Mesophotic and Deep Benthic Communities Restoration: Progress Updates and Planned Activities for 2023

April 11th, 2023

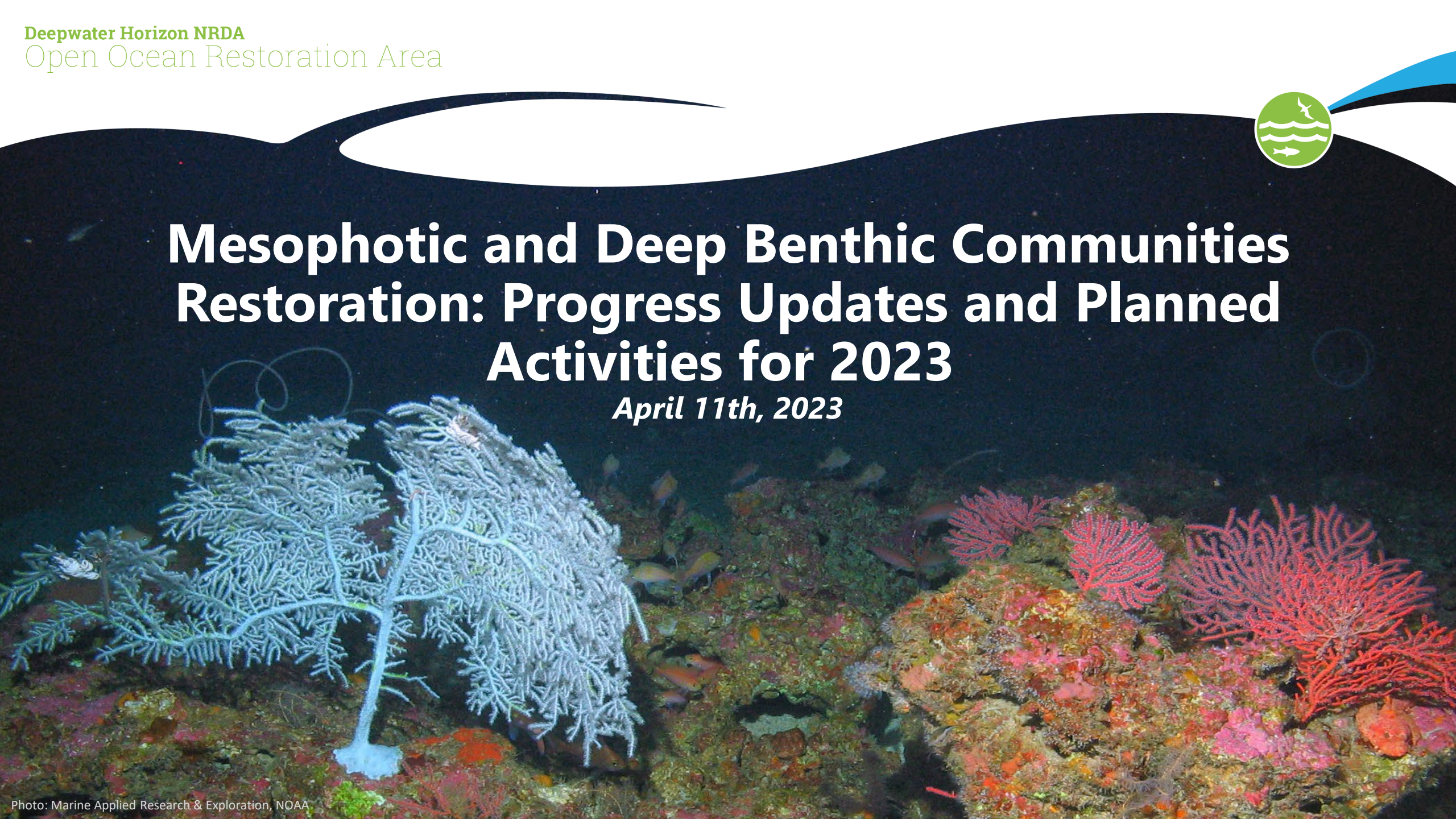
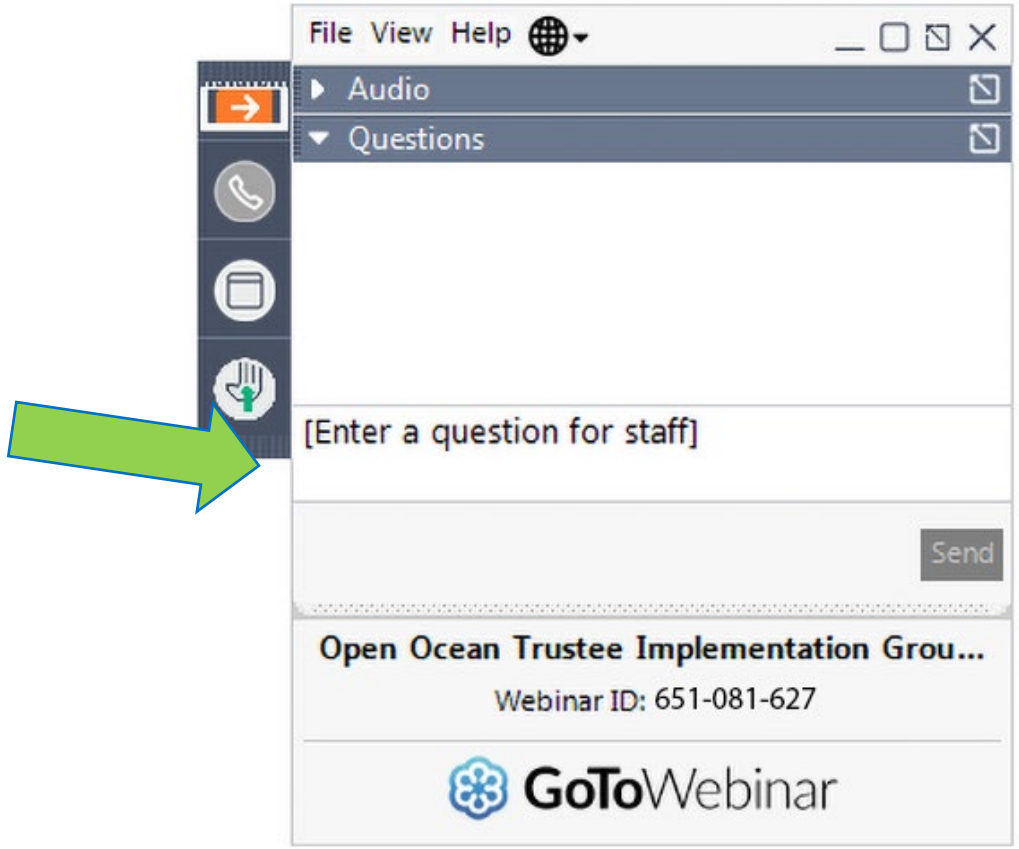


Photo: Marine Applied Research & Exploration, NOAA

Webinar Participation

- If you're using a phone, turn off your computer's microphone and speakers
- Please use the "Questions" box to type questions for the Q&A session
- Presentation will be posted on www.gulfspillrestoration.noaa.gov
- A link to the recording will be sent to all registrants



MDBC Webinar Overview

- *Deepwater Horizon* Oil Spill Background
- Overview of 2022 Field Activities
- Planned 2023 Field Activities
- Individual Project Updates
  - Mapping, Ground-Truthing, & Predictive Habitat Modeling
  - Habitat Assessment and Evaluation
  - Coral Propagation Technique Development
  - Active Management & Protection
- Accessing MDBC Portfolio Products & Resources
- Q&A Session

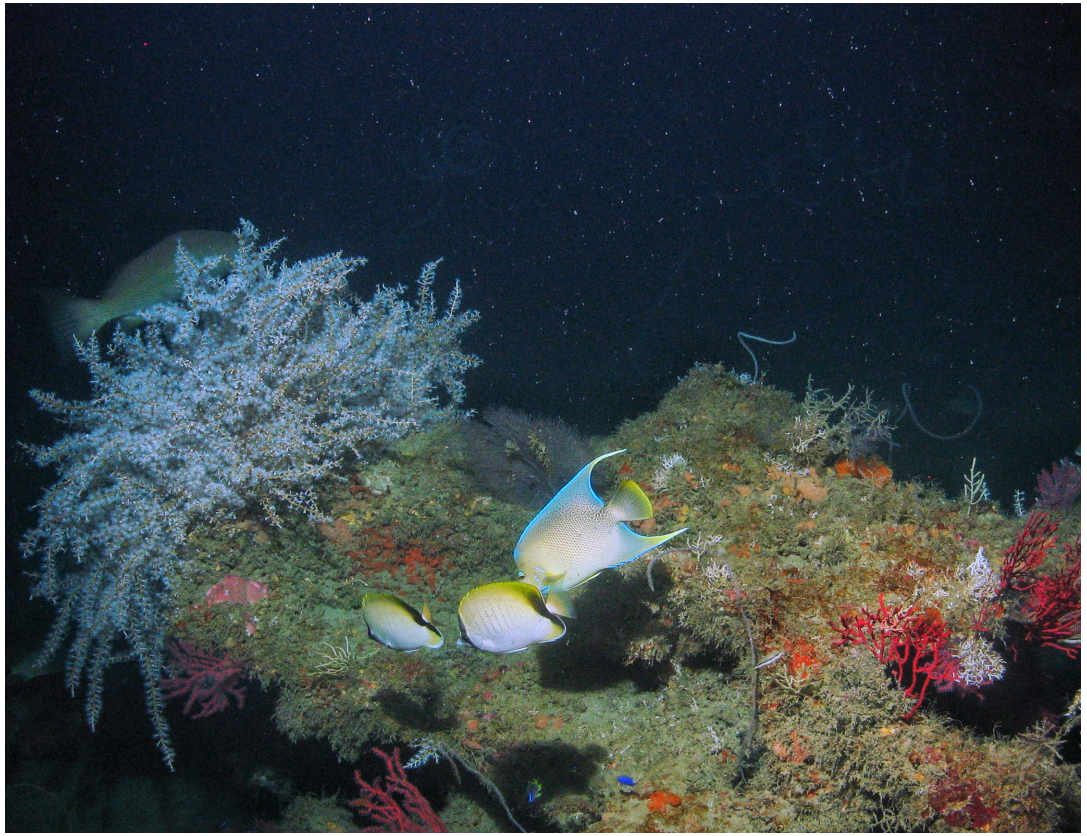


Photo: Marine Applied Research & Exploration, NOAA

Common Acronyms

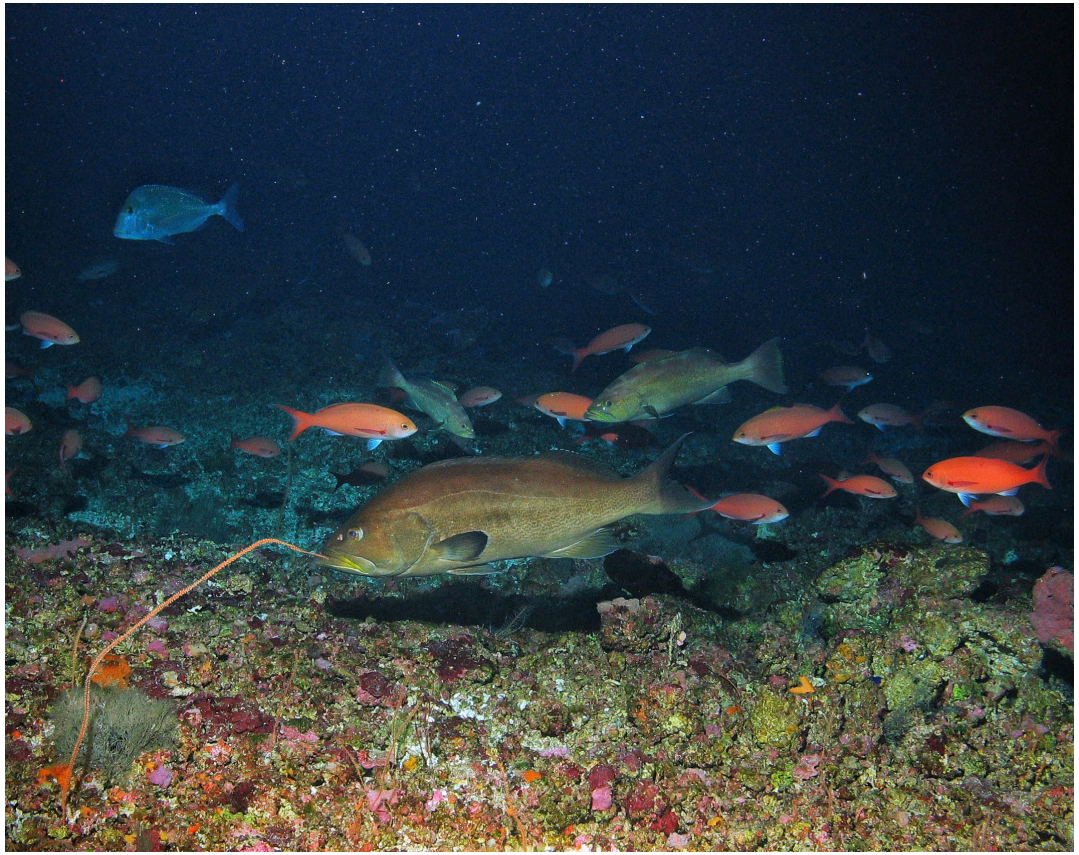


Photo: Marine Applied Research & Exploration, NOAA

- **MDBC** = Mesophotic & Deep Benthic Communities
- **MGM** = Mapping, Ground-Truthing, & Predictive Habitat Modeling
- **HAE** = Habitat Assessment and Evaluation
- **CPT** = Coral Propagation Technique Development
- **AMP** = Active Management & Protection

