

Synthesized OEAB Meeting & Program Review Notes

Dates: October 9-10, 2024

1. Opening Remarks and Meeting Minutes.....	1
2. Advice Letter Review.....	1
3. FY2020 Program Review Results.....	1
4. Director’s Comments: FY25 NOAA Exploration Priorities.....	2
5. Focus Area 1 “Ensuring a Coordinated Program of National Ocean Exploration”.....	3
6. Focus Area 3 “Enhancing Public Engagement and Education”.....	8
7. Focus Area 2 “Advancing Technological Innovation in Ocean Exploration”.....	13
8. Working Session for Board Members.....	18

1. Opening Remarks and Meeting Minutes

- Vicki commended the structure of the materials that were provided for the focus areas.
- **The Board approved minutes from Meeting #26.**

2. Advice Letter Review

- The floor was opened to discuss the advice letter that will be given to Dr. Rick Spinrad.
- There were discussions regarding Ocean Exploration Advisory Board (OEAB) members wanting to see Indigenous communities’ participation in data decision-making processes, the Board’s scope with regard to supporting the transition from *Okeanos Explorer* to *Discoverer*, and data interoperability and accessibility.
- The Board changed a sentence within the advice letter to “Committed to providing input and supporting this transition in any way we can” with relation to *Discoverer* coming onboard.
- **The Board voted to modify and approve the advice letter.**

3. FY2020 Program Review Results

- David Turner presented a review of recommendations and actions from the FY2020 program review. 176 recommendations were made that were distilled into 46 unique actions. Out of 46, 42 actions were closed, and others were affected by external movements like the establishment of the National Ocean Mapping, Exploration, and Characterization (NOMECE) Strategy and Council.

- The FY2020 review informed the office by identifying strategies and techniques that enable remote ocean observation, setting a path forward for ship access, and improving media and outreach products to allow greater accessibility to the broader public.
- There were discussions about the program review's relevance and impact for teams, how to distill several recommendations into smaller messages, the internal review process, measures of success and how those are established, and the three review criteria.
- Climate change was brought up as a special topic to consider throughout the program review.

4. Director's Comments: FY25 NOAA Exploration Priorities

- Jeremy Weirich presented on NOAA Ocean Exploration priorities for FY25.
- Priority #1 - Continue the Beyond the Blue campaign to explore unknown areas of our United States Exclusive Economic Zone (US EEZ) in the Central Pacific and engage international partners in the Western Pacific to help them explore their EEZ
 - The Beyond the Blue campaign is an exploration of the Pacific, focusing on areas like Johnston Atoll and expanding to American Samoa and Palau.
 - During calendar year 2024, we expect to map 1% of the US EEZ on *Okeanos Explorer*.
- Priority #2 - Maintain and advance our field operations
 - NOAA Ocean Exploration is transitioning from older platforms like *Okeanos Explorer* to *Discoverer*, and adjusting ROV operations.
 - Calendar year 2024 expeditions have been 100% dedicated to mapping as the office transitions from a no-cost extension with Global Foundation for Ocean Exploration (GFOE).
- Priority #3 - Maximize the accessibility and use of our data while serving as a testbed for NOAA's best practices on effective data management
 - **Request feedback for the group on this priority, as it is one of the top on our list.**
 - There are partnerships with National Environmental Satellite, Data, and Information Service (NESDIS)/National Centers for Environmental Information (NCEI) to archive our data.
 - The team has been looking at Indigenous Knowledge as an important component of the data pipeline.
- Priority #4 - Partnership development - practical and meaningful
 - We want to strengthen partnerships with federal agencies, local communities, and international partners. This involves looking at current agreements to determine which should continue and which should be phased out.
 - We should better leverage existing funding mechanisms.

- There will be an emphasis on philanthropic operations in FY25.
- Priority #5 Continue to plan and prep for the transition from *Okeanos Explorer* to *Discoverer*
 - We are focused on maintaining operations during ship transition while preparing to integrate *Discoverer*.
 - **This is relevant to the Board; how do they want to be involved?**
- **OEAB members requested to be sent the slide deck of priorities and a breakdown of the office's budget distribution.**
- There were additional conversations about international efforts, data management standards internationally, mapping as not just being bathymetric/depth data, and Lakebed 2030.

5. Focus Area 1 “Ensuring a Coordinated Program of National Ocean Exploration”

Review members: Dr. Vicki Ferrini, Mr. Eric King, Dr. Kevin Hand, Dr. Peter Girguis

