



Project Instructions, EX-18-12, Mapping Deepwater Areas in the Caribbean and South Atlantic Bight

Date Submitted: Approved Nov 19 , 2018
Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX-18-12
Project Title: Mapping Deepwater Areas in the Caribbean and South Atlantic Bight
Project Dates: November 28 - December 16, 2018

Prepared by: _____ **Dated:** Oct 15, 2018
LT Nick Pawlenko and Mike White
Expedition Coordinator(s)
Office of Ocean Exploration & Research

Approved by: _____ **Dated:** _____
Craig Russell
Program Manager
Office of Ocean Exploration & Research

Approved by: _____ **Dated:** _____
Captain David Zezula, NOAA
Commanding Officer
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

A. Brief Summary and Project Period

This document contains project instructions for EX-18-12. Operations for this cruise will be conducted 24 hours/day and consist of:

- (5) remotely operated vehicle (ROV) supported DAS
- 24 hour/day Seafloor mapping operations when not operating ROVs
- Recording of EX EM302 multibeam echosounder sonar radiation Patterns in the Atlantic Undersea Test and Evaluation Center (AUTEK) hydrophone range in coordination with the NAVY.
- 1 hydrophone deployment and recovery
- Naval Sensor Deployment over the side (Similar to CTD Ops)

The expedition will commence on November 28th, 2018 in San Juan, Puerto Rico (18.4603° N, 66.1166° W) and conclude on December 16, 2018 in Charleston, SC (41.6127° N, 071.471° W). Operations will include the use of the ship’s deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, Knudsen 3260 chirp sub-bottom profiler sonar, and Teledyne Acoustic Doppler Current Profiler), XBT casts in support of multibeam sonar mapping operations, OER’s two-body ROV Deep *Discoverer* and *Seirios*, and the ship’s high-bandwidth satellite connection for continuous real-time ship-to-shore communications. Operations are planned in the US EEZ, Dominican Republic, Turks and Caicos Islands and Bahamas.

NOAA’s Office of Ocean Exploration and Research (OER) is the only federal organization dedicated to exploring the global ocean. OER works with partners to identify priority areas for exploration; support innovations in exploration tools and capabilities; and encourage the next generation of ocean explorers, scientists, and engineers to pursue careers in ocean exploration and related fields. The data and information collected during our expeditions and the research we fund gives resource managers, the academic community, and the private sector the information they need to identify, understand, and manage ocean resources for this and future generations of Americans.

NOAA Ship *Okeanos Explorer* is the only U.S. federal vessel dedicated to exploring our largely unknown ocean for the purpose of discovery and the advancement of knowledge.



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America's future depends on understanding the ocean. We explore the ocean to make valuable scientific, economic, and cultural discoveries; we explore because ocean health and resilience are vital to our economy and to our lives. Exploration supports NOAA mission priorities and national objectives by providing high-quality scientific information about the deep ocean to anyone who needs it.

In close collaboration with government agencies, academic institutions, and other partners, NOAA's Office of Ocean Exploration and Research (OER) conducts deep-ocean expeditions using advanced technologies on the *Okeanos Explorer*. From mapping and characterizing previously unseen seafloor to collecting and disseminating information about ocean depths, this work helps to establish a foundation of information and to fill data gaps. Data collected on the ship follow federal open-access data standards and are publicly available shortly after an expedition ends. This ensures the delivery of reliable scientific data needed to identify, understand, and manage key elements of the ocean environment. Data collected in support of Naval Operations will be treated as

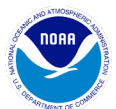
Operations conducted in the AUTECH range will be coordinated with AUTECH and the Navy. All data collected at the AUTECH range must be cleared for public release by the Navy.

B. Days at Sea (DAS)

There are 19 DAS scheduled for this project ; 7 DAS will be funded by Oceanic and Atmospheric Research (OAR) Base Funded Days, 7 DAS will be funded by Naval Undersea Warfare Center (NUWC) and 5 DAS funded by Office of Marine and Aviation Operations (OMAO). This project is estimated to exhibit a High Operational Tempo due to 24 hour operations consisting of ROV Operations, small boat operations, mapping operations, sensor deployments/recoveries and shore-side participation via telepresence.

C. Operating Area

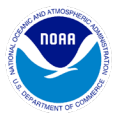
EX-18-12 is a mapping and ROV expedition that will focus operations in the US EEZ, Bahamas, Dominican Republic and Turks and Caicos Islands. Operations will focus in depths generally between 250 and 6000 meters



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Figure 1: Map showing the general expedition operating area for Dec 2-8th



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EX1812: Cruise Track and Operational Area Overview

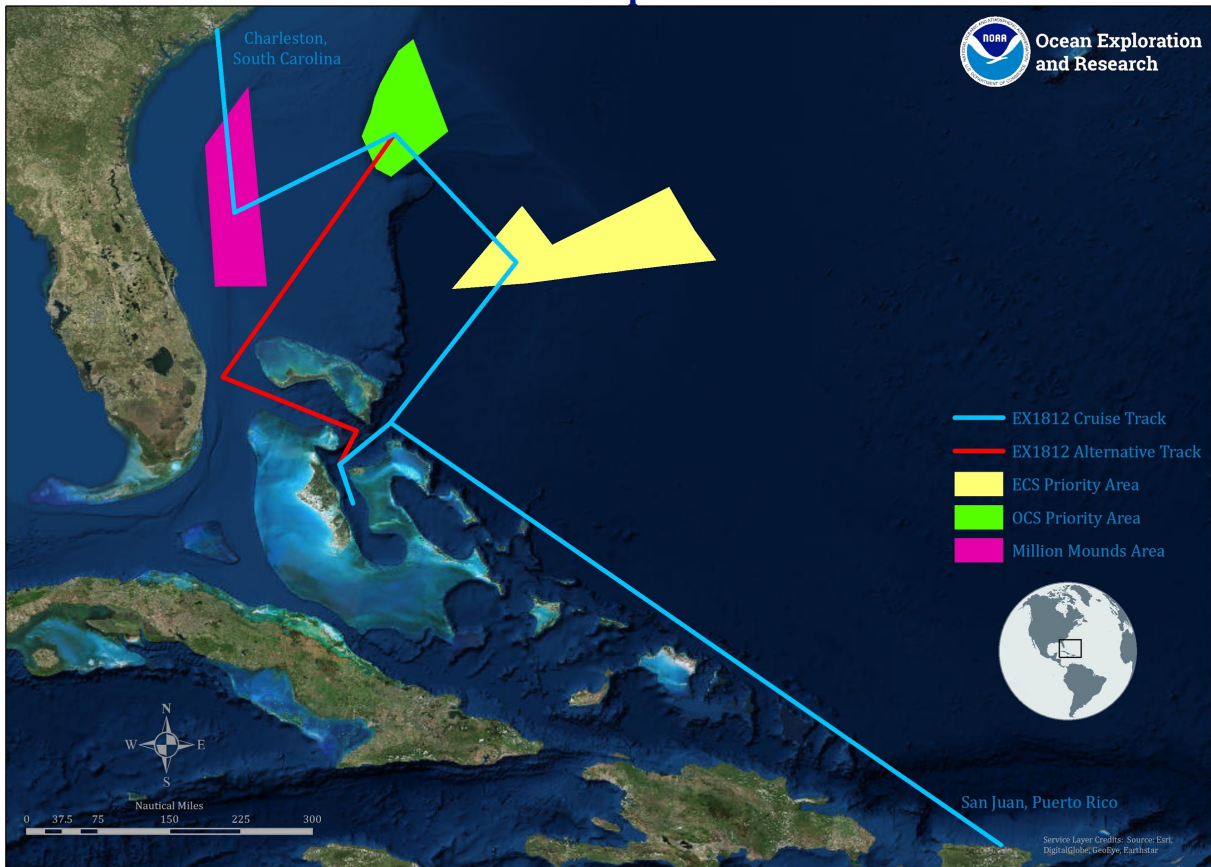


Figure 2: Map showing the general expedition cruise track and potential operational areas.

EX1812 General Cruise Track Vertices		
ID	Latitude	Longitude
1	18° 28.571' N	66° 7.613' W
2	25° 52.680' N	76° 50.207' W
3	25° 8.048' N	77° 41.403' W
4	24° 27.332' N	77° 28.084' W
5	25° 8.014' N	77° 42.275' W
6	25° 55.930' N	76° 46.637' W
7	28° 42.783' N	74° 42.416' W
8	31° 6.136' N	76° 32.756' W
9	29° 32.435' N	79° 32.452' W
10	32° 43.700' N	79° 50.601' W



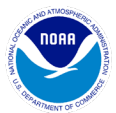
Table 1: Approximate vertices of the proposed EX1812 Cruise track, all coordinates in decimal minutes.

EX1812 Office of Coast Survey, Blake Plateau Priority Area		
ID	Latitude	Longitude
1	32° 22.210' N	76° 40.367' W
2	32° 34.724' N	76° 24.691' W
3	30° 57.973' N	75° 48.009' W
4	30° 10.124' N	76° 47.858' W
5	30° 18.656' N	77° 4.146' W
6	30° 52.931' N	77° 19.022' W
7	31° 17.367' N	77° 9.004' W
8	31° 32.625' N	77° 5.458' W
9	31° 48.259' N	76° 59.400' W
10	32° 22.210' N	76° 40.367' W

Table 2: Approximate vertices of NOAA OCS priority area, all coordinates in decimal minutes.

EX1812 Million Mounds, South Atlantic Bight Area		
ID	Latitude	Longitude
1	28° 15.094' N	78° 58.374' W
2	28° 14.665' N	79° 52.732' W
3	30° 43.073' N	80° 3.619' W
4	31° 44.755' N	79° 18.043' W
5	28° 15.094' N	78° 58.374' W

Table 3: Approximate vertices of Millions Mounds, South Atlantic Bight priority area, all coordinates in decimal minutes.



EX1810 Priority Area 2		
Vertice	Latitude	Longitude
1	29° 45.189' N	72° 25.184' W
2	29° 59.652' N	71° 56.092' W
3	29° 13.630' N	71° 29.016' W
4	28° 42.522' N	71° 6.697' W
5	28° 38.980' N	71° 39.324' W

Table 4: Latitude and longitude in degrees decimal minutes of the bounding coordinates of Priority Area 2.

EX1810 Priority Area 3		
Vertice	Latitude	Longitude
1	28° 24.075' N	73° 43.213' W
2	28° 58.869' N	73° 59.001' W
3	29° 39.221' N	74° 30.532' W
4	29° 37.516' N	74° 32.549' W
5	28° 12.266' N	75° 44.211' W
6	28° 17.990' N	74° 27.381' W

Table 5: Latitude and longitude in degrees decimal minutes of the bounding coordinates of Priority Area 3.

D. Summary of Objectives

November 28 - December 16, 2018 (San Juan, Puerto Rico – Charleston, SC)
 Caribbean/SAB ROV and Mapping. EX-18-12 operations are planned in the US EEZ, Dominican Republic, Turks and Caicos Islands and Bahamas. Mission objectives for EX-18-12 include a combination of Naval Objectives, mapping, science, and data collection/management objectives:

1. Science

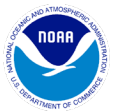


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- a. Acquire data to support marine science and management needs;
 - b. May explore U.S. maritime heritage by investigating sonar anomalies and characterizing shipwrecks.
 - c. Acquire a foundation of sonar, and oceanographic data to better understand the characteristics of the water column and the fauna that live there.
 - d. Collect high-resolution bathymetry in areas with no (or low quality) sonar data;
 - e. 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 management activities;
 - f. Follow UCH SOPs as identified in Appendix H.
 - g. Follow EX Best Management Practices to ensure all mitigation procedures with respects to environmental impacts are followed.
2. Remote Science/Exploration Command Centers
 - a. Provide operational support and training to scientists and managers to enable remote participation in at-sea operations;
 - b. Continue to test best practices for hosting internet-1 based live interactions;
 - c. Facilitate outreach and engagement activities and events at the ECCs and other facilities that host interactions;
 - d. Test and refine ship-to-shore communications procedures that engage multiple ECCs and other remote participants;
3. Video Engineering (VSAT ~15 mb/sec ship-to-shore; 2.5 mb/sec shore-to-ship)
 - a. Test terrestrial and high-speed satellite links;
 - b. Support telepresence operations;
 - c. Collect/create video products for Naval Objectives;
 - d. Facilitate live outreach events between ship and shore;
 - e. Follow UCH SOPs as identified in Appendix H;
4. Mapping
 - a. Collect high resolution mapping data from sonars in priority areas as dictated by operational needs as well as science and management community needs;
 - b. Support ROV operations with mapping products and expertise;
 - c. Conduct mapping operations during transit, with possible further development of exploration targets;
 - d. Collect XBT casts as data quality requires, during mapping operations;
 - e. Create daily standard mapping products;
 - f. Follow UCH SOPs as identified in Appendix H;
 - g. Collect sun photometer measurements as part of survey of opportunity;
 - h. Deploy and recover UNH CCOM Hydrophone sensors (See Appendix K)



- i. Record radiation patterns of the EM302 Multibeam Echosounder, using deployed moored hydrophones and the AUTEAC acoustic array.
5. Data Management
- a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities (all data collected in the AUTEAC range will need to be cleared for public release by the Navy);
 - b. Provide daily products, when possible, to shore for operational decision making purposes;
 - c. Test protocols and procedures for handling the data from the Telestream video recording system;
 - d. Cross train existing ROV dedicated personnel;
 - e. Formalize Data Management SOPs;
 - f. Follow UCH SOPs as identified in Appendix H;
6. Ship
- a. Provide a high quality stable internet connection with the VSAT;
 - b. Provide stable and reliable VoIP telecommunications;
 - c. Continue training new deck department personnel in ROV launch and recovery;
 - d. Develop and maintain proficiency with small boat operations for new and long term crew;
 - e. Conduct CTD winch operations to deploy Naval Sensor;
 - f. Aft Conn Training;
 - g. Follow UCH SOPs as identified in Appendix H;
 - h. Review ROV Emergency Procedures;
 - i. Additional safety training.
7. ROV Engineering
- j. Daytime ROV Operations; Video Survey, no sampling
 - k. Ongoing system maintenance, documentation, and training;
 - l. Follow UCH SOPs as identified in Appendix H.
8. Training of new OER Physical Scientist
- a. EX1812 will provide a valuable opportunity to train the new Physical Scientist/Mapping coordinator
 - b. Training will include familiarization of ship's systems, acquisition procedures, processing procedures, familiarization of data management, participation in planning meetings, participation in onboard operational meetings and orientation of roles and responsibilities at sea.



E. Participating Institutions

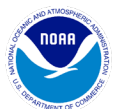
- National Oceanic and Atmospheric Administration (NOAA), Office of Ocean Exploration and Research (OER)–1315 East-West Hwy, Silver Spring, MD 20910 USA
- NOAA, National Oceanographic Data Center, National Coastal Data Development Center, Stennis Space Center MS, 39529 USA
- University Corporation for Atmospheric Research Cooperative Programs for the Advancement of Earth System Science (CPAESS), PO Box 3000 Boulder, CO 80307 USA
- University of New Hampshire (UNH) Center for Coastal and Ocean Mapping (CCOM) Jere A. Chase Ocean Engineering Lab, 24 Colovos Rd, Durham, NH 03824 USA
- Global Foundation for Ocean Exploration, P.O. Box 417, Mystic, CT 06355
- University of Rhode Island Inner Space Center, 215 South Ferry Road Narragansett, RI 02882
- Naval Underwater Warfare Center (NUWC), Newport RI
- US Naval Atlantic Undersea Test and Evaluation Center (AUTEK), Bahamas

F. Personnel (Mission Party)

Mission Berthing:

11/28 - 12/2 (small boat ops on 12/2)

0-1 - Staterooms			
01-14-2	238		CET Dave Blessing
01-20-2	226	U	23rd SCI Nick Pawlenko
		L	ENS Brian Caldwell
01-24-2	227	U	Steven Licht
		L	Wright, D
01-29-2	228	U	Mike White
		L	
01-34-2	229	U	Liam Pilsbury
		L	Matt Thompson
01-42-2	230	U	Rogers, D
		L	Brian, R
		U	Unema, L
		L	McLetchie, K
01-14-3	235	U	Josh Alder
		L	Grady Bolan
		U	Richard Nagle
		L	Robert Mills
01-20-1	234	U	ENS Anna Hallingstad
		L	ENS Brianna Pacheco
01-29-1	233	U	Brian Doros
		L	Todd Gregory
		U	O'Brien, A
		L	Carlson, J
01-34-1	232	U	Neah Baechlor
		L	Shannon Hoy
01-39-1	231	U	Allison Redington
		L	



12/2 -12/8 (small boat ops on 12/2 and 12/8)

0-1 - Staterooms			
01-14-2	238		CET Dave Blessing
01-20-2	226	U	23rd SCI Nick Pawlenko
		L	ENS Brian Caldwell
01-24-2	227	U	David Lovalvo
		L	Wright, D
01-29-2	228	U	Mike White
		L	Kevin Jerram
01-34-2	229	U	Liam Pilsbury
		L	Matt Thompson
01-42-2	230	U	Rogers, D
		L	Brian, R
		U	Unema, L
		L	McLetchie, K
01-14-3	235	U	Georges Dessot
		L	Robert Mills
		U	Michael Smith
		L	Patrick Bordner
01-20-1	234	U	ENS Anna Hallingstad
		L	ENS Brianna Pacheco
01-29-1	233	U	Brian Doros
		L	Todd Gregory
		U	O'Brien, A
		L	Carlson, J
01-34-1	232	U	Neah Baechler
		L	Shannon Hoy
01-39-1	231	U	OER Leadership
		L	Larry Mayer

12/8-12/16 (small boat ops on 12/8)

0-1 - Staterooms			
01-14-2	238		CET Dave Blessing
01-20-2	226	U	
		L	ENS Brian Caldwell
01-24-2	227	U	
		L	
01-29-2	228	U	Mike White
		L	
01-34-2	229	U	
		L	Dan Frietas
01-42-2	230	U	
		L	
		U	Brian, R
		L	
01-14-3	235	U	
		L	
		U	
		L	
01-20-1	234	U	ENS Anna Hallingstad
		L	ENS Brianna Pacheco
01-29-1	233	U	Brian Doros
		L	Andy Obrien
		U	
		L	
01-34-1	232	U	Neah
		L	Shannon Hoy
01-39-1	231	U	
		L	

Table 2: Full list of seagoing mission party members and their affiliations

#	Name (First, Last)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Mike White	Expedition Coordinator / Mapping Lead	11/26	12/17	M	OER	USA



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2	LT Nick Pawlenko	Expedition Coordinator	11/26	12/8	M	OER	USA
3	David Lovalvo	Engineering Lead (GFOE)	12/2	12/8	M	GFOE	USA
4	Josh Carlson	GFOE Engineering team	11/26	12/18	M	GFOE	USA
5	Roland Brian	GFOE Engineering team	11/26	12/18	M	GFOE	USA
6	Levi Unema	GFOE Engineering team	11/26	12/8	M	TBD	USA
7	Andy O'Brien	GFOE Engineering team	11/26	12/17	M	GFOE	USA
8	David Wright	GFOE Engineering team	11/26	12/8	M	GFOE	USA
9	Todd Gregory	GFOE Engineering team	11/26	12/8	M	GFOE	USA
10	Karl McLetchie	GFOE Engineering team	11/26	12/8	M	GFOE	USA
11	Dan Rogers	GFOE Engineering team	11/26	12/8	M	GFOE	USA
12	Georges Dossot	NUWC Technical Staff	12/2	12/8	M	NUWC	USA
13	Liam Pillsbury	NUWC Technical Staff	11/26	12/8	M	NUWC	USA
14	Matthew Thomson	NUWC Technical Staff	11/26	12/8	M	NUWC	USA
15	Patrick Bordner	NUWC Technical Staff	12/2	12/8	M	AUTEC	USA
16	Robert Mills	UNH CCOM Mapping Team	11/26	12/8	M	UNH CCOM	USA
17	Michael Smith	UNH CCOM Mapping Team	12/2	12/8	M	UNH CCOM	USA
18	Kevin Jerram	UNH CCOM Mapping Team	12/2	12/8	M	UNH CCOM	USA
19	Larry Mayer	UNH CCOM Mapping Team	12/2	12/8	M	UNH CCOM	USA



20	Shannon Hoy	Mapping Lead	11/26	12/17	F	OER	USA
21	Daniel Freitas	Mapping Watch Lead	12/8	12/17	M	UCAR	USA
22	Neah Baechler	Mapping Watch Lead	11/26	12/17	F	UCAR	USA
23	Possible 23rd Bunk	OER Leadership	12/2	12/8		OER	USA
24	Brian Doros	GFOE	11/26	12/17	M	GFOE	USA

URI 3D Printing Team onboard for 4 DAS depart via small boat

1	Josh Allder	URI	11/27	12/2	M	URI	USA
2	Grady Bolan	URI	11/27	12/2	M	URI	USA
3	Richard Nagle	URI	11/27	12/2	M	URI	USA
4	Steven Licht	URI	11/27	12/2	M	URI	USA
5	Allison Redington	URI	11/27	12/2	F	URI	USA

G. Administrative

1. Points of Contact:

Ship Operations

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439 West York Street
Norfolk, VA 23510-1145
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Fax: (757) 441-6495

Chief, Operations Division, Atlantic (MOA)
LCDR Ryan Wartick, NOAA
Telephone: (757) 441-6842
E-mail: Chiefops.MOA@noaa.gov

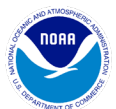
Mission Operations

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Expedition Coordinator / Mapping Lead
NOAA Office of Ocean Exploration and Research (ERT)

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Mobile: 202-631-1790
E-mail: alan.leonardi@noaa.gov

Vessel Shipping Address

1. Shipments

Send an email to the *Okeanos Explorer* Operations Officer at OPS.Explorer@noaa.gov indicating the size and number of items being shipped.

