oeci

Impact Report

July 2022–June 2023

NOAA OCEAN EXPLORATION

Photo credit: OET

OECI

Ocean Exploration Cooperative Institute

The Ocean Exploration Cooperative Institute (OECI) is an integrated ocean exploration program that leverages the unique, world-class knowledge and expertise of its partner institutions—Ocean Exploration Trust (OET), University of New Hampshire (UNH), University of Rhode Island (URI), University of Southern Mississippi (USM) and Woods Hole Oceanographic Institution (WHOI)—and NOAA Ocean Exploration.

Our mission is to explore the three billion acres of underwater territory of the U.S. Exclusive Economic Zone by investigating the nation's submerged resources, developing and deploying new exploration technologies, and inspiring and preparing the next generation of blue economy professionals.

OCEAN EXPLORATION COOPERATIVE INSTITUTE

oeci

EXPLORING THE NATION'S BLUE FRONTIER

Photo credit: OET

EXECUTIVE COUNCIL

Dr. Adam Soule
OECI Executive Director
URI-GSO

Jeremy Weirich
Director, NOAA Ocean Exploration

Dr. Richard Murray
WHOI

Dr. Larry Mayer
UNH

Allison Fundis
OET

Dr. Leila Hamdan
USM

Jason Fahy
OECI Associate Director, Ex Officio
URI-GSO

Dr. Aurora Elmore
NOAA Ocean Exploration CI Manager, Ex Officio

COUNCIL OF FELLOWS

Jason Fahy
URI-GSO, OECI Associate Director
OECI CoF Chair

Dr. Mashkoor Malik
NOAA Ocean Exploration, Chief Science & Technology Division

Rachel Medley
NOAA Ocean Exploration, Chief Expeditions and Exploration Division

Dr. Daniel Wagner
OET

Andy Bowen
WHOI

Dr. Leonardo Macelloni
USM

Dr. Brian Calder
UNH

Kristen Crossett
NOAA Ocean Exploration, Chief Outreach and Education Division

Dr. Aurora Elmore
NOAA Ocean Exploration CI Manager

NOTE FROM THE EXECUTIVE DIRECTOR

Dr. Adam Soule

The OECI hit its stride this year, thanks to the hard work of all the OECI institutional affiliates and the tremendous support and guidance of NOAA Ocean Exploration and other OECI sponsors, including NOAA Mesophotic and Deep Benthic Community Restoration, Bureau of Ocean and Energy Management, NOAA Office of Coast Survey.

Our accomplishments in operational exploration, technological innovation, data stewardship, and engagement with underrepresented groups are only possible through the collaboration of the OECI institutions where solutions are generated and then utilized for the benefit of NOAA, the ocean exploration community, and beyond.

We are particularly proud of our advancements in multi-vehicle operations for simultaneous and cooperative ocean exploration. The Technology Challenge cruise this year saw three vehicles exploring the full water column with an uncrewed surface vehicle, a midwater autonomous underwater vehicle, and a benthic hybrid remotely operated vehicle all while the vessel was free to map and explore elsewhere.

This is an example of the foundational work of OECI that presents an important model for the future of ocean science, where purpose-built vehicles that work within specific ocean domains can operate simultaneously and collaboratively to approach a synoptic view of the ocean that has been otherwise difficult to achieve.

With the Ocean Exploration Trust's *E/V Nautilus* positioned in the Central Pacific, we are afforded the opportunity to explore some of the most remote and underexplored parts of the US territory. By telepresence, we are able to reach thousands of students and millions of people across the world to share the excitement of exploration and the stories of the explorers themselves.

Additional education efforts have focused on groups who have been left out of ocean science in the past through partnerships with Tuskegee University, Jackson State University, Community College of Rhode Island, and the indigenous communities of the regions we are exploring. Many of these students are participating in research for the first time and gaining a new perspective on the ocean enterprise as a potential career path.

The scale of ocean exploration is enormous but it is matched by the promise of discovery that will improve our lives and partnership with the ocean. Working together, we must take full advantage of every minute of every expedition, of every resource, and of every person to advance scientific understanding, promote responsible management of our ocean resources, and strengthen an equitable blue economy.

Thank you to all of our staff and partners who made this year successful.

