02/16/2024

BD028

**Interviewer 1:** So, to start, do you mind telling us a little bit about yourself and your background, your area of expertise?

**BD028:** Sure. I’m kind of a jack of all trades, if you want to call it that. I’ve worked in basically, the role of habitat structure and function and ecosystem has really been my primary focus. So, I’ve sort of made my way around. I’ve worked pretty much in every state in the Gulf, in every habitat from marshes, midshore, to offshore, deep-water corals. I’ve done it all. I did get my PhD there at Dauphin Island, I did a post-doc there as well, and then I did another post-doc at the Hart Research Institute. Um, and then went on to - from there, I was faculty for a while, and then I moved on to the National Park Service where I built out an ecosystem, um. Basically it was an ecological monitoring program for the areas of the Gulf Islands National Seashore, built an ecology program, which is right there by y’all. And then moved on to FOAM, where I did a lot of deep-water ecology. And then I ran the long term monitoring coral project for FOAM. I did flower gardens. So, moving along, I moved to NOAA in Miami, I got kind of tired of the bureaucracy there and not being in the field. So I moved over to get a little bit more sciency, back to what I was doing with policy. And, became the program lead for coral ecology program and the national coral reef monitoring program, became head scientist for that. Um, and so, yeah so working on biodiversity is a big part of what we do in that. What we do - I mean, I don’t know how familiar y’all are with NCRMP at all, um, but basically it’s a massive coral species biodiversity, you name it, we monitor it across the entire Florida reef track, the Gulf of Mexico, as well as the Virgin Islands. It’s a huge monitoring program, it’s very cool. So I was lead scientist for that for fishes, um, for coral stuff as well, and then from there I sort of moved on to where I’m now the branch chief for the habitat ecology branch. I have been there for 3, 3 and a half years I think. So we do a lot in coral research, we do a lot fishery research on the East Coast and the Gulf of Mexico. We do Everglades restoration and ecosystem models we’re developing for restoration in the everglades. What else do we mess around with… we do a lot of clean conch work, looking at - because that’s been labeled as a threatened species. And we do quite of bit of shrimp work as well, that’s sort of floundering at the moment but we’ve done a lot of shrimp genetics. Looking at biodiversity as it relates to the shrimp and shrimping and how that’s impacting a lot of stuff. So, very broad. And right now, currently I’m acting as a regional administrator for the regional office. So I’ve been there since May. I’ll probably be here for a couple more months. So, back in the policy, you know, making things work. Kind of coming full circle.

**Interviewer 1:** Sweet. Great, perfect. So, like I said in the email, really broad high level, the goal of the project is to look at how we manage for biodiversity in marine resource management. So, one thing that we’ve been hearing a lot in the project is that the term biodiversity means different things to different people, and of course it can be measured in multiple different ways. So, as a starting point, we would just like to know what you think about when you think about the term biodiversity. What do you see as the key aspects of biodiversity.

**BD028:** Wow, that’s not a simple question.

**Interviewer 1:** Yeah, we get that answer a lot.

**BD028:** Um, I would say biodiversity is probably the most appropriate breadth of animals, habitat, situations that are supposed to be present in an environment. Rather than - not what we could make it, right. So, what’s appropriate. Because not every area has to have high biodiversity. Not every area has to have low biodiversity. It’s just what’s appropriate, when I think of biodiversity.

**Interviewer 1:** Ok great. So, when thinking about marine biodiversity specifically, part of the project has been to build a framework to conceptualize marine biodiversity a little bit more concretely. And so, we’ve put together this framework and we’re wondering if you agree with it? Oh, you want to put it in the chat [Interviewer 2]?

**BD028:** Yeah.

**Interviewer 1:** That’s great, thank you. So we have four bins, they are habitat-forming species, species of conservation concern, harmful organisms, and key food-web supporting species. And so I’m wondering if you agree that these are the key components of marine biodiversity. If not, are we missing anything, do these not sound right to you? Is there anything we should take out?

**BD028:** And we’re just - we’re just talking critters, right?

**Interviewer 1:** Yeah, for this framework, of course this is marine species biodiversity, but after talking about the previous answer, we’d love to hear your thoughts on biodiversity more broadly as well. But yeah, this framework is just for critters.

