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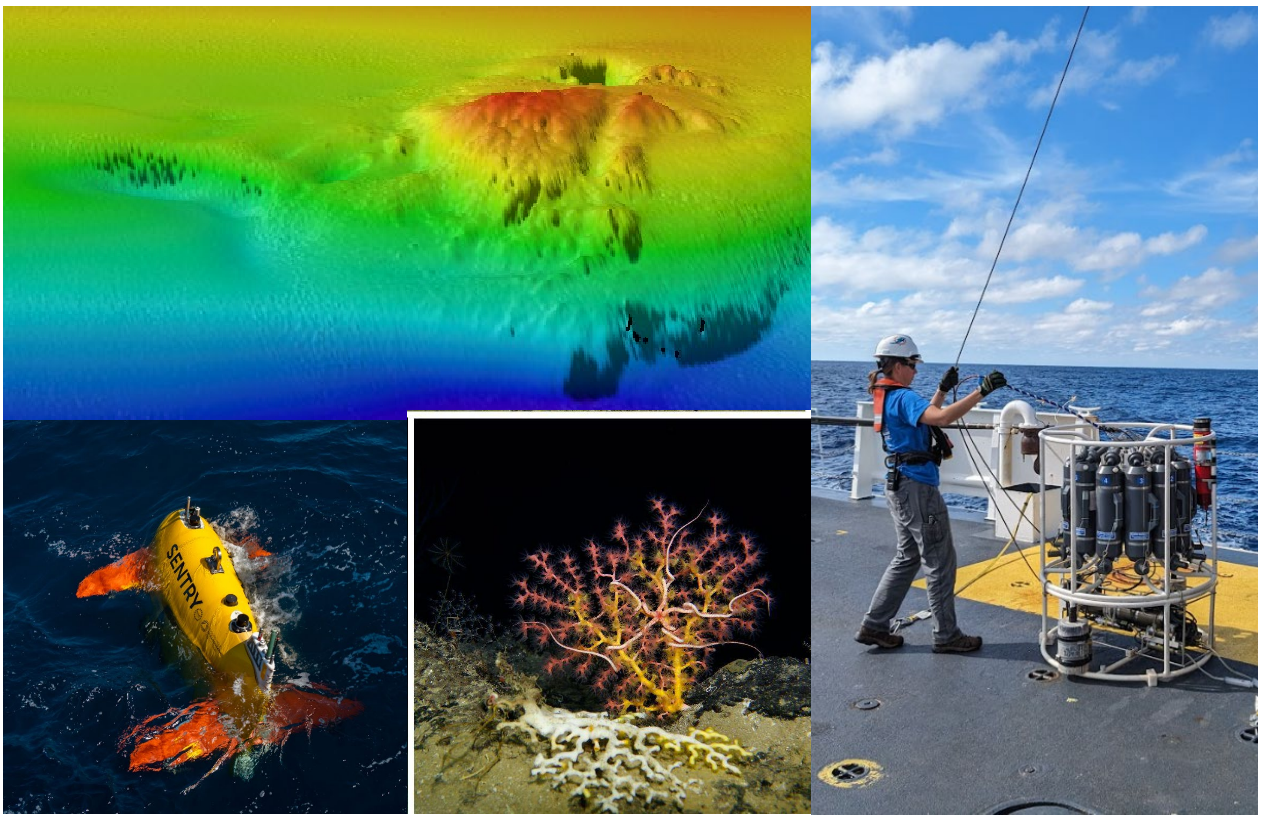
Cruise Report:
MDBC Expedition NOAA Ship *Nancy Foster*, July 28–October 21, 2023



November 2024

DWH MDBC Cruise Report 2024-01

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE NOAA

DWH Mesophotic & Deep Benthic Communities Restoration

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For more information on MDBC Restoration, please visit:

https://www.fisheries.noaa.gov/southeast/habitat-conservation/mesophotic-and-deep-benthic-communities-restoration

and

https://coastalscience.noaa.gov/science-areas/restoration/gulf-mdbc-restoration/

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Cruise Report:
MDBC Expedition NOAA Ship *Nancy Foster*,
July 28–October 21, 2023

Habitat Assessment and Evaluation Project
and
Mapping, Ground-truthing, and Predictive Habitat Modeling Project

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***Deepwater Horizon* Mesophotic and Deep Benthic Communities Restoration**

This report is part of the NOAA Mesophotic and Deep Benthic Communities (MDBC) Series of publications that share the results of work conducted by the *Deepwater Horizon* MDBC restoration projects.

The 2010 *Deepwater Horizon* oil spill was an unprecedented event. Approximately 3.2 million barrels of oil were released into the deep ocean over nearly three months. The plume of oil moved throughout the water column, formed surface slicks that cumulatively covered an area the size of Virginia, and washed oil onto at least 1,300 miles of shoreline habitats. More than 770 square miles (2,000 square kilometers) of deep benthic habitat were injured by the oil spill, including areas surrounding the *Deepwater Horizon* wellhead and parts of the Pinnacles Trend mesophotic reef complex, located at the edge of the continental shelf.

Under the Oil Pollution Act, state and federal natural resource trustees conducted a Natural Resource Damage Assessment (NRDA). The Trustees assessed damages, quantifying the unprecedented injuries to natural resources and lost services. They also developed a programmatic restoration plan to restore injured resources and compensate the public for lost services.

In April 2016, a settlement was finalized that included up to $8.8 billion in funding for the Deepwater Horizon Trustees to restore the natural resource injuries caused by the oil spill as described in their programmatic restoration plan, Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. The Deepwater Horizon Open Ocean Trustee Implementation Group is responsible for restoring natural resources and their services within the Open Ocean Restoration Area that were injured by the oil spill. The Open Ocean Trustees include NOAA, U.S. Department of the Interior, U.S. Environmental Protection Agency, and U.S. Department of Agriculture.

In 2019, the Open Ocean Trustee Implementation Group committed more than $126 million to implement four restoration projects to address the injury to MDBC. The MDBC projects are: Mapping, Ground-Truthing, and Predictive Habitat Modeling; Habitat Assessment and Evaluation; Coral Propagation Technique Development; and Active Management and Protection. NOAA and the Department of the Interior are implementing the projects, in cooperation with a range of partners, over eight years.

Together, the projects take a phased approach to meet the challenges involved in restoring deep-sea habitats. Challenges to restoration include a limited scientific understanding of these communities, limited experience with restoration at the depths at which these communities occur, and remote locations that limit accessibility.

More information about *Deepwater Horizon* restoration and the MDBC restoration projects is available at: www.gulfspillrestoration.noaa.gov.

Table of Contents

Acronyms

AOI	Area of Interest
ARMS	Autonomous Reef Monitoring Systems
AUV	Autonomous Underwater Vehicle
CTD	Conductivity, Temperature, and Depth
eDNA	Environmental DNA
MBES	Multibeam Echosounder
MDBC	Mesophotic and Deep Benthic Communities
NOAA	National Oceanic and Atmospheric Administration
NCEI	National Centers for Environmental Information
POM	Particulate Organic Matter
ROV	Remotely Operated Vehicle
RWCDA	Rice’s Whale Core Distribution Area
SSS	Sidescan Sonar
UCTD	Underway Conductivity, Temperature, and Depth
USGS	U.S. Geological Survey
WHOI	Woods Hole Oceanographic Institution

Background

This report comprises four sections detailing objectives, operations, locations, and results for each of four expedition legs. Information about data accessibility is also provided. These data are considered preliminary until reviewed and quality assured/quality controlled by the MDBC data management team, finalized, and packaged for public access.

While the scientific objectives of each leg of the expedition were specific and targeted, the overall mission goal was to conduct new data collection and sampling to better inform restoration, protection, and management of habitats within *Deepwater Horizon* impact and reference sites, as well as new uncharacterized areas. Ship-based sensors, autonomous underwater vehicles (AUVs), and remotely operated vehicles (ROVs) were used to produce seafloor basemaps and characterizations of habitats and biological communities. Multiple data types were collected including hydrographic multibeam (ship), high-resolution bathymetric multibeam (AUV), still imagery (AUV and ROV), video imagery (ROV), oceanographic data (conductivity, temperature, and depth [CTD]), and physical collections (ROV). However, the focus of leg 2 principally focused on collecting coral imagery for health assessment, deploying push cores to assess sediment community, and collecting biological samples for genetic, isotopic, and reproductive analyses and for husbandry.

Leg 1: July 28–August 12, 2023

Cruise NF-23-05

Objectives of Mission

1. Collect high-resolution multibeam and fish acoustic fisheries data, with 100% seafloor ensonification in mid- to deep-water depths (100–3,000 m).
2. Define water column oceanographic properties and sound velocity through CTD profiles.
3. Test offshore telepresence capabilities with occasional livestream broadcasts.

Science Team

The objectives of this cruise were carried out by scientists and technical operational support staff (Table 1.1) from the National Oceanic and Atmospheric Administration (NOAA), University of Rhode Island, and students from the College of Charleston.

Table 1.1. Participant list for NOAA Ship *Nancy Foster* NF-23-05. MBES = multibeam echosounder; NOAA = National Oceanic and Atmospheric Administration; CofC = College of Charleston; UCSD = University of California San Diego; URI = University of Rhode Island.

Last Name	First Name	Affiliation	Role on Cruise	Dates on Board
Urquhart	Karina	NOAA	Field Party Chief	7/27/23–8/13/23
Faggart	Erin	CofC	MBES Support	7/27/23–8/13/23
Stewart	Ava	CofC	MBES Support	7/27/23– 8/13/23
Benson	Kristopher	NOAA	Project Manager	7/27/23–8/12/23
Martin	Kelly	NOAA	Telepresence Lead	7/27/23–8/13/23
Walsh	Kevin	UCSD under contract to URI	Telepresence Support	7/27/23–8/13/23

Operations

NOAA Ship *Nancy Foster* NF-23-05 conducted 24-hr multibeam operations over the course of 13 days. Working grounds were segmented into areas of interest (AOI) prioritized by data need. Features of note in AOI2 include Viosca Knolls East and Viosca Knolls West. AOI5, AOI6, and AOI7 were in the vicinity of the Western Florida Slope and Florida Escarpment.

A hull-mounted Kongsberg EM712 echosounder was used to acquire bathymetry, backscatter, and water column data. Fish acoustics data were simultaneously collected using a Simrad EK80 echosounder. Underway conductivity, temperature, and depth (UCTD) casts for sound velocity correction were collected every 4 hr, or more frequently as conditions required. Three static, deepwater, CTD casts (1,000+ m) were completed and used as references to extend UCTD profiles to survey depth. A Starlink Wi-Fi system installed by the URI Inner Space Center was used to test offshore telepresence capabilities with a total of seven live stream programs.

NF-23-05 working grounds largely overlapped with the Rice's whale core distribution area (RWCDA), restricting operations at night. Daytime operations were planned to maximize acquisition within the RWCDA, but long transits in and out of protected waters were unavoidable.

Locations

Survey sites were prioritized based on depth. NF-23-05 surveyed locations are shown in Figure 1.1 and Table 1.2.

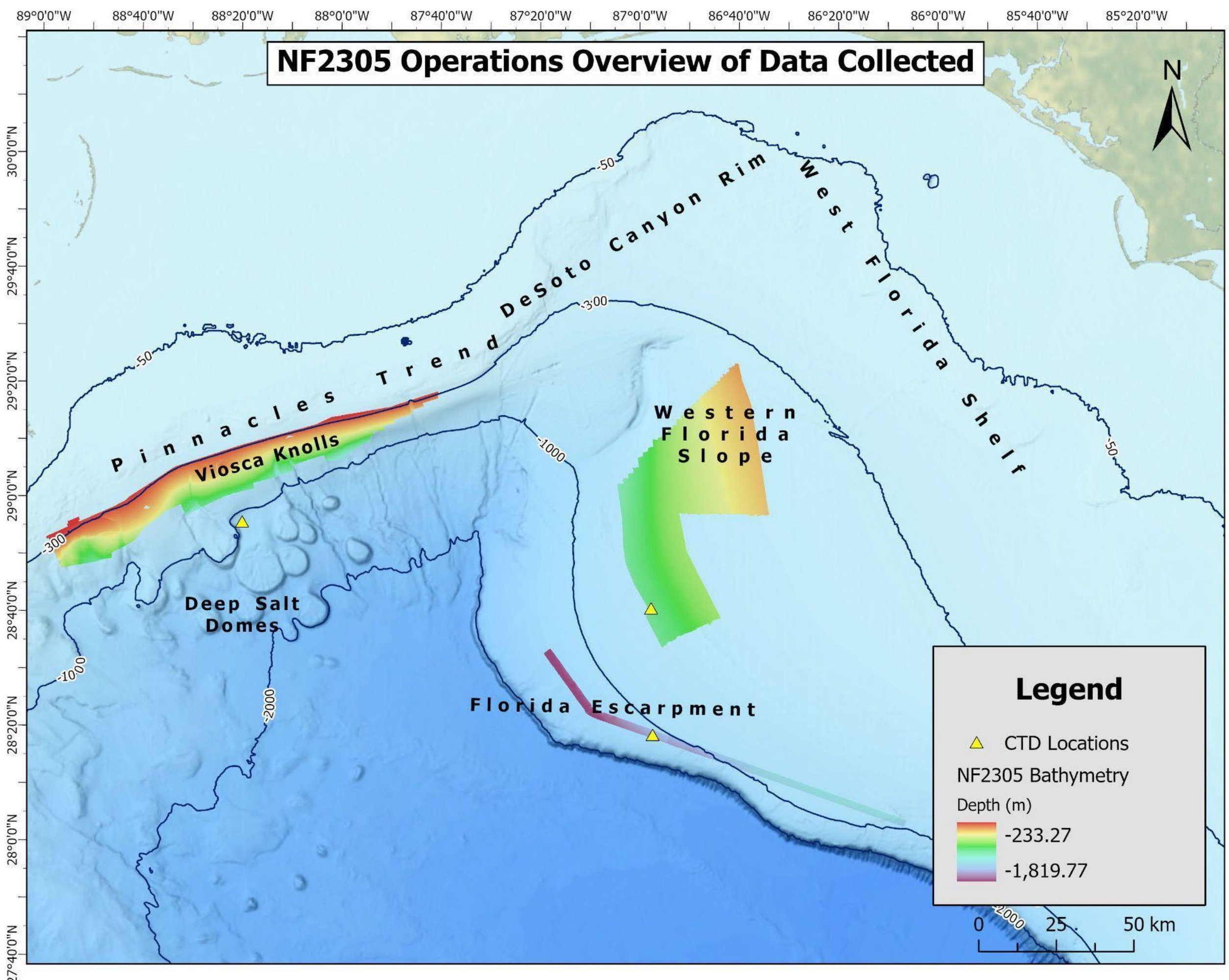


Figure 1.1. NF-23-05 multibeam coverage and deepwater CTDs collected within AOI2 (Viosca Knolls), AOI5/6 (Western Florida Slope), and AOI7 (Florida Escarpment). CTD = conductivity, temperature, and depth.

Table 1.2. Cruise itinerary for NF-23-05. MBES = multibeam echosounder; MDBC = Mesophotic and Deep Benthic Communities; (U)CTD = (underway) conductivity, temperature, and depth; FA = Fish Acoustics; AOI = area of interest.

Date	Operations Conducted	Brief Description
7/27/2023	Scientists Arrive, Staging Day	Moored Key West, FL. See Table 1.2 for science team.
7/28/2023	Departed Key West, FL	Transit to working grounds.
7/29/2023	Underway	Transit to working grounds.
7/30/2023	MBES, FA, CTD, UCTD	Commenced mapping through Florida Escarpment (AOI7 to AOI2).
7/31/2023	MBES, FA, UCTD	Acquisition in Florida Escarpment.
8/01/2023	MBES, FA, UCTD	Acquisition in Florida Escarpment.
8/02/2023	MBES, FA, UCTD, Telepresence	Acquisition in Florida Escarpment. Telepresence test with MDBC Communications Team.
8/03/2023	MBES, FA, UCTD	Acquisition in Florida Escarpment.
8/04/2023	MBES, FA, UCTD, CTD	Completed mapping in Florida Escarpment.
8/05/2023	MBES, FA, UCTD, Telepresence	Transit to West Florida Slope, commenced mapping. Telepresence broadcast, community event.
8/06/2023	MBES, FA, UCTD	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night.
8/07/2023	MBES, FA, UCTD, Telepresence	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night. Telepresence broadcast for Scouts of America.
8/08/2023	MBES, FA, UCTD, Telepresence	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night. Two telepresence broadcasts.
8/09/2023	MBES, FA, UCTD	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night.
8/10/2023	MBES, FA, UCTD, Telepresence	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night. Two telepresence broadcasts: educators and family/friends/partners.
8/11/2023	MBES, FA, UCTD, CTD	Mapping in Florida Escarpment: site AOI5 during the day; site AOI6 at night.. Departed working grounds.
8/12/2023	Demobilization	Moored Singing River Pier. Science team demobilization and data transfer.
8/13/2023	Science Team Depart	Moored Singing River Pier, Pascagoula, MS. Science team departed.

Results and Discussion

With excellent weather and functioning equipment for the duration of the cruise, NF-23-05 experienced very few obstacles and was able to successfully meet objectives. Three out of the 16 days allocated for this cruise were committed to transits to/from the working grounds, leaving thirteen days designated for mapping operations. Acquiring an average of 17 hr of multibeam data each day, NOAA Ship *Nancy Foster* mapped an area of 4,076 km^2 at 8- and 16-m resolutions in the Gulf of Mexico. Coverage spanned water depths 200 to 1,800 m and filled high-priority data gaps in the MDBC portfolio. This effort required 2,966 linear kilometers (LKM) run and 137 CTD/UCTD casts to derive sound velocity profiles. The telepresence team organized seven well-received live broadcasts that cumulatively reached an audience of over 400 people. The survey metrics are shown in Table 1.3.

Table 1.3. Kongsberg EM712 and Simrad EK80 survey metrics for NF-23-05. LKM = linear kilometers. (U)CTD = (underway) conductivity, temperature, and depth.

Date	Duration (hh:mm:ss)	EM712 & EK80 LKM	CTD/UCTD Casts	Locality
7/28/23	0:00:00	0.0	0	In-port/Transit
7/29/23	0:00:00	0.0	0	Transit
7/30/23	14:30:18	161.1	7	Florida Escarpment & Viosca Knolls
7/31/23	23:15:46	293.9	16	Viosca Knolls
8/1/23	21:22:43	284.6	16	Viosca Knolls
8/2/23	21:55:44	283.6	11	Viosca Knolls
8/3/23	20:57:46	263.8	12	Viosca Knolls
8/4/23	13:29:47	169.0	9	Viosca Knolls
8/5/23	13:15:51	154.7	8	Western Florida Slope
8/6/23	21:09:01	247.2	11	Western Florida Slope
8/7/23	20:52:57	251.1	10	Western Florida Slope
8/8/23	19:55:01	227.1	11	Western Florida Slope
8/9/23	18:12:09	213.2	9	Western Florida Slope
8/10/23	18:06:20	206.9	10	Western Florida Slope
8/11/23	17:27:19	209.9	7	Western Florida Slope
8/12/23	0:00:00	0.0	0	Transit/In-port
Total	**166:44:54**	**2966.0**	**137**	

Leg 2: September 4–September 20, 2023

Cruise NF-23-06

Objectives of Mission

1. Collect high-resolution images of corals at impact and reference sites to continue time series monitoring for coral health/resilience.
2. Collect sediment samples in areas adjacent to coral sites to continue time series monitoring for infaunal communities associated with impacted and reference coral habitats.
3. Deploy benthic landers, physical markers, temperature loggers, and autonomous reef monitoring systems (ARMS) for environmental characterization, visual reference, and discovery of cryptic biodiversity.
4. Sample select animal taxa for population genetics, isotope analysis, diversity assessment, microbiology, histology, and husbandry.
5. Collect water samples to determine levels of particulate organic matter (POM) and nutrients and to characterize species diversity through environmental DNA (eDNA) sequencing.
6. Define water column oceanographic properties and sound velocity through CTD profiles.
7. Conduct material test of 3D printed corals for potential future deployments.
8. Map seafloor to increase resolution of existing grids.
9. Test offshore telepresence capabilities with occasional livestream broadcasts.

Science Team

The objectives of this cruise were carried out by scientists and technical operational support (Table 2.1) from NOAA, Lehigh University, Monterey Bay Aquarium Research Institute/University of Hawaiʻi at Mānoa, URI, U.S. Geological Survey (USGS), Glidden Inc, and Oceaneering.

Table 2.1. Participant list for NOAA Ship *Nancy Foster* NF-23-06. MBARI = Monterey Bay Aquarium Research Institute; UHM = University of Hawaiʻi at Mānoa; USGS = U.S. Geological Survey; URI = University of Rhode Island; ROV = remotely operated vehicle.

Last Name	First Name	Affiliation	Role on Cruise	Dates on Board
Herrera	Santiago	Lehigh University	Field Party Chief	9/04/23–9/19/23
Girard	Fanny	MBARI/ UHM	Coral Imaging, Animal Sampling	9/04/23–9/20/23
Vohsen	Sam	Lehigh University	Animal Sampling	9/04/23–9/20/23
Johnstone	Julia	NOAA	Animal sampling, Husbandry	9/04/23–9/19/23
Gomes	Kristofer	URI	Mini-Landers	9/04/23–9/20/23
Weinnig	Alexis	USGS	Water Sampling, Outreach	9/04/23–9/20/23
McClain-Counts	Jennifer	USGS	Sediments	9/04/23–9/19/23
Joss	Hannah	USGS	Water Sampling	9/04/23–9/20/23
Farrington	Stephanie	NOAA	Data Management	9/04/23–9/19/23
Leeuwenburg	Zach	USGS	Sediments	9/04/23–9/19/23
Glidden	Eric	Glidden Inc.	Navigation Technician	9/04/23–9/20/23
Tripp	Jason	Oceaneering	ROV Technician	9/04/23–9/19/23
Cook	Timothy	Oceaneering	ROV Technician	9/04/23–9/19/23
Lipe	Nathan	Oceaneering	ROV Technician	9/04/23–9/19/23

Operations

NOAA Ship *Nancy Foster* NF-23-06 was planned to conduct CTD casts and ROV operations during the day and 12 hr of ship multibeam and EK80 at night. During the ROV deployments, video transects and imaging, coral sampling, CTD and water sampling, and sediment sampling were conducted. The deployment of the lander was planned for the first day of the leg. The cruise was planned for 14 days.

NF-23-06 utilized Oceaneering's ROV *Global Explorer* to conduct high-resolution still and video imaging along seafloor transects and targeted sites. The vehicle's sensor payload was used to conduct ground-truthing verification of seafloor composition during the mission, including: 4K ultra-high-definition (HD) camera, manipulator-held 24-MP digital single-lens reflex (DSLR) still camera, laser scales, Sea-Bird Scientific SBE16+ CTD with ECO FLNTU and oxygen sensors, and a seven-function manipulator arm with coral cutters, suction sampler, bio-box, eight push cores, coral quivers, and Niskin bottles.

NF-23-06 utilized USM's Sonardyne Ranger 2 HPT 5000 gyro USBL with Hypack software to visualize in-situ survey results. Onboard ship and ROV navigation processing were subcontracted through CSS.

URI's benthic mini-landers deployed during this leg were equipped with: Nortek profiling 2-MHz current profiler (or single point acoustic current meter; Aquadopp Profiler), and a JFE Advantech combined optical chlorophyll/turbidity sensor (ACLD), optical oxygen sensor (RINKO), and conductivity sensor (A7CT).

Nancy Foster's hull-mounted Kongsberg EM712 echosounder was used to acquire bathymetry, backscatter, and water column data. UCTD casts for sound velocity correction were collected every 4 hr, or more frequently as conditions required. Static deepwater CTD casts conducted for water sampling were used as references to extend the more frequently acquired UCTD profiles to survey depth.

Locations

NF-23-06 cruise surveyed locations are shown in Figures 2.1 and 2.2 and Table 2.2.

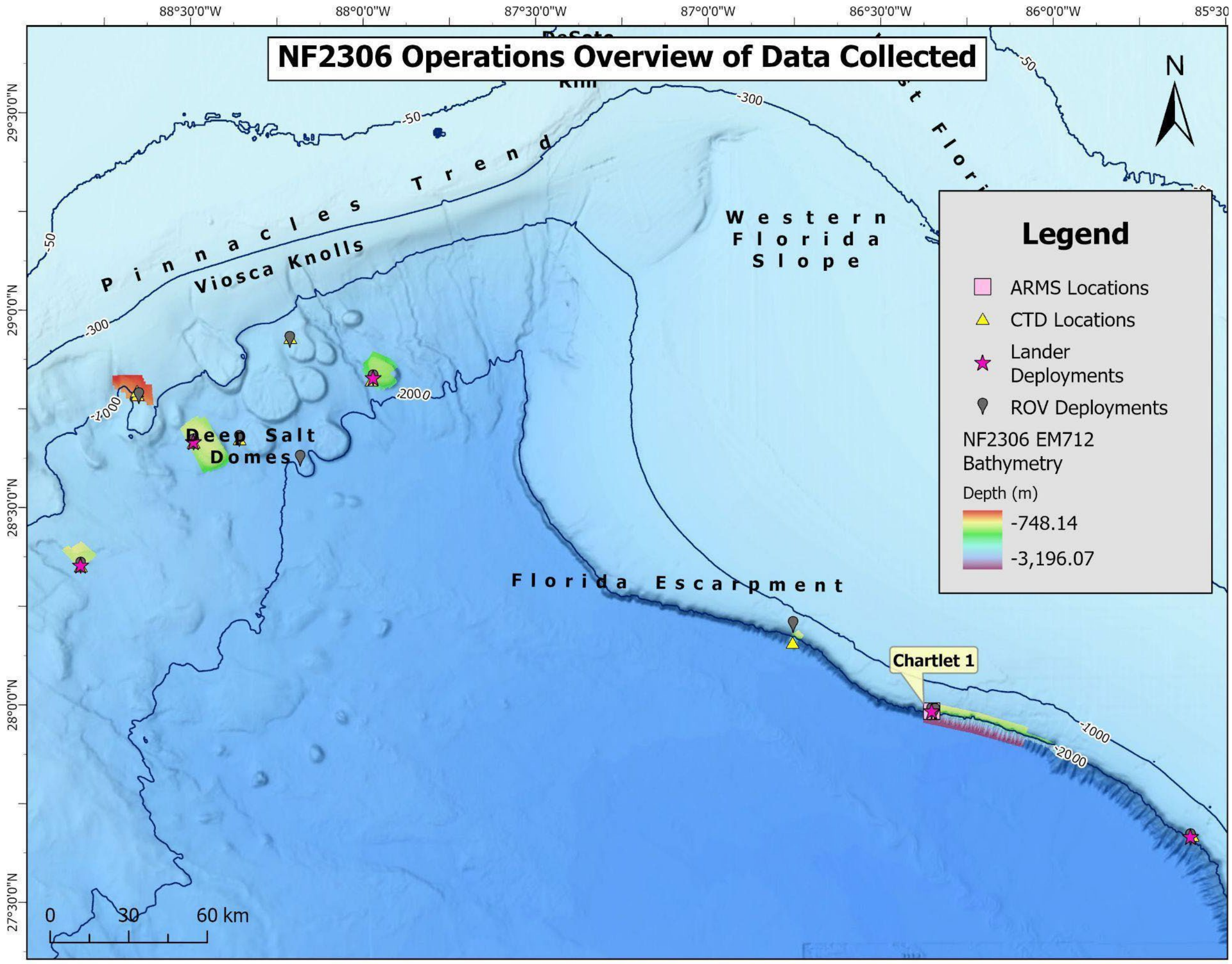


Figure 2.1. NF-23-06 multibeam coverage and deployments. ARMS = autonomous reef monitoring systems; CTD = conductivity, temperature, and depth; ROV = remotely operated vehicle. See Figure 2.2 for *Chartlet 1 referenced above. * A chartlet is a zoomed-in view of the features marked on an overview map.

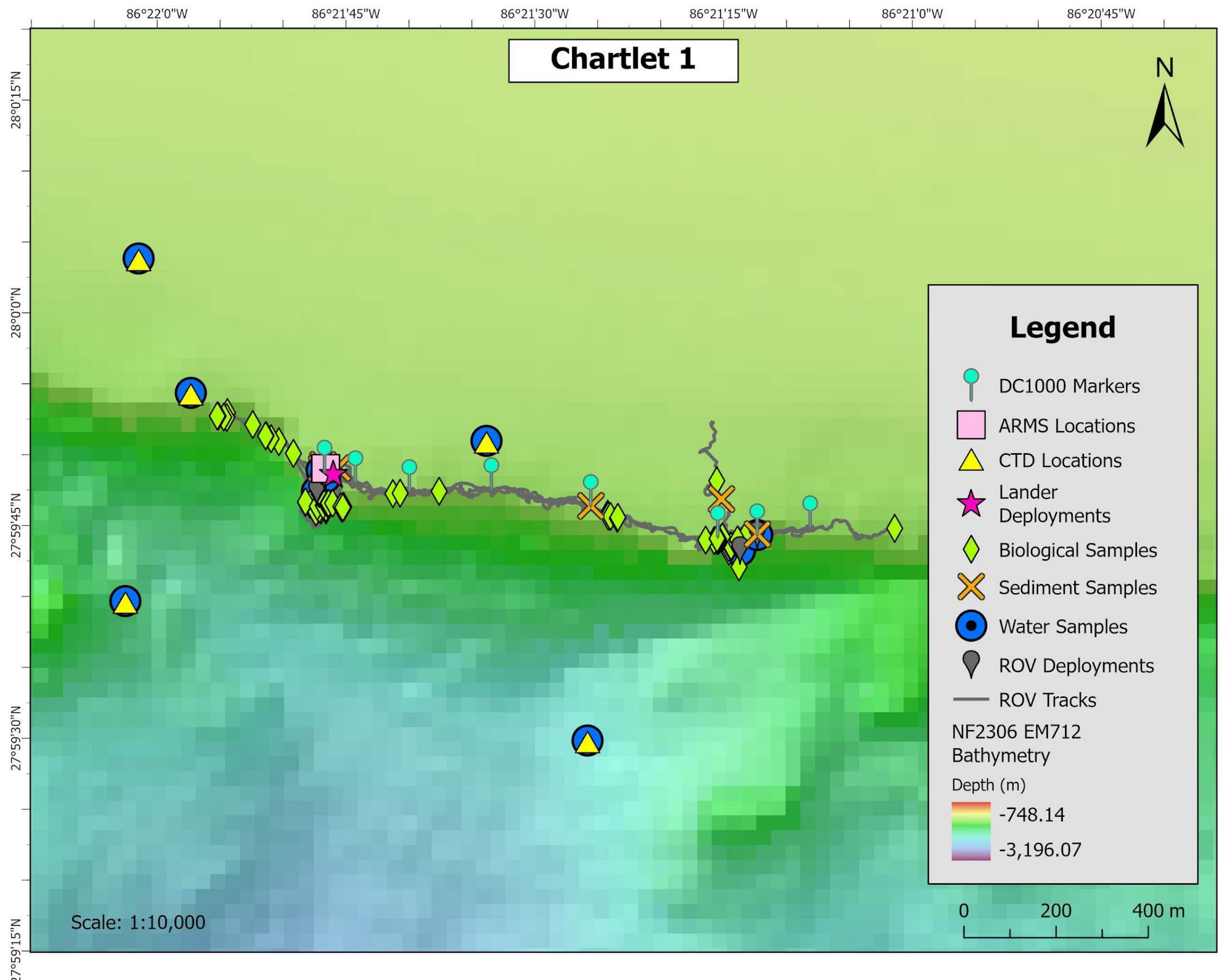


Figure 2.2. Chartlet 1 referenced in Figure 2.1 showing NF-23-06 EM712 multibeam coverage, ROV dive tracks, and deployment locations, ARMS deployment locations, CTD locations, lander deployment locations, sampling locations, and marker locations. CTD = conductivity, temperature, and depth.

Table 2.2. Cruise itinerary for NF-23-06. ROV = remotely operated vehicle; CTD = conductivity, temperature, and depth.

Date	Operations Conducted	Brief Description
09/04/2023	Mobilization	Pascagoula, MS, Science team arrives. Mobilization.
09/05/2023	CTD/Expendable Bathythermograph	Left port at 1000 hr. Transit.
09/06/2023	ROV, CTD	ROV – sensors and navigational testing, exploration, animal sampling, push cores, water collection.
09/07/2023	ROV, CTD	ROV – Coral imaging, push cores, water collection.
09/08/2023	ROV, CTD	ROV – short-term lander, exploration, animal sampling, push cores, water collection.
09/09/2023	ROV, CTD	ROV – long-term lander, push cores, water collection.
09/09/2023	ROV, CTD	ROV – coral imaging, push cores, water collection.
09/10/2023	ROV, CTD	ROV – exploration, animal sampling, push cores, water collection.
09/11/2023	ROV, CTD	ROV – short-term lander, exploration, animal sampling, push cores, water collection.
09/12/2023	ROV, CTD	ROV – exploration, animal sampling, push cores, water collection.
09/13/2023	ROV, CTD	ROV – exploration, animal sampling, push cores, water collection.
09/14/2023	ROV, CTD	ROV – exploration, animal sampling, push cores, water collection.
09/15/2023	ROV, CTD	ROV – long-term lander, exploration, animal sampling, push cores, water collection.
09/16/2023	ROV, CTD	ROV – exploration, animal sampling, push cores, water.
09/17/2023	ROV, CTD	ROV – coral imaging, push cores, water collection.
09/18/2023	ROV, CTD	ROV – coral imaging, push cores, water collection, animal sampling.
09/19/2023	Demobilization	Arrive at Pascagoula, MS by 1000 hr. Demobilization.
09/20 /2023	Demobilization	Pascagoula, MS, Demobilization.

Results and Discussion

With excellent weather and functioning equipment for the duration of the cruise, NF-23-06 experienced very few obstacles and was able to successfully meet all targeted objectives. Two out of the 15 days allocated for this cruise were committed to transits to/from the working grounds, leaving 13 days designated for sample and data collection operations. ROV and CTD operations were conducted daily during the 13 non-transiting days (Tables 2.3 and 2.4). Results of the mission's objectives are detailed below.

Table 2.3. List of ROV dives for NF-23-06. ROV = remotely operated vehicle.

