

John Davis:

Hello, everybody. My name is John Davis. I'm editor of MPA News, the newsletter on planning and management of marine protected areas, or MPAs. For more information on MPA News, including past issues of the newsletter and instructions on how to subscribe, please visit our Web site at www.mpanews.org.

MPA News is co-presenting this webinar with the EBM Tools Network, a voluntary alliance of leading tool users, developers, and training providers. Their Web site is www.ebmtools.org.

We welcome all of you, an audience of roughly—we're getting up toward 50 people so far, and that will keep going up in the next few minutes, participating from around the world.

This is the second webinar co-presented by MPA News and the EBM Tools Network, and we look forward to hearing from you afterward with your feedback on it. There will soon be a poll question on-screen that we would like for you to answer as best you can to give us a sense of the make-up of our audience. Thank you for doing that.

This is how the webinar will work. Our panel of two experts on MPA networks will each provide a 15-minute audio/visual presentation offering lessons learned so far from MPA networking programs in two areas. Those of you participating via computer will actually see each speaker's PowerPoint presentation on your own computer screen, then we will open the floor to questions from you, the audience, for the remainder of the webinar. We will conclude it about an hour-and-a-half from now.

Our panelists are Billy Causey of the U.S. National Marine Sanctuary Program, and Joachim Claudet of the University of Salento in Italy. I'll describe them in a bit more detail in a couple minutes. I'll turn it over now to Sarah Carr of the EBM Tools Network to provide instructions on how you can deliver your questions to our panelists.

Sarah Carr:

Okay, thank you everyone! We've gone ahead and launched the poll, so if you could all answer that it will help us know a little bit more about you guys, as you'll be getting to know the presenters a bit better and what they do.

There are two ways to ask questions during the webinar. One, you can type your questions into the "Question Panel" in your graphical user interface for the webinar system, and John and I will relay those questions to the speakers.

The other way you can ask questions—and the second way will only work if you have a working microphone—is to raise your virtual hand, and then when we see your hand raised we can un-mute you. There's a little bit of a lag there, so be forewarned, but if you'd like to ask your questions directly—verbally—to the presenters, raise your hand and we'll un-mute you and you can ask it. Otherwise, you can type it into the "Question Panel."

We'll give it just a few more seconds if anybody else who wanted to log into the poll.... Okay, we're going to go ahead and close the poll now.

We see that quite a few people on the call are involved in planning a new MPA network; about 34 percent, and 59 percent provide scientific or other advice to MPA network planning. Also, about a quarter of you are helping to manage an existing MPA network, or conducting research on MPA networks. A few are in the very early stages of thinking about a new MPA network—about 12 percent. Okay, thank you everyone!

Back over to John and Billy.

John Davis:

Great. Thanks, Sarah. All right, we'll get started with the presentations.

Our first speaker is Billy Causey. Billy is the Southeast Regional Director for the National Marine Sanctuary Program of the National Oceanic and Atmospheric Administration in the U.S. He has observed and studied coral reefs since the 1960's. From 1991-2006, Billy served as Superintendent of the Florida Keys National Marine Sanctuary, the third largest marine protected area in the United States. He spearheaded the efforts to establish a comprehensive marine zoning plan for that MPA, including what became the nation's largest network of no-take areas.

In his current role as Southeast Regional Director, Billy is focused on several initiatives around the Southeast Atlantic, the Gulf of Mexico, and Caribbean, where MPAs and MPA networks are being considered for management of coastal and marine resources.

Here is Billy Causey.

Billy Causey:

Hey, good morning everyone. Good afternoon to some, and good evening to others. John, thank you very much for that introduction.

Specifically, I work for NOAA, which is the National Oceanic and Atmospheric Administration, which is in the U.S. Department of Commerce. I'm in the Office of National Marine Sanctuaries, and currently we have 13 national marine sanctuaries in our system, and one marine national monument. Those areas are broken up into four different regions, and I'm going to be talking about the Southeast Region; I'm going to specifically be talking about the Florida Keys National Marine Sanctuary.

Sanctuaries are areas of the marine environment with special conservation, recreational, ecological, historical, cultural, and archeological or esthetic qualities. Now I promise not to read to you all the way through. I wanted to really emphasize that the Florida Keys is one such national marine sanctuary, with over 9,800 square kilometers, or 2,900 square nautical miles.

The Florida Keys was the first congressionally designated sanctuary, and it was the first one to totally surround an entire community, and surrounds the Florida Keys. It protects America's only living barrier coral reef that lies adjacent to the continent. There are many firsts that come with it, but one thing is that we manage it through a co-trustee agreement with the state of Florida. Over 60 percent of the sanctuary, which is inside this pink line, is state waters; 40 percent is federal waters.

Like any other marine protected area, the IUCN defines marine protected areas as "any area of intertidal or subtidal terrain." I'm not going to go through the entire definition, but my point is national marine sanctuaries are marine protected areas. We are a multiple-use program; we have both commercial and recreational activities taking place. But our primary objective is resource protection.

So that's the real challenge for us as managers: How do we get up in the morning and go to work, and live up to the Act that tells us to protect this area and conserve it, but still allow multiple uses.

The Florida Keys sanctuary gets over four million visitors a year; they spend 14 million visitor days. One visitor might spend five days.

The primary activity is tourism; that's the basis for the economy of the Florida Keys. The thing that people like to do the most is go either snorkeling or scuba diving on the coral reefs.

Recreational fishing is the second largest and most popular activity, and we have a large number of people come down just for recreational fishing.

Commercial fishing is the second largest industry, with our fishermen landing between US\$50-70 million annually in the Florida Keys.

Like any coral reefs around the world, the coral reefs of the Florida Keys are threatened by four major areas: climate change, land-based sources of pollution, habitat loss and destruction, and overfishing. Three of these can be dealt with at the local level, but I'm going to only be talking about overfishing and what we can do locally, and what we've done in the Florida Keys to address this activity.

We all have stories of the past—what it used to be like. I have over four decades of experiences on coral reefs, and I remember when it looked like these photos. In fact, I may have been in one of these somewhere. But definitely, we've seen changes take place from the '30s, '40s, and '50s.

What's been driving this change? Well, in South Florida, the NOAA National Marine Fisheries Service, Southeast Fisheries Center, have actually calculated that reef fish landings—68 percent of them—are coming from recreational fishing activities; 5 percent are headboats (which are really recreational fishermen on charter boats); and 27 percent come from commercial landings. You can see in this graph right here that our number of recreationally registered vessels in South Florida has continued to grow and to increase, and no telling where this is going to go into the future; whereas, the commercial vessels—registered vessels—have remained somewhat constant.

People come into the Keys and have fun. They either catch fish and release them, or they catch fish to take home for food. All sorts of pleasurable activities take place out on the water. But it's commercial fishing, too, that we have to look at, in that changes in technology, changes in the types of gear that have been used over the years, have really affected our reef fish populations. Wire fish traps, which are now prohibited in the Gulf waters, South Atlantic waters, and have been prohibited in state waters since the late '70s, were really devastating. They really were overfishing a lot of the stock, they had a lot of bi-catch, very devastating.

This has all resulted in the fact that right now over 85 percent of the species listed here, which are our primary reef fish complex, are overfished. Dr. Jerry Ault and Dr. Jim Bohnsack have estimated that all of these species with red bars are below the 30 percent spawning potential ratio, which means they are overfished, which means they're going to have to struggle to come back.