**BD028:** Talk about the critters, ok. Habitat forming, species of conservation concern… what exactly does that mean? And who is defining that?

**Interviewer 1:** That is what we kind of want to hear from you. Like, does that term resonate with you, does that… yeah. That’s up for interpretation right now.

**BD028:** Ok. And sort of the same thing goes for harmful organisms, so. And are we into, are we in the phytoplankton realm? Or are we just talking about things that swim around.

**Interviewer 1:** Everything. Whatever you think of.

**BD028:** Ok. Key food-web supporting species. And how - so what’s the… are you guys just considering these as four different buckets? Are they interacting? What are you trying to do with these things?

**Interviewer 1:** Yeah so because, to the first question, we were hearing so many different things about how folks think about biodiversity, we were trying to come up with a way to simplify that, the term biodiversity, in a way that could then translate to marine resource management. To provide some sort of framing for how to manage for biodiversity. But, this is very, you know, rough draft of what we’ve come up with and we want to hear what you think of. So, however you interpret it is what we would love to hear.

**BD028:** Hm. Ok. I think that a lot of them are connected to each other, and whatever sort of model you’ve come up with is going to need to definitely take that into consideration, right. Habitat forming… um, that seems reasonable. I would think that - and I’m just going to chat here. I don’t want to get off the rails of what you’re thinking either, but you know, habitat forming definitely needs to have some sort of component in it that is long term and short term. Right? So when you start talking about our hard corals versus something that is growing off the side of a dock that’s going to grow up and create a thing and in the winter it’s going to die and slip off. And, so, yes. You should probably take that into consideration. Species of conservation concern, I mean that seems pretty straightforward. Of course a lot of that seems to be habitat forming, like the coral example I shared with you. Personally, I don’t know if you paid a lot of attention to a lot of the coral disease that’s going on right now in Florida. And of course there’s harvest measures in place for soft corals as well, because the industry’s involved. So do we consider that a - because it has a fisheries management plan, is that a conservation concern? Because it has a management plan? That’s a - something that y’all might have to… you know, how that intersects with the commercial side. Because there is a commercial industry around that. Harmful organisms… that’s also a relative thing. So, how did y’all come up with that? What is the…

**Interviewer 1:** Yeah so a lot, so these terms came from a lab that has… there was a precursor project and that project was basically collecting knowledge and doing oral history with experts. And they produced this framing. And so, my understanding from that project is that the focus was on invasive species and on, like, habitats was a big focus. And so those two things are what come up a lot.

**BD028:** So harmful to people.

**Interviewer 1:** Yeah. But we don’t have definitions for these for this stage of the project. So, that’s part of the goal of asking folks like you about it, like does this make sense, how would we define these bins for this framework is we moved forward with it, basically.

**BD028:** So, out of curiosity, if you’re talking about habs, why… that instead of the critters. Is that, like the exception? So…

**Interviewer 1:** I think so, yeah, I mean to go back to the biodiversity part, if - it can be all encompassing based on what ends up falling into the framework. So habs, I guess, has been included.

**BD028:** So let’s talk sargassum, right. So at what point, and this is actually one of the great soapboxes that I have. At what point does sargassum stop becoming a essential fish habitat and start transitioning into a harmful algal bloom? Like, what is that definition? And who defines that definition? Is it only becoming a harmful algal bloom when it gets 400 m from the coast, it’s fixed to wash up, right? And at that point it’s not even harmful, technically, to the beach, because it builds in on the beach and we clean it all off right? Because we consider it harmful. Um, technically it’s not. But that’s the fun part of human dimensions, right?

**Interviewer 1:** Yeah.

**BD028:** So, yeah. So, I mean if you’re going to work with harmful organisms, you need to have a, you know, transition I guess. You need to be able to be flexible in and out of that particular category. So I think the - yeah, it’s probably a pretty good category, I would have to say. Um, and then of course key food-web supporting species… what does key mean to y’all? Or what’s the idea behind it?

**Interviewer 1:** I think - again, like that would be up for interpretation. We would love to hear the - we would throw it back to you. We would love to hear your thoughts on that.