- **Question:** Where do Indigenous communities intersect with the Explorer Model?
 - **Answer:** We work within existing networks and partnerships (e.g., NOAA Sanctuaries) to connect with Indigenous communities, ensuring we avoid stakeholder burnout and leverage established relationships. When *Okeanos Explorer* returned to the Pacific, NOAA Ocean Exploration sought community input to prioritize local needs. Community suggestions led to adjustments in operations and inclusion of cultural liaisons.
- **Question:** How are the campaigns sharing resources, and how is NOAA Ocean Exploration involved?
 - **Answer:** Regional working groups foster collaboration among stakeholders, including federal groups, to ensure shared learning and benefit from collective expertise. This collaboration feeds into the broader Beyond the Blue campaign, which is bigger than just *Okeanos Explorer*, and helps NOAA Ocean Exploration share insights and data.
- **Question:** Have you been getting feedback from local and Indigenous communities and stakeholders with respect to data products generated?
 - **Answer:** Yes, feedback has been iterative. Outreach efforts are region-specific, and NOAA Ocean Exploration respects the diversity of values and needs in local communities. We receive input on areas where their data could be improved or expanded (e.g., suggestions on studying tuna or using sonar and plankton data), and the team considers adding or partnering on new data collection as needed. Even if our program cannot specifically tackle a problem, we can share it across our network to find someone who may be able to.

- **Question:** Do your protocols get shared with others so that when they are on the ship, they understand what is happening as they move from place to place so there is continuity? How much is their presence impacting efforts moving forward? How much of this inspires and informs what you do?
 - **Answer:** Permission is always sought before sharing data. In some cases, communities may not want their data shared, which influences how Indigenous Knowledge is integrated into the process, from data collection to post-operation. The Papahānaumokuākea experience is helping create templates for future partnerships, ensuring regional adaptability and early community engagement. The NOAA Ocean Exploration program is working to integrate protocols internally and share them across federal spaces and campaigns, such as the Great Lakes and internationally. Our partnership with the Ocean Exploration Trust (OET) and E/V *Nautilus* has helped evolve best practices, emphasizing collaboration and cultural sensitivity. OET has transformed how conversations occur at the Indigenous community level by centering traditional cultural information in expedition narratives. In collaborating with OET, we aim to avoid redundant engagement in overburdened communities. Over time, we have also improved processes to hold principal investigators funded by our Notice of Funding Opportunity (NOFO) accountable for engaging Indigenous communities.

- **Question:** What is the role that NOAA Ocean Exploration takes in the federal space? Is it through NOMECS or federal working groups? How is the country organizing these activities that lead to one common goal?
 - **Answer:** NOAA Ocean Exploration plays a leadership role in coordinating federal efforts, aiming to understand existing activities in an area before engaging. This coordination helps prevent overlap and ensures federal agencies are aware of each other's work. Maintaining continuous dialogue between these entities is crucial, but it requires a full-time commitment to manage effectively. NOAA Ocean Exploration, NOMECS, and the National Oceanographic Partnership Program (NOPP) all take on this responsibility, and although it requires extra effort, we are well-positioned to lead these efforts. Some people may not fully realize our leadership role in this space, and that is something that can be further clarified.

- **Question:** When best practices are developed, how are they advertised and shared?
 - **Answer:** We develop Standards of Practice (SOPs), including a [Deepwater Exploration Mapping Procedures Manual](#) that is the first of its kind. *Falkor* (too) uses that protocol. We also inform mapping technicians that take the guidance to other vessels. We take a “best practices” approach and invite the rest of the community to provide feedback on our methods.

- **Question:** Is there an intention of **stepping through the ocean exploration variables (EVs) and making sure best practices and protocols for these variables are established?**
 - **Answer:** This is an excellent recommendation. There is a goal to walk through the EVs and improve the standardization and accessibility of NOAA Ocean Exploration data. We engage at many levels in talking about these variables, internally and externally.

- **Question:** How are we tracking who is using the documents that are prepared and put into the ocean exploration community?
 - **Answer:** Given rules on tracking information on downloaded documents, much of our feedback is anecdotal. The [Benthic Animal Guide](#) has shown up on 15 different expeditions and even has a ship-friendly version that was created due to demand. There is also a cheat sheet for taxa in our sampling guide that was developed with the Smithsonian.

- **Question:** How do you get data into the hands of communities who need it?
 - **Answer:** There is a distinction between data being archived in NOAA repositories and being functionally accessible to the public. NOAA Ocean Exploration partners with NCEI for archiving data and physical samples go to the Smithsonian. However, making data easier to use is still a challenge we are working on, particularly in ensuring its practicality for end-users. The Data Analytics and Synthesis Team (DAST) reviewed the accessibility of different data types. While some data, like multibeam data, is widely accessible, other formats, such as video data, face technical barriers that limit accessibility. We try to work directly with partners and communities from the beginning to ensure the data meets their needs. E.g., NOAA Ocean Exploration collaborated with the Southeast Fisheries Management Council to provide data that helped inform management decisions. The collaboration resulted in products like science briefs and GIS layers that were tailored to the stakeholders' needs. There is direct dialogue with users on specific projects, but there's room to improve the distribution and accessibility of NOAA Ocean Exploration's SOPs and data products. **Taking feedback from communities more seriously is an area the OEAB could assist with, ensuring that NOAA Ocean Exploration has a direct and meaningful impact.**

