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

MEMORANDUM FOR: Commander Mark Wetzler, NOAA
Commanding Officer, NOAA Ship *Okeanos Explorer*

FROM: Captain Anne K. Lynch, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for EX-15-04 Leg 4
CAPSTONE NWHI Exploration Leg IV

Attached is the final Project Instruction for EX-15-04 Leg 4, CAPSTONE NWHI Exploration Leg IV, which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of September 7 – September 30, 2015. Of the 24 DAS scheduled for this project, 0 DAS are funded by OMAO allocations, 20 DAS are funded by a NMFS Line Office Allocation, 1 DAS is funded by an OAR Line Office Allocation, 3 DAS are founded by a NOS Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are other agency funded. This project is estimated to exhibit a High Operational Tempo. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

cc:
Deputy Director, Office of Ocean Exploration & Research
Expedition Coordinator, Office of Ocean Exploration & Research

DRAFT Project Instructions

Date Submitted:	August 26, 2013
Platform:	NOAA Ship *Okeanos Explorer*
Project Number:	EX-15-04 Leg IV
Project Title:	*Campaign to Address Pacific monument Science, Technology, and Ocean NEeds (CAPSTONE) Leg IV*
Project Dates:	September 7, 2015 – September 30, 2015

Prepared by: Brian Kennedy, NOAA
Expedition Coordinator
Office of Ocean Exploration & Research

Approved by: John Mcdonough Digitally signed by John Mcdonough DN: cn=John Mcdonough, o=Ocean Exploration, ou=NOAA/OAR, email=john.mcdonough@noaa.gov, c=US Date: 2015.08.26 10:54:33 -04'00' Dated: _____
John McDonough
Deputy Director
Office of Ocean Exploration & Research

Approved by: _____ Dated: 9/4/2015
Captain Anne K. Lynch, NOAA
Commanding Officer
Marine Operations Center - Atlantic

I. OVERVIEW

A. Brief Summary and Project Period

From July to September 2015, NOAA Ship *Okeanos Explorer* will conduct four telepresence-enabled ocean exploration cruises as part of the "Hohonu Moana: Exploring the Deep Waters off Hawai'i" Expedition to collect critical baseline information to meet NOAA science and management needs within the Hawaiian Archipelago and Johnston Atoll. The expedition is the first in a three-year Campaign of Expeditions (Campaign to Address Pacific monument Science, Technology, and Ocean NEeds or CAPSTONE) focused on exploring deepwater marine protected areas in the Pacific, serves as an opportunity for NOAA and the Nation to highlight the uniqueness and importance of the Pacific Monuments and Sanctuaries, which are national symbols of ocean conservation. Operations conducted during this campaign support NOAA missions to understand and predict changes in climate, weather, oceans and coasts, and share that knowledge and information with others. Much of this year's work will contribute to and complement Deep Sea Coral Research and Technology Program's three-year Pacific Islands Regional Initiative.

This document contains project instructions for EX-15-04 Leg IV, the last ROV cruise of the 2015 CAPSTONE effort. Operations for this cruise will include ROV, mapping, CTD rosette and telepresence-based remote participation. The expedition will be staged in and out of Honolulu, HI with operations beginning on September 7 and concluding on September 30. Operations will use the ship's deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonar, and Knudsen 3260 chirp sub-bottom profiler sonar), NOAA's two-body 6000 m rated remotely operated vehicle (ROVs *Deep Discoverer* and *Seirios*), CTD rosette, and the ship's high-bandwidth satellite connection for real-time ship to shore communications. ROV dives will mostly be conducted during the day, while CTD casts, and multibeam, singlebeam, and sub-bottom acoustic mapping will occur when the ROV is on deck. Exploration operations for Leg II will focus on areas around the North West Hawaiian Islands. Dives are planned in deep-water offshore of Oahu, in and just outside of Papahānaumokuākea Marine National Monument (PMNM) and Johnston Atoll in the Pacific Remote Islands National Marine Monument. ROV dives will include high-resolution visual surveys and limited rock and biologic specimen sampling. ROV dives during this cruise will offer the first-ever look at deep seafloor habitats deeper than 400m in PRIMNM. This expedition will help establish a baseline of information in the region to catalyze further exploration, research and management activities.

NOAA Ship *Okeanos Explorer* systematically explores the ocean every day of every cruise to maximize public benefit from the ship's unique capabilities. With 95% of the ocean unexplored, we pursue every opportunity to map, sample, explore, and survey at planned destinations as well as during transits; "Always Exploring" is a guiding principle. An integral element of *Okeanos Explorer*'s "Always Exploring" model is the ship's seafloor and water column mapping capabilities. All three mapping sonars (EM 302, EK 60, Knudsen sub-bottom) will be operational on all transits during this expedition for 24-hour seabed, water column, and sub-bottom data collection and selected processing.

As a telepresence-enabled ROV cruise, EX-15-04 Leg IV is anticipated to have a robust complement of shore-based science experts participating from their home institutions and Exploration Command Centers around the country. This shore-based science team will actively engage with the at-sea team in real-time using *Okeanos Explorer*'s state-of-the art telepresence technology, including during ROV dives and daily ship-to-shore science planning meetings. In general, operations will focus in the areas highlighted in Figure 1.

B. Days at Sea (DAS)

Okeanos Explorer (EX1504L4): Campaign to Address Pacific monument Science, Technology, and Ocean

Of the 24 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 20 DAS are funded by a NMFS Line Office Allocation, 1 DAS is funded by an OAR Line Office Allocation, 3 DAS are funded by a NOS Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are other agency funded. This project is estimated to exhibit a High Operational Tempo due to daily ROV operations, nighttime mapping, and possible evening CTD work.

C. Operating Area

Leg IV of the CAPSTONE Expedition is a telepresence-enabled ROV cruise that will focus on sites near Johnston Atoll inside the Pacific Remote Islands National Marine Monument, and a few sites offshore of Oahu and Ni'ihau en route to and from the Monument as well as dives in Papahānaumokuākea Marine National Monument .The ship will depart Pearl Harbor, Oahu and conduct a short dive near the island then head to towards the southern border of PMNM, then transit to PRIMNM where the majority of ROV dives will be conducted. Rift zone ridges, ridge features and other types of abrupt topography will be targeted due to their likelihood of hosting extensive communities of deepwater corals and sponges, as well as likely manganese crust habitats from 1,000-2,500m. The deepest extent of important coral and sponge groups will also be explored during dives to depths of 3,000-5,000 m. The ship will then depart PRIMNM and head to back the main Hawaiian Islands before heading back into port in Pearl Harbor, Oahu to complete the cruise.

The ship will conduct 24 hour operations consisting of daytime ROV dives and evening/nighttime mapping operations including during transit. During this cruise we will conduct 8 hour ROV dives on most days with occasional 10 or 12 hour dives on particularly interesting or deep dive sites. ROV operations will focus in depths between 250 and 6,000 meters and will include high-resolution visual surveys and limited sample collection. Mapping operations will be conducted in 250m of water and deeper, and include transit and overnight multibeam, water column backscatter, and sub-bottom data collection. Opportunistic CTD rosette operations may be requested to collect more information about the environmental parameters at ROV dives sites, or opportunistically at selected sites where collecting the data is considered important to understanding the physical or chemical properties of the overlying water column. ROV and mapping operations will not be conducted in state waters. CTD rosette operations may be requested in state waters.

The National Fish and Wildlife Service has requested the Okeanos Explorer drop off some supplies to researchers operating on Johnston Atoll. We will shorten one ROV dive to allow for a small boat transfer to the Island with the supplies some time when the ship is in close proximity to the atoll.

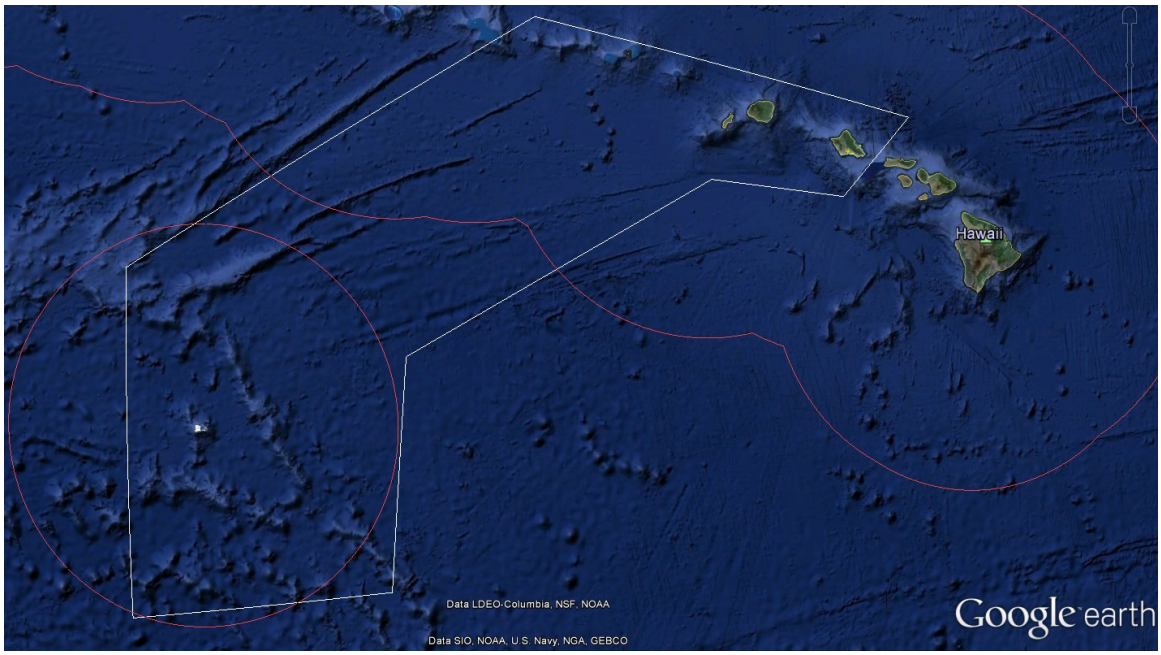

Figure 1: The white line is the approximate operating area of *Okeanos Explorer* for EX-15-04-Leg IV. The red lines denote the approximate locations of the EEZ boundaries. Figure produced in Google Earth Pro.

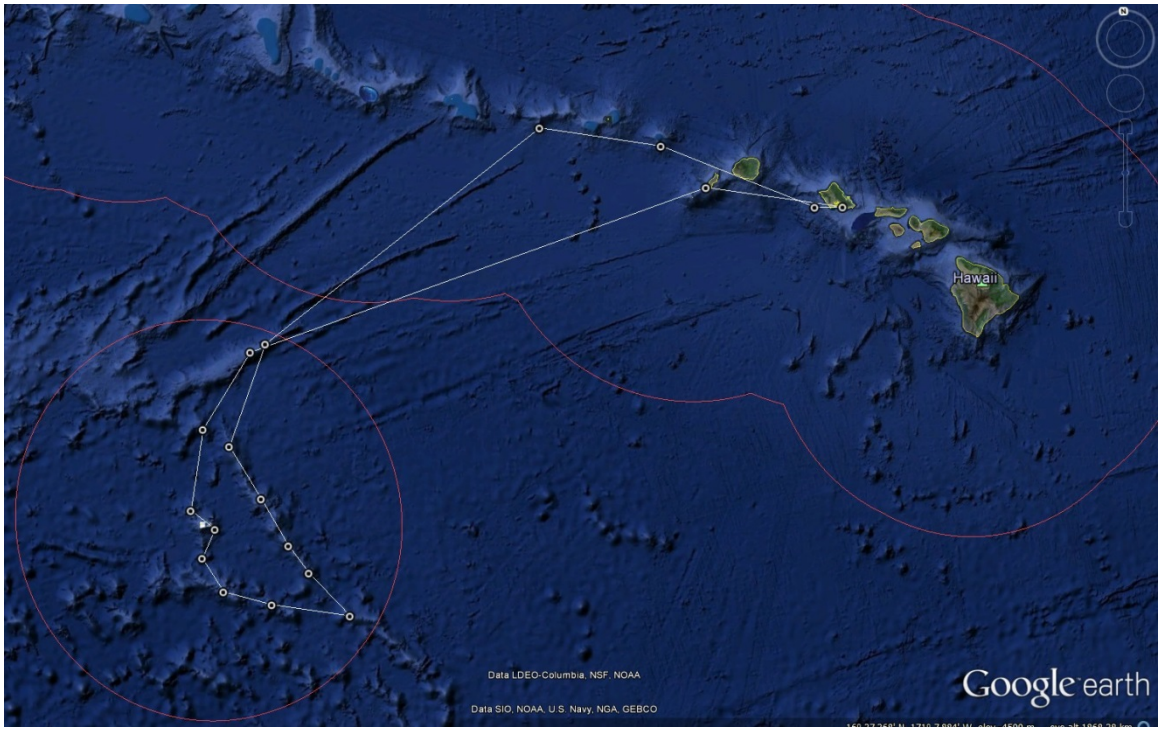

Figure 2: Approximate operating area of *Okeanos Explorer* for EX-15-04-Leg IV. The white line is the proposed ship track. The White circles are possible dive sites and the red lines denote the approximate locations of the EEZ boundaries. Figure produced in Google Earth Pro.

D. Summary of Objectives

Leg IV: September 7- September 30 (Honolulu, HI to Honolulu, HI) Telepresence-enabled ROV cruise with mapping and possible CTD operations

EX-15-04 Leg IV operations will cover a wide area of the US EEZ around Johnston Atoll and the Hawaiian Island Chain. The primary goal for this cruise is to collect baseline data and information to support priority NOAA science and management needs.

Mission objectives for EX-15-04 Leg IV include a combination of operational, science, education, outreach, and data management objectives:

1. Science
    a. Acquire data to support priority Monument and Sanctuaries science and management needs;
    b. Discover and characterize vulnerable marine habitats - particularly high density deep sea coral and sponge communities;
    c. Collect data to characterize seamounts within the Prime Crust Zone;
    d. Collect information on the geologic history of Central Pacific Seamounts, including those that are or may be relevant to our understanding of plate tectonics and subduction zone biology and geology;
    e. Refine specimen collection protocols and processing procedures
    f. Ground-truth acoustic data using video imagery and characterize associated habitat
    g. Engage a broad spectrum of the scientific community and public in telepresence-based exploration
    h. Successfully conduct operations in conjunction with shore-based Exploration Command Centers and remote science team participants
    i. Create and provide input into standard science products to provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities.
    j. Drop off supplies at Johnston Atoll to resupply researcher working there

2. Remote Science/Exploration Command Centers (ECCs)
    a. Engage and facilitate remote science participation from the new Exploration Command Centers at the University Hawaii, Manoa and the NOAA Inouye Regional Center (IRC) and other ECCs around the country.
    b. Provide operational support and training to scientists and managers to enable remote participation in at-sea operations.
    c. Facilitate outreach and engagement activities and events at the ECCs.
    d. Test and refine ship-to-shore communications procedures that engage multiple ECCs and other remote participants
    e. Test and refine operating procedures and products

3. ROV
    a. Daytime ROV dives on exploration targets
    b. Ongoing training of pilots
    c. Ongoing system familiarization, documentation, and training
    d. Test and refine new ROV systems and pilot sampling protocol
    e. Demobilize the ROV system in preparation for dry dock

4. Telepresence (VSAT 20 mb/sec ship-to-shore; 2 mb/sec shore-to-ship)
    a. Test terrestrial and high-speed satellite links
    b. Support telepresence-enabled ROV operations
    c. Collect/create all standard video products
    d. Facilitate live outreach events between ship and shore
    e. Continue to refine protocols for the new WOWZA servers at the Inner Space Center
    f. Continue to refine protocols for using YouTube live to host live video
    g. Configure new video editing workstation
    h. Formalize / Finalize parallel processing of imagery and video compression routines
    i. Work develop protocols and procedure for using the Telestream video recording suite
    j. Refine operation at the two new Exploration Command Centers – one at University of Hawaii Manoa and the other at the NOAA Inouye Regional Center on Ford Island, Honolulu, HI
    k. Work with the NASA xGDS team to improve telepresence software

5. Mapping
    a. Collect high resolution mapping data from all three sonars in priority areas as dictated by operational needs as well as science and management community needs
    b. Support ROV operations with mapping products and expertise
    c. Conduct mapping operations during transit, with possible further development of exploration targets
    d. Collect XBT casts at regular intervals no longer than 6 hours, as data quality requires, during mapping operations
    e. Create daily standard mapping products
    f. Collection of sun photometer measurements as part of survey of opportunity

6. CTD operations
    a. Conduct CTD cast for comparison to ROV CTDs after first ROV dive if needed
    b. Conduct CTDs to collect environmental data, possibly including water sample collection, as requested by the science team

7. Data Management
    a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities, as detailed in the 2014 post-cruise product list
    b. Provide daily products to shore for operational decision making purposes, as detailed in the 2015 field products list
    c. Continue to test the ability to record high definition video footage of a full dive onboard the ship
    d. Develop and test protocols and procedures for handling the data from the Telestream video recording system
    e. Develop and test protocols and procedures for handling data from pilot sampling efforts
    f. Train new data engineers
    g. Cross train existing ROV dedicated personnel
    h. Formalize Data Management SOPs
    i. Formalize / Finalize parallel processing of imagery and video compression routines
    j. Continue development on real time data visualization of ROV geospatial and environmental parameters

