Transcript of EX introduction 2018-02-06 trimmed.mp4

Good Morning, Good Afternoon, everyone. My name's Brian Kennedy and I'm one of the exhibition managers for NOAA's Office of Ocean Explorational Research and today we'll be doing a quick introduction into operations on board the NOAA Ship Okeanos Explorer and her capabilities.

First, why do we explore? I think all of you probably watching this video have a pretty good idea in your own answers for why ocean exploration is just as important, but as we all know, our reliance on the ocean to produce oxygen, for trade, for commerce, for resources, is super important, and the fact that we have only explored 5% or so of our ocean is really silly. It's the job of OER and the Okeanos Explorer to help roll that number back, to go out to unexplored sections of the ocean and get that first kind of glimpse of what's there and then disseminate that data as widely as possible. One of the things that makes the Okeanos Explorer program kind of different is the way we approach ocean exploration beyond just the fact that we're America's only federal ship dedicated to ocean exploration, and part of that is that main objective that you see there in the first bullet, to go out and get that first-look characterization of higher priority areas for ocean exploration. Our goal is not to go out and fully characterize the area, or do individual research. It's to go out there find an interesting site, collect enough data to peak someone else's interest, bring that data back and disseminate as widely as possible. Think about it more as a hypothesis generating ship than a hypothesis testing ship.

One of the other really kind of different ways we do things is we do operations on the Okeanos Explorer that are mission-driven not PI-driven. So how that really looks in operations is we don't expect a volunteer or a scientist to come and say my lab researches this organism, I need more of this organism, I need you to find this organism here for my research. We expect you to come and represent the kind of marine science community in general. This is a cap in our understanding from my discipline. If we can understand these types of organisms better, that would help. So please don't come to an operation with the Okeanos Explorer expecting your own particular lab to get data for their research. We hope you will work up the data and whatnot but don't come with your PI hat on; come with a kind of more collaborative nature of, this is what we think we need from the Benthic ecologist's need to understand about this area, or this is what fisheries biologists is a shortcoming[?] to understand. We try and represent those ideals and those broader categories when suggesting dive sites and participating with the Okeanos Explorer. We want to see that kind of mission-driven collaborative nature come together in the daily operations of working together in an interdisciplinary team to locate dive sites, plan dive sites, and dive plans that accomplish the most for as many different people and bring back the broader breadth of data as possible, instead of just going down, finding one spot, and focusing on it, and getting a traditional amount of data from that particular area. We're going

exploring. We're looking for multiple sites to the dive, we might try and look for Benthic Community for part of the dive and then go look for bottom fish for another part of the dive. We try and optimize across disciplines or areas that are really hard to access and it may be years before another vessel is able to access those areas again.

What is the third kind of further that collaborative idea of serving marine science in general, is our data sharing policy. Any data that the ship collects is publicly available as quickly as possible. We try and live stream or near real-time send the data to the collaborating scientists on shore through a suite of methods we call our collaboration tools, which before an expedition will be a whole training set to teach you all how to use these collaboration tools. So, you'll have access to FTP, things like that, that you can download the data within hours of it being collected from the ship, and then post-cruise, all the data we collected is archived in one of the NOAA repositories within 60 to 90 days post-cruise for anyone to access. We kind of take the approach of trying to collect the data and archive the data in such a way that it can be used for purposes we can't even imagine right now 15 or 20 years from now. Even if the use of the data hasn’t been invented, we're hoping that it will be able to be used in those ways later on. We do that by building really good metadata records, being very careful in our archival format and everything to make sure that this data will remain evergreen for decades to come.

A little bit about the specific ships capabilities. This is the Okeanos Explorer, she is a 224-foot T-AGOS class, she was built by the Navy in the 80s as a surveillance ship and then she came to NOAA in the mid-2000s and retrofitted to the ocean exploration platform we know and love today. She's America's only federally dedicated vessel to ocean exploration and that's her sole job within NOAA, exploring the unknown and poorly known areas of the U.S. and world waters. If we kind of think of it in three different operations: the reconnaissance to go out and make the map. It's a very basic idea of what the area is like. Looking at the water column both CTD operations and our ROV dive looking at the broader community, and in the Benthic kind of component of the site characterization of going down, ground truthing the sonar and chemical data and trying to get a much better idea of what actually is on the sea floor.

Here's a list of the ways all of our data has been used in the past. I think we are all continuously surprised by what people have found ways to use our data, and hope that that will continue for many, many years to come.

Probably one of the most important datasets that we collect is our mapping data. We have a nice suite of sonars from a 30 kHz EM302 Multibeam that is capable of giving us seafloor bathymetry and backs data for both the seafloor and the water column. We have a suite of multiple frequencies, the EK60 Split Beam fishery sonars, a 3.5 kHz Subbottom Profiler, and two frequencies of Acoustic

Doppler Current Profiler.

This is a couple of examples of the data types you can get off the Multibeam: the standard bathymetry there in the top left; Seafloor Backscatter there on the top right. That gives us an idea of the relative hardness or the relative intensity of the return from the sea floor. It's not calibrated so they're not absolute values, but this is a very useful tool when looking at ROV dive planning and trying to come up with the highest likelihood of getting hard bottom communities. Then down to the bottom, you see the water column backscatter, and that's a combination of data from both the Multibeam and the EK60. That triangular swath there is the backscatter recording from the multibeam, the more boxy looking one is from the EK60, and then those vertical multi-color lines that emanate from the seafloor are gas bubbles that were detected by the sonars emanating from the seafloor. Here's a good example of our subbottom profile data. It gives you an idea of what's beneath the sea floor in terms of geological layering. This is great especially for finding some gas and bury channels at 3.5 kHz system. On a really good day, we can get up to 80 meters of penetration into the sea floor.