- **Question:** Is NOAA Ocean Exploration aligning its exploration frameworks, like the EVs, with other biological data frameworks, such as those used by groups that interact with NCEI? Are there multiple variable frameworks, or are they combined?
 - **Answer:** The Science and Technology (S&T) division of NOAA Ocean Exploration is considering revisiting the EV report and updating it to a 2.0 version. The original version was developed alongside the Ocean Variables and new standards have since been published. The EVs were exploration-specific, whereas other frameworks, like Global Ocean Observing System (GOOS) variables, are more specialized for certain areas. NOAA Ocean Exploration is

engaged with programs like the Ocean Biogeographic Information System (OBIS) and ensures that data from our projects meet OBIS standards. **OEAB members suggested producing a fact-sheet style document to help distill the key points of the EV document.**

- **There was a recommendation here that NOAA Ocean Exploration help/harmonize with essential ocean variables.**

- **Question:** How do you ensure that data products meet community needs? Is there follow-up like capacity building to teach users how to utilize the data?
 - **Answer:** NOAA Ocean Exploration engages with stakeholders in two stages. First, we ask what communities need from the science effort. After gathering feedback, we revise data products accordingly. NOAA Ocean Exploration produces standardized data that feeds into larger portals but also works directly with communities to customize outcomes based on their specific needs. Listening and reporting back to stakeholders are crucial parts of the process. There is tension between collecting broad data for general use and creating specific products for certain partners. We aim to balance broad data collection with fulfilling the unique needs of specific projects, but producing highly customized data is not always part of our mandate.

- **Question:** How does NOAA Ocean Exploration prioritize creating customized datasets for individual communities with making data universally accessible and fair to all?
 - **Answer:** That tension is important to address and there is a need to gather feedback to understand community needs better. NOAA Ocean Exploration views itself as a "broker" of data, providing standardized data for public use while recognizing that additional analysis or customization may be needed for specific communities. Our goal is to create variables that can be applied broadly across all regions.

- **Question:** How do NOMECE goals influence NOAA Ocean Exploration's priorities and strategy development?
 - **Answer:** NOAA Ocean Exploration leads NOMECE, rather than NOMECE leading us. NOAA Ocean Exploration coordinates federal efforts but doesn't dictate what other federal agencies should do. However, we facilitate collaboration and coordination across agencies. NOMECE plays a significant role in guiding federal efforts related to deep ocean exploration, bringing agencies with different agendas together under a shared understanding. This coordination allows NOMECE to leverage various ocean exploration campaigns (such as Seabed 2030) and involve regional stakeholders in a broader effort to support seabed mapping globally. Interagency coordination under NOMECE has grown, with new working groups formed regularly. Although NOMECE is federally focused, there's an opportunity for more outside engagement. NOMECE's legislative focus and NOAA Ocean Exploration's reauthorization are distinct.

- **Question:** What percentage of NOAA Ocean Exploration efforts is devoted toward NOMECE? Are plans altered based on what the NOMECE community is asking for?
 - **Answer:** NOMECE has increased federal awareness of NOAA Ocean Exploration's work and facilitated interagency collaboration. By leveraging the NOMECE network and partnerships, NOAA Ocean Exploration can fund various projects, funneling money through programs and ensuring federal partners without funding can still participate. This system prevents duplication of efforts and maximizes resources.

- **Question:** Has NOMECE provided any additional funding to OE?
 - **Answer:** NOAA Ocean Exploration has not received extra funding through NOMECE. However, NOMECE has both national and programmatic goals, and our activities within the EEZ often align with NOMECE's objectives. By aligning with NOMECE, NOAA Ocean Exploration gains a platform to engage at higher levels, such as with the Office of Science and Technology Policy and the Navy. The Administration is currently at a crossroads in making policy decisions about unexplored territories, particularly regarding the need for industry partnerships and investment in three priorities: mapping the EEZ, maintaining a healthy federal fleet, and improving the data management pipeline.

- **Question:** Since NOMECE is an EEZ program, does the mandate drive NOAA Ocean Exploration visions on where to go (i.e., international versus U.S.)?
 - **Answer:** NOAA Ocean Exploration's operations are driven by various factors, including annual cycles, appropriations, guidance from the State Department, and our own authorization language. NOMECE is only one component of our decision-making framework, and the program must also address other priorities. While NOAA Ocean Exploration is seen as a deep-sea expert, its capacity is limited, meaning we cannot handle every aspect of deep-sea exploration, but we contribute where we can.

- **Question:** Who influences the program's direction? How is taxpayer input integrated; can the taxpayer influence organizational decisions?
 - **Answer:** Collecting high-quality, accessible data that anyone can use is important for this. There is a political context, where NOAA Ocean Exploration is often asked to collect data for specific purposes, but we should not let users drive the policy. Being seen as an honest broker—independent and neutral—is important for maintaining credibility and avoiding vulnerability to external pressures.
 - There was a comment on the need for communities, particularly Indigenous ones, to trust NOAA Ocean Exploration's process. Indigenous perspectives often view the ocean and all its living things as interconnected and valuable, and stakeholder engagement should reflect this holistic mindset.