Deepwater Horizon Oil Spill Background

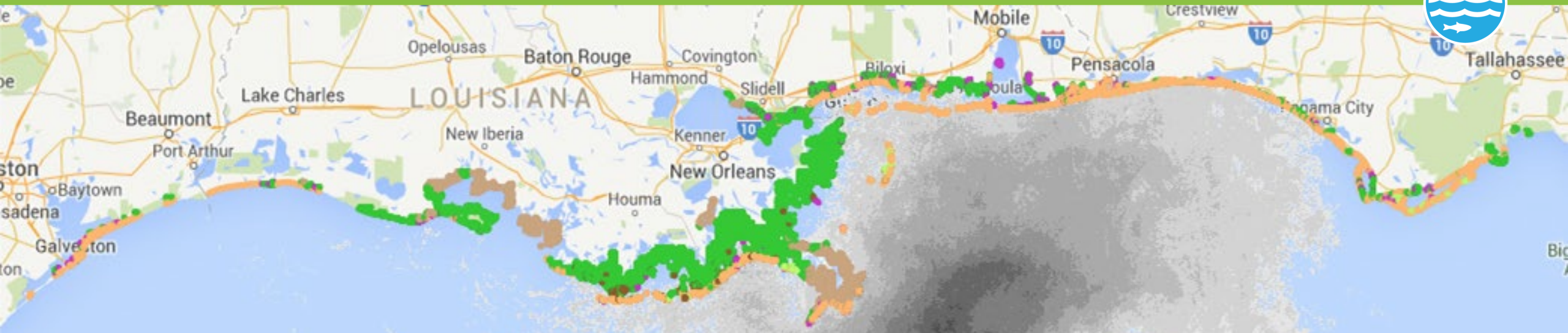
Photo: Marine Applied Research & Exploration, NOAA

Deepwater Horizon Incident

Photo: U.S. Coast Guard

- The tragic loss of 11 workers and largest marine oil spill in U.S. history
- 3.2 million barrels (134 million gallons) of oil released into the ocean over 87 days
- 43,300 square miles: Cumulative extent of surface slick during the spill—an area almost the size of Virginia

Deepwater Horizon Response



Data Collection to Assess Damages:

- Thousands of trips to survey and collect data, and thousands of environmental samples collected.
- Sediment, air, water, tissue samples, carcasses, photos and videos, telemetry, aerial imagery, GPS data, observations.
- Including quantified injury to over 2,000 km^2 of benthic habitat
- All these data at https://dwhdiver.orr.noaa.gov

Settlement & Programmatic Restoration Plan

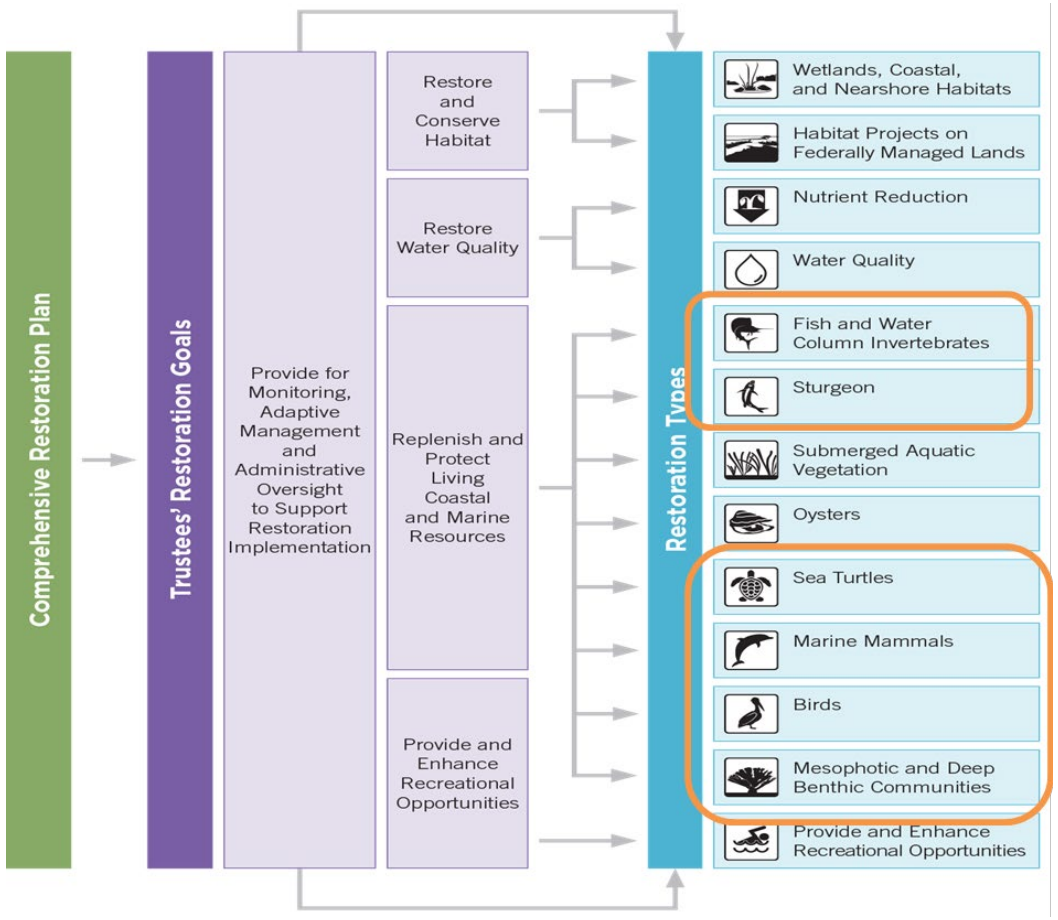
Deepwater Horizon Natural Resource Damage Assessment 2016 Settlement: up to $8.8 billion

- Restore and Conserve Habitat: $4.7 billion
- Replenish and Protect Living Coastal and Marine Resources: $1.8 billion
- Restore Water Quality: $400 million
- Provide and Enhance Recreational Opportunities: $400 million
- Monitoring, Adaptive Management, Administrative Oversight: $1.5 billion
- Adaptive management for unknown conditions: up to $700 million

Open Ocean Restoration Area

Open Ocean Trustee Implementation Group

- Restores wide-ranging and migratory species throughout their geographic range
- Allocation to restore Living Marine Resources: ~$868M
- Currently implementing 29 projects across 6 restoration types



Restoring Mesophotic & Deep Benthic Communities

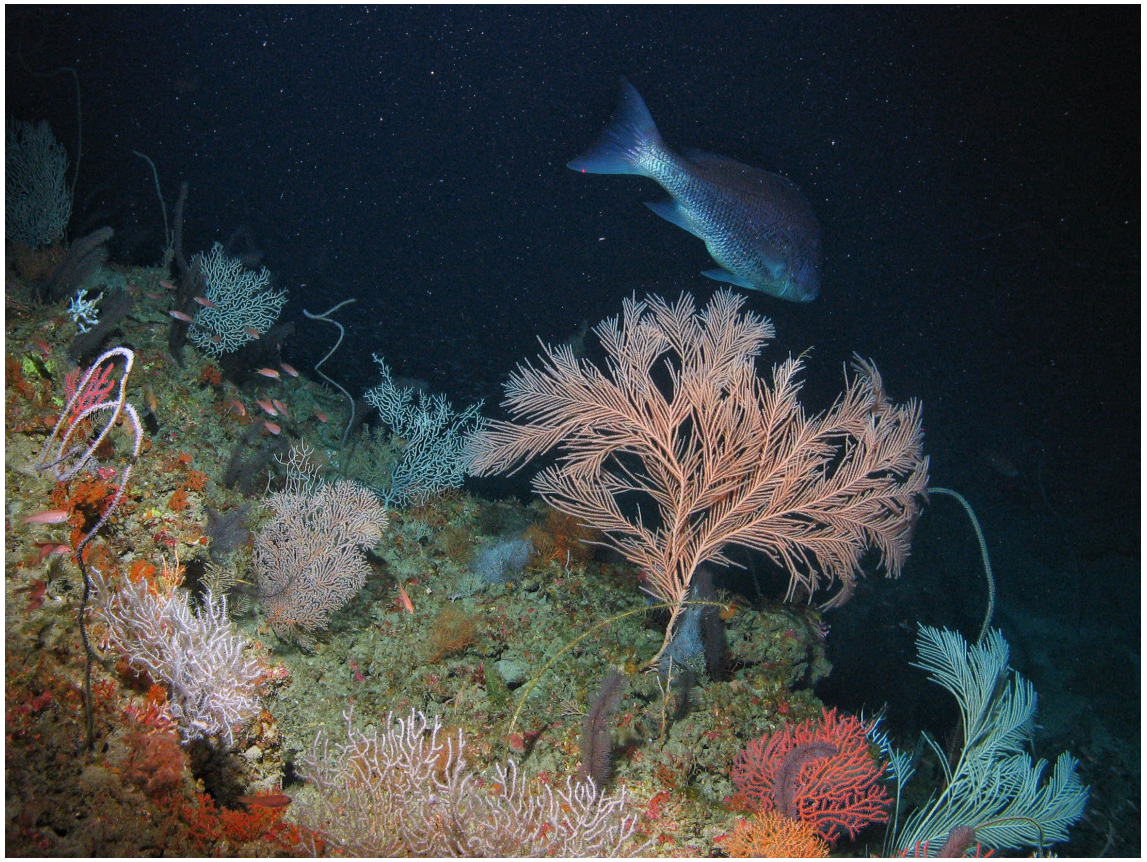


Photo: Marine Applied Research & Exploration, NOAA

Long-term Restoration Goals

- Restore mesophotic and deep benthic invertebrate and fish abundance and biomass for injured species.
- Actively manage valuable MDBC to protect against multiple threats and provide a framework for monitoring, education, and outreach.
- Improve understanding of MDBC to inform better management and ensure resiliency.

Mesophotic and Deep Benthic Communities Restoration Portfolio

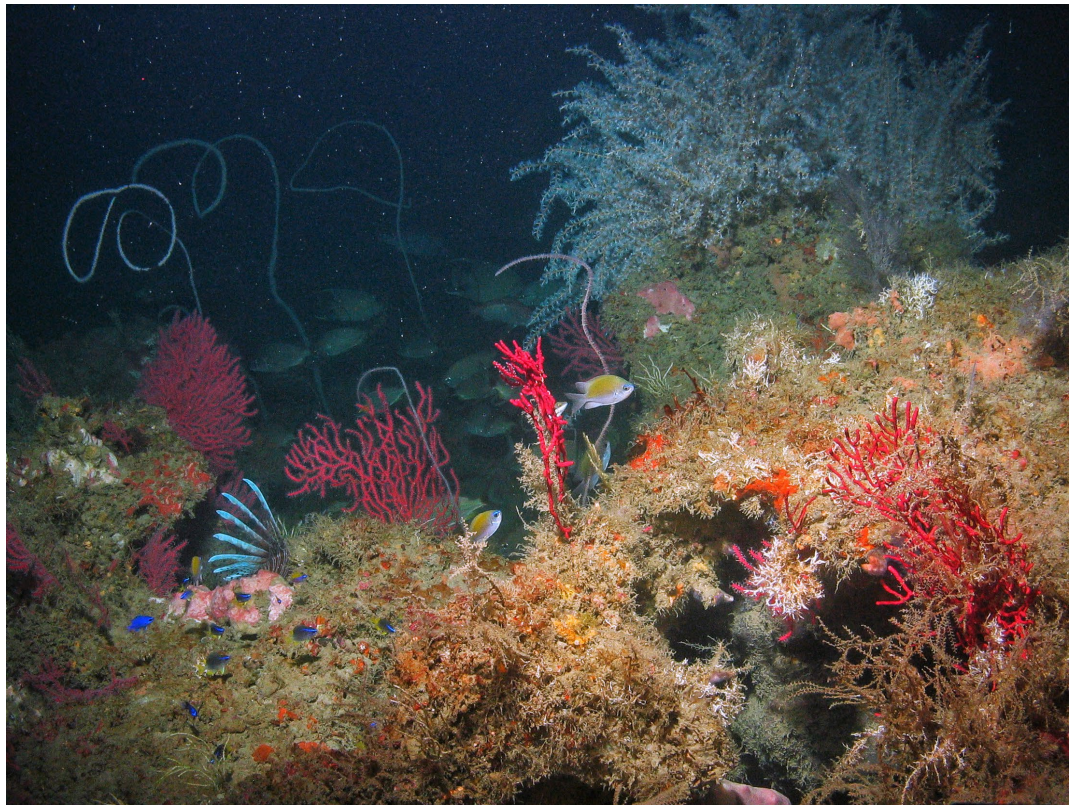


Photo: Marine Applied Research & Exploration, NOAA

- Mapping, ground-truthing, and predictive habitat modeling (MGM): $35.9M
- Habitat assessment and evaluation (HAE): $52.6M
- Coral propagation technique development (CPT): $17.0M
- Active management and protection (AMP): $20.7M

2022 Field Activities Overview

Photo: Marine Applied Research & Exploration, NOAA

2022 Field Activities Overview

5 ships, including the NOAA ships Ferdinand R. Hassler, Pisces, Nancy Foster and the research vessels Point Sur and Manta