Date	ROV Dive ID	Locality	Latitude	Longitude	Depth (m)	Duration (hh:mm)
9/7/2023	ROV-01	Uchupi Dome	28.83906	−87.93247	1,560	04:50
9/7/2023	ROV-02	Gloria Dome	28.68234	−88.34492	1,595	05:53
9/8/2023	ROV-03	Chandeleur Valley	28.35599	−88.79466	1,399	06:45
9/9/2023	ROV-04	Biloxi Dome	28.67225	−88.47660	1,380	00:47
9/9/2023	ROV-05	Dauphin Dome	28.63333	−88.16967	1,874	03:19
9/10/2023	ROV-06	West Florida Escarpment 1	28.16978	−86.75741	2,509	07:08
9/11/2023	ROV-07	West Florida Escarpment 2	27.67271	−85.62952	1,710	07:10
9/12/2023	ROV-08	West Florida Escarpment 3	27.99622	−86.35420	1,665	06:54
9/13/2023	ROV-09	West Florida Escarpment 3	27.99647	−86.36327	1,536	07:27
9/14/2023	ROV-10	West Florida Escarpment 3	27.99688	−86.36319	1,514	07:08
9/15/2023	ROV-11	West Florida Escarpment 3	27.99684	−86.36305	1,506	07:25
9/16/2023	ROV-12	West Florida Escarpment 3	27.99552	−86.35318	1,511	07:34
9/17/2023	ROV-13	Horn Dome	28.93473	−88.20352	1107	06:50
9/18/2023	ROV-14	Redfish Valley	28.78733	−88.63492	925	05:48

Table 2.4. List of CTD Casts and Water Samples for NF-23-06. CTD = conductivity, temperature, and depth.

Date	CTD ID	Site	Deployment Time (UTC)	Deployment Latitude	Deployment Longitude	Max Depth (m)
9/6/2023	CTD-01	Uchupi Dome	8:50:13 AM	28.83383	–87.96500	1,789
9/7/2023	CTD-02	Gloria Dome	10:46:23 AM	28.68217	–88.34430	1,545
9/8/2023	CTD-03	Chandeleur Valley	9:40:06 AM	28.35800	–88.79330	1,386
9/9/2023	CTD-04	Biloxi Dome	9:38:07 AM	28.67317	–88.47620	1,281
9/10/2023	CTD-05	West Florida Escarpment 1	9:15:54 AM	28.17033	–86.75550	2,451
9/11/2023	CTD-06	West Florida Escarpment 2	9:06:55 AM	27.67300	–85.62380	1,531
9/12/2023	CTD-07	West Florida Escarpment 3	9:38:50 AM	27.99767	–86.35970	1,451
9/13/2023	CTD-08	West Florida Escarpment 3	9:15:00 AM	27.99800	–86.36400	1,422
9/14/2023	CTD-09	West Florida Escarpment 3	9:07:57 AM	27.99217	–86.36470	1,800
9/15/2023	CTD-10	West Florida Escarpment 3	9:23:45 AM	27.99333	–86.35470	2,075
9/16/2023	CTD-11	West Florida Escarpment 3	9:27:59 AM	27.99667	–86.35820	1,457
9/17/2023	CTD-12	Horn Dome	10:47:14 AM	28.93683	–88.20170	1,087
9/18/2023	CTD-13	Redfish Valley Head	9:42:50 AM	28.79333	–88.63670	945
9/18/2023	CTD-14	Redfish Valley Head	9:03:26 PM	28.80150	–88.63570	910

1. Collected high-resolution images of corals at impact and reference sites to continue time series monitoring for coral health/resilience.
   - A total of 92 coral colonies (56 *Paramuricea biscaya* and 36 *Paramuricea* sp. B3) were imaged at long-term monitoring sites using the handheld digital still camera of the ROV *Global Explorer* (Table 2.5; Figure 2.3).
   - The crew was not able to revisit long-term reference sites (Henderson Ridge South and St. Tammany Basin) due to strong currents (loop current).
   - Video surveys (4K video camera) were conducted to build 3D models of coral colonies using 3D photogrammetry.

Table 2.5. Number of coral colonies imaged and associated effort at each marker. ROV = remotely operated vehicle.

ROV Dive	Site	Marker	Number of Colonies Imaged	Coral Species	Time Spent
2	Gloria Dome	M11	23	*Paramuricea biscaya*	2 hr and 40 min
5	Dauphin Dome	5	10	*Paramuricea biscaya*	30 min
5	Dauphin Dome	M32	8	*Paramuricea biscaya*	37 min
5	Dauphin Dome	M47	9	*Paramuricea biscaya*	35 min
5	Dauphin Dome	M49	6	*Paramuricea biscaya*	10 min
13	Horn Dome	M11	8	*Paramuricea* sp. B3	36 min
13	Horn Dome	M18	8	*Paramuricea* sp. B3	1 hr and 6 min
13	Horn Dome	M43	11	*Paramuricea* sp. B3	52 min
14	Redfish Valley	M24	9 + 5 colonies re-imaged after sampling	*Paramuricea* sp. B3	15 min + 9 min to re-image sampled colonies

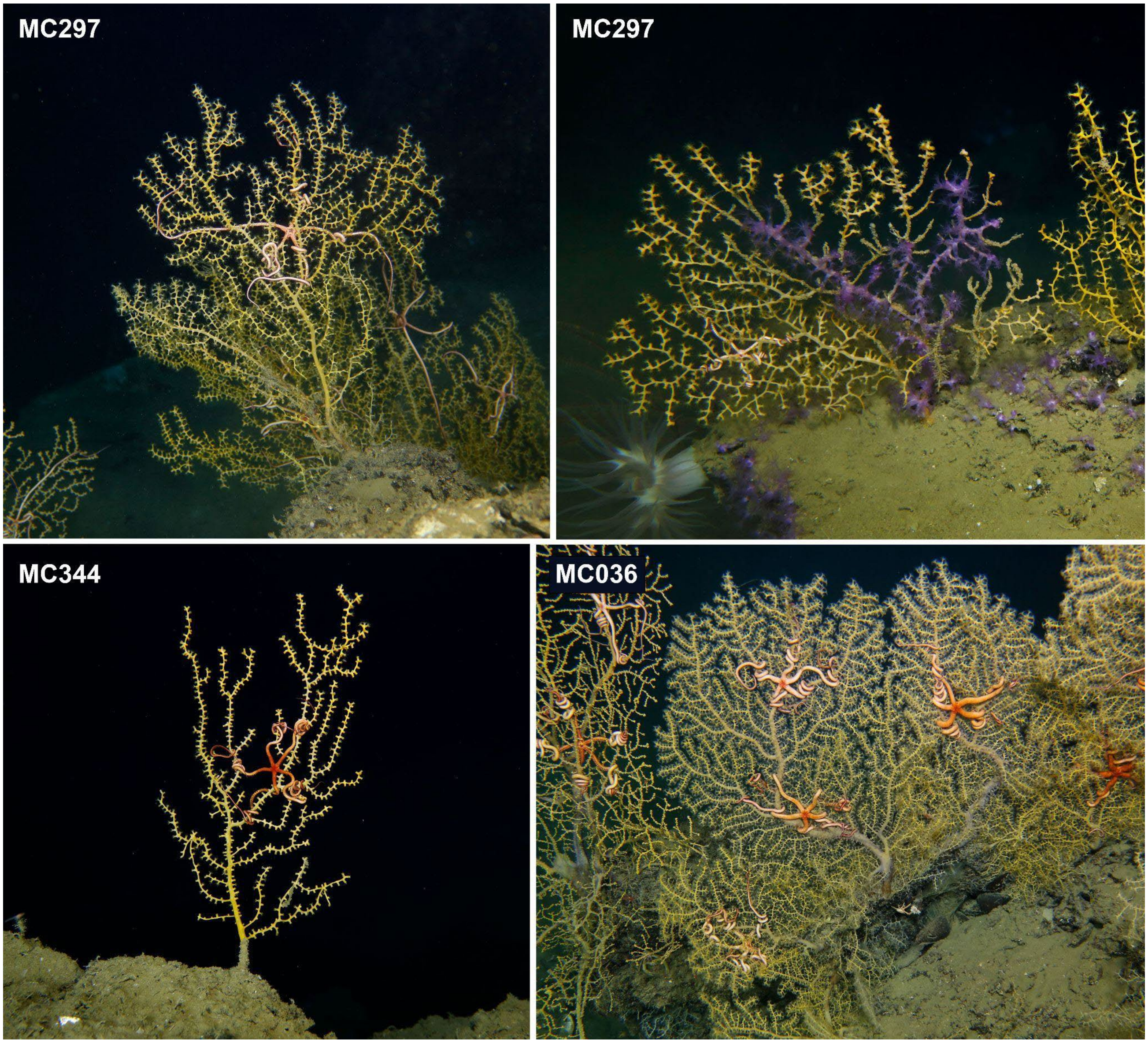


Figure 2.3. Example coral images from long-term monitoring sites.

- Imaged 104 coral colonies belonging to 10 different species at newly deployed markers at West Florida Escarpment (Table 2.6 and Figure 2.4). This site hosts high densities and diversity of octocorals including *Paramuricea biscaya*, the species that was impacted by the spill.

Table 2.6. Number of coral colonies imaged and associated effort at West Florida Escarpment 3. ROV = remotely operated vehicle.

ROV Dive	Marker	No. of Colonies Imaged	Coral Species	Time Spent
11	M15	18	*Candidella* sp., *Enallopsammia* sp. *Paragorgia* sp., *Narella* sp., *Acanthogorgia* sp.	42 min
11	SH025 (temp. logger)	18	*Paramuricea biscaya*, *Narella* sp., *Candidella* sp.	1 hr and 26 min
11	M2	21	*Paramuricea biscaya*, *Narella* sp., *Candidella* sp., *Paragorgia* sp., *Enallopsammia* sp., Keratoisididae, *Calyptrophora* sp.	38 min
11	M13	15	*Paramuricea biscaya*, *Narella* sp., *Hemicorallium* sp.	33 min
12	SH024 (temp. logger)	16	*Paragorgia* sp., *Anthothela* sp., *Paramuricea biscaya*, *Candidella* sp., *Enallopsammia* sp., *Narella* sp., *Hemicorallium* sp.	48 min
12	M8	9	Keratoisididae, *Narella* sp., *Paramuricea biscaya*	43 min
12	M9	7	*Paramuricea biscaya*, *Enallopsammia* sp., *Narella* sp.	25 min

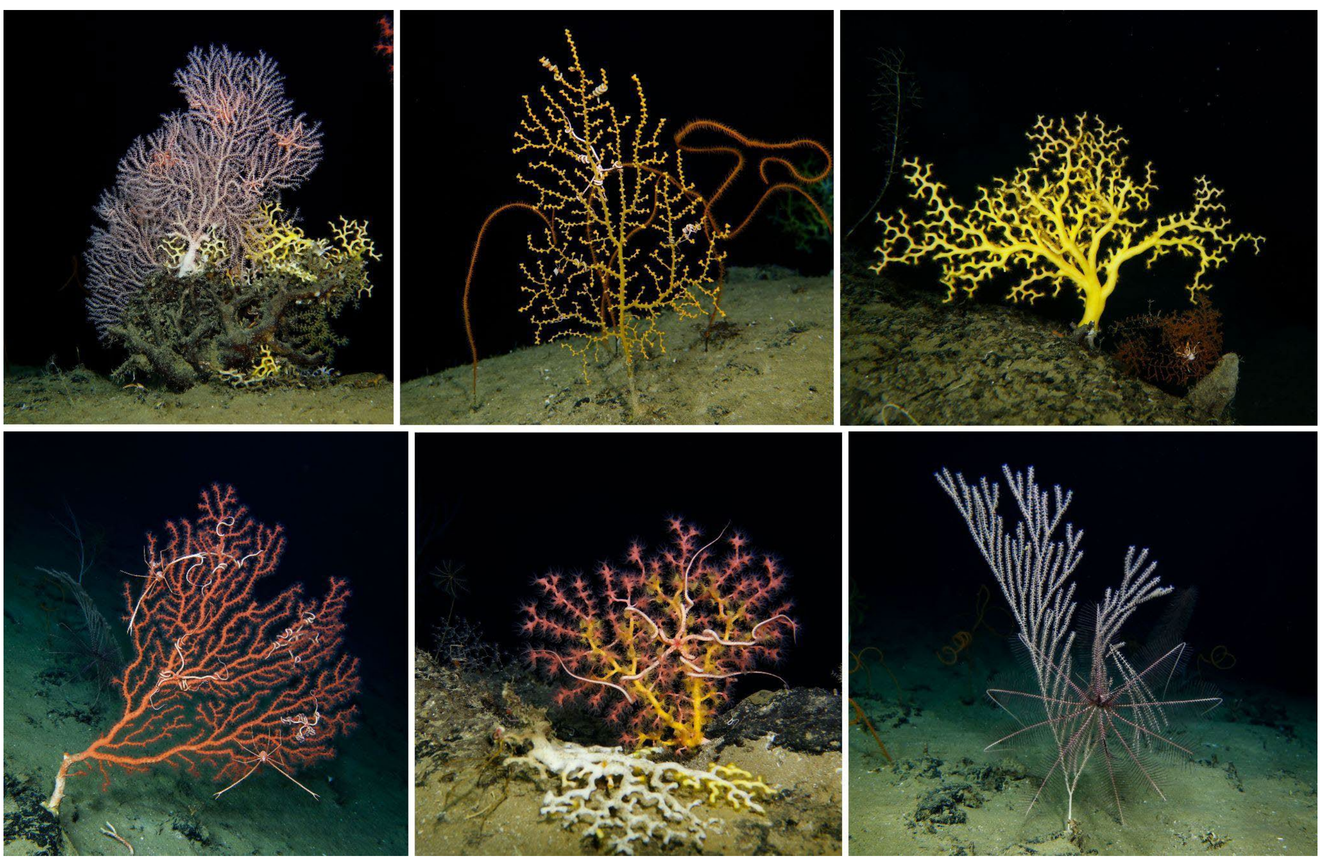


Figure 2.4. Example of coral images from West Florida Escarpment 3.

2. Collected sediment samples in areas adjacent to coral sites to continue time series monitoring for infaunal communities associated with impacted and reference coral habitats.
   - 80 sediment samples were collected with the push cores by the ROV (Table 2.7 and Appendix B Table 1).
   - Collected a minimum of eight cores at impact sites and West Florida Escarpment at individual locations (e.g., markers) with the following allocations: fauna analysis (N = 4), hydrocarbon analysis (N = 1), metals/carbon-14 analysis (N = 1), microbial/grain size (N = 1), and porewater analysis (N = 1).

Table 2.7. Number of sediment samples collected per site during NF-23-06. WFE = West Florida Escarpment.

Field ID	Uchupi Dome	Gloria Dome	Chandeleur Valley	Biloxi Dome	Dauphin Dome	WFE 1	WFE 2	WFE 3	Horn Dome	Redfish Valley
Core - ethanol					3					
Core - frozen		5		5				15	5	5
Core - grain size		6		6	6			18	6	6
Core - hydrocarbon		6		6	6			18	6	6
Core - macrofauna	15	20	15	20	20	15	15	90	20	20
Core - metals		6		6	6			18	6	6
Core - microbial		6		6	6			18	6	6
Core - porewater		3		3				9	3	3
Core - porosity		1		1	1			3	1	1
Core – sediment chemistry	5		5			5	5	10		

3. Deployed benthic landers, physical markers, temperature loggers and ARMS for environmental characterization, visual reference, and discovery of cryptic biodiversity (Figure 2.5):
   - Deployed three ARMS at site WFE2 near Marker 15.
   - Four benthic landers were deployed during this leg (Table 2.8).
     - Two benthic landers were deployed for initial short-term deployment to test sensor systems and platform stability before long-term (1-year) deployments at target sites. Landers for short-term deployments were placed at the beginning of the ROV dive, recovered after completing other ROV operations, and brought back on deck to assess data collection and sensor integrity.
     - A long-term deployment of a benthic mini-lander, equipped with its full sensor payload (current transformer, ECO FLNTU, dissolved oxygen, and acoustic Doppler current profile) was performed at West Florida Escarpment 3 (Figure 2.6).

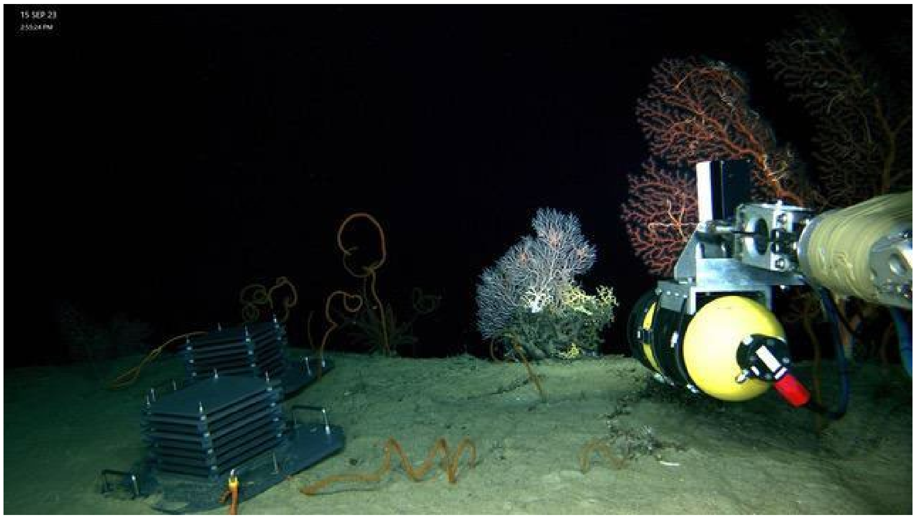


Figure 2.5. Two autonomous reef monitoring system (ARMS) units deployed at West Florida Escarpment 2.

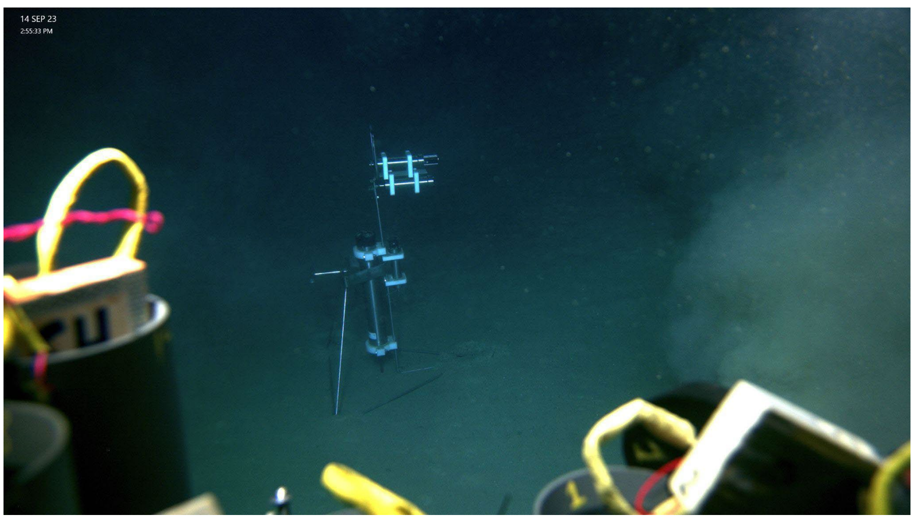


Figure 2.6. Benthic lander deployment at West Florida Escarpment 3.

Table 2.8. NF-23-06 University of Rhode Island benthic lander deployments. ROV = remotely operated vehicle.

ROV Dive	Site	Latitude	Longitude	Depth (m)	Duration	Deployment (UTC)	Recovery (UTC)
3	Chandeleur Valley	28.35599	–88.79466	1,393	Short-term	9/8/23 14:27	9/8/23 21:07
4	Biloxi Dome	28.67221	–88.46652	1,375	Long-term	9/9/23 12:29	Summer 2024
7	West Florida Escarpment 2	27.67272	–85.62951	1,709	Short-term	9/11/23 14:31	9/11/23 21:38
10	West Florida Escarpment 3	27.99684	–86.36275	1,513	Long-term	9/14/23 14:46	Summer 2024

4. Animal sampling of select taxa for population genetics, isotope analysis, diversity assessment, microbiology, histology, and husbandry:
    a. Genetics
        - Sampled and preserved fragments from 25 *Paramuricea biscaya* colonies and nine *Paramuricea* B3 colonies from West Florida Escarpment sites for population genomic analyses (Appendix B Table 2).
    b. Coral reproduction
        - 73 samples were collected for reproductive analysis across six sites, including representatives from 21 species (Table 2.9 and Appendix B Table 2)

Table 2.9. Samples collected during NF-23-06 for reproductive analysis separated by morphotaxa.

Species	# Specimens Collected for Histology	Species	# Specimens Collected for Histology
Acanella sp.	4	*Lepidisis* sp.	2
Acanthogorgia sp.	1	*Metallogorgia* sp.	1
Bathypathes sp.	2	*Narella* sp.	1
Callistephanus sp.	1	*Paragorgia* sp.	2
Candidella sp.	3	*Paramuricea* B3	5
Chrysogorgia sp.	2	*Paramuricea biscaya*	28
Cladorhizidae	2	Primnoid	2
Dendropathes sp.	1	*Stauropathes* sp.	1
Hexapathes sp.	1	*Trachythela* sp.	2
Iridogorgia sp.	1	*Tetrapathes* sp.	2
Keratoisididae	8	*Trissopathes* sp.	1
TOTAL	**73**		

c. Coral husbandry

- A total of 14 samples of *P. biscaya* and five samples of *P.* B3 were collected during this expedition, with 12 samples of *P. biscaya* and five samples of *P.* B3 surviving to demobilization on September 19th, 2023. These surviving samples ranged from collection 9 days earlier to collection just 1 day previously, and ranged widely in condition, from very poor, with pale, apparently necrotic tissue, to healthy fragments with open polyps (Figure 2.7).
    - Fragments of *Paramuricea biscaya* colonies were collected from West Florida Escarpment 1 on September 10th, 2023, with four colonies subsampled for husbandry trials from 1,612- to 1,632-m depth. At West Florida Escarpment 3 on September 13th, 2023, two more colonies were subsampled for husbandry from 1,617 to 1,672 m. On September 15th, 2023, six colonies of *P. biscaya* were collected intact from West Florida Escarpment 3 at depths of 1508–1513 m; that is, these were complete colonies, rather than fragments.
    - On September 17th, five colonies of *P.* B3 were collected from 923 m at Redfish Valley.

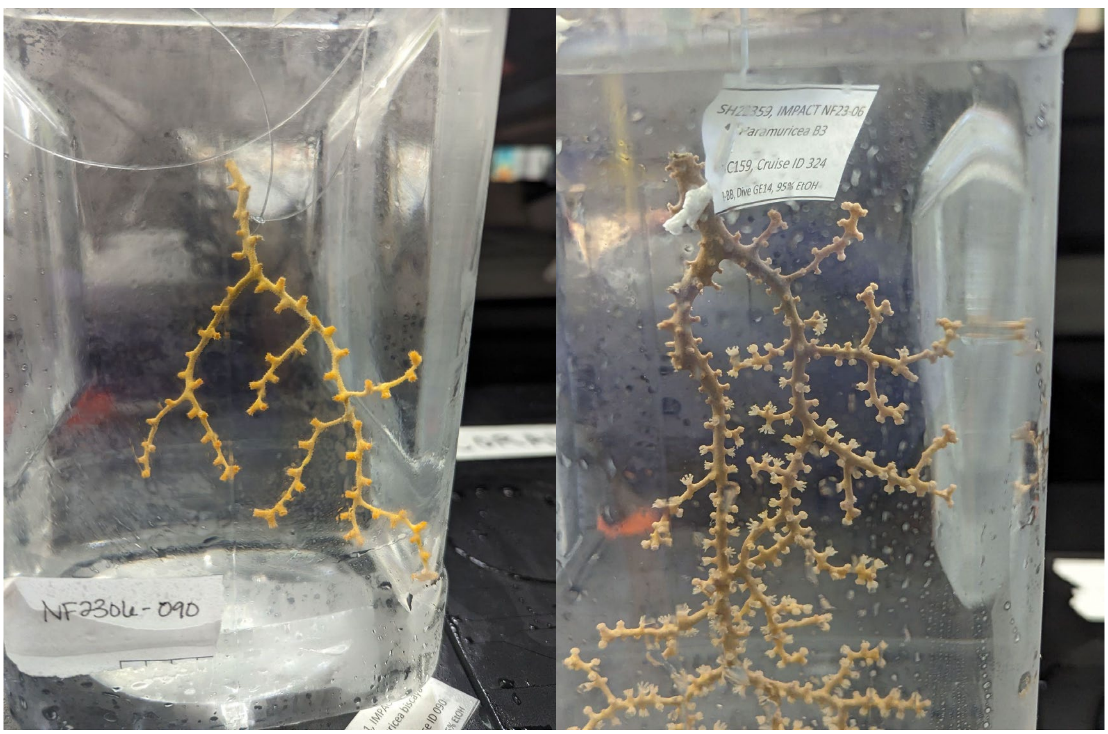


Figure 2.7. Live samples of *Paramuricea biscaya* (left) and *Paramuricea* B3 (right) in aquarium jars. The *P.* B3 specimen has its polyps extended.

d. Animal diversity

- 111 total animals were collected including 37 *Paramuricea biscaya* (Table 2.10 and Appendix B Table 2). The majority of these were from West Florida Escarpment 3 where 100 samples were collected including 34 coral morphotaxa.

Table 2.10. Breakdown of biological diversity collections by site. Note: Specimens were not collected at Biloxi, Dauphin, Horn Dome, or Chandeleur Valley sites. WFE = West Florida Escarpment. * Taxonomic classifications of species are subject to change.

Specimen Collected*	Uchupi Dome	Gloria Dome	WFE1	WFE2	WFE3	Redfish Valley	Grand Total
Arthropoda		**2**		**1**	**6**		**9**
Crustacea		**2**		**1**	**5**		**8**
Chirostyloidea				1	3		**4**
Cirripedia					1		**1**
Lepadidae		2			1		**3**
Malacostraca					**1**		**1**
Bathynomus giganteus					1		**1**
Cnidaria		**4**	**12**	**8**	**78**	**5**	**107**
Anthozoa		**4**	**12**	**8**	**77**	**5**	**106**
Acanella arbuscula				1			**1**
Acanella sp.				2	1		**3**
Acanthogorgia sp.					3		**3**
Acanthogorgiidae					1		**1**
Actiniaria		1					**1**
Alternatipathes alternata		1					**1**
Anthomastus sp.					1		**1**
Antipatharia					1		**1**
Aphanostichopathes sp.					2		**2**
Callistephanus sp.					1		**1**
Candidella sp.					3		**3**
Chrysogorgia sp.				2	1		**3**
Dendropathes sp.					1		**1**
Enallopsammia sp.					1		**1**
Hexapathes sp.			1				**1**
Iridogorgia sp.					1		**1**
Isidella sp.					1		**1**
Isididae		1					**1**
Keratoisididae			2		1		**3**
Keratoisis sp.					5		**5**
Lepidisis sp.				2			**2**
Madrepora sp.					1		**1**
Metallogorgia sp.					1		**1**
Narella bellissima					1		**1**
Paragorgia sp.					3		**3**
Paramuricea biscaya			9		28		**37**

Specimen Collected*	Uchupi Dome	Gloria Dome	WFE1	WFE2	WFE3	Redfish Valley	Grand Total
Paramuricea sp.					1	5	**6**
Pennatulacea				1			**1**
Pleurocorallium borneense					3		**3**
Plexauridae					1		**1**
Primnoidae					4		**4**
Solenosmilia sp.					2		**2**
Stauropathes sp.					1		**1**
Stichopathes sp.					1		**1**
Tetrapathes sp.					2		**2**
Trachythela sp.					2		**2**
Trissopathes sp.					2		**2**
Zoanthidae		1					**1**
Medusozoa					**1**		**1**
Hydrozoa					1		**1**
Echinodermata			**6**		**21**		**27**
Asterozoa			**6**		**21**		**27**
Asteroidea					1		**1**
Asteroschema sp.			6		16		**22**
Ophiacanthidae					1		**1**
Ophiuroidea					3		**3**
Echinodermata					**4**		**4**
Crinozoa					**4**		**4**
Crinoidea					4		**4**
Mollusca					**2**		**2**
Aplacophora					**1**		**1**
Aplacophora					1		**1**
Bivalvia					**1**		**1**
Acesta sp.					1		**1**
Porifera	**1**				**5**		**6**
Demospongiae	**1**				**3**		**4**
Cladorhizidae	1				1		**2**
Geodia sp.					1		**1**
Polymastia sp.					1		**1**
Hexactinellida					**2**		**2**
Farrea sp.					1		**1**
Hyalonema sp.					1		**1**
Grand Total	**1**	**6**	**18**	**9**	**116**	**5**	**155**

5. Collected water samples to determine the abundance of POM and nutrients and characterize species diversity through eDNA sequencing.
    - A total of 13 CTD casts were conducted, and 12 were fully successful (CTD04 was aborted due to sensor error) (Table 2.11 and Appendix B Table 3).
        - In each cast, two Niskin bottles were fired at six different depths across the water column. Two bottles were always fired at the deepest depth, two at the surface, and two at each of four other sites through the water column based on water column characteristics.
        - The majority of ROV Niskin samples were successful, but there were a few misfires where no sample was acquired.
        - One field blank sample was collected at each site. Deionized water was run through a filter to test that the system was contaminant free. These samples were processed and sequenced with the other field samples.
        - A total of 144 CTD filters, 52 ROV filters, and 20 field blanks were collected and frozen in the −80°C freezer on board.

6. Defined water column oceanographic properties and sound velocity through CTD profiles.
    - During ROV dives, eight Niskins (~1.7-L capacity) were fired at site locations with identified coral communities. These samples were all collected a few meters above the seafloor before sediment sampling or in areas where the ROV had yet to disturb the bottom. Nutrient samples were collected from two Niskins to provide a duplicate sample.
        - Four Niskins were designated for eDNA sampling, and four were designated for nutrient and POM sampling. In cases where an ROV Niskin misfired (occurred at Gloria Dome, Chandeleur Valley, and West Florida Escarpment), only the three remaining Niskins fired in the same location contributed to the POM sample.
    - In total, 110 discrete nutrient samples and 89 POM samples were collected from CTD and ROV dives (Table 2.11).

Table 2.11. Numbers of subsamples collected by CTD casts and ROV dives at each station. CTD = conductivity, temperature, and depth; eDNA = environmental DNA; ROV = remotely operated vehicle; POM = particulate organic matter; WFE = West Florida Escarpment. * Includes one field blank collected.

Sample Type	Uchupi Dome	Gloria Dome	Chandeleur Valley	Biloxi Dome	Dauphin Dome	WFE1	WFE2	WFE3	Horn Dome	Redfish Valley Head	Grand Total
CTD	**25**	**23**	**23**	**3**	**0**	**23**	**21**	**117**	**23**	**23**	**281**
eDNA*	13	13	13	0	0	13	13	65	13	13	156
Nutrient	8	6	6	2	0	6	8	32	6	6	80
POM	4	4	4	1	0	4	0	20	4	4	45
ROV	**11**	**9**	**10**	**10**	**12**	**10**	**10**	**48**	**11**	**7**	**138**
eDNA*	5	4	4	4	5	5	4	23	5	5	64
Nutrient	2	3	2	2	3	2	2	10	2	2	30
POM	4	2	4	4	4	3	4	15	4	0	44
Total	**36**	**22**	**53**	**13**	**12**	**33**	**31**	**165**	**34**	**30**	**419**

7. Conduct material tests of 3D printed corals for potential future deployments.
    - Polylactic acid 3D printed corals (Figure 2.8) showed no obvious signs of pressure stress or damage after repetitive dives to 1,500–2,500 m (i.e., they look the same before and after).
    - There were no noticeable differences between the two material densities (25% and 50%).

Figure 2.8. Polylactic acid 3D printed corals for testing (left); mounted to ROV for dives (right).

8. Seafloor mapping to increase resolution of existing grids
    - Multibeam mapping with the *Nancy Foster*'s EM712 and water column surveys with the EK80 were conducted overnight at each site (Table 2.12).
    - A total of 295.98 linear nautical miles of EM712 multibeam echosounder (MBES) and EK80 water column echosounder data were collected in this cruise (Figure 2.9). The MBES surveys generated 714.4 km^2 of mapping data at 320-m resolution. The team also completed 27 UCTD casts to derive sound velocity profiles.

Table 2.12. EM712 multibeam and EK80 echosounders survey metrics for NF-23-06. MBES = multibeam echosounder; LKM - linear kilometers; SV = sound velocity. UCTD = underway conductivity, temperature, and depth.

Date	MBES KM^2	EM712 & EK80 LKM	UCTD Casts
9/6/23	47.3	24.1	2
9/7/23	67.5	46.4	2
9/8/23	38.4	49.8	3
9/9/23	124.5	60.3	2
9/10/23	9.6	8.2	1
9/11/23	20.9	13.1	1
9/12/23	44.9	46.6	2
9/13/23	65.1	68.8	3
9/14/23	80.6	70.1	4
9/15/23	85.4	57.7	2
9/16/23	63.7	44.8	2
9/17/23	0	0	0
9/18/23	66.1	57.5	3
TOTAL	**714.0**	**547.4**	**27**

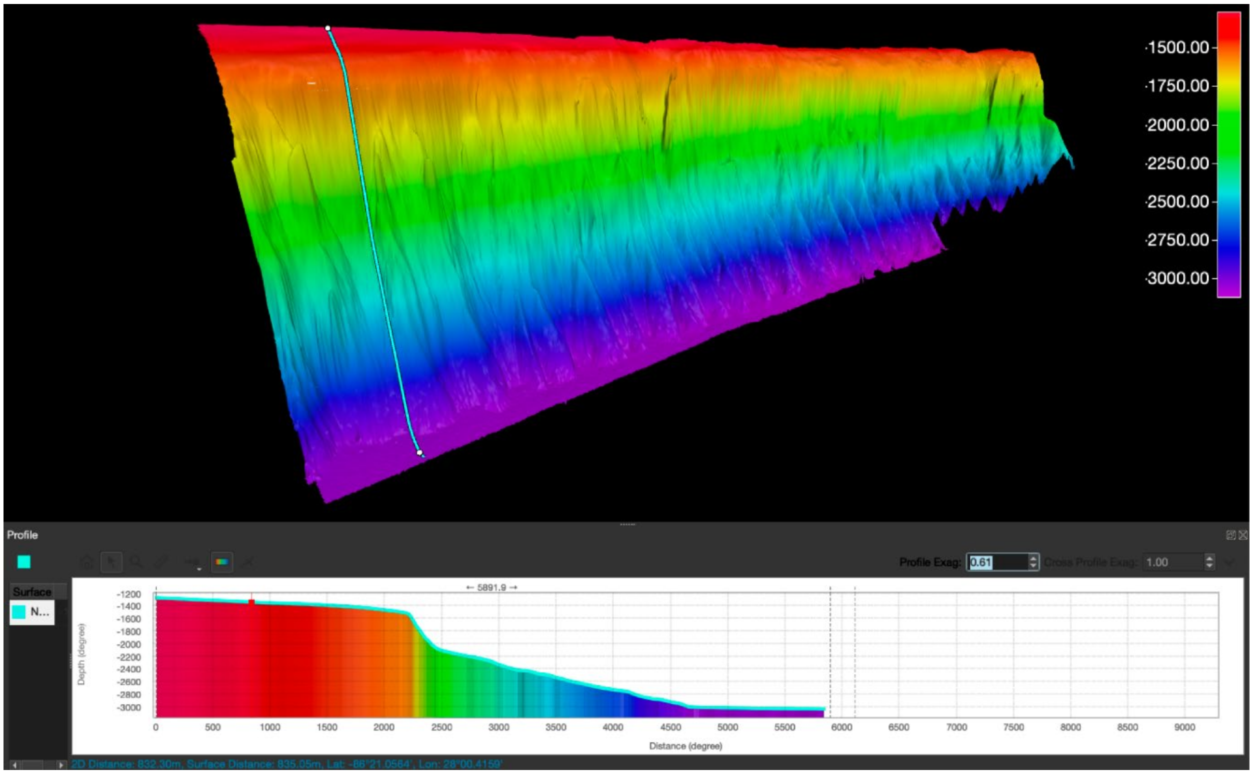


Figure 2.9. Example 3D bathymetry surface obtained from NF-23-06 West Florida Escarpment 3.

