components that can be used, and this is the forum to start the discussion, and then we have some our direct linkages to make these even better tools or capabilities with our partnerships on the web services, the digital dashboard, and anything to support the ecosystem plan.

That is kind of the process to begin in, because -- That's why we want to highlight this, because this is still evolving, opportunities to make them be useful across the different systems, and this is it, and so I think the mechanism is us seeing this and then advance how do we advance these to benefit our regional partners as well as individual states in this process.

MS. DEATON: I would like just to add that I feel like it's just a tool, and it's a great tool. It's a great tool for you guys to review your grant proposals for, and, if I was reviewing proposals in North Carolina, you would have to look at several different tools, and so I would look at yours, and then I would look at maybe a North Carolina more specific thing, and I might look at what the EFH classifications are, if they weren't in those projects, and so you've got to kind of pull it together based on the specifics of what you're doing.

MR. JONES: Lisa, where is the -- Which website do you go to see the mapping and the database?

MS. HAVEL: I am happy to share that. I can email it out to you all. For the southeast mapping, it's on Databasin, and I can give you the direct link to these maps, and then, for the species habitat matrix, that will be on the ACFHP website, and the ACFHP website will be updated and released next month, in early December.

MS. COOKSEY: Tom, while Lisa was speaking, I was like let me look at this database, and so I was able to Google Databasin and get right to the link. Then, within Databasin, I searched for ACFHP, and it took me right to all of the maps that they have posted, and so it was pretty easy to get to.

MR. GEIGER: When is the final report anticipated, and what's the status of your budget?

MS. HAVEL: I keep pushing that back, because meetings keep popping up, and so the final report, realistically, in January, I would say. You have the most updated version right now, and the status of the budget is -- So, we have closed out the contracting work for the southeast mapping project, and we have funding for the northeast mapping project. If there is interest or a need to update or improve this, we're happy to work with people to maybe find a funding source to do a Version 2.0 of the southeast mapping project, and I believe Jessica will be talking next about how she might be taking this initial step in trying to move it into her realm as well, and so I don't want to step on her toes by talking more, but, yes.

DR. GEIGER: The figure of one-dollar spent for four-dollars of benefit, is that -- Is that based on the latest U.S. Fish and Wildlife Service economic analysis?

MS. HAVEL: No, that's just our literal match, and so, if we put $50,000 into a dam removal, but the project cost $250,000, then we were able to match, for that example, five-to-one for the amount

that we put in, and so we've just looked at how much money have we put into projects versus how much was the total cost of those projects for on-the-ground.

MR. GEIGER: If I had to ask a question, what is the total budget for this particular fish habitat process? Is it stable, going down, or going up?

MS. HAVEL: The operating budget is stable. It's around $100,000 a year for operating, and I'm the only staff member, and we could always use more money. We could always do more projects on-the-ground, and we could always do more science and data work, and, if we have the funding to do that, then we can bring on more staff in order to accomplish that, and so, really, there is no limit to what this partnership could do, as long as we have the funds to do it, and we're meeting -- Our steering committee is meeting next week up in Massachusetts, and we're going to discuss ways to diversify the funding that we get. Right now, we're focused mostly on federal grants, but that's always difficult and never guaranteed, and so we're creating a business plan that we hope to finalize by the end of the year, and we're looking to diversify into the private sector and foundations and all of that.

MS. DEATON: Lisa, what you're saying is the operating budget is not the budget that you use towards projects, and like how money, approximately, per year does ACFHP have to support these restoration projects, approximately?

MS. HAVEL: It varies, and so, for national fish habitat action plan funding, we receive I would say between $100,000 to $225,000 a year for on-the-ground projects, and we've also received NOAA funding for on-the-ground projects, but that's not as guaranteed as a yearly income, but we have definitely received funding for that. We have received Mid-Atlantic Council funding for research, and so we're currently funding a professor at the University of Maryland to do a research project on black sea bass in the Mid-Atlantic Bight, and so, whenever we can get funding, we apply it, and it varies year-to-year. If we get a big grant, then we spend it.

MR. PUGLIESE: Just specific to the budget, I mean, this is umbrellaed under the whole discussion about the national fish habitat plan, because I think, originally, when that entire process -- You had all the different partnerships, and you had the Atlantic coast, as well as SARP, which Jessica is going to get into now, and the intent was far more money for fish habitat restoration than has been able to be generated over time, because the idea was really the whole thing about, without fish habitat, you didn't have fish, and it really went all the way for the entire nation on it, and it has survived.

There still is a National Fish Habitat Board, of which everybody is involved, including the councils, and they have specific representation, and we rotate out the council member annually, and different councils do it, but the dollars, in terms of translation to the Atlantic coast, as well as SARP, and SARP is probably more heavily involved in the years on, because it was one of the foundational groups, and it has advanced a lot of some of the same kind of similar tools or capabilities.

Again, the dollars just haven't come as far as they wanted to to get the restoration efforts. They're trying to really engage the private sectors, and we'll see how far -- Hopefully we actually see more advancement on some of these, but the bottom line is we've been trying over the years to engage

all the regional partners to do as much as we can, and they're still advancing, with limited budgets compared to what they should have been in the past.

MR. GEIGER: I would like to see a recommendation come out of this to maximize the on-the-ground project monies for habitat protection and restoration and continue to emphasize that. More importantly, when those monies are spent, make sure you have the outreach tools necessary to immediately show all the stakeholders, as well as everybody else in the general public, what this means to them on-the-ground, because, again, you can vary about the amount of scope and resolution and everything else, but some of the maps are extremely powerful to send your message, and, again, to tell the general public how much money we're spending on-the-ground for habitat protection and/or restoration, and, more importantly, for every dollar we spend, it's generating four or five-dollars in economic benefit, or output. Those are powerful numbers that we need to update and verify and continue to express to a variety of different stakeholders, and so I hope that would be a recommendation coming out of this. Thank you.

MS. DEATON: Is that, Roger, something that the panel could do, is like write a letter to somebody or have a motion, a recommendation, to somebody?

MR. PUGLIESE: We can -- I mean, this can be part of the report-out to the council, is the recommendation, because I think where the rubber meets the road, in terms of the decision-making, is, for this activity specifically, it would be to the national board, and they're the decision-makers on divvying up the monies to the different areas.

The legislation that drives it, or the not legislation yet, because there has been proposed legislation many times to advance that even further, is something that I think -- But you do have aspects of this, as well as some of the other partners with the Landscape Conservation -- There is a lot of different ones that have the opportunity to advance that very specifically, and there have been programs that have been dropped that did exactly what you're talking about.

The community restoration grants that were originally -- Those got to -- You had to have that outreach thing on the frontend of that, essentially, before you even did the rest of it, and so they were very targeted, but they got consumed in kind of a broader directive on restoration, and so I think, back to your question specifically, this can be a recommendation from the panel to the council, and we can figure out exactly what different avenues that that messaging can go to, because I think, getting to maybe the representatives on the board specifically can advance this, to the LCC steering committees, and to NOAA in general, and that may be different ways that this can be advanced and integrated further into the way the implementation plan highlights needs.

MR. GEIGER: I would say anything we could do to emphasize any dollars showing on-the-ground habitat restoration or protection, regardless of programs, and show how they interact between various local, state, and federal agencies is a huge thing right now, and to tie into the latest economic data is going to be a very, very powerful tool. As the dollars shrink, those that have the economic input showing the best use of both local, state, federal, and private-sector dollars are going to generate support. Again, the more we can show that, from the grassroots up, I think it's to our benefit. Thank you.

MS. HAVEL: Once we finish the website update, our primary initiative for 2019, in terms of outreach, is updating all of our outreach materials, and so that's pretty broad, but one of the things

that I want to do is create pretty much a one-pager, or a fact sheet, for each state that is in our fish habitat partnership on the projects that we've done in that state specifically, and then we can share that with legislators, so they can see the great work that we're doing and how it affects them specifically, because they're the ones that control the funding, and so, if we can do some more targeted outreach to them, which we haven't done yet, I think that might be a good first step.

MR. PUGLIESE: One of the other things that I think will be really -- I think that's the way to get right to the legislative, having tools that can be used at the local and state levels. I think the other thing that -- The reason you're seeing multiple things is that what I want to do is be able to continue to advance our capabilities that we've been building with the FEP dashboard to be able to create something that gives you a regional -- Go in there to a regional perspective and say these are on-the-ground restoration efforts that are being done through SARP, being done through Atlantic Coast, and have connections.

I mean, we can get really sophisticated and work with Kathleen and our partners with FWRI to really in-your-face be able to, in this watershed, you've done this, and be able to pull up videos showing the habitats or whatever, and begin to show how that's foundational conservation and meets the directives under EFH to advance -- You know, people don't like to use the old words of "no net loss" or whatever, but some of the guidance we had on that was that restoration was going to get you to at least be able to advance those habitat conservation goals, and so do it from that perspective and link a lot of the capabilities, and I think that's going to be a lot more powerful than anything, and we set things in motion with some of the capabilities that are advancing right now with the dashboards and the capabilities.

MS. HAVEL: Also, on our new website, and we currently have a map of all of our projects, but we're going to be updating that, and so, for each project, you'll be able to -- It's a Google map, and you'll be able to click on it, and it will take you to a separate page, where it lists all of the news articles that have come out about the project and if there's a story board on a website about the project, any fact sheets that we've created, all of that, and so we'll have an individual page for each project that we've done, and then you can easily just add it to whatever you're doing.

MR. GEIGER: Roger, what you just said was spot-on. I would hope that we can sort of encapsulate what you just said for another recommendation of this panel to move forward. We talk about having these products every year, and, for whatever reason, for whatever reason, they are either delayed or postponed, and, when it comes time to the cutting, we don't have them. It's time to have those kinds of proposals and the things that you just mentioned, so we have them in our hot little hands and we're ready to go. It's more than time to do that, and so I would hope that would also be a recommendation coming out of this panel.

MS. DEATON: That's duly noted, and I agree that this is where the rubber hits the road to make a difference, and I would like to see more money put toward it. I think we're ready to move on, unless somebody else has anything. Now we've got Jessica Graham from SARP on the phone.

MS. GRAHAM: Thank you all for giving flexibility and allowing me to present from afar today. I really wanted to be there, but Hurricane Michael had different plans. Luckily, it didn't blow us away, and so I'm grateful to still be able to present. I wasn't sure who would be in audience, and so, similar to what Lisa just did, I'm going to give a little bit of background on SARP, the Southeast Aquatic Resources Partnership.

SARP, our overarching mission, which is extremely broad, is to protect, conserve, and restore aquatic resources. We were started in 2004 by the Southeast Association of Fish and Wildlife Agencies, or SEAFWA. The directors wanted to do something to conserve aquatic resources across political boundaries. Then, in 2007, we became one of the first partnerships under the NFHP partnership, and so I always talk about us having these two separate umbrellas, and so one umbrella is very state-governed, and then the fish habitat partnership is everyone has a role and a say in the governance of SARP.

With that, we have a lot of different plans, action plans, under both umbrellas that kind of govern what we do on a day-to-day or month-to-month basis. The Southeast Aquatic Habitat Plan was published in 2008, and it outlined eight different objectives and set targets for each of those objectives, and these are just what I call them in short, but native black bass initiative, connectivity, instream flows, coastal, riparian, physical habitat, water quality, and invasive species.

When I came onboard, we really were trying to figure out a more refined focus, and so I've been in this position for about three-and-a-half years now, but we're trying to narrow our focus a bit, and so I asked the state reps which -- I guess all of the reps, with the NFHP umbrella, all of the reps which objectives were most important to their agencies, and we eliminated the water quality and invasive species only, and so it didn't get as refined as I was hoping, but we got down to at least two less. Then we merged our physical habitat into our restoration, and so now we have these five main areas of focus across our region, and our region is fourteen southeast states and Puerto Rico, and so it's a large region, and we have these five main areas that we're trying to focus in on.

I am not going to go into all of those different areas, but I did want to touch briefly on them, especially the ones that I thought would be most interesting to the folks in the room. The Native Black Bass Initiative is one that has been ongoing for many years, and we worked with NFWF in 2010 and published a black bass business plan. Again, it set targets on what we wanted to do, and we chose three species of native black bass, and this is really -- In NFWF's mind, this was a way to try to raise money for warm-water streams, because there were struggling to raise money for restoration in these warm-water streams, and so this was something that they felt could really be brought to the next level and help bring in funders.

We have been going on that for about eight years now, and it was a ten-year business plan and so now we've been making really great progress, and the Guadalupe bass is doing really great over in Texas, and, for the shoal bass, we're into the restoration, and we've identified areas for restoration, and, for redeye bass, there is still a lot of research questions associated around redeye bass that we're working to try to address with our partners.

A lot of this is governed by science, and so we really are trying to show that we're not just going out to random landowners and trying to work on their property, but we are trying to be more strategic in how we are working, with the understanding that it all depends on the willingness of private landowners, and the southeast is 95 percent privately owned, and so we have what we call a threats assessment, but we have translated it into actionable layers, and so we have different layers, and you can click through.

There is acquisition layers, a sedimentation layer, threats management practices, connectivity, and so this is just different areas that are going to tell you where to do certain actions, because we were

able to kind of figure out where the threats were, but it didn't give us that much information as to what those threats were, and so we tried to split the analysis a little bit and get actionable layers out of that, and we're working on setting this up in a publicly-accessible story map, so that folks can toggle through and zoom-in and do what they want to do in order to try to get more folks working towards the same direction.

Again, it's a lot of habitat restoration. For the Guadalupe bass, a lot of the research questions were already answered, and they were able to do a lot of restoration. The Chipola River had some research questions to be answered, which have been, and now we're into the restoration for these species, and then, again, we've been able to secure some money for them to do some research on habitat use and introgression rates in the Savannah River Basin, and we're hoping that we'll be ready to do restoration in the next year or two in those areas that have been identified.

The next program, the connectivity program, I talk about this as having three different components of inventory, prioritization, and connectivity teams. The inventory, we have -- We call it the Comprehensive Southeast Barrier Inventory, and so we manage the most comprehensive database of barriers in the southeast, and so you will see on this slide, at the top, is what you can access through the NID and the barriers that are there, and then we have added is in red on the bottom, and it's a bar chart as well, and so we've almost tripled the number of dams, and we've added in culverts, bridges, and fords, which are low-water crossings.

This is all for the goal of trying to really understand the level of fragmentation in our rivers. What we were finding is that we couldn't understand instream flow, because there were so many more barriers than were in the databases, and so nothing was working with in-stream flow, and it led us into this connectivity realm, which has really allowed us to better understand our river systems and what may be threatening some of the species that we're seeing, the at-risk species.

Prioritization, we do a lot of different prioritizations for the users, and some folks -- We have a SEACAP tool, which some of you may be familiar with, with TNC, and we've kind of taken that tool, and we're trying to make it bigger and cover our entire region, but then also refine it based on our user feedback, and so we've been trying to really almost -- I don't want to say dumb-down, but kind of make things a little bit more streamlined in how folks are prioritizing, because there are so many metrics that can go into the different barriers that, a lot of times, you end up double-ranking something, because it comes twice and it's a redundant metric, and so now we're trying to look at what is our connectivity benefit, and then that is also the miles of habitat gained by a barrier removal.

Then water shed condition is composed of three different metrics. It's percent natural land cover, average sinuosity, and the number of river size classes gained by the barrier's upstream functional network. We are trying to at least give that as a baseline prioritization and then allow users to put in additional layers, and so some layers are barriers that are important for mussels, and so we would overlay the mussel layer, rather than having that in the actual prioritization, and, that way, we have a more standardized prioritization across the region, and then users can put in their own individual mission-specific metrics.

The most important part of our connectivity team -- Well, they're all important, but the connectivity teams really make this program what it is, because these are the folks that are telling us information about the barriers, and they're gathering more barriers for the inventory. Without

these connectivity teams, which are made up of people all over the states and different sectors that make up these teams, and, if we didn't have them, we wouldn't have a very comprehensive inventory.

These teams are state-based, and we help support a team to be picked off, if they desire it, and so it's not something we will go in and say we're going to start a connectivity team and that's the way it is. We usually wait for someone to ask, and we wait for a champion, because we can't actually manage each one of these on our own.

Tennessee and North Carolina were kind of already started before we really had this formal connectivity team and connectivity program, and so Tennessee and North Carolina are both state-run, and they have a strong partnership with American Rivers to help with the programs in those states, and then we've started a Georgia team with TNC and an Arkansas team with the Heritage Group, and we're hoping to have a Florida team. We just did a kick-off workshop, and then Hurricane Michael cancelled our second kick-off workshop, but we're going to be revamping that and hoping to get one started up in Florida as well.

These all make up our connectivity program, and we're able to get a lot of folks excited about barrier removal, where, most of the time, they're just -- A lot of people don't think that it's possible, but we've had some successes with these teams, and it's all about trying to get more people doing projects on the ground.

We're working on trying to get this inventory accessible to the public, and so we are working with the Conservation Biology Institute to create a barrier prioritization tool, and it's, again, a similar concept to the SEACAP tool, but it will be across our entire region and a little bit more user-friendly, we hope, and so these are just some snapshots that are hopefully going to be rolled out at the end of this year, at least Phase 1.

This is something that I just wanted to bring up, and it's a little bit in the details, but we have a standardized protocol stream crossing, and so we train folks, similar to what happens in the North Atlantic, but we do it across the southeast on how to assess culverts to determine a barrier, and so it gives the culvert a score on whether or not it's a barrier to fish passage, and I bring this up because the Coastal Group, which I will talk about next, identified culverts as a gap, and that's a gap in our dataset, and it's also a gap of understanding for the folks that make up our Coastal Group, and so I just wanted to kind of put that in the back of you all's mind.

The coastal programs, we used to have a stronger coastal presence prior to me coming onboard, and we were run in with NOAA's Community Restoration Program, and so we were helping to get projects on the ground with our partners across the region. Once the funding was spent out of that agreement, we didn't really keep our presence in the coastal arena, and so now we're trying to kind of get back into the game, I guess you could call it, but, before we did this, we had a number of conversations with the steering committee as well as the coastal reps of the member states to determine whether or not there was a role for SARP in the coastal realm.

There is a lot going on, especially in the Gulf, and there is a big difference from the South Atlantic to what the Gulf has, as far as resources go, and so we didn't want to step on anyone's toes or be redundant to anything, and so we had a number of conversations for I would say almost about two years, and it was determined by the member states and federal partners that there was a role and

that we needed to make sure to identify what that role was, and it's been really great, because a lot of the members that are the state members are also members on the Gulf of Mexico GOMA Initiative as well as -- Well, there is no longer the South Atlantic GOMA equivalent, but there were some folks that had been involved in that as well, and so they kind of have lessons learned from that.

Our biggest thing, and kind of almost our governing pillars, are that SARP aims to be value added. We don't want to be redundant, and we don't want to step on toes. There is a lot going on in the coastal realm, but we do have a niche that was identified by the states in connecting the Gulf and South Atlantic regions together, coordination and science support, and even just grant writing, fiscal management support, anything like that.

Another interest of the committee was topical workshops, and so the ability of SARP to be able to hold workshops for folks to be able to come and discuss different things, and so coastal hydrological impairments, and, again, the coastal culverts was something that they identified as an interest, derelict crab trap removal and recycling, trying to find innovative ways, and then freshwater inflows and upstream connectivity, kind of circling back to what we used to have before we got into the connectivity realm.

Again, all of this is really our way of trying to figure out what are the needs, what are threats, what are the actions, and getting more projects on the ground. We're trying to really be that delivery network and providing the support, and, again, the value added to the different agencies, to make sure that we can get more projects on the ground and make a difference in the region.

With this, of course, comes this wonderful thing called effectiveness metrics, which I'm sure everyone in the room has heard of, but we are getting more and more pressure, especially by the funders, to get a lot of federal grants, and they want to know how many fish they're getting for their stream-based restoration projects, and so we're really good at having these project-level metrics into these short-term responses, and so we're going to restore one mile of stream and ten acres of habitat, and it's going to reduce this much sediment short-term, but what we have a harder time doing is doing the regional-level metrics into the long-term biological responses, and so being able to connect everything in that system to understand, if we put retrofits on the center pivot to make the water use less, it's going to help a population of mussels survive or repopulate in a stream in critical habitat downstream.

It's trying to understand those responses, and that's what we've been really trying to do with the South Atlantic LCC, or previously known as South Atlantic LCC. Rua and that group has been helping try to understand the flow component and what we're doing with restoration there, and so that's kind of our first step of how can we do this.

The next step, which builds off of what Lisa spoke about, the assessment that we did for ACFHP was kind of a quick-and-dirty assessment, filling the need that ACFHP told us that they needed to be able to fill, and so we think that we can really take that to the next step, and so we have a good idea of what is there and the layers, and there is more layers out there, of course, but we're trying to do a more cross-scale approach to modeling the coastal habitats and biota by including the watershed scale, the upstream level, with the coastal habitat metric and then understand what's going on with the coastal biota.

We can do this with hierarchical Bayesian analyses, and I am by no means the expert. This is out of a partnership with Clemson that they are the experts. I just tell them what we need, and then they try to figure out the science behind it. Watershed-level factors and datasets, a lot of this we've already compiled and merged and put to the region of the South Atlantic region, and so anthropogenic land use, human population size, and this is, again, by no means an exhaustive list, but just examples of different things that we would want to make sure that we have in the dataset.

Then the coastal habitat variables, again, we have a lot of this already from that ACFHP assessment, and this is where I think we could learn a lot from you all in the room and your partners and kind of understand what are the other datasets out there that might be able to refine this, and, if anyone has ideas -- I heard that folks were talking about the North Carolina information, which is a layer in the database, and I forgot to mention that, but trying to figure out that smaller, more refined scale and then growing that out to the regional, so that, when you go regional, you are not losing that resolution, but it is very difficult with the existing variables and datasets out there, and so being able to refine those would be a great, great effort.

Then the coastal biotic data, again, I think, if folks have better ideas of what's out there, and we have the SEAMAP, South Atlantic SEAMAP, that we would use, and my understanding is that, when you get into coastal biotic data, it starts to get tricky, and so, if anyone has lessons learned, and I know that the Clemson folks have great methods around being able to accommodate for sampling efforts and sizes and different methods, but, again, lessons learned is always great.

What we're trying to do is link these variables to the hierarchical Bayesian models and allow those to be able to say, okay, coastal habitat variable Y and watershed variable X, and this is the trend that we're going to see and then connect that then into the biotic variable.

This is an example that kind of got us thinking in this direction, and this is out of South Carolina DNR, Mark Scott's work, and this is in Savannah, I believe, but he's working on doing it across the entire state. He took a lot of time to do a lot of various sampling for different fish species and assemblages and then has taken information on the landscape characteristics, and so now what you have is sort of a decision support tool of, so you have this variable on the left, and then, if you decrease your forest by a certain percentage and you increase your urban by a certain percentage, what happens to the density of these different species, and so it's a tool to be able to look at what might be happening to the fish species when certain landscape actions are occurring on the landscape.

We're trying to get around this, so that maybe we'll be able to say, okay, if you increase the riparian habitat, like our funders are wanting, that this is what you might see if we can also get some more money to do this much more, and so it's all trying to connect back to what those effectiveness measures are. Again, it's taking our delivery network and then trying to figure out what is our return on investment, and so what are folks seeing in response from the work that we're doing on the ground?

I just wanted to mention, and I didn't put this in there, and I'm not sure why, but I just put together an annual report, and some of the information that you were asking Lisa for I have in there readily available, but it does tell a message, and so one of the things, through our fourteen years, is we've had about $79 million of ecosystem services annually that we're providing to our on-the-ground restoration projects, and that just continues to build. The more projects we do, the greater that

gets, but it's trying to get those metrics and trying to get more money on the ground doing projects. I think that's all I had, and so I will be happy to take any questions.

MS. DEATON: Thank you, Jessica. I would like to open it up for questions or comments.

MR. GEIGER: That was a good presentation, Jessica. I guess my question would be, if you had to identify the greatest strength, in terms of return on investment with SARP, what would it be?

MS. GRAHAM: The greatest strength, I would probably say our science support, but it does depend on the region of the southeast that you're talking about, because we do have some on-the-ground presence in certain areas, where we can actually provide support on how to fix the project, which is a big gap in the region. It's folks who know this is what needs to be done and this is how you do it and this is how much it costs, and we have that in some small areas, but, broadly, I would say our science support to be able to connect the science to the management decisions, which is really where we're trying to focus.

MS. DEATON: All right. I guess one question I have is how much interaction does SARP have with ACFHP, not knowing -- I am not really familiar with that, and maybe others are, and do you know?

MS. GRAHAM: We interact a lot, mainly by email, I think, but we try to make sure that we're each aware of what we're all doing, and we try to do joint grant proposals for projects as well that address both of our missions, and so I think we're trying to be, again, value added to ACFHP, and I don't want to put words in Lisa's mouth, but the same on the ACFHP side.

MR. PUGLIESE: One of the reasons that I was real anxious to have you do a presentation on especially the proposal to advance some of the refined mapping, et cetera, the characterization, et cetera, was the opportunity to coordinate -- As you indicated, a number of the people that are directly involved with what may make that, again, a more effective and useful tool are sitting around this room or are involved directly with the Habitat and Ecosystem Panel.

I think we're early enough in the process that hopefully that's going to be something that we can really -- Again, just as I discussed with Lisa, we'll be able to provide additional guidance and additional opportunity to figure out how to closer integrate, and it sounds as if you're already looking at that, because of the ability to look at that finer-resolution distributional mapping or capability that would be ultimately still representative, and I think that's an important aspect, that this group provides that linkage, or the invited participants even, because I think we have representatives relative to the fishery-independent surveys, et cetera, directly involved in these discussions over the next couple of days.

MS. GRAHAM: Yes, absolutely, and this was a proposal that we submitted to the NFHAP coastal assessment opportunity, and we didn't get it, which we were just told on Friday, but that's not necessarily going to stop us. We're just going to look for additional funding and other grant opportunities for it, but one of the things we wrote in there is needing to really increase our partnership with the folks in the room there and your partners, because my background is coastal, but, when it comes to fisheries, I am not up on everything, and so I really need to lean on others who are very familiar with it.

MR. PUGLIESE: Thank you, Jessica, and one other point is I think this is where it's really important, as we move down the road in refining some of the capabilities and tools, where we can highlight how the different regional partners are providing capabilities that we may not have at the council level or the state level or whatever that -- I think, in the way we're building our digital dashboard or things that highlighted those activities that were linking back to council activities, to essential fish habitat, to support of fisheries.

The more we can highlight the programs input into the region in those different -- Similar to what I had mentioned before about restoration, and I think the better that that's going to help all of us, and so we've built some of the beginning activities, and I think it's going to take, again, closer coordination with each of the groups to make sure that we both represent it well, but also make those linkages on these products as they're developing. It will also provide the capabilities for us to better understand distribution of habitats and species and change relative to that, because everybody is bringing very useful pieces of the puzzle together in these discussions.

MS. GRAHAM: Absolutely.

DR. BAUMSTARK: This feeds off of that, and so, most of the products you talk about, it's very clear how it fits into this, but I want to ask about the structured equation modeling, which I guess, in a sense, at that watershed level, where it's almost an ecological model that Cornell is developing, and so you guys are driving that, and I'm wondering -- I've seen it a lot in smaller scale, with specific applications they're looking to get out of that, but what is the intent of that? What do you see coming out of that?

MS. GRAHAM: With that whole effort, we're really trying to understand -- Because we put a lot of money on the ground, and we do a lot of projects, but we're not really sure exactly what that's getting us in the long run, and so we're trying to better understand, in the theoretical component, until we can prove it later, right, but, in theoretical component, what that can be for the species that -- You know, we always talk about the species it's going to benefit, but, in order to really determine that and see that, it takes a lot of money and effort to do those monitoring efforts, and that's not something that we can do, and it's something that has to be very targeted when you're doing it project related, and so we're trying to back up and do it at a larger scale, to see what is coming out of these projects and whether it's an individual project or multiple projects in the same area, but just what might come out for our species, if we can do it.

Really, our goal is to be able to bring more money into the partnership and the region, and so we want to be able to say, look, this is based on science, and it's been vetted by science experts, and this is what we're hoping will happen when we do this project that we're telling you that we're going to do and that we can do, and so give us this much money, and then, if you don't mind, add some more.

DR. BAUMSTARK: That makes sense, and so that's the ROI part of your puzzle. Thank you.

MS. GRAHAM: Yes.

MR. PUGLIESE: Thanks, Jessica, again. One of the things that I will dig back further on is that we definitely have a very close connection back to SARP, because, in the original Fishery Ecosystem Plan, the fish habitat plan of SARP is an appendix to our Fishery Ecosystem Plan, and

so we have set the stage and, even within that document, identified that some of those targets and different things were a first-level approach to try to get to some of these issues of restoration goals and watershed-based initiatives, and so I think we've got some foundation.

What we want to do now is to do what I had indicated earlier, is to figure out how do we advance this. I mean, the FEP dashboard provides a nice vehicle to cross-walk between all of our partners, but then the various spatial layers are going to be really critical to be able to advance that, and so I think we're going to probably look at some maybe specific GIS meetings to advance this kind of coordinated effort and advancing the dashboard as well as the spatial connections here, because I think they have implications for a lot of what we're working on, and even I think all the way into the future generations of the regional ecosystem modeling efforts, because some of those different types of layers, if they're designed right, are going to be things that may influence of affect things like Ecospace and Ecopath modeling efforts into the future, and so this is exactly why're having these discussions, as the springboard to take it to the next steps. We've got a lot of foundational opportunities, and things are maturing at different levels, and here is the opportunity to go even further.

MS. GRAHAM: Absolutely. One thing that I did want to mention is the North Carolina is a layer on Databasin, and I mentioned that, but, if there are other folks that have done something that want it up on that Databasin, to overlay with the ACFHP assessment, we can easily put that up, and so it's just a layer that you can toggle on and off, and so, if there's other folks who want to see how their stuff matches up with that assessment, we can put that up there.

MS. HAVEL: As I was presenting, I was also thinking that we should probably add more climate change layers, if they're in there, like projected sea-level rise and stuff like that, because that would be really cool to have on top of the conservation areas as well, but I will email you offline.

MS. GRAHAM: Okay. Sounds good.

MS. DEATON: Are there any other questions or comments? All right. Thank you, Jessica.

MS. GRAHAM: Thank you.

MS. DEATON: Next on the agenda is lunch, but we're early, and so I don't know what you want to do, Roger.

MR. PUGLIESE: Our next presenter is still in transit, and I think he's going to also be involved in the second part of that discussion on natural events, and that is about the main open -- I think that we were hoping that the Navy discussion was going to kind of take up most of the afternoon, or I think a big portion of the afternoon, and so what might be good is do you want to start this discussion?

MR. GEIGER: One thing strikes me. As these various partnerships group mature and evolve, it almost seems like they need to determine what they do best, what is the greater strength they have in the various partnerships. I think, between SARP and the National Fish Habitat Partnership, there is a definitive overlap and integration, but what does SARP do best, and what does the National Fish Habitat Atlantic Coastal Fisheries Habitat do best?

You can't be jack-of-all-trades, and so you need to focus, and I would hope this would be a recommendation coming out of our grassroots panel, that they need to prioritize what they do best and how they best can add, and then hand it off to another partnership group that may have greater capability or scientific support to take that information and factor it into more applicable models and so on.

Budget is going to drive this. I think legislation, ultimately, is going to drive it as well, but, right now, you're at a critical point. I would hope that we're looking to refine some of the best products that each one of these partnerships provide and then hand it off to the next partnership to further evolve and develop. I am seeing a lot of people doing the same things at different phases of the watershed.

When we developed the National Fish Habitat Action Plan, our vision was continental divide to the continental shelf, and it was that broad, and then we started focusing it down to the watersheds and in the states and into everything else, but it started with that basic concept of continental divide to the continental shelf, and I think enough time has passed that we need to re-examine what the greater and lesser strengths of each one of these partnerships are. What do they bring to the table to support that greater strength, and then hand it off to the next partnership group that can take that and evolve it to the next step, targeting what that specific agency mission or function or role and responsibility is. I think we're getting to that point, and I would like to see that as possibly a recommendation coming out of this grassroots. Thank you.

MS. HAVEL: That's a good point, and each Fish Habitat Partnership is so different. Like there are some Fish Habitat Partnerships that don't do any science and data. They mostly do outreach, and others are more on-the-ground, and some don't do any on-the-ground work. Around 2:00 p.m. on the second day of every steering committee meeting, we have this existential discussion of why are we here, and everyone wants to be there, of course, but why are we here and what makes us special, and why ACFHP, and what we keep coming back to, for ACFHP at least, is our tag line of making the connection.

We're kind of like the Rolodex on the Atlantic coast for, if you have a question -- For example, Pew Charitable Trusts contacted me recently, and they were like we're going to shift away from fisheries into fish habitat, and I was like, awesome, and they said, well, I have questions about oyster reefs, and who can I talk to, and I put them in contact with everyone in the ACFHP partnership that worked on oyster reefs, and he was able to talk on the phone with January Murray from Georgia and other people, Louis Chiarella of NOAA, and he was able to reach multiple people just with that one phone call to me.

We do this time and again. For example, if we receive a project that needs funding, but it's primarily focused on invasive species in Florida, and we don't really work on that, our representative from Florida was like, hey, we actually have a different pot of money that works on invasive species and let's use that, and so we helped to get that project funded, even though we didn't end up putting any money towards it, and so it's hard to capture that in our measurable successes, but I think that is, at least for ACFHP, what we do best is we can put you in contact from the federal level down to the local level, the person that is the expert and can help you get what you need done, and so that's at least, I think -- We're trying to figure out how to market that and how to repurpose that moving forward, but I think that's kind of where ACFHP has come to as what we do best.

MR. PUGLIESE: I think the bottom line is -- I was involved in SARP, as I mentioned, mostly over the years, and it always came back to budget, because the vision you had is exactly what it was. There were even statements made of, if they did it for ducks for the nation, why can't we do it for fish and make that strong linkage in habitat and fish, and the problem was is the dollars just did not materialize, and the linkages back to the sectors didn't materialize as far as people wanted, but I think we're at a stage, and this is exactly why we're having these discussions, is to draw on the best of all and figure out how they can do it.

That's why I mentioned things about connecting it with what we're working on, because that is added value. If you identify that this product is guiding how we look at specific watersheds and loss of essential fish habitat, and we can link that to how many permits were reviewed in those areas, which we're building some of those very specific layers now already with partners in NOAA, et cetera, it's going to advance these and build on those strengths, and so we are at that stage to at least get the best we can out of these different things, and I think the presentation with Jessica, in terms of some of that fine-resolution capability there, has aspects that the states can use. I think this is the time, and I think they are doing that, because they're having to do that, at least to the degree they can at this stage.

MS. DEATON: I think we could answer Jamie's budget question fairly quickly. David is coming up, and he's from NOAA. If you could introduce yourself and give what you know about the NOAA budget.

MR. DALE: I'm David Dale with the Habitat Conservation Division at the Southeast Region. I had a meeting with Dr. Crabtree, our Regional Administrator, yesterday, and that question was posed to him, and, right now, the FY19 budget is unknown. We're under a continuing resolution until early December. The good news is that keeps us at a relatively flat funding, and so we're not losing money, but there is talk of a rescission, and, of course, the administration is talking about that, but I think a lot of that will hinge on what happens by seven o'clock tonight.

Of note, last year, we were successful in the Senate mark-up included an additional $8 million to augment the essential fish habitat consultation program, and the Southeast Region made a successful bid to our agency management for about $1.8 million of that. I don't know if that's one-time funding or if it's going to be long-term funding or if it's even going to come around when the budget actually does get passed, but that's kind of where we're at right now.

MS. DEATON: Just one question. I had heard, from North Carolina specifically, and we had an EFH permit reviewer leave, and they had a vacancy, and now I've heard that they're not allocating as much time to the EFH permit reviews, and is that budget related, or not enough -- What's going on there?

MR. DALE: It is. As we lose people, particularly through retirements, there is kind of a backend hit on our budget from those folks leaving, and we're using some of those lapses in bringing people on to cover the gaps in our funding. Again, we've been flat-funded for several years, and our labor costs are our biggest costs, and those continue to rise, and so we've got to have those flexibilities built in that way. Again, with the $1.7 million, we're looking at trying to get I think ten people onboard. In Texas, we're not looking at permits right now at all. We're not, essentially, doing any EFH consultations there, because all we have is a supervisor covering that whole state.

MS. DEATON: So those ten positions are for the whole -- Is that the South Atlantic?

MR. DALE: The Southeast Region, and so Texas through North Carolina and Puerto Rico and the Virgin Islands.

MR. PUGLIESE: I think that's good news, because, also, it aligns really well with the discussions we're having at this meeting, because that's one of the things we're trying to do, and we'll get into some breakouts, and we'll get into discussions, of how we can ramp up those connections on addressing EFH and supporting the consultation process and building tools and how it's been done in the past to really connect in EFH with ongoing partners on this, and I think it all is weaving together really well with some support money through their end to make it actually translate to something real, and so I think it's really timely.

MR. GEIGER: Just an observation on this. Again, probably I'm an old-timer that has seen this cycle go through at least four times in thirty-five years, but I will offer possibly a piece of advice that, right now, I think the agencies would be well served, rather than build up headcount or infrastructure, it would be better to ask what do we do best, in terms of that particular research environment, research and habitat restoration environment, and do that well, partner with other agencies that may have other resources to do that, share the credit or the blame, whatever it may be, and then utilize that to lever, in terms of return on investment, in terms of leveraging those dollars to show on-the-ground results.

I mean, it almost seems that that is a survival mechanism that needs to be implemented, not only by the federal agencies, but also by some of the other state agencies as well, and now, more than ever, that's the way you can get around some of these type budget cycles, but I will tell you that I would not necessarily increase my FTE level right now.

I would look to leverage that in terms of on-the-ground results and also leverage the FTE requirements with IPAs or anything else with other federal agencies or other states. Get the state guys coming to the feds, and vice versa, trade them through IPA agreements, and that will save you a lot of money and a lot of overhead and get more on-the-ground results. That's just a little bit of expertise for you all.

MS. DEATON: Thanks, Jamie. As far as your question about state budgets, I can say, for North Carolina, I feel like we're kind of stable right now. We're not hearing talks about huge cuts. Our budget has a little surplus, but we're not seeing increases either, and so we had a lot of cuts over the last four years or so, and so that's all I can really say for North Carolina resource agencies, unless anybody else -- Does any of the other states want to have input?

DR. BAUMSTARK: I can say, for Florida, our fiscal is July to June, and we're heavily reliant on federal funds for fish, the Fish and Wildlife Service, Sportfish Restoration, for monitoring, independent monitoring, SEAMAP and those things. Our trust funds could be healthier, but they're sustaining us, and a lot will ride on the governor's election today.

MR. GUADOGNOLI: Unfortunately, I don't have the data. I could take a stab at it, but I don't want to misrepresent it, but I could get back to you all.

MR. MARTORE: I think we're similar to what you mentioned for North Carolina. Again, I don't know the budget for the entire organization, but, for the past several years, we've been relatively stable, no big cuts, but no big influxes either, and so we seem to be holding our own.

MR. GEIGER: For the states, I would look real hard at the number of licensed hunters and fishermen and look at trends for those for the next three to five years, because that's going to reflect your DJ Wallop-Breaux funding, and it may not necessarily be for the better, unless that formula is rearranged or redistributed, based upon legislation, and I think there are some real issues that the states need to really focus on, especially those states that are relatively heavily invested in federal funding, to really look hard at that and start taking some possible analytical steps to look at what-if scenarios.

Certainly I'm seeing, especially in the hunting area, significant reductions of hunting licenses, and I think fishing probably will not be that far behind, as some of the more activist groups, like PETA, get more involved in animal health and safety and animal -- How would I say it? The hurt issues that they are bringing up that we have very little response for right now. That's not on our radar screen, but you might want to check that out.

MR. PUGLIESE: Just about the states, South Carolina does contribute the most significant fishery-independent survey, with the SEAMAP and MARMAP systems being funded through, but for the region, and those are critical foundational areas. Additional funding comes through NOAA Fisheries specifically, with the SEFIS program, and there needs to be an assurance that those programs, all three of those programs, are fully funded.

A third is still in the air, in terms of what those numbers are, and hopefully those are going to support all three, because the way the system works in the Southeast is they're all joined at the hip, but South Carolina bears the lion's share of the support of the fishery-independent surveys, and those are some pretty significant ones.

Another budget side that is a good one, from a historical connection Bob has, is the artificial reef programs. They have been very successful at ramping up connections into the Charleston Artificial Reef, where they have really significantly made that linkage, to the degree where you're getting million-dollar investments in the resources in the protected area, and it not only is serving its function for the protected area, but having the secondary benefit of being a very significant pelagic opportunity, and so the message has made it very strong, and that sounds like it's getting ramped up into even some of the other areas that have been designated, Area 51 and Area 53, et cetera, and so I will let Bob -- I was going to ask him to actually report on that earlier on, but I didn't get a chance to, but, on that level, engaging information is really translating to a lot of support.

