

# NOAA Ship *Okeanos Explorer* FY22 Field Season Instructions

**Date Submitted:** December 29, 2021

**Platform:** NOAA Ship *Okeanos Explorer*

This document provides an overview of Fiscal Year 2022 expeditions on NOAA Ship *Okeanos Explorer*. For further details, refer to the expedition-specific project instructions.

**Prepared by:** 

**Dated:** 12/6/2021

Lu Wang  
Knauss Fellow, Expeditions and Exploration/Science and Technology  
NOAA Ocean Exploration


**Approved by:** 

**Dated:** 12/8/2021

Kasey Cantwell  
Operations Chief, Expeditions and Exploration  
NOAA Ocean Exploration

**Approved by:**

**Dated:** 12/09/2021

Rachel Medley   
Division Chief, Expeditions and Exploration  
NOAA Ocean Exploration

**Approved by:** CHROBAK.NICHOLAS  
.JAMES.1241660199

**Dated:**

Digitally signed by  
CHROBAK.NICHOLAS.JAMES.124166  
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Date: 2021.12.22 12:46:57 -05'00'  
Captain Nicholas J. Chrobak  
Commanding Officer  
NOAA Marine Operations Center  
— Atlantic

# I. Overview

*“America’s future depends on understanding the ocean. We explore the ocean because its health and resilience are vital to our economy and to our lives. We depend on the ocean to regulate weather and climate; sustain a diversity of life; for maritime shipping and national defense; and for food, energy, medicine, and other essential services to humankind.”*

— NOAA Office of Ocean Exploration and Research Strategic Plan

## 1. NOAA Ocean Exploration Mission Summary

NOAA Ocean Exploration is the only federal program dedicated to exploring our deep ocean (greater than 200 meters depth), closing prominent gaps in our basic understanding of U.S. deep waters and the seafloor and delivering the ocean information needed to strengthen the economy, health, and security of our nation.

Using the latest tools and technology, NOAA Ocean Exploration explores previously unknown areas of our deep ocean, making discoveries of scientific, economic, and cultural value. Through live video streams, online coverage, training opportunities, and real-time events, NOAA Ocean Exploration allows scientists, resource managers, students, members of the general public, and others to actively experience ocean exploration, expanding available expertise, cultivating the next generation of ocean explorers, and engaging the public in exploration activities. From this exploration, NOAA Ocean Exploration makes the collected data needed to understand our ocean publicly available, so we can maintain the health of our ocean, sustainably manage our marine resources, accelerate our national economy, and build a better appreciation of the value and importance of the ocean in our everyday lives.

### A. Synopsis of *Okeanos Explorer* 2022 Field Season

This document describes planned NOAA Ocean Exploration mission operations for the Fiscal Year 2022 (FY22) field season. These plans are subject to change throughout the year. For a permanent record of actual accomplishments, individual expedition reports will be produced and publicly archived. Additionally, NOAA Ocean Exploration operations during the FY22 field season will extend beyond 250 nautical miles (nm) from the continental United States, and a medical officer is requested to be aboard for all expeditions.

NOAA Ocean Exploration will complete the [Atlantic Seafloor Partnership for Integrated Research and Exploration \(ASPIRE\)](#) campaign in FY22, before transitioning to operations in the Pacific basin. ASPIRE is a major multiyear, multinational, collaborative ocean exploration campaign focused on raising our collective knowledge and understanding of the North Atlantic Ocean. The

North Atlantic Ocean plays a pivotal role to humankind, providing biological and geological resources, ecosystem services such as seafood production and climate regulation, and a route for trade and travel between Europe and the Americas. This campaign has contributed to our understanding of the North Atlantic Ocean's ecosystems, resources, and oceanography, and provides timely and actionable information to support decision-making based on reliable and authoritative science. It also serves as an opportunity for the nation to highlight the uniqueness and importance of deepwater environments. ASPIRE builds on the momentum of past U.S. campaigns and international initiatives to support ecosystem-based management of marine resources. With the signing of the [Galway Statement on Atlantic Ocean Cooperation](#) by the European Union, Canada, and the United States, and the Atlantic Ocean Research Alliance's deep-sea science and exploration efforts, there is significant momentum within the international community to cooperate on integrated exploration and research of the North Atlantic Ocean. Building on previous work in the North Atlantic, including the 2011-2014 Atlantic Canyons Undersea Mapping Expeditions (ACUMEN), NOAA's ASPIRE campaign will provide data to inform research planning and management decisions in the region.

The FY22 field season will begin with the Windows to the Deep: Southeast U.S. ROV and Mapping expedition as part of the final year of the ASPIRE campaign. This expedition will focus on the Blake Plateau region, and include daytime ROV dives, overnight mapping operations, and continuous shoreside participation via telepresence.

Following winter dockside repairs, *Okeanos Explorer* will then undergo a mapping and remotely operated vehicle (ROV) shakedown in the Southeast U.S. before transiting to San Juan, Puerto Rico for two mapping expeditions. A large motivator for this work is the completion of deepwater mapping in the U.S. EEZ around Puerto Rico. These expeditions will also leverage information and capabilities across NOAA to conduct a multidisciplinary project in which the data collected will benefit and address informational needs in high priority areas in the U.S. Caribbean. In addition, the work will help catalyze other regional contributions to the global Seabed 2030 initiative from members of the MesoAmerican Caribbean Hydrographic Commission (MACHC). The higher resolution data would also contribute to improvements in the Tsunami Warning System for the Caribbean and Adjacent regions that NOAA supports. Specifically these data could be integrated into tsunami hazard assessments and modeling, as well as improved tsunami forecasting.

The second mapping expedition will also focus on developing a new concept of operations integrating the collection of imagery data using a drop camera attached to the conductivity temperature and depth (CTD) rosette. Collecting water column and seabed snapshots will help build understanding of ecosystems in between ROV dives.

NOAA Ocean Exploration will then embark on three expeditions as part of the “Voyage to the Ridge” endeavor in the Mid-Atlantic Ridge, which will involve ROV operations and mapping in the high seas of the North Atlantic. These expeditions aim to collect critical baseline information and improve knowledge about unexplored and poorly understood deepwater areas of the Mid-Atlantic Ridge, Azores Plateau, and Charlie-Gibbs Fracture Zone. Geologically, these areas feature a divergent plate boundary, volcanism, and hydrothermal vents. Biologically, there are a variety of marine life supported by the hydrothermal vents and an abundance of hard seafloor, with migration corridors that run through the region that connect the eastern and western shores of the Atlantic Basin.

NOAA Ocean Exploration will conclude Atlantic operations as part of the ASPIRE campaign with the Voyage to the Ridge expeditions, and transit to the Pacific Basin through the Panama Canal to San Diego, California in the fourth quarter of FY22. After *Okeanos Explorer* arrives in the Pacific, NOAA Ocean Exploration will focus initial operations in support of existing [EXPRESS](#) campaign priorities, while also completing any necessary dockside repairs along the U.S. West Coast. EXPRESS priorities will be identified through a SeaSketch call for input. Additionally, on EX2208, NOAA Ocean Exploration and partners will use an AUV (potentially two AUVs, depending on availability) to explore poorly understood areas along the U.S. west coast in addition to closing mapping gaps in the region.

Exploratory mapping work completed during the FY22 field season will directly support the international Seabed 2030 project and the [National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone, also known as the NOMEK Strategy](#). Seabed 2030 aims to bring together all available bathymetric data to produce the definitive map of the world ocean floor by 2030 and make it publically available. The NOMEK Strategy calls for complete mapping of U.S. waters deeper than 40 m by 2030, exploring and characterizing priority areas of U.S. waters, and developing and operationalizing emerging mapping and exploration technologies.

The NOAA Ocean Exploration FY22 expedition field season on *Okeanos Explorer* has been planned to maximize contributions to these key initiatives in U.S. and international waters of the North Atlantic Ocean. The geographic focus of exploration work in FY22 will encompass the Southeast U.S., the Caribbean, the Mid-Atlantic Ridge, and the U.S. West Coast. These areas will be explored by leveraging expertise from other U.S. federal agencies such as the U.S. Geological Survey (USGS) and the Bureau of Ocean Energy Management (BOEM), academic partners, and international partners from other transatlantic countries.

## 2. FY22 Okeanos Explorer Schedule

See expedition-specific project instructions (e.g., EX-22-01) for a detailed accounting of days-at-sea. The general schedule for the field season is shown below in **Table 1**, and is subject to change at any time throughout the year.

**Table 1.** FY22 field season schedule.

Action	Dates	Ports	Expedition Name	Program <sup>1</sup>	DAS	Expedition Coordinator
Depart	10/26/21	Charleston, SC	<b>EX-21-07</b>	OAR	25	Matt Dornback
Arrive	11/15/21	Port Canaveral, FL	Windows to the Deep 2021: SE US ROV and Mapping			
Depart	2/15/22	Key West, FL	<b>EX-22-01</b>	OAR	12	Kim Galvez
Arrive	2/26/22	Port Canaveral, FL	Mapping & ROV Shakedown			
Depart	3/5/22	Port Canaveral, FL	<b>EX-22-02</b>	5% DAS	21	TBD
Arrive	3/25/22	San Juan, PR	Caribbean Mapping (MACHC partnership)			
Depart	4/2/22	San Juan, PR	<b>EX-22-03</b>	OAR	25	Shannon Hoy
Arrive	4/26/22	Newport, RI	North Puerto Rico Mapping + Dropcam			
Depart	5/10/22	Newport, RI	<b>EX-22-04</b>	OAR	24	TBD
Arrive	6/2/22	St. Johns, Newfoundland	Voyage to the Ridge 1 (Mapping)			
Depart	6/10/22	St. Johns, Newfoundland	<b>EX-22-05</b>	OAR	25	TBD
Arrive	7/4/22	Horta, Faial, Azores	Voyage to the Ridge 2 (ROV and Mapping)			

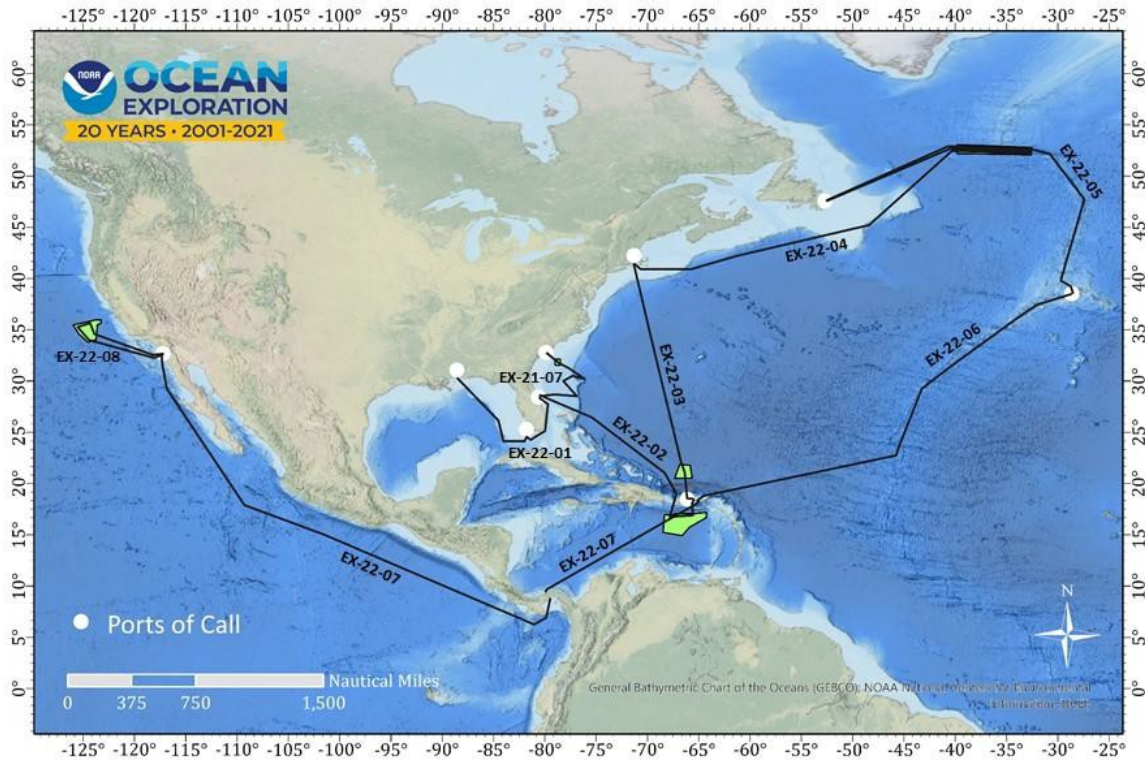
Action	Dates	Ports	Expedition Name	Program <sup>1</sup>	DAS	Expedition Coordinator
Depart Arrive	7/12/22 8/5/22	Horta, Faial, Azores  St. Thomas, U.S. Virgin Islands	<b>EX-22-06</b>  Voyage to the Ridge 3 (ROV and Mapping)	OAR	25	TBD
Depart Arrive	8/13/22 9/3/22	St. Thomas. U.S. Virgin Islands  San Diego, CA	<b>EX-22-07</b>  Panama Canal transit to the West Coast	OAR PFD	22	TBD
Depart Arrive	9/11/22 9/30/22	San Diego, CA  San Diego, CA	<b>EX-22-08</b>  ( <a href="#">EXPRESS</a> ) West Coast Mapping and AUV exploration	OAR PFD	20	TBD

<sup>1</sup> OMAO=Office of Marine and Aviation Operations; OAR=Office of Oceanic and Atmospheric Research, PFD= Program-funded day, 5% DAS = DAS allocated through 5% pool

### 3. Operating Area

**Figure 1** shows the general operating areas for FY22. See the expedition-specific project instructions for specific operating areas.