6. Focus Area 3 “Enhancing Public Engagement and Education”

Review members: Dr. Veronique Le Roux, Dr. Mark Moline, Dr. Ellen Prager, Mr. Ramsay RM Taum

- **Question:** What is the geographic distribution of where the teachers who take part in the education and professional development programs are? How do you advertise your programs?
 - **Answer:** NOAA Ocean Exploration's education programs are funded through a grant from the National Marine Sanctuary Foundation and are run in collaboration with alliance partners like aquariums and science centers. These partners are subcontracted to invite educators to participate in workshops and professional development sessions. One goal of ours is to increase the number of alliance partners. Some of these partners are long-standing, and the goal is to achieve national coverage. Our workshops can reach up to 30 educators, who, in turn, can reach as many as 150 students each. To expand reach, we train facilitators to lead workshops and support conference travel so facilitators and grantees can promote programs directly. We also collaborate with local school districts, marine educator chapters, and school boards, leaving promotional templates for partners to use in their regions. We also promote our products through newsletters and presentations that are distributed across the U.S.

- **Comment/Question:** Many of the professional development efforts focus on formal education (K-12), but **that could be expanded to other groups, including the private sector. It should include data, technologies, and standards that would be relevant to industry and broader workforce development. This could be incorporated into the NOFO process.** Can there be more of a synergy between the private sector and NOAA Ocean Exploration to educate the broader community?
 - **Answer:** We primarily focus on middle and high school students at the moment. This is a valuable idea worth exploring, though there are currently limitations such as the potential appearance of endorsement. We are actively incorporating real datasets into lesson plans, providing students with hands-on experiences. We also support programs such as SeaPerch and MATE, which help students learn about underwater robotics and engineering.
 - There was a comment that NOAA Ocean Exploration should explore the process of better engaging the private sector. There is also a growing connection between industry and science, including under the Ocean Decade umbrella.

- **Comment:** There may be an opportunity to build a bridge with early career ocean professionals (ECOPs). **The program may think about engagement and connection to hook students over a longer time cycle, versus forming the metric as “we talked to this many people at this grade level”.**

- **Answer:** We are thinking about this specifically in our internship programs, though we don't have a specific priority or focus yet.
- **Question:** What is the staffing in the Outreach and Education division?
 - **Answer:** We have 12 folks right now: 4 on the education team (with 3 focusing on professional development and education products), 5 on the website and communications team as well as an additional part-time Cooperative Institute worker, and 2 people who work on outreach and special projects.
- **Question:** Are you reaching out to Sea Grant offices and utilizing their networks and modules?
 - **Answer:** We do reach out regarding community outreach when *Okeanos Explorer* goes into new areas. We try to be involved with the local Sea Grant office in that case. More recently, we have worked through NOAA Sanctuaries for a regional, NOAA-amplifying effect. Sea Grants are usually fiscally managed as part of a University system, and our alliance partner mechanism works well when we don't want to lose our workshops in University IDCs or administrative timelines.
 - **There was a suggestion that getting local Sea Grant outreach professionals involved would be helpful, as they can reach out to schools.**
- **Comment/Question:** If you could label success externally, what would it be? Public engagement should involve the excitement of exploring the ocean, and metrics should be based on that, not the brand.
 - **Answer:** While public recognition of the NOAA Ocean Exploration brand is one measure of success, engaging such a broad audience is challenging. We collect web and social media metrics, but those don't necessarily reflect whether our message is resonating or if teachers are using the information in classrooms. There are obstacles, such as the Paperwork Reduction Act, which complicates gathering meaningful, timely feedback from audiences.
 - There was a comment that NOAA Ocean Exploration should explore more high-risk, high-reward approaches to public engagement. **NOAA Ocean Exploration asked for clarification on what types of high-risk strategies could be envisioned.**
- **Comment/Question:** What is the strategy for developing NOAA Ocean Exploration's educational workshops? There is an absence of topics such as climate change, deep ocean timescales... Engaging topics are important, but teaching broader, critical topics is essential for public education.
 - **Answer:** Our educational content is influenced by the direction of our office. Climate change has not been included as a focus for the office before, which is why it is not included in our workshops despite it being an important topic. Within NOAA, each program has its own education team, which limits the topics

NOAA Ocean Exploration can cover. We might need to collaborate more with other NOAA programs to address broader themes like climate change.

- **Comment/Question:** Is there an intent to develop professionals within the communities themselves? There is an extractive nature to education, where individuals often leave their communities to learn but do not return. **NOAA Ocean Exploration's programs need to create opportunities for local professional development that keep individuals within their communities.**
 - **Answer:** NOAA Ocean Exploration takes different approaches to engagement depending on the region. In Palau, we spoke with local teachers to ensure that educational materials were appropriate and relevant to their needs. We also work with NOAA partners to provide resources, and an internship program is being developed with Palau to build local capacity with on-the-ground mentors. Palau is responsible for a large National Marine Sanctuary, but there is limited local knowledge about deep-water environments. NOAA Ocean Exploration has worked with Palau over several months to design a program that builds capacity within the government and scientific branches. This includes supporting interns onboard the *Okeanos Explorer* next summer and training mentors as deep-water scientists to create demand for these jobs locally. The Palau internship program is designed to allow partners to define who a student is, expanding opportunities to early-career researchers. This flexibility aims to ensure that the skills developed during internships return to the community, fostering local investment in scientific and professional growth.