**BD028:** Yeah, so, I mean… yeah that seems to be a fairly good bin.

**Interviewer 1:** Ok.

**BD028:** Um, but I would have concern on that that, especially with, you know, we think a lot in the Gulf of Mexico that so many species are omnivorous, that it would be difficult to identify a real, like a linch-pin, like a keystone species. You know, everything is like ‘oh well, that’s not here, I’m gonna eat this’. You know, ‘if that’s not there, I’m going to eat this’. And so, I think being able to incorporate omnivory and prey selection flexibilities is probably something that is really going to be needed in that. And I don’t see a lot of, outside of a handful of species, I don’t know that there’s a few key food-web supporting species in the Gulf of Mexico. Because there is high nutrient production, and there are so many things. You know, you could throw in your manahays right, your mullet and your manahays, um, and your shrimps. Right, everything eats shrimp. And those are probably the only ones you’re going to get, you know, without getting into phytoplanktons and your filter feeders, right. So, you’ve still got to have your green algae to keep your mullet alive and, but, at a higher level it’s going to be fairly limited. But, there’s a ton of things that get eaten opportunistically. And being able to incorporate opportunism into this concept of key food-web - because I think that’s where a lot of the ecosystem models start breaking down. It’s that they give too much reliance on one or two species, and omnivorance gets snubbed out. And that’s a conversation that we have routinely. So they’re like ‘oh this doesn’t make any sense, why is that happening?’, you know, why is it that everything collapsed between all the - like that transition on the Pacific coast between sardines and anchovies, I guess, is what switches back and forth depending on the upflowing of the california current, or of the shells. And things just switch, right, and you don’t think much about it. And the other idea too, behind, I think, a key food-web supporting species is that that’s only really applicable in situations where there’s nutrients or some sort of habitat, nutrient, food limitation situations. You know, because of the omnivory. And it’s actually - key food-web species mean very little if there’s a lot of species eaten. And that’s one thing we do have in the Gulf which is far different from what you see up in the Northeast and that sort of stuff, where… mostly because shrimp are everywhere, croaker are everywhere, manhaven are everywhere. They’re kind of ubiquitous. They might look a little different, they might swim a little different, but you still got the same basic type of species all the way around.

**Interviewer 1:** Ok, great. Um -

**BD028:** I don’t know if you got anything useful out of that, but…

**Interviewer 1:** No, no, no, that was really helpful. Yeah, like you said. I mean, a lot of what you said is things that we’ve heard from other folks as well. And if we want to produce some sort of framework like this, having definitions and proving some sort of framework is what we need to do. So we’re trying to gather information from everyone and feedback and that sounds really helpful.

**BD028:** Good.

**Interviewer 1:** Um, so I want to dive into the management component of the conversation.

**BD028:** Sure.

**Interviewer 1:** So, thinking back to this framework to start, do you think that these four bins, if you will, these four buckets, are currently explicitly considered in marine resources management?

**BD028:** Um, I think that - well, I know that when it comes to… probably in some form or fashion, but not in… from the nims perspective, we’re really really trying to make this advance into this ecosystem based fisheries management, which would of course take into all these things, you know, into account. Um, but in reality, it’s extremely difficult. Right, so we’ve sort of transitioned into a little bit more of multi-species management, but not true ecosystem, which is what would account for this. It’s extremely rare, it is definitely - when it comes to a lot of management decisions which we do take into account, especially from the NEPA side, that is, and I don’t know how familiar you are with the NEPA process, are y’all familiar with that?