[Contact Name]
TBD

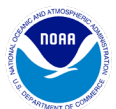
2. Diplomatic Clearances

Marine Science Research Permit pending approval for Bahamas, Turk and Caicos Island and Dominican Republic.

3. Licenses and Permit

Pursuant to the National Environmental Policy Act (NEPA), NOAA OER is required to include in its planning and decision-making processes appropriate and careful consideration of the potential environmental consequences of actions it proposes to fund, authorize and/or conduct. NOAA's Administrative Order (NAO) 216-6A Companion Manual describes the agency's specific procedures for NEPA compliance. Among these is the need to review all proposed NOAA-supported field projects for their environmental effects. An Environmental Review Memorandum has been completed for this survey, in accordance with Section 4 of the Companion Manual. This evaluation document memorandum describes all activities that are part of the SouthEast Deep Coral Initiative (SEDCI). (Appendix C).

Informal consultation was initiated under Section 7 of the Endangered Species Act (ESA), requesting NOAA Fisheries' Protected Resources Division concurrence with our biological



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evaluation determining that *Okeanos Explorer* operations conducted as part of SEDCI, may affect, but are not likely to adversely affect, ESA-listed marine species. The informal consultation was completed on July 13th 2017 when NOAA NCCOS received a signed letter from the Regional Administrator of South East Regional Office, stating that NMFS concurs with OER's determination that conducting proposed *SEDCI* cruises are not likely to adversely affect ESA-listed marine species (Appendix D).

OER has now completed consultation with NOAA's Habitat Conservation Division on potential SEDCI impacts of our operations to Essential Fish Habitat (EFH). They concurred that our operations would not adversely affect EFH provided adherence to our proposed procedures and their guidance stated in the letter (Appendix E).

II. Operations

The Expedition Coordinator is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives, priorities and environmental compliance procedures. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary

All times and dates are subject to prevailing conditions and the discretion of the Commanding Officer. Locations are approximate. Final dive sites will be delivered to the bridge at night for the next day's dive. Mission may need to adjust schedule for ROV and CTD ops based on overall objectives of expedition being met. Mission will inform command of any schedule changes the day before at the daily OPS meeting, with the understanding that Deck OPS will need to be secured at times stated below.

Date	Activities
11/26	EX-18-12 personnel arrive and mobilization. Crane support, Hydraulics and High Voltage may be needed.
11/27	Final personnel arrive and Mobilization. Crane support, Hydraulics and High Voltage may be needed. Operations and safety brief at 1230 for the mission team, followed by introductory meeting with new personnel.
11/28	Depart San Juan, Puerto Rico
11/29	Transit
11/30	Transit / Mapping
12/1	Transit / Mapping
12/2	Arrive 1NM North of Nassau Harbor Lighthouse for personnel transfer via Nassau Harbor Pilotage Boat at approximately 0800. 0900 transit to Naval Operations Area (Figure). 1030 deploy CCOM Hydrophone arrays followed by CTD ops. All deck Ops secured by 1700. Conduct evening mapping objectives.



12/3	ROV Dive 1: 0800 ROV launch, 1830 ROV recovery - All Deck Ops Secured by 1900 - Evening Mapping objectives
12/4	ROV Dive 2: 0800 ROV Launch, 1300 ROV recovery, Navy and UNH CTD ops after ROV recovery - All deck Ops secured by 1700 , Evening Mapping objectives
12/5	ROV Dive 3: 0800 ROV launch, 1830 ROV recovery - All Deck Ops Secured by 1900 - Evening Mapping objectives
12/6	ROV Dive 4: 0800 ROV Launch, 1300 ROV recovery, Navy CTD ops after ROV recovery - All deck Ops secured by 1700 - Evening Mapping objectives
12/7	Day ROV Dive 5: 0800 ROV launch. Possible ½ day ROV ops followed by UNH and Navy CTD ops (schedule will be depended on objectives being met on previous days). All Deck Ops Secured by 1900
12/8	0600 Hydrophone recovery. 0800- 1400 CTD or ROV ops (schedule will be depended on objectives being met on previous days). 1600 Small boat personnel transfer via Nassau Pilotage Boat - All deck Ops secured by 1700
12/9	Transit to South Atlantic Bight/ Blake Plateau
12/10	24 hour mapping operations
12/11	24 hour mapping operations
12/12	24 hour mapping operations
12/14	24 hour mapping operations
12/15	24 hour mapping operations
12/16	Arrive Charleston, SC

Table 2: Detailed Cruise Itinerary. This is an approximate itinerary and is subject to change based on final partner availability, equipment readiness, field conditions, and discretion of the CO.

B. Mobilization and Demobilization

Standard preparation for ROV expeditions is anticipated, which includes hydraulic use and high voltage operations. Also crane support may be needed to load scientific sensors and small winch. Additional equipment mobilization.

1. (1) Hydrophone Array (see Appendix I and K)
 - a. 80 kg air weight each
 - b. (6) 20 kg Olympic weights
2. Small Winch (crane support for mob/demob)
3. Navy Transducer



Minimal de-mobilization is expected. Offload systems at Davisville RI with crane support.

C. Operations to be Conducted

1. Telepresence / Outreach Events

a. TBD

2. In-Port Events

a. TBD

D. SCUBA Dive Plan

All dives are to be conducted in accordance with the requirements and regulations of the [NOAA Diving Program](#) and require the approval of the ship's Commanding Officer. No science dives are planned during EX-18-12, but the ship may plan training, safety drill, or maintenance dives.

E. Applicable Restrictions

Sonar Operations

EM 302, EK 60, ADCP, and sub-bottom profiler data acquisition is planned for this cruise. 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 appendices of this document. The final decision to operate and collect 24-hour sub-bottom profiler data will be at the discretion of the Commanding Officer.

III. Equipment

A. Equipment and capabilities provided by the ship

- Kongsberg Simrad EM302 Multibeam Echosounder (MBES)
- Kongsberg Simrad EK60 Deepwater Echosounders and GPTs (18, 70, 120, 200 kHz)
- Knudsen Chirp 3260 Sub-bottom profiler (SBP)
- Teledyne RDI Workhorse Mariner (300 kHz) ADCP
- Teledyne RDI Ocean Surveyor (38 kHz) ADCP – not operable
- Seabird SBE 911Plus CTD
- Seabird SBE 32 Carousel and 24 2.5 L Niskin Bottles
- LHM Sippican XBT Mark21 System
- POS/MV
- Seabird SBE-45 (Micro TSG)
- Kongsberg Dynamic Positioning-1 System
- Scientific Computing System (SCS)
- ECDIS



- Met/Wx Sensor Package
- 1 functioning and seaworthy SOLAS approved fast rescue boat
- 1 functioning and seaworthy work boat to support ROV operations and personnel transfers
- CTD Winch

B. Equipment and capabilities provided by the scientists

- MarineStar GPS
- Light Scattering Sensor (LSS)
- Oxidation – Reduction Potential (ORP)
- Dissolved Oxygen (DO) sensor
- Altimeter Sensor and battery pack
- Teledyne Underway CTD- currently not on board
- AOML Automated XBT Launcher
- Deep Blue XBT Probes
- Microtops II Ozone Monitor Sun photometer and handheld GPS required for NASA Marine Aerosols Network supplementary project.
- NOAA OER 6000 m *Deep Discoverer* ROV
- NOAA OER *Seirios* Camera Platform
- IVS Fledermaus Software suite
- SIS Software
- QPS software
- Hypack Software
- EK 60 acquisition computer
- Sub bottom profiler acquisition computer
- CTD acquisition computer
- Hypack Software
- GFOE provided VSAT High-Speed link (15 Mbps ship to shore; 5 Mbps shore to ship)
- GFOE VOIP system
- GFOE data storage
- GFOE exploration operations networking infrastructure
- Backscatter Mosaic computer - currently not operable
- Telepresence System
- NCEI Cruise Information Management System (CIMS)
- Netshares mapping storage system
- 2 Hydrophone Arrays - provided by UNH CCOM
- 1 Navy sensor
- 1 small winch
- 3D Printer

IV. Hazardous Materials



A. 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 samples and HAZMAT on and off the ship. By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, 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 scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- 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, notify 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 scientific party will provide to the CO or their designee:

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

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Item	Use	Approx. locations
------	-----	-------------------



95% Denatured Ethanol (20 gallons)	Sample preservation	Wetlab, under the chemical hood
10% Buffered Formalin (2 gallons)	Sample preservation	Wetlab, under the chemical hood
Chaos Buffer (0.5 gallons) (4 M guanidine thiocyanate, 0.5% N-lauroylsarcosine, 25 mM Tris pH 8.0, 0.1 M beta-mercaptoethanol)	Sample preservation (genetics)	Wetlab, under the chemical hood
Aqua Shield	Underwater Lubricant	ROV Workshop Fire Cabinet, Pit
Dow Corning 4	Electrical insulating compound	ROV Workshop Fire Cabinet, Pit
Fluid Film Spray	Silicone Lubricant	ROV Workshop Fire Cabinet
Isopropanol Alcohol (35 gallons)	Solvent	ROV Workshop Fire cabinet
Scotchkote	Electrical insulating compound	ROV Workshop Fire cabinet
3M Silicone Spray	Silicone Lubricant	ROV Workshop Fire cabinet
Synthetic AW Hydraulic Oil, ISO-22	Amsoil (AWG-05)	Hanger, Pit, Vehicles
Tap Magic Cutting Fluid	Cutting/Machining Lubricant	ROV Workshop Fire cabinet
Tap Magic Heavyweight Cutting Fluid	Cutting/Machining Lubricant	ROV Workshop Fire cabinet
Tuff Coat M	Marine Lubricant	Winch room
Dow Corning Molykote 111	Valve Lubricant and Sealant	ROV Workshop Fire cabinet, Pit
WD40	Lubricant	ROV Workshop Fire cabinet
Loktite	Bolt adhesive	ROV Workshop Fire cabinet
Mineral Oil	Vitrea	Hanger, Vehicles
Por-15	Paint Kit	ROV Workshop Fire cabinet
Univis HVI 13	Hydraulic Fluid	Hanger, ROV D2
Ultratane	Butane fuel	ROV Workshop fire cabinet
Rust-oleum	Protective Enamel	ROV Workshop fire cabinet
Flux-Off	Soldering Flux remover	ROV Workshop fire cabinet
Propane	Torch Fuel	ROV Workshop fire cabinet
Adhesive Pliobond 25	General adhesive	Tool room
AP 120 Metal Prep	Degreaser/cleaner for metal surfaces	Pit
Butane Fuel	Torch refill	Tool Room
PVC cement	Adhesive for PFV plastic piping	Tool Room
Phosphoric Acid	Ferrous metal rust removal	Tool room
Pipetite Paste	Plumbing sealant	Tool room/pit
Spindle Oil 10, ROS PT	Lubricant/compensation oil	Tool room



DC557	Silicon grease	Tool room/pit
Tether Potting Catalyst	Two part epoxy catalyst	Pit
Tether Potting Compound	Two part epoxy ingredient	Pit
ThermaPlex Bearing Grease	Lubricant	Pit
Tritech Seaking	Compensator oil for sonar head	Pit
Photoreactive Resin	Resin	Wetlab

C. 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 has been provided to the ship's ECO.

D. Radioactive Materials

NOT APPLICABLE TO THIS CRUISE

V. Additional Projects

A. Supplementary Projects

NASA Maritime Aerosol Network

During the cruise 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. Resulting data will be delivered to the NASA MAN primary investigator Alexander Smirnov by the expedition coordinator. All collected data will be archived and publically available at: http://aeronet.gsfc.nasa.gov/new_web/maritime_aerosol_network.html
Equipment resides on the ship and is stewarded by the Expedition Coordinator. See Appendix G for full Survey of Opportunity Form.

3D Printing Project University of Rhode Island (URI)

A team of 5 from URI will conduct 3D printing for 4 DAS. This should have minimal impact to establish ops. They require an area (32" x 32") in the wetlab to setup their 3D printer on a gimbaled platform that will compensate for rolling, pitching and heaving. Please contact EC for additional information. Link with printer specs: <https://formlabs.com/3d-printers/form-2/>

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.



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VI. Disposition of Data and Reports

A. Data Responsibilities

All data collected in the AUTEK range will be treated as not for public release. This data will be released at the Navy's discretion. The Navy has agreed to release data collected in support of EX SONAR characterization.

All data acquired outside the AUTEK range on *Okeanos Explorer* will be provided to the public archives without proprietary rights. All data management activities shall be executed in accordance with [NAO 212-15, Management of Environmental and Geospatial Data and Information](#)

Ship Responsibilities

The Commanding Officer is responsible for all data collected for missions until those data have been transferred to mission party designees. Data transfers will be documented on NOAA Form 61-29. Reporting and sending copies of project data to NESDIS (ROSCOP form) is the responsibility of OER.

NOAA OER Responsibilities

The Expedition Coordinator will work with the *Okeanos Explorer* Operations Officer to ensure data pipeline protocols are followed for final archive of all data acquired on *Okeanos Explorer* without proprietary rights. See Appendix B for detailed data management plans.

Deliverables

1. At sea
 - a. Daily plans of the Day (POD)
 - b. Daily situation reports (SITREPS)
 - c. Summary forms for each ROV dive
 - d. Database containing records for each sample collection
 - e. Summary forms for each CTD rosette cast
 - f. Daily summary bathymetry data files
 - g. Raw sonar files (EM 302, EK 60, Subbottom, ADCP)
2. Post cruise
 - a. Refined SOPs for all pertinent operational activities
 - b. Assessments of all activities
3. Science
 - a. Multibeam raw and processed data (see appendix B for the formal cruise data management plan)
 - b. XBT raw and processed data
 - c. EK 60 raw data
 - d. Knudsen 3260 sub-bottom profiler raw data
 - e. ADCP raw data
 - f. Mapping data report
 - g. Cruise report



Archive

OER and ship will work together to ensure documentation and stewardship of acquired data sets in accordance with NAO 212-15. The Cruise Information Management System is the primary tool used to accomplish this activity.



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VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Shipboard Meetings

A safety brief and overview of POD will occur on the Bridge each morning at 0800. Daily Operations Briefing meetings will be held at a time and location determined by Operations Officer based on watch schedule, to review the current day, and define operations, associated requirements, and staffing needs for the following day. A Plan of the Day (POD) will be posted each evening for the next day in specified locations throughout the ship. OER Daily Situation Reports (SITREPS) will be produced by onboard Expedition Coordinator (EC). OMAO related information in SITREPS will be discussed during either safety or operations meetings. Additionally, EC and OPS will meet as needed to discuss OMAO related information in SITREPS. The OPS Officer will be cc'd on SITREPS sent to shore to provide additional clarification as needed.

1. Pre-Project Meeting:

The Expedition Coordinator and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Expedition Coordinator in arranging this meeting.

Briefing for operations in the AUTECH Range will be conducted by Navy personnel.

2. Vessel Familiarization Meeting:

The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

3. Post-Project Meeting:

The Commanding Officer is responsible for conducting a meeting no earlier than 24 hours before or seven days after the completion of a project to discuss the overall success, challenges, and shortcomings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the applicable ship's officers, applicable crew, the Expedition Coordinator, and members of the scientific party and is normally arranged by the Operations Officer and Expedition Coordinator.

4. Project Evaluation Report:



Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Expedition Coordinator. The form is available at https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbjp9g/viewform and provides a “Submit” button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ship, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

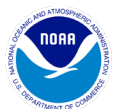
A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. 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, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship’s command at least twenty-one days prior to the survey (e.g., Expedition Coordinator is allergic to fin fish).

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Expedition Coordinator. The Expedition Coordinator and Operations Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current makeup of the ship’s complement. The Expedition Coordinator is 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 which were issued. The Expedition Coordinator is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Expedition Coordinator will ensure that all non-NOAA or non-Federal scientists aboard also have proper orders. It is the responsibility of the Expedition Coordinator to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give 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 illegal drugs and alcohol aboard NOAA Vessels.



B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed 30 days in advance by each participating scientist. The NHSQ can be obtained from the Expedition Coordinator or the NOAA website

<http://www.corporateservices.noaa.gov/noaforms/eforms/nf57-10-01.pdf>.

All NHSQs submitted must be accompanied by [NOAA Form \(NF\) 57-10-02 - Tuberculosis Screening Document](#) in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than four weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below.

Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab," after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email, usually within one business day of your approval. The "Send Tab" function will be accessible for 30 days.

Contact Information:

Regional Director of Health Services

Marine Operations Center – Atlantic

439 W. York Street

Norfolk, VA 23510

Telephone: (757) 441.6320

Fax: (757) 441.3760

E-mail: MOA.Health.Services@noaa.gov

Please make sure the medicalexplorer@noaa.gov email address is cc'd on all medical correspondence.

Prior to departure, the Expedition Coordinator must provide a listing of emergency contacts to the Operations Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

Emergency contact form is included as Appendix A.



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C. 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 will be 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. Hard hats are also 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 will be provided by the ship when required.

Operational Risk Management: For every operation to be conducted aboard the ship (NOAA-wide initiative), risk management procedures will be followed. 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. Particularly with new operations, risk assessment will be ongoing and updated as necessary. This applies to over-the-side operations and 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 onboard *Okeanos Explorer*.
- All personnel onboard are in the position of calling a halt to operations/activities in the event of a safety concern.

D. Communications

A daily OER situation report (SITREP) on operations prepared by the Expedition Coordinator will be relayed to the program office. Sometimes it is 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. The ship's primary means of communication with the Marine Operations Center is via e-mail and the OMAO Very Small Aperture Terminal (VSAT) link.

Specific information on how to contact NOAA Ship *Okeanos Explorer* and all other fleet vessels can be found at <http://www.moc.noaa.gov/MOC/phone.html#EX>

Important Telephone and Facsimile Numbers and E-mail Addresses

Ocean Exploration and Research (OER):

OER Program Administration

Phone: (301) 734-1010

Fax: (301) 713-4252

E-mail: Firstname.Lastname@noaa.gov

University of New Hampshire, Center for Coastal and Ocean Mapping



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Phone: (603) 862-3438

Fax: (603) 862-0839

NOAA Ship *Okeanos Explorer* - Telephone methods listed in order of increasing expense:

Okeanos Explorer Cellular: (401) 713-4114

Okeanos Explorer Iridium:(808) 659-9179

OER Mission Iridium (dry lab): (808) 851-3827

EX INMARSAT B

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

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

Voice Over IP (VoIP) Phone:

(541) 867-8932

(541) 867-8933

(541) 867-8934

E-mail: Ops.Explorer@noaa.gov- (mention the person's name in SUBJECT field)

E-mail: expeditioncoordinator.explorer@noaa.gov for dissemination of all hands emails by Expedition Coordinator while onboard. See ET for password.

