National Oceanographic Partnership Program

SUMMARY OF THE 2025 NATIONAL OCEANOGRAPHIC PARTNERSHIP PROGRAM (NOPP) OCEAN LIFE FORUM 2.0

Hosted by

NOPP, Integrated Ocean Observing System (IOOS), Marine Biodiversity Observation Network (MBON), Marine Technology Society (MTS) Aquatic eDNA Technology Committee, and Johns Hopkins University Applied Physics Laboratory

September 15-16, 2025

NOPP

IOOS Integrated Ocean Observing System

MBON Marine Biodiversity Observation Network

MTS marine technology society

EXECUTIVE SUMMARY

On September 15-16, 2025, the 2025 NOPP Ocean Life Forum 2.0 was convened on the Johns Hopkins University Applied Physics Laboratory campus in Laurel, MD. This forum brought together over 50 experts from government, academia, nonprofit organizations, industry, and technology development who sought to produce "sandbox" or project concepts that take a cross-sector approach to observing life in our ocean, coasts, and Great Lakes, integrating the most appropriate new and emerging technologies to deliver actionable information to identified users. The event began with presentations from a few speakers discussing the state of ocean biodiversity observing efforts in U.S. waters, the value of a sandbox framework to test the effectiveness of different solutions, and setting the charge for the forum. Participants worked in groups to develop sandbox ideas and presented them to a panel of cross-sector development experts, who provided feedback and assessed the merits of each idea. The second day was spent refining those proposals based on that feedback, and advancing sandbox development. The forum finished with invitations for participants to keep working on their sandbox ideas within their groups and to meet with the planning committee for advice on bringing their ideas to the next step.

Group photo of the 2025 NOPP Ocean Life Forum event attendees taken on the Johns Hopkins University Applied Physics Laboratory campus.

BACKGROUND AND CONTEXT

The economic benefits of observing ocean biodiversity are clear, particularly when such observations are delivered at scales appropriate to support actions important to human communities, such as those that prevent infrastructure damage by invasive species or predict harmful algal blooms that affect human health. Such observations are also necessary for industries and other entities to meet regulatory requirements in advance of activities such as deep-sea mining or offshore energy exploration. The number of permits, beach closures, or infrastructure management decisions that depend on observations of marine or freshwater species is substantial in these cases.

The 2023 NOPP Ocean Life Forum explored the needs for and challenges associated with establishing coordinated ocean observing systems for tracking ocean life in ways that inform actions across sectors and regions. It called on the broader community to:

- coordinate, share, and apply knowledge about ocean life to create actionable information and real-world solutions; and
- identify commonly accepted methods and standards for collecting, managing, and sharing biological data that supports sustainable economic growth.

This and other community events, such as the 2024 Summit on Ocean Biodiversity and the 2024 Ocean Biodiversity TechSurge, have emphasized significant efficiencies that can be achieved when government, researchers, industry, NGOs, philanthropy, and affected communities work collaboratively and integrate across methods and disciplines.

The 2025 NOPP Ocean Life Forum 2.0 built on those concepts through a "sandbox[1]" approach, bringing together representatives from across sectors to prioritize practical project and/or trial ideas which leveraged integrated ocean life observations and commonly agreed data standards to advance ocean life observing efforts for single- or multi-species applications.

To provide context to the event participants, Emmett Duffy (Smithsonian Institution) gave a presentation during the working lunch on the first day of the forum. He discussed the importance of ocean biodiversity, emphasizing humanity's dependence on ocean life and the threats it faces, such as extreme weather and biodiversity loss. He highlighted the urgent need for data to understand how human actions impact marine life and mentioned the emergence of biodiversity and blue carbon credits, emphasizing the necessity of observational data to support their use. Duffy then outlined the strong science foundation in the U.S. for ocean life science, detailing a timeline of initiatives like the Marine Biodiversity Observation Network (MBON) and the 2024 National Ocean Biodiversity Strategy[2]. He also presented technological solutions for large-scale biodiversity observation and discussed key organism categories for measurement, concluding with questions for discussion on indicators, metrics, benchmarks, and common approaches for assessing marine life, citing an oyster habitat restoration success story in the Chesapeake Bay as an example.