- **Comment:** While NOAA Ocean Exploration products are high quality, they may not be as relevant from a community perspective, particularly in the Pacific. Communities are focused on justice, self-determination, and issues like energy sovereignty. **NOAA Ocean Exploration can incorporate justice into conversations and move toward decolonizing academic content by co-creating material with Indigenous voices, rather than solely using Western perspectives.**
 - NOAA Ocean Exploration asked for thoughts on how NOAA, as a Western scientific organization, can reconcile the idea of co-creation with Indigenous communities, acknowledging the challenges of integrating different worldviews. Indigenization was clarified as a process that brings authentic Indigenous voices to the forefront. Co-creation should reflect Indigenous communities giving knowledge, not an extraction.
 - There was a comment that content often fails to resonate with communities because it lacks relevance to their lived experiences. There is a need for facilitation processes that help onboard Indigenous ways of thinking. Time is a critical factor in building relationships with communities. Engagement can be either invasion or invitation. Entering without a deep understanding of the community and its history of unfulfilled promises sets NOAA Ocean Exploration up for failure.
 - **Answer:** We have teams at NOAA Ocean Exploration discussing data sovereignty as one aspect of Indigenous engagement. **Please bring the**

recommendations you have in this field, since there is a lot of interest in continuing these discussions.

- **Comment/Question:** Indigenous Knowledge is not mentioned in NOAA Ocean Exploration's NOFOs and competitive grants. Is NOAA Ocean Exploration reaching all minority communities, not just through awards and internships? Are you meeting your diversity goals?
 - **Answer:** NOAA Ocean Exploration is working on creating a non-competitive direct hire authority as an entry point into NOAA. This initiative aims to provide future opportunities for students from marginalized and Indigenous communities to move up in research roles within NOAA. Until recently, NOAA wasn't allowed to collect or promote demographic information due to PII and PRA rules. However, we partnered with Sea Grant, which now has a demographic questionnaire that can be used to gather this information. NOAA Ocean Exploration has historically not done well in grading DEIA and JEDI in funding decisions, but improvements were made in 2019 when a DEIA statement was added to the evaluation criteria. In FY25, NOAA Ocean Exploration will require a Tribal support letter for projects in Tribal areas, and Section 106 compliance will be needed for work in areas under Indigenous sovereignty.

- **Question:** How many minorities are being reached? Are there PIs funded from these communities?
 - **Answer:** Ocean Odyssey grants are administered through the National Marine Sanctuaries Foundation. They do not look into PI demographics but applicants that can show they've identified a target community, their barriers, and how a project overcomes that barrier are scored higher. NOFO grants are more limited as they are federally managed. Efforts to increase transparency on where federal funding goes are occurring across all levels of government, but there has been pushback from academics. **We would appreciate creative recommendations that are feasible for federal agencies to implement, while avoiding suggestions that agencies like NOAA cannot realistically achieve.**

- **Question:** Can you elaborate on connections between your work and broader efforts of ocean literacy happening within NOAA?
 - **Answer:** NOAA Ocean Exploration participates in high-level ocean literacy efforts both nationally and internationally, following established standards. NOAA Ocean Exploration promotes ocean literacy through its professional development programs but relies on broader NOAA resources for major ocean literacy initiatives. Team members participate in the National Marine Educators Association and various working groups tied to strategic priorities, though we do not have a specific priority area dedicated to ocean literacy. Ocean literacy is a global and national effort requiring firm goals, objectives, and a clear strategy for implementation. NOAA Ocean Exploration lacks the resources to push forward

such a monumental initiative and can contribute through smaller efforts.

- **Question:** Are NOAA Ocean Exploration's education and professional development topics constrained by expedition-related content? Are there other ways to promote ocean exploration? Is funding a constraint?
 - **Answer:** NOAA Ocean Exploration is not necessarily constrained by its vessel or deep-sea science focus; resources are a limiting factor. There is a National Marine Sanctuaries Foundation proposal for a teacher training initiative that would offer a broader ocean science curriculum beyond deep-sea topics. This would provide a more comprehensive approach to ocean literacy, though the primary constraint remains funding. Recently, NOAA Ocean Exploration received an influx of emails from students, teachers, and parents involved in a First Lego League challenge which focused on building underwater robots. One of the assignment's criteria was to interact with a scientist or explorer. Since we couldn't respond to all requests, we coordinated with partners and organized a webinar where experts answered questions from students and teachers. Approximately 1,300 people participated, and some staff members even visited schools to engage directly with students. There are opportunities to expand beyond expedition-focused topics.