21+ collaborating partners, agencies, and offices

153
total days at sea

8 cruises

107
Remotely Operated Vehicle dives accomplished for mapping and habitat surveys

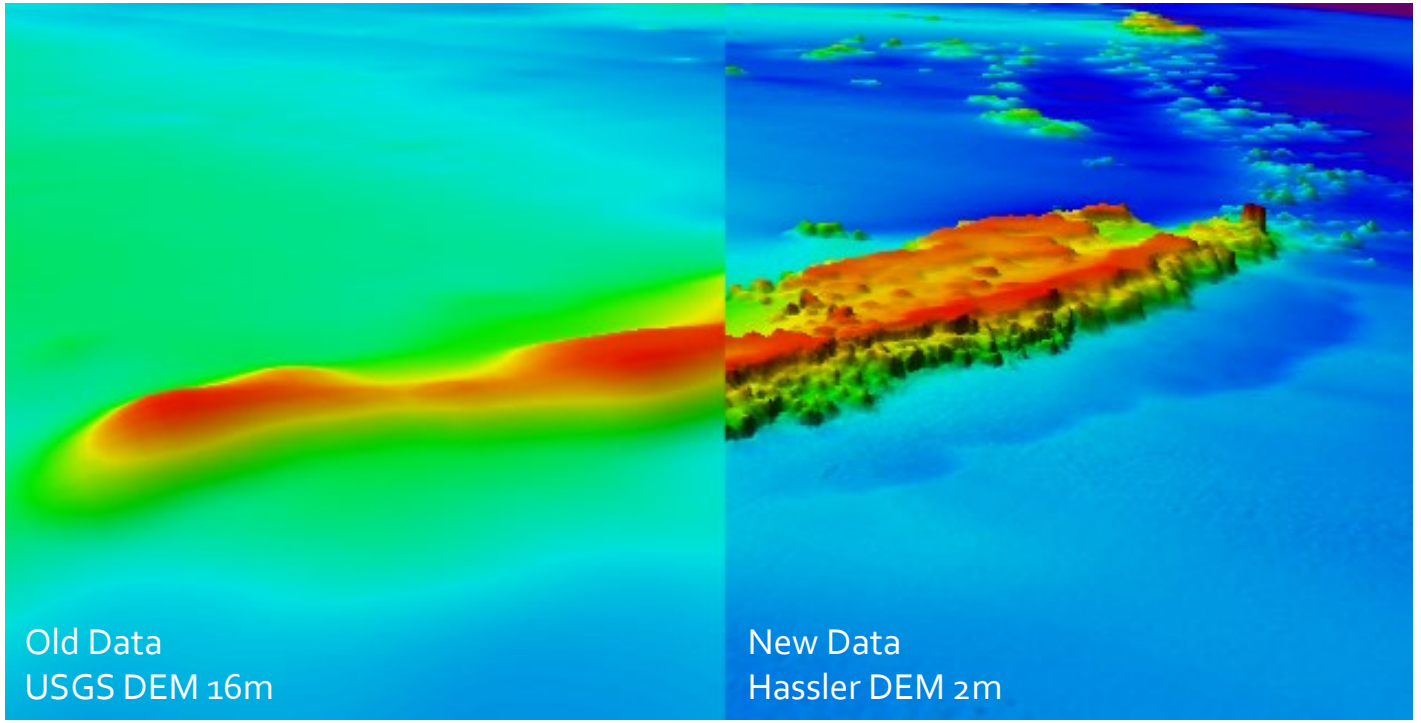
1,650 square nautical miles mapped (about 2,185 square miles, an area a bit larger than the state of Delaware)

2022 Field Activities Overview

Mapping, Ground-Truthing, and Predictive Habitat Modeling

NOAA Ship *Ferdinand R. Hassler*

- Collected data that will support the development of models to predict where MDBC habitat is found
- Mapping data collected in 2022 provides significantly more detail than previously existing data
- 2022 efforts are already helping to inform future planning



2022 Field Activities Overview

Habitat Assessment and Evaluation

NOAA Ship *Pisces* and *Nancy Foster*, R/V *Point Sur*

- Autonomous Underwater Vehicle (AUV) surveys provided unprecedented detail of MDBC habitat
- Remotely Operated Vehicle (ROV) surveys collected thousands of images of MDBC habitat and corals
- Collected small coral samples to compare genetics

2022 Field Activities Overview

Coral Propagation Technique Development

R/V *Point Sur* and *Manta*

- Collected coral samples to keep alive in labs and study biology, reproduction, growth, etc.
- Conducted visual surveys of coral habitat
- Deployed and collected instruments that collect information about the environment
- 6 species of coral now in 3 federal labs

Photos: NOAA

2023 Planned Field Activities

Photo: Marine Applied Research & Exploration, NOAA

2023 Field Activities Overview

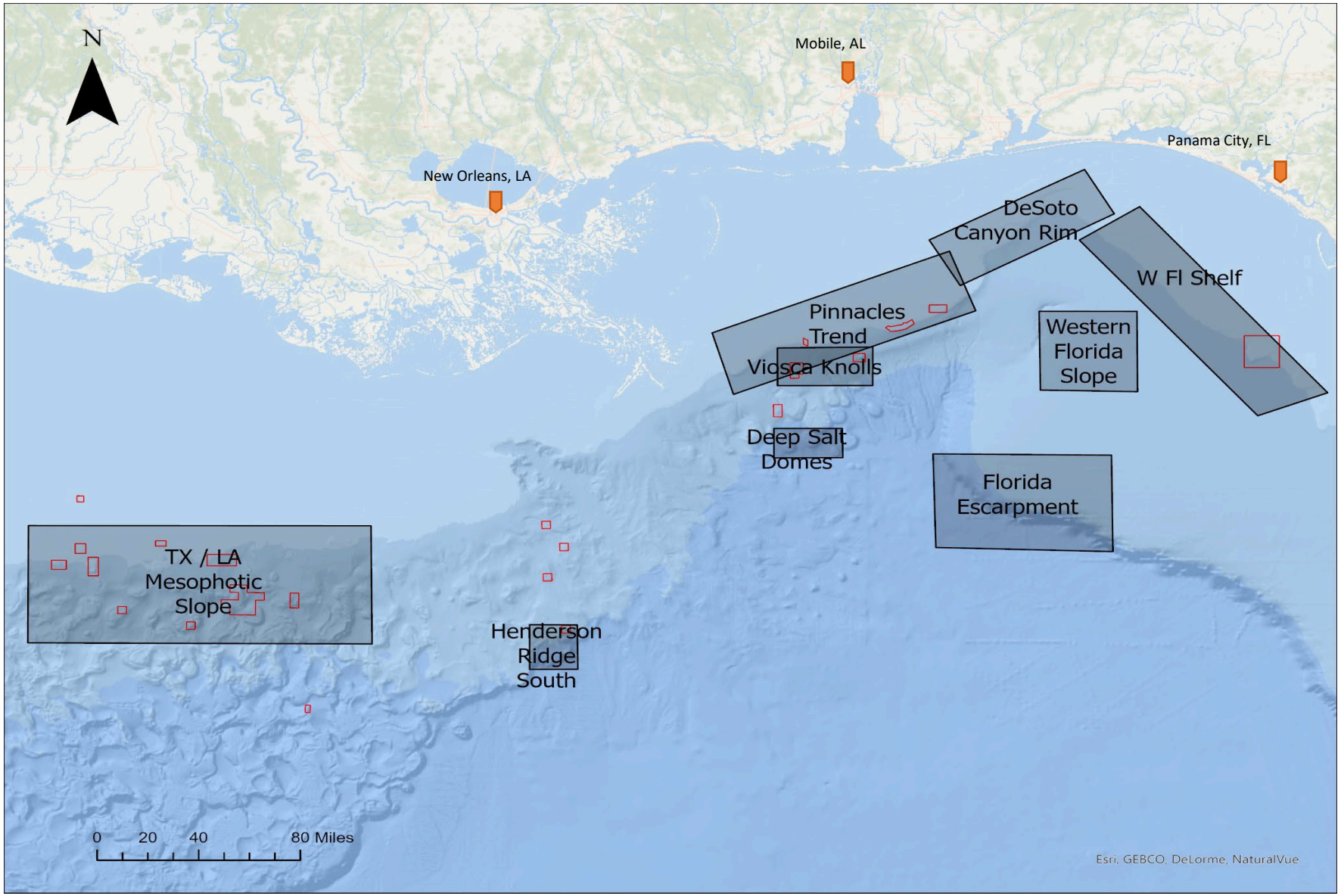
Summary:

- 8 cruises - some with multiple legs
- May – November
- ~200 days at sea (DAS)

Major Partners

- Marine Applied Research & Exploration (MARE)
- National Marine Sanctuary Foundation (NMSF)
- Univ. of North Carolina Wilmington Undersea Vehicles Program (UNCW)
- Channel Ship Services (CSS Inc.)
- Oceaneering
- United States Navy & Navy Saturation Divers
- Ocean Exploration Cooperative Institute (OECI)
- Woods Hole Oceanographic Institute (WHOI)
- Univ. of Southern Mississippi (USM)
- NOAA Office of Marine and Aviation Operations
- Civilian Tech Diver Corps – NMSF, Moody Gardens Aquarium

2023 Field Activities Spatial Overview

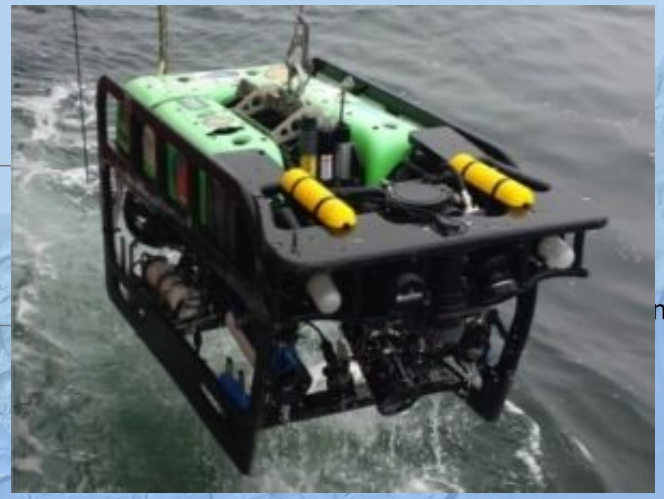


R/V Point Sur : May 2023

Dates: May 15 – 28
Vessel: R/V *Point Sur*
Asset(s): Remotely Operated Vehicle (ROV) Beagle

Objectives

- Characterize the community, sample coral, measure diversity
- Survey areas for technical diving operations in mesophotic water depths
- Collect water chemistry and quality data
- Collect water samples to understand coral food sources
- Collect data loggers from prior missions
- Deploy landers to collect long-term data at DeSoto Rim



R/V Point Sur : June 2023

Dates: June 6 – 20
Vessel: R/V *Point Sur*
Asset(s): ROV Global Explorer

Objectives

- Repeat ROV dives conducted during the damage assessment to investigate changes in the community over time
- Collect sediment samples to analyze chemistry and characterize the infauna community
- Collect live corals at Henderson Ridge

R/V Pelican : June 2023

Dates: June 19 - 30
Vessel: R/V *Pelican*
Asset(s): ROV Beagle

Objectives

- Characterize the community, sample coral, measure diversity
- Collect water chemistry and quality data
- Collect water samples to understand coral food sources
- Conduct propagation tests and deploy settlement substrates using technical divers.

April 2023

NOAA Ship Pisces : June/July 2023

Dates: June 12 – July 30
Vessel: NOAA Ship *Pisces*
Asset(s): ROV Mohawk, Remus 600 Autonomous Underwater Vehicle (AUV)

Objectives

- Characterize the communities and collect samples to measure diversity
- Collect high resolution mapping and images with the AUV
- Collect water chemistry and quality data
- Collect water samples to understand food sources
- Collect high resolution mapping with the ship multibeam system
- Retrieval of landers at DeSoto Rim and redeployment

NOAA Ship Nancy Foster : August, September - October 2023

Dates: August 1 – 12, September 5 – October 16
Vessel: NOAA Ship *Nancy Foster*
Asset(s): ROV Global Explorer, Sentry AUV

Objectives

- Characterize the communities and collect samples to measure diversity
- Collect high resolution mapping and images with the AUV
- Collect water chemistry and quality data
- Collect water samples to understand food sources
- Collect high resolution mapping with the ship multibeam system
- Deployment/Retrieval of short term landers
- Telepresence

R/V Point Sur : September 2023

Dates: September 7 - 29
Vessel: R/V *Point Sur*
Asset(s): Multicorer

Objectives

- Collect sediment samples to analyze chemistry and characterize the infauna community
- Collect acoustic sub-bottom profiling data to determine physical properties of the sea floor
- Collect water chemistry and quality data
- Collect water samples to understand food sources

R/V Point Sur : October 2023

Dates: October 8 - 18
Vessel: R/V *Point Sur*
Asset(s): ROV Mohawk, AUV Mola Mola