In the Florida Keys National Marine Sanctuary, to manage this area for multiple uses, we are using a marine spatial planning activity called marine zoning. We've developed five different types of marine zones—I can't talk about all of them—but in order to protect these resources and conserve them, we had to come up with a zoning plan. Three of the zones that we have are no-take areas; 18 sanctuary preservation areas, 4 research-only areas, and 2 ecological reserves, as well as 27 wildlife management areas and existing management areas.

The only one that I want to talk about are ecological reserves. These are the larger no-take areas, and you might imagine, this was very controversial in the '90s. In the mid-'90s when we were coming out with our zoning plan—our final management plan—the topic of no-take areas and large reserves was very controversial.

Ecological reserves are areas that are set aside to protect high habitat and species diversity. Our charge in National Marine Sanctuaries is not to establish these to manage the fishery, but to really protect the biodiversity, the habitat, the home, the food source of all these species out there, including the commercially and recreationally important species. The reserves are representative of the Keys marine ecosystem, they are areas of some of the best remaining water quality, and we tried to locate areas where we have natural spawning, nursery, and permanent resident areas for the replenishment of marine life.

The Western Sambo Ecological Reserve was the first one established. It was established in July of 1997, and it's a 32 square kilometer area that lies in the lower Florida Keys. It runs from mean high water, and includes in-shore hatcheries, mid-channel reefs, and the outer spur and groove for reef environment.

The Tortugas Ecological Reserve was implemented in July of 2001, and it's made up of two different areas: this hashed area up to the north that I'm highlighting, as well as a 60 square nautical mile area to the south called Riley's Hump. The two of these together make 518 square kilometers in size. Recently, in March

of 2008, the National Parks Service added this research natural area to the Tortugas reserve.

Our scientists immediately started measuring the effects of the reserves. And, of course, scientists very often look at the commercially and recreationally important species. At the Western Sambo Ecological Reserve, our scientists immediately started measuring and just looking at spiny lobster. You can see inside the reserve are the red bars. You can see immediately after it was implemented in '97, that we started seeing an increase in the population of spiny lobster at that location. As a result of hurricanes and the fishery itself, we had a drop, but you can see it also dropped in the fished areas as well. Then, again, in 2004 and 2005, we started seeing a dramatic increase in the number of lobster.

It's not only the number of lobster in the reserve and the fished areas that has changed. In the fished areas you can see the size of the lobster have gone down, and really have been affected; whereas in the reserve, the size of the lobster have increased, particularly the male spiny lobster. So this is very important for the fishery.

Reef fish have responded very much the same. You can see in this illustration here, that with the black grouper in the protected area, that we had a tremendous increase in numbers, and then all of a sudden we had a drop-off in 2004 and 2005. That was a result of major hurricanes during those two years.

The same thing happened with the yellowtail snapper. We saw an increase, peaking up between 2000 and 2001, a drop, and then when the hurricanes hit we saw it drop out to 2006. Now it's back on the increase again.

The hurricanes of '04 and '05 are something that we don't always take into consideration, but we've had a number of hurricanes in '04 cross-cross South Florida and affect the Keys, and in '04 we looked like a spaghetti bowl—back and forth with a lot of hurricanes. Those all had an impact.

The Tortugas Ecological Reserve is an area that has proven to show the greatest amount of change since it was implemented in July of 2001. Dr. Jerry Ault and Dr. Jim Bohnsack have been looking at the fisheries in that area, and looking at different commercial and recreationally important species in that area. If you look at this particular graph here, you can see the red is the

Tortugas North, and the red dots signify pre-designation, as well as the green dots. These are all dives—these are all surveys that were made prior to the implementation of the ecological reserve in 2001.

This is what they got in the way of black grouper in 2000, and you can see just by the number of red dots that the numbers are way down, both inside the reserve (or the proposed reserve at that time), as well as outside.

Just three years after the implementation of the reserve, you can see here the numbers of black grouper increased dramatically in that area. In fact, if we look at this, I know there's a lot of data on this slide, but just look for green—green is good, red is not. Looking at black grouper, you can see that on the bank that was fished, the dives saw an 84 percent increase in black grouper, while on the bank that was in the marine protected area, the dives saw a +120 percent increase. This is just the change between 1990-2000 and 2002-2004. So in three years we saw that dramatic increase. Here, looking at mutton snapper, we saw a tremendous increase in the sightings and observations of that species.

Another way to look at that data: this whole column over here to the left is the fished area, the reserve, and the Dry Tortugas National Park in the pre-designation period. You can see in the fished areas about 25 percent observations. In 2008, in the fish area, it went down. But if you look at the Tortugas Reserve, the numbers of black grouper went up dramatically, up until 2008. So this is some of the most recent data that we have at this point from Dr. Jerry Ault and Jim Bohnsack, and you can see inside the park there's also been an increase. These are very significant data.

Now Dr. Ault and Dr. Bohnsack primarily looked at reef fish complexes, but Dr. John Burke with NOAA, and his colleagues, have looked at a number of different aspects. They're not only looking at the fish, but they're looking at the entire ecosystem, and the entire adjacent coral reef systems that help make up an intact ecosystem.

They are finding significant changes have occurred in the reef fish community following the establishment of the reserve. There's been an increase in abundance of large fish, and what's really interesting is the small fish are disappearing. This is what's important, is that we're getting more prey species being consumed by the predators, and we're starting to see a shift in the predator/prey population. This is very important for a healthy

coral reef community. We've seen a reverse, to some extent, of the decline of commercially exploited fish stocks around the Tortugas.

While I mentioned the controversy of setting up the Tortugas, I can't go through this presentation and not talk about how this happened. We made some mistakes the first time we were making our plans, and we came back in 2000 and started designing a process to designate a reserve somewhere in the Tortugas region. The lessons learned fell down in four categories: participation, process, science, and jurisdictions.

In participation, we used an advisory working group: we have a Sanctuary Advisory Council in this sanctuary, as we do all of our national marine sanctuaries, made up of diverse stakeholder representation.

In this process, in participation, we included all the fishery resource managers, and we maintained a very integrated working group. We involved the public as much as possible. The working group was made up of 25 members that met, and they were asked to consider an ecosystem approach, ignore jurisdictions, and focus on objectives—not on size and percent-area set-aside.

The process was open and flexible. We used a neutral facilitator. The working group itself identified the goals and objectives, and they agreed on site selection criteria. They engaged the public in public forums, they listened and valued stakeholder input of all sorts, and they strived for the highest-level consensus. We went out into the community and met as frequently as possible. We held our formal scoping meetings, but also informal meetings.

Science was another lesson learned. We had to use science to drive the process, both in forums and in front of the public. But it wasn't just about the natural sciences. It was also about the physical sciences, as well as the socio-economic sciences. The idea was to produce lines, eventually, that would reflect what the community felt [the reserve] should look like.

Why the Tortugas area? It was important for the Tortugas working group to hear from oceanographers, geologists, scientists of all sorts, but also stakeholders such as fishermen and divers, about what is in that special area. The most impressive science then in oceanography was from Dr. Tom Lee with the University of Miami and Liz Williams, who identified that as the Florida current moves between the Keys and Cuba, a series of counter-clockwise gyres spin off. You can see here that these gyres are lined up

with—and these are long-standing gyres—they are lined up closely with our two ecological reserves. So anything reproducing or spawning in the Tortugas area gets carried up the way.