**Interviewer 1:** Yeah, a bit. Um…

**BD028:** Yeah, ok. But these are sort of ecosystem level effects, long-term effects, cumulative effects. That’s all the sort of thing that are now - and that’s really sort of a shift in the last 10 years in NEPA work. It’s where that stuff is becoming increasingly accounted for in the process for being able to make management level decisions. And that’s really the one place where I see that stuff coming through. Being here at Sero, so, I don’t know if y’all know how NOAA fisheries work at all. Essentially the science centers do a lot of the science and data gathering, but they don’t make a whole lot of decisions, the science centers. They don’t make any decisions. They just collect the data. Well the data is sent to the regional office, which would be Sero, which is where I’m at now. They take that data and they’re the ones that issue, between there and the Gulf Council, on fishery stuff. But we deal with more than just the Gulf Council. Um, you know, the policy, the management decisions, were made there. The ‘we’re closing a fishery’, or not approving this. They’re all made at Sero. The science center doesn’t make any management decisions at all, we don’t manage anything. That’s all done at the regional office. So that is where there’s a lot need for this stuff. The state and the county, there’s a lot of policies that have to be followed. I think Madison has - I think if I remember correctly in the reauthorization, they had to start reconsidering these ecosystem approaches into account now, if I remember correctly. And that’s where they’re all… but the problem is putting them into practice. It’s the sort of thing that everybody thinks is an excellent idea, it needs to be done, but I assume that’s why you guys have jobs right now. You can’t figure out how to really get it done. This is not a simple problem at all, and it often conflicts with the policies that are in place and how process-oriented they are. Because they’re never simple - there’s never simple answers in ecology. Right. And that’s something that we fight with all the time. We even see that in our own, you know, dealing with our own management group, they just don’t get like, well, how ecosystem management can be used in a management decision. Like, it’s not, but it’s going to form the basis for what you’re going to need in 10 years to make a decision. By the time you’ve collected this data, this data, and this data, it’s the foundational building stones of what you’re going to need in the future. They’re like, ‘oh, well we’re not going to fund it because we can’t make a decision off of it right now’. Ok, that’s, you know, you’re getting paid to make the poor decisions, not me. I can just say ok. Do what I will do, right. So, I just - being able to, figuring out how to put these four bins into practice is really what is needed, and how to simplify it. But it’s - and I would recommend, have you guys had a chance to interview Jason Link on this? Have you talked to Jason? Ok, yeah.

**Interviewer 1:** He’s one of the first people.

**BD028:** Yeah, that wouldn’t surprise me. Yeah, and he probably has a little bit different - because he’s in DC doing stuff. A lot of high in the sky, ‘oh we’re doing’... we’re on the operational end, and at the end of the line where things actually happen. Not where we tell people that things have happened. So, um, what they’re coming up with is a lot of great theory, but in reality the practice is the problem.

**Interviewer 1:** Right. So, you’ll love this next question. You just - you just set yourself up for the next question. The next question was, what approaches are needed to better manage for biodiversity. So how do we actually make ecosystem based management like you just said. I think you just answered your own question because you said that we don’t know, but that’s -

**BD028:** It has to be incorporated into the management.

**Interviewer 1:** Yeah, ok.

**BD028:** More strongly. Because if it’s not, or in the NEPA. Because that’s what everything seems to revolve around. Or you just blame it on red snapper. If you can throw red snapper in it, they’ll pay for it, right? Just, tell them red snapper is reducing biodiversity. That’s a little know it joke. Obviously [Interviewer 2] is familiar with the problem. But -

**Interviewer 2:** Yeah, very familiar.

**BD028:** Yes. Um, but yeah. It really has to be codified as to what, you know, what it means and how it can be measured and standardized. And unless that can be developed, it’s going to be really really difficult to be able to say, so, like ‘ok well, we’re going to improve biodiversity and we’re going to introduce nine species’. Great! Biodiversity’s up, but we’ve completely changed the ecosystem. Right? So, what are the trade-offs, and really what’s needed is to be able to, for the decision makers, to understand consequences. Right? Because going to a - you know, sometimes going into a monoculture environment, like the state seagrass. Because I did my doctorate in seagrasses. So, if we’re dealing with a mono-specific habitat, that’s not always that bad. Because your carbon production is through the roof. You know, you’re dealing with a single species, it provides ability to an environment, but then you get - you start getting into the scale. What scale are we talking about with biodiversity now? Are we talking about a 100 meter bay system, or are we talking about an entire Mobile Bay complex? So, being able to define that scale, because typically, and one of the issues when it comes to making management decisions is that it’s often done on the scale of the species. Right? And this is an issue we run into when we - so I published a paper a couple of years ago with Jerry Alt, out of University of Miami, and we were looking at our incurrent data using a machine learning through space management model. And it basically says that the fisheries are garbage at this point. We’ve wrecked the fisheries. And if you’ve been to the Florida Keys, you’ll understand that with the coral reef. And, it caused - I mean I had Janet Coi contacting me, asking me what’s going on. Right? And why she’s getting phoned by a congressman in front of the NRCC. And so we had to do all this big rebuttal, sort of write up some stuff on that. But, the issue was that what we were coming up with was not applicable at the range of the species. And as a result, they wanted to ignore it. Because the scale of management is not defined well. And, they’re like well, black grouper is essentially collapsed in the Florida Keys. Well, all our own models say they’re working fine throughout the entire range of the species, from Main to South Texas. They’re there, they show up, but in the area where you find about 85% of the population, they’re essentially gone. Outside of a handful of locations. So being able to understand the scale is probably the most - the scale and the consequences are probably the most important things.