E. IT Security

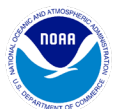
1. Any computer that will be hooked into the ship's network must comply with the OMAO Fleet IT Security Policy 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:
Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
2. Installation of the latest critical operating system security patches.
3. No external public Internet Service Provider (ISP) 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.

F. Foreign National Guests Access to OMAO Facilities and Platforms

There are currently no planned Foreign National Guests.



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Appendix A

EMERGENCY CONTACT DATA SHEET–NOAA SHIP *OKEANOS EXPLORER*

Scientists sailing aboard *Okeanos Explorer* shall fill out the form found at the following link location:

<https://docs.google.com/a/noaa.gov/forms/d/e/1FAIpQLSeybwV9MK0DKVgGf1okc5vZelcxqe9ils4Hi51RrMdfBa1ILg/viewform>

with their emergency contact information and other information



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Appendix B: Data Management Plan

Data Management Plan

Okeanos Explorer (EX1812):
Caribbean/SAB ROV and
Mapping

OER Data Management Objectives

Data collected for the Navy will not be released for public consumption. This includes video and multibeam. OER Data Management Team will manage any data considered unrestricted by the Navy.

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1.1 Name and Purpose of the Data Collection Project

Okeanos Explorer (EX1812): Caribbean/SAB ROV and Mapping

1.2 Summary description of the data to be collected.

Operations will include the use of the ship's deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, Knudsen 3260 chirp sub-bottom profiler sonar, and Teledyne Acoustic Doppler Current Profiler), XBT casts in support of multibeam sonar mapping operations, OER's two-body ROV Deep Discoverer and Seirios, and the ship's high-bandwidth satellite connection for continuous real-time ship-to-shore communications and the ship's high-bandwidth satellite connection for continuous real-time ship-to-shore communications.

Operations are planned in the US EEZ, Dominican Republic, Turks and Caicos Islands and Bahamas.

Operations conducted in the AUTEK range will be coordinated with AUTEK and the Navy. All data collected at the AUTEK range must be cleared for public release by the Navy.

1.3 Keywords or phrases that could be used to enable users to find the data.

expedition, exploration, explorer, marine education, noaa, ocean, ocean discovery, ocean education, ocean exploration, ocean exploration and research, ocean literacy, ocean research, OER, science, scientific mission, scientific research, sea, stewardship,



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systematic exploration, technology, transformational research, undersea, underwater, Davisville, mapping survey, multibeam, multibeam backscatter, multibeam sonar, multi-beam sonar, noaa fleet, okeanos, okeanos explorer, R337, Rhode Island, scientific computing system, SCS, single beam sonar, singlebeam sonar, single-beam sonar, sub-bottom profile, water column backscatter, oceans, Bahamas, Dominican Republic, Turks and Caicos Islands,

1.4 If this mission is part of a series of missions, what is the series name?

Okeanos ROV Cruises

1.5 Planned or actual temporal coverage of the data.

Dates:

11/28/2018 to

12/16/2018

1.6 Planned or actual geographic coverage of the data.

Latitude Boundaries: Longitude Boundaries:

18.47 to

-80.06 to

32.74

-66.12

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1.7 What data types will you be creating or capturing and submitting for archive?

Multibeam (raw), Raw Video (digital), SCS Output (compressed), SCS Output (native), Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw), Cruise Plan, Cruise Summary, Data Management Plan, Highlight Images, Quick Look Report, CTD (processed), CTD (product), CTD (raw), Dive Summaries, EK60 Singlebeam Data, Images, Multibeam (image), Multibeam (processed), Multibeam (product)

1.8 What platforms will be employed during this mission?



NOAA Ship Okeanos Explorer, Deep Discoverer ROV, SEIRIOS Camera Sled

Overall POC: Lt. Nikolai

Pawlenko, Michael White

Title: Co-Expedition

Coordinators

Affiliation/Dept: NOAA Office of Ocean Exploration and Research

E-Mail: nikolai.f.pawlenko@noaa.gov, michael.white@noaa.gov Phone:
401-874-6478, 301-938-8460

Data POC Name: Josh Carlson, Megan Cromwell

Title: GFOE Onboard and Shoreside Data

Manager, Stewardship Data Manager E-Mail:

joshocar@gmail.com, megan.cromwell@noaa.gov

4.1 Have resources for management of these data been identified?

True

4.2 Approximate percentage of the budget devoted to data management. (specify % or "unknown")

unknown

5.1 What is the processing workflow from collection to public release?

SCS data shall be managed by OMAO; Between December 2 and December 8, multibeam and video data shall remain restricted and will not be archived. Otherwise, the multibeam data will be post-processed at the University of New Hampshire's Center for Coastal and Ocean Mapping and delivered to NCEI for documentation and archive.

5.2 What quality control procedures will be employed?

Data gathered between December 2 and December 8 will be quality controlled by the US Navy. Otherwise, the UNH CCOM will be responsible for quality control procedures.

6.1 Does the metadata comply with the Data Documentation Directive?

6.1.1 If metadata are non-existent or non-compliant, please explain:

not applicable

True

6.2 Where will the metadata be hosted?

Organization:

URL:

Meta Std:

An ISO format collection-level metadata record will be generated during pre-cruise planning and published in an OER catalog and Web Accessible Folder (WAF) hosted at NCEI-MS for public discovery and access. The record will be harvested by data.gov.

<https://www.ncddc.noaa.gov/oer-waf/>

ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed; a NetCDF3 standard for oceanographic data will be employed for the SCS data; the Library of Congress standard, MACHine Readable Catalog (MARC), will be employed for NOAA Central Library records.

6.3 Process for producing and maintaining metadata:



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Metadata will be generated via xml editors or metadata generation tools.

7.1 Do the data comply with the Data Access Directive?

7.1.1 If the data will not be available to the public, or with limitations, provide a valid reason.

True

Data collected between December 2 and December 8 will not be made publicly accessible. Between these dates, the US Navy will be exploring within their Atlantic Undersea Test and Evaluation Center.

7.1.2 If there are limitations, describe how data are protected from unauthorized access.

Account access to mission systems are maintained and controlled by the Program. Data access prior to public accessibility is documented through the use of Data Request forms and standard operating procedures.

7.2 Name and URL of organization or facility providing data access.

Org: URL:

National Centers for Environmental Information

<https://www.ncei.noaa.gov>

7.3 Approximate delay between data collection and dissemination. By what authority?

Hold Time: Authority:



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Data that are intended for public release will be made available as soon as possible after the mission end. not applicable

7.4 Prepare a Data Access Statement

No data access constraints, unless data are protected under the National Historic Preservation Act of 1966.

8.1 Actual or planned long-term data archive location:

Unrestricted data from this mission will be preserved and stewarded through the NOAA National Centers for Environmental Information. Refer to the Okeanos Explorer FY18 Data Management Plan at NOAA's EDMC DMP Repository (EX_FY18_DMP_Final.pdf) for detailed descriptions of the processes, procedures, and partners involved in this collaborative effort.

8.2 If no archive planned, why?

8.3 If any delay between data collection and submission to an archive facility, please explain.

For unrestricted data, 60-90 days from NCEI receipt.

8.4 How will data be protected from accidental or malicious modification or deletion?

Data management standard operating procedures minimizing accidental or malicious modification or deletion are in place aboard the Okeanos Explorer and will be enforced.

8.5 Prepare a Data Use Statement

Data use shall be credited to NOAA Office of Ocean Exploration and Research.

Appendix C: Categorical Exclusion

Form Version: September 2017

Categorical Exclusion (CE) Evaluation Worksheet

Project Identifier: EX1812

Date Review Completed: 10/16/2018

Completed by: Craig W. Russell, NOAA Office of Ocean Exploration and Research

OAR Functional Area: OER

Worksheet File Name: 2018-10-OER-G3-EX1812

Step 1. CE applicability

- 1. Is this federal financial assistance, including via grants, cooperative agreements, loans, loan guarantees, interest subsidies, insurance, food commodities, direct appropriations, and transfers of property in place of money?**

no

- 2. What is the proposed federal action?**

The proposed action is:

- 1) Collection of baseline mapping data using the NOAA Ship Okeanos Explorer's sonar systems
- 2) Empirical measurements and characterization of EM302 multibeam echosounder beam patterns within the Atlantic Undersea Test and Evaluation Center (AUTEK) using the U.S. Navy's fixed fixed passive hydrophone array and temporary moored passive hydrophone array provided by the Center for Coastal and Ocean Mapping.
- 3) ROV survey to support the Navy in the AUTEK range using NOAA's two-body remotely operated vehicle (ROV)

ROV operations will include collection of detailed high resolution imagery and digital sensor data collection. Sonar characterization will include the deployment of a non-permanent hydrophone array. Estimated focuses mapping operations will occur within Bahamian and U.S. water and are estimated to last 12-16 days. Included in those days are 6 days of mapping and ROV operations within AUTEK with mapping operations lasting 12 hours or less per day. This action is not associated with subsequent actions.



The expedition will conduct operations in the US Exclusive Economic Zone (EEZ), Dominican Republic, Bahamas and Turks and Caicos Islands and potentially in international waters. ROV operations and hydrophone array deployment are scheduled for Bahamian waters coordinated with the U.S. Navy and Bahamas. The expedition is scheduled to depart Puerto Rico on November 28, 2018 and concluding on December 16, 2018 in Charleston, South Carolina. See Project Instructions EX-18-12 for more details.

3. Which class of CE in Appendix E of the NAO 216-6A Companion Manual is applicable to this action and why?

- a. G3: Topographic, bathymetric, land use and land cover, geological, hydrologic mapping, charting, and surveying services that do not involve major surface or subsurface land disturbance and involve no permanent physical, chemical, or biological change to the environment.
- b. The main cruise objectives are to collect seafloor and water column sonar data, the acquisition of which will cause no permanent physical, chemical or biological change to the environment. The using of the sonar equipment in the manner proposed does not alter substrate and is not known to cause any permanent, long lasting or even short-term physical, chemical or biological changes. Exploration mapping operations are transitory in nature and effects, which are unlikely, are ephemeral.

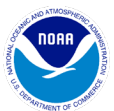
Step 2. Extraordinary Circumstances Consideration

4. Would the action result in adverse effects on human health or safety that are not negligible?

No, NOAA Ship Okeanos Explorer will be operating in deep-sea (>250 m) areas off Puerto Rico, Bahamas, Dominican Republic and Turks and Caicos Islands and in the U.S. EEZ during EX1812. See Table 1 of the EX1812 Project Instructions for bounding coordinates of the expedition's operating area. Using the described techniques and best practices is not known or likely to affect human health and safety. None of the procedures or outcomes are known to result in adverse effects on human health and safety.

5. Would the action result in adverse effects on an area with unique environmental characteristics that are not negligible?

No, These actions will not take place in or in proximity to: State or National Parks and Wildlife Refuges (various statutes); Wetlands (CWA et al); Prime farmland (FPA); Wildlife and Scenic Rivers (WSRA); National Marine Sanctuaries (NMSA); archeological or historic resources listed in



or eligible for listing in the National Register of Historic Places (NHPA) and coral reefs (E.O. 13089). Data collection will primarily occur in remote offshore, in water deeper than 3000 meters transit mapping to the AUTECH Range for 6 days of ROV work with overnight SONAR characterization. Work will continue with seafloor mapping departing the AUTECH range to Charleston, SC. The effects will be negligible or less than negligible, as acoustic mapping operations will not cause any permanent impact on the seabed or water column. An Essential Fish Habitat (EFH) consultation for this same time period has resulted in the determination that the proposed cruises will not reduce the quality and/or quantity of EFH, provided there is adherence to the OER proposed procedures. The EFH consultation is provided in the project instructions of EX-18-12 in Appendix D. Operations will not occur in any sanctuaries and therefore NMSA does not apply.

The NOAA Ship Okeanos Explorer and Officer of Ocean Exploration and Research maintain and adhere to a series of mitigation measures and best management practices which sole purpose is to ensure negligible effects to the environment. These practices include procedures for minimizing exposure to elevated noise levels.

6. Would the action result in adverse effects on species or habitats protected by the ESA, MMPA, MSA, NMSA, or MBTA that are not negligible?

OER has taken measures to ensure that any effects on species or habitats protected by the ESA, MMPA, MSA or NMSA meet the definition of 'negligible'. Our current informal ESA Section 7 consultation obtained NOAA Office of Protected Resources concurrence with NOAA OER's EX operations during the summer of 2018 and 2019 field season, may affect, but are not likely to adversely affect, ESA-listed marine species.

EX 1812 is predominantly focused offshore with 6 days in the AUTECH range. If we did encounter any marine mammals or seabirds protected under the MMPA or MBTA, our effect would be negligible because of the good management practices to which we adhere to avoid or minimize environmental impacts including round the clock bridge watch for marine mammals, round the clock monitoring of any acoustic interference from marine mammals (detailed mitigation measures are outlined in project instructions). An Essential Fish Habitat (EFH) consultation for this same time period has resulted in the determination that the proposed cruises will not reduce the quality and/or quantity of EFH, provided there is adherence to the OER proposed procedures. The EFH consultation is provided in the project instruction of EX18-12 in Appendix D. Operations will not occur in any sanctuaries and therefore NMSA does not apply.

Operation in the Navy AUTECH Range will be limited to 6 days with 12 hour ROV operations and 12 hour EM302 mapping operations. Operations using EM302 multibeam sonar produces a narrow-beam, sonar ping. To date, best data available and models indicate these systems to be de minimis since the "zone of influence" with respect to marine mammals is narrow. The operating window of the SONAR Characterization is also limited in scope with only 1/2 day



SONAR activities each day for 6 days at sea. The passive hydrophone array will also be deployed for a short period of less than 6 days resulting in negligible impact to marine life. In evaluation whether extraordinary circumstances apply, we considered the effects of our actions on resources outside the United States, as well as those not subject to the management authority of the United States, pursuant to EO 12114.

7. Would the action result in the potential to generate, use, store, transport, or dispose of hazardous or toxic substances, in a manner that may have a significant effect on the environment?

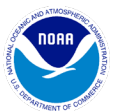
No. The cruise operations will be in compliance with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it) to ensure generation, use, storage, transport, and disposal of such substances will not result in significant impacts.

8. Would the action result in adverse effects on properties listed or eligible for listing on the National Register of Historic Places authorized by the National Historic Preservation Act of 1966, National Historic Landmarks designated by the Secretary of the Interior, or National Monuments designated through the Antiquities Act of 1906; Federally recognized Tribal and Native Alaskan lands, cultural or natural resources, or religious or cultural sites that cannot be resolved through applicable regulatory processes?

There are no operations planned for this cruise that involve underwater cultural heritage sites.

9. Would the action result in a disproportionately high and adverse effect on the health or the environment of minority or low-income communities, compared to the impacts on other communities (EO 12898)?

No, the NOAA Ship Okeanos Explorer will be operating in remote areas of the Mid Atlantic, U.S. Caribbean, Turks and Caicos Island and Bahamas (see Table 1 in EX1812 Project Instructions for bounding coordinates). There are no communities within or near the geographic scope of the cruise and the cruise does not involve actions known or likely to result in adverse impacts on human health.



10. Would the action contribute to the introduction, continued existence, or spread of noxious weeds or nonnative invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of the species?

No. During EX1812 the ship will not make landfall in areas other than commercial ports in San Juan, Puerto Rico and Charleston, SC. The ship and OER mission team will comply with all applicable local and federal regulations regarding the preventing or spread of invasive species. At the completion of every ROV dive or instrument deployment the equipment will be thoroughly rinsed with fresh water and completely dried to prevent spreading organisms from one site to another. Also the Engineering Department aboard the NOAA Ship Okeanos Explorer attends yearly Ballast Management Training in accordance with NOAA Form 57-07-13 NPDES VGP Annual Inspection and Report to prevent the introduction of invasive species.

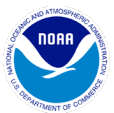
11. Would the action result in a potential violation of Federal, State, or local law or requirements imposed for protection of the environment?

The proposed action will not result in a potential violation of Federal, State, or local law or requirements imposed for protection of the environment. The survey coordinators obtained authorizations and/or consultations pursuant to applicable laws. We determined consultations pursuant to MSA and ESA were required (as discussed in responses to Q 5 & 6) and those consultations have been concluded. No other permits, consultations or licenses are necessary to undertake this action.

12. Would the action result in highly controversial environmental effects?

No. The exploration activities will be localized and of short duration in any particular area at any given time. Also the U.S. Atlantic Undersea Test and Evaluation Center has been in operations since 1966. Over the years the acoustic range has characterized sound through water for U.S. and Allied ships. In addition, the NOAA Ship Henry Bigelow has operated in the AUTEK Range in 2007 and August 2018. Given the projects scope and previous work, no notable or lasting changes or highly controversial effects to the environment will result.

13. Does the action have the potential to establish a precedent for future action or an action that represents a decision in principle about future actions with potentially significant environmental effects?



On the contrary, SONAR characterization in the AUTECH range may provide data useful to characterize and quantify multibeam SONAR emissions in water better. Currently Multibeam SONAR is insufficiently characterized by empirical data. Measurements over the AUTECH tracking range offer an opportunity to compare theoretical performance with actual measurements using passive arrays on the seafloor. Similar operations were conducted in the Southern California Offshore Range (SCORE) using a EM122 MBES which has a stronger amplitude.

14. Would the action result in environmental effects that are uncertain, unique, or unknown?

No. The techniques and equipment used are standard for this type of field activity are employed on every cruise by the Okeanos Explorer. Based on ten years of cruises, the environmental effects, or lack thereof, are documented.

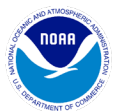
15. Does the action have the potential for significant cumulative impacts when the proposed action is combined with other past, present and reasonably foreseeable future actions, even though the impacts of the proposed action may not be significant by themselves?

By definition, actions that a federal agency classifies as a categorical exclusion have no potential, individually or cumulatively, to significantly affect the environment. This cruise is consistent with a class of CE established by NOAA and there are no extraordinary circumstances for this action that may otherwise result in potentially significant impacts. In evaluation whether extraordinary circumstances apply, we considered the effects of our actions on resources outside the United States, as well as those not subject to the management authority of the United States, pursuant to EO 12114.

CE Determination

I have determined that a Categorical Exclusion is the appropriate level of NEPA analysis for this action and that no extraordinary circumstances exist that would require preparation of an environmental assessment or environmental impact statement.

I have determined that an environmental assessment or environmental impact statement is required for this action.



Form Version: September 2017

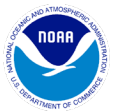
Signature: 

Signed by: Craig Russell

Date Signed: 10/16/2018



Appendix D: ESA Section Letter of Concurrence



**Ocean Exploration
and Research**



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

November 6, 2018

Refer to NMFS No: FPR-2018-9284

Commander William Mowitt
Deputy 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 Office of Ocean Exploration and Research's Reinitiation of Section 7 Consultation for Marine Operation Activities on the National Oceanic and Atmospheric Administration Ship *Okeanos Explorer* for the 2018 through 2019 Field Seasons

Dear Mr. Mowitt:

On November 5, 2018, the National Marine Fisheries Service (NMFS) received your reinitiated request for a written concurrence that the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research's marine operations activities on the NOAA Ship *Okeanos Explorer* for the 2018 through 2019 field seasons under the Endangered Species Act 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 reinitiation request is in response to added survey areas and vessel operations during the 2018 to 2019 field season. These added survey areas include Bahamian waters of the Blake-Bahama Ridge and the U.S. Navy's Atlantic Undersea Test and Evaluation Center range. Added vessel transit zones include areas between Charleston, South Carolina; Nassau, Bahamas; and San Juan, Puerto Rico. In addition to new survey and transit areas, NOAA Office of Ocean Exploration and Research has included new vessel operations, which consist of deploying a moored hydrophone array for six days. The following response to your request 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.