9. Test offshore telepresence capabilities with occasional livestream broadcasts.
   - The Starlink system performed well and only briefly (~30 min) lost connection during the length of the expedition.
   - Two successful live interactions were conducted on September 6 with Lehigh University's Ocean Solutions class and on September 14 with USGS leadership.

Leg 3: September 25–October 5, 2023

Cruise NF-23-07

Objectives of Mission

1. Use ship-based acquisition systems to collect high-resolution multibeam and fish acoustic fisheries data, with 100% seafloor ensonification in mid- to deep-water depths (100–3,000 m).
2. Deploy an AUV to collect high-resolution seafloor imagery, multibeam, and sidescan data.
3. Deploy an ROV to collect high-resolution seafloor imagery.
4. Define water column oceanographic properties and sound velocity through CTD profiles.
5. Conduct occasional livestream broadcasts to various audiences.

Science Team

The objectives of this cruise were carried out by scientists (Table 3.1) from NOAA, Oceaneering, University of Rhode Island, University of North Carolina Wilmington, and Woods Hole Oceanographic Institution (WHOI).

Table 3.1. Participant list for NOAA Ship *Nancy Foster* NF-23-07. NOAA = National Oceanic and Atmospheric Administration; WHOI = Woods Hole Oceanographic Institution; UNCW = University of North Carolina Wilmington; URI = University of Rhode Island; AUV = autonomous underwater vehicle; ROV = remotely operated vehicle.

Last Name	First Name	Affiliation	Role on Cruise	Dates on Board
Battista	Tim	NOAA	Field Party Chief	9/23/23–10/5/23
Winship	Arliss	CSS Inc./NOAA	Modeler	9/23/23–10/5/23
Flanagan	Patrick	URI	Telepresence	9/23/23–10/5/23
Fujii	Justin	WHOI	AUV Lead	9/23/23–10/5/23
Kelley	Sean	WHOI	AUV Support	9/23/23–10/5/23
Schwartzman	Mathew	WHOI	AUV Support	9/23/23–10/5/23
Shukla	Asmita	CSS Inc./NOAA	Data Manager	9/23/23–10/5/23
Farrington	Stephanie	TESA/NOAA	Data Manager	9/23/23–10/5/23
Tripp	Jason	Oceaneering	ROV Technician	9/23/23–10/5/23
Cook	Timothy	Oceaneering	ROV Technician	9/23/23–10/5/23
Lipe	Nathan	Oceaneering	ROV Technician	9/23/23–10/5/23
Glidden	Eric	Glidden Inc.	Navigation Technician	9/23/23–10/5/23

Operations

NF-23-07 was planned to conduct 12-hr ROV operations by day and 12-hr AUV operations at night with opportunistic ship multibeam over the course of 12 days. The cruise was shortened to four days due to poor weather and conditions that exceeded *Nancy Foster's* operational capabilities.

The ROV *Global Explorer* was used to conduct ground-truthing verification of seafloor composition. Vehicle sensors used for this leg include: 4K ultra-HD video camera, stereo 3D HD video camera for photogrammetry, 24-MP DSLR still camera, and laser scaler for stills and HD cameras.

NF-23-07 utilized WHOI's AUV *Sentry* to conduct high-resolution mapping along seafloor transects. AUV *Sentry* sensor payloads utilized for the mission included: EdgeTech 2205 sidescan sonar (SSS), Kongsberg 2040 multibeam sonar, Reson SVP70 sound velocity probe, IXSEA PHINS III INS DVL, RDI DVL, Paroscientific 8B7000 pressure depth sensor, SBE FastCAT 49 CTD, Aanderaa Optode dissolved oxygen sensor, and Seapoint optical backscatter turbidity sensor.

Nancy Foster was equipped with a hull-mounted Kongsberg EM712 echosounder used to acquire bathymetry, backscatter, and water column data. Fish acoustics data were simultaneously collected using a Simrad EK80 echosounder. Upon review of the AUV data, there was noticeable interference between the AUV's EM2040 and *Nancy Foster*'s EK80, so the EK80 was secured for the duration of subsequent AUV dives. UCTD casts for sound velocity correction were collected every 4 hr, or more frequently as conditions required.

Locations

NF-23-07 cruise surveyed locations are shown in Figures 3.1, 3.2, and 3.3 and Table 3.2.

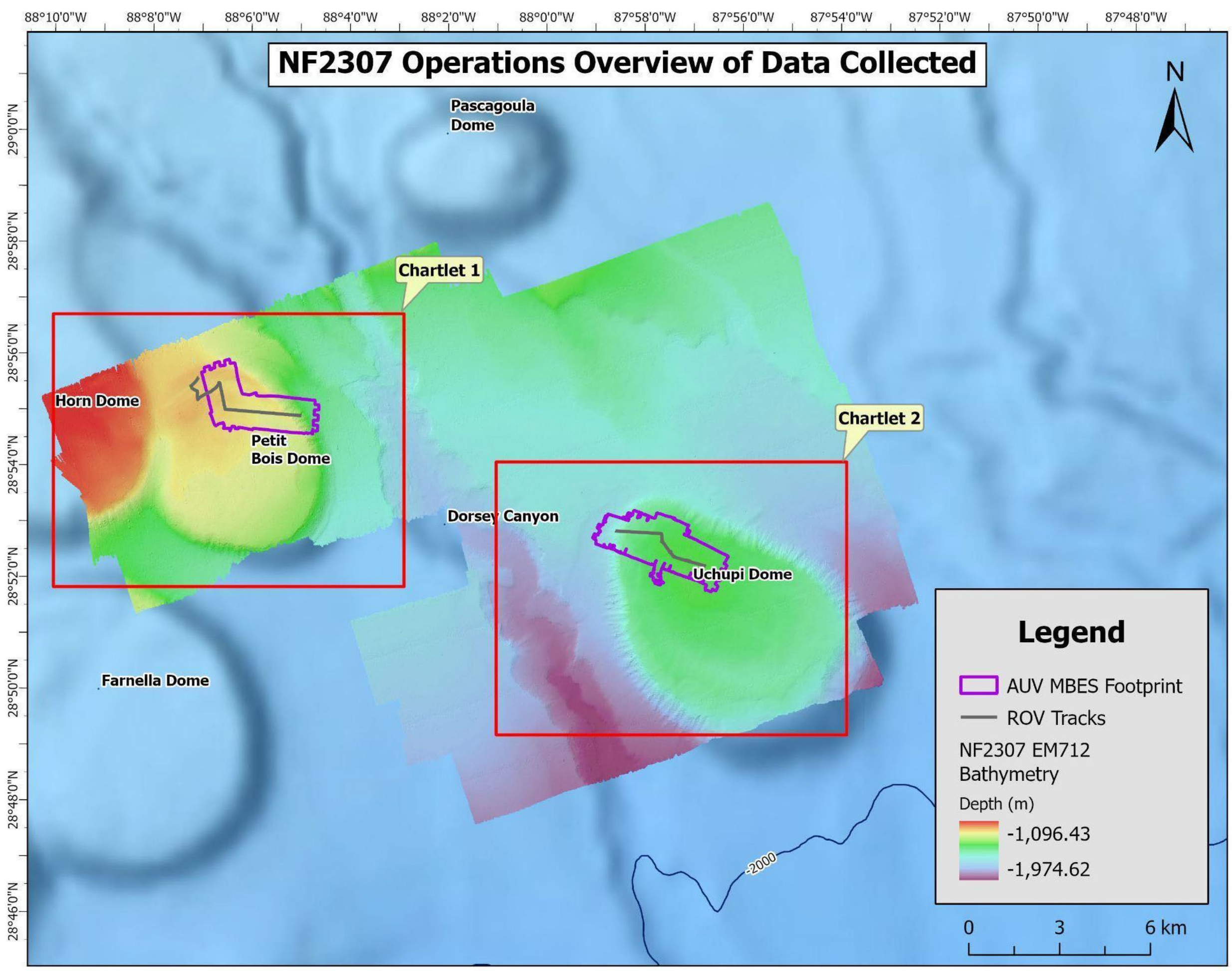


Figure 3.1. NF-23-07 multibeam coverage ROV dive tracks, and AUV multibeam footprints. See Figures 3.2 and 3.3 for Chartlets 1 and 2 referenced above.

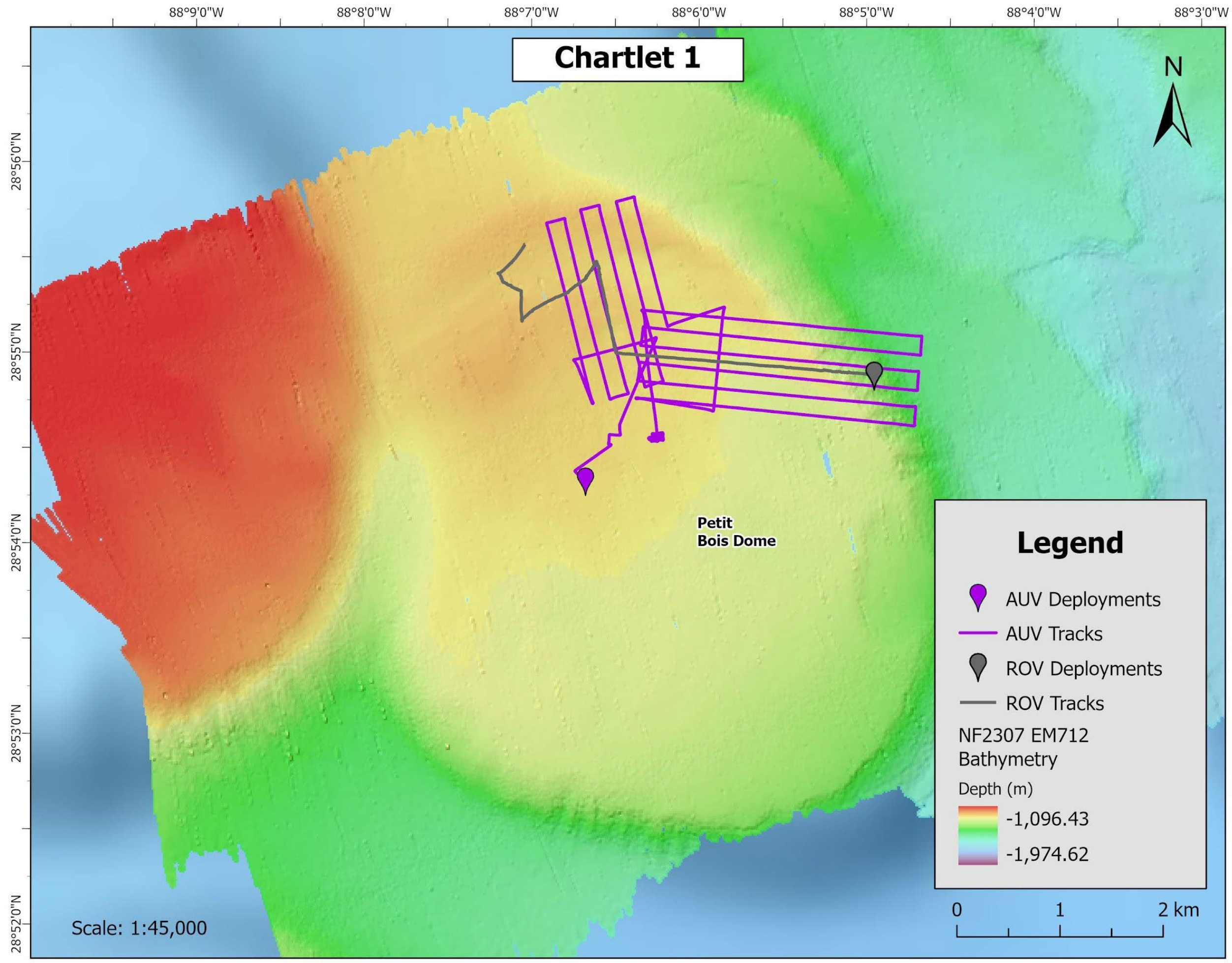


Figure 3.2. Chartlet 1 referenced in Figure 3.1 showing EM712 multibeam coverage, ROV and AUV dive tracks, and deployment locations at Petit Bois Dome.

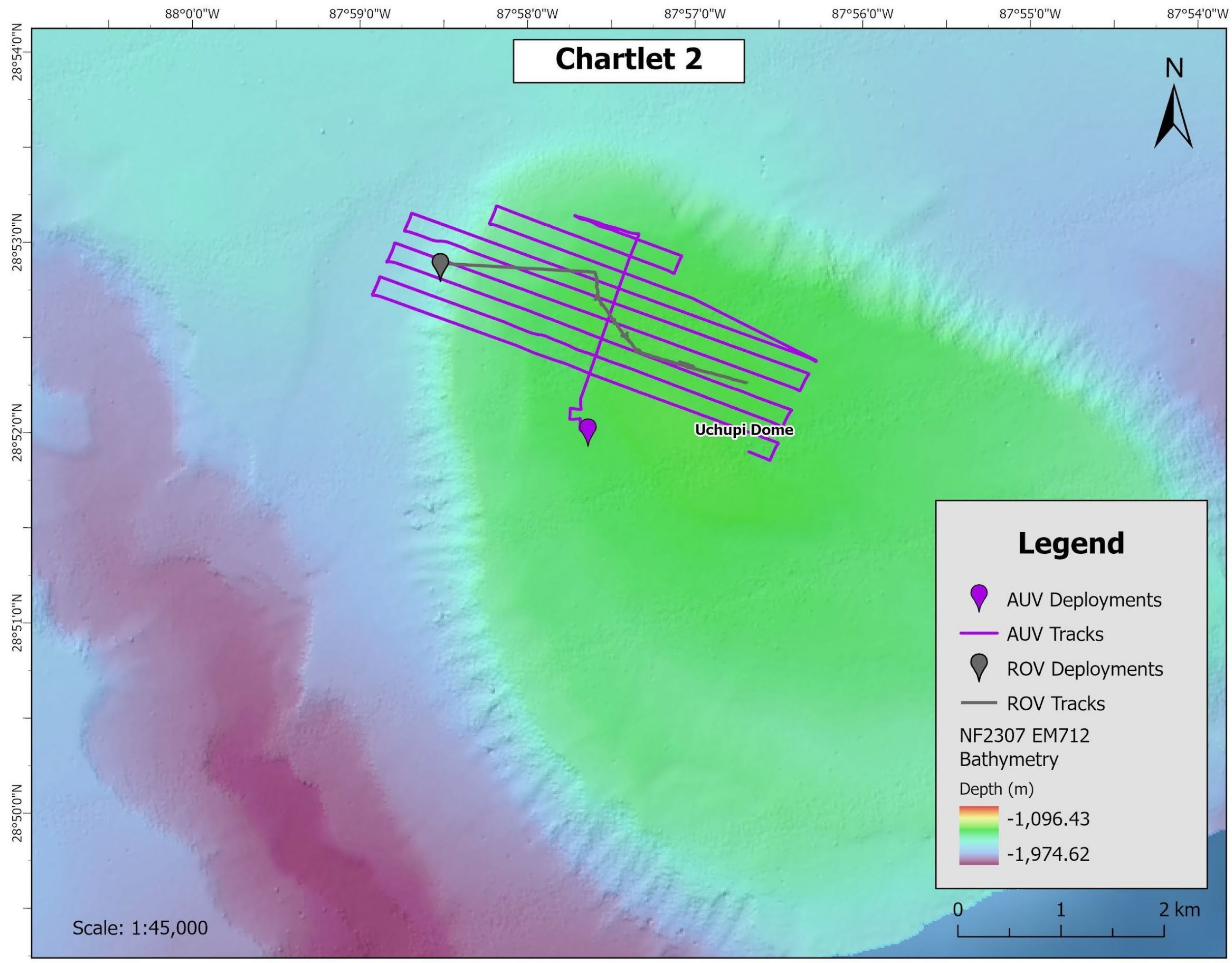


Figure 3.3. Chartlet 2 referenced in Figure 3.1 showing EM712 multibeam coverage, ROV and AUV dive tracks, and deployment locations at Uchupi Dome. AUV = autonomous underwater vehicle; ROV = remotely operated vehicle.

Table 3.2. Cruise itinerary for NF-23-07. AUV= autonomous underwater vehicle. MBES = multibeam echosounder; FA = fish acoustics; UCTD = underway conductivity, temperature, and depth; ROV = remotely operated vehicle.

Date	Operations Conducted	Brief Description
09/23/2023	Moored Pascagoula, MS	AUV Mobilization. AUV team arrived.
09/24/2023	Moored Pascagoula, MS	Scientists Arrive. Staging Day. See Table 3.1 for science team.
09/25/2023	Departed Pascagoula, MS	Transit to working grounds. MBES, FA, and UCTD operations.
09/26/2023	MBES, FA, UCTD, ROV, AUV	MBES/FA acquisition until morning ROV deployment; afternoon/night ROV recovery and AUV deployment MBES opportunistically.
09/27/2023	MBES, FA, UCTD, ROV, AUV	Opportunistic MBES until AUV recovery. Morning ROV deployment. Afternoon/night ROV recovery and AUV deployment. MBES opportunistically.
09/28/2023	--	Opportunistic MBES until AUV recovery. Transit to Pascagoula due to declining weather.
09/29/2023–10/05/2023	--	Weather day. Demobilization of ROV and AUV. Scientists depart.

Results and Discussion

Confounding conditions during NF-23-07 impacted mission success. While foundational mapping and ground-truthing data were collected to meet MDBC project objectives, the reduced number of operational days significantly affected the planned accomplishments. Data collected on NF-23-07 will help document the abundance and distribution of MDBC, as well as provide data for maps, models, and observations to prioritize and support protection and restoration activities.

Cruise operations were active across 4 days, with significant portions of 2 of those days spent transiting to and from Pascagoula, MS. Operations were suspended on 29 September and demobilization occurred due a lapse in NOAA appropriations. Over the course of the cruise, 340 km^2 of the ocean floor were mapped at 16- and 32-m resolution using a ship-based MBES acquisition system, and 168 LKM were surveyed using the EK80 echosounder. These data provide high-to-moderate resolution (8–16 m) bathymetry and backscatter data across 1,000- to 2,000-m depth range.

The AUV *Sentry* was deployed on two dives across two days to collect very high-resolution seafloor mapping data along transects and images of the seafloor. Initially, the *Sentry* was deployed to conduct MBES and SSS-collected surveys at Petit Bois and Uchupi Domes. Over the course of NF-23-07, the *Sentry* collected 6.1 km^2 of sidescan data and 11 km^2 of MBES data.

Two ground-truthing verification transects were conducted with the ROV *Global Explorer* to characterize seafloor composition at Petit Bois and Uchupi Domes. Each dive was approximately 6 hr and 45 min, and the team conducted 13.8 LKM of cumulative transects.

The *Nancy Foster* was equipped with Starlink high speed internet, although no telepresence events were scheduled.

Table 3.3. List of ROV dives for NF-23-07. ROV = remotely operated vehicle.

Date	Dive	Locality	ID	Latitude (DD)	Longitude (DD)	Depth (m)	Duration (hh:mm)	No. of Transects
09/26/2023	1	Uchupi Dome	ROV-01	28.87154	–87.94457	1,446–1,620	06:40	6
09/27/2023	2	Petit Bois Dome	ROV-02	28.92652	–88.11714	1,250–1,430	06:48	9

Table 3.4. List of AUV dives for NF-23-07. AUV = autonomous underwater vehicle.

Date	Dive	Locality	ID	Latitude (DD)	Longitude (DD)	Depth (m)	Duration (hh:mm)	Sensors
09/26–27/2023	1	Uchupi Dome	AUV-01	28.86706	–87.96022	1,367–1,616	10:48	MBES & SSS*
09/27–28/2023	2	Petit Bois Dome	AUV-02	28.90578	–88.11087	1,175–1,434	11:48	MBES & SSS

*SSS malfunctioned on Dive 1, Uchupi Dome, and the data quality did not meet the usability standard.

Leg 4: October 8–October 21, 2023

Cruise NF-23-08

Objectives of Mission

1. Use ship-based acquisition systems to collect high-resolution multibeam and fish acoustic fisheries data, with 100% seafloor ensonification in mid to deep water depths (1,000–3,000 m).
2. Deploy an AUV to collect high-resolution seafloor imagery, multibeam data, and sidescan data.
3. Define water column oceanographic properties and sound velocity through CTD profiles and water sampling.
4. Conduct total water column CTD rosette casts and water sampling at ROV and AUV sites for nutrient and eDNA analysis.
5. Conduct occasional livestream broadcasts to various audiences.

Science Team

The objectives of this cruise were carried out by scientists (Table 4.1) from the NOAA, Humboldt University, University of Rhode Island, and WHOI.

Table 4.1. Participant list for NOAA Ship *Nancy Foster* NF-23-08. NOAA = National Oceanic and Atmospheric Administration; WHOI = Woods Hole Oceanographic Institution; URI = University of Rhode Island; AUV = autonomous underwater vehicle.

Last Name	First Name	Affiliation	Role on Cruise	Dates on Board
Menza	Charlie	NOAA	Field Party Chief	10/07/23–10/21/23
Frometa	Janessy	CSS Inc./NOAA	Vessel Coordinator	10/07/23–10/21/23
Dar	Rabiya	CSS Inc./NOAA	Data Manager	10/07/23–10/21/23
Urquhart	Karina	NOAA	MBES Manager	10/07/23–10/21/23
Weathers	Katharine	NOAA	Data Manager	10/07/23–10/21/23
Fuji	Justin	WHOI	AUV Lead	10/06/23–10/21/23
Gruner-Miscgek	Renee	WHOI	AUV Technician	10/06/23–10/21/23
McCarthy	Mike	WHOI	AUV Technician	10/06/23–10/21/23
Skowronski	Mike	WHOI	AUV Technician	10/06/23–10/21/23
Vandor	Isaac	WHOI	AUV Technician	10/06/23–10/21/23
Joss	Hannah	Humboldt University	Water Chemistry	10/07/23–10/21/23
Melville	Sophia	URI	Telepresence	10/07/23–10/21/23

Operations

NF-23-08 was planned to conduct 12-hr AUV operations during the day and 12 hr of ship multibeam at night. During AUV deployments, CTD and water sampling operations were conducted in addition to opportunistic multibeam operations. The cruise was planned for 14 days.

NF-23-08 utilized WHOI's AUV *Sentry* to conduct high-resolution mapping and imaging along seafloor transects. AUV *Sentry* sensor payloads utilized for the mission included: EdgeTech 2205 SSS, Kongsberg 2040 multibeam sonar, Reson SVP70 sound velocity probe, IXSEA PHINS III INS DVL, RDI DVL, Paroscientific 8B7000 pressure depth sensor, SBE FastCAT 49 CTD, Aanderaa Optode dissolved oxygen sensor, Prosilica Ge-4 11-MP digital still camera and Seapoint Optical backscatter turbidity sensor.

Nancy Foster was equipped with a hull-mounted Kongsberg EM712 echosounder used to acquire bathymetry, backscatter, and water column data. Fish acoustics data were collected using a Simrad EK80 echosounder; however, the EK80 was secured during AUV dives to avoid acoustic interference. UCTD casts for sound velocity correction were collected every 4 hr, or more frequently as conditions required. Static, deepwater, CTD casts conducted for water sampling were used as references to extend the more frequently acquired UCTD profiles to survey depth.

Locations

NF-23-08 cruise surveyed locations are shown in Figure 4.1 and Table 4.2.

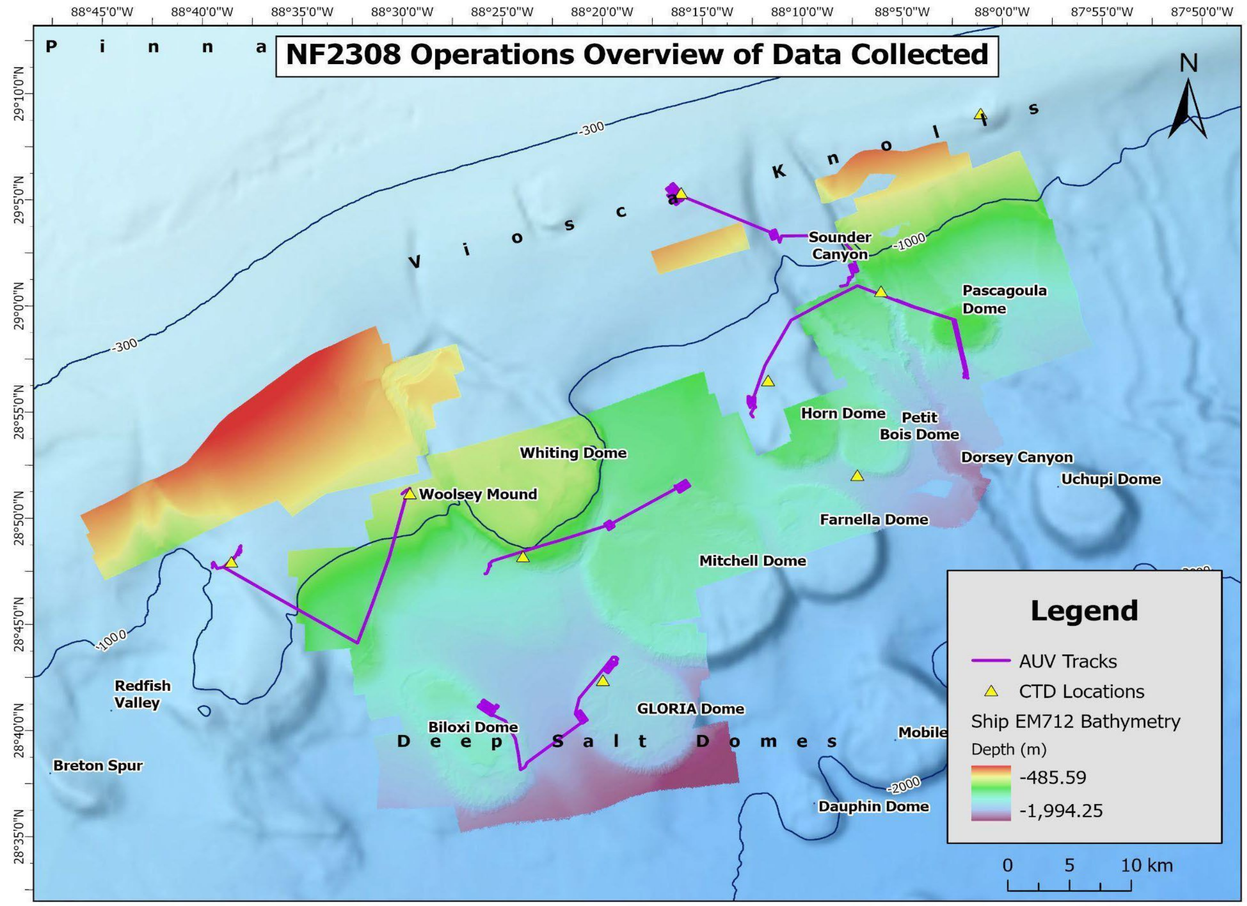


Figure 4.1. NF-23-08 multibeam coverage, AUV operations, and deepwater CTDs.

Table 4.2. Cruise itinerary for NF-23-08. MBES = multibeam echosounder; (U)CTD = (underway) conductivity, temperature, and depth; FA = fish acoustics; AUV = autonomous underwater vehicle.

Date	Operations Conducted	Brief Description
10/06/2023	Moored Pascagoula, MS. Staging Day	AUV team arrived.
10/07/2023	Moored Pascagoula, MS. Staging Day	Scientists arrive. See Table 4.1 for science team.
10/08/2023	Underway	Transit to working grounds.
10/09/2023	AUV, MBES, FA, CTD, UCTD	Commenced mapping and fish acoustics. AUV; CTD sampling.
10/10/2023	AUV, MBES, FA, UCTD	Concurrent AUV and MBES operations. Evening departure from working grounds due to declining weather.
10/11/2023	Arrived Pascagoula, MS	Weather day. Moored at Singing River Pier.
10/12/2023	Departed Pascagoula, MS	Transit to working grounds.
10/13/2023	AUV, MBES, FA, CTD, UCTD	Concurrent AUV and MBES operations. Water sampling CTD.
10/14/2023	AUV, MBES, FA, CTD, UCTD	Morning AUV deployment experienced propulsion issues. Recovered at noon. Water sampling CTD. Deployed AUV in the afternoon. MBES/FA during the day and at night.
10/15/2023	MBES, UCTD, Transit to Anchorage	Declining weather in early morning hours. MBES/FA data to the ships operational limit, then transited to anchorage in the vicinity of Pascagoula Sea Buoy.
10/16/2023	Departed Anchorage	Anchored in the morning with an afternoon departure. Transited to working grounds.
10/17/2023	AUV, MBES, FA, CTD, UCTD	Concurrent AUV and MBES operations. Water sampling CTD.
10/18/2023	AUV, MBES, FA, CTD, UCTD	Concurrent AUV and MBES operations. Water sampling CTD.
10/19/2023	AUV, MBES, FA, CTD, UCTD	Concurrent AUV and MBES operations. Water sampling CTD.
10/20/2023	MBES, FA, CTD, UCTD	AUV demobilization. MBES/FA operations. Water sampling CTDs. Secured all operations and commenced transit to Pascagoula, MS.
10/21/2023	Arrive Pascagoula, MS	Gear demobilization. Scientists depart.

Results and Discussion

NF-23-08 met cruise objectives and is expected to provide foundational mapping and ground-truthing data to meet MDBC project objectives. Data collected on NF-23-08 will help document the abundance and distribution of MDBC, as well as provide data for maps, models, and observations to prioritize and support protection and restoration activities.

Cruise operations were active across 9 days. Operations were paused on 3 full days and 2 partial days due to poor weather. Over the course of the cruise, 2,074 km^2 of the ocean floor were mapped at 16- and 32-m resolution using a ship-based MBES acquisition system, and 990 LKM were surveyed using the EK80 echosounder. These data provide high-to-moderate resolution (8–16 m) bathymetry and backscatter data across 600- to 1,600-m depth range.

The AUV *Sentry* was deployed on eight dives across 7 days to collect very high-resolution seafloor mapping data along transects and images of the seafloor. Initially, the *Sentry* was deployed over transects in two passes. On the first pass, the *Sentry* was positioned high in the water column, and MBES and SSS collected swaths of high-resolution sonar data. On the second pass, the *Sentry* traversed the same transects but was positioned at a lower altitude to take photos of the previously ensonified seafloor. This strategy was modified on October 16, 2024, when the *Sentry* camera strobe broke. Afterwards, the *Sentry* collected only MBES and sidescan data and was deployed over longer transects to more efficiently cover a broader range of bottom types. Over the course of NF-23-08, the *Sentry* collected 65 km^2 of sidescan data, 39 km^2 of MBES data, and 11,558 photos.

Total water column CTD rosette casts and water sampling were completed at nine sites distributed across the study area. Sites were chosen close to hard bottom based on seafloor backscatter and depth maps so that nutrient and eDNA analysis would characterize deepwater MDBC and habitats.

The *Nancy Foster* was equipped with Starlink high speed internet, which provided bandwidth for telepresence events. The team completed two separate live 30-min “meet the scientist” sessions telecast to the Smithsonian National Museum of Natural History. In these sessions, scientists onboard the *Nancy Foster* described their work and the communities they help to restore. Tables 4.3, 4.4, and 4.5 show AUV dives, CTD casts, and water samples, respectively.

Table 4.3. List of AUV dives for NF-23-08. ID refers to the identification number created and used by the Woods Hole Oceanographic Institution *Sentry* survey team. Duration is defined as the time elapsed between the start and end times recorded in a dive's navigation file. SSS = sidescan sonar.

Date	Dive	Locality	ID	Latitude (DD)	Longitude (DD)	Depth (m)	Duration (hh:mm)	Sensors	No. of Photos
10/09/2023	1	near Redfish Valley Head and Woolsey Mound	693	28.810536	–88.627217	785–1,151	11:00	MBES, SSS, camera	1,166
10/10/2023	2	near Redfish Valley Head and Woolsey Mound	694	28.797266	–88.649617	874–1,171	11:09	MBES, SSS, camera	4,827
10/13/2023	3	near Pascagoula Dome and Sounder Canyon	695	28.952695	–88.025861	945–1,450	11:00	MBES, SSS, camera	1,791
10/14/2023	4	near Pascagoula Dome and Sounder Canyon	696	28.950890	–88.025861	987–1,501	05:48	MBES, SSS, camera	2,848
10/14/2023	5	Horn Dome	697	28.9231833	–88.205600	1042–1,108	02:28	MBES, SSS, camera	926
10/17/2023	6	near Mitchell Dome and Whiting Dome	698	28.796868	–88.422714	951–1,248	9:50	MBES, SSS	0
10/18/2023	7	near Biloxi Dome and Gloria Dome	699	28.724521	–88.314543	1312–1,605	11:05	MBES, SSS	0
10/19/2023	8	near Sounder Canyon	700	29.023005	–88.130281	454–1,134	11:00	MBES, SSS	0

Table 4.4. List of CTD casts for NF-23-08. CTD = conductivity, temperature, and depth. Duration is defined as the time elapsed between the start and end of sampling.

Date	Locality	ID	Latitude (DD)	Longitude (DD)	Depth (m)	Duration (hh:mm)
10/09/2023	Northeast of Redfish Valley	CTD01	28.801941	−88.635841	931	00:24
10/09/2023	Woolsey Mound	CTD02	28.857271	−88.488428	881	00:25
10/13/2023	Horn Dome	CTD03	28.948981	−88.191970	1,082	00:30
10/14/2023	Sounder Canyon	CTD04	29.019845	−88.098878	1,223	00:30
10/17/2023	Whiting Dome	CTD05	28.808897	−88.393825	1,115	00:37
10/18/2023	Gloria Dome	CTD06	28.712291	−88.326281	1,489	00:41
10/19/2023	West of Sounder Canyon	CTD07	29.095582	−88.266091	522	00:20
10/20/2023	Petit Bois Dome	CTD08	28.875307	−88.116991	1,460	00:41
10/20/2023	East of Sounder Canyon	CTD09	29.160123	−88.017387	442	00:20

Table 4.5. List of water samples for NF-23-08. eDNA = environmental DNA; POM = particulate organic matter. For some samples, the collection depth was not available (NA) at the time of preparation of this report.