- **Comment:** NOAA Ocean Exploration's contributions are not often prominently featured. Partnerships are important to raise NOAA Ocean Exploration's visibility in high-profile outlets. Even when NOAA contributions are present, the office's name is often missing, which limits its public recognition.
 - **Answer: We welcome suggestions for increasing NOAA Ocean Exploration's visibility.**
 - One suggestion related to this was using FRESCO workshops as a low-cost, high-impact educational tool. The format involves a 3-hour card game workshop where participants make connections between problems and solutions, and it could be deployed at political, private, and public events.

- **Question:** What are the most successful efforts within NOAA Ocean Exploration's education program that should be continued, and what hasn't worked that might be phased out?
 - **Answer:** The combination of our education products and professional development has been highly successful, particularly through partnerships with alliance organizations around the country, including inland areas. If budget constraints required changes, it would prompt a deeper discussion about NOAA Ocean Exploration's operational model. We would have to choose between continuing our educator-focused programs with standard efforts or shifting toward a risk-taking model that explores new approaches. NOAA Ocean Exploration's education budget is about \$500k, and new ideas can sometimes require half of that amount. Adopting new initiatives would represent a significant shift rather than simply dropping an existing program. Our professional development programs, supported by partnerships with the

Foundation and alliance partners, would be the gold standard. Partnerships are crucial to the program's success and sustainability.

- **Question:** Can the Explorer-in-Training program grow beyond the *Okeanos Explorer*?
 - **Answer:** The program is an office-wide effort, with mentorship playing a key role in providing a rewarding experience for interns. The team is actively exploring ways to expand the program, including partnering with other NOAA offices and increasing the number of interns at the Smithsonian. The program's internship coordinator is receiving training to enhance mentor preparation and ensure that students have the best possible experience. One limitation of ship-based internships is scaling them up equitably, making it difficult to offer these opportunities to all students. Other organizations like Ocean Exploration Trust and OceanX run similar internship programs, often attracting the same pool of applicants. While these groups have been hesitant to collaborate, there is a need to maximize placements and reduce overlap, especially for undergraduates applying to multiple programs. Coordination between these programs could lead to more efficient placements, though this idea has been discussed but not yet realized.

- **Question:** Can connections with OECI be leveraged to bring some internships under the same umbrella?
 - **Answer:** Within the government space, we are working to consolidate our internship programs. Though there wasn't momentum in the past (partly because NOMECE didn't exist), there is now increased interest in deep-sea exploration, which presents new opportunities for growth. However, scaling up involves challenges, particularly related to IT and security. While industry is shifting toward the remote space for early-career hires, NOAA vessels lack the infrastructure for that, though there are plans to evolve in this direction.
 - There was a comment that we should be leveraging collaborations that work toward a common point, and that we should be moving from a collaboration mindset (that risks mission drift) to a convergent mindset.

- **Question:** What is the funding mechanism for the internship program?
 - **Answer:** Our EIT program is from base office funds that we have every year, with a budget for a certain number of interns. We also use other programs, like Hollings, EPP/MSI, and Lapenta, where funding comes from NOAA Office of Education. The EIT program itself, we internally budget.

7. Focus Area 2 “Advancing Technological Innovation in Ocean Exploration”

Review members: Mr. Justin Manley, Mr. David Millar, Dr. Frank Muller-Karger, Dr. Clara Smart

- **Comment/Question:** How do we leverage OECI to greatly expand NOAA Ocean Exploration's capabilities, improve technology, and overcome resource constraints? OECI and *Discoverer/Okeanos Explorer* are not introducing new technologies, but rather implementing existing ones. How is NOAA Ocean Exploration deriving true innovation from its investments? How do we translate objectives in NOAA Ocean Exploration strategies into actions and tactics and key results around innovation and technology development?
 - **Answer:** OECI is enthusiastic about technology and not underutilized, but there's a need for clearer decision-making regarding how OECI moves forward with tech development. There is a tension within ships like *Okeanos Explorer* focusing on operations and data acquisition while also serving as a testbed for new technologies. The team is interested in increasing the testbed opportunities, though it's currently challenging to implement on *Okeanos Explorer*.

- **Question:** Who is making decisions on the OECI front to test certain technologies? Is that coming from NOAA Ocean Exploration directly?
 - **Answer:** The process of deciding OECI projects is not linear. OECI partners pitch their ideas to NOAA Ocean Exploration, or other external parties express their priorities and request how they can be met. We try to dilute risk by involving a broad range of partners. For example, technologies like the medium ROV underwent initial testing through OECI, and further funding came from the NOFO team. While the process is nimble and flexible, it is not easy to map out, as decisions are made based on partner proposals and NOAA Ocean Exploration's priorities.