They heard about the coral reefs, and how special the reefs are in that area. But most importantly, I guess of all, is that we had an economist go out and interview all the commercial fishermen, and many of the recreational fishermen and divers, and find out where they were doing their activities, and we put that down in a GIS system. It was at that point the working group started drafting boundary lines as to where they thought things would work using the criteria that they selected.

Jurisdictions was another big one. We used the ecosystem approach. We had to work with seven different jurisdictions in that region. I won't belabor that point, but one thing we really learned is that we needed to make sure people at the table could speak for their agencies as much as possible.

In summary, we involved stakeholder leadership in the process. We integrated the best available natural and socio-economic science into the process. And we utilized a process that's precise and science-driven, but incorporated the best anecdotal information when necessary. In other words, commercial fishermen have a lot of knowledge, and we had to listen to them.

The process should not wait for complete scientific validation. And overcoming the perceptions of social and economic injustices by incorporating the socio-economic data was extremely crucial. Thank you.

John Davis: That's great. Thanks a lot, Billy.

I know that in order to fit the time allotment that you had, you needed to cut out some material on spillover measurement technology, and we'll give you a chance to talk about some of that in the question and answer session coming up.

Billy Causey: Absolutely! That's a big question.

John Davis: Excellent. Thanks again.

Our second speaker comes from the science side of the MPA networking field. He is Joachim Claudet. Joachim is a post-doc at the University of Salento in Lecce, Italy. His research is mainly focused on Applied Coastal Ecology, and examines how natural

environmental factors, such as habitat and anthropogenic stressors like overfishing can both play roles in structuring fish and benthic communities.

He has dedicated most of his research toward the study of MPAs, both as experimental sites to assess the impacts of external stressors, and as a tool for managing biodiversity, resources, and coastal uses.

He has been involved in various multi-disciplinary EU research projects on MPAs, mostly in the Mediterranean, including a meta-analysis on the effect of MPA design on MPA effectiveness, and a meta-analysis on the effect of fish life history and ecological traits on response of fish species and protection.

He is currently editing a multi-disciplinary book on MPAs for Cambridge University Press.

Here is Joachim Claudet.

Joachim Claudet: Hi, everyone. John, I want first to thank you for your invitation to this webinar. I'm really happy to be here with you.

In this presentation, I will share with you some thoughts about MPA networks and illustrate them with the Mediterranean case study. I hope that you all will understand me with my French accent.

The concept of MPA networks is a recurring issue in MPA literature and practice. Throughout there is the desire to achieve both conservation and fishery management goals by minimizing the potential negative economic, social, and cultural impacts of one big large MPA, while still producing similar or even greater ecological and economic returns.

Despite many international commitments made to establish MPA networks, the current rates of MPA establishment indicate that the EEZ goals will not be met until 2047, and 20 percent of marine habitats will not be protected until 2083. So the number of MPAs is expected to grow dramatically in the near future, and their establishment within networks will help to minimize the trade-offs between ecological and socio-economic goals.

First, without the clear definition of a "network," it can be difficult to identify attainable management goals, and to design a process for evaluating whether a network achieves those goals or not.

Besides, different management goals may, in turn, result in the need for different types of networking.

So, in this presentation, I will first present some definitions and propose outcomes of network types, to clarify the outcomes of different network design, and then I will demonstrate how one of these network types can perform within the Mediterranean.

So, MPA network objectives can be diverse, and therefore they call for different network types. First, there is a widespread temptation to consider a system of MPAs to be an ad hoc or regional network. For instance, this is the case in some parts of the Mediterranean Sea with the existing collection of MPAs. Each of those MPAs was established independently of the others, but this collection of MPAs is expected to be part of marine policy goals of the bordering countries to meet international conservation targets. Later on in the second part of this presentation, we will see how such networks can perform.

Second, an MPA network can be designed to have strict conservation goals. The underlying objective of a conservation network would be to conserve the representativeness of an area by protecting replicated sites that encompass habitats or species of ecological interest. The replication of MPAs would appear as a buffer against potential threat of an impacted portion of the several protected sites. However, in these cases, most of the time connectivity among the protected components may be assumed, but is not planned for, or is not even assessed. If network sites are not connected, conservation goals may be undermined by a lack of protection afforded to upstream resources. An example of such network can be, I think, the Great Barrier Reef, or some of the MPAs of the Chilean coast.

Third, MPA networks can be management networks, with the aim to manage and facilitate the economical uses of a given marine resource, or some marine resources (for example, fisheries management), at a scale broader than the single MPA approach has afforded. I think that such an example could be the West Hawaii network.

Fourth, an MPA network can be referred to as a social network. The aim of a social network would be to involve different MPA managers, stakeholders, decision makers and scientists to transfer knowledge, share best practices, and build capacity. For instance, the MedPAN South (which is Mediterranean Protected Area Network South, a kind of spinoff from WWF), is a social network

directed towards non-European Mediterranean countries. It is dedicated to improving the management plans of existing MPAs, providing support when limited information is available, helping fund-raise and train field staff, and integrating MPAs into broader discipline plans. I guess that the Caribbean Marine Protected Area Management Network shares some of these goals.

Finally, MPA networks can be connectivity networks. They would be defined by a set of mutable MPAs connected by the dispersal of larvae, and/or the movements of juvenile adults. The general objective of such networks is to maximize the conservation benefits while minimizing the space allocated to these benefits in order to devote the remaining space to fisheries or coastal uses.

Now, the recognition of these five network types raises a new question: Can a single network achieve all of the above stated objectives? Social networks (if connection among practitioners is managed properly) may act as a management network and therefore achieve better regional governance.

Ad hoc or regional networks are considered with the hidden aim of serving as a different connectivity network; the benefit is most of the time not the case. A conservation network also assumes connectivity among its different components. A connectivity network can therefore achieve the goals of a regional or conservation network, with management and social network components being a potential added value for connectivity networks.

As network objectives can be interconnected, this raises the important issue of success of assessments. How do we measure whether an existing network meets its objectives and what framework should be used to assess the success of the network?

So now in the second part, I will focus on evaluating the effectiveness of a regional network in the Med.

In this example, I examined the influence on MPA effectiveness of different features of MPAs within a regional network or ad hoc network. The effect of MPA size was assessed with two variables: the size of the no-take zones, and the size of the buffer zones. The buffer zones here are multiple-use zones where most of the time fisheries are low.

The neighborhood effect was assessed through the distance to the nearest neighboring reserve. The age was considered as the years

since effective enforcement and not the year when the MPA was established, because sometimes effective enforcement began later on.

The distance to the closest MPA is an important component of a network design that can be selected during the planning phase, and mathematical and theoretical work showed the importance of distance on the overall network effectiveness. However, the optimal distance in the corresponding studies varied depending on the management goals, or on the input data, or the assumptions made in the models.

So the initial data set we worked on on this project was consistent in 58 case studies from 19 MPAs, distributed over 3000 kilometers from the central Mediterranean to the northeastern Atlantic. The data spanned a period of 42 years.