CTD Dive	Sample ID	Depth (m)	eDNA	Nutrient Analysis	POM	Lab Blank - eDNA
CTD-01	NF2308_20231009_02_CTD01_Spec001W	931	x	x	x	
CTD-01	NF2308_20231009_02_CTD01_Spec002W	931	x	x	x	
CTD-01	NF2308_20231009_02_CTD01_Spec003W	750	x	x		
CTD-01	NF2308_20231009_02_CTD01_Spec004W	750	x	x		
CTD-01	NF2308_20231009_02_CTD01_Spec005W	399		x		
CTD-01	NF2308_20231009_02_CTD01_Spec006W	151		x		
CTD-01	NF2308_20231009_02_CTD01_Spec007W	111		x		
CTD-01	NF2308_20231009_02_CTD01_Spec008W	75	x	x		
CTD-01	NF2308_20231009_02_CTD01_Spec009W	75	x	x		
CTD-01	NF2308_20231009_02_CTD01_Spec010W	40		x		
CTD-01	NF2308_20231009_02_CTD01_Spec011W	2.3	x	x	x	
CTD-01	NF2308_20231009_02_CTD01_Spec012W	2.3	x	x	x	
CTD-01	NF2308_20231009_02_CTD01_Spec013W	NA				x
CTD-02	NF2308_20231009_03_CTD02_Spec001W	881	x	x	x	
CTD-02	NF2308_20231009_03_CTD02_Spec002W	881	x		x	
CTD-02	NF2308_20231009_03_CTD02_Spec003W	765		x		
CTD-02	NF2308_20231009_03_CTD02_Spec004W	600	x	x		

CTD Dive	Sample ID	Depth (m)	eDNA	Nutrient Analysis	POM	Lab Blank - eDNA
CTD-02	NF2308_20231009_03_CTD02_Spec005W	600	x			
CTD-02	NF2308_20231009_03_CTD02_Spec006W	366		x		
CTD-02	NF2308_20231009_03_CTD02_Spec007W	100	x	x		
CTD-02	NF2308_20231009_03_CTD02_Spec008W	100	x			
CTD-02	NF2308_20231009_03_CTD02_Spec009W	78		x		
CTD-02	NF2308_20231009_03_CTD02_Spec010W	60		x		
CTD-02	NF2308_20231009_03_CTD02_Spec011W	2	x	x	x	
CTD-02	NF2308_20231009_03_CTD02_Spec012W	2	x		x	
CTD-02	NF2308_20231009_03_CTD02_Spec013W	NA				x
CTD-03	NF2308_20231013_02_CTD03_Spec001W	1,082	x	x	x	
CTD-03	NF2308_20231013_02_CTD03_Spec002W	1,082	x		x	
CTD-03	NF2308_20231013_02_CTD03_Spec003W	800	x	x		
CTD-03	NF2308_20231013_02_CTD03_Spec004W	800	x			
CTD-03	NF2308_20231013_02_CTD03_Spec005W	580		x		
CTD-03	NF2308_20231013_02_CTD03_Spec006W	421		x		
CTD-03	NF2308_20231013_02_CTD03_Spec007W	150		x		
CTD-03	NF2308_20231013_02_CTD03_Spec008W	80	x	x		
CTD-03	NF2308_20231013_02_CTD03_Spec009W	80	x			
CTD-03	NF2308_20231013_02_CTD03_Spec010W	56		x		
CTD-03	NF2308_20231013_02_CTD03_Spec011W	2.3	x	x	x	
CTD-03	NF2308_20231013_02_CTD03_Spec012W	2.3	x		x	
CTD-03	NF2308_20231013_02_CTD03_Spec013W	NA				x
CTD-04	NF2308_20231014_02_CTD04_Spec001W	NA	x	x	x	
CTD-04	NF2308_20231014_02_CTD04_Spec002W	NA	x	x	x	
CTD-04	NF2308_20231014_02_CTD04_Spec003W	NA	x	x		
CTD-04	NF2308_20231014_02_CTD04_Spec004W	NA	x			
CTD-04	NF2308_20231014_02_CTD04_Spec005W	NA		x		
CTD-04	NF2308_20231014_02_CTD04_Spec006W	NA		x		
CTD-04	NF2308_20231014_02_CTD04_Spec007W	NA	x	x		
CTD-04	NF2308_20231014_02_CTD04_Spec008W	NA	x			
CTD-04	NF2308_20231014_02_CTD04_Spec009W	NA		x		
CTD-04	NF2308_20231014_02_CTD04_Spec010W	NA		x		
CTD-04	NF2308_20231014_02_CTD04_Spec011W	NA	x	x	x	
CTD-04	NF2308_20231014_02_CTD04_Spec012W	NA	x	x	x	

CTD Dive	Sample ID	Depth (m)	eDNA	Nutrient Analysis	POM	Lab Blank - eDNA
CTD-04	NF2308_20231014_02_CTD04_Spec013W	NA				x
CTD-05	NF2308_20231017_02_CTD05_Spec001W	NA	x	x	x	
CTD-05	NF2308_20231017_02_CTD05_Spec002W	NA	x		x	
CTD-05	NF2308_20231017_02_CTD05_Spec003W	NA	x	x		
CTD-05	NF2308_20231017_02_CTD05_Spec004W	NA	x			
CTD-05	NF2308_20231017_02_CTD05_Spec005W	NA		x		
CTD-05	NF2308_20231017_02_CTD05_Spec006W	NA		x		
CTD-05	NF2308_20231017_02_CTD05_Spec007W	NA		x		
CTD-05	NF2308_20231017_02_CTD05_Spec008W	NA	x	x		
CTD-05	NF2308_20231017_02_CTD05_Spec009W	NA	x			
CTD-05	NF2308_20231017_02_CTD05_Spec010W	NA		x		
CTD-05	NF2308_20231017_02_CTD05_Spec011W	NA	x	x	x	
CTD-05	NF2308_20231017_02_CTD05_Spec012W	NA	x		x	
CTD-05	NF2308_20231017_02_CTD05_Spec013W	NA				x
CTD-06	NF2308_20231018_02_CTD06_Spec001W	NA	x	x	x	
CTD-06	NF2308_20231018_02_CTD06_Spec002W	NA	x		x	
CTD-06	NF2308_20231018_02_CTD06_Spec003W	NA		x		
CTD-06	NF2308_20231018_02_CTD06_Spec004W	NA	x	x		
CTD-06	NF2308_20231018_02_CTD06_Spec005W	NA	x			
CTD-06	NF2308_20231018_02_CTD06_Spec006W	NA		x		
CTD-06	NF2308_20231018_02_CTD06_Spec007W	NA		x		
CTD-06	NF2308_20231018_02_CTD06_Spec008W	NA		x		
CTD-06	NF2308_20231018_02_CTD06_Spec009W	NA	x	x		
CTD-06	NF2308_20231018_02_CTD06_Spec010W	NA	x			
CTD-06	NF2308_20231018_02_CTD06_Spec011W	NA	x	x	x	
CTD-06	NF2308_20231018_02_CTD06_Spec012W	NA	x		x	
CTD-06	NF2308_20231018_02_CTD06_Spec013W	NA				x
CTD-07	NF2308_20231019_02_CTD07_Spec001W	NA	x	x	x	
CTD-07	NF2308_20231019_02_CTD07_Spec002W	NA	x	x	x	
CTD-07	NF2308_20231019_02_CTD07_Spec003W	NA	x	x		
CTD-07	NF2308_20231019_02_CTD07_Spec004W	NA	x			
CTD-07	NF2308_20231019_02_CTD07_Spec005W	NA		x		
CTD-07	NF2308_20231019_02_CTD07_Spec006W	NA		x		
CTD-07	NF2308_20231019_02_CTD07_Spec007W	NA		x		

CTD Dive	Sample ID	Depth (m)	eDNA	Nutrient Analysis	POM	Lab Blank - eDNA
CTD-07	NF2308_20231019_02_CTD07_Spec008W	NA		x		
CTD-07	NF2308_20231019_02_CTD07_Spec009W	NA	x	x		
CTD-07	NF2308_20231019_02_CTD07_Spec010W	NA	x			
CTD-07	NF2308_20231019_02_CTD07_Spec011W	NA	x	x	x	
CTD-07	NF2308_20231019_02_CTD07_Spec012W	NA	x	x	x	
CTD-07	NF2308_20231019_02_CTD07_Spec013W	NA				x
CTD-08	NF2308_20231020_01_CTD08_Spec001W	NA	x	x	x	
CTD-08	NF2308_20231020_01_CTD08_Spec002W	NA	x		x	
CTD-08	NF2308_20231020_01_CTD08_Spec003W	NA	x	x		
CTD-08	NF2308_20231020_01_CTD08_Spec004W	NA	x			
CTD-08	NF2308_20231020_01_CTD08_Spec005W	NA		x		
CTD-08	NF2308_20231020_01_CTD08_Spec006W	NA		x		
CTD-08	NF2308_20231020_01_CTD08_Spec007W	NA		x		
CTD-08	NF2308_20231020_01_CTD08_Spec008W	NA		x		
CTD-08	NF2308_20231020_01_CTD08_Spec009W	NA	x	x		
CTD-08	NF2308_20231020_01_CTD08_Spec010W	NA	x			
CTD-08	NF2308_20231020_01_CTD08_Spec011W	NA	x	x	x	
CTD-08	NF2308_20231020_01_CTD08_Spec012W	NA	x		x	
CTD-08	NF2308_20231020_01_CTD08_Spec013W	NA				x
CTD-09	NF2308_20231020_02_CTD09_Spec001W	NA	x	x	x	
CTD-09	NF2308_20231020_02_CTD09_Spec002W	NA	x	x	x	
CTD-09	NF2308_20231020_02_CTD09_Spec003W	NA		x		
CTD-09	NF2308_20231020_02_CTD09_Spec004W	NA		x		
CTD-09	NF2308_20231020_02_CTD09_Spec005W	NA	x	x		
CTD-09	NF2308_20231020_02_CTD09_Spec006W	NA	x			
CTD-09	NF2308_20231020_02_CTD09_Spec007W	NA		x		
CTD-09	NF2308_20231020_02_CTD09_Spec008W	NA		x		
CTD-09	NF2308_20231020_02_CTD09_Spec009W	NA		x		
CTD-09	NF2308_20231020_02_CTD09_Spec010W	NA	x	x		
CTD-09	NF2308_20231020_02_CTD09_Spec011W	NA	x	x	x	
CTD-09	NF2308_20231020_02_CTD09_Spec012W	NA	x	x	x	
CTD-09	NF2308_20231020_02_CTD09_Spec013W	NA				x

Data Accessibility

The MDBC portfolio has a data sharing plan for internal (project team members including those belonging to non-NOAA organizations) and external (public) stakeholders. Below is a list of data (and data products) collected on the four legs of the *Nancy Foster* 2023 MDBC mission and how they will be shared.

1. Seafloor Mapping Data. The seafloor mapping data collected during the mission included:
    a. Ship's MBES – All four legs
    b. MBES payload on AUV *Sentry* – legs 3 and 4
    c. SSS payload on AUV *Sentry* – legs 3 and 4
    d. Images from the downward-facing camera on AUV *Sentry* – leg 4

The raw data from MBES (1a through 1c) will be used by the data analysts to create bathymetry and backscatter surfaces. These surfaces will be available to the internal stakeholders via NOAA's GeoPlatform. The raw data along with the surfaces will be archived with the National Centers for Environmental Information (NCEI) and will be available to the public from NCEI's portal.
The images (1d) will be color corrected and georeferenced by data analysts and ingested into Tator (image and video management system by C-Vision, Inc.) where they will be annotated. Internal stakeholders will have access to the images in Tator. The images along with the annotations will be archived with NCEI and made available to the public.

2. Data collected using the ROV *Global Explorer*. The ROV was on board for only legs 2 and 3. Data collected during the mission included:
    a. Videos – legs 2 and 3
    b. Images – leg 2 and 3
    c. Biological samples – leg 2
    d. Ancillary data (ROV navigation and environmental data) – legs 2 and 3

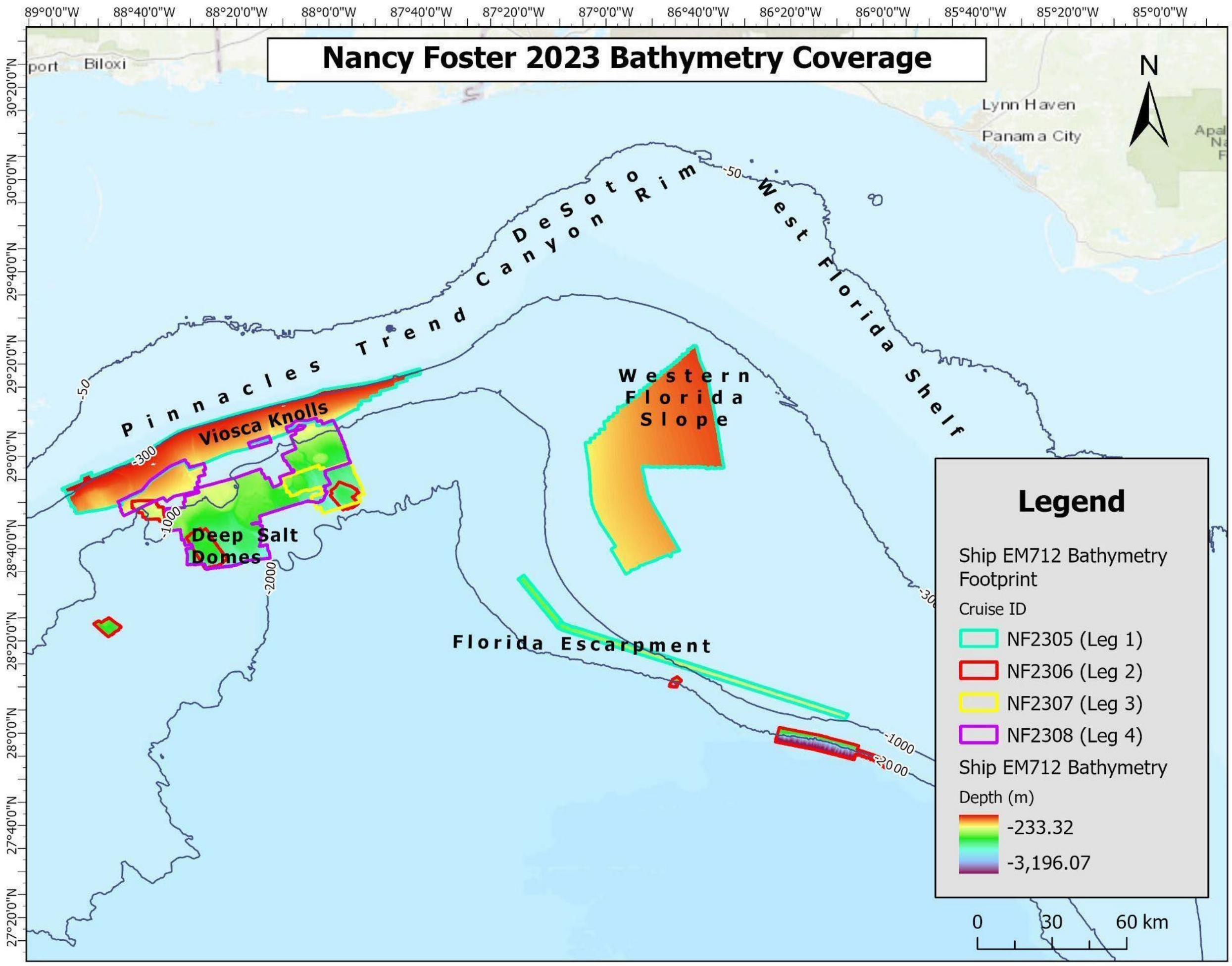
The videos and images will be ingested into Tator where the internal stakeholders will have access to them. Once the annotations are complete, the media along with annotations will be exported and archived with NCEI and made available to the public. The biological sample metadata will be ingested into the project database maintained by NCCOS and also made available to the internal stakeholders via Google Drive. The biological samples are collected by both NOAA and non-NOAA partners. Once they have been analyzed, the results will be archived by the collectors with an archiving authority for public availability. The collector will also be responsible for the appropriate disposition of samples. The ROV navigation data will be smoothed, quality assured, and used to create ROV tracklines, which will be available to the internal stakeholders via the NOAA GeoPlatform. In addition, the navigation data will also be ingested into Tator and will subsequently be archived with the NCEI. The environmental data (conductivity, temperature, etc.) will also be ingested into Tator and subsequently archived with the NCEI. The NCEI will create a DOI, a unique and persistent identifier for the mission, and links to all archives will be associated with it.

3. Data collected using ship CTD Rosette. The ship CTD rosette was used to collect water samples as well as the CTD profiles on legs 2 and 4. Like biological samples, water sample metadata will be ingested into the project database maintained by NCCOS and also made available to the internal stakeholders via Google Drive. The water samples were collected by USGS, and once they have been analyzed, USGS team members will archive the data and data products with an archiving authority for public availability. The final disposition of the water samples will be decided by the MDBC technical team. The CTD profile will be available for the internal stakeholders on Google Drive. The raw and processed ship CTD files will be archived with NCEI and made available to the public. Links to archives will be accessible under the aforementioned DOI created by the NCEI.

Information to access data and other products from this expedition can also be found on the Data Integration Visualization Exploration and Reporting (DIVER) web page: https://www.diver.orr.noaa.gov/web/guest/dwh-mdbc-portfolio

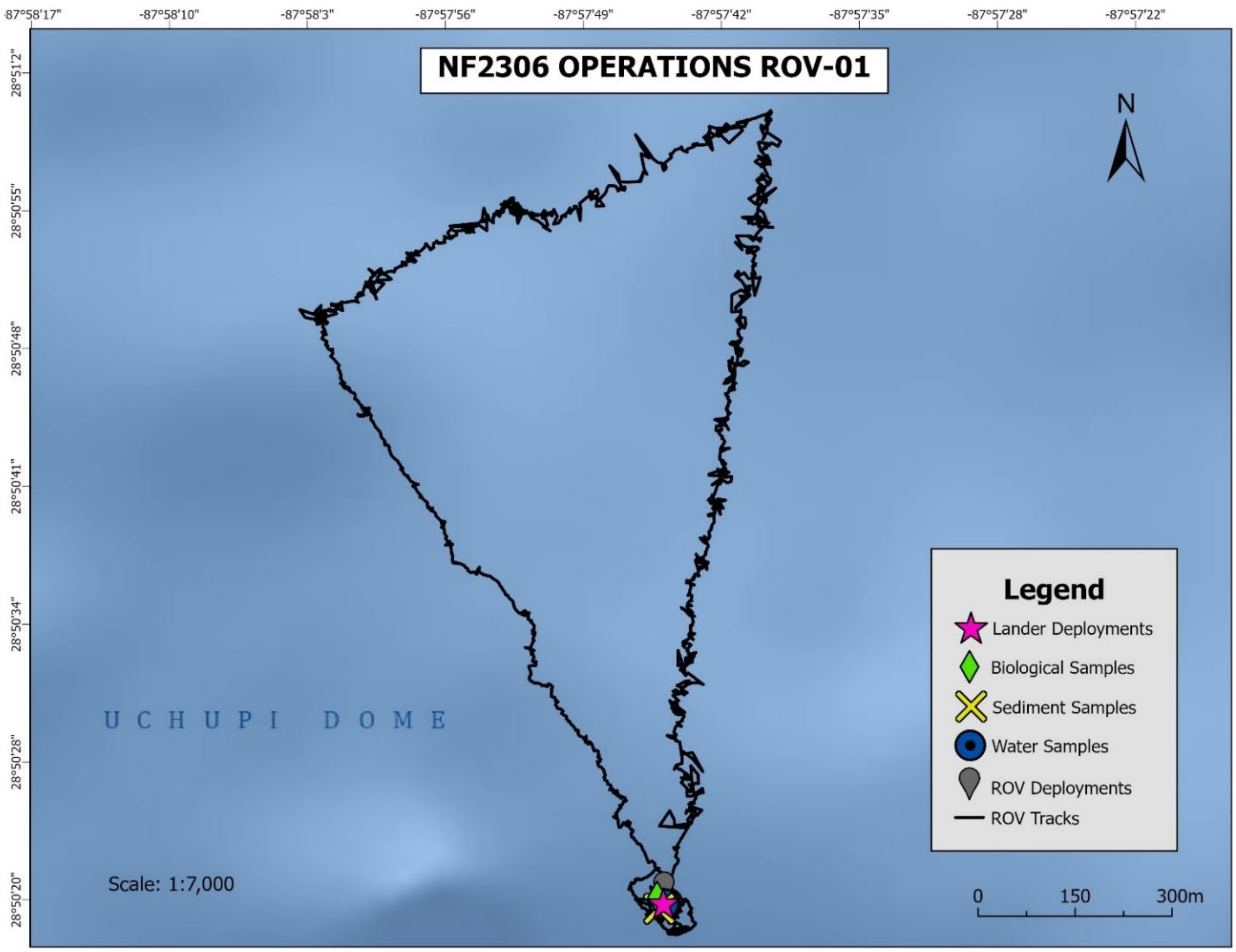
Appendix A. Dive Summaries

1. Overall Multibeam Coverage

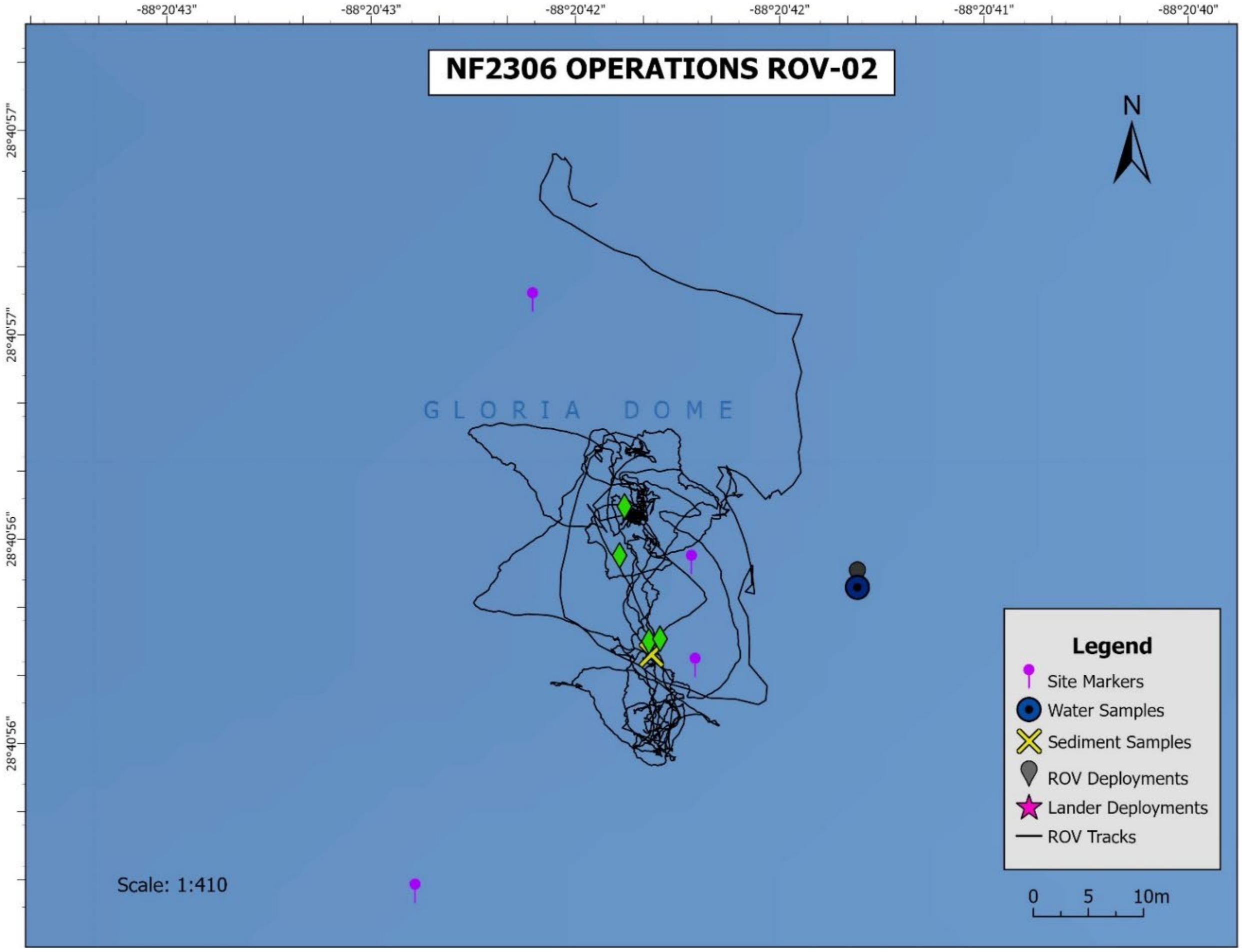


Appendix A Figure 1.1. Multibeam coverage for MDBC Expedition NOAA Ship *Nancy Foster* 2023.

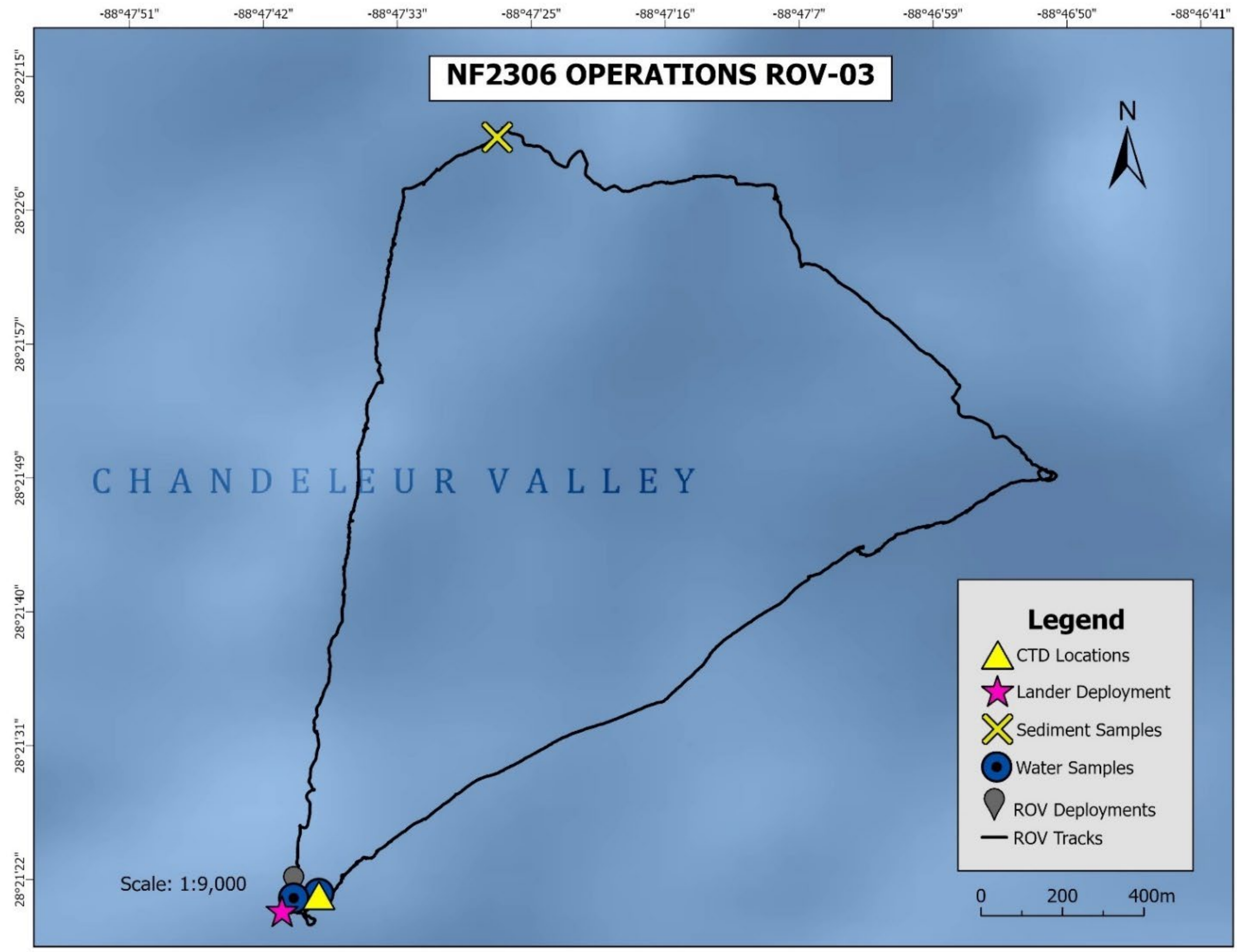
2. Leg 2 Dive Summaries



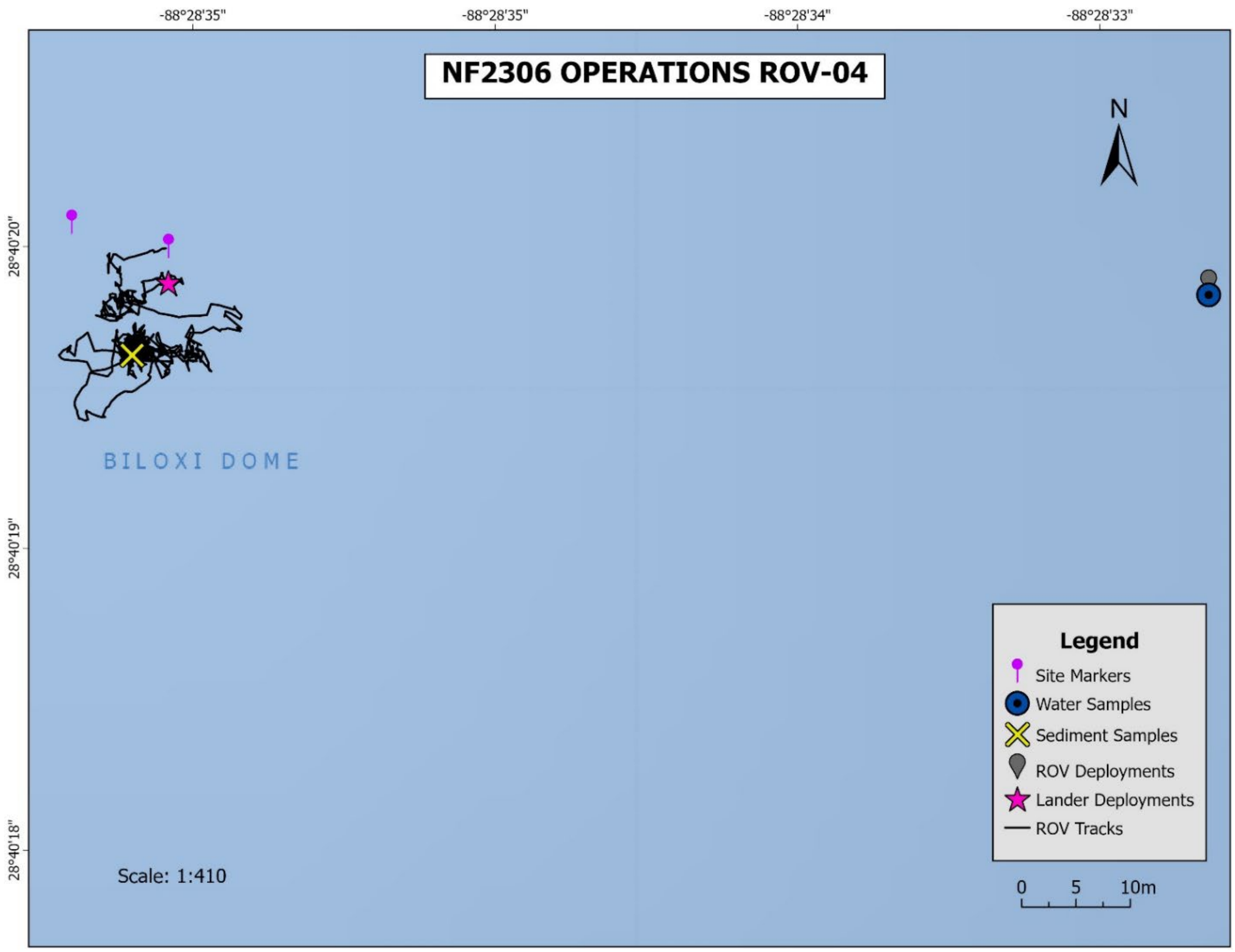
Appendix A Figure 2.1. Dive track for leg 2 ROV-01 conducted 09/07/2023 at Uchupi Dome.



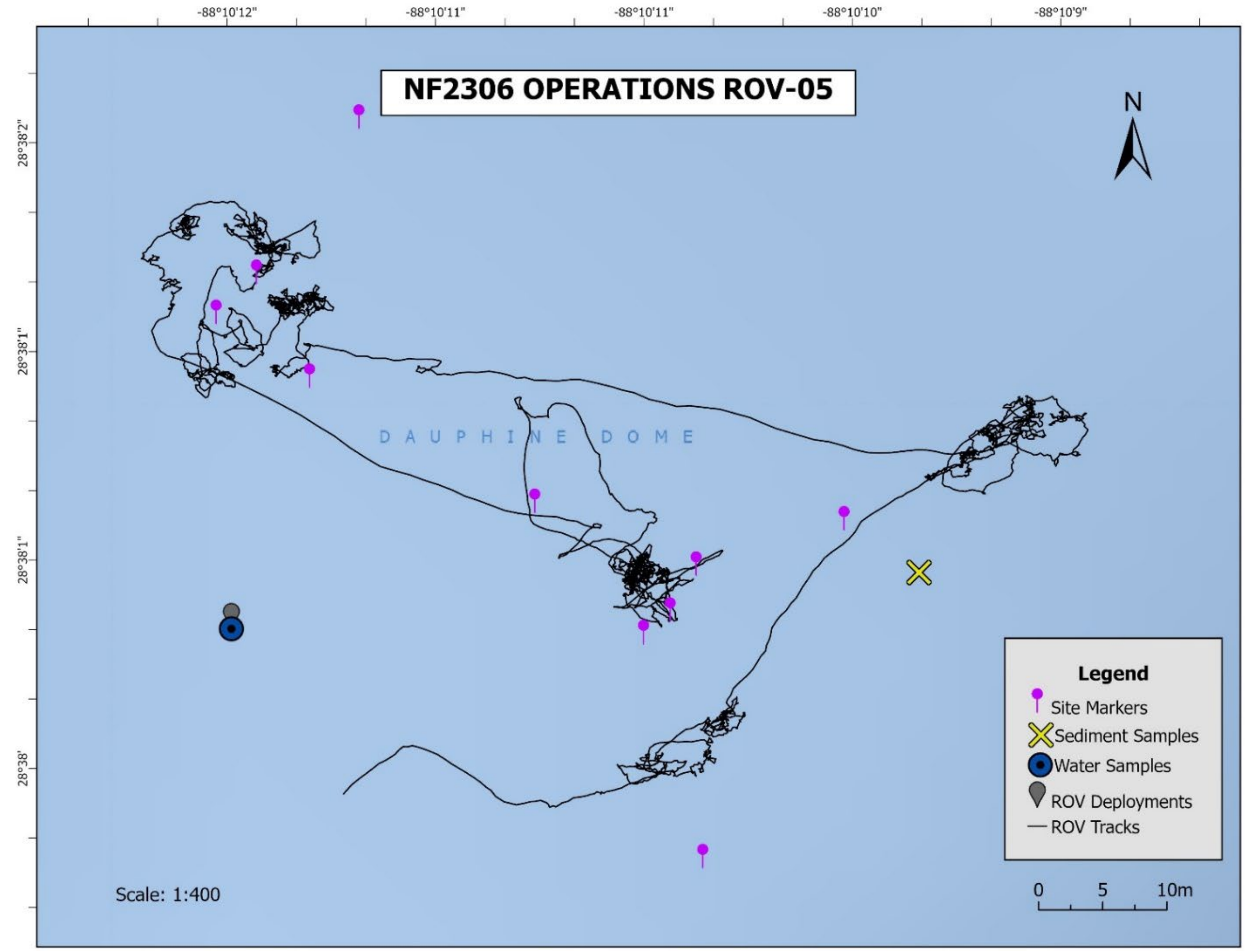
Appendix A Figure 2.2. Dive track for leg 2 ROV-02 conducted 09/07/2023 at Gloria Dome.