Photo credit: Marley Parker & WHOI

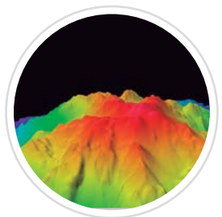
Dr. Adam Soule
Executive Director | OECI
Professor of Oceanography | URI

Photo credit: OET

EXPLORING THE CENTRAL PACIFIC

Yr4 Expeditions

Aboard the Ocean Exploration Trust's *E/V Nautilus*, OECI and its partners explored the Central Pacific around the Papahānaumokuākea Marine National Monument (PMNM) and the Pacific Remote Islands Marine National Monument (PRIMNM). These expeditions highlighted a wide diversity of habitats and geological features by integrating and testing emerging exploration technologies focused on seafloor mapping and remotely operated vehicle explorations.



Mapping & Exploring Deep Sea Biodiversity & Ancient Volcanoes near Johnston Atoll

NA 140 & NA 141
May 25 – July 13

NA 140

NA 141

Back-to-back expeditions explored the deep-water geology and biology at deep-water ancient seamounts near the Johnston Atoll, one of the most isolated atolls globally located between the Hawaiian Islands and the Line Islands. Several seamounts and larger ridge features were mapped for the first time with discovery of a fossilized *Megalodon* tooth, whale skulls, and the first record of the *Solumbellula* sea pen genus in the Pacific. A record of 278 samples were collected, which will support future studies on the deep-sea biodiversity, geological age, and volcanic history of the region.

Lu'uaeaahikiikawawāapalaoa: Dual Technology Mapping

NA 142
July 16 - August 8

NA 142

Focused on the southeastern edge of PMNM, ship-based sonars were integrated with shallow-water mapping capabilities of UNH's uncrewed surface vehicle (USV) *DriX*. Data will enhance understanding of deep-water and shallow-water terrain formation of the Northwestern Hawaiian Islands, and contribute to new nautical charts that improve safe navigation and prioritize areas of protection.

Lu'uaeaahikiikawawāapalaoa: Seafloor Mapping

NA 143
Aug. 19 – Sept. 13, 2022

NA 143

This expedition was named by members of the PMNM Cultural Working Group Nomenclature Subcommittee and team members of OET to represent the continued efforts to map and understand the papa (seafloor). Data from ship-based mapping surveys will enhance understanding of the Northwestern Hawaiian Islands, map habitats protected within the monument, and assist in prioritizing areas of protection.

Shakedowns

NA 147 & NA 148
April 24 – May 13, 2023

Back-to-back shakedown expeditions tested the ship's mapping, ROV, and telepresence systems in preparation of the 2023 field season, in addition to field operations tests of UNH's USV *DriX*, and the University of Hawai'i Hadal Water Column Profiler.

Kingman Reef & Palmyra Atoll ROV

NA 149
May 16 – June 13, 2023

NA 149

This telepresence-enabled expedition explored deep-sea biology and geology surrounding Kingman Reef and Palmyra Atoll. Ten new seamounts were surveyed and hundreds of species were documented, including several potentially undescribed species, and several range extensions. Data from biological, geological, and eDNA water samples will support studies on deep-sea biodiversity, geological age, and volcanic history of the region. In addition, six ROV dives included the first integration of the "Laser Divebot" Raman and fluorescence spectrometer, which help develop important new tools for ocean exploration.

Photo credit: NOAA

DATA, DECISIONS, AND DISCOVERY

Refining technologies for ocean exploration

Data is a crucial component in our understanding of planetary-scale climate processes and resources. However, collection and analysis can be expensive and time-consuming with data volumes consistently increasing as technologies advance and exploration expands. Often, there's too much data that isn't always easy to process, find, or use.

OECI, NOAA's National Centers for Environmental Information, and affiliates are taking steps to facilitate greater generation of ocean exploration and science data, processing capabilities, accessibility and usability of data, and collaboration for faster decision making needed to enhance ocean exploration efforts.

In the Cloud

Cloud computing is one pathway that offers a scalable solution to ocean exploration's data challenges. Unlike traditional desktop setups, cloud computing provides a warehouse of remote computers that allows users to adjust processing power as needed–enhancing exploration efforts by maintaining operational tempo of the assets at sea.

OECI affiliates at UNH are testing ways to use cloud-based storage for seafloor mapping data, specifically bathymetry, but is equally applicable to other acoustic datasets (e.g., backscatter and water column data).