Objectives

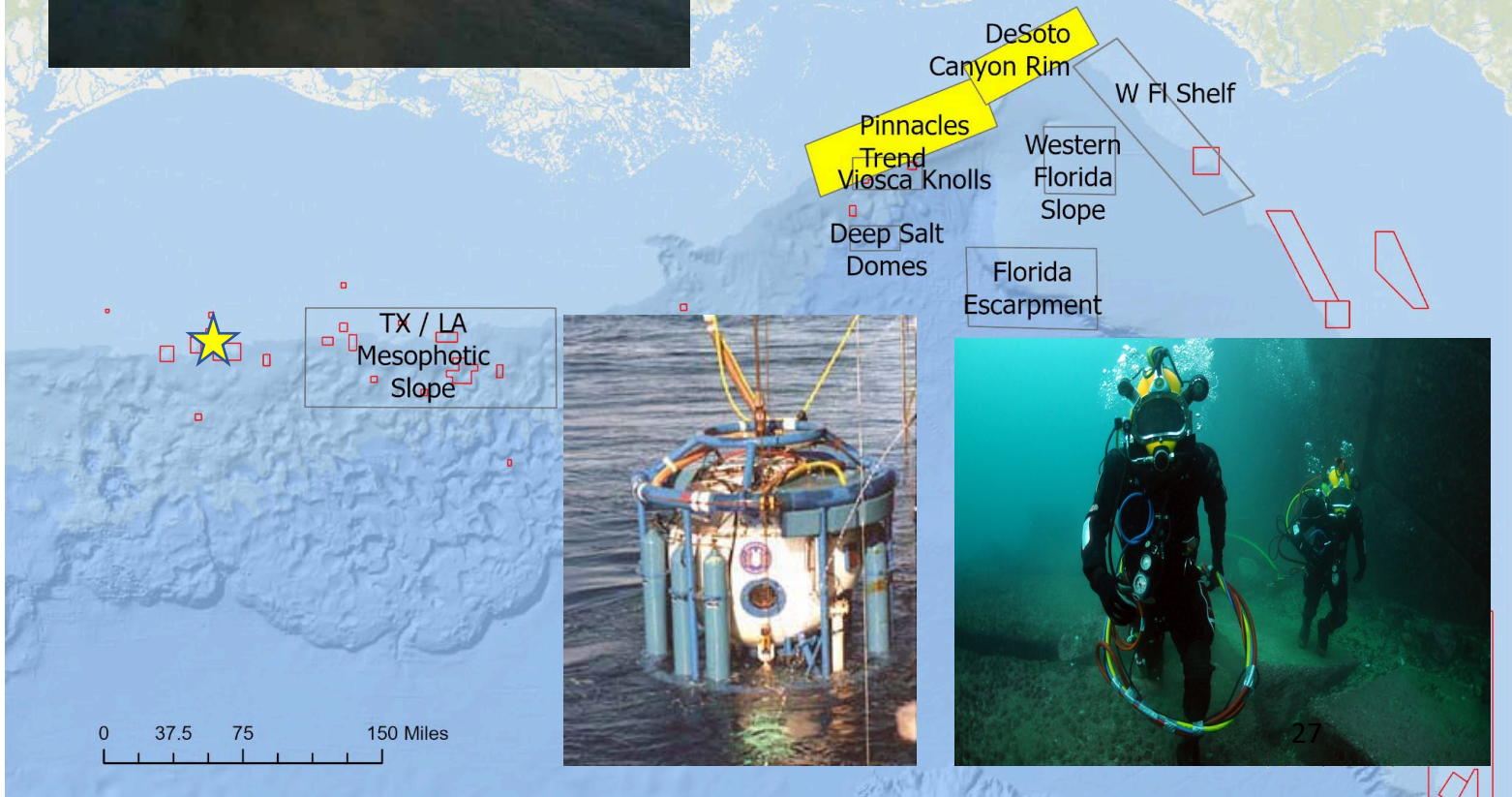
- Characterize the community, sample coral, measure diversity
- Collect water chemistry and quality data
- Collect water samples to understand coral food sources
- Collect high resolution imagery of propagation sites

Saturation Diving : October 2023

Dates: October TBD (~30 DAS)
Vessel: TBD – possibly Harvey Gulf Deep-Sea
Asset(s): Navy Saturation Divers, TBD Working Class ROV

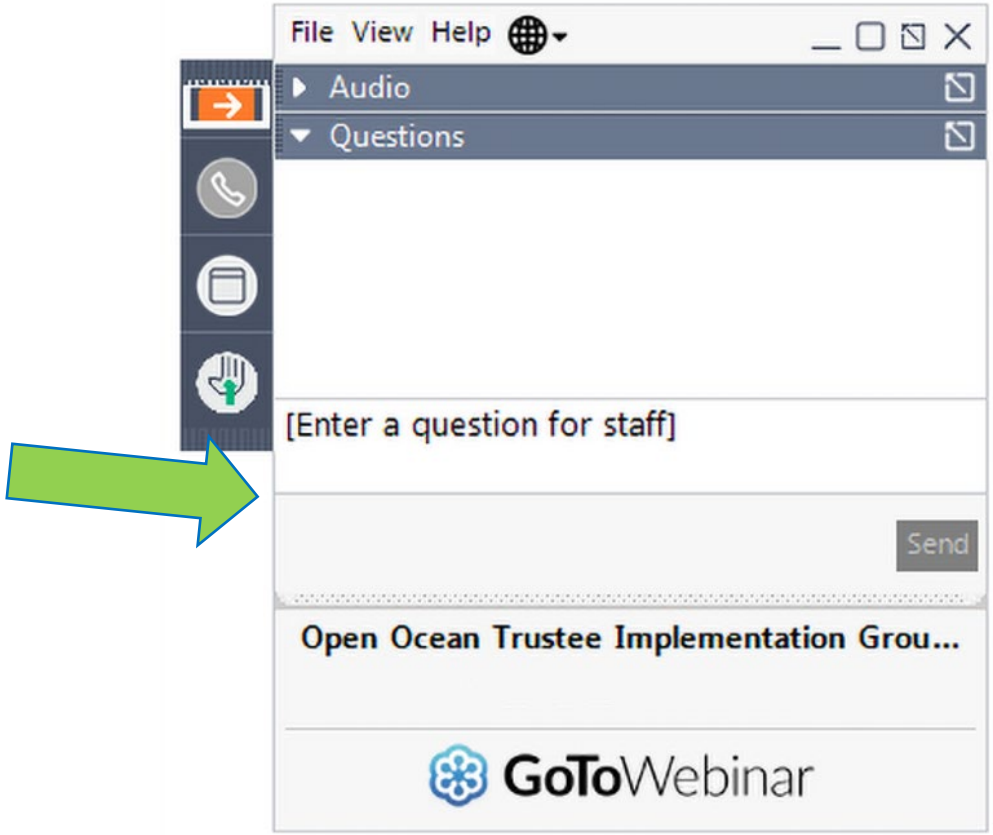
Objectives

- Potential threat reduction activities:
  - Marine debris & invasive species surveying and removal
  - Mooring buoy installations
- Recovery of Autonomous Reef Monitoring Structures (ARMS)
- Collect samples of corals and other invertebrates or sediment
- Coral propagation activities:
  - Substrate placement and recovery
  - In situ fragmentation and propagation tests
- Telepresence



Questions

- Please type your questions in the “Questions” box.
- We’ll do our best to get to as many questions as possible.

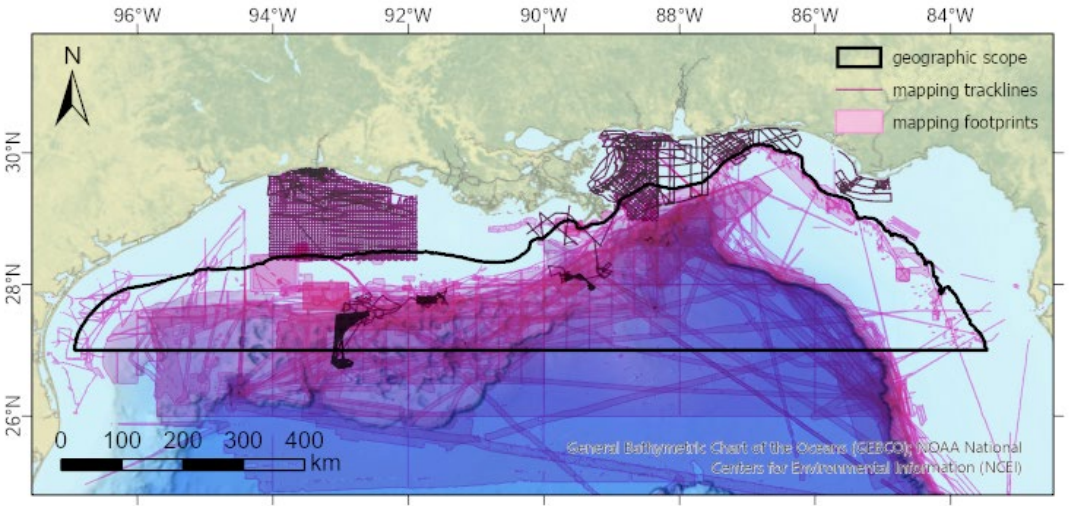


Project Update: Mapping, Ground-Truthing, and Predictive Habitat Modeling (MGM)

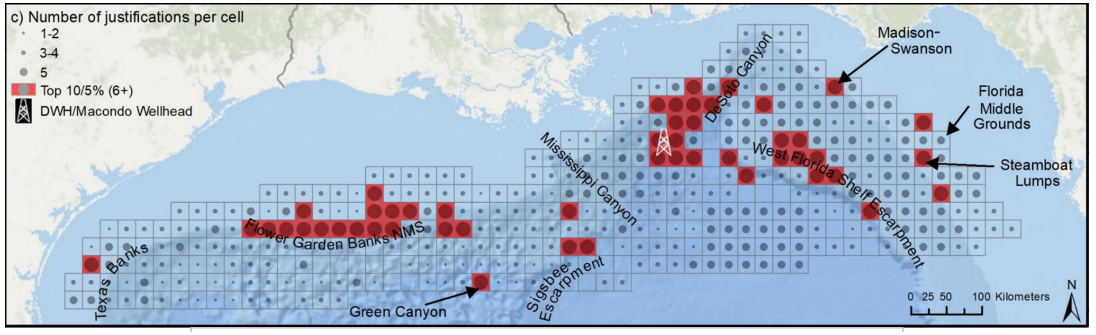
Photo: Marine Applied Research & Exploration, NOAA

Project Update - MGM

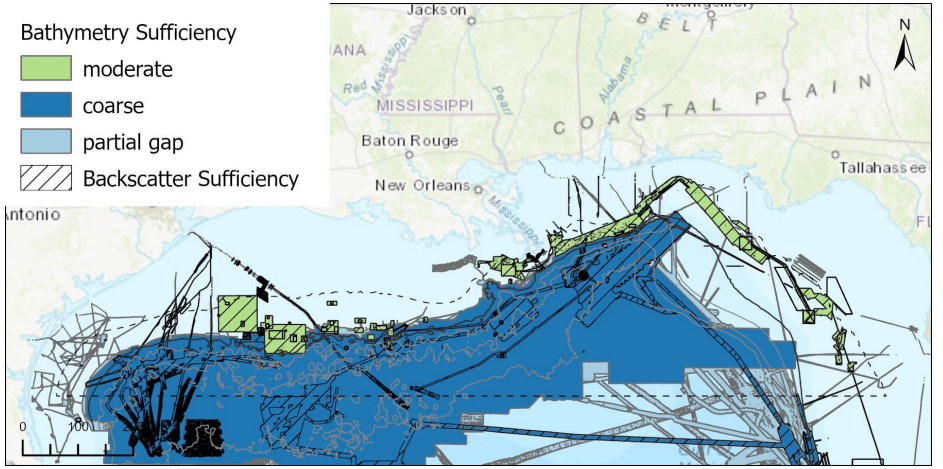
- Data Inventory & Workshop Report completed (Paxton et al., 2023)
- Spatial Prioritization Report completed (Kendall et al., 2022)
- Complete Gap Analysis



Data Inventory: compiling of existing data for the study area including acoustic data, ground truthing, and predictive models.



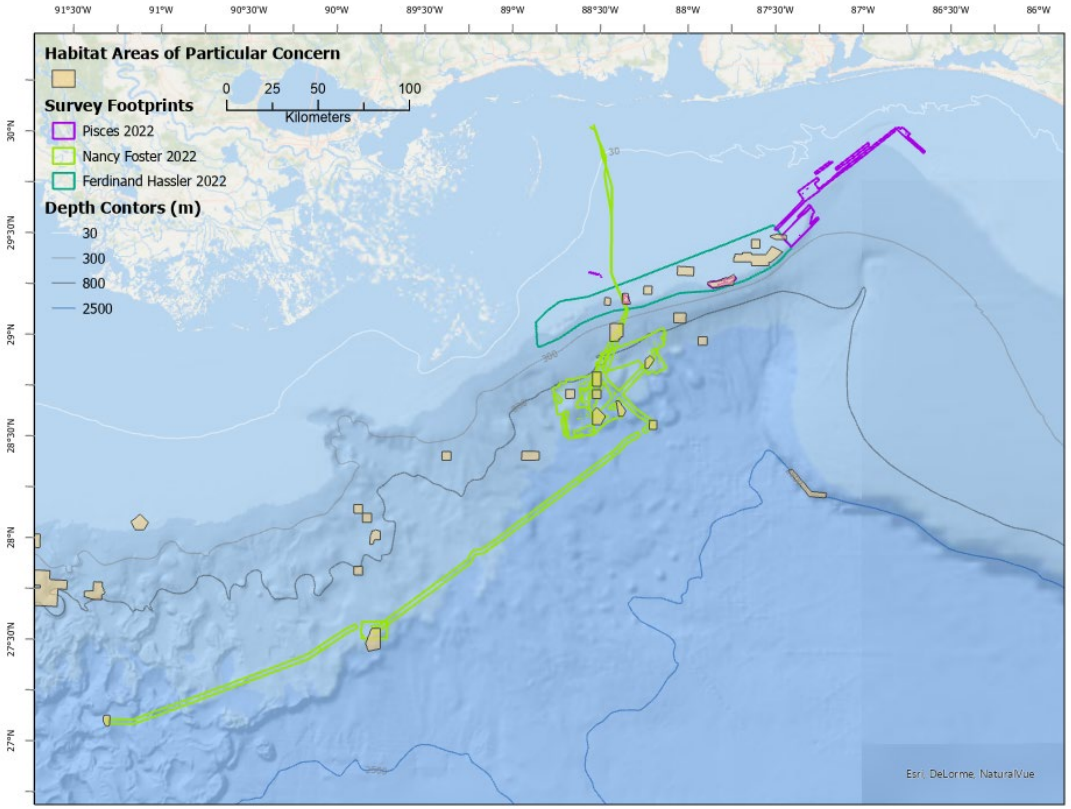
Spatial Prioritization: Sum of all coins representing the total number of different Justifications used in each cell.