8. Outreach

a. Engage the general public in ocean exploration through live video and timely content (daily updates, topical essays and web logs, highlight videos, video clips, still imagery and mapping products) posted on the Ocean Explorer website
b. Conduct demonstration dive on September 7th for guests
c. Host a live interaction with potential VIPs on shore around September 25th to celebrate the 1 year anniversary of PRINMM's expansion.
d. Conduct Live interactions with OER teacher professional development workshops
e. Conduct Live interactions with school groups at the IRC
f. More TBD

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

NOAA, Office of Coast Survey, Hydrographic Surveys Division, Atlantic Hydrographic Branch, 439 W. York St., Bldg 2, Norfolk, VA 23510 USA

University Corporation for Atmospheric Research Joint Office for Science Support (JOSS), PO Box 3000 Boulder, CO 80307 USA

University of Hawai'i Manoa- 2500 Campus Rd, Honolulu, HI 96822

NOAA, National Ocean Service, Office of National Marine Sanctuaries, Papahānaumokuākea Marine National Monument - 1845 Wasp Blvd., Building 176, Honolulu, HI 96818

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

University of Louisiana at Lafayette Biology Department, 300 E St. Mary Blvd., Lafayette, LA 70503 USA

NOAA National Ocean Service, Office of National Marine Sanctuaries, Papahānaumokuākea Marine National Monument, 1845 Wasp Blvd., Building 176, Honolulu, HI 96818

F. Personnel (Mission Party)

Table 1: Leg IV—Full list of sea going mission party members and their affiliations

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Kennedy, Brian	Expedition Coordinator	9/5/15	10/2/15	M	NOAA OER	USA
McKenna, Lindsay	Mapping Lead	9/6/15	10/2/15	F	NOAA OER (ERT Inc)	USA

O'Brien, Andy	Data Engineer	Already on Board	10/2/15	M	UCAR	USA
Drewniak, Jared	Video Engineer	9/5/15	10/2/15	M	NOAA OER (ERT Inc)	USA
France, Scott	Science Co-Lead	9/5/15	10/2/15	M	UL, Lafayette	US permanent resident (Canadian)
Gerringer, Mackenzie	Science Co-Lead	9/6/15	10/2/15	F	UH Manoa	USA
McLetchie, Karl	Dive Supervisor	Already on Board	10/2/15	M	UCAR	USA
Wright, Dave	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Williams, Jeff	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Mohr, Bobby	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Lanning, Jeff	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Kennison, Sean	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
TBD	ROV Engineer		10/2/15		UCAR	USA
Ritter, Chris	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Carlson, Joshua	ROV Engineer	Already on Board	10/2/15	M	UCAR	USA
Rogers, Dan	Video Engineer	Already on Board	10/2/15	M	UCAR	USA
Howard, Art	Video Engineer	Already on Board	10/2/15	M	UCAR	USA
Brian, Roland	Video Engineer	Already on Board	10/2/15	M	UCAR	USA
Dornback, Matt	Data Engineer	Already on Board	10/2/15	M	NOAA NCEI	USA
Raymond, Annie	Mapping Watch Lead	9/5/15	10/2/15	F	PHB	USA

Table 2: LegIV—Shore-based Operations Team

Last Name	First Name	Organization	Area of interest or expertise.	Location
Cantwell	Kasey	NOAA OER	Shore-side Ops and Web Coordinator	UH Manoa/ NOAA IRC/SS
Elliot	Kelley	NOAA OER	Shore-side Ops	Varies
Martinez	Catalina	NOAA OER	Shore-side Ops	ISC
Potter	Jeremy	NOAA OER	Shore-side Ops	SS
Crum	Emily	NOAA OER (Acentia)	Communications Coordinator	Key West

Graddy	Sarah	NOAA OER (Acentia)	Media specialist	SS ECC
Elliot	Kelley	NOAA OER	Shore-side Ops	Varies

Table 3: Leg IV-- Shore Based Science Team

Description of Participation Levels	
Level 1	"Core" team member of the interdisciplinary science team guiding science operations and providing input into a core suite of science products during a significant portion or all of the expedition.
Level 2	Focused team member participating during operations focused on areas, topics or dates of interest.
Level 3	Occasional team member participating when convenient and likely unable to commit to specific dives or dates.
Level 4	"Doctors-on-call" who are actively engaged only when called upon by the core science team.

Last Name	First Name	Organization	Area of interest or expertise.	What is your level of intended/desired participation?
va	Amon	University of Hawaii	Deep-sea mining-seamounts with polymetallic nodules or ridges with cobalt crusts; Organic falls (wood and marine mammals); Hydrothermal vents/cold seeps; Litter	Level 1: Legs 2 and 4 (Latter Half) Level 3: Leg 2
Jamie	Austin	UT Austin	Geology	Level 3 "Occasional"
Jesse	Ausubel	Rockefeller University	All	Level 3 - Occasional
Amy	Baco-Taylor	FSU	All	Available for all cruises. Would like to be core for some.
Samantha	Brooke	NOAA	Monuments	Level 1 "Core"
David	Clague	MBARI	Submarine Volcanism, esp. formation and degradation of oceanic volcanoes, particularly Hawaiian volcanoes, mid-ocean ridges, and isolated seamounts	Level 4 Doctor on Call
Erik	Cordes	Temple University	Biology. Deep Sea Corals and Seep Communities.	Level 3 Occasional
Melanie	Damour	BOEM	Archaeology	Level 2 - Archaeology Dives. 4 - Doctor on Call for unexpected wrecks.
Jim	Delgado	NOAA	Archaeology	Level 4 Doctor on Call

Dan	Distel	Northeastern University	Biological sampling across all taxonomic groups, locations and ecotypes. Priorities: organic falls (wood), hydrothermal vents/cold seeps, deep sea corals.	Level 2 (all biosampling)
Jeff	Drazen	UH	Fish	Occasional
Stephanie	Farrington	HBOI at FAU	Deep Sea Corals	TBD
Kim	Faulk	ACUA/GEMS	Archaeology	TBD. Level 3/4?
Mike	Ford	NOAA NMFS	Water Column; Gelatinous Zooplankton	1. Core for Midwater work
Ben	Frable	Oregon State University Ichthyology Collection	Meso-, bathy- and benthopelagic fishes and have worked on dragonfish and lizardfish systematics	Level 2 or 3
Michael	Garcia	UH	Geology & Geophysics	Level 1 and 2 except for August 8-22nd.
Chris	German	WHOI	Hydrothermal Vents	3 Doctor-on-Call
Steve	Haddock	MBARI	Midwater	Midwater
Esprit	Heestand Saucier	University of Louisiana at Lafayette	Biology	TBD
Santiago	Herrera	University of Toronto / WHOI	Biology	Level 1 and 2
Kim	Hum	The Nature Conservancy	Interest in deep water ecology and marine conservation in general region	TBD
Reed	John	HBOI- Florida Atantic University	Deepwater and Mesophotic Coral Ecosystems	TBD; CORE at HBOI-ECC
Astrid	Leitner	UH - Masters Students	Fish	TBD
List	Levin	UCSD, Director CMBC	Deep sea Ecology	Level 3 "Occasional"
Jennifer	McKinnon	ECU	Archaeology	Level 2 - Archaeology Dives
Margaret	McManus	UH	primarily interested in plankton video from the descents and ascents	occasional in ECC and on own
Tina	Molodtsova	P.P.Shirshov Institute of Oceanology	deep-sea corals, black corals, fauna of cobalt crust	Level 3 for leg 2 and 4
Bruce	Mundy	NOAA NMFS Pacific Islands Fisheries Science	The fish fauna of the 200 nmi Exclusive Economic Zones of the U.S.-affiliated	Occasional team member for the ROV surveys

		Center	central Pacific islands	
Risa	Oram	NOAA PIFSC	Monuments Science, Fisheries, NOAA	Level 3 "Occasional"
Michael	Parke	NOAA NMFS	Deep Sea Corals	Rep for DSCRTP
Frank	Parrish	NMFS, PRD & DSCRTP	Deep Sea Corals, Fish	1. Core, Onboard Co-Lead, NMFS Rep for EX DAS
Andrea	Quattrini	USGS	Deep Sea Corals, Fish	Level 2 or 3
Waller	Rhian	University of Maine	Cold water coral ecosystems	Level 3
Brendan	Roark	Texas A&M University, College Station	Deep Sea Corals, Ecology	Level 1-2
Sonia	Rowley	UH	Deep Sea Corals	Level 3
Ken	Rubin	UH	Geology - Carbonate Terraces	Level 3 "Occasional". Interested in dives during Leg 3 and possibly the drowned reef terrace at Gardner Pinnacles.
Carolyn	Ruppel	USGS	Geology- hydrates	
Charlotte	Seid	Northeastern University, Nahant, MA	Biological sampling across all taxonomic groups, locations and ecotypes. Priorities: organic falls (wood), hydrothermal vents/cold seeps, deep sea corals.	Level 2 (all biosampling)
Hans	Van Tilburg	NOAA MHP - HI Region	Archaeology	1 for Archaeology
Mike	Vecchione	NOAA NMFS/ SI National Systematic Lab	Cephalopods; Water Column Transects	2. Core for Midwater transects. Occasional for midwater work?
Scott	White	USC	Geology	TBD
Mary	Wicksten	Texas A&M University, College Station	Biology - crustaceans	TBD
Gary	Williams	CA Academy of Natural Sciences	Deep Sea Corals, especially octocoral cnidarians, including soft corals, (sea fans) gorgonians, and sea pens (pennatulaceans)	TBD
Amanda	Ziegler	UH Manor	Interested in hard substrate fauna of the deep sea and currently work on baseline studies of megafauna	Level 2 for Leg 2 (July 31-Aug 22) and Leg 4 (Sept 8 - 30)

			for the UK in their nodule claim area within the CCZ. Working with Diva Amon	

G. Administrative

1. Points of Contact:

Ship Operations

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Other Mission Contacts

John McDonough, Deputy Director
NOAA Ocean Exploration & Research
Phone: (301) 734-1023 / (240) 676-5206
E-mail: John.McDonough@noaa.gov

Vessel shipping address:

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

Items sent to Honolulu should arrive at the below address prior to **COB September 3, 2015**.

LT Emily Rose/Name of Recipient
NOAA Ship Okeanos Explorer
1897 Ranger Loop
Ford Island Bldg. 184
Honolulu, HI 96818

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

This project will be conducted under the Scientific Research Permit PMNM-2015-018 issued to Ms. Kelley Elliott and permit PMNM-2015-025 issued to CDR Mark Wetzler to conduct work in the Papahanoumokuakea Marine National Monument (PMNM). The permit was issued by the Co-Trustees of the PMNM Board effective July 1, 2015 and expiring June 30, 2016. (Appendix C)

OER has also completed an informal consultation with NOAA's National Marine Fisheries Service (NMFS) under section 7 of the Endangered Species Act of 1973 that address the potential impacts of project activities to ESA-listed species and critical habitat within the project operating area. A Letter of Concurrence was received from NMFS on July 7, 2015, concurring with OER's determination that EX-15-04 cruise 1-4 activities are not likely to adversely affect ESA-listed marine species, and would have insignificant effects on designated or proposed critical habitat (Appendix D).

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)*

Okeanos Explorer (EX1504L4): Campaign to Address Pacific monument Science, Technology, and Ocean

We will primarily conduct 8 hour ROV dives, and operate on Hawaiian Standard Time. CTD casts are expected and requested, but will be TBD based on the availability of ship personnel and operational constraints.

Table 3: Leg II Detailed Itinerary
This is an approximate itinerary and is subject to change

Date	Activity	Notes and Requirements
9/5/2015	Crew Rest. New mission personnel will start arriving.	Crew Rest
9/6/2015	Crew Rest. The remaining mission personnel arrive	Train new mission personnel and crew rest
9/7/2015	Get underway Dive 1 Demonstration dive	Dive 1 will be on the S-19 Submarine and we will have additional personnel on board for the demonstration dive. Small boat transfer following the ROV dive.
9/8/2015	Dive 2	Normal ROV Dive
9/9/2015	Transit	Transit
9/10/2015	Transit	Transit
9/11/2015	Dive 3	Normal ROV Dive
9/12/2015	Dive 4	Normal ROV Dive
9/13/2015	Dive 5	Normal ROV Dive
9/14/2015	Dive 6	Normal ROV Dive
9/15/2015	Dive 7	Normal ROV Dive
9/16/2015	Dive 8	Normal ROV Dive
9/17/2015	Dive 9	Normal ROV Dive
9/18/2015	Dive 10	Approx. Date of short ROV dive to allow for resupply of Johnston Atoll
9/19/2015	Dive 11	Normal ROV Dive
9/20/2015	Dive 12	Normal ROV Dive
9/21/2015	Dive 13	Normal ROV Dive
9/22/2015	Dive 14	Normal ROV Dive
9/23/2015	Dive 15	Normal ROV Dive
9/24/2015	Dive 16	Normal ROV Dive
9/25/2015	Dive 17	ROV dive with possible live interaction with VIPs on shore to celebrate the 1 year

		anniversary of the expansion of PRINMM
9/26/2015	Dive 18	Normal ROV Dive
9/27/2015	Dive Transit	Transit
9/28/2015	Transit	Transit
9/29/2015	Dive 19	Normal ROV Dive
9/30/2015	Arrival Honolulu	Arrival. Crane support will be required to Demob the ROVs
10/1/2015	Demob	Crane Support will be required to Demob the ROVs
10/2/2015	Demob, Mission personnel start to depart	
10/3/2015	Demob, Final Mission personnel depart	

B. Staging and Destaging

A. All staging operations will be completed on the prior leg.
B. The ROV will be completely demobilized at the end of leg IV to prepare for the ship heading to dry dock.

C. **Operations to be Conducted**

Telepresence Events

A. Host a live interaction with potential VIPs on shore around September 25th to celebrate the 1 year anniversary of PRINMM's expansion.
B. Conduct Live interactions with OER teacher professional development workshops
C. Conduct Live interactions with school groups at the IRC
D. Additional Dates TBD- there will be additional live events that come up as the cruise progresses. These events will have little to no effect on the ship's operations and will be raised during daily operations briefings.

In-Port Events

E. On September 7th we will bring guests on board prior to departure for a short ROV demonstration

dive. At the conclusion of the dive they will be transferred back ashore by small boat.

D. SCUBA Dive Plan

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (http://www.ndc.noaa.gov/dr.html) and require the approval of the ship's Commanding Officer. No SCUBA dives are currently planned for this cruise.

E. Applicable Restrictions

Sonar Operations
EM 302, EK 60, 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 Appendix D.

III. EQUIPMENT

A. Equipment and capabilities provided by the ship

- Kongsberg Simrad EM302 MultibeamEchosounder (MBES)
- Kongsberg Simrad EK60DeepwaterEchosounder
- Knudsen Chirp 3260 Sub-bottom profiler (SBP)
- LHM Sippican XBT (Deep Blue probes)
- Seabird SBE 911Plus CTD
- 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
- CNAV GPS
- POS/MV
- Seabird SBE-45 (Micro TSG)
- Kongsberg Dynamic Positioning-1 System
- NetApps mapping storage system
- CARIS HIPS Software
- IVS Fledermaus Software
- SIS Software
- Hypack Software
- Scientific Computing System (SCS)
- ECDIS
- Met/Wx Sensor Package
- Telepresence System
- VSAT High-Speed link (Comtech 20 Mbps ship to shore; 2 Mbps shore to ship)
- Cruise Information Management System (CIMS)

- Three VoIP telephone lines
- NOAA OER 6000 m *Deep Discoverer* ROV
- NOAA *Seirios* Camera Platform

B. Equipment and capabilities provided by the scientists

- Microtops II Ozone Monitor Sunphotometer and handheld GPS required for NASA Marine Aerosols Network supplementary project.
- Equipment associated with new sampling protocol (See Appendix D)

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 (10 gallons)	Sample preservation	Wetlab, under the chemical hood
10% Buffered Formalin (3 gallons)	Sample preservation	Wetlab, under the chemical hood
Chaos Buffer (0.5 gallons) (4 M guanidine thiocyanate, 0.5% N-laurosyl sarcosine, 25 mM Tris pH 8.0, 0.1 M beta-mercaptoethanol)	Sample preservation (genetics)	Wetlab, under the chemical hood
Aqua Shield	Underwater Lubricant	ROV Workshop Fire Cabinet, Pit
Dow Corning 4	Electrical insulating compound	ROV Workshop Fire Cabinet, Pit
Fluid Film Spray	Silicone Lubricant	ROV Workshop Fire Cabinet
Isopropanol Alcohol	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	ROV Workshop Fire cabinet
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

C. Chemical safety and spill response procedures
    A. All safety and spill response procedures will be handled according to OMAO guidelines and following the manufacturers MSDS which has been provided to the ship's ECO.
D. Radioactive Materials

NOT APPLICABLE TO THIS CRUISE

V. ADDITIONAL PROJECTS

A. Supplementary Projects

NASA Maritime Aerosol Network

During the cruise the marine aerosol layer observations will be collected for the NASA Maritime Aerosol Network (MAN) as personnel availability allows. Observations will be made by the mapping team 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 Mapping Team Lead.