Limitations in graphics capabilities of existing bathymetric processing software provided the team with better insight into what new technologies would be needed to integrate cloud computing for complex bathymetric data processing.

Progress has been made in the design of a cloud-native processing system, development of supporting infrastructure, and the creation of a scalable data processing environment. The team continues to refine the system's overall design, demonstrate a proof-of-concept, and fine-tune the user interface with a focus on ensuring rapid data transfer back to the ship through technologies like Skylink.

CoExploration

The narrow bandwidth of acoustic communication between operators and AUVs prevents data from being analyzed in real time. This limits operational efficiency of redirecting mission plans to interrogate "promising" targets, increase resolution, or change the mapping tools until after data has been downloaded, analyzed, and interpreted.

Teams at WHOI and USM are developing a CoExploration toolbox to improve efficiency by making use of any bandwidth not required for safe vehicle operation.

"The idea is that humans and robots work together as a team because they each bring strengths to the problem of exploration in the deep sea," says Dr. Mike Jakuba, senior engineer at WHOI and project lead.

Development of the Modular Autonomy Payload is underway as are machine learning algorithms and technologies that will allow AUVs to process data, recognize "features of interest" and communicate essential information for redirecting the mission plan internally and autonomously.

This approach is suited to a high-risk environment and provides a pathway for transitioning autonomy to operations. Efforts will continue to execute at sea in conjunction with cruises exploring deep water sites or investigating the impact of the *Deepwater Horizon* oil spill.

CoExploration: Real Time Multi Modal AUV Mapping with Low Throughput Acoustic Links

Machine Learning & AI

Images and videos are valuable tools in monitoring ocean biodiversity in remote environments. However, datasets are manually reviewed in a labor-intensive process that creates barriers to accessibility due to the sheer volume of data.

Using machine learning and artificial intelligence, researchers at URI have developed an algorithm to autonomously refine large video sets into highlight clips. Annotations from domain experts as well as non-experts, including community college students in the OECI Bridge to Ocean Exploration program, were important to this achievement.

Referred to as ROVIA (ROV Intelligence Agent), the algorithm successfully recognized biological and geological features using video data collected during exploration of the Kingman Reef and Palmyra Atoll region, demonstrating a success rate of over 85% when compared with human annotated highlight videos.

It is anticipated that this new model will be used for real-time video processing and for the vast amount of video archives, which will be a valuable resource for identifying and sharing the best quality video.

CoExploration: Real-Time Multi-Modal AUV Mapping with Low-Throughput Acoustic Links

Learn more

EXPANDING OCEAN EXPLORATION FOOTPRINT

Using uncrewed autonomous vehicles for independent missions

To expand ocean exploration away from the constraints of research vessels that are only able to support a single robotics operation at a time, we look toward the use of autonomous platforms that allow simultaneous performance of multiple exploration operations, enhancing exploration efficiency.

OECI's affiliates at UNH Center for Coastal and Ocean Mapping (CCOM) are building upon the successful demonstrations of the uncrewed surface vehicle (USV) DriX to provide high quality mapping data acquisition in both shallow and deep waters. In Year 3, DriX was a key contributor to data collection and a force-multiplier for multi-vehicle operations, demonstrating its capabilities in communicating data to and from (WHOI's) autonomous underwater vehicles, Mesobot and NUI, and the scientists on board OET's E/V *Nautilus*.

This year, we focused on integrating deep-water sonar capabilities by replacing DriX's EM2040 shallow water multibeam sonar with an EM712 to map deeper waters. This required a redesign of the DriX gondola to accommodate significantly larger transducers, which was a major engineering feat.

Initial EM712 trials offshore demonstrated predicted coverage and data quality to depths of approximately 650 m–the deepest the team could achieve from shore-based operations. Deep-water testing trials during the Shakedown Cruise (NA147) allowed for modifications and improvements of launch and recovery operations, which included the use of a painter boom. Operational use throughout the year has demonstrated the ability of the new system to map in water depths up to 3,000 m. Additional improvements included a new latching mechanism and CTD winch, as well as a towing method for the E/V *Nautilus* to aid in emergency recovery should there be a need. Ongoing efforts are being made to improve radar-based obstacle avoidance systems, as well as integration of the StarLink satellite system to provide connectivity for operations throughout the Pacific.