**Figure 1.** Expected NOAA Ocean Exploration field operations area for FY22 on NOAA Ship *Okeanos Explorer*. Black lines indicate approximate tracklines for each expedition. The light green boxes indicate high priority mapping areas.

The geographic focus of exploration work in FY22 will encompass the Southeast U.S., the Caribbean, the Mid-Atlantic Ridge, and the U.S. West Coast. The Blake Plateau region offshore of the Southeast United States has been an area of focused mapping and ROV exploration by NOAA Ocean Exploration and partners for the past several years. FY22 will see the completion of NOAA Ocean Exploration [ASPIRE](#) campaign activities in the Blake Plateau with the Windows to the Deep ROV and Mapping Expedition (EX-21-07), which will continue to explore and map unexplored regions of the Blake Plateau, focusing on areas deeper than 400 m. NOAA Ocean Exploration will then focus mapping efforts to the Caribbean, with two mapping expeditions and additional drop camera objectives. These activities will focus on deep water areas, and will address high priority areas in the South Atlantic, specifically around Puerto Rico. Following these expeditions, *Okeanos Explorer* will transit to the Mid-Atlantic Ridge for the Voyage to the Ridge project that includes one mapping focused expedition and two ROV focused expeditions to explore the biology and geology of the surrounding area. NOAA Ocean Exploration will then transit to the Pacific Basin through the Panama Canal, and complete the FY22 field season with AUV and mapping operations along the U.S. West Coast.

The priority focused mapping areas are shown as colored polygons in **Figure 1**. Priority focused mapping areas for the FY22 field season include a small remaining portion of the Blake Plateau, the far northern and far southern portions of the U.S. EEZ surrounding Puerto Rico, the Charlie-Gibbs Fracture Zone, and a large region of the U.S. EEZ southwest of Monterey Canyon. In addition, extensive new mapping data will be collected over extensive parts of the Mid-Atlantic Ridge.

The first expedition of FY22 will be the 25-day Windows to the Deep ROV and Mapping expedition along the Southeast U.S., focusing on the Blake Plateau region. This expedition will include daytime ROV dives, overnight mapping operations, and continuous shoreside participation via telepresence. Following this expedition, *Okeanos Explorer* will transit to Pascagoula, Mississippi for winter dockside repairs. The second expedition of FY22 will be a complete shakedown (testing, troubleshooting, and calibration) of all ocean mapping systems and the dual-body ROV system of *Deep Discoverer* and *Seirios*. This 12-day shakedown expedition will be completed between the ports of Key West, Florida, and Port Canaveral, Florida.

Following the shakedown expedition, the ship will transit from Port Canaveral to San Juan, Puerto Rico, for a 21-day mapping expedition in support of the MACHC. This expedition will focus on deep waters of the Caribbean, and will provide bathymetric coverage for this significant mapping gap in the U.S. Exclusive Economic Zone (EEZ) This project is directly responsive to the NOMECS [Strategy](#) and contributes to Seabed 2030 objectives. The ship will then embark on a 25-day mapping expedition covering north Puerto Rico and ending in Newport, Rhode Island. This expedition will also see the demonstration of a drop camera to explore the water column and seabed.

From Rhode Island, the ship will transit to St. Johns, Newfoundland, to begin the three-part series of expeditions (Voyage to the Ridge) to map and explore the Mid-Atlantic Ridge (see **Figure 1**). This is a 74-day, telepresence-enabled project. The first expedition of the series will focus on mapping the region of the Charlie-Gibbs Fracture Zone. The second expedition will involve mapping and ROV exploration of the Mid-Atlantic Ridge from the Charlie-Gibbs Fracture Zone to the Azores. The third and final expedition in the series will conduct mapping and ROV exploration of the Mid-Atlantic Ridge south of the Azores and ending in St. Thomas. Live video and data from the ROV dives and multibeam sonar mapping operations will be shared in real time with shore-based participants and the public. Mapping data collected during Voyage to the Ridge 2022 will help improve fundamental understanding of this region and facilitate ROV dive planning. ROV dives ranging from 250 to 6,000 meters deep are anticipated, with transit days planned to optimize operations in priority areas. ROV dives are expected to explore deep-sea



coral and sponge habitats, potential hydrothermal vent and extinct polymetallic sulfide systems, fracture and rift zones, and the water columns. CTD rosette operations are also expected.

NOAA incorporated the 2020 and 2021 Calls for Input, [results from the 2018 ASPIRE Workshop](#), and priorities from resource managers to establish expedition objectives and refine the operating areas. In the months leading up to the expedition, collaborative planning calls will be held to further refine these operating areas into specific ROV dive targets and discrete mapping boxes. This expedition will provide high-resolution information about seafloor features and an opportunity for scientists, students, and managers to engage in exploration of this largely unknown area in real time. Additionally, this expedition will contribute directly to the science objectives of the [ASPIRE](#) and the [Galway Statement on Atlantic Ocean Cooperation](#).

The ship will conclude ASPIRE activities in the Atlantic and transit to the Pacific Basin via the Panama Canal, from St. Thomas, U.S. Virgin Islands, to San Diego, CA, for 22 days at sea. NOAA Ocean Exploration will conclude its FY22 operations with a mapping and ROV expedition along the U.S. West Coast, in partnership with [EXPRESS](#).

## 4. Fiscal Year 2022 Executive Summary of Objectives

### 1. Ship Objectives

- a. Sustain safe operations aboard the ship.
- b. Develop and maintain small boat deployment proficiency for new and long-term ship personnel (weather permitting).
- c. Conduct conductivity, temperature, depth (CTD) operations as requested and at least once per expedition to maintain equipment in working order and ensure proficiency of ship personnel.
- d. Conduct man overboard/ship handling training.
- e. Conduct additional safety training, including standard drills (fire, medical emergency, abandon ship, spill response, etc.).
- f. Provide opportunities for incoming officers to observe and train during mapping and ROV expeditions. This training may include aft-con and dynamic positioning training.
- g. Support training of ship personnel.
- h. Maintain proficiency and training in ROV emergency procedures.
- i. Integrate and deploy an AUV system on EX2208

### 2. Sonar Mapping Objectives

- a. Continue to refine cloud-based mapping data processing workflows:
  - i. Use shoreside data processing contractors for some expeditions in lieu of onboard data processing personnel.

- b. Continue to refine remote mapping watchstanding capabilities:
  - i. Work with the Global Foundation for Ocean Exploration (GFOE) to enable onshore control of sonar data acquisition settings and remote support from Kongsberg for troubleshooting the EM 304 multibeam sonar.
- c. Collect high-quality ocean mapping data:
  - i. Collect the maximum amount of mapping data possible, using all available time including strategic transit mapping. This entails 24-hour-a-day mapping operations for the entirety of the expedition on mapping-only expeditions and approximately 12-hour-per-day mapping operations on combination ROV/mapping expeditions.
  - ii. Execute mapping line plans as defined by onboard mapping personnel, with real-time adjustments made to obtain complete seabed coverage as necessary.
  - iii. Collect mapping data from all or most sonars (synchronization and community priority dependent) in priority areas, including multibeam, split-beam, sub-bottom, and acoustic Doppler current profiler (ADCP) sonars. Focused surveys may also be completed in contingency areas as time allows or to adapt to adverse weather conditions.
  - iv. Collect high-resolution bathymetry in areas with no or low-quality sonar data.
  - v. Use average survey speeds of 8.5-9 kn during mapping operations. Faster transit speeds may occasionally be requested in certain areas and as feasible.
  - vi. Ensure timely operational mode transition from daytime ROV operations to overnight mapping operations.
- d. Map high-priority areas:
  - i. Map seafloor, subseafloor, and water column as deemed priority by policy (NOMECS Strategy) and scientific and resource management community partners, as defined in the Science section below.
- e. Process data:
  - i. Create daily standard bathymetry and backscatter mapping products
  - ii. Conduct ancillary mapping data processing objectives, including reviewing water column data for anomalies and produce images of processed sub-bottom data.
  - iii. Generate a final expedition map showing bathymetric coverage obtained.
  - iv. Generate field estimates of mapping area coverage in square kilometers.

### 3. Mapping Sound Speed Profiling Objectives

- a. Collect expendable bathythermograph (XBT) casts as data quality requires, but no more than six hours apart, during mapping operations using handheld and Atlantic Oceanographic and Meteorological Laboratory automatic XBT launchers.

- i. Maintain CTD capabilities as a backup sound speed profiling method for mapping data requirements. Test casts may be requested by the Senior Survey Technician on a regular basis to maintain this expertise.
- ii. Collect CTD data with the CastAway-CTD, a handheld, hand-deployed CTD deployable up to 100 m depth, as needed. This will be done primarily during EK calibrations, but may be useful in other situations.
- iii. Maintain a calibrated, hull-mounted Reson SVP-70 probe for sound speed measurement at the EM 304 sonar transducer face.
- iv. Maintain a calibrated thermosalinograph as a backup system and do a quality-control check for sound speed values from the SVP 70 probe.

## 4. Science Objectives

- a. Acquire data on deepwater habitats to support scientific and resource management needs and in support of ASPIRE goals.
- b. Map geological features to better understand the geological context of the region and improve knowledge of past and potential future geohazards.
  - i. Collect, document, and preserve geological specimens that can be used to age a geological feature, provide additional insight into the geological context of the region, or improve knowledge of potential geohazards.
- c. Acquire ROV, sonar, and oceanographic data as a foundation to better understand the characteristics of the water column and the pelagic fauna that live there.
- d. Collect high-resolution mapping data in priority areas as dictated by operational needs, as well as input received from the scientific and resource management communities to support ASPIRE and Seabed 2030 goals.
- e. Gather data to support priority underwater cultural heritage (UCH) needs. Acoustically identify potential UCH sites such as shipwrecks as requested by UCH partners and only in water depths where onboard sonars can be reasonably expected to detect such sites. Conduct ROV surveys over potential UCH targets.
- f. Explore areas relevant to resource managers such as essential fish habitat, habitat areas of particular concern, national marine monuments, marine protected areas, and other priority areas for resource management.
- g. Identify, map, and explore the diversity and distribution of benthic habitats, including potential deep-sea coral and sponge communities, fish habitats, and chemosynthetic communities.
  - i. Collect data on habitat size, animal diversity, and density.
  - ii. Focus close-up imaging operations on potential new, rare, and poorly documented species, as well as dominant members of these communities.

- iii. Collect, document, and preserve biological specimens of potential new species, new records, numerically dominant members of the community, other animals to aid in site characterization, and any animals requested and identified as high priority by the scientific community.
- iv. Document substrate types as it relates to characterizing habitat suitability of various deep-sea benthic species.
- v. Support transatlantic connectivity studies through collection of biological specimens.
- vi. Investigate biogeographic patterns and connectivity of deep-sea organisms for use in broader comparisons of deepwater habitats across the Atlantic Basin.
- h. Identify, map, and explore the diversity and distribution of midwater communities and organisms.
  - i. Focus close-up imaging operations on potential new, rare, and poorly documented species, as well as dominant members of these communities.
  - ii. Collect, document, and preserve biological midwater specimens of potential new species, new records, and any other midwater animals identified as high priority by the scientific community.
- i. Continue to refine specimen collection procedures, including the use of the ROV suction sampler and the collection of water samples via ROV-mounted Niskin bottles.
- j. Engage a broad spectrum of the scientific and resource management communities, as well as the public, in telepresence-based exploration.
- k. Conduct operations in conjunction with shore-based exploration command centers and remote science team participants.
- l. Create and provide input into standard science products to provide a foundation of publicly accessible data and information products to spur further exploration, research, and resource management activities.
- m. Collect sun photometer measurements as part of the Exploration Project of Opportunity collaboration with NASA.
- n. Explore the feasibility and functionality of technologies to advance science as it pertains to ocean exploration through technology demonstrations.

Additional science objectives can be found in the expedition-specific supplemental project instructions.

## 5. Data Management Objectives

- a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and resource management activities.