MR. MARTORE: We are getting additional support for that. We haven't quite reached that million-dollar mark, but we are getting some significant donations to the program, primarily because of the deepwater MPA reefs. That's something we're -- Our connection to the council and being able to have things declared SMZs and MPAs and things like that, it really has made a big difference to the fishing public and what they contribute.

MR. PUGLIESE: One thing that I think is really interesting on that, and eventually maybe we can get a report from Bob on that, is that the real interesting aspect of that really gets to the issue of ecosystem activities, because of the biggest benefits that came from there -- I still remember, in

discussing where to place that, was the fact that it was close enough to some of the known pelagic fishing areas that, if the structures were there -- Sure enough, in last year's Governors Cup, you had some of the highest catch rates on sailfish in South Carolina that have ever been recorded in the state from that area. You talk about a big sell and understanding, beyond just the benthic systems and how these entire systems are connected and interact, and that was a good promo for understanding the bigger picture.

MR. JONES: Was that funding coming from public government sources or private money or both?

MR. MARTORE: That was almost exclusively private money, private donations. Because of the way our artificial reefs are funded, we couldn't technically build an unfishable artificial reef, and so we had to rely almost exclusively on public donations.

MS. DEATON: Thank you. I was thinking that we have time to probably move forward and do the presentation on the Atlantic fleet testing if Laura is prepared.

MR. PUGLIESE: As Laura gets ready, I really appreciate her advancing this, and especially with connecting with Cindy, because I think one of the keys on this is that there was a very clear indication of how they joined the real need to address the EFH directives under this effort, and so I think this is a good example of working with our partners to advance that coordination and the consultation process.

MS. BUSCH: Thank you. I'm Laura Busch, and I'm with Fleet Forces Command, headquartered out of Norfolk, Virginia. Cindy Cooksey is going to help me on maybe a couple of slides, and I will let her jump in if there is ever questions on the consultation process for EFH. Here is just a quick agenda of the things that I'm going to cover really quickly, and I will warn folks that my slides have a lot of words on them, and I don't plan on reading all of them, but we'll just kind of talk through it all, but I wanted to kind of get some of that language on the slide so that you could see what mitigations that we came up with.

This is just some quick background on the Atlantic fleet training and testing environmental impact statement. It covers all of Navy training along the east coast and in the Gulf of Mexico. We have to do this environmental impact statement in order to get our Marine Mammal Protection Act permits, and those permits previously had a life cycle of five years, and so, every five years, we had to kind of redo our documents and start over again, and this is the second phase.

It's actually called the third phase, but it's the second time that we did this large, comprehensive environmental impact statement that covered the entire Atlantic coast and Gulf of Mexico, and it's basically to allow us to conduct training and testing in those areas. Then there is different Navy offices that are involved in it, and that's why it's so large, but, just real quick, the goal is to maintain training sea space, flexibility, and permit capacity to support our realistic at-sea training while complying with applicable environmental laws.

This is our study area. It covers what is the new Second Fleet area of responsibility, and it goes all the way out to what we call the chop line. As a ship heads over to Europe, once it crosses that middle line, it's now chopped to the commander of Naval Forces Europe, and so most of our training is conducted in the boxes, the op areas, along the coast. We do a little bit of training --

They will do a little bit of training on their way out to sea, if they're going to chop over, but that's our big study area.

This is the EFH consultation process, and here's where I will invite Cindy to jump in if there's anything that she wants to add to this. Basically, the agency submits a notification to the National Marine Fisheries Service. In our case, we submit it to both the Northeast office and the Southeast office, and then we submit the EFH assessment, and NMFS reviews that EFH assessment, and they provide recommendations back to the agency, if necessary, and then the federal agency must respond if they're going to accept those conservation recommendations or why they cannot accept them.

As I mentioned, this is the third phase of our documents, and, through each phase, we've created mitigations that we then included as part of the proposed action in each year. Once we're say we're already doing those mitigations, they're part of the proposed action, and so that's how we put them in the next phase.

The way that we develop mitigations is we have both a scientific and an operational look at them, and so a scientific basis is we have to make sure that it does help the species that it's targeted to and also make sure that it doesn't push impacts to another species by taking it off of one species. Then, the operational feasibility, we have to make sure that it doesn't impact our training, our safety, that it's practicable, and that it doesn't impact military readiness. If we had to continually push training further and further off the shore, it would take ships forever to get out there to train and then get back, which just increases the time out at sea and starts to reduce your military readiness.

We have two different types of mitigations. We have mitigation zones around an activity, and so, before a ship will conduct say a gun shoot, it has a zone that it has to look at to make sure that there is no protected resources within that mitigation zone, and those are regardless of where the activity is conducted, and so that mitigation zone is attached to that activity, and then we also have mitigation areas where we have certain mitigations that are applicable only to that one mitigation area. We have a lot for the North Atlantic right whale, different mitigation zones and areas for that species.

Then we also have standard operating procedures, and we went through all of those and determined that there are some that do offer benefits to protected resources, marine mammals, or fish, or whatever the resource may be, even though that wasn't the reason that it was developed. Area clearance is one, and they also make sure that there is no commercial fishing boats or recreational folks out in an area, and so that also protects other resources, because they have to clear that area. Then, also, obviously, animal strike avoidance, and a ship does not want to strike a whale, because it can be bad for both of them, and so they avoid those.

The different consultations that we're doing under the Atlantic fleet training and testing EIS, our Marine Mammal Protection Act permit is on its way right now, and we should be getting that within the next week. Our current permit expires on the 13th, and we should have this one in place by the 14th, and we also consulted under the Endangered Species Act with both NMFS and Fish and Wildlife.

We do have our biological opinion from NMFS, but it doesn't go into effect until we get the MMPA permit, and then we consulted with Fish and Wildlife, and you can see the species we have up there that fall into our study area. Bats was a new one that we added to this phase. They are finding more and more bats are traveling offshore. We consulted under the National Marine Sanctuaries Act, and we finalized that one, and the essential fish habitat, and we finalized that back in August, and also the National Historic Preservation Act and the Coastal Zone Management Act.

Our study area has eighteen states and two territories, and we did not consult with the territories this round, because there was no change from how we consulted with them under Phase 2, and the only state that did not agree with our coastal zone management was Georgia, and we proceeded over their objection.

This is a summary of all the mitigation areas that we have in the AFTT study area. The pink one up in the northeast is for the North Atlantic right whale, and then there are some purple and yellow down in the southeast, where the right whale migrates during the winter. The brown off of Georgia and South Carolina is hard bottom, and then also off the Gulf, part of Florida, and that's live hard bottom. We have shipwrecks, and we have submerged aquatic vegetation, and that's the green, and then the hatched areas are different biologically-important areas or planning awareness areas.

Then this is just a zoomed-in of our operating areas, or we call them op areas, and so, as you can see, we pretty much mitigate everywhere that we train and test. These areas are mostly -- They are kind of split up so that the Navy can manage units when they're out there. You don't want two units training in the same place at the same time, and so a lot of it is just for management purposes.

To start out with the EFH consultation, like I said, we sent the assessment to both the Northeast, which was Keith Hanson, and, in the Southeast, Pace Wilber was my contact there. They read through that document, and they came back and said that the Navy currently had five mitigations that were already part of our proposed action that they noticed also afforded protection to essential fish habitat, and so they provided those back to us as conservation recommendations, and it's mostly not doing explosive things where EFH is, and so, in the coral reefs, live hard bottom, artificial reefs, and around shipwrecks, and then -- Again, I'm trying not to read all of these, but it's mostly the coral reefs, again, like I said. Then, up in the Northeast, the North Atlantic right whale planning awareness area, that encapsulated a lot of EFH up there as well.

In addition to the five, they also provided four more conservation recommendations to us. Keith, up in the Northeast, provided the first one, to avoid precision anchoring within SAV for the flounder, and then Pace came back and said, well, if you strike out the flounder piece, we can adopt that all over in both, and so that's what we did with that one.

We also agreed to avoid conducting explosive mine countermeasures and neutralization within 350 yards of SAV, and then we have looked at sandbar and sand tiger shark EFH HAPCs all up and down the coast, and we already had a mitigation area off of Cherry Point that we agreed not to do certain things for sea turtle nesting, and we found out that the sandbar shark HAPC was right in that same area, and so we created a mitigation area now that protects both sea turtles and the sandbar shark.

Then we agreed that the ships would only conduct in areas where they had at least one-foot of clearance down in the Key West op area, where there is shallow seagrass or coral, shallow coral.

Then, finally, they asked us to include large schools of fish in our procedural mitigations, in our buffer zones, and, that one, we were unable to do, because it would just be very difficult to spot large schools of fish and then follow them to make sure that they were no longer in the mitigation zone.

Our mitigation zones for marine mammals, if a marine mammal is sighted, they are not allowed to start that activity until it hasn't been sighted for at least thirty minutes, because we figure that's about the average time that it requires an animal to come back up to breathe, or they have actually seen the animal leave, and we felt that trying to do that with large schools of fish would just be very, very difficult, and so that was the one that we rejected.

Now I'm just to kind of go through each of the mitigation for each of the areas, and then we'll map those, and so, again, this is the mitigation that we agreed for shallow-water coral reefs. Basically, we're not going to put an anchor an explosive or a mine shape or a mooring device on top of those areas. Then we have Key West. Again, there's a lot of activity down there, and then we also have the South Florida Ocean Measurement Facility Testing Range, which is kind of off of Fort Lauderdale and Dania Beach, and they have mapped that area, and so we avoid coral reefs there as well when they are conducting activities.

Here is our mapped shallow-water coral reefs, and the way that we avoid this is the Navy has a software tool called Protective Measures Assessment Protocol, or PMAP. Every unit is required to run this program before they conduct an activity. They put in there the coordinates of where they are located, or where their target is located, if they are firing at something, and then they have to run that report, and it will tell them if they're allowed to do that activity, or it will tell them that they need to move, and then it will also provide the mitigations that they have to do in order to conduct that activity where they are. We have an extensive kind of mapping database, where we have all of the stuff in that program, so that the ships know exactly where they can and cannot do stuff.

The mitigation that we agreed to for live hard bottom, artificial reefs, SAV, and shipwrecks, it's basically the same type of mitigation, but we just agreed not to do it in these areas, and then, again, our mapping of those areas, the live hard bottom, submerged aquatic vegetation, and the shipwrecks and artificial reefs. When we gather that data, we add a 350-yard buffer around say a shipwreck, but then, if the shipwreck is just a point, or if the artificial reef, if we just have a point, then we assume that that artificial reef is about a thousand yards, and then we add a 350-yard buffer, and so we're making sure that we cover all of that area when we put it into our system.

I included our mitigation for the North Atlantic right whale, and these are the things that we don't do from November to April, and so the big thing is just not expending explosives or non-explosives in that area, and that also will benefit species. Then here is the Navy Cherry Point Near-Shore Mitigation Area that we developed to help protect the sandbar shark habitat, and so we agreed not to conduct explosives within 3.2 nautical miles of an estuarine inlet and 1.6 nautical miles of the shoreline. From March to September, that was for the sea turtle nesting, and the sandbar shark was a little bit smaller area, but it got completely covered as well, time-wise.

Then, additionally, we also have mitigation that we will not use active sonar, anti-swimmer grenades, line charge testing, explosive torpedoes, a lot of explosive stuff, if there is floating vegetation around, and so we avoid that. If we started an activity and floating vegetation comes

into the mitigation zone, we don't stop our activity, but we won't start it if there is vegetation there. A lot of times, ships also do want to avoid floating sargassum, because you never know what's in it. They don't know if there is like a log in there or something, and so they try to avoid it as much as possible.

Then here is our two mitigation areas. You can see the kind of pink up around North Carolina, and that's the new mitigation that we developed for the sandbar shark, and then the North Atlantic right whale critical habitat areas down along the coast.

Then I also just want to talk about some of the different activities or monitoring projects that we're doing in the study area right now. The majority of them are for marine mammals, because that is what we get hammered with by the public and the NGOs with sonar, and so you can see that we're doing different vessel surveys and tagging all up and down the east coast, and I'll talk about the last bullet before the break, and we do have the underwater surveillance camera, and I think I spoke about that at the last meeting.

They are expanding the Chesapeake Bay Bridge Tunnel, and they're adding -- It's the big bridge that goes across from Norfolk to the Delmarva Peninsula, and they're expanding that tunnel. They are pile driving, and so they are going to be building two lanes on -- They're building a whole new tunnel under one of the lanes, and so we've got permission to come out and deploy our camera while they are pile driving out there, and so we'll try to see how fish behave to that pile driving.

The current data that we've collected with that camera is mostly all along the shore and just along Norfolk piers, and so we're getting small fish that are along the area, and so we're hoping that maybe this pile driving out further, out to sea at the mouth of the Chesapeake, will help increase that data. Unfortunately, our camera is being fixed right now, but we should get it back fairly soon.

Then some other projects that we have either previously funded or are not actually in our study area, we put in a lot of arrays for the Atlantic sturgeon tracking the Chesapeake Bay that went up the Pocomoke and the York River and up the James River, and then we implanted a few sturgeon, and that project is coming to an end. We have kind of gotten all that the Navy can get out of that, and so they will be pulling those arrays out of the water later this year.

With that project, we also put trackers on sea turtles. Whenever the Virginia Aquarium had a sea turtle that they were going to release, we would pay to put a tag on it, and so we were tracking those guys to see how they used the bay and the coast. I will mention that we've also done that for harbor seals, and we're capturing those. Again, we did eight last year, and we will try to do ten this year, to see how those guys are using the Chesapeake Bay.

Seabird underwater hearing, we've funded some studies for that, and they're actually trying to figure out how well seabirds can hear underwater. For us, it affects us for our sonar analysis and then also our explosive analysis, and then we also just funded a project to determine how fish respond to underwater explosives, and so they were just out in California a couple of weeks ago exposing fish to underwater explosions to see how they react to that, and that data -- The data from that research will go, again, into our environmental impact statements and our essential fish habitat assessments as well.

The total EFH process was about a ten-month process, consulting. As you can see, we had a very large study area, and so we had a lot of habitat to consult on with Keith and Pace, and we worked very collaboratively, a lot of emails going back and forth and sharing things. As I said, we had five mitigation measures that they considered conservation recommendations, and we added four new ones, based on the EFH consultation, mostly for submerged aquatic vegetation, sandbar, and sand tiger shark and shallow-water corals.

Again, I mentioned that it's all been captured in our Protective Measures Assessment Protocol Database, so that the sailors know where they can and cannot do activities, based on those protected resources, and then we also continue to fund research in marine resources, to try to get to answers that help us analyze our activities. Our EFH consultation, the assessment and the recommendations can be found at our website, aftteis.com/consultations, and we have that up, if you are interested in looking at that, and that's all I have, if there is any questions from anybody.

MR. WEBB: I had two questions. One, when the Navy is testing a new surveillance or detection or weaponry system, obviously it would be classified at the time, and is there classified interaction between some of the fishery agencies and other agencies? How do you determine if the new technology is going to have a negative impact, and what is that process like?

MS. BUSCH: One way that we look at our impacts is all of our sound sources are binned. We have over 300 sound sources that we look at, and we have ten bins, and so then we pick the most impactful sound source in that bin, and that's what we model and analyze, and then, anything that's less and fits with that bin, it just goes in, and so that's how we get away from a lot of the classification, because we don't have to know exactly what the sound source is, but we know that we've analyzed the impacts from it, or something similar to it.

We do have to do yearly reports to the National Marine Fisheries Service, and we provide a classified report on some activities, where we've conducted them, and how many counts. We don't want people to -- We don't want adversaries to be able to look at our reports and say, well, we know how much training you've done, and so we know how prepared you are, and so a lot of those reports are classified, but we do have unclassified reports up on our monitoring website.

MR. WEBB: With the new technology though, and maybe not specifically sound or sonar, but, if there's a new weaponry or a new propulsion system or a new other than sonar detection system, how does the -- Where in that process does the Navy going to look at it's going to impact human beings, or it's going to impact bird life, or it's going to impact mammals, or it's going to impact -- I mean, is there a process? Is that part of the analysis, formally, or do you know?

MS. BUSCH: I work mostly on the training side. I know a little bit about the testing. I know they do a lot of laboratory work, and we do have different ponds and freshwater places where they test stuff, where there is no marine life, and they do a lot of that testing for some systems there before it gets out into at-sea. Once it gets into the at-sea document, it's pretty much unclassified. There are certain parameters, maybe, but the weapons system itself is not, and so that's when we kind of look at the whole suite of things.

MR. WEBB: One more question. The highlight that you brought up about testing how fish react to explosives, would that be sophisticated to the point that you would analyze or be concerned about whether those were just fish that were transiting the area where there was a spawning

congregation in that area, because they might react differently, depending on what the purpose is of being there, and is that part of -- Is that at that level?

MS. BUSCH: I am not 100 percent sure on this one study, but, generally, how we would do it is we're looking at fish with and without swim bladders and trying to develop a criterion of thresholds, and so at what sound level does it impact their swim bladder or non-swim-bladder, and so we'll develop that threshold, and then, when we do our modeling, we'll know that any fish below that criteria, that decibel, that 190 or 200 or whatever dBs it is, then we'll analyze the different species based on their biology.

AP MEMBER: Do you also do that research on what depth those fish are at?

MS. BUSCH: I'm not sure if this one takes into account, and I know a lot of our analysis that we do, because we can't answer questions like that, a lot of times, and it's overconservative, and so we make a lot of assumptions, and we always make them on the conservative side. I'm not familiar with this one, but, once that report is done, it will adequately explain all of that.

MR. HOOKER: Kind of a question or a comment, but I definitely want to follow-up with you on the Chesapeake Bay pile driving. Do you know the timelines on when a report might be available on that?

MS. BUSCH: I don't know. I know they are pile driving now, and I don't know when our system is going to get back up, but we can certainly share data with you as we get data in.

MR. HOOKER: On the explosions one, that hasn't started yet, and that's in the future?

MS. BUSCH: They just did their first round of testing a couple of weeks ago, and I would have to follow-up and get some more information on that, but I will definitely contact you and share that with you.

MR. HOOKER: Thanks, and then the last is actually more of a comment, kind of good news. In talking with Carter, it looks like, that lower part of the Chesapeake Bay array, BOEM will continue to fund that for at least another additional year on the receivers right at the mouth of the bay and extending out into where BOEM's existing receivers are, but I know we're actively looking for long-term solutions to continuing that array off the Chesapeake Bay, and so at least a temporary solution to keeping those in the water a little bit longer.

MR. GEIGER: Does the Navy keep records of how much aviation fuel they jettison on carrier-based operations and where those locations might be if they jettison aviation fuel?

MS. BUSCH: That, I don't know. We don't analyze that in our document, because that's considered a safety issue, and our document only analyzes training and testing. We don't look at things that you do for safety. I am not well-versed on jettison fuel. I know, if they do it, they try to do it as high as possible, so that it vaporizes before coming to the surface.

MR. GEIGER: It would be very helpful, I think, in the future, again assuming that it's not classified, is if we could get some indication of, when you have these large-scale exercises and you are dealing with a lot of aircraft, some semblance of dumping of aviation fuel prior to landing

or takeoff and possible locations where that may be and a designated target area. If you're doing all these other issues, with regular protocols, it would be beneficial, I think, from primarily an environmental contaminants point of view, just to get a sense of the magnitude, if it is indeed a problem or not a problem, but, again, only if it can be unclassified. Thank you.

MS. BUSCH: I wanted to add one more thing, too. On our habitat database, I do have a habitat database report, and it's also available at aftteis.com, and I also have with me a list of all the literature that went into that database, and so, if anybody wants to look at that list, I have that, and I can get that to anybody as well.

MS. DEATON: One question. I had heard that the Navy was going to, and I don't know if this could be a rumor, but move away from using real lead, using lead in bullets or whatever, because of the lead contamination concern, just for training purposes, and is that true, do you know?

MS. BUSCH: I don't know. We have heard little discussions about lead and the bullets, but I don't know anything beyond the discussion.

MS. DEATON: I know, like in North Carolina, there is some areas in the bombing ranges, and they're always targeting in the same area, and so those sediments have been found to have elevated concentrations, and so that was an environmental concern that maybe could be alleviated with that, and so, if you find out if they are working toward that, that would be good to know.

MS. BUSCH: Okay. I will follow-up on that.

MR. PUGLIESE: Thanks, Laura. Just a couple of quick questions on kind of some bigger-picture things. I was curious about if there had been discussions or a review of the opportunities where you have, again, non-confidential type of information and the ability to possibly provide oceanographic information into the observing systems. The Navy is such a major player in that already, and, with that type of a fleet, again, the non-confidential side, the cruising sites, and the ability to have that type of information connected into the active ocean observing systems and refining the models and all that would be a real benefit. I didn't know if that's gotten any traction or opportunities for discussion, as this entire review or other discussions, maybe side discussions, have happened.

MS. BUSCH: My office doesn't work with that ocean observing data, but I can follow up on that. I know that a lot of data that the Navy collects that we do try to make publicly available. Like I said, all of the data that we use for AFTT is publicly available, because we all paid for it, basically, and so I will follow-up on the ocean observing stuff and see if there is a website that shares that and then how to get to it.

MS. DEATON: All right. If there is no other comments, I guess we can move on to the next item on the agenda, which is quite important, lunchtime. It's now ten to twelve, and we're supposed to have lunch from 12:00 to 1:30.

(Whereupon, a recess was taken.)

MS. DEATON: We are here to continue our discussions on ecosystem-based fishery management, and so the first thing we were going to talk about is a presentation from Steve Poland, and he is

with a very good agency, North Carolina Division of Marine Fisheries, and he is going to talk to us about prey supporting dolphin wahoo fisheries. Steve, you can take it away.

MR. POLAND: Thanks, Anne. Yes, it's a very top-tier agency, and I appreciate that. Anne told me that the meeting is running ahead of schedule, and so she's given me a couple of hours to fill everybody with some knowledge. No. Before I begin, I will just provide a little context of why I'm even here presenting this and why the council wants some feedback from the Habitat AP on this.

The Mid-Atlantic Fishery Management Council recently developed a forage fish amendment, and it was an omnibus amendment for most of their plans, and it identified forage fish and classified them as ecosystem component species in a lot of their fisheries, and it included -- Originally included in that forage fish amendment was Auxis, and so bullet tuna and frigate tuna, but, during final implementation, the final rule, NOAA Fisheries decided to remove Auxis from that action, citing that there was not sufficient evidence for any of the Mid-Atlantic-Council-managed species to support the forage fish classification for Auxis.

The Mid-Atlantic Fishery Management Council then sent a letter to the South Atlantic Fishery Management Council asking them to consider management of Auxis, and, when I say management, I don't mean FMP, but just consider including Auxis in a similar forage fish amendment, and we can certainly do a full FMP or just classify it as an ecosystem component, but they felt like the South Atlantic Council should have that conversation, given the importance of Auxis to some of the South-Atlantic-managed species.

Today, I will talk a little bit about the pelagic food web in the South Atlantic Bight and the role that Auxis has in that food web, and then I will present some information from two different studies. The first was my thesis work, four or five years ago, at UNC-W, and the second is some work published by Rudershausen et al. out of North Carolina. Then, at the end, I will field any questions and facilitate any discussion among the AP.

The South Atlantic prey community and the South Atlantic pelagic prey community can really be characterized by four different functional prey groups, the first being sargassum-associated prey, and so this is prey around floating sargassum, the brown algae sargassum, and this is really the only habitat structure out there in that pelagic environment, and so it's a very crucial habitat, so crucial that the council has a fishery management plan specifically for sargassum, and so sargassum is really the habitat structure in the base of this community out there.

The prey field found around sargassum is typically filefish, a lot of your puffers and diodontidaes and tetraodontidaes and juvenile fish like jacks, even juvenile fish of some of the pelagic top predators, like dolphin and wahoo and even your billfish and sargassum-associated crustaceans, like swimming crabs and such.

The second prey group is surface-schooling prey, and so things like flyingfish and schools of larger fish. They are still mostly primary consumers, and there might be some secondary consumers, but just surface-schooling prey. The third is schooling prey, and schooling prey that might not necessarily be associated with the surface or schooling prey that spends time at the surface down in the water column, and maybe even going down past the thermocline and touching that mesopelagic community, and this is the prey group that includes bullet tuna and frigate tuna and a

lot of your herrings, your larger jacks, and your cephalopods, and these prey items are typically secondary consumers, and might even be some of your smaller, tertiary consumers. Then aggregations of crustaceans, and so things like amphipods, stomatopods, isopods, and these are just typically just masses of these small crustaceans out there, either at the surface or within the water column, and they're seen a lot in diets of tuna and ram feeders.

As far as the trophic ecology and the trophic hierarchy of the community, you certainly have your prey base, your primary consumers, and some of your secondary consumers, and none of my work or Rudershausen's work that we'll go over really looked at the primary producers in this food web, and so your phytoplankton and even some of your larger zooplankton that act as primary consumers, and we just focused on more of the macrofauna in here, but the brown algae, sargassum, we used, or I used, later on in the stable isotope analysis, as a proxy for that primary production in this system.

This prey base certainly is associated with sargassum and a lot of your smaller fish, like your filefish and your puffers and that kind of stuff, and getting into some of your smaller secondary consumer fish. As you move up, it's more mid-level predators, and this is where you start to see some of those council-managed species, and so dolphin and wahoo and king mackerel, especially on the smaller side, and so, when they make that transition to piscivory and secondary consumers.

These mid-level predators, this is where Auxis fits in, but you also have your flyingfish and some of your larger scads and carangids, and then, at the very top, you have your larger individuals of council-managed species, and so your larger dolphin and your larger wahoo and king mackerel, and this is where your billfish and a lot of your sharks -- It's interesting though that false albacore, for whatever reason, falls out at the top, and I can go into some discussion about that if anyone is interested in that, and it really doesn't bear a lot on this conversation, but that was just a peculiarity that was interesting when we got these results.

Auxis, there is two species of Auxis in the Atlantic, and there is four species worldwide, and the two that we have in the Atlantic are frigate tuna and bullet tuna, and you have also heard them called frigate mackerel and bullet mackerel. There is not a lot known about their life history. They have been observed up to about half-a-meter, but they're typically seen less than thirty-five centimeters, and, in the diets, you will see them as small as a couple of centimeters, even down to one centimeter.

They are schooling fish when they are observed out in the environment, and they're seen in schools, and they feed on invertebrates and small fish, mostly invertebrates. The few diets of Auxis that I actually looked at were mostly the small crustaceans, isopods, amphipods. Nothing is really known of the stock size, stock structure, stock dynamics, or anything like that for bullet mackerel and frigate mackerel.

For the rest of the presentation, I will be going over my work, my graduate work, and then I will transition into the work that Rudershausen et al. completed, and so this is two separate PowerPoints that I've just mashed together.

My work is "Trophic Dynamics of Large Pelagic Fish Predators in the U.S. South Atlantic", and I had four objectives with this study. The first was just to describe the diets of each species. Some of these species, the diets have been investigated in the Carolinas before, and some of them have

not, and none of them have been done recently, excluding the Rudershausen work, and then examine the predator-prey relationship there, the size-based relationships, the trophic niches, the interactions, seasonality of predator-prey relationships. Then evaluate the competitive interactions among the different predators and then see if those competitor interactions change throughout the year, and then to just bring it all together and describe the structure of the U.S. South Atlantic, the total community, including the prey.

We collected fish in North Carolina and South Carolina from fishing tournaments, from commercial catches, from for-hire fleets, from just cooperating recreational fishermen, and we would take anything and everything. Most of the fish that were collected were council-managed species and HMS species, and so yellowfin tuna, blackfin tuna, which is unmanaged, wahoo, dolphin, and we also sampled all the marlin species, king mackerel, really just anything from that pelagic community that was being landed.

One thing to note about this too is that, because all our fish sampling relied on tournaments and the fishery, our sampling was very seasonal, and it was not consistent throughout the year. We were able to sample fish for most of the year, but, given the effort in the fishery and just the seasonal availability of these fish, not all fish were sampled in every month, but, in a few later slides, I will touch on the seasonal relationships there with diet, but, for the most part, we were able to collect enough samples of the four primary predator species that we investigated during the spring, summer, and fall to infer a little bit about seasonal variations in diet.

We employed two different methods to evaluate the diet and trophic structure within the communities. The first was a traditional stomach content analysis, and we removed the stomach from all the predators, and even from some of the prey recovered from some of the predators' diets, and we identified all the prey within those stomachs and counted and weighed and measured, and we analyzed that data a few different ways and calculated diet indices and frequency of occurrence and percent of prey by mass across predators, percent number of prey, and we looked at size-based relationships in predation, and so we looked at -- We used quantile regression to investigate if there was any changes in prey use over the ontogeny of the fish.

We also used stable isotope analysis, specifically carbon and nitrogen, to investigate the trophic structure in seasonal variability and trophic position as well as dietary use. We looked at two different tissue types, muscle and liver, and the two tissue types give you different signals, because the two tissue types are different energetically, and so your more energetic tissue that regenerates more frequently is more of a short-term signal, and tissue that doesn't regenerate as frequently is more of a long-term signal, and that captures more of a -- In our case, it's more of a seasonal trend, and so the muscle tissue regenerates, and that signature turns over about every three or four months. The liver tissue regenerates a lot faster, and that signal turns over about once a month.

We looked at the total isotopic niche space of each of the predators, and that's basically a biplot of carbon and nitrogen values, and then, in that isotopic space, we were able to look at competition among the different predators, just looking at the overlap and cluster analysis, to categorize all the predator and prey into different assemblages, based on similarity of not only trophic position, but carbon, and carbon isotopes give you a signal of the source of the primary production.

All in all, there were 1,119 diets sampled that had identifiable prey in them. The total number of fish that we sampled for diets was over 1,200, but there were empty stomachs included in that. A

nice thing about doing a stomach analysis in conjunction with a stable isotope analysis is you can still collect dietary information from those individuals that have empty stomachs through stable isotopes. In a way, it's a little bit more efficient, and your resolution is not quite there, as far as being able to identify a particular prey item from stable isotopes, but you can at least get some information of that individual's trophic position.

From the diets, we identified ninety-one different species of fish in thirty-seven families, and the real diversity is probably a little bit higher, because of just digestion and just varying degrees of being able to identify these fish, and the diversity is probably a little bit more, just because there is some that we just had to lump into genus or even as high as family or order.

A fair amount of diversity in cephalopods and crustaceans, and three gastropod families were identified, and one thing to note on this slide is we found a lot of trash, either organic trash or inorganic trash. This bottom-right picture, those are oranges, and we pulled those out of a dolphinfish diet, and I remember when -- I can still smell that smell when I opened up that stomach. It was like lemon Pledge, but we found a lot of candy bar wrappers and bottle tops and fishing weights and fishing line and bailing line, that kind of stuff. That is a rubber band, and so all I can figure for the oranges is someone was probably just making a drink on the back of the boat and just tossed them over, because we did find chicken wing bones and stuff like that, too.

There were four predator species that we were able to collect enough diet samples on that we felt like that we could characterize their diet seasonally, and that was blackfin tuna, dolphinfish, wahoo, and yellowfin tuna. Excluding blackfin tuna, we were only able to collect a sufficient sample size for three of the four seasons, spring, summer, and fall, and, for the rest of this talk, I'm just going to focus on dolphin and wahoo, since those are the two council-managed species.

For dolphinfish, they were head and shoulders above everything else in the community as far as diversity in their diets. There were over a hundred different genera identified from their diets. They were definitely opportunistic and generalist feeders, and their diets were dominated by fish prey, most notably flyingfish and sargassum-associated fish prey, and there was some evidence of seasonal differences, and it seemed like, in the fall, there were more fish prey that showed up in their diets, but, for the most part, it seemed like sargassum-associated prey and flyingfish were definitely important to dolphinfish diets.

Since we're specifically interested in bullet tuna and frigate tuna, there were some recovered from the diets of dolphinfish, but, for the most part, the two Auxis species really did not show up a lot in dolphinfish diets.

There was plenty of evidence that dolphinfish, as they grew larger, that there were differences in diet prey size over ontogeny, but, interestingly, the median size of prey recovered from the diets of dolphin really didn't change a whole lot, especially relative to the maximum sizes of prey recovered from those diets, and this is really explained I think pretty well by this next figure, and so, looking at the changes in diet over fish size, as dolphinfish got larger, you started to see more and more larger fish prey, and so larger flyingfish, and so it really seemed like there was a point where dolphinfish -- They grew to a point that they were not necessarily gape limited anymore, and they started to become more cannibalistic, and they really focused in on larger fish prey, because, energetically, they could probably select for those larger prey as well.

Wahoo, wahoo diets were the least diverse out of all the predators that we investigated, and they were definitely the most piscivorous, as far as their feeding habits. Almost 100 percent of wahoo diets had fish parts, fish remains, in their diets. Scombrids, bullet tunas, and frigate tunas, specifically, were the most dominant prey recovered from wahoo diets. Other fish did show up in wahoo diets, and, most notably, scads and some of your larger carangids, and so, again, fish that were much larger, not necessarily sargassum-associated, and fish that, given wahoo's large size and fast swimming speed and mouth morphology, they were very quickly not gape limited.

As far as prey size recovered from wahoo diets, they had the largest mean prey length of any of the predators that we investigated, and that includes the blue marlin that we were able to characterize in this study. It's interesting to note that, if you look at this scatter plot, there is not a lot of points, and that's because we did not recover a lot of prey items from wahoo that were whole or that we could restrict the prey sizes on, because of the way that wahoo feed.

It's very similar to a bluefish. They take bites, and so a lot of the prey items recovered from wahoo were chunks of fish, either a --- or a head or a midsection, and, if all three of those pieces were in one stomach, yes, we could get a length, or, if we could at least get an eye socket diameter, we could calculate the length of that prey item, but, for the most part, wahoo was just bites of different fish.

For the stable isotope analysis, we looked at all the predators and all the prey that we recovered from the diets, or all that we could, and we analyzed for stable isotopes, in hopes that we could characterize the community a little bit better. This cluster analysis includes carbon and nitrogen isotope values for predator and prey, and this is the entire community. In this figure, I did break wahoo, blackfin tuna, and dolphinfish up into size bins, and I did kind of just a 50/50 split, and so larger dolphinfish and smaller dolphinfish.

In this cluster gram, there is really -- You can see the three -- There is definitely three functional groups that pop out of here, and so you have your prey-based, and that's where a lot of your filefish and sargassum-associated fish, even some of your scad and that kind of stuff, fell out, and you had your mid-level predators, and, within that cluster, it further broke out into two different clusters, with your smaller kind of secondary consumers, and so this is where Auxis fell out.

Other things, like larger jacks and even some of your smaller predators, and so the smaller dolphin, wahoo, and blackfin, fell out in this mid-level predator group, and then your top-level predators are your larger predators, and so your predators that, again, are not gape limited and are more energetic and can afford to be a little bit more selective, because they can actually go out and capture whatever they want, and your quintessential top predators, and so your blue marlin and your mako sharks, and that's just to show where the predators that we investigated fell out.

We took the stable isotope work a little bit further and tried to see if what we saw in the diets from the stomach content analysis -- Trying to see if those relationships -- If we could identify those relationships with the stable isotope analysis, and so we employed a stable isotope mixing model, and basically what this is we characterized the prey community, and we pulled out five functional groups from that prey community, the ones that were most representative in the stomach content analysis, and so your squid and scrombrids, which include bullet tuna and frigate tuna, and paper nautilus, because paper nautilus were evident in wahoo as well blue marlin and yellowfin tuna, and one of those species constituted at least 10 percent of diet by mass in one of those species and

so we felt like that was a representative prey group to pull out, and then your flyingfish and your sargassum-associated prey.

This is a biplot of the carbon and nitrogen signatures for those five prey functional groups. Then, from that, we estimated the proportion that each of those prey groups contribute to the predators and the proportion that can explain the best as far as the carbon and nitrogen signatures that we observed in the predators, and what really jumps out of this is this really corroborates what we saw with the diet analysis for dolphinfish, is that sargassum-associated prey contributed proportionally greater than the other prey groups to the overall diet of dolphinfish.

Interestingly though, wahoo, there is really no strong signal there for really any of the prey species. It seems like all the prey species contributed proportionally about even to the overall diet of dolphinfish, which is kind of in contrast to what we saw with the stomach content analysis, and the only explanation I have for this is, if we go back to the scatter plot of the prey community, and there is a lot overlap there, and, since wahoo is really the only predator that showed any evidence of selection for any of these prey species, and they selected heavily for scrombrids, and scrombrids tends to fall out towards the middle of these other prey groups, I feel like this is just more of an artifact of the model and there wasn't enough variation there for it to really see a signal with any of those groups, and so it just proportionally just kind of split the difference between all of them, and so, as far as for wahoo with this, I wouldn't put too much value in this analysis.

The overall conclusions from our work is there is definitely evidence of generalist foraging for all the predators, but, specifically for wahoo, there was some evidence that there might be some selection for larger prey, and, given wahoo's size and swimming ability and gape, they probably have the best advantage out there to select from that prey field.

Next, I will just briefly go over the Rudershausen et al. paper from 2010, and I can't remember which attachment this was, and I think Attachment 6 in the briefing materials, and so Rudershausen et al., Paul Rudershausen and Jeff Buckel out of the CMAST Lab, they started this work in conjunction with one of the billfish tournaments in the Morehead City area, the blue marlin billfish tournament, of sampling the diets of all the predators brought in to weigh.

This if the first paper that they have published from that work, and this was the first ten years of that study, and Jeff mentioned to me last week that they're thinking about -- Since they've got another ten years of data added on to this, they will probably try to publish something else in the next couple of years, just kind of an update, and maybe pull in some newer studies and look at comparisons not only within the region but in different basins across the world.

The objectives of the Rudershausen et al. work were to look at the diet overlap of blue marlin, wahoo, yellowfin tuna, and dolphin. These are the four species that are brought in to weigh at the Big Rock Blue Marlin Tournament, and they occur together, and the fishery, for the most part, targets all of these species as a complex. They were also interested in looking at a couple of different temporal comparisons, and so interannual variation in the diet, and so the difference in each species diet over the decade, and if there were any interesting relationships there looking at historic diet data, and so if there were any changes in diet over time. Then they also did a special comparison where they compared the North Atlantic to other oceans.

Again, the methods, they sampled fish from the Big Rock Blue Marlin Tournament, and this is a week-long tournament, and it occurs the same week every single year, and the fishing occurs in the Gulf Stream waters off of North Carolina, really from Cape Hatteras south to really Cape Fear. They used principal component analysis to try to see if there were any trends there in the diet data, in the diet indices data, to evaluate the temporal comparisons and the spatial comparisons.

Briefly, Rudershausen et al. was looking at frequency of occurrence of the different prey in the diets for wahoo and dolphin. For wahoo, mackerels, and I did talk to Jeff, and he said that they included bullet tuna and frigate tuna in that mackerel category, and so really that category would probably be better labeled as scrombrids, but wahoo, similar to my work, the majority of their diet was those scrombrids. Dolphin, again, not a lot of scrombrids, and a lot of diversity in the diets, and a lot of the sargassum-associated prey showed up in the dolphin diets.

For PCA analysis, and PCA is a multivariate analysis, and so it tries -- It basically takes a multivariate dataset and tries to pick out the two most parsimonious axes through that cloud of data, the two axes that explain the most variation in that dataset, and then you graphically present the two axes, the principal components, and so, for dolphin, the temporal comparisons, this is dolphin diets, and these are the average diets, and I would have to go back to the paper, but I think by frequency of occurrence each year, and so each individual red dot is an average dolphin from a particular year, and so one dot is one year of sampling at the Big Rock Tournament.

A lot of the variation, or a lot of the dolphin from year to year, tend to load around those structure fish, and so sargassum-associated fish, and other dolphinfish. There was one year where dolphin diets seemed to load a little bit more towards cephalopods, but, for the most part, a lot of the diet can be explained by sargassum and conspecifics.

Wahoo is the same thing. Each individual blue square is an individual year of wahoo diets, and there are ten squares on here, but it's just that a lot of them loaded up on mackerels, and so, for most of the years, 1998 to 2009, a lot of the variation in wahoo diets were explained by the presence of mackerels.

Temporal comparisons, Rudershausen et al. then looked at diet studies as a whole from different decades, not only in the North Atlantic, but worldwide. Sorry. This slide is just the Atlantic, and so four different studies, including the Rudershausen et al. study, showed similarity and a lot of consistency that dolphinfish diets were mostly made up of sargassum-structure fish, sargassum-associated fish, and other dolphins.

Wahoo, again, they tended to load more towards those mackerels, and that was consistent with what Rudershausen et al. observed at the Big Rock Blue Marlin Tournament, and, spatially, looking at the North Atlantic and other ocean basins, and there was a lot of consistency there in dolphinfish diets as well from the North Atlantic and the North Pacific. Again, spatially, and this title is wrong, and this is the spatial comparison and not the historic versus present comparison, but, interestingly, for wahoo, there was some difference in diets from the North Atlantic and the South Atlantic.