**Interviewer 1:** Ok. Great. I think I’m going to maybe pause there. And then [Interviewer 2], do you want to maybe transition and share your screen?

**Interviewer 2:** Yes. One second.

**Interviewer 1:** Ok. While you’re doing that, so, [BD028], are you familiar with fuzzy cognitive mapping? Steven uses it a lot with his group.

**BD028:** Yeah. A little bit, yeah.

**Interviewer 1:** So, our - we’re using, for the second part of these interviews, we’re using mental modeler to understand how these different components of biodiversity and figuring out those approaches.

**BD028:** Yeah, let me rearrange my screen so I can see it bigger.

**Interviewer 1:** Ok.

**BD028:** Um, that’s the problem with this… I need a new spotlight. Alright, there we go. Ok.

**Interviewer 1:** Ok, cool. So while we’ve been talking about this, [Interviewer 2] has been making a concept list from your responses and our hope for the rest of the interview is to just understand how these different system components are related to one another. So do you want to run through, [Interviewer 2] what you’ve produced?

**Interviewer 2:** Yeah, sure. So, the orange concept in the top left is just how you would define biodiversity, so just simply appropriate presence or absence of organisms. In the center, I have the four bins that we talked about first. With a couple of edits, so I added harmful organisms to people and then I broke out habitat forming species into short and long term. And then key food-web supporting species into omnivorous fish as a general list, and then the abundance of prey species. And then the bottom left in blue are management policies or regulations that currently incorporate biodiversity in some kind of fashion, and then the yellow ones on the right are policies that are needed to do that in a better way.

**BD028:** Ok.

**Interviewer 1:** Does that all sound - like, do those boxes accurately represent your thoughts or are there any changes we should make? Or does this look good to start?

**BD028:** Well, I think the harmful organisms, probably is not just to humans. But I think if you’re thinking about it it should be to humans and to ecosystems, right. Because it might not necessarily harm humans, right. Do the pythons in Florida harm humans at all? No, not really. But they hurt everything else, right.

**Interviewer 1:** Ok. Is there anything else that we should change before we move forward?

**BD028:** I think that’s… no, let’s give this a shot.

**Interviewer 1:** Great. So, let’s start with the orange box at the top. Biodiversity. So how we’ll go about this is i’ll ask you if that component was to increase, would it have an impact on any of the other components on our map. So would an increase in biodiversity as the appropriate presence or absence of an organism, would it impact anything else on this map as we have it?

**BD028:** I’m not quite getting what you’re asking.

**Interviewer 1:** Yeah, it’s challenging with the different concepts that we have on this list, but I think maybe habitat forming species might be a good example. So, if we were to increase biodiversity, would that impact long-term habitat forming species?

**BD028:** I mean, I guess it could.

**Interviewer 1:** Ok.

**BD028:** I mean, theoretically it could affect any of them.

**Interviewer 1:** Any of the gray boxes?

**BD028:** Yeah.

**Interviewer 1:** Ok. Um, ok. So, maybe [Interviewer 2], should we delete out the habitat forming species? Just that box, yeah. Because that might be redundant. Um, ok. So you said an increase in biodiversity could have an impact on long-term habitat forming species. Is that situational, or do you think that would always be a positive or negative impact?