See Appendix D 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

Okeanos Explorer (EX1504L4): Campaign to Address Pacific monument Science, Technology, and Ocean

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 [http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_212/212-15.html].

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

a. At sea
   - Daily plans of the Day (POD)
   - Daily situation reports (SITREPS)
   - Daily summary bathymetry data files
   - Summary forms for each ROV dive
   - Summary forms for each sample collection
   - Summary forms for each CTD rosette cast

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

c. Science
   - Multibeam and XBT raw and processed data (see appendix B for the formal cruise data management plan)
   - EK 60 raw data
   - Knudsen 3260 sub-bottom profiler raw data
   - Mapping data report
   - 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

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 1330 in the forward lounge 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 e-mail and/or the EX FTP site.

A. 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.

B. 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.

C. Post-Project Meeting: The Commanding Officer is responsible for conducting a meeting no earlier than 24 hrs before or seven days after the completion of a project to discuss the overall success and short comings 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 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.

D. 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 http://www.omao.noaa.gov/fleeteval.html 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 ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

III. 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 make-up 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 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 after March 1, 2014 must be accompanied by NOAA Form (NF) 57-10-02 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

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

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

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

Contact information:

Regional Director of Health Services
Marine Operations Center – Atlantic

439 W. York Street
Norfolk, VA 23510
Telephone (757) 441.6320
Fax (757) 441.3760
E-mail: MOA.Health.Services@noaa.gov

Please make sure the medical.explorer@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.

- 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 e-mail and the Very Small Aperture Terminal (VSAT) link. VSAT bandwidth at 20Mbps will be provided by OER.

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

Important Telephone and Facsimile Numbers and E-mail Addresses

Ocean Exploration and Research (OER):

OER Program Administration:
Phone: (301) 734-1010
Fax: (301) 713-4252
E-mail: Firstname.Lastname@noaa.gov

University of New Hampshire, Center for Coastal and Ocean Mapping

Phone: (603) 862-3438
Fax: (603) 862-0839

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

Okeanos Explorer Cellular: (401) 713-4114
Okeanos Explorer Iridium:(808) 659-9179
OER Mission Iridium (dry lab): (808) 851-3827

EX INMARSAT B
Line 1: 011-870-764-852-328
Line 2: 011-870-764-852-329

Voice Over IP (VoIP) Phone:
541-867-8932
541-867-8933
541-867-8934

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

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 National Guest are Expected on Leg 4

Appendix A

EMERGENCY CONTACT DATA SHEET

NOAA OKEANOS EXPLORER

Scientists sailing aboard the *Okeanos Explorer* should fill out the form found at the following link location: https://docs.google.com/a/noaa.gov/forms/d/1pcoSgPluUVxaY64CM1hJ75l1iIYirTk48G-lv37Am_k/viewformwith their emergency contact information

Appendix B: Data Management Plan

Data Management Plan

Okeanos Explorer (EX1504L4): Campaign to Address Pacific monument Science, Technology, and Ocean Needs Leg IV

OER Data Management Objectives

Normal data management pipelines will be utilized during this cruise. The principal investigators will be trained prior to the cruise to use the new sampling database.

1. General Description of Data to be Managed

21.1 Name and Purpose of the Data Collection Project

Okeanos Explorer (EX1504L4): Campaign to Address Pacific monument Science, Technology, and Ocean Needs Leg IV

21.2 Summary description of the data to be collected.

The ship will conduct 24 hour operations consisting of daytime ROV dives and evening/nighttime mapping operations including during transit. During this cruise we will conduct 8 hour ROV dives on most days with occasional 10 or 12 hour dives on particularly interesting or deep dive sites. ROV operations will focus in depths between 250 and 6,000 meters and will include high-resolution visual surveys and limited sample collection.

Mapping operations will be conducted in 250m of water and deeper, and include transit and overnight multibeam, water column backscatter, and sub-bottom data collection. Opportunistic CTD rosette operations may be requested to collect more information about the environmental parameters at ROV dives sites, or opportunistically at selected sites where collecting the data is considered important to understanding the physical or chemical properties of the overlying water column. ROV and mapping operations will not be conducted in state waters. CTD rosette operations may be requested in state waters.

21.3 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, Papahānaumokuākea Marine National Monument, Johnston Atoll, Pacific Remote Islands National Marine Monument, PRIMNM, Hawaiian Islands, Prime Crust Zone, CAPSTONE, Hohonu Moana, Hawaiian Archipelago, Deep Sea Corals, Pacific Islands Regional Initiative, Northwest Hawaiian Islands, Oahu, Rift zone ridges, sponges, corals, ridge features, manganese crust habitats

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

Okeanos ROV Cruises

21.5 Planned or actual temporal coverage of the data.

Dates:	9/7/2015 to		9/30/2015

21.6 Planned or actual geographic coverage of the data.

	12.85	to	23.83
	-170.5	to	-157

Latitude Boundaries:

Longitude

Boundaries:

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

Cruise Plan, Cruise Summary, Data Management Plan, Highlight Images, Quick Look Report, CTD (processed), CTD (product), CTD (raw), Dive Summaries, EK60 Singlebeam Data, Expedition Cruise Report, Highlight Video, HL Image captions/credits, HL Video captions/credits, Images, Mapping Summary, Multibeam (processed), Multibeam (product), Multibeam (raw), Raw Video (digital), SCS Output (native), Sub-Bottom Profile data, Water Column Backscatter, XBT (raw)

1.8 What platforms will be employed during this mission?

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

2. Point of Contact for this Data Producing Project

Overall POC:	Scott France, Associate Professor of Biology, University of Louisiana at Lafayette, france@louisiana.edu
Title:	Associate Professor of Biology
Affiliation/Dept:	University of Louisiana at
Lafayette E-Mail:	france@louisiana.edu
Phone:	(337) 482-6320

3. Point of Contact for Managing the Data

Data POC Name:	Susan Gottfried
Title:	OER Data Management Coordinator
E-Mail:	susan.gottfried@noaa.gov

4. Resources

4.1 Have resources for management of these data been identified? False

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 NetCDF-3 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 and are not quality controlled. CTDs are

processed into profiles for display only on the Okeanos Atlas.

6. Data Documentation

6.1 Does the metadata comply with the Data Documentation Directive? True

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

6.2 Where will the metadata be hosted?

Organization: URL:	An ISO format collection-level metadata record will be generated during pre-cruise planning www.ncddc.noaa.gov/oer-waf/ discovery and access. The record will be harvested by data.gov.
Meta Std:	ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed; a NetCDF-4 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

7.1 Do the data comply with the Data Access Directive? True

7.1.1 If the data are not to be made available to the public at all, or with limitations, provide a valid reason.

Not Applicable

7.1.2 If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure.

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

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

Org:

URL: explore.noaa.gov/digitalatlas

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

Hold Time: data shall be made available as soon as possible after the cruise ends - usually 30-60 days not applicable

Authority:

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:

22-**Data from this mission will be preserved and stewarded through the NOAA National Data Centers. Refer to the Okeanos Explorer FY14 Data Management Plan at NOAA's EDMC DMP Repository (EX_FY14_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.

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

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

8.5 Prepare a Data Use Statement

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

Appendix C: Categorical Exclusion

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OCEANIC AND ATMOSPHERIC RESEARCH
Office of Ocean Exploration and Research
Silver Spring, MD 20910

August 21, 2015

MEMORANDUM FOR: The Record

FROM: John McDonough
Deputy Director, NOAA Office of Ocean Exploration and Research (OER)

John Mcdonough
Digitally signed by John Mcdonough
DN: cn=John Mcdonough, o=Ocean Exploration, ou=NOAA/OAR, email=john.mcdonough@noaa.gov, c=US
Date: 2015.08.24 08:45:52 -04'00'

SUBJECT: Categorical Exclusion for NOAA Ship *Okeanos Explorer* Cruise EX-15-04 Leg IV

NAO 216-6, Environmental Review Procedures, requires all proposed projects to be reviewed with respect to environmental consequences on the human environment. This memorandum is assessing the possible effects of this NOAA Ship *Okeanos Explorer* ocean mapping survey on the human environment.

Description of the Project
This project is part of the NOAA Office of Ocean Exploration and Research's "Science Program" and entails ocean mapping activities, Remotely Operated Vehicle (ROV) Operations, and water column profiling using CTD casts designed to increase knowledge of the marine environment. This four leg expedition is entitled "EX-15-04 CAPSTONE NWHI & Johnston Exploration." Leg IV will be led by Brian Kennedy, Expedition Manager for the 2015 CAPSTONE effort. This expedition serves as an opportunity for NOAA and the Nation to highlight the uniqueness and importance of the Pacific Monuments and Sanctuaries, which are national symbols of ocean conservation. Operations conducted during this campaign support NOAA missions to understand and predict changes in climate, weather, oceans and coasts, and share that knowledge and information with others. Much of this year's work will contribute to and complement Deep Sea Coral Research and Technology Program's three-year Pacific Islands Regional Initiative.

Leg IV of the CAPSTONE Expedition is a telepresence-enabled ROV cruise that will focus on sites near Johnston Atoll inside the Pacific Remote Islands National Marine Monument, and a few sites offshore of Oahu and Ni'ihau en route to and from the Monument as well as dives in Papahānaumokuākea Marine National Monument .The ship will depart Pearl Harbor, Oahu and conduct a short dive near the island then head to towards the southern border of PMNM, then

transit to PRIMNM where the majority of ROV dives will be conducted. Rift zone ridges and other types of abrupt topography will be targeted due to their likelihood of hosting extensive communities of deepwater corals and sponges, as well as likely manganese crust habitats from 1,000-2,500m. The deepest extent of important coral and sponge groups will also be explored during dives to depths of 3,000-5,000 m. The ship will then depart PMNM and head to Ni'ihau for final ROV dive, before heading back into port in Pearl Harbor, Oahu on September 30, 2015 to complete the cruise.

Operating Area

The operating area of 2015 CAPSTONE effort will encompasses the marine environment of the Papahānaumokuākea Marine National Monument; the marine environment around Johnston Atoll in the Pacific Remote Islands Marine National Monument; the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; the Geologists Seamounts located about 100 miles south of Honolulu; and the vessel transit areas between Honolulu, Hawai'i and these locations where ESA-listed marine species or their habitats may be impacted by an applicant's activities.

Leg IV will primarily operate within the Pacific Remote Islands Marine National Monument with dive in Papahānaumokuākea Marine National Monument and the main Hawaiian Islands.

ROV Operations on *Okeanos Explorer*

The purpose of conducting ROV operations is to conduct interdisciplinary site characterization at priority targets in the Monument. Interdisciplinary site characterization would be achieved by visually surveying priority targets while simultaneously acquiring environmental data with in situ sensors mounted on the ROVs (CTD and DO). ROV targets include seamount summits and flanks, rift zone ridges, drowned reef terraces, guyots (i.e., flat topped tablemounts), a submerged crater, submarine canyons, and other types of topography where high density deep water coral and sponge communities are likely to occur. The combined dives will enable scientists and managers to have a better understanding of the diversity and distribution of deep water habitats in the Monument, and should contribute to enhanced protection of these resources. The ROVs 6000m depth capability puts areas of the Monument within reach that have never been seen before.

The *Okeanos Explorer* is equipped with OER's dedicated, fully integrated, two-body ROV system. ROV operations are conducted primarily during daylight hours while the vessel is stopped and hold station using dynamic positioning. ROV operations will typically take place within several meters of the seafloor, and are conducted in a way to minimize seafloor disturbances. On occasion, the ROV is set down on the seafloor in order to acquire very close imagery of habitats or features of interest. Common procedure includes visually scanning the seafloor to ensure the area the ROV is set on does not include corals or other animals, however some animals may reside beneath the sediment or may be too small to see. The ROV also has a temperature probe that may be shallowly inserted into the seafloor sediment to measure the depth or temperature of features of interest. Finally, though every effort is made to prevent any unnecessary seafloor disturbance, it is likely that at some point the ROV will inadvertently touch some benthic fauna (e.g., sea whip) or that water moving through the ROV thrusters will stir up small amounts of seafloor sediment. Any disturbance would likely be similar to that seen during

normal near bottom SCUBA dives. During Leg IV, up to 21 deployments of the ROV would occur during the expedition, resulting in 168 hours total dive time (~8 hours for each dive).

During the 2015 CAPSTONE effort, a pilot sampling program is being conducted to collect very selective specimens with the ROV that have the potential to contribute significant scientific discoveries. Biological specimen collections will focus on, but are not limited to, corals and sponges (and their incidentally collected commensals). Only biological specimens suspected of being new species or new records for Hawaiian waters will be targeted. When possible, only a subsample will be taken of biological specimens (e.g., only a piece or branch of corals and sponges will be collected, not the entire organism). Selective rock specimens that have the potential to contribute significant scientific discoveries as outlined in the expedition goals will also be targeted. These are expected to include rocks from seamounts; manganese-coated rocks; and rock samples to support the United States Extended Continental Shelf effort. When possible, rock samples will be selected in a way to minimize the amount of attached organisms. Any sample collection activity within PMNM would meet PMNM's policy for voucher specimen collections.

Mapping Operations on *Okeanos Explorer*

The acquisition of high-resolution seafloor mapping data is an essential precursor to making significant biological, geological, archaeological and oceanographic discoveries in the monument. The Okeanos Explorer cruises will collect seafloor mapping data to supplement previous work. These maps form the basis for selecting ROV dive targets. ROV cruises would take the next major step in baseline habitat characterization by using the ROV system to visually investigate unknown and little known deep water habitats within the monument identified as priority by scientists and managers, including providing the first ever look at deep water communities living below 2,000 m. CTD casts may be conducted to collect additional information about the physical and chemical properties of the water column, including at sites of interest identified from mapping and ROV investigation.

As is standard procedure on exploration cruises with this vessel, the ship will conduct sonar mapping operations at during non-ROV operations throughout the cruise. Acoustic instruments that will be operational during the project are a 30 kHz multibeam echosounder (Kongsberg EM 302), an 18 kHz singlebeam echosounder (Kongsberg EK60), and a 3.5 kHz sub-bottom profiler (Knudsen Chirp 3260). Additionally, expendable bathythermographs (XBTs) will be deployed at regular intervals in association with multibeam data collection. All of these systems are routinely used by this exploration vessel and have provided invaluable scientific data for marine researchers and managers, including numerous National Marine Sanctuaries, the Bureau of Ocean Energy Management and the U.S. Geological Survey.

Bridge Officers and Watch Standers will be on watch during all hours and will to look for marine mammals and other observable species potentially sensitive to the sound of the sonars. If cetacean species are present within 400 m of the ship, the vessel will stop until the animals depart the area. In addition to a dedicated observer monitoring for the presence of protected species during daylight hours, standard practice during all *Okeanos Explorer* cruises. If a cetacean is observed, the Mapping Watch Lead and Expedition Coordinator are notified, and if appropriate, the ship will slow down or stop until the animal has departed the area. When marine mammals are able to be

identified by Bridge Officers or Watch Standers, these observations are noted in the NOAA fleet marine mammal observation log as part of standard practice.

CTD Operations
The CTD rosette instrument does not emit anything and is used to obtain conductivity, temperature, depth and other sensor data (dissolved oxygen, light scattering, oxygen reduction potential). The instrument would be attached to an open cylindrical steel frame approximately 1.15 m in diameter and 1.4 m high with a 24-position rosette carousel containing 24 2.5 L niskin bottles for collecting water samples. The system would be lowered to a maximum depth of 6800 m by an embedded scientific winch and wire while the vessel would be stopped and hold station using dynamic positioning (DP). The average time to conduct a CTD casts varies from one to several hours depending on water depth (the CTD is lowered through the water column at 60m/min). CTD casts would be conducted at selected sites including locations where ROV dives are conducted to allow for an improved understanding of the environmental conditions by measuring the physical or chemical properties of the water column overlying or hosting a particular habitat. The CTD would not touch the seafloor.

Permits
This project will be conducted under the Scientific Research Permit [PMNM-2015-018] for work in the Papahanoumokuakea Marine National Monument (PMNM) issued by NOAA on [July 1, 2015].

OER has also conducted a Biological Evaluation for all operations to be conducted as part of CAPSTONE expeditions EX1504 Legs 1-4. On July 7th, OER received concurrence from National Marine Fisheries Service Protected Resources Division that under Section 7 of the Endangered Species Act (ESA), the activities slated to occur during the 2015 CAPSTONE expeditions are not likely to adversely impact ESA-listed marine species, and would have insignificant effects on designated or proposed critical habitat.

Effects of the Project
As expected for ocean research with limited duration or presence in the marine environment, this project will not have the potential for significant impacts. Knowledgeable experts who are aware of the sensitivities of the marine environment will conduct the at-sea portions of this project. The potential gains or beneficial effects of the project seem to outweigh any potential adverse effects. This expedition will provide baseline characterization of poorly understood deep water habitats contained within marine protected areas inside the U.S. exclusive economic zone. This work will provide essential information for further research, exploration, and conservation of marine habitat within the Monument(s).