Then we retained studies by the [inaudible]. The protected location had to be a true no-take zone. Control location had to be in unprotected areas, and the data set had to report all fish species that could be identified and counted based on the survey techniques used.

This led to a final database consisting of data from 40 studies, from 12 MPAs distributed over 2500 kilometers. Here you can see the distribution of the MPAs: you have the central Mediterranean, you have the northeastern Atlantic, and for each MPA you can have the name of the MPA, country, the date when effective enforcement began, the size. The first size corresponds to the size of the no-take zone; then you have the size of the buffer zone. When you don't have any buffer zone, you have zero. And you have the distance to the closest MPA.

So now some of the results. On this figure you can see the MPA effectiveness represented as the relative fish density as a function of years since protection, and the size of the no-take zone. The plane here gives the fitted effect, so the average overall effectiveness of all the MPAs included in the study. The size of the sphere you can see here represents the weight of each study [in the overall study]. So each sphere is an effect size: it is the relative density of a given study.

Here, only by looking at the plane, we can see that for each year since protection there was an average increase of fish density of 8.3 percent. When you look at this axis, we can see that for every

tenfold increase in the size of the no-take zone there was a 35 percent increase in fish density.

So now a second graph, still the relative fish density, the year since protection. But now it is not any longer the size of the no-take zone but the size of the buffer zone. We can see that for each tenfold increase in the size of the buffer zone—so in this direction—there was a 31 percent decrease in fish density.

So to summarize these two graphs, we just have seen that the MPA's effectiveness within these regional networks is linked to the time elapsed since the establishment of protection, and that increasing the size of the no-take zone and decreasing the size of the buffer zone have positive effects on the response to protection. No results suggested that the efficacy of the MPA was affected by the distance with numerous neighboring MPA. I have passed all the math behind it, but it wasn't significant, that's all.

So therefore, we can conclude here that in the northwestern Mediterranean and northeastern Atlantic, the ecological effectiveness of when-enforced MPAs is not increased by the proximity of further MPAs. So such an ad hoc network, or regional network, could not therefore be considered as an ecological network of MPAs since the system of MPAs does not seem to meet ecological objectives that single MPAs do not achieve. However, I caution that other factors are at stake—for instance, the habitat discontinuities and fragmentation, larval dispersal, species disturbance, the dynamics that weren't accounted for just by the distance to the nearest MPA. But unfortunately we didn't have such information for all the MPAs.

So when designing or assessing the effectiveness of an MPA network, one should also account for the—at least in the studies cited here in the Med—one should account for the small spatial scales over which spillover can operate. So, in fact, in the studied MPAs here, these MPAs may be too far apart to act as a network at the regional scale. Besides, it has recently been shown that in the same set of MPAs, even mobile species with wide home ranges benefited from protection. In fact, the effect of protection was at least as strong for mobile species as it was for sedentary ones.

Finally, looking at densities of juveniles and small fishes, and contrary to what is often showed in some coral reef MPAs, no self-recruitment has been indirectly evidenced in these MPAs.

To conclude, expanding from the results presented here, a suggestion to design effective networks would be to build experimental frameworks using MPA networks to test ecological hypotheses about factors that potentially influence connectivity. Such an effort would, however, require the cooperation of scientists, managers, and decision-makers.

Finally, I would like to say that some of the results presented here come from a cooperative research project called EMPAFISH, and I would like to acknowledge the efforts of the colleagues who made this work possible. And, of course, thank you all for your attention. Thank you.

John Davis: Thanks very much, Joachim.

Joachim Claudet: Thanks to you.

John Davis: We now open up the webinar to the audience for the next 40 minutes. If you have a question for our panelists, and if you have not done so already, please feel free to raise your virtual hand on the webinar "Control Panel," click on the little hand beside your name, and we will call on you. When we do so please identify yourself so we know who you are and where you are from. Thank you.

Alternatively, if you don't feel like speaking out loud, you can submit your question in the question box that's also in the Control Panel for the webinar. We will be drawing from those questions through this question and answer session. So, thanks again.

QUESTION & ANSWER SESSION:

John Davis: We have a first question. It has to do with spillover, which played a role in both of your presentations. "When planning networks of reserves, spillover of adults and export of larvae can both be important factors, including for political reasons where there is opposition to closures from stakeholder groups. For various reasons, it is not always easy or straightforward to determine when spillover and export are occurring. What is the state-of-the-art these days in measuring spillover and/or larval export, particularly in MPA reserve networks?"

Billy Causey: Well if you want, I will start with that, John.

John Davis: Sure.

Billy Causey: I would like to point out that there are many technologies out there now, particularly through the use of sonic tags, that help us determine the movement of lobster and fish. We are having some of our scientists right now (particularly with the state of Florida working with lobster, as well as with different fish species), they have been putting transponders out on the water actually to receive the signals from these sonic tags. They are able to get pings off of these arrays of transponders, or receivers, and they can determine the movement of the lobster or fish. For example, the Western Sambo Ecological Reserve is an area that, for political reasons and for decisions by the Advisory Council, we stopped it way short of including some deeper habitats that are rich and important to the spiny lobster. We came back and asked the scientists to determine the importance of that habitat and should we include it in the future, and they tagged lobster and were able to determine that that area is, in fact, essential and very important for the biology/ecology of the lobster.

They are doing the same thing now with different reef fish species such as the mutton snapper.

Joachim Claudet: What I could say about this, is that from a sensory point-of-view as you say, Billy, it can be also difficult to assess a spillover, because sometimes it is quite expensive to have those kind of equipment. Many times, plastic tags have been used, but most of the time it is only for a few species that are protected by the MPA, and that are commercially targeted species outside. Regarding larval export, I was involved recently in a European project called "Biomex" (biomass exportation), and it was both dedicated to study spillover and larval export. They have really great results for spillover and for specific fish species, but it is really difficult to quantify the larval export from the MPA to outside, Most of the time we have to use genetics, and to work on connectivity through genetics.

Speaking of the Med: as I say, spillover, when it is evidenced, occurs most of time at really, really small spatial scales, and we are speaking here about 200 or 300 meters, sometimes not much more. This is because most of time fishers around the MPA are fishing the line, and those species that can go outside of the MPA are not really restoring the population outside because they are fished directly.

Billy Causey: If I could continue on that, John? As you heard from both of our presentations, water circulation and current patterns are very

important to a network. In the instance that I gave in the Florida Keys, the Tortugas Ecological Reserve is upstream of the nursery areas and the important habitats for the larvae as they settle out of the plankton. So fish that are in the plankton for about three to four weeks can, in fact, make their way into the seagrass beds, and into the nursery areas. So water circulation for transport is very important.

After we started seeing the success in the reserves, and the scientists were measuring larger fish—more fish—the naysayers, the opponents to reserves started pulling immediately, "Well, you can't prove spillover." Well, just this last year, recreational fishermen are starting to point to the Tortugas Reserve where the mutton snapper spawn (it's a major mutton snapper spawning aggregation site), and they are having record years with mutton snapper up and down the Florida Keys now, and they're starting to point to the reserves as the reason why.

So that's a little bit of success, when you can celebrate the fact that the stakeholders are now starting to point to the solution.