The South Atlantic wahoo diets tend to load more towards flyingfish, and mackerels were really not that present there, and so it's interesting that, in a single basin like that, there is that much of a difference between the North Atlantic and South Atlantic, and what Rudershausen et al. is referring

to as South Atlantic is South America, I think Brazil, Trinidad, Tobago, that area, and not the South Atlantic as a management unit.

The overall results from the Rudershausen et al. work is there was substantial diet overlap between blue marlin and wahoo, and so there was some evidence that there was competition there between blue marlin and wahoo for Auxis, and there was a diverse diet from year to year and over decades for dolphinfish, and they did not observe a lot of changes in diet for dolphinfish over the three different decades that they investigated, and, again, similarities in diet among the oceans for dolphinfish, and they also observed that for blue marlin as well.

These are conclusions pulled from the Rudershausen et al. paper, and they stated that this study was further support that Auxis species do play an important role for apex predators in this community, and that also suggests that there is a stable pelagic food web and forage base in the waters of the Gulf Stream, at least off of North Carolina for that one week every calendar year, and there was some strong selection for particular prey types, and this was referring to wahoo and Auxis, the evidence that it seemed like wahoo, and blue marlin to a lesser degree, tended to select for bullet and frigate mackerel.

With that, I will take questions, but, before we really get into a lot of discussion on this, Anne did ask me to just further clarify what the council -- The type of input the council is really seeking from the Habitat AP on this issue, and so this was something that the Mid-Atlantic Council asked us to investigate, to see if there was any justification to maybe consider management for Auxis species, and so what the council would really like from the Habitat AP is really just some discussion, and, depending on where the discussion goes, maybe a recommendation from the Habitat AP, if the collective knowledge and expertise here feels like this is something that the council should investigate or pursue, or, if not, if there is other species that the council should maybe consider for more protection, either as an ecosystem component or just a broader forage complex. With that, I will take questions, and I'm sure Roger can give a little bit more context to what --

MR. PUGLIESE: No, I just was going to follow up with that request, and I think what I just wanted to reiterate is that the dolphin wahoo plan is an entire Atlantic plan, and so we've been collaborating with our partners in the Mid-Atlantic and New England to manage it through the South Atlantic Council, but the key with it, I think, is that, from its inception, it was supposed to be innovative and proactive and really have conservation, I think, in its mind from the beginning.

This is the first time we've discussed really looking at prey considerations, and this was the right forum for those discussions, and we already started some earlier on today, and I think that's really where Steve is trying to guide and request some of that input. Is it worth continuing on that proactive conservation ethic in a plan that was really cutting-edge when it came out and to investigate, and it provides the opportunity for us to begin to consider that and for the SSC to understand what it means to look at ecosystem components or how we would do it, and then how do we collaborate with our partners in the Mid-Atlantic to advance that, if that is a desire to begin to investigate this new tool or capability. I just kind of wanted to springboard off of that, because I think it does have some roots to kind of the bigger picture in this plan of being a proactive one to begin with.

MR. ROFFER: It's interesting to me that, comparing the two studies, that you didn't see that much difference, considering the amount of sargassum that's now in the North Atlantic compared to what it was years ago, and it seems like that population seems to be stable, which is a surprising thing to a lot of us, that we haven't seen an increase in any of the prey species, or even mahi, in this, and so I just wanted to get your comments on that.

MR. POLAND: Certainly, and so I know that there's been a lot of work and a lot of focus, really in south Florida and even into the Bahamas and some of the Caribbean areas, about this increase in sargassum, and there's plenty of evidence to show that, yes, there is an increase in sargassum. I don't know if we're seeing that same increase up off of the Carolinas.

I mean, if you feel like you have any evidence that we are, I would certainly be interested, but that is one thing about both of these studies. They were really spatially limited in the fact that they only looked off of the Carolinas, and the Rudershausen only was off of North Carolina for one week every calendar year, but you would certainly expect, if that sargassum community really acts as a nursery area for things like dolphin and a lot of your billfish, and you're seeing an increase in it, that eventually you would start to see that increase coastwide, but I really don't have a good answer of why these diets seem so consistent over time like that.

It is certainly interesting, and I will certainly use that to float the fact that I think we need continued research and continued monitoring on the diets of these species and really expand that out over the whole managed area as well, because, if you go to the literature and look, it's really snapshots of studies, of a two-year study here and a two-year study there, and the Rudershausen one is very novel, in that it's been consistent every year.

They've got a two-decade dataset now, and they're still seeing that same stability there, but, again, that's only one calendar week every single year, and so I guess what I'm getting at is certainly we would love to see more of a shift and more of an interest in maybe incorporating diet monitoring and maybe something as simple as just a stable isotope analysis from the catch at a coast-wide level, to build that long-term dataset and to really look at those trends and maybe forecast what those trends might mean later on down the road.

MR. ROFFER: I would expect, through climate change, that you would see a change in the species composition. They are certainly seeing changes in mackerel arriving in Norfolk Canyon, chub mackerel, rather than bullet. Over the years, it has changed.

MR. POLAND: Yes, and there is certainly expansion as far as fish just expanding their range, but it's interesting that we're not really seeing a change in community structure or community diversity yet, and that might speak to I guess just the buffering capacity of this community, but you certainly worry that, at some point, we might get to a breakpoint and it will change, or maybe there is some indicator species that we just haven't seen yet, and I don't know. Maybe we don't have a good canary.

MR. ROFFER: Particularly in the squids that it digested very quickly, and it could be a switch from the Caribbean, but you say that -- You described, and it is a relatively limited area geographically, but most of these fish, if not all, are Gulf-Stream-related, and what we have noticed over the years is that, during that Big Rock Tournament, there is a wide range of temperatures in the Gulf Stream over there, over a five-degree temperature range, in that time period, and yet it's

stable, and so that's -- It just may be that the Gulf Stream ecosystem is pretty stable, at least until now. Thank you.

MR. WEBB: I would certainly speak in favor of including this in our recommendation for management, the Auxis species. It seems compatible. We have already included sargassum as a generic component of the things that are important to us, and I think we also, at the last meeting, talked about bunker herring and other baitfish as well, and so this seems to be consistent, to me, especially if the Mid-Atlantic has already adopted that, and is that correct or not?

MR. PUGLIESE: The Mid-Atlantic has a separate forage amendment that they had created, and these were some considerations here, and these species fall directly under the Dolphin Wahoo FMP, which that's -- We've opened those discussions, and we're actually going to have another session at the council, during the Dolphin Wahoo Committee level, to begin to discuss where potentially things could go, and so that's why we're looking at it now.

MR. WEBB: Is there any commercial targeting of Auxis at all, other than just somebody getting them for bait?

MR. PUGLIESE: It's fairly limited, but what we're doing is -- That's exactly what the idea here is, it's to open up the door to investigate what we're really looking at, and I think there were some numbers that I had heard at one time of from a thousand pounds someplace, but that's exactly why we need to begin the discussion, to determine exactly what that is, and the idea is there is a number of different avenues the council can go, in terms of -- There was a number of ways that the Mid-Atlantic dealt with it, and it wasn't necessarily just going in with a prohibition, but there was like putting rules in that would provide the ability to make sure that you don't have explosive fisheries, where, if you didn't realize how significant that was, you would have significant impacts on those resources.

I think, again, these are ones that we wanted to get Steve to come in, and we wanted to be able to open the door on what is known, and I guess that's one of the first questions, is they're going to have to understand that connection between dolphin and these species, and I think what we're seeing here speaks to it, and this is the opportunity for the AP to recommend taking the next steps, and that will be part of the process to investigate what exactly is going on throughout the region.

That will have to be the whole Atlantic, because that's a partnership with our other partners to the north, and that's part of the bigger picture that we're going to be discussing, and some things have been raised before about species movements, and that's a whole other trajectory that we're going to have separate discussions on, how we advance those as things change with the systems, but that's a separate item.

MS. DEATON: Do we know -- Is there any data available for Florida or South Carolina or Georgia on the diet, or are we just assuming, because they are so pelagic and in the Gulf Stream, that it would be the same, or is that the need, for specific information from those other states?

MR. POLAND: I think some of that diet information is already there. Some of it -- I don't want to use the term "outdated", but it might already be a couple of decades old. Like I mentioned a few minutes ago, it just seems like it's been kind of sporadic, a study here and a study there and a master's thesis here and a master's thesis there, but I do know there has been some dietary work

done in the Gulf recently on dolphinfish and along both coasts of Florida, but more along the east coast of Florida, on wahoo diets, and so I think there's some of that information that is already there, but I don't know if anyone is collecting information as we speak.

MS. DEATON: But that information also has the same basic findings, that there is a high dependence on the bullet and frigate?

MR. POLAND: Yes, specifically for wahoo. It seems like everything that's out there in the literature for wahoo in the North Atlantic, and even over in the Pacific, it was pretty consistent in that. Auxis, or small scrombrids, are a prey item that functionally serves and acts like that large pelagic prey that a scrombrids, and Auxis is, does occur in the diets of wahoo.

MR. PUGLIESE: One thing as, again, we go down the process of wherever we go with this, something that's going to be happening in the background anyway is we are shoring up information on our diet compositions within the Ecopath model and Ecosim model, and the development of that is getting as much more additional information as we can, and so the idea is there is opportunity to look at the existing Ecospecies online system relative to these species and then to expand and tap any other things, and so it's the opportunity to go further beyond this point, and so some of those, I think, are going to be in motion as we -- It's a very opportunistic time, because we are already advancing some of those efforts.

MR. POLAND: Roger, that just jogged my memory too there. The Ecopath and Ecosim model in the Pacific, and I think Olsen published a paper on it back in the early 2000s, and I want to say maybe 2003, but I know, in that paper, they did observe Auxis, or large scrombrids, Auxis, the Scombridae genus too, as being a disproportionate contributor to -- I can't remember the exact term that they used, and I would have to go back and look at the paper, but --

MR. PUGLIESE: The forage group or whatever group they --

MR. POLAND: Yes, and I remember that, specifically, there was a figure in that paper that showed a bunch of different prey categories, and it showed the relative influence that each of those prey categories had in explaining the structure of the community, or trophic positions of the top predators and stuff, and I remember those Auxis -- It was mostly for yellowfin, I think, over there, but they were identified as an important prey group in the Pacific as well.

MR. PUGLIESE: Yes, and let me correct it. It would be the prey groups for the functional group for dolphin or wahoo in the Pacific and not the forage group, and so, yes, that's the connection.

MR. GEIGER: Has this been identified as a priority research issue for wahoo?

MR. PUGLIESE: I would have to go back and look at actually what we have on some of the original research recommendations, and I would think we probably do have something relative to that, but I would have to go back and re-look at some of those. I know, because we had limited information when we did the original plan on the details of that, we had a pretty big list of needs for both dolphin and wahoo, and so I can't believe it's not in the list, and so I think it is already kind of a -- It's you need to do this and you need to know the distributions, more finer resolution of the distribution of habitats and prey species, et cetera.

MR. GEIGER: Certainly I think the importance of identifying prey species for these high-priority fish species are important, but, again, it looks like this is a hellacious amount of work to encompass, and, if we don't have an ongoing issue that we're continually adding to the dataset, are we really going to answer the question, or are we going to just continue to nibble around the edges? I get the sense that the prey species base is relatively stable, based upon what I see in the paper and what your presentation is, and I heard nothing to say that that prey base is changing or shifting right now, and it appears to be stable over one or two decades.

Given that, I just want to raise the issue of the old question of is the juice worth the squeeze, in terms of priorities, and it seems like wahoo may be one that we would want to recommend more fully, because the data is better. If we're going to bite that bullet, let's go with the best available data we have and the species that makes the most sense. That would be where I would be coming from on this right now.

AP MEMBER: I've got a question. Aren't we managing sargassum? Are we allowing harvest of sargassum in the South Atlantic and the Mid-Atlantic? I think, years back, when I heard certain companies were going to start harvesting it, I thought it was the craziest thing in the world, because that's pure habitat, shelter, floating out there, and these fish, these prey fish, that we're talking about that are the diet of the wahoo and the yellowfin tuna and so forth, they use that as shelter.

If we're managing sargassum, the sargassum weed, would that not encompass -- Since these things are living in or near -- Most of this prey is living in or near the sargassum, but would that mean that they're included, these small fish that are prey are included in that habitat, sargassum habitat? I don't know.

MR. PUGLIESE: To that, really, the plan itself goes to management of the sargassum algae, and it identifies the connections, and it's identifying kind of the flip side under the managed species, like dolphin wahoo, as essential habitat or habitat areas of particular concern for those species. The species we're talking about right now are not under any of the fishery management plans, and so, while they may be part of the complex that that habitat constitutes, the way the plan is operating, it really is focused on protection of the habitat itself, and so, in order to address the species-specific issues, and that's why this is being raised, while the connection -- I mean, what it does is it provides maybe even more justification. It's more of a justification side than it is the ability to manage under that plan, because what you're doing is you're making a connection to a managed species with dolphin and wahoo directly.

I understand what you're saying, but, the way it is right now, it's on the fish under Magnuson, under the sargassum plan, is sargassum. Now, that said, under the Coral and Coral Reef and Live Hard Bottom FMP, you have coral, coral reefs, and live hard bottom, and basically anything attached is managed, and theoretically protected, because we prohibited live rock removal, and so you can do organisms, but that has a very specific connection attached to the habitats.

I mean, it's crossing boundaries here, but I think what it is -- I think this is a key point too, and this may get to some of Jamie's issue, is that, the way that these are being done right now, they're being proactive, and so they're not being driven on absolute. They are verifying as much as we know to make a connection, but it really is to be proactive, and then you build the information over time on how much of a -- How more detailed of a connection there is to other species and the true complex and all the other types of things that you need to know into the future, but, the way they

did it in the Mid-Atlantic, it's not driven on a direct biomass reaction, and Steve can get probably to that point, but I think that's something that also needs to be understood. The biggest point we're trying to make is there is enough of a connection here to advance the discussion and for the council to begin to investigation how to move forward.

AP MEMBER: I think we should address it and attach these prey species to the sargassum management, and so let's move ahead. Thank you.

MR. GEIGER: A quick question. There's a lot of speculation that American eels hang around a lot around sargassum, and is there any indication of American eels being subject to any of these predator-prey relationships?

MR. POLAND: I never saw any, but I think a lot of those American eels also head further out to the Sargasso Sea and that area, and, really, I say we sampled this community, but really all we sampled was just the bit of the community that was offshore of North Carolina and South Carolina, and I would certainly expect that there is some variations in that community from the west North Atlantic to the east North Atlantic and all that stuff, but, no, I did not see any American eel.

MR. PUGLIESE: To that point specifically, I think you're getting to one of the most significant points of the ecosystem efforts that are going to advance, is we need to get the diet information on these species more extensively across the board, and a lot is being done, and a lot is happening right now. A lot of was done through our existing fishery-independent surveys, and even some of the newest information still is going to be integrated, and so, while those are advanced far beyond where we were before in the past modeling efforts, we still have a lot of work that needs to be done to get the full understanding of what those diets -- Because, in most cases, they are kind of focused, and you have to get further down the road, and I think one of the biggest things that's going to change into the future, and I'm looking further down, is we go from ecosystem modeling to Ecospace, which really begins to look at the spatial.

Then you can begin to look at some of those areal temporal variations in there, and that's going to get really interesting when we get to that point, but we've got to get kind of the first iteration first, and I think that's where we are on some of these things, and this is just another, I guess, piece of the equation to begin to consider.

MS. DEATON: I will just add, to answer Jamie's question earlier, that, under the implementation plan and the roadmap, those prioritized actions, and the food web one, it does say to identify species for which diet data are lacking and prioritize future research accordingly. Then another is to characterize life history of primary prey for the council-managed species, including dolphin and wahoo, among others, and so there is a research need identified in that implementation action plan.

MR. GEIGER: So, based upon that, what's our recommendation going to be?

MS. DEATON: What I have heard is the need for more diet information so far. Can anybody comment on that?

MR. POLAND: I wanted to reiterate the council, or at least the type of feedback that we would like to get. Really, from a management perspective, we would like to hear if the Habitat AP feels like that the information presented and the information already pulled together for the ecosystem

plan -- Is there sufficient information there to consider, and does the Habitat AP feel like there is a need and a justification there to consider protecting any of these prey species, protecting the forage base in this community, because that's really what the council is going to have to decide to take action on, if we feel like we want to move forward and initiate some type of action to protect bullet tuna and frigate tuna, or maybe even expand that out to the whole prey community, similar to how the Mid-Atlantic Council did. I certainly agree that more diet information is needed, but, from a management perspective, really, we've got to make the decision of if we feel like this prey community needs further protection under either the Dolphin Wahoo Plan or the Sargassum Plan or any of our council-managed plans.

MR. GEIGER: If we were talking about menhaden and striped bass, I would say yes, but, based upon what you have presented right now, the need to protect prey species, I don't see that there, with a stable prey base right now. I would rather have more information about climate change and effects on predator-prey relationships and prey abundance.

I think it's a step too far to do that right now, but, at the same time, do I think we need to discontinue these kinds of studies? Absolutely not. That's why I think, if we're going to pick one species, pick the one that you want to continue getting that information as an indicator on should these be protected in the future, and I just think it's a step too far right now, but, to discontinue and to ignore it right now is also not a wise or prudent move, in my opinion, from my three-cents' worth.

AP MEMBER: An alternative view is we might, if we continue management of species in the traditional way we've done, then, when we see a collapse in wahoo and study that for five years, we'll realize that there was a collapse in the frigate mackerel population, because there is a new commercial industry that has sprung up, and so, to me, that's a scenario that presents trying to catch up from a disaster, and I don't disagree with Jamie's observations, but is it more prudent to start looking at -- If we know that the frigate mackerel and the bullet mackerel are the predominant prey species for wahoo, which is a managed fish, how do we -- If we don't want to put it under a protective net, how do we start observing it, and what's the process to at least acknowledge that it needs to be researched, and do we even know if they are considered pelagic? Are the prey species pelagic as well, or are there different populations that just stay in certain areas and the pelagics feed as they go along?

I don't know -- I am hesitant to say -- I know you're not saying that, no, don't do anything, but I think we need to be fairly aggressive and fairly proactive and specific in what we want to do, so that we can see what the problems are before it affects the major population, and I don't know what that is, but --

MS. DEATON: Before you talk, Jamie, I was just going to say that, if this advisory panel went forward with a recommendation to manage the forage species, to be proactive, that doesn't mean they will. That's just a recommendation to the council, and so it would be the beginning of them discussing it further, and so that's just one thought to keep in mind. Jamie, what did you want to add?

MR. GEIGER: I would ask what are the identified threats to these prey species? I will go back to menhaden and striped bass. In menhaden, you have a reduction fishery that's impacting it, and you've got a whole bunch of other factors that are there that are just going to impact a billion-dollar fishery if it's gone unchecked.

That is being proactive, but, at the same time, we don't want to get these species in the same situation like we find ourselves in menhaden in the Chesapeake Bay and that part of the Atlantic, and so my sense is that -- I would ask, what are the identified threats to these prey species, if any right now? Are they being overfished, are they being overharvested, or is there any kind of industry that is using them for anything else? Do we have any indications of an imminent population collapse? The data you have presented indicates that there may not be, that we have a stable prey base.

With that in mind, I am looking to see what's the highest-priority work we need to do, and we don't want to lose sight of predator-prey relationships, but, again, is the juice worth the squeeze? You've got limited resources, and I want to pick the highest amount of resources we need to go forward in, and I don't want to basically recommend doing the universe, so to speak, and I would rather take a smaller bite and do it well and use that as a proxy for other prey species, if we can. I am not disagreeing with you. I would love to have the resources and recommend the resources to do that, but my sense is the council is already stretched thin.

We have a lot of stuff we need to do, and is this another task to be added that may be a step too far? I don't know, and I'm just throwing it out. I am not seeing those threats to that prey species, and I'm just not seeing it. If you could identify some of those threats, convince me, but I don't see it right now. Thank you.

MS. DEATON: Steve, what are some of the threats that you know of? Do you know of any?

MR. POLAND: Well, first off, I'm not here to convince you of anything. I am just presenting --

MR. GEIGER: No, but you're the best one to tell us.

MR. POLAND: Yes, and I understand that, and those are really good questions, and those are questions that need to be asked, and those are questions that I assume the council is going to weigh-in on and discuss, because there is not a fishery for at least the two Auxis species here in the South Atlantic right now.

There is really, I think, two ways to approach this issue. There is the way that the Mid-Atlantic Council approached the issue of just being very proactive in identifying the forage field out there and identifying the species that are important forage-wise to their managed species and protecting them by classifying them as ecosystem component species and implementing a vessel limit and reporting requirements, so a fishery wouldn't develop, or the council would have time to work on further management if a fishery did develop for those species, and so there is that approach.

Then there is the other end of the spectrum approach of just wait until there is a problem, and I don't know which way the council is leaning, and I don't know if the council feels like we're at a point now that we need to be proactive or if we're at a point where we just wait, because, like you said, we are working on a lot of stuff. I mean, lord knows there is forty-some snapper grouper amendments, and so, to answer your question, there are no threats, I feel like, to the two Auxis species, in the sense that there is really insignificant commercial landings, but, with that being said, we really don't know what's being landed.

There is nobody out there targeting them, but we don't know of the recreational significance of this resource, and we don't know if there's recreational fishermen out there collecting these fish to use for bait, and we don't know if there is a cultural significance to them and if there's somebody that just feels happy that they're swimming around out there, and we don't know.

The council hasn't done that work yet, and, really, the council is going to discuss in December if we feel like that there is enough justification there or if there's even a need there to maybe consider this type of proactive approach now, or maybe in the future, and so, to answer your question, there are no threats, but we haven't really investigated if there are any threats either.

DR. BAUMSTARK: I think it's probably important to briefly put on the ecosystem hat and say that, if we don't understand how these prey species fit into the ecosystem big picture, how can we suggest that they are managed? We don't understand what the threats are, and we don't understand when there really is a problem if we don't understand how it all fits together, and so I would think, at the AP, our task and our role in this would be the understanding of how it fits in would be the priority before saying it should be managed, would be my perspective.

MS. DEATON: One question. What about oil and gas? If there was to be an oil facility, and there was a spill, and I'm just saying, and there might not be, but that could impact -- How would that impact the fish and the sargassum?

MR. PUGLIESE: I guess you would look at the Gulf. We don't have enough on some of these things, but I think -- I mean, if you look at the -- I still have images of burning the sargassum rafts in the Gulf of Mexico, and I didn't want to go down those roads, and hopefully we won't, but that is a non-fishing threat that is in the background. The one thing I think I wanted to make a point to, kind of to Jamie's point about taking an incremental step, I think that's what this is intended to be, is a very focused look under a very specific plan and not necessarily look at that whole broad range, and they may consider that as something else, but it's going to be discussed very much under that, where it's a collaboration with these other ones, and to investigate this, because I think this is the first time that we've had these discussions at the council level on management of prey.

I say prey very specifically, because this a higher-level trophic level than some of these other ones that have been dealt with, and I think there are some of those considerations in the South Atlantic of interaction between species, and I think we're seeing some of those already, as some of these other populations build. This opens that door of looking at a higher trophic level as a component, and it just begins the discussion, and so that's something, and making the link is, I think, the intent of showing the information that Steve has presented, both from his work and from past efforts to set the stage for the discussion, which everybody has been having, of where we go from here and your next steps on -- It sounds as if there is support for some level of discussion and consideration and concern over workload.

I wouldn't worry about, as much, the concern -- That's going to be Steve's issues and the council's issues to balance it, and they will say yes or no or maybe, if it's beyond things, but I think the idea is to say is this a consideration that needs to be done as we move forward under ecosystem-based management.

MR. GEIGER: In my opinion, yes, but it has to be focused, and it has to be targeted, and it has to focus on outcomes and not outputs. Thank you.

MS. DEATON: Is this something that we want the advisory panel to maybe put into a motion, because I am hearing -- Just to clarify what we want to recommend to the council, because I feel like there is different opinions on how far to take it.

MR. PUGLIESE: Well, I think the way that Jamie stated it, combining with -- I mean, if you put those statements together, I think you have kind of the context, because I think everybody has been kind of reaching to getting that, and so combining those in a statement, and that probably would be good to have a motion under here. We have consensus on the other, but I think this is important enough to have that input from a council member on this issue and having it discussed at the next council meeting to at least put it in context, so that they can discuss it and look forward.

MS. DEATON: Then we need somebody to come up with that wording.

MR. WEBB: I just was asking them to submit something that outlines what they would like to have, so that they can at least present it to the council and let the council determine where in the priority list it falls and what resources are available, and so, if we could get an outline of a request, Jamie and I would be happy to work on a rough draft.

MR. PUGLIESE: Yes, that's something we can -- You all can work on it in the background, and we'll get back and get that done before we leave this meeting and make sure that it's really clear about what to advance, and that will definitely advance it forward, and I think Steve has heard the specific discussions, and having a statement, I think, is going to be really important to advance it at the committee level as part of the bigger report-out for the AP report. It doesn't have to be done this second, and we have time here. We're going to be working over these issues, and, plus, we'll have other things that may be connected to make you think more about the connections on ecosystem, et cetera.

MS. DEATON: Okay. Steve, are you staying for the rest of the meeting?

MR. POLAND: Until I fly out tomorrow afternoon.

MS. DEATON: So we'll conclude this tomorrow.

MR. PUGLIESE: Maybe we can sit down and discuss it, and we could get something ready, so that it can be done in the morning, before we get into a lot of the other actions, because it's going to be a full day tomorrow, and we could get buried before we get a chance to even weigh-in on this, and, while it's still fresh in everybody's mind, have it together, and we'll get together and sort that out. If that sounds like a reasonable direction, I think that's probably what we ought to do.

MS. DEATON: All right then, and so we're going to move on to Marcel.

MR. PUGLIESE: We're going to have a little adjustment. We're going to go directly into the South Atlantic discussion on natural events, because of all the mayhem that has happened this year, and the idea is that we also will cover the first part of the fishery-independent presentations, and Marcel will be able to provide that before we leave today, and so that's the revised schedule. We keep on tweaking it a little bit.

MS. DEATON: Do we need a break?

MR. PUGLIESE: Yes. We did bad this morning, and sorry. That was my bad.

MS. DEATON: Let's take a break for ten minutes.

(Whereupon, a recess was taken.)

MR. PUGLIESE: We're about ready to get started. We're going to have a little shift around, where we're going to Marcel's presentation on the update on fishery-independent surveys to start with, but one point I wanted to clarify is that we're going to have Dave Webb and Jamie Geiger work on the guidance and getting input on the presentation, et cetera, but then the guidance will be developed so that we can advance that in the morning, just so it's clear for the record how we're going to move forward.

MS. DEATON: Marcel, do you want to just take it away?

DR. REICHERT: Absolutely. Thank you for the opportunity to update you on some of the fishery-independent survey information. You have seen my update in previous meetings. Since I realized there were a number of new AP members, I added a little more information to describe the surveys for your information, but we can go through those slides relatively quickly. I also want to mention that all the videos and photos, underwater photos, that I show are actual videos from our trap survey.

The update I am going to give you is mostly about the MARMAP and the SEAMAP programs, and those are long-term, regional, fishery-independent monitoring programs, and they are general monitoring areas from Cape Hatteras to south of Cape Canaveral, roughly the St. Lucie area. The MARMAP Program, or Marine Resources Monitoring Assessment and Prediction Program, has been in place since 1972. Initially, we did a number of surveys, including an ichthyoplankton survey and a trawl survey.

In around 1978, we started the reef fish survey with a variety of trap gears, the long bottom longlines and rod-and-reel, and, currently, we're using mostly the chevron trap, and that's a survey that started in 1989, and, in 2009, or 2010, SEAMAP got additional funding, and we started expanding our survey, and then, in 2009/2010, SEFIS, or the Southeast Fishery Independent Survey, housed at the Beaufort Lab In North Carolina, came online, and they provided additional funding, and the map shows the current coverage of our sampling in the region, and so, currently, we have a pretty good sampling coverage.

It also introduced the trap cameras. In the past, we've done some still photography on the traps, and some film, but, since 2010, we have underwater videos on all the traps, and I will talk with you a little bit more about that later, and, currently, that combined survey, MARMAP, SEAMAP, and SEFIS, is called the Southeast Reef Fish Survey, or SERFS.

Then the SEAMAP South Atlantic started off as the Coastal Trawl Survey, and the map shows you the shallow coastal survey area, and the yellow stripes are the sampling areas. Again, it's Cape Hatteras to south of Cape Canaveral, and, in 2009, we received additional funding through SEAMAP, and that helped us with the reef fish survey, but it also provided funding for the red

drum and coastal shark longline surveys that were conducted in both North Carolina, South Carolina, and Georgia.

It provided some funding for the Pamlico Sound survey, and it also provided some funding for the Southeast Regional Taxonomic Center that helped us, in particular, with identifying diet items for our diet studies, and what was very important is it also provided information for data management, and we'll talk a little bit more about that later.

A little bit about the Coastal Trawl Survey. We are using the Lady Lisa, and that boat was built in 1980, and it has well passed its expected life, and so South Carolina DNR is currently looking at possibilities of replacing the vessel, but, obviously, that means quite an investment in the survey.

The trawl survey is the only long-term regional trawl survey in the southeast, and we collect information of about 800,000 to a million individual fish and crustaceans each year. We have three cruises, in the spring, summer, and fall, and we target between 102 and 112 stations each season, and the depth over which is trawled is between fifteen and thirty feet. They are short trawls, and we don't use turtle excluder devices, so we can collect information on turtles, also.

In recent years, starting in the summer of 2017, we were able to sample almost all of our stations. In the fall of 2017, we only managed to sample ninety-five stations, and that was mostly because you may remember that we had quite a busy hurricane season that year, and, in the spring, we were plagued with a lot of bad weather, and also we had some staffing issues, some turnover, but, fortunately, in the summer, we were able to sample all of our stations, and the fall 2018 season is ongoing right now.

This is a brief overview of our 2017 results, and we collected over 900,000 individuals in the trawls, about 185 taxa, and mostly species, but there are some species that we can't identify to the species level. I list a number of species here that are quite common in our catches, and that includes menhaden, but also sea turtles and coastal sharks, horseshoe crabs, and some other crustaceans, and then, of course, you were talking about prey species, and we are collecting a large number of prey species in the trawl survey. We also collect life history information, mostly age and reproductive data, on Atlantic croaker, southern kingfish, bluefish, weakfish, and the two Spanish mackerel species.

In 2017, we have seen relatively high CPUE overall in the last couple of years, including those for king mackerel, white shrimp, southern kingfish, and southern flounder, and the data are summarized in our annual data reports that are available, and our data are also available in the SEAMAP database, and that was partially a result of the additional funding that we received through SEAMAP.

Then a big step for the trawl survey was we moved towards a more integrated data acquisition system, and that's the BigFin fish measuring boards, combined with FEED software, and we implemented that in the reef fish survey last year, or the year before, and it's now fully integrated in the trawl survey also, and that means that, from the data collection onboard to entering the information into the database, and that's all streamlined and done electronically, and it includes a number of QA/QC steps.

What is important is the reduced number of errors, and it streamlined and made our data acquisition a lot more efficient. The data for the trawl survey are used regularly in stock assessments and for management, in particular for a number of species that are managed by the Atlantic States Marine Fisheries Commission, but also species that are managed by individual states and the federal government, and a lot of the data is used for compliance reports and for analyses to potentially trigger management actions and for CPUE for bycatch, for instance in the shrimp fishery, and we collect a lot of information on shrimp abundance and blackgill disease in shrimp, and the data was also recently used for ecosystem-based modeling efforts, and Tracey Smart will update you on some of those efforts later.

Some of the challenges, I already mentioned the age of our primary research vessel, and replacement is sorely needed. The replacement, however, is somewhat uncertain, mostly as a result of funding. The weather, increasingly, is plaguing us, as I mentioned earlier. It means that we lose sea days, because we have to secure the vessel, and/or the weather is too rough for us to go out, and it also affects our sampling efficiency. After storms, there is generally a lot more debris in the water, and the photo on the left-hand side shows a net that is completely ripped up by debris in the water, and that means that we have to replace the nets, mend the nets, and that means reduced sampling efficiency.

Another major challenge is the funding. The funding has remained largely stagnant, and, currently, we need sixty sea days for three field seasons, or probably a little more, because we are increasingly plagued by the weather. Current funding allows for about forty-eight sea days, and the costs are going up, and so those number of sea days will probably go down in the future. That means, in 2020, we are planning to eliminate one of the sampling seasons each year, and on a rotating basis. This was a decision that we initially saw in 2017 and 2018, and we were fortunate to receive some additional funding through the Atlantic States Marine Fisheries Commission, and that allows us to hopefully continue sampling the three seasons through the 2019 season. Hopefully, we will receive some additional funding and it will not be necessary to eliminate a season, but this is probably what we are facing in 2020.

Then, for the Southeast Reef Fish Survey, I already mentioned that is a collaboration between three programs, and we are using three research vessels, the Palmetto, owned by South Carolina, and that underwent a major renovation that I reported on earlier to you, and South Carolina DNR invested over a million dollars in that complete overhaul of the vessel, and the engines are now 20 percent more efficient, and the exhaust is a lot less, and it also was modernized a lot, and it is now a research vessel that hopefully we can use for at least the foreseeable future. Then we also are using the Savannah, mostly by the SEFIS program, and NOAA Ship Pisces, and, again, this is a video from one of our sampling sites. I want to let you know that not all of our videos look like that.

Our sampling season is from May through September, and I already mentioned the sampling area, and we've been using a variety of gears, and I am mostly going to focus on the chevron trap, and we are using some other gears also. We are targeting live bottom habitat with low relief to medium relief deployed to about 110 meters. We have used it consistently and standardized since 2019, and that's very important for the use of analyses based on these trap catches for stock assessments.

All of our gear is soaked for about ninety minutes, and the traps are baited with clupeids, mostly menhaden, and, as you can see on the right-hand side, there is generally three cameras on the trap,

one facing forward, one facing the opening of the trap, and then, on occasion, there's a third one that looks inside the trap, and this picture is made by a fourth camera that's attached above the trap, just to give an idea of the trap area.

Currently, we're using GoPros, and that is very nice, because the cameras that we used earlier in big, underwater housings were very expensive, and, on occasion, we do lose a trap, and so the GoPros are very affordable underwater cameras, and we're using deepwater, underwater housing, and it has worked very, very well for us.

We are using some other gears. The short bottom longline is a twenty-meter line, and we use that over high-relief bottom, deeper than about ninety meters, especially to sample the deepwater snapper grouper species. Due to funding, we halted that survey in 2012, but, in recent years, we were able to resume that survey.

We also have a long bottom longline predominantly sampling the mud bottom habitat where the golden tilefish is -- That is mostly golden tilefish habitat. We halted that in 2012, and I think we did that one season since, but, due to funding, we have not been able to resume that survey. Then we used hook-and-reel mostly to collect some additional life history information, and we -- About once every six traps, we use a CTD to collect oceanographic information, like temperature, depth, light, and oxygen, depending on the CTD that we're using.

The cameras have become really important. We use them to provide additional indices of relative abundance, and it's particular species that we generally don't catch in the traps, such as lionfish and a variety of other species. It gives us an opportunity to do a lot of habitat characterization, and the video analysis is mostly done by our colleagues at SEFIS, and they characterize the habitat, and it also gives us an opportunity to observe non-target species, such as this aggregation of rays and cobia that we open see.

This is a clump of sponges that is attached to a clam that is reproducing, and you see these clouds, and, initially, I thought that I have never seen sponges move, and then until we realized that it was actually a clam, but these are the types of observations that you can do when you have those two videos attached to your traps, and so we are collecting a lot of information on fish behavior and non-fish behavior and other target species. I have another slide with some videos that I think are really cool.

This is, for instance, courtship behavior of hogfish, and the white one with the black stripe is a male, and they usually have a harem. It's a protogynous species, and here you see the movement of the fins, particularly the pectoral fins, and it swims around a female, and we have seen other courtship behavior or spawning behavior also, again something that otherwise would be very difficult to collect, and, on the lower-right-hand video, and I think I've shown this before, but it's a red snapper coming into a trap, and it actually eats a number of fish in the trap, and that is -- One, it's important information, but, also, the GoPro cameras record sound, and we can actually hear the sound of the fish when they are being caught by the red snapper, and, in this video, you can also see some other species. A little while ago, you could see a moray eel, but this gives us an opportunity to, for instance, look at fish entering and leaving the trap. Sometimes fish willy-nilly leave and enter the trap, especially small ones, and some other behavior in and around the trap.

This is kind of an overview of our efforts. In the past, the number of traps we sampled was around 500, and so, here, you see 500 to 700, and here you see that we have well doubled our effort since 2009/2010, when SEFIS came online. The red numbers are this year, and we just finished the sampling season, and so these are some preliminary numbers, and, as you can see, we had a pretty good year this year. Last year, with all the hurricanes, again, the second-half of the sampling season was heavily impacted.

Again, in red are some preliminary numbers for this year. You can see between 1,500 and 1,700 chevron traps that we deployed in the region, and the blue dots are chevron trap locations, with pretty good coverage, I would say, and we also were able to deploy the short bottom longline. We deploy our traps in sets of six, and each are individually tethered to the surface, and we do one CTD per six traps, and we caught between 40,000 and 47,000 fish, roughly between sixty-five and sixty-nine species.

We keep, and, for life history, it's age, reproduction, diet, and other information between 10,000 and 11,000 fish, roughly, and I mentioned already that we fully implemented our new data acquisition system. It's really cool, because it provides labels based on the data that we collect during the day. During the day, we catch the fish, and, during the night, we process them, and so all of that information is immediately integrated into our system, and so it's really nice.

This is an overview of the 2017 data. The blue ones are the species that we do not collect life history information for, but the black ones we are. Every year, tomtate, black sea bass, and vermilion snapper are very abundant species in our traps. It's very interesting that red snapper is eight, and it wasn't that long ago that we were lucky if we saw a handful of red snapper each year, and now it's our eighth-most abundant species in the trap, and I will show you a trend plot in a little bit.

The data, I already mentioned some of the data, and I think this is one of the videos that I showed you last year. Obviously, species diversity, abundance, age, reproduction, diet, DNA, and we collect information on habitat structure, oceanographic information, and what is really nice is we have -- The partners have one combined dataset that is housed at South Carolina DNR.

We are doing all the life history workup, and then our SEFIS partners are doing all the video analysis and video examination, although we have assisted them with that, and what's nice is that all the data, both for the trawl survey and the reef fish survey, is available online for query at www.seamap.org, and that's all made possible by the additional funding through SEAMAP for data management. You can query the data yourself and extract the data. It also gives us an opportunity to follow and see how many people have looked at the data and downloaded the data.

Then, for the data use, a lot of our information is critical for stock assessments and management in the region. All the data that I mentioned earlier is used in the last two years, and our data was used for a variety of important species for recreational and commercial fisheries, such as black sea bass and red snapper and the other species you see on the slide, and then the diet and oceanographic information is being used in the South Atlantic Fishery Management Council's Fishery Ecosystem Plan and also for the ecosystem modeling efforts in the South Atlantic, and I think you're going to discuss that later.

Also, we provide training for students. We provide samples, and we have one volunteer on each of our reef fish cruises, and so anyone who wants to join us for a cruise can do that, and we've had high school kids, and we have had teachers and colleagues from other state agencies, and we provide a lot of samples and data for third-parties, and we are happy to accommodate that for anyone, if at all possible, at no or marginal cost, since we are out there anyway collecting that information or collecting those samples.

We also provide, once a year, usually in the June council meeting, we provide the council with an overview of CPUE, and, in the most recent overview, we started providing distribution maps, and Tracey Smart is one of the people who is mostly responsible for this, and these are the quadrants of our nominal CPUE, and red means the highest abundance, and blue means absent. Of course, you have to take into account that there may be areas where we don't sample, and so the fish are absent there.

This is black sea bass, and it's a shallow-water species, widely distributed along the coast, and this is the long-term CPUE. The black line is the standardized CPUE, using a zero-inflated binominal standardization, and the red dots are the nominal CPUE, and the gray area is the 95 percent confidence interval, and, here, I selected black sea bass because it had a real increase in abundance between like say 2009 and 2011, and then with a subsequent decline, which has gone on until at least 2017, and we are still analyzing the 2018 data.

Another example that I added, and, if you guys are interested in some other species, I can certainly show you, is, of course, a red marine fish that is of a lot of interest to a lot of people, is red snapper, and, as you probably know, red snapper has increased, since probably 2009, steadily, and I think the preliminary 2018 data show that that increase is still ongoing, although we may see a little bit of a flattening here, but this also is indicating -- I mentioned earlier, in our earlier time series, that we were happy if we saw like a handful of red snapper. Well, now, it's the eighth-most abundant species.