- b. Use daily bathymetric mapping products, user datagram protocols, and scientific computing system mailers to update the [Okeanos Explorer Live Operations Map](#) for onshore situational awareness.
- c. Verify GFOE-managed data systems perform as expected.
- d. Update standard operating procedures (SOPs) to reflect GFOE-managed network changes.
- e. Confirm mapping data file throughput to the shoreside FTP, with raw and/or processed file types specified in the expedition-specific project instructions.
- f. Confirm ROV data and video file throughput to the shoreside FTP, with file types specified in the expedition-specific project instructions.
- g. Cross-train ROV personnel.
- h. Document and improve data management SOPs.
- i. Follow UCH SOPs for any archaeological sites that may be documented and explored during the expedition (see Appendix D).
- j. For ROV expeditions, document samples in the Sample Operations Database Application (SODA) database to create digital tracking and metadata records for all physical specimens.

## 6. Video Engineering Objectives

- a. Provide onboard support for 24-hour mapping and telepresence objectives.
- b. Provide the following very small aperture terminal (VSAT) connectivity: ~15 Mbps ship-to-shore; 5 Mbps shore-to-ship.
- c. Test terrestrial and high-speed satellite links.
- d. Create, document, and collect standard video products.
- e. Facilitate live interactions between the ship and shore.
- f. Continue to test best practices for hosting live interactions.
- g. Verify GFOE-managed telepresence systems perform as expected.

## 7. Outreach Objectives

- a. Engage the general public in ocean exploration through live video and timely content (dive summaries and other updates and mapping products) posted on the NOAA Ocean Exploration website.
- b. Conduct live interactions during all ROV expeditions and select mapping expeditions
- c. Conduct ship tours and port events as COVID-19 protocols allow

NOAA Ocean Exploration is interested in hosting ship tours and potentially port events in FY22. However, opportunities will be closely coordinated with the ship and scoped in light of current COVID-19 protocols. Additional details about any expedition-specific outreach activities will be articulated in the expedition-specific project instructions.

## 8. Remote Explorers-in-Training Objectives (mapping-only expeditions)

- a. Train shore-based explorers-in-training to process sonar data remotely to support field expeditions. Communication and collaboration with onboard mapping personnel will be frequent. NOAA Ocean Exploration is likely offering at-sea Explorer-in-Training Program internships in FY22, but this will be dependent on COVID-19 risks.

## 9. ROV Engineering Objectives

- a. Conduct daytime, or as scheduled, ROV dives on exploration targets.
- b. Conduct ongoing training of engineers and pilots.
- c. Conduct ongoing system maintenance, documentation, and training.
- d. Continue training and testing sampling operations to refine methods for collecting physical specimens during ROV dives.
- e. Continue refining midwater imaging SOP with new lighting first tested during FY21 and potential use of ME20 low light camera.
- f. Continue refining Blueview Multibeam imaging sonar operation for obstacle avoidance and for potential data products (UCH imagery).

## 10. Telepresence-Enabled Science and Exploration Command Centers

- a. Provide operational support and training to scientists and managers to enable remote participation in at-sea operations.
- b. Facilitate outreach and engagement activities and events at exploration command centers and other facilities that host interactions. This objective is COVID-dependent.
- c. Test and refine ship-to-shore communications procedures that engage multiple exploration command centers and other remote participants.
- d. Test and refine operating procedures and products.
- e. Continue refining the use of SeaTubeV3 software to conduct real-time science annotations during ROV dives.



## 5. Participating Institutions

Additional participating institutions will be identified in the expedition-specific supplemental project instructions, if applicable. The following institutions will participate in all FY22 missions.

- National Oceanic and Atmospheric Administration (NOAA), Office of Ocean Exploration and Research — 1315 East-West Highway, Silver Spring, MD 20910 USA
- NOAA, National Centers for Environmental Information — Stennis Space Center, MS, 39529 USA
- University Corporation for Atmospheric Research, Cooperative Programs for the Advancement of Earth System Science — P.O. Box 3000 Boulder, CO 80307 USA
- University of New Hampshire, Center for Coastal and Ocean Mapping/Joint Hydrographic Center — Jere A. Chase Ocean Engineering Lab, 24 Colovos Road, Durham, NH 03824 USA
- Global Foundation for Ocean Exploration — P.O. Box 417, Mystic, CT 06355 USA

## 6. Personnel (Mission Team)

The individuals sailing on each expedition will depend on the objectives of the specific mission. A detailed list of mission personnel sailing on each expedition will be provided in the expedition-specific project instructions.

## 7. Administrative

### 1. Points of Contact

See expedition-specific project instructions.

### 2. Diplomatic Clearances

See expedition-specific project instructions.

### 3. Licenses and Permits

See Appendices A and B for the Endangered Species Act Section 7 Concurrence Letter and Essential Fish Habitat Consultation Letters, respectively.

Other expedition specific licenses and permits will be included in the expedition-specific project instructions, including National Environmental Policy Act documentation.

### 4. Shipments

See the expedition-specific project instructions.

## II. Operations

The Expedition Coordinator will be responsible for ensuring the science personnel are trained in planned operations and knowledgeable of expedition objectives, priorities and environmental compliance procedures. The Commanding Officer will be responsible for ensuring all operations conform to the accepted practices and procedures for the ship.

### 1. Expedition Itinerary

See expedition-specific project instructions.

### 2. Staging and De-staging

See expedition-specific project instructions.

### 3. Operations to be conducted

See expedition-specific project instructions.

### 4. SCUBA Dive Plan

See expedition-specific project instructions.

### 5. Applicable Restrictions

See expedition-specific project instructions.

### 1. Sonar Operations

EM 304, EK60/80, ADCP, and sub-bottom profiler sonar data acquisition are planned for the entire field season. All data acquisition will be conducted in accordance with established standard operating procedures under the direction of the Mapping Team Lead. These operating procedures will include protection measures when operating in the vicinity of marine mammals, sea turtles, or Endangered Species Act-listed species as described in Appendix A of this document.

## III. Equipment

### 1. Equipment and Capabilities Provided by the Ship

See the expedition-specific supplemental project instructions for any equipment changes specific to an individual expedition.

- Kongsberg EM 304 multibeam echosounder
- Kongsberg Simrad EK60/80 split-beam sonars: general purpose transducers and transceivers (18, 120, 200 kHz) and wide band transducers (38 and 70 kHz)
- Knudsen Chirp 3260 sub-bottom profiler
- Teledyne RDI Workhorse Mariner ADCP (300 kHz)
- Teledyne RDI Ocean Surveyor ADCP (38 kHz)
- Lockheed Martin Sippican XBT Mark21 system (Deep Blue probes)
- Atlantic Oceanographic and Meteorological Laboratory automated XBT launcher (Deep Blue probes)
- Sea-Bird SBE 911Plus CTD and deck box
- Sea-Bird SBE 32 carousel and 12 10 L Niskin bottles
- Light scattering sensor (LSS)
- Oxidation-reduction potential (ORP) sensor
- Dissolved oxygen (DO) sensor
- Altimeter sensor and battery pack
- Scientific Computing System (SCS)
- POS/MV with serial data feeds for the GFOE network
- Seapath-380 as part of a new integration to be installed winter 2021-2022
- Sea-Bird SBE-45 MicroTSG thermosalinograph data feeds for the GFOE network
- Kongsberg dynamic positioning system (DP1)
- Electronic Chart Display and Information System (ECDIS)
- Meteorological and weather sensor package with serial data feeds for GFOE the network
- Three Voice over Internet Protocol (VoIP) telephone lines
- One functioning and seaworthy Safety of Life at Sea (SOLAS)-approved fast rescue boat
- One functioning and seaworthy work boat to support operations and personnel transfers
- Hypack software (OMAO license)

## 2. Equipment and Capabilities Provided by NOAA Ocean Exploration and Partners

See the expedition-specific supplemental project instructions for any equipment changes specific to an individual expedition.

- NOAA Ocean Exploration 6,000 m rated *Deep Discoverer* and *Seirios* ROVs
- Microtops II ozone monitor sun photometer and handheld GPS required for NASA Marine Aerosols Network supplementary project
- Sontek CastAway-CTD
- Kongsberg synchronization unit (K-Sync)
- EK80 wideband transceivers (38 and 70 kHz)

- Kongsberg’s Seafloor Information System software and acquisition computer
- EK60/80 acquisition computer
- Sub-bottom profiler acquisition computer
- CTD acquisition computer
- QPS software suite (two licenses)
- Sound Speed Manager software
- GFOE provided VSAT high-speed link (15 Mbps ship-to-shore; 5 Mbps shore-to- ship)
- Backscatter mosaic computer
- Exploration operations networking infrastructure
- MarineStar GPS with satellite corrections serial data feeds provided for the GFOE network
- Telepresence system
- NOAA’s National Centers for Environmental Information’s (NCEI) Cruise Information Management System (CIMS)
- GFOE VoIP system
- GFOE-provided data storage

## IV. Hazardous Materials

### 1. Policy and Compliance

The Expedition Coordinator is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). The Expedition Coordinator and Science Team Lead will be responsible for transporting all mission samples and hazardous materials on and off the ship. By federal regulations and OMAO operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, material safety data sheets (MSDSs), appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures.

Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the science team will include with their project instructions and provide to the Commanding Officer of the ship 30 days before departure:

- A list of chemicals by name with anticipated quantity;
- A list of spill response materials, including neutralizing agents, buffers, and absorbents;
- and

- Chemical safety and spill response procedures, such as excerpts of the program's chemical hygiene plan or SOPs relevant for shipboard laboratories.
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, the science team will notify the ship's Operations Officer regarding quantity, packaging, and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the science team will provide to the Commanding Officer or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material,
- Confirmation that a sufficient amount of neutralizing agents and spill equipment were brought aboard to contain and clean up all of the hazardous material brought aboard by the program, and
- Confirmation that chemical safety and spill response procedures were brought aboard.

Upon departure from the ship, the science team will provide the Commanding Officer or their designee an inventory showing that all chemicals were removed from the vessel. The Commanding Officer's designee will maintain a log to track the science team's hazardous materials. MSDSs will be made available to the ship's complement, in compliance with hazard communication laws.

The science team is expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

## 2. Inventory

See expedition-specific project instructions.

## 3. Chemical Safety and Spill Response Procedures

All safety and spill response procedures will be handled according to OMAO guidelines and following the manufacturer's MSDS which have been provided to the ship's Environmental Compliance Officer (ECO).

## 4. Radioactive Materials

Standard NOAA Ocean Exploration operations aboard NOAA Ship *Okeanos Explorer* do not include any radioactive materials. Should this change, it will be noted in the expedition-specific project instructions.

## V. Additional Projects

### 1. Supplementary Projects

#### 1. NASA Maritime Aerosol Network

During the expedition, the marine aerosol layer observations will be collected for the NASA Maritime Aerosol Network (MAN). Observations will be made by mission personnel (as time allows) with a sun photometer instrument provided by the NASA MAN program.

NOAA Ocean Exploration's Mapping Lead will deliver the resulting data to the NASA MAN primary investigator, Alexander Smirnov. All collected data will be archived and publically available on the [NASA MAN website](#).

The equipment will reside on the ship and will be stewarded by NOAA Ocean Exploration's Mapping Leads. See Appendix C for the information from the survey of opportunity form.

#### 2. NOAA Fleet Ancillary Projects

No NOAA fleet ancillary projects are planned. Should this change, it will be noted in the expedition-specific project instructions.

## VI. Disposition of Data and Reports

### 1. Data Responsibilities

Disposition of data gathered aboard NOAA ships will conform to [NOAA Administrative Order \(NAO\) 212-16 Policy on NOAA Observing Systems Portfolio Management](#), [NAO 212-15 Management of Environmental Data and Information](#), and the [NOAA Plan for Increasing Public Access to Research Results. Procedural Directives](#) from NOAA's Environmental Data Management Committee guide the implementation of these orders.

All data acquired on *Okeanos Explorer* will be provided to public archives without proprietary rights.

### 2. NOAA Ocean Exploration Responsibilities

The Expedition Coordinator will work with the ship's Operations Officer(s) to ensure data pipeline protocols are followed for the final archiving of all data acquired on *Okeanos Explorer* without proprietary rights. Detailed data management plans will be included as an appendix to the expedition-specific project instructions.



## 3. Deliverables

### 1. At Sea

- a. Daily plans of the day (PODs)
- b. Daily internal situation reports (SITREPs)
- c. Summary forms for each CTD rosette cast
- d. Daily summary bathymetry data files
- e. Raw sonar files (EM 304, EK60/80, Knudsen 3260, ADCP)

### 2. Post Expedition

- a. Refined SOPs for all pertinent operational activities
- b. Assessments of all activities

### 3. Science

- a. Multibeam raw and processed data (details noted in the expedition-specific project instructions)
- b. XBT and CTD raw and processed data
- c. EK60/80 raw data
- d. Knudsen Chirp 3260 sub-bottom profiler raw data and processed images
- e. ADCP raw data
- f. Mapping data report
- g. Cruise report (for ROV expeditions only)
- h. Dive summary reports
- i. Daily ROV and sampling products
- j. Raw ROV environmental data
- k. Raw ROV environmental sensor data
- l. Biological and geological specimens
- m. Summary fact sheet (ROV expeditions only, typically one summary for each expedition of a field season)

See the expedition-specific project instructions for any additional products or data deliverables.