This project will not result in any changes to the human environment. As defined in Sections 5.05 and 6.03.c.3 (a) of NAO 216-6, this is a research project of limited size or magnitude and will not result in individually or cumulatively significant impacts on the quality of the human environment. Specifically, this research cruise would have only short-term effects with the principle goals of natural resource inventories and environmental monitoring over a wide geographic area. Furthermore, this action would not be subject to the exceptions for categorical exclusion provided at NAO 216-6 section 5.05c. As such, this project is categorically excluded from the need to prepare a NEPA environmental assessment.

Appendix D: Permit to conduct research activities in Papahanaumokuakea Marine National Monument

PAPAHĀNAUMOKUĀKEA
Marine National Monument

Ms. Kelley Elliott
NOAA Office of Ocean Exploration and Research
1315 East-West HWY, SSMC3 Room 10236
Silver Spring, MD 20910

JUL 0 1 2015

Dear Ms. Elliott:

The National Oceanic and Atmospheric Administration (NOAA), the U.S. Fish and Wildlife Service (FWS), and the State of Hawaii (collectively, the Co-Trustees) have approved the issuance of permit number PMNM-2015-018 to conduct activities within Papahānaumokuākea Marine National Monument ("Monument") for research purposes. Activities are to be conducted in accordance with the permit application and all supporting materials submitted to the Monument, and the terms and conditions of permit number PMNM-2015-018 attached.

Enclosed for your signature is a permit signed by all Co-Trustees. This permit is not valid until your signature page is received at this office. The original copy should be signed and returned to the Monument office at the following address within 30 days of issuance:

NOAA/Daniel K. Inouye Regional Center
NOS/ONMS/PMNM/ATTN: Permit Coordinator
1845 Wasp Blvd., Building 176
Honolulu, HI 96818

You are required to carry a signed copy of the permit with you while conducting the permitted activities. Your permit contains specific special conditions and reporting requirements. Please review them closely and fully comply with them while undertaking permitted activities.

The Point of Contact for questions concerning this permit and all associated reporting requirements is Permits and Policy Specialist, Justin Rivera at 808-725-5831 or Justin.Rivera@noaa.gov. Thank you for your continued cooperation with NOAA, FWS, and the State of Hawaii.

Suzanne Case — Date 6/29/15
Chairperson
Board of Land and Natural Resources
Department of Land and Natural Resources
State of Hawaii

7/1/15

Barry Stieglitz Date
Refuge and Monument Supervisor
Hawaiian and Pacific Islands National Wildlife Refuge Complex
Department of the Interior
U.S. Fish and Wildlife Service

for 6-30-2015

Athline Clark Date
Superintendent
Papahānaumokuākea Marine National Monument
Department of Commerce
National Oceanic and Atmospheric Administration

PAPAHĀNAUMOKUĀKEA
Marine National Monument

JUL 0 1 2015

RESEARCH PERMIT

Permittee:
Ms. Kelley Elliott
NOAA Office of Ocean Exploration and Research
1315 East-West HWY, SSMC3 Room 10236
Silver Spring, MD 20910

Permit Number: PMNM-2015-018
Effective Date: July 1, 2015
Expiration Date: June 30, 2016

Project Title: Bathymetric Mapping in Papahānaumokuākea Marine National Monument

This permit is issued for activities in accordance with Proclamation 8031 ("Proclamation") establishing Papahānaumokuākea Marine National Monument ("Monument") under the Antiquities Act of 1906, 16 USC §§ 431-433 ("Antiquities Act") and implementing regulations (50 CFR Part 404). All activities must be conducted in accordance with the Proclamation and the regulations (attached). No activity prohibited by the Proclamation or 50 CFR Part 404 is allowed except as specified below. Chapter 13-60.5, Hawaii Administrative Rules remains in effect for proposed activities in State waters.

Subject to the terms and conditions of this permit, the National Oceanic and Atmospheric Administration (NOAA), the State of Hawaii, and the U.S. Fish and Wildlife Service (collectively, the Co-Trustees) hereby authorize the permittee listed above to conduct research activities within the Monument. All activities are to be conducted in accordance with this permit. The permit application is incorporated into this permit and made a part hereof; provided, however, that if there are any conflicts between the permit application and the terms and conditions of this permit, the terms and conditions of this permit shall be controlling.

PERMITTED ACTIVITY DESCRIPTIONS:

The following activities are authorized by this permit:

1. The permittee and sixty-one (61) individuals from the following list are authorized to enter Papahānaumokuākea Marine National Monument ("PMNM" or "Monument") and conduct activities under this permit: one (1) Field Principal Investigator, Christopher Kelley; and sixty (60) research technicians: Brian Kennedy, John McDonough, Jeremy Potter, Elizabeth Lobecker, Derek Sowers, Lindsay McKenna, David Lovalvo, Brian Bringham, Brendan Reser, Jared Drewniak, Daniel Wagner, Michael Parke, Frank Parrish, and 47 TBDs. Permittee shall provide an updated Compliance Information Sheet prior to each entry into the Monument.

2. Conducting mapping and deep sea characterization activities using the following instruments aboard NOAA Ship OKEANOS EXPLORER (vessel entrance and support operations permitted under permit no. PMNM-2015-025):

    a. Multi-beam echo sounder (Kongsberg EM 302) for the purpose of obtaining sea floor topography data.

    b. Split-beam sonar (Kongsberg EK 60) for the purpose of detecting biological and gaseous targets in the water column.

    c. Sub-bottom profiler sonar (Knudsen Chirp 3260) for the purpose of interpreting sub-seafloor geology.

    d. Ultra-short baseline acoustic system (Tracklink TL 10000 MA) for navigating the Deep Discoverer Remote Operated Vehicle (ROV).

    e. Conductivity-Temperature-Depth (CTD) instrument.

3. Deploying and operating the Deep Discoverer ROV for the purpose of characterizing deep (> 250 meters depth) underwater sites.

4. Touching coral, living or dead while operating the ROV in Activity # 3.

5. Photographing and recording video of marine resources through the operation of the ROV in Activity # 3.

6. Conducting deployments of up to 218 Deep Blue expendable bathythermographs (XBTs) for the purpose of calibrating mapping instruments, and depositing XBTs on the sea floor upon deployment completion.

7. Removing, moving, taking, harvesting, possessing, or attempting to move, take, harvest, or possess two (2) rock samples per ROV dive site (up to 40 sites).

8. Removing, moving, taking, harvesting, possessing, or attempting to move, take, harvest, or possess a set number of any visually observable marine organism morphotype, which cannot be visually identified or may represent a new geographic record or new species, from each of the Permitted Activity Location areas defined, based upon the abundance criteria below:
    a. One (1) specimen can be taken, removed, or possessed if an abundance assessment cannot be ascertained, or fewer than ten (10) such specimens are present, cumulative during the course of the collection event per location;
    b. Up to three (3) specimens can be taken, removed, or possessed if an abundance assessment of ten (10) or more of such specimens is ascertained, cumulative during the course of the collection event per location;

c. For clonal organisms that cannot be visually identified or may represent a new geographic record or new species, take shall be limited to no more than half the clonal organism visually observed. Up to three (3) clonal specimens of similar morphology can be taken, removed, or possessed if an abundance assessment of ten (10) or more of such specimens is ascertained, cumulative during the course of the collection event per location.

9. Sharing rock samples collected under Permitted Activity # 8, with the following researchers:

    i. Michael Garcia (mogarcia@hawaii.edu), University of Hawai'i, Post 617D, Honolulu, HI 96822

    ii. David Clague (clague@mbari.org), Monterey Bay Aquarium Research Institute, 7700 Sandholdt Road, Moss Landing, CA 95039

    iii. James Hein (jhein@usgs.org), U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025

    iv. Christopher Kelley (ckelley@hawaii.edu), University of Hawai'i, 1000 Pope Rd., MSB 229, Honolulu, HI 96822

10. Sharing of biological specimens collected under Permitted Activity # 9, with the following researchers:

    i. Christopher Kelley (ckelley@hawaii.edu), University of Hawai'i, 1000 Pope Rd., MSB 229, Honolulu, HI 96822

    ii. Steve Cairns (cairns@si.edu), National Musueum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC 163, Washington, DC 20013-7012

    iii. Holly Bollick (holly@bishopmuseum.org), Bernice Pauahi Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817

    iv. Henry Reiswig (hmreiswig@shaw.ca), University of Victoria, 3800 Finnerty Road, Victoria BC V8P 5C2 Canada

    v. Christopher Mah (brisinga@gmail.com), National Musueum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC 163, Washington, DC 20013-7012

11. The Monument Management Board (MMB) may monitor activities under the permit. Any member of the MMB or their designee may, for a period not to exceed 48 hours, verbally require the permittee to temporarily modify or temporarily cease activities identified in the permit if, in the opinion of the MMB member or their designee, such

action is necessary to limit effects on Monument resources beyond the intended scope of the permit, to protect governmental equipment, or to ensure the safety of personnel. Such action will be followed as soon as possible by MMB emergency consideration of the temporary permit modification or temporary permit cessation. If the MMB concurs with the temporary action taken by the MMB member or designee, the Co-Trustees may amend the permit with the necessary changes or withdraw it. A decision by the Co-Trustees to amend the permit or to allow the activity to continue unchanged will include the necessary findings that the activity and its effects satisfy Monument permit issuance criteria and do not risk the safety of governmental employees or damage to governmental equipment.

No further disturbance of the cultural or natural resources of the Monument is allowed.

PERMITTED ACTIVITY LOCATIONS:

Other than entrance into the Monument, the permitted activities listed shall take place within marine areas greater than 250 meters depth throughout the Monument including the Midway Atoll Special Management Area and the following Special Preservation Areas:

1. Nihoa Island
2. Mokumanamana (Necker) Island
3. French Frigate Shoals
4. Gardner Pinnacles
5. Maro Reef
6. Laysan Island
7. Lisianski Island
8. Pearl and Hermes Atoll
9. Kure Atoll

GENERAL TERMS AND CONDITIONS:

In accordance with the Proclamation and applicable regulations, the permitted activities listed above are subject to the following general terms and conditions:

1. The permittee must sign and date this permit on the appropriate line below. Once signed and dated, the permittee must provide a signed original copy to the Monument official identified below. The permit becomes valid on the date the last signature is obtained and shall remain valid until the permit expiration date.

   NOAA/Daniel K. Inouye Regional Center
   NOS/ONMS/ Papahānaumokuākea Marine
   National Monument
   1845 Wasp Blvd., Building 176
   Honolulu, HI 96818

2. This permit is neither transferable nor assignable and must be carried by the permittee while engaging in any activity authorized by this permit. All other persons entering the Monument under the authority of this permit must provide the name of the permittee or the permit number to any authorized enforcement or management personnel upon request.

3. This permit may only be modified by written amendment approved by the Co-Trustees. Modifications to this permit must be requested in the same manner as the original request was made. Any modifications requested by the permittee, such as adding or changing personnel to be covered by the permit or to change the activities that are allowed, must be made in writing.

4. This permit is subject to suspension, modification, non-renewal, or revocation for violation of the Proclamation, implementing regulations, or any term or condition of the

permit. Any verbal notification of a violation from an authorized Monument representative may require immediate cessation of activities within the Monument. The issuance of a permit shall not constitute a vested or property right to receive additional or future permits. This permit may, in the sole discretion of the Co-Trustees, be renewed or reissued. However, there is no right to a renewal or re-issuance. Failure to fulfill permit requirements may affect consideration of future permit applications.

5. Permit terms and conditions shall be treated as severable from all other terms and conditions contained in this or any other ancillary permit. In the event that any provision of this permit is found or declared to be invalid or unenforceable, such invalidity or unenforceability shall not affect the validity or enforceability of the remaining terms or conditions of this permit.

6. This permit does not relieve the permittee of responsibility to comply with all federal, state and local laws and regulations. For a list of federal, state and local laws and regulations, refer to attached Papahānaumokuākea Marine National Monument Laws and Regulations document. Activities under this permit may be conducted only after any other permits or authorizations necessary to conduct the activities have been obtained.

7. The permittee may be held liable for the actions of all persons entering the Monument under the authority of this permit.

8. All persons entering the Monument under the authority of this permit are considered under the supervision of the permittee and may be liable in addition to the permittee for any violation of this permit, the Proclamation and implementing regulations in conjunction with this permit. The permittee must ensure that all such persons have been fully informed of the permit terms and conditions prior to entry into the Monument. Each such person must provide written acknowledgment to the permittee, prior to entry into the Monument, that he/she has received a copy of the permit, agrees to abide by all applicable terms and conditions, and may be liable for violations of the permit. The permittee shall maintain all signed acknowledgments and submit them with the summary report described in General Condition #22.b. An acknowledgement form is attached.

9. Notification of entry into the Monument must be provided at least 72 hours, but no longer than one month, prior to the entry date. Any updates to the list of personnel must also be provided at least 72 hours before entering the Monument. Notification of departure from the Monument must be provided within 12 hours of leaving the Monument. Notification may be made via e-mail or telephone by contacting: E-mail: nwhi.notifications@noaa.gov; Telephone: 1-866-478-6944; or 1-808-395-6944. No other methods of notification will be considered valid.

10. The permittee and any person entering the Monument under the authority of this permit shall, before entering the Monument, attend a cultural briefing or view designated cultural informational materials on Papahānaumokuākea regarding the region's cultural significance and Native Hawaiians' spiritual and genealogical connection to the natural

and cultural resources. Persons entering the Monument at Midway Atoll may satisfy this requirement upon arrival.

11. All vessels (including tenders and dive boats), engines and anchor lines shall be free of introduced species prior to entry into the Monument. To ensure this, all vessels, engines and anchor lines shall be inspected for potential introduced species prior to departing the last port before entering the Monument. No later than 24 hours prior to entry, the permittee shall provide the Monument Permit Coordinator with a report prepared by the individual conducting the inspection that: a) sets forth when and where the inspection occurred; b) identifies any introduced species observed, including where found; c) summarizes efforts to remove any species observed; and d) certifies the vessel as free of all introduced species. The Monument Permit Coordinator shall review the report and, based on the review, may delay the entry into the Monument until all concerns identified by the Monument Permit Coordinator have been addressed.

12. All hazardous materials, biohazards and sharps, must be pre-approved by the Co-Trustees. For purposes of this permit, "hazardous material" has the same meaning as the definition found at 49 CFR §105.5 (U.S. Department of Transportation). All hazardous materials, biohazards and sharps must be stored, used, and disposed of according to applicable laws and Monument-approved protocols. The permittee or a designated individual entering the Monument under the authority of this permit must be properly trained in the use and disposal of all such materials proposed. Proof of appropriate training may be required by the Co-Trustees. No such material may be left in the Monument after the departure of the permittee unless it has been previously approved by Monument staff. Immediately after the project is complete the permittee must remove all such materials from the Monument. The permittee will be responsible for all costs associated with use, storage, transport, training, disposal, or HazMat response for these materials.

13. All equipment or supplies brought into the Monument, or structures of any kind built in the Monument by the permittee are the responsibility of the permittee. All materials that are brought to the Monument by the permittee must be removed by the permittee except as otherwise permitted. Any permanent structures, equipment, or supplies that require maintenance, are determined to be unserviceable, or are a safety hazard, must be immediately repaired or removed from the Monument by the permittee. No structures, equipment, or supplies may be left in the Monument following the completion of the project except as listed in the permit.

14. If Monument staff is present at the field site, the permittee must meet with them before beginning permitted activities. Even with a valid permit, authorized Monument staff may prohibit entry into any location(s) within the Monument as they may deem appropriate to conserve or manage resources, particularly in areas where cumulative impacts of permitted activities are concentrated.

15. In order to facilitate monitoring and compliance, any person entering the Monument under the authority of this permit, including assistants and ship's crew shall, upon request

by authorized Monument enforcement personnel, promptly: a) allow access to and inspection of any vessel or facility used to carry out permit activities; b) produce for inspection any sample, record, or document related to permit activities, including data, logs, photos, and other documentation obtained under, or required by, this permit; and c) allow inspection on board the vessel or at the permitee's premises of all organisms, parts of organisms, and other samples collected under this permit.

16. It is prohibited to possess or consume alcohol in the Hawaiian Islands National Wildlife Refuge in accordance with the refuge policy. Any violations will result in immediate removal of the offender from the Monument at the individual's own cost. Offenders may not be readmitted to the Monument.

17. All persons entering the Monument under the authority of this permit are responsible for the cost of removing themselves from the Monument at the conclusion of the term of the permit or upon revocation or suspension of the permit. All such persons are also responsible for the cost of removing themselves from the Monument in the event of a necessary medical evacuation, emergency evacuation, including weather, or for the cost of any necessary search and rescue operation.

18. Except as expressly required by applicable law, the Co-Trustees are not liable for any damages to equipment or injuries to the permittee and persons entering the Monument under the authority of this permit. The permittee and any person entering the Monument under the authority of this permit shall release, indemnify, and hold harmless the National Oceanic and Atmospheric Administration, the Department of Commerce, the U.S. Fish and Wildlife Service, the Department of the Interior, the United States Government, the State of Hawai'i, and their respective employees and agents acting within the scope of their duties from and against any claims, demands, actions, liens, rights, subrogated or contribution interests, debts, liabilities, judgments, costs, and attorney's fees, arising out of, claimed on account of, or in any manner predicated upon the issuance of this permit or the entry into or habitation upon the Monument or as the result of any action of the permittee or persons participating in the activity authorized by this permit. In the event that a government employee, acting in his official capacity, is the permittee, or is entering the Monument under the authority of this permit, then he shall be subject to all applicable federal and State laws that pertain to claims by or against him predicated upon the issuance of this permit or entry into or habitation upon the Monument.