The distribution map also shows that they are somewhat abundant off of North Carolina, and then they are getting more abundant off the southern part of South Carolina and Georgia, but in particular off of Florida, and so the council was very happy to see this distribution, and what we are trying to do is provide a distribution in five-year blocks, to see if there were some changes over time, and Tina has also worked on similar graphic displays for several of our species in her work on the council's website, and so, as I said, I picked just two species out. If you are interested in others, I can certainly show them to you.

Obviously, this is work that relies on the hard work of a lot of people, and so I always acknowledge the many staff and students and research vessels that are present today or have worked with us in the past, and, before I entertain any questions, for a while, we were wondering why we were losing labels on our traps, and we found the culprit. That fish wasn't particularly happy, I guess, with our traps. Anyway, I am happy to entertain any questions.

MS. DEATON: Any questions or comments?

AP MEMBER: I am just curious. I see the increase in the red snapper numbers, and, obviously, they have been managed quite heavily, but then, the decrease in black sea bass, I am just curious

if there are any -- What are your opinions, or what does the data suggest, because it too has had a significant amount of management.

DR. REICHERT: One of our staff is doing his master's thesis on diet studies, and red snapper is one of the species that he is investigating, and we were wondering the same thing, and we have had some discussions, or the council has had some discussions, and the SSC has had some discussions on this topic.

Interestingly enough, I don't believe, in his data, that he has seen a lot of black sea bass in the stomachs of red snapper, and so those are preliminary data, but this is not -- Black sea bass is not a species that jumped out, in terms of diet of red snapper. There may be some other stuff going on. What is interesting, and I hope this works, is we have seen a similar pattern in bank sea bass, and so I'm not entirely sure what is going on there, in terms of patterns. Around the same time, we see that same decline, and so this is something that is definitely worth investigating, and I would argue that maybe the interactions between species, and that it's ecosystem-based, but it doesn't look like it's a direct effect in terms of predation.

MS. COOKSEY: Anne and I were having a brief sidebar, and what stood out to us was the juvenile habitat usage differences between the black and the bank sea bass and the red snapper, in that both of the sea bass really like our near-shore habitat and our estuaries, and, from the near-shore perspective, both in South Carolina and North Carolina, since the late 2000s, we've seen a massive increase in the amount of beach nourishment activities going on and what has become routine disturbance to the near-shore environment, and in periods of time where you may have juveniles moving through, and so that was just something that jumped out to us.

MR. MARTORE: Marcel, with the increase in lionfish all over the Southeast, do you guys ever look at lionfish stomachs and see what they're eating?

DR. REICHERT: I am looking at Tracey, and I think we did look at that. I'm not sure if Kevin Spanik looked at that, but other studies have looked at that also, and what I remember is they devour anything that they can fit in their mouth, and so whatever is abundant, and I have seen stomachs that were full of juvenile tomtate and juvenile vermilion snapper, but we are looking at that, and what's also interesting is lionfish is now our thirty-first-most abundant species in the trap, and it doesn't sound like much, but we did not catch them for the longest time, but now they are regularly seen in the traps, and so they are there, and I believe they are here to stay, and we see them a lot on the videos, but I'm not sure if that answers your question.

MR. PUGLIESE: To Bob's question, in the past, all the way up until literally the last number of years, most all of the diet work that had been done had shown that there was essentially a competition with prey, and so they were really consuming a lot of the same prey species that many of the snapper grouper were, and I think it may be a population increase enough where you're getting the spillover, where now they are basically -- As Marcel said, they are eating everything, and so you're getting other contributions from those, and so I think those are still things that need to be understood, in terms of that entire -- It gets all the way back to the whole thing of understanding the full diet complex of all the species, including lionfish, on the reef systems.

MR. MARTORE: I was just wondering if you could correlate an increase in lionfish with a decrease in anything else.

DR. REICHERT: Yes, and we have done that in the past. What we like to do is go beyond that correlation. That gives you a first indication, but then it would be nice to see a cause-and-effect, because that was the first thing that we thought of when we saw that increase in the red snapper and then that decrease in the black sea bass, and the diet information is telling us that there is not a direct -- There may be other links, but there is not a direct link.

The other thing is our mesh size is, and I forgot the exact size, but it's about two-and-a-half or two inches or something like that, and so we are missing the really small juveniles, and so we are really interested in seeing if we can collect some information on juveniles in the area, because a lot of these species -- A lot of the juveniles of these species obviously are prey for larger individuals or for individuals of larger species.

MR. HART: With the presence of the predators in the traps, do you happen to see less recruitment into the traps? If you're getting the snapper or the lionfish in, do you not necessarily see the black sea bass that used to be in those traps? Is there like a predator avoidance?

DR. REICHERT: We have started looking at that, and that's what we are using our inside-the-trap videos for. We had a PhD student who specifically looked at that, and we could not see any signals, in terms of avoidance or, on the contrary, if there is a number of smaller species, do you see that larger predators have a higher incidence of getting into the traps or not, and that may be because that signal isn't there, and it may also be that our -- That the variability in our data may be high, because, the larger the fish, the more rare the occasion is. We catch a lot of large fish, but in a lot lower numbers than smaller fish, obviously, and so we are starting to look at that, and, over time, I hope we accumulate sufficient information.

That's very important, because then you can potentially correct your CPUE estimates by looking at what's in the trap and when it entered the trap, because you can imagine, if there's a big fish in the trap, a lot of smaller fish say, well, that may not be a good place to go, and vice versa. If there's a lot of small fish, like you see with the red snapper, and we have a similar video with a gag grouper, if there's a lot of prey in there that apparently can't go anywhere, but that is a very interesting type of information that we hope to get.

MR. HART: Thanks, and I didn't know maybe even sound-wise, and I know you said that you're recording sound, and so, even if it's not a larger fish, they may be putting out that sound that is preventing other things from entering that trap.

DR. REICHERT: We are currently looking to see if the GoPros actually record sound that is useful in these type of analyses, and we are also starting to work with a colleague who is willing to put passive sound recorders on the traps to link that to our videos, but also to look at the general soundscapes underwater and link that potentially to species diversity and habitat type and the like, but, with a lot of that, we collect a lot of information, and it's the examination and the analysis that is usually the most time-consuming.

MS. DEATON: Any other questions or comments? Okay. Thank you, Marcel, and thank you for doing that early at the last minute. The next thing on the agenda is -- We're going to go backward, because we went forward for that, and we're going to go to the South Atlantic State Natural Events of 2018, and what Roger had asked is for just some discussion about people from the various states

here, and everybody has had some kind of crazy -- Well, extreme weather events, let's say, and so we'll just go over what happened there and what we think the impact may be on the ecosystem and the fisheries and that kind of thing. Should we start from the south, or we can start in the north. We'll start in Florida.

(The roundtable discussion of habitat and environmental impacts was not transcribed.)

MS. DEATON: Laura, did you want to give us an update?

MS. BUSCH: I reached out to someone in my office, who went to the Fleet Forces weapon's officer, who he was unfamiliar with the issue, and he hadn't heard anything, but it could be a DOD-wide research, because the Navy doesn't use any bullets that are special to the Navy. It's a DOD-wide procurement, and our current inventory will last us into the next few years.

MS. DEATON: Thanks for that update. So we're done for the day?

MR. PUGLIESE: Yes, I think so. I do appreciate everybody stepping up and doing this kind of a roundtable forum, and it was a little open-ended, and we can maybe get into this same type of issue in maybe a little more detail at the next advisory panel meeting, with kind of maybe shoring up some of the specifics on where things are and what some of the implications are beyond here, but this was kind of a springboard to open it, because this has been a crazy year.

I mean, the last two years have been this way, but this year has -- Like Jeff said, the beginning of it, with the cold event, and then through hurricanes and red tides, et cetera, and, again, the extremes and some of these big events seem to be the standard instead of the difference nowadays, and so the implications, I think we understand, are going to be probably long-term, and what they may mean is something that we need to keep in the back of our mind as we start looking at the bigger picture, and so I appreciate all the consideration, and I appreciate all the individuals today that advanced a lot of good discussions on where we are in the Southeast.

MS. DEATON: Tomorrow, we meet again at 9:00, and we're adjourned for the day.

(Whereupon, the meeting recessed on November 6, 2018.)

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NOVEMBER 7, 2018

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 Sirata Beach Resort, St. Petersburg Beach, Florida, November 7, 2018, and was called to order at 9:00 o'clock a.m. by Chairman Anne Deaton.

MS. DEATON: Yesterday, we had a nice presentation and discussion about the prey of dolphin and wahoo fisheries by Steve Poland, and I just also wanted to mention that I failed to tell everyone that Steve Poland is on the council, and so he's with Marine Fisheries, and many of you recall that Michelle Duval moved, and so he is now in her position at Fisheries, and he is serving on the council, and so sorry about that, Steve, but I just wanted you all to be aware.

Yesterday, we also did one thing that was on the agenda for today, and so we're a little bit ahead, but, before we start off with our other topics, we were going to finish off on this wahoo prey discussion, and there was interest in a motion, possibly, because the Mid-Atlantic Council had asked us to consider whether management actions were needed for the prey species that these fisheries species rely on. Jamie Geiger and David Webb worked on a motion, and would you like to -- Would anybody like to make that motion?

MR. GEIGER: I mean, it's not necessarily in the form of a motion, Anne. What we've done is basically -- I thought it was going to be a recommendation to the council, and so our thought was that, if the AP basically concurs with that recommendation, it would be forwarded to the council for discussion and debate.

MS. DEATON: Okay, and that's on the screen right now.

MR. PUGLIESE: We will need to read it into the record.

MS. DEATON: The recommendation reads as that the Habitat Advisory Panel feels that a proactive approach to monitoring these prey species by the South Atlantic Fishery Management Council is both warranted and potentially valuable as management of these predator species transitions to a more ecosystem-based management approach. Do we have consensus on that recommendation? Should we say what the predator species are?

MR. WEBB: The issue is the Mid-Atlantic Fishery Management Council has requested the South Atlantic Fishery Management Council to consider the possibility of managing prey species, such as frigate and bullet mackerel, as ecosystem components in the Dolphin Wahoo FMP. The HAP has reviewed current information on the prey forage base of these predators. These prey species are currently neither overfished nor facing any immediate threats to the respective populations. Current levels of these prey species and others also appear to be stable over the last few years relative to dolphin wahoo populations in the South Atlantic.

The recommendation is the HAP feels that a proactive approach to monitoring these prey species by the South Atlantic Fishery Management Council is both warranted and potentially valuable as the management of these predator species transitions to a more ecosystem-based management approach. It's just a recommendation to start the process of evaluation and make sure that they're at least considered and then leave it to the council to determine what level they want to do the investigation.

MS. DEATON: All right. That makes sense. Is that good with you as written, Roger? Okay. Is there any objection to recommending that? There is no objection to doing that, and so Roger will forward that along.

Now that that's done, yesterday, Marcel gave a presentation on the research that's been going on through SEAMAP and MARMAP and SEFIS, and we've got a lot of acronyms there, and they are monitoring fish, and they're monitoring habitat, and they're monitoring fish use of the habitat in the ocean, and it's really valuable information for helping do stock assessments on many species in the South Atlantic.

Marcel has asked if these type of updates are what the advisory panel members want to see, or are there any suggestions of what other information he could provide that would be valuable to you all, so that you can evaluate any suggestions for the council regarding the programs?

MR. GEIGER: I do think that it would be extremely valuable for the HAP to provide a recommendation to the council on both funding issues as well as constraints to maintain the current sampling program and also what may be needed in the future to expand into higher-priority activity, if necessary. If we had a recommendation to forward that to the council, I think it would be extremely valuable, given the importance of these kinds of surveys. Thank you.

MS. DEATON: I think Marcel usually does provide information about funding limitations almost every time, and I know that vessel is an issue, and that's an expensive issue that you have coming up.

DR. REICHERT: Yes, and I try to incorporate that, and I can provide more detail if the panel is interested in that. Just to give you an indication, and I'm not sure if I mentioned that, but our funding level -- The base funding for MARMAP is currently about $730,000. Just to put that in perspective, our base funding in the early 1990s was $850,000, and so we have been trying to maintain that level of funding, and, of course, we have some additional sources of funding, through SEAMAP and others, and so that helped in maintaining our sampling level, but I am also interested in what type of information -- Because we have been providing these updates on a regular basis, and the structure -- Every now and then, I provide a little more detailed information, such as in this meeting, especially when there is new panel members, but, by and large, the type of information that I provide to the panel is roughly the same.

I have asked the same question to the council, and the council asked us to add those distribution maps that they found very helpful, and so that's why I am interested, and, if you want to email me later, if you think of something that could be helpful to the panel, I am more than happy to see if we can accommodate that, but what other information would be useful for the Habitat AP, in particular, to formulate their recommendations to the council, other than what I have presented, in terms of CPUE and some of the habitat information? We always like to provide the best information and the most useful information to the various panels.

MR. GEIGER: I agree, and I think there's two issues here. The first issue is doing more with less, and, too many times, we take that for granted, and smart managers always manage to do more with less, but, at some point in time, you have to have a baseline of this is the expectation of what it's going to cost to get the necessary data that you need to have, and you need to fully fund that. You can't continue to put managers under those kind of constraints and then continue to ask them for new information or new analysis without increasing some kind of a funding base. I would love to see that recommendation come forward to the council, because sometimes managers and administrators lose sight of that critical thing. That has to be factored into budget analysis and execution.

Secondly is the important part to most figure out. What new information needs to be given that is more valuable to fisheries managers, but, secondly, in that decision, is there some other information that could be either postponed or delayed to put higher-priority activities into place, and give the council a chance to make those discussions and have that debate, but, again, you can't continue to try to squeeze blood out of a lemon. Enough is enough, and I think it has to start at the grassroots, and that's where these advisory panel recommendations, I think, are very powerful. Thank you.

MR. PUGLIESE: I appreciate that, Jamie, and I think, in the response the council had on this roadmap, that actually comes out as a very strong statement about the support as baseline, because the whole reason we're having these discussions is those programs in place are the foundational information from everything from the habitat information that we have to the information going into the assessments and into the ecosystem models and into the future of how we do it, but there is significant -- I think that point about maintaining is something that we have struggled with over time in the program, because I have been chairing the SEAMAP committee for a number of years, and it's exactly it. You're doing more with less all the time, and it's the battle to try to keep ahead, and we've passed that line about baselines, but I think the messaging is getting there, but it has to keep on getting sent forward.

The other opportunity, I think, is to get that messaging about the opportunities that are potentially available. You've got platforms out on the water that can be carrying new technologies, and those are the types of things that our partners in the region, through the Ocean Observing Association, through NOAA itself, need to step up and start bringing some of these things and providing them to the ongoing programs we have, because the added values are going to be massive to be able to do that.

You've already got a platform collecting information on a routine over a very -- You saw the significant period of time that we're talking about, and you start expanding that capability with other technologies, whether it be mapping or all types of expanded environmental collection of information or whatever on those, and, I mean, it just -- It does more with less, technically, less in terms of the structural operations of the system, but more, because, all of a sudden, you have added new science.

One thing that I will plug is that, and I have provided this before, and it's actually part of the implementation plan, is the SEAMAP five-year plan is very specific on a lot of things that need to be done to maintain the existing systems and to expand and then to go even to things like creating new surveys, because, right now, for example, we do not have a pelagic survey in the Southeast. Some of the key species, king and Spanish mackerel, do not have fishery-independent surveys, other than the sub-components for juveniles that are used through the Coastal Trawl Survey.

Those are some of the issues that are ongoing, and the messaging from this panel that that needs to be supported and maintained and expanded, and really it does. It doesn't need to just be there, because I look outside our region, and, if you look to someplace like where they're doing work in the California Current and things like that, and their technology is so far beyond what we're doing on these, and NOAA has to realize that, if they really want to see ecosystem-based management move forward and really support the foundational systems, such as SEAMAP and MARMAP and SEFIS, to make sure they advance.

MS. DEATON: Any other comments? All right, and so send your email to Marcel of what you would like him to present in the next meeting to us, if you have any ideas or suggestions, and Roger will capture the funding piece in the recommendations. Now we're going to continue on in a similar topic with discussion on South Atlantic ecosystem model development, and so Tracey Smart is going to present that, and she works with Marcel at South Carolina DNR, and let's hear what you're doing with the data.

MS. SMART: Thank you. Good morning. As Anne mentioned, I work with Marcel, and so I work with both the MARMAP and the SEAMAP programs, which are the primary funding sources for the Reef Fish Survey that is part of the Southeast Reef Fish Survey that is run out of the South Carolina Department of Natural Resources and also with the SEAMAP South-Atlantic-funded Coastal Trawl Survey, and so I'll talk a little bit about both of those surveys and what data we have provided to support the Ecopath modeling that I believe is on the agenda for Friday.

Since Marcel gave an overview of both surveys yesterday and how we sample and where, I'm going to skip all of that level of detail. Everything that he said yesterday applies to these data, and so the overview of what we've provided to date so far cover a timeframe from 1990 to 2016, and that is when both the Coastal Trawl Survey and the Reef Fish Survey have been sampling with the current standardized methodology that's in place to date, and, at the time we started this project, 2016 data were finalized, but we do have 2017 data available now in full form, as well as 2018 is coming up.

The Coastal Trawl Survey provided biomass estimates, annual biomass estimates, for three species of interest that were identified in the Ecopath working group as well as fifteen different trophic groups, and this covers a little over a hundred species that are included in those groups. We were also able to provide detailed diet information for six species that were identified as needs for the Ecopath model. In the Reef Fish Survey data, we provided annual biomass estimates for twenty-one species, most of which were species of interest, as well as diet information for fifteen species.

I won't go through this in detail, and you have this available on Dropbox as well as online, and so the Coastal Trawl Survey annual biomass estimates are nominal estimates, and we haven't done any fancy modeling or anything with them, just because of the time which we had available to provide them, but a little bit of review.

The numbers that are in the parentheses are the number of species that are included in each group. The three species of interest that were identified that we had decent data for were Atlantic menhaden, bluefish, and weakfish, and we had a variety of benthic groups, demersal groups, and pelagic groups that we encounter very frequently in the survey, and mackerels, both Atlantic, king, and Spanish, a couple of mullets, the three big penaeid species off of our coast of brown, pink, and white shrimp, a huge variety, thirteen species, of sciaenids, thirteen species of sharks, and thirteen species of skates and rays.

The Coastal Survey diet data that we were able to provide included percent by number, percent by weight, and also percent frequency of occurrence of prey in diets of Atlantic croaker, and these are both sub-adult and adult, bluefish, which is primarily juvenile fish, king mackerel, which is primarily juveniles, age-zeroes and ones, southern kingfish, a variety of sizes, sub-adult and adult,

Spanish mackerel, primarily juveniles, mostly age-zeroes and ones, a few twos, as well as weakfish, which are generally sub-adults and adults, in the survey.

For the annual biomass estimates for the Reef Fish Survey, the vast majority were broken out as species of interest, and this included gray triggerfish, two grunts, a couple of jacks, a variety of porgies, a large variety of serranids, which are very commonly encountered by the trap survey as well as our longline survey. In particular, a couple of species, such as speckled hind, gag and scamp grouper, were the primary dataset for those. Then snappers, including red and vermilion, and then tilefishes from our deepwater longline surveys, blueline and golden.

Over the years, the Reef Fish Survey has had a variety of projects looking at diet data, most of which are adult life stages or some sort of mix of adult and sub-adult. Several of these are available in publications, and we have a few reports to ASMFC and the South Atlantic Council's SEDAR working papers as well as some upcoming publications that we're finishing up.

Gray triggerfish, both tomtate and white grunt, and we have data for a variety of porgies, a variety of sizes. Then black sea bass, sand perch, gag and scamp grouper, and snappers, both the red and vermilion, as well as some other species that we happened to have projects on a few years ago, the lionfishes and squirrelfish, and I did follow up with our diet guy yesterday, Kevin Spanik, and he said that he hasn't really seen any black sea bass in the lionfish diets, to date, but, in the Gulf of Mexico, there is a couple of publications that note black sea bass, or at least Centropristis.

In terms of what we probably can provide in the near future, both surveys continue to monitor for annual biomass. Like I said earlier, we have the 2017 data in hand, and 2018 is just wrapping up, and, unfortunately, of note for funding, the Coastal Trawl Survey diet studies have been suspended, due to lack of funding for that component, and so what we have available is all from previously collected and processed fish, and I think we're up-to-date on all of the species that we have stored.

The Reef Fish Survey diet studies are continuing under a limited basis. Most of the MARMAP and SEAMAP funding isn't available currently to support that. However, we've gotten a few small grants to support Kevin Spanik, who is our biologist, who specializes in diet studies, and he's currently a master's candidate at the College of Charleston, and so our projects are currently to support this thesis work, and what he's working on right now is red snapper, gag, scamp, red and snowy groupers are all heavily reliant on fish prey species, most of which is I think somewhere around 60 percent unidentified fish tissue, and so he's been using genetic barcoding to identify those fish species, and he'll actually be finishing up in December, I believe, and so those data should be available soon as well as published in the coming year, and I think that's all I have.

MS. DEATON: Thank you, Tracey. Any questions or comments?

MR. PUGLIESE: Thank you, Tracey. I mean, this is critical to advance the Ecopath ecosystem modeling efforts, and it's an ongoing effort, and so the good thing is that, as that model effort goes, highlighting which species still need more or updated information is going to be hopefully something that can go back to the programs and be able to identify some maybe priorities as time goes on.

DR. REICHERT: That's a similar question I had relative to the surveys. This was an overview, and some of the diet information we're still processing, and would it be useful for the Habitat AP

to provide maybe some overview of the primary diet items for a number of these species in a future update?

MS. DEATON: I would say yes. We saw that yesterday with our discussions, right? That would be great.

DR. REICHERT: Okay.

MR. HART: Is there any -- Are you guys also looking at like benthic invertebrates, as to like the actual availability and their abundances, or are you just looking at the diets?

MS. SMART: Only the diets, and so we haven't approached any of the benthic sampling that would be needed to look at the prey field availability.

MR. HART: If you're building an Ecopath model and looking at the diets, it's beneficial to know what's available, and so that was just out of curiosity.

MR. PUGLIESE: To that, actually in one of the previous iterations, we used some of the species, the lower-trophic-level species, for some of the biomass estimates and distribution from the trawl surveys, and that was in earlier iterations. Not necessarily as prey, but as characterizing some of the other lower-trophic groups.

MS. SMART: One thing that we potentially will have is, as I mentioned, quite a few of these large groupers are reliant on other fish, and so we should be able to use both the Reef Fish Survey itself as well as the trawl survey for some of those species, in terms of availability.

DR. BAUMSTARK: Another curiosity question. Do you all collect environmental parameters when you're sampling, like physical oceanography and bottom type?

MS. SMART: Since 2010, the trap survey has had those cameras that Marcel mentioned, and so we have habitat data consistently since 2011, in terms of habitat types, and we also are conducting the CTD cast, and so we have temperature and salinity. Depending on which CTD we have onboard which vessel, we have a few more things, like dissolved oxygen, and light as well.

MS. DEATON: Anything else? All right then. Thank you, Tracey. Next, we're going to hear from Tina about enhancing the spatial presentation of species distributions.

MS. UDOUJ: Good morning, everyone. My name is Tina Udouj, and I work here at the Florida Fish and Wildlife Research Institute, although I have worked from home in Arkansas for the last ten to eleven years, but I keep in contact with Roger and my boss, Kathleen, who is in the back, and so I'm glad to be here, and thank you for the invitation to participate today. Roger gave me this great title, and so I hope I can live up to it. I have some videos that I hope come through. They are not as cool as Marcel's, but we'll try.

Quickly, just a little data overview for the SEAMAP South Atlantic component, we've been working with our partners at the Georgia DNR and South Carolina and North Carolina to incorporate their survey data into an online database that is accessible to everyone, and then I am in charge of the GIS data component of this diagram, and that's what I will be showing today. Just

a little overview of what kind of data we're serving, for each survey, we have station data, the catch by two, length for individual species, and age/growth information for individual species.

This is just a table to show how many records are in each shapefile that we're creating and to also show that there is a delay in Reef Fish Survey information, and so, when I show some graphs relating to reef fish, there is just a time lag there for the research requests, and so that's why the data is a little -- That they don't match up all exactly time-wise.

The main web application to view all of this GIS data is called the SA Fisheries Application, and it's a newer version than we've had previously, and it's HTML-based, and so it's going to work across all platforms. It will work on your desktop, and it will work on your phone, and it's not very easy to look at on your phone, but it can be done, and it works on Roger's iPad, and so he's happy about that.

I will just go through some slides quickly to show you what it looks like, and I think most of you have seen it, but some of you are new, and so we'll breeze through this. On this tab, you can find out more information about the SEAMAP program, and then there are links to each individual survey. If you want more information, you can find it here.

These are all those layers that I showed you in the table at the beginning that we're serving on the application, and here you can interact and turn layers on and off and move them around, and there is lots of functionality. Just to show some of the charting functionality, you can draw an area of interest in a particular area, select the draw by rectangle, go to your area and hit "apply", and it returns a chart of all the species found in that particular area, and this is from the Reef Fish Survey, and the chart and the map are interactive, and so, if you click on the bar in the chart, you can see the total number of gray triggerfish, and then it shows where those gray triggerfish were caught. There is another chart that shows that breakdown of what was caught in that particular area.

Another way that we're serving the SEAMAP data is through our ArcGIS online, and it's template that they provide, and it's called operational dashboard, and I've been exploring that this summer for our SEAMAP meeting, I made this dashboard rather quickly, and it's pretty easy to do. What it's showing is the main species composition across all the surveys in one interface. There is not a lot to do with it, other than just to look at it and go, oh, that's cool.

Then I said, well, I'll make another one, and I'll make it more interesting, maybe, and have some more information on just the Coastal Trawl Survey data, and here you can see their stations, and you've got a number of how many stations they sampled in 2017, and this is the composition of species caught, and, at the bottom, we have average weight for those species and average length.

Then, to explore the functionality further, I have made this dashboard, and it's looking at the 2016 abundance data from the Coastal Trawl Survey data, and so the map and the pie chart on the right are interactive, and so, if you're interested in say this Atlantic croaker, where it was caught in the survey, you click on that piece of the pie, and the map updates and shows you exactly where Atlantic croaker was caught in 2016. If you do it for another species, you can see the distribution across the survey design.

This panel over here, there is a location selector and a bottom temperature slider, and so, for the location selector, you can choose one of the stations, and then the map and the chart update

accordingly, and you can also click other stations and kind of see what that distribution of species is like across different locations.

Then you just turn those back off by selecting them, and everything goes back to the original map display, and the bottom temperature range that is part of the attributes of the shapefile that we're serving, you can change the range of temperature, and the species chart and map will update, and so you can see there is different composition of species found in these cooler waters, and then you can compare that to what some of the warmer-water species were caught. That was a lot of fun, and we're just starting to experiment more with the functionality that's available in the template, and so hopefully that might be useful for managers.

Then I'm going to talk a little bit about some spatial analysis tools that we've been using to look at the survey data. The first tool is called the Optimized Hotspot Analysis, and, basically, what it's doing is it's taking that cluster of points on the left and analyzing it by looking at all the neighbors and then generating output of significantly spatial clusters of high values, and so we are looking at abundance for our data, and those areas come out as red, and then low values of abundance come out as cold spots.

This is just more information about the tool, and it's called Optimize because it automatically does a lot of the corrections for you with your data, and it creates a new output feature class, and you take your clump of points, and you run the tool, and then the new data layer has a z-score, a p-value, and a confidence level associated with each feature.

Real quickly, the z-scores are standard deviations, and the p-values are probabilities, and so, in a normal distribution, you're going to find higher z-scores and lower probabilities in these tail-ends of the distribution, and so that is what makes it significant and why these clusters that have values of high z-scores and low p-values are spatially significant.

I have looked at Pamlico Sound survey data first, and I talked with their biologist, and we identified five species of interest to look at to run this tool on, and so these are the species that they pointed out for me to work with, and this is just an example of their survey design. This map shows blue crab abundance from 1987 to 2017, and it's roughly 4,000 points of data on the map, and so that's great that there is a lot of blue crab, but it's not very helpful.

We ran the tool on this dataset, and we got these results, and so, these areas of dark red, we're 99 percent confident that there is spatial significance of why those high values of blue crab abundance are occurring in these regions with dark red, and the lighter red is 95 percent confidence, and then there is like a melon color, and there's some up here, which has a 90 percent confidence level. The same goes for the blue. The colder spots, the lower values of blue crab abundance, are found in the lower regions of the Pamlico Sound, and this graph just shows that distribution of the high z-scores, and the zeroes are non-significant data in the middle.

I showed this map to the biologists in North Carolina, and they said, yes, we agree that looks pretty good, but can you break the data out by summer and fall, and so then we did that for them, and then the map looks completely different. We have lost the cold values down here in the south, and there is a few in the fall, in like the Neuse River, and then you do see some spatial patterns of some significant high values up in the northeast part of the sound and then some in the shallower area

here for summertime, and so that was really interesting, to me, that there was so much difference just by breaking out the data by season.

This is another species that they were interested in looking at, and so there's quite a big difference here, where there is more hotspots in the rivers in the fall, and lots of cold, low values in the middle part of the sound, and then you just have a few hotspots in the summertime for spot.

Another way that you can look at hot versus cold, or dense versus sparse, data is to use like a heat ramp to symbolize your data, and so that's what I have done here for those thirty years of data, is just applied this heat ramp to the data, and so these areas of yellow are where there is high clusters or high density values for total abundance, and so we did that for summer and fall, and that's what the map looks like.

These are my videos, and they're working, which is great, and so what this is doing is going through each year and symbolizing that data using the heat ramp and showing you how the abundance changes over time, and so I was amazed by this too, like how much it varies from year to year and season to season.

The next map shows Atlantic croaker. In this one, there is the most striking difference between the summer and fall months, where there is quite a bit of hotspots in the northern regions of the sound and lots of cold in the fall months, and so that's something that you can look at the data and then analyze it again and look at temperature and salinity and what's driving these high values of abundance for Atlantic croaker. Here's that heat ramp for all thirty years applied, and so it's showing up more in the rivers than it did in the Optimize Tool, but you get a general idea, and here is videos for Atlantic croaker.

I have sent all these maps to the biologist that I was working with, and then she got a new job, and so I haven't got more feedback yet, but I'm hoping that they can get a new biologist onboard and continue to work with them.

This is weakfish, and there are some differences here between summer and fall, and the heat map, and I won't make you watch the video, but they're there. Then, finally, the last species I think is shrimp, and they said to just combine them all together, and you don't have to separate out pink, white, and brown, and so there is some pattern differences between summer and fall here, too. That's the heat ramp and videos there. I made these videos, and they go really slow, but it's just amazing, the differences across the years.

Some of the take-aways from this tool, I think it's pretty helpful that you can see the different spatial patterns across summer and fall for the Pamlico Sound, and the Atlantic croaker showed the most difference in spatial clustering between summer and fall, and the statistically significant high values for spot were mostly found in the rivers during fall.

Another tool that we're using, and we're just starting, is the emerging hot spot analysis, which is very similar to Optimize, but we're adding a time component to the analysis, and so the input for this tool is you have to create a space-time cube, and then it kind of does a similar analysis as before, and then it identifies new consecutive -- All these different categories of hot and cold spots for the data over time.

This is an example of what, in theory, the space-time cube looks like. You have added the time component here and the X and the Y, of course, are your location data, and so the yellow column here represents a time series, and so let's say 2017 is at the top, and you go down year-by-year, and that's what used, was a one-year time step, for analyzing the data. Then here is a time slice, and this could be 2016 for locations across your space-time bin.

This is just more examples to show, and I like this one, because it helps you visualize that, okay, here's my point data across the years going down at a particular location, and what it does is the analysis runs and goes through the space-time cube and looks at its neighbors spatially and looks at the neighbors temporally, and so what's happened before and after for one location, and then it generates a trends statistic, and so it's a 3D analysis, but it gives you a 2D output, because not everybody has the capability to look at 3D data, and so the output looks something like this, where they have categorized the cube based on the trends that they're seeing across time.

This is what the output looks like for weakfish, and I don't remember if I broke it out by -- I didn't label it correctly if I did, if that's fall or summer, but I think I might have just run it on the whole dataset. Anyway, not as much clustering of data over time, but you can see that these three little red dots with white circles around them are identified as new hotspots, and that means that it's the first time that those locations had high values for weakfish abundance.

Then these other colors that have got little white dots on them, those are sporadic hotspots, and so, over time, they have been hot, and then they've not been hot. Hot and then not hot, and then, the maroon colors, and we've got about five of those locations, where they are just a persistent hotspot, and so I would want to say consistently over time, but they say persistent, but that's the idea here, and so you could look at these points and try to say, well, what's gone on with the new hotspot areas and these we know you generally always find high values for weakfish abundance here in the north. This is just to show you, again, that that was the results from the Optimize, and then adding the time component kind of just fine-tunes the data even further.

For the future, we are going to look at species of interest in the Reef Fish Survey, the Longline Survey, and the Coastal Trawl Survey. I need some feedback from Coastal Trawl folks on if they like these, and I just picked these species because they are usually found in the surveys in high numbers, and, if we had a weakfish in the Pamlico Sound and a weakfish in the Coastal Survey, then we could compare across the different surveys for a species.

Anyway, I will work with the biologists for these different programs and hopefully generate some more useful maps for them, and, if you have questions, I am happy to take them, and my email is included, if you want to follow-up with other ideas.

MS. DEATON: Well, I am really glad that you used Pamlico Sound as an example there. I could really relate, and that's great information for some of the management issues that we're dealing with right now, and so I'll be in touch with you, Tina.

MS. UDOUJ: Okay. Great.

MS. DEATON: Are there any other questions and comments?

MR. PUGLIESE: Thank you, Tina, and I think what that really wanted to do was highlight how far you've come with being able to get into this detail and getting to especially -- Now you're actually getting into timeframes, et cetera, because, as we move forward, getting more information on the actual species distributions in these areas and things that are affecting those distributions is going to be pretty critical, and it dovetails real nicely with what Tracey has been working with, some of the heat maps they had developed.

As we go down the road, and there are a lot of other stresses and other activities going on, it's really critical that we get that information on the distribution of these species in the systems, and it's -- In the longer-term for some of the spatial modeling too, it may have really significant opportunities to integrate into the Ecospace systems as we move into the future, and so I think it's really good.

The other aspect is that, as they develop like this, the ability -- We'll touch on that in the breakouts later on, but the ability to be able to grab some of these and use them in environmental assessments or in permitting activities, and some of these representations become more critical, because, before, a lot of the things were just basically statements that they exist within the system, and having some additional tools and capabilities that can highlight some specifics about what we know about distributions is probably going to be really important for those aspects, and that's kind of an over-arching discussion that we're having today on the ability to refine tools and capabilities for those uses.

MR. GEIGER: Just sort of a comment. I think section sort of highlights, to me, the really good benefit of a robust fisheries-independent sampling, and monitoring assessment and evaluation is very, very good, but I keep coming back to, I guess, fundamental and foundational issues related to water quality and wondering are we ignoring or sometimes underestimating some of the critical water quality parameters that, given climate change and given the environmental influence and given the robust biological aspect, are we somehow neglecting or underestimating the value of some elementary water quality analysis that may or may not be done?

Sure, we have temperature and salinity, but are we doing chlorophyll a and b for possible harmful algal blooms or whatever and having that biological information available? Are we using proxies for pesticides like glycophosphate, as an indicator species with all this freshwater inflow and outflow going? Are we using some kind of other proxies that we could do nutrient analyses, basic nitrogen and phosphorous analyses, to look at the trend as we are correlating and taking this biological information?

I don't know if there is any one agency or agencies doing bits and pieces of that, but I think, as part of our habitat panel responsibilities, I think we at least need to look at some of those foundational inputs and opportunities. I am getting very concerned about the issue with red tide that we heard yesterday, and I'm getting very concerned about nutrient input into the Atlantic, and I'm getting very concerned about freshwater inflow and some of the things there, and I don't see the foundational water quality analysis and chemistry to support or otherwise complement the biological information.

We are very good at collecting biological information, and we seem to be very good at analyzing biological information, but are we also equally giving attention to the water quality parameters

that influence and/or modify or that affect the biological distribution patterns that we're so interested in? Thank you.

DR. REICHERT: I am not a member of the Habitat AP, but, to that point, I completely agree with you. I think, in terms of chlorophyll and maybe some related water temperature, I think satellite data can grab some of the surface conditions. What's happening on the bottom, where a lot of these communities are, I think we don't have that information, other than our CTD information.

I know, the SECOORA buoys, there is some movement within SECOORA to add some of those capabilities, but I am not sure how far we are with that, and then it comes back to the broken record of is the funding available to do that. All I can offer, in terms of our surveys, is we are out there collecting the samples, and it can probably be done at relatively low cost, because we're out there sampling anyway, and it's the analysis where we probably will need some assistance from others or funding, but that's all I can offer, and I'm not entirely sure if any of those parameters are collected.

I think they are collected region-wise, on an ad hoc basis, if there are universities or state agencies who happen to have a project that collect that type of information as part of that particular project, and it's not a concerted effort long-term to collect that information. I think the same is true for identifying benthic communities. I think there is some information, but those are generally done whenever there is a particular project going on by an academic institution or otherwise that collect that type of information, and there is not a coordinated effort to gather that type of information.

MR. PUGLIESE: One other aspect that links to here is things we've already discussed in some of the partnerships, like working with SARP. SARP is very closely tied to the instream flow networks in the Southeast, and that's getting down to literally some of the local levels, in terms of understanding flows and water regimes in there, and so there is some linkages back to at least knowing what's going on, and I think Marcel was right about the other opportunity really is with the Ocean Observing, as you expand into near-shore connections and really highlighting how this is being collected, and then the last thing is the opportunity we have, again, of being able to collect these, if they are not being collected in other areas, at least in association with the ongoing systems. All of those are hopefully going to advance some of that concern.

MS. DEATON: I would just like to add that I know that NOAA does get a lot of satellite imagery, and, like this summer, we're having some fish kills, and I don't know how it happens, but somebody from DMF talked to somebody at NOAA, and we got imagery that showed chlorophyll levels to the sea, if it was related to algal blooms, and so it's out there, but it's just a matter, I think, of coordinating, because one agency doesn't do it all, and so multiple agencies are getting all the information, but it does take time to pull it together, and maybe that's what is lacking. We're doing it more as an ad hoc basis, and, when they sent that, I was like, oh, this is great, because we also had all the shellfish die further down, and so we are going to contact them about getting that, and so they have the data, and it was very helpful.

MR. PUGLIESE: A follow-up on that is one thing that -- I think the whole idea of having that discussion we had yesterday was to be a springboard to advance some of those discussions, and so hopefully, maybe at the next AP meeting, some of the different things that have collected and represent what those events meant, in terms of flow offshore and different things, characterizations that were done with some of the satellite imagery, with the monitoring of those, can actually be

brought to the next council meeting, or maybe the committee meeting, in cooperation with SECOORA and some of the people that are collecting those on the satellite imagery and other imagery and the states, where they may have more fine resolution.

That was kind of why we started the discussion yesterday, was to get further down that road to understand and begin to document, and then to begin to make sure that it is being collected and can be advanced, and so that's, I think, a nice springboard into saying let's advance that further as we go into it and begin to provide it and then be able to provide guidance beyond that.

AP MEMBER: I agree, and this discussion now is getting toward the modeling side, and I think the data availability is usually the biggest limitation, where you have to refine your model to account for lack of information, but I wanted to get back to the visualization part for a second of Tina's presentation, because I am sure we'll talk more about that in the modeling session.

The spatial analytics, which are great, I want to emphasize the importance, and I think you are doing this, or making sure that the biologists and the species experts, as well as the person who knows where you are doing the model of the environment, is involved, and I think you're doing probably a good job of that, because we can paint pictures very differently depending on how we pull these parameters together and what we look at.

To that extent, also, including the council and ensuring that their needs are also being met, which made me think about the operational dashboard, which seems to be a tool that is really geared toward looking at information, maybe not real-time, but looking at information and being able to evaluate, in a very simple way, quickly, what's going on, what's the state of the system, and so I would suggest, if you're not already, making sure that, now you're getting familiar with what's available, maybe pulling together some ideas on what could be useful to them and soliciting some feedback on what information they would want to see come out of this that would help them with management.

MS. UDOUJ: Thank you. I am trying to work with biologists of each survey and to be sure that the council's management needs are met as well.

MS. DEATON: Thank you, Tina. I think, if there aren't any other comments, we'll move on.

MS. UDOUJ: Thank you.

MS. DEATON: We're going to take a ten-minute break before we hear about cool coral.

(Whereupon, a brief recess was taken.)

MS. DEATON: We're going to hear about some new research doing deepwater ecosystem characterization by NOAA, and, today, we have both Heather Coleman and Kasey Cantwell here to tell us about that, and so I will just turn it over to you all.

MS. COLEMAN: Thank you, everybody. I am really happy to be here, and I just flew in, and so I'm excited that I made it in time to kick-off this presentation. We're talking about deep-sea coral research and exploration, and so my affiliation is with the NOAA Deep-Sea Coral Research Technology Program, and I work with Tom Hourigan, who some of you may have met, and we

are in Silver Spring, but we coordinate research around the country, and so, in every region, we have coral researchers, and we work with the councils in every region, and so I'm going to tell you a little bit about the program in general and then move into what we're doing in the South Atlantic.