We reviewed the reinitiated consultation request document and related materials submitted by your office. We requested and received more information related to the monitoring effort that will occur during deployment of the hydrophone array. In addition, we requested and received historical data on past deployments of similar hydrophone arrays. This assisted NMFS's ESA Interagency Cooperation Division to determine that the entanglement risk from the moored hydrophone array was discountable and is not likely to adversely affect ESA-listed species in the action area during the 2018 through 2019 field season of the NOAA Ship *Okeanos Explorer*. In addition, our determination from our analysis of the original request still stands and applies to new survey areas. This determination states that acoustic disturbance from the activity's active sound sources is discountable and is not likely to adversely affect ESA-listed species or designated critical habitat. Based on our knowledge, expertise, and the materials submitted in your reinitiation request for informal consultation, we concur with the Office of Ocean



Ocean Exploration
and Research

Exploration and Research's conclusions that the proposed action is not likely to adversely affect ESA-listed species.

This concludes reinitiation of consultation under the ESA for species under NMFS's purview for NOAA Office of Ocean Exploration and Research to add survey areas, vessel transit zones, and vessel operations to deploy a moored hydrophone array using the NOAA Ship *Okeanos Explorer* for the 2018 through 2019 field seasons.

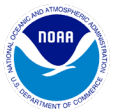
Reinitiation of consultation is required and shall be requested by the NOAA Office of Ocean Exploration and Research or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) take occurs; (b) new information reveals effects of the 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).

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.tortorici@noaa.gov or Jonathan Molineaux at (301) 427-8440 or by email at jonathan.molineaux@noaa.gov.

Sincerely,



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





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

AUG 17 2017

Rebecca R. Holyoke, Ph.D.
Acting Director
United States Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
National Centers for Coastal Ocean Science
Silver Spring, Maryland 20910

Refer to NMFS No: FPR-2017-9223

RE: Concurrence letter for activities to be conducted for National Centers for Coastal Ocean Science-led activities as part of the Southeast Deep Coral Initiative in 2017 through 2019

Dear Dr. Holyoke:

On June 22, 2017, the National Marine Fisheries Service (NMFS) received your request for a written concurrence that the National Centers for Coastal Ocean Science's activities to be conducted as part of the Southeast Deep Coral Initiative in 2017 through 2019 under the Endangered Species Act 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 to your request was prepared by NMFS pursuant to section 7(a)(2) of the ESA, implementing regulations at (50 CFR §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). The concurrence letter will be available through NMFS' consultation tracking system <https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts>. A complete record of this consultation is on file at NOAA Fisheries Office of Protected Resources in Silver Spring, Maryland.

Action Agency's Effect Determinations

The National Centers for Coastal Ocean Science determined that the activities to be conducted as part of the Southeast Deep Coral Initiative may affect, but are not likely to adversely affect, the species or distinct population segments (DPS) listed in Table 1. Additionally, the National Centers for Coastal Ocean Science determined that the proposed action would not destroy or adversely modify any critical habitats designated in the action area (Table 1).



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Table 1. Action agency determinations for species and critical habitat.

Species	ESA Status	Critical Habitat	Action Agency Determination
Marine Mammals			
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	N/A	Not likely to adversely affect
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	N/A	Not likely to adversely affect
Sei Whale (<i>Balaenoptera borealis</i>)	Endangered	N/A	Not likely to adversely affect
Bryde's whale, Gulf of Mexico subspecies (<i>Balaenoptera edeni</i>)	Endangered	N/A	Not likely to adversely affect
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	N/A	Not likely to adversely affect
North Atlantic Right whale (<i>Eubalaena glacialis</i>)	Endangered	No effect	Not likely to adversely affect
Marine Reptiles			
Green turtle (<i>Chelonia mydas</i>) – North Atlantic DPS	Threatened	No effect	Not likely to adversely affect
Hawksbill turtle (<i>Eretmochelys imbricata</i>)	Endangered	No effect	Not likely to adversely affect
Kemp's ridley turtle (<i>Lepidochelys kempii</i>)	Endangered	N/A	Not likely to adversely affect
Leatherback turtle (<i>Dermochelys coriacea</i>)	Endangered	No effect	Not likely to adversely affect
Loggerhead turtle (<i>Caretta caretta</i>) – Northwest Atlantic Ocean DPS	Threatened	No effect	Not likely to adversely affect
Marine and Anadromous Fishes			
Gulf sturgeon (<i>Acipenser oxyrinchus desotoi</i>)	Threatened	No effect	Not likely to adversely affect
Smalltooth sawfish (<i>Pristis pectinata</i>) – U.S. portion of range DPS	Endangered	No effect	Not likely to adversely affect
Nassau grouper (<i>Epinephelus striatus</i>)	Threatened	N/A	Not likely to adversely affect
Atlantic sturgeon (<i>Acipenser oxyrinchus oxyrinchus</i>) – South Atlantic DPS	Endangered	No effect	Not likely to adversely affect
Atlantic sturgeon (<i>Acipenser oxyrinchus oxyrinchus</i>) – Carolina DPS	Endangered	No effect	Not likely to adversely affect
Oceanic whitetip shark (<i>Carcharhinus longimanus</i>)	Proposed Threatened	N/A	Not likely to adversely affect
Giant manta ray (<i>Manta birostris</i>)	Proposed Threatened	N/A	Not likely to adversely affect



Species	ESA Status	Critical Habitat	Action Agency Determination
Marine Invertebrates			
Elkhorn coral (<i>Acropora palmata</i>)	Threatened	No effect	Not likely to adversely affect
Staghorn coral (<i>Acropora cervicornis</i>)	Threatened	No effect	Not likely to adversely affect
Pillar coral (<i>Dendrogyra cylindrus</i>)	Threatened	N/A	Not likely to adversely affect
Mountainous star coral (<i>Orbicella faveolata</i>)	Threatened	N/A	Not likely to adversely affect
Boulder star coral (<i>Orbicella franksi</i>)	Threatened	N/A	Not likely to adversely affect
Lobed star coral (<i>Orbicella annularis</i>)	Threatened	N/A	Not likely to adversely affect
Rough cactus coral (<i>Mycetophyllia ferox</i>)	Threatened	N/A	Not likely to adversely affect

Proposed Action and Action Area

The NOAA Deep-Sea Coral Research and Technology Program identified research needs in the U.S. Federal waters of the South Atlantic Bight, the Caribbean Sea, and the northern Gulf of Mexico. The National Centers for Coastal Ocean Science proposes to fund a three-year project to collect information on the deep-water corals found in these areas to provide scientific information to manage, conserve, and protect deep-sea coral and sponge ecosystems. The proposed action will survey the species and abundance of deep-water corals and sponges to inform proposals for new managed areas in the region. The proposed action will:

- 1) Survey deep-sea coral ecosystems using remotely operated vehicles.
- 2) Map deep-water habitats using multibeam echosounders.
- 3) Sample the physical and chemical properties of the water column via the deployment of conductivity, temperature, and depth casts and collection of water samples.

The study will target several non ESA-listed species of deep-water corals. “Deep-water corals” here are regarded as those at depths greater than 50 meters. These include *Lophelia pertusa*, *Leiopathes glaberrima*, and other coral members of the Cnidarian orders Gorgonacea, Antipatharia, Alcyonacea, and Scleractinia. Deep-water sponge species will also be sampled: Classes Demospongiae, Hexactenellidae, Calcarea, and Homoscleromorpha. *Lophelia pertusa*, and *Leiopathes glaberrima* are typically found at depths between 300 and 1,000 meters. The other coral members of the Cnidarian orders are found at depths greater than 50 meters, as are the deep-water sponge species.

The study will involve vessel operations aboard two vessels; the vessel used will depend upon the area for the particular cruise and the availability of the vessel at a given time. The two cruises in August 2017 will be conducted aboard the NOAA Ship *Nancy Foster*. The later cruises in 2018 and 2019 will be conducted on board either the NOAA Ships *Nancy Foster* or the NOAA *Okeanos Explorer*, depending on availability and proximity to the sampling site.



Researchers will use either of two remotely operated vehicles (ROVs) to collect samples from target coral species and collect video imagery. The ROV used for each cruise will depend on the ship used. It is still being determined what type of ROV will be used for cruises aboard the NOAA Ship *Nancy Foster*. For cruises aboard the NOAA Ship *Okeanos*, the researchers will use the two-bodied ROV Deep Discoverer and Serios. Each of the proposed ROVs are equipped with acoustic telemetry devices (a transponder unit, a receiving beacon, and an altimeter) which are used to locate the ROV during use. The transponder units emit signals at between eight and 30 kilohertz, and the receiving beacons also transmit signals in the mid-frequency range (21.5 to 43.2 kilohertz). The ROV may also use high-frequency imaging sonar (675 kilohertz) and an altimeter (500 kilohertz).

Active acoustic sources would be part of the proposed action. There will be a few different hull-mounted multi-beam echosounders used by the research vessels. The proposed action would use different multibeam echosounders because each has a unique operational depth and will thus be able to ensonify the seafloor at a variety of depths. On board the NOAA Ship *Nancy Foster*, three devices may be used. The Reson 712 SV2 has a dual frequency of 200 kilohertz or 400 kilohertz, with an optimal depth range of five to 250 meters. The Simrad EM 1002 operates at 95 kilohertz, and has an optimal depth of 200 to 1,000 meters. The Kongsberg/Simrad EK60 operates at 38, 120, and 200 kilohertz. The NOAA Ship *Okeanos* has two mutli-beam echosounders. The Kongsberg EM-302 operates at 30 kilohertz, with an optimal range of 250 to 7,000 meters. The NOAA Ship *Okeanos* also uses a Kongsberg/Simrad EK60. During operation, the power setting for all devices is at the lowest possible level (approximately 190 to 210 dB re: 1 μ PA with a duty cycle set to 10 to 30 hertz).

The ROV will move along pre-determined transects; dives last about two to six hours. The ROV will be tethered at all times. The ROV and the vessel will be moving at between 0.5 and one knot while the ROV is deployed. About six samples will be collected during each dive, and there will be between one and three dives per day. During sample collection, the ROV will hover about one meter from the bottom to avoid making contact with substrate. Coral samples will be collected by a cutting tool on the ROV. Samples will be about ten to 50 centimeters long, cut from the distal branches of each targeted coral colony.

During cruises, researchers would also use a conductivity, temperature, and depth (CTD) cast to collect water samples and characterize the chemical and physical properties of the water around deep-water coral and sponge ecosystems. The CTD Sea Bird Electronics-32 (SBE-32) is a device, 3.25 feet in diameter and four feet tall, that holds 12 five liter bottles on a carousel. The bottles are programmed to open and collect water at different depths. It weighs 69 kilograms, and is lowered into the water by a power winch. An SBE 9-11 sensor is attached to the CTD SBE-32, and it is used to take water measurements for parameters like temperature, depth, conductivity, pressure, and dissolved oxygen.

The study will be conducted for three years, with cruises typically taking place in the summer (May through September). The first two cruises will take place in August 2017, with one 13-day cruise and one five-day cruise. The first 2017 cruise will leave and return to St. Petersburg, Florida, and focus on surveying the deep-sea coral habitats off West Florida, in the Gulf of Mexico. The second 2017 cruise will leave St. Petersburg and end in Charleston, South Carolina, focusing on deep-sea corals off East Florida. The cruises for 2018 and 2019 are still being planned, and could occur in the South Atlantic, northern Gulf of Mexico, and the Caribbean. The



National Centers for Coastal Ocean Science expects that there will be four surveys per year in 2018 and 2019.

Action Area

The study would take place in three regions of the Southeast U.S. Federal waters: the northern Gulf of Mexico, the South Atlantic Bight, and the Caribbean Sea. The deep-water coral research activities could take place in existing (in orange on the maps) or proposed (in green and purple on the maps) marine managed areas. Areas proposed for inclusion in the marine managed areas would be prioritized for sampling over already-existing marine managed areas.

Gulf of Mexico

The areas prioritized for survey in the northern Gulf of Mexico include those in the Flower Garden Banks National Marine Sanctuary, off Alabama, Mississippi, Louisiana, and Texas (Figure 1). Other potential areas for research include the waters around the Florida Keys National Marine Sanctuary and additional areas off Florida.

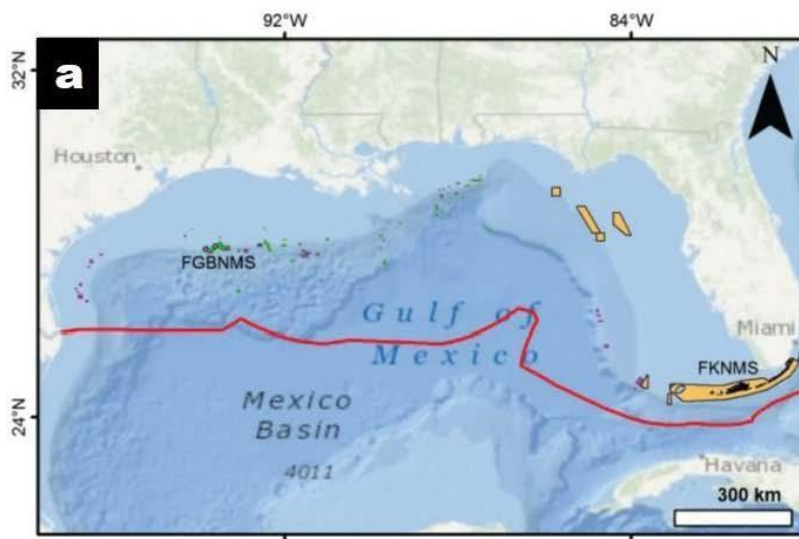


Figure 1. Map of proposed survey areas in the Gulf of Mexico. Areas prioritized for surveys include the Flower Garden Banks National Marine Sanctuary (FGBNMS) and the Florida Keys National Marine Sanctuary (FKNMS).

South Atlantic Bight

The areas surveyed in the South Atlantic Bight would include those off the coast of North Carolina, south around the Florida Peninsula (Figure 2). Sites proposed for inclusion in marine managed areas include those near Gray's Reef National Marine Sanctuary, off Georgia, and the Monitor National Marine Sanctuary, off North Carolina.



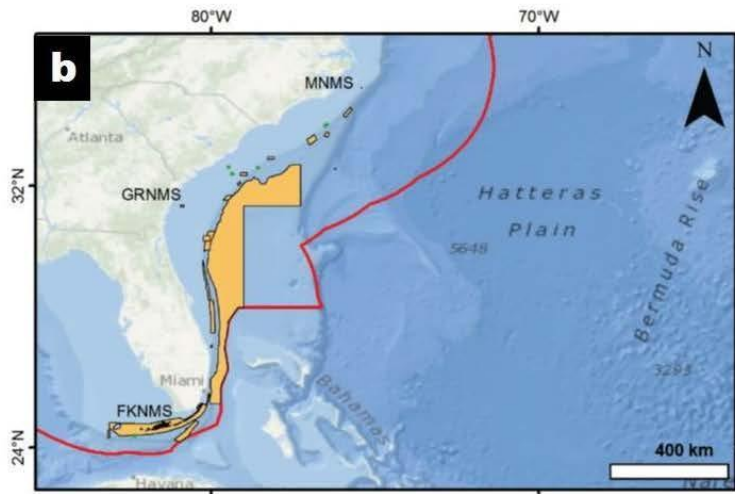


Figure 2. Map of proposed survey areas in the South Atlantic Bight. Areas prioritized for surveys include the Florida Keys National Marine Sanctuary (FKNMS), the Gray's Reef National Marine Sanctuary (GRNMS), and the Monitor National Marine Sanctuary (MNMS).

Caribbean Sea

The areas surveyed in the Caribbean Sea will include those waters around the U.S. Virgin Islands, Puerto Rico and its surrounding islands such as Vieques, Culebra, Mona, Desecheo, and Monito (Figure 3). Surveys may also take place around the Navassa Island National Wildlife Refuge, a small, uninhabited island west of Haiti administered by the U.S. Fish and Wildlife Service.

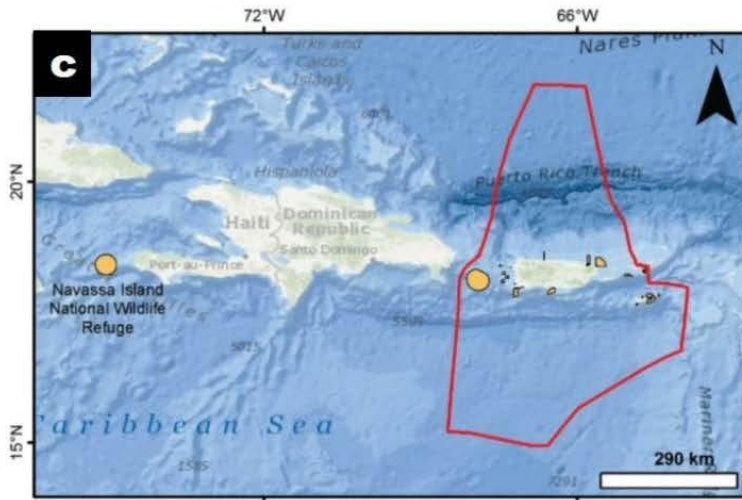


Figure 3. Map of proposed survey areas in the Caribbean.

Neither NMFS nor the Office of Coast Survey identified any interrelated or interdependent activities associated with the proposed action.

Minimization Measures

The National Centers for Coastal Ocean Science's activities would include the same protective measures described and analyzed in the 2013 Biological Opinion (see description in Consultation History). These measures are as follows:

- Minimize vessel disturbance and ship strike potential
 - Reduced speeds (less than 13 knots) when transiting through ranges of ESA-listed cetaceans (unless otherwise required, e.g., NOAA Sanctuaries)
 - Reduced speeds (less than 13 knots) while transiting through designated critical habitat (unless slower speeds are required, e.g., less than 10 knots in right whale designated critical habitat and management areas)
 - Trained observers aboard all vessels; 100 percent observer coverage
 - Species identification keys (for marine mammals, sea turtles, as applicable) will be available on all vessels
- Minimize noise
 - Reduced speed (see above)
 - Multibeam surveys using ≥ 50 kilohertz frequencies, lowest possible power and ping-rate
 - Single beam surveys using ≥ 30 kilohertz frequencies, lowest possible power and ping-rate, and 12° beam angle.
 - Reduce use of active acoustics as much as possible. Active acoustic sources should be used only when required for navigation or data collection and should be used at the lowest source level and highest frequency available that is suitable for the purpose.
- Minimize vessel discharges (including aquatic nuisance species)
 - Meet all Environmental Protection Agency Vessel General Permits and Coast Guard requirements¹.
 - Avoid discharge of ballast water in designated critical habitat.
 - Use anti-fouling coatings.
 - Clean hull regularly to remove aquatic nuisance species.
 - Avoid cleaning of hull in critical habitat.
 - Avoid cleaners with nonylphenols.
 - Rinse anchor with high-powered hose after retrieval.
- Minimize anchor impact to corals, seagrass or other designated habitat (e.g., Essential Fish Habitat)
 - Use designated anchorage area when available
 - Use mapping data to anchor in mud or sand, to avoid anchoring on corals

¹ See requirements for Vessels General Permits at: <https://www.epa.gov/npdes/vessels-vgp>



- Avoid anchoring in seagrass critical habitat
- Minimize anchor drag
- Avoid collecting bottom samples in seagrass designated critical habitat
 - There will be no bottom sample collections of any kind conducted during this cruise
- Cetaceans
 - Avoid approaching within 200 yards (182.9 meters), 500 yards for right whales.
 - Avoid critical habitat, when possible.
- Sea Turtles and Manatees
 - Avoid approaching within 50 yards.
- Entanglement Protective Measures
 - Use stiff line materials for towing and keep taut during operations to reduce potential for entanglement
 - Reduce knots in the line as much as possible
 - Clearly mark lines in the event an animal does become entangled so that NMFS experts can identify the gear.
- Habitat Protection
 - Avoid contact of gear, towed or lowered, with the sensitive bottom habitat (e.g., submerged aquatic vegetation and hard bottom)

ESA-Listed Species and Designated Critical Habitat Not Affected by the Proposed Action

Upon review of their known range and overlap with the proposed action, we have determined that the following species will not be affected by the proposed action: Gulf sturgeon, smalltooth sawfish, and ESA-listed corals. These species will not be considered further.