- **Comment:** NOAA Ocean Exploration needs to better articulate its philosophy around innovation and technology or risk being outpaced by defense and venture capital sectors.
 - **Answer:** We emphasize a holistic view of innovation and prioritize the data and information needed from tools rather than focusing solely on developing new tools. The degree of innovation should be appropriate to the space NOAA Ocean Exploration operates in and the types of partnerships cultivated. Federal vessels are limited in bringing new technologies onboard. However, NOAA is designing *Discoverer* for maximum flexibility, allowing it to support a range of innovative technologies. NOAA develops technology that eventually enters the broader market, and the key challenge is ensuring these innovations benefit the ocean exploration community specifically. NOAA Ocean Exploration's strength lies in leveraging external investments. For example, while DARPA might fund initial development, NOAA Ocean Exploration takes on the risk of testing the technology in the field.
 - **There was a comment that showcasing the linkages between partnerships and tech advancement would provide helpful context.**

- **Question:** NOAA Ocean Exploration seems to be in the deployment domain, not innovation. Is the office okay with responding to a demand signal and not coming up with the demand?
 - **Answer:** While NOAA Ocean Exploration is more forward-leaning compared to other NOAA counterparts, it's not at the cutting edge of innovation like academia or industry. Earlier this year, our Director did not approve a technology roadmap because it didn't align with NOAA Ocean Exploration's realistic capacity. We have faced challenges in working with industry partners like IBM and Amazon because we couldn't offer the necessary funding to start collaborative projects. Despite this, NOAA Ocean Exploration has seen success in areas like machine learning, 'omics, and data management—not cutting-edge, but addressing important needs. NOAA doesn't have a strong system for supporting low transition-level investment for basic engineering and autonomous systems, which makes it hard for small businesses to compete. **Looking at the need for evaluating technology and the role of tech in the office is very relevant and important for the review team.**

- **Question:** Does the office have the opportunity to propose project ideas to OECI?
 - **Answer:** Every proposed project within OECI comes with a full budget proposal and undergoes internal review at NOAA Ocean Exploration. The more external funding OECI can secure, the more projects they can undertake. Once a project is approved, funds are transferred to Rhode Island, OECI's headquarters, where work is conducted through key partners. A major strength of OECI is its flexibility, allowing it to collaborate with startups, research institutions, and non-profit organizations. NOAA Ocean Exploration cannot direct OECI to work on specific projects. We can provide recommendations and be supportive partners, but we can only fund projects that OECI partners propose. The key is for NOAA Ocean Exploration to maintain strong partnerships and work collaboratively with OECI to advance mutual goals.

- **Question:** Is there any formal requirement for NOAA Ocean Exploration to fund technology development?
 - **Answer:** There is no mandate requiring NOAA Ocean Exploration to fund technology development. We do a lot of promotion by acting as a broker within NOAA, connecting various programs and external partners. While we have the ability to fund technology development, it is not obligated to do so. NOAA Ocean Exploration funds projects that align with its operational needs and partnerships. There is no specific directive stating NOAA Ocean Exploration must allocate a certain amount of money for technology development.

- **Comment:** Defining NOAA Ocean Exploration's priorities and resources depends on knowing what the organization wants to be. OECI serves as a useful interface for exchanging ideas, especially when it comes to evaluating technology like machine learning and AI. There isn't a clear Request for Information process to engage the public

and tech community, which could help NOAA Ocean Exploration discover existing technologies that could be adapted to its needs.

- **Answer:** NOAA Ocean Exploration identifies its challenges through multiple channels, including the NOFO process, which helps us gain insight into challenges faced by academia and industry. Conferences and internal NOAA discussions also provide informal opportunities to gather information. NOAA Ocean Exploration's priorities are shaped by internal discussions and external influences, with many decisions coming from collaborative efforts both within NOAA and with external partners. NOAA Ocean Exploration has been discussing how to engage more with industry outside its traditional sphere. We haven't fully explored programs like Small Business Innovation Research (SBIR), particularly SBIR Phase 3, which supports commercializing technologies.
- **Comment/Question:** If OEI issued deliberate calls for tech development based on NOAA Ocean Exploration's needs, it would generate responses from a broader range of actors. This could help NOAA Ocean Exploration identify and adapt existing solutions rather than always pursuing new developments. Who conducts market research for NOAA Ocean Exploration to ensure they are selecting the best partners for technology development?
 - **Answer:** NOAA Ocean Exploration needs to revisit collaboration with NOAA's Office of Science and Technology to improve how we assess tech partners. Regarding ROV work, we have an RFI coming out that would lead to Request for Proposals, ensuring an open and competitive process.
 - There was a comment on the importance of populating the space between NOAA Ocean Exploration and OEI with ideas from outside the organization.
- **Comment:** Sometimes NOAA Ocean Exploration's contributions to projects aren't fully recognized, and the extent to which NOAA Ocean Exploration's investments improve technical capabilities may not always be clear. NOAA Ocean Exploration should be able to answer questions about the impact of its investments by defining clear metrics and Key Performance Indicators (KPIs), such as miles mapped or samples stored. NOAA Ocean Exploration materials reference "next generation of exploration" and "taking things to the next level," but they don't clearly define what that vision is. **The program needs to clearly define what next-generation exploration looks like and how it evolves over time.**
 - **Answer:** NOAA Ocean Exploration tracks many metrics, but are we asking the right questions about how our investments affect performance? Technology can be viewed as a driver for achieving mission objectives and ensuring we are using the right tools to meet those goals. We must also position ourselves to leverage opportunities that arise from changing priorities, such as the development of the *Discoverer*, which is designed to project NOAA's capabilities forward. For each variable, NOAA Ocean Exploration seeks to find the most efficient and innovative solutions. NOAA Ocean Exploration's role is to present a strong case for innovation and attract partners. We are multi-mission, responding to a wide

range of stakeholders, customers, and drivers. NOAA Ocean Exploration's approach to technology is holistic, balancing various interests and advancing technology in ways that support multiple stakeholders. We leverage OECI and develop partnerships with agencies like BOEM and USGS, breaking down traditional silos within NOAA through initiatives like NOMECE.