The program's mission is sound science to conserve and manage vulnerable deepwater ecosystems. We're mandated by Magnuson-Stevens, and the act explicitly says that we work with each council to make informed decisions, and we provide data to the councils based on what the councils have told us that they want to know.

We first were called for in the Magnuson-Stevens Act in 2007, and we were appropriated two years later, and we have had a pretty stable budget ever since 2010. We work with four line offices, and the program is through NMFS, given our tie to Magnuson-Stevens, but we work very closely with OER, as Kasey will talk about in a little bit, and the Sanctuaries Program, through the National Ocean Service, as well as the data side of NOAA, through the National Centers for Environmental Information. Everything that we do is really tied to council work. It's our most important both source of priorities and destination for the data that we collect.

The reauthorization has given councils a number of authorities to protect deep-sea coral. EFH is one way that coral can be protected, and National Standard 9, through bycatch, is another way. Discretionary authority is a method that's been used a little bit. Two councils have used it so far, and the Pacific Council is thinking about using discretionary authority, and I think that the South Atlantic may be as well, and so I can talk more about that later. It's not the focus of this presentation, but, if the council is interested in learning more about how the discretionary authority works, I am happy to talk about that more.

I did just want to mention that the South Atlantic Council has really been a leader in the field of protecting deep-sea coral. It had one of the first protections in 1984 for deep-sea coral habitats, and that is something that I really wanted to make sure that I noted, is that this council has been doing a lot of work in the area.

Basically, our program funds regional research initiatives, and we have changed the model a little bit recently. It used to be three or four-year initiatives. This current initiative in the Southeast is a four-year initiative, and it's the last of that kind. What we are doing now is shorter initiatives with more funding, and so, basically, the next time we come to the South Atlantic region, in about five or six years, we will have a short ramp-up year of about $200,000 of funding and then two years of up to $1 million funding, each of those years, and then one ramp-down year of about $100,000 of funding, and so, for that focused initiative, we will be working closely with the councils and the researchers in this region.

Whenever the council requests a briefing, or one of the committees or an AP requests a briefing, we're very happy to come and do that, and I just wanted to note that our data has been used by all the councils, as well as the sanctuaries, although that's less relevant in this region, as well as in aquaculture and regional portals, and so this shows the South Atlantic Atlas and deep-sea coral dots and some protected areas.

I just wanted to note that, for this current initiative that's wrapping up, and this is its last year, we did gather priorities from the councils, including the South Atlantic Council, in 2015 and in 2016,

and then, in 2017, the council reviewed our science plan, and we're mostly working with Chip Collier on that, and he's been an incredibly valuable resource for us.

I mentioned input from the council, and these were the three main areas that we received. The South Atlantic goal for this initiative that is wrapping up this year was to protect deepwater corals by refining existing and designating new deepwater coral habitat areas of particular concern and by increasing our understanding of deep-sea coral ecological role and coral function in the South Atlantic region to further guide management actions.

Up on the slide, it just shows some highlighted areas that we heard from the council and from researchers in the region, and the map shows some areas of priority that we were given. A particular area of interest is mapping golden crab areas of interest for the southern coast of South Carolina and the southeast coast of Florida, and I particularly wanted to mention that.

This map shows a little more detail than the small one before about areas that the council told us were important for deep-sea coral surveys, and I know that Kasey will come back to this in a little bit, but I just wanted to show you before she gets going. I think this is my last slide for now, but we have been working for three years in the region, and so, just with this initiative, we have a number of ROV, AUV, and human-occupied vehicle cruises that have happened, and each of those has contributed data that is either already in our national database or will be in the next year or so, and we've also had data-mining projects that I know that John Reed can speak to.

We've had cruise reports, site characterizations, and what's showing up right here, on the bottom part of the picture, is our -- The geodatabase is on the top picture, and it has a number of facets to it, and I can show you more about that later, if anyone is interested, but there is past ROV cruises, and there is cruise tracks, and there is all of our data points, and there is predictive habitat models, there is managed areas, and there is all kinds of things in there to play with.

On the bottom, it shows our national database with site characterization reports, and we have a new story map that enables you to click on those, and it's very interactive. We've had a number of students, especially through Charleston, that have presented to council meetings and conferences on all of this work. There's been a few publications, and we have many more to come, and the Version 2 of our predictive habitat model is in development right now, and so we'll be excited to show everybody that when it's out and ready.

One other thing I would like to mention is that there was council participation as well in some of these cruises, and Chip Collier, for example, sailed on a cruise in 2017 with us, and he's been engaged in the site selection for Okeanos Explorer expeditions, and we've very appreciative of that. Now I'm going to kick it over to Kasey with some details on how we've been partnering with OER on this work and what they've been up to and finding.

MS. CANTWELL: Hi, and I'm Kasey Cantwell. I work for NOAA's Office of Ocean Exploration and Research. The work that I do is primarily using the NOAA Ship Okeanos Explorer, and I'm on the expedition coordinators for that part of our program, but what I want to do is actually talk a little bit more about some of the work that we did in the Southeast this year.

NOAA OER is the only federal organization that is dedicated to ocean discovery and exploring the deep sea, mainly for the purpose of advancing our scientific knowledge in the area. 95 percent

of the ocean is unexplored, and less than 10 percent of it has been mapped. Those numbers get a little more drastic as you move offshore and into the deep ocean, where, really, there are so many places that we have not even figured out what exactly lives there.

We really are sort of the Lewis and Clark of the ocean, because that's -- A lot of times, when we're going to areas, we're going to sites that haven't been seen before, and, really, the areas that we're mapping, we have no idea what is there, and I will show you some examples of that that we had just offshore in the Southeast this year.

I do also have to apologize that my videos are not working with playing the sound, and so we're going to play the sound from one computer and the video from another computer, so you can all see it, and I do promise that all of the videos are publicly available, and I'm happy to distribute those links, if you guys are interested in them, and they're all on our website. If you have problems hearing them, you can hear the full sound in all its glory on our website, and I apologize for the technical difficulties in advance, but hopefully it will be fine when we get there.

Over the last couple of years, and in the upcoming years, NOAA has sponsored a number of expeditions and projects in the Southeast Region. In 2018, we sponsored three, and one was an expedition called Deep Search, and this is a multi-year project that's a partnership between NOAA, BOEM, USGS, and TDI Brooks International, as well as a number of academic partners, some of which are on the phone today, actually, and Sandra Brooke can answer any questions related to that project.

The chief PI from Temple University is Erik Cordes and Amanda Demopoulos from USGS, for that project, and, this year, we supported twenty-three days at-sea, or two expeditions, one that focused entirely on mapping and then one that was an HOV cruise that also included mapping and coring as well and CTD work.

The expedition that I am specifically going to be talking about today is the Windows to the Deep Expedition, and this was a two-cruise expedition that focused on ROV work as well as mapping in the Southeast, and then, a couple of days ago, we wrapped up an expedition that had about eleven days at sea in the Southeast, focused on well offshore of the Blake Ridge area, mapping some priorities for the Department of State, where we were looking at the continental shelf edge, and so this map here is a summary of the first four cruises, but the data has not yet been processed from that one that just came into port a few days ago.

Windows to the Deep was an expedition that was on Okeanos Explorer, and it was really focused on collecting preliminary data in the region in a way that would help managers as well as scientists better understand the deepwater resources here. Our priority is always to support good management and good science in a region that we go to, and so we typically tend to focus on areas where there are data gaps that have been identified by scientists and resource managers.

Particularly in this area, we were looking at biogeographic patterns and connectivity across the Southeast Region, and we were hoping to map, identify, and explore diversity of benthic habitats as well as collect high-resolution bathymetry in areas that previously had no multibeam bathymetry in the past, or had low-quality sonar data. Then we also have a suite of EK60s, which are fisheries sonars, which map what's in the water column between the seafloor and the surface of the ocean, and so we were also conducting preliminary characterization of the water column as well.

When Heather was going to be a little late, I had stolen this slide, but it's a good reminder, before I show you the expedition summary map, that you guys can see and you can pay attention to where some of the areas that were prioritized by the council prior to this expedition, and so that was the Northeast Canyons, the Blake Ridge, the Blake Escarpment, Stetson Bank and the Charleston Bump area and Savannah Bank, and this area here, which is the edge of the golden crab fishing areas. We may have renamed them with some cutesier names, because that's the way we work, but, for the most part, we did hit all of these areas during this expedition, with the exception of Savannah Bank, simply because the Gulf Stream kicked us out of that area before we could dive there that day.

The way our expeditions work on Okeanos Explorer is that we really have to be driven by the community. Everything that we do is not in service to one individual PI or to scientists needs, but it's really in response to what hundreds of people and managers are interested in, and so we call this community-driven exploration.

For this expedition, we engaged with the council, through Chip Collier, well in advance of going out to our science community, to really help us refine what areas of the Southeast we would be focusing in, which was that map that we talked about before, and then we open up our process to the broader science and management community and say, tell us where your data gaps are and where are you in need of the most information, and, for this case, in just this little area, we got over 120 ROV targets, and we received a large number of mapping requests that will keep us busy for many, many years to come.

It is physically impossible to accomplish all of the priorities that were put on the table by the science community in one expedition, but, luckily, there was a lot of overlap in both the areas that were presented from the council as well as from the science community, and we were able to narrow down our expedition targets, and we did receive input from the South Atlantic Fishery Management Council, multiple offices within NOAA, BOEM, USGS, the Deep Search Team, which is that collaborative project that I talked about earlier, non-profits, and other academic partners.

To give you guys an idea, before I start going too far into the details, I kind of want to start with the high level and work down the funnel, and so we mapped over 29,600 square kilometers of seafloor during our expedition, and we conducted seventeen ROV dives. We collected 175 biological specimens and thirty-eight geological specimens, and we had over 140 participating scientists and students and managers during the course of the expedition, and we observed deep-sea coral and sponges on every dive except for one, and that one dive was actually a chemosynthetic-community-focused dive, and so we were not expecting to see corals and sponges on that one. That being said, seeing corals and sponges on every dive at the variety of depths that we were working at and the variety of features was actually quite surprising as well.

Before, I was talking about our multibeam bathymetry that we collected, and so, in the grayscale here, what you can see is the satellite altimetry, and so this is gravity data that is from Smith and Sandwell 2014, and you can see a few anomalies that might be really interesting dive sites. They could be really interesting features for us to map, and so, based on our satellite altimetry, we then target the ship's operations, so that we can hopefully identify unique features that we can conduct ROV dives on.

In this case, these sites, we thought there might have been a couple of lumps and holes and ridges, and both of these sites turned out to be very different than what was anticipated based on the satellite altimetry. As you can see in the top picture, there was nothing there. The highest portion of relief at the site is actually about a five-meter mound that we think might actually be an error in our data rather than a true five-meter mound, because it's so flat, and our mapping lead for that cruise had said that this is the flattest seafloor that they've ever seen, and so there is always a value to conducting ship-based observations compared to satellite data, for reasons like this.

Again, this is an area that we mapped as part of the expedition, and you can see, in the background, the grayscale is the level of resolution that we have of features in this region prior to conducting our operations, and then you can see the multi-colored image here is our bathymetry, and you can just look at the detail, and the level that you can see of all of these features is striking, and it really shows the importance of doing this kind of work, because, prior to coming in with our ship and doing mapping here, you would have thought that this area might have had a couple of ridges and bumps, and that was really it, but you can see there is actually quite a really unique karstic feature that has evolved over time here.

Two exciting things that we found in this dataset was actually what we believe to be potentially iceberg scours, and these were 6.5-kilometer-long scours, and they were about twenty-five meters wide, and a second one is at the bottom there, which was a four-kilometer potential iceberg scour. We have some partners at USGS that are looking into this further to confirm, but these weird right-angle turns are pretty indicative of an iceberg scour, and what's interesting about it is that, if these are in fact iceberg scours, they will be much deeper than the known ones in the region.

With our ROV, we went and visited a number of sites, and these sites were, like I said, prioritized by the community, but they were all very different, and each of the sites that we looked at were -- They had their own unique community, which was really exciting to see, and so, to orient you to the next couple of slides, there is going to be pictures on the left-hand side with a everything that we saw at a variety of different sites, and then the map is going to tell you where we are relative to both the coastline as well as throughout the expedition.

The first group, the first two slides, that I'm going to show you are our two most frequently-visited habitats, and one of those is the lophelia reef systems, and so we saw a number of these lophelia habitats, where the seafloor was either the live, living coral, which has built up these large mounds, or it was the dead skeletal matrix, which then has provided habitat for additional species over time.

The second-most common sites that we visited were soft-bottom habitat. Soft-bottom habitats range from some of the ones that we were looking at in the 300-meter range down to 3,500 meters, and so we got to see a variety of different habitats, and some of them did actually have seeps, but it was a really unique habitat, and we're seeing both corals and sponges on them as well, as well as the typical fauna that are indicative of soft-bottom habitats.

Up in the northern part of our operating area, we looked at the North Carolina Canyons, and what was notable from here is that it was -- Primarily, these habitats were sedimented, but we had a lot of complications with the weather and the Gulf Stream in this area, and so we weren't always able to dive along what were our sort of priority targets, where we were hoping to find those big canyon walls, which we would expect to see corals in, based on some of the work that's been done in the

past just a little bit further north, but we did still see corals and sponges in this area, and what was notable is the high biomass that we saw in these canyons was really extraordinary, and this is fairly indicative of canyons in general, but, of the sites that we surveyed during this cruise, they were the highest biomass in the water column, whether they be the krill or the euphausiid shrimps or just generally squid and other water-column fish that we saw during descent and ascent.

There were often times that the ROV would get so swarmed with the krill that you couldn't see in front of you, and so we would have to come off the seafloor and wait a minute and then go back down or turn the lights on and off to try and startle them away. Again, it's fairly indicative of canyons, and this is by far not the first time that this has been seen, but it was the first time during this expedition that we saw it.

The next set of habitats that we saw were steep terraced features, and these were particularly good habitats for our filter feeders, which, in these cases, were deep-sea coral and sponges as well as Brisingid sea stars, and some of these terraces I'm going to talk a little bit more about later, but we were surprised to find them, and others were -- One of them was, up at the north end there, is the Currituck Landslide, which is the largest landslide on the east coast, and this was a terraced feature that is at the toe of that landslide.

Another habitat that we saw quite a bit of was rubble, or general hard bottom, and so we planned most of these dives to try and cross a number of different habitats. Part of the reason that we had so many of the soft-bottom habitats is that we typically plan to start a dive in the soft bottom and then climb up a steeper, hard feature. Then, a lot of times, we would cross rubble fields as part of crossing those terraced, hard features as well. Again, these happen to be really good habitat for deep-sea corals, and we weren't seeing typically as large deep-sea corals in the rubble fields, because they're not as stable, but, in some cases, we did still see large ones, like that bamboo coral in the top corner there.

We also looked at seeps, and these were up in the Carolina Canyons areas. While we did not see the typical seep communities that have become pretty iconic on the east coast, and that is the large mussel communities, we did see lots of bacterial mats, and I'm not a seep expert, and so I can't tell you much more about that, but we did see the fauna that are typical of these sites as well in the Carolina Canyons.

Before, I mentioned that we have a suite of EK60 sonars that survey the fishery biomass in the water column, and we also conduct water column exploration with our ROV, and, in this case, we saw a number of jellyfish, siphonophores, and, at the bottom, you can see cyclothones, which is bristlemouth fish, and it's actually one of the most common fish that we see in the mid-water globally. Then, on one day, we actually saw a billfish as well, which was really exciting. This is where things get complicated with the audio and the video, and so give me one second.

(Whereupon, a video was played. The audio was not transcribed.)

MS. CANTWELL: There, you guys can kind of get an idea of some of the habitats that we saw during this expedition, and there will be a couple more videos, but I just will not have the audio for all of them, but one of the things that we saw during this expedition that was really interesting was that we were able to make some great observations about deep-sea life history.

It's one of the things that we get from almost every expedition, but it's always something new and exciting, depending on exactly what we see, and so this expedition documented several rarely-observed predation events, and that really has to do more with the fact that there really aren't that many eyes in the deep-sea rather than it is actually something that is truly rare, and you can actually see one up in the corner here while I'm talking, which I will tell you about in a second.

We documented commercially-important species in new areas, and this includes the red and gold Chaceon crabs as well as we observed mating pairs of those crabs as well as young juveniles and young recruits of several different species as well, and then we also had some range extensions and new records for the region, which were also really important to understanding the deepwater areas offshore.

What you're seeing at the top here is a Neolithodes king crab that is taking apart a brittle star, and the audio that goes along with this, which I can sum up, and it's a four-minute video, but I can sum it up pretty quickly, is that, oh, there's no way that that brittle star will get eaten by that crab, and there's no way this is going to happen. Then, oh, there's no way that it's actually eating that, as it's tearing it apart. Then it's, okay, well, it's fine. If it eats the arms, that's one thing, but there's no way that it's going to eat the inside like oral disc area, and that's exactly what it did, and so this really brings to mind though the importance of getting these types of observations, so that you can in fact understand that this crab does in fact eat brittle stars and is able to crack open that central disc area and eat the insides of it. It's a little graphic, but it's an important lesson that we learned.

At the Cape Fear Lophelia Banks HAPC, we had originally not planned to dive on this site, but we were going to dive on what looked like a site that was going to be very similar just north of this area, which would have been great if we had found another one of these beautiful lophelia reefs. However, we mapped overnight in that area, and it turns out that there is nothing there. It was, again, very flat seafloor, and so, at like three or four in the morning, we made the decision to turn back and go instead to the Cape Fear Lophelia Banks HAPC, to be able to dive that day, and we chose a side of the mound that hadn't been surveyed before.

While most of what we found was dead lophelia reef, we did in fact find a couple of live colonies, and we found that the lophelia reef that was dead had been used by other deep-sea corals and sponges to create a new habitat, and one of the most surprising things that we found were in fact the wreckfish. We saw several of them, and they were all quite large, and so this video here is a number of those wreckfish that we saw, and you can kind of see, throughout the video, the habitat and what it looks like, and so, from far away, it will look gray and dead. As we got closer, you could actually see living organisms that had colonized there, and, the closer you got, the more you saw, and so this was certainly a case that, every time we turned a corner, or every time we got a little bit closer, we were seeing different things, which was always exciting.

Of course, the entire day was stolen by the large number of wreckfish that we saw. We don't typically get to see fish this large, and it was exciting, because it was also something that had been -- We had been specifically asked to be on the lookout for them by the council, and so there you can see, relative to the ROV, how large they were, and we also saw a large number of squid at this site as well.

The next series that I'm going to show you here is from just offshore in the Blake Escarpment area, and this is an area that we had originally thought was going to be a very gentle slope. If you think

about the continental margin in this region, you typically think that the whole thing is very gently sloping, and this here is -- The red dot is going to be the same through each of the figures that I'm going to show you, and so you can kind of see that this is what the satellite altimetry was prior to our expedition, and this is what it actually looks like.

It's a series of steep, terraced features, which we were calling inner slope terraces, and the site itself was absolutely incredible. It was an incredibly high density and high diversity of deep-sea corals, and several of them were quite large. We found a -- I think it's more than 50 percent of some of the black corals that live in this southeast region we found at just this one site, and it was the highest diversity of the sites that we observed overall throughout the whole expedition, and it was in an area that we didn't have enough data to accurately predict habitat suitability for prior to this expedition, since there was no high-resolution mapping data, there was no backscatter, and there was no slope data, all of which are things that feed into the models.

We also had no coral records from that region, which also helps feed into the models, and so, by going out there and doing this, we have shown that not only is this a potential habitat, but it is in fact a true habitat for deep-sea corals and sponges, which is an exciting find.

Another exciting discovery that came from our work in this region this year is not actually one that were able to confirm ourselves, but we mapped this region as part of the Windows to the Deep expedition, and you can see, again, the differences between what was known prior to our expedition and what we were able to fill in.

A really good example of that is right here, and so you can see these high-resolution features along the edge here and compared to what the satellite altimetry looks like prior to us mapping, but, luckily, the Deep Search Project was focusing in this region as well, and they were able to conduct HOV dives on a number of features here, and they have now hypothesized that this whole region is actually lophelia and is made up of an eighty-five-mile long lophelia reef, and so these are articles, and they had a reporter onboard during the expedition who was able to share this news live with the public, and it picked up a lot of traction during the expedition, which is fantastic, and Sandra can answer any more questions about the specifics of that discovery, and I'm not the best person to talk to it, but it really is a fantastic discovery, and it's not that far offshore, which is incredible.

One of the areas that the council had asked us to take a look at during this expedition was the Million Mounds region, and this is an area that we mapped in 2014 with the Okeanos Explorer, but we hadn't done any ROV dives here. There had been isolated dives in this region over the years by Harbor Branch as well as some of the folks out of UNC-W, and a couple of others in the region as well, that had sort of nominally identified that some of these features were likely lophelia habitats, and so we -- Basically, during this expedition, we expanded the mapping coverage and conducted ROV dives on several more of these mounds, and we found lophelia habitat at all of them, and, again, you can see the breadth of these features. This map covers, in one direction, from here up to this turn here, and it's 100 miles, and then across is sixty miles.

This feature is quite extensive, and we conducted more dives here on a couple of these mounds, and, on each one, we found additional lophelia habitat, and so we now believe that this area, and this is still hypothetical and needs to go through the proper channels, but we believe this area to be

one of the largest deep-sea coral habitats that have been discovered to date in U.S. waters. Here's one more video. Again, my apologies for the complicated setup.

(Whereupon, a video was played. The audio was not transcribed.)

MS. CANTWELL: That was a nice summary of the expedition, and one of the other things, and I've got two more slides here about the expedition, that was really interesting, for us at least, was we had a large surge of media throughout the expedition, and then particularly post-cruise, once we had sort of wrapped it up and some of the summary products were available. There were over eighty articles, both locally in the region we were working as well as on the west coast and internationally, and we're really excited by the work that we were doing in this area.

Then, as part of our expeditions, we always do try to do some on-the-ground engagement, and so we conducted six ship tours for sixty-six people and reached over 8,000 people through sixteen live interactions and live streaming events throughout the expedition, and one of our ship tours was actually to the South Atlantic Fishery Management folks that were in town, in Charleston.

Then, looking ahead, we've got a couple of things that will help identify future priorities in this region. One is the ASPIRE Workshop, which is happening next week, and ASPIRE is the Atlantic Seafloor Integrated Partnership for Research and Exploration, and it's a mouthful, but we are working -- We will have a representative from the council there, and Roger and Chip will put in a white paper, and this is really to help us identify the priorities throughout the Atlantic basin that we'll be addressing in the coming years, and that is next week.

Then we have another upcoming deep search cruise this spring, which will be a mapping and ROV cruise, and another Okeanos Explorer also this spring, which will also be a mapping and ROV cruise, and so there is more work to come. I highly encourage you guys to continue to be a part of our process and to please keep submitting data targets, because we can't go to the areas that have been prioritized -- We can't go to the best-use areas until we know from you guys where it is that you need data. Now I'm going to hand it back to Heather.

MS. COLEMAN: Thank you, Kasey, and so Kasey mentioned all kinds of data collection, and so we're going to show, just quickly, what that looks like when we put it on our database and do a little bit of preliminary analytics, since we don't have all of the data yet in our database.

What you see on the left map is lots of different corals and sponges, and you can see the legend there, and we delineate them in about twelve different ways, and the sponges are the triangles, and the corals are in circles, and those are known coral and sponge sightings that have been added to our database, and so, if you see a blank area, that does not necessarily mean there is nothing there. It either means we haven't gone there, or it could mean there is nothing there, or that we just don't have it in our database yet.

There is about 199 described species of deepwater corals in the South Atlantic region, and that's second only to the better-studied Gulf of Mexico among U.S. regions in the number of species described, and so this is a very rich area, and we relatively know quite a bit about it, compared to the rest of the U.S., although, still, this is deepwater, and so there's still very much to learn.

With 17,500 records, and that's what those dots are, and, a lot of times, records means one individual has been found there, but sometimes records can mean two, three, four, or five individuals are grouped together and noted by one of those dots, and so there's 17,500 records in this South Atlantic region, and we've broken them up by three ecoregions, and the Floridian ecoregion and the Southern Carolinian ecoregion is a break of really different sets of species. There is some tropical and semi-tropical divide there. Between the Northern Carolinian and the Southern Carolinian ecoregion, there is the Charleston Bump, which is, we think, where the Gulf Stream separates and diverts off further to the east, and so that's a line that we are going to use in a few other slides to show some differences within there.

We have all these data points, and there are a number of things we do. One, as I've said, is give those data to the councils and help inform decisions that councils are making, and we also use them to inform predictive habitat models, as we've mentioned a few times, and that is what is shown on the right side. Those are predictions of where we're likely to see deep-sea coral, and the white dots are, I think, lophelia sightings, or maybe all stony corals, and so you can see that those dots both inform the models, both help the models figure out where there are going to be coral, and then we'll test the models. As we go do future dives, are they actually there or are they not? If we find disagreement, we can figure out how to make the models better.

Then the third major use of these data are for identifying research gaps and planning for major regional research efforts, as Kasey has talked about quite a bit, and so I will go on. This is divided by ecoregions, and it just shows the number of deep-sea coral records, and we're just talking about corals right now, and we don't have a whole lot of information on sponges, and so, for right now, we're leaving them out, and this is delineated by depth.

What the charts that come for the next few slides show is really an accounting of where our data come from. I am not trying to compare regions, and the data are way too sparse to be able to say there is more coral in the Floridian region, and that's not what we're trying to do, but this is what we have in our database, and so you can see there's about twice as many records in the Floridian region as the South Carolinian, and then quite a bit more in South Carolinian than North Carolinian.

Moving on, these photos show differences in habitats in coral communities as you move from north to south in the South Atlantic and as you move from shallow, what we're calling shallow, which is shallower than 300 meters, and a deep region is deeper than 300 meters of depth.

The first image is in the deepwater snapper grouper kind of range, and it actually shows Swiftia, which, if you look, I don't think you can actually see on the pie chart, but it's not necessarily a representative picture, but it's just there are so many species going on in shallow northern regions, and we just wanted to show our favorite picture.

The second one is also in the deepwater snapper grouper range, but it's more representative, and the third image in the Florida ecoregion shallow is in the Oculina HAPC. Then the deep images are all in deepwater HAPC areas, and what you can see with the pie charts is that oculina, the reef-forming oculina, which is shown in the Florida ecoregion shallow photo, is really starting to dominate as you move south, and the lophelia that Kasey has been talking quite a bit, which you can see in the deep photos, really dominates in the deep.

Black corals are also really valuable ecologically as habitat, and they are particularly long-lived. We have had samples of black corals that are over 4,000 years old in the Pacific Islands, and it's an incredible animal that I'm really happy is receiving some protection, because it doesn't come back quickly if it grows that slowly that it lives 4,000 years. There is also important coral habitats in the shelf-edge region in the snapper grouper range that are dominated by sponges and soft coral, but we still need to learn a lot more about these ones.

The pie charts show the relative number of records in each region for the most common types of coral. We do expect to be adding a fair bit of data from John Reed's work with the Southeast Fisheries Science Center in snapper grouper MPAs, and those aren't in the database yet, but they will provide a richer basis for understanding deep habitats, and so, through this work and through the Southeast Regional Initiative, we're getting a much better idea of what's there, and I look forward to seeing John's slides coming up, and, also, if Sandra Brooke is able, she can give an accounting of what she's seen in the region.

This chart is filtered for taxa that have more than twenty-five occurrences in our database, and so you're not seeing the rare things here. The plot shows median depth with the horizontal line and then quartiles around the median. The range is shown by the vertical lines, and then outliers are less than one-and-a-half times the upper and lower quartile, and so, just in case you're really curious about what all this is, that is -- The dots are those outliers.

Otherwise, it's just nice to see, kind of qualitatively, how the data change from taxa as you look across depth, and so there's a number of taxa that you really just see shallow, and there's a number of taxa that you mostly see depth, and there's a lot of variability in the depth, and I put stars on two, the oculina and on lophelia, so that you could see which ones they are. Oculina are the shallow starred, and you can see there is not as much variation there, and then, with lophelia, there is quite a bit of variation, and we have a lot of records from lophelia. The deepest record we have in our database right now in this region is I think 3,018 meters, but we will be adding to that in the 3,500-meter range.

There is just a few slides left, but this, again, is accounting, and so I think we've done quite a bit more work inside managed areas and outside managed areas, and I will show you a map of what that includes in a second, but this just shows that, so far, data come from largely managed areas, and I should say that the Southeast has quite a lot of managed areas, and so it's really nice to be able to show this graph.

This shows what counts as managed area in the graph before it and in this pie chart, and it's the Oculina Bank HAPC, the Snapper Grouper MPA and deepwater coral HAPCs and then a pie chart of who is found in what kind of relative proportions there, and I included photos of the three most-common species.

Then, finally, we heard that the Stetson-Miami Terrace is of interest. Well, actually, in the pie chart, I failed to mention that this pie chart is specifically for Stetson-Miami. That is the area that all of these species are represented, and so this is also for Stetson-Miami Terrace, and that is the biggest of the protected areas, and it shows the distribution of taxa that are in there. That is all that I wanted to show. We are happy to take questions, and I don't know how you want to have John Reed and Sandra Brooke give their thoughts.

MR. COLLINS: They are unmuted, and so they can jump in whenever.

MR. PUGLIESE: Yes, we have both John Reed and Sandra Brooke online right now, and John does actually have a presentation, and one of the things that goes into somewhat of the third component of this discussion is the complexity, because a lot of I think what's been discussed so far has been deep-water-coral-centric, in terms of looking at the distributions and the complexity, and John, I think, was going to touch on and open the issue of the complexity of species and the complex of the entire habitat system that you're dealing with in these deepwater ecosystems, and that's why this is before our habitat group, because we're dealing with the broader scope of that entire ecosystem, and the council, in the designation of the coral HAPCs, also has designated these areas as essential fish habitat habitat areas of particular concern, so that, in the consultation process, they have to consider all the habitats, benthic and pelagic component of these different areas, very specifically, because they want to look at the entire system.

I think John was going to jump in and be able to do it, and John, for those who may not know who John is, John is with Harbor Branch Oceanographic Institute, and he has been involved with this, with the Oculina Bank, from back in the beginning, from 1984, to all the way to the present, the expansions of the Oculina and then into essentially his compendium of all research into the deepwater coral systems that set the foundation for this, even in advance of some of the deepwater program that was done. The council was, even before that, advancing this and the conservation movement forward, but, with that, I will pass that on over to John and then make some additional connecting statements after we get further into that.

DR. REED: I've been working for about forty-three years off the southeastern United States. A big plus that came about through the South Atlantic Council was the coral HAPC in 2010, and it was 43,000 square kilometers, and the researchers that had been working out here, off the southeastern United States, first presented much of this data I believe it was in 2003, and so it took us seven years to get it implemented, but we did, and it was a great thing for the South Atlantic Council to do to protect this amount of region from potentially destructive fishing gear.

Certainly the lophelia thickets are a major part of this region, but there is other types of habitat within this region. Most of this presentation is just talking about the habitat off of eastern and southern Florida and in the Straits of Florida. As we see, the red zone is the deep-sea coral lithoherms and bioherms, primarily lophelia, but we also have these extensive hard, rocky habitats, such as the Miami Terrace and the Pourtales Terrace off the Florida Keys.

These are Miocene Age rock that formed escarpments and just plain flat hard bottom, low-relief, low to moderate-relief hard bottom, that still provides habitat for coral and sponges and other species, and, further around in the Straits of Florida, off of the Tortugas, we have the Agassiz Valley, and it's very deep channels or canyons that have very little work done in these, but we have made a few dives.

Then, also, the slopes of the Bahama Banks, Cay Sal Bank, and the northern coast of Cuba, you have these very steep escarpments, most of them rocky, and especially sites off the Great Bahama Bank, and we've done a lot of dives with the John Sea Link submersible, and we have found pretty extensive lophelia mounds down at the foot of these escarpments, and so most of these regions have had very little study. The Cuba region has virtually no studies in the deep water, although,

in 2017, we just completed a survey of the mesophotic reefs of the Cuba, circumnavigating the entire coastline, and discovering incredible mesophotic coral reefs all the way around the island.

One component, in addition to the corals, are the sponges on these deepwater habitats, both within the lophelia reefs and the hard-bottom communities, and many of these species we've found to be exclusively found in these deepwater hard-bottom habitats, and, in many of the species we've found, we're working on looking at their anti-cancer compounds. In one species of sponge we found, at least in the lab, it's showing a very potent component that kills pancreatic cancer, which is a very serious disease.

This is from a paper I did in 2013. If you just look at the first two columns, the second column is the amount of area off the eastern Florida coast, and we can see the total habitat, deep-sea coral habitat off the Florida region, is 22,000 square kilometers, but, in the bottom number there, we see that 30 percent of potential deep-sea coral habitat is actually outside of the C-HAPC, and so it still remains unprotected, which means bottom trawlers and other types of bottom-tending gear can fish these areas legally and be destroying very important habitat.

In addition to the lophelia, we have the oculina reefs off the eastern coast. In 2013, we discovered that yellow zone that we didn't know were oculina reefs until 2013, and I have been working out here since 1975, and so you were able to get this region extended and protected in 2015. The oculina reefs, just like the lophelia, are azooxanthellate, and they form mounds, coral mounds, and provide an incredible habitat for numerous species of fish, commercially-important fish. Where the reefs are healthy, these provide habitat for spawning aggregations of various scamp and gag grouper.

In studies I did a long time ago, doing lock-out diving at eighty to a hundred meters, we found an incredible community of organisms living within the coral habitat within a coral head. There were 230 species of mollusks and fifty species of crustacea, hundreds and hundreds of species of various annelid worms and other benthic invertebrates.

This shows a general food web of the oculina reef, which would be similar to the lophelia reefs. Within the coral, even the dead coral, you have this incredible community of macroinvertebrates providing food for the smaller fish and the larger fish. The biggest impacts can be, and will be, offshore energy projects, bottom fisheries, especially shrimp trawling and bottom longlines for crab traps, as well as future global warming.

Our biggest impacts out here have been from benthic trawling, bottom trawling, for shrimp, rock shrimp in the oculina reefs and royal red shrimp offshore. Fishing for the golden crab, they lay out extensive longlines, over a kilometer long, with large crab pots that are dropped into the Straits of Florida within the Gulf Stream, and so they drift quite a ways, and so we really don't know where they land in relation to the coral habitat. They try to miss the coral habitat, but, then again, we don't have -- Right at the edge, we really don't know the extent of the coral habitat. We certainly have seen impact on the oculina reefs from longlines and certainly from the bottom shrimp industry.

The top photo is the oculina reef off of Cape Canaveral in 1978, and the same reef in 2001 was just a pile of coral rubble. This shows individual reefs from Cape Canaveral down to the Fort Pierce region during the timeframe of the 1970s to the early 1990s, and some of the reefs had

nearly 100 percent coral loss due to shrimp trawling. This region and the deeper waters within the C-HAPC, the yellow border is the boundary of the C-HAPC, and the black polygon is the region where there is allowable crab fishing for the golden crab.

In this paper I did in 2013, I believe, it showed areas within the allowable crab areas that are very likely live-bottom habitat, and these are the red polygons drawn within the black polygon, and so, even though it was assumed that this area open for crab fishing was a flat, sandy bottom, it appears that many of these sites are very likely hard-bottom, live-bottom either coral or sponge habitat.

This just shows one region where there is very probable hard-bottom or live-bottom habitat within the fishing area within the allowable crab area and another region at the southern part of the Miami Terrace, also within the allowable fishing area, where there is very obvious live-bottom habitat.

We certainly know both the oculina and lophelia corals grow very slowly, maybe one to two centimeters a year, and the lophelia reefs we have aged at over 20,000 years old, and so these are very, very old reefs, very slow-growing, and so any damage we do from trawling, longlines, exploration, or the oil industry certainly could impact these where they would never return again. Thank you very much. This little guy here was on the oculina reefs, and I saw another three of them swimming over a lophelia reef in the Florida Keys at 1,200 feet deep.

MS. CANTWELL: We saw one over a lophelia reef as well. It was a little bit smaller, but --

MR. REED: He was eight feet tall.

MR. PUGLIESE: Thank you, John, and thank you, Heather and Kasey. I think the importance of all this is that, as we have been advancing into the future, one of the most important things is, while we were able to create the best we could, in terms of the boundaries of these systems going into it, I think there was a clear understanding that, while we had some of the most unique systems found at that time, with the new technology and with the new partnerships and with Okeanos and -- OER has been a big player from the beginning on some of these things, but the ability to refine our understanding of the deepwater coral ecosystems, the complexity of the coral systems, the complexity of the species managed and associated species, everything from HMS -- Because I know there is one video with I guess swordfish moving through one of your videos on these different things.

They may seem like little pieces, but they are pieces of a large puzzle, and, also, they are large pieces, and some of those things that there is really of value this time is to be able to go back to the first cruise that was done on Okeanos back in 2014, because that one was really one of the first times we kind of sat down with the director of OER and talking about opportunities, and we were able to fit that, and they fit it in between another cruise, and they were able to map one of the largest areas, and now the ability to go back and validate the distribution of those habitats and being that extent and that complex, and it really adds to the justification of the conservation in these areas and the need to keep on looking at how do we go further, in terms of characterizing.

It's really good to see that, as it goes forward, it's not as simple as just some of the basics, but it's getting everything from water column and different things. I mean, you're really going far beyond that on both the exploration program as well as Okeanos, and the idea too is I think, in highlighting a lot of what you're showing, the availability of the information and a closer connection.

We're going to get into some of that a little later on today, in some of the discussions we have about how we can provide and connect that information, and so the online presence of as it's going on as well the research efforts and the future work that really supports it and really gets to the biggest pictures of the conservation and the move towards ecosystem-based management, because that's really what this did provide, is one of the first, really, opportunities to look at the biggest system and work within operations that were going on, but then also do the most extensive conservation you could in the past, and what you're showing really validates a lot of parts of what we were seeing, and it just gets more complex every time you see it.

I have been down this thing before, because, every time you go out there, even from when we first started working with John and others, it was amazing, the types of things you're seeing, and so it just keeps on getting more complex with new species and new complexity and the distributions of when you think one thing that all of a sudden you're finding totally different things going on in the deep system, and the connections between systems too, the pelagics and -- That, I think, is going to be a really important thing, especially in the deep ocean systems, because of how those are important for things beyond council management, such as HMS species and pelagic species, too.

That was, at least, the opportunity, and I appreciate the opportunity of everybody bringing this to the table, and I would kind of open it up to the panel for discussion on the importance of this kind of continuing this kind of work, but also on the conservation of the bigger system.

MS. COLEMAN: I just wanted to add one quick thing, and I wanted to thank Roger for having us here, and also thank the council for being one of the leaders of conservation among all the councils. You saw the area protected, and it's really remarkable what this council has done. I also wanted to have a thought question for this group. We are wrapping up the Southeast initiative, and we won't be putting as much funding in this area for the next few years, but, with an initiative change that we have just created, we will have more money for smaller, targeted projects, and so, if the AP, if the council, has smaller projects in mind that we could help identify corals in particular areas, we are very, very interested in that input from the council and from the AP and from researchers and from everybody.

MR. PUGLIESE: Right off the bat, one thing I think that's pretty amazing is you begin to show different things, the currents of -- We know, in various areas, the currents of wreckfish throughout the areas and getting more information on the connection of those, because then, all of a sudden, you're connecting not only the deepwater coral systems, but you're also really refining our understanding of essential fish habitat for those species within this area, and so you're adding even more complexity and understanding, and so the opportunity to -- Where some of those different areas have been defined in that area and some have been traditionally looked at in say the Miami Terrace areas, but really not refined further, and so opportunities to do that, but also to go into some of the newest areas that have not been explored, because there is still some deeper areas that have some of the most complex and unknown systems yet to be touched on.

MS. DEATON: One question I have is, as John pointed out, as they find new areas coral habitat that are outside the protected management boundaries, is that modified? Are the boundaries changed to include those new coral areas?

MR. PUGLIESE: Those are discussions that I think at the Coral Advisory Panel has further opportunities to look at some of those different areas, and most of those areas that he is talking about I think occurred in the Florida Straits or the southern Florida areas, and some of that information has been on the table before, and there has not been a movement on doing that yet on some of that, and there definitely has not been anything in terms of adjusting the internal areas at this time.

Right now, some of the discussion is the industry had asked about potentially expanding some of those areas, and I think the Coral Advisory Panel response was to get refined mapping and characterization of a lot of these areas in advance of really the designation, and so I think some of this detailed work here goes to both characterizing what some of those areas are, and then it's going to be a decision on if other areas are considered in the future.

MS. DEATON: Thank you. Is there any other comments or questions on this work?