Learn more

EXPLORING THE TWILIGHT ZONE

Environmental DNA methods to understand biodiversity

The twilight zone, also known as the mesopelagic zone, is the region below the surface where light begins to fade into the deeper reaches of the ocean. This rich and diverse ecosystem, which contains more than 50% of the ocean's biomass, is poorly understood.

OECI affiliates at WHOI are using environmental DNA (eDNA) methods to characterize and understand the biodiversity within this region using trace genetic material found in fecal pellets, gametes, sloughed cells, and scales in the water column. This allows researchers to detect specific animal taxa without having to collect them.

After successfully collecting eDNA samples *in situ* at depths up to 400 m, researchers have now constructed new autonomous eDNA samplers that were deployed to 1,000 m on the *Mesobot* AUV and up to 6,000 m on other OECI vehicle systems. These samplers streamline and add flexibility to eDNA collection strategies in this generally inaccessible environment, as well as allow samples to be analyzed in the context of other sensed data (e.g., acoustics and imaging) collected simultaneously by these platforms. The team will look to capture water column biodiversity differences related to diel vertical migration (DVM) – a process that influences the distribution of animal diversity in the water column and plays an important role in the biological carbon pump that helps regulate global CO_2.

"Some twilight zone species are fast enough to avoid net tows, so they're really hard to study. Others are fragile, and will be destroyed when they're caught. With eDNA, we can account for animals that other sampling methods miss," says Dr. Annette Govindarajan, a molecular ecologist and WHOI's project lead.

BUILDING PATHWAYS TO THE BLUE ECONOMY

Engaging the next generation of ocean explorers, scientists, and engineers

OECI's aim is to increase long-term retention in the blue economy by developing sustainable mentoring systems and prioritizing inclusivity, equity, and belonging throughout the program that leverages the wider ocean science network to showcase the range of ocean-related career pathways.

Bridge to Ocean Exploration Experiential Learning

The Bridge to Ocean Exploration (B2OE) Program is an experiential learning program in ocean science and science communication to interested and eligible students.

Based out of URI, the program seeks to engage diverse and lower socioeconomic status students in Science, Technology, Engineering, and Mathematics (STEM) focused on ocean exploration and blue economy careers.

B2OE students learned about machine learning, autonomous vehicle data analysis, website development, media design, and storytelling. Students also participated in OECI's virtual Blue Economy (BE) Career Exploration Fair, along with other students and early career scientists from across the U.S., and blue economy sector members representing ports/harbors, research/tech, defense, offshore wind, commercial fishing, aquaculture, coastal planning and resilience, sailing, media production, and ferries/transportation. This exposed students to varying career opportunities and even resulted in one student interning for Thayer Mahan, a company that focuses on autonomous maritime security solutions, this past summer.

> *I would love to work in the Blue Economy field in the future and am thankful for the opportunities this program has provided to me.*
>
> **– '22 B2OE student**

> *The B2OE program taught me what the Blue Economy was. A career developing software towards the Blue Economy would be interesting for me.*
>
> **– '22 B2OE student**

> This experience gave me real-world expectations and deadlines... Communication is key, and I learned that more than ever.
>
> **– '22 B2OE student**

Photo credit: URI GSO

The Ocean Explorers Program

The Ocean Explorers Program strives to increase awareness and access to ocean science careers by engaging students attending minority serving institutions, and is jointly coordinated USM's Marine Education Center and Tuskegee University.

Students in the **Ocean Explorers Internship** program gained skills in seafloor mapping, data acquisition, processing and analysis, engineering design and development, at-sea operations, science communication, and content development through OECI affiliated organizations.

The **Ocean Exploration Club** has been an important recruitment tool for the internship program as the number of members in the club nearly quadrupled, representing 5% of the TU student body. Activities of the club include Lake Tuskegee clean-up, virtual career panels, shark dissections, water quality sampling, and building ROVs.