- **Question:** Was there a cost analysis to compare how much it cost SailDrone to map areas compared to using the *Okeanos Explorer*?
 - **Answer:** A large report, produced by a neutral OECI partner, laid out the rewards and risks of using SailDrone for mapping, allowing NOAA Ocean Exploration to evaluate the investment. One of the findings was that SailDrone realized their business model needed retooling based on the results. The total cost of the project was \$2.7 million, with \$1.1 million coming from NOAA Ocean Exploration and the rest from other NOAA offices. The project's report is publicly available and has been used within NOAA for decision-making, though it hasn't gained traction outside the agency. The SailDrone Surveyor case study provides valuable insights about the technology's limitations, such as sea state and water depth constraints, making it a useful case study for determining where such technology is best applied.

- **Question:** What are the next steps for the Surveyor project?
 - **Answer:** The SailDrone project took place mostly in 2021. The data collected in the Aleutians was used as a training dataset and helped identify potential seeps. This data was utilized by our office to prioritize exploration locations. The project was emblematic of successful private-public partnerships. All parties involved—NOAA, SailDrone, and other collaborators—shared the risk and worked collaboratively. The project allowed NOAA to ground-truth and assess whether SailDrone was the right tool for certain missions, particularly for parts of NOAA that are contract dependent and have less capacity for R&D and testing. The project revealed that the technology wasn't fully ready for use in remote areas, which led to important internal discussions about force multipliers. SailDrone learned a lot from the project about their technology's limitations, particularly regarding operator effort in certain conditions. As a result, they retooled the system. This process of testing and adjusting provided valuable information that can be shared with the broader community, which is considering deploying similar technologies in challenging environments.

- **Comment/Question:** Using the SailDrone project as an example, NOAA Ocean Exploration delivered on quality and relevance in terms of next-generation technology, but there are concerns about performance from a pure ocean exploration perspective. Was the \$1.1 million investment in SailDrone used for high-performance ocean exploration; are there performance metrics specific to NOAA Ocean Exploration's mission?
 - **Answer:** NOAA tracks transitions, referring to how technology moves through various stages of development, with NOAA Ocean Exploration shining at

Research Levels 5 to 7. This is part of the Government Performance and Results Act framework used by NOAA's Office of Oceanic and Atmospheric Research to measure progress. Because the SailDrone project was conducted through a Cooperative Institute, it needed to have a R&D function. The project couldn't focus solely on data collection, as this would violate regulations. Therefore, the measure of success wasn't just the number of square kilometers mapped, but rather the broader deliverable of a detailed performance report. The mapped area was more of a byproduct. Some of the project's deliverables included outreach efforts. For example, the project mapped 46,000 sq km and generated 158 media stories. While there wasn't a numerical metric to measure performance, the project still had clear value in testing the operational limits of new technology and generating broader insights for future exploration.

- **Comment: It would be helpful for NOAA Ocean Exploration to share its metrics and KPIs with a narrative to help the review team understand what we are measuring and why it matters.**

8. Working Session for Board Members

Key points discussed during the working session:

- Vicki shared challenges in moving from past successes to future directions, noting that individual expertise guided previous recommendations. This time, there's a broader scope, with suggestions that distillation of ideas within smaller groups may be more productive.
- Mark suggested that recommendations from individual board members should be categorized and brought together for final review.
- Clara proposed that each team put together a white paper and circulate it for comments, while Mark emphasized including context and limiting recommendations to a few tangible actions. Recommendations should also acknowledge past successes.
- A timeline of 2.5 months was proposed, with an initial distillation phase in the first month and broader aggregation in the second.
- A web form was proposed as a means to gather input efficiently from the group.
- Ramsay raised concerns about understanding the program's overarching "why", noting that while data and technical activities are emphasized, aligning the mission with people and programs could improve relevance and productivity.
- David T shared that the review will inform NOAA Ocean Exploration's strategic plan and recommendations will influence NOAA's leadership, including Dr. Spinrad.

- Kristen stressed the need for more resources to expand outreach and education efforts, specifically through partnerships and growing the Explorer-in-Training program. She mentioned the need for better impact measurement methods, focusing not only on quantitative data but also on qualitative outcomes.
- The group discussed timelines for drafting the functioning draft by mid-January, with a virtual board meeting in early May to vote on it.