John Davis:

That's great. Thanks, guys. Actually, hoping to bring up for the next question, one that we received last week along the lines of recreational fishing, continuing what you were just talking about, Billy. The question came from a recreational fisher, and the main part of the question is: "In the context of the Florida Keys, how has the management team dealt with the perspective of many in the recreational community that any problems in low fish populations are more the fault of commercial fishermen, and that you shouldn't try stopping recreational fishermen from having fun or just catching a few fish for their own consumption? And in general, how have you dealt with the recreational fishing community's concerns in introducing MPAs, while also achieving real gains for marine conservation?"

Billy Causey:

I'll take that one first, and I'll just say that our Sanctuary Advisory Council, as I have mentioned, is made up of stakeholders. We have many recreational and commercial fisherman that become members of the Advisory Council, and they are not necessarily won over yet—they haven't seen the changes take place. As they see us include them in our decision making, and drawing the lines on the maps and so on, they realize that we have the same interest as they do. This is where we fail to communicate with the recreational fishing community: we all want the same thing. We all want more fish, we all want bigger fish, and we want the stocks to be like they were in those photos of 30 or 40 years ago. The

only way we can get there is using tools that have not been used previously, and marine reserves (and ecological reserves in our case) are proving to be successful. I think the thing that we need to do is really improve our communication with the recreational fisherman—the people along the waterfront.

We tend to run into more obstacles when we are working with the recreational fishing lobby. There is a lot of fear out there about the use of this tool, and they tend to think that we are trying to target them and eliminate recreational fishing. Well, this is not the case. I am a recreational fisherman, I fish a lot, and I enjoy it.

Now as far as commercial fisherman, they have seen the changes. We do not have near the opposition or concern from commercial fisherman, and, in fact, when we implemented the Tortugas reserve, we did not have one commercial fisherman stand up before the Governor and Cabinet and oppose the reserve. We had one recreational fisherman representing an organization that lobbies for recreational fisherman that did stand up and oppose it. Governor Jeb Bush, at the time, said, "Shame on you."

So commercial fisherman, I am not saying that they have not been responsible for fishing down stocks. I am just saying it's a different climate now. We have more people out there taking a lot of fish under the disguise of recreational fishing. We just had a spearfishing tournament here in the Florida Keys, and hundreds of pounds of fish that were landed by spear fisherman were taken over to the docks and sold.

Joachim Claudet: If I can jump in on this issue? In the Med, we are facing a huge problem, because we have very few studies that manage to quantify the catch of recreational fishery, and most of the time they were even higher than the local commercial fishermen. It is really difficult to manage pleasure fishery in these places because contrary to the U.S. they are not at all organized in lobbies, or clubs, or whatever. They are non-residents, most of the time. They are tourists. They don't want to say what they fish. They think they can do whatever they want, as usual. And, of course, they can't represent that they are numerous, and even if they fish not that much, there are so many that at the end it represents a lot. It is really difficult to implement some management actions toward them because they are not at all organized, and they don't have representatives, or that kind of stuff.

So it is problematic in the Mediterranean.

John Davis: Okay, thanks. The next question is: "Can you please tell us what the impact is of enforcement on the effectiveness of both types of MPA networks that each of you have talked about, whether it is the Florida Keys or in the Mediterranean?"

Joachim Claudet: If I can drop in directly, Billy? There is a really nice paper that came out in *Biological Conservation* a few months ago, by Paolo Guidetti from the lab here at the University of Salento, and, in fact, he studied the 15 Italian MPAs. I guess Italy is the Mediterranean country with the highest number of MPAs. Most of them did not have effective enforcement, and, in fact, he showed that only three of those 15 MPAs were effective at protecting densities and the richness of fish species, and at increasing size of fish species. Those three MPAs were the only three ones where there was effective enforcement.

So I would say that enforcement is crucial, and is the most important aspect of MPA effectiveness.

Another point is that sometimes syntheses on management effectiveness in other parts of the globe didn't see an effect of size as I showed here on MPA effectiveness. I guess that this can also be linked with enforcement, because even if big MPAs can be more effective at increasing fish densities, they can be more difficult to enforce and poaching can be higher. So I guess tradeoffs should be done between enforcement and size.

Billy Causey: I would add that enforcement is absolutely essential to effective management of MPA networks.

Now, there is a certain amount of the public that immediately comply, and I use the 80/15/5. Eighty percent of the public out there will pretty much comply if they know what the regulations are, but you have to have an enforcement arm, and you have to have an education and outreach component to get that information to that 80 percent.

Fifteen percent of the public coming down here—now realize, these are Billy Causey's estimates—15 percent of the public coming down to the Keys will go about their business until which time they're confronted with the law. Then 5 percent get up in the morning just to break the law. It's that 5 percent that you have to absolutely hammer, or you start eroding at the base of the 15 percent, which will erode at the base of the 80 percent.

So you have to make a commitment to enforcement. But enforcement comes in many designs. Education and outreach does, in fact, provide and support enforcement activities by providing the right information. In the Tortugas, we do have a crew that is dedicated to making that 70-mile trip west of Key West, way out into the ocean, to enforce the regulations there. In the first two years, they actually shut down some illegal poachers that had been working out there for years, and things have changed enormously. You have to make that commitment.

John Davis:

Great. The next question refers to ecosystem impacts. Billy, you referred several times to ecosystem considerations—and I know that it's a big part of your research as well, Joachim. The data set for Florida, that you showed, Billy, indicated fish population increases within the no-take zones and anecdotal evidence of some increased fish population outside the no-take zones. We've already talked about spillover, and larval export. What are, in general, the measurable ecosystem benefits of the Florida no-take zones that you talked about, Billy, and Joachim, the reserves in the Mediterranean?

Billy Causey:

I'll start here with what John Burke and his colleagues have been getting from NOAA's NCCOS program, and that is they've been looking at the importance of even soft substrate and various habitat types in the coral reef environment, and the changes that take place with the reserves in place. They have been doing this since the reserve went into effect in 2001, and now they're starting to see this predator/prey relationship. We all know that if you go to a coral reef around the Caribbean, you have so many black colored damsels, and those damsels are just eating away at the branching corals, you have Acropora corals, and they're setting up their little nests. Well, they seem to be out of control, and they're out of control in places here in the Keys. Well, are we going to start seeing some of those little damaging damsel fish disappear with these increasing predators? I say yes. So I think on a small scale, we're seeing a tremendous amount of benefit and may be experiencing it both scientifically and anecdotally.

The other thing is that John Burke and his colleagues found out how important even the soft substrate is to the overall health of the system, and just one centimeter of sand in 50 feet of water produces more photosynthesis than the whole water column above it.

So this is really important when we think about trawling and all the physical disturbances. So reserves can serve to benefit the ecosystem in many ways.

Joachim Claudet: For the Med, if we first focus only on the fish species, even when we have increases of large predator species in the MPAs, both in density and size, we don't have evidence yet of a decrease in the small prey species as has been evidenced in many MPAs in the coral reefs.

So for the moment we have positive effects in terms of density increase and species richness, but no decrease of small species or prey species. They remain equal inside and outside the MPA.

Regarding habitat and trophic cascades involving fish and invertebrates, such as fish preying on the sea urchins, we have evidence in many MPAs of restoration of habitats from complete barrens with sometimes no life due to too many sea urchins that were eating all the macroalgae. So we see an increase of their predators—for example, the *Sargus* population—and then a decrease of the sea urchin through trophic cascade and restoration of habitat with macroalgae instead of barrens.