Gulf sturgeon could occur within the northern Gulf of Mexico action area. Gulf sturgeon are found in coastal rivers in Florida, Alabama, Mississippi, and Louisiana throughout most of the year, moving into the Gulf of Mexico between September and November to forage over winter. During winter, gulf sturgeon are typically found in nearshore waters two to four meters deep (Fox et al. 2002). Since the research activities will take place primarily in waters greater than 50 meters deep, we do not expect gulf sturgeon to be exposed to the stressors associated with ROV operation and coral sampling. The vessels used for the sampling cruises may transit through waters occupied by gulf sturgeon. However, the proposed action would take place during the summer, when gulf sturgeon are in rivers, not the Gulf of Mexico. Therefore, we do not expect gulf sturgeon to be exposed to stressors associated with vessel activity. We have determined that there will be no effect to gulf sturgeon as a result of the proposed action.

In the United States, smalltooth sawfish are typically found in shallow coastal waters around southern Florida up to ten meters deep (NMFS 2010). Since the proposed action will take place in waters greater than 50 meters deep, we do not expect smalltooth sawfish to be exposed to the proposed action. We have determined that there will be no effect to smalltooth sawfish as a result of the proposed action.

In their concurrence request, the National Centers for Coastal Ocean Science identified several species of ESA-listed invertebrates that may be affected by the proposed action. These species included: mountainous star coral (*Orbicella faveolata*), rough cactus coral (*Mycetophyllia ferox*),



boulder star coral (*Orbicella franksi*), lobed star coral (*Orbicella annularis*), pillar coral (*Dendrogyra cylindrus*), staghorn coral (*Acropora cervicornis*) and elkhorn coral (*Acropora palmata*).

Upon examining the current known range of each of these species and the extent of the action area, we determined that these ESA-listed corals occur in some parts of the action area. ESA-listed corals occur in the Caribbean and Florida Keys; there is no confirmed presence of ESA-listed corals in the northern Gulf of Mexico region (Veron 2014). The proposed action is focusing on corals in the deep-water environment at depths greater than 50 meters. ESA-listed corals found in the Caribbean and Florida Keys are found at depths shallower than the proposed action area (Table 2), so we do not expect any ESA-listed coral species to be exposed. Because the proposed action would take place in an environment where we do not expect ESA-listed corals to occur, we conclude that there is no effect of the action to ESA-listed corals.

Table 2. Depth ranges of ESA-listed coral species found in the Caribbean.

ESA-listed Coral Species	Depth	Source
Elkhorn Coral	Usually less than 6 meters; up to 20 meters	(NMFS 2015)
Staghorn Coral	0 to 30 meters	(NMFS 2015)
Mountainous Star Coral	Typically 10 to 20 meters; up to 40 meters	(Holstein et al. 2015)
Boulder Star Coral	1 to 30 meters	(Brainard 2011)
Lobed Star Coral	1 to 30 meters	(Brainard 2011)
Pillar Coral	1 to 25 meters	(Aronson 2008a)
Rough Cactus Coral	5 to 30 meters	(Aronson 2008b)

Several areas of critical habitat have been designated throughout the action area. Designations for smalltooth sawfish, Gulf sturgeon, and the proposed Atlantic sturgeon critical habitat are in shallow coastal areas or in rivers. These areas will not be affected by the proposed action, which will take place in the oceanic, deep-water environment. These areas will not be considered further.

Affected ESA-listed Species and Designated Critical Habitat

The proposed action has the potential to affect ESA-listed species that occur in the waters of the South Atlantic Bight, Caribbean Sea, and Gulf of Mexico. Species or designated critical habitat that may overlap the action area are included in Table 3. Because the action would occur in three distinct areas, each with its own variety of ESA-listed resources, not all species or critical habitat would be affected by the action at any one time. We have identified the potentially affected resources in the table by the three areas: Gulf of Mexico, South Atlantic Bight, and Caribbean Sea.



Table 3. Potentially affected ESA-listed species and designated critical habitat.

Species	ESA Status	Critical Habitat	Recovery Plan	Survey area where species are most likely to be affected
Marine Mammals				
Blue whale (<i>Balaenoptera musculus</i>)	E – 35 FR 18319	-- --	07/1998	Gulf of Mexico, South Atlantic, Caribbean
Fin whale (<i>Balaenoptera physalus</i>)	E – 35 FR 18319	-- --	75 FR 47538	Gulf of Mexico, South Atlantic, Caribbean
Sei whale (<i>Balaenoptera borealis</i>)	E – 35 FR 18319	-- --	76 FR 43985	Gulf of Mexico, South Atlantic, Caribbean
Bryde's whale Gulf of Mexico subspecies (<i>Balaenoptera edeni</i>)	E -- 81 FR 88639	-- --	-- --	Gulf of Mexico
North Atlantic Right Whale (<i>Eubalaena glacialis</i>)	E – 73 FR 12024	59 FR 28805 and 81 FR 4837	70 FR 32293	South Atlantic
Sperm whale (<i>Physeter macrocephalus</i>)	E – 35 FR 18319	-- --	75 FR 81584	Gulf of Mexico, South Atlantic, Caribbean
Marine Reptiles				
Green turtle (<i>Chelonia mydas</i>) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	63 FR 28359	Gulf of Mexico, South Atlantic, Caribbean
Hawksbill turtle (<i>Eretmochelys imbricata</i>)	E – 35 FR 8491	63 FR 46693	57 FR 38818	Gulf of Mexico, South Atlantic, Caribbean
Kemp's Ridley turtle (<i>Lepidochelys kempii</i>)	E – 35 FR 18319	-- --	75 FR 12496	Gulf of Mexico, South Atlantic, Caribbean
Leatherback turtle (<i>Dermochelys coriacea</i>)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	63 FR 28359	Gulf of Mexico, South Atlantic, Caribbean
Loggerhead turtle, (<i>Caretta caretta</i>) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39856	63 FR 28359 74 FR 2995	Gulf of Mexico, South Atlantic, Caribbean
Fishes				
Nassau grouper (<i>Epinephelus striatus</i>)	T – 81 FR 42268	-- --	-- --	Caribbean
Scalloped hammerhead shark (<i>Sphyrna lewini</i>) Central and Southwest Atlantic DPS	T -- 79 FR 38213	-- --	-- --	Caribbean
Atlantic sturgeon, (<i>Acipenser oxyrinchus</i>)	T -- 77 FR 5879	81 FR 35701 (Proposed)*	-- --	South Atlantic



Species	ESA Status	Critical Habitat	Recovery Plan	Survey area where species are most likely to be affected
<i>oxyrinchus</i>) Gulf of Maine DPS				
Atlantic sturgeon, (<i>Acipenser oxyrinchus oxyrinchus</i>) New York Bight DPS	E -- 77 FR 5879	81 FR 35701 (Proposed)*	-- --	South Atlantic
Atlantic sturgeon, (<i>Acipenser oxyrinchus oxyrinchus</i>) Chesapeake DPS	E -- 77 FR 5879	81 FR 35701 (Proposed)*	-- --	South Atlantic
Atlantic sturgeon, (<i>Acipenser oxyrinchus oxyrinchus</i>) Carolina DPS	75 FR 61904	81 FR 36077 (Proposed)*	-- --	South Atlantic
Atlantic sturgeon, (<i>Acipenser oxyrinchus oxyrinchus</i>) South Atlantic DPS	75 FR 61904	81 FR 36077 (Proposed)*	-- --	South Atlantic
Oceanic whitetip shark (<i>Carcharhinus longimanus</i>)	T -- 81 FR 96304 (Proposed)	-- --	-- --	Gulf of Mexico, South Atlantic, Caribbean
Giant manta ray (<i>Manta birostris</i>)	T -- 82 FR 3694 (Proposed)	-- --	-- --	Gulf of Mexico, South Atlantic, Caribbean

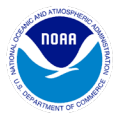
*Critical habitat has been designated, but it will not be affected by the proposed action.

Consultation History

On June 1, 2017, the National Centers for Coastal Ocean Science submitted a memorandum requesting a letter of concurrence under the ESA for activities to be conducted on the NCCOS-led field activities to be conducted as part of the Southeast Deep Coral Initiative in 2017 through 2019. On June 22, 2017, the National Centers for Coastal Ocean Science submitted a revised memorandum with additional information. The National Centers for Coastal Ocean Science have requested our concurrence that these activities are not likely to adversely affect ESA-listed species or designated critical habitat. NMFS Office of Protected Resources responded on the same date that it received all necessary information.

Effects of the Action

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the ESA-listed species or designated critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR §402.02). 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 discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the



impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

Effects of the Action: Vessel Activity

The 2013 biological opinion identified several stressors associated with the Office of Coast Survey's hydrographic surveys in coastal waters. These included vessel activity (strike, acoustic disturbance, vessel presence, discharges, and introduction of aquatic nuisance species). These stressors pose risks to ESA-listed whales, sea turtles, and fishes.

Stressor: Vessel Strike

Because the vessel would move at a very slow speed during the survey, a strike of marine mammals or sea turtles would be improbable and extremely unlikely. Further, adherence to observation and avoidance procedures is also expected to avoid vessel strikes for marine mammals and sea turtles. We also expect ESA-listed fishes to move away from the vessel, and thus a strike would be extremely unlikely. Therefore, effects from vessel strikes during the survey would be discountable for ESA-listed fishes, whales, and sea turtles.

Stressor: Acoustic Disturbance and Vessel Presence

When a vessel transits to and from the survey areas, potential effects on the ESA-listed species include vessel strikes, acoustic disturbance, and disturbance from the vessel's presence. Combined vessel noise and presence could cause slight marine mammal or sea turtle response or behavioral interruptions, but they would be minor and temporary as the vessel moves away from any marine mammals or sea turtles. The distance between the vessel and observed marine mammals and sea turtles, per avoidance protocols, would also minimize the potential for acoustic disturbance from engine noise. Therefore, effects from acoustic disturbance or presence associated with vessels would be insignificant for ESA-listed whales and sea turtles.

ESA-listed fishes such as all five Atlantic sturgeon DPSs, Nassau grouper, Central and Southwest Atlantic DPS scalloped hammerhead sharks, oceanic whitetip sharks, and giant manta rays might occur in the action area and be exposed to the stressors associated with vessel activity.

Central and Southwest Atlantic DPS scalloped hammerhead sharks, oceanic whitetip sharks and giant manta rays occupy tropical and subtropical oceanic waters. Oceanic whitetip sharks can be found at the ocean surface, but most frequently stay between 25.5 and 50 meters deep (Carlson and Gulak 2012; Young 2016). Giant manta rays are found at depths less than ten meters during the day (Miller 2016). Scalloped hammerhead sharks can be found to depths of 1,000 meters. We expect that scalloped hammerhead sharks, giant manta rays, and whitetip oceanic sharks will, for the most part, be at depths where there will be minimal risk of vessel strike or exposure to noise.

When in the marine environment, Atlantic sturgeon adults and sub-adults typically occupy shallow marine waters, less than 15 meters deep (Dunton et al. 2015; Erickson et al. 2011). The proposed action would take place in summer months, placing Atlantic sturgeon largely out of the area where most of the vessel activity and research will occur.



Nassau grouper typically associate with coral reefs, with juveniles occupying shallow reef habitat, and adults occupying deep reefs (NMFS 2013). The vessels in use for the proposed action would be too large to enter shallow waters, and we expect that any exposed Nassau grouper would move away from the vessels.

The vessel's passage past an ESA-listed fish would be brief and not likely to be significant in impacting any individual's ability to feed, reproduce, or avoid predators. Because the potential acoustic interference from engine noise would be undetectable or so minor that it could not be meaningfully evaluated, we find that the risk from this potential stressor is insignificant. Therefore, we conclude that acoustic interference from engine noise is not likely to adversely affect any ESA-listed fishes.

Stressor: Discharges

The potential for discharges via fuel or oil leakages is extremely unlikely. An oil or fuel leak would likely pose a significant risk to the vessel and its crew and actions to correct a leak should occur immediately to the extent possible. In the event that a leak should occur, the amount of fuel and oil onboard the research vessel is unlikely to cause widespread, high dose contamination (excluding the remote possibility of severe damage to the vessel) that would impact listed species directly or pose hazards to their food sources. Because the potential for fuel or oil leakage is extremely unlikely to occur, we find that the risk from discharges to any ESA-listed species is discountable.

Stressor: Aquatic Nuisance Species

To minimize the risk of aquatic nuisance species introduction, personnel would: avoid discharge of ballast water in designated critical habitat; use anti-fouling coatings; clean the hull regularly to remove aquatic nuisance species (but avoid doing so in critical habitat), and rinse the anchor with a high-powered hose after retrieval. These protective measures go beyond the requirements of the Vessel and Small Vessel General Permits², as described in the mitigation measures above. Furthermore, the vessels would not transit outside of the United States; therefore, they would not introduce foreign aquatic nuisance species. Given the protective measures, it is highly unlikely that the vessels would transfer aquatic nuisance species to any ESA-listed species during the proposed action. We find that the risk from aquatic nuisance species to any ESA-listed species is discountable.

Conclusion

Therefore, we conclude that the effects from vessel activity, pollution by oil or fuel leakage, and risk of aquatic nuisance species introduction are insignificant or discountable, and not likely to adversely affect ESA-listed marine mammals, sea turtles, or fishes.

Effects of the Action: Deployment and Operation of Survey Equipment

The proposed action includes the operation of equipment such as the remotely operated vehicles and CTD casts that could be potential stressors for ESA-listed species. The ROVs will be used to collect coral samples, and the CTD casts will be used to collect water samples and data.

² See requirements for the Vessels General Permit at: <https://www.epa.gov/npdes/vessels-vgp>



ROVs have acoustic tracking devices on them that emit sound which could be detected by and impact ESA-listed species. The effects of sound from the ROV operation will be discussed in the section below.

Stressor: Operation of Remotely Operated Vehicle and CTD Cast

A ROV is an underwater observation vehicle connected to a computer operated by personnel on board the ship. The operator directs the ROV to use its camera to photograph the sea floor. The ROV is tethered at all times. The CTD cast is lowered into the ocean by a power winch and is tethered the entire time.

Possible stressors from the ROV and CTD cast during the proposed activities include entanglement from the tether during operation, equipment strike (which could include hitting coral reefs, substrate, or an ESA-listed species while in the water column).

The ROV is controlled by an operator who would have visual of the surroundings during operation and would avoid interaction with ESA-listed species by navigating the ROV away from the organism, thereby reducing the likelihood that the ROV would strike any ESA-listed resource while in use. In addition to the camera, the ROV has navigational equipment (e.g., depth, heading, altitude), allowing the operator to avoid striking bottom. To reduce the risk of entanglement from the tether attached to the ROV, the Office of Coast Survey proposed mitigation measures. These include using a stiff line material, keeping the line taut during operations and reducing knots in the line as much as possible. Therefore, the risks of strike or entanglement to ESA-listed species from ROV use are discountable.

Unlike the ROV, the CTD cast would not have a camera on it while in use. Before deploying the CTD cast, researchers would use the echosounder to ensure that the water depth is greater than the maximum depth of the CTD cast. This would prevent the CTD cast from striking bottom. While there is some possibility that a CTD cast could strike an ESA-listed species while being lowered into the ocean, we consider that possibility to be extremely unlikely. Another stressor from the CTD cast would be risk of entanglement from the tether. Similar to the ROV, researchers would use a stiff line material, keeping the line taut during operations and reducing knots in the line as much as possible. Therefore, the risks of strike or entanglement to ESA-listed species from CTD cast are discountable.

Stressor: Sound Sources

Devices such as multibeam echosounders and ROVs would be in use and emit sound which could be within the hearing range of ESA-listed whales, sea turtles, and fishes. There are up to five different types of multibeam echosounders that could be used during the proposed action, each with a different operating frequency (Table 4).



Table 4. Operating frequencies of acoustic devices in the proposed action.

Vessel	Device	Operating Frequency
NOAA Ship <i>Okeanos Explorer</i>	Kongsberg EM-302	30 kHz
	Kongsberg/Simrad EK-60	38, 120, and 200 kHz
NOAA Ship <i>Nancy Foster</i>	Reson 7125 SV2	200 or 400 kHz
	Simrad EM 1002	95 kHz
	Kongsberg EM 710	65 to 100 kHz
	Kongsberg/Simrad EK-60	38, 120, and 200 kHz

The ROVs proposed for use in the proposed action are equipped with various devices used to locate and operate the ROV. The ROVs are equipped with acoustic tracking equipment which operates at frequencies between eight and 30 kilohertz. The ROV or research vessel's acoustic telemetry systems could have transponder units, altimeters, and/or sonar that would operate at frequencies and emit sound that could be within the functional hearing range of ESA-listed sea turtles, fishes, and marine mammals (Table 5).

Table 5. Functional hearing ranges of species in the action area.

Species/Group	Functional Hearing Range	Source
Low frequency cetaceans (Baleen whales)	7 Hz to 25 kHz	(NMFS 2016)
Mid-frequency cetaceans (Toothed whales)	150 Hz to 160 kHz	(NMFS 2016)
Sea turtles (general)	Less than 1 kHz	(Moein et al. 1994)
Loggerhead sea turtles	250 Hz to 750 Hz	(Bartol et al. 1999)
Kemp's ridley sea turtles	100 Hz to 500 Hz	(Ketten and Bartol 2005)
Green sea turtles	100 Hz to 800 Hz	(Ketten and Bartol 2005)
Elasmobranchs (Lemon sharks and horn sharks)	20 Hz to 1,000 Hz	(Casper and Mann 2006)

The functional hearing ranges of ESA-listed sea turtles are not well understood and vary by species. In general, the available information on sea turtle hearing indicates that their hearing thresholds are less than 1 kilohertz (Moein et al. 1994). Loggerhead sea turtles are thought to have a functional hearing range of 250 to 750 hertz (Bartol et al. 1999), Kemp's ridley sea turtles a range of 100 to 500 hertz, and green sea turtles 100 to 800 hertz (Ketten and Bartol 2005). The operating frequencies of the ROV telemetry devices (i.e., transponder units, altimeters, and sonar) and the multibeam echosounders are outside the functional hearing range of ESA-listed



sea turtles, meaning that sound associated with their operation is discountable, therefore, not likely to adversely affect ESA-listed sea turtles.

Mid-frequency toothed whales, including the ESA-listed sperm whale, have a functional hearing range of 150 hertz to 160 kilohertz. The Simrad EM 1002, Kongsberg/Simrad EK-60, and the Kongsberg EM-302 would operate at frequencies within the hearing range of sperm whales.

Sperm whales have been observed in the continental slope waters north of Cape Hatteras, North Carolina, in waters 1000 meters or deeper. Sperm whale densities in this area are higher during summer months (Mullin and Fulling 2004; Waring et al. 2006). The survey would be south of where we expect sperm whales to occur in high densities. As such, we believe it is very unlikely that sperm whales would be exposed to the proposed action. The minimization measures further reduce the likelihood of exposure. Multibeam echosounder transmissions would be suspended when ESA-listed whales are within range. The research vessel would also avoid approaching cetaceans within 200 yards (600 feet). Due to the minimization measures and that it is unlikely that sperm whales would be present in the action area, we conclude that the effects of the proposed action to sperm whales would be discountable, and sperm whales not likely to be adversely affected.

The functional hearing range of ESA-listed baleen whales (Gulf of Mexico Bryde's whale, blue, fin and sei whales) is 7 hertz to 25 kilohertz. The multibeam echosounders operate outside the functional hearing range of these whales, meaning that operation of these devices are not likely to adversely affect ESA-listed baleen whales.