Gap Analysis: evaluating the inventory of existing data to analyze gaps , and guide mission planning.

Project Update - MGM

2023 Planned Activities



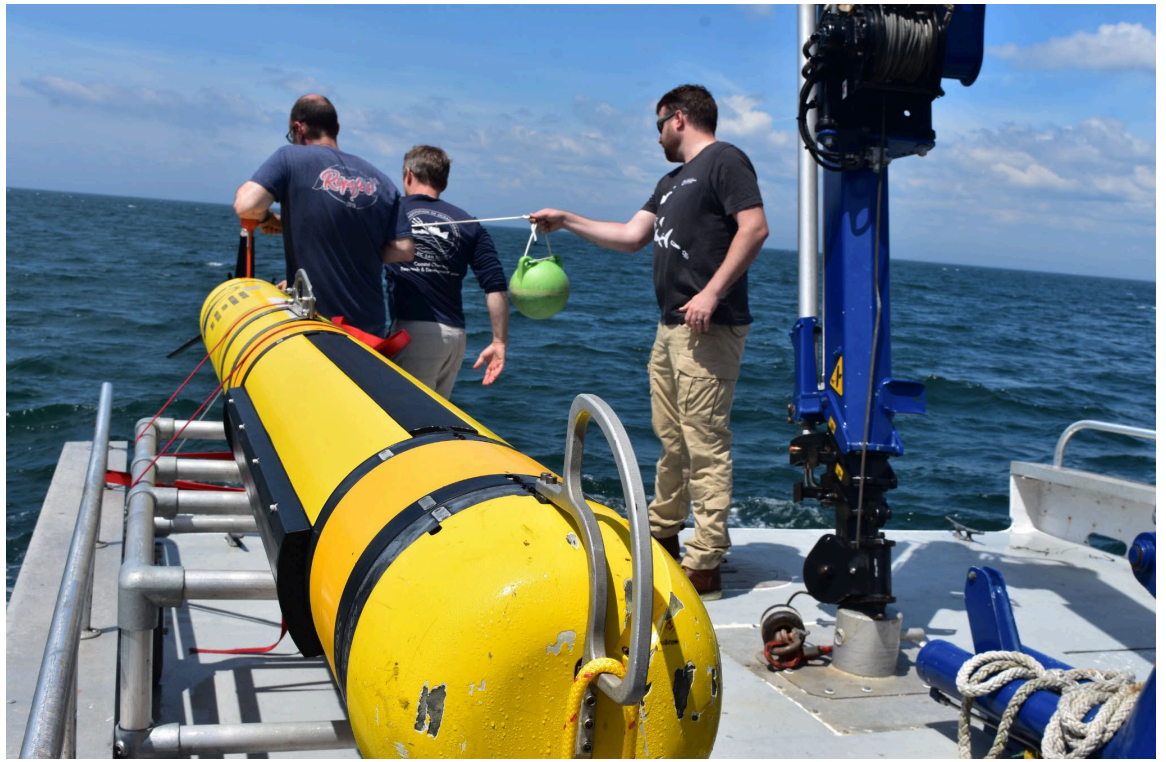
2022 Cruise Data Processing & Analysis

- Bathymetric features and coarse-level habitat models
- Moderate substrate and species distribution models
  - Pinnacles Trend region
  - DeSoto Canyon Rim
  - Henderson Ridge South
  - Areas near DWH
- High-resolution benthic characterizations within protected areas

Project Update - MGM

Implementation Partners

- Ocean Exploration Cooperative Institute
- National Marine Sanctuary Foundation
- Navy
- BOEM
- Subject Matter Experts



Deployment of NOAA partner UxS with Navy SAS payload

Project Update: Habitat Assessment and Evaluation (HAE)

Photo: Marine Applied Research & Exploration, NOAA

Project Update - HAE

2022 Accomplishments

- Project Management Plan including a budget and updated Monitoring and Adaptive Management plan
- Annual Adaptive Management Workshop completed in December 2022
- Partnerships with key SMEs and institutions implemented, others coming online in 2023

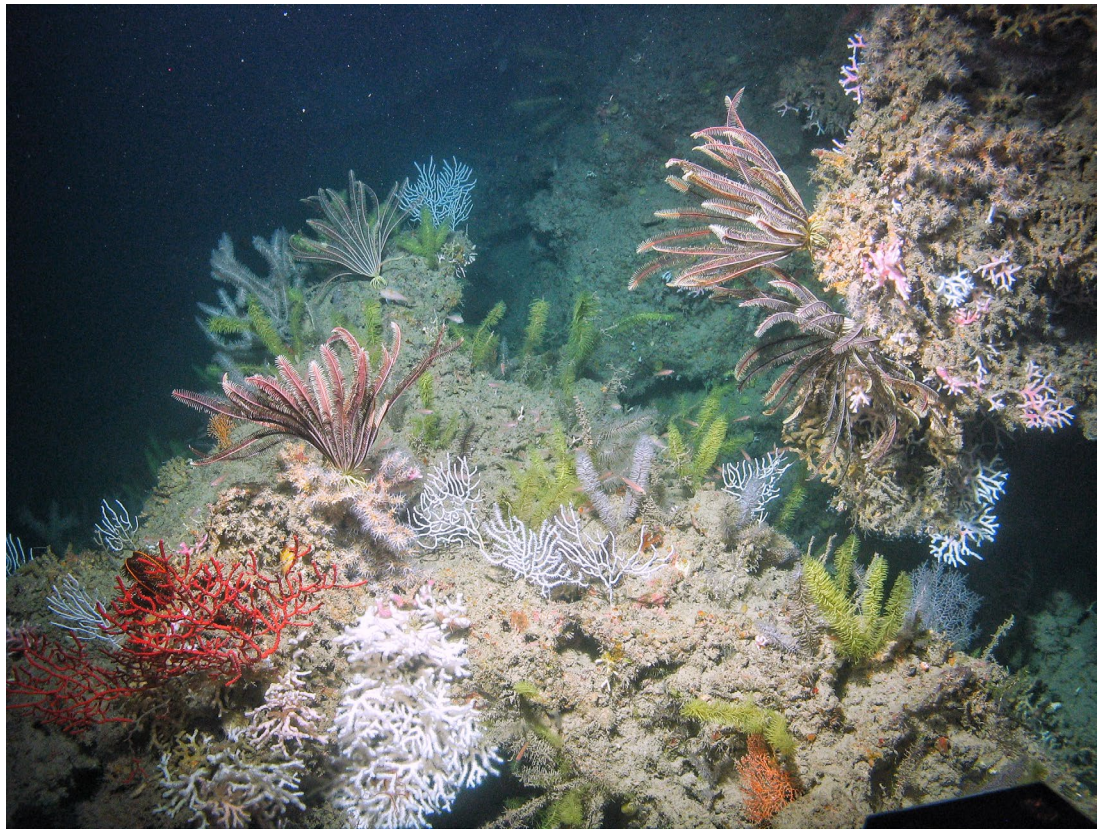
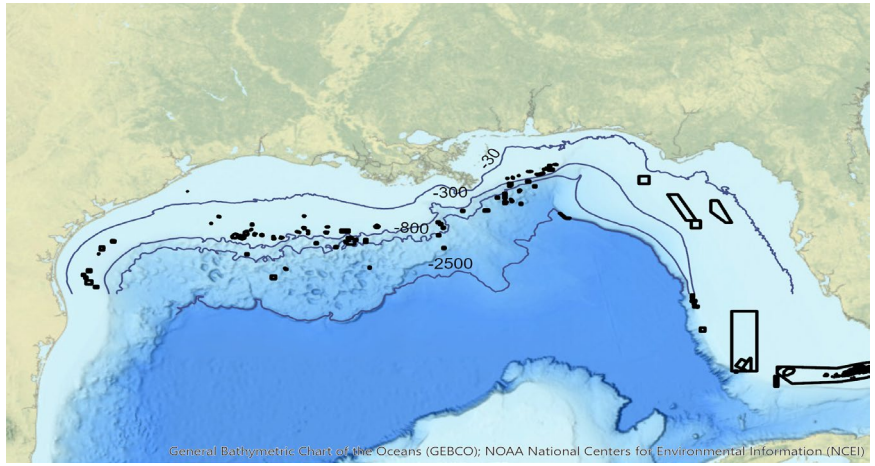
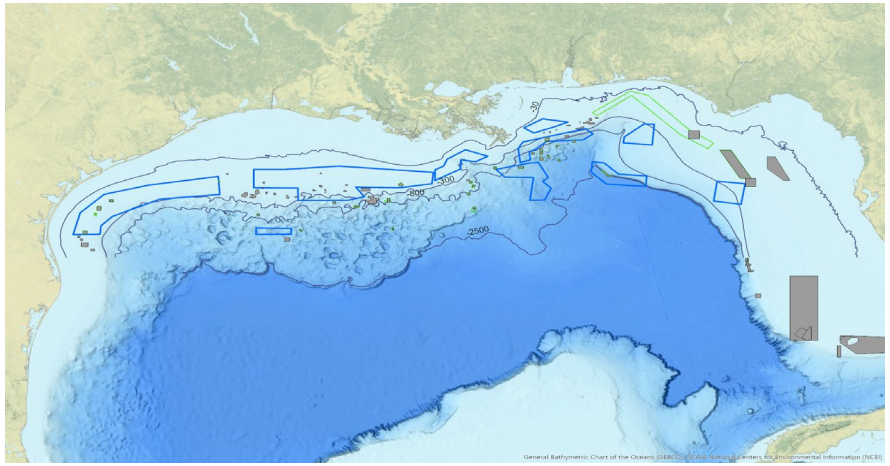


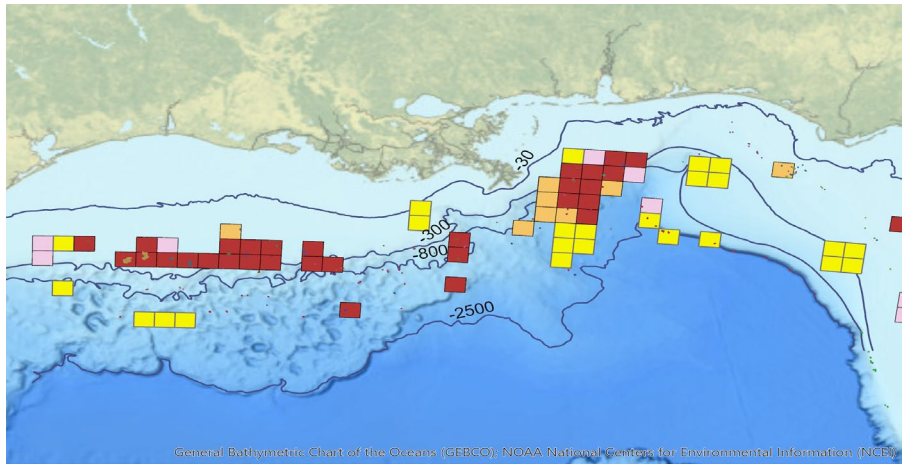
Photo: Marine Applied Research & Exploration, NOAA

Project Update - HAE

2023: In-Depth Gap Assessment







Project Update - HAE

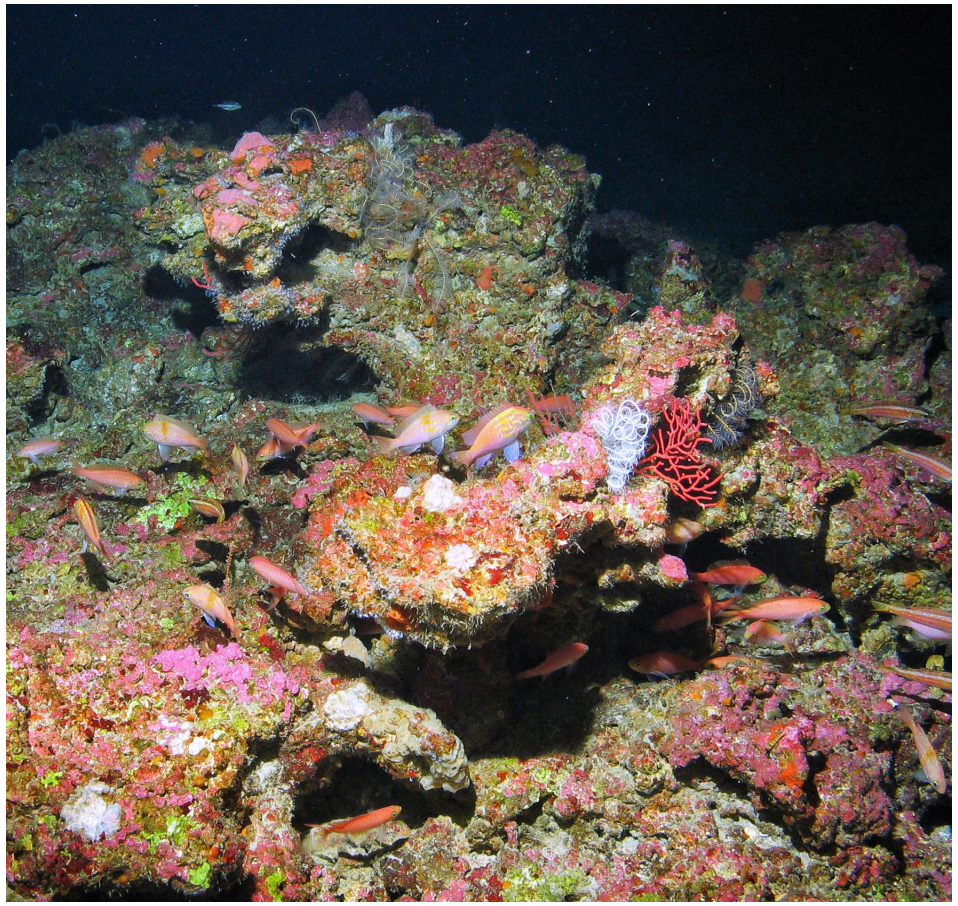


Photo: Marine Applied Research & Exploration, NOAA

2023 Planned Activities:

- Sediment work – cores, soft community characterization
- Community composition – video transects, specimen collections
- More days at sea in areas > 600m