In the Med it is positive to have macroalgae habitats, not as in the coral reefs.

John Davis: Okay, thanks. The next question deals with engaging stakeholders. One person wrote in to say that her experience with stakeholders has been less positive than the example in the Florida Keys. I assume she's talking about the Tortugas 2000 process rather than the earlier stakeholder interactions that you had, Billy. She says, "We have problems getting the key stakeholders to come to the table during the design process. What carrots or sticks did you use to ensure their participation?"

Billy Causey: Okay, yeah. In the '90s we mostly used sticks. I think the big lesson that we learned in the 1990's was no matter how much you coerced or tried to prod them into getting engaged, there was a certain feeling that if they engaged then they immediately bought into whatever you were planning. I will say that the only group that repeatedly voted against the zones early-on was a recreational fishing lobby representative, a very well-known group along the Gulf Coast and Southeast, and she was told to vote against it each time. She finally left the process.

So what we really did is we started looking for people that truly made their living on the waterfront: the charter boat captains, the commercial fishermen, the flats guides, the charter boat fishermen that run the \$500 paying-customers out. We brought them into the process so they could experience it themselves. But I think what really helped us overall was that we demonstrated we were listening. Early on in the process, you need to let the stakeholders that are involved know that (1) their time is not wasted, and (2) you value their input.

I used to tell the commercial fishermen, "You have Ph.D.'s in commercial fishing. We need your input." With the Tortugas working group, we let it diversify. One commercial fisherman cannot represent all commercial fishermen. There are trappers. There are scale fishermen, hook and line fishermen. There are netters. There's all sorts of types of fishing going on, so you need to have that representation.

So we demonstrated confidence in them by listening to them, and when they wanted to have someone else like a Hispanic lobster fishermen, then we brought them into the working group. So we really had to work harder at the second time around to get that stakeholder involvement, but now they realize that when they do get involved we listen to them.

Joachim Claudet:

If I can say something about this. First, it is a really difficult question to answer easily because I can speak indirectly of something I was involved in, but it wasn't initiated by me.

Around here where I'm working, we have two MPAs. Someone here initiated a project of co-management in the MPAs, involving researchers, scientists, the MPA managers, and the fishermen. The project was to open a sector of the no-take zone to regulated fishing where fishermen were involved and had to reduce their fishing effort—they were able to fish only once a week. And all this stuff was decided by a common bottom-up approach.

In one of the MPAs, they agreed. Everything worked and now they are so happy because their catches are higher where they can fish with the restricted condition in the MPA, even once a week. They even say that they would agree to reduce their fishing efforts [further] if that's what the results would require. They have even obtained an ecolabel from this, because they fish inside an MPA in a sustainable way and fish prices are higher. Besides, fishes are bigger, and they can even sell them at a higher price.

In the other MPA, even with this positive experience of the professional fishermen—the other fishermen don't want to try it at all. We organized a working group with the fishermen fishing around the two different MPAs, but it was really difficult, even with the [first group of] fishermen saying that the benefits were a lot, in terms of money, in terms of everything—of revenue—from this experience, the [second group] didn't want at all to do it.

So it may be difficult and it really depends on the people and stakeholders, I would say.

John Davis: Okay. Thank you.

Next we have a question that is directed specifically to you, Joachim. It regards MPAs in Africa and the Middle East. "How do you engage MPAs in those places to improve the Mediterranean Sea network?" I think that you had at least a couple sites in the Canary Islands that were part of your study. Also, if we could maybe even broaden this question to include Billy. I know that as part of your southeast regional work, Billy, you're also looking at MPAs in the Caribbean, not just in US waters. So perhaps you can jump in as well.

Billy Causey: Sure.

Joachim Claudet: So first, let's speak about Africa in general, not only the Mediterranean parts, and there are many well-enforced MPAs in the eastern parts—in Kenya, Madagascar, Mozambique—and they have been studied a very long time. There are lots of data and many interesting results, and they are an effective regional network, I would say, in this place.

Now regarding Middle East and North Africa.... In the Mediterranean, there are some MPAs, but for now they are mainly paper parks because they are not enforced that well. They are not really well managed for the moment, and they are all involved in the MedPAN South project I was speaking about. So there is some capacity building, some training that is engaged, and the objective of this MedPAN South is to involve all of these MPA into a regional Mediterranean network of MPAs, at least at the scale of the managers, to share best practices.

So, I mean, there are MPAs—not enough in these places—but there is a lot of desire for paper park MPAs to be effective, let's hope, in the near future.

Billy Causey: Yeah, I'll jump in. There has been a huge amount of interest in national marine sanctuaries over the last eight, ten years, or so. Right now in our National Marine Sanctuary Act, which is reauthorized every five years by Congress, they took a position back in 2000 to really restrict any more sanctuaries from being designated until which time we had all the sanctuaries operating at a reasonable level financially, and so on.

During this time, it's allowed us to put more emphasis on our existing sites around the region, and particularly around the entire national system, and we're getting a huge amount of public interest in more sanctuaries. One in particular, we have one on right now in Florida—there's interest off the northeast Florida coast—but we had a project that we're working on that it's on pause because right now we're not prepared to move it forward. But it was one that was referred to frequently as "Islands in the Stream," or it was a network of marine protected areas around the Gulf of Mexico. We were even talking internationally, through second and third parties, to Mexico and Belize, about including them in an international network. This is a project that, again, is maximizing the benefits of the current flows coming through the Yucatan Straits, up between Cuba and Mexico, entering the Gulf as the loop current. And there are many topographic prominences around the Gulf of Mexico that are very unique, that are very diverse coral reef environments, and this is something that has been of keen interest. Right now, we're not moving forward with that project because we have this restriction. We're waiting for our reauthorization to be approved through Congress, and we're hoping to see that move at some point to where we, once again, can take these initiatives that are being generated by the public and start moving forward on them.

There's interest in Puerto Rico right now, for some sanctuaries somewhere in and around Puerto Rico.

John Davis: Great. Thanks, guys.

Sarah Carr: Okay, John, Dan Clark raised his hand. Dan, are you there? You've been unmuted if you want to ask your question. Anything from Dan? Okay, well, John, we'll go on with the questions then.

John Davis: Okay. We have a brief, perhaps loaded, question. It says, "What advice would you give to someone planning to set up a no-take MPA"—in this case in Florida? I'm not sure what context this person is writing from, whether he's a stakeholder, or in management, but if you'd like to try your hand at that question....

Billy Causey: Well, definitely the advice I would give is, both sides—and I hate to say there are sides—but people with interests should, again, focus on our common interests, and that is to improve the coastal and ocean resources, and to protect and conserve them with the very best tools available to us.

Now I'm not talking about just the fish that we want to take home in our coolers for our families to eat. I'm talking about the fish that are important to the health of the entire system.

So I would advise people to really get involved with the process. If you're a stakeholder, I would get engaged, I would stay engaged, and really stay on top of the literature. If I were a manager, and if this question were coming from a manager, I would say keep the process open, keep it transparent, and keep it inclusive of all the stakeholders—that's from the government agencies right down to whoever is being affected in various ways.

I think openness, honesty, a good dialogue and communication will take us a long way.