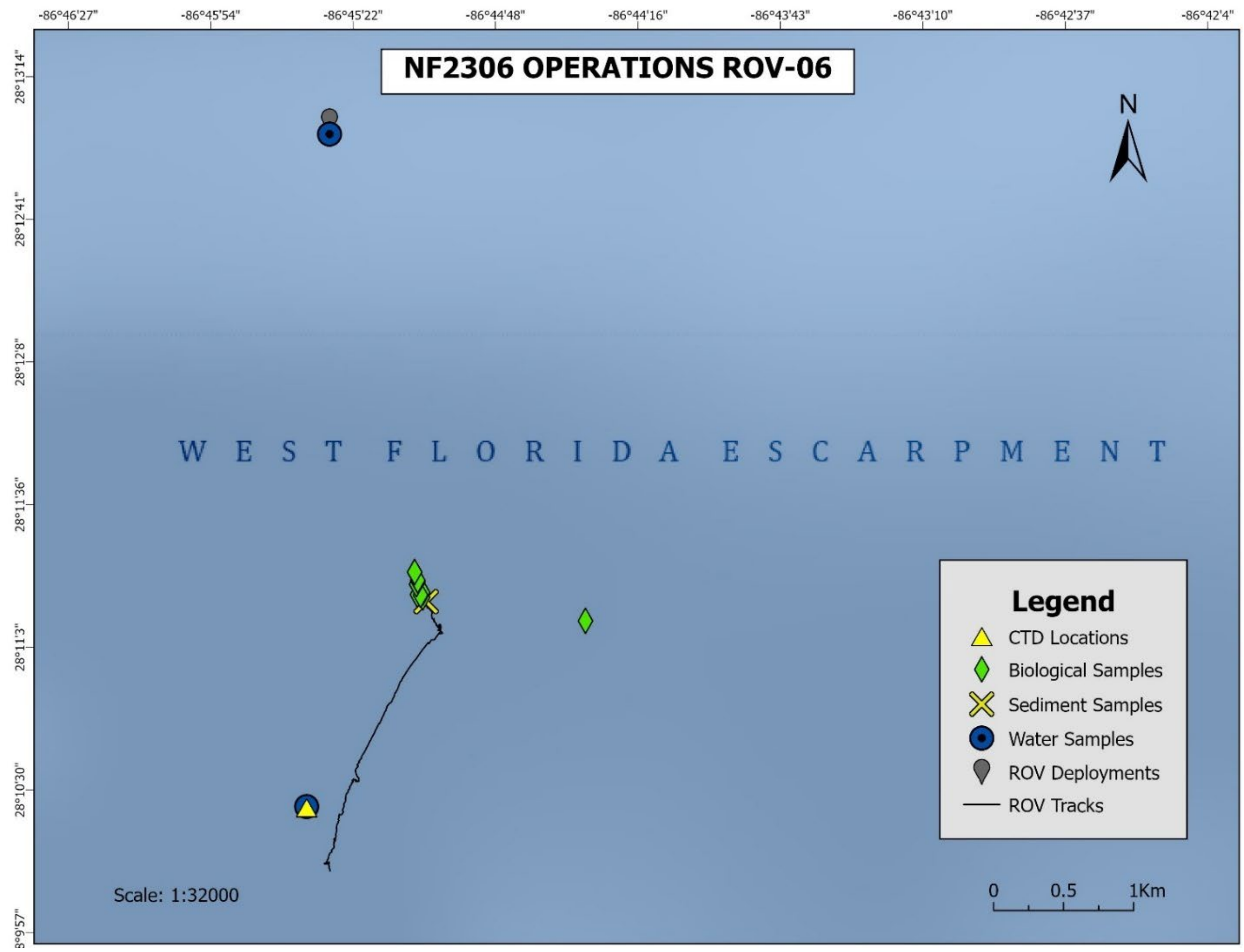
Appendix A Figure 2.3. Dive track for leg 2 ROV-03 conducted 09/08/2023 at Chandeleur Valley.



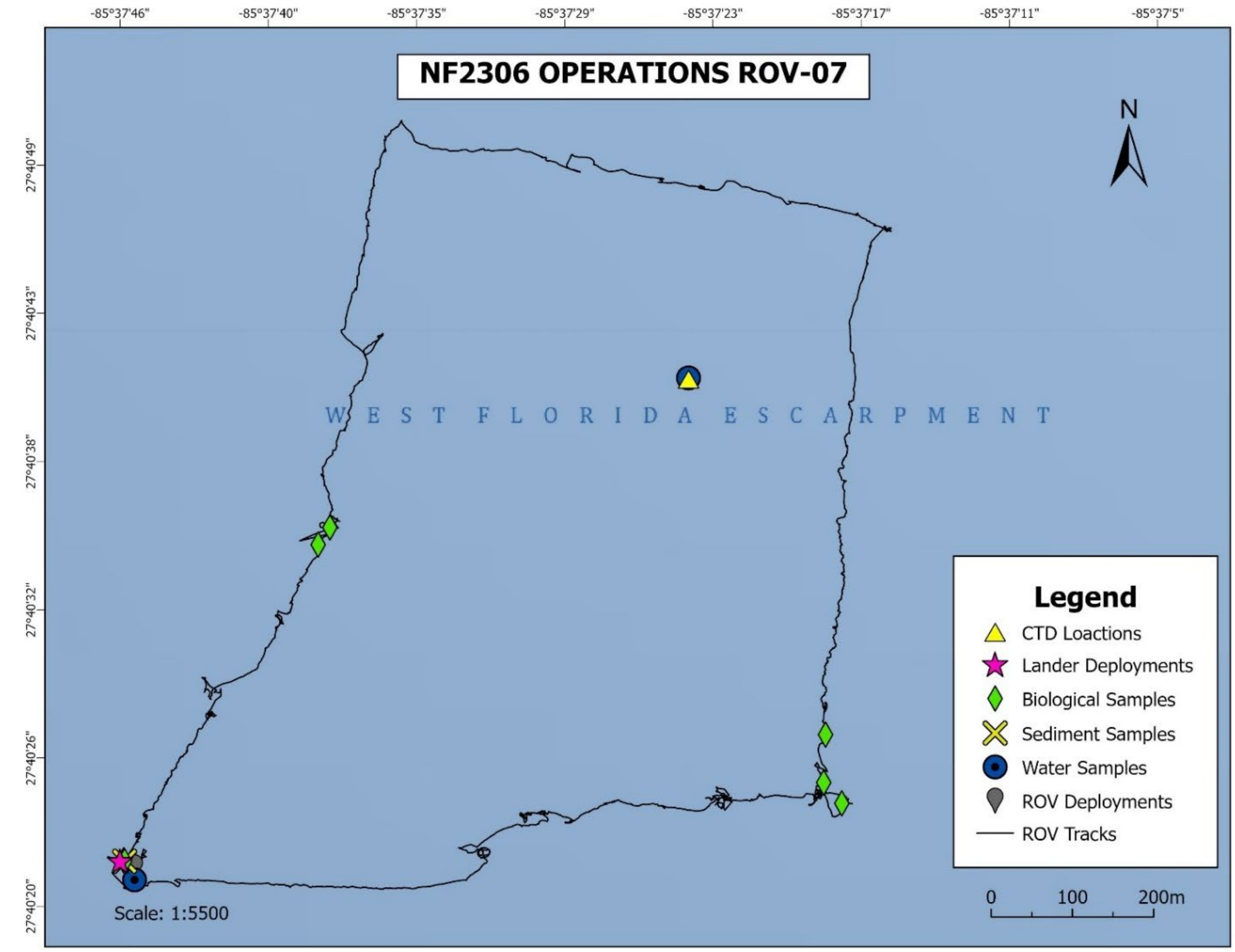
Appendix A Figure 2.4. Dive track for leg 2 ROV-04 conducted 09/08/2023 at Biloxi Dome.



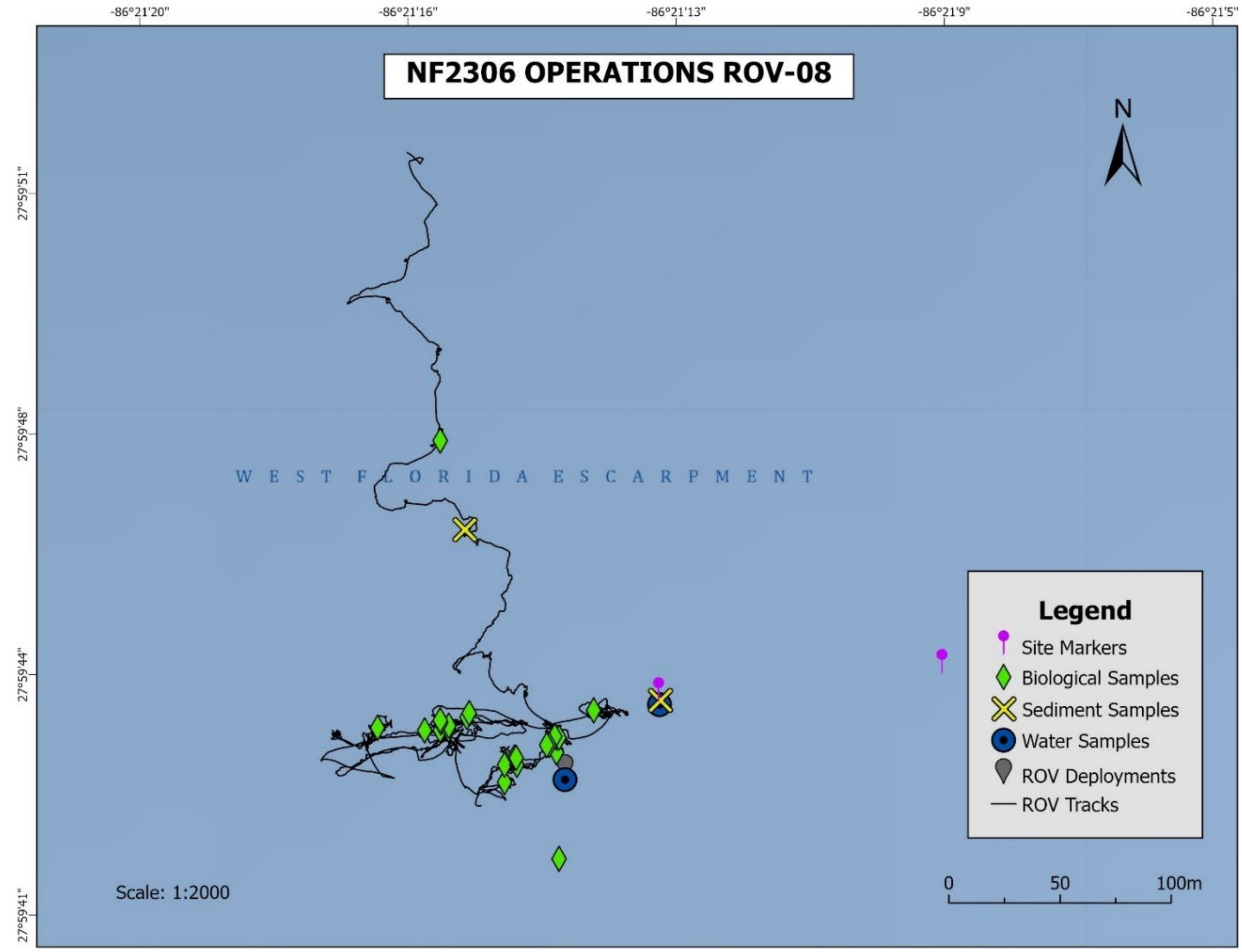
Appendix A Figure 2.5. Dive track for leg 2 ROV-05 conducted 09/09/2023 at Dauphin Dome.



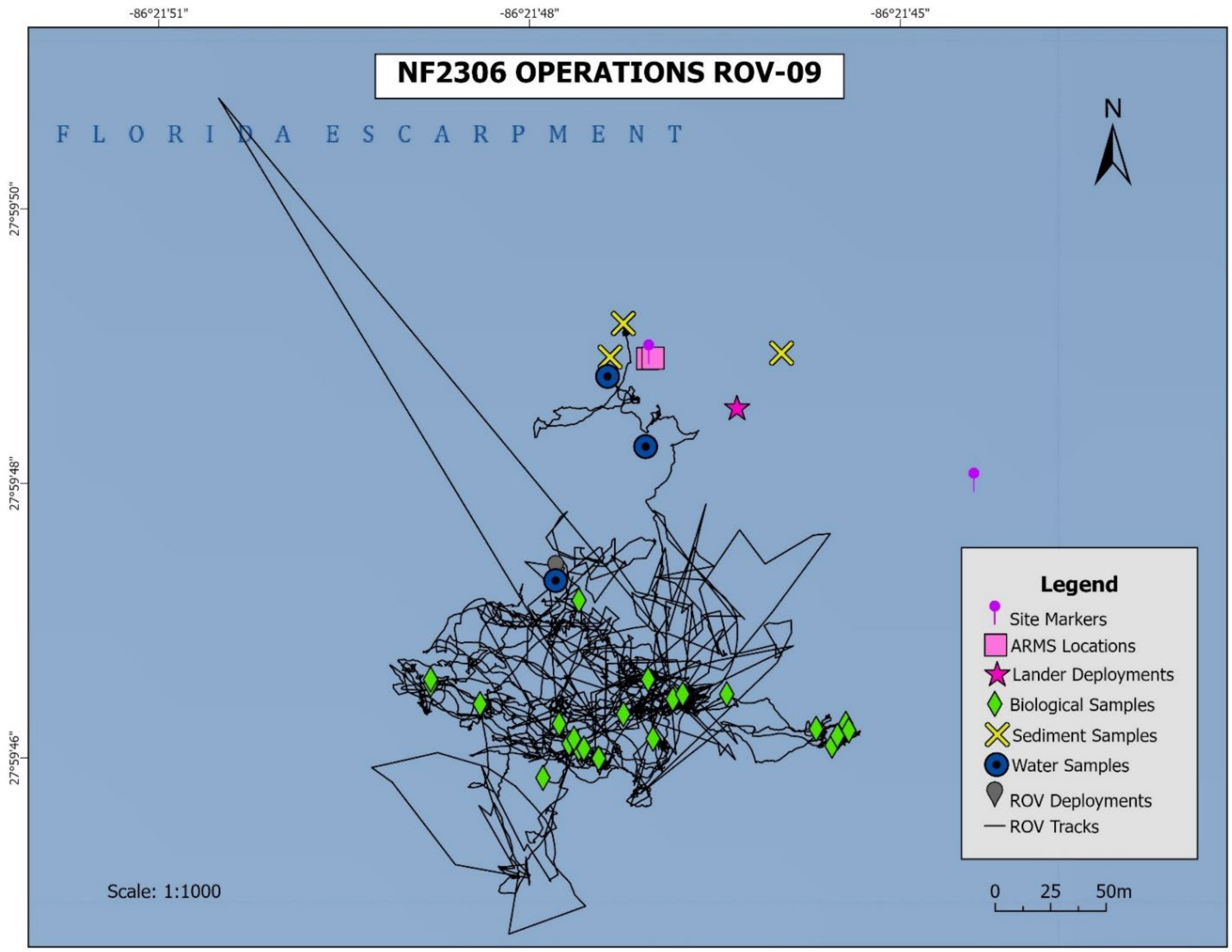
Appendix A Figure 2.6. Dive track for leg 2 ROV-06 conducted 09/10/2023 at West Florida Escarpment 1.



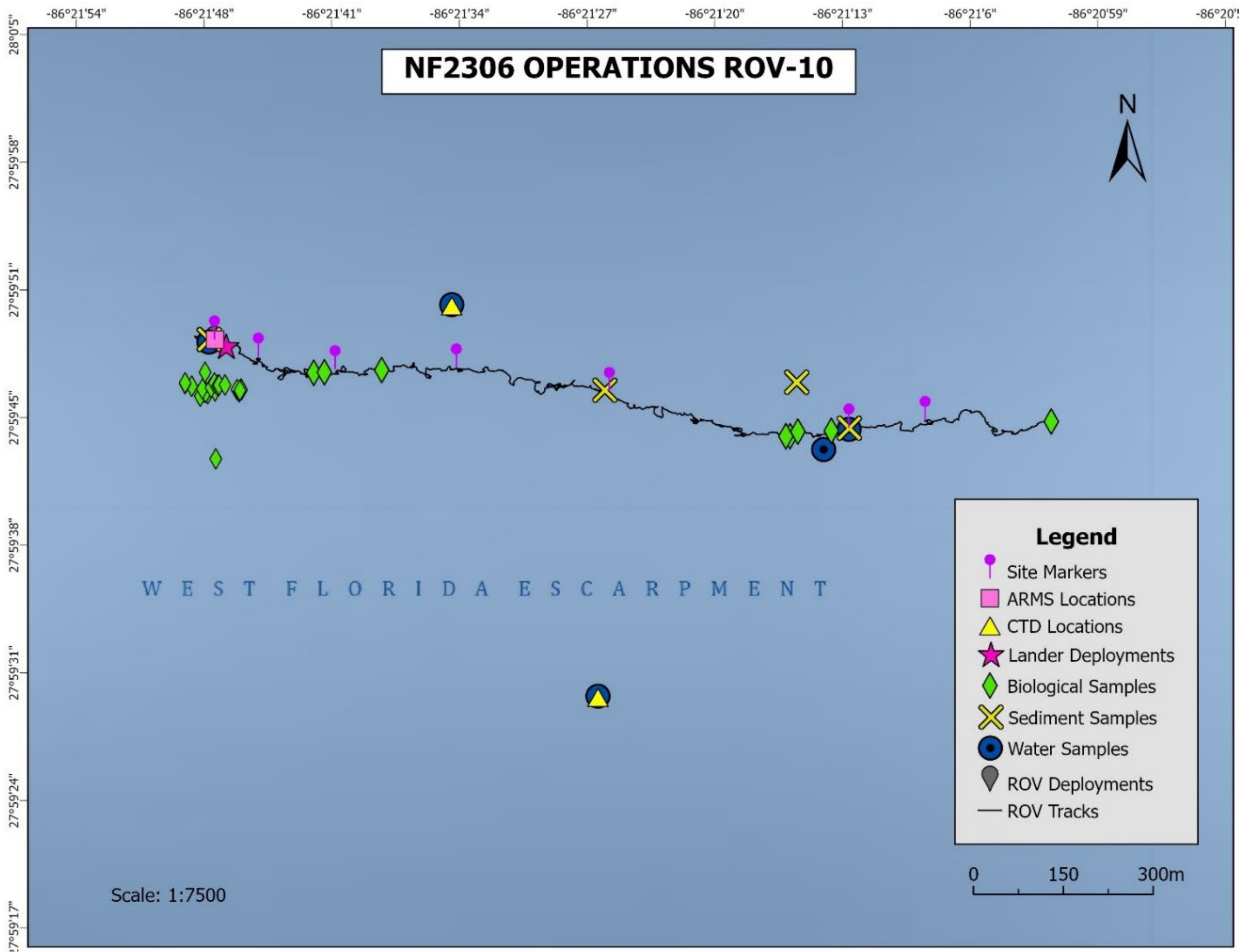
Appendix A Figure 2.7. Dive track for leg 2 ROV-07 conducted 09/11/2023 at West Florida Escarpment 2.



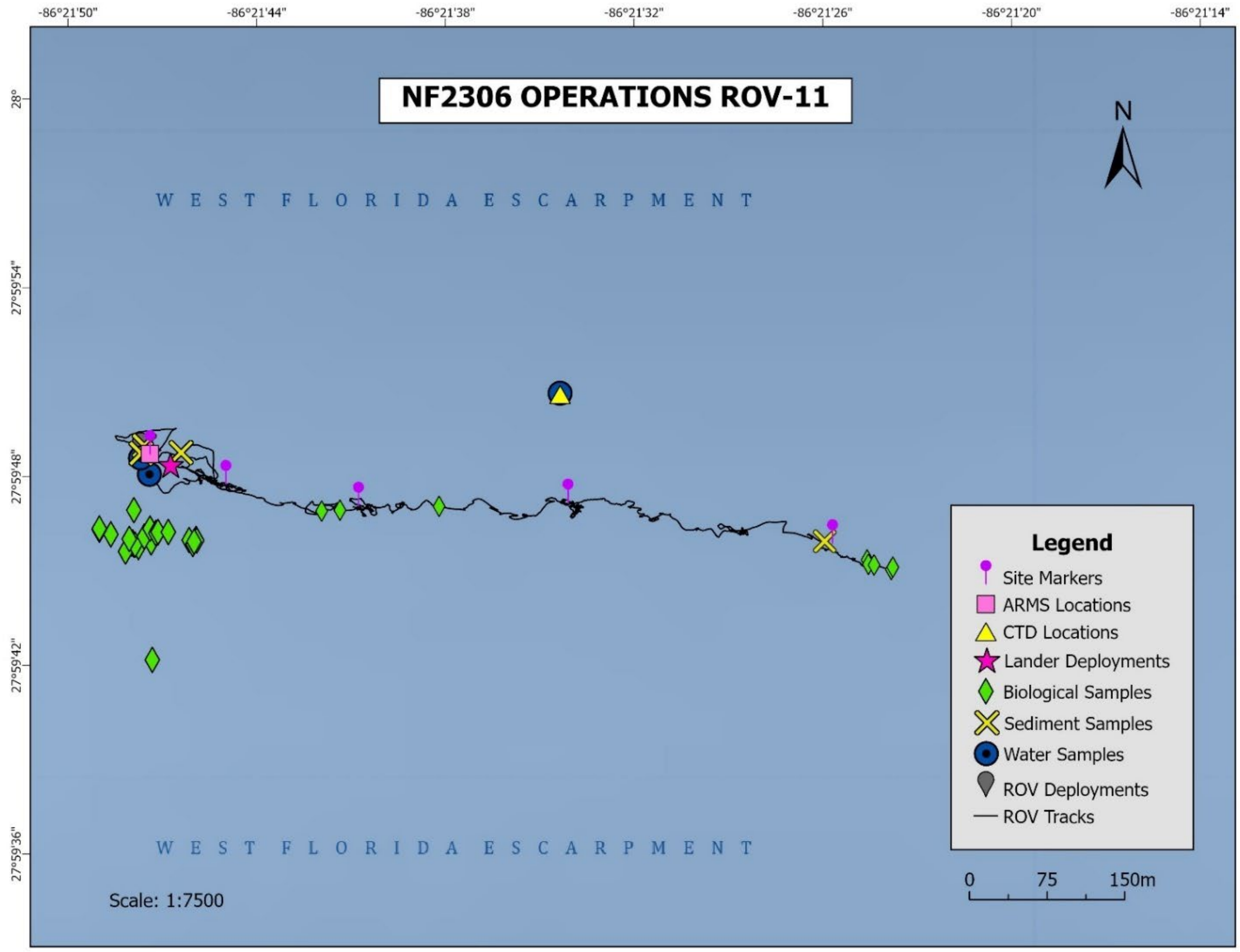
Appendix A Figure 2.8. Dive track for leg 2 ROV-08 conducted 09/12/2023 at West Florida Escarpment 3.



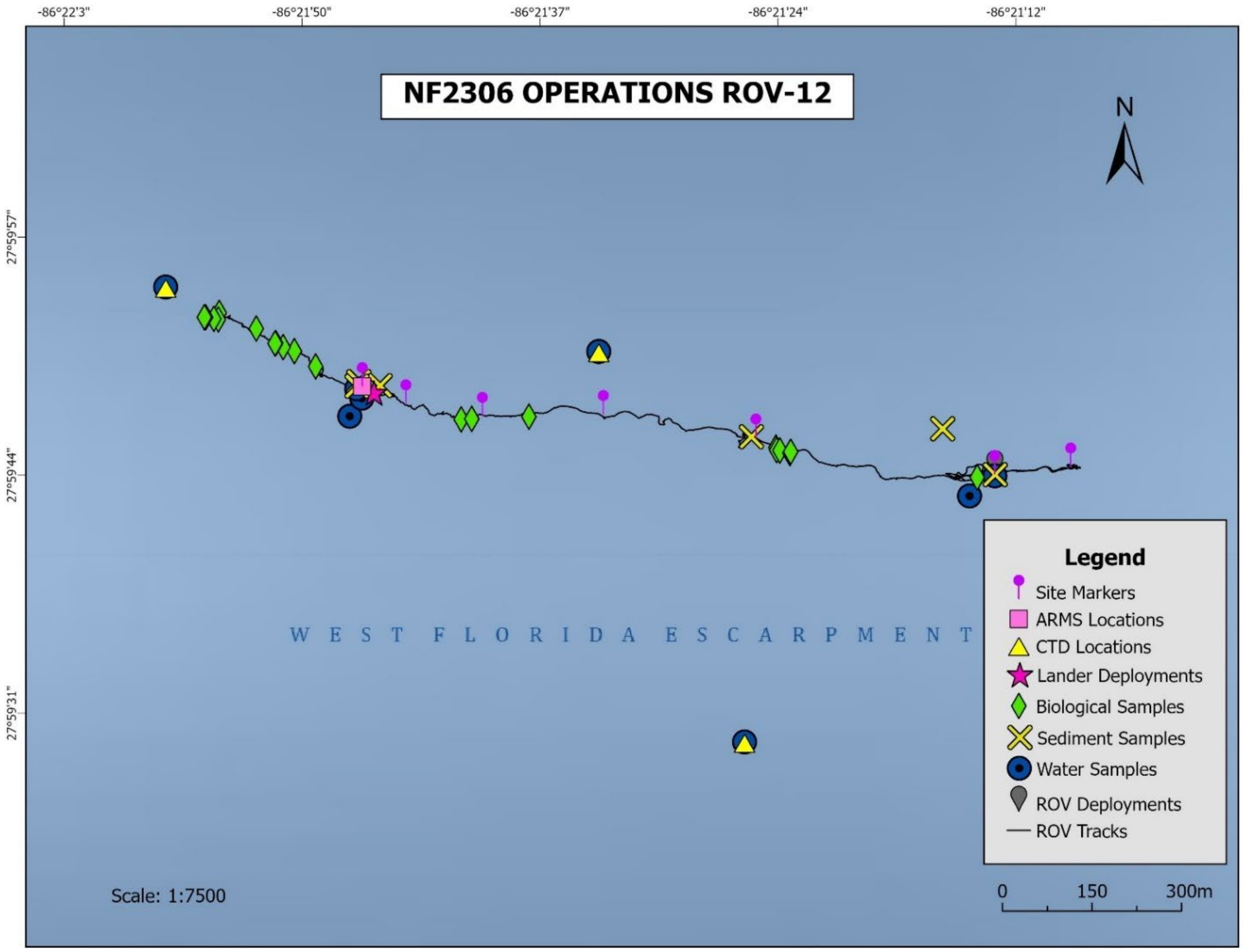
Appendix A Figure 2.9. Dive track for leg 2 ROV-09 conducted 09/13/2023 at West Florida Escarpment 3.



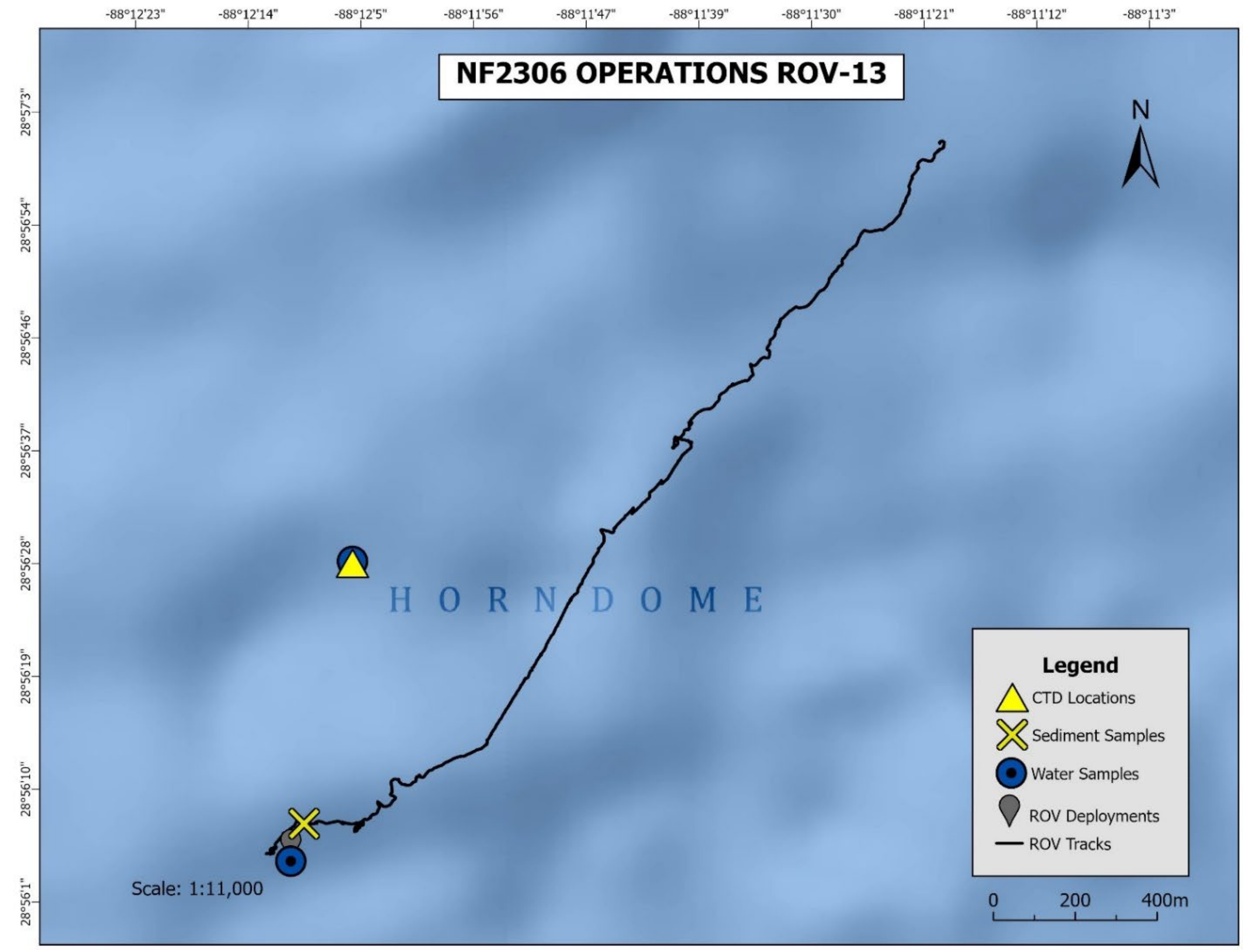
Appendix A Figure 2.10. Dive track for leg 2 ROV-10 conducted 09/14/2023 at West Florida Escarpment 3.



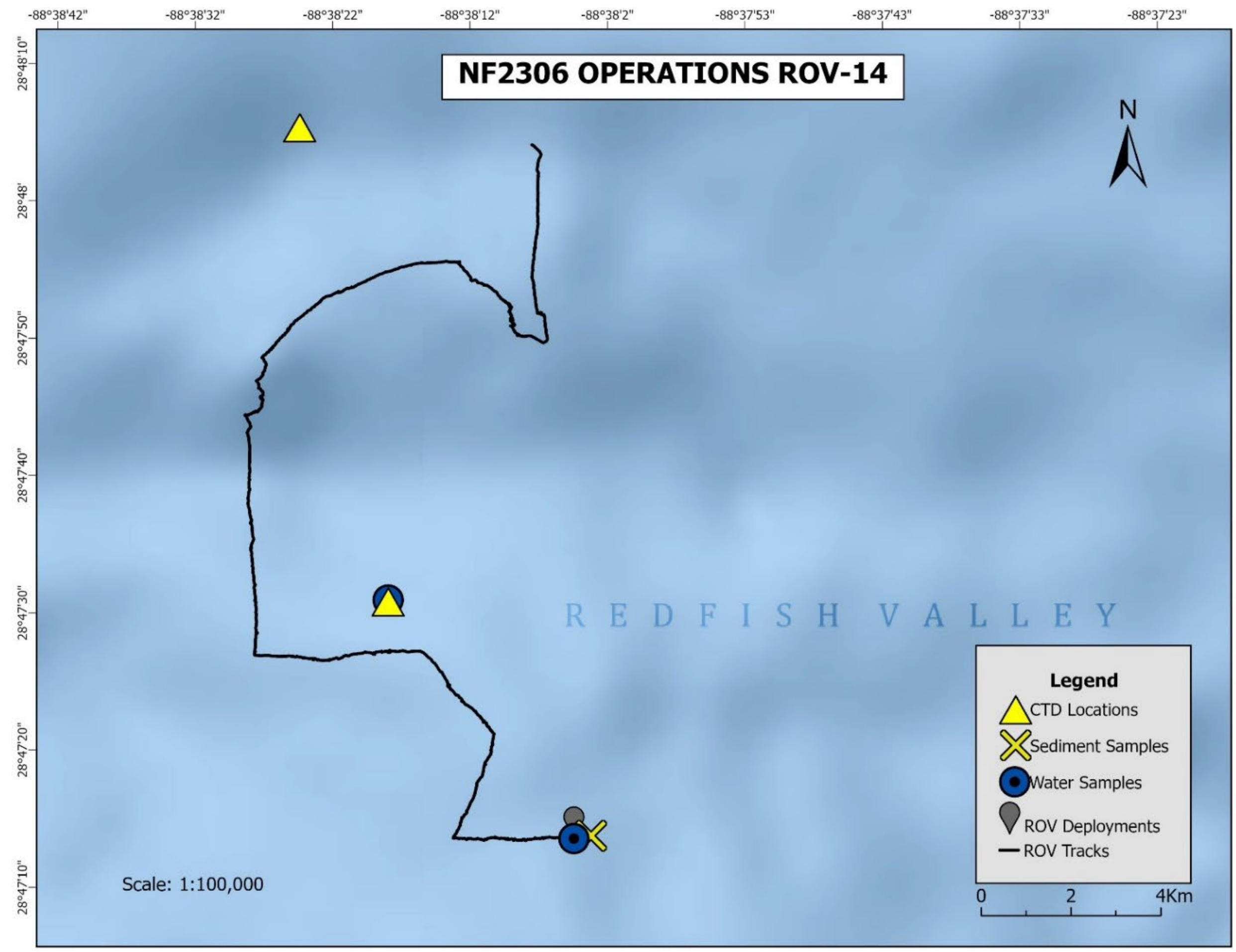
Appendix A Figure 2.11. Dive track for leg 2 ROV-11 conducted 09/15/2023 at West Florida Escarpment 3.