**BD028:** Oh, that would be situational all the time.

**Interviewer 1:** Ok. That’s ok. We can leave as that. So if you aren’t able to assign a direction, we can leave it as a question mark. That’s fine.

**BD028:** Well that’s - you know what, the direction is another one of those issues. You know, you’ve probably heard this before, but especially dealing with NEPA, you know it often has a negative connotation and impact. And it doesn’t always have a negative impact, it just changes things.

**Interviewer 1:** Right.

**BD028:** So.

**Interviewer 1:** Ok, yeah. And that’s the thing with this process of mental modeling, we try to talk about things in terms of increasing or decreasing rather than positive or negative for that exact reason. But it gets a little bit tricky with -

**BD028:** Yeah, how do you define increasing, you know.

**Interviewer 1:** Right. I guess for habitat forming species, it would be increasing the number of species in that ecosystem.

**BD028:** Yeah, I mean I think that’s always a positive thing.

**Interviewer 1:** Ok.

**BD028:** You’re increasing the number of species, yes. Habitat forming species are important. While you’re creating habitat, you’re increasing genetic resiliency. So that’s what you mean by - ok. If we’re talking on… yeah. Increasing biodiversity would help long-term habitat forming species, yes.

**Interviewer 1:** Ok. Um, you just mentioned genetic resiliency. Is that something you think we should be adding to the map, is that important in our consideration?

**BD028:** Oh, I think genetic variability in biodiversity is a major major issue.

**Interviewer 1:** Ok, let’s add that in.

**BD028:** But even if you just consider genetic biodiversity, because that leads to resiliency just through the natural processes.

**Interviewer 1:** Yeah, ok.

**BD028:** But I think that as a big component, I mean it’s just way more than thinking about abundance and you know, how many are there.

**Interviewer 1:** Are there any other components related to biodiversity that we missed that we should add along with genetic biodiversity? Or is that ok with you.

**BD028:** No, that’s probably good for now, I guess.

**Interviewer 1:** Ok. So, in that same vein of how we just drew that relationship between our biodiversity bin and our long-term habitat forming species. Are there other relationships we can draw between that habitat forming species and our other gray boxes here? So, short term habitat-forming species, harmful organisms, key food-web supporting species, and species of conservation concern?

**BD028:** Uh, are you saying can we draw more lines?

**Interviewer 1:** Yeah, exactly. Does that have a relationship?

**BD028:** Yeah, I would say there’s a relationship with all of them, obviously.

**Interviewer 1:** Ok.

**BD028:** So yeah, I would say that one is certainly questionable.

**Interviewer 1:** Ok, which one - are you saying that species of conservation concern was questionable?

**BD028:** Um, the short-term habitat forming. I was saying that one was questionable because that’s depending on perspective, typically.

**Interviewer 1:** Ok.

**BD028:** Um, you know, often times biodiversity is - harmful organisms, especially if we’re thinking like habs, they’re not harmful in a stable ecosystem. Right? So you don’t have harmful algal blooms unless you have - I mean the algae’s… the critters that follow harmful algal blooms and are always present in the environment, they’re just, they don’t have the right conditions to grow exponentially. So, I mean obviously - and they don’t think it’s bad. So… we got to hurry up!

**Interviewer 1:** I know. I’ve never heard that happen before.

**BD028:** Ok, so how can we speed this up? We can just do yes or no rather than me -

**Interviewer 2:** I can also - I don’t know how much time you have, but I can send another link. I don’t know why it’s telling me I don’t have a premium plan. But… I’ll figure out how that happened.

**BD028:** Ok, well, we can do - yeah, I’ve got a little bit of time after this if this goes over. Alright, so, I mean I would say that increasing or decreasing biodiversity would certainly be positive on the key food-web supporting and the rest I would have to probably say they are questionable except for the species of conservation concern. That would probably be positive as well.

**Interviewer 1:** Ok. Ok, so… that orange box, appropriate presence or absence of species to species of conservation concern, is positive you said?

**BD028:** I would say yes.

**Interviewer 1:** Ok.

**Interviewer 2:** I’m sorry, the wifi here is cutting in and out.

**Interviewer 1:** Oh no, you’re fine. Ok, what about genetic diversity then. How would that impact - increased genetic diversity impact those boxes?