To the greater example of the echogram from the EK60 system: the green stuff over the water [combee], the biomass that red line being the sea floor. Then those vertical emanations from the sea floor that are darker in color are likely gas plumes. And then last but not least, to give you an idea of what the ACDP data looks like that we collect from the Okeanos Explorer.

One of the other systems, a workhorse kind of system, we've got a Seabird 911+ CTD, to that we've added an Oxidation Reduction Potential sensor, Dissolved Oxygen, Light Scattering Sensor, and an altimeter. It can also be fitted with 24 2.5L Niskin bottles. We don't normally do water samples as part of our normal operation, but for specific areas or regions, if there's a real need to collect water samples, certainly talk to the Expedition Coordinator Manager for that project and we can see if we can accommodate them.

I'm thinking about the ROVs here. ROVs are two-body systems so both platforms operate in tandem underwater, Seirios being the camera sled there on the left, and Deep Discover being the primary ROV on the right. They're both weighted to 6000 meters. Like I said, they work in tandem supported by a 6-8 Electro Fiber cable truckling down from the ship. Between the two ROVs, there's over 11 cameras. The lighting on these vehicles is amazing. They have over 250,000 lumens of light between the two of them. D2 has specially fitted swing arms that allow us to maneuver the light angles and change them in real-time underwater so we can see under ledges or optimize the shot for a certain organism. It's really an amazing imaging platform.

Both vehicles also have the same CTD setup as the ship's CTD, so every time we do an ROV dive,

we get two CTD casts, complete with the additional sensors the ORT, the LLS, the DO. D2 has several file boxes and geological sample boxes. I'll talk about that a little bit more here in a minute. It has two manipulator arms, a Kraft seven function force feedback, a predator arm, and then an Orion Shilling arm on the left side of the vehicle.

Imaging is really the primary dataset that these vehicles were designed to collect. The HD cameras on both vehicles are amazingly good, they have an 18-times optical zoom so that really allows you to fill the entire frame with a very small organism and certainly maybe even an entire acropora polyp. So, this example of the voteroid here. It gives us an insight into the deep sea and high resolution that really hasn't been captured before. They make for a wonderful science data without [?] trying to ID and even do some limited taxonomy work from visuals alone because you can actually count individual sclerites and things like that in organisms, as well as make for a wonderful education outreach tool to bring the beauty to the deep sea to people's home in near real-time. We do collect a limited number of samples on a dive. Right now, we have four bio boxes and two rock boxes so we generally limit sampling to four to six samples per dive so we can keep track of them. It's also a pretty delicate balance between taking the time to pick up samples and collect them and covering more ground and getting more imaging. It kind of depends on a cruise by cruise, dive by dive basis how many samples we take and what the actual objectives are for what sample we might want to collect, but we are able to bring back some of these specimens. Everything we bring back is publicly available through a national repository, just like the digital data, and there'll be more details about that in individual crew's planning process once we get there.

One of the very unique things about the Okeanos Explorer is our use of Telepresence. Telepresence loosely defined as the ability to use modern technology to give you the impression you are somewhere your body is physically not. In doing that we try and take you from pretty much anywhere in the world in an exploration command center, or working from your home institution and give you the perspective in the presence of being on the ROV on the sea floor anywhere in the world. We can get a video signal from the bottom of the sea floor to an ECC in about two and a half seconds. For the video and nearly real-time voice communication, it's measured in milliseconds to the ship to talk with the onboard scientists. Each time we sail with two or three scientists on the ship and then have another 100 to 150 scientists on shore participating in some form or fashion during an expedition.

We've got a couple of different models with people that work: some passively watch for their own interest and entertainment, some will travel to an ECC and be a core member of the team participating in every dive planning call and every dive, or at least every dive that is of interest to their expertise. Or you can even be a participant from your home institution that would have a couple of different

tools that allow people to participate without having to move to ECC. I mean, the vast majority of the 100-plus scientists on shore do not travel to an ECC, but we do try and get that core team together to work together. That was the collaborative dive planning calls. There's a whole suite of different technological tools you can use to get information and feel connected to the ship, and a lot more. I'll be going into the details about that and your individual crew's planning process and when we get ready to do the collaboration tools trainings and things like that.

The current ECCs are listed here. Like I alluded to earlier, there are some newer technologies that are allowing us to set up ECCs more easily and more widespread. If you're interested in hosting a group of scientists to hear institutions or crews, just talk to your Expedition Coordinator and Manager and we can talk through some of those options.

One of the other really important things about the Okeanos Explorer is the education outreach. Via streaming everything live for the scientist to be displayed on shore, we also stream it live for everyone to participate in the world from the general public aspect, so we do web coverage, we do different social media engagements, live interactions with school groups, with VIPs. If you're a core member of one of our expeditions you will likely be pulled into some form of educational outreach activity. We find this really important especially when exploring the deep sea that is so remote and so foreign to people, bringing them down there with us in real-time to enjoy the thrill of the discovery and really, I think most importantly, to see the scientists stumped. I found that as an education tool, seeing a room or hearing scientists stress all across the country or the world and none of them be able to identify what they're looking at, is one of the best engagement education tools we can possibly leverage through telepresence is seeing that scientists are real people and don't always know everything, is super important.

There will be more details at the end of your expedition about data access and whatnot, but it's really that core, everything is publicly available if we can make it and it's publicly available as quickly as possible. We have a whole suite of tools to allow you to learn how to access the data, access previous data, and all of that will be covered in a different training session.

Well thank you very much for your interest in the Okeanos Explorer program and NOAA's ocean exploration research. Please visit our website www.oceanexplorer.noaa.gov for more information or watch some of the other training sessions online. Thank you very much.