John Davis: Great. All right, we have a question on MPA networks in developing nations. "Can MPA networks be achieved in nations"—in the questioner's case, it was Nicaragua—"where the economy is relatively poor, and fisheries management is not strong? And if so, how can it be done?" This could be answered by either of you, basically, in the context of developing MPA networks in developing nations.

Billy Causey: Go ahead, first.

Joachim Claudet: Okay, I jump in. Yes, I think it can be, but first there will always be cases of paper parks, as I can say about North Africa and the Middle East, and even in many parts of Italy—developing countries are not alone with the problem of enforcement and of poaching.

So, as you said first, Billy, the process needs to be transparent, every stakeholder needs to be involved, objectives need to be clearly defined, and the whole project needs to be well sold. Communication is important in those cases. Of course, enforcement will be important, but even without speaking about networks, but sole MPAs, we can see effects on the catch. I mean, fishermen can see positive effects on what they fish after one, two, or three years.

So if the legislation is well enforced at the very beginning, and MPAs can be effective, positive effects can be used to convince the local communities that such approaches can be really effective. I think it is not a problem of developing or not developing countries. It's just having appropriate enforcement, good communication to stakeholders, and—this might be problematic—having people to collect data and to show that those MPAs are effective.

Billy Causey:

Okay. John, I would argue that, yes, in areas like Nicaragua, MPAs—marine protected areas—fully protected areas are very feasible. I would even go as far as to say that this is the major tool that should be used when you don't have the infrastructure or the resources for a lot of enforcement, and a lot of fisheries management enforcement. You can't deny that if you mark off an area and you don't allow fishing in that area, that fish won't become more abundant and larger. What happens over time as the locals see this, they start embracing it and engaging it, and you start getting more of a self-policing situation. This has been proven in the Philippines, and many Indo-West Pacific areas, where it's been really the communities that have embraced this concept.

When you come in with a lot of size limits, and bag limits, and seasons, it does become an enforcement nightmare and issue. But when you set areas aside for the long-term, you will get benefits that people notice and embrace.

John Davis:

Yeah, excellent points. Thanks. The next question steps away from fishing and fisheries—which we've been talking about for the most part—and talks about other human impacts: "Are you aware of any instances where commercial shipping traffic and its impacts on an MPA have been addressed—in MPAs or MPA networks?"

Billy Causey:

Yeah, I do. One of the things that led to the designation of Florida Keys Sanctuary—many things led to the designation—but one of them, the last straw, was the fact that we had three major ship-groundings on our coral reefs in a 17-day timeframe in 1989: October/November of 1989. This was what prompted Congress to take immediate action to protect these coral reefs. In doing so they embraced an International Maritime Organization "Area To Be Avoided" that was being designated off the Florida Keys, and put that into federal law.

So now ships passing through the Florida Straits have to stay about six miles off the reef track. This has really benefited, in fact, that

we haven't had a major ship grounding now since February of 1998, whereas before that we were having at least one or more every year.

So that's one instance where shipping traffic has been affected by MPAs. Also, our Stellwagen Bank National Marine Sanctuary has done a phenomenal job of looking at the right whale, and the movement of the right whale, and adjusting shipping lanes in that area to avoid areas that were high in whale strikes. They've been able to really adjust that with a little bit of effort on the part of the shipping community—a little bit more cost to them—but it is keeping that endangered species more protected.

The same thing off our West Coast. The Monterey Bay National Marine Sanctuary has shipping corridors to keep the ships well outside harmful areas.

John Davis: Are you aware of any similar measures, Joachim, in the Mediterranean, in some of the MPAs that you've studied?

Joachim Claudet: No, no, because they are mainly really coastal; they are smaller than the whole Florida Keys network. No, I don't have an example of such a thing.

John Davis: Okay. All right, the next question is directed toward the Florida Keys. "What kinds of changes—whether it's more and/or bigger reserves, or other sorts of management actions—is the Florida Keys management authority aiming at for increasing the effectiveness of the sanctuary for resource restoration, and reducing user conflicts, and whatever other goals the sanctuary holds?"

Billy Causey: Well, we've had a huge interest in our marine zoning plan in the Florida Keys, and the sanctuary superintendent Shawn Morton and his crew are going to be entering into, within a year or so, a management plan revision process where they'll be looking at the marine zoning plan that we have now.

Things that we've already heard from the public during our scoping meetings is that they'd like to have more of these wildlife management areas. These are 27 areas, and they've actually turned out to be our stealth tool. We wanted to reduce conflicts between various boating activities (such as personal watercraft and flats fishermen) and various bird roosting areas, bird rookeries, and so on, on the shallow seagrass flats and the mangrove habitats. By establishing these 27 wildlife management areas and marking

them, we've been able to keep a lot of these motor craft outside these sensitive habitats. The flats fishermen love them! They're not harassed by other boaters or other personal watercraft, and that's been very beneficial.

We've also had a desire for more of the sanctuary preservation areas, which are smaller in size; they range from roughly a quarter of a square mile, to one-and-a-half square miles in size. Those were established as no-take areas, but really to eliminate user conflicts between spear fishermen, tropical fish collectors, lobster divers, and shell collectors, with the other activities that were going on there. By moving those activities outside those heavily used sanctuary preservation areas, we saw an immediate response: the divers are not snagged by charter boats trolling through the area anymore. We don't have the conflict between the diving and the fishing. There's certainly more appropriate areas for the fishermen to be fishing in, and what we've done is actually move them out. We're hearing people want more of those in the Keys.

We've also heard some interest about fine-tuning the boundaries of our existing ecological reserves. Right now they fall short of protecting all of the habitat that needs to be protected, and we're hearing some interest from the scientists about expanding these slightly in some areas.

As far as another large ecological reserve, we're hearing that some want them, some are concerned about any more at this point. I think we'll really vet that out of the process, as to whether or not we have any more large reserves. In my estimation, they are needed, but they need to be done right, in the right place, with the right scientific input, and the right stakeholder involvement.

John Davis:

Joachim, have you observed any management trends in some of the MPAs that you've been studying in the Mediterranean? Any new directions?

Joachim Claudet:

I could give two contrasting examples. In the Corsica Islands, which are French (really close to Sardinia Island, which is Italian), there is a big marine park. The authority here managed to expand the protected area size, which is a buffer zone with multiple-use. They were able to change every five or six years the uses that are regulated. They were able to implement new complete no-take zones, and no-access no-take zones. They were even able to expand the marine park to Sardinia, which is now a transboundary park between France and Italy, like between Corsica and Sardinia, between two countries.

The contrasting example: There is an effectively working MPA in the southwestern French Mediterranean [Cerbere-Banvuls], really close to Spain, and this MPA is really close to another one—the Medes Islands MPA, which is Spanish. Here all the currents are going from the French MPA to the Spanish MPA.

So first the MPA managers wanted to increase the size of the no-take zone, and of the buffer zone (in the buffer zone, the local commercial fishermen can fish), but it was really difficult, and the management team faced great difficulties to do this.

Then they wanted to implement a transboundary marine park between France and Spain, to build a network upon those two no-take zones, but the work is in progress. It will hopefully happen, but it is really difficult to do this because of many administrative problems. Even though we are all in Europe, it is really difficult.

So sometimes it is possible, sometimes it is not. This is what I would say. It can be tough in some places to change the regulations.