## 4. Archive

NOAA Ocean Exploration and OMAO will work together with NCEI's Data Management Team to ensure the documentation and stewardship of acquired datasets in accordance

with NAO 212-15. All expedition-specific project instructions will include a detailed data management plan with relevant information.

## VII. Meetings, Vessel Familiarization, and Expedition Evaluations

### 1. Shipboard Meetings

A safety brief and overview of the plan of the day typically will occur on the bridge each morning at 0800 (0745 for days with ROV dives). Daily operations briefing meetings will be held at a time and location determined by the Operations Officer(s), based on watch schedule, to review the current day and define operations, associated requirements, and staffing needs for the following day. Safety meetings and daily operations briefing meetings may alternatively be conducted using the onboard telephone system (ship-to-ship) to limit the number of people in a room as a COVID-19 mitigation measure, if still applicable at the time of the expedition. The POD will be posted each evening for the next day in specified locations throughout the ship. NOAA Ocean Exploration daily situation reports (SITREPs) will be produced by the Expedition Coordinator. OMAO-related information in SITREPs will be discussed during either the safety or operations briefing meetings. Additionally, the Expedition Coordinator and Operations Officer(s) will meet as needed to discuss OMAO-related information in SITREPs. The Operations Officer(s) will be included on SITREP emails sent to shore to provide additional clarification as needed.

### 2. Pre-expedition Meeting

The Expedition Coordinator and Commanding Officer will conduct a meeting of pertinent mission and ship personnel to discuss required equipment, planned operations, and concerns and establish mitigation strategies for all concerns. This meeting will be conducted before the beginning of the expedition with sufficient time to allow for preparation of the ship and mission personnel. Usually, the Operations Officer(s) will be delegated to help the Expedition Coordinator arrange this meeting.

### 3. Vessel Familiarization Meeting

The Commanding Officer is responsible for ensuring mission personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting will be conducted in the first 24 hours of the expedition's start (prior to departure) and will usually be conducted by the Operations Officer(s). As a COVID-19 mitigation measure, the familiarization meeting may be split into a virtual informational session followed by an in-person safety walkthrough on the ship.

## 4. Post-expedition Meeting

The Commanding Officer is responsible for conducting a meeting no earlier than 24 hours before or seven days after the completion of the expedition to discuss the overall successes, challenges, and shortcomings of the expedition. Concerns regarding safety and efficiency and suggestions for future improvements will be discussed and mitigations for future expeditions will be documented for future use. This meeting will be attended by the applicable ship personnel, the Expedition Coordinator, and mission personnel and will usually be arranged by the Operations Officer(s) and Expedition Coordinator.

## 5. Expedition Evaluation Report

Within seven days of the completion of the expedition, the Expedition Coordinator is to complete a [Marine Operations Customer Satisfaction Survey](#). Submitted form data will be deposited into a spreadsheet for analysis by OMAO management. Though the complete form will not be shared with all ship personnel, specific concerns and praises will be passed along without attribution.

# VIII. Miscellaneous

## 1. Meals and Berthing

The ship will provide meals for the mission personnel listed in the expedition-specific project instructions. Meals will be served three times daily throughout the expedition, beginning one hour before scheduled departure and ending two hours after completion of the expedition. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example, a variety of sandwich items, cheese, fruit, milk, juices, coffee) during what are not typically meal hours. Special dietary requirements for any mission personnel will be made available to the ship's Commanding Officer at least 21 days prior to the expedition.

Berthing requirements, including number and genders of the mission personnel, will be provided to the Operations Officer(s) by the Expedition Coordinator. The Expedition Coordinator and Operations Officer(s) will work together on a detailed berthing plan to accommodate the gender mix of the mission personnel, taking into consideration the current makeup of the ship's complement. If applicable at the time of the expedition, one mission stateroom will be utilized as a medical isolation room for the duration of the FY22 field season for suspected COVID-19 cases while underway. The Expedition Coordinator will be responsible for ensuring the scientific berthing spaces are left in the condition in which they were received, for stripping bedding and linen return, and for the return of any room keys that were issued. The Expedition Coordinator

will also be responsible for the cleanliness of the laboratory spaces and storage areas used by the science team, both during the expedition and at its conclusion prior to departing the ship.

All NOAA federal employees will have proper travel orders when assigned to any NOAA ship. The Expedition Coordinator will ensure that all non-NOAA or nonfederal mission personnel aboard also have proper orders. It will be the responsibility of the Expedition Coordinator to ensure there is a mechanism in place to provide lodging and food to all mission personnel and to reimburse them for associated costs in the event the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled expedition.

Anyone boarding a NOAA vessel gives implied consent to comply with all safety and security policies and regulations, which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999, which forbids the possession and/or use of alcohol and illegal drugs aboard NOAA vessels.

## 2. Medical Forms and Emergency Contacts

All mission personnel must complete the [NOAA Marine Health Services Questionnaire \(NHSQ, NF 57-10-01 \(3-14\)\)](#) in advance of the expedition. A copy of the NHSQ can be obtained from the Expedition Coordinator or the NOAA website.

Mission personnel under the age of 50 must submit an NHSQ every two years, and mission personnel age 50 and above must submit an NHSQ every year. NHSQs must be accompanied by the Tuberculosis Screening Document ([NOAA Form 57-10-02](#)) in compliance with [OMAO Policy 1008: Tuberculosis Protection Program](#), which requires a yearly purified protein derivative (PPD) test or tuberculosis exam).

As of October 7th, 2021, the COVID-19 vaccine is mandatory for all personnel embarking on NOAA ships and aircraft. To sail on a NOAA platform, personnel must be fully vaccinated for COVID-19, which means two weeks after the second shot of either Pfizer/Moderna or two weeks after the single shot of Johnson and Johnson.

Mission personnel must submit their completed COVID-19 vaccination card, NHSQ and Tuberculosis Screening Document, indicating the expedition ship (i.e., *Okeanos Explorer*), to Marine Health Services at the applicable Marine Operations Center (see below) so they are received no later than four weeks prior to the start of the expedition to allow time for additional information to be obtained and submitted should Marine Health Services require it before granting clearance to sail. Mission personnel should take precautions to protect their personally identifiable information (PII) and medical information. The only secure submission process approved by NOAA is [Kiteworks](#) by Accellion, which requires the sender to set up an account

using a valid NOAA email address and password. User accounts may expire after 30 days of inactivity, but new ones can be created as needed to send and receive files.

Mission personnel will receive an email when Marine Health Services clears them to sail if they provide a legible email address on their NHSQ.

Forms and questions should be sent to:

Marine Health Services  
Marine Operations Center – Atlantic 439 W. York Street  
Norfolk, VA 23510  
Telephone: (757) 441-6320  
Fax: (757) 441-3760  
Email: [MOA.Health.Services@noaa.gov](mailto:MOA.Health.Services@noaa.gov)

Prior to departure, the Expedition Coordinator will provide an electronic listing of emergency contacts to the Executive Officer for all embarked mission personnel with the following information: emergency contact name, address, relationship to mission personnel, and telephone number.

COVID-19 guidelines and expectations specific to mission personnel will be included in the expedition-specific project instructions. Any NOAA Ocean Exploration-specific guidelines and expectations will be in addition to OMAO COVID-19 requirements and the Commanding Officer's standing orders for the ship. All mission personnel will be responsible for ensuring their compliance with the COVID-19 guidelines and expectations from both NOAA Ocean Exploration and OMAO.

Mission personnel sailing aboard *Okeanos Explorer* must fill out a [Sailing Contact Form](#) that collects emergency contact information for each person. This information is available to the Operations Officer to fulfill safety requirements to sail.

### 3. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests are provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots.

Operational Risk Management (ORM): As part of a NOAA-wide initiative, risk management procedures will be followed for every operation to be conducted aboard the ship. For each operation, risks will be identified and assessed for probability and severity. Risk mitigation strategies/measures will be investigated and implemented where possible. After mitigation, the residual risk will have to be assessed to make go/no go decisions for the operations. Risk assessment will be ongoing and updated as necessary, particularly for new operations. In addition to over-the-side operations, ORM will also apply to everyday tasks aboard the vessel that pose risk to personnel and property.

- CTD, ROV, and other pertinent ORM documents will be followed by all personnel working aboard *Okeanos Explorer*.
- All onboard personnel can call a halt to operations/activities in the event of a safety concern.

## 4. Communications

The Expedition Coordinator will prepare and submit daily SITREPs to NOAA Ocean Exploration. Sometimes it may be necessary for the Expedition Coordinator to communicate with another vessel, aircraft, or shore facility. Through various modes of communication, the ship is able to maintain contact with the Marine Operations Center on an as needed basis. These methods will be made available to the Expedition Coordinator upon request in order to conduct official business. Communication with the Marine Operations Center is primarily via email and the VSAT link.

[Specific information on how to contact \*Okeanos Explorer\* and all other fleet vessels](#) can be found on the OMAO website.

### Important Telephone and Facsimile Numbers and Email Addresses

#### NOAA Ocean Exploration

Kasey Cantwell, Operations Chief, Expeditions and Exploration Division

Email: [kasey.cantwell@noaa.gov](mailto:kasey.cantwell@noaa.gov)

Cell: (301) 717 - 7776

Rachel Medley, Division Chief, Expeditions and Exploration Division

Email: [rachel.medley@noaa.gov](mailto:rachel.medley@noaa.gov)

Cell: (301) 789 - 3075

NOAA Ocean Exploration Mission Iridium (dry lab): (808) 851 - 3827



## NOAA Ship *Okeanos Explorer*

Telephone methods are listed in order of increasing expense.

*Okeanos Explorer* Cellular: (401) 932-4114

*Okeanos Explorer* Iridium: (808) 659-9179

*Okeanos Explorer* INMARSAT B:

Line 1: 011-870-764-852-328

Line 2: 011-870-764-852-329

Voice over Internet Protocol (VoIP) Phone:

(541) 867-8932

(541) 867-8933

(541) 867-8934

Email: [Ops.Explorer@noaa.gov](mailto:Ops.Explorer@noaa.gov) (include addressee's name in the subject field)

Email: For dissemination of all hands emails while aboard, contact the Expedition Coordinator (firstname.lastname@noaa.gov).

## 5. IT Security

Data related to the mission will be accessible to mission personnel via the GFOE network, which will be accessible via a Wi-Fi connection. In the event that mission personnel require access to the ship's network in addition to the GFOE network, computers must comply with all OMAO IT policies prior to boarding the ship. Specifically, any computer that will be hooked into the ship's network must comply with the OMAO Fleet IT Security Policy 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

- Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system,
- Installation of the latest critical operating system security patches, and
- No external public internet service provider connections.

Completion of these requirements prior to boarding the ship is required.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within three days of embarking.

## 6. Foreign National Guest Access to OMAO Facilities and Platforms

See expedition-specific project instructions.

### References

NMFS. (2013). Compliance Guide for Right Whale Ship Strike Reduction Rule (50 CFR 224.105). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. OMB Control #0648-0580.

## Appendix A: Endangered Species Act Section 7 Concurrence Letter

As required under Section 7 of the Endangered Species Act (ESA), NOAA Ocean Exploration conducted an informal consultation with the NMFS Office of Protected Resources to request their concurrence with NOAA Ocean Exploration's biological evaluation determining that FY22 operations on *Okeanos Explorer* are not likely to adversely affect ESA-listed marine species. NMFS concurred with NOAA Ocean Exploration's determination.

