



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

March 12, 2018

MEMORANDUM FOR: Commander Eric Johnson, NOAA
Commanding Officer, NOAA Ship *Okeanos Explorer*

FROM: Commander Stephanie Koes, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for EX-18-01
Sea Trials and Shakedown


Attached is the final Project Instruction for EX-18-01, Sea Trials and Shakedown, which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of March 17 – March 19, 2018. Of the 3 DAS scheduled for this project, 3 DAS are funded by an OMAO allocation and 0 DAS are funded by Line Office Allocation. This project is estimated to exhibit a High Operational Tempo. Acknowledge receipt of these instructions via e-mail to deputyops.moa@noaa.gov at Marine Operations Center-Atlantic.






Final Project Instructions


Date Submitted: February 12, 2018
Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX-18-01
Project Title: Sea Trials and Shakedown
Project Dates: March 17 - 19, 2018

Prepared by: 
Meme Lobecker, NOAA
Expedition Coordinator
Office of Ocean Exploration & Research

Dated: 3/5/18

Approved by: 
Craig Russell, NOAA
Program Manager
Office of Ocean Exploration & Research

Dated: 3/6/2018

Approved by: 
Commander Stephanie Koes, NOAA
Commanding Officer
Marine Operations Center - Atlantic

Dated: 13 - MAR - 2018

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-18-01. Operations for this cruise will be conducted 24 hours/day and consist of ship and science shakedown operations following the winter alongside repair period. The expedition will commence on March 17, 2018 in Pascagoula, Mississippi (30° 20.355'N, 88° 34.499'W) and conclude on March 19, 2018 in Pascagoula, Mississippi. 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 and CTD casts in support of multibeam sonar mapping operations, and the ship’s high-bandwidth satellite connection for continuous real-time ship-to-shore communications. Operations are planned in the northern Gulf of Mexico, due south of Mississippi.

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. 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.



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In close collaboration with government agencies, academic institutions, and other partners, 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.

B. Days at Sea (DAS)

Of the 3 DAS scheduled for this project, 3 DAS are funded by an OMAO allocation and 0 DAS are funded by OAR allocation. This project is estimated to exhibit a High Operational Tempo due to 24-hour operations consisting of 24-hour-per-day ship and science shakedown operations.

C. Operating Area

EX-18-01 is a 24-hour ship shakedown and mapping cruise that will focus operations in the U.S. Gulf of Mexico.



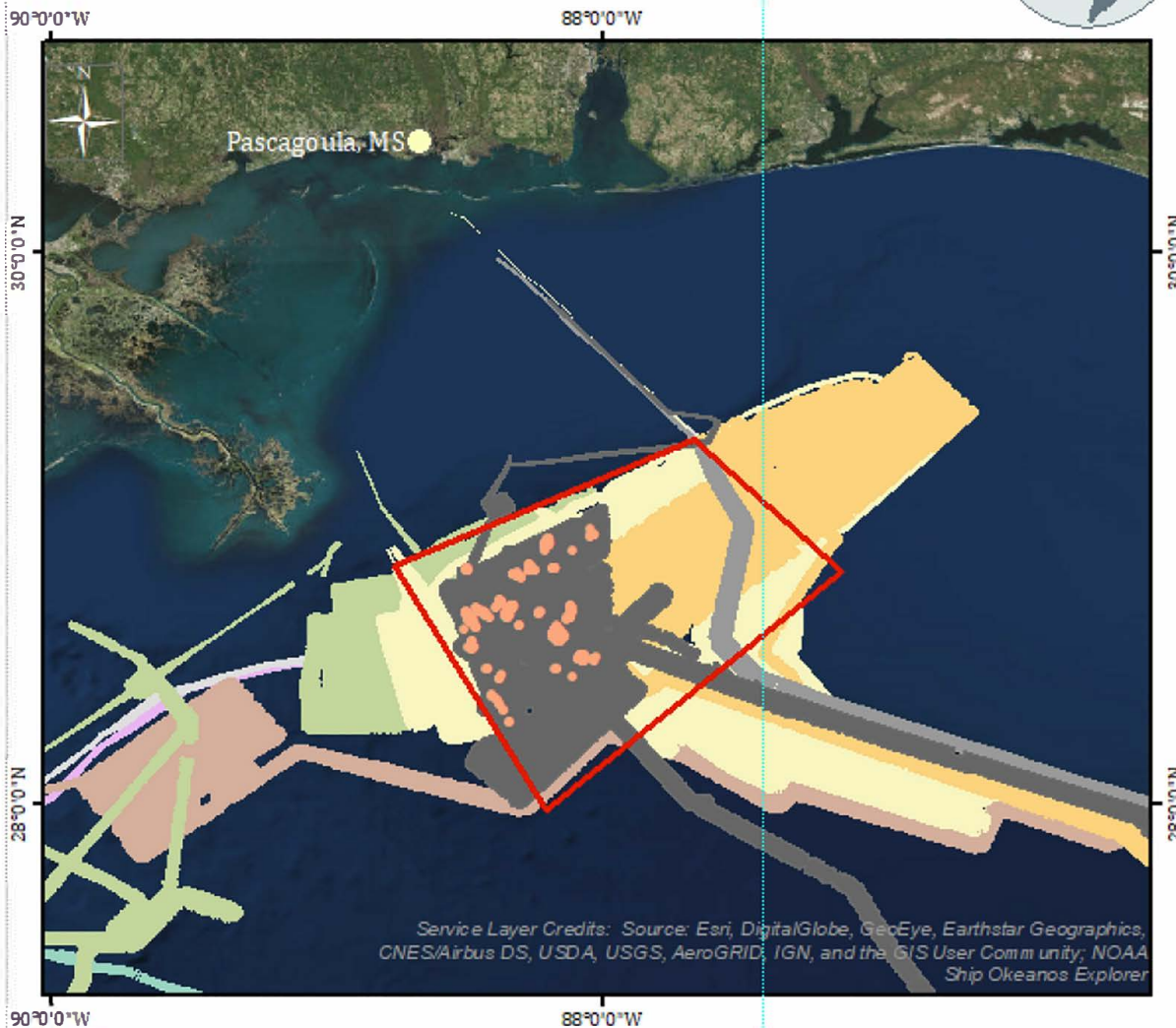
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EX-18-01