Appendix A Figure 2.12. Dive track for leg 2 ROV-12 conducted 09/16/2023 at West Florida Escarpment 3.

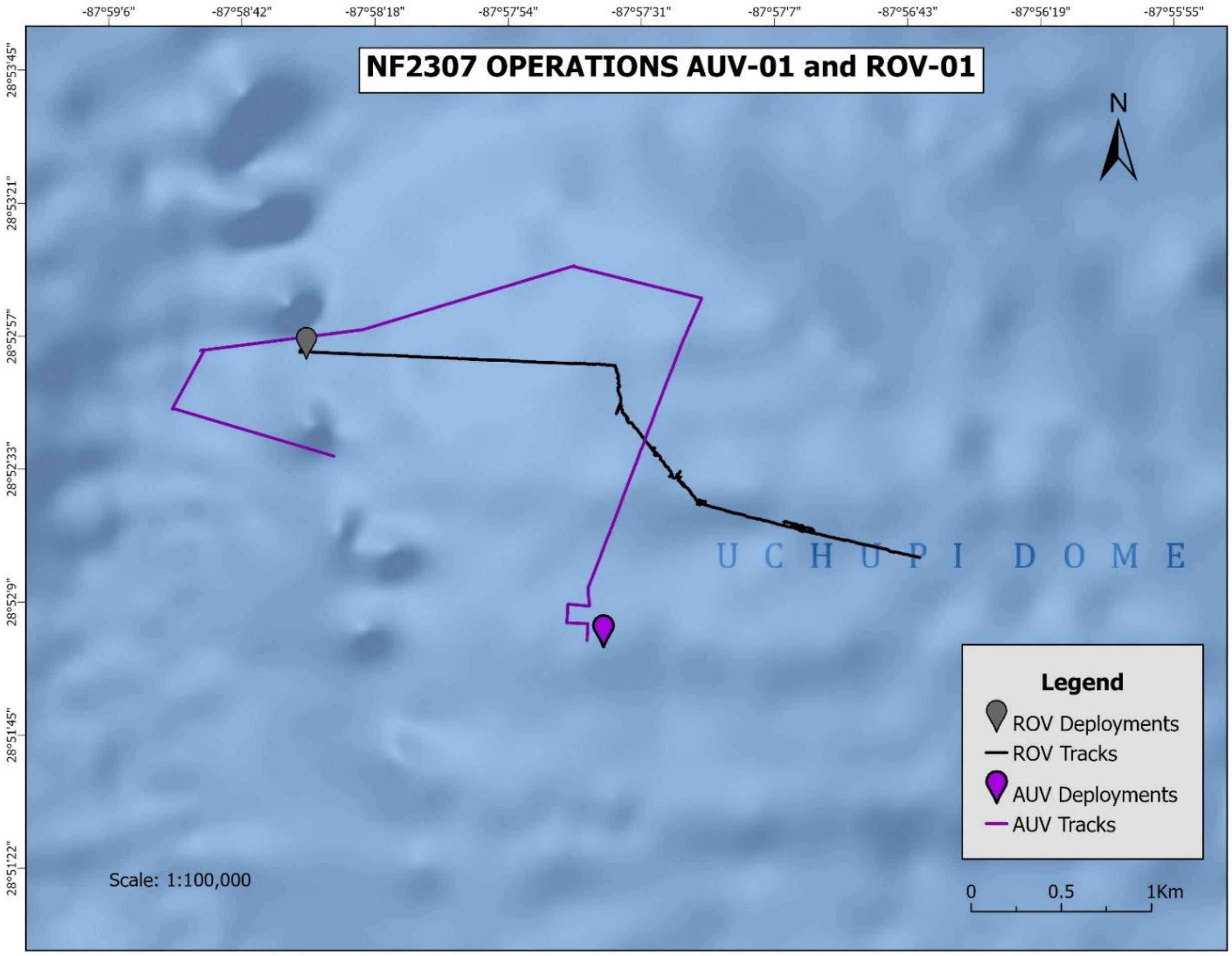


Appendix A Figure 2.13. Dive track for leg 2 ROV-13 conducted 09/17/2023 at Horn Dome.

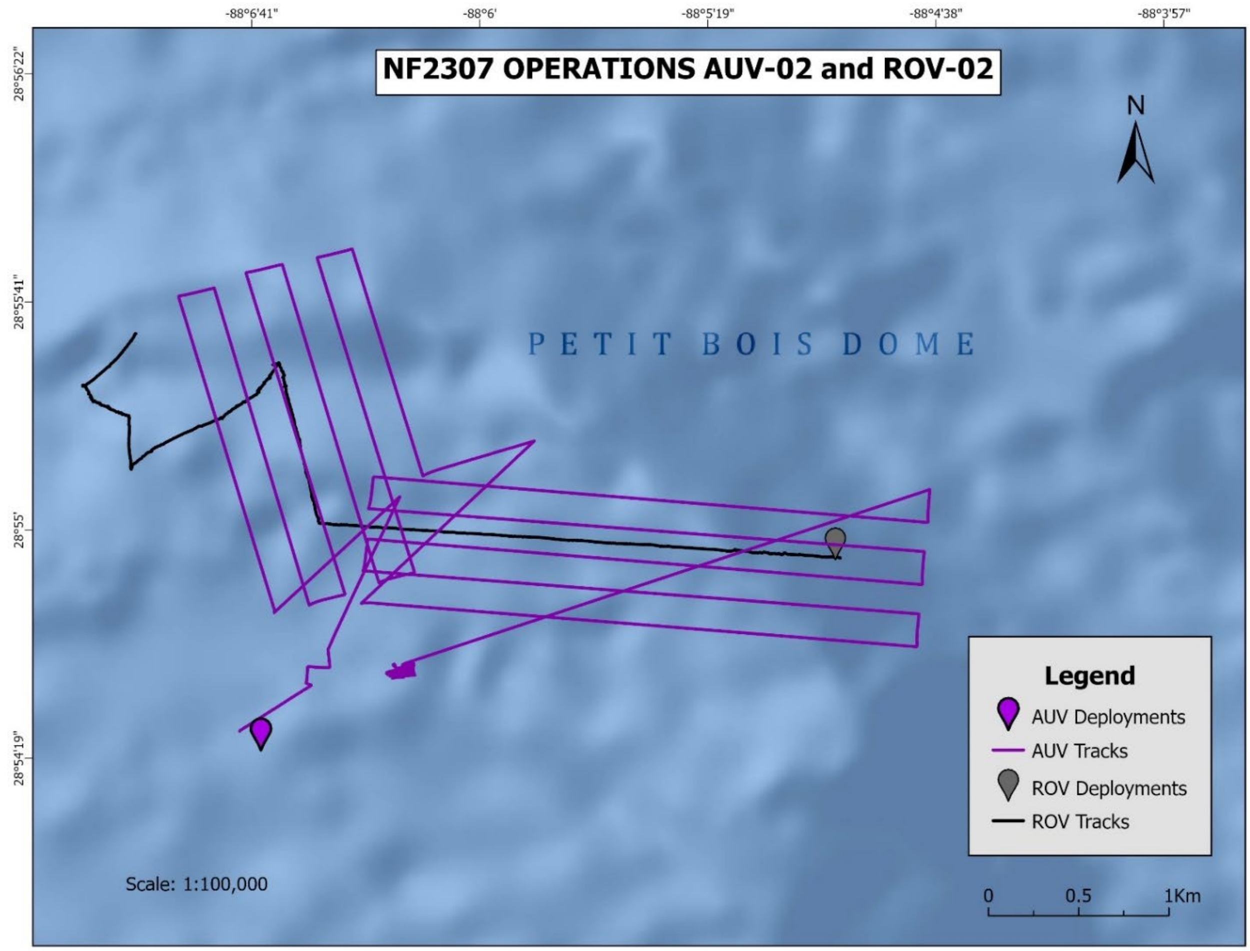


Appendix A Figure 2.14. Dive track for leg 2 ROV-14 conducted 09/18/2023 at Redfish Valley.

3. Leg 3 Dive Summaries

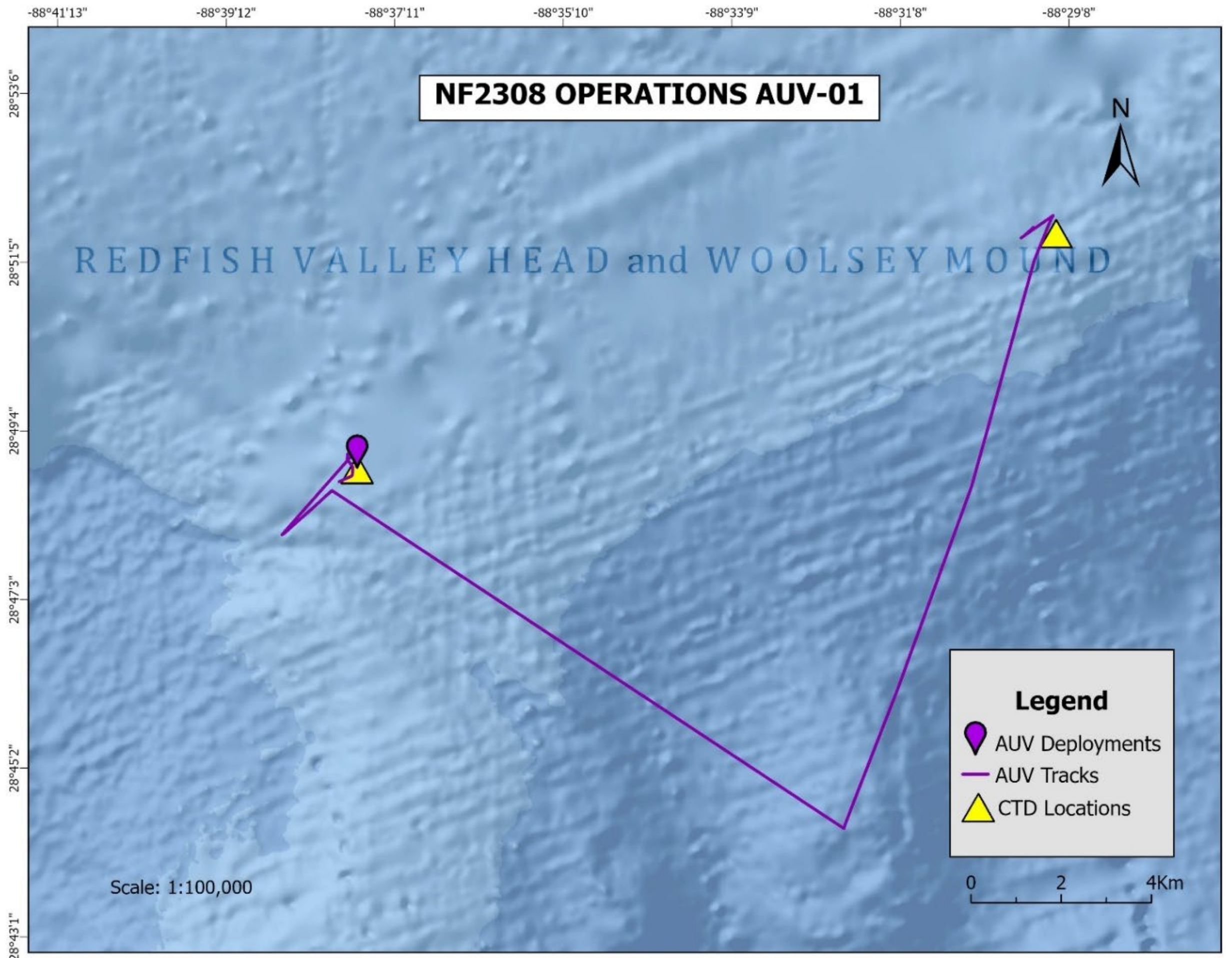


Appendix A Figure 3.1. Dive track for leg 3 AUV-01 and ROV-01 conducted 09/26/2023–09/27/2023 at Uchupi Dome.

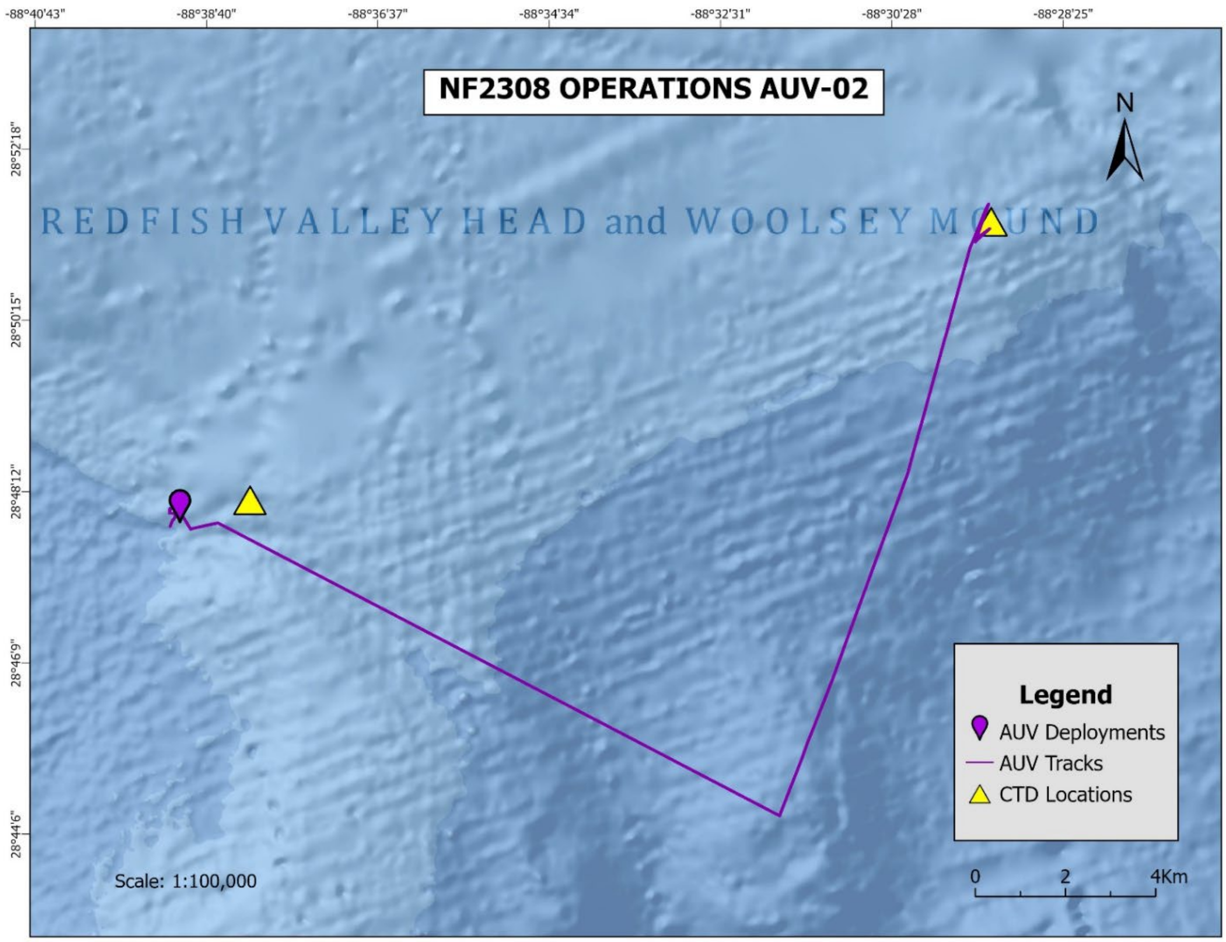


Appendix A Figure 3.2. Dive track for leg 3 AUV-02 and ROV-02 conducted 09/27/2023–09/28/2023 at Petit Bois Dome.

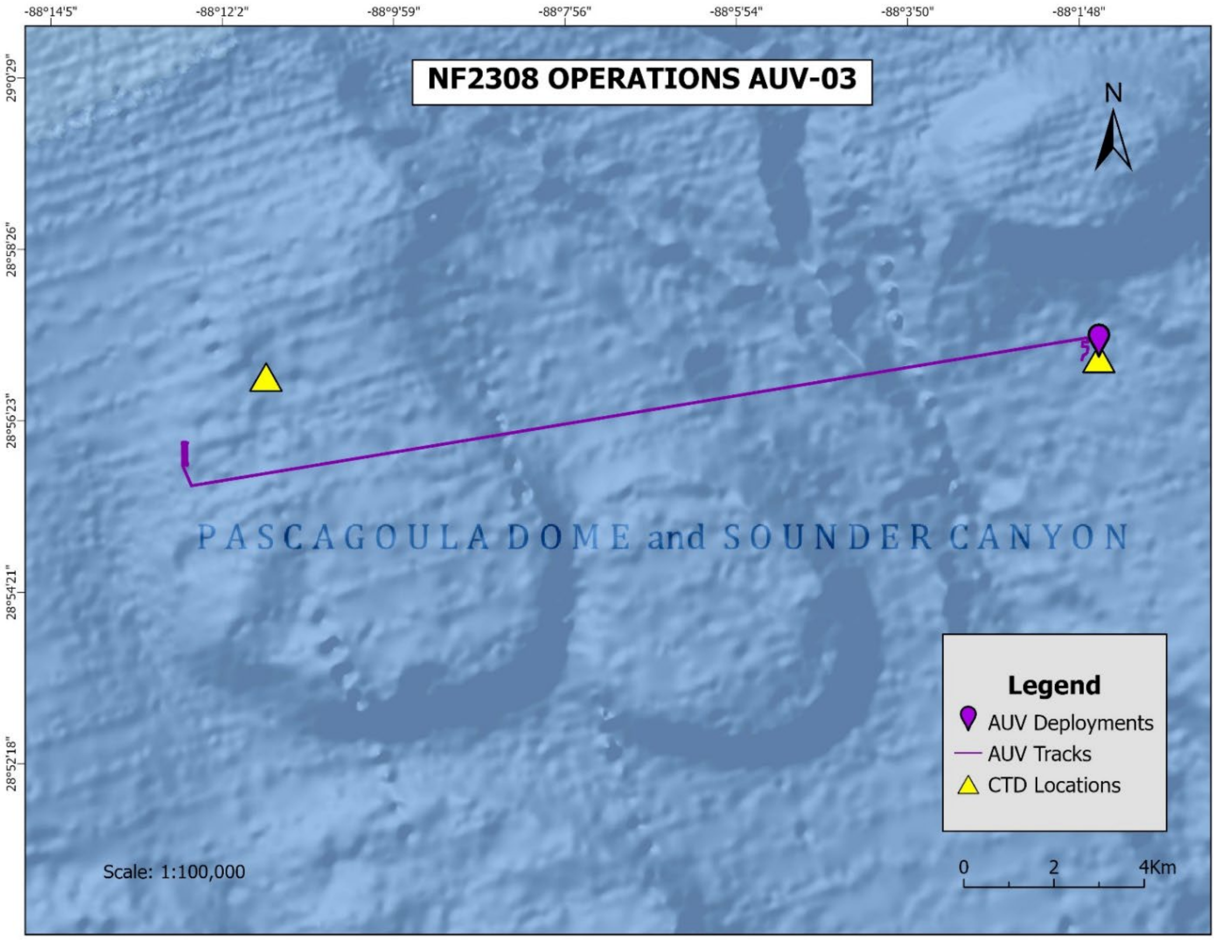
4. Leg 4 Dive Summaries



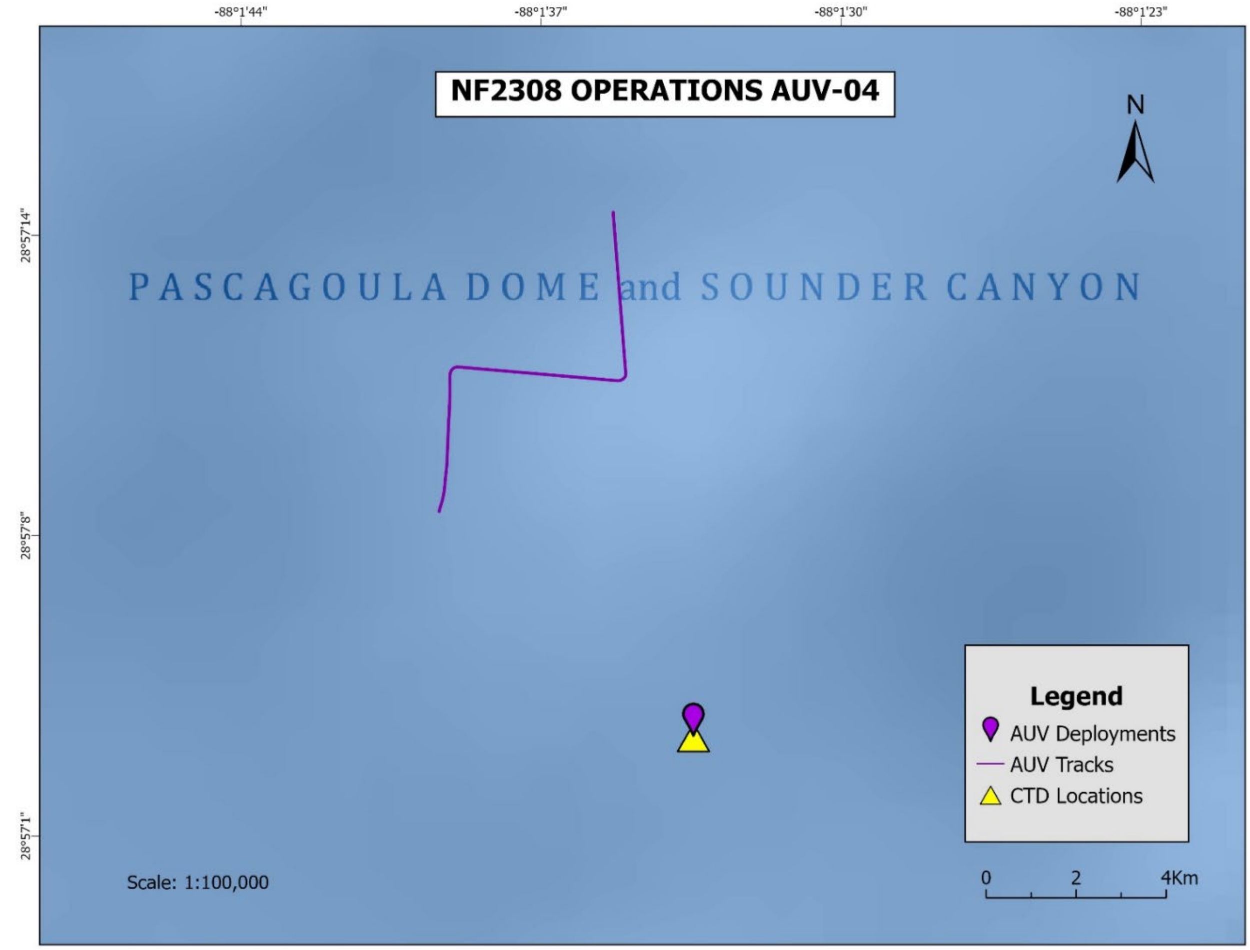
Appendix A Figure 4.1. Dive track for leg 4 AUV-01 conducted 10/09/2023 near Redfish Valley Head and Woolsey Mound.



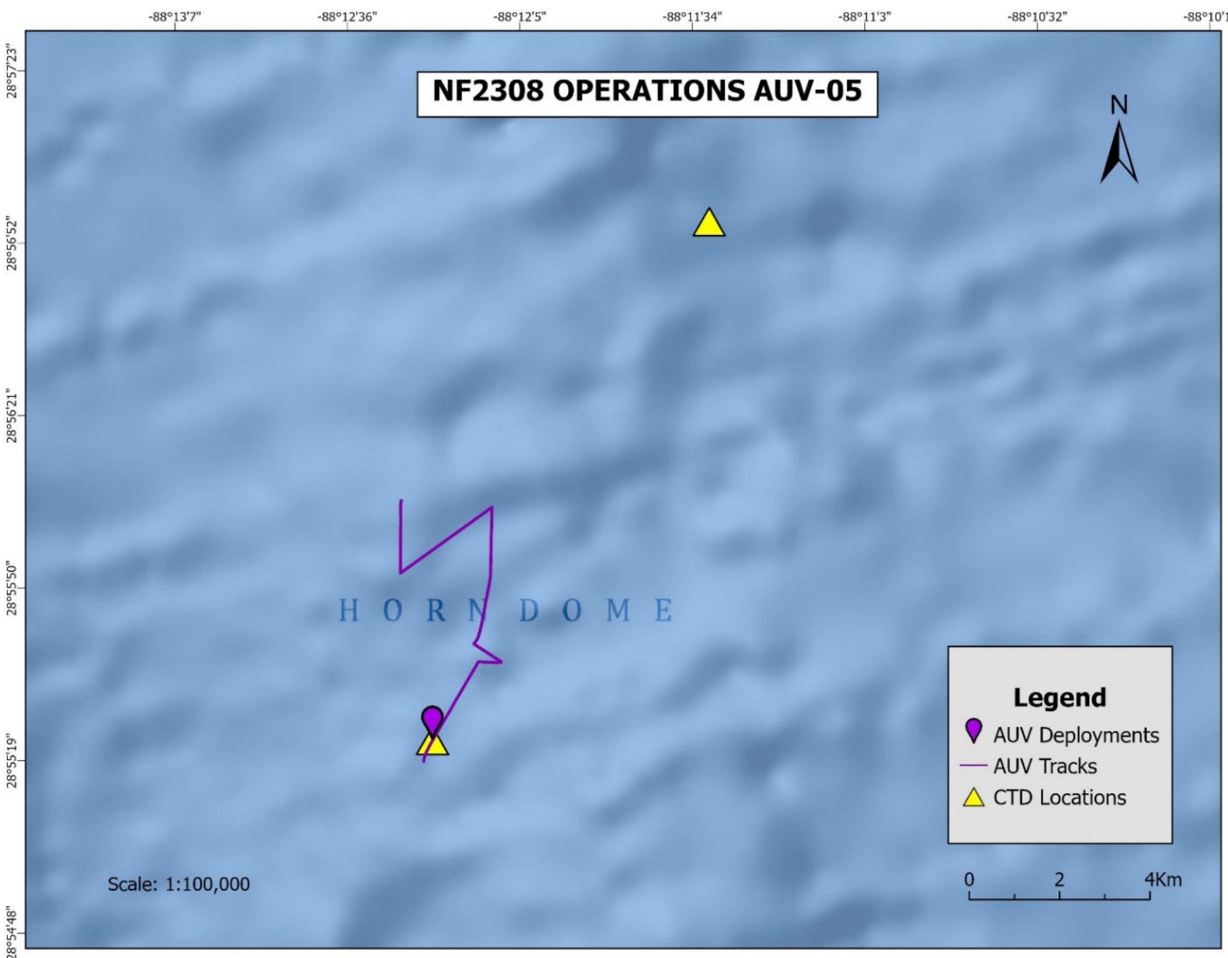
Appendix A Figure 4.2. Dive track for leg 4 AUV-02 conducted 10/10/2023 near Redfish Valley Head and Woolsey Mound.



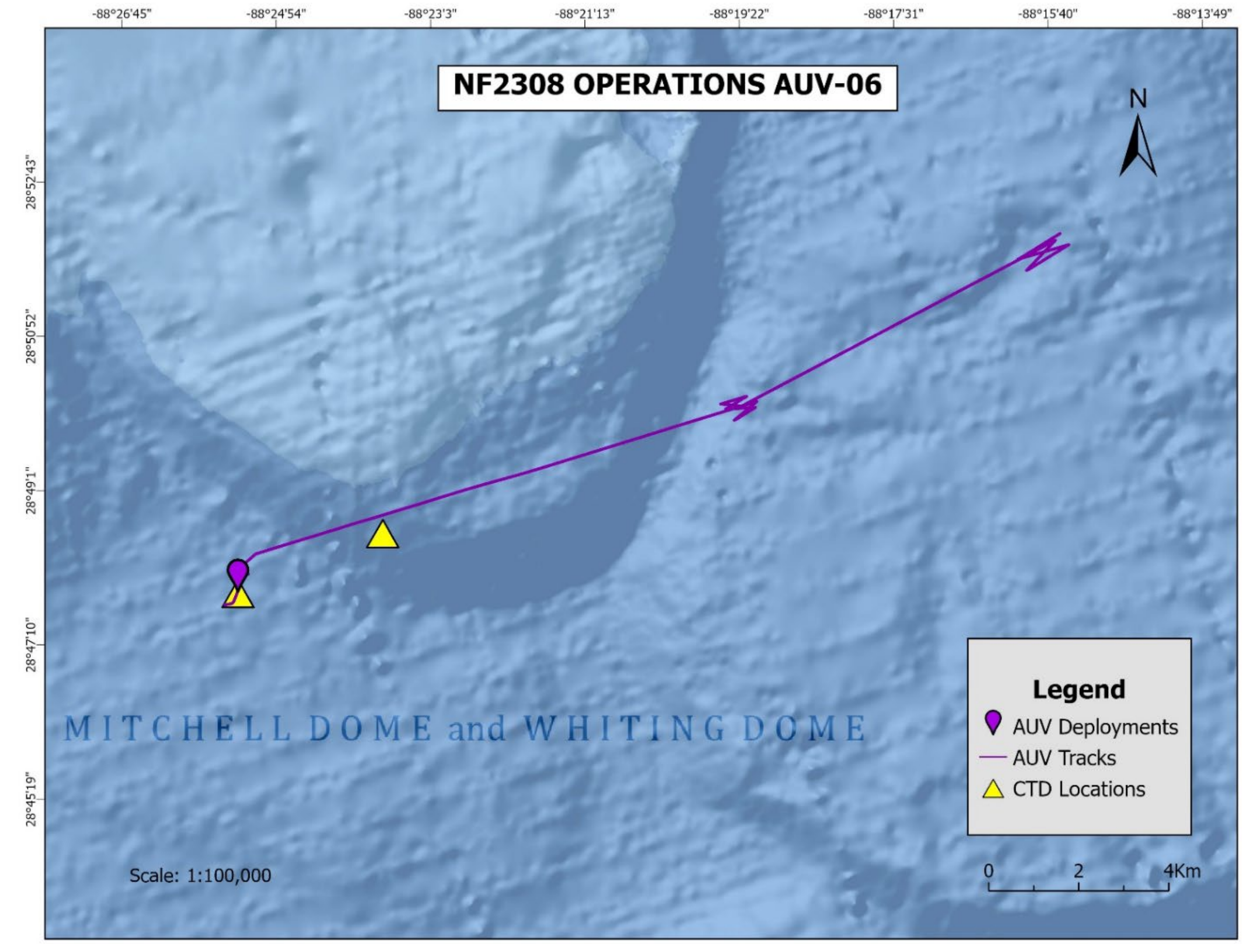
Appendix A Figure 4.3. Dive track for leg 4 AUV-03 conducted 10/13/2023 near Pascagoula Dome and Sounder Canyon.



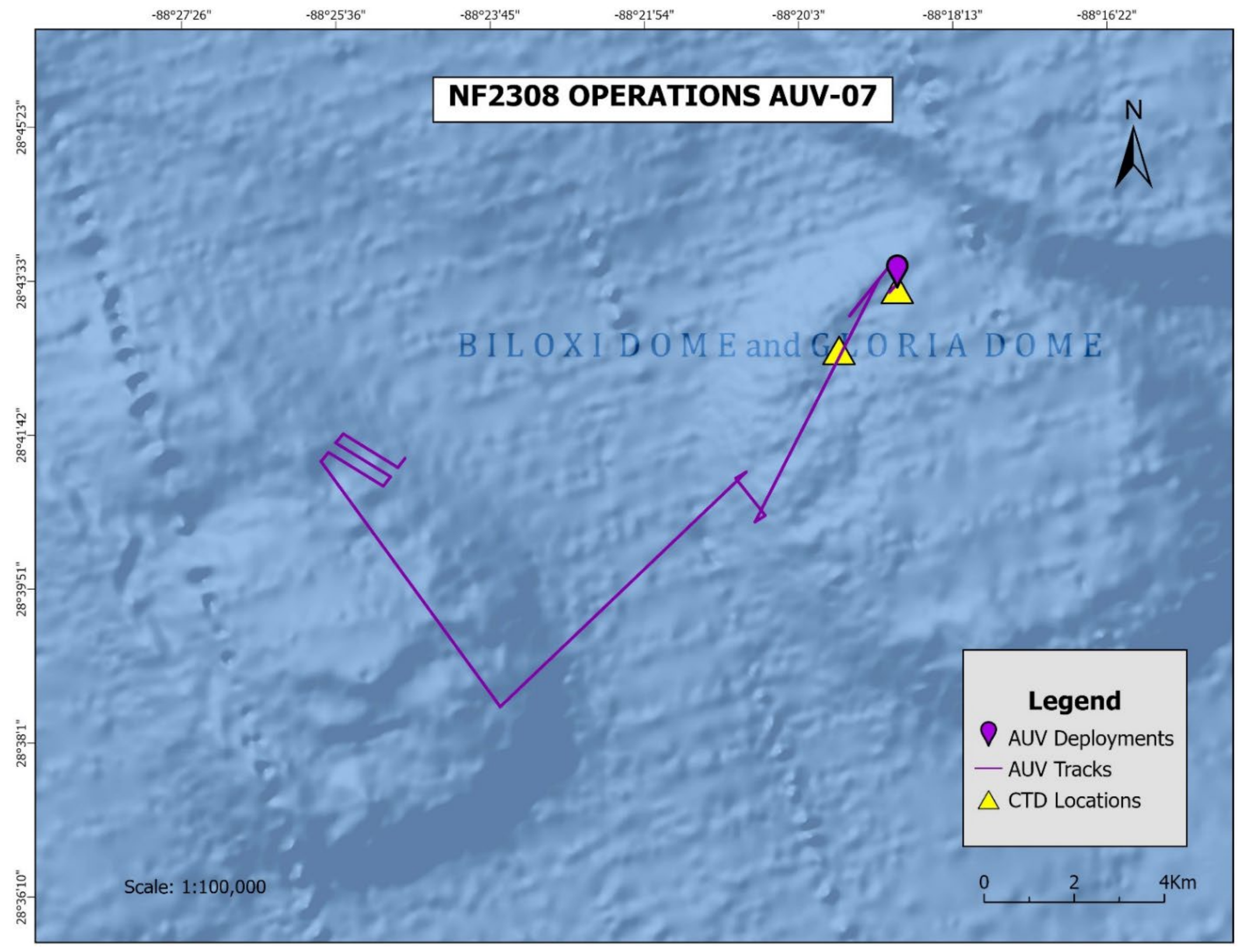
Appendix A Figure 4.4. Dive track for leg 4 AUV-04 conducted 10/14/2023 near Pascagoula Dome and Sounder Canyon.