The altimeters (500 kilohertz) and sonar systems (675 kilohertz) associated with the ROVs proposed for use will be outside the functional hearing range of ESA-listed baleen whales. As a result, the risk of effects to ESA-listed baleen whales from exposure to sound associated with the operations of altimeters and sonar systems are discountable, and are not likely to adversely affect these species. However, the transponder units for the acoustic tracking systems are within the hearing range of ESA-listed baleen whales. The transponder units for the acoustic tracking systems operate at between eight and 30 kilohertz or 21.5 and 43.2 kilohertz, putting these devices in the functional hearing range of ESA-listed baleen whales (Gulf of Mexico bryde's, blue, fin and sei whales). We expect that ESA-listed species will avoid the vessel and ROV, minimizing the exposure to sound from the ROV operation and the multibeam echosounders. Generally, we expect that ESA-listed whales to move away from or parallel to the vessel (Hauser and Holst 2009). The minimization measures further reduce the likelihood of exposure. We conclude that the effects of the proposed action to ESA-listed baleen whales would be discountable, and not likely to be adversely affected.

The functional hearing ranges of ESA-listed fishes are not well understood. Oceanic whitetip sharks, scalloped hammerhead sharks, and giant manta rays are elasmobranchs, and although there is no known information on the hearing ability of these species specifically, other species of elasmobranchs have been studied. Hearing ranges of lemon sharks and horn sharks are between 20 hertz and one kilohertz (Casper and Mann 2006), and we assume that the hearing range of oceanic whitetip sharks and giant manta rays are within this range as well. The altimeters, sonar systems, and transponder units for the acoustic tracking system for the ROV are



not in the hearing range of elasmobranchs, and thus not within the range of scalloped hammerhead sharks, oceanic whitetip sharks and giant manta rays. The multibeam echosounders all operate at frequencies above one kilohertz, and thus not in the hearing range of ESA-listed sharks.

Information available about the hearing abilities of Atlantic sturgeon come from studies of other species of sturgeon. All five DPSs are considered in this analysis since Atlantic sturgeon from multiple river systems “mix” in the marine environment (Wirgin et al. 2015a; Wirgin et al. 2015b). Meyer et al. (2010) recorded auditory evoked potentials to pure tone stimuli of varying frequency and intensity in lake sturgeon (*Acipenser fulvescens*) have best sensitivity from 50 to 400 hertz. Lovell et al. (2005) also studied sound reception in and the hearing abilities of paddlefish (*Polyodon spathula*) and lake sturgeon in pressure dominated and particle motion dominated sound fields. They concluded that both species were responsive to sounds ranging in frequency from 100 to 500 hertz with lowest hearing thresholds from frequencies in bandwidths between 200 and 300 hertz and higher thresholds at 100 and 500 hertz. Based on this information, we conclude that the multibeam echosounders and the systems associated with the ROVs operate outside the functional hearing range of Atlantic sturgeon. The effects are insignificant, and Atlantic sturgeon are not likely to be adversely affected.

There are limited data on sound production in Nassau grouper; other species of grouper have been studied and summarized here. Nassau grouper sound production, or “grunts”, involves contraction of a bilateral post-opercular muscle that is connected to the swim bladder (Hazlett 1962). Nelson et al. (2011) reported on red grouper sound production in Florida using passive acoustic and video monitoring. Red grouper produce low-frequency pulses, broadband pulses and pulse trains, as well as short calls labelled as “growls” with their dominant frequency at about 180 hertz (Nelson et al. 2011). Based on this information, we conclude that the multibeam echosounders and the systems associated with the ROVs operate outside the functional hearing range of Nassau grouper. The effects are insignificant, and Nassau grouper are not likely to be adversely affected.

Due to the minimization measures and the expected avoidance behavior of ESA-listed species, we believe that the proposed use of the multibeam echosounders, ROVs, and those associated sound sources would have insignificant effects, if any, on ESA-listed species. Therefore, the effects from sound associated with ROV use and its operation are not likely to adversely affect ESA-listed whales, sea turtles, or fishes.

Effects of the Action: Designated Critical Habitat

The proposed action may occur within critical habitats that have been designated for loggerhead sea turtle Northwest Atlantic Ocean DPS, green turtle North Atlantic DPS, hawksbill and leatherback sea turtles, elkhorn and staghorn corals, and North Atlantic right whale.

Critical habitat for the Northwest Atlantic Ocean distinct population segment of loggerhead sea turtles is designated in several units off the southeastern coast of the United States, within the proposed action area, specifically, the *Sargassum* habitat. Other units of designated critical habitat for loggerhead sea turtles, such as nearshore reproductive, foraging, breeding, migratory,



or winter units, are outside the action area. The essential biological features for *Sargassum* habitat include:

1. Convergence zones, surface-water downwelling areas, margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for optimal growth of *Sargassum* and inhabitation of loggerheads.
2. *Sargassum* in concentrations that support adequate prey abundance and cover.
3. Available prey and other material associated with *Sargassum* habitat including plants and cyanobacteria and animals native to the *Sargassum* community.
4. Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerheads, i.e., greater than ten meters depth.

The proposed action will involve vessel activity, ROV operation, bathymetric data acquisition, and coral and water sample collection. These activities will not affect the oceanic features, prey abundance, cover, water depth, or other essential biological features for loggerhead *Sargassum* critical habitat. Therefore, we conclude that there will be no effect from the proposed action to loggerhead designated critical habitat.

Critical habitat has been designated for hawksbill sea turtles in Puerto Rico, around the coastal waters adjacent to Mona and Monito Islands, and may be exposed to the proposed action. Critical habitat has been designated for green sea turtles in Culebra Island, Puerto Rico. No primary constituent elements were identified in either designation, but several activities were identified as requiring special management considerations. These include vessel traffic, coastal construction, point and non-point source pollution, fishing activities, dredge and fill activities, and habitat restoration. The proposed action will include vessel activity, and therefore does require special management consideration with regard to hawksbill and green sea turtle designated critical habitat. The rule includes a discussion of vessel traffic potentially affecting designated critical habitat, specifically, propeller dredging and anchor mooring disrupting benthic habitats by crushing coral, breaking seagrass root systems, and severing rhizomes. Recreational boating may also trample seagrass beds and live bottom, and disturb seagrasses and coral. The vessel operators will use mapping data to avoid anchoring on sensitive bottom types like coral reefs and seagrasses. The ROV would be operated to avoid hitting bottom. We believe it is extremely unlikely that the large research vessels, which have a 13.5-foot and 20-foot draft, would be in such shallow waters as to damage benthic habitats with its propeller. We conclude that the proposed action would not destroy or adversely modify designated critical habitat for green and hawksbill sea turtles.

Critical habitat has been designated for leatherback sea turtles in the coastal waters adjacent to St. Croix, U.S. Virgin Islands, and may be exposed to the proposed action. No primary constituent elements were identified in the designation, but several activities were identified as those that might modify critical habitat. These include recreational boating and swimming, and sandmining. The proposed action will include vessel activity, ROV operation, bathymetric data acquisition, and coral and water sample collection. These activities are not identified as ones that



can modify the critical habitat. We conclude that the proposed action would not be likely to destroy or adversely modify designated critical habitat for leatherback sea turtles.

Critical habitat has been designated for elkhorn and staghorn coral in the Florida Keys, Puerto Rico, and the U.S. Virgin Islands. Designated critical habitat for these species is within the action area, specifically the South Atlantic Bight and the Caribbean Sea. The essential biological features for the designation includes substrate of suitable quality and availability to support successful larval settlement and recruitment, and reattachment and recruitment of fragments. The proposed action will involve vessel activity, ROV operation, bathymetric data acquisition, and coral and water sample collection. These activities will not involve altering the availability or quality of substrate. The researchers will use designated anchorage areas and use mapping data to only anchor in appropriate areas (e.g., mud or sand). We conclude that the proposed action would not be likely to destroy or adversely modify designated critical habitat for elkhorn and staghorn coral.

Critical habitat for North Atlantic right whales is designated within the action area, in the marine waters extending from Cape Fear, North Carolina to approximately 27 nautical miles below Cape Canaveral, Florida. This unit was designated as a calving area for North Atlantic right whales. Essential features for North Atlantic right whale critical habitat include:

- Calm sea surface conditions of Force Four or less on the Beaufort Wind Scale,
- Sea surface temperatures from a minimum of seven degrees Celsius and never more than 17 degree Celsius, and
- Water depths of six to 28 meters, where these features simultaneously co-occur over contiguous areas of at least 231 nautical miles squared of ocean waters during the months of November through April.

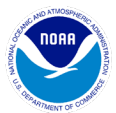
The proposed action would not entail activities that affect the essential features of the critical habitat, because the activities would not affect oceanographic conditions. We conclude that the proposed action would not be likely to destroy or adversely modify designated critical habitat for North Atlantic right whales.

Conclusion

Based on this analysis, NMFS concurs with National Centers for Coastal Ocean Science's determination that all effects of the proposed action are not likely to adversely affect the subject ESA-listed species and/or designated critical habitats.

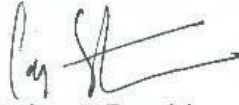
Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the Federal agency, or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) new information reveals effects of the action that may affect an ESA-listed species or designated critical habitat in a manner or to an extent not previously considered; (2) the identified action is subsequently modified in a manner that causes an effect to the ESA-listed species or designated critical habitat that was not considered in this concurrence letter; or if (3) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR §402.16).



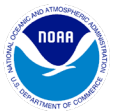
Please direct questions regarding this letter to Colette Cairns, consulting biologist, NMFS' Office of Protected Resources, at (301) 427-8414 or colette.cairns@noaa.gov.

Sincerely,



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

cc: Paula Whitfield; National Centers for Coastal Ocean Science, National Ocean Service



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Appendix E: EFH Consultation Letter




UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
<http://sero.nmfs.noaa.gov>

June 15, 2017

F/SER4:DD

MEMORANDUM FOR: Steven Thur, Ph.D.
Deputy Director, National Centers for Coastal Ocean Science

FROM: Virginia M. Fay  /for
Assistant Regional Administrator, Habitat Conservation Division

SUBJECT: Essential Fish Habitat (EFH) Consultation for activities to be
conducted as part of the Southeast Deep Sea Coral Initiative in
2017-2019

This responds to the request for an EFH review of the subject action. During this project, National Centers for Coastal Ocean Science (NCCOS) researchers will lead field efforts that will map, survey and sample deep-sea coral ecosystems throughout the Southeast U.S., a region including the U.S. federal waters of the Gulf of Mexico, South Atlantic Bight and Caribbean Sea. These efforts will be conducted on research expeditions aboard the NOAA Ship *Nancy Foster* in 2017-2019 (3 years), as well as on the NOAA Ship *Okeanos Explorer* in 2018-2019 (2 years). Specifically, these efforts will (1) survey deep-sea coral ecosystems using remotely operated vehicles (ROV), (2) map deep-water habitats using multibeam echosounders, and (3) sample the physical and chemical properties of the water column via the deployment of CTD-casts and collection of water samples.

As specified in the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), EFH consultation is required for federal actions which may adversely affect EFH. As the federal action agency in this matter, the NCCOS has determined the proposed activities would not adversely affect EFH. The Habitat Conservation Division (HCD) has reviewed the proposed activities as well as the protective measures and best management practices incorporated into the action. In our assessment of overall activity including the experimental design, nature of the collection, and limited scope of subject activity the HCD has no EFH conservation recommendations to provide pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act. Further EFH consultation on this action is not necessary unless future modifications are proposed and you believe that resulting activities may result in adverse impacts to EFH.

Be advised the harvest and possession of coral is prohibited by current federal fishing regulations in the Gulf of Mexico. NCCOS should contact Susan Gerhart (Susan.Gerhart@noaa.gov), Chief of the Southeast Region's Sustainable Fisheries Division Gulf of Mexico Branch, to apply for a letter of acknowledgment (LOA) of scientific research activities. LOAs are issued by the National Marine Fisheries Service (NMFS) under the authority of the MSFCMA for situations where research activities would normally be in violation of federal fishing regulations. The NMFS indicates its acknowledgment by issuing a LOA specifying the activities are scientific research, and therefore, exempt from the fishing regulations developed under the MSFCMA.

cc:
F/SER24 – susan.gerhart@noaa.gov, lauren.waters@noaa.gov
F/SER4 – rusty.swafford@noaa.gov
File



**Ocean Exploration
and Research**

Appendix F: NASA Maritime Aerosols Network Survey of Opportunity

Survey or Project Name

Maritime Aerosol Network

Lead POC or Principle Investigator (PI & Affiliation)

POC: Dr. Alexander Smirnov

Supporting Team Members Ashore

Supporting Team Members Aboard (if required)

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.



**Ocean Exploration
and Research**

Appendix G: CITES Permit

Not Required for this expedition



**Ocean Exploration
and Research**

Appendix H: UCH Standard Operating Procedures

NOAA Office of Ocean Exploration and Research Operational Policy and Procedures for Underwater Cultural Heritage Missions Conducted onboard the NOAA Ship *Okeanos Explorer*

IV. Purpose

The purpose of this document is to provide guidance for OER mission activities conducted aboard the NOAA Ship Okeanos Explorer, when such mission activities involve either unexpected discovery or targeted exploration of potential Underwater Cultural Heritage sites.

II. Background

Since the inception of NOAA's ocean exploration program in 2000, OER data management practices have been guided by the 2000 President's Panel 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 OER 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.

OER missions conducted aboard the NOAA Ship Okeanos Explorer offer a 'best-case' scenario for meeting Program mission objectives related to data sharing:

- Dedicated shipboard and shore-side 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 shore-side participants and the public;
- Mission information is publically 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 underwater cultural heritage (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. In the case of OER expeditions aboard the 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.

III. 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.

The NOAA Office of Ocean Exploration and Research (OER) 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.

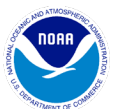
Preservation and protection of prehistoric and historic cultural resources is the policy of the Federal government and OER has a responsibility to consider the effects of its activities on these resources. If data is found to be sensitive because it reveals the location of a historically significant cultural resource, Section 304 of the National Historic Preservation Act 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 will use 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 each location will be nominated and will qualify for protection under the NHPA Section 304. OER considers these data to fall within the scope of the NAO 212-15 exceptions during this period.

IV. Roles and Responsibilities



**Ocean Exploration
and Research**

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 position
 - Seafloor mapping operations and data production
 - Telepresence-enabled ROV operations
 - Video annotations and production
 - Public broadcast operations via website and maps
- Post-cruise data management

This table summarizes the roles and responsibilities of each Team Lead in implementing the policy through the management approaches described herein and the SOPs as defined in the Appendices.

MISSION PERSONNEL (Coordinated by: Expedition Coordinator)	
Responsible Team	Accountable for these (primary) actions
Expedition Coordinator	Notification of NDA to Mission Personnel ID , communicate and enforce UCH buffer zone Coordinate with Team leads and key personnel / ensure SOP compliance
Seafloor 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 is 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 cruise and archive procedures as specified.
Communications Team	Ensure all communications are controlled through one primary POC; ensure communications are not geo-referenced.
<i>Okeanos Explorer</i> Operations (Coordinated by: CO or Designee)	
OMAO Operations	Notification to crew of NDA responsibilities Stop SCS events (email notifications) upon entering buffer zone; Start SCS events (email notifications) upon exiting buffer zone

V. Appendices: Standard Operating Procedures

Appendix A: MAPPING OPERATIONS

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

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

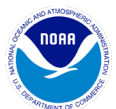
A. Pre-Cruise Planning

1. Standard Mapping Pre-Cruise Planning

- a.** This section does not affect normal pre-cruise or data management processes for standard mapping cruises that are not conducting targeted UCH mapping. During pre-cruise planning the EX Cruise Coordinator is advised to consult with the OER 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 non-standard grid size to create higher resolution mapping products to provide better images of potential UCH. If so, follow guidance in the UCH Mapping Pre-Cruise Planning section below.

2. UCH Mapping Pre-Cruise Planning

- a.** Background information - The EX 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 OER's marine archaeologist and collaborating archaeologists.
- b.** 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 cruise coordinator and mapping team lead will work with OER's marine archaeologist to coordinate this activity.
- c.** Consultation and data sensitivities - Cruise planning must also include a discussion on data sensitivity and data management/archiving. It 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-cruise 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 OER's marine archaeologist, cruise coordinator and cruise data manager along with cultural resource managers and archaeologists from other agencies with an interest in the UCH. Agencies that may have an interest include the Office of National Marine Sanctuaries (ONMS) Maritime Heritage Program, Bureau



of Ocean Energy Management, Bureau of Safety and Environmental Enforcement, U.S. Navy History and Heritage Command, National Park Service, 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.

- d.** In survey areas where an agency has responsibility for UCH, the data management team should carry out a consultation process with the agency 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.
- e.** On mapping missions within the National Marine Sanctuary System, pre-cruise discussions between the EX Cruise Coordinator and ONMS should include the ONMS Director of the Maritime Heritage Program (MHP) and the maritime heritage coordinator at the sanctuary site. They will help determine the sensitivity of data and data products.

B. Mapping Field Operations

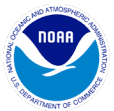
1. Standard Mapping Field Operations

- a.** 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, or other items which may appear anthropogenic in origin and have some associated cultural or historical significance.
- b.** The EX Cruise Coordinator will consult with OER's marine archaeologist immediately on the discovery of UCH in the field. The Cruise Coordinator should provide an image and location information by email. The OER marine archaeologist may request special data products that have higher resolutions than standard data products to aid in characterizing UCH.
- c.** If 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.
- d.** If UCH is historically significant or potential to be historically significant, data and data products should be held from public release until reviewed for sensitivity as applicable under the National Historic Preservation Act and other pertinent legislation and regulations, prior to releasing data to a public archive.
- e.** The expedition coordinator is responsible for the overall execution of the data management plan.
- f.** When appropriate, OER's marine archaeologist will contact relevant entities to notify them of the discovery and consult with them regarding the significance of the UCH.



2. UCH Targeted Mapping Field Operations

- a.** No informal information about UCH should be released to the general public by the ship or 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.
- b.** A five-mile buffer zone shall 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:
 - i. NOAA Shiptracker: Disable the SCS feed from the ship going to Shiptracker
 - ii. Automated Information System (AIS): NOAA requires that the AIS feed which 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 cruise planning phase the Expedition Coordinator will provide the AIS broadcast range on the EX to the chief scientist and science team. The Chief scientist, the science team, or other parties involved in a UCH mapping cruise should be made aware of this and decide whether the value of the operation merits acceptance of the potential issues/outcomes imposed.
 - iii. Telepresence Video Feeds: Do not stream any feeds that include a visible ship location, for example the multi-beam acquisition screen does not high enough resolution over the video feed to see ship position. Streams include but not limited to the SCS data screen, or any active mapping data acquisition screens, or video feeds. It is acceptable to stream video feeds that do not include the ship's location.
 - iv. The Cruise Coordinator will ensure the survey department takes steps to distinguish and separate UCH mapping data from non-UCH mapping data as appropriate.
 - v. 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.
 - vi. Multibeam Data Field Processing: Restricted files will be processed and gridded separately from other non-restricted 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, in order to not become publicly available via normal channels (FTP / Digital Atlas).
 - vii. Raw EK 60 and Subbottom 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.

- viii. Cruise Data Transfer (EX to UNH) 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).
 - ix. CTD and XBT operations conducted within the buffer zone do not need to be isolated from non-UCH data, or repressed from the *Okeanos* Atlas. CTD and XBT files should follow the normal unrestricted processing procedures and archiving.
 - x. 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 shall be provided. If a position is required, the position should be posted as it makes sense, 5 miles outside of the extent of the survey area.
- c.** Normal transmissions from the ship shall resume after the EX finishes UCH survey operations and exits the 5-mile buffer zone. Exiting the buffer zone should occur at approximately the same location as entry to prevent obvious data location gaps pointing to UCH location.

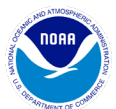
C. Post-Cruise Follow Up

1. Information Release

- a.** No informal information about UCH should be released to the general public by the ship or 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.

2. Standard Mapping Cruise follow-up where UCH is discovered

- a.** 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.
- b.** The EX Cruise Coordinator and the OER Marine Archaeologist have an initial consultation to discuss the nature of the UCH and its potential significance. This consultation may include other agencies or entities.
- c.** If UCH is determined not to be historically significant no change to standard data management procedures is required.
- d.** If UCH has the potential for historical significance but it is determined that no

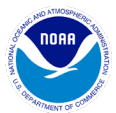


harm will result by disclosing position information, such as UCH in deep water, no change to standard data management procedures is required.