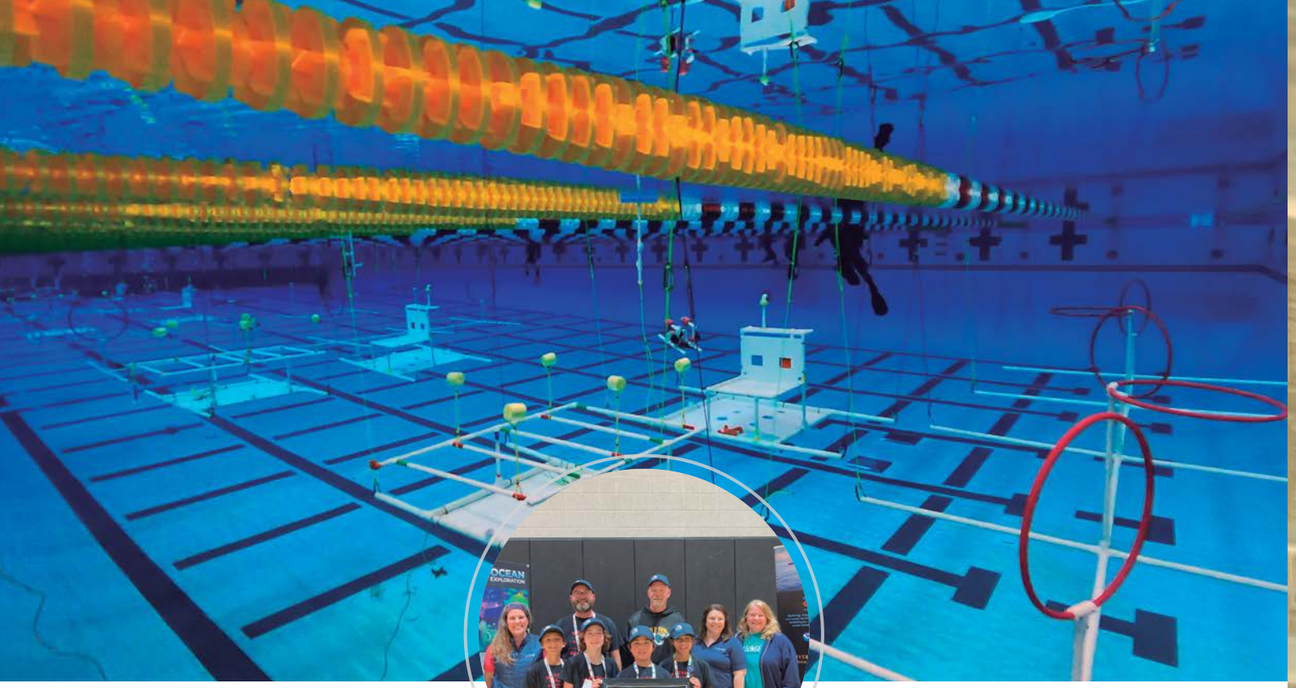
In addition, 21 one students and two faculty/staff members participated in the annual Mississippi Coast Field Trip on February 8-12, 2023, where they toured the NOAA *Oregon II* and networked with NOAA Corps and NOAA OMAO staff members, USM academic researchers, and current graduate students. They also demonstrated their SeaPerch ROV, and five of the 21 field trip participants submitted an application for the ocean exploration internship.

> *I was inspired by everyone's passion and now want to go into the marine field. I now feel comfortable in my academic journey and have a better vision as far as what I want to do.*
>
> **– OE Club Member Reflection on Mississippi Field Trip**

> *[At Tuskegee University] you are so far away from the ocean that you wouldn't even know that there are careers in the blue economy. This is exactly what the [Ocean Club] provides.*
>
> **– Student President of the Ocean Exploration Club**

> It was the first time I felt like a scientist! Respected and truly part of a team.
>
> **– '22 Ocean Explorers Intern**

Photo credit: USM



SeaPerch International Challenge

This annual underwater robotics competition hosted by the nonprofit organization Robonation guides students from all over the world on building underwater robots.

As the official event sponsor for the 2022/2023 competition, OECI used a technology cruise on E/V Nautilus to inspire the mission theme and provided educational support materials to the participants. OECI's research activities were highlighted in the mission design, which was then implemented at over 150 qualifying regional competitions all over the world (135 in the US) with a potential worldwide reach of ~30,000 - 50,000 participants.

Nearly 800 students and 250 coaches/educators from across the globe, and hundreds of spectators amassed at the University of Maryland College Park campus for the final competition event. This also provided an opportunity for OECI affiliates and NOAA Ocean Exploration personnel to engage with youth and educators on site during the competition. OECI will continue to expand its interactions and connections with the SeaPerch community.