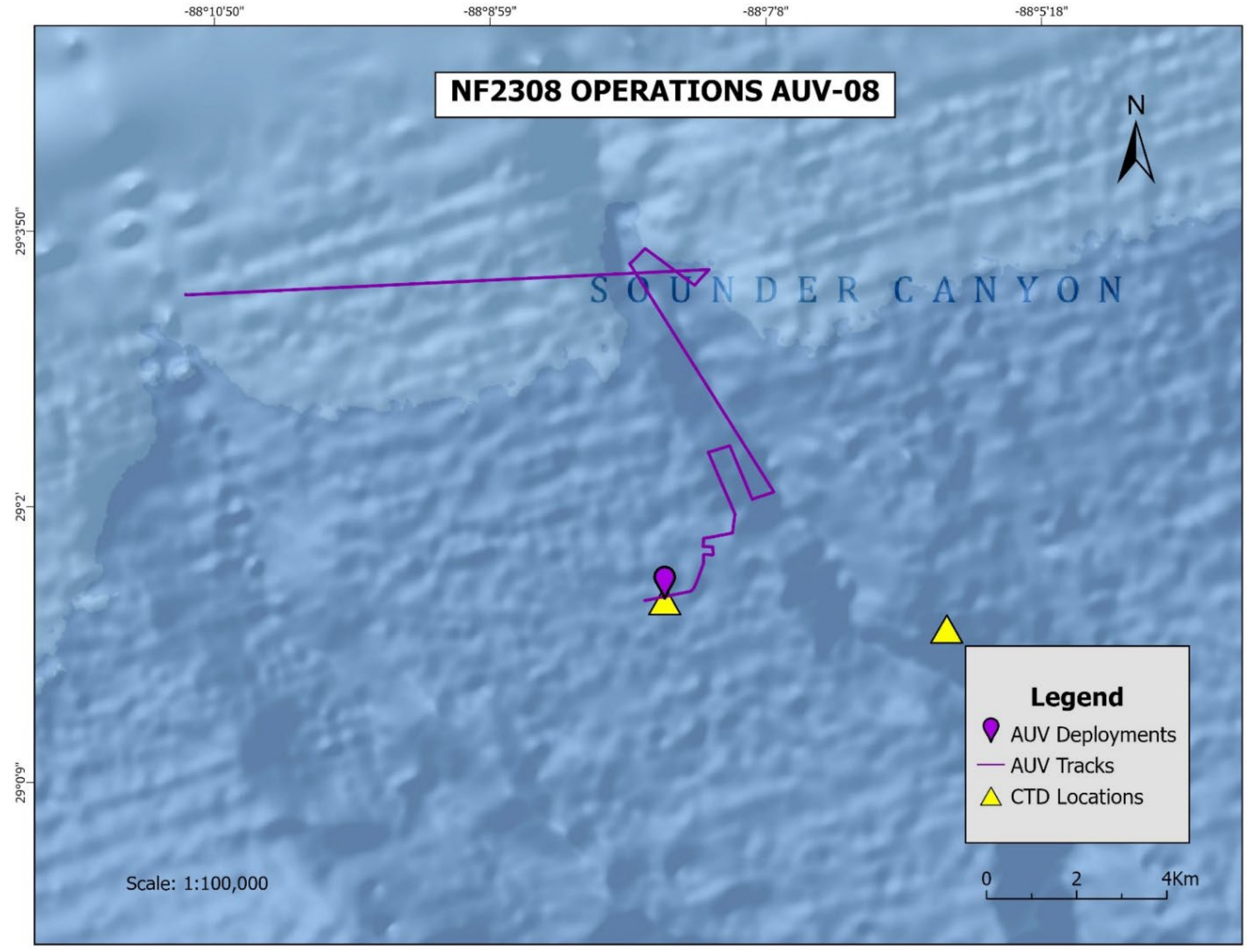
Appendix A Figure 4.5. Dive track for leg 4 AUV-05 conducted 10/14/2023 near Horn Dome.



Appendix A Figure 4.6. Dive track for leg 4 AUV-06 conducted 10/17/2023 near Mitchell Dome and Whiting Dome.



Appendix A Figure 4.7. Dive track for leg 4 AUV-07 conducted 10/18/2023 near Biloxi Dome and Gloria Dome.



Appendix A Figure 4.8. Dive track for leg 4 AUV-08 conducted 10/19/2023 near Sounder Canyon.

Appendix B. Leg 2 Data Tables

Appendix B Table 1. Sediment samples collected during NF-23-06. ROV = remotely operated vehicle; Lat = latitude; Long = longitude; Chem = chemistry: microbiology + grain size + isotopes; Pore = pore water analysis; Vou = voucher; Micro = microbiology; Hydro = hydrocarbons.

ROV Dive	Sample ID	Collection Time (CST)	Lat	Long	Depth (m)	Macro fauna	Chem	Pore	Vou	Grain Size	Micro	Hydro	Trace Metals
ROV-01	NF2306_20230906_02_ROV01_Spec009G	9/6/2023 21:28:45	28.83896	–87.96253	1,561	x							
ROV-01	NF2306_20230906_02_ROV01_Spec010G	9/6/2023 21:30:39	28.83896	–87.96253	1,561	x							
ROV-01	NF2306_20230906_02_ROV01_Spec011G	9/6/2023 21:36:45	28.83896	–87.96253	1,561		x						
ROV-01	NF2306_20230906_02_ROV01_Spec012G	9/6/2023 21:34:45	28.83896	–87.96253	1,561	x							
ROV-02	NF2306_20230907_02_ROV02_Spec015G	9/7/2023 18:21:48	28.68263	–88.34501	1,589			x	x				
ROV-02	NF2306_20230907_02_ROV02_Spec016G	9/7/2023 18:20:10	28.68263	–88.34501	1,589	x							
ROV-02	NF2306_20230907_02_ROV02_Spec017G	9/7/2023 18:26:21	28.68224	–88.34494	1,589								x
ROV-02	NF2306_20230907_02_ROV02_Spec018G	9/7/2023 18:18:34	28.68224	–88.34494	1,589	x							
ROV-02	NF2306_20230907_02_ROV02_Spec019G	9/7/2023 18:23:02	28.68263	–88.34501	1,589					x	x		
ROV-02	NF2306_20230907_02_ROV02_Spec020G	9/7/2023 18:17:09	28.68224	–88.34494	1,589	x							
ROV-02	NF2306_20230907_02_ROV02_Spec021G	9/7/2023 18:24:14	28.68263	–88.34501	1,589	x							
ROV-02	NF2306_20230907_02_ROV02_Spec022G	9/7/2023 18:25:27	28.68263	–88.34501	1,589							x	
ROV-03	NF2306_20230908_02_ROV03_Spec037G	9/8/2023 18:58:19	28.36965	–88.79078	1,305		x						
ROV-03	NF2306_20230908_02_ROV03_Spec038G	9/8/2023 18:56:35	28.36965	–88.79078	1,305	x							
ROV-03	NF2306_20230908_02_ROV03_Spec039G	9/8/2023 18:57:30	28.36965	–88.79078	1,305	x							
ROV-03	NF2306_20230908_02_ROV03_Spec040G	9/8/2023 18:55:42	28.36965	–88.79078	1,305	x							
ROV-04	NF2306_20230909_02_ROV04_Spec058G	9/9/2023 13:09:26	28.67216	–88.47655	1,379	x							
ROV-04	NF2306_20230909_02_ROV04_Spec059G	9/9/2023 13:08:43	28.67216	–88.47655	1,379	x							
ROV-04	NF2306_20230909_02_ROV04_Spec060G	9/9/2023 13:07:52	28.67216	–88.47655	1,379							x	
ROV-04	NF2306_20230909_02_ROV04_Spec061G	9/9/2023 13:07:07	28.67216	–88.47655	1,379	x							
ROV-04	NF2306_20230909_02_ROV04_Spec062G	9/9/2023 13:06:12	28.67216	–88.47655	1,379			x	x				
ROV-04	NF2306_20230909_02_ROV04_Spec063G	9/9/2023 13:05:11	28.67216	–88.47655	1,379	x							
ROV-04	NF2306_20230909_02_ROV04_Spec064G	9/9/2023 13:04:09	28.67216	–88.47655	1,379								x

ROV Dive	Sample ID	Collection Time (CST)	Lat	Long	Depth (m)	Macro fauna	Chem	Pore	Vou	Grain Size	Micro	Hydro	Trace Metals
ROV-04	NF2306_20230909_02_ROV04_Spec065G	9/9/2023 13:03:17	28.67216	−88.47655	1,379					x	x		
ROV-05	NF2306_20230909_04_ROV05_Spec075G	9/9/2023 21:46:36	28.63349	−88.16928	1,860	x							
ROV-05	NF2306_20230909_04_ROV05_Spec076G	9/9/2023 21:45:56	28.63349	−88.16928	1,860	x							
ROV-05	NF2306_20230909_04_ROV05_Spec077G	9/9/2023 21:45:04	28.63349	−88.16928	1,860							x	
ROV-05	NF2306_20230909_04_ROV05_Spec078G	9/9/2023 21:43:09	28.63349	−88.16928	1,860					x	x		
ROV-05	NF2306_20230909_04_ROV05_Spec079G	9/9/2023 21:42:25	28.63349	−88.16928	1,860								x
ROV-05	NF2306_20230909_04_ROV05_Spec080G	9/9/2023 21:41:28	28.63349	−88.16928	1,860	x							
ROV-05	NF2306_20230909_04_ROV05_Spec081G	9/9/2023 21:40:00	28.63349	−88.16928	1,860	x							
ROV-05	NF2306_20230909_04_ROV05_Spec082G	9/9/2023 21:44:09	28.63349	−88.16928	1,860				x				
ROV-06	NF2306_20230910_02_ROV06_Spec104G	9/10/2023 21:36:00	28.18703	−86.75123	1,636		x						
ROV-06	NF2306_20230910_02_ROV06_Spec105G	9/10/2023 21:36:00	28.18703	−86.75123	1,636	x							
ROV-06	NF2306_20230910_02_ROV06_Spec106G	9/10/2023 21:36:00	28.18703	−86.75123	1,636	x							
ROV-06	NF2306_20230910_02_ROV06_Spec107G	9/10/2023 21:36:00	28.18703	−86.75123	1,636	x							
ROV-07	NF2306_20230911_02_ROV07_Spec126G	9/11/2023 21:28:28	27.67272	−85.62945	1,712	x							
ROV-07	NF2306_20230911_02_ROV07_Spec127G	9/11/2023 21:27:04	27.67272	−85.62945	1,712	x							
ROV-07	NF2306_20230911_02_ROV07_Spec128G	9/11/2023 21:29:32	27.67272	−85.62945	1,712		x						
ROV-07	NF2306_20230911_02_ROV07_Spec129G	9/11/2023 21:25:41	27.67272	−85.62945	1,712	x							
ROV-08	NF2306_20230912_02_ROV08_Spec159G	9/12/2023 20:55:40	27.99628	−86.35427	1,490	x							
ROV-08	NF2306_20230912_02_ROV08_Spec160G	9/12/2023 20:55:02	27.99628	−86.35427	1,490	x							
ROV-08	NF2306_20230912_02_ROV08_Spec161G	9/12/2023 20:54:19	27.99628	−86.35427	1489	x							
ROV-08	NF2306_20230912_02_ROV08_Spec162G	9/12/2023 20:55:45	27.99628	−86.35427	1,490		x						
ROV-09	NF2306_20230913_02_ROV09_Spec204G	9/13/2023 21:51:33	27.99699	−86.36306	1,498	x							
ROV-09	NF2306_20230913_02_ROV09_Spec205G	9/13/2023 21:50:41	27.99699	−86.36306	1,498		x						
ROV-09	NF2306_20230913_02_ROV09_Spec206G	9/13/2023 21:49:37	27.99699	−86.36306	1,498	x							
ROV-09	NF2306_20230913_02_ROV09_Spec207G	9/13/2023 21:48:09	27.99699	−86.36306	1,498	x							
ROV-10	NF2306_20230914_02_ROV10_Spec217G	9/14/2023 15:32:25	27.99692	−86.36309	1,508	x							

ROV Dive	Sample ID	Collection Time (CST)	Lat	Long	Depth (m)	Macro fauna	Chem	Pore	Vou	Grain Size	Micro	Hydro	Trace Metals
ROV-10	NF2306_20230914_02_ROV10_Spec218G	9/14/2023 15:53:56	27.99693	−86.36274	1,508	x							
ROV-10	NF2306_20230914_02_ROV10_Spec219G	9/14/2023 15:53:23	27.99693	−86.36274	1,508								x
ROV-10	NF2306_20230914_02_ROV10_Spec220G	9/14/2023 15:51:32	27.99693	−86.36274	1,508			x	x				
ROV-10	NF2306_20230914_02_ROV10_Spec221G	9/14/2023 15:50:28	27.99693	−86.36274	1,508					x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec222G	9/14/2023 15:49:32	27.99693	−86.36274	1,508							x	
ROV-10	NF2306_20230914_02_ROV10_Spec223G	9/14/2023 15:48:05	27.99693	−86.36274	1,508	x							
ROV-10	NF2306_20230914_02_ROV10_Spec224G	9/14/2023 15:46:59	27.99693	−86.36274	1,508	x							
ROV-11	NF2306_20230915_02_ROV11_Spec237G	9/15/2023 21:03:25	27.99616	−86.35715	1,515								x
ROV-11	NF2306_20230915_02_ROV11_Spec238G	9/15/2023 21:02:40	27.99616	−86.35715	1,515							x	
ROV-11	NF2306_20230915_02_ROV11_Spec240G	9/15/2023 21:01:55	27.99616	−86.35715	1,515					x	x		
ROV-11	NF2306_20230915_02_ROV11_Spec241G	9/15/2023 21:01:05	27.99616	−86.35715	1,515	x							
ROV-11	NF2306_20230915_02_ROV11_Spec242G	9/15/2023 20:59:23	27.99616	−86.35715	1,515	x							
ROV-11	NF2306_20230915_02_ROV11_Spec243G	9/15/2023 21:00:00	27.99616	−86.35715	1,515			x	x				
ROV-11	NF2306_20230915_02_ROV11_Spec244G	9/15/2023 20:57:32	27.99616	−86.35715	1,515	x							
ROV-11	NF2306_20230915_02_ROV11_Spec245G	9/15/2023 20:58:27	27.99616	−86.35715	1,515	x							
ROV-12	NF2306_20230916_02_ROV12_Spec252G	9/16/2023 14:36:12	27.99559	−86.35348	1,515							x	
ROV-12	NF2306_20230916_02_ROV12_Spec253G	9/16/2023 14:35:13	27.99559	−86.35348	1,515							x	
ROV-12	NF2306_20230916_02_ROV12_Spec254G	9/16/2023 14:32:47	27.99559	−86.35348	1,515					x	x		
ROV-12	NF2306_20230916_02_ROV12_Spec255G	9/16/2023 14:34:03	27.99559	−86.35348	1,515	x							
ROV-12	NF2306_20230916_02_ROV12_Spec256G	9/16/2023 14:31:41	27.99559	−86.35348	1,515	x							
ROV-12	NF2306_20230916_02_ROV12_Spec257G	9/16/2023 14:30:19	27.99559	−86.35348	1,515	x							
ROV-12	NF2306_20230916_02_ROV12_Spec258G	9/16/2023 14:27:55	27.99559	−86.35348	1,515								x
ROV-12	NF2306_20230916_02_ROV12_Spec259G	9/16/2023 14:29:27	27.99559	−86.35348	1,515	x							
ROV-13	NF2306_20230917_02_ROV13_Spec296G	9/17/2023 15:58:49	28.93538	−88.20269	1,101	x							
ROV-13	NF2306_20230917_02_ROV13_Spec297G	9/17/2023 15:57:58	28.93538	−88.20269	1,101	x							
ROV-13	NF2306_20230917_02_ROV13_Spec298G	9/17/2023 15:54:57	28.93538	−88.20269	1,101								x

ROV Dive	Sample ID	Collection Time (CST)	Lat	Long	Depth (m)	Macro fauna	Chem	Pore	Vou	Grain Size	Micro	Hydro	Trace Metals
ROV-13	NF2306_20230917_02_ROV13_Spec299G	9/17/2023 15:55:50	28.93538	−88.20269	1,101							x	
ROV-13	NF2306_20230917_02_ROV13_Spec300G	9/17/2023 15:53:39	28.93538	−88.20269	1,101					x	x		
ROV-13	NF2306_20230917_02_ROV13_Spec301G	9/17/2023 15:52:13	28.93538	−88.20269	1,101	x							
ROV-13	NF2306_20230917_02_ROV13_Spec302G	9/17/2023 15:51:30	28.93538	−88.20269	1,101			x	x				
ROV-13	NF2306_20230917_02_ROV13_Spec303G	9/17/2023 15:49:43	28.93538	−88.20269	1,101	x							
ROV-14	NF2306_20230918_02_ROV14_Spec313G	9/18/2023 14:45:23	28.78728	−88.63433	926			x	x				
ROV-14	NF2306_20230918_02_ROV14_Spec314G	9/18/2023 14:44:19	28.78728	−88.63433	926	x							
ROV-14	NF2306_20230918_02_ROV14_Spec315G	9/18/2023 14:42:54	28.78728	−88.63433	926	x							
ROV-14	NF2306_20230918_02_ROV14_Spec316G	9/18/2023 14:41:46	28.78728	−88.63433	926		x						
ROV-14	NF2306_20230918_02_ROV14_Spec317G	9/18/2023 14:40:51	28.78728	−88.63433	926							x	
ROV-14	NF2306_20230918_02_ROV14_Spec318G	9/18/2023 14:39:10	28.78728	−88.63433	926	x							
ROV-14	NF2306_20230918_02_ROV14_Spec319G	9/18/2023 14:39:59	28.78728	−88.63433	927	x							
ROV-14	NF2306_20230918_02_ROV14_Spec320G	9/18/2023 14:38:05	28.78728	−88.63433	926								x

Appendix B Table 2. Biological Samples collected during NF-23-06. ROV = remotely operated vehicle; Lat = latitude; Long = longitude. An "x" indicates that a sub sample was taken for the reason indicated in the column header. Pop Gen = population genetics; Vou = voucher; Iso = isotope; Wh Gen = whole genome skimming; Repr = reproduction; Live = Live samples for aquarium.

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-01	NF2306_20230906_02_ROV01_Spec013B	9/6/2023 21:45:16	28.83898	–87.96243	Cladorhizidae	1,560	x	x	x	x		
ROV-02	NF2306_20230907_02_ROV02_Spec031B	9/7/2023 19:01:08	28.68232	–88.34496	Isididae	1595	x	x	x	x		
ROV-02	NF2306_20230907_02_ROV02_Spec031B_A01	9/7/2023 19:01:08	28.68232	–88.34496	Lepadidae	1595		x		x		
ROV-02	NF2306_20230907_02_ROV02_Spec031B_A02	9/7/2023 19:01:08	28.68232	–88.34496	Lepadidae	1595		x		x		
ROV-02	NF2306_20230907_02_ROV02_Spec032B	9/7/2023 19:10:32	28.68225	–88.34494	Zoanthidae	1,589	x	x		x		
ROV-02	NF2306_20230907_02_ROV02_Spec033B	9/7/2023 19:15:29	28.68225	–88.34493	Actiniaria	1,589	x	x		x		
ROV-02	NF2306_20230907_02_ROV02_Spec034B	9/7/2023 20:44:59	28.68236	–88.34496	*Alternatipathes alternata*	1,593	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec084B	9/10/2023 17:53:21	28.18594	–86.75072	Keratoisididae	1,633	x	x		x		
ROV-06	NF2306_20230910_02_ROV06_Spec085B	9/10/2023 18:18:53	28.18731	–86.75145	*Paramuricea biscaya*	1,637	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec086B	9/10/2023 18:30:30	28.18746	–86.75151	*Paramuricea biscaya*	1,633	x	x	x	x	x	
ROV-06	NF2306_20230910_02_ROV06_Spec086B_A01	9/10/2023 18:30:30	28.18746	–86.75151	*Asteroschema* sp.	1,633	x			x		
ROV-06	NF2306_20230910_02_ROV06_Spec087B	9/10/2023 18:36:39	28.18746	–86.75151	Keratoisididae	1,635	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec088B	9/10/2023 18:49:48	28.18749	–86.75159	*Hexapathes* sp.	1,636	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec089B	9/10/2023 18:58:46	28.18746	–86.75159	*Paramuricea biscaya*	1,634	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec090B	9/10/2023 19:38:57	28.18815	–86.75185	*Paramuricea biscaya*	1,626	x	x	x	x	x	x
ROV-06	NF2306_20230910_02_ROV06_Spec090B_A01	9/10/2023 19:38:57	28.18815	–86.75185	*Asteroschema* sp.	1,626	x			x		
ROV-06	NF2306_20230910_02_ROV06_Spec091B	9/10/2023 19:48:44	28.18835	–86.75176	*Paramuricea biscaya*	1,615	x	x	x	x	x	x
ROV-06	NF2306_20230910_02_ROV06_Spec091B_A01	9/10/2023 19:48:44	28.18835	–86.75176	*Asteroschema* sp.	1,615	x			x		
ROV-06	NF2306_20230910_02_ROV06_Spec092B	9/10/2023 20:13:41	28.18840	–86.75177	*Paramuricea biscaya*	1,623	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec092B_A01	9/10/2023 20:13:41	28.18840	–86.75177	*Asteroschema* sp.	1,623	x			x		
ROV-06	NF2306_20230910_02_ROV06_Spec093B	9/10/2023 20:38:11	28.18893	–86.75198	*Paramuricea biscaya*	1,634	x	x	x	x	x	
ROV-06	NF2306_20230910_02_ROV06_Spec093B_A01	9/10/2023 20:38:11	28.18893	–86.75198	*Asteroschema* sp.	1,634	x			x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-06	NF2306_20230910_02_ROV06_Spec094B	9/10/2023 20:45:56	28.18892	–86.75197	*Paramuricea biscaya*	1,635	x	x	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec094B_A01	9/10/2023 20:45:56	28.18892	–86.75197	*Asteroschema* sp.	1,635	x			x		
ROV-06	NF2306_20230910_02_ROV06_Spec095B	9/10/2023 20:50:49	28.18893	–86.75197	*Paramuricea biscaya*	1,635	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec109B	9/11/2023 14:43:36	27.67273	–85.62946	*Acanella arbuscula*	1,713	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec111B	9/11/2023 15:47:07	27.67622	–85.62731	*Lepidisis* sp.	1,569	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec112B	9/11/2023 15:53:16	27.67623	–85.62730	*Chrysogorgia* sp.	1,569	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec112B_A01	9/11/2023 15:53:16	27.67623	–85.62730	Chirostyloidea	1,569	x	x				
ROV-07	NF2306_20230911_02_ROV07_Spec113B	9/11/2023 16:05:10	27.67641	–85.62718	*Lepidisis* sp.	1,564	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec114B	9/11/2023 18:58:27	27.67412	–85.62170	*Acanella* sp.	1,644	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec117B	9/11/2023 19:23:01	27.67336	–85.62152	*Acanella* sp.	1,675	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec124B	9/11/2023 19:56:34	27.67349	–85.62174	*Chrysogorgia* sp.	1,666	x	x	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec130B	9/11/2023 21:34:32	27.67272	–85.62945	Pennatulacea	1,712		x				
ROV-08	NF2306_20230912_02_ROV08_Spec132B	9/12/2023 14:49:54	27.99526	–86.35411	*Paramuricea biscaya*	1,657	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec133B	9/12/2023 14:58:35	27.99533	–86.35411	*Paramuricea biscaya*	1,648	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec133B_A01	9/12/2023 14:58:35	27.99533	–86.35411	*Asteroschema* sp.	1,648	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec136B	9/12/2023 15:08:57	27.99533	–86.35406	*Paramuricea biscaya*	1,647	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec137B	9/12/2023 15:17:05	27.99536	–86.35407	*Narella bellissima*	1,647	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec137B_A01	9/12/2023 15:17:05	27.99536	–86.35407	*Asteroschema* sp.	1,647	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec138B	9/12/2023 15:27:55	27.99536	–86.35406	*Dendropathes* sp.	1,648	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec139B	9/12/2023 15:33:45	27.99536	–86.35406	*Stauropathes* sp.	1,648	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec140B	9/12/2023 15:41:58	27.99538	–86.35390	Cladorhizidae	1,643	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec140B_A01	9/12/2023 15:41:58	27.99538	–86.35390	Crinoidea	1,643	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec141B	9/12/2023 15:49:53	27.99544	–86.35390	*Paramuricea biscaya*	1,639	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec141B_A01	9/12/2023 15:49:53	27.99544	–86.35390	*Asteroschema* sp.	1,639	x	x		x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-08	NF2306_20230912_02_ROV08_Spec142B	9/12/2023 15:57:36	27.99544	–86.35389	*Paramuricea biscaya*	1,639	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec143B	9/12/2023 16:01:03	27.99545	–86.35391	*Madrepora* sp.	1,639	x	x				x
ROV-08	NF2306_20230912_02_ROV08_Spec143B_A01	9/12/2023 16:01:03	27.99545	–86.35391	Acanthogorgiidae	1,639	x			x		
ROV-08	NF2306_20230912_02_ROV08_Spec143B_A02	9/12/2023 16:01:03	27.99545	–86.35391	*Acanthogorgia* sp.	1,639	x					
ROV-08	NF2306_20230912_02_ROV08_Spec143B_A03	9/12/2023 16:01:03	27.99545	–86.35391	Ophiuroidea	1,639	x	x				
ROV-08	NF2306_20230912_02_ROV08_Spec144B	9/12/2023 16:14:21	27.99541	–86.35393	*Tetrapathes* sp.	1,640	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec145B	9/12/2023 16:28:36	27.99531	–86.35410	*Iridogorgia* sp.	1,606	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec146B	9/12/2023 17:02:31	27.99538	–86.35433	*Paramuricea biscaya*	1,613	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec146B_A01	9/12/2023 17:02:31	27.99538	–86.35433	*Asteroschema* sp.	1,613	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec147B	9/12/2023 17:13:51	27.99552	–86.35426	*Paramuricea biscaya*	1,580	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec147B_A01	9/12/2023 17:13:51	27.99552	–86.35426	*Asteroschema* sp.	1,580	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec148B	9/12/2023 17:20:52	27.99554	–86.35425	Primnoidae	1,565	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec149B	9/12/2023 17:40:38	27.99547	–86.35443	*Solenosmilia* sp.	1,550	x	x				
ROV-08	NF2306_20230912_02_ROV08_Spec149B_A01	9/12/2023 17:40:38	27.99547	–86.35443	Primnoidae	1,550	x			x		
ROV-08	NF2306_20230912_02_ROV08_Spec152B	9/12/2023 18:04:24	27.99548	–86.35462	*Enallopsammia* sp.	1,520	x	x				
ROV-08	NF2306_20230912_02_ROV08_Spec153B	9/12/2023 18:51:50	27.99548	–86.35433	*Paragorgia* sp.	1,519	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec154B	9/12/2023 18:51:50	27.99547	–86.35434	*Acanthogorgia* sp.	1,519	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec155B	9/12/2023 19:12:15	27.99540	–86.35447	*Paragorgia* sp.	1,514	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec155B_A01	9/12/2023 19:12:15	27.99540	–86.35447	*Asteroschema* sp.	1,514	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec156B	9/12/2023 19:30:00	27.99550	–86.35437	*Paramuricea biscaya*	1,514	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec156B_A01	9/12/2023 19:30:00	27.99550	–86.35437	*Asteroschema* sp.	1,514	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec156B_A02	9/12/2023 19:30:00	27.99550	–86.35437	*Acanthogorgia* sp.	1,514	x					
ROV-08	NF2306_20230912_02_ROV08_Spec157B	9/12/2023 19:52:43	27.99550	–86.35394	*Keratoisis* sp.	1,514	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec158B	9/12/2023 20:12:48	27.99555	–86.35375	*Keratoisis* sp.	1,514	x	x	x	x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-08	NF2306_20230912_02_ROV08_Spec158B_A01	9/12/2023 20:12:48	27.99555	−86.35375	Ophiacanthidae	1,514	x	x		x		
ROV-08	NF2306_20230912_02_ROV08_Spec167B	9/12/2023 21:18:37	27.99701	−86.35438	*Acanella* sp.	1,474	x	x	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec167B_A01	9/12/2023 21:18:37	27.99701	−86.35438	Asteroidea	1,474	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec169B	9/13/2023 15:21:22	27.99622	−86.36335	*Pleurocorallium borneense*	1,698	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec170B	9/13/2023 15:32:01	27.99611	−86.36311	*Paramuricea biscaya*	1,700	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec171B	9/13/2023 15:41:55	27.99614	−86.36317	*Candidella* sp.	1,694	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec172B	9/13/2023 15:48:57	27.99613	−86.36315	*Keratoisis* sp.	1,695	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec173B	9/13/2023 15:57:33	27.99615	−86.36316	*Paramuricea biscaya*	1,698	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec173B_A01	9/13/2023 15:57:33	27.99615	−86.36316	*Asteroschema* sp.	1,698	x	x				
ROV-09	NF2306_20230913_02_ROV09_Spec174B	9/13/2023 15:58:28	27.99607	−86.36322	*Keratoisis* sp.	1,701	x			x		
ROV-09	NF2306_20230913_02_ROV09_Spec175B	9/13/2023 16:09:40	27.99626	−86.36345	Farrea sp.	1,695	x	x	x			
ROV-09	NF2306_20230913_02_ROV09_Spec175B_A01	9/13/2023 16:09:40	27.99626	−86.36345	*Asteroschema* sp.	1,695				x		
ROV-09	NF2306_20230913_02_ROV09_Spec176B	9/13/2023 16:13:31	27.99627	−86.36345	*Hyalonema* sp.	1,693	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec177B	9/13/2023 16:32:11	27.99613	−86.36314	*Metallogorgia* sp.	1,683	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec177B_A01	9/13/2023 16:32:11	27.99613	−86.36314	*Asteroschema* sp.	1,683	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec178B	9/13/2023 16:46:49	27.99618	−86.36319	*Paramuricea biscaya*	1,676	x		x	x	x	
ROV-09	NF2306_20230913_02_ROV09_Spec179B	9/13/2023 16:50:47	27.99618	−86.36319	*Polymastia* sp.	1,677	x	x				
ROV-09	NF2306_20230913_02_ROV09_Spec181B	9/13/2023 17:27:12	27.99611	−86.36300	*Paramuricea biscaya*	1,655	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec181B_A01	9/13/2023 17:27:12	27.99611	−86.36300	*Asteroschema* sp.	1,655	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec181B_A02	9/13/2023 17:27:12	27.99611	−86.36300	Aplacophora	1,655	x					
ROV-09	NF2306_20230913_02_ROV09_Spec182B	9/13/2023 17:37:57	27.99615	−86.36300	*Paramuricea biscaya*	1,655	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec182B_A01	9/13/2023 17:37:57	27.99615	−86.36300	*Asteroschema* sp.	1,655	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec182B_A02	9/13/2023 17:37:57	27.99615	−86.36300	Crinoidea	1,655	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec183B	9/13/2023 17:58:34	27.99620	−86.36306	Keratoisididae	1622	x	x	x	x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-09	NF2306_20230913_02_ROV09_Spec184B	9/13/2023 18:13:09	27.99652	−86.36308	*Pleurocorallium borneense*	1,609	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec184B_A01	9/13/2023 18:13:09	27.99652	−86.36308	Crinoidea	1,609	x	x		x		
ROV-09	NF2306_20230913_02_ROV09_Spec193B	9/13/2023 19:21:33	27.99623	−86.36296	Chirostyloidea	1,611	x	x				
ROV-09	NF2306_20230913_02_ROV09_Spec193B_A01	9/13/2023 19:21:33	27.99623	−86.36296	Chirostylidae	1,611	x	x				
ROV-09	NF2306_20230913_02_ROV09_Spec194B	9/13/2023 19:24:41	27.99624	−86.36294	*Isidella* sp.	1,611	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec195B	9/13/2023 19:37:22	27.99627	−86.36301	Antipatharia	1,611	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec196B	9/13/2023 19:47:16	27.99623	−86.36296	*Paramuricea biscaya*	1,615	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec197B	9/13/2023 20:07:25	27.99624	−86.36294	*Paramuricea biscaya*	1,617	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec197B_A01	9/13/2023 20:07:25	27.99624	−86.36294	*Candidella* sp.	1,617	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec197B_A02	9/13/2023 20:07:25	27.99624	−86.36294	*Candidella* sp.	1,617	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec198B	9/13/2023 20:13:11	27.99624	−86.36285	*Trachythela* sp.	1,613	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec199B	9/13/2023 20:28:18	27.99618	−86.36261	*Paramuricea biscaya*	1,613	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec200B	9/13/2023 20:37:15	27.99617	−86.36267	Trissopathes sp.	1,612	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec201B	9/13/2023 20:46:39	27.99614	−86.36264	*Keratoisis* sp.	1,618	x		x	x	x	
ROV-09	NF2306_20230913_02_ROV09_Spec202B	9/13/2023 20:55:15	27.99617	−86.36260	*Paramuricea biscaya*	1,618	x	x	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec203B	9/13/2023 21:04:28	27.99616	−86.36263	*Aphanostichopathes* sp.	1,619	x	x	x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec225B	9/14/2023 20:23:30	27.99548	−86.35392	*Trissopathes* sp.	1,521	x	x	x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec226B	9/14/2023 21:38:38	27.99569	−86.35045	*Tetrapathes* sp.	1,530	x	x	x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec287B	9/14/2023 21:39:05	27.99573	−86.35047	*Aphanostichopathes* sp.	1,530		x		x		
ROV-10	NF2306_20230914_02_ROV10_Spec327B	9/14/2023 21:39:05	27.99573	−86.35047	*Bathynomus giganteus*	1,530		x		x		
ROV-11	NF2306_20230915_02_ROV11_Spec228B	9/15/2023 17:48:08	27.99642	−86.36152	*Callistephanus* sp.	1,515	x	x	x	x		
ROV-11	NF2306_20230915_02_ROV11_Spec229B	9/15/2023 17:55:37	27.99643	−86.36136	*Paramuricea biscaya*	1,513					x	
ROV-11	NF2306_20230915_02_ROV11_Spec230B	9/15/2023 18:55:44	27.99646	−86.36050	*Paramuricea biscaya*	1,514					x	
ROV-11	NF2306_20230915_02_ROV11_Spec246B	9/15/2023 21:15:44	27.99600	−86.35678	*Paramuricea biscaya*	1,516					x	