MR. PUGLIESE: One of the things, and I think it gets to this issue of the complexity, is -- I had raised this early on, in some of the modeling efforts, is the opportunity to, while it's focused on deepwater coral complexes and species, if there's an ability to maybe take it one step further and combine that with potential hard bottoms or other types of significant habitats, because, under the Coral, Coral Reef, and Live Hard Bottom FMP, we technically manage everything from the coral systems to all the attached systems, because we have prohibited the retention of corals under the FMP, but also the retention of live rock, and so basically hard bottom with any attached organisms.

If there is an ability to, while focusing on the deepwater coral modeling capability, especially for targeting future mapping efforts, the ability to maybe do the complexity by adding in other parameters that characterize some of what I guess John was raising, some of those hard-bottom structures that have associated hard-bottom organisms that are part of the overall complex.

MR. HOOKER: I guess I just wanted to thank Roger and the AP for putting it together in this perspective. I think, when those headlines first splashed across, it was undiscovered country and all this new area that's never been -- For folks around me, and I'm at BOEM, it was like, hold on, that's HAPC, and we knew that there was some -- There's a history to this, and to have Dr. Reed's presentation is -- This is a continuum of stuff that began at least in 2003, carrying forward to continuing to study and understanding the extent of the lophelia and sponge communities offshore, and sometimes I think that's lost on people, but it's great that --

On the other hand, the fact that the newspapers did all grab onto it and to bring attention to it and to maybe increase potential funding or increase the awareness of the general public to those outside this room is definitely good, and so I appreciate this kind of wrapping back around and talking about kind of that whole history and the role that the council has played in helping to identify those areas, because it is always interesting in looking at the whole history and learning more about the extent core areas and should the HAPC be changed as a result of the research, and so just a thank you.

MR. COLLINS: Sandra would like to jump in, I think.

DR. BROOKE: Just a follow-on to -- I didn't see who was asking the questions about changing the HAPC boundaries to accommodate new data, but we have actually done that a couple of times

since they were first implemented, and we found a particularly shallow site off of Jacksonville, in 2010, I believe, and then John did some work on the Oculina banks, and there was an amendment to expand the boundaries to incorporate those areas.

This new reef that was splashed all over the newspapers earlier on this year is actually outside of the current HAPC boundaries. When those boundaries were put in place through the process with the council earlier on, we tried to accommodate all that was known of the deep-sea coral areas, but, as you can see, if you recall from Heather's and Kasey's maps, there is a vast area out there that hasn't even been mapped yet, and so I think there's still a lot more to discover that are outside the boundaries of the current HAPCs, and so I can envision, once we have more data, that there may be a collective going back to the council to look at changing those boundaries a little bit.

MS. DEATON: Thank you, Sandra. This is Anne, and I asked that question, and that is really good history, too. I remember when they expanded the Oculina in the northern area, and so thanks for all of your good research.

DR. BROOKE: Thank you.

MR. PUGLIESE: I think one of the real benefits too is the opportunity to use a platform like the Okeanos Explorer, where, in the past, sometimes a lot of the efforts were really truly on exploring and not linking it to management needs, and there's been a very significant shift to ensure that, while we're exploring, we are meeting some of the most important, and I think that's exactly what we saw today, is they're getting to some of the areas now that really expand our knowledge and are aligning very closely with that, and so it's really providing significant added value to the efforts of kind of the most technologically-capable vessel that the NOAA fleet has right now, or at least that operates occasionally in our region.

MR. POLAND: I'm not on the Habitat AP, but I just had a question about bottom disturbance. John mentioned a little bit of it off of Florida, and did you all observe any bottom disturbance from fishing gear north of there, and especially in these areas outside of that HAPC?

MS. CANTWELL: John, if you want to go first, I will follow up.

DR. REED: I thought he meant like north of Florida, where the OER was working, and I wasn't part of that this year.

MS. CANTWELL: Okay, and so I can answer that, and I would appreciate, Sandra, if you want to weigh-in on the stuff that you saw on the Deep Search stuff as well. We, quite commonly, see human anthropogenic litter, garbage and trash, and balloons is a big one that we see quite often, and this cruise was similar to other ones that we've had.

It certainly was not super pristine, and we've had areas where there was quite a bit of anthropogenic litter, and we did not, during this expedition, see what I would consider direct impacts from fishing gear, where you have nets that are completely tangled around a wreck or nets that are completely draping over like the big coral mounds, and that's not to say that it's not there, but we just didn't see it during this expedition.

We did see derelict fishing gear, trash, in various areas throughout the whole expedition. Almost on every dive, we saw some piece of trash, but, that being said, that's no different than some of the areas that we've done work in like in the Pacific, where we were thousands of miles away from the closest human civilization and there was still trash. It is an unfortunate reality with our dives, but, Sandra, what about you guys? What did you see during the Deep Search cruise?

DR. BROOKE: We were mostly sort of on the coral mounds specifically, the dives that we did on the Alvin cruise, and we were quite far from shore. Well, we were very far from shore, like 160 miles, and we did a few further in, and we didn't see any fishing gear that I recall on those outer reefs, the so-called new reefs, and we didn't see anything there that I remember. What we do find a lot is in the canyons, and this is true of the ones that we researched, Baltimore and Norfolk Canyons and the ones even further north, but we find a lot of -- We saw quite a bit of fishing gear, longlines and traps, tangled up in the canyon corals, and there was an awful lot of rubbish, especially near the heads.

Now, this year, on the Alvin cruise, we did do a dive in Wilmington Canyon, and there was, again, a lot of line and rubbish in those canyons, and we were -- Just to reiterate that we were sort of usually further offshore than the fishing activity occurs, and that's mostly in that strip that I think Heather showed you, and John showed you, of the open areas within the HAPCs. That's where most of the crab fishing occurs, and the royal red fishing is sort of further up on the shelf, and we were a bit further out, and so we probably wouldn't have come across fishing interactions out there anyway, and I hope that helps answer the question.

MS. CANTWELL: Thank you, Sandra. One other thing that I just thought of when Sandra mentioned the canyons is, when we were diving on Hatteras Canyon, we were surrounded by fishing vessels, and they were mainly recreational fishing, but it was a holiday weekend, and it was gorgeous out, and there were like no waves, no wind, and it was probably the best fishing day of the year, and so we had a lot of vessel traffic around us. The bridge counted, I think, 250 points of contact during the dive, and so they were busy all day, but that dive site didn't actually have much fishing gear.

There wasn't much line that was tied up on the corals that we saw. Again, the canyons, we had some bottom current issues that kind of kept pushing us off the site that we were looking for, and, in that case, we were chasing some seep targets, and so we weren't expecting the hard bottom that we typically catch gear, but I was -- Given how many fishermen that were around us very obviously fishing, I was quite surprised that we didn't find more even just cut lines or anything, which is really impressive.

DR. REED: I just want to bring up one point that I think everybody understands, but, with all this great new mapping that we have, which is wonderful compared to when I started, and we were just flying blind, and to have these incredibly-detailed maps, and the biggest problem I have is when we do new expeditions, like work on the shelf-edge MPA sites, or discover new sites around Florida and the Gulf of Mexico, and the data is immediately available to the public, and they're seeing it live, and they're seeing the maps virtually live, and they're able to take those maps and download that data and go to them the next weekend to fish, either commercially or recreationally, and it's especially dangerous when we're providing that data showing spawning grounds or something like that, because there is a big gap in the time -- From the time we discover a reef or a spawning ground that's made public to the time we can implement protection of that, as we saw

with the -- With the C-HAPC, it was seven years to go from where we first presented it to the council until it was finally enacted.

I would like to see, wherever we are able to show live-bottom coral and sponge habitat, it should be immediately illegal to do bottom-tending gear that's destructive to that habitat, primarily trawling, instead of having to wait to bring it within a protected area or into a protected area before you could stop that, if that makes sense. Thank you.

MR. PUGLIESE: A little bit to that, one of the aspects, John, I think that's important to understand, from the bigger picture here, is that one of the other directives of the council, other than specifically managed areas, is the designation of essential fish habitats, and many of those, what you're talking about, the hard live-bottom systems, are technically EFH HAPC or EFH for especially many of the snapper grouper species.

At least from that aspect, those are all encompassed in the conservation that gets at, to a great degree, the non-fishing activities that impact those areas. With regard to an automatic activity that would just encompass everything, that's a little harder to do with what you're doing with this type of system. I think the process has -- The council has such a long history of looking at gears across-the-board, in terms of fish trap prohibitions and bottom longline prohibitions and a lot of other gear activities, bottom-tending trawls and roller-rig trawl prohibitions, that are already specifically addressing kind of the bigger picture, through each FMP over time, but a lot of those inshore and near-shore shelf edge, and even into the deep systems, technically are addressed at those levels.

I think that very close focus has the ability to advance further in these areas as new information is found, and, I mean, that's the type of information that's being collected now, and the opportunities to advance that into the discussion that's already being looked at, as Sandra said, and so hopefully those are things that can be further addressed, but automatic system becomes a little bit difficult to just do.

MS. DEATON: Are there any other comments or questions?

DR. BAUMSTARK: It's precariously close to the lunch hour, but I did want to bring this point up, quickly. I mean, this is exploratory information, which is amazing, and we need this, and the dives are critical to validate models and whatnot, but I'm also seeing an opportunity here. I mean, you, right now, are collecting baseline information, whereas, decades from now, we're going to want to understand how this habitat is changing and status and trends. When you all are in the water, is there any consideration given to the possibility of revisiting, or is there a monitoring component in mind at all?

MS. CANTWELL: The monitoring process is not something that Okeanos Explorer really does. We try to basically be collecting the first data in areas that haven't been looked at before, to establish that baseline. With OER, there are times where we have contributed to monitoring studies, but, usually, they're not the really long-term projects. There are other arms within NOAA who are responsible for that kind of work. OER's real mission is to basically provide data as quickly as possible to the science community and to the management community, and we essentially then move on.

There have been a couple of times where we've gone back to areas when there has been a warranted need to help establish how change over time is happening, but they're rare. With so much of the ocean seafloor being unknown, we try to go to the newer places. That being said, we have turned over data to programs that do then immediately start plugging and chugging it into a monitoring program, but we just aren't that group, but we try to really -- We really do try to make our data as open-source and as publicly-available -- Everything is georeferenced, and we drop digital targets along the way that you can go back and directly trace our course, particularly in the shallow-water areas, when our georeference systems are much more spatially accurate, and there is not the error that is introduced when we work at 6,000 meters. It would be very easy to go back to a lot of these areas that we have gone to, but that's not necessarily something that OER does. That might be of interest to the Deep-Sea Coral Program, but it's just different nuanced parts of NOAA.

MS. COLEMAN: Just as Kasey said, I was going to add that the Deep-Sea Coral Research Technology Program would certainly be interested in that if it were a high council priority.

DR. BROOKE: They made my point that all of our dives are georeferenced, and so there is the capability of going back, but, as Heather pointed out, and I think it was Heather that was speaking, we're still exploring a lot of these areas. There is some places that we know reasonably well, and that is a relative term, of course, like the Cape Canaveral Triceratops Mounds, and that might be a good one for monitoring. It's close inshore and it's nice, healthy reef, and so it's a funding issue and a priority issue, as much as anything else, I think. If there were to be money available for that, I think we could pull out some good sites for monitoring, but we're just not able to do that within the current economic situation.

DR. BAUMSTARK: Thank you. Yes, I think you're getting toward the point that at least consideration of potential future needs is on the table, even if it's not part of any particular mission of OER.

MS. COLEMAN: Just one quick addition. The Ocean Acidification Program has been studying a number of sites along the Atlantic and all the way down to Florida, and we did ask them to hit some deep-sea coral known locations, and so they are willing to add those to their monitoring sites, and, if that's of council interest, it's something that we would be happy to work more with that program on, and then there is the added bonus of getting ocean acidification information as well.

MS. CANTWELL: The Cape Fear Lophelia Banks area is one of the sites that crosses their transect with a known deep-sea coral habitat.

DR. BROOKE: How far south do they come? Would the Canaveral Mounds be within their survey purview?

MS. CANTWELL: I have got to find the map. It's been a while since I've looked at it, Sandra, but I'll make sure that you get a copy of it.

DR. BROOKE: Great. Thanks.

MS. COLEMAN: I only remember that they were going from the border with Canada all the way south to Florida, but, how far south in Florida, I don't know, but we can figure that out.

DR. BROOKE: It's interesting. We took some aragonite saturation data during one of our cruises, and the data indicate that the reefs are sort of a little bit over the saturation horizon, but not by very much, and there is an awful lot of temperature variation, because the Gulf Stream meanders, and so these are extremely dynamic places, and temperature is just an indicator, but different water masses are moving over the reefs, and so I think it would be interesting to see whether the aragonite saturation state is changing over time and how temporally and spatially variable that is.

MS. CANTWELL: The Gulf Stream certainly does play a very unique role in this area. We saw, with our mapping data, sound velocity errors that could only really be attributed to the Gulf Stream and the changing water masses that we see overnight, and we had a lot more than we normally have to do, because the water temperature was changing so much, and so I think you make an excellent point, Sandra, that there is a lot more in this region to be understood on the impact of the Gulf Stream.

MR. PUGLIESE: One real quick question, and I think I raised it when I was on the vessel, about opportunities to look at the use of other technologies during cruises or during ocean exploration in general or during Okeanos cruises, because maybe there is a way to begin to add in other assets, such as AUVs or different things, to be able to do -- There are so many areas still to be mapped and to be characterized in different aspects, and really to add in some of those assets, and I think you all do some tests of new technology, and so kind of add back to that, because I think that's a real good opportunity to advance some of this, and then maybe other platforms can use it once you have tested the capability out, and maybe that would be the AUV that we could bring to the fishery-independent survey and integrate into there.

MS. CANTWELL: Advancing technology is a key component of one of OER's missions, and we do it in a number of different ways. Sometimes it's through our federal funding opportunity, which we typically have every year, and there is typically some component of marine technology incorporated in there, whether it be sea time for it or helping develop a new sensor or something like that, and so that's one way.

On the Okeanos Explorer specifically, we have two separate paths that we do technology development and testing. One is that we have technology demonstration cruises, where we partner with people in the community, and we say that we have ship time and what resources do you need to test, and we've done work with a number of different academic partners, as well as federal partners, to get the first deepwater trials of some new technologies out in the last year.

Then, on a piggyback basis, pretty much any Okeanos Explorer cruise, we're willing to take sensors and such out and deploy them, if we can accommodate them. On ROV cruises, it's a little bit more challenging, and we don't typically have berth space available, but, during non-ROV cruises, and so mainly during our mapping cruises, there is always berthing space, and we've done anything from NASA satellite calibrations to NOAA satellite calibrations, but we've done buoy deployments, buoy rotations, Argo deployments, and we've done glider rescues and recoveries, and we've done deployments of gliders, and it really depends on when we're in an area, and we are always open to at least fielding the discussion of, if you have an asset that you need deployed or if we can help collect data in a certain area, we're always open to discussion, but it's just figuring out exactly if it will work and if we're going to be in that area, and it just depends.

DR. BROOKE: Just to continue on the technology pathway, and that's really interesting to hear, and I might be hitting you up for that, actually, but Deep Search is collaborating with the ADEON Project, and I forget what the acronym means off the top of my head, but there are a series of moorings, some of which are next to our study sites, that have an active and passive acoustic monitoring on them. They are looking at soundscapes, and this is in the ocean, and this is something that has been done in shallow water, but I think this is the first foray into the deep sea.

Our sort of role in this collaboration is to try and calibrate what those moorings are hearing, so that the ADEON folks know what they are listening to, and I think this sort of extends maybe the capacity for monitoring. Maybe, in a blue-sky world, we might understand what healthy reef looks and sounds like, rather than an unhealthy reef, and how much boating activity there may be in the vicinity, these kinds of things, and so that's kind of a step forward in technology that is very cutting edge, and we're not quite there yet, but I think it's got a lot of potential, and we're working with those guys.

Going back to the ocean acidification technology issue, I'm working with some guys from --, actually on the West Florida Slope, where we're deploying some --, and they're developing in-situ sensors, long-term sensors, for carbonite chemistry, and that's actually through the OE funding program, and so watch this, because, if this works, if that sensor works, then that could, again, expand the monitoring of ocean acidification in other places, too.

MR. HOOKER: I will just jump in on what ADEON stands for. It's the Atlantic Deepwater Ecosystem Observatory Network, and it's a National Ocean Partnership Program that BOEM and NOAA and several others are involved with, and so I was just jumping in there.

MS. CANTWELL: Thank you. I couldn't remember what it was.

DR. BROOKE: Thank you.

MS. DEATON: All right. I think that wraps it up, and it was excellent information, and thank you so much for coming and showing us. It is exciting, and we look forward to learning more about that.

MS. CANTWELL: Thank you, guys, for having us. I can't speak for -- You guys work with the management council all the time, but this was the first time that OER has actually been invited to come to a council meeting. We always try to engage the regional councils in every area that we're in, but you guys have always seemed to have shown a very strong interest in this area, and so we really appreciate you offering that opportunity for us.

We try our best to address your management needs through the cruises, and so, like I said, we do have another one coming up this year, and so, if you guys start thinking about the kinds of things that you would like to see and the areas, now that you've got more information on deepwater areas, and other ones you would like to look at, we would really be interested in hearing that, and we look forward to future discussions with you all. Thank you so much for having us.

MS. COLEMAN: Absolutely. Thank you.

MR. PUGLIESE: Thank you, all. Again, I would just reiterate what Anne said. This has been excellent, the opportunities. The priorities you're talking about, I didn't want to go too far, and I think you're going to see that ocean acidification and a lot of those things are on the radar and are critical things that need to be done.

I do appreciate it being something that they're really interested in staying that close on it, because, before, the way it first started, it was like, oh, by the way, could we be involved, and so flipping it all the way around the other way is very valuable, because I think it really does address some pretty significant priority needs and is the cutting edge and provides benefits to the program as well as to the entire Southeast.

MS. DEATON: Okay, and so we'll break now for lunch and come back at 1:30. Thank you.

(Whereupon, a recess was taken.)

MS. DEATON: We're going to start the meeting here, so we can get out on time. First, we're going to hear some information about energy development activities in the South Atlantic from Brian Hooker, and so the floor is all yours, Brian.

MR. HOOKER: Again, thank you all for the opportunity to give you an update from BOEM on our activities in the Atlantic. We're trying to focus on the South Atlantic, and I will include in this presentation a little bit regarding our other BOEM programs, the Marine Minerals Program and the Oil and Gas Program, as well. For those of you who don't know me, my name is Brian Hooker, and I'm a biologist within the Renewable Energy Program based out of Sterling, Virginia, in the D.C. area.

Where we are right now, we're up to -- We have had seven competitive lease sales resulting in now currently twelve leases. I will get to that a little bit later, but the Massachusetts Wind Energy Area that you see up there has now been divided into three additional leases, and it was originally two more lease areas, but now we've divided the two lease areas into three more, and so that map is a little incorrect on how many leases are within that Massachusetts Wind Energy Area, but I will come back to that shortly. As I mentioned, we're scheduled to lease those three areas next month.

Working from north to south, I'll give you just a very quick overview of what the status is of each of these projects. Then, if you have questions, I will be happy to go into more detail about them. The furthest north lease site is the Vineyard Wind project, and we're very close to releasing the draft environmental impact statement, and so, if you recall from our leasing process, what the developers do is they submit to us a construction and operations plan, and we review that construction and operations plan and then develop an environmental impact statement in order to approve or disapprove that construction and operations plan, and so, right now, we're in the draft EIS process for that construction and operations plan for -- It's around a hundred turbines that will supply power to Massachusetts.

Moving further to the west, we have the South Fork Wind Farm, and we're actually actively having scoping meetings for that draft environmental impact statement right now in Massachusetts, and they were in Amagansett, New York last night, and they will be in Rhode Island tomorrow. Lucky me, I get to be here instead of at those scoping meetings, and so they have already done their site assessment plan, which is primarily the deployment of a FLiDAR buoy to look at wind speeds,

and, as I mentioned, the COP has been submitted, and we are in the middle of those scoping meetings.

Lastly, in that area, Bay State Wind, we do anticipate a construction and operations plan from them also in 2019, and so, on the renewable energy side in the southern New England area, it's pretty busy right now, with several projects submitting their construction and operations plans, and so this is really where the rubber is beginning to hit the road in these areas with actual real plans, turbines on a map, and looking at the environmental effects of these projects.

As I mentioned earlier, we have those unleased areas, and so this is the Massachusetts Wind Energy Area when it first went to auction, and there were some sites that didn't get bid on, and the times have changed since then, and everybody is now interested in bidding on those areas, but we have now divided them up from two to three lease areas, and that will occur -- That auction will occur on December 13.

Moving into the New York Bight, Empire Wind, which is owned by Stat Oil, now known as Equinor, their surveys are ongoing, and they are very close to having their site assessment plan for, again, up to two FLiDAR buoys deployed in that lease area. Also in the New York Bight, our leasing process has received some attention, because we have, again, started off with some very large areas, and we're now still in the winnowing process for those four areas, and I can show you what we're talking about.

These are the four areas, and, actually, I need to update that map, because those names have changed. It was Fairways North and Fairways South and Hudson North and Hudson South are the names that we did eventually go with these, and we're going to be soliciting feedback from a multi-state, multi-federal partner taskforce meeting later this month on some reduced areas for further consideration in this area. As you can imagine, there is a lot of fishing that occurs in these areas, and so, from the fishing community perspective, there is a lot of concern regarding these areas.

Moving further down the coast, Ocean Wind New Jersey, that is an Orsted project, similar to Bay State, and surveys are ongoing there. We approved their site assessment plan, and we anticipate a construction and operations plan from them as well in 2019. The Skipjack Wind Farm, again, we anticipate a construction and operations plan from them in 2019. They are one of the ones that have received an offshore renewable energy tax credit from the State of Maryland, and so they actually have a customer, with the State of Maryland.

US Wind, a little further south, off of Ocean City, their SAP was approved back in March of 2018, and they're still in the process of building a meteorological tower in that project site, and they were also a recipient of an OREC, offshore renewable energy tax credit, from the State of Maryland. The Coastal Virginia Offshore Wind Project is demonstration scale project for two turbines. That's a partnership between Orsted and the Department of Mines, Minerals, and Energy with the State of Virginia. We do anticipate getting closer.

They are revising -- After Orsted came as a partner, this project, which was formerly known as -- It had a previous life, when it was under a DOE grant prospect, and, anyway, some of the project parameters have changed slightly, and so we're waiting on an update on that, and we anticipate construction, actual construction, on that in 2020, and so that one might be our first constructed

offshore project, similar to how Block Island Wind Farm off of Block Island, Rhode Island was the first offshore wind farm in state waters.

Then, lastly, moving down the coast, the Commercial Lease 0508, also known as Kitty Hawk, was executed to Avangrid Renewables, who is here today to talk about that project, back in October of 2017, and they had their preliminary term extended for one year, and the preliminary term extends the site assessment term for doing wind speed calculations and so forth and early surveys on the lease site.

Other BOEM program notes, we're continuing to work on the 2019 to 2024 proposed program for oil and gas lease sales. If you recall, there was a draft proposed program, and the comment period of that ended back in August of 2017, and the next step in this process is a proposed program, and then, following that, is the proposed final program, and so this step-two of the three-step process, as expected, this winter.

Regarding the Atlantic G&G Seismic Survey Permits, this bullet I don't think has changed since May, when I last updated the council. We do anticipate those permits to be authorized from the -- To receive their Marine Mammal Protection Act permits very soon, and apparently they're ready to go forward with that, and I will be sure to mention that, following the issuance of those permits, the EFH consultation will be conducted for those -- Or finished for those permits. There is additional data that BOEM has promised the National Marine Fisheries Service once those conditions of permit approval are known for the MMPA.

Lastly, looking toward the Marine Minerals Program, they're still progressing on their EFH mapper tool, which I presented at the last meeting, but I also wanted to highlight some other studies that they're doing, and these are more studies that are internal to BOEM by just really trying to focus on how to improve predictions for dredging impacts, again looking at dredging intensity and where you predict all your activity may occur. The information is on our website.

Also, another more internally-focused study is looking at the efficiency of bringing fine materials to a beach, and there's a lot that goes into identifying where the borrow areas are and what the mix of fine and coarse grains are, and there is the opportunity to do some tradeoffs on, if you're actually losing a lot of the fine in the pumping out onto the beach, maybe you can -- You have more flexibility in your borrow areas than you may have previously thought, and so that's kind of the basis behind that particular study.

A lot of that then enters into our EFH mapping tool that will help better predict and help better -- It will help BOEM better do our EFH impact assessments for beach renourishment projects and from borrow areas. The Marine Minerals Program, I also wanted to highlight that, as a result of the hurricane supplemental bill, there will likely be some OCS sand borrow areas that are going to be needed to do some beach restoration work in Florida over the next two years, and so more coming on that side of things, and I guess that means more EFH consultations coming up.

That is the status of where that is, and it's very close to being finalized, and hopefully that will improve our EFH consultations for the Marine Minerals Program, and, if it works really well, we might borrow it for the Renewable Energy Program, too.

Right now, with our BOEM studies, we have -- As you guys know, we do a lot of studies, and I always want to highlight, because I usually just kind of focus on some of the fisheries-type studies for this particular group, but we do conduct studies on a wide variety of things. As you heard, BOEM is a partner on like the ADEON Project and the Deepwater Coral Project. Unfortunately, most of renewable energy stuff is on the boring coastal shelf, and so I don't get involved in those sexier projects with the deep-sea coral exploration and stuff like that, but we do have a lot of different studies that we do.

To highlight some of those studies, especially for the Renewable Energy Program and the Marine Minerals Program, you might want to note that, on January 23 and 24, we'll be having a science workshop in Sterling, Virginia, if you're in the area or want to come up to the lovely D.C. area, right near Dulles Airport, which is very convenient, and I'm working right now on a fisheries-focused panel that I think will likely focus more on ecosystem-level impacts and monitoring and kind of thing for that workshop.

Again, I wanted to just highlight that -- I gave you an update on this project at the last meeting. Since then, they have flown actually three surveys, a February survey, a June survey, and a September survey, and the February data is on the data portal. That data link is down below. The June data, I think, should be up very soon, and I meant to check it before this presentation, but I didn't get a chance to, and so just an example of some of the information that's available, and you can look at where there is occurrences of 526 bony fish, 278 sharks, and fifty-five fish shoals, and that was just in the month of February, and you can query it and see where those show up on the aerial survey lines, and we expect a final report on that in 2020, and so stay tuned on that.

Lastly, we have our -- We are entering into our studies development planning for the next phase, 2019 through 2021, and the 2018 to 2020 is on our website, and, actually, right now -- Actually, I think the 2019 is already up on our website too, and I need to update that slide as well, but we actually have our national studies list now for 2019. If you go to the environmental studies planning part of our website, you can actually click on "2019" and click on "Atlantic", you will see a full list of studies and who the BOEM contact is for each one of those studies.

Those are all studies that we are planning in 2019, and there are several that do have a fisheries component to them, whether it's modeling larval transport through a particular wind farm or even some work on Cox Ledge with spawning, and then we're continuing some of our acoustic work with black sea bass and squid as well, and all of that is on that website, and you can dig into detail on any of those if you would like.

I think that's actually my last slide, and, again, there is my contact information and the direct link to our environmental studies page and also our fishing industry page as well. I would be happy, at this point, to take any questions. I know I zipped through that, and that was quick, and I probably didn't take long enough, since I was told that I have the whole afternoon, and it's only 2:05. Are there questions?

MR. GEIGER: Brian, I noticed, on the permits, that you had several Atlantic seismic permits that are going to be issued, and where are the locations of those going to be taking place at?

MR. HOOKER: I would have to dig it up, but it's basically a large portion of the South Atlantic, and so they're very large tract lines, I think covering a good part of off of the Georgia/South Carolina coast, primarily, and there is a map, and I can dig that up and send it to you.

MR. GEIGER: Okay, and I guess I would ask -- I'm assuming this is for oil and gas potential leasing?

MR. HOOKER: Yes, that's what that is for.

MR. GEIGER: Okay. Once those seismic tests are completed, any non-proprietary data, will that be available to the states and/or other federal agencies for possible habitat protection activities?

MR. HOOKER: Yes, and, on the oil and gas side, I think there is -- Like the multibeam data does become available fairly soon, and I think there's maybe like a two to three-year lag between when that's made available. I know, just within the past couple of years, our Gulf of Mexico office, which processes all that data, they recently did this really cool map, where they had tons of updated map features in the Gulf of Mexico, and I think it made a lot of press, and so some of you might be familiar with it, but that was based upon a lot of that data that they received from private entities, and so there is that possibility, yes.

MS. DEATON: Any other comments or questions? Okay. Thank you, Brian, and I guess we'll move on to Craig for Kitty Hawk.

MR. POFF: My name is Craig Poff, and I'm the Director of Development for Avangrid Renewables Kitty Hawk Offshore Wind Project, and I've got a few slides to share with you, to kind of tell you what we're up to, but I have left a fair amount of time, at Roger's request, for questions, knowing that wind energy in your area is something of a new thing, in the southeastern U.S., and I'm going to give you a little bit of a Wind Energy 101, and any questions are welcomed, for certain.

First, Avangrid Renewables is one of the largest owners of renewable generation assets in the U.S. We own over sixty land-based wind energy projects across the country, and I will get to some maps here in a moment, and we have some solar and a little bit of very strategic gas generation out in Oregon, and we're part of -- We are publicly traded, under the Avangrid Group, and it's an AGR ticker on the New York Exchange, and our primary shareholder is the Iberdrola Group, and Iberdrola is one of the largest utilities in the world. It's Spanish-based, and their global portfolio is really geared toward the non-carbon-generating future.

Avangrid Renewables in the U.S. and our affiliated companies, like Scottish Power Renewables over in the U.K., are really undertaking kind of the scaling up of renewable energy generation in the offshore space, and so this slide kind of shows where we are globally. Over in the U.K., we have operating projects out here of West of Duddon Sands in the Irish Sea, and we have recently commissioned, just last month, the Wikinger Project off the northern coast of Germany.

The East Anglia Complex on the east coast of the U.K. is in process of construction and permitting, and then, here in the U.S., our parent company, Avangrid, is a 50 percent stakeholder in the Vineyard Wind project that Brian mentioned earlier, and I don't know anything about that project, because I am solely focused on the Kitty Hawk project off of Currituck, North Carolina.

As I mentioned, here in the U.S., our company has quite a depth of experience in land-based, and our headquarters and a large part of our portfolio is out in the Pacific Northwest, and then kind of our wires and distribution utility part of our business is primarily focused up in the Northeast, but, certainly anywhere the wind blows, we have a presence operating projects, more than sixty of them across the country.

Just, kind of the first things first, I want to share with you kind of the things that we need in order to generate energy from wind, and so, whenever we're out prospecting for sites, we have three fundamental things, and I'm sure anybody can guess the first one is wind, adequate wind resource, and we're not necessarily looking at the wind on the ground. We're looking at the wind anywhere from 200 to 600 feet above the ground and what are the characteristics of that, and so we're looking for wind and then transmission. We need to be able to move the generated electrons into the market that needs that energy, and then we need sites. On onshore, that's typically privately-owned land that's properly zoned, and we look at the both natural features of the land and the manmade features and then try to integrate a project into that environment, and then, of course, in the offshore environment, we're working on federal waters on the outer continental shelf with Kitty Hawk.

What we have here are the basic components of a wind farm. The most interesting and sexy part of it, of course, is the wind turbine. Turbines today are three-bladed upwind, meaning the turbine will sense the speed and direction of the wind and turn into the wind and then adjust the pitch of the blades to most efficiently convert that wind to rotational energy driving a generator inside the nacelle, or the box, at the top of a tall tower. That energy is then transformed. On land, typically, it's at about 345 kV to a sub-station, where it's then transformed to grid voltage, and then it flows on into lights and homes and businesses and such.

All of the time that a wind turbine is out there in the environment, it's sensing the speed and direction of the wind, and all of the parameters and the operation of that are monitored 24/7/365, either through an onsite crew, which on land-based projects are typically 7:00 a.m. to three o'clock or something like that. After working hours, it's back at a national control center, and that's a secure facility in an office building in the Brewery Block of Portland, Oregon. From there, we monitor the weather, the operation of the project, and, in that control center, we are constantly in communication with the grid operators, the people that make sure that, when we flip a light on here in St. Pete, that the lights come on.

All of that has to be balanced at the speed of light. There's no function in the electric grid today that allows us to store energy, and so, when we generate, it goes right into the grid and right into people's lights, and the grid operator is constantly adjusting those parameters to balance supply with demand. It's actually a pretty amazing process, when you think of it. The electrons are generated up-tower, and they go down the tower through an electrical cable under the ground or the seafloor, typically, to a sub-station, where it's then converted to grid voltage and then goes on out.

As I mentioned, at our national control center, we're working across eighteen states and seven electric power markets and all of our assets, from wind to a little bit of combined-cycle gas and solar, and then we also use some other energy-trading mechanisms to balance supply and demand for our customers.

I am here today primarily to tell you about Kitty Hawk, which is a wind energy area right off of Currituck or Corolla, North Carolina. It's approximately twenty-four nautical miles off the beach. This would be the state line, with Virginia to the north and North Carolina to the south. Virginia Beach is in this area, in the mouth of the Chesapeake Bay up here.

Then you all kind of, I think, understand this possibly a little better than I, but we're really just kind of starting to understand what we have out there, and certainly BOEM, whenever they determined which wind energy areas to put up to lease, did quite a bit of stakeholder outreach and investigation to look at the habitat, the ocean uses, and then settled on this wind energy area, which we acquired last year.

We are in the process of kind of gathering information about this site to inform how we might go about developing it. This slide demonstrates the revenue intensity of fishing uses in the area, and so we're looking at it from the geologic features to the ocean uses to the meteorological aspects of the site, all to try to understand how best to go about development.

Right now, we're really in a planning and assessment and outreach phase, and that's what I'm doing here today, is I would welcome any input from you all, either as a council or individually. As we start taking our steps forward, we're interested in hearing from you stakeholders on any concerns that you might have or conflicts that you may see in the future or assets that you may even see in the future, and we want to hear about that, so we can consider all of this in our process.

Coming in 2019, along with continued planning, assessment, and outreach, we intend to kick off some aerial studies, similar to what Brian showed with the remote program, where they're doing the transects all the way down the South Atlantic coast, and we'll be doing a very intense study of avian, marine mammals, sea turtles, et cetera, using aerial imagery of the Kitty Hawk Wind Energy Area.

We will also plan, in the spring of 2019, to begin to conduct marine surveys, geophysical surveys, and benthic surveys in the wind energy area and most likely two potential routes to shore. We really want to start understanding what's going on on the seabed, and we need to characterize all of that. In the middle, or really following that first round of surveys, we will prepare the site assessment plan and submit that to BOEM and hope that they will turn that around, and, possibly in the fall of next year, deploy probably two floating LiDAR instruments and acoustic wave profilers that will help us start to understand the meteorological and currents and wave forces.

Moving on to 2020, we expect to continue all the planning and assessment, of course, and the aerial surveys and then increase the resolution and the intensity of the marine surveys to better focus in on what might be a project, and so, in 2019, we're going to look at the entire wind energy area, and it's about 120,000 acres, and we'll look through all that data and determine what part of that might make a good first project and focus in on surveying that into 2020.

I kind of changed colors here, because, really, we don't know yet if there is a project. If things appear to be favorable, then we will start moving towards project permitting on into 2021 and 2022, and that will involve further, more detailed surveys out there and submission of the COP to BOEM. Again, if all of that continues to work in our favor, perhaps we would begin onshore construction in 2023 and leading to commercial operation on or around 2025 and later.

We anticipate that the project could yield as much as about two-and-a-half gigawatts of wind energy. That really doesn't mean much today, because we don't know really the size of the turbines that we're going to be looking at in five to ten years' time, and so, if we're looking at twenty-megawatt turbines, you can do the math backwards, and there is 1,250 over the entire area, but, again, we would doing this in chunky projects, I would expect, as data becomes available and as technology advances and as the market requires.

Wind energy is getting more competitive with land-based energy sources, and it's not there yet, at parity yet, but we're expecting the technology to continue to advance and certainly warrant the great deal of work that we're planning to undertake in the next couple of years to hopefully prepare this project for a market and generate good, clean energy out there for many years to come.

With that, I will be glad to take questions, and my contact information is here, and I've got a pile of business cards, and I would love to hear from any of you with regard to, again, any concerns you have locally in that area. If there is anybody that you would like to recommend that we talk to in the Kitty Hawk/Wanchese/Virginia Beach area, we're very keen to engage with those folks, to make sure that, whenever we move towards marine survey work in the spring, that we can re-engage with those people and avoid conflicts and work together to let everybody do their job with very little headache, and so, if there are any questions, I would love to answer them.

MR. GEIGER: Thank you for your presentation. I understand -- You gave a good overview on land-based wind power facilities, and I understand there is some significant differences between land-based wind power development as well as offshore, and can you elaborate on some of the more significant differences, please?

MR. POFF: In the offshore environment, of course, we just can't walk out there and do our work, and so, in addition to the wind turbines that will be part of a project, there will be an offshore sub-station, again kind of built on piers or pilings, at a sufficient height above the water to be protected from wave impacts. Probably the biggest difference is going -- Really, that's about it. That's turbines and an offshore sub out there for the life of the project.

During construction is going to be the most impactful time. There will be quite a bit of vessel traffic, similar to the way we build onshore, but just much more logistically complex. There will be crew ships, almost certainly, to house the workers offshore, and there may be aircraft involved, helicopters, but large vessels that are going to be transiting the areas regularly during that construction.

We don't know yet the character of the foundations that will be used on this project, and we have some assumptions that there will be some monopiles, which are simply big tubes driven into the seabed, and we may also use what's called a jacketed foundation, which is like a three-legged tripod, for lack of a better term, that is then pile driven into the seabed, and then the turbine structure sits above that.

All of these activities are regulated quite closely with the BOEM requirements under our lease, all of the NOAA and NMFS and EPA and Army Corps requirements, and I don't know if that's touched on everything, but certainly one other thing I should add is, during the long-term operation of the project, there will be crew transfer of vessels transiting the area that will be based out of

somewhere along the coast, and we don't know whether it would be Oregon Inlet yet or Rudee or perhaps surrounding Lynnhaven or the Port of Norfolk. We're still undertaking those studies to find those optimal locations.

MR. GEIGER: A follow-up. You indicated that the lease site is approximately twenty-four miles offshore?

MR. POFF: Yes, the closest point.

MR. GEIGER: Depending upon the size and the height and the number of these offshore units, are they going to be visible from the horizon for people onshore?

MR. POFF: It's over the horizon at sea level. I have a business and an accounting background, and I Wikipediaed like the square root of the diameter of the Earth type of calculation, and I think it was somewhere above 370 or 380 feet might be visible under optimal conditions at this closest point, which is twenty-four nautical miles. The project extends about -- I think it's eighteen miles or so south and east, and so every additional turbine is getting farther and less visible.

If any of you know the weather up in that area as well, it's high humidity, and I guess there is some lensing conditions with the heat of the water and the atmosphere that you might get some views over the horizon, but, by and large, that wind energy area was determined, after considerable input from a variety of stakeholders, and the significance of twenty-four nautical miles, I believe, and, Brian, you can correct me, but it comes from the National Parks Service, and you won't see any sites in this area closer than that, and I think it's primarily due to visual.

MR. HOOKER: Yes, that was exactly the point I was going to make. Yes, the National Parks Service, in our negotiations with them, put that setback as being what they thought was good to preserve the national seashore. One thing that may be a slight follow-up to what Jamie was saying is I don't think you really talked about the spacing offshore and the size of the turbines in comparison to the land, and I don't know if you wanted to touch on that.

MR. POFF: I don't know what those are going to be yet, but it's typically four to eight rotor diameters. Here, we may be a half-mile to a mile apart. Again, depending on the ultimate size of the turbines and the orientation of the prevailing local meteorological conditions, that will greatly affect how we lay that out, and so I really want to avoid setting any particular expectations right now. It's just a little too early, but it's certainly something that we would be interested in discussing with stakeholders as that becomes more known.

MS. DEATON: Craig, I was wondering if you could give more details on what the benthic surveys are that you mentioned that you would be doing and what that would involve, and, also, I noticed, on the nautical chart, there was a shipwreck within your leased area, that symbol, and so what would happen with that and fishing activity? Those are my two questions.

MR. POFF: The benthic studies early on are simply some reconnaissance-level grab samples at the buoy deployment areas, and that's our near-term focus, to just confirm what exists there or not, and then, as it goes forward, there is a much more detailed requirement under BOEM's COP considerations to understand not only the geology, but also, of course, the critters down there as well.

I don't have all of the details of those requirements and what they are today, but suffice it to say that, in advance of dropping a one-meter-cube mooring for a buoy on the bottom of the ocean, there will be a high-resolution geophysical survey with benthic and camera on that site before we can submit that SAP to BOEM for consideration.