Photo credit: URI

NATIVE HAWAIIAN COMMUNITY ENGAGEMENT

OECI continues its commitment to engage with native and Indigenous communities in the regions we explore. Through the Ocean Exploration Trust's relationship with NOAA ONMS and members of the Papahānaumokuākea Marine National Monument's (PMNM) Cultural Working Group facilitated by the Office of Hawaiian Affairs, OECI research in the Monument has incorporated Hawaiian cultural values into expedition implementation in respect to native Hawaiian culture, traditions, and worldview. This included working with Native Hawaiian language practitioners with the support of the National Marine Sanctuary Foundation to develop an original mele (chant) and Hawaiian expedition names for each of the OECI cruises – reflecting Hawaiian relationships with mission themes, educational videos in ʻŌlelo Hawaiʻi (Hawaiian language), and a Hawaiian language vocabulary glossary of ocean science and technology terms.

Further efforts encompassed outreach to the local Department of Education charter and kula kaiapuni (Hawaiian language immersion schools), live ship-to-shore interactions in ʻŌlelo Hawaiʻi, paid internships for Native Hawaiian students and educators, and paid at-sea positions for cultural liaisons to incorporate cultural protocols and practices into expedition operations.

These strategic and collaborative efforts resulted in content from OECI's *Nautilus* expeditions reaching students at nearly 40% of all kula kaiapuni and many thousands of others across the State of Hawaiʻi.

Learn more

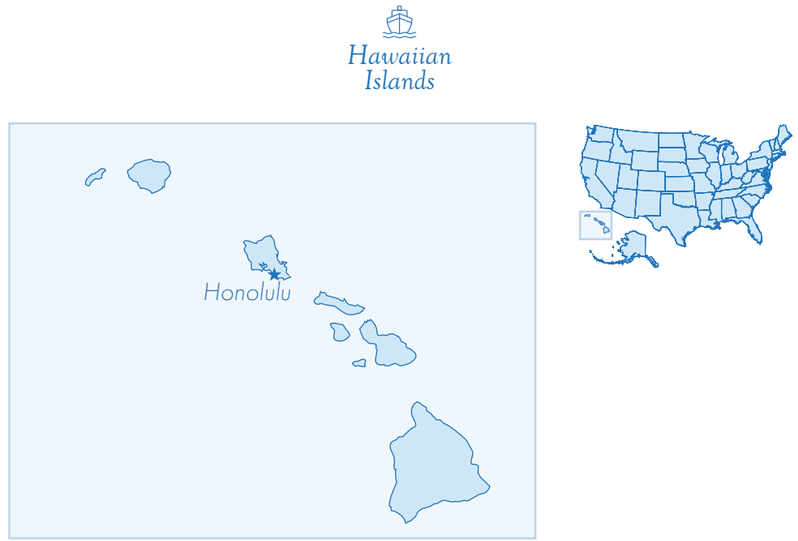
Photo credit: OET

What's in an expedition name?

Building relationships between people and place through ʻŌlelo Hawaiʻi (Hawaiian language)

Papahānaumokuākea is the wahi kūpuna (cultural resource) of the Hawaiian people and the largest marine conservation area in the US. The Papahānaumokuākea Marine National Monument (PMNM) is a place of tremendous natural wonders and a place of deep cultural significance for Native Hawaiians. We are privileged and grateful to conduct expeditions in this region through OET's E/V *Nautilus*, and honored for these expeditions to be gifted Hawaiian language—ʻŌlelo Hawaiʻi—names.

The names reflect the significance of these areas to Hawaiian peoples and serve to remind those conducting exploration activities of their responsibility to a specific place. For example, "Luʻuaeaahikiikekumu," which represents the journey to and work in the foundation of the ocean/islands was the name for one expedition.