19. Monument managers or their designees may verbally require the permittee to modify or cease activities not identified in this permit if, in the opinion of the managers or designees, such action is necessary to limit disturbance to or protect Monument resources, to protect government equipment, or to ensure the safety of personnel. After providing such verbal instructions, the managers or designees will provide the permittee with a written modification, suspension or revocation to this permit at the earliest practicable opportunity. The failure to follow verbal instructions or modified permit terms, or to cease activities upon suspension or revocation of this permit, may constitute a violation of this permit, the Proclamation, the regulations, or other applicable law.

20. Disturbance of any cultural or historic property, including but not limited to Native Hawaiian cultural sites, burials, archaeological deposits, and WWII structures and features, such as stone walls and mounds, stone uprights, bunkers, batteries, camp sites, maritime heritage sites, hospitals, housing areas, and radio towers; or the disturbance or collection of any historic or cultural materials and artifacts, including but not limited to bottles, dishes, cartridges, hospital materials, carvings, human remains, or Native Hawaiian bone or stone implements, found within the Monument, including the sale or trade in such items, is prohibited.

21. All Monument resources within the jurisdiction of the State of Hawai'i are held in trust under the Hawai'i State Constitution, Article XI, Sec. 1. The State of Hawai'i and the Government of the United States reserve ownership or control, as the case may be, of Monument resources, both living and nonliving, that may be taken or derived from those found in the Monument.

22. The permittee must satisfy the following reporting requirements:

    a. Within thirty (30) days after the expiration date of this permit, the permittee must submit a summary report of activities conducted under this permit. The report shall be submitted using the Monument permit report template, if applicable.

    b. For permitted vessels, the permittee having authority over the vessel must maintain and submit a cruise log within thirty (30) days after the expiration date of this permit. The log shall include but is not limited to: description of cruise activities, geographic locations of those activities, anchoring locations, and small boat dive locations. The permittee shall also maintain a daily vessel discharge log, which must be submitted with the cruise log.

    c. Annual Report. The comprehensive annual report is a summary of all activities undertaken, including but not limited to: dates of all arrivals and departures from islands and atolls within the Monument, names of all persons involved in permitted activities, details of all specimens collected, handled, etc., any other pertinent information, GPS locations of all samples collected, transects, etc., results of work to date, copy of all data collected, and a proposed schedule of publication or production of final work. The report shall include a concise summary or abstract for use in Monument reports. Two hard copies and one electronic copy (Microsoft Word preferred, but not required), must be submitted to the Co-Trustees. The annual report is due by December 31 for each calendar year the permit was in effect. Subsequent annual reports are requested each year until all data collected under research permits are fully analyzed or before a new permit is issued, whichever comes first.

    d. For activities on State lands or within State waters, the permittee must submit a monthly report on the specified form.

e. The permittee may debrief the Co-Trustees following the completion of all activities in the Monument covered under this permit. The permittee may schedule the debriefing upon submitting the annual report.

f. The permittee must submit two copies of any article, publication, or other product created as a result of the information gained or work completed under this permit, including materials generated at any time in the future following expiration of this permit.

g. Any publications and/or reports resulting from activities conducted under the authority of this permit must include the notation that the activity was conducted under permit number PMNM-2015-018. This requirement does not apply to publications or reports produced by the news media.

h. All required submissions (including plans, logs, reports, and publications) shall be provided to the Monument official at the address indicated in General Condition #1.

23. All data acquired or created in conjunction with this permit will be submitted with the summary report, and annual report. Photographic and video material is considered data. The permittee retains ownership of any data, (including but not limited to any photographic or video material), derivative analyses, or other work product, or other copyrightable works, but the Federal Government and the State of Hawai'i retain a lifetime, non-exclusive, worldwide, royalty-free license to use the same for government purposes, including copying and redissemination, and making derivative works. The permittee will receive acknowledgment as to its ownership of the data in all future use. This requirement does not apply to data acquired or created by the news media.

24. Because photographic or video material that is created for personal use (i.e., not specifically acquired or created in conjunction with this permit) could unintentionally collect data that is also valuable for management purposes, the Co-Trustees reserve the right to request copies of any such material and the permittee agrees to provide a copy of such material within a reasonable time. The Co-Trustees may use such material for management purposes.

25. Any question of interpretation of any term or condition of this permit will be resolved by the Co-Trustees.

SPECIAL TERMS AND CONDITIONS:

1. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized activities must be for noncommercial purposes not involving the use or sale of any organism, by-products, or materials collected within the Monument for obtaining patent or intellectual property rights.

2. The permittees may not convey, transfer, or distribute, in any fashion (including, but not limited to, selling, trading, giving, or loaning) any coral, live rock, or organism collected under this permit without the express written permission of the Co-Trustees.

3. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

4. Refueling of tenders and all small vessels must be done at the support ship and outside the confines of lagoons or near-shore waters in the State Marine Refuge.

5. No fishing is allowed in State waters except as authorized under State law for subsistence, traditional and customary practices by Native Hawaiians.

6. Observers shall monitor for the presence of Federally-listed marine species at all times.

7. Unless specifically covered under a separate permit that allows activity in proximity to marine protected species, all mapping will be postponed, meaning the vessel would stop when whales and other protected species are within 400 meters of the ship, and magnetometer would be retrieved. Vessel will resume mapping operations only after the animal(s) depart the area.

8. To ensure the protection of Monument resources, the permittee must conduct all activities in accordance with the following Monument Best Management Practices (BMPs) and guidelines, as attached:

    a. Best Management Practices for Boat Operations and Diving Activities (BMP #004)
    b. Marine Wildlife Viewing Guidelines (BMP #010)

Your signature below, as permittee, indicates that you accept and agree to comply with all terms and conditions of this permit. This permit authorizes only those activities listed above. This permit becomes valid on the date when signed by the last Monument Official. Please note that the expiration date on this permit will not be extended by a delay in your signing below.

Kelly P. Elliott July 9, 2015

Kelly Elliott (Date)
NOAA Office of Ocean Exploration and Research

Attachments (5):

1. Map of the Papahānaumokuākea Marine National Monument (PMNM)
2. PMNM Rules and Regulations
3. Permit Acknowledgement Form
4. Best Management Practices for Boat Operations and Diving Activities (BMP #004)
5. Marine Wildlife Viewing Guidelines (BMP #010)

6/29/15

Suzanne Case
Chairperson
Board of Land and Natural Resources
Department of Land and Natural Resources
State of Hawaii

Date

2/1/15

Barry Stieglitz
Refuge and Monument Supervisor
Hawaiian & Pacific Islands National Wildlife Refuge Complex
Department of the Interior
U.S. Fish and Wildlife Service

Date

for 6-30-2015

Athline Clark
Superintendent
Papahānaumokuākea Marine National Monument
Department of Commerce
National Oceanic and Atmospheric Administration

Date

Appendix E: ESA Section 7 Initiation Letter, Biological Evaluation and Letter of Concurrence

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1845 Wasp Blvd., Bldg 176
Honolulu, Hawaii 96818
(808) 725-5000 · Fax: (808) 725-5215

JUL 07 2015

Dr. John J. McDonough
Deputy Director
National Oceanic and Atmospheric Administration
Office of Ocean Exploration and Research
Silver Spring, MD 20910

Dear Dr. McDonough:

This letter responds to your June 10, 2015 Request for Consultation by the NOAA Office of Exploration and Research (OER) regarding efforts aboard the NOAA vessel *Okeanos Explorer* that would include four telepresence-enabled ocean exploration cruises from July to September 2015, to collect critical baseline information to meet NOAA science and management needs within the Hawaiian Archipelago and offshore Johnston Atoll. You have requested our concurrence under Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 et seq.), with your determination that the proposed action may affect but is not likely to adversely affect green, hawksbill, leatherback, olive ridley, and north Pacific loggerhead sea turtles; Main Hawaiian Islands false killer whale distinct population segment, humpback whales, blue whales, fin whales, sei whales, sperm whales, north Pacific right whales, the Indo-West Pacific distinct population segments of the scalloped hammerhead shark, Hawaiian monk seals, and monk seal critical habitat.

Proposed Action/Action Area: The proposed activities are described in the OER request for consultation and the associated biological evaluation (CAPSTONE 2015). In summary, the proposed action consists of activities to explore and improve understanding of the distribution and diversity of deep water habitats. The activities would occur during four different research cruises aboard the Okeanos Explorer scheduled between July – October 2015. No activities would occur on land. Up to 60 individuals (20 rotating scientists/technicians on 3 expedition legs) would be authorized to conduct mapping and ROV surveys using the vessel's multibeam, single beam and subbottom profiling sonar systems, conducting conductivity-temperature depth (CTD) casts, and deploying an ROV.

The action area covered by this biological evaluation encompasses the marine environment of the Papahānaumokuākea Marine National Monument (PMNM); the marine environment around Johnston Atoll in the Pacific Remote Islands Marine National Monument (PRIMNM); the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; the Geologists

Seamounts located about 100 miles south of Honolulu; and the vessel transit areas between Honolulu, Hawai'i and these locations where ESA-listed marine species or their habitats may be impacted by the proposed activities.

Within the PMNM, focused operations are planned from Middle Bank on the southern border of the Monument northwest reaching up to Pearl and Hermes Atoll. Within the Johnston Atoll portion of PRIMNM, focused operations are planned at Horizon tablemount, through both the Karin and Johnston Seamount chains, and offshore of Johnston Atoll. Operations offshore of Oahu are planned on the south and southeast side of the island, and on the west/southwest side of the Hawai'i.

Species That May Be Affected: OER has determined that the proposed action may affect but is not likely to adversely affect green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), North Pacific distinct population segment of loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), Main Hawaiian Islands false killer whale distinct population segment (*Pseudorca crassidens*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sei whales (*Balaenoptera borealis*), North Pacific right whales (*Eubalaena japonica)*, the Indo-West Pacific distinct population segment of the scalloped hammerhead shark (*Sphryna lewini*), Hawaiian monk seals (*Neomonachus schauinslandi*), and Hawaiian monk seal critical habitat. Detailed information about the biology, habitat, and conservation status of sea turtles can be found in their recovery plans and other sources at http://www.nmfs.noaa.gov/pr/species/turtles/. The same can be found for Hawaiian monk seals and cetaceans at http://www.nmfs.noaa.gov/pr/species/mammals/; and for scalloped hammerhead sharks at http://www.fpir.noaa.gov/PRD/prd_scalloped_hammerhead_shark.html.

Critical Habitat: The proposed action would take place within designated monk seal critical habitat. Critical habitat was designated under the ESA for the Hawaiian monk seal on April 30, 1986 and revised on May 26, 1988. Designated critical habitat includes all beach areas, lagoon waters, and ocean waters out to a depth of 20 fathoms around Kure Atoll; Midway Islands (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals, Necker Island, Maro Reef, and Nihoa Island. On June 2, 2011, NMFS proposed revising critical habitat for monk seals by extending the current designation out to the 500 meter depth contour and including Sand Island at Midway Island but this proposal is not yet final.

Analysis of Effects: In order to determine that a proposed action is not likely to adversely affect listed species, NMFS must find that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook: (1) insignificant effects relate to the size of the impact and should never reach the scale where take occurs; (2) discountable effects are those that are extremely unlikely to occur; and (3) beneficial effects are positive effects without any adverse effects (USFWS & NMFS 1998). This standard, as well as consideration of the probable duration, frequency, and severity of potential interactions, was applied during the analysis of effects of the proposed action on ESA-listed marine species, as is described in detail in the OER

consultation request. The OER determined that the risk of collisions with vessels and the risk of entanglement would be discountable; and that the risk from exposure to elevated noise level, disturbance from human activity, as well as exposure to wastes and discharges would result in insignificant effects on ESA-listed sea turtles, marine mammals and the scalloped hammerhead shark, and that the potential effects of the proposed action to designated or proposed critical habitat would also be insignificant.

Considering the information and assessments presented in the OER consultation request, and in the best scientific information available about the biology and expected behaviors of the ESA-listed marine species considered in this consultation; NMFS agrees that: 1) the list of ESA-listed species and critical habitats potentially exposed to the effects of the action is correct, 2) the suite of identified stressors is comprehensive, and 3) the assessment of exposure risk and significance of exposure to those stressors is accurate. Therefore, NMFS agrees that the risk of collisions with vessels and the risk of entanglement would be discountable for marine mammals, sea turtles and the scalloped hammerhead shark; and that those animals would be unlikely to respond to elevated noise level, disturbance from human activity, as well as exposure to wastes and discharges, and if perchance a response were to occur, it would be temporary in nature and never reach the scale where it would affect the individual's health, and as such, cause insignificant effects; and that the action would have insignificant effects on critical habitat.

Conclusion: NMFS concurs with your determination that the proposed cruises of the Okeanos Explorer are not likely to adversely affect ESA-listed marine species, and would have insignificant effects on designated or proposed critical habitat. This concludes your consultation responsibilities under the ESA for species under NMFS's jurisdiction. However, this consultation focused solely on compliance with the ESA. Additional compliance review that may be required of NMFS for this action (such as assessing impacts on Essential Fish Habitat) would be completed by NMFS Habitat Conservation Division in separate communication, if applicable.

ESA Consultation must be reinitiated if: 1) a take occurs; 2) new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or designated critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have further questions please contact Richard Hall on my staff at (808) 725-5018. Thank you for working with NMFS to protect our nation's living marine resources.

Sincerely,

Michael D. Tosatto
Regional Administrator

cc: Kelley Elliott, NOAA/OER
Justin Rivera, NOS/ONMS/PMNM
Aaron Nadig, ESA Section 7 Program, USFWS, Honolulu

NMFS File No.: PIR-2015-9649
PIRO Reference No.: I-PI-15-1283-AG

Literature Cited

Campaign to Address Pacific Monument Sciecne, Technology and ocean Needs (CAPSTONE) 2015. Request for Informal Consultation. Letter from John McDonough to Ann Garrett dated June 10, 2015 and attachments.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.
http://www.nmfs.noaa.gov/pr/pdfs/laws/esa_section7_handbook.pdf

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OCEANIC AND ATMOSPHERIC RESEARCH
Office of Ocean Exploration and Research
Silver Spring, MD 20910

June 10, 2015

Ann Garrett
Assistant Regional Administrator
Protected Resources Division
NMFS Pacific Islands Regional Office
1845 Wasp Blvd., Building 176
Honolulu, HI 96818

Re: Request to Initiate Consultation under Section 7 of the Endangered Species Act for the Campaign to Address Pacific Monument Science, Technology and Ocean Needs (CAPSTONE Project)

Dear Ms. Garrett:

Operating under a partnership with NOAA's Office of Ocean Exploration and Research and the Office of Marine and Aviation Operations, the *Okeanos Explorer* team is preparing to conduct four telepresence-enabled ocean exploration cruises from July to September 2015 to collect critical baseline information to meet NOAA science and management needs within the Hawaiian Archipelago and offshore Johnston Atoll. The overarching goal of the project is to extend and improve the understanding of the distribution and diversity of deepwater habitats within the Monument. Data and information from the cruises will build on the recent work conducted by the Schmidt Ocean Institute research vessel *Falkor* and provide a foundation of publicly-accessible baseline information to improve management and spur further exploration and research. Like previous expeditions in the Gulf of Mexico, western Atlantic, and Indonesia, NOAA will work with the scientific community and public to characterize unknown and poorly-known areas through telepresence-based exploration. Operations will use the ship's deep water mapping systems, NOAA's 6000m remotely operated vehicles (ROV), CTD rosette, and a high-bandwidth satellite connection for real-time ship to shore communications. These expeditions will help establish a baseline of information in the region to catalyze further exploration, research and management activities.

We propose to conduct activities to explore and improve understanding of the distribution and diversity of deep water habitats. The activity would occur during four different research cruises aboard NOAA Ship *Okeanos Explorer* scheduled between July – October 2015. No activities would occur on land. Up to 60 individuals (20 rotating scientists/technicians on 4 expedition legs) would be authorized to conduct mapping and ROV surveys using the *Okeanos Explorer's* multibeam, single beam and subbottom profiling sonar systems, conducting conductivity-temperature depth (CTD) casts (The CTD would be lowered into the water column via the

vessel's winch system and would not touch the seafloor), and deploying an ROV.

Enclosed is a Biological Evaluation (BE) to initiate consultation under Section 7(a)(2) of the Endangered Species Act (ESA). As described in the BE, we have determined that the proposed 2015 CAPSTONE cruises may affect, but are not likely to adversely affect, the following ESA-listed marine species: green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), North Pacific distinct population segment of loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), Main Hawaiian Islands false killer whale distinct population segment (*Pseudorca crassidens*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sei whales (*Balaenoptera borealis*), north pacific right whales (*Eubalaena japonica)*, the Indo-West Pacific and Central Pacific distinct population segments of the scalloped hammerhead shark (*Sphryna lewini*), Hawaiian monk seals (*Neomonachus schauinslandi*), and Hawaiian monk seal critical habitat.

We request your concurrence with our 'not likely to adversely affect' determination for the species listed above and for Hawaiian monk seal critical habitat.