Then, as we get on to the consideration of an actual COP preparation and submission, all of that is -- The requirements that BOEM has under 106 in particular, kind of the cultural/historic requirements, are very intense for side-scanning sonar to pick up all the paleo-landscapes and wrecks and any of those sorts of hard features on the bottom, and then all of that is supplemented with both the geotechnical sensing as well as, by the time we eventually get to the further down construction reports, the facility and design and installation reports, we'll actually be taking cores of the bottom of the sea, to make sure that we understand what is going on down there.

MS. DEATON: Would that also include the two routes, the cable routes, because that is --

MR. POFF: From a geotechnical and benthic perspective, yes. There would not be a geotechnical portion in those areas, except where structures are required, and so, to answer your question about cable routes, yes, both the geophysical and benthic surveys are required.

MR. HOOKER: If I could follow-up, on the grab sample aspect, pretty much it's standard now in the industry that all of the grab samples come with imagery data as well, and so all of our construction and operations plans come with seafloor imagery along the cable routes and in the areas themselves as a part of that grab sampling, whether it's ground-truthing the geophysical data or purely for understanding some of the benthos.

Then I will reiterate what Craig already said. We have very strict guidelines on disrupting cultural resources, whether it be a shipwreck or some other aspect that we have setback distances, and they won't be pile driving on top of a shipwreck, that's for sure, and they wouldn't want to anyway, but the --

MR. POFF: In fact, what I was going to point out is I believe this isn't actually a shipwreck. I believe that is an F-14 Tomcat laying on its top.

MR. HOOKER: Yes, we did find an F-14, and I don't think that was that one. I think it was a different site, because I think that one was unmapped. It showed up as one of our anomalies on a reconnaissance-level survey that we did. It was an F-14 based out of Norfolk, and thanks to the Navy for helping us sluice that down. As you can see, the fishing is -- That dot is obviously offset slightly by that known shipwreck, and so I'm sure that was a fishing location as well. Stuff like that easily pops out in some of this fisheries data.

AP MEMBER: Do we know if these turbines add anything to the acoustic landscape in the marine environment?

MR. POFF: The acoustic impacts really occur during construction. Over the life, I am not aware of any personally, and I'm not an acoustics expert or an engineer. I have a business background, but I do know that there is considerable modeling and consideration of the acoustic impacts, not only of any pile driving or any other construction activities, the ships and everything else, but I

don't believe there is a monitoring requirement on the acoustics of the operational phase. Brian, you can correct me if I'm wrong.

MR. HOOKER: No, that's correct. I mean, we have several studies, like we did with Block Island, and I think one of my last slides talked about the RODEO Project, and that's a project that we are actively monitoring the project, and so we recently concluded the operational acoustic monitoring for Block Island Wind Farm, and there is some results on that now. Basically, you can hear it operationally right next to the base, but, as you move even slightly off, it's eaten up by just background wind and wave noise that is there.

We will be extending that also for the CVOW project as well, and that will be using a monopile, which has slightly different characteristics than the jacket structure that was used at Block Island, and so we'll have some baseline work in the Atlantic on what operational noise is, both in-water and above-water as well. Above the water, no one is going to be able to hear it, unless you're in a boat right next to it.

AP MEMBER: How much drift do you anticipate to have in your transmission lines on the sea-bottom? Is the line going to move?

MR. POFF: No, they will be buried. I think we have to better understand the geophysical structure, so we can design it properly, but that's the intention, is that they will be buried, to protect them on both sides. We don't want anybody snagging our cable, and certainly nobody going by there would want to snag it, and so, yes, all of that will be determined as we kind of get the survey data back.

MR. HOOKER: I was just going to say there is no drift. Those cables are really heavy. There is actually greater damage to a vessel, if they were to snag it, than to the cable itself, I think. You're not moving that cable.

MR. GEIGER: I am assuming that you're requiring a sub-station to be constructed somewhere above the ocean surface because of the distance from this wind farm to the shore and you can run cables directly to a sub-station on-land?

MR. POFF: Well, any offshore wind project of scale like this is going to have an offshore sub, almost certainly, and so, yes, it would be -- You would have a lot of electrical losses if each turbine had to run sixty miles, if you were connecting here, or twenty-five or thirty miles running this way, and so, yes, you bring that to a higher voltage and then push it to shore.

MR. GEIGER: We're looking to construct -- If the whole thing goes around 2020 or 2023 or 2024, and I'm assuming technology will be evolving significantly by then, especially looking at the evolution of wind power, or at least what they're doing in Europe at least these days, and do you foresee the possibility of these sub-stations, instead of being located above sea level, being located on the bottom?

MR. POFF: No.

MR. GEIGER: Why?

MR. POFF: I just don't expect, in this horizon, that that technology is going to occur. We need to be able to access it, for maintenance and monitoring and such, and just the personnel aspect of dealing with this, and that's just for me, and it's hard for me to get my mind around how that would become much different in the five to ten-year timescale.

MS. DEATON: Craig, what happens in a storm, if that sub-station gets wet and the generator shuts down? How does that affect the project?

MR. POFF: Let me answer those kind of backwards. Turbines are constantly sensing speed and direction of the wind, and so let's say a hurricane comes through North Carolina, as they are known to do on occasion, and, first of all, the turbine will be designed to withstand extreme forces. You know, that's why we put a floating LiDAR and wave profilers and all that out there, is we want to make sure the investment, which we may be looking at somewhere between $3 and $6 billion of investment in this project, is going to be able to pay itself back and earn a return and generate energy for many years.

The turbines sense the speed and direction. Whenever they get to what's called a cutout speed, the design maximum, they pitch the blades to a stall position, and then the turbine simply yaws and stays into the wind, but in a non-rotating fashion. Then, with regard to the sub-stations, they are designed for the marine environment, and so they are very heavily built, well above the wave height, and we build plenty of safety factors in there. Again, if a sub-station goes down offshore, you're probably looking at two to four years of procurement and installation, and you would have your investment sitting there for many years unusable, and so all of those are design considerations that we take very seriously and build into the initial deployment of the project.

MS. DEATON: All right. Thank you. That was very enlightening. Are there any other questions?

MR. PARKER: Is the power coming out of the body of the generator itself -- Is it AC current or DC current?

MR. POFF: The turbines generate at AC. Now, that's not to be -- There has been no determination yet as to the offshore sub-station and whether that will convert to DC to move it to shore. That is still being evaluated. Again, thank you all for your time and your questions, and I welcome any of your feedback. I will leave some cards with Roger, if that's okay, and we would love to hear from you, if have specific questions, general questions, or if you would like to refer me to somebody up in that neighborhood or them to me, and please reach out. Thank you, all, very much for having me.

MR. PUGLIESE: Thank you, Craig, and I really appreciate it, because, for everybody's understanding, Craig had reached out directly to the council early, and I think he has emphasized a couple of times that this is right at the beginning of the process and the real opportunity to have input early in guiding how some of the survey work is done, and so it sounds as if there is some latitude to work under the umbrella of how it's going to be directed into the future, but to make sure that you're collecting enough information to really understand it and the adjacent areas and advance the design and layout.

I think what is -- This is very much encouraged, because the council has been very clear on the support for renewables in lieu of oil and gas exploration, and we've gone on the record on that,

and early coordination is going to do things, and I think, in our region, I think there is opportunities to do things that haven't been thought about.

A couple of aspects, I think, that are going to be really interesting as this goes down the road is, if you're looking at actually putting structural materials in there, the opportunity to provide some of the observing capabilities that some of those structures could actually inform oceanographic models and things that are affecting hurricane modeling and currents and even some of the oceanographic parameters in the system, and so opportunities to look into the future as that goes forward and to work with the industries to maybe align the systems, so that they can create trolling alleys within the areas, and so we're so far in advance that there's a real opportunity to work more as a partnership as you all move forward on this, and the commitment to make it happen is there, and so I think this group really provides a lot of the guidance on how we collaborate to make sure that happens.

Craig and Brian will be presenting at the council meeting, during our Habitat and Ecosystem Committee, and so we want to follow-up and continue this discussion, and everybody take to heart his request for direct input, especially on individual input or other input, and we'll follow up, very specifically, on how we can advance maybe recommendations on how to guide some of the survey capabilities or survey activities you're doing, because you've heard the importance of some of the other discussions about getting as much as we can about the information and the operations and understanding of that, and this provides a very unique situation, and we do really appreciate the early involvement of the council and the entire region, and this is pretty much a representation of the entire Southeast, and so it sets the stage for far beyond just this one footprint.

MS. DEATON: Just one more question from Jeff.

MR. SOSS: I just want to touch real quick on post-construction information gathered. Just about any buoy that you find offshore is going to have some kind of information-gathering device, whether it be an acoustic array or something like that, and I was just wondering if you had any plans to work with any organizations and maybe piggy-backing your structures to have anything from an acoustic array and picking up on fish going by or wave height information, and maybe having NOAA piggy-back, so that, if you're a fisherman, for instance, you can figure out what the wave heights are or the wind or anything like that is out there.

Then, from a science perspective, after construction, being able to work together to have an array of some sort or gather information, of course, post-construction, because I think, in the long run, it can be very valuable to have those structures out there, and even from a fine-tuned perspective, from turbine to turbine, understanding maybe fish movements or anything like that, and so I just wanted to bring that up.

MR. POFF: We don't have any plans yet, but that's something to certainly consider. I would say that we have met with a number of oceanographers and scientists from the University of North Carolina and North Carolina State with regard to some of their meteorological and oceanographic modeling capabilities, and we participated in a grant application with them earlier this year. It wasn't selected, but we're going to try again next year, and it would lead towards some of those things that I think you've touched on, and I will be sure to include in our list of things to consider as we go forward. Thank you, all.

MS. DEATON: All right. Now we're going to do some breakout groups.

(The afternoon member breakout session was not transcribed.)

(Whereupon, the meeting recessed on November 7, 2018.)

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NOVEMBER 8, 2018

THURSDAY 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 Sirata Beach Resort, St. Petersburg Beach, Florida, November 8, 2018, and was called to order at 9:00 o'clock a.m. by Chairman Anne Deaton.

MS. DEATON: Good morning. We are ahead of schedule a little bit, because, yesterday, instead of breaking out, we just talked about our topics together, and we don't have to do a recap this morning, which was Number 10 on the agenda for the first thing, and so we're going to go right into a webinar from the South Atlantic Landscape Conservation Cooperative, the SA LCC, and the webinar is going to be by Hillary Morris, who is on the line, on refinement of the Conservation Blueprint Simple Viewer. Hi, Hillary.

MS. MORRIS: Hi. Thanks for having me.

MR. PUGLIESE: Hillary, welcome.

MS. MORRIS: We are doing an overview of the latest and greatest improvements to the Simple Viewer on our 3rd Thursday web forum coming up in a few weeks, and I think that you all would be interested in that as well.

MR. PUGLIESE: Yes, and I'll make sure that everybody has the link to that. The timing on it was really close, but I thought that this would be a really good opportunity, since we have the entire group, to at least get the core of the discussion of what's going to happen at that webinar.

MS. MORRIS: Absolutely. If you all still want to tune into the 3rd Thursday web forum on your own, I do encourage you to do that, and we're also going to have our software developer, Brendan, from the Conservation Biology Institute on the line for that webinar, and he will get a little bit more detailed than I am able to go into today, but it looks like you all can see my slides. Again, I'm Hillary Morris, and I work on user support and communications for the South Atlantic Blueprint, and I'm based here in Raleigh, North Carolina.

I wanted to provide a little bit of background, just for any of you who might not be familiar with the blueprint, and the blueprint was initially developed by the South Atlantic Landscape Conservation Cooperative, of which Roger is a Steering Committee member, and so the blueprint

has always been a key part of our mission and this partnership. Our mission is to facilitate conservation actions that sustain both natural and cultural resources, guided by a shared, adaptive blueprint, and that's the blueprint that you're looking at on this slide.

The blueprint is a living, spatial plan, and it's intended to prioritize opportunities for shared conservation action in the face of future change, and so it's identifying the highest priorities areas for us to come together as a community and focus our conservation actions and investment to sustain the resources that we care about.

The current version of the blueprint is Version 2, and it's being iteratively adapted and improved over time, through feedback from the conservation community, and that's the version that we'll be showcasing in the Simple Viewer today, and I do always like to reinforce that the blueprint is not what we jokingly call One Plan to Rule Them All. We do encourage you to use the blueprint in combination with your local data and knowledge, and it's just intended to provide a regional lens that can help you identify those high-priority areas on a landscape scale.

The blueprint is based on a suite of indicators of ecosystem health that are all modeled and incorporated into the blueprint, and that's what's driving the priorities, and it's also based on a connectivity analysis that identifies the connections between areas with high conservation value, and so that's what is driving the blueprint priorities.

If you want to access the data underlying the blueprint and access the final priorities themselves, there are really two places that you can do that online, and the first is our conservation planning atlas, and this is a little bit like online ArcGIS lite. It's a free program, and it allows you to explore and visualize all of the data online in this VPA, and you can overlay different layers, and you can export maps, and you can do some really basic analysis.

The simpler way to explore the blueprint is called the Simple Viewer, and that's what I am going to be talking to you about today. Because of the way this webinar is set up, I wasn't able to share my screen and kind of do a classic live demo with you all, where I click around and narrate over it, but I did record myself doing that in a video for you all, and so I think I will go ahead and ask that you all listen to that video and take a look at that and see what that's all about, and then I will be on the line for questions, and so the Simple Viewer has been recently updated with some new features, and that's what that video is going to showcase for you all. If anyone has any quick questions about the blueprint before we go, I would be happy to answer those, but, otherwise, I will just leave you to it, and just let me know if you have questions afterwards.

AP MEMBER: I did have a quick question regarding the CPA and the blueprint. The peninsular Florida LCC has been going through a similar process, and I think they modeled everything pretty closely with the indicators and developing a blueprint, and how does that line up? Are these separate and different CPAs, and are they different blueprints, and so the seams line up well between these two, to give us a continuous --

MS. MORRIS: (Ms. Morris's response is not audible on the recording.)

AP MEMBER: Thank you. Essentially, though some of the methods in developing something like a blueprint might differ slightly, there is that holistic layer, and I had a little trouble hearing you there, but there is that holistic layer that covers the entire South Atlantic, or this FMC area?

MS. MORRIS: Yes, that covers the entire -- It's a fifteen-state definition of the southeast United States and the Caribbean as well, with Puerto Rico and the Virgin Islands, and so it covers the same area as the Southeast Association of Fish and Wildlife Agencies area, and so we do have a blueprint for the entire southeast.

AP MEMBER: Great. Thank you.

MS. MORRIS: I want to go ahead and give an overview of the entire interface, for any of you who may not have explored it before, and so the URL for the Simple Viewer is just blueprint.southatlanticlcc.org and I have typed that into my browser to navigate to the viewer. I can also get there from the South Atlantic LCC website, through the conservation blueprint page, which is typically the first place that we point people to learn about the blueprint, and you can click on this link in the upper-right-hand corner to get to the Simple Viewer, and you can also get there from the conservation planning atlas, by clicking this link on the CPA homepage.

Let's close out of these, and you can see that the Simple Viewer really first drops you into this fairly zoomed-out view of the South Atlantic blueprint, just to give you a sense of where we are in the southeast, and then this sidebar on the left-hand side of your screen provides some information about what the Simple Viewer is, what the blueprint is, and how it was developed. It defines each of the blueprint priority categories for you, and then, if you're the type of person who likes to read the directions before jumping into a new viewer, we have tried to help you out here. Alternative, if you're more like me and you prefer just to jump in and start clicking, I think that you will find the interface is pretty intuitive and allows you to do that.

You may notice that this viewer isn't particularly interactive right now, and that's because it's prompting you through this message to zoom in first, so that you can select an area. There is a lot of ways to zoom in. Here, I'm using my scroll wheel on my mouse, and I can use these plus and minus buttons in the upper right, and I can use a zoom box, by drawing this little rectangle around the area that I want to zoom into it.

If I have enabled permissions to allow my computer to share my location, I can use this zoom to my location button, and I have not enabled that, and so I'm not going to show you that today, or my personal favorite is you can use this little location finder and type in the place that you want to zoom into. In my case, I'm going to choose Brunswick, Georgia.

I will select Brunswick from the drop-down menu, and you can see that the interface has zoomed me into Brunswick, Georgia and dropped a pin. I am going to go ahead and zoom out, because it has zoomed me in a little further than I want, and I'm going to unselect Brunswick to get rid of our pin, so it's not distracting. If I continue to zoom back out, you can see that, by zooming in far enough, I now see selectable boundaries for each of the summary units to explore the blueprint priorities.

In the terrestrial and the near-shore environment, my selectable unit is a HUC 12 sub-watershed. In the marine environment, my selectable unit is an outer continental shelf lease block, and so I'm going to select a HUC 12 sub-watershed for our demonstration, just to show you some of the new things that you can do with the Simple Viewer.

As soon as I select a sub-watershed, the side-bar view changes, and it's now showing me information specific to this sub-watershed. Most of this watershed, as you can see on the pie chart, is prioritized in the blueprint, and we have 10 percent in the highest priority dark-purple category, 41 percent of this watershed is in the hot-pink high-priority category, another 41 percent is in medium, and then we have 2 percent in corridors, and so, in total, only 6 percent of this sub-watershed is not prioritized in the blueprint.

Farther down, you can see some regional and state-wide conservation plans, and these are plans that also identify priorities in this sub-watershed, and so they might be of interest to you. Even further down, the Blueprint 1.0 workshop feedback shows input that we received during the first round of blueprint workshops about the sub-watershed and what makes it special. I will note that it's not at all intended to be a comprehensive summary of everything that is important in the sub-watershed, but we just didn't want to lose this feedback, and so we've carried it through in the viewer, even as the blueprint itself has become data driven rather than expert driven.

I am going to scroll back up to the top. Next on our list is the indicators tab, and this is going to tell us about how the indicators are scoring in the sub-watershed. The first thing that I look at is the ecosystems that occur in the sub-watershed, and I can see that 43 percent of this sub-watershed is in the forest and wetland ecosystem, and we also have a good chunk of pine and prairie, and more than a quarter of the watershed is made up of the pine and prairie ecosystem, and we also have some estuaries, some maritime forests, and some freshwater marsh.

In addition, we can look at indicators that aren't specific to a particular ecosystem, but are more intended to capture connections across terrestrial and aquatic systems, and they apply to the entire South Atlantic region, like freshwater aquatic, landscapes, and waterscapes indicators, and so we have a lot of indicators that can tell us about the current condition of this sub-watershed.

If I sort of scan the indicators, I can get a sense of which indicators are scoring highly and might therefore be driving the blueprint priorities. The average score for each indicator in the sub-watershed is plotted on the line as a dot. For example, we can see that forested wetland amphibians is doing pretty well, but what does that really mean? I can click on it to learn more.

Now I can read more about the forested wetlands amphibians indicator and how it's developed, and I'm reading that it draws on priority amphibian and reptile conservation areas, or PARCAs, within forested wetlands, and so it's telling me that PARCA is expert driven and it's a non-regulatory designation and it's intended to identify places that support good populations of reptiles and amphibians.

Here, I can see more details about how this indicator is scoring. 79 percent of the forested wetlands in this sub-watershed received a high value for this indicator, and 21 percent of the forested wetlands in this sub-watershed received the low value. Let's go back and look at some more indicators. What else is scoring highly? It looks like wetland patch size in our estuarine environment scores pretty highly in this sub-watershed, and I can read about wetland patch size, and this description is telling me that, perhaps unsurprisingly, big, connected chunks of wetland are better than smaller, fragmented chunks of wetland, and, within the estuarine marsh ecosystem, 79 percent of that ecosystem in this sub-watershed receives the highest value for wetland patch size.

I will also point out that, if I want to learn a lot more about the wetland patch size indicator, and even visualize it spatially, I can click this link that will take me to the CPA, so that I can actually look at this indicator. Here, I can also read a lot more detail about the metadata and exactly what datasets this indicator is based on, what known issues are we aware of, and see all of the citations, and so, if you really want to get into detail about an indicator, feel free to explore them on the CPA using these links. I will close out of this, and so that's wetland patch size.

Let's look at a couple more indicators. Let's see. Let's look at a freshwater aquatic indicator, and this is one that applies more broadly across the landscape and isn't just specific to an ecosystem, and let's check our riparian buffers. It's telling me that riparian buffers measures the amount of natural habitat surrounding rivers and streams, but it's also telling me that this indicator applies within the active river area, or basically the historic flood plain, of the freshwater aquatic environment.

I see that 54 percent of the active river area in this sub-watershed receives the highest score for this indicator, with more than 95 percent of natural habitat surrounding rivers and streams. One thing you might notice on this indicator is this dotted line that says "good condition". You might also notice that the values up here are green and the values down here are red. The good condition threshold is essentially our attempt to tease out which range of indicator values correspond to healthy, functioning, and connected ecosystems. We use these thresholds and initially developed them for the State of the South Atlantic, which is our ecosystem report card, and we use them to calculate grades.

Here, we thought it would be helpful to include them to assist in interpreting, but what do these indicator values really mean for the condition of the ecosystem? What is truly meaningful on the ground? We don't have this cutoff for all indicators. As you can see, we looked at a couple already, and those were gray. Here, we're bringing in that dotted line and the green and the red, but, for those indicators where we had identified a threshold, we went ahead and included them here, just to assist you in interpreting the scores. You will see these good condition thresholds come up in a couple of other places in the Simple Viewer.

That's basically all I wanted to show you with the indicators, and let's go ahead and move on to the threats tab. The Simple Viewer includes two threats in its charts, and the first is sea level rise. This data comes from the NOAA Sea Level Rise Inundation Projections, and, if you want to learn more about this dataset in depth, I recommend that you go to the NOAA Sea Level Rise Viewer, and you can get there by following this link. You will want to open it in a new tab, so it doesn't overwrite where you are in the viewer. This is a site where you can go ahead and download the data, or you can go to the viewer, if you want to interact with it online.

I am just going to go to this button and hit "launch" to bring up the viewer and then click "get started". I need to zoom-in to see the data. Let's go ahead and look at coastal Georgia, since that's where we were in the Simple Viewer, and it's a big dataset, and so it may take a moment to load. One thing I want to point out that you can look at in the sea level rise viewer is mapping confidence. These inundation projections are based on elevation measurements, and, just like anything else, there is uncertainty and there is confidence intervals associated with those elevation measurements, which impact our confidence and our uncertainty surrounding the inundation projections.

In the sea level rise viewer, you can visualize that by seeing areas with high confidence in blue and areas of low confidence in orange, and I can click this "identify" button to learn more about the mapping confidence. You can also, of course, just explore the sea level rise data in this viewer and learn more about it. I am going to close out of the sea level rise viewer, but I just wanted to point out that this is a good resource for you if you want to learn more about the underlying data in the sea level rise charting, and I also just wanted to clearly state that the uncertainty around the elevation measurements and the inundation projections are not captured in our threat chart. This was really just one of the simplest possible ways to display these projections.

What you're looking at in this chart is areas that are likely to be impacted by inundation at the mean higher high water line under different sea level rise scenarios, and so mean higher high water just refers to the higher of two high-tide measurements, and so think of this as showing what percentage of the sub-watershed is likely to be impacted by inundation at high tide for each sea level rise scenario, which is displayed here in feet, and so, in this sub-watershed, we can see that about 24 percent of it is likely to be impacted by inundation at high tide currently under a zero feet of sea level rise scenario, and then that percentage increases as our feet of sea level rise increases.

I do want to say that we are in no way advocating for abandoning conservation efforts in a watershed like this one that is projected to be impacted by sea level rise. Perhaps there are some really important opportunities in this sub-watershed for assisting with marsh migration, but we're just showing you what the projected impact of these threats may be, so that you can use that with your best judgment to help inform your conservation actions.

The next threat we look at is urban growth, and this chart is based on data from the SLEUTH Urban Growth Model, as you can see here, and SLEUTH looks at the patterns of road development from the decade starting in the year 2000, and it basically says, if those trends continue, what might the urban landscape look like at different timesteps in the future, and this is a study that got a lot of press, and you may remember its predictions of a southeast megalopolis along the I-85 corridor that might connect Charlotte to Atlanta, and so this chart, again, shows us the percent of the sub-watershed that is likely to be urban by particular decades in the future.

Now that we've looked at threats, we can move on to the partners tab, and so you can see that this sub-watershed does have quite a bit of conserved lands within it. 15 percent of the sub-watershed is comprised of conserved lands owned by states, 9 percent of the sub-watershed is made up of conserved lands that are owned by a private landowner, 4 percent federally-owned, 3 percent by the Nature Conservancy, 2 percent we don't know, and then 66 percent of the watershed is not conserved.

This land protection status section tells us more about the GAP status associated with those conserved lands. A little over 3 percent is in this most stringent category of GAP, where it's permanently protected for biodiversity. If I mouse over this, I can learn a little bit more about the types of lands that might fall into this category, like nature reserves, research areas, and wilderness areas. 26 percent of the sub-watershed is permanently protected to maintain a primarily natural state, and this includes things like National Wildlife Refuges, many state parks or national parks, that get a little bit more use and visitation, and 4 percent is in this permanently secured for multiple uses and in a natural cover, like state forests or forest easements, and then, again, just like the chart above showed us, 66 percent of this watershed is not conserved.

Here, you can see land trusts that are working in the counties that intersect the watershed, and these links are going to take you to a land trust alliance and land trust finder by county, so that you can see maybe who you might want to partner with in this watershed. I am going to close this out.

Next, let's say maybe that you really like this information that you saw in the Simple Viewer, and maybe you're working on a grant, or you're working on a presentation where you might want to re-use some of this information. One of our new features is that we've added a download report function, and so, by clicking on this link on the upper left, that's going to export all of this information from the Simple Viewer into a report that you can look at in Word.

The Word document format was important to us, because we wanted you to be free to cut and paste and re-purpose these elements for whatever you had in mind, and so this report is specific to the sub-watershed that you had selected when you did the export, and you can see that it's telling you how many acres are in this sub-watershed, and it's reminding you of the name of the sub-watershed.

As you scroll, you're going to see essentially a lot of the same information that you just looked at in the Simple Viewer. We have a map of the sub-watershed, of the blueprint priorities within it, definitions of the priority categories, and a pie chart showing the breakdown of priority categories within this sub-watershed.

One thing that you will see in the report that you didn't see in the Simple Viewer itself is a lot of tables that tell you not just the percent of area in a particular category, but also the absolute acreage of the near sub-watershed, and so here's one of those tables for blueprint priority.

The next section, we're getting into more details about the indicators, and you're going to see a lot of the descriptions of the indicators that were in the Simple Viewer, and you're going to see tables. This one shows percent of area in each ecosystem and the number of acres in each ecosystem within that sub-watershed and then breakdowns of each indicator by ecosystem, and so this is one indicator that we looked at in the Simple Viewer, and here's the table version of it, and so you can see that, in this sub-watershed, there are really good, high scores for forested wetland amphibians, and, again, here you're seeing not only that almost 80 percent of the forested wetlands within this sub-watershed are in this high value for this indicator, but also the number of acres, and so that 80 percent is translating into almost 95,000 acres that fall into this category.

The indictors pretty much continue in that vein, and I will pause here to, again, remind you about this good condition threshold, and so this is looking at the scores for forested wetland birds within the sub-watershed, and you can see that we have classified the top three values for this indicator as qualifying as good condition, and the best value is being able to get Swainson's warbler, but being able to get Prothonotary warbler as well as all of these additional species, that's still pretty darned good habitat, and so we're totaling up everything that falls within that good condition here in this gray line.

You can see that really almost 80 percent of the forested wetlands within this sub-watershed qualify as being in good condition for forest wetland birds, and so, if we keep scrolling through all the indicators, you will see, at the end, the threat charts right here, and you can see the sea level rise and the urban growth charts and the links to more information, and you can see the content of

the partners tab, the links to different conservation plans, conserve land ownership, and land protection status.

We consider this report sort of a pilot for reporting, to work out the bugs and kind of figure out how it works, and, if we're able to continue to refine and update this viewer, as we hope to, we want to move toward a system, or you could export a report for a custom area, and basically to export information from the Simple Viewer for your custom polygon or shapefile, so that you can look at blueprint priorities and indicator values and threats for maybe a parcel that you're looking to acquire or a refuge or a sub-region or whatever it is that's of interest to you, and so we think that this is moving us forward to hopefully achieving that later on.

That's about all I have to show you with the report, and so I'm going to go ahead and close out of that and take us back to the viewer. One thing that we've tried to make a lot easier with this version of the Simple Viewer is to provide feedback and to get help from staff, and we do that with these buttons here in the upper-right-hand corner.

Feedback, what we're talking about here is things like, wow, those priorities don't look right to me, and that should be higher or that should be lower, or I think you're missing this data. If you have that sort of feedback, we encourage you to reach out, and we really welcome that input, because the blueprint is a living, spatial plan, and it continues to evolve based on your feedback and review. The same goes for feedback on the interface itself. If you find something really clunky or confusing, we would love it hear it, so we can make it better.

You can also use this "contact staff" button if you want to do something like get help using the blueprint in a grant or to inform your priorities or to help with a decision. That's really my job, is blueprint user support, as well as the job of my colleague, Louise Vaughn, who I think has presented to you all in the past, and it's really what we do, and we would love to hear from you and assist you in incorporating the blueprint into your decision-making.

The last thing I will point out here is that we've also made the Simple Viewer mobile friendly in this update, and I'm not going to be able to film myself using my mobile device, and so I just wanted to let you know that you can access all of this information from your phone. The interaction with that information will, of course, be a little different, just because of the differences between pointing and clicking with the mouse and the tapping and swiping that we do on our phone, but, if you do want to play with this on your mobile phone, this is all there at your fingertips as well.

Now, I have really saved the best for last, and so, if your neighbor has fallen asleep, please elbow them or nudge them. We have made a really cool leap forward in communicating why particular areas are a priority in the blueprint, and so I've clicked out of our selected HUC, and I'm going to mouse-over this little button here that says "view pixel level details". If I click here, it's going to take me to this pixel detail mode, where I can really get into why a particular pixel is a priority in the blueprint.

Let's zoom back over into coastal Georgia, where we were before. This question of why a particular pixel is a priority in the blueprint is something that we get from users all the time. One of my favorite quotes from a user interview was why is this purple, and is it my kind of purple, and, in other words, he was asking why is this a priority and is it for the reasons that I care about,

and answering that question for folks has been a communication challenge for us as staff, because, in the past, it's required you to really dig into desktop GIS to answer that question and toggle layers on and off, and that was a little complicated, and we wanted to make that process of discovery way more transparent and invite people and welcome them to get under the hood and really dig into this data.

We fondly call this pixel mode The Pixel Hunter, internally, and it's because you can see that you have these little crosshairs in the center of your screen, a little target, and, as the message at the top instructs, you click and drag using this little hand cursor to move the map behind your bullseye. Now, the summary mode for the Simple Viewer was telling you about average scores for a particular HUC, but now I can find out about the blueprint priorities and the indicators for a particular pixel, and, since the blueprint is prioritized at a pixel level, this is really the finest scale that we can get to in uncovering why a particular area is a priority.

It's going to tell you priority for this pixel, which is easy to see from the legend, but the indicator summaries are really a lot more interesting. First, I am going to look and see what ecosystem this pixel is in, because that's going to tell us what indicators apply here, and so that's going to tell me that the indicators that apply to this pixel are forested wetland ecosystem specific indicators as well as all of those cross-ecosystem connection indicators that we talked about earlier, our freshwater aquatic and our landscapes and waterscapes.

Again, you're seeing that some of our indicators are gray, where we don't have a good condition threshold set, whereas some of our indicators have that green and red good condition binary, so that you can tell which values of that indicator correspond to high levels of ecosystem health function and connectivity. This text at the bottom, below the bar, is telling you exactly what the value is for that indicator.

If we look at forested wetland birds, it's telling me that these three categories that we looked at in the report a minute ago are good condition, and the specific value that this pixel has on this indicator is this second-highest value with the potential for the additional presence of Prothonotary warbler. Let's say that I want to dig into this indicator a little more. Again, I can click on it, and I'm going to see that same description that I saw earlier in the summary mode, and then this is reinforcing what we saw before about the indicator value of this pixel.

Once I have selected a particular indicator, one of the really interesting things that you can do is drag your map around and look at how that value might change, and so notice that here I'm basically staying within highest-priority areas of the blueprint. You can see that, here, for example, we're not in good condition, whereas, if I scroll just a tiny bit over, we are in good condition, and so it's very interesting to see how these values change as you move from pixel to pixel and ecosystem to ecosystem and see what indicators are driving our blueprint priorities.

We can do the same thing with another indicator, perhaps one that we haven't looked at before, and we can look at low-road density, and this is an index of essentially road density, where low is obviously better for ecosystem condition, and so we can see that this pixel that I am zoomed-in on in my bullseye has high road density, and so it's not in good condition, but, if I pan over here, we see that, all of a sudden, I am in a low-road-density area, and I'm in good condition again.

Now, in order to showcase a lot of the really cool new features in the Simple Viewer, like the threat charting, I've really been focused on the near-shore and terrestrial environments, because, obviously, we're not super worried about sea-level rise inundation or urban growth in the marine environment, but, of course, this is the South Atlantic Fishery Management Council, and so I did want to take a second to show you a little bit of what this looks like in the marine priorities.

I am going to go ahead and stay in the pixel-level view now and just pan over to some of our marine priorities. I have got to back out of this indicator, and I see the indicators that do apply in the marine ecosystem. We have marine birds, and we can see that this pixel that the bullseye is on is scoring very highly on marine birds. It's above the 80th percentile. If I click on it, I can learn more about that indicator, and, again, like I showed you in the terrestrial environment, I can kind of pan around and see how the values for marine birds changes as I move, and I can also go back and select a different indicator.

This isn't a particularly important area for marine mammals that I have selected right now, according to this indicator, and I can back out of this and look at potential hard-bottom condition, and this is an indicator that measures the protected status or potential stress on hard-bottom habitat. This particular pixel that I am looking at here is not predicted to have hard bottom, and so it's not in good condition, but, if I find another area where hard bottom is more prevalent, like here, here, I can see that we're not only likely to have hard-bottom habitat, but that habitat is likely to be in great condition as well, because it has some additional protections, and, in the pixel model, just like in the summary mode, you can always link to the conservation planning atlas from here to learn more about the indicator and to visualize it individually.

If I turn off the pixel-level-detail mode, it's going to take me back to summary mode, and I can zoom-in a little bit more into the marine environment, so that I can show you what it looks like to select a lease block. I am going to go back to our priority tab. Frankly, the charting for the marine is just not as interesting, because we don't have the threat charting, but you can still learn about the breakdown of blueprint priorities within a marine lease block, and you can look at the summarized indicator scores within the selected unit. That pretty much concludes my demo of the new and improved Simple Viewer. Does anyone have questions for me about the Simple Viewer or about the blueprint or anything else going on in the world of the South Atlantic?

DR. BAUMSTARK: Thanks, Hillary. It looks good, and it's nice to see it really fast. A lot of times, these tools take a lot of time to draw things up, and it seems like most of it, a lot of it, is prerendered. I saw three indicators, seabirds, mammals, and hard bottom, and are there any others?

MS. MORRIS: Those are the three that apply to the marine environment right now, and so there are about thirty different indicators of ecosystem health in total, but, if you're asking specifically about the marine environment, those are the three that apply. We had explored a primary productivity indicator, based on some chlorophyll a remote sensing, but it was really wildly over-predicting, and we weren't having success with it, and so we eventually cut that out, but those are the three that we have in the current version of the blueprint.

MR. PUGLIESE: To that specifically, that's one of the aspects that we have, is refinement of this system intersection with the work that we've been working on in the marine side. A lot of our essential fish habitat information or distributional information was included in the building of the

conservation efforts, but now we, I think, are at a point where hopefully we're going to be able to ramp that up.

The group that was involved from the coastal didn't go beyond that, but there is a lot of different things that we talked about, things such as connecting it to estuarine-dependent species and distributions of habitats, like inshore habitats, combined systems, like SAV and oysters, as an indicator for gag estuarine habitat conditions or things, and so I think there's a lot of other directions this can go, but we just need to reconstitute the coastal and marine component and figure out how to further evolve it.

The biggest thing, I think, was to get the structure, to get the baseline, to advance it with the first iterations, and this literally is like -- This iteration is right out of the door, and we just saw it from the steering committee, and so I think the functionality is phenomenal, and I think what it does is it says, well, yes, we need to do that, and so I think there's opportunities for the group as well as the AP to weigh-in on let's advance, maybe, what some of those other marine indicators are, and I know Pace Wilber was involved in some of the group, and there is a number of other individuals involved in there, but I think we need to go further to really take advantage of how far this has advanced and the capabilities.

Again, it aligns, and, Hillary, it aligns so closely with a lot of the things we've been discussing, both the council systems as well as ones that have been developed through SARP and the Atlantic Cooperative Fish Habitat Partnership, and there is just real opportunity to walk between these, and I know a lot of those things are already integrated in different layers.

MS. MORRIS: The only thing I would add to that is, in answer to your question, is that we do have a lot of waterscapes indicators, many of which are relevant to like diadromous fish, and we have a couple of indicators of aquatic connectivity that -- They're not applying to the marine environment, but I think they are conceptually relevant to the marine environment and diadromous fish.

MR. PUGLIESE: (The first part of Mr. Pugliese's comment is not audible on the recording.)

Now you're looking at all of these different areas combining and the opportunity to advance this, and one of the things right off the bat, and Hillary can acknowledge this, but I know the State of South Carolina used the prioritization scenario directly for some of their conservation planning for the whole state, and so that was working with TNC, I think, is what they were advancing some of these things, because it got to things like connectivity of systems and things that everybody talks about, but doesn't look, and I think it's very relevant, because, also, as we focus only on our marine side of the thing, or the estuarine side and then everything, when she brought up that whole --

That was one of the first things, when we looked at that bigger picture, that really jumped out, is that dual attack on the systems with the inland corridor of growth that's going to happen, and it's coming strong in the Atlanta to Charlotte areas, and then the marine combined, the water issues that are coming up to maintain our estuarine systems, and, I mean, those things really -- You can use this to begin to see those, and I think those indicators really will start queuing up, in terms of how potentially those are going to affect the marine side of things. There is more to come, and I really appreciate everything, Hillary, and I will open it back up to member comments.

DR. BAUMSTARK: I know Florida right now is in the midst of, or maybe is wrapping up, a marine indicators workshop, and is there an opportunity for this panel to be involved, or maybe at least have them working directly with Florida, to see what worked in Florida? I guess those are two things, two separate things, but I would volunteer to be involved, to some degree, if there is more.

MS. MORRIS: Beth Stys would be a great person to talk to with the State of Florida.

DR. BAUMSTARK: That's why I'm offering.

MR. PUGLIESE: Yes, and I think the comment was made, Beth, and you just reiterated it right there. Beth is involved in the Peninsular Florida, and I think Hillary is making it clear that the idea is that, for our importance, we really need to have both of those, and there's a lot of working in the background to make it, but it's just the South Atlantic LCC has built all that structure, and here's the opportunity to do it, and so, while that's going on, I think that can definitely feed directly up into the system, and I know that's planned to have those discussions, but we just need to keep on advancing, so that, ultimately, for our area, we really can look at the entire combined South Atlantic and that, and even beyond, if it extends beyond that, as we talked, outside of our area.

MS. DEATON: I will just add that, in North Carolina, we've been doing sort of a prioritization project of strategic habitat areas, where we're identifying priority areas based on complexes of habitat and landscape as well as their condition, which is approximated using threats, known mapped threats, and, when we were doing this last area, I was hoping we could maybe just use the SA LCC information, but we couldn't, because it was just different scale and other things, and so everybody has slightly different purposes, but it would be so nice if these could all just be like put together, if they just plop our stuff into their project, and then it would save them work, and we would have our thing in connection with this larger landscape, and I guess that's a wish I had.

MS. MORRIS: We completely share that wish. One thing that you might be interested in that we're moving forward is trying to get the blueprint to a finer resolution, which might help with the scale issues that you were talking about. We're at a 200-meter-pixel resolution right now, and we're just trying to set that down a little bit finer, as close as our data will permit.

One of the things that we have to keep in mind, working at this scale of six states in the South Atlantic, is just that sometimes one state will have really, really strong data for something that we just can't match up with an equivalent in a neighboring state, and so we're a little bit limited sometimes in what datasets that we can actually use as an indicator to drive the blueprint priorities, but we can always use that type of finer-scale information for validation, to sort of make sure that our blueprint priorities are tracking with the finer-scale information that we have and that that's all lining up.

I just wanted to preview that we are trying to work toward finer resolution and say that we are, as staff, available to help you try to work out some of those kinks, if you are working on a particular project where you're trying to incorporate the indicators and it doesn't seem like it's working, and we would be happy to help you, and we breathe, eat, and sleep this stuff, and so, if we can help in any way, please don't hesitate to reach out, but that is definitely our goal as well, to move towards increasingly seamless integration of the blueprint with all sorts of different planning processes at multiple scales.