DAY 1: EXPLORING APPLICATION AREAS AND NEEDS

Peter Thielen (Johns Hopkins University Applied Physics Laboratory (JHU/APL)) welcomed attendees to the forum, introducing himself and JHU/APL's work in automation and eDNA analysis, and highlighted the diverse group present. Alan Leonardi (National Oceanographic Partnership Program (NOPP)) then

[1] https://onlinelibrary.wiley.com/doi/full/10.1002/edn3.470
[2] https://www.noaa.gov/sites/default/files/2025-01/NSTC_National-Ocean-Biodiversity-Strategy.pdf

thanked sponsors and partners, emphasizing the importance of contributions and the opportunity for actionable steps over the next few days, also introducing NOPP and its history of supporting ocean research projects. Elif Demir-Hilton (Oceankind; Marine Technology Society (MTS) Aquatic environmental DNA (eDNA) Technology Committee) and Gabrielle Canonico (National Oceanic and Atmospheric Administration (NOAA); U.S. Integrated Ocean Observing System (IOOS)) discussed the forum's collaborative origins and encouraged participants to engage in discussions, utilize templates for sandboxes, and self-assign to topics based on expertise, while Leonardi concluded with housekeeping items before transitioning to the next session on sandbox themes.

Ryan Kelly (University of Washington) gave a presentation explaining the concept of sandboxes in general, and then the goal for this forum's sandbox ideas. He introduced sandboxes as a mechanism to get science and technologies over the hump from research to being routinely used by industry and other sectors. Kelly explained that sandbox projects are low consequence spaces for productive creativity, seeded with opportunities, with collaboration between potential partners and funders. From a software context, this means participants have freedom to innovate, and from a regulatory context it means participants have freedom from liability. Rules and requirements are relaxed for the sandbox's limited set of participants for a set timeline, and metrics of success are evaluated before funders offer further commitment. Kelly said that criteria for a good sandbox idea include a meaningful management question, a relatively low stakes regulatory environment, tools that are fit for purpose, and multi-party engagement across sectors.

Kelly charged the forum attendees to work together on sandbox ideas that would translate scientific knowledge into an action framework to meet real world management or decision-making needs while demonstrating that the technology and/or solution proposed works. He introduced the following breakout group themes, and participants self-selected based on their interest and expertise:

1. Invasive species detection
2. Large mammal detection
3. Nearshore habitat change
4. Deep water seabed biodiversity assessment
5. Fisheries monitoring and management

Participants were able to choose the breakout group theme they worked in, were welcomed to ask the planning committee for advice regarding placement, and were allowed to change groups on the second day or be a general participant that didn't commit to a particular theme. Stephen "Steve" Weisberg (Southern California Coastal Water Research Project (SCCWRP)) introduced the "Shark Tank" style approach –

2025 NOPP Ocean Life Forum event attendees raise their hands in response to an icebreaker question from the planning committee. The forum prioritized engagement with participants from across sectors.

breakout groups would brief on and receive feedback about their initial sandbox ideas to an expert panel on first day, giving them time to incorporate receive feedback and revise the sandbox concepts before the end of the forum. The expert panel asked clarifying questions, explained why they would (or would not) hypothetically want to fund and/or advocate for the sandbox idea to potential funders, and offered advice for improvement.

Joining Weisberg as the "sharks" were Justin Manley (Oceankind; MTS), Jackie Motyka (Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS)), and Woody Turner (National Aeronautics and Space Administration (NASA)). Weisberg brought experience of working with local and state governments, Manley brought experience of working in venture capital and with foundations, Motyka brought experience of advocating for programs to Members of the U.S. Congress, and Turner brought experience of coordinating with other federal agency partners to put out NOPP funding calls for projects.

Because funding for the breakout groups' sandbox ideas have not been secured at the time of writing this report and to protect the intellectual property of the participants who generated the ideas, delving into the specifics of each sandbox idea is beyond the scope of this forum summary report. When reacting to the ideas on the first day of the forum, the expert panel said the following attributes would make a sandbox idea attractive to potential funders:

- If the sandbox's solution was successful, it would address a real world problem and/or need, especially one that could be implemented long term.
- The sandbox idea's metrics for success were clear, especially if a trial could start generating those metrics within the first year of funding.
- The funding estimate being requested for the sandbox is reasonable for the duration of the trial and the work being proposed thereof.
- The partners included multiple sectors and had clear roles within the sandbox trial that covered the work being proposed thereof (i.e. who would conduct fieldwork, who would manage data analysis, etc.).
- The scope of the sandbox is clear and achievable, both the geographical scope of the trial and the scope of work being done in the proposed time period. Sandboxes were also more attractive if they could be adapted or applied to a larger scope if more funding and/or partners were brought in after the initial trial period demonstrated success.
- The sandbox idea takes into account risk analysis for what could go wrong at different stages of the trial period, such as regulatory hurdles, and how partners might mitigate such challenges.