Please contact Kelley Elliott (**Kelley.Elliott@noaa.gov**, 301-734-1024) with questions regarding this consultation request.

Respectfully,

John J. McDonough
Deputy Director
NOAA Office of Ocean Exploration and Research

Biological Evaluation
Campaign to Address Pacific Monument Science, Technology and Ocean Needs
(CAPSTONE Project)

Background

NOAA Ship *Okeanos Explorer*, "America's Ship for Exploration", is the nation's first and only federal vessel with a mandate to systematically explore our mostly unknown ocean for the purpose of discovery and the advancement of knowledge. Operating under a partnership with NOAA's Office of Ocean Exploration and Research and the Office of Marine and Aviation Operations, the overarching goal of the project is to extend and improve the understanding of the distribution and diversity of deepwater habitats within the Monuments, and collect data and information to address NOAA science and management priorities. Data and information from the cruises will build on the recent work done by the Schmidt Ocean Institute vessel Falkor, and provide a foundation of publicly-accessible baseline information to improve management and spur further exploration and research. Like previous expeditions in the Gulf of Mexico, western Atlantic, and Indonesia, NOAA will work with the scientific community and public to characterize unknown and poorly-known areas through telepresence-based exploration. Operations will use the ship's deep water mapping systems, NOAA's 6000m remotely operated vehicles (ROV), CTD rosette, and a high-bandwidth satellite connection for real-time ship to shore communications. These expeditions will help establish a baseline of information in the region to catalyze further exploration, research and management activities.

Action Area

The action area covered by this biological evaluation encompasses the marine environment in and around the Papahānaumokuākea Marine National Monument (PMNM); the marine environment around Johnston Atoll in the Pacific Remote Islands Marine National Monument (PRIMNM); the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; the Geologists Seamounts located about 100 miles south of Honolulu; and the vessel transit areas between Honolulu, Hawai'i and these locations where ESA-listed marine species or their habitats may be impacted by an applicant's activities.

Within the Papahānaumokuākea Marine National Monument, focused operations are planned from Middle Bank on the southern border of PMNM northwest reaching up to Pearl and Hermes Atoll. Within the Johnston Atoll portion of PRIMNM, focused operations are planned at Horizon tablemount, through both the Karin and Johnston Seamount chains, and offshore of Johnston

Atoll. Operations offshore of Oahu are planned on the south and southeast side of the island, and on the south and southwest side of the Hawai'i (see Appendix A for maps).
All mapping and ROV operations are expected to be in Federal waters at depths of 250m and greater, including within the boundaries of PMNM, PRIMNM (Johnston Atoll) and the U.S. EEZ, but will not include work within state waters (0-3 nautical miles from shore). Transit mapping operations are planned between all areas mentioned, and in the high seas between PMNM and Johnston Atoll. CTD rosette operations may be conducted in marine areas within state waters. Monument boundaries are further specified under the code of federal regulations 50 CFR Part 404.

Proposed Action
The applicant proposes to conduct activities to explore and improve understanding of the distribution and diversity of deep water habitats. The activity would occur during four different research cruises aboard the NOAA Ship Okeanos Explorer scheduled between July – October 2015. No activities would occur on land. Up to 60 individuals (20 rotating scientists/technicians on 3 expedition legs) would be authorized to conduct mapping and ROV surveys using the Okeanos Explorer's multibeam, single beam and subbottom profiling sonar systems, conducting conductivity-temperature depth (CTD) casts (The CTD would be lowered into the water column via the vessel's winch system and would not touch the seafloor), and deploying an ROV.

The overarching goal of the project is to extend and improve the understanding of the distribution and diversity of deepwater habitats within the Monument. Data and information from the cruises will build on the recent Falkor work and provide a foundation of baseline data to improve management and spur further exploration and research. NOAA priorities for the work include a combination of science, education, outreach, and open data objectives that will support management decisions at multiple levels. The effort also serves as an opportunity to highlight the uniqueness and importance of this national symbol of ocean conservation.

The acquisition of high-resolution seafloor mapping data is an essential precursor to making significant biological, geological, archaeological and oceanographic discoveries in the monument. The Okeanos Explorer cruises will collect seafloor mapping data to supplement previous work. These maps form the basis for selecting ROV dive targets. ROV cruises would take the next major step in baseline habitat characterization by using the ROV system to visually investigate unknown and little known deep water habitats within the monument identified as priority by scientists and managers, including providing the first ever look at deep water communities living below 2,000 m. CTD casts may be conducted to collect additional

information about the physical and chemical properties of the water column, including at sites of interest identified from mapping and ROV investigation.

The information and data generated by this project will directly contribute to a better understanding of the deep water habitats, ecosystems and geologic history of the NWHI, the PRIMNM, the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; and the Geologists Seamounts by providing basic information about the about the rich and unique biological resources and habitats of this region. It is this understanding that provides continuous support for the monument and its protection of these resources.

MAPPING

NOAA Ship Okeanos Explorer has three scientific sonars that are configured to operate simultaneously without interference: a 30 kHz multibeam system, 18 kHz split-beam fisheries sonar, and 3.5 kHz chirp sub-bottom profiler sonar. The multibeam is used to map broad swaths for bathymetry and water column feature detection (e.g. gaseous seeps), the split-beam gathers calibrated target strength measurements of biologic and gaseous targets in the water column, and the sub-bottom profiler provides data useful for interpreting sub-seafloor geology. The ship's ROVs utilize an ultrashort baseline (USBL) system for underwater positioning, which would be energized at all times when the ROVs are in the water. All of these systems are routinely used by this exploration vessel and have provided invaluable scientific data for marine researchers and managers, including numerous National Marine Sanctuaries, the Bureau of Ocean Energy Management and the U.S. Geological Survey.

Mapping activities would occur continuously throughout the day and night except when the ROV is deployed. If cetacean species are present within 400 m of the ship, the vessel would stop until the animals depart the area but the mapping sonar would continue transmitting. Observers would continuously monitor for the presence of protected species during the 24-hour mapping cruise and document all encounters with these species.

In addition to a dedicated observer monitoring for the presence of protected species during the 24-hour mapping cruise, standard practice during all Okeanos Explorer cruises and operations include Officers or Watch Standers on the Bridge around-the-clock, monitoring the surrounding ocean for the presence of other ships, unanticipated hazards, and marine animals – especially Cetaceans. If a Cetacean is observed, the Mapping Watch Stander or Science Lead is notified and if appropriate the team then proceeds with protocols to continue monitoring the animal or shut down mapping or other ship operations until the animal has departed the area for an appropriate period of time. When marine mammals are able to be

identified by Bridge Officers or Watch Standers, these observations are noted in the NOAA fleet marine mammal observation log as part of standard practice. During the July to September CAPSTONE expedition these procedures will include monitoring for the presence of sea turtles and, when appropriate, taking protection measures.

Multibeam :
Multibeam sonar mapping will be conducted with a Kongsberg EM 302 (30 kHz) sonar in areas within and in the vicinity of the PMNM and the PRIMNM where gaps are present in the existing coverage, or the existing data is poor quality. Specifically this is planned to include: offshore of Johnston Atoll along Horizon tablemount, the Karin and Johnston seamount ranges; and along the Geologists seamounts groups. Multibeam mapping will also take place during the transits to and from sites where other operations will be conducted, and are planned to continue to build upon previous mapping surveys as much as feasible. Multibeam sonar data will produce high-resolution bathymetry and acoustic backscatter maps. These maps will provide critical baseline information to scientists and resource managers interested in identifying and expanding our understanding of the important biological habitats and ecological connections in the Monuments, and the geology of the NWHI. Additionally, the data collected will help scientists better understand the size and character of seafloor habitats in the area, allowing for improved targeting of future exploration and research, including the selection of sites for further investigation with a ROV.

Expendable bathythermographs (XBT):
XBTs are deployed to obtain sound velocity profiles. The profiles are required to calibrate the multi-beam system and ensure accurate bathymetric mapping. The XBT type is the Deep Blue probe produced by Lockheed Martin Sippican. A single Deep Blue XBT is 8.5 in. length x 2 in. width and weighs 2.53 lbs. It consists of a plastic spool, hair thin copper wire (< 1mm width), zinc weight, thermistor (comprised of two short wires (< 8.5 in. length)) and is contained in a clear plastic housing. The Deep Blue XBT contains no chemical solutions. During the Okeanos Leg 1 dedicated mapping cruise, XBTs will likely need to be deployed once every 4-6 hours to ensure accurate bathymetric data collection (resulting in 4-6 total XBT deployments in a 24-hour period, and an estimated 58 to 88 XBTs during the duration of the mapping cruise). During the three planned ROV expeditions, mapping operations would be conducted mainly at night in transit to the next dive location, resulting in a total of 2 XBT deployments in a 24-hour period, or an estimated 108 XBTs during the duration of the three ROV cruises. While CTD casts every 4-6 hours are an alternative method to obtain sound velocity profiles, the ship must interrupt survey operations for approximately 3.5 hours to conduct a single cast in 3000-6000 meters of water.

The impact would be highly detrimental and cost prohibitive in terms of efficient use of ship time for mapping. Assuming we would need 166-196 sound velocity profiles, and given that the ship can map 10,000 sq. km in 4.7 days at depths between 3000-6000 m, conducting CTD casts instead of XBTs would reduce the seafloor area mapped during the three legs by 42,000-50,000 square km. For comparison purposes, the total area of the state of Hawaii including all of its lands and surrounding territorial waters is 28,313 square kilometers. Given that most of the areas the Okeanos Explorer will be mapping have never been mapped with high resolution multibeam, foregoing the mapping of such a massive area would be a huge missed opportunity to characterize the marine environment of the region. Additionally, ROV dive site locations are often spaced far apart and the ship will need to transit overnight to dive sites planned for the following day – taking 3.5 hours of this time to conduct a CTD would severely limit ROV dive options. For these reasons XBT deployments are requested.

The very fine wire connecting the XBT probe to the ship is extremely easy to break by hand once the probe reaches maximum depth. The minimal tensile strength of the wire should represent a minimal entanglement risk for species of concern. The potential for XBT deployments to impact ESA-listed species was the topic of an informal consultation request from the PMNM to NMFS during PMNM permit review for the Falkor expeditions. The determination was that the Falkor's use of XBTs may affect, but is not likely to adversely affect, Hawaiian monk seals, green sea turtles, hawksbill sea turtles, leatherback sea turtles, olive ridley sea turtles, North Pacific loggerhead sea turtles, MHI Insular false killer whales, humpback whales, sperm whales, fin whales, blue whales, sei whales, and north pacific right whales. We expect the same determination would be made with respect to the deployment of XBTs by the Okeanos Explorer.

Single Beam and Split Beam Sonar:
The Kongsberg EK 60 (18 kHz) single beam is used to collect information about the water column, such as at gas plume or seep sites, and to obtain information about biomass. The EK60 split-beam sonar is used as a quantitative scientific echosounder to identify water column acoustic reflectors - typically biological scattering layers, fish, or gas bubbles – providing additional information about water column characteristics and anomalies. Fishery scientists have developed methods to analyze EK60 data to support fish stock assessment (e.g. Atlantic herring, pollock, capelin) and to predict hot spots of large fish in coral reefs. Split beam sonars are also being used to help develop "acoustic signatures" of different marine species, which will greatly enhance existing efforts to assess abundance, distribution, and behavior using remote sensing methods. Additionally, split beam sonars are also being used to generate gaseous seep flux rates and their contribution to ocean and atmospheric chemistry.

Sub Bottom Profiler:
The primary purpose of this Knudsen Chirp 3260 (3.5 kHz) sonar is to provide echogram images of surficial geological sediment layers underneath the seafloor to a maximum depth of about 80 meters below the seafloor. The Sub Bottom Profiler is normally operated to provide information about the sedimentary features and the bottom topography that is simultaneously being mapped by the multibeam sonar. The data generated by this sonar is fundamental in helping geologists interpret the shallow geology of the seafloor. Collecting this data within the CAPSTONE project area will provide greatly improved insights into the geology of the region, and supplement existing magnetometer and gravity measurements obtained by other vessels. If only limited sub-bottom operations are allowed, the profiler would be used at selected sites to provide additional insight into the geologic history of the project area.

ROV OPERATIONS:
The purpose of conducting ROV operations is to conduct interdisciplinary site characterization at priority targets in the monuments. Interdisciplinary site characterization would be achieved by visually surveying priority targets while simultaneously acquiring environmental data with in situ sensors mounted on the ROVs (CTD and DO). ROV targets include seamount summits and flanks, rift zone ridges, drowned reef terraces, guyots (i.e., flat topped tablemounts), a submerged crater, submarine canyons, and other types of topography where high density deep water coral and sponge communities are likely to occur. The combined dives will enable scientists and managers to have a better understanding of the diversity and distribution of deep water habitats in the monuments, and should contribute to enhanced protection of these resources. The ROVs 6000m depth capability puts areas of the monuments within reach that have never been seen before.

The Okeanos Explorer is equipped with OER's dedicated, fully integrated, two-body ROV system. The first body of the system is the ROV Deep Discoverer (D2), a 10.4ft long x 6.4ft wide x 8.5ft high vehicle weighing approximately 9150 lbs (in air), and capable of diving to 6000 meters. D2's primary data set is high definition video collected by two HD cameras. In addition to the HD video cameras, D2 carries a CTD with dissolved oxygen sensors. The second body of the system is the camera platform Seirios, an 11.5ft long x 3.67ft wide x 4.05ft high vehicle that weighs 2925 lbs and provides additional lighting and an "aerial" view of D2 while she investigates the seafloor. Like D2, Seirios carries two HD cameras, a Sea Bird 9/11+ CTD with DO2 sensors. During operation, the two vehicles are connected to each other by a "soft" electro-optical tether 30 meters in length. Seirios is also attached to the ship by an 8,200-meter armored fiber-optic cable that provides power and telemetry to the vehicles. ROV operations are

conducted primarily during daylight hours while the vessel would be stopped and holding station using dynamic positioning.

ROV operations will typically take place within several meters of the seafloor, and are conducted in a way to minimize seafloor disturbances. On occasion, the ROV is set down on the seafloor in order to acquire very close imagery of habitats or features of interest. Common procedure includes visually scanning the seafloor to ensure the area the ROV is set on does not include corals or other animals, however some animals may reside beneath the sediment or may be too small to see. The ROV also has a temperature probe that may be shallowly inserted into the seafloor sediment to measure the depth or temperature of features of interest. Finally, though we try to prevent any unnecessary seafloor disturbance, it is likely that at some point the ROV will inadvertently touch some benthic fauna (e.g., sea whip) or that water moving through the ROV thrusters will stir up small amounts of seafloor sediment. Any disturbance would likely be similar to that seen during normal near bottom SCUBA dives.

Up to 52 deployments of the ROV would occur during the expedition, resulting in 416 hours total dive time (~8 hours for each dive). Currently 17 deployments of the ROV are planned in PMNM waters, and 13 ROV deployments are planned offshore Johnston Atoll in the PRIMNM.

ROV Sampling:
A pilot sampling program is being conducted during the July to September ROV cruises to collect very selective specimen collections with the ROV that have the potential to contribute significant scientific discoveries. Biological specimen collections will focus on, but are not limited to, corals and sponges (and their incidentally collected commensals). Only biological specimens suspected of being new species or new records for Hawaiian waters will be targeted. When possible, only a subsample will be taken of biological specimens (e.g., only a piece or branch of corals and sponges will be collected, not the entire organism). Selective rock specimens that have the potential to contribute significant scientific discoveries as outlined in the expedition goals will also be targeted. These are expected to include rocks from seamounts; manganese-coated rocks; and rock samples to support the United States Extended Continental Shelf effort. When possible, rock samples will be selected in a way to minimize the amount of attached organisms.

Ultra Short Base Line Acoustic Navigation (USBL):
The Tracklink TL10000MA system is used to track and record the position of the ROVs during the course of a dive. It functions by the transmission of an acoustic pulse from the surface ship,

which travels through the water column and triggers a responding acoustic pulse from the ROV. The measurement of the travel time and direction of arrival of the responding acoustic pulse from the ROV enables calculation of the position of the submerged ROV with respect to the surface ship. Integration of this relative position information with the surface ship position as determined by GPS allows the calculation of the position of the ROV on the seafloor. In this way, observations made by the ROV can be geo-referenced to standard latitude, longitude and depth coordinates. The USBL is used during ROV operations, which are conducted daily and primarily during daylight hours while the ship holds station using dynamic positioning. Although such frequencies are within the hearing range of marine mammals, the USBL navigation system is commonly used by researchers and has no known adverse impact on marine life.

The Tracklink operates at frequencies from 7.5 kHz to 12.5 kHz. Acoustic emissions by the USBL system occur at the surface from the hull of the ship, and at both of the ROVs as they travel through the water column and at the seafloor. The repetition rate of emissions is typically no faster than once 2 every seconds, increasing by 1.33 seconds for every 1000 meters of depth of the ROVs. The character of these emissions is detailed below:

Surface transceiver, Okeanos Explorer:
Tracklink model TL10000MA
Frequency of operation: 7.5 kHz - 12.5 kHz Spread Spectrum
Beam width: 120° directed at nadir
Peak electrical power: 100 W
Peak acoustic power: 187db relative to 1 micro Pascal at 1 meter.