- e.** If UCH has potential historical significance 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 Data Archiving section of this document. The EX cruise Coordinator, a representative from the data management team, OER's marine archaeologist, a representative from the ONMS Maritime Heritage Program, and any parties with jurisdiction, management or other legal ties to the resource shall meet to determine what measures are needed to protect the UCH while minimizing impacts on the distribution of data and data products.

3. UCH Targeted Mapping Cruise Follow-Up

- a.** 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.
- b.** The EX cruise coordinator, OER'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 shall 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 National Historic Preservation Act.
- c.** The outcome of this meeting will determine if it is necessary to protect site location information from public release.
- d.** When data can be released
 - i.** If the findings determine that releasing information and data on UCH is not a threat, development of products and data management should follow the guidelines for a standard mapping cruise.
- e.** When data should be protected
 - i.** 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.
 - ii.** Data products that contain position information will be forwarded to the EX data management team where data and products will be stored in an archive with restricted access.
 - iii.** Cruise plans, cruise reports, situation reports, mapping summary reports and other documents that are publically available outside NOAA or freely accessible within NOAA shall not provide location information for UCH or survey areas. In certain circumstances the lead archaeologist for the cruise may request that certain UCH sites



are not mentioned in the public reports.

4. UCH mapping follow-up for National Marine Sanctuaries

- a.** When the EX conducts UCH work inside a National Marine Sanctuary the EX Cruise Coordinator shall inform the OER 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 it can be disclosed to the public. Published metadata shall indicate the point of contact to access UCH data within the NMS system is the Director of the Office of National Marine Sanctuaries.

D. Data Archiving – See Appendix C



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Appendix B: TELEPRESENCE-ENABLED ROV OPERATIONS

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

- When a cruise conducts ROV operations specifically targeted at UCH.
- When UCH is unexpectedly discovered on non-archaeological operation

A. *Unexpected UCH Discovery*

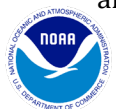
- During the Cruise: If UCH is unexpectedly discovered during an ROV dive, the onboard Expedition Coordinator should immediately contact OER's Lead Maritime Archaeologist, and the Archaeology Doctors-on-Call identified for that expedition. Those archaeologists should be engaged in the site investigation 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-cruise discussion will be held with the OER archaeologist to determine whether any datasets should be withheld from archive. (Section 2.D.II).
- **Follow-up when UCH is unexpectedly discovered**
 - a. The EX Cruise Coordinator and the OER 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.
 - b. If UCH is determined not to be historically significant no change to standard data management procedures is required.
 - c. If UCH has the potential for historical significance 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.
 - d. If UCH is or has potential historical significance 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 Data Archiving section of this document. The EX cruise Coordinator, a representative from the data management team, OER's marine archaeologist, a representative from the ONMS Maritime Heritage Program, and any parties with jurisdiction, management or other legal ties to the resource shall meet to determine what measures are needed to protect the UCH while minimizing impacts on the distribution of data and data products.

B. *Cruises conducted with ROV operations specifically targeted at UCH.*

1. Pre-Cruise Planning: ROV Exploration

a. Notifying the Team of their Responsibility to Protect Sensitive UCH Resources

Expedition members and OER personnel to have a legal responsibility to protect sensitive archaeological information (primarily location information) from untimely release.



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For a planned UCH cruise, the EC shall notify the CO and each shall have responsibility for ensuring personnel are aware of this responsibility. The EC shall provide an archaeology background document to familiarize personnel with the particular mission and requirements.

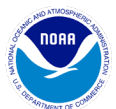
Appendix D details the range of existing accountability mechanisms already in place.

2. Pre-dive planning

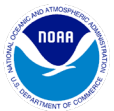
- a.** Archaeologists will develop a dive plan based on the best available knowledge of the site that will maximize data recovery and minimize any potential impact to the site. The archaeology team will work closely with the cruise coordinator and deep submergence vehicle manager to develop and implement the plan. The plan should include:
 - I.** Objectives (cultural/interdisciplinary science)
 - II.** The types of sensors needed and data to be generated
- b.** As a rule ROV dives will not disturb or touch the shipwreck or cultural feature. Exceptions to this rule must discuss the rationale behind such a decision and incorporate it into the dive plan (collection of diagnostic artifacts or samples is sometimes conducted if the activity leads to better baseline characterization).
- c.** Prior to the cruise any permitting requirements should be identified and if required, permits must be procured.
- d.** Automated Information System (AIS): NOAA requires that the AIS feed which 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 cruise planning phase the Expedition Coordinator will provide the AIS broadcast range on the EX to the chief scientist and science team. The science team, chief scientist, or other parties involved in a UCH mapping cruise 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.

C. Field Operations

- 1.** 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.
 - a.** 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.
 - b.** A three-mile buffer zone shall be created around the UCH target or isolated survey box. The time at which the ship enters, and departs the three-mile buffer



- zone needs to be recorded and provided to the Data Team Lead for post-processing use. Following work at the site, the ship will return to the site where it first entered the three-mile buffer zone to continue operations.
- c.** The following steps will be taken just prior to entering the five-mile buffer zone in order to stop broadcasting the ship's location while the survey is conducted:
- I.** NOAA email events will be stopped (OMAO/ET)
 - NOAA Shiptracker: Disable/stop the e-mail updates from the ship going to OMAO / Shiptracker
 - *Okeanos Atlas*: Disable/stop the e-mail updates to NCDDC
 - SAMOS: Disable/stop the e-mail update to FSU containing METOC and flow-through data, etc.
 - II.** Telepresence Video Feeds (OER Telepresence team lead): Do not stream any feeds that include the ship's location, including but not limited to the SCS data screen, or any active mapping data acquisition screens, or video feeds. It is acceptable to stream video feeds that do not include the ship's location.
 - III.** Redirect Live Feed as needed (OER EC or CO): If highly sensitive features (human remains, evidence of human remain such as shoes or other accoutrements, highly valuable items, etc.) are going to be investigated or are unexpectedly encountered during the course of our seafloor investigation, the lead archaeologist, ROV Team Leader, Expedition Coordinator or Commanding Officer has authority to immediately switch the live feed from the ROV and Seirios camera sled to another camera on the ship.
- d.** Daily updates on the *Okeanos 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 shall be provided. If a position is required, the position should be posted as it makes sense, 3 miles outside of the extent of the site or survey area.
- e.** Normal transmissions from the ship shall resume after the EX finishes UCH survey operations and exits the 3-mile buffer zone. The point of exit should be as near to the point of entry as is feasible to minimize location data gaps pointing to the location of the UCH.
- f.** No informal information about UCH should be released to the general public by the ship or personnel. This includes posting information and images on social networking sites like Facebook, Twitter or personal blogs. Images, video and information on 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.
- g.** In addition to the items listed, the ship sends out automated weather (autoIMET) observations every hour and manual weather observations every 6 hours with positions as a voluntary ship observer. 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.

D. Post-Cruise Data Management – Appendix C for detail

Following completion of the expedition, the Expedition Coordinator should have a follow-up call with the Data Management Team & OER lead archaeologist to review the datasets collected, confirm those that need to be withheld from public archive, and provide information to the data management team for associated metadata records.

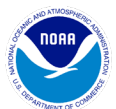
E. Post-Cruise Follow-Up

1. Information Release

- a.** No informal information about UCH should be released to the general public by the ship or 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.
- b.** Determination of whether UCH is potentially eligible for nomination to the National Register of Historic Places, 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 cruise. Sensitive or potentially sensitive information about the UCH is to remain restricted until determination is complete. Following completion of the cruise, the lead 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 National Register of Historic Places.
 - I.** If the UCH is determined to be eligible, the lead Archaeologist will prepare the nomination for the NRHP process.
 - II.** If the UCH is determined to NOT be eligible, and protection of the site does not fall under other legislation, the Lead archaeologist will notify the data management team that site information can be made publicly available.

2. UCH Targeted Cruise Follow-Up

- a.** The EX cruise coordinator, OER'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 shall 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 National Historic Preservation Act. The outcome of this meeting will determine if it is necessary to protect site location information from public release.
 - I.** When location data can be released:
 - a.** If the findings determine that releasing information and data on UCH is not a threat, development of products and data management should



follow the guidelines for a standard ROV cruise.

- II.** When location data should be protected:
 - a.** 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.
- III.** Data products that contain position information will be forwarded to the EX data management team where data and products will be stored in an archive with restricted access.
- IV.** Cruise plans, cruise reports, situation reports, mapping summary reports and other documents that are publically available outside NOAA or freely accessible within NOAA shall not provide location information for UCH or survey areas. In certain circumstances the lead archaeologist for the cruise may request that certain UCH sites are not mentioned in the public reports.

Appendix C: Post-Cruise Data Management

Data collected by OER 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 OER;
- Accessible upon request to OER (controlled access by permission);
- 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 they are eliminated from consideration for nomination to the National Register of Historic Places (NHPA Section 304), or for protection under other legislation such as the Sunken Military Craft Act or National Marine Sanctuary Act.

If data are 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 the *Okeanos Explorer* is archived under a data management agreement with NCEI. Only data that has potential to reveal the nature and location of UCH shall be restricted from public access. In accordance with the data management agreement, sensitive data from the EX will have restricted access at NCEI. To assist researchers in discovering sensitive data NGDC will publish a metadata record (but not the data) that identifies a point of contact for access. Requests to access the data will be made to the Director of OER who may delegate to the OER marine archaeologist. In lieu of the OER marine archaeologist, the OER Director may delegate to the Director of the ONMS Maritime Heritage Program.

If data is found to be sensitive because it reveals the location of a historically significant cultural resource, Section 304 of the National Historic Preservation Act 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 EX that is considered sensitive will be archived in a location where it can be withheld from public disclosure.

Data sets and associated products are housed in the appropriate NOAA archive; National Oceanographic Data Center, National Geophysical Data Center, National Coastal Data Development Center, National Climate Data Center, and the NOAA Central Library.

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

Start and end times for the 3-mile buffer zone surrounding a 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, made restricted and pertinent metadata records created and made available.

- Multibeam, sub-bottom and single beam sonar data
- SCS Data Logs are to be restricted
- All ROV dive products (including associated sensor data) need to be restricted
- CTD rosette and *in situ* sensor datasets collected in relation to the UCH, and within the 3 nm buffer zone, need to be restricted.
- All imagery needs to be reviewed and geospatial imagery removed before being made public. Imagery with geospatial information should be restricted.
- Ship track and other datasets within the buffer zone

Appendix D: NDA References

Expedition members and OER personnel to 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 *Okeanos Explorer* Expedition, where their responsibility to protect sensitive location information about UCH lies, and whether this responsibility has already been addressed or signature of a Non-Disclosure Agreement (NDA) is required to allow their participation in an expedition with planned UCH operations.

- If they are federally-employed scientists, they 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 onboard the ship are under the CO'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.
- All other members of the Mission team who are not federal employees and are engaged at-sea or ashore (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 OER 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. OER contractors signed an NDA as 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:

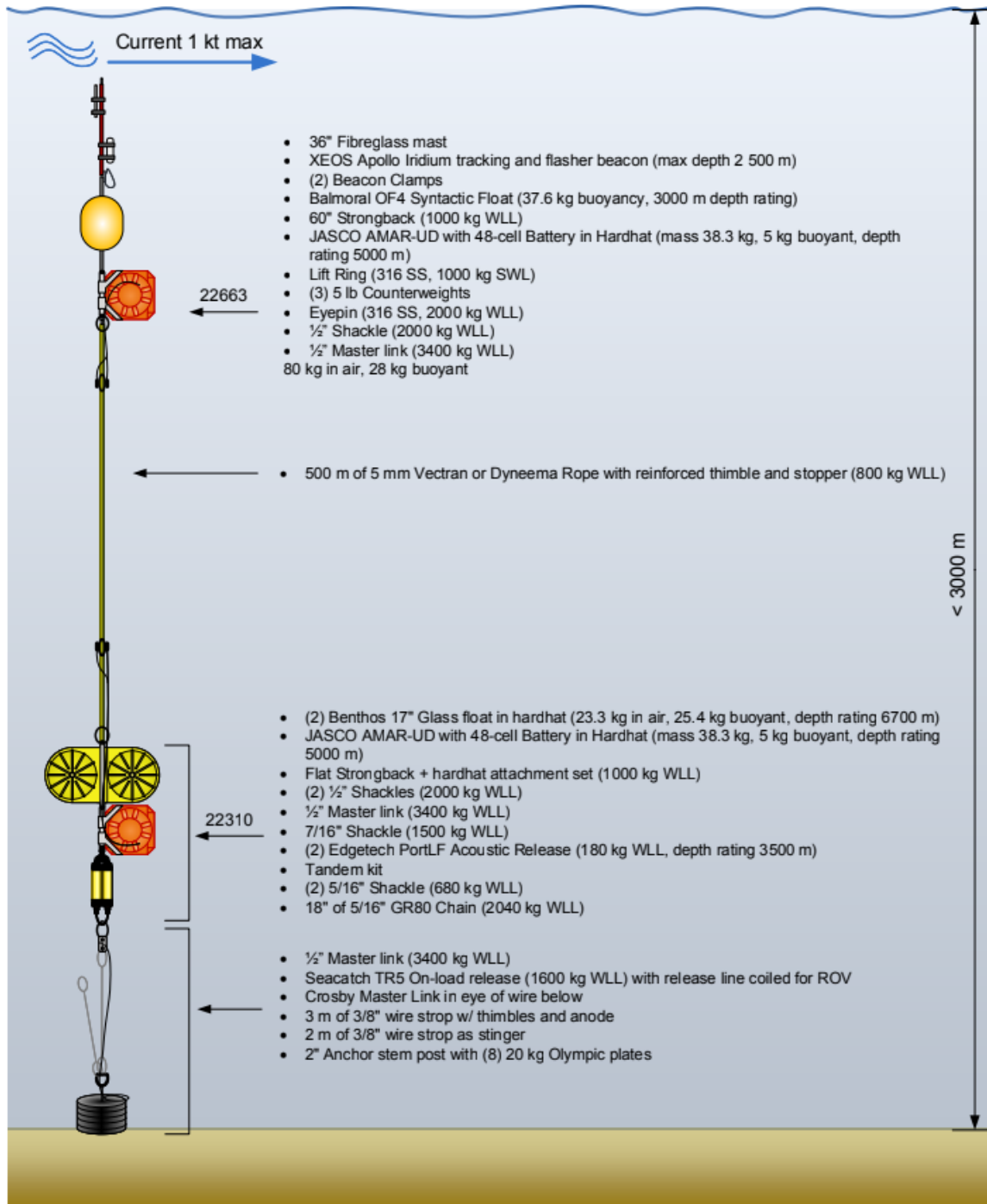
MISSION PERSONNEL (Notified by: Expedition Coordinator)		
Employee	Accountability Mechanism for With-holding Sensitive Data	Action
NOAA Federal Employees	NOAA and Federal Contract	Reminder of contract, and provide archaeology background document.
Mission Contractors (UCAR, ERT Inc., 2020 Company LLC)	Non-Disclosure Agreement	Confirm all contractors signed NDA. Send reminder of contract and provide archaeology background document.
NOAA/Federal Scientists	NOAA and Federal Contract	Reminder of Contract, and provide Archaeology background document
Other Federal Scientists (BOEM, Navy, NPS, etc.)	Federal Contract	Reminder of Contract, and provide Archaeology background document
Other Mission Personnel and Scientists	Non-Disclosure Agreement	Get NDA Signed
Okeanos Explorer Crew (Notified by: CO or Designee)		
NOAA Federal Employees	Subject to NOAA and the ship's communications plans and protocols for sensitive data	CO sends out reminder of contract to ship via All Hands, and provides 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	CO sends out reminder of contract to ship via All Hands, and provides Archaeology background document
Wage Mariners	Subject to NOAA and the ship's communications plans and protocols for sensitive data	CO sends out reminder of contract to ship via All Hands, and provides Archaeology background document

Appendix I: Hydrophone Array



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Mooring Diagram 223



Appendix J:

NOAA Ship *Okeanos Explorer*: SOPs for Environmental Compliance

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 subbottom sonar. The subbottom 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 60s. 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 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.

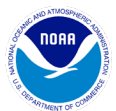
2. Minimize Temporary Disturbance from Human Activity

- 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. 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
- c. 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 (appendix G), and NOAA Fisheries as part of a Biological Opinion:

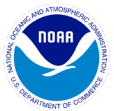
a. *Vessel Strike Avoidance*

Vessel operator 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

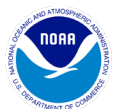
- i. If a sighted whale is believed to be a North Atlantic right whale, federal regulation requires a minimum distance of 500 yards be maintained from the animal (50 CFR 224.103 ©).
- ii. Vessels entering North Atlantic right whale critical habitat are required to report into the Mandatory Ship Reporting System.
- iii. 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).
- iv. Injured, dead, or entangled right whales should be immediately reported to the U.S. Coast Guard via VHF Channel 16.
- v. Adherence to seasonal vessel speed restrictions of 10 knots or less as [designated locations](#) (Appendix H) along the U.S. east coast.
- vi. Adherence to NOAA Compliance Guide for Right Whale Ship Strike Reduction Rule (Appendix I)

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.
- 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 and 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 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.

Appendix K:



**Ocean Exploration
and Research**



2018 Multibeam Echo Sounder Sound Source Characterization

Prepared by:

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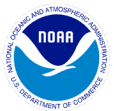
31 August 2018

Submitted to:

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**Ocean Exploration
and Research**

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1. Introduction

JASCO Applied Sciences (Canada) Ltd, an ISO 9001 certified company, is pleased to provide this proposal in response to a request by the University of New Hampshire (UNH) for static acoustic monitoring to characterize the full-ocean-depth multi-beam echo sounder (MBES) of NOAA vessel, *Okeanos Explorer*. This proposal provides a description of the methods, deliverables and assumptions, budget and certain contractual requirements for JASCO to complete the scope of work.

1.1. Proposal Contact Information

For additional information or questions regarding this proposal or JASCO, please contact:

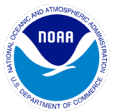
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2. Technical and Scope Proposal

JASCO will characterize the 30 kHz EM302 of the *Okeanos Explorer*. JASCO will deploy a mooring in the United States Navy's Atlantic Undersea Test and Evaluation Center (AUTC; Figure 1) deep water range. Measurements will be characterized during one, possibly two short deployments of the recorders in water depths up to 1,800 m. This estimate is based on a cruise length of 18 days (see details in Section 3.2).

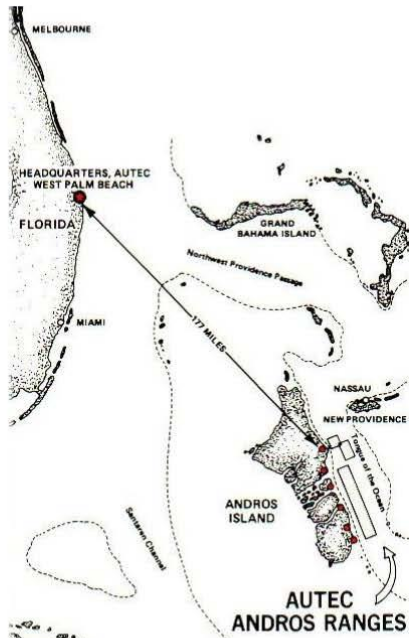


Figure 1. AUTC location.