Sea Trials and Shakedown
March 17 - 19, 2018



Previous NOAA Ship Okeanos Explorer EM 302 Bathymetry

- EX-11-05 Seep Detection
- EX-11-05
- EX-11-06
- EX-12-02 Leg 1
- EX-12-02 Leg 2
- EX-12-02 Leg 3
- EX-12-03
- EX-14-02 Leg 1
- EX-14-02 Leg 2
- EX-14-02 Leg 3



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Figure 1: Map showing the general expedition operating area. The red polygon designates the shakedown working grounds.

Generalized operating area coordinates		
ID	Latitude	Longitude
SW corner	27° 58.9'N	88° 12.3'W
SE corner	28° 50.8N	87° 7.9'W
NE corner	29° 20.1'N	87° 40.1'W
NW corner	28° 51.6'N	88° 45.1'W

Table 1: Bounding coordinates of the EX-18-01 operating area

D. Summary of Objectives

March 17 - 19, (Pascagoula, MS - Pascagoula, MS.) Telepresence-enabled post shipyard sea trials and ship shakedown operations.

EX-18-01 operations will occur in the waters of the Gulf of Mexico. This short cruise will conduct post shipyard sea trial and shakedown operations, and will include a combination of ship operations, mapping/operational, and data management objectives:

1. Ship
 - a. Small boat deployment (weather permitting); Develop and maintain proficiency with small boat operations for new and long term crew;
 - b. Conduct CTD operations as requested and able;
 - c. Aft Conn Training;
 - d. Man overboard / ship handling training
 - e. Additional safety training.
 - f. Bow thruster / DP testing. ~1 hr @ night
 - g. Swing compass just off pier, small boat transfer technician back to shore.

2. EK Water Column Sonar Objectives
 - a. Conduct EK 60 GPT calibration with new autocal gear and EK 80 software
 - b. Conduct EK 80 WPT calibration (18 kHz, 120 khz) on loan from UNH. See appendix H for calibration settings plan. Calibrations not completed will be deferred to EX1802.
 - c. Potentially integrate and conduct EK 80 data collection over active seeps (potentially deferred to EX-18-02, CCOM Scientist Liz Weidner)
 - d. Troubleshoot EK 60 interference
 - e. Potentially test new Trigger Jigger with new programming (if available)