ROV transponder, Seirios:
Tracklink model TL10010C
Frequency of operation: 7.5 kHz - 12.5 kHz Spread Spectrum
Beam width: 210° directed at zenith
Peak electrical power: 200 W
Peak acoustic power: 190db relative to 1 micro Pascal at 1 meter.

ROV transponder, Deep Discoverer:
Tracklink model TL10015C
Frequency of operation: 7.5 kHz - 12.5 kHz Spread Spectrum
Beam width: 30° directed at zenith

Peak electrical power: 500 W
Peak acoustic power: 200db relative to 1 micro Pascal at 1 meter.

CTD OPERATIONS:
The CTD rosette instrument does not emit an acoustic signal and is used to obtain conductivity, temperature, depth and other oceanographic data (dissolved oxygen, light scattering, oxygen reduction potential). The instrument would be attached to an open cylindrical steel frame approximately 1.15 m in diameter and 1.4 m high with a 24-position rosette carousel containing 24 2.5 L niskin bottles for collecting water samples. The system would be lowered to a maximum depth of 6800 m by an embedded scientific winch and wire while the vessel would be stopped and hold station using dynamic positioning. The average time to conduct a CTD casts varies from one to several hours depending on water depth (the CTD is lowered through the water column at 60m/min). CTD casts would be conducted at selected sites including locations where ROV dives are conducted to allow for an improved understanding of the environmental conditions by measuring the physical or chemical properties of the water column overlying or hosting a particular habitat. The CTD would not touch the seafloor.

Analysis of Effects
Our analysis considers potential impacts or stressors to identified marine resources within the PMNM and PRIMNM (Johnston Atoll), the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; and the Geologists Seamounts on green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), North Pacific distinct population segment of loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), Main Hawaiian Islands false killer whale distinct population segment (*Pseudorca crassidens*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sei whales (*Balaenoptera borealis*), north pacific right whales (*Eubalaena japonica)*, the Indo-West Pacific distinct population segments of the scalloped hammerhead shark (*Sphryna lewini*), Hawaiian monk seals (*Neomonachus schauinslandi*), and Hawaiian monk seal critical habitat. We believe that the most likely potential impacts or stressors are:

1. Exposure to elevated noise levels;
2. Temporary disturbance from human activity;
3. Entanglement;
4. Collisions with vessels; and
5. Exposure to waste and discharge.

1. Exposure to elevated noise levels

As described earlier, the proposed action would include the operation of NOAA Ship Okeanos Explorer's mapping sonar systems, as well as the underwater positioning systems associated with the ROVs Deep Discoverer and Seirios.

The effects on marine life from exposure to high intensity noise vary with the frequency, intensity, and duration of the sound source, and the physiology and hearing characteristics of the exposed animal. Exposure to very high levels of sound can cause soft tissue injuries that could directly result in fatality. Exposure to lower levels at frequencies within the animal's range of hearing may cause injury in the form of permanent hearing damage, also referred to as permanent threshold shift (PTS). Exposure to even lower levels may cause behavioral effects that include temporary threshold shifts (TTS), temporarily masked communications and/or acoustic environmental cues, alteration of ongoing behaviors, and areal avoidance.

Okeanos Explorer sonars will be turned on for the entirety of each cruise during CAPSTONE and will only be turned off during ROV dives or CTD casts. We will minimize turning the system on and off as a precautionary measure to avoid possible startling of the animals. When the sonars are powered down for ROV and CTD operations, the flexible "soft start" mode will be used to restart the multibeam first. The soft start mode is a delay function, starting the sonar transmissions at a low output level and then gradually increasing to the level required for optimal bathymetry data collection. The soft start modes can either be set at -10 or -20 decibels with a 0 to 15 minute ramp up time to the desired power. We can select -10 dB, -20 dB or maximum transmit power. Maximum transmit power is recommended by Kongsberg for maximizing the mapping swath coverage. In the deepest operating mode the EM302 is 243 dB re 1 microPa. When operating in shallow modes the decibels are 238 dB re 1 microPa. Because the EK60 and SBP sonars are of lower intensity than the multibeam, and are run simultaneously with the multibeam, these protective measures will help avoid inadvertant exposure of marine mammals, sea turtles, and hammerhead sharks to all three sonars.

We therefore do not believe the Okeanos Explorer mapping activities will have any significant adverse effects on ESA-listed species in the monuments and the waters around the Main Hawaiian Islands. Similar opinions regarding the safety of multibeam mapping activities have been expressed by the NMFS Southwest Fisheries Science Center in their draft programmatic environmental assessment. Even so and in order to mitigate impacts to marine mammals, observers on the Okeanos Explorer's bridge will carefully monitor for the presence of marine

protected species, and permitted personnel would follow established best management practices to minimize disturbance. If cetaceans are present within 400 meters of the ship, the vessel would stop until the animals depart the area. We will try to minimize turning the multibeam system on and off to reduce the possibility of startle responses by marine mammals that could be in the vicinity of the ship, particularly at night. Leaving them on also provides marine mammals advanced warning that the ship is in the vicinity, further reducing the possibility of a collision. When the systems have been shut down for any reason, such as during an ROV dive or CTD cast, the multibeam soft start mode – a delay function, starting sonar transmissions at a low output level and gradually increasing - would be used to minimize any impact on cetaceans. Only after the multibeam has been brought from soft start to full power would the SBP sonar then be turned back on.

NMFS Shift Thresholds

The current NMFS-defined threshold for the onset of PTS in cetaceans from exposure to in-water sounds is ≥ 180 dB re 1 µPa. The same threshold for pinnipeds is ≥ 190 dB re 1 µPa. Exposure to impulsive in-water sounds at ≥ 160 dB re 1 µPa is the threshold for the onset of TTS and behavioral disturbance for all marine mammals, whereas the same threshold for exposure to non-impulsive sound (continuous noise) is ≥ 120 dB re 1 µPa. Because the sonar systems to be used in this action are considered impulsive sources, the 160 dB re 1 µPa threshold for the onset of TTS and behavioral disturbance would apply, and significant exposure above that level at a frequency within the animal's hearing range would be considered an adverse impact.

Acoustic Modeling

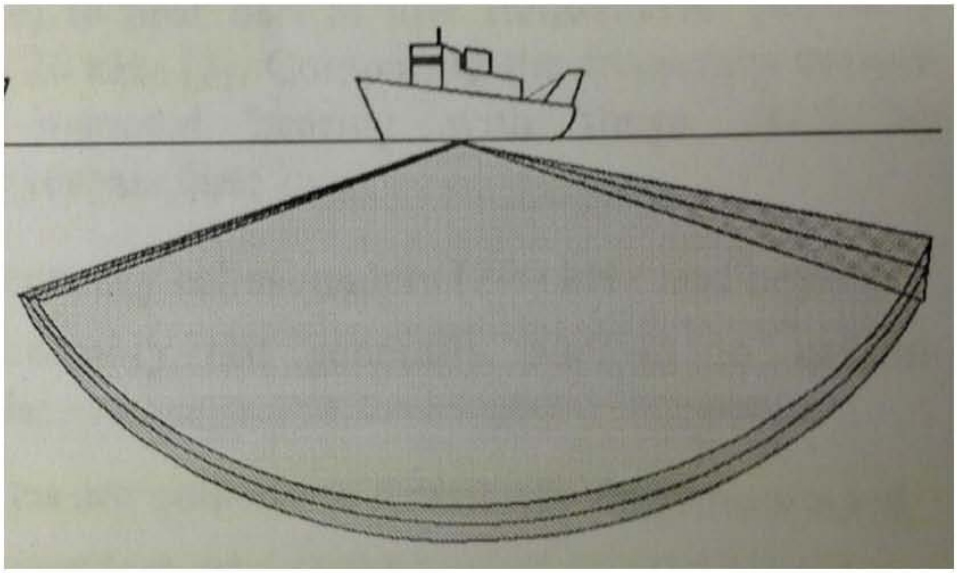
Accurately predicting the 160 dB re 1 µPa isopleth from any sound source is difficult, but particularly so for multibeam sonar. Using the simplest example, that of an unfocused, omni-directional single point source in unbounded homogenous water, sound will disperse from the source in a spherical pattern. In this example, the equation $RL = SL - (20\text{Log}R + \alpha R)$ estimates spherical spreading loss where RL = received level; SL = source level; R = range in meters, and α is the absorption coefficient in water at 1 m as a function of frequency (Lurton & DeRuiter 2011). In addition to source level and frequency, the distance for which different decibel levels are experienced away from the source is also dependent on a number of other factors that include density, salinity, and the amount of suspended solids in the water. Detailed information on these naturally occurring factors in the marine environment is rarely available and consequently they are generally not considered in the equations.

Assuming for the moment that the EM 302 system is a simple omni-directional point source, then the 180 dB and 160 dB re 1 microPa isopleths would fall at approximately 1,000 m and 2,800 m, respectively, based on a α value of 6 dB/km (@30 kHz) as computed from representative CTD casts of local oceanographic conditions in the vicinity of the monuments.

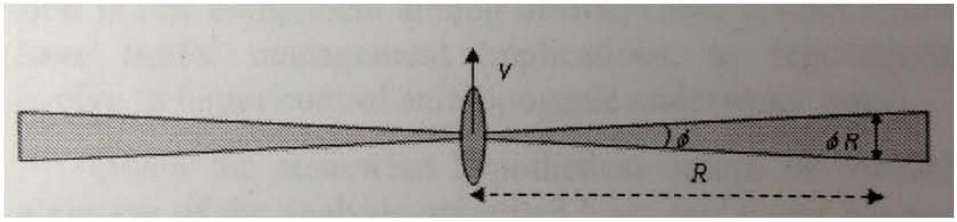
Acoustic Modeling - Generic Multibeam

However, multibeam systems are not simple omni-directional point sources but rather are focused sonar arrays that use "selective angular directivity" and furthermore transmit "very short pulses at limited ping rates" (Lurton & DeRuiter 2011). These two characteristics of this type of sonar decrease the potential sound exposure level as well as decrease the probability of the animals being subjected to TTS threshold intensity levels. Figure 1 provides diagrams excerpted from Lurton & DeRuiter (2011) showing the generalized ensonification volume of a generic multibeam sonar system from both horizontal (Fig 1a) and overhead (Fig. 1b) perspectives. Fig 1b also provides the variables used to estimate the exposure time of a stationary animal as the ship passes on its survey track. The exposure time can be estimated by ØR/V where Ø is the longitudinal transmitting lobe aperture in radians, R is the range from the source to the animal, and V is the speed of the ship.

The aperture of the EM 302 on the Okeanos is 0.5° but since it would operate in dual swath mode in shallower water it will be conservatively treated as 1° (same as the Falkor), yielding a Ø value of 0.02 radians. The ship will be mapping at 8 knots (4.116 m/s). At 200m distance, the exposure times for a stationary animal caught in the ensonification plane of the EM 302 are therefore calculated to be 1 second. This exposure time increases linearly with R so that at 1000 m distance, the exposure time increases to 5 seconds.



1a)



1b)

Figure 1: Diagrams showing a typical multibeam ensonification volume from a) the horizontal and b) the overhead prospective (From Lurton & DeRuiter 2011).

Acoustic Modeling - Okeanos Explorer EM 302 Multibeam

Dr. Xavier Lurton (IFREMER) has recently created a simplified model of the specific behavior of the *Okeanos Explorer's* EM302 system in terms of direct radiated level inside the water. Model output graphics showing radiated sound transmission patterns in the horizontal and

vertical planes of the water column are provided in Appendix C (Case Study: Okeanos Explorer - EM 302 - Hawaii). This analysis represents our best estimates of radiated sound levels given the current configuration of the sonar. The assumptions behind the model are:

1) The Deep Mode of the EM302 was used (i.e., longest pulse length and highest power -- or worst case scenario).
2) The model uses the current best understanding of the directivity pattern of the sonar that includes both the individual transducer directivity and the transmit sector beam forming.
3) The model does not include any masking effects by the hull or gondola. The draft of the transducer "gondola" on the Okeanos Explorer is 5.65 m below the water line. This configuration causes a baffle effect from the gondola structure and the hull above, and further reduces the likelihood of direct ensonification of an animal on or near the surface, especially a short distance away from the ship.
4) A value of 6 dB/km @ 30 kHz was used as a first-order approximation of the absorption coefficient representative of oceanographic conditions in the vicinity of PMNM, the PRIMNM, the Main Hawaiian Islands and the Geologists Seamounts.

Figure 1c (below) shows horizontal plane (top-down) views of sound pressure levels at three different receiving depths within the water column directly below the transducer: 10m, 50m, and 200m. These figures demonstrate the remarkably narrow zone of ensonification in the along-track direction. Note the difference in the 160 dB/µPa isopleth in the beam plane and elsewhere around the ship. For all but this plane, the isopleth occurs at 400 m or less from the ship. For animals directly within the beam plane, sound pressure levels drop below 160 dB/µPa within 1500 m of the ship near the surface, and within 1800 m at a depth of 200 m. Submerged animals more than 400 m from the ship that are caught in the ensonification volume as the ship passes will be only briefly subjected to the elevated sound levels occurring inside the transmitter beam pattern. Furthermore, the narrow fan-shaped beam patterns of the Okeanos Explorer system provide ample possibilities for the animals to quickly escape the sound. The only possible scenario for more extended exposure would be if the animal were to suddenly start moving in the exact direction and speed as the ship while within the narrow ensonification beam, which is unlikely. This very selective spatial pattern of the sound radiation makes this configuration very different from seismic airgun sources (omnidirectional) or military mid-frequency active sonars that are often directed horizontally through the water column.

Figure 1d (below) shows the across track radiation pattern for the full water column below the EM302 transducer, with a close up of the near surface region. The 160 and 180 dB/µPa isopleths

are plotted to show ranges from the sonar relevant to potential PTS and TTS impacts on cetaceans.

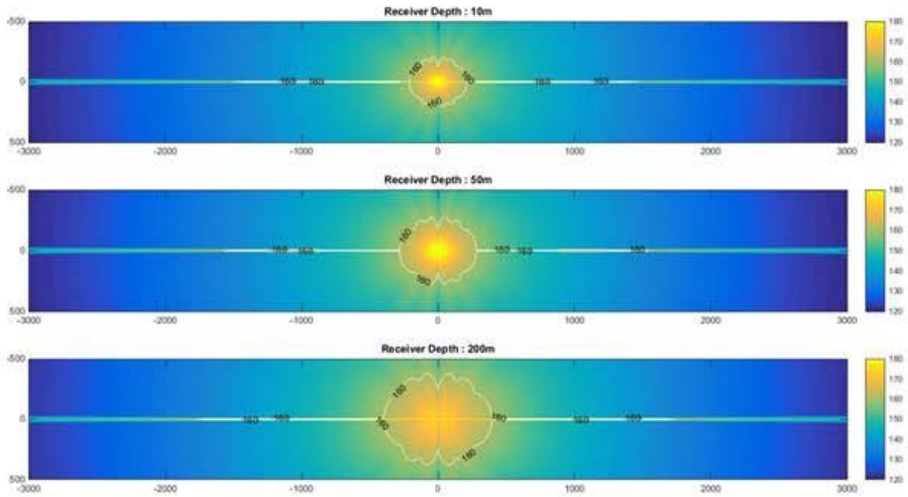


Fig. 1c: Top down view image of the EM302 radiated beam pattern at several depths (10m, 50m and 200m created by Dr. Xavier Lurton (IFREMER). The ship track is straight up, the Y axis is distance in meters while the X axis in distance in meters. The color scale is signal strength in decibels (dB).

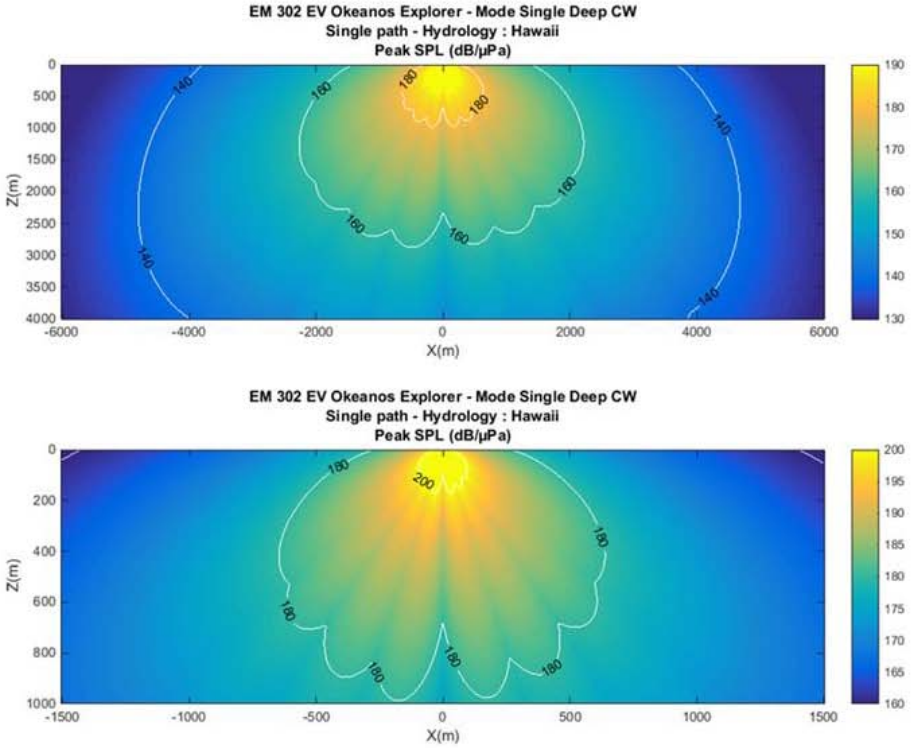


Fig. 1d: Model created by Xavier Lurton (IFREMER) of the EM302 radiated transmission patterns with the 140, 160 and 180 dB/µPa isopleths plotted for the full water column (top) and of the near surface region (bottom) of a single ping, looking forward through the water column in the along track direction. The y axis is depth below sea surface in meters, and the x axis is distance in meters. The color scale is signal strength in decibels (dB).

