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

April 11th, 2023
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

- **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

Photo: Marine Applied Research & Exploration, NOAA
Deepwater Horizon
Oil Spill Background
Deepwater Horizon Incident

- 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
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 km² of benthic habitat
• All these data at https://dwhdiver.orr.noaa.gov
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 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

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

- 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

Photo: Marine Applied Research & Exploration, NOAA
2022 Field Activities Overview
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
- 8 cruises
- 153 total days at sea
- 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

Old Data
USGS DEM 16m

New Data
Hassler DEM 2m
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
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 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

April 2023

New Orleans, LA
Mobile, AL
Panama City, FL
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
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.
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

April 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

April 2023
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)
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.
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
Implementation Partners

• Ocean Exploration Cooperative Institute
• National Marine Sanctuary Foundation
• Navy
• BOEM
• Subject Matter Experts
Project Update: Habitat Assessment and Evaluation (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
Project Update - HAE

2023: In-Depth Gap Assessment
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
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)
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
2023 Activities: Lab Activities, Stakeholder Engagement, Data Products

- 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
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
Implementation Partners

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)
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
2023 Work Plan: Education & Outreach

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
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
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)
MDBC Portfolio Products & Resources
MDBC Webpages

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

Photo: Marine Applied Research & Exploration, NOAA
Overview of Gulf of Mexico 2022 expeditions
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

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• We’ll do our best to get to as many questions as possible.
Deepwater Horizon NRDA
Open Ocean Restoration Area

Photo: Marine Applied Research & Exploration, NOAA

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