- f. Confirm read/write permissions.
- 3. EM 302 Sonar Objectives
 - a. Conduct multibeam patch test.
 - b. Conduct RPM noise testing.
 - c. Confirm triggering status.
 - d. Confirm read/write permissions.
- 4. Subbottom profiler sonar objectives
 - a. Confirm navigation and heave inputs are received.
 - b. Confirm triggering status.
 - c. Confirm read/write permissions.
- 5. Complete mapping systems readiness report for 2018 field season.
- 6. Mapping Computer/Network Objectives
 - a. Continue testing installation and integration of new mission computers.
 - b. Continue testing installation and integration of new mission network.
- 7. Mapping Sound Velocity Profiling Objectives
 - a. Collect XBT casts as data quality requires, during mapping operations;
 - b. Test each XBT hand launcher
 - c. Integrate new software Sound Speed Manager (part of Pydro) into normal operations for processing XBT casts, converting to .asvp and sending to SIS automatically.
 - d. Potentially host technicians from AOML to support AXBT system troubleshooting.
 - e. Potentially host technicians from Teledyne to support UCTD system troubleshooting.
 - f. Potentially conduct deep water test CTD to test sensors and bottle firing/water sampling capabilities.
- 8. Video Engineering (VSAT ~15 mb/sec ship-to-shore; 5 mb/sec shore-to-ship)
 - a. Test terrestrial and high-speed satellite links;
 - b. Verify Global Foundation for Ocean Exploration (GFOE)-managed telepresence systems perform as expected
 - c. placeholder
 - d. placeholder
- 9. Data Management
 - a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities;
 - b. Verify GFOE-managed data systems perform as expected
 - c. Update SOPs to reflect GFOE-managed network changes
 - d. Confirm mapping data file throughput to shoreside FTP.



- i. EM 302 .all, .wcd
- ii. EK 60 .raw
- iii. SBP .segy, .keb, .kea

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 Joint Office for Science Support (JOSS), 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

F. Personnel (Mission Party)

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

#	Name (First, Last)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Elizabeth Meme Lobecker	Expedition Coordinator	3/14/18	onboard for EX1802	F	OER (ERT)	USA
2	Zachary Barton	AOML / AXBT Launcher Engineer	3/15/18	3/20/18	M	OER	USA
3	Kevin Jerram	Mapping Watch Lead	3/15/18	onboard for EX1802	M	UCAR	USA
4	Daniel Freitas	Mapping Watch Lead	3/15/18	onboard for EX1802	M	UCAR	USA
5	Adrienne Copeland	EK 60 Expert	3/15/18	TBD	F	OER	USA
6	Elizabeth Weidner	EK 60 Expert	3/15/18	onboard for EX1802	F	UNH	USA
10	Derek Bolser	Explorer in Training	3/15/18	onboard for EX1802	M	UCAR	USA



11	Michael White	Mapping Team Lead	3/15/18	3/19/18		OER (ERT)	USA
12	Andrew O'Brien	Engineer	3/14/18	onboard for EX1802	M	GFOE	USA
13	Mike Durbin	Engineer	3/15/18	3/20/18	M	GFOE	USA
14	Andy Lister	Engineer	3/15/18	TBD	M	GFOE	USA
15	Fernando Aragon	Engineer	3/15/18	onboard for EX1802	M	GFOE	USA
16	Joe Godlewski	EK 60 cal expert	3/15/18	3/20/18	M	GFOE	USA

G. Administrative

1. Points of Contact:

Ship Operations

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Mission Operations

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Other Mission Contacts

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CDR William Mowitt, Deputy Director
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Alan Leonardi, Director
NOAA Ocean Exploration & Research
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Email: alan.leonardi@noaa.gov

Vessel Shipping Address

1. Shipments

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

ATTN: OPS
151 Watts Ave,
NOAA Ship *Okeanos Explorer*
Pascagoula, MS 39567

2. Diplomatic Clearances

None required

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 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 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



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with OER’s determination that conducting proposed SEDCI cruises are not likely to adversely affect ESA-listed marine species (Appendix D).

NCCOS has 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.

Date	Activities
03/14	EX-18-01 personnel arrive
03/14	Alongside testing of AXBT, UCTD, new network and mission computers
03/17	Depart pier in morning as early as possible, swing compass, return compass tech to shore, commence transit to EK calibration site
03/17	Conduct EK calibration in daylight hours; multibeam patch test in overnight hours
03/18	Continue EK calibration in daylight hours; conduct ship shakedown items possibly including small boat ops, continue multibeam patch test in overnight hours
03/19	Transit to Pascagoula
03/19	Some mission personnel stay onboard in preparation for EX1802

Table 2: Detailed Cruise Itinerary. This is an approximate itinerary and is subject to change based on objective completion.