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-11	NF2306_20230915_02_ROV11_Spec247B	9/15/2023 21:20:10	27.99596	–86.35677	*Paramuricea biscaya*	1,516	x				x	
ROV-11	NF2306_20230915_02_ROV11_Spec248B	9/15/2023 21:24:40	27.99595	–86.35672	*Paramuricea biscaya*	1,517	x		x	x	x	
ROV-11	NF2306_20230915_02_ROV11_Spec248B_A01	9/15/2023 21:24:40	27.99595	–86.35672	Ophiuroidea	1,517				x		
ROV-11	NF2306_20230915_02_ROV11_Spec248B_A02	9/15/2023 21:24:40	27.99595	–86.35672	Ophiuroidea	1,517				x		
ROV-11	NF2306_20230915_02_ROV11_Spec248B_A03	9/15/2023 21:24:40	27.99595	–86.35672	Lepadidae	1,517				x		
ROV-11	NF2306_20230915_02_ROV11_Spec249B	9/15/2023 21:37:18	27.99592	–86.35657	*Chrysogorgia* sp.	1,517	x	x	x	x		
ROV-11	NF2306_20230915_02_ROV11_Spec250B	9/15/2023 21:42:45	27.99594	–86.35656	*Paramuricea biscaya*	1,516					x	
ROV-12	NF2306_20230916_02_ROV12_Spec268B	9/16/2023 19:35:25	27.99722	–86.36371	*Paramuricea biscaya*	1,505	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec268B_A01	9/16/2023 19:35:25	27.99722	–86.36371	*Asteroschema* sp.	1,505	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec269B	9/16/2023 19:50:37	27.99745	–86.36403	*Solenosmilia* sp.	1,507	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec270B	9/16/2023 19:54:20	27.99746	–86.36408	*Paramuricea biscaya*	1,507	x		x			
ROV-12	NF2306_20230916_02_ROV12_Spec271B	9/16/2023 20:06:27	27.99752	–86.36419	*Acesta* sp.	1,507	x					
ROV-12	NF2306_20230916_02_ROV12_Spec272B	9/16/2023 20:08:08	27.99751	–86.36420	*Paramuricea biscaya*	1,508	x			x		
ROV-12	NF2306_20230916_02_ROV12_Spec273B	9/16/2023 20:13:56	27.99757	–86.36431	*Paramuricea biscaya*	1,507	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec274B	9/16/2023 20:22:17	27.99757	–86.36431	*Stichopathes* sp.	1,508	x	x	x	x		
ROV-12	NF2306_20230916_02_ROV12_Spec275B	9/19/2023 20:22:17	27.99757	–86.36432	Chirostylidae	1,510	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec276B	9/16/2023 20:43:01	27.99779	–86.36460	*Paramuricea* sp.	1,508	x					
ROV-12	NF2306_20230916_02_ROV12_Spec276B_A01	9/16/2023 20:43:01	27.99779	–86.36460	Cirripedia	1,508	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec276B_A02	9/16/2023 20:43:01	27.99779	–86.36460	*Asteroschema* sp.	1,508	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec276B_A03	9/16/2023 20:43:01	27.99779	–86.36460	Primnoidae	1,508	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec277B	9/16/2023 20:48:28	27.99778	–86.36462	*Pleurocorallium borneense*	1,508	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec278B	9/16/2023 21:07:17	27.99801	–86.36514	Geodia sp.	1,511	x	x				
ROV-12	NF2306_20230916_02_ROV12_Spec279B	9/16/2023 21:13:05	27.99803	–86.36516	*Paramuricea biscaya*	1,512	x	x		x		x
ROV-12	NF2306_20230916_02_ROV12_Spec279B_A01	9/16/2023 21:13:05	27.99803	–86.36516	*Asteroschema* sp.	1,512	x	x		x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Species	Depth (m)	Pop Gen	Vou	Repr	Iso	Live	Wh Gen
ROV-12	NF2306_20230916_02_ROV12_Spec280B	9/16/2023 9:20:14	27.99793	–86.36518	*Paragorgia* sp.	1,516	x	x	x	x		x
ROV-12	NF2306_20230916_02_ROV12_Spec280B_A01	9/16/2023 9:20:14	27.99793	–86.36518	*Asteroschema* sp.	1,516	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec281B	9/16/2023 21:20:14	27.99794	–86.36524	*Anthomastus* sp.	1513	x			x		
ROV-12	NF2306_20230916_02_ROV12_Spec283B	9/16/2023 21:38:07	27.99796	–86.36539	*Trachythela* sp.	1,514	x	x		x		
ROV-12	NF2306_20230916_02_ROV12_Spec283B_A01	9/16/2023 21:38:07	27.99796	–86.36539	Crinoidea	1,514	x			x		
ROV-12	NF2306_20230916_02_ROV12_Spec283B_A02	9/16/2023 21:38:07	27.99796	–86.36539	Primnoidae	1,514	x			x		
ROV-12	NF2306_20230916_02_ROV12_Spec283B_A03	9/16/2023 21:38:07	27.99796	–86.36539	Plexauridae	1,514	x			x		
ROV-12	NF2306_20230916_02_ROV12_Spec283B_A04	9/16/2023 21:38:07	27.99796	–86.36539	Hydrozoa	1,514	x			x		
ROV-14	NF2306_20230918_02_ROV14_Spec321B	9/18/2023 15:30:32	28.78730	–88.63473	*Paramuricea* sp.	926	x			x		
ROV-14	NF2306_20230918_02_ROV14_Spec322B	9/18/2023 15:33:23	28.78727	–88.63474	*Paramuricea* sp.	927	x			x		
ROV-14	NF2306_20230918_02_ROV14_Spec323B	9/18/2023 15:38:49	28.78726	–88.63473	*Paramuricea* sp.	927	x			x		
ROV-14	NF2306_20230918_02_ROV14_Spec324B	9/18/2023 15:58:56	28.78725	–88.63475	*Paramuricea* sp.	927	x			x		
ROV-14	NF2306_20230918_02_ROV14_Spec325B	9/18/2023 16:05:58	28.78725	–88.63479	*Paramuricea* sp.	927	x			x		

Appendix B Table 3. CTD rosette Niskin samples in NF-23-06. CTD = conductivity, temperature, and depth; eDNA = environmental DNA; POM = particulate organic matter.

CTD Dive	Sample ID	Depth (m)	eDNA	POM	Nutrient Analysis	Lab Blank - eDNA
CTD-01	NF2306_20230906_01_CTD01_Spec001W	1,787	x	x	x	
CTD-01	NF2306_20230906_01_CTD01_Spec002W	1,787	x	x	x	
CTD-01	NF2306_20230906_01_CTD01_Spec003W	1,400	x		x	
CTD-01	NF2306_20230906_01_CTD01_Spec004W	1,400	x			
CTD-01	NF2306_20230906_01_CTD01_Spec005W	900	x		x	
CTD-01	NF2306_20230906_01_CTD01_Spec006W	901	x			
CTD-01	NF2306_20230906_01_CTD01_Spec007W	400	x		x	
CTD-01	NF2306_20230906_01_CTD01_Spec008W	400	x			
CTD-01	NF2306_20230906_01_CTD01_Spec009W	101	x		x	
CTD-01	NF2306_20230906_01_CTD01_Spec010W	100	x			
CTD-01	NF2306_20230906_01_CTD01_Spec011W	3	x	x	x	
CTD-01	NF2306_20230906_01_CTD01_Spec012W	3	x	x	x	
CTD-01	NF2306_20230906_01_CTD01_Spec013W					x
CTD-02	NF2306_20230907_01_CTD02_Spec001W	1,545	x	x	x	
CTD-02	NF2306_20230907_01_CTD02_Spec002W	1,545	x	x		
CTD-02	NF2306_20230907_01_CTD02_Spec003W	1,001	x		x	
CTD-02	NF2306_20230907_01_CTD02_Spec004W	1,001	x			
CTD-02	NF2306_20230907_01_CTD02_Spec005W	511	x		x	
CTD-02	NF2306_20230907_01_CTD02_Spec006W	511	x			
CTD-02	NF2306_20230907_01_CTD02_Spec007W	302	x		x	
CTD-02	NF2306_20230907_01_CTD02_Spec008W	301	x			
CTD-02	NF2306_20230907_01_CTD02_Spec009W	51	x		x	
CTD-02	NF2306_20230907_01_CTD02_Spec010W	51	x			
CTD-02	NF2306_20230907_01_CTD02_Spec011W	3	x	x	x	
CTD-02	NF2306_20230907_01_CTD02_Spec012W	3	x	x		
CTD-02	NF2306_20230907_01_CTD02_Spec013W					x
CTD-03	NF2306_20230908_01_CTD03_Spec001W	1,386	x	x	x	
CTD-03	NF2306_20230908_01_CTD03_Spec002W	1,386	x	x		
CTD-03	NF2306_20230908_01_CTD03_Spec003W	900	x		x	
CTD-03	NF2306_20230908_01_CTD03_Spec004W	900	x			
CTD-03	NF2306_20230908_01_CTD03_Spec005W	451	x		x	
CTD-03	NF2306_20230908_01_CTD03_Spec006W	451	x			

CTD Dive	Sample ID	Depth (m)	eDNA	POM	Nutrient Analysis	Lab Blank - eDNA
CTD-03	NF2306_20230908_01_CTD03_Spec007W	251	x		x	
CTD-03	NF2306_20230908_01_CTD03_Spec008W	251	x			
CTD-03	NF2306_20230908_01_CTD03_Spec009W	151	x		x	
CTD-03	NF2306_20230908_01_CTD03_Spec010W	151	x			
CTD-03	NF2306_20230908_01_CTD03_Spec011W	3	x	x	x	
CTD-03	NF2306_20230908_01_CTD03_Spec012W	3	x	x		
CTD-03	NF2306_20230908_01_CTD03_Spec013W					x
CTD-04	NF2306_20230909_01_CTD04_Spec001W	3		x	x	
CTD-04	NF2306_20230909_01_CTD04_Spec002W	3			x	
CTD-05	NF2306_20230910_01_CTD05_Spec001W	2,451	x	x	x	
CTD-05	NF2306_20230910_01_CTD05_Spec002W	2,451	x	x		
CTD-05	NF2306_20230910_01_CTD05_Spec003W	1,700	x		x	
CTD-05	NF2306_20230910_01_CTD05_Spec004W	1,701	x			
CTD-05	NF2306_20230910_01_CTD05_Spec005W	1,201	x		x	
CTD-05	NF2306_20230910_01_CTD05_Spec006W	1,201	x			
CTD-05	NF2306_20230910_01_CTD05_Spec007W	401	x		x	
CTD-05	NF2306_20230910_01_CTD05_Spec008W	401	x			
CTD-05	NF2306_20230910_01_CTD05_Spec009W	81	x		x	
CTD-05	NF2306_20230910_01_CTD05_Spec010W	81	x			
CTD-05	NF2306_20230910_01_CTD05_Spec011W	3	x	x	x	
CTD-05	NF2306_20230910_01_CTD05_Spec012W	3	x	x		
CTD-05	NF2306_20230910_01_CTD05_Spec013W					x
CTD-06	NF2306_20230911_01_CTD06_Spec001W	1,531	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec002W	1,531	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec003W	826	x			
CTD-06	NF2306_20230911_01_CTD06_Spec004W	826	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec005W	400	x			
CTD-06	NF2306_20230911_01_CTD06_Spec006W	400	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec007W	166	x			
CTD-06	NF2306_20230911_01_CTD06_Spec008W	166	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec009W	81	x			
CTD-06	NF2306_20230911_01_CTD06_Spec010W	81	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec011W	2	x		x	

CTD Dive	Sample ID	Depth (m)	eDNA	POM	Nutrient Analysis	Lab Blank - eDNA
CTD-06	NF2306_20230911_01_CTD06_Spec012W	2	x		x	
CTD-06	NF2306_20230911_01_CTD06_Spec013W					x
CTD-07	NF2306_20230912_01_CTD07_Spec001W	1,451	x	x	x	
CTD-07	NF2306_20230912_01_CTD07_Spec002W	1,451	x	x		
CTD-07	NF2306_20230912_01_CTD07_Spec003W	800	x		x	
CTD-07	NF2306_20230912_01_CTD07_Spec004W	800	x			
CTD-07	NF2306_20230912_01_CTD07_Spec005W	401	x		x	
CTD-07	NF2306_20230912_01_CTD07_Spec006W	401	x			
CTD-07	NF2306_20230912_01_CTD07_Spec007W	101	x		x	
CTD-07	NF2306_20230912_01_CTD07_Spec008W	101	x			
CTD-07	NF2306_20230912_01_CTD07_Spec009W	60	x		x	
CTD-07	NF2306_20230912_01_CTD07_Spec010W	60	x			
CTD-07	NF2306_20230912_01_CTD07_Spec011W	2	x	x	x	
CTD-07	NF2306_20230912_01_CTD07_Spec012W	2	x	x		
CTD-07	NF2306_20230912_01_CTD07_Spec013W					x
CTD-08	NF2306_20230913_01_CTD08_Spec001W	1,422	x	x	x	
CTD-08	NF2306_20230913_01_CTD08_Spec002W	1,422	x	x		
CTD-08	NF2306_20230913_01_CTD08_Spec003W	1,250	x		x	
CTD-08	NF2306_20230913_01_CTD08_Spec004W	1,250	x			
CTD-08	NF2306_20230913_01_CTD08_Spec005W	640	x		x	
CTD-08	NF2306_20230913_01_CTD08_Spec006W	640	x			
CTD-08	NF2306_20230913_01_CTD08_Spec007W	220	x		x	
CTD-08	NF2306_20230913_01_CTD08_Spec008W	220	x			
CTD-08	NF2306_20230913_01_CTD08_Spec009W	31	x		x	
CTD-08	NF2306_20230913_01_CTD08_Spec010W	31	x			
CTD-08	NF2306_20230913_01_CTD08_Spec011W	2	x	x	x	
CTD-08	NF2306_20230913_01_CTD08_Spec012W	2	x	x		
CTD-08	NF2306_20230913_01_CTD08_Spec013W					x
CTD-09	NF2306_20230914_01_CTD09_Spec001W	1,800	x	x	x	
CTD-09	NF2306_20230914_01_CTD09_Spec002W	1,800	x	x		
CTD-09	NF2306_20230914_01_CTD09_Spec003W	1,701	x		x	
CTD-09	NF2306_20230914_01_CTD09_Spec004W	1,701	x			
CTD-09	NF2306_20230914_01_CTD09_Spec005W	1,551	x		x	

CTD Dive	Sample ID	Depth (m)	eDNA	POM	Nutrient Analysis	Lab Blank - eDNA
CTD-09	NF2306_20230914_01_CTD09_Spec006W	1,551	x			
CTD-09	NF2306_20230914_01_CTD09_Spec007W	1,300	x		x	
CTD-09	NF2306_20230914_01_CTD09_Spec008W	1,300	x			
CTD-09	NF2306_20230914_01_CTD09_Spec009W	151	x		x	
CTD-09	NF2306_20230914_01_CTD09_Spec010W	151	x			
CTD-09	NF2306_20230914_01_CTD09_Spec011W	2	x	x	x	
CTD-09	NF2306_20230914_01_CTD09_Spec012W	2	x	x		
CTD-09	NF2306_20230914_01_CTD09_Spec013W					x
CTD-10	NF2306_20230915_01_CTD10_Spec001W	2,075	x	x	x	
CTD-10	NF2306_20230915_01_CTD10_Spec002W	2,075	x	x	x	
CTD-10	NF2306_20230915_01_CTD10_Spec003W	1,901	x		x	
CTD-10	NF2306_20230915_01_CTD10_Spec004W	1,901	x			
CTD-10	NF2306_20230915_01_CTD10_Spec005W	1,501	x		x	
CTD-10	NF2306_20230915_01_CTD10_Spec006W	1,501	x			
CTD-10	NF2306_20230915_01_CTD10_Spec007W	1,350	x		x	
CTD-10	NF2306_20230915_01_CTD10_Spec008W	1,350	x			
CTD-10	NF2306_20230915_01_CTD10_Spec009W	1,000	x		x	
CTD-10	NF2306_20230915_01_CTD10_Spec010W	1,000	x			
CTD-10	NF2306_20230915_01_CTD10_Spec011W	2	x	x	x	
CTD-10	NF2306_20230915_01_CTD10_Spec012W	2	x	x	x	
CTD-10	NF2306_20230915_01_CTD10_Spec013W					x
CTD-11	NF2306_20230916_01_CTD11_Spec001W	1,458	x	x	x	
CTD-11	NF2306_20230916_01_CTD11_Spec002W	1,458	x	x		
CTD-11	NF2306_20230916_01_CTD11_Spec003W	1,001	x		x	
CTD-11	NF2306_20230916_01_CTD11_Spec004W	1,001	x			
CTD-11	NF2306_20230916_01_CTD11_Spec005W	501	x		x	
CTD-11	NF2306_20230916_01_CTD11_Spec006W	501	x			
CTD-11	NF2306_20230916_01_CTD11_Spec007W	151	x		x	
CTD-11	NF2306_20230916_01_CTD11_Spec008W	151	x			
CTD-11	NF2306_20230916_01_CTD11_Spec009W	41	x		x	
CTD-11	NF2306_20230916_01_CTD11_Spec010W	41	x			
CTD-11	NF2306_20230916_01_CTD11_Spec011W	2	x	x	x	
CTD-11	NF2306_20230916_01_CTD11_Spec012W	2	x	x		

CTD Dive	Sample ID	Depth (m)	eDNA	POM	Nutrient Analysis	Lab Blank - eDNA
CTD-11	NF2306_20230916_01_CTD11_Spec013W					x
CTD-12	NF2306_20230917_01_CTD12_Spec001W	1,087	x	x	x	
CTD-12	NF2306_20230917_01_CTD12_Spec002W	1,087	x	x		
CTD-12	NF2306_20230917_01_CTD12_Spec003W	849	x		x	
CTD-12	NF2306_20230917_01_CTD12_Spec004W	849	x			
CTD-12	NF2306_20230917_01_CTD12_Spec005W	601	x		x	
CTD-12	NF2306_20230917_01_CTD12_Spec006W	601	x			
CTD-12	NF2306_20230917_01_CTD12_Spec007W	301	x		x	
CTD-12	NF2306_20230917_01_CTD12_Spec008W	301	x			
CTD-12	NF2306_20230917_01_CTD12_Spec009W	101	x		x	
CTD-12	NF2306_20230917_01_CTD12_Spec010W	101	x			
CTD-12	NF2306_20230917_01_CTD12_Spec011W	2	x	x	x	
CTD-12	NF2306_20230917_01_CTD12_Spec012W	2	x	x		
CTD-12	NF2306_20230917_01_CTD12_Spec013W					x
CTD-13	NF2306_20230918_01_CTD13_Spec001W	944	x	x	x	
CTD-13	NF2306_20230918_01_CTD13_Spec002W	944	x	x		
CTD-13	NF2306_20230918_01_CTD13_Spec003W	676	x		x	
CTD-13	NF2306_20230918_01_CTD13_Spec004W	676	x			
CTD-13	NF2306_20230918_01_CTD13_Spec005W	450	x		x	
CTD-13	NF2306_20230918_01_CTD13_Spec006W	450	x			
CTD-13	NF2306_20230918_01_CTD13_Spec007W	160	x		x	
CTD-13	NF2306_20230918_01_CTD13_Spec008W	160	x			
CTD-13	NF2306_20230918_01_CTD13_Spec009W	50	x		x	
CTD-13	NF2306_20230918_01_CTD13_Spec010W	50	x			
CTD-13	NF2306_20230918_01_CTD13_Spec011W	2	x	x	x	
CTD-13	NF2306_20230918_01_CTD13_Spec012W	2	x	x		
CTD-13	NF2306_20230918_01_CTD13_Spec013W					x

Appendix B Table 4. ROV water samples for NF23-06. ROV = remotely operated vehicle; Lat = latitude; Long = longitude; POM = particulate organic matter; eDNA = environmental DNA.

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Depth (m)	Nutrient Analysis	POM	eDNA	Lab Blank - eDNA
ROV-01	NF2306_20230906_02_ROV01_Spec001W	9/6/2023 21:19:25	28.83903	−87.96246	1,559			x	
ROV-01	NF2306_20230906_02_ROV01_Spec002W	9/6/2023 21:19:25	28.83903	−87.96246	1,559			x	
ROV-01	NF2306_20230906_02_ROV01_Spec003W	9/6/2023 21:19:25	28.83903	−87.96246	1,559			x	
ROV-01	NF2306_20230906_02_ROV01_Spec004W	9/6/2023 21:19:25	28.83903	−87.96246	1,559			x	
ROV-01	NF2306_20230906_02_ROV01_Spec005W	9/6/2023 21:19:25	28.83903	−87.96246	1,559	x	x		
ROV-01	NF2306_20230906_02_ROV01_Spec006W	9/6/2023 21:19:25	28.83903	−87.96246	1,559	x	x		
ROV-01	NF2306_20230906_02_ROV01_Spec007W	9/6/2023 21:19:25	28.83903	−87.96246	1,559		x		
ROV-01	NF2306_20230906_02_ROV01_Spec008W	9/6/2023 21:19:25	28.83903	−87.96246	1,559		x		
ROV-01	NF2306_20230906_02_ROV01_Spec014W								x
ROV-02	NF2306_20230907_02_ROV02_Spec023W	9/7/2023 18:44:07	28.68229	−88.34477	1,593			x	
ROV-02	NF2306_20230907_02_ROV02_Spec024W	9/7/2023 18:45:41	28.68229	−88.34477	1,593			x	
ROV-02	NF2306_20230907_02_ROV02_Spec026W	9/7/2023 18:47:09	28.68229	−88.34477	1,593			x	
ROV-02	NF2306_20230907_02_ROV02_Spec027W	9/7/2023 18:47:17	28.68229	−88.34477	1,593	x	x		
ROV-02	NF2306_20230907_02_ROV02_Spec028W	9/7/2023 18:47:44	28.68229	−88.34477	1,593	x			
ROV-02	NF2306_20230907_02_ROV02_Spec030W	9/7/2023 18:48:06	28.68229	−88.34477	1,594	x	x		
ROV-02	NF2306_20230907_02_ROV02_Spec035W								x
ROV-03	NF2306_20230908_02_ROV03_Spec041W	9/8/2023 20:48:42	28.35592	−88.79445	1,404			x	
ROV-03	NF2306_20230908_02_ROV03_Spec042W	9/8/2023 20:49:25	28.35592	−88.79445	1,406			x	
ROV-03	NF2306_20230908_02_ROV03_Spec044W	9/8/2023 20:50:00	28.35592	−88.79445	1,403			x	
ROV-03	NF2306_20230908_02_ROV03_Spec045W	9/8/2023 20:50:12	28.35592	−88.79445	1,404		x		
ROV-03	NF2306_20230908_02_ROV03_Spec046W	9/8/2023 20:50:22	28.35592	−88.79445	1,405		x		
ROV-03	NF2306_20230908_02_ROV03_Spec047W	9/8/2023 20:50:33	28.35592	−88.79445	1,405	x	x		
ROV-03	NF2306_20230908_02_ROV03_Spec048W	9/8/2023 20:50:54	28.35592	−88.79445	1,404	x	x		

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Depth (m)	Nutrient Analysis	POM	eDNA	Lab Blank - eDNA
ROV-03	NF2306_20230908_02_ROV03_Spec049W								x
ROV-04	NF2306_20230909_02_ROV04_Spec050W	9/9/2023 12:34:42	28.67221	−88.47566	1,378			x	
ROV-04	NF2306_20230909_02_ROV04_Spec051W	9/9/2023 12:36:05	28.67221	−88.47566	1,378			x	
ROV-04	NF2306_20230909_02_ROV04_Spec053W	9/9/2023 12:37:33	28.67221	−88.47566	1,378			x	
ROV-04	NF2306_20230909_02_ROV04_Spec054W	9/9/2023 12:37:53	28.67221	−88.47566	1,379		x		
ROV-04	NF2306_20230909_02_ROV04_Spec055W	9/9/2023 12:37:50	28.67221	−88.47566	1,378		x		
ROV-04	NF2306_20230909_02_ROV04_Spec056W	9/9/2023 12:38:23	28.67221	−88.47566	1,379	x	x		
ROV-04	NF2306_20230909_02_ROV04_Spec057W	9/9/2023 12:38:34	28.67221	−88.47566	1,378	x	x		
ROV-04	NF2306_20230909_02_ROV04_Spec066W								x
ROV-05	NF2306_20230909_04_ROV05_Spec067W	9/9/2023 18:31:35	28.63345	−88.16983	1,861	x	x		
ROV-05	NF2306_20230909_04_ROV05_Spec068W	9/9/2023 18:32:46	28.63345	−88.16983	1,861	x	x		
ROV-05	NF2306_20230909_04_ROV05_Spec069W	9/9/2023 18:33:24	28.63345	−88.16983	1,860	x	x		
ROV-05	NF2306_20230909_04_ROV05_Spec070W	9/9/2023 18:33:56	28.63345	−88.16983	1,860		x		
ROV-05	NF2306_20230909_04_ROV05_Spec071W	9/9/2023 18:34:23	28.63345	−88.16983	1,860			x	
ROV-05	NF2306_20230909_04_ROV05_Spec072W	9/9/2023 18:34:32	28.63345	−88.16983	1,860			x	
ROV-05	NF2306_20230909_04_ROV05_Spec073W	9/9/2023 18:34:42	28.63345	−88.16983	1,860			x	
ROV-05	NF2306_20230909_04_ROV05_Spec074W	9/9/2023 18:34:49	28.63345	−88.16983	1,859			x	
ROV-05	NF2306_20230909_04_ROV05_Spec083W								x
ROV-06	NF2306_20230910_02_ROV06_Spec097W	9/10/2023 21:24:53	28.21698	−86.75743	1,626			x	
ROV-06	NF2306_20230910_02_ROV06_Spec098W	9/10/2023 21:24:53	28.21698	−86.75743	1,626		x		
ROV-06	NF2306_20230910_02_ROV06_Spec099W	9/10/2023 21:24:53	28.21698	−86.75743	1,626	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec100W	9/10/2023 21:24:53	28.21698	−86.75743	1,626	x	x		
ROV-06	NF2306_20230910_02_ROV06_Spec101W	9/10/2023 21:24:53	28.21698	−86.75743	1,626			x	
ROV-06	NF2306_20230910_02_ROV06_Spec102W	9/10/2023 21:24:53	28.21698	−86.75743	1,626			x	

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Depth (m)	Nutrient Analysis	POM	eDNA	Lab Blank - eDNA
ROV-06	NF2306_20230910_02_ROV06_Spec103W	9/10/2023 21:24:53	28.21698	−86.75743	1,626			x	
ROV-06	NF2306_20230910_02_ROV06_Spec108W								x
ROV-07	NF2306_20230911_02_ROV07_Spec115W	9/11/2023 18:59:51	27.67251	−85.62934	1,644			x	
ROV-07	NF2306_20230911_02_ROV07_Spec116W	9/11/2023 19:00:23	27.67251	−85.62934	1,644			x	
ROV-07	NF2306_20230911_02_ROV07_Spec119W	9/11/2023 19:43:22	27.67251	−85.62934	1,666			x	
ROV-07	NF2306_20230911_02_ROV07_Spec120W	9/11/2023 19:43:25	27.67251	−85.62934	1,666		x		
ROV-07	NF2306_20230911_02_ROV07_Spec121W	9/11/2023 19:43:32	27.67251	−85.62934	1,666		x		
ROV-07	NF2306_20230911_02_ROV07_Spec122W	9/11/2023 19:43:45	27.67251	−85.62934	1,666	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec123W	9/11/2023 19:44:05	27.67251	−85.62934	1,666	x	x		
ROV-07	NF2306_20230911_02_ROV07_Spec131W								x
ROV-08	NF2306_20230912_02_ROV08_Spec134W	9/12/2023 15:02:38	27.99527	−86.35387	1,647			x	
ROV-08	NF2306_20230912_02_ROV08_Spec135W	9/12/2023 15:03:35	27.99527	−86.35387	1,647	x		x	
ROV-08	NF2306_20230912_02_ROV08_Spec151W	9/12/2023 17:44:32	27.99527	−86.35387	1,552	x		x	
ROV-08	NF2306_20230912_02_ROV08_Spec163W	9/12/2023 21:04:02	27.99527	−86.35387	1,480		x		
ROV-08	NF2306_20230912_02_ROV08_Spec164W	9/12/2023 21:04:50	27.99527	−86.35387	1,481		x		
ROV-08	NF2306_20230912_02_ROV08_Spec165W	9/12/2023 21:04:50	27.99527	−86.35387	1,481		x		
ROV-08	NF2306_20230912_02_ROV08_Spec166W	9/12/2023 21:04:50	27.99527	−86.35387	1,481	x	x		
ROV-08	NF2306_20230912_02_ROV08_Spec168W								x
ROV-09	NF2306_20230913_02_ROV09_Spec186W	9/13/2023 19:11:26	27.99647	−86.36320	1,613	x	x		
ROV-09	NF2306_20230913_02_ROV09_Spec189W	9/13/2023 19:14:21	27.99647	−86.36320	1,614		x		
ROV-09	NF2306_20230913_02_ROV09_Spec190W	9/13/2023 19:14:37	27.99647	−86.36320	1,610			x	
ROV-09	NF2306_20230913_02_ROV09_Spec191W	9/13/2023 19:14:52	27.99647	−86.36320	1,607			x	
ROV-09	NF2306_20230913_02_ROV09_Spec192W	9/13/2023 21:36:43	27.99647	−86.36320	1,479			x	
ROV-09	NF2306_20230913_02_ROV09_Spec208W								x

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Depth (m)	Nutrient Analysis	POM	eDNA	Lab Blank - eDNA
ROV-10	NF2306_20230914_02_ROV10_Spec209W	9/14/2023 15:03:29	27.99674	−86.36302	1,509			x	
ROV-10	NF2306_20230914_02_ROV10_Spec210W	9/14/2023 15:04:43	27.99674	−86.36302	1,508			x	
ROV-10	NF2306_20230914_02_ROV10_Spec211W	9/14/2023 15:16:56	27.99674	−86.36302	1,500			x	
ROV-10	NF2306_20230914_02_ROV10_Spec212W	9/14/2023 15:17:11	27.99674	−86.36302	1,497			x	
ROV-10	NF2306_20230914_02_ROV10_Spec213W	9/14/2023 15:17:45	27.99674	−86.36302	1,490	x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec214W	9/14/2023 15:17:51	27.99674	−86.36302	1,489		x		
ROV-10	NF2306_20230914_02_ROV10_Spec215W	9/14/2023 15:18:04	27.99674	−86.36302	1,486		x		
ROV-10	NF2306_20230914_02_ROV10_Spec216W	9/14/2023 15:18:15	27.99674	−86.36302	1,485	x	x		
ROV-10	NF2306_20230914_02_ROV10_Spec227W								x
ROV-11	NF2306_20230915_02_ROV11_Spec231W	9/15/2023 20:22:10	27.99688	−86.36309	1,514			x	
ROV-11	NF2306_20230915_02_ROV11_Spec232W	9/15/2023 20:24:39	27.99688	−86.36309	1,515	x	x		
ROV-11	NF2306_20230915_02_ROV11_Spec233W	9/15/2023 20:24:52	27.99688	−86.36309	1,514	x	x		
ROV-11	NF2306_20230915_02_ROV11_Spec234W	9/15/2023 20:25:16	27.99688	−86.36309	1,515			x	
ROV-11	NF2306_20230915_02_ROV11_Spec235W	9/15/2023 20:25:45	27.99688	−86.36309	1,515			x	
ROV-11	NF2306_20230915_02_ROV11_Spec236W	9/15/2023 20:26:33	27.99688	−86.36309	1,515			x	
ROV-11	NF2306_20230915_02_ROV11_Spec251W								x
ROV-12	NF2306_20230916_02_ROV12_Spec260W	9/16/2023 15:35:30	27.99557	−86.35348	1,515			x	
ROV-12	NF2306_20230916_02_ROV12_Spec262W	9/16/2023 15:39:03	27.99557	−86.35348	1,515		x		
ROV-12	NF2306_20230916_02_ROV12_Spec263W	9/16/2023 15:39:27	27.99557	−86.35348	1,515	x	x		
ROV-12	NF2306_20230916_02_ROV12_Spec264W	9/16/2023 15:39:39	27.99557	−86.35348	1,515	x	x		
ROV-12	NF2306_20230916_02_ROV12_Spec265W	9/16/2023 15:39:52	27.99557	−86.35348	1,515			x	
ROV-12	NF2306_20230916_02_ROV12_Spec266W	9/16/2023 15:40:07	27.99557	−86.35348	1,515			x	
ROV-12	NF2306_20230916_02_ROV12_Spec267W	9/16/2023 15:40:18	27.99557	−86.35348	1,515			x	
ROV-12	NF2306_20230916_02_ROV12_Spec285W								x

ROV Dive	Sample ID	Collection Time (UTC)	Lat	Long	Depth (m)	Nutrient Analysis	POM	eDNA	Lab Blank - eDNA
ROV-13	NF2306_20230917_02_ROV13_Spec288W	9/17/2023 15:13:51	28.93456	−88.20298	1,105	x	x		
ROV-13	NF2306_20230917_02_ROV13_Spec289W	9/17/2023 15:16:54	28.93456	−88.20298	1,105		x		
ROV-13	NF2306_20230917_02_ROV13_Spec290W	9/17/2023 15:16:41	28.93456	−88.20298	1,105		x		
ROV-13	NF2306_20230917_02_ROV13_Spec291W	9/17/2023 15:17:27	28.93456	−88.20298	1,105	x	x		
ROV-13	NF2306_20230917_02_ROV13_Spec292W	9/17/2023 15:17:43	28.93456	−88.20298	1,105			x	
ROV-13	NF2306_20230917_02_ROV13_Spec293W	9/17/2023 15:17:59	28.93456	−88.20298	1,105			x	
ROV-13	NF2306_20230917_02_ROV13_Spec294W	9/17/2023 15:18:13	28.93456	−88.20298	1,105			x	
ROV-13	NF2306_20230917_02_ROV13_Spec295W	9/17/2023 15:18:23	28.93456	−88.20298	1,105			x	
ROV-13	NF2306_20230917_02_ROV13_Spec304W								x
ROV-14	NF2306_20230918_02_ROV14_Spec305W	9/18/2023 14:22:00	28.78723	−88.63467	925	x			
ROV-14	NF2306_20230918_02_ROV14_Spec308W	9/18/2023 14:22:00	28.78723	−88.63467	925	x			
ROV-14	NF2306_20230918_02_ROV14_Spec309W	9/18/2023 14:22:00	28.78723	−88.63467	925			x	
ROV-14	NF2306_20230918_02_ROV14_Spec310W	9/18/2023 14:22:00	28.78723	−88.63467	925			x	
ROV-14	NF2306_20230918_02_ROV14_Spec311W	9/18/2023 14:22:00	28.78723	−88.63467	925			x	
ROV-14	NF2306_20230918_02_ROV14_Spec312W	9/18/2023 14:22:00	28.78723	−88.63467	925			x	
ROV-14	NF2306_20230918_02_ROV14_Spec326W	9/18/2023 14:22:00	28.78723	−88.63467	925			x	

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