The FY21 Letter of Concurrence will be applied to EX-22-01. A Programmatic Letter of Concurrence is expected to be in place by EX-22-02 for the remainder of the FY22 field season. See the expedition-specific project instructions for the applicable ESA LOC.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Silver Spring, MD 20910

February 3, 2021  
Refer to NMFS No: OPR-2021-00095

Dr. Alan Leonardi  
Director  
Office of Ocean Exploration and Research  
1315 East West Highway  
Silver Spring, Maryland 20910

RE: Concurrence Letter for the National Oceanic and Atmospheric Administration's (NOAA) Office of Ocean Exploration and Research's Section 7 Consultation Pursuant to the Endangered Species Act for Marine Operation Activities on the NOAA Ship *Okeanos Explorer* for the 2021 Field Season

Dear Dr. Leonardi:

On January 14, 2021, the National Marine Fisheries Service (NMFS) received your request for a written concurrence that the NOAA Office of Ocean Exploration and Research's (OER) marine operation activities on the NOAA ship *Okeanos Explorer* for the 2021 field season under the Endangered Species Act (ESA) of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) is not likely to adversely affect species listed as threatened or endangered or critical habitats designated under the ESA. This response was prepared by NMFS pursuant to section 7(a)(2) of the ESA, implementing regulations at (50 C.F.R. §402), and agency guidance for preparation of letters of concurrence.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with agency guidelines issued under section 515 of the Treasury and General Government Appropriations Act of 2001 (Data Quality Act; 44 U.S.C. 3504(d)(1) and 3516). A complete record of this informal consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

#### Background and Consultation History

Previous consultations for NOAA's Office of Ocean Exploration and Research's marine operation activities on the NOAA Ship *Okeanos Explorer* were concluded in 2020, 2019, and 2018 (NMFS 2018a; NMFS 2018b; NMFS 2019; NMFS 2020). Each of these consultations assessed NOAA OER's bathymetric mapping activities in the North Atlantic Ocean. Although similar in scope, these activities differed slightly by geographic location and/or consisted of new sonar technologies added to the NOAA Ship *Okeanos Explorer*. Critical habitats for the following species were proposed since the conclusion of these consultations and may be in the action area of the 2021 survey: lobed star coral (*Orbicella annularis*), boulder star coral (*Orbicella franksi*), mountainous star coral (*Orbicella faveolata*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*), see 85 FR 76302, November 27, 2020.





## Action Agency's Effect Determinations

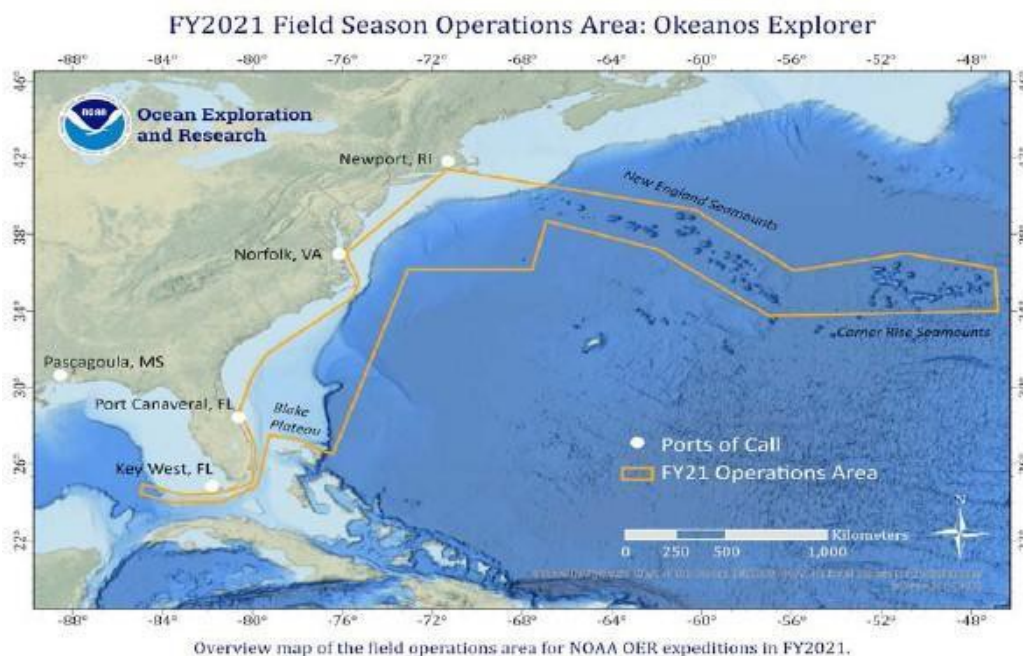
The 2018 to 2019 NOAA OER Biological Evaluation (BE) contained information regarding species and DPSs that may also be affected by the proposed marine operation activities on the NOAA ship *Okeanos Explorer* during the 2021 field season. Your staff provided an analysis and effects determinations for newly proposed ESA-listed coral critical habitat via email for the 2021 request for consultation on January 27, 2021. In the 2018 BE and the 2021 consultation initiation request, you concluded that the marine operation activities on the NOAA ship *Okeanos Explorer* were not likely to adversely affect ESA-listed species or their proposed or designated critical habitat within the action area.

## Proposed Action and Action Area

Although still within the Gulf of Mexico and North Atlantic Ocean, the proposed action area is not the same as that for the 2020 consultation. The 2021 survey area includes additional marine environments within the U.S. exclusive economic zone (EEZ) off the coast of South Carolina extending north to New Jersey and along the New England Seamounts. Other proposed survey areas off the coast of Florida, Georgia and New England were included in the marine operation activities consulted on in 2020 and are contained in the 2021 survey area as well.

In addition to new survey areas, NOAA's Office of Ocean Exploration and Research plans to use additional sonar technology, the Teledyne Blueview Sonar, which was not used in the 2020 survey.

**Figure 1. NOAA OER FY 2021 Field Season Action Area**



## Affected ESA-listed Species and Designated/Proposed Critical Habitat



Based on the information submitted by your office for the 2021 survey, although new areas will be surveyed, we determined that all ESA-listed species consulted on during the 2018, 2019 and 2020 field season would be the same for the 2021 field season. Furthermore, the additional information you provided related to the frequency and source levels of the Teledyne Blueview Sonar system indicated that it will operate at a frequency range (900 kHz to 2,250 kHz), which is outside of the hearing range for ESA-listed species in the action area. Therefore, the addition of this sonar technology to the cruise will not result in additional effects to ESA-listed species.

For this reason, this consultation considers only the potential effects to the proposed coral critical habitats from the 2021 survey.

### **Effects of the Action**

“Effects of the action” has been recently revised to mean all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 C.F.R. § 402.02; see also 50 C.F.R. § 402.17).

The applicable standard to find that a proposed action is not likely to adversely affect ESA-listed species or designated critical habitat is that all of the effects of the action are expected to be extremely unlikely to occur, insignificant, or wholly beneficial. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat. Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. For an effect to be extremely unlikely to occur, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did affect a listed species), but it is very unlikely to occur.

Based on the information submitted by your office, we determined that all newly proposed coral critical habitat would experience the same impacts from the survey as critical habitat that is currently designated for elkhorn and staghorn coral in the action area. This is due to the survey depths of the cruise, which are planned to occur at depths greater than 250 meters, well below the depth distributions for all of the ESA-listed corals that have proposed critical habitat in the action area (See Figure 2). For this reason, we believe the effects of the cruise such as potential stressors associated with vessel transit and operation will be extremely unlikely to occur as previously determined for elkhorn and staghorn coral designated critical habitat. Therefore, the proposed 2021 surveys may affect, but are unlikely to adversely affect proposed coral critical habitat.



**Figure 2.** Depth distributions for ESA-listed corals with proposed critical habitat in the action area (85 FR 76302).

Species	Reef Environment	Depth Distribution	US Geographic Distribution
<i>Dendrogyra cylindrus</i>	most reef environments	1 to 25 m	Southeast Florida from Lake Worth Inlet in Palm Beach County to the Dry Tortugas; Puerto Rico; USVI; Navassa
<i>Mycetophyllia ferax</i>	most reef environments	5 to 90 m	Southeast Florida from Broward County to the Dry Tortugas; Puerto Rico; USVI; Navassa
<i>Orbicella annularis</i>	most reef environments	0.5 to 20 m	Southeast Florida from Lake Worth Inlet in Palm Beach County to the Dry Tortugas; FGB; Puerto Rico; USVI; Navassa
<i>Orbicella faveolata</i>	most reef environments	0.5 to 90 m	Southeast Florida from St. Lucie Inlet in Martin County to the Dry Tortugas; FGB; Puerto Rico; USVI; Navassa
<i>Orbicella franksi</i>	most reef environments	5 to 90 m	Southeast Florida from Lake Worth Inlet in Palm Beach County to the Dry Tortugas; FGB; Puerto Rico; USVI; Navassa

**Conclusion**

Based on this analysis, NMFS concurs with NOAA OER that the effects of the proposed action may affect, but are not likely to adversely affect proposed coral critical habitat.

**Reinitiation of Consultation**

Reinitiation of consultation is required and shall be requested by the NOAA Office of Ocean Exploration and Research or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) take occurs; (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this consultation; (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered in this consultation; or (d) if a new species is listed or critical habitat designated that may be affected by the action (50 C.F.R. §402.16). In the case of this consultation, because the effects of the proposed action on proposed critical habitat for ESA-listed Atlantic/Caribbean corals have been considered in this consultation, we do not anticipate the need for reinitiation should the designation be finalized.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact me at (301) 427-8495 or by email at [cathy.totorici@noaa.gov](mailto:cathy.totorici@noaa.gov) or Jonathan Molineaux at (301) 427-8440 or by email at [jonathan.molineaux@noaa.gov](mailto:jonathan.molineaux@noaa.gov).

Sincerely,

TORTORICI.CATH  
RYN.ELISA.136582  
6850

Digitally signed by  
TORTORICI.CATHRYN.ELISA.1  
365826850  
Date: 2021.02.03 14:54:44 -0500

Cathryn E. Tortorici  
Chief, ESA Interagency Cooperation Division  
Office of Protected Resources

cc: Amanda Maxon  
Environmental Compliance Contractor  
Office of Ocean Exploration and Research

# Appendix B: Essential Fish Habitat Consultation Letters

NOAA Ocean Exploration has completed consultation with NOAA's Habitat Conservation Division on potential impacts of our operations to Essential Fish Habitat (EFH) in the Pacific Region, Greater Atlantic Region, and Southeast Atlantic Region, including the Caribbean Sea. They concurred that our operations would not adversely affect EFH provided adherence to our proposed procedures and their guidance stated in the letter below.

Consultation documents are currently in review. See the expedition-specific project instructions for applicable consultation letters.

# Appendix C: NASA Maritime Aerosols Network Survey of Opportunity

The information below was provided from an exploration of opportunity form submitted to NOAA Ocean Exploration by Dr. Alexander Smirnov.

## Survey or Project Name

Maritime Aerosol Network

## Lead POC or Principle Investigator (PI & Affiliation)

Dr. Alexander Smirnov, NASA

## Activities Description(s) (Include goals, objectives, and tasks)

The [Maritime Aerosol Network \(MAN\)](#) component of AERONET provides ship-borne aerosol optical depth measurements from the Microtops II sun photometers. These data provide an alternative to observations from islands as well as establish validation points for satellite and aerosol transport models. Since 2004, these instruments have been deployed periodically on ships of opportunity and research vessels to monitor aerosol properties over the World Oceans.

# Appendix D: Operational Policies and Procedures for Explorations of Underwater Cultural Heritage Sites

## 1. Purpose

The purpose of this document is to provide guidance for NOAA Ocean Exploration mission activities conducted aboard NOAA Ship *Okeanos Explorer* when such mission activities involve either unexpected discovery or targeted exploration of potential underwater cultural heritage (UCH) sites.

## 2. Background

Since the inception of NOAA's ocean exploration program in 2000, NOAA Ocean Exploration data management practices have been guided by the 2000 President's Panel for Ocean Exploration report recommendations, which prioritized rapid and unrestricted data sharing as one of five critical exploration program components. More recently, Public law 111-11 [Section XII Subtitle A Part 1 Exploration] reinforced and expanded NOAA Ocean Exploration data management objectives, continuing to stress the importance of sharing unique exploration data and information to improve public understanding of the oceans, and for research and management purposes.

NOAA Ocean Exploration missions conducted aboard *Okeanos Explorer* offer a best-case scenario for meeting program mission objectives related to data sharing:

- Dedicated shipboard and shoreside teams work in tandem to ensure near real-time data product generation from shipboard and ROV sensors,
- Telepresence is used to share data products and information in real-time with shoreside participants and the public,
- Mission information is publicly communicated in real time via internet access to streamed video and related resources, and
- Data are managed throughout the lifecycle in accordance with all applicable policy directives and community best practices.

The nature of exploration defines the possibility of discovery, including unexpectedly exposing the location of underwater cultural resources; on some occasions, exploration targets are specifically focused on the exploration of suspected UCH sites. The need to protect the location of suspected UCH sites until they are fully understood, whether purposefully explored or fortuitously discovered, is an important statutory responsibility. During NOAA Ocean Exploration expeditions aboard *Okeanos Explorer*, a range of operational procedures must be modified to

ensure this protection occurs to the fullest extent possible. The following sections of this document define the methods for ensuring protection of these sensitive data throughout the data lifecycle.

## 3. Authority

### A. Marine Archaeology

This document is informed by: the Federal Archaeology Program, U.S. legislation on the treatment of cultural remains, and the UNESCO Convention for the Protection of the Underwater Cultural Heritage. NOAA Ocean Exploration supports the standards for conducting marine archaeological activities enumerated in the annex rules of the UNESCO Convention on the Protection of the Underwater Cultural Heritage.