Work continuing from 2022:

- Video transects
- Microbiome
- Coral imaging – analysis
- Data processing for sediments/water sampling/video

Project Update - HAE

Implementation Partners

- OECI - partnerships for sediment & environmental characterization
- Lehigh University - population genetics/connectivity
- Temple University - deep community characterization
- LUMCON - deep invertebrate communities
- UNR/UGA - soft sediments
- MBARI - deep coral health & assessment
- Smithsonian NMNH - multiple activities
- UNCW sponge ecology/taxonomy

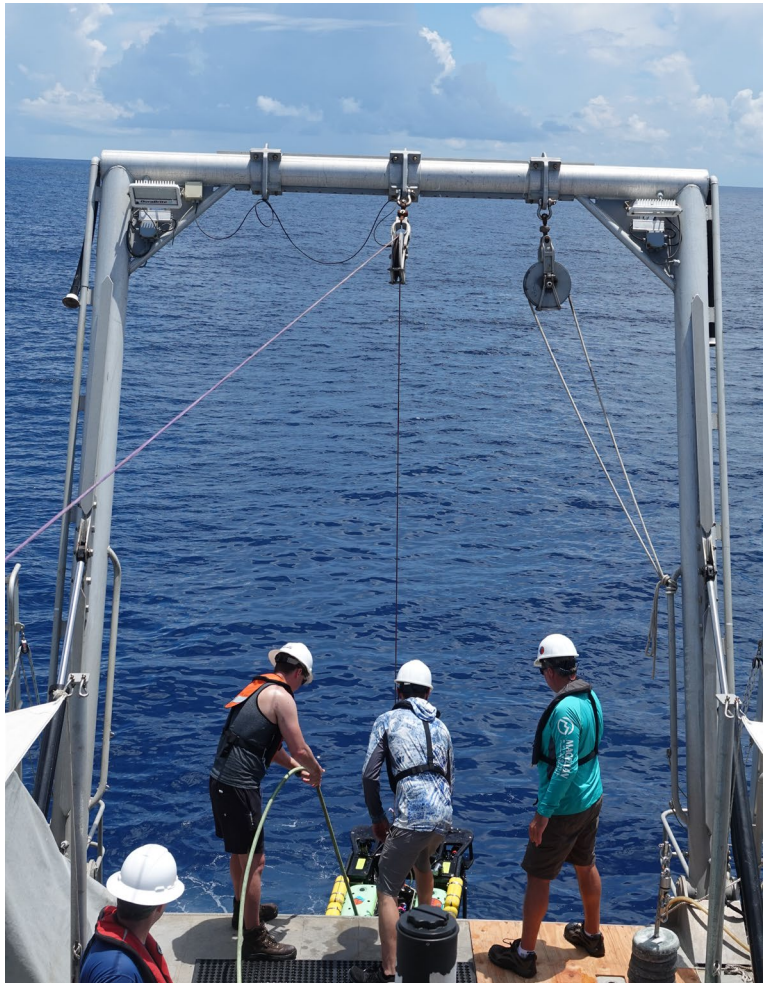


Photo: NOAA

Project Update: Coral Propagation Technique Development (CPT)

Photo: Marine Applied Research & Exploration, NOAA

Project Update – CPT

Coral Propagation Technique Development: 2022 Accomplishments

- Project Management Plan completed and Monitoring and Adaptive Management plan updated
- Data Inventory & Workshop Report completed
- Octocorals alive in three federal labs (Galveston, Charleston, Gainesville) – some have been in labs for over 18 months!
- Spawning of at least one species in all three labs
- Finalized agreements/contracts with partners (OECI, NMSF) to support ROVs, technical diving, network of aquaria partners

Photo: NOAA

Project Update - CPT

2023 Activities: Lab Activities, Stakeholder Engagement, Data Products

Photo: NOAA

- Collect livestock for partner aquaria
- Experiments in feeding, nutrition, and water quality
- Build out cold room/deepwater systems in federal labs
- Continue student funding
- **Products:**
  - Online data: CPT groups on NOAA Geoplatform, Google Site
  - New data sets: CTD summaries, coral observations, reeftop polygons
- **Sharing:**
  - Publications: 3 tech memos, 9 potential papers
  - Conference participation

Project Update - CPT

2023 Planned Activities

- Further studying biology & reproduction modes of priority corals
- Progress has been made on testing 4 out of 9 propagation methods
- Looking to outplant first colonies in 2023 with technical divers
- Evaluating potential natural and artificial substrates

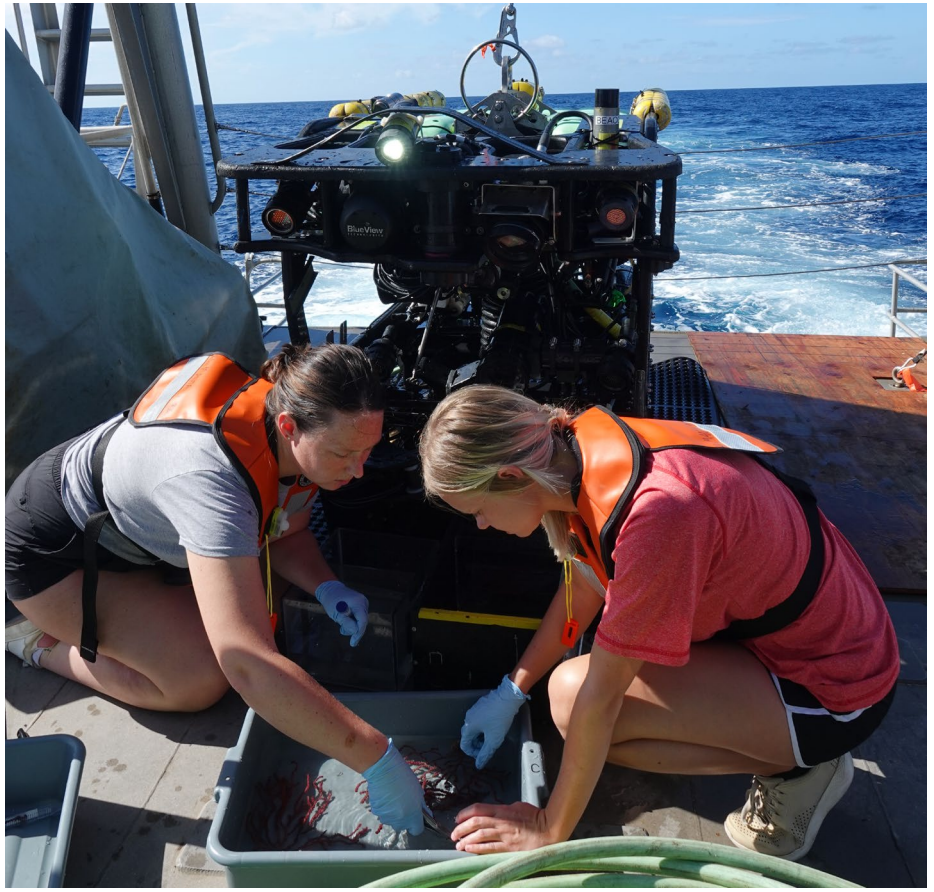


Photo: NOAA

Project Update - CPT

Implementation Partners

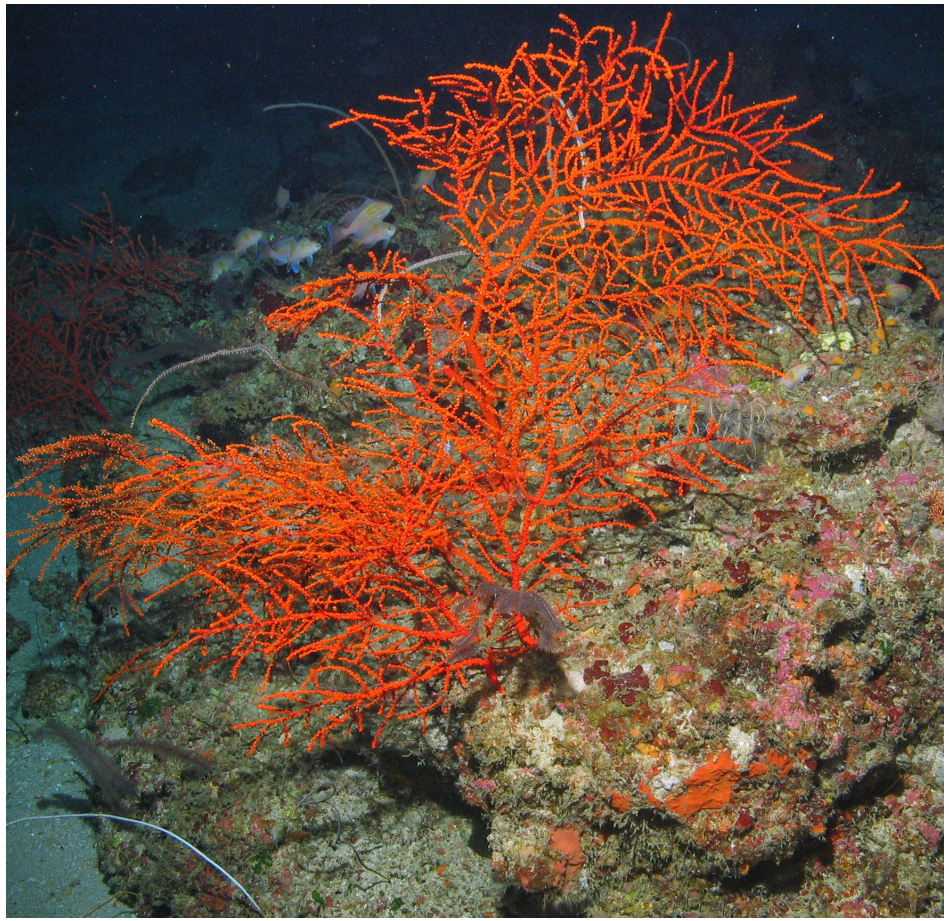


Photo: Marine Applied Research & Exploration, NOAA

Artificial Substrate Development

- Subject Matter Experts: **University of Rhode Island/Ocean Exploration Cooperative Institute, The State University of New York (SUNY)**
- Technical Divers **(Moody Gardens/CalAcademy)**

Developing new designs for artificial substrates with plans to deploy this year

Coral Biology Partners

- Partners at **Lehigh University, Smithsonian NMNH, URI, SUNY**
- Looking at:
  - Population genetics, reproduction, growth, health, microbiology, modeling

Working to characterize key biology features to support ongoing propagation technique development

Project Update: Active Management and Protection (AMP)

Photo: Marine Applied Research & Exploration, NOAA

Project Update - AMP

Active Management & Protection: 2022 Accomplishments

- Team development & onboarding
- Development of project strategies, budget, objectives
  - Education & Outreach
  - Threat Reduction
  - Science to Management
- Began some implementation activities
- Partnership development