MS. DEATON: Yes, and everybody has been very helpful, and I think scale is definitely the issue, having common categories.

MR. GEIGER: I think connectivity is going to be the key, and certainly it would be extremely helpful, as we look at all of these issues on a broader scale, but if particular states or particular user groups have concerns on why they cannot utilize this data or why it may not be applicable, can they identify those restraints now and have that as a recommendation from the Habitat Advisory Panel up through the South Atlantic Fishery Management Council and provide it to the SA LCC, so at least we get those potential obstructions or resistance points identified, so that we can make them more user-friendly and more applicable? The more people that use this and become familiar with the connectivity issues, it's going to benefit everybody. A rising tide floats all boats.

MS. MORRIS: That's a great suggestion. I mean, we really try to track those barriers and those known issues, as staff in the South Atlantic, so that we can prioritize what do we take on to fix and improve in the next round of revisions, and so getting that sort of formalized input from you all would be very helpful.

Frankly, a lot of what we work on and what we try to improve is really driven by demand from our users, what are people kind of beating down our door for help with, and you all are a main group of our marine users, and so it would be really helpful to get that feedback from you all and to help chart what we take on in future years.

MS. DEATON: Any other questions or comments?

MR. GEIGER: Just one more question I will ask. What is the status of funding for the SA LCC?

MS. MORRIS: That's a great question. The South Atlantic LCC, as you all probably know, and most LCCs have been historically really funded and staffed by the U.S. Fish and Wildlife Service. That's where my position comes from and Rua's and Mallory's and Amy's and funding for Louise's position as well.

The South Atlantic LCC does continue to exist, and the steering committee is still meeting. We just had a meeting yesterday, and the funding for staff is -- It has just changed our roles slightly, and so the Fish and Wildlife Service has made a decision that they are no longer going to provide dedicated staff and funding for LCCs as an initiative.

However, all of the former South Atlantic LCC staff, including me, we're still empowered to continue working on the South Atlantic and the Southeast Blueprints, just because of the Fish and Wildlife Service's continued commitment to collaborative landscape-scale conservation and to the Southeast Conservation Adaptation Strategy in particular, and so it's a little bit a weird nuance, where Fish and Wildlife Service is technically no longer funding us as LCC staff, but we are still continuing to work on the blueprint and all of these similar issues, but it's just that we're a little bit more limited in kind of how we can provide support and work with the steering committee itself, and so our relationship with the partnership has changed slightly, but, really, our day-to-day work is continuing, and so it's kind of a weird, nuanced situation. We keep saying that we're in transition, but we're still full speed ahead on the blueprint and on improving the priorities and on supporting users of the blueprint.

MR. GEIGER: If I can make one suggestion. Again, part of the problems with the LCC system, and, again, my opinion, for what it's worth, is that you guys have a brand that's related to the previous administration. The best thing you all could do is rebrand it and come to your own Spartacus moment, so to speak.

What you provide is not branded under an LCC, but is of value to the South Atlantic Fishery Management Council and the Mid-Atlantic Fishery Management Council and the various birding groups and everything else. You have to lose that identity and bring it into the identity with current established entities to show the value added of what you do and why you do it.

I would urge that it goes both ways. The South Atlantic Fishery Management Council has to identify the value and need for this kind of data, and, likewise, you all have to identify the value to other organizations, and, if necessary, to try to rebrand it towards that directive. I mean, the administrations are going to recognize the value of it, but it has to come from the top-down and the bottom-up. That's just a few words of advice for you all.

MS. MORRIS: That's a great suggestion and really well-said. I mean, one of the things that we're talking about branding around in the interim is just the blueprint itself. I mean, that is the value that we provide, is this data and the integration and the staff to help you use it, and so, whether the LCC itself and the partnerships use this to rebrand, my gut feeling is that that would be a decision the steering committee would need to make, and it's actually something that was touched on in the discussion of our meeting yesterday, and so I think there's a lot of different paths that are on the table, and, in the meantime, I would expect to see most of our communications really branded around the South Atlantic blueprint rather than branded around the LCC as a partnership.

MR. PUGLIESE: Jamie, we're going to do everything we can to advance our connections, and, I mean, it's been -- From the inception, we've been involved and working on it and evolving, and the comments that Anne made about figuring out ways to advance this even further to address those, so that it becomes the one -- I think those are going to be some of the things that we definitely are going to move forward and look at how we can connect the systems that operate and what the benefits are or how we can highlight the values relative to these, because I think the functionality of what's going forward and the commitments, even with that aspect there, are still pretty significant, and all the partners on the steering committee and the LCC still have buy-in, and so USGS, regardless of how that unfolded, still are maintaining the Climate Science Center full function, and that's why you're seeing some of the immediate inputs on the scaled-down input, and so I think there's a lot of commitments from those other areas.

You are right on target that we need to align these and advance them on how better they show how they are meeting critical needs, and I think we're at that stage, and highlighting what you did now, Hillary, on how the functionality makes that happen, and I've already been talking with our FWRI partners on how do we functionally do that and make it even better to advance this, and then we can talk about getting to the weeds about the next generation and advancing the indicators and advancing the spatial layers, because I even have issues on some of the homogenization that has to happen to do some of the -- There's got to be ways of being able to do things, especially in the offshore areas, that we have done better or things that have to advance to be able to get us to a finer-resolution capability, and it really also aligns very well with the broader discussion of this meeting about advancing essential fish habitat information and the use of permit and EIS and EA

functionality, and so a lot of what you have here, in terms of report capabilities, and then finer resolution to the -- They are all kind of -- The stars are aligning to make these things really complement and advance multiple mandates.

MR. GEIGER: Just one more final comment. Don't underestimate the leadership and power that the South Atlantic Fishery Management Council has and, Roger, your leadership in this to make it happen. I mean, whether you realize it or not -- I have seen LCCs from a variety of different perspectives when I was working in Washington as well as in the Northeast.

This LCC and the capabilities of the complementary datasets and collection that this group has is extremely powerful, and don't underestimate the value and impact you have to make this happen. Of all the LCCs, this one has probably the most potential, because of the support, and, again, also, the politics of where we are right now, and don't underestimate that. You truly do have a Spartacus moment, if you want to use that overused phrase, but only if you seize it and take advantage of it and leverage it, and I think you have the leadership and the desire and the drive to do it. Thank you.

MS. MORRIS: We really appreciate that support, and we hope to take really good advantage of that.

MS. DEATON: All right. Thank you, Hillary.

MS. MORRIS: Thanks for having me.

MR. PUGLIESE: Thank you very much. I really appreciate you condensing and actually creating that interactive -- One other point that I wanted to -- I guess the last point I was going to make is that that representation of access and being able to do something like that, we're going to probably have to do that for some of our specific things, so that you can go into our system and be able to look at something and be able to pull up a YouTube that this is something that I want to create and here's a quick -- Everybody has gotten used to that, with Google and YouTube, to do anything, and that's very powerful, and this really helped, Hillary, to be able to do it this way, but it also was a light going on that we need to do that for a lot of our things too, and maybe the cross-walk between them is also going to be the way to make it happen.

MS. MORRIS: Sure. We would be happy to provide any help or advice in you all taking that on. We certainly have the software developer to recommend.

MS. DEATON: Okay. We have a second webinar, and this one is South Atlantic Ecopath Model, and so we've got Tom Okey and Howard Townsend, and they're both online. I think we're ready any time you are.

DR. OKEY: Thank you very much, everybody. This is Tom Okey, and I'm speaking from Victoria, British Columbia, and it's 7:00 a.m. here, but I'm really happy that I caught the end of that conversation. It was very interesting, and also there is a little bit of segue between that conversation and this one on the South Atlantic Region Ecopath Model.

The SA LCC funded this latest iteration, or this latest effort, to update the South Atlantic Ecopath Model, and it originally was constructed in 2000, and so the last eighteen years. Just a conversation

about -- We would like to get to the point with this model where there is more seamless updating between the various datasets and the data that were being discussed now and this model, because our vision has been, from the beginning, that the model will be used by a whole variety of folks, including fishery managers, in making the assessments and helping to make decisions about the management of the various species, but also, obviously, the ecosystem model, and so bringing in a lot of questions, larger and broader questions, including questions related to interactions between the land and ocean, but also spatial questions and climate change impacts and spatial management and so forth, and so there is a lot of potential for this model, especially now that Ecopath with Ecosim and Ecospace approach has really advanced considerably.

This is really a team effort between myself and Roger and Howard, this presentation, and so hopefully we can all sort of chime in on these parts, but I will be the main person going through the slides, and, Roger and Howard, please interject when you -- Is there a time limit in the presentation? Originally, it was a ten-minute presentation and then discussion afterwards, or is there more time in the agenda?

MR. PUGLIESE: No, I think just go through it, and I think you're fine. We're trying to wrap up around eleven or so, and so what we want to do is get enough of the presentation that we can have discussion, and that's kind of the -- I mean, as long as everything is wrapped up within probably about forty-five minutes for the presentation and the discussion, I think we'll be fine, and so go ahead.

DR. OKEY: Okay. The first few slides, actually many of you have seen this before, and there may be some in the room and in the audience who are not familiar, and so I'll just try to make a balance between those two. This is a fishery ecosystem model in which we try to characterize the state of biomass flow, if you will, amongst various identified --

The other part of the Ecopath modeling and Ecosim modeling is that it includes fisheries as a component, or a group, as a more explicit kind of component with various gear types and sectors and so forth. You can go further with Ecopath and do lots of economic analysis as well, but we've been focusing just on putting together the latest iteration of the model in terms of biomass flows, so that we can go from there with dynamic simulation.

Essentially, what we're trying to do though with this model is include all the components of the system, whether they are explicitly articulated or aggregated, depending on what the questions are and the anticipated kinds of questions are, so that the model can be optimally useful for various kinds of questions.

In this case, we know that there is a lot of different kinds of questions that will be coming forward that people will want to use this for, which is why I tend to err on the side of articulated or just aggregated, and that's kind of the style in which I approach these models, but, when I started doing this, about twenty years ago -- I am originally trained as a benthic ecologist, and so I started adding in all those benthic groups that some people at the time were not including in these models. I started including all the benthic groups, but, for a lot of systems, including the South Atlantic region, including those groups is essential in --

MR. PUGLIESE: Tom, try to definitely speak directly into your mic or whatever, because you are fading out every once in a while, and we're losing the tail-ends of some of your comments.

DR. OKEY: Okay. I will try. All right. This slide, just very quickly, this just shows the three components of the overall modeling approach. On the left there, it just represents characterizing the structure or really the biomass, state of biomass flows, I like to say, and so the next panel there just indicates like some temporal dynamic gaming that you can do, just sort of the gaming interface, but there is more explicit ways to construct ecosystem change and calibrating that with known time series of change, such that you can model and calibrate in more useful -- Your projection and asking questions where you have more quantitative confidence. Then the third one just represents the spatially-explicit modeling, which folks there in the region will be interested in, but, really, for this talk, I'm just going to focus on where we're at going through putting together the Ecopath part and then the Ecosim part, and we want to set it up so that we can start doing the Ecospace.

This slide, I have shown this before, and people have seen this before, but, essentially, the purpose of doing this is to support the South Atlantic Fishery Management Council's move into ecosystem-based management and advance and refine the LCC conservation blueprint, and, again, this includes spatially-explicit modeling and questions about what kind of environmental change is happening.

This just shows the history of the South Atlantic region model, and it's called the SAB Model in this slide, and we were calling it the South Atlantic Bight Model, and it's more appropriately called the South Atlantic Region Model, and especially -- Also to recognize that the region includes the -- Basically, that first effort was really a Strawman forty-eight-group model, and then, in 2004, we really broke it out, with a lot of help from --

MR. PUGLIESE: You are still breaking up, Tom. I'm not sure what's going on, but we're losing it.

MR. COLLINS: I think it's his signal.

MR. PUGLIESE: Is it our signal here?

MR. COLLINS: I think it's his signal.

DR. OKEY: It could be my mic here. Sorry about that. Can you hear me now?

MR. PUGLIESE: Yes, and you're nice and clear. It starts out really clear, and then, all of a sudden, it just kind of starts fading away.

DR. OKEY: Okay. Well, anyway, then, in 2014, you got interested in forage fish, and so I essentially took the model and I broke out the forage fish group more explicitly and asked questions about -- Then this current effort now is broken out more, with 141 boxes, because it's all of the managed species with quantitative information were included.

MR. PUGLIESE: We've lost you altogether, Tom, now.

DR. OKEY: Sorry. Can you hear me now?

MR. PUGLIESE: Yes.

DR. OKEY: This just shows the Fisheries Centre Research Report that Roger and I authored back in 2001, and these are a number of contributors that many of you know who contributed a lot of effort to that first iteration of four. These are just more people from your region who have contributed in various ways towards that effort.

This is that 2014 report, and it's in the UBC Fisheries Centre working paper series, as a place to publish it, and that just has simulations about the forage species and the relative importance. I just essentially did increase and removal simulation, and decrease and increase simulations, to try to estimate their role, their relative roles, in the ecosystem in terms of their effects on other species in the system. I thought those simulations were very interesting, in terms of which species are very important. Like menhaden came out as really super strong.

MR. PUGLIESE: Tom, we lost you again. I mean, we totally lost it.

DR. OKEY: Sorry. I've got to fix this. Can you hear me now?

MR. COLLINS: Yes.

DR. OKEY: This is just those forage fishes that are broken out in that effort, that particular effort, and they weren't really broken out before. They were all aggregated into this large pelagic oceanic planktivores, which I have now renamed pelagic planktivores. Then those simulations were focused on predatory fish of particular value in that particular effort, and so some of the simulations were just based on changing those forage fishes to see what the effect would be on these groups as well. This was all of the functional groups in that ninety-nine-box model in 2014. Then this just shows -- Obviously, this is of limited usefulness, this kind of figure, but it's just showing the food web, one conceptualization, or one way to look at the food web here to see all the groups.

Then, in the current effort, we added, or I should say we disaggregated, these managed species from the aggregated groups that they were in in the model, and so let's say, for example, if fishery managers who are in charge of single-species models to assess the stocks of a particular species here, I have the -- We would have the Ecopath with Ecosim and Ecospace model as a tool to complement what they are doing normally. Then we essentially came up with -- This says 137 functional groups, but there is now really 141 functional groups in the model, and this is just a slightly older slide. This is a working group that was formed with the help of the SA LCC funding, and that kicked off this process, in order for us to put together this next iteration of the model.

This just shows the various datasets underlying this latest iteration of the model and data that have been provided, and so, like, for example, for diets, the diets come from the Southeast Reef Fish Survey, the MARMAP and SEAMAP South Atlantic and SEFIS databases, and it's provided by Tracey Smart and Kevin Spanik and Marcel Reichert, and we're discussing, right now, sort of collaborating with people at the -- That are working on the Ecospecies, Kathleen Okeife and Lauren Gentry, and they might be in the room there, and I'm not sure.

We haven't fully had conversations with them, but we want to get to the point that relates to getting to the point of finalizing and actually having a balanced model, which we are close to having, but one of the things that we need to finish is diet composition, which is foundational for this model, which it really matters, in terms of dynamics and -- Then you just see some of the other datasets

that are really fantastic. Like, for example, the time series of annual total catch and biomass of southeast assessments, like the SEDAR stuff, and just really fantastic data.

I mean, I think this was said in the last talk, and I didn't catch the whole talk, but that the datasets, the data from your region, are amazing, and, when this model is finalized, it will be quite possibly the best and most useful Ecopath with Ecosim model in the world, and a couple of other people will quibble about that, but it has that potential, and all of those people are on our team anyway, on a broader team --

Just to summarize where we're at, this first phase of this latest iteration essentially we are trying to provide a snapshot of the South Atlantic ecosystem and the South Atlantic Fishery Management Council species and, essentially, that's Ecopath's first phase, and we're almost there, of having that model, and that sets us up for the second phase where we can really start asking questions and doing the dynamic simulation, but, of course, to get there, we have a step of doing the time series fitting of the model to calibration and adjust it, so that it behaves in a way that it has behaved in the past, so that it will be useful for simulations and projecting into the future.

We can use it to ask all kinds of what-if scenarios, in terms of how you might -- What kind of dials you have for management and what would be the effect of doing this or that and like whether it's with the fisheries or potentially with other management decisions that you have in the system, so we can really -- These days, we can incorporate the effects of pollution and climate change impacts, and so the simulations that I did --

MR. COLLINS: We're starting to lose you again.

DR. OKEY: Just to mention that I originally constructed the West Florida Shelf model, the original West Florida Shelf model, and one of the things that I was interested was the harmful algal blooms and the effect on the broader ecosystem and sort of the trophic cascades in those harmful algal blooms, and I know that's a huge topic now in your region, and so I just happened to be really interested in that back then, and so I published a paper on that for the West Florida Shelf, but that sort of stuff can be -- There is a lot of potential there. Then the third phase is --

MR. COLLINS: We have lost you again.

MR. PUGLIESE: Tom, it's breaking up so much that we're losing core parts of what you're saying.

DR. OKEY: That's cool, and so, Roger, why don't you take it? It's only this slide and a couple more, because, here, you're as well -- And Howard. You guys can say this as well as I can.

MR. PUGLIESE: Okay. We also have Howard here, too. We're all together on this, because I think this gets to some of where we are and where we're going and what we need to do.

DR. OKEY: Yes, and so go ahead, Howard.

MR. TOWNSEND: This is based on some conversations that we had, and Tom presented to the SSC a couple of months ago, or last month, and I lose track of time here, but to discuss this with them and perhaps move forward with having the SSC develop a workgroup to help coordinate the

model and review the model and decide what sort of applications they would want for the model and what particular questions they would want to answer with it and that sort of stuff, and even the potential to develop sort of sub-models, and so this is a really big, highly-articulated model, but there were questions of -- As a big, highly-articulated model, it's really designed for kind of doing a first cut of, if you have a question, use the model to test out that question and get a broad sense of what might happen to the ecosystem under a given management scenario.

You also might want to develop some sub-models, where you have a little more detail of say some age structure for a species or a few species or that sort of thing that would maybe be more suitable for sort of entering tactical questions and more immediate -- I am trying to think of the best way to define "tactical", and sort of stock assessment models tend to be tactical decisions, like setting catch limits and that sort of thing, whereas a big, broad, strategic model like this is more suited for what-if questions or broader strategic thinking, the what if we fished everything at MSY or those sorts of questions, and so we had these sorts of discussions and then also just sort of discussions about how to maintain the model long-term and have a working group that helps to maintain the model long-term and develop processes for using sub-models and that sort of thing. We had these discussions with the SSC, and I forgot when that was. Was that last month?

MR. COLLINS: Yes.

MR. TOWNSEND: Okay. Here is the next steps, and we'll start with a couple of examples. We've been talking over email about some of those potential examples, and I just mentioned the idea of sort of the broad strategic question with MSY, and we also could be more specific and look at some red snapper and black sea bass interactions or if there are other sort of scenarios, but the idea here is that, for the next SSC meeting, to have one or two example demos done to help the SSC decide how to best move forward with the working group for the model that really moves it into the management realm and with review and all that sort of stuff. That was the last slide, and so I guess Roger, Tom, and I can answer any questions from here and sort of have further discussion, and I don't know if you had some other things planned here, Roger.

MR. PUGLIESE: I just was going to follow-up quickly on yours, and then we can have questions immediately. The bottom line is a number of members have been involved and seen this iteration evolving over time. We're at a stage now where this model will be completed by the end of the year. The Ecosim and the Ecopath model itself will be completed by the end of the year, with some specific targeted efforts to ramp it up to the point where the Ecosim component, that simulation capability, to provide some examples, as were identified, to give the SSC some indication of where this potentially can go and the capabilities and the tools, so that then they can discuss terms of reference for creating potentially a workgroup that would help facilitate it into the future.

The other one, as he highlighted, is the need for long-term operation of this and identify strategies or individuals or however we can make sure, because, once we get that done, then we get into the realm of advancing more refined, at the request of the SSC, additional simulations and then get into creating the spatial Ecospace, which is a really exciting side of the world, because that has evolved so much further than any other component of this, and everything everybody has seen here may be consumable by this model itself, from the environmental to the distribution of habitat and distributions of species, and so this can be really, looking into the future, a very powerful thing, and so the bottom line is it's time to get it to the next stage and begin to really understand

how we can advance this and how this can be a useful function in our region. With that, I will bounce it to the members.

MR. WEBB: This may not be a fair question, and so, if it isn't, I will take my beating, but, as you all have been developing this model, obviously, at points along the way, or I'm assuming at points along the way, you actually run it, to see how it's functioning and if it's going to function, and so some of the things that you're looking at presenting to the SSC as examples, have you actually done some trial runs already, and what were the results?

MR. PUGLIESE: I think Tom will answer that, and Howard, because I think that was a point that -- That's where you're getting right now, to be able to do some of those testing capabilities of the model.

DR. OKEY: With this iteration, we haven't done that, but that is the next thing on our list to do, and so, as soon as we get the diet composition completed, then we can balance the model, and it will be very interesting to see how close to balanced it is with all this great data and a solid diet composition. That's one really interesting question, to me, at first.

Then the next task is use those long-term time series from the systems that we already have and have been provided and to then fit the model to those time series, to calibrate it, and then that's when we're evaluating how the model dynamics is forming relative to what we know about how the system has changed in the past, and so then we can get some -- Then, essentially, what you do during that step is that you are fitting the model to time series, in the sense that the parameter of vulnerability to predation is adjusted so that sort of the sensitivity of those individual predator-prey relationships in the system is matched to how presumably the system really is working, and then that gives you a balanced and calibrated model that then you can do these kind of simulations that you're asking about and with some level of confidence that at least the overall system is performing the way it has performed in the past.

That's when we can start asking those what-if questions and actually run it, like you say, and so, because the data are so good, and because it's a really articulated model, I have a lot of hope -- I am pretty excited about seeing what the answers to some of those questions are, and we can decide whether we hang our hats on --

MR. COLLINS: We're losing you, Tom.

DR. OKEY: Once we do those scenarios, we can decide on whether to hang our hat on the direction of the -- Just the qualitative direction of the results of the simulations or even the quantitative magnitude of the results of those simulations.

MR. WEBB: From a layman's perspective, especially with the South Atlantic Council, we have, over the years, accumulated enormous amounts of data about the life cycle of the managed species, what the growth rates are and when they become sexually mature and so on. Is it accurate to say that we have less understanding and less data about the prey-predator relationships within this whole ecosystem model? In other words, if we say we're going to let the red snapper population grow by 15 percent through management processes, are we comfortable that the environment can actually support that level of growth? Where are we with the other pieces of data that I'm not sure

have been collected over time to make the assumptions correct in this model? Can you just enlighten us a little bit about that?

DR. OKEY: I mean, that's a whole conversation, and that's a great kind of question, because, really, you're getting at like how useful this model will be, and so what we are -- In terms of the predator-prey relationships, of course, it's affected by the consumption rates and the production rates, which are some of the basic parameters that we specify each group with, but it's also the diet composition that we have, that diet composition data and information that we have in the diet matrix, that is going to really influence the dynamics that you're talking about. The diet composition, the diet data, nowadays, essentially, is much better than it used to be, and so my professional experience in these models and these kind of simulations is that -- What happens, oftentimes, is that the models -- If you have really good data, which I think you do --

MR. PUGLIESE: Tom, you're breaking up a lot here, and let me respond some. I think I'm going to get to the -- You got to the point already, but that is we are at a stage with the evolution of this model now where we have the best diet composition information, and all of what's been compiled through the MARMAP and SEAMAP programs and all of the information.

The other aspect is that's really good, specifically for our snapper grouper species, some of the ones that you may not have thought we had some of that information, because of monitoring of those prey, and they aren't necessarily -- That was one of the big caveats of say the last forage model, because a lot of that wasn't included in there.

That's why menhaden kind of rose to the top, because a lot of the ones that really were the foundational ones for snapper grouper were not included. This iteration and the refinement of the diet compositions here integrates as much as we can, as far as we can, on those information, specifically from our surveys in our region.

The other aspect is we do benefit though from that last forage model, because a lot of work was done on all the other species in here, and so those diets and components are the best that we can do with kind of the ones that we don't manage, but are in the system, and so I think we're at a far better situation, and we're there, but the bottom line gets to the last thing, and you've got to crank the wheel and get this in there and start seeing if it's beginning to look at reality.

I mean, you have the ability to adjust some of those parameters in there and to begin to start the process, and so I think the excitement you're hearing from Tom is the fact that we do have the best, and we've also integrated the direct information from assessments for -- How many more species have been assessed since the time that this was first discussed and the full complement of recreational and commercial information into the system, and so there are a lot of parameters that are at least going to get us to a more realistic first step and to really understand where we can go.

In that forage one, that was my -- I was involved in that stuff, but that was my beginning one, is that we didn't have some of those very specific, and so you -- What it ended up being is it was really good for the species that it looked at, to look at very big dynamics, but this one is going to get more to exactly what you're saying, and then we'll go from there, because it's the what else do we need to collect for the species that still need better information.

MR. WEBB: Well, that was what my next question was going to be. This is going to clearly identify -- We touched on it very tangentially here, with one little species of forage fish, but there is obviously a bigger gap than what we have identified, and this will clearly shine a light on that, and, ultimately, in the end, it's a product for management. I mean, that's, ultimately, what it is, and they're going to have to make big decisions, I'm assuming, because if increasing habitat or increasing the quality of the existing habitat is essential to growing the biomass, and those are limited by different political or economic issues, then it's clearly going to say, well, then this is how we're going to manage the species. If we can't grow it, then we've got to limit access to it, and is that a fair statement?

MR. PUGLIESE: Yes, I think so, and one of the other aspects on the diet side, before I leave that, is the revision of finalizing this is we're working very closely with Florida Fish and Wildlife under Ecospecies already and have tasked -- We're considering figuring out how to work with Lauren Gentry, who is advancing that, to focus on some of the really -- Kind of to fill in whatever else we need to get some of those components on diet, and so that adds even another iteration about how far we can get, at least to there, but I think it does get down to that.

I think the other side of it is, as we have those discussions on the spatial aspects of it, that, again, this convergence of the Ecospace stuff may add -- It may be added to understand exactly what you're saying on the distributions of these areas and the best information on the ability for that, because, when you had the forage, when you were doing what-if scenarios that would show major, like a 50 percent reduction, and where did you see things change. If this advances as far as I'm hoping it can, we can begin to look at some of those spatial components and begin to understand where you're looking at limitations or whatever.

MR. TOWNSEND: I will just weigh-in real quick here. Just the question of -- Really, what I was talking about with strategic versus tactical management is, with your example of the red snapper, if you find that the data -- When the SSC working group helps to review, and they maybe decide that the diet data aren't adequate for red snapper for sort of tactical decision-making, and so you wouldn't set a catch limit or something that based on it, but it would be still useful maybe for strategic-level thinking, to say, all right, we don't know exactly, but we know this prey composition looks like this, but it may be some species --

You could have a few different mixes of what the diet composition looked like, higher or lower numbers for different species, and run scenarios to see what different actions, management actions, would have under different hypotheses about what the diet composition is, to sort of start to put an envelope around the uncertainty and to start to get a handle on it. Then it also helps to inform where maybe some additional research and studies may be conducted, and so that's a good question there to sort of point out the utility of the model.

DR. REICHERT: Hello, Tom, and hello, Howard. Thanks for the presentation. To Dave's earlier, for your first question, that was actually what the SSC struggled with, and, in terms of them looking further at the model and starting to develop recommendations, we were hesitant, and so we are really looking forward to the full first iteration of the model.

To Howard's last point, I think that is a fair statement. I don't think, at this point, we should expect a series of ACLs rolling out of this ecosystem model, and I don't think that's the primary function of the model, and I think that's also something that we discussed within the SSC at one of our

earlier meetings, and I think these modeling efforts are very powerful to look at what are some of the potential implications of management decisions, et cetera.

Then, to Roger's point, yes, we provided a lot of data. South Carolina DNR provided a lot of diet information, but there were other entities that have done studies over the years that were included in here, and I think the diet information -- Yes, we have a lot of diet information, but it's relative, and I think there's a lot more that can be done, in particular because it's such a relatively labor-intensive process.

Diets can shift over time, and, if we are looking at the relationship, for instance, between red snapper and black sea bass, the black sea bass densities, as well as bank sea bass densities, have come down, and, if, for instance, hypothetically, the red snapper was preying on black sea bass, that may be entirely now than it was three or four or five years ago, and so, in that respect, it gives a good indication what some of these species rely on, but, obviously, there is a temporal component in that, too.

The last point that I wanted to make is, in addition to the diet information, I think one of the other things, one of the other data, that I think could enhance this modeling effort a little further is, for instance, the abundance of -- We talked about it yesterday, but the abundance of benthic organisms, of zooplankton organisms, and I would argue, in the South Atlantic, that we have some historical data, but I don't think we have a lot of current data on abundance of any of these species, and that includes the smaller prey species, and so I think, in terms of a potential next step to strengthen these modeling efforts, I think those are some areas that we -- I think additional data would be extremely helpful, and, Howard or Tom, please chime in if you think that that may not be critical or if you have other thoughts, and so thank you for allowing me to comment on this.

MR. TOWNSEND: I will weigh-in real quick. I mean, you point to a big thing about these models. Because they have so many species in them, and you're constantly getting new information, it becomes sort of a living, breathing thing on its own just to maintain it, and so what other groups have done has been to say, all right, this is Version 1.0, and we're going to use it for the strategic assessment of MSY or snapper diet data or whatever purposes you have it set for, and then those sorts of analyses you do with the data, with the model, lead to what new data you need to include, and then, also, in the meantime, you are getting new data on new things, and so that is a perfect example.

Then just a point of clarification. Ecopath starts with a fixed diet composition, but, once you start to simulate the -- The diet composition of a species can change over time, and so, if you have diet composition over periods of time, that's another thing that you can sort of -- When you run your simulation, you can look at diet compositions in the model over time and compare it to the actual diet data over time, and that's another indicator of how well the model is capturing the dynamics of the system.

DR. OKEY: Just to add to that, thank you, Howard, because I was going to say that same thing about the diet composition, and just one more point about that. Yes, those are -- The diet composition that you characterize is the starting point of the model diet composition, as Howard was saying, and then the diet shifts over time, but only if you have those items specified at some level in the diet.

You can start increasing the diet proportion on something that isn't specified at all, and so, in other words, you basically -- Even if you specify a little bit, like a fraction of 1 percent, of a particular prey item in the diet, then the model, over time, as the abundance changes, it can adjust that portion of the diet, and so that's why I say that it's important to think about that diet composition carefully when you're putting together, and that's the same with all the different components of the model, too. I forgot what else I was going to say about Marcel's point, but diet and -- I forgot the second part of that, Marcel.

DR. REICHERT: Perhaps about the benthic and zooplankton and smaller species?

DR. OKEY: Yes, and I think that was addressed by Howard as well. That is why I think the other point we're going to make about this, and that we made to the SSC, is that this modeling effort does need a quarterback. I mean, in the past, I've called it a custodian of the model, but someone who is the dedicated -- Who a bit of their time, if not all of their time, is dedicated to this model.

Because I live in Victoria, B.C., and we're trying to figure out how -- I don't think I could, myself, relocate there, because I have kids in Victoria, B.C., and so we're just trying to think about how to interface this model, or mainstream it, with other staff time or potentially getting somebody devoted to it.

MS. DEATON: All right, and, well, thank you for calling in from so far away.

DR. OKEY: No problem.

MS. DEATON: Are there any other comments?

DR. BAUMSTARK: In Florida, our managed species, our state species, we have our traditional stock assessments, and I want to bring this up, because I think it's something that we might come across. The Ecopath and Ecospace, these modeling efforts, are still considered very academic, and there have been some opportunities, where folks like Behzad have had a very targeted need, where decision-makers will consider this more, this evolving technology, and it has worked, but there have been few opportunities where I think the academic side has become a rubber meets the road and where managers will look at the models and actually consider them beyond their traditional stock assessments.

I think we are getting closer, and, as we get closer -- I mean, as scientists, we could probably go on forever trying to refine these models and make them perfect, but there is going to be a point where we need to really champion them to make that paradigm shift, and it's probably not going to be a flip-the-switch kind of thing, and I think there's going to have to be looking for opportunities where the model really is needed, where we go beyond what a traditional stock assessment can do for us. I don't know that that's necessarily the AP's role, but I'm sure we will play a role in it, because of our understanding of this modeling and getting the management to that point of comfort and trust.

MR. TOWNSEND: You raised a question that was sort of -- I was sort of involved with this, and so I'm the NMFS Ecosystem Modeling Coordinator, and so I work all across all of our different regional areas, our Science Centers and Regional Offices, and so you raise really good points. A lot of this modeling is moving, the Ecopath and Ecosim and other types of ecosystem models, are

moving kind of out of the academic realm and into practical management application, but we are moving a lot in that direction with ecosystem-based fishery management, and we have the Atlantic States Marine Fisheries that is currently reviewing two Ecopath with Ecosim models actually for some of their ecological reference points and menhaden and its predators.

Folks in Alaska have been using this for a while, where they do side-by-side biomass projections of what biomass -- Estimated biomass of a suite of fish, and then they compare what the stock assessment shows, what the Ecopath model shows, and I think it's a multispecies -- It used to be a multispecies, and I think they have moved to another type now, and they have a really big model out in California, with the Atlantis model. If you think Ecopath is complicated, Atlantis takes a new level, and so you raise a good point, and that's something to think about.

Maybe this Habitat and Ecosystem Advisory Panel is kind of the group that helps with thinking about research and moving forward and getting the ecology right in the model and the ecosystem, and then there is sort of the SSC working group, which might also include this advisory panel, that's more sort of, all right, now how do we make this relevant to managers and what scenarios do we run and that sort of stuff, and that might be a way to sort of parse out the duties here, and I'm just offering that up as a suggestion.

MR. WEBB: I am going to put on the Jamie Geiger hat for just one moment, and I mean that in a complimentary way, but, at the beginning of the presentation, I think there was some reference to economic values that might be put in at a later date or in the whole compass of the system, and is the economic impacts not a defined area right now or part of the modeling?

DR. OKEY: It hasn't been identified as a component of what we're doing right now, but the Ecopath with Ecosim modeling suite includes the tools populate and do economic analyses, and so it's available to do, and I don't think that would be nearly as -- I think it would be more straightforward, because I think that economic information is more readily available than the biological information and ecological information.

MR. WEBB: The only reason I bring that up is because, on the allotment side of this, who gets access to the fishery, more and more, the private recreational side is getting more organized and more aggressive in pushing their point of view, which needs to be heard as much as anybody else's, but they seem to be getting more organized of late, and I know the Yamaha Corporation sponsored a recreational fishing summit right before the last council meeting, South Atlantic Council meeting, and they've been involved more and more publicly in driving the conversation about the management philosophies not working for recreational anglers, and they capitalize on the fact that it's very difficult to get catch information about recreational anglers, because there is no organized or methodical way to do that, and their approach, to this point, has been, well, you can't then -- We just have to abandon that and go on to something else, and so I would just suggest that a serious look at the economic impact, because I think that's going to be something in the future that is brought up more and more on that particular side, and it would be good to be ahead of the game on that.

MR. PUGLIESE: Yes, and, to that, Dave, specifically, I think one of the biggest things that changed also from the last iteration was making sure that the way that -- The structure that better represented the recreational information, and so the MRIP information is totally integrated and ACCSP, and all of these are in there.

Also, the fleet dynamics structuring and working very closely with ACCSP to come up with -- We worked very closely to get those so they were more representative of what the fleet's components were and the different types of gears and everything in the Southeast, and so I think linking the information there with then some of the dollars and then the actual functional capability that goes beyond just kind of the simple side of that into the real things, and that is something that -- But you've got to get kind of the core done first, and I think that's where we are right now, is to get this first biological component functional.

As Tom said, that was understood as we were developing it, and that was one of the big drawbacks, because the last iteration really way underrepresented the recreational component. Here, it's shored up, the body of it, so that it makes the connections and so all the inputs on catch and bycatch are more fully represented. That link to then the economics is something then that we can do, and then you start looking at the dynamics, and those can carry over into what they mean in terms of the dynamics for economics.

MR. WEBB: Just another point of view on whether it's easy to collate the economic data or not, if a commercial operator buys a boat for $100,000, you can pretty much guarantee that every day the weather permits that that boat is going to be out on the water catching fish and they're going to be accounting for all the fish that's caught.

Recreational anglers spend $350,000 on a center console, and it may just go to the sandbar 90 percent of the time and have a rum punch with their friends, and so you can't make that direct linear connection. There has got to be other assumptions that are put in there and more demand for more positive proof of how many dollars are being spent.

MS. DEATON: One question I have is when did you start working, what year? What year did they start working on this?

MR. PUGLIESE: The first opportunity, and Tom can weigh-in, but the first opportunity we had is when we first started talking about some of the move toward ecosystem management and the desire to look at what modeling may be, and it was very opportunistic, because the Sea Around Us Project was being done for the world, essentially, and so we worked closely with the University of British Columbia, and we happened to link directly up with Tom, and, right from the get-go, we were able to get the first iteration of the South Atlantic Ecopath model, and then I think you've seen the different tiers we've had.

It's been based on the ability to get support to advance this, and we've done as much as we can, and we got to a certain point and then had to back off the different iterations, because I was, truthfully, hoping, when we did that last forage one, that we would have had most of everything that we're talking about now integrated into that model area, and there was such a desire to go down that one, very focused path that the next step was to do what we're doing now, and so it's been a long run, since 2001, or what was our publication, Tom?

DR. OKEY: Yes, 2001 was the publication, and so we probably started working on that in 2000, but, of course, as Roger said, it's been off and on, and mostly off, over those years. Like there has only been a few moments in time where we've revisited it, or slightly more than moments in time,

but there's only been a few periods that we revisited it and focused on it and then either there wasn't -- Just for various reasons.

Like I was finishing my PhD, and I finished in 2004, and then I was recruited to CSIRO in Australia, and so nothing happened with this model during that time, and then it was just a few more years before we reconnected and he was interested, and so we always, throughout the whole time, we always had the same vision, and I give a lot of credit to Roger to continue to pursue the idea of making it really happen in the region.

MR. PUGLIESE: I appreciate that, Tom, and I think one of the things that -- The reason we're here today is that our partnerships in the region, because the Landscape Conservation Cooperative funded this effort fully, and that was where all of the resources, and now we're getting collaboration to make sure that our partners that have been involved have been able to provide additional input, but the dollars to get the bulk and advance it to this stage has been from a partner in the region.

I think now -- I think those are some comments we made in our comments all the way full-cycle back to the South Atlantic roadmap, is that there has to be commitment from NOAA Fisheries on those different things we saw as well as support for these types of efforts in the future if we really want to see these become useful for exactly the reasons we're talking about and operational in management.

MS. DEATON: Okay. Thank you. Howard and Tom, thank you very much for calling in.

DR. OKEY: No problem. My pleasure.

MR. TOWNSEND: Glad to do it.

MS. DEATON: We look forward to those test cases and seeing what we can roughly see.

MR. PUGLIESE: Yes, and the timing may be for our next meeting, because the SSC is in advance of that, and so pretty much a lot is going to have happened by the time we get to the next stage, and so maybe we'll even bring Tom in for that specifically, and that might be a good point, or we'll see where we are when we get to the next point. I think the directive to get to that next step is very clear at this stage.

MS. DEATON: Okay, and so we'll leave it at that, and that's the last agenda item for our meeting, except for Other Business, and so does anyone have any other business they would like to discuss?

MR. GEIGER: I would like to make one comment. Again, I think the value of what we just heard is going to be much stronger in the future, as models are resolved and refined, and certainly I can understand that, ultimately, the holy grail is to utilize these ecosystem approaches to management to make management decisions. However, I don't think we're going to be there yet, and the proof in the pudding is, if a management entity makes a management decision utilizing this, will it hold up in a court of law when you're sued, and, right now, it's not going to happen.

I would recommend that the South Atlantic Fishery Management Board reach out to some of the other ecosystem models that are being developed and especially those that are relatively more

simple, and, if you wanted to use an economic impact to a species that is going to carry big economic input, I would look at striped bass and the modeling effort that is going on to look at striped bass and how to use predictive ecosystem modeling on striped bass, menhaden and striped bass interactions, and so on and some of the work that may be going on in the Chesapeake Bay as an example of a simple, more simple, model that may have maybe more immediate applications to manage a particular fishery, and I think reaching out and seeing what other elements are going on might be extremely valuable for us to put this in a better perspective.

Again, that is not underestimating the value or the importance of this work, because the interrelationships being shown here are going to be fabulous, but I'm a real proponent of the KISS principle, keep it simple stupid, and, again, I think looking at a high-level predator with a minimum input, and, if you're really going to be serious about making management decisions using an ecosystem approach to management, it's going to have to be relatively validated, and we're a little bit away from that right now.

MS. DEATON: All right. We will meet again in six months in Charleston, probably. Thank you, all, for coming. Meeting adjourned.

(Whereupon, the meeting adjourned on November 8, 2018.)

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