Preservation and protection of prehistoric and historic cultural resources is the policy of the federal government, and NOAA Ocean Exploration has a responsibility to consider the effects of its activities on these resources. If data are found to be sensitive because they reveal the location of a historically significant cultural resource, Section 304 of the National Historic Preservation Act (NHPA) provides that the head of a federal agency or other public official shall withhold from public disclosure information about the location, character, or ownership of a historic property when disclosure may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners. This document uses the term underwater cultural heritage, or UCH, to refer to historic and prehistoric traces of human existence that are totally or partially underwater.

### B. Data Management

Geospatial data are considered a national capital asset. National policy and international standards guide data management best practices to ensure timely and broad public accessibility to these data. Within NOAA, data management practices are informed by NOAA Administrative Order (NAO) 212-15 Management of Environmental Data and Information, which states in part:

*Environmental data will be visible, accessible, and independently understandable to users, except where limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information), or by security requirements.*

Sensitive UCH data collections require special handling while determinations are made as to whether a location will be nominated and will qualify for protection under the NHPA Section 304. NOAA Ocean Exploration considers these data to fall within the scope of the NAO 212-15 exceptions during this period.

## 4. Roles and Responsibilities

Particular to the NOAA Ship *Okeanos Explorer*, there are many methods employed to ensure rapid and broad data access. When the goal is to restrict access to precise positional information, several operational scenarios must be considered. Alternate operating procedures are then developed for:

- Real-time operations:
  - Routine data transmissions and events that broadcast the ship’s position
  - Seafloor mapping operations and data production
  - Telepresence-enabled remotely operated vehicle (ROV) operations
  - Video annotations and production
  - Public broadcast operations via website and maps
- Post-expedition data management

The tables below summarize the roles and responsibilities of each team lead in implementing the policy through the management approaches described herein and the standard operating procedures (SOPs) as defined in Section V.

**Table 1.** Mission personnel UCH roles and responsibilities (coordinated by the Expedition Coordinator)

Responsible Team	Accountable for These (Primary) Actions
Expedition Coordinator	Notification of nondisclosure agreement to mission personnel; identify, communicate, and enforce UCH buffer zone; coordinate with team leads and key personnel; ensure SOP compliance.
Mapping Team	Segregate raw and processed data into marked files so that restricted data are held separately and are clearly marked.
Telepresence Team	Ensure broadcast data are free of any positional information.
Video Team	Ensure UCH dives and dive products are annotated as such; ensure all raw data and products are not geo-referenced.
Data Management Team	Ensure all UCH data are appropriately segregated and documented. Follow post-expedition and archiving procedures as specified.

Responsible Team	Accountable for These (Primary) Actions
Communications Team	Ensure all communications are controlled through one primary point of contact; ensure communications are not geo-referenced.

**Table 2.** *Okeanos Explorer* crew (ship personnel) UCH roles and responsibilities (coordinated by the Commanding Officer or designee)

Responsible Team	Accountable for These (Primary) Actions
OMAO Operations	Notification to crew of nondisclosure agreement responsibilities; stop scientific computing system (SCS) events (email notifications) upon entering buffer zone; start SCS events (email notifications) upon exiting buffer zone.

## 5. Standard Operating Procedures for UCH

### A. Mapping Operations

The following outlines the process for pre-expedition planning, mapping field operations, post-expedition follow-up, and data archiving procedures for the following scenarios:

- When UCH is unexpectedly discovered on a standard, non-UCH targeted mapping expedition.
- When the expedition is specifically targeted at UCH.
- When an isolated UCH survey is conducted as part of a broader expedition.
- When a large survey is conducted over a UCH area with potential to contain multiple instances of UCH.

### Pre-expedition Planning

#### Standard Mapping Pre-expedition Planning

These SOPs do not affect normal pre-expedition or data management processes for standard mapping expeditions that are not conducting targeted UCH mapping. During pre-expedition planning, the Expedition Coordinator is advised to consult with the NOAA Ocean Exploration Marine Archaeologist to discuss possible UCH targets in the mission area. The mapping team may be requested to optimize line planning as necessary to detect UCH and to process data, when possible, to a smaller nonstandard grid size to create higher resolution mapping products



to provide better images of potential UCH. If so, follow guidance in the UCH Mapping Pre-Expedition Planning section below.

### UCH Mapping Pre-expedition Planning

- Background information: The mapping team should be supplied with information about targets in the survey area that will help in their detection and identification. This information will be supplied by NOAA Ocean Exploration's Marine Archaeologist and collaborating archaeologists.
- Data processing and data products: Archaeologists involved with the survey will consult with the mapping team to discuss data processing and data products that will increase the potential to discover UCH. The Expedition Coordination and Mapping Team will work with NOAA Ocean Exploration's Marine Archaeologist to coordinate this activity.
- Consultation and data sensitivities: Expedition planning must also include a discussion on data sensitivity and data management/archiving. Pre-expedition is the appropriate time to collaborate with other federal and state agencies that may have a legal or management interest in potential UCH in the survey area. The risks to the resources should be weighed to inform a post-expedition decision on whether or not UCH with potential historical or cultural significance should have information about their location restricted from public release. This should be a collaborative discussion that includes NOAA Ocean Exploration's Marine Archaeologist, the Expedition Coordinator, and the expedition data manager along with cultural resource managers and archaeologists from other agencies with an interest in UCH. Possible interested parties include the NOAA Office of National Marine Sanctuaries (ONMS) Maritime Heritage Program, the Bureau of Ocean Energy Management (BOEM), the Bureau of Safety and Environmental Enforcement, the U.S. Navy History and Heritage Command, the National Park Service (NPS), state historic preservation officers, and others. While planning expeditions in any foreign country, the host government should be made aware of the potential to discover UCH.
- Survey areas where an agency has responsibility for UCH: If applicable, the data management team should carry out a consultation process with the agency with UCH responsibility to identify any special protocols that should be put in place to conform with the policies of the agency and these should be incorporated into the data management plan. The Expedition Coordinator is responsible for the overall execution of the data management plan.
- Mapping missions within the National Marine Sanctuary System: If applicable, pre-expedition discussions between the Expedition Coordinator and ONMS should include the ONMS Director of the Maritime Heritage Program and the Maritime Heritage

Coordinator at the sanctuary site. They will help determine the sensitivity of data and data products.

## Mapping Field Operations

### Standard Mapping Field Operations

- While standard mapping field operations are not affected by the marine archaeology SOP, any features which appear to be of cultural or historical significance, and appear anthropogenic in origin, do require special consideration. Cultural features include wrecks of ships or aircraft, the recognizable debris from wrecks, evidence of previous human settlements, and other items which may appear anthropogenic in origin and have some associated cultural or historical significance.
- The Expedition Coordinator will consult with NOAA Ocean Exploration's Marine Archaeologist immediately on the discovery of UCH in the field. The Expedition Coordinator should provide an image and location information by email. The NOAA Ocean Exploration Marine Archaeologist may request special data products that have higher resolutions than standard data products to aid in characterizing the UCH.
- If the UCH is determined not to be historically or culturally significant or it is determined that no harm will result by disclosing position information, no change to standard mapping field procedures is required.
- If the UCH is historically significant or potential to be historically significant, data and data products will be archived but not publicly accessible. The data can be obtained by request and approval from the NOAA Ocean Exploration Marine Archaeologist.
- The Expedition Coordinator is responsible for the overall execution of the data management plan.
- When appropriate, NOAA Ocean Exploration's Marine Archaeologist will contact relevant entities to notify them of the discovery and consult with them regarding the significance of the UCH.

### UCH Targeted Mapping Field Operations

- No informal information about the UCH should be released to the general public by ship or mission personnel. This includes posting information and images on social networking sites like Facebook, Twitter, or personal blogs. Mapping data will be released to the public following the normal process, and announcement of discoveries will be made through the appropriate offices and public affairs officials.
- A 5-nm buffer zone will be created around the UCH isolated survey box. The following steps will be taken just prior to entering the buffer zone in order to stop broadcasting the ship's location while the survey is conducted:

- NOAA Shiptracker: Disable the scientific computing system (SCS) feed from the ship going to Shiptracker.
- Automated information system (AIS): NOAA requires that the AIS feed that broadcasts information about the ship, including position, course and speed, must remain on at all times for collision avoidance and other safety reasons. Although the International Maritime Organization's (IMO) Maritime Safety Committee condemns the internet publication of AIS data, it is easily available for viewing. During the expedition planning phase, the Expedition Coordinator will provide the AIS broadcast range on Okeanos Explorer to the chief scientist and science team. The chief scientist, the science team, and other parties involved in a UCH mapping expedition should be made aware of this and decide whether the value of the operation merits acceptance of the potential issues/outcomes imposed.
- Telepresence video feeds: Do not stream any feeds that include a visible ship location (the multibeam acquisition screen does not have high enough resolution over the video feed to see ship position). Streams include, but are not limited to, the SCS data screen, any active mapping data acquisition screens, and video feeds that show the ship's location. It is acceptable to stream video feeds that do not include the ship's location.
- The Expedition Coordinator will ensure the survey department takes steps to distinguish and separate UCH mapping data from non-UCH mapping data as appropriate.
- Raw multibeam data acquisition: Raw data will be logged in the standard folder structure on the multibeam acquisition computer. Raw data will be copied into a "Restricted" folder in the RAW data network folder structure. Data acquisition and processing logs will clearly state which files are restricted.
- Multibeam data field processing: Restricted files will be processed and gridded separately from other nonrestricted data and will be clearly labeled as such in projects and filenames. The products will be created according to normal field quality-control procedures, but will not be sent to shore with the daily products so that they do not become publicly available via normal channels (e.g., FTP site, NOAA Ocean Exploration Digital Atlas).
- Raw EK60/80 and sub-bottom data acquisition: Raw data will be logged in the standard folder structure on the acquisition computers. Raw data will be copied into a "Restricted" folder on the RAW and CRUISE DATA data network folder structure. Data acquisition and processing logs will clearly state which files are restricted.
- Cruise data transfer (*Okeanos Explorer* to University of New Hampshire) Package: In the cruise data package carried from the ship by the Mapping Team Lead, a "Restricted" top-level directory will be added in the cruise data folder. Within the "Restricted" folder

the same directory structure as the unrestricted folder will be repeated (i.e., SCS, CTD, Multibeam, Imagery, etc.).

- CTD and XBT operations: CTD and XBT data collected within the buffer zone do not need to be isolated from non-UCH data or repressed from the NOAA Ocean Exploration Digital Atlas. CTD and XBT files should follow the normal unrestricted processing procedures and archiving.
- Daily updates: Daily updates are normally linked to the location of the ship at the time the update is posted. If daily updates are made during UCH surveys, no position will be provided. If a position is required, a nearby position outside the 5-nm buffer zone of the survey area can be provided.
- Normal transmissions from the ship will resume after finishing UCH survey operations and exiting the 5-nm buffer zone. Exiting the buffer zone should occur at approximately the same location as entry to prevent obvious data location gaps pointing to the UCH location.

## Post-expedition Follow-up

### Information Release

No informal information about UCH should be released to the general public by ship or mission personnel. This includes posting information and images on social networking sites like Facebook or personal blogs. Mapping data will be released to the public following the normal process, and announcement of discoveries will be made through the appropriate offices and public affairs officials.

### Standard Mapping Expedition Follow-up When UCH is Discovered

- The mapping team will provide a brief summary of the survey and target that includes a description of the survey, water depth, site location, site dimensions, bottom type, and images of the target at the best available resolution.
- The Expedition Coordinator and the NOAA Ocean Exploration Marine Archaeologist will have an initial consultation to discuss the nature of the UCH and its potential significance. This consultation may include other agencies or entities.
- If the UCH is determined not to be historically significant, no change to standard data management procedures is required.
- If the UCH has the potential to be historically significant but it is determined that no harm will result by disclosing position information, such as UCH in deep water, no change to standard data management procedures is required.
- If the UCH has the potential to be historically significant and disclosing information about the site poses a threat, further discussions will be held on how to minimize potential harmful impacts, including data management decisions outlined in the

Post-Expedition Data Management section of this document. The Expedition Coordinator, a representative from the data management team, NOAA Ocean Exploration's Marine Archaeologist, a representative from the ONMS Maritime Heritage Program, and any parties with jurisdiction, management, or other legal ties to the resource will meet to determine what measures are needed to protect the UCH while minimizing impacts on the distribution of data and data products.