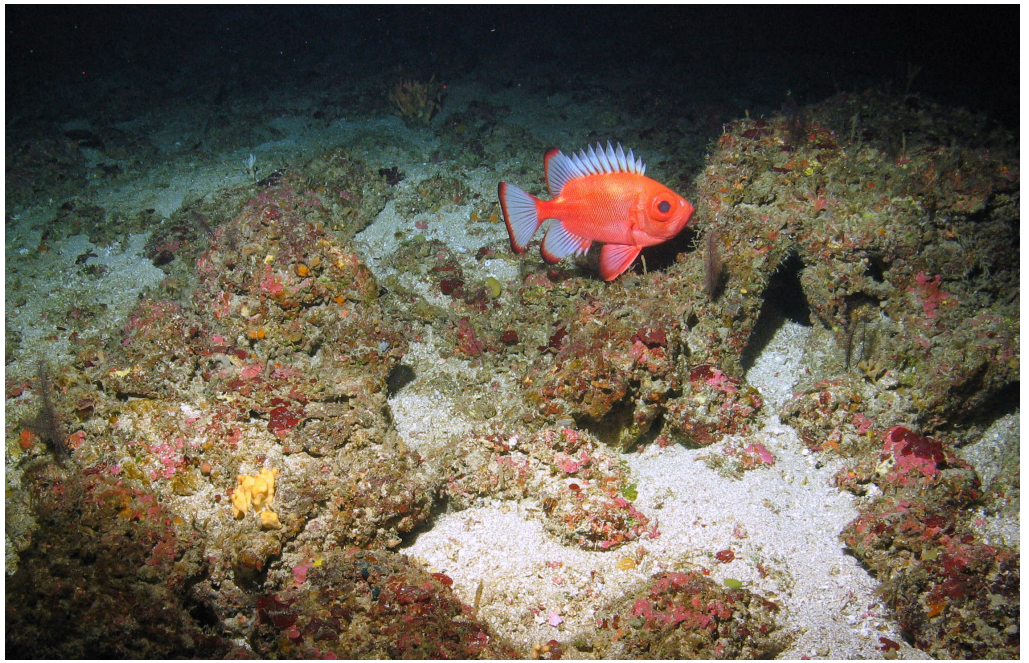


Photo: Marine Applied Research & Exploration, NOAA

Project Update - AMP

2023 Work Plan: Education & Outreach

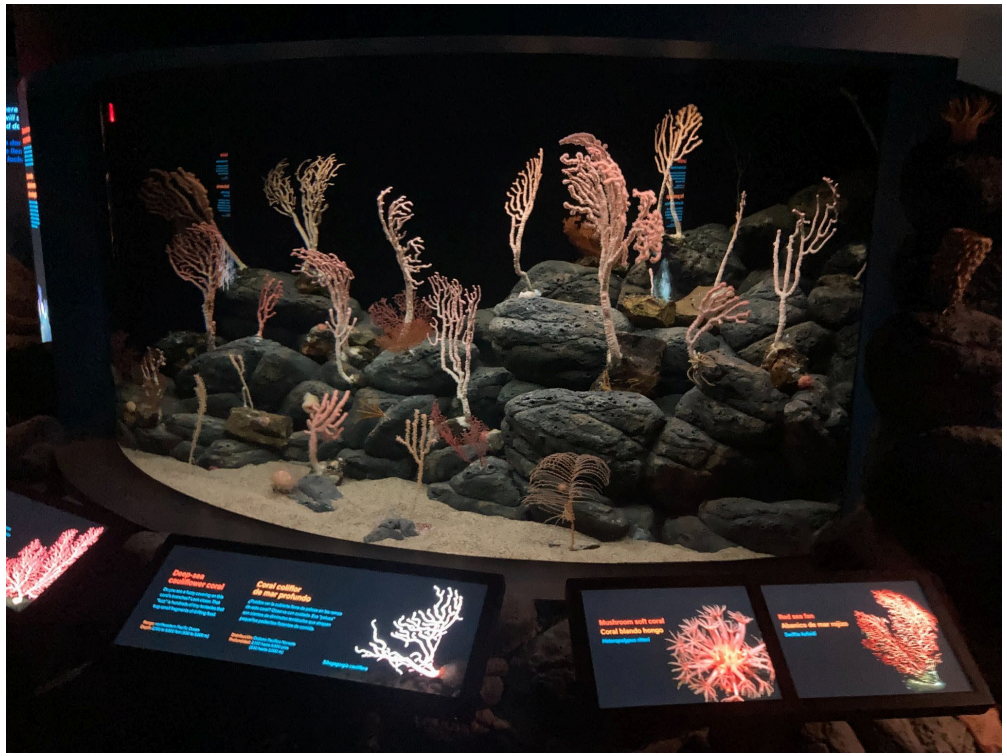


Photo: NOAA

Engage & inform our target audiences:

- About Mesophotic & deep benthic communities
- About the MDBC Restoration Portfolio

Activities

- Multimedia Content Collection & Development
- Public Venues
- Telepresence
- Web, Social Media, Popular Press

Project Update - AMP

2023 Work Plan: Threat Reduction & Science to Management

Threat Reduction

- Build our team
- Identify locations of MDBC threats & create site database
- 2023 site prioritization report

Science to Management

- Establish Working Group
- Regular engagement & open lines of communication

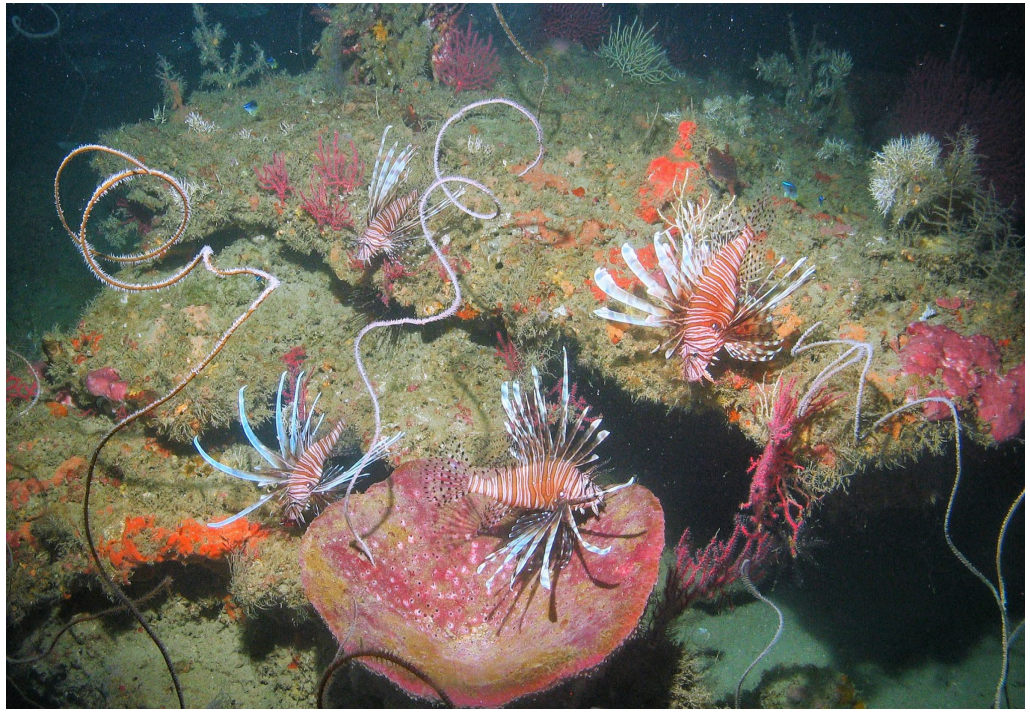


Photo: Marine Applied Research & Exploration, NOAA

Project Update - AMP

Implementation Partners

- **Ocean Exploration Cooperative Institute –** Education & Outreach support and Telepresence
- **Smithsonian National Museum of Natural History** - Education & Outreach support
- **National Marine Sanctuary Foundation** - Education & Outreach support
- **Navy Experimental Diving Unit –** Threat Reduction (saturation divers)

Photo: NOAA

MDBC Portfolio Products & Resources

Photo: Marine Applied Research & Exploration, NOAA

MDBC Webpages

- Gulf Spill Restoration
- NOAA Fisheries Office of Habitat Conservation
- NOAA National Centers for Coastal Ocean Science

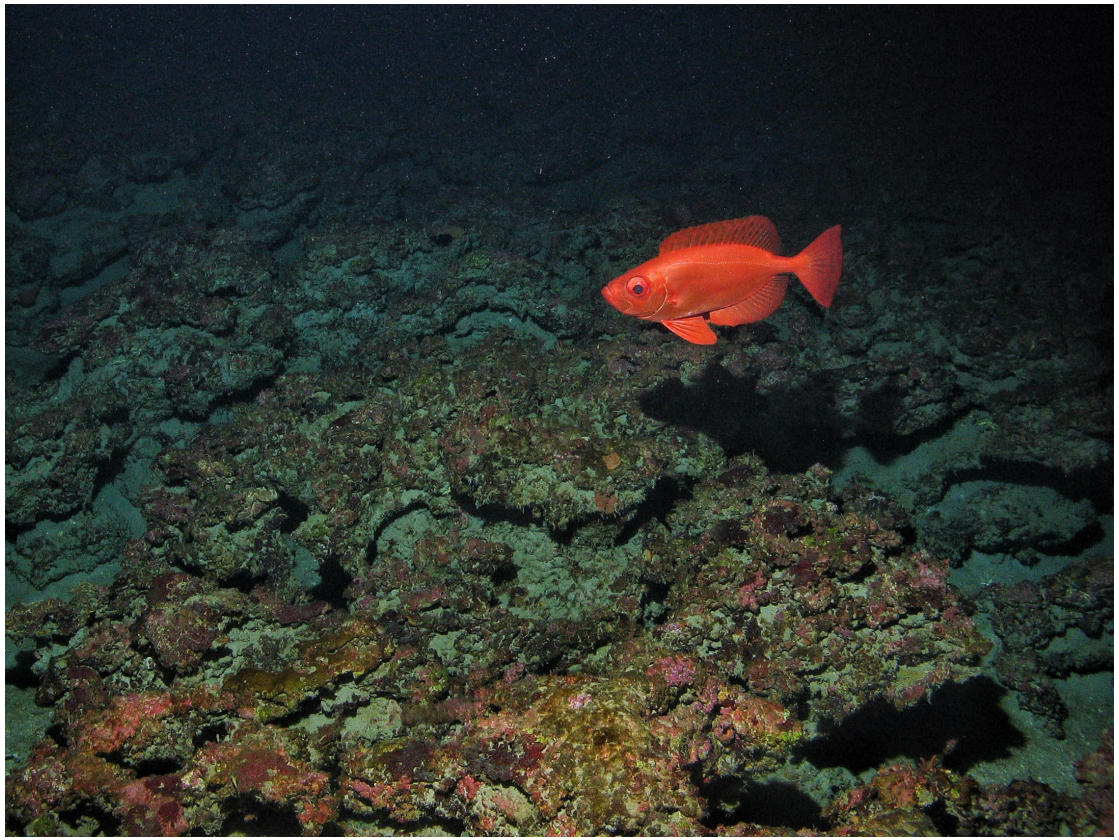
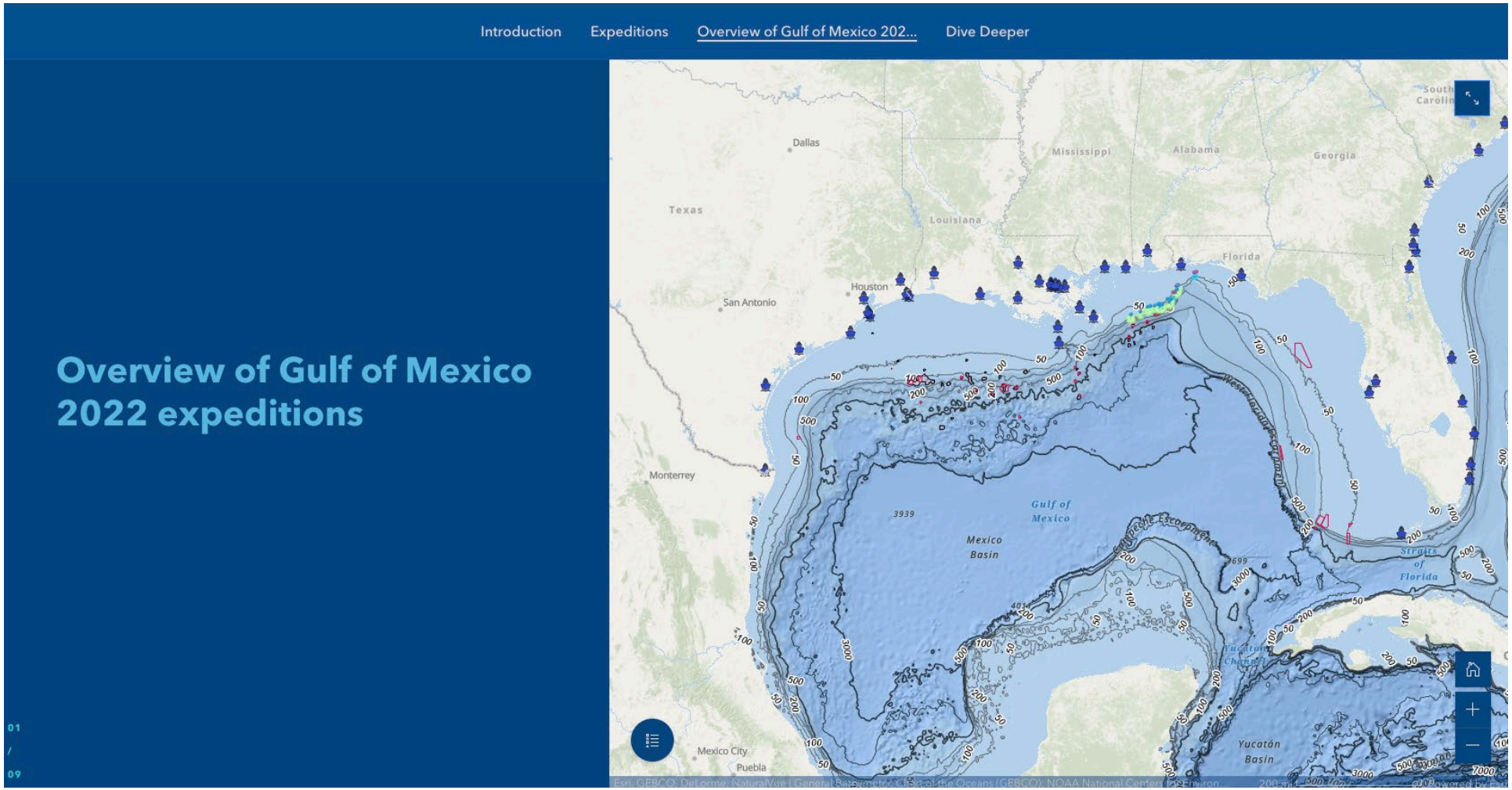


Photo: Marine Applied Research & Exploration, NOAA

MDBC Expeditions StoryMap—Coming Soon



Publications

Publications are posted in the NOAA Institutional Repository. Six to date:

- MGM Stakeholder Spatial Prioritization Report
- MGM Best Practices Workshop Report
- HAE Best Practices Workshop Report
- HAE Data Inventory Report
- CPT Review of Corals Injured by DWH Oil Spill, Recommendations for Coral Propagation and Genetic Assessment
- CPT Cruise Report: Submerged Acquisition of Living Tissue (SALT 1) Expedition

Data

- MDBC Data Catalog
- MGM Inventory Data Package: "Comprehensive inventory of seafloor mapping, ground-truthing, and predictive habitat modeling datasets to support Deepwater Horizon mesophotic and deep benthic community restoration"