B. Staging and Destaging



Minimal staging is expected as mission personnel will have been working onboard for two weeks prior to integrate new mission computers and network equipment.

No destaging is anticipated.

C. Operations to be Conducted

1. Telepresence / Outreach Events

- a. Three live video feeds will be used throughout the cruise to provide situational awareness for onshore personnel.
- b. No live events are anticipated.

2. In-Port Events

- a. No in-port events are anticipated.

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-18-01, but the ship may plan training, safety drill, or maintenance dives. A hull dive is requested within one week prior to EX-18-01 to inspect for potential marine fouling and resulting impact on noise in water near sonars, and on the sonar faces themselves. The purpose of the dive is to inspect the hull, running gear and mission systems. Recommend cleaning and removing marine growth from sonar transducers using non-abrasive tools such as bamboo scrapers and blue scotch brite pads to minimize the possibility of scratching the protective covers on mission systems.

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



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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 and GPTs(SBP)
- Teledyne RDI Workhorse Mariner (300 kHz) ADCP
- Teledyne RDI Ocean Surveyor (38 kHz) ADCP – not operable
- Teledyne Underway CTD
- LHM Sippican XBT Mark21 System(Deep Blue probes)
- AOML Automated XBT Launcher (Deep Blue probes)
- Seabird SBE 911Plus CTD and deck box
- Seabird SBE 32 Carousel and 24 2.5 L Niskin Bottles
- Light Scattering Sensor (LSS)
- Oxidation – Reduction Potential (ORP)
- Dissolved Oxygen (DO) sensor
- Altimeter Sensor and battery pack
- MarineStar GPS serial data feeds provided for GFOE network
- POS/MV with serial data feeds provided for the GFOE network
- Seabird SBE-45 (Micro TSG) data feeds provided for GFOE network
- Kongsberg Dynamic Positioning-1 System
- ECDIS
- Met/Wx Sensor Package with serial data feeds provided for GFOE network
- Three VoIP telephone lines
- 1 functioning and seaworthy SOLAS approved fast rescue boat
- 1 functioning and seaworthy work boat to support ROV operations and personnel transfers

B. Equipment and capabilities provided by the OER and partners

- Microtops II Ozone Monitor Sun photometer and handheld GPS required for NASA Marine Aerosols Network supplementary project.
- ~~NOAA OER 6000 m *Deep Discoverer* ROV (*currently capable of 4,500 m with shortened 0.68 wire)~~
- ~~NOAA *Scirios* Camera Platform~~
- IVS Fledermaus Software suite
- SIS Software and Kongsberg acquisition computer
- 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)
- Backscatter Mosaic computer
- GFOE exploration operations networking infrastructure
- Scientific Computing System (SCS)
- Telepresence System
- NCEI Cruise Information Management System (CIMS)
- GFOE VOIP system
- GFOE provided data storage

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-laurosylsarcosine, 25 mMTris 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

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



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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.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

A. Data Responsibilities

All data acquired 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



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1. At sea
 - a. Daily plans of the Day (POD)
 - b. Daily situation reports (SITREPS)
 - c. Summary forms for each CTD rosette cast
 - d. Daily summary bathymetry data files
 - e. 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.

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. Daily Situation Reports (SITREPS) will be posted as well and shared daily through email.

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.

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_FXqblp9g/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/noaaforms/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](http://ocio.os.doc.gov/ITPolicyandPrograms/ITPrivacy/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
Email: 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.

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 does not only apply to over-the-side operations, but to everyday tasks aboard the vessel that pose risk to personnel and property.



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- 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 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 email and the Very Small Aperture Terminal (VSAT) link. VSAT bandwidth at 15Mbps will be paid by OER and provided by OMAO.

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

Email: Firstname.Lastname@noaa.gov

University of New Hampshire, Center for Coastal and Ocean Mapping

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



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Voice Over IP (VoIP) Phone:

(541) 867-8932

(541) 867-8933

(541) 867-8934

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

Email: 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

No Foreign Nationals will participate.