**BD028:** Um, I would definitely say on the long-term habitat forming species, and the genetic diversity, it would be very positive. And then species of concern as well. Um, and then usually - that’s probably, I think those are the strongest relationships. Obviously that’s going to impact everything, but um… ok. I think I can live with that.

**Interviewer 1:** Ok. Um, so then to go to the gray boxes. So how do long-term habitat forming species impact these other system components?

**BD028:** Um… like the stuff at the bottom?

**Interviewer 1:** Yeah, exactly yeah. The other gray boxes, and the orange, mainly.

**BD028:** Well, that’s an interesting question. Like, well basically, everything is something that has to be considered for multi-species management. Maybe not so much harmful species, but maybe to people. I guess you can put that in there. Or I mean, yeah they all kind of fit towards that, because that’s all components of…

**Interviewer 1:** I think, can you - I think [Interviewer 2] maybe… I’m trying to think about the direction of those arrows, if they need to be flipped. So will you just repeat, [BD028] what you just said?

**BD028:** Yeah, I think all of those are necessary for multi-species management. So, I don’t know who to defect to. It’s sort of a circle, right?

**Interviewer 1:** Right.

**BD028:** So, it could certainly go both ways. Um, it’s again absolutely going to depend on if you - I think EBFM is the goal, but in reality we’re getting multi-species management.

**Interviewer 1:** Right.

**BD028:** So the same sort of stuff would fit into EBFM, in almost the same identical relationship. I don’t know, that’s just - the EBFM is the goal right?

**Interviewer 1:** Right.

**BD028:** And multi-species management is just what we have at the moment. As far as like, I mean, FMPs would be more geared towards abundance of prey species and then omnivorous generalists I think would be the real connection there. You know, the rest of this stuff is I think harmful organisms. You know what’s really missing on here? Is just, abundance of - I mean what’s really missing is… harmful to people. Does that necessarily mean that - you get harvested species, but I think harvest is not the right word because we’re not growing crops. Um, but the, for lack of a better term, commercially harvested species. Extracted species, something like that, you know, I think is the other group that definitely has to be considered in that. Because basically everything that essentially drives, especially fisheries management from an ecosystem supported view, and it’s changing a little bit, you know. It’s back to that red joke. It all feeds back into that. If you can’t figure out how to, um, get the - you know, if you don’t have an issue with the extracted or harvested species, you’re not going to have the policy triggers to be able to start triggering everything else and approaching everything else.

**Interviewer 1:** Right, ok.

**BD028:** And I hope I’m not the first one to say this.

**Interviewer 1:** No.

**BD028:** Yeah. And that goes for all the yellow ones too. So, and in turn, really when you start - a lot of times when you see that harvested species then creates the loop, because that’s when you start seeing shifts in ecosystems because of harvesting practices. Which gets back to the top left-hand box, and top right-hand box.

**Interviewer 1:** Right.

**BD028:** They start feeding back into that. Right. You manage for one thing, they eat everything. And the same thing goes for fishing behavior as well, I mean, and probably human behavior, or fishing regulations would also be somewhere in here as well. Because it’s such a driver, um, I mean let’s take - I’ve been fishing in the Gulf for 40 years now. And you can watch how, and I’ve been diving on all this sort of stuff and how the ecosystems change as they start managing the… especially with single-species management. You know, they move off the red snapper, they move over to the trigger fish. Well we don’t have trigger fish in the Gulf anymore, so now we’re moving over to… and take a look at the trigger fish, they’re overfishing the amberjack. And now the amberjacks are all shut down. And, um, I don’t know if y’all are familiar with all that fun stuff. Um, but I think as far as being able to look at a top-down ecosystem approach, you know, fishing regulations have a huge impact on that stuff.

**Interviewer 1:** Right. Ok, that’s great. Um, I think we’re going to be physically kicked out in two minutes. I keep seeing that little thing at the bottom. Um, is there anything else that we should know, that we should add, before we run out of time?

**BD028:** No, I think it’s pretty close. And this isn’t a free call on google? Really? Huh.