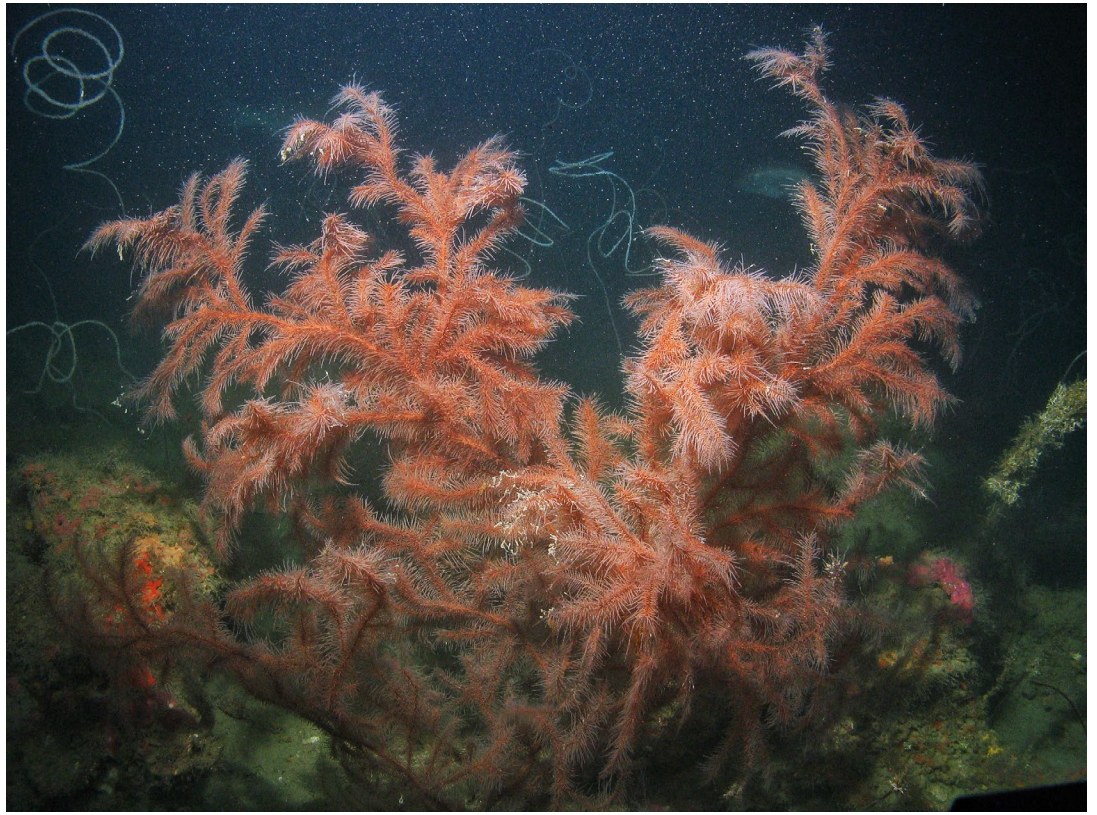
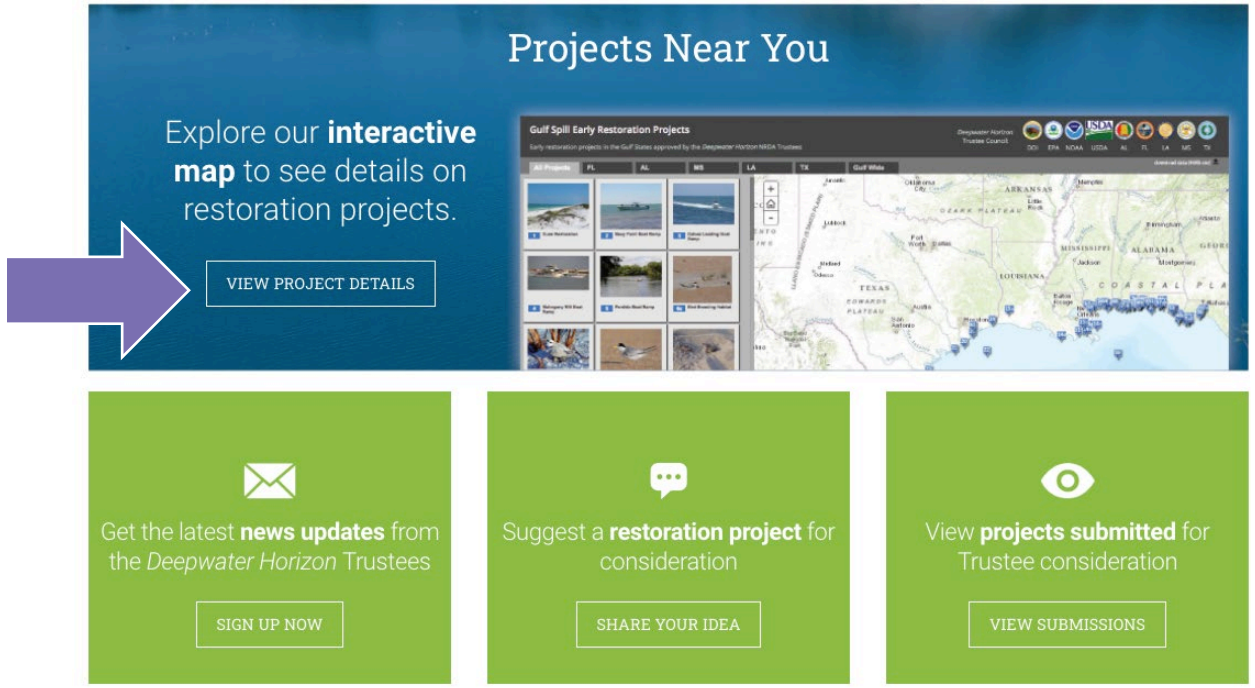
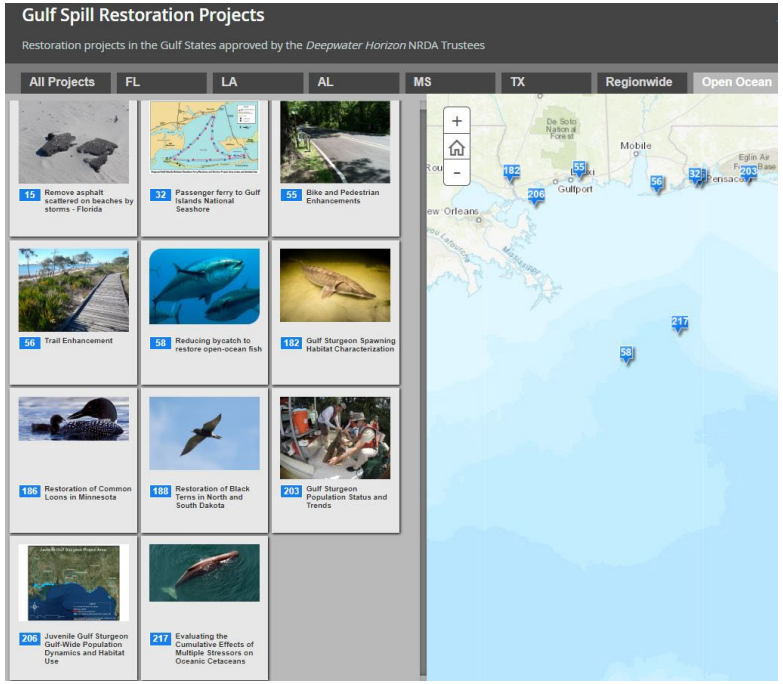


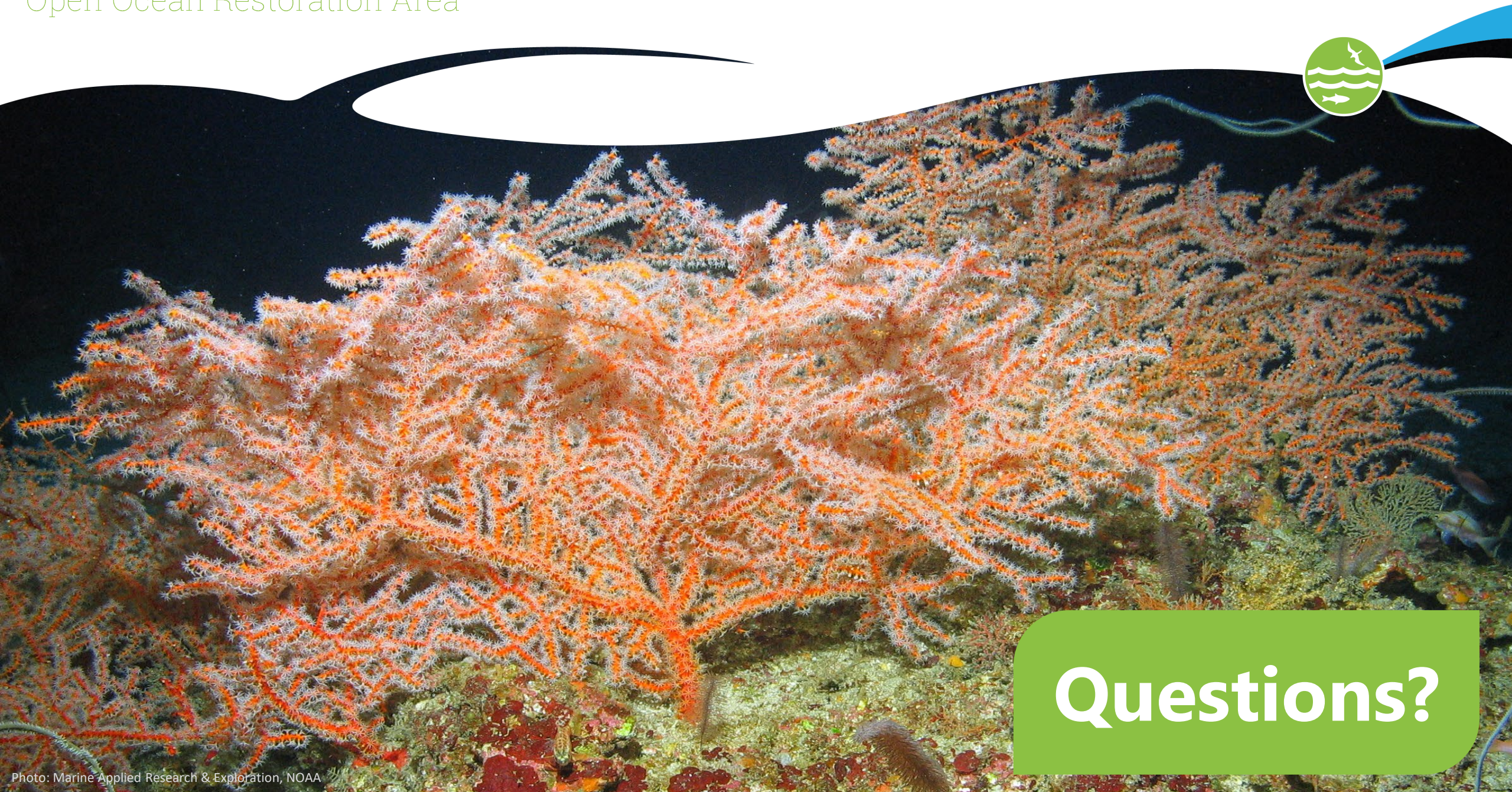
Photo: Marine Applied Research & Exploration, NOAA

How to Access Open Ocean Project Information





www.gulfspillrestoration.noaa.gov

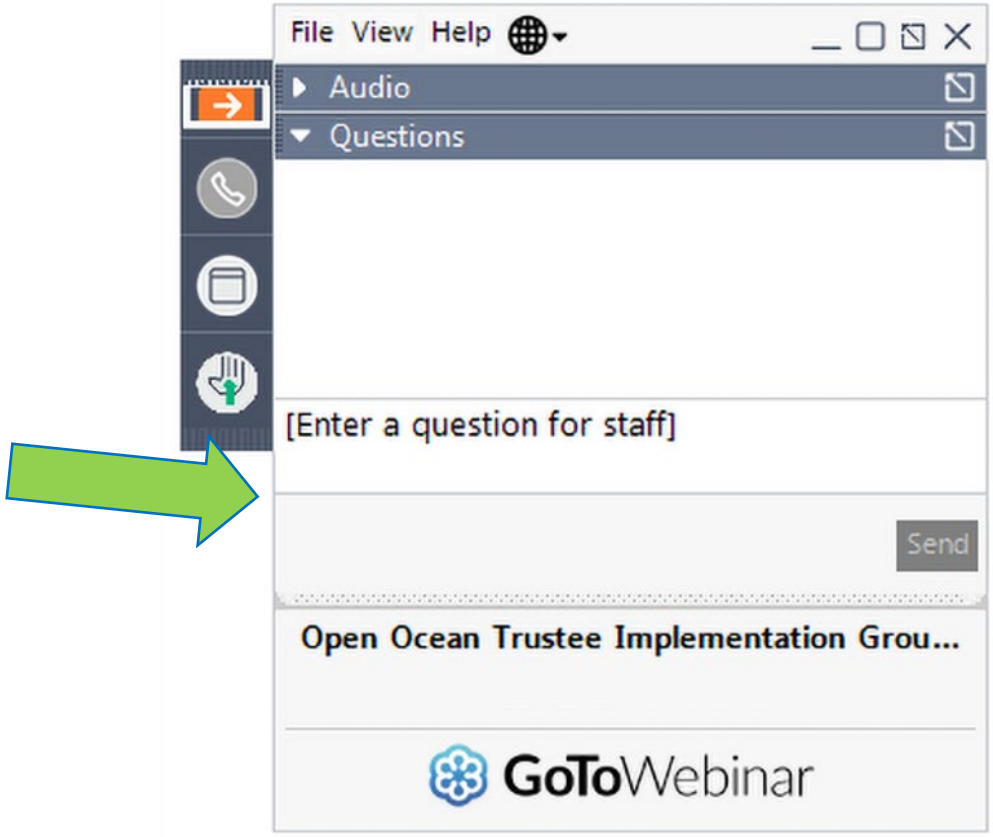


Questions?

Photo: Marine Applied Research & Exploration, NOAA

Questions

- Please type your questions in the “Questions” box.
- We’ll do our best to get to as many questions as possible.



openocean.TIG@noaa.gov

Photo: Marine Applied Research & Exploration, NOAA