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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/forms/d/e/1FAIpQLSe0spa6ORrLrUXvl0bttA50tQNeCKmNpq2_VKnFh0_BHlhN1g/viewform with their emergency contact information



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Appendix B: Data Management Plan



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Data Management Plan
Okeanos Explorer (EX1801): Sea Trials and
Shakedown



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OER Data Management Objectives

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

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1. General Description of Data to be Managed

1.1 Name and Purpose of the Data Collection Project

Okeanos Explorer (EX1801): Sea Trials and Shakedown

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 and CTD casts in support of multibeam sonar mapping operations, and the ship's high-bandwidth satellite connection for continuous real-time ship-to-shore communications.

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, 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, shakedown

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

Okeanos Mapping Cruises

1.5 Planned or actual temporal coverage of the data.

Dates: 3/17/2018 to 3/19/2018

1.6 Planned or actual geographic coverage of the data.

Latitude Boundaries: 27.98 to 29.34

Longitude Boundaries: -88.752 to -87.13

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

Cruise Plan, Cruise Summary, Data Management Plan, CTD (processed), CTD (product), CTD (raw), EK60 Singlebeam Data, Expedition Cruise Report, Floating Point GeoTIF, GSF, HDCS, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), NetCDF, SCS Output (compressed), SCS Output (native), Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw)

1.8 What platforms will be employed during this mission?

Okeanos Explorer (EX1801): Sea Trials and Shakedown



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NOAA Ship Okeanos Explorer

2. Point of Contact for this Data Producing Project

Overall POC: Elizabeth Lobecker
Expedition Coordinator

Title: Contractor (ERT, Inc.) for NOAA Office of Ocean Exploration and Research

Affiliation/Dept: elizabeth.lobecker@noaa.gov

E-Mail: 240-429-7023

Phone:

3. Point of Contact for Managing the Data

Data POC Name: Susan Gottfried, Andrew O'Brien

Title: Stewardship Data Management Coordinator, Onboard and Shoreside Data Management Coordinator

E-Mail: susan.gottfried@noaa.gov, andrew.obrien@tgfoe.com

4. Resources

- 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. Data Lineage and Quality**5.1 What is the processing workflow from collection to public release?**

SCS data shall be delivered in its native format as well as an archive-ready, documented, and compressed NetCDF3 format to NCEI-MD; multibeam data and metadata will be compressed and delivered in a bagit format to NCEI-CO

5.2 What quality control procedures will be employed?

Quality control procedures for the data from the Kongsberg EM302 is handled at UNH CCOM/JHC. Raw (level-0) bathymetry files are cleaned/edited into new data files (level-1) and converted to a variety of products (level-2). Data from sensors monitored through the SCS are archived in their native format and are not quality controlled. Data from CTD casts and XBT firings are archived in their native format. CTDs are post-processed by the data management team as a quality control measure and customized CTD profiles are generated for display on the Okeanos Atlas (explore.noaa.gov/okeanosatlas).

6. Data Documentation

True

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

6.2 Where will the metadata be hosted?

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Organization:

An ISO format collection-level metadata record will be generated during pre-cruise planning

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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.

URL: <https://www.ncddc.noaa.gov/oer-waf/ISO/Resolved/2018/>

Meta Std: 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:

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

7. Data Access

True

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.

Not Applicable

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: NOAA National Centers for Environmental Information

URL: <https://data.noaa.gov>

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

Hold Time: not applicable

Authority: 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. Data Preservation and Protection

8.1 Actual or planned long-term data archive location:

Data from this mission will be preserved and stewarded through the NOAA National Centers for Environmental Information. Refer to the Okeanos Explorer FY16 Data Management Plan at NOAA's EDMC DMP Repository (EX_FY17_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.

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Data management standard operating procedures minimizing accidental or malicious modification or deletion are in

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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.

Okeanos Explorer (EX1801): Sea Trials and Shakedown



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Appendix C: Categorical Exclusion



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Appendix D: ESA Section Letter of Concurrence



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
Sci 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 Scleractinia, 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 sonify 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 multi-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.