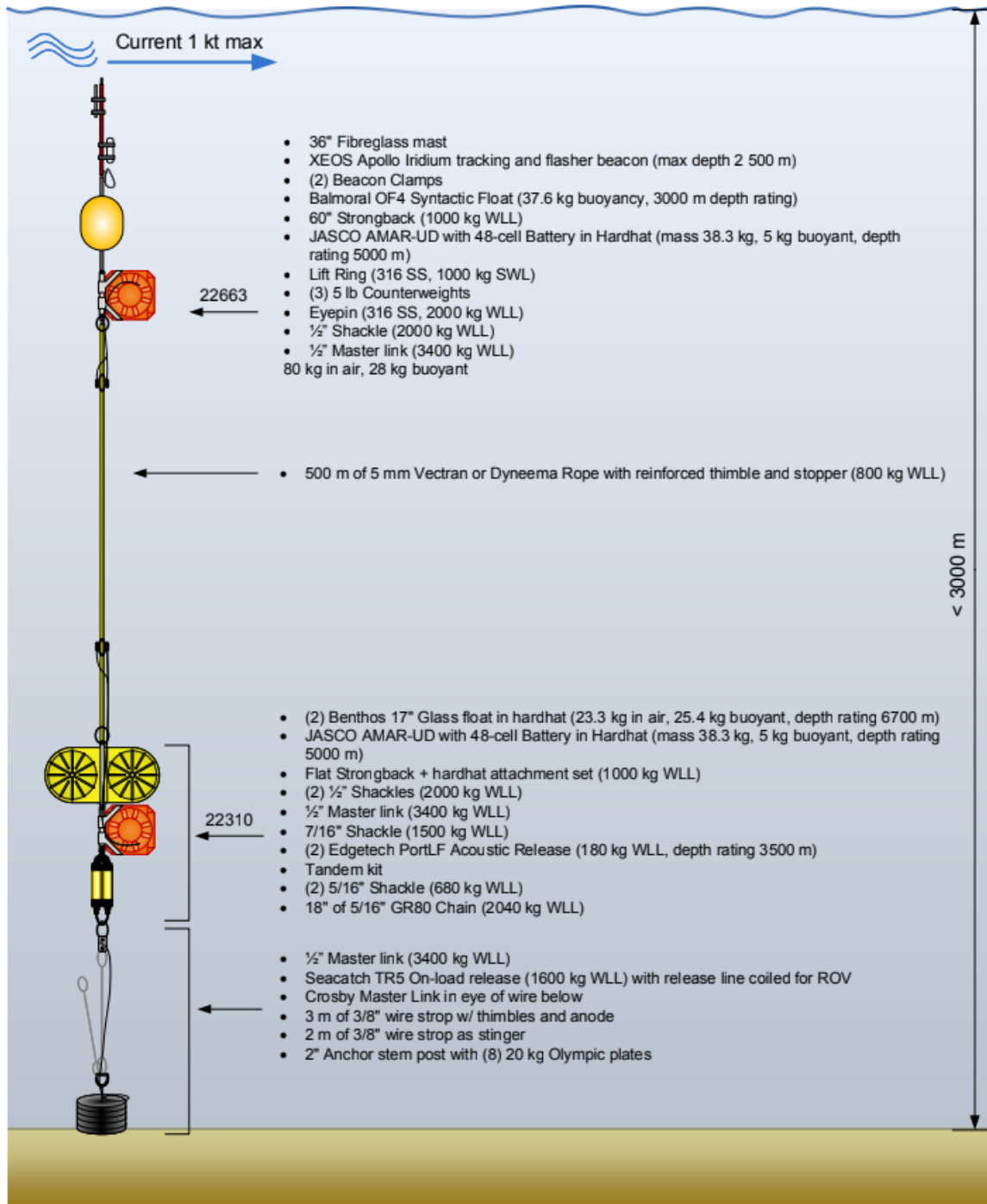
An accurate Sound Source Characterization (SSC) requires specialized measurement equipment operating in good condition.

JASCO proposes to supply one mooring with two acoustic recorders. Each of the two acoustic recorders will be equipped with both high- and low-sensitivity hydrophones to capture the widest possible dynamic range, and accurately characterize the multibeam echosounder at all ranges and operating conditions. Each system will be fully calibrated to record accurate sound levels over the required dynamic and frequency ranges.

JASCO proposes to supply one mooring with two acoustic recorders. The mooring and recorders will meet or exceed the UNH specification.

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Mooring Diagram 223



2.2. Acoustic Recorder Configuration

The acoustic recorders will be JASCO's Autonomous Multichannel Acoustic Recorder Generation 4 (AMAR G4), each equipped with a high- and low-sensitivity hydrophone. The AMARs will record at 512 kHz, with 24-bit resolution for maximum dynamic range on a 12-hr cycle as requested by the client (Table 1).

Given the short duration of the study period, one(1) 512 GB SD card will support four(4) 12-hour days of continuous recording. An additional 512 GB card will be added to the AMAR in case the recording deployment goes over the initial schedule.

The AMAR G4 supports up to 20 high-speed SD cards. With 512 GB SD cards installed, the total system memory is 10 TB and the recording endurance is 38 days continuous.

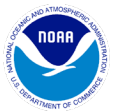
Each AMAR will be equipped with two hydrophones that will accurately measure, with a flat response, from 10 to 150 kHz with reduced response to 200 kHz. One hydrophone will have a lower sensitivity, enough to accurately record the impulses at close range without clipping. The second will have a higher sensitivity and will be suitable for characterizing longer-range impulses, and inter-pulse and background levels. The details for the listed hydrophones are:

- M36-V35, which can measure a PK of 165 dB re 1 μ Pa and has a broadband noise floor of 62 dB re 1 μ Pa.
- M36-V0-101, which can measure a PK of 200 dB re 1 μ Pa and has a broadband noise floor of 98 dB re 1 μ Pa.

Table 1. Summary of equipment specifications.

Acoustic sampling rate (kHz)	Bits per channel	Hydrophone	Duty cycle
512	24	M36-V35-100 M36-V0-101	12hr continuous recording (from 7 pm to 7 am), 12hr sleep

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2.3. AMAR G4 Technical Specifications

The AMAR G4 is JASCO's fourth generation of AMARs (Figure 3). Released in Q1 2018, the AMAR G4 provides increased performance and new features to JASCO's mature and highly-recognized line of capable and reliable marine acoustic recorders. Importantly, this recorder is much easier to use than previous versions; it provides full Ethernet control, including an internal wireless system. This connection facilitates easy set-up and allows wireless data downloads for easy reviewing in the field without opening the pressure housing or disconnecting undersea cables.



Figure 3. AMAR Ultra Deep G4 with a single hydrophone.

Performance-wise, the AMAR G4 is an extremely powerful and highly configurable data acquisition and processing system. It comprises a high-speed acquisition system, a digital signal processor, and a host of peripheral interfaces, which are supplied as daughterboards. Various hydrophones from all major manufacturers are supported. Choice of hydrophone depends on user requirements, including operating depths, frequency bandwidths, and sound pressure levels of interest.

The AMAR G4 operates as an autonomous data logger/recorder or as a real-time in situ data processing system that stores detection events and raw data. As well as being a very capable acoustic data recorder/processor, it also interfaces with other oceanographic sensors and systems. The G4 can be configured to act as an acoustic projector (in development) or to control peripheral devices. The G4 is highly configurable, with many optional sensors, features, and accessories to satisfy myriad ocean science missions.

Four-Channel Acoustic Sampling

- 24-bit resolution
- Fixed base sample rate of 512 000 sps
- Signal is filtered and decimated internally to produce lower sample rates as desired:
 - 8 000, 16 000, 32 000, 64 000, 128 000, 256 000, and 512 000 sps
 - All channels are sampled synchronously at the same rate
 - This approach yields significantly better noise performance than most recorders at lower than maximum sample rates
- Three variants of the 4-channel ADC board to interface with:
 - Single-ended voltage input,
 - Differential voltage input, or
 - Single-ended current input hydrophones

Gain

- ADC's internal analog gain is set to accommodate the full dynamic range of the selected hydrophone

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Frequency Response

- ADC is configured for AC coupling to hydrophones
- -3 dB low-frequency roll-off occurs at 2.4 Hz
- Third-order anti-alias filter with 3 dB roll-off shoulder at 200 kHz is used for all sample rates since the ADC always samples at 512,000 sps
- Lower sample rates are then produced via decimation

Calibration

- Calibrations are performed before shipment with precision signal sources
- Specialized hydrophone calibrations can be ordered
- Can be calibrated in the field before and after each deployment to verify system operation with a GRAS pistonphone calibrator and hydrophone-specific couplers supplied by JASCO

Memory: Removable SD Cards

- Recorded data are stored on up to 20 SD memory cards
- SD cards are removable and directly readable by any computer
- Data are stored as multichannel WAV files and CSV files
- 10 TB (10,240 GB) total memory capacity by using twenty 512 GB cards (the largest cards currently available with sufficiently high read/write speed)
- With terabyte SD cards soon to be available, and with optional three-to-one lossless compression under development, 60 terabytes of storage may be available in the very near future
- JASCO-proprietary SD card power management system turns off individual cards when not in use to minimize power draw

Batteries and Battery Packs

The G4 Ultra Deep has shrink-wrapped alkaline battery packs for easy replacement.

- G4 Ultra Deep in glass sphere:
 - Internal battery pack of 48, 96, or 128 D cells
 -

Wireless Communications

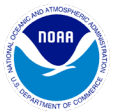
The G4 Ultra Deep models offer wireless communications:

- Wi-Fi connectivity to configure and download test data with AMARlink PC software
- Magnetic reed switches to power on/off and start/stop recording
- Bluetooth capable

Power

- Power draw: 559 mW (one channel @ 32 kbps)
- Operating voltage: 7–24 V_{DC}
- AC power adapter: 110–240 V, 50–60 Hz, 0.5 A
- Environmental
 - Operating temperature: -5 to 50 °C
 - Storage temperature: -18 to 55 °C
- G4 PVC 2X in PVC housing is depth rated for 250 m

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2.4. Calibration

Each AMAR will be calibrated before deployment and upon retrieval with a pistonphone type 42AC precision sound source (G.R.A.S. Sound & Vibration A/S; Figure 4). The pistonphone calibrator produces a constant tone at 250 Hz at a fixed distance from the hydrophone sensor in an airtight space with known volume. The recorded level of the reference tone on the AMAR yields the system gain for the AMAR and hydrophone. To determine absolute sound pressure levels, this gain is applied during data analysis. Typical calibration variance using this method is less than 0.7 dB absolute pressure.



Figure 4. Split view of a G.R.A.S. 42AC pistonphone calibrator with an M36 hydrophone.

2.5. Deployment Procedure

The following steps outline the procedure for deploying the AMAR mooring from the *Okeanos Explorer* (Figure 5). This procedure is subject to change based on weather conditions and consultation with the vessel master and crew.



Figure 5. Photo of *Okeanos Explorer*, vessel indented for deployment and retrieval. Photo from: <https://oceanexplorer.noaa.gov/okeanos/>.

JASCO's field team and vessel crew will deploy the mooring as follows:

Job Safety Analysis meeting with JASCO crew, ship's crew, crane operator, and vessel master.

1. Prepare the equipment for deployment:

- a. Load the ~500 m mooring line onto the main winch.
- b. Choose a suitable spot to secure the mooring on the aft deck to support load transfers.
- c. Move the anchor plate assembly, acoustic release assembly, and bottom float to the chosen location on deck.
- d. Lift anchor and place over side aft (or stern depending on vessel). Secure anchor at or just below waterline with a on-load release.
- e. Prepare top float assembly and connect to mooring line on winch.

2. Deploy the upper-float and AMAR:

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- a. Attach off-load hook to crane hook and secure to upper float lift ring. Attach one pass-through tagline. Lift the upper float and deploy overboard while controlling the top mooring assembly via tagline.
 - b. With vessel making min steerage, pay out mooring line from winch.
 - c. Secure the mooring line to the hardpoint on the aft deck and disconnect the winch once the line is paid out.
- 3. Deploy the mid-float and AMAR:**
- a. Load bottom ~20 m of mooring line on winch.
 - b. Choose a suitable spot to secure the mooring on the aft deck to support load transfers.
 - c. Connect the mid-float and AMAR assembly to the end of the ~ 500 m mooring line.
 - d. Attach off-load hook to crane hook and secure to mid-float lift ring. Lift the float and transfer load, disconnecting from the deck hardpoint.
 - e. Lift the assembly and deploy overboard while controlling with a tagline.
 - f. Continue to pay out the mooring line from the winch.
- 4. Deploy the lower float and tandem release:**
- a. Connect bottom float and acoustic release assembly to mooring under tow.
 - b. Using the A frame or a crane as appropriate, lift the anchor forward until the anchor takes the load of the mooring and the winch line can be disconnected.
 - c. Lift the anchor weight aft, lower to water line, steam until coordinates are reached.
- 5. Deploy the anchor weight:**
- a. Activate on-load release to drop anchor.
- 6. Debriefing meeting to capture lessons learned.**

2.6. Retrieval Procedure

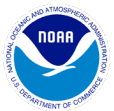
The following steps outline the procedure for retrieving the mooring from the *Okeanos Explorer*. The AMAR will be lifted from the water by the crane. This procedure is subject to change based on weather conditions and consultation with the vessel master and crew. Discuss with the vessel crew how to capture mooring float using hooked poles from the main deck or launch a small boat.

The AMARs will be retrieved as follows:

Job Safety Analysis meeting with JASCO crew, ship's crew, crane operator, and vessel master.

- 1. Position ship:**
 - a. Heading abeam the wind, the vessel approaches the location to within 50 m and maintains position.
 - b. Lower the transducer into the water and holds it steady. The Universal Deck Set is used to wake up the modem and then range the mooring.
- 2. Release the mooring:**
 - a. Send the release signal to let go of the anchor weight so the mooring can float to the surface.
 - b. Once the mooring is spotted, bring the transducer back onboard.
- 3. Retrieve the upper-float and AMAR:**
 - a. Attach to the lift ring of the top mooring assembly and lift the top of the mooring on board with the crane.
 - b. Once the top of the mooring is onboard and secured, disassemble the connection to the ~ 500 m mooring line, which will be attached and wound onto the winch.

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4. Retrieve the mid-float and AMAR:

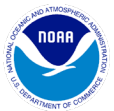
- a. While winding the mooring line onto the winch, watch for the mid-float assembly.
- b. Attach the crane to the lifting ring on the mid-float assembly and lift onboard.
- c. Connect the ~20 m mooring line to the aft deck and disconnect the mid-float assembly from the mooring line.

5. Retrieve the lower float and tandem release:

- a. Connect the winch to the stopped off mooring line and use the crane to take the load off the bottom of the mooring.
- b. Use the winch to take the load and disconnect the crane hook.
- c. Wind the remaining mooring line on the winch until the lower float and tandem release surface.
- d. Attach the crane to the lifting ring on the lower float assembly and lift onboard.
- e. Disassemble and stow mooring components.

6. Debriefing meeting to capture lessons learned.

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3. Deliverables, Timeline, and Assumptions

3.1. Deliverables

JASCO will provide one copy of all raw acoustic data on original SD memory cards at the end of the cruise. This copy of the data will have no Quality Control (QC).

3.2. Timeline

The proposed deliverable schedule is shown in Table 2.

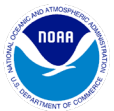
Table 2. Proposed schedule of deliverables and key milestones.

Item	Time
Contract Award	5 Oct 2018
Equipment preparation begins	12 Oct 2018
Equipment ships from JASCO	9 Nov 2018
Equipment Arrives in San Juan	23 Nov 2018
Equipment loaded in San Juan	28 Nov 2018
Mooring deployed x2	4-6 days
Equipment unloaded in Charleston	16 Dec 2018

3.3. Assumptions

- The pricing proposal is based on the best available information from UNH and the following assumptions:
 - JASCO field staff **are** restricted to US Citizenship
 - All permits will be handled by the client.
 - The client will provide best available site bathymetry and currents prior to mobilization starting, in order for the mooring performance to be accurately simulated to guarantee sufficient measurement quality.
 - Fieldwork departure from San Juan, Puerto Rico in late November 2018 (dates in this proposal for estimate purposes only and will be adjusted upon direction from UNH). Air freight shipment of equipment to San Juan is assumed because sea freight would likely require more transit time than the schedule will allow.
 - Sufficient time and resources will be available to accurately survey the final as-deployed mooring locations after deployment. This can be accomplished with either the vessel's survey equipment, or by performing a manual series of range measurements to the JASCO acoustic releases post-deployment.
 - A suitable dry lab working space will be available shortly after mooring retrieval to open the recorders and extract the data.

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4. Health, Safety, and Environment

JASCO's Health, Safety and Environment (HSE) Program aspires to consistently apply HSE standards company-wide. As an organisation, we strive to achieve this goal by meeting the highest standard, from legislation or industry, applicable to our work. We are committed to our staff's safety and the safety of companies and their staff who work alongside us.

We recognize the responsibility for Health and Safety is shared, and thus encourage our staff and everyone working with us to be actively involved in managing one another's safety. It is because of our staff's proactive efforts that JASCO has an excellent safety record (see Table 3). JASCO's safety record reflects the focus JASCO places on the health and safety of its personnel and its environmental stewardship. JASCO has had no reported lost work time incidents since it began in 1982.

Table 3. JASCO's safety statistics for internally recorded incidents. All numbers are annual totals for the whole company and have been modelled on ISNetworld.

Categories	2016	2015	2014
Employees	79	78	77
Person hours*	154,050	152,100	150,150
Fatalities	0	0	0
Lost workday/lost time cases	0	0	0
Modified/restricted duty incidents	1	1	0
Medical treatment incidents	0	0	0
First aid cases	3	0	0
Near misses	5	0	0

* Approximated for the year.

JASCO's HSE Program is formalized in documents and managed with a standard framework HSE Management System that allows us to plan, implement, evaluate, and improve our occupational health and safety program (i.e. Plan, Do, Check, Act).

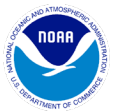
The HSE Program includes a number of unique employment-specific procedures, supporting templates, and guidelines that support our policies. JASCO's HSE Manual outlines program and review requirements.

JASCO continually learns from, and adjusts our program based on, our experiences with client HSE programs as well as from lessons we've learned from specific projects. Our program, built from industry practices and legislated program requirements, continues to grow and become more comprehensive each year. Our HSE Management System fosters growth and fine-tunes our Program through an annual audit.

Our environmental focus is to limit our footprint wherever possible, including using passive scientific practices, leaving nothing behind in the environment, and reducing, reusing, or recycling where possible. JASCO's Sustainability Program, currently being formalized, will address such items as community involvement and positive effects as we refine our activities.

Our approach to health and safety and environmental management on all projects is intended to complement both the client's and JASCO's programs such that the effectiveness of each program is maximized. We welcome client feedback. Upon request, we would be happy to provide clients with specific program components for further inspection.

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4.1. Quality Assurance and Quality Control

The primary objectives of JASCO's ISO 9001 certified Quality Management System are to achieve and maintain outstanding performance by consistently providing timely products and services that exceed client expectations and to continually improve the quality of the products and services we deliver. Our retrieval and data return rates in Figure 6 clearly show JASCO has achieved these objectives.

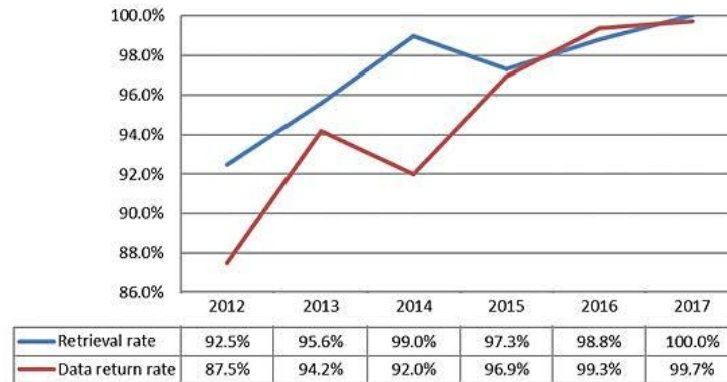


Figure 6. Continual improvement in retrieval and data return rates.

JASCO is proud of achieving this level of quality and improvement, while continually responding to the increasingly challenging and specialized needs of clients. From 2012 to 2017, we deployed over 600 moorings. These impressive deployment statistics demonstrate our shared success:

- ~25% of moorings were deployed at depths greater than 1000 m.
- ~30% of moorings were deployed for durations greater than 6 months.
- ~10% of moorings were deployed for durations greater than 1 year.
- ~200 cumulative years of recorder deployments.

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