So if people are about to design an MPA, or a network of MPAs, what I would say from my scientific point-of-view, and even from my practice, is that it is, of course, better to try to target initially the best size, design, and whatever, according to your initial objectives, because once it is in place it can be really difficult to change it.

John Davis:

Thank you. We have about ten minutes remaining in this webinar—in the question and answer portion of it. So audience members, if you have any more questions that are on your mind that you'd like to submit, please do so and we'll try to get to them before we close up shop today.

We have a question here regarding the importance of before/after/control/impact studies, mainly the importance of monitoring fish stocks in your MPAs both before and after designation. Could either of you, or both of you, talk a little bit about the role of such studies in monitoring the effectiveness of MPAs, and your thoughts on that?

Joachim Claudet:

Billy, I can jump in—okay, go ahead.

Billy Causey:

You go ahead first.

Joachim Claudet: Okay. Yeah, I can speak about that because I have worked a lot on the most appropriate experiments of design and statistical issues around MPA assessment. Of course, if it is possible, if you can, you should always go for before-after-control-impact design. It is the best way to reveal an effective MPA. I think that only one Mediterranean MPA was assessed with such a design. It is the best way to partition the natural variability from what is really due to the MPA.

When you can't—and most of the time you can't because MPAs are already established, and you either have to monitor them or assess them—I would go for what is called a "Beyond-ACI." So, beyond-after-control-impact, so you have multiple controls to compare the situation from what is happening inside the MPA, to what is happening outside. Those controls should be really in the same kind of habitats. There are many external factors that can have an influence on the fish distribution—for example, if you monitor fish—and the more of these factors you can control, the better it is. So habitats, death, all those factors.

So BACI designs are the best: before-after-control-impact. If you can't, it is better to have multiple controls. And, of course, large time series also are really good.

Billy Causey: Okay, I certainly concur. It's essential—and I think we owe it to ourselves and to the public, and to the stakeholders—to be able to measure and gauge success or lack of success. I think monitoring these areas prior to the designation is ideal. As you saw in the Tortugas area, Dr. Jerry Ault and Dr. Bohnsack were both able to get funding to work in that area two years prior to the designation of the ecological reserve, and they were able to demonstrate change within three years. That's incredible, and I think it's so important to know if we've done it in the right place—if we have them sited in the correct locations. There are many questions that need to be answered about the use of this particular marine spatial tool. One of the things that we really try to do—at least from the minimum, from the start of the designation—is to have monitoring going on.

Now we tend to talk about not doing these [reserves] within sanctuaries for fisheries management purposes, but rather for protection of biodiversity of an area, and so on. But the very thing that people start to measure and want to see first are changes in the commercially and recreationally important species.

So knowing that, I think it's important that we have a full coverage of monitoring, from before implementation all the way through, and it needs to be continuous.

John Davis: Okay, thanks.

Joachim Claudet: If I could just add something. Most of the time we focus on ecological effectiveness. But it can be also important in this same kind of design—a BACI design, before-after-control-impact, or multiple controls—to collect and to assess, and to show the success of the MPA through socio-economic studies, because they can increase income of the resident and also the income of a fishery, of course. I mean, everything we say doesn't apply only to ecological effectiveness.

John Davis: Okay, thank you. I have a Convention on Biological Diversity question for each of you. Relating to the definition of a "network," are there any examples of jurisdictions that have attempted to apply the CBD COP 9 decision for criteria for MPA networks? Can either of you speak to that?

Billy Causey: No, I cannot.

Joachim Claudet: Neither can I. I mean, in the Med there is not any true network. I mean, all the existing networks are either big marine parks with several no-take zones and multiple-use zones managed by the same authority (but they are more a big marine park than a network, because they are not—as I showed before—designed according to connectivity, etc.), and others are a regional network or ad hoc network that are considered to be a network because they protect a certain amount of the coast, but they are not even connecting one to another.

John Davis: Okay, thank you.

Billy Causey: I've certainly become familiar with this.

John Davis: Okay. I think I mistakenly deleted some of the questions in the "Question Panel." Actually, I think most of them we had already asked, but what would you say are the biggest challenges with regard to designating MPA networks? How do you address those challenges?

Joachim Claudet: I would say connectivity—assessing connectivity. This is really tough. To have a really effective ecological network—even effective in terms of economic or social goals—you need

connectivity among the protected components. I think the major issue for designing and even for assessing networks is to design them according to fish connectivity.

Billy Causey: I'll make it short, and just agree with everything—fully agree.

John Davis: Okay.

Billy Causey: I think the question right now that is so important with networks and marine protected areas, is the effectiveness of the connectivity, and I think looking at sources and sinks, and looking at the importance of movement, these are all criteria that need to be incorporated into what would be a network.

Joachim Claudet: Because from an ecological point-of-view, it is the only way that a network of MPAs can work better than just a collection of several MPAs—connectivity.

John Davis: All right, I think it's a tremendous call to scientists young and old out there, the need for research that management has in order to design and manage these networks effectively. What you guys are both calling for is basically a lot more research to be done to inform effective MPA network management.

Joachim Claudet: Yeah, but I would also go for the importance of the involvement of—I tried to tackle this issue in the presentation—decision-makers and managers. Because if you have an existing network or newly designed network, and if you don't see connectivity—or if connectivity is too low between the components (the protected component, or the protected reserves)—then you need to be able to change the design of the MPA. So you need to consider those new networks as experiments, and to be able to change either the location of the no-take zones or the distance between them according to scientific inputs on connectivity. You also need the involvement of managers, decision-makers, and stakeholders.

So the importance of connectivity has to be not only acknowledged by scientists, but also by all practitioners of MPAs, I would say.

Billy Causey: That's such a critical point, and those are excellent points. I'll take it one more step in that we also need to look beyond jurisdictions. It's pretty hard to sometimes say, “Blur the jurisdictional boundaries,” but I'm not talking about usurping anyone's authority in say, for instance, another nation. I'm saying this is how we collaborate and work together to increase the capacity to improve stocks that have been diminished. A network doesn't just stop at

the border of another country, and this is where we need to work more collaboratively, and look at international networks of MPAs.

John Davis:

I think that's a good point to end on. With that, we conclude this webinar. I want to thank Billy and Joachim for contributing their insights, and the audience for participating as well. I know that there are still a number of you who have questions that we've not yet gotten to, and we want to hear them. Anyone who still has a question, please submit it in the Question Box on your webinar screen. Your questions will be invaluable for informing future issues of MPA News, and we look forward to tracking down answers for you.

Also, upon departing the webinar today, please participate in the poll question on the usefulness of this session. As I mentioned at the beginning, we're looking to learn from this event. If you'd like to add any comments in response to your poll answer, you can use the Question Box for that as well.

We will leave the webinar open for the next five minutes or so to allow you time to contribute your questions and comments. Again, thank you for participating, and we look forward to hearing from you.

Billy Causey:

And, John, thank you and Sarah, both.

Joachim Claudet:

Yeah, thank both of you.

John Davis:

You're very welcome! Thanks, Sarah.

Sarah Carr:

Yep, okay. I'm on, and thank you guys. That went really well. So, we'll just leave it open for a few minutes if you guys want to stick around or not, you can go as you need. Oh, actually, let me stop the recording.

[End of Recording]