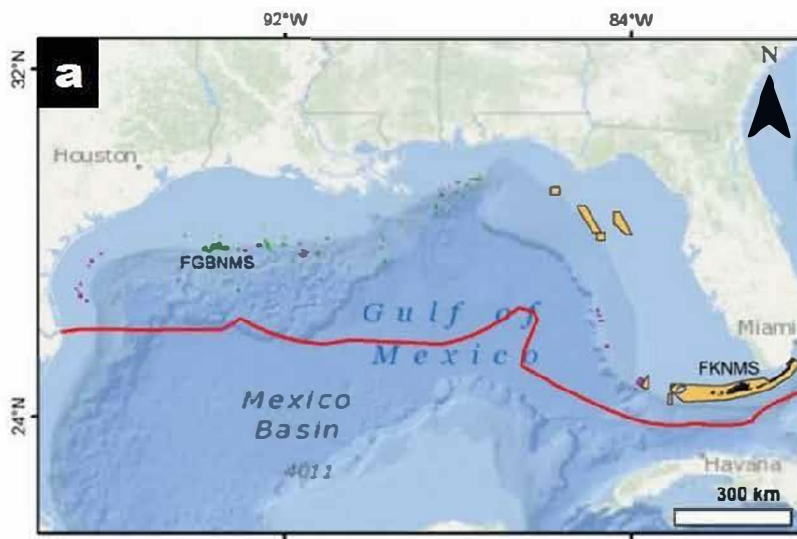


Figure 1. Map of proposed survey areas in the Gulf of Mexico. Areas prioritized for surveys include the Flower Garden Banks National Marine Sanctuary (FGBNMS) and the Florida Keys National Marine Sanctuary (FKNMS).

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.



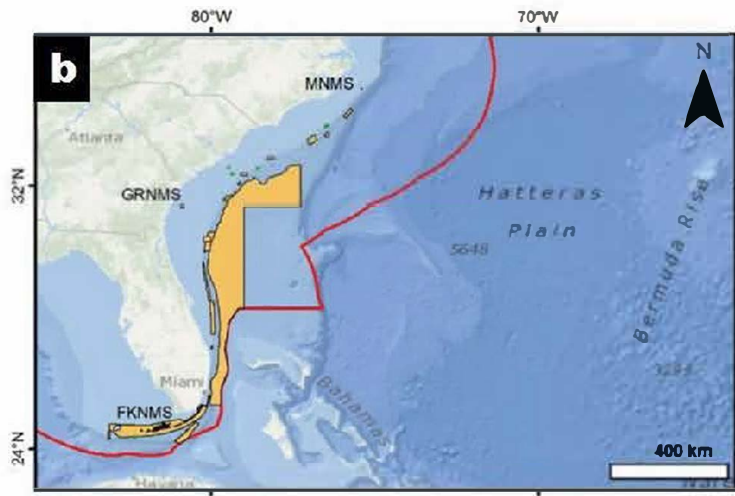


Figure 2. Map of proposed survey areas in the South Atlantic Bight. Areas prioritized for surveys include the Florida Keys National Marine Sanctuary (FKNMS), the Gray's Reef National Marine Sanctuary (GRNMS), and the Monitor National Marine Sanctuary (MNMS).

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 Morito (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.

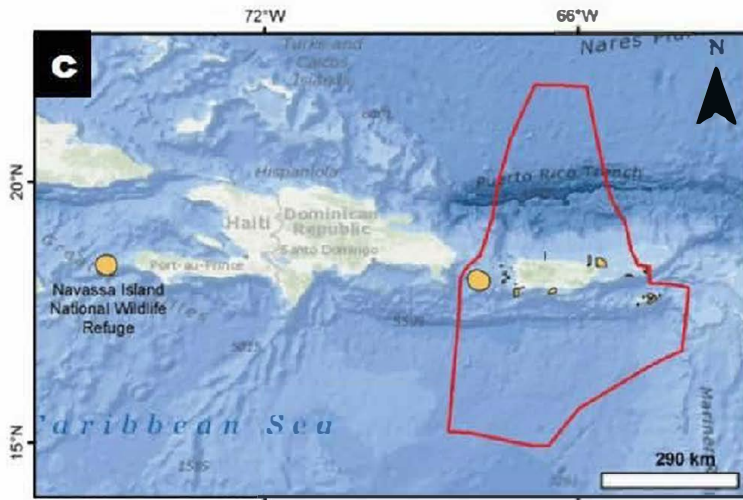


Figure 3. Map of proposed survey areas in the Caribbean.

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/npdcs/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	30kHz
	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 bandwidth 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
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Appendix G: EK Calibration Plan

Priority 1: The following EK 60 GPT settings will be calibrated using EK 80 software:

18 kHz: 8.193 ms and 1.024 ms, 2000 W

38 kHz: 4.096 ms and 1.024 ms, 2000 W

70 kHz: 2.048 ms and 1.024 ms, 1000 W

20 kHz: 1.024 ms, 250 W

200 kHz: 1.024 ms, 150 W



**Ocean Exploration
and Research**