### UCH Targeted Mapping Expedition Follow-up

- The mapping team will create a survey report that provides technical details on the survey, data processing, and data products. It should contain a list of targets that includes site location, water depth, site dimensions, bottom type/topography, and images of the target at the best available resolution. Other helpful products include .sd and .kmz files.
- The Expedition Coordinator, NOAA Ocean Exploration's Marine Archaeologist, a representative from the ONMS Maritime Heritage Program, archaeologists involved in the survey, and any parties with jurisdiction, management or other legal ties to the resource will meet to discuss the potential historical significance of the UCH and the sensitivities of releasing data to the public that can be protected under Section 304 of the NHPA. The outcome of this meeting will determine if it is necessary to protect site location information from public release.
  - If it is determined that releasing information and data on the UCH is not a threat, development of products and data management should follow the guidelines for a standard mapping expedition.
  - If it is determined that a site is or has the potential to be historically significant and eligible for nomination to the National Register of Historic Places, the location and data containing the location should not be released to the public.
  - Data products that contain position information will be forwarded to the Data Management Team, and data and products will be stored in an archive with restricted access.
  - Expedition plans, cruise reports, situation reports, mapping summary reports, and other documents that are publically available outside NOAA or freely accessible within NOAA will not provide location information for the UCH or survey areas. In certain circumstances, the Lead Marine Archaeologist for the expedition may request that certain UCH sites not be mentioned in the public reports.

### UCH Mapping Follow-up for National Marine Sanctuaries

When NOAA Ocean Exploration conducts UCH work on *Okeanos Explorer* inside a national marine sanctuary, the Expedition Coordinator will inform the NOAA Ocean Exploration Marine

Archaeologist, ONMS Maritime Heritage Program Director, Sanctuary Superintendent and Sanctuary Maritime Heritage Coordinator on the availability of data products and initial results of the survey. ONMS shall determine the sensitivity of the data and whether or not they can be disclosed to the public. Published metadata will indicate that the point of contact for access to UCH data within the sanctuary system is the ONMS Director.

## B. Telepresence-enabled ROV Operations

The following outlines the process for pre-expedition planning, field operations, post-expedition follow up, and data archiving procedures for the following scenarios:

- When UCH is unexpectedly discovered during non-archaeological operations
- When the expedition includes ROV operations specifically targeted at UCH

### Unexpected UCH Discovery

- During the expedition: If UCH is unexpectedly discovered during an ROV dive, the onboard Expedition Coordinator should immediately contact NOAA Ocean Exploration's Marine Archaeologist and the archaeology "doctors-on-call" identified for that expedition. Those archaeologists should be engaged in the site investigation as soon as possible to provide information to help assess the site discovered. No changes to the data, video, or onboard data acquisition processes should be made. A post-dive and post-expedition discussion will be held with the NOAA Ocean Exploration Marine Archaeologist to determine whether any datasets should be withheld from the archive.
- Follow-up when UCH is unexpectedly discovered:
  - The Expedition Coordinator and the NOAA Ocean Exploration Marine Archaeologist will have an initial consultation to discuss the nature of the UCH and its potential significance. This consultation may include other agencies or entities.
  - If the UCH is determined not to be historically significant, no change to standard data management procedures is required.
  - If the UCH has the potential to be historically significant but it is determined that no harm will result by disclosing position information, such as UCH in deep water, no change to standard data management procedures is required.
  - If the UCH is or has the potential to be historically significant and disclosing location information about the site poses a threat, further discussions will be held on how to minimize potential harmful impacts, including data management decisions outlined in the Post-Expedition Data Management section of this document. The Expedition Coordinator, a representative from the data management team, NOAA Ocean Exploration's Marine Archaeologist, a representative from the ONMS Maritime Heritage Program, and any parties with

jurisdiction, management, or other legal ties to the resource will meet to determine what measures are needed to protect the UCH while minimizing impacts on the distribution of data and data products.

## Expeditions Conducted With ROV Operations Specifically Targeted at UCH

### Pre-Expedition Planning: ROV Exploration

Notifying the Team of their Responsibility to Protect Sensitive UCH Resources: Ship, mission, and NOAA Ocean Exploration personnel have a legal responsibility to protect sensitive archaeological information (primarily location information) from untimely release. For a planned UCH expedition, the Expedition Coordinator will notify the Commanding Officer, and each will be responsible for ensuring their personnel are aware of this responsibility. The Expedition Coordinator will provide an archaeology background document to familiarize personnel with the particular mission and its requirements. See the Non-Disclosure Agreement References section for details of the accountability mechanisms.

### Pre-Dive Planning

- Archaeologists will develop a dive plan based on the best available knowledge of the site that will maximize data recovery and minimize any potential impact to the site. The archaeology team will work closely with the Expedition Coordinator and Global Foundation for Ocean Exploration (GFOE) Team Lead to develop and implement the plan. The plan should include:
  - Objectives (cultural/interdisciplinary science)
  - The types of sensors needed and data to be generated
- ROV dives will not disturb or touch a shipwreck or other cultural features. Exceptions to this rule require the necessary permits, approvals, and notifications based on the location of the dive.
- Prior to the expedition, any permitting requirements should be identified and if required, permits must be procured.
- NOAA requires that the AIS feed that broadcasts information about the ship, including position, course, and speed, must remain on at all times for collision avoidance and other safety reasons. Although the International Maritime Organization's (IMO) Maritime Safety Committee condemns the internet publication of AIS data, it is easily available for viewing. During the expedition planning phase, the Expedition Coordinator will provide the AIS broadcast range on the ship to the chief scientist and science team. The science team, chief scientist, and other parties involved in a UCH mapping expedition should be made aware of this and decide whether the value of the operation merits acceptance of the potential issues/outcomes imposed. A go/no-go decision will be made based on this information.



## Field Operations

Exploration dives by ROV should be planned to collect optical and acoustic images without causing physical disturbance to the UCH. Representatives and leads from operational groups, including the ROV, data, video, and telepresence teams and ship operations should meet to discuss ROV operations and data collection. The guidelines for mapping operations should be followed to ensure site locations are not disclosed during field operations. SOPs with full operational details are available on the ship. A 3-nm buffer zone will be created around the UCH target or isolated survey box. The times at which the ship enters and departs the 3-nm buffer zone needs to be recorded and provided to the Data Management Team Lead for data post-processing. Following work at the site, the ship will return to the site where it first entered the 3-nm buffer zone to continue operations.

The following actions will be taken just prior to entering the 3-nm buffer zone in order to stop broadcasting the ship's location while the survey is conducted:

- NOAA email events: Disable/stop email events (OMAO/ET)
- NOAA Shiptracker: Disable/stop the email updates from the ship going to OMAO/Shiptracker
- SAMOS: Disable/stop the email update to FSU containing METOC and flow- through data, etc.
- GFOE will pause the User Datagram Protocol (UDP) to NOAA Ocean Exploration and Seatube
- Telepresence video feeds (NOAA Ocean Exploration Telepresence Lead):
  - Do not stream any feeds that include the ship's location, including, but not limited to, the SCS data screen, any active mapping data acquisition screens, and video feeds that show the ship's location. It is acceptable to stream video feeds that do not include the ship's location.
  - If highly sensitive features (human remains, evidence of human remains such as shoes or other accoutrements, highly valuable items, etc.) are going to be investigated or are unexpectedly encountered during the course of the seafloor investigation, the Lead Marine Archaeologist, GFOE Team Lead, Expedition Coordinator, and Commanding Officer have the authority to immediately switch the live feed from the ROVs to another camera on the ship.

Daily updates on the NOAA Ocean Exploration Digital Atlas are normally linked to the location of the ship at the time the update is posted. If daily updates are made during UCH surveys, no position will be provided. If a position is required, a nearby position outside of the buffer zone can be reported. Normal transmissions from the ship will resume after finishing UCH survey operations and exiting the 3-nm buffer zone. The point of exit should be as near to the point of entry as feasible to minimize location data gaps pointing to the location of the UCH. No informal



information about the UCH should be released to the general public by ship or mission personnel. This includes posting information and images on social networking sites like Facebook, Twitter, or personal blogs. Images, video, and information on the UCH will be released to the public following the normal process, and announcement of discoveries will be made through the appropriate offices and public affairs officials.

In addition to the items listed, the ship sends out automated weather observations every hour and manual weather observations every six hours with positions. These observations are pulled onto public sites by several different websites and Google Map apps. One example is sailwx.info. This is only accurate to the nearest decimal degree (6 nm). This level of accuracy is not of concern.

## Post-Expedition Data Management

Following completion of the expedition, the Expedition Coordinator should have a follow-up call with the data management team and NOAA OCEAN Exploration Marine Archaeologist to review the datasets collected, confirm those that need to be withheld from the public archive, and provide information to the data management team for associated metadata records.

## Post-Expedition Follow-Up

### Information Release

- No informal information about the UCH should be released to the general public by ship or mission personnel. This includes posting information and images on social networking sites like Facebook or personal blogs. Images, video, and mapping data will be released to the public following the normal process and announcement of discoveries will be made through the appropriate offices and public affairs officials.
- Determination of whether the UCH is potentially eligible for nomination to the National Register of Historic Places (NRHP), or eligible for protection under other legislation such as the Sunken Military Craft Act or National Marine Sanctuary Act, will take some time following completion of the expedition. Sensitive or potentially sensitive information about the UCH is to remain restricted until determination is complete. Following completion of the expedition, the designated Lead Marine Archaeologist will work with others to analyze the UCH data and conduct historical research to determine whether the UCH is eligible for nomination to the NRHP.
  - If the UCH is determined to be eligible, the Lead Marine Archaeologist will prepare the nomination for the NRHP process.
  - If the UCH is determined to NOT be eligible, and protection of the site does not fall under other legislation, the Lead Marine Archaeologist will notify the data management team that site information can be made publicly available.

## UCH Targeted Expedition Follow-Up

- The Expedition Coordinator, NOAA Ocean Exploration's Marine Archaeologist, a representative from the ONMS Maritime Heritage Program, archaeologists involved in the survey, and any parties with jurisdiction, management, or other legal ties to the resource will meet to discuss the potential historical significance of the UCH and the sensitivities of releasing data to the public that can be protected under Section 304 of the NHPA. The outcome of this meeting will determine if it is necessary to protect site location information from public release.
  - If the findings determine that releasing information and data on the UCH is not a threat, development of products and data management should follow the guidelines for a standard ROV expedition.
  - If it is determined that a site is or has potential to be historically significant and eligible for nomination to the National Register of Historic Places, the location and data containing the location should not be released to the public.
  - Data products that contain position information will be forwarded to the expedition's data management team, and data and products will be stored in an archive with restricted access.
  - Expedition plans, cruise reports, situation reports, mapping summary reports, and other documents that are publically available outside NOAA or freely accessible within NOAA will not provide location information for the UCH or survey areas. In certain circumstances, the Lead Marine Archaeologist for the expedition may request that certain UCH sites not be mentioned in the public reports.

## C. Post-Expedition Data Management

Data collected by NOAA Ocean Exploration that is considered sensitive will be protected from direct public release until such time as a final determination can be made as to permanent protection. Data in this state will be:

- Fully documented so as to be independently understandable to users,
- Visible through publication of metadata records by NOAA Ocean Exploration,
- Accessible upon request to NOAA Ocean Exploration (controlled access by permission), and
- Preserved in NOAA archives as “restricted” (not available for direct public access).

These data will not be available for direct public access unless and until the UCH with which they are associated is eliminated from consideration for nomination to the NRHP (NHPA Section 304) or for protection under other legislation such as the Sunken Military Craft Act or National Marine Sanctuary Act. If the UCH is nominated and accepted for any official protection, then the

exceptional status will be made permanent, and all documentation updated and finalized as such.

Data generated by expeditions on *Okeanos Explorer* are archived under a data management agreement with NCEI. Only data that have the potential to reveal the nature and location of the UCH will be restricted from public access. In accordance with the data management agreement, sensitive data from the expedition will have restricted access at NCEI. To help researchers discover sensitive data, NCEI will publish a metadata record (but not the data) that identifies a point of contact for access. Requests to access the data should be made to the Director of NOAA Ocean Exploration, who may delegate responsibility to the NOAA Ocean Exploration Marine Archaeologist. In lieu of the NOAA Ocean Exploration Marine Archaeologist, the NOAA Ocean Exploration Director may delegate to the Director of the ONMS Maritime Heritage Program.

If data are found to be sensitive because they reveal the location of a historically significant cultural resource, Section 304 of the NHPA provides that the head of a federal agency or other public official shall withhold from public disclosure information about the location, character, or ownership of a historic property when disclosure may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners. Data collected by the expedition that are considered sensitive will be archived in a location where they can be withheld from public disclosure.

Data sets and associated products are housed at NCEI and the NOAA Central Library.

- NCEI will develop appropriate metadata records to post on the NOAA Ocean Exploration Digital Atlas.
- CTD and XBT data collected during mapping operations conducted within the buffer zone will not be repressed from the NOAA Ocean Exploration Digital Atlas and will be held in a public archive.
- Cruise reports, expedition plans, mapping summary reports, and other documents that are publicly available outside NOAA or freely accessible within NOAA should not provide location information for the UCH or survey areas.