Participants were asked to keep potential funders for their sandbox ideas in mind, because knowing their audience's priorities and motivations could inform how the sandbox attributes detailed above were fleshed out, both for the second day of the forum report out to the expert panel as well as maybe taking their idea beyond the boundaries of the forum.

Weisberg closed out the first day with words of encouragement, as the initial sandbox ideas were more well fleshed out than expected thus far. He said that on the second day, the breakout groups would be able to revise their sandbox ideas based on the feedback they received and then they would report out to the expert panel again to explain their updates. Weisberg encouraged breakout groups to invite expert panel members into their groups tomorrow and ask follow up questions if they wanted more direction as they made those updates to their ideas.

DAY 2: FRAMING THE ACTION PLAN

Leonardi welcomed back the participants to the forum and acknowledged the promising outcomes from the initial sandbox ideas. He announced that the planning committee would provide direct feedback to the groups, facilitating further refinement of their products following the forum. Thielen underscored the importance of producing written materials and Canonico emphasized the necessity of identifying key stakeholders for next steps. The group discussed the role of AI, recognizing its potential while stressing the need for data validation and addressing its limitations. Discussion also covered the readiness of eDNA and biodiversity tools, the need for the consolidation of existing knowledge on scaling eDNA to prevent repetition from past discussions, and the value of a sandbox approach for moving towards concrete, funded projects, with a suggestion for future merger opportunities for overlapping sandboxes. The participants then returned to their breakout groups to refine their sandbox ideas to report out to the expert panel for a second time.

When breakout groups reported to the expert panel again, they emphasized how they addressed the feedback they received. The expert panel then provided input on if they felt that their concerns or questions were adequately addressed, and if not, they provided further guidance on how breakout groups could revise their sandbox ideas to be more attractive to potential funders. They also emphasized the importance of providing alternate examples or prior use cases to help support why their methods, timeline, and/or amount of funding being requested were justified.

During both afternoons' report out sessions, after the expert panel spoke, the discussion was opened up to the room, so participants heard from and interacted with those from other breakout group themes as well. If participants continued developing their ideas within their groups beyond the forum, they were encouraged to determine which partners were needed to help implement a project but which were not yet at the table, as they would need to be connected with and possibly leveraged in finalizing sandbox details.

CONCLUSIONS AND NEXT STEPS

Overall, participants were actively engaged and found the "Shark Tank" format enjoyable, potentially leading to future funding and positive impact. Discussions also included the benefits of a white paper or journal article(s), and the potential for a committee to be established. Concrete actions were highlighted and participants were encouraged to provide contact information for working group follow up. The meeting concluded with a positive outlook on continuing conversations and exploring practical solutions, with a consensus on the interest in developing additional sandbox ideas to be considered for subthemes within each breakout group theme.

In their working sandbox idea documents, participants were asked to identify which breakout group they participated in, any plans their group had for next steps for their idea, and when they would be interested in meeting virtually with the planning committee next (i.e., two weeks or one month after the forum) to discuss their progress. Participants were also encouraged to provide anonymous feedback on the forum via an exit survey, responses to which were positive, with most who answered the survey feeling the forum was worthwhile and that they would be interested in contributing to similar events in the future, should those occur.

ACKNOWLEDGEMENTS AND APPENDICES

The 2025 NOPP Ocean Life Forum 2.0 was co-sponsored by the NOPP Office[3], MTS Aquatic eDNA Technology Committee, and JHU/APL. The event was also co-hosted by IOOS and MBON. The NOPP Office thanks the planning committee members for their assistance leading up to and during the forum, as well as all of the speakers and participants (see Appendix II).