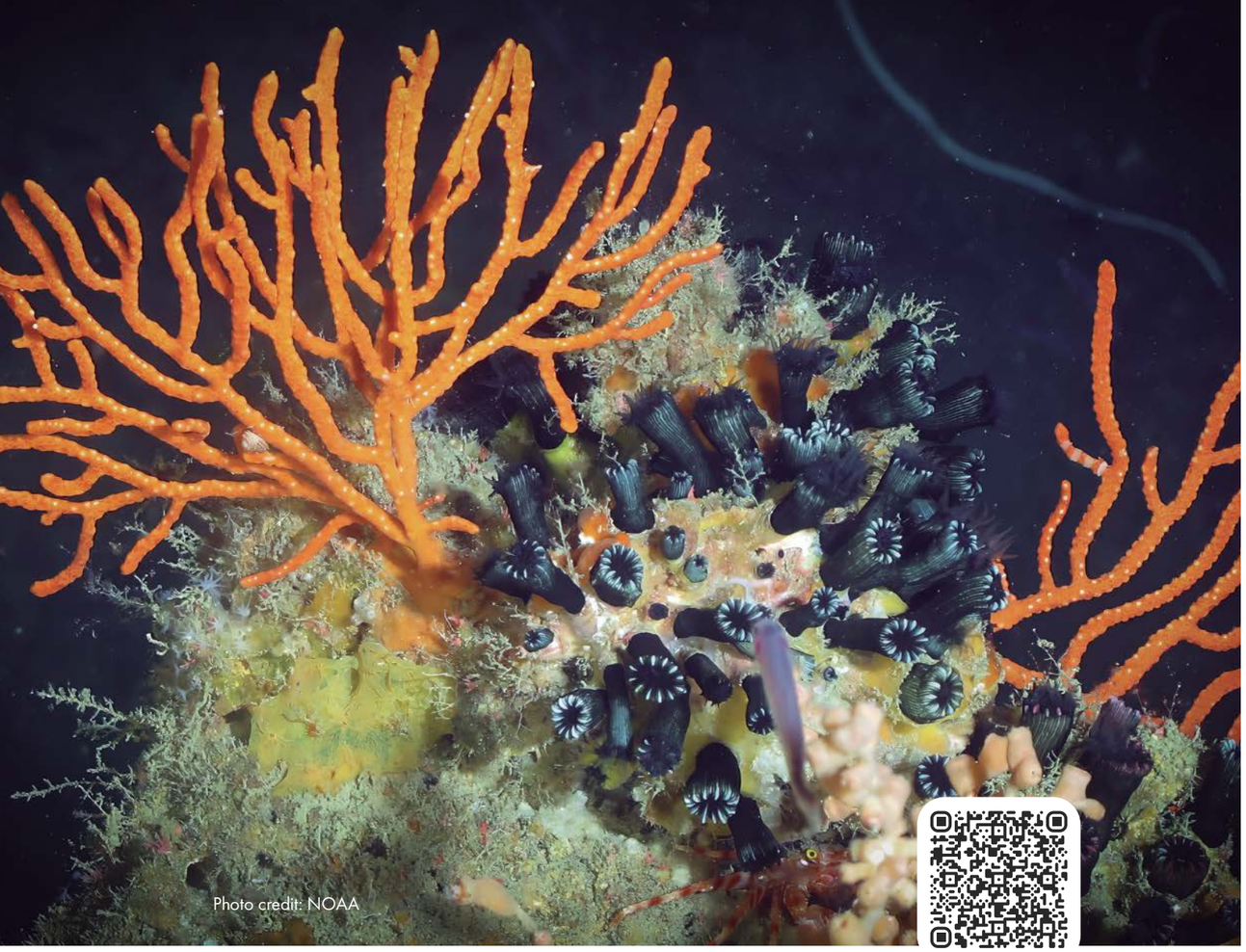


Photo credit: NOAA

Learn more

Deepwater Horizon Recovery

MESOPHOTIC AND DEEP BENTHIC COMMUNITIES RESTORATION

More than 770 square miles of deep-sea habitat–an area about half the size of Rhode Island–was impacted by the *Deepwater Horizon* oil spill in 2010. Known as the Mesophotic and Deep Benthic Communities (MDBC), these vast and complex ecosystems span the Gulf of Mexico's deepest points and are composed of foundational species that anchor the region's ecosystem. This includes slow-growing, deep-sea coral that can live more than 1,000 years. Limited knowledge about the physical condition, species composition, and biological activity and connectivity make restoring these critical habitats challenging.

OECI and affiliates at USM, WHOI, and URI are working in coordination with NOAA's MDBC team to leverage ocean exploration tools and technology to better understand these benthic communities, determine locations for restoration and monitor recovery.