Start and end times for the 3-nm buffer zone surrounding the UCH site need to be provided to the data management team. Datasets containing sensitive location information will be restricted in their entirety unless other parsing arrangements have been made. The following datasets may contain sensitive UCH location information and need to be reviewed, post-processed as appropriate, and made restricted, and pertinent metadata records need to be created and made available:

- Multibeam, sub-bottom, and single beam sonar data
- SCS data logs

- All ROV dive products (including associated sensor data)
- CTD rosette and in situ sensor datasets collected in relation to the UCH and within the 3-nm buffer zone
- Imagery with geospatial information (all imagery should be reviewed and geospatial imagery removed before being made public)
- Ship track and other datasets within the buffer zone

## D. Non-Disclosure Agreement References

Ship, mission, and NOAA Ocean Exploration personnel have a legal responsibility to protect sensitive archaeological information (primarily location information) from untimely release. The following summarizes the types of personnel who might be engaged in an expedition on *Okeanos Explorer*, where their responsibility to protect sensitive location information about UCH lies, and whether this responsibility has already been addressed or their signature on a non-disclosure agreement (NDA) is required in order for them to participate in the expedition with planned UCH operations.

- Federally employed scientists agreed not to disclose sensitive information and to adhere to federal laws as part of the terms of their employment with the federal government.
- The crew aboard the ship (ship personnel) are under the Commanding Officer's purview. On *Okeanos Explorer*, all crew are federal employees, and thus agreed not to disclose sensitive information and to adhere to federal laws as part of the terms of their employment with the federal government. This can also include personnel from partner organizations like maritime academies or U.S. Coast Guard personnel.
- Mission personnel (aboard and shoreside) who are not federal employees (including technicians, vehicle operators, students, etc.) are required to sign a non-disclosure agreement to protect sensitive cultural heritage information as part of their contract agreement.
- Other NOAA Ocean Exploration personnel who have access to data and information on the FTP site are either federal employees or contractors and need to be similarly reminded of their responsibilities. NOAA Ocean Exploration contractors signed an NDA as a condition of employment with the federal government (this should be confirmed annually).

At the beginning of the expedition, all personnel need to be notified of their responsibilities as described in the tables below:

**Table 3.** Mission personnel NDA responsibilities (notified by Expedition Coordinator)

Employee Type	Accountability Mechanism for Withholding Sensitive Data	Action
NOAA Federal Employees	NOAA and Federal Contract	Send reminder of contract and provide archaeology background document
Other Mission Contractors (UCAR, ERT Inc., 2020 Company LLC, etc.)	Non-Disclosure Agreement	Confirm all contractors signed NDA, send reminder of contract, and provide archaeology background document
NOAA/Federal Scientists	NOAA and Federal Contract	Send reminder of contract and provide archaeology background document
Other Federal Scientists (BOEM, Navy, NPS, etc.)	Federal Contract	Send reminder of contract and provide archaeology background document
Other Mission Personnel and Scientists	Non-Disclosure Agreement	Get NDA signed

**Table 4.** *Okeanos Explorer* crew (ship personnel) NDA responsibilities (notified by Commanding Officer or designee)

Employee Type	Accountability Mechanism for Withholding Sensitive Data	Action
NOAA Federal Employees	Subject to NOAA and the ship's communications plans and protocols for sensitive data	Send reminder of contract to ship via all hands, and provide archaeology background document
Other Federal Employees (e.g., Public Health Service)	Subject to NOAA and the ship's communications plans and protocols for sensitive data	Sends reminder of contract to ship via all hands and provide archaeology background document
Wage Mariners	Subject to NOAA and the ship's communications plans and protocols for sensitive data	Sends reminder of contract to ship via all hands and provide archaeology background document

# Appendix E: Summary of Mitigation Measures and Best Management Practices

Protective Measures and Best Management Practices (BMPs) Incorporated into the Action. BMPs are required to be incorporated within project instructions, cruise plans and NEPA documentation including financial assistance awards and environmental review memoranda. All applicable BMPs must be communicated to the science leads, boat operators and field staff, and as necessary between ship's crew (Commanding Officer/Master or designee(s), as appropriate) and scientific party in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

Bridge Watchstanders on the *Okeanos Explorer's* bridge will carefully monitor for the presence of marine protected species, and permitted personnel would follow established best management practices (BMPs) to minimize disturbance.

## 1. Minimize Exposure to Elevated Noise Levels

- a. Maintain watch for the presence of marine protected species. Immediately notify the survey department of the proximity of cetaceans and sea turtles. When marine mammals are able to be identified by Bridge Officers or Watch Standers, these observations are noted in the NOAA fleet marine mammal observation log as part of standard practice.
  - i. If a sea turtle is present within 400 m of the ship, the survey department will respond by stopping the pinging of the sub-bottom sonar. The sub-bottom shall remain off until the sea turtle has departed the 400 m safety zone.
  - ii. If cetaceans are present within 400 m of the ship (460 m/500 yards for North Atlantic Right Whales), the vessel would stop if the animal is in danger of colliding with the ship but the mapping sonars would continue transmitting to avoid startle responses. If an observed animal is unable or unwilling to depart the immediate area, sonars will be secured and the ship will slowly move away from the area if feasible.
  - iii. If the cetacean is within 400 m (460 m/500 yards for North Atlantic Right Whales) and is not in danger of collision, reduce speed and seek to avoid the animal as much as possible.
  - iv. The Survey Department will respond by stopping the pinging of the sub-bottom sonar and switching the multibeam sonar into "mammal protection" mode (keeps it pinging but at a source level reduced by 20 decibels). No change will occur to the EK 60/80s. Note: the ADCPs are never run simultaneously with the multibeam and sub-bottom, so they would already be off. The ADCPs are mostly

run when the ship is stationary at a dive site and risk to marine mammals is minimal.

- b. Minimize turning all sonar sound sources on and off as a precautionary measure to avoid possible startling of animals.
- c. When the systems have been shut down for any reason, the multibeam mammal protection mode would be used to turn the multibeam back on first. Only after the multibeam has been brought from mammal protection mode to full power would the sub-bottom profiler and EK 60/80 sonars then be turned back on.
- d. If the multibeam sonar is not being used, but other sonar systems are being turned on, they will be started in lower power settings and will gradually (over a 15 minute time period) be adjusted to higher power settings as appropriate for the water depths to essentially mimic the approach of the “mammal protection” mode of the multibeam.
- e. Start-up and operation of the USBL will be postponed, if porpoises, dolphins or Kogia are sighted within 1093 yards (1000 meters) of the ship.

## 2. Minimize Temporary Disturbance from Human Activity

- a. All in-water work will be postponed when whales are within 100 yards, or other protected species are within 50 yards;
  - i. This includes postponing start-up of the USBL in preparation for an ROV dive.
- b. If porpoises, dolphins or Kogia are sighted within 1093 yards (1000 meters) of the ship, the vessel will postpone start-up and operation of the USBL.
- c. Should a marine protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s); and
- d. No attempts will be made to feed, touch, ride, or otherwise intentionally interact with any marine protected species.

## 3. Minimize Entanglement

- a. Maintain watch for and avoid the presence of marine protected species. Notify the department heads of the proximity of animals;
- b. All in-water work will be postponed when whales are within 100 yards, or other protected species are within 50 yards of the vessel;
- c. Should a marine protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s); and
- d. Individuals participating in the activity will closely monitor the instrument cables at all times while they are deployed.



## 4. Minimize Collisions with Vessels

The [following guidelines](#) for vessel operation in the presence of marine protected species and other marine wildlife are provided by the Bureau of Ocean Energy Management in a Notice to Lessees and Operators, and NOAA Fisheries as part of a Biological Opinion:

### a. Vessel Strike Avoidance

Vessel operators and crew must maintain a vigilant watch for all marine mammals and sea turtles and slow down or stop the vessel or alter course, as appropriate, to avoid striking any marine mammal. These requirements apply when the vessel is in transit and do not apply in any case where compliance will create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel according to the parameters stated below. Visual observers monitoring the vessel strike avoidance zone can be either third-party visual protected species observers or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena. Vessel strike avoidance measures shall be followed during sonar surveys and while in transit.

Vessel personnel should do the following in order to avoid causing injury or death to marine mammals and sea turtles:

- i. Maintain a vigilant watch for marine mammals and sea turtles and slow down or stop their vessel to avoid striking protected species.
- ii. When whales are sighted, maintain a distance of 100 yards (91 meters) or greater from the whale. If the whale is believed to be a North Atlantic right whale, vessel personnel should maintain a minimum distance of 500 yards (460 meters) from the animal (50 CFR 224.103).
- iii. When sea turtles or small cetaceans are sighted, attempt to maintain a distance of 50 yards (45 meters) or greater whenever possible.
- iv. When cetaceans are sighted while a vessel is underway, attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the cetacean has left the area.
- v. Reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised.

- vi. Whales may surface in unpredictable locations or approach slowly moving vessels. When vessel personnel sight animals in the vessel's path or in close proximity to a moving vessel, reduce speed and shift the engine to neutral. Do not engage the engines until the animals are clear of the area.

The vessel must maintain a minimum separation distance of 100 m (328.1 ft) from large whales (i.e. sperm and baleen whales). The following avoidance measures must be taken if a large whale is within 100 m (328.1 ft) of the vessel.

- The vessel must reduce speed and shift the engine to neutral, and must not engage the engines until the whale has moved outside of the vessel's path and the minimum separation distance has been established.
- If the vessel is stationary, the vessel must not engage engines until the whale(s) has moved out of the vessel's path and beyond 100 m (328.1 ft).

b. Additional Requirements for the North Atlantic Right Whale

- i. If a sighted whale is believed to be a North Atlantic right whale, federal regulation requires a minimum distance of 500 yards be maintained from the animal (50 CFR 224.103 ©).
- ii. Vessels entering North Atlantic right whale critical habitat are required to report into the Mandatory Ship Reporting System. Mariners shall check with various communication media for general information regarding avoiding ship strikes and specific information regarding North Atlantic right whale sighting locations. These include NOAA weather radio, U.S. Coast Guard NAVTEX broadcasts, and Notices to Mariners. Commercial mariners calling on United States ports should view the most recent version of the NOAA/USCG produced training CD entitled "A Prudent Mariner's Guide to Right Whale Protection" (contact the NMFS Southeast Region, Protected Resources Division for more information regarding the CD).
- iii. Injured, dead, or entangled right whales should be immediately reported to the U.S. Coast Guard via VHF Channel 16.
- iv. Adherence to seasonal vessel speed restrictions of 10 knots or less as [designated locations](#) along the U.S. east coast.
- v. Adherence to NOAA Compliance Guide for Right Whale Ship Strike Reduction Rule (NMFS, 2013).

## 5. Minimize Vessel Waste and Discharge & Prevent Invasive Species

- a. All vessels operating in areas where ESA-listed species are present will continue to follow MARPOL discharge protocols, but will postpone any authorized discharge if any protected species are within 100 yards of the vessel.
- b. Meet all EPA Vessel General Permits and Coast Guard requirements, and/or NOAA ship-specific guidance that meet compliance goals.
- c. Avoid discharge of ballast water in designated critical habitat.
- d. Use anti-fouling coatings.
- e. Clean hull regularly to remove aquatic nuisance species.
- f. Avoid cleaning of hull in critical habitat.
- g. Avoid cleaners with nonylphenols

## 6. Avoid or Minimize Impacts to Essential Fish Habitat

- a. The vessel would employ the use of dynamic positioning during ROV dives (no anchoring);
- b. ROVs would be operated in a manner to avoid seafloor disturbance, and setting the ROV on the seafloor will be held to a minimum. For those situations when the ROV does make contact with the seafloor, visual observations will be made to confirm that the area the ROV is set down on does not include corals or other fragile animals that can reasonably be avoided;
- c. Sample collections would be limited (typically 4 - 6 total rocks and primary biological specimens per dive) that represent new species, new records, the dominant morphotype animal in a community, or species to support connectivity studies. These specimens would be collected using the ROV's manipulator arms or scoop. Whenever possible, sample collections will be made using the cutting implementation tool on the ROV, and only portions of organisms (<50 cm) will be collected to avoid mortality. Clonal biological specimens (corals, sponges) would be subsampled;
- d. When possible, rock samples will be selected in a way to minimize disturbance to the surrounding environment and to minimize the take of attached organisms.;
- e. After each ROV dive, the vehicles are brought back onboard, thoroughly sprayed with freshwater and allowed to air dry before the next dive. Though marine organisms should not survive this process, the ROV is thoroughly inspected prior to every dive and checked for the presence of biological organisms to prevent the spread of invasive or non-endemic species from one location to another;
- f. Instruments deployed to collect water samples and current data (except for expendable instruments) would not be allowed to contact the seafloor;

- g. The use of detergents and other pollutants which may be washed into the marine environment will be avoided or held to a minimum;
- h. The vessel will adhere to MARPOL discharge regulations at all times during the proposed cruises;
- i. Except in an emergency, the vessel will not anchor while at sea.