Appendix I. 2025 NOPP Ocean Life Forum 2.0 Agenda

Day 1: Exploring Application Areas and Needs September 15, 2025 | Venue: Johns Hopkins University Applied Physics Laboratory		
08:30	**Registration & Breakfast**	
09:00	**Welcome** ● Welcome to Johns Hopkins University Applied Physics Laboratory (JHU/APL)	Peter Thielen, JHU/APL
	Goals and outcomes of the Forum ● Introduction ● Housekeeping ● Why the 'shark tank lite' format? ● Charge to the group: What does success look like?	Alan Leonardi, NOPP Gabrielle Canonico, US IOOS/MBON Elif Demir-Hilton, MTS eDNA Technology Committee
09:20	**Introducing Sandbox Themes** ● Invasive species detection ● Large mammal detection ● Nearshore habitat change ● Deep water seabed biodiversity assessment ● Fisheries monitoring and management	Ryan Kelly, UW Stephen Weisberg, SCCWRP
9:40	**Group Photo**	
10:00	**Proceed to breakout groups**	All Participants
12:00	**Working Lunch: Ocean Biodiversity - Community perspectives, needs, and action** *(Lunch provided)*	Emmett Duffy, SI
01:00	**Continue breakout groups**	All Participants
03:00	**Break** *(Coffee/tea provided)*	

[3] Funding for the NOPP Office is provided via National Oceanic Atmospheric Administration (NOAA) contract to Integrated Systems Solutions, Inc. (Contract/Task Order#1305M419DNCNA0016/1305M322FNRMA0216) and the U.S. Navy's Office of Naval Research (ONR).

03:30	**Report out to the Expert Panel (each group gives a 5 minute report, with ten minutes for feedback)**	All Participants
05:00	**Adjourn**	
05:30	**Hosted Working Dinner at Facci Restaurant** **7530 Montpelier Rd, Laurel, MD 20723**	

Day 2: Framing the Action Plan September 16, 2025 | Venue: Johns Hopkins University Applied Physics Laboratory		
08:30	**Registration & Breakfast**	
09:00	**Welcome Back to the NOPP Ocean Life Forum** ● Recap of Day 1 and charge for the day	Alan Leonardi, NOPP
09:30	**Breakout groups reconvene to address Expert Panel Feedback**	All Participants
12:00	**Working Lunch** *(provided)*	
01:00	**Second report out to the Expert Panel**	All Participants
02:00	**Break** *(Coffee/tea provided)*	
02:30	**Breakout group writing session**	All Participants
3:30	**Wrap Up & Synthesis** ● Outline and Timeline for Forum Report ● Next steps: Asynchronous writing to finalize proposals; virtual meeting ● Assignments ● Thank You!	Alan Leonardi, NOPP
04:30	**Adjourn**	

Appendix II. 2025 NOPP Ocean Life Forum 2.0 Participants

First Name	Last Name	Affiliation	Forum Participation
Stephen	Weisberg	Southern California Coastal Water Research Project	Expert Panel Moderator; Planning Committee
Woody	Turner	National Aeronautics and Space Administration	Expert Panel
Gabrielle	Canonico	National Oceanic and Atmospheric Administration; U.S. Integrated Ocean Observing System	Planning Committee; Speaker
Elif	Demir-Hilton	Oceankind; Marine Technology Society Aquatic eDNA Technology Committee	Planning Committee; Speaker
Alan	Leonardi	National Oceanographic Partnership Program	Planning Committee; Speaker

Catherine	Puma	National Oceanographic Partnership Program	Planning Committee; Notetaker
Kasondra	Herrera	National Oceanographic Partnership Program	Planning Committee; Notetaker
Susanna	Theroux	Southern California Coastal Water Research Project; Marine Technology Society Aquatic eDNA Technology Committee	Planning Committee; Breakout Group 1 - Invasive species detection
Katy	Carneal	Johns Hopkins University Applied Physics Laboratory	Breakout Group 1 - Invasive species detection
Jeremy	Crossland	U.S. Army Corps of Engineers	Breakout Group 1 - Invasive species detection
Matt	First	Naval Research Laboratory	Breakout Group 1 - Invasive species detection
Amy	Freestone	Smithsonian Environmental Research Center	Breakout Group 1 - Invasive species detection
Maggie	Hunter	U.S. Geological Survey	Breakout Group 1 - Invasive species detection
Shanna	Ratnesar-Shumate	Johns Hopkins University Applied Physics Laboratory	Breakout Group 1 - Invasive species detection
Greg	Ruiz	Smithsonian Environmental Research Center	Breakout Group 1 - Invasive species detection
Jackie	Motyka	Northeastern Regional Association of Coastal Ocean Observing Systems	Expert Panel; Breakout Group 2 - Large mammal detection
Peter	Thielen	Johns Hopkins University Applied Physics Laboratory	Planning Committee; Breakout Group 2 - Large mammal detection
Ari	Friedlaender	UC Santa Cruz	Breakout Group 2 - Large mammal detection
Megan	Howson	Gulf of America Coastal Ocean Observing System	Breakout Group 2 - Large mammal detection
Laura	Morse	JASCO Applied Sciences	Breakout Group 2 - Large mammal detection
Eric	Patterson	National Oceanic and Atmospheric Administration Fisheries	Breakout Group 2 - Large mammal detection
Gray	Redding	National Fish and Wildlife Foundation	Breakout Group 2 - Large mammal detection
Tom	Weber	MITRE	Breakout Group 2 - Large mammal detection