Mapping, Ground Truthing, and Predictive Habitat Modeling

A Remus 600 AUV outfitted with a synthetic aperture sonar for extremely high resolution maps was used to identify hard ground where deep-sea coral communities thrive and identify the presence, abundance, and species of corals present. Successful integration of the KRAKEN Synthetic Aperture Sonar payload package by the WHOI team provided imagery and depth information that allowed the identification of distinct new reef structure, which will contribute to ROV dive planning or enhancement.

Lander Platforms for Habitat Assessment

Subsea landers and ROVs are part of an integrative and innovative observation program to characterize key environmental conditions and assist with translating shallow-water coral restoration techniques to deep-water species.

Two advanced landers are being developed to facilitate long-term observations near these mesophotic and deep benthic communities. Recent deployments have led the USM team to fabricate a new lander optimized for the seabed and hydrodynamic conditions for short-term observations.

A fleet of deep-sea benthic landers by the URI team will soon provide an unprecedented view of the environmental conditions that affect deep-sea communities within the Gulf. This will be a key technological component for long-term observations of diverse deep-sea reefs in order to better understand their response to disturbances, seasonal change, and changing food supplies.

Landers are outfitted with various sensors and equipment such as cameras and acoustic sensors, providing critical technology for long-term monitoring of deep-sea habitats. Operating as autonomous observational platforms that sit on the seabed or benthic zone. They are invaluable for recording physical, chemical, and biological activity over extended periods of time.

Soft Sediment Community

DNA sequencing from over 1,300 sediment samples spanning microorganisms to micro-, meio- and macrofauna is ongoing by the USM team to better understand the longevity of oil and its impacts on benthic communities. Data collected from sediment samples will be used in downstream bioinformatics analyses as well as support biogeochemical and geological analyses. These samples will be paired with metadata collected in the field to determine connectivity of macro- and microbial infaunal communities, and aid in targeting restoration efforts.

Coral Propagation & Technology

Coral propagation techniques have never been adapted for deep water corals, whose biology are largely unknown. Recovery of these populations is either through natural recruitment, assisted recruitment, or colony propagation.

The MDBC project has established a number of labs for coral propagation, and are now working to develop methods for replanting mesophotic corals. OECI's affiliates at URI are testing various methods including *in situ* propagation of octocorals, design of fragmentation racks and ship-board aquaria systems, and coral fragment deployment to develop new techniques for the first propagation of corrals in the Gulf. Early results indicate coral restoration with ROVs and shipboard operations are feasible with the ability to generate over at least 100 fragments per day. In addition, of the 198 coral specimens collected for genomics analysis, at least two morphotypes have been identified as possible new species–although genetic analysis is still ongoing.

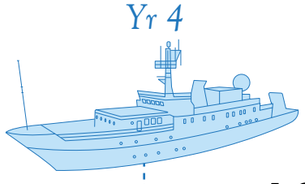
URI affiliates are also developing new methods for ROV coral propagation utilizing UV-sensitive cements to attach corals to weighted bases. This method has been tested in the lab and will soon be tested with corals in the Gulf.

Photo credit: NOAA

Photo credit: OET

BY THE NUMBERS

Yr 4



19	Expeditions
324	Days at Sea
150,655 KM²	Total Seafloor Mapped
142	Total ROV/UsX Deployments
866	Hours of Subsurface Video
100,823	Subsurface Images
7	Technology Transitions

1,948	Samples Collected
102	Students Supported
17,177	K-12 Students Reached
3,920	Members of the Public Reach (in person)
838	Media Stories
1,168,737	Live Stream Views
552,158	Video Highlight Views

NOAA OER Expeditions

13	Expeditions
263	Days at Sea
150,655 KM²	Total Seafloor Mapped
83	Total ROV/UsX Deployments
866	Hours of Subsurface Video
100,823	Subsurface Images
7	Technology Transitions

1,086	Samples Collected
97	Students Supported
17,177	K-12 Students Reached
3,920	Members of the Public Reach (in person)
838	Media Stories
1,168,737	Live Stream Views
552,158	Video Highlight Views

MDBC Expeditions

Mesophotic and Deep Benthic Communities

6	Expeditions
38	Days at Sea
59	Total ROV/UsX Deployments

862	Samples Collected
5	Students Supported

Impact Report

July 2022–June 2023

OCEAN EXPLORATION COOPERATIVE INSTITUTE

oeci

EXPLORING THE NATION'S BLUE FRONTIER

NOAA OCEAN EXPLORATION

Photo credit: OET