Michael	Weise	Office of Naval Research	Breakout Group 2 - Large mammal detection
Matthew	Ogburn	Smithsonian Environmental Research Center	Planning Committee; Breakout Group 3 - Nearshore habitat change
Emmett	Duffy	Smithsonian MarineGEO	Speaker; Breakout Group 3 - Nearshore habitat change
Christine	Angelini	AECOM	Breakout Group 3 - Nearshore habitat change
Olivia	Caretti	Oyster Recovery Partnership	Breakout Group 3 - Nearshore habitat change
Katelyn	DiBenedetto	Smithsonian MarineGEO; Tennenbaum Marine Observatories Network	Breakout Group 3 - Nearshore habitat change
Matthew	Harke	Gloucester Marine Genomics Institute	Breakout Group 3 - Nearshore habitat change
Chris	Meyer	Smithsonian National Museum of Natural History	Breakout Group 3 - Nearshore habitat change
David	Millar	Fugro	Breakout Group 3 - Nearshore habitat change
Luke	Thompson	National Oceanic and Atmospheric Administration Atlantic Oceanographic and Meteorological Laboratory; Northern Gulf Institute; Mississippi State University	Breakout Group 3 - Nearshore habitat change
Alison	Watts	University of New Hampshire	Breakout Group 3 - Nearshore habitat change
Justin	Manley	Oceankind; Marine Technology Society	Expert Panel; Breakout Group 4 - Deep water seabed biodiversity assessment
Kai	Lee	Owl of Minerva; Oceankind; Marine Technology Society Aquatic eDNA Technology Committee	Planning Committee; Breakout Group 4 - Deep water seabed biodiversity assessment
Adrienne	Copeland	National Oceanic and Atmospheric Administration Ocean Exploration	Breakout Group 4 - Deep water seabed biodiversity assessment
Simon	Freeman	MITRE Corporation	Breakout Group 4 - Deep water seabed biodiversity assessment
Zachary	Gold	National Oceanic and Atmospheric Administration Pacific Marine Environmental Laboratory	Breakout Group 4 - Deep water seabed biodiversity assessment (Day 2); Breakout Group 5 - Fisheries monitoring and management (Day 1)

Beth	Orcutt	Bigelow Laboratory for Ocean Sciences	Breakout Group 4 - Deep water seabed biodiversity assessment
Nicolas	Tsesmetzis	Shell	Breakout Group 4 - Deep water seabed biodiversity assessment
Ben	Williams	Fugro	Breakout Group 4 - Deep water seabed biodiversity assessment
Kevan	Yamahara	Monterey Bay Aquarium Research Institute; Marine Technology Society Aquatic eDNA Technology Committee	Breakout Group 4 - Deep water seabed biodiversity assessment
Ryan	Kelly	University of Washington	Speaker; Breakout Group 5 - Fisheries monitoring and management
Allan	Adams	Aquatic Labs	Breakout Group 5 - Fisheries monitoring and management
Mathew	Biddle	National Oceanic and Atmospheric Administration; U.S. Integrated Ocean Observing System	Breakout Group 5 - Fisheries monitoring and management
Danielle	Dickson	North Pacific Research Board	Breakout Group 5 - Fisheries monitoring and management
Nathan	Furey	University of New Hampshire	Breakout Group 5 - Fisheries monitoring and management
Luke	McEachron	Florida Fish and Wildlife Conservation Commission	Breakout Group 5 - Fisheries monitoring and management
Frank	Cantelas	National Oceanic and Atmospheric Administration; National Oceanographic Partnership Program	General Participant
Jason	Landrum	Blue Convergence Fund	General Participant
Angela	McMellen Brannigan	National Invasive Species Council	General Participant
Morgan	Trexler	Johns Hopkins University Applied Physics Laboratory	General Participant