Additional Considerations Specific to EM 302 Multibeam

Transmit pulse forms and rates are yet two other differences that distinguish multibeam sonar from other types of sonar and acoustic sources and further reduce their potential threat to ESA-listed species. Sound is not transmitted continuously from these systems but rather in extremely short pulses (i.e., pings). Ping durations obtained from the EM302 manual (page 36) are very

brief -- 0.7 to 5.0 milliseconds. The ping rate or in other words, how frequently pings are emitted, is depth dependent and is provided for different depths in tables 2 and 3 of the manual and show that at a depth of 400 m, the ping rate is 30 pings/min, decreasing to 3.6/min at 4000 m. Another way of putting it is that when the ship is mapping in 400 m of water, any submerged animal within the ensonification volume will be subjected to only a 0.7 millisecond ping every 2 seconds. When the ship is mapping in 4,000 m of water, a submerged animal could potentially experience a 5-40 millisecond ping every 17 seconds. The fore-aft width of the ensonification volume at 200 m distance from the ship is approximately 4 meters. Based on a mapping speed of 8 knots and using this width as an example, this distance will be traversed by the ship in 1 second. Therefore, a submerged stationary animal 200m from the ship while it is surveying depths of 400 m should be subjected to at most a single ping of 0.7 milliseconds of duration. If the encounter occurs where the water depth is 4,000 m, the chances are low that it will even be subjected to a single ping.

Another consideration is the hearing range of the various species covered under the ESA. As mentioned earlier, the EM 302 system is 30 kHz. Figure 1e provides a general diagram of the hearing ranges of the various groups of marine mammals that was originally presented as Fig 4.2-3 of the Southwest Fisheries Science Center's Draft Programmatic Environmental Assessment released in April, 2013. The frequency range of the EM 302 system was superimposed on the bars. The first observation from this figure is that the system is not expected to produce sound audible to the low frequency cetacean group (baleen whales or Mysticetes) whose hearing range is believed to be below 30 kHz.

The second observation is that the system is also transmitting at the upper portion of the pinniped hearing range. Together, these observations suggest that toothed whales are likely to be the ESA group potentially most affected by the mapping activities. Within the project area, the sperm whale and the false killer whale, are the only species of toothed whales that are ESA listed. Observers will therefore pay particular attention to spotting and avoiding these two species.

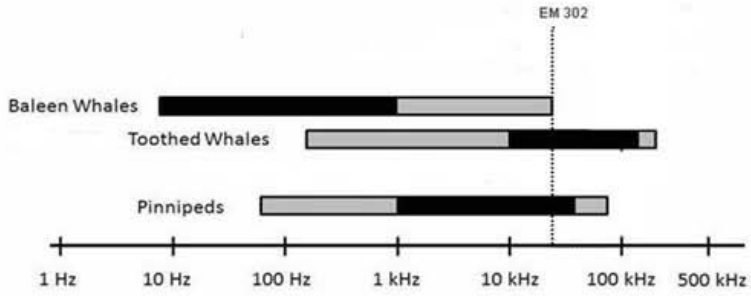


Fig. 1e: Hearing ranges of ESA-listed marine mammals groups in Hawaiian waters. Black bars show the most sensitive portion of these ranges. This figure was modified from Figure 4.2-3 of NOAA's Southwest Fishery Science Center draft Programmatic EA (see text for more details).

On December 23, 2013, NOAA released for public comment it's new "Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts". The document is anticipated to be finalized winter 2015. Included are updated acoustic threshold levels for the onset of both PTS and TTS that "will replace those currently in use by NOAA." The updates include PTS and TTS levels for both impulsive and non-impulsive sound sources for 5 marine mammal functional hearing groups that include low, mid, and high-frequency cetaceans, phociid pinnipeds, and otariid pinnipeds. In addition, the updates include the addition of a second new metric for assessing acoustic activities: PTS and TTS cumulative sound exposure level (SELcum) thresholds. These thresholds are calculated with and without marine mammal auditory weighting functions. Since SELcum is not as yet being used for ESA recommendations, we only examined what the new sound intensity thresholds will be, now calculated as dB peak values instead of dB rms values. Tables 6a and 7 in that guidance document provide these threshold values. TTS peak decibel levels range from 195 dB re 1 microPa for high frequency cetaceans, 224 dB re 1 microPa for low frequency cetaceans, and 229 dB re 1 microPa for both families of pinnipeds. While dBpeak (maximum value) is calculated differently than dBrms, the rule of thumb is that the latter are generally 3 dB less than the former (Tom Weber, pers comm and see Fig 1f below). These new TTS thresholds are based on the most current science available and suggest that the Okeanos Explorer multibeam system will not exceed these levels for any of the functional groups if they are further than 100 m from the ship at the surface and 300 m from the ship if diving directly below the transducer.

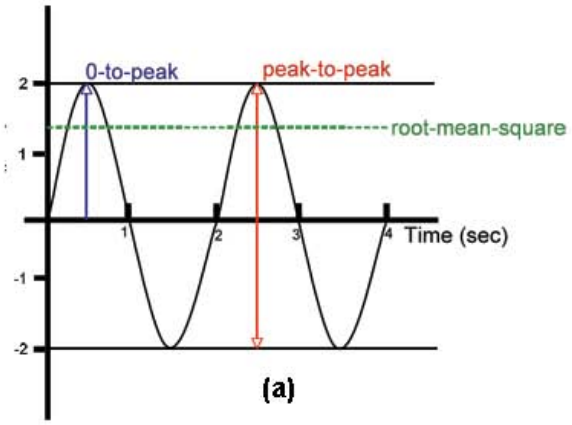


Fig. 1f: Relationship between RMS and Peak dB measurements (from http://www. *http://acousticslab.org).*

Background Information: NSF 2011 Programmatic EIS

The National Science Foundation's 2011 document "Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey" provides a detailed analysis of potential impacts of seismic, multibeam, and sub-bottom sonars on sea turtles and marine mammals and provides useful information. The document evaluates deep water multibeam systems ranging from 12-95 kHz. The EM302 operates at 30 kHz so falls within the frequency, source levels, pulse lengths and beam widths evaluated by this report. The SBP on the *Okeanos* is of the same type evaluated in the report. With respect to multibeam echosounders (MBES) and sub-bottom profilers (SBP), the following direct excerpts are conclusions of this document regarding the potential impact on sea turtles, mysticetes, odontocetes, and pinnepeds:

Sea Turtles

"Operation of the MBES, SBP, or pingers is not expected to affect sea turtles, because the associated frequency ranges are above the known hearing range of sea turtles. The SBP operates at 3.5 kHz with a maximum source output of 222 dB re 1 µPa-m. Thus, the frequency range of the SBP is outside the known detection range of sea turtles based on available data. As a result,

sea turtles are not expected to be capable of hearing the higher frequency sounds produced by SBPs. Furthermore, the intermittent and narrow downward-directed nature of the MBES and SBP as emitted from the transiting seismic vessel would result in no more than one or two brief ping exposures."

Mysticetes

"During the proposed marine seismic surveys, the pings from the MBES, SBP, and pingers would be very short (<1-64 ms) (Table 2-5).

Table 2-5. Acoustic Parameters of MBESs, SBPs, ADCPs, Pingers, and Acoustic Releases Used by NSF-Funded or USGS Research Vessels Conducting Marine Seismic Research.

Acoustic Source		*Frequency (kHz)*	*Source Level (dB re 1 µPa-m)*	*Pulse Length (ms)*	*Beam Width**	
					Fore-aft	*Athwart.*
MBES	Seabeam 2000	12	234	7-20		
	Seabeam 2100/12	12	237	<1 – 12	2° x 2°	
	Kongsberg EM122	12	242	2-15	1° x 2°	150°
	Simrad EM 120/122	12	242	2, 5,15	1°x1°, 1°x2°	150°
	Simrad EM 300	30	237 (1°), 231 (2°)	0.7, 2,15	1°x1°, 1°x2°	
	Simrad EM 1002	95	225 (3°)	0.2, 0.7, 2	2° x 2°	
	Krupp-Atkas HydroSweep DS	15.5	237		2.3°	
SBPs		3.5	222	64	27°	
ADCPs		38-1,200	224		30°	
Pingers		55-110	183			
Pingers		12	192	0.5, 2, 10		
Acoustic Releases		9-15	187	8		

Notes: *The beams of all acoustic sources would be directed downward from the research vessel. Athwart = athwartship. *Sources:* USCG 2001; L-DEO and NSF 2003e; SIO and NSF 2003; University of Washington 2003; SIO and NSF 2004; SIO 2005a, b; UAF and NSF 2005; University of Hawaii 2005; WHOI.

Thus, a given mammal would not receive many of the downward-directed MBES or SBP pings as the vessel passes by. In the case of the MBESs that operate at 30 kHz or higher, their operating frequencies are too high to have any effects on mysticete behavior. Source levels of the SBPs, another type of echosounder, are lower (maximum source level 222 dB re 1 microPa [rms]) than those of the MBES discussed above (Table 2-5). Thus, there is even less likelihood of TTS occurring through exposure to SBP sounds, even in an animal that is briefly near the source. The SBP is usually operated simultaneously with other higher-power acoustic sources. Many marine mammals, particularly mysticetes, move away in response to the approaching higher-power sources or the vessel itself before the mammals are close enough for there to be

any possibility of effects from the SBP's less-intense sounds. The possibility of PTS through exposure to MBES or SBP sounds is considered negligible and PTS is not expected to occur. Burkhardt et al. (2008) concluded that immediate direct injury was possible only if a cetacean dived under the vessel into the immediate vicinity of the transducer. Furthermore, PTS (or any injury or pathological effect) has never been demonstrated for any marine mammal exposed to echosounders such as the proposed MBESs and SBPs."

Odontocetes

"In summary, sounds from all the MBESs would be readily audible to most and possibly all odontocetes when animals are within the narrow angular extent of the intermittent sound beam. As with baleen whales, odontocete communications will not be masked appreciably by MBES, SBP, or pinger signals given their low duty cycles, the brief period (i.e., seconds) when an individual mammal would potentially be within the downward-directed MBES or SBP beam from a transiting vessel, and the relatively low source level of a pinger. Operation of MBESs, SBPs, and pingers is not likely to impact odontocetes. The project MBESs, SBPs, and pingers are not expected to induce TTS. The possibility of PTS through exposure to MBES or SBP sounds is considered negligible."

Pinnipeds

"The SBPs associated with the proposed marine seismic activities operate in the MF range of approximately 3.5 kHz with a maximum source output of 222 dB re 1 µPa-m (rms). The frequency range of the SBPs is within the frequency band audible to pinnipeds. Masking effects due to MBES, SBP, or pinger signals are expected to be minimal or non-existent. Thus, brief exposure of pinnipeds to small numbers of signals from the MBES or SBP would not result in a —take by harassment as defined by NMFS and the ESA. The project MBESs, SBPs, and pingers are not expected to induce TTS. Although the MBESs, SBPs, and pingers can presumably be heard by pinnipeds, their operation is not likely to affect pinnipeds. The intermittent and narrow downward-directed nature of the MBESs and SPBs would result in no more than one or two brief ping exposures of any individual pinniped given the movement and speed of the vessel and animal; such brief exposure to this sound is not expected to cause injury or PTS based on results of limited studies of some pinniped species."

As described above, no marine mammals or turtles would be exposed to sound intensity at or above the levels required for the onset of TTS or PTS, but those species exposed may experience behavioral responses as the result of exposure to the project's sonar noise. Based on the best information available, including the motility of free-ranging marine mammals and turtles in the

water column, the propensity for these species (especially marine mammals) to avoid obtrusive sounds, and the proposed mitigation measures, mild alert and startle responses, avoidance of the survey vessel are the most probable responses to exposure. No measurable impacts are expected to occur on the ability of marine mammals and turtles exposed to forage, shelter, navigate, reproduce, and avoid predators and other threats such as vessels. Therefore, the expected behavioral responses expected to result from exposure to the project's sonar noise would have insignificant effects on ESA-listed marine mammals or turtles that may be in the area.

Acoustic Information Related to Elasmobranchs

A sound source produces both pressure waves and actual motion of the medium particles. In fish, particle motion is detected using the inner ear, while pressure signals are initially detected by the gas-filled swim bladder or other bubble of air in the body. These air filled spaces vibrate and serve as a medium to "reradiate" (or resend) the signal to the inner ear as a near field particle motion (Popper, 2008) in those species where a connection exists between the swim bladder and the inner ear.

While the air bladder in fish may play a role in sound detection, its primary purpose is for buoyancy. Elasmobranchs (sharks and rays) on the other hand do not have air bladders. Instead elasmobranchs have developed overly large livers which provide buoyancy. Because of this lack of an air bladder elasmobranchs are unable to detect pressure waves, instead sharks detect the kinetic stimulus rather than the acoustic pressure wave. Unlike acoustic pressure, the kinetic stimulus is inherently directional, but its magnitude rapidly decreases as it propagates outward from the sound source in the near field (Corwin, 1981).

Although research has shown that the upper range of behavioral sensitivity to this kinetic stimulus is 600 to 800 Hz in both scalloped hammerheads, *Sphryna lewini* (Olla, 1962), and the lemon shark, *Negaprion brevirostris* (Nelson, 1967); sharks are more low frequency sensitive, with the most effective spectral range occurring from 40 Hz to 300 Hz (Myrberg, 1978). Above these frequencies both the behavioral sensitivity and the sensitivity of the ear fall off rapidly (Corwin, 1981).

As previously described, the NOAA Ship Okeanos Explorer's three scientific sonars operate at 30 kHz (the multibeam system), 18 kHz (split-beam fisheries sonar), and 3.5 kHz (the chirp sub-bottom profiler sonar). All three of these frequency ranges are well above the hearing sensitivity ranges for elasmobranchs based on the research that has been done to date.

Based on the best available scientific information which indicates that the multibeam, split-beam and chirp sub-bottom profiler operate and frequencies above the hearing ability for all

elasmobranchs (including scalloped hammerheads), and the propensity for the species to avoid human activities; no measurable impacts are expected to occur on the ability of the species to forage, navigate, reproduce, and avoid predators and other threats such as vessels. Therefore, the expected behavioral responses expected to result from exposure to the project's sonar noise would have insignificant effects on the ESA-listed Indo-Pacific distinct population segment of the scalloped hammerhead shark.

2. Temporary disturbance from human activity

Nearly all the activities associated with ROV dives and vessel operations in the PMNM, the PRIMNM, the marine environment around Ni'ihau, Oahu and the big island of Hawai'i; the Geologists Seamounts, and the vessel transit areas to these areas from Honolulu, Hawai'i involve work in the marine environment where ESA-listed species are known to occur. Marine species may experience a startle reaction and resulting stress should they encounter human activities in the water. The reaction could range from one extreme where an animal calmly approaches and investigates the person or gear, to a panicked response in which the animal flees, which could result in injury or reduce vitality.

Following the BMPs associated with the Marine Wildlife Viewing Guidelines for PMNM and Boat Operations and Diving Activities reduce the likelihood of interactions with ESA-listed species. These BMPs, which will be used in all project areas, include:

- All in-water work will be postponed when whales are within 100 yards, or other protected species are within 50 yards;
- Should a marine protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s); and
- No attempts will be made to feed, touch, ride, or otherwise intentionally interact with any marine protected species.

Sea turtles, marine mammals and sharks usually avoid human activity. The most likely effect on this interaction will be a moderate to high energy avoidance behavior resulting in the animal temporarily leaving the immediate area unharmed. Considering this avoidance behavior, in combination with the nature of the activities, and implementation of the above mentioned BMPs, we have determined that disturbances related to vessel operations and ROV dives will be infrequent, would be temporary in nature and never reach the scale where it would affect the

individual's health, and thus are expected to result in insignificant effects on ESA-listed marine species discussed in this biological evaluation.

3. Entanglement

The planned cruise would include the deployment of a CTD, which would be deployed over the side of the vessel with a cable; and a ROV, which would be tethered to the vessel; creating the potential for entanglement of the marine species considered in this consultation should any of those animals encounter the cable or tether. However, in addition to compliance with the BMP listed above, which would require maintaining watch for and avoiding protected marine species, we propose to postpone deployment of these devices when sea turtles, marine mammals or scalloped hammerhead sharks are within 50 yards of the vessel, and all individuals participating in the activity would closely monitor the instrument cables at all times while they are deployed. Based on the expected compliance with the required protective measures, and the expectation that protected marine species would be widely scattered throughout the proposed areas of operation, we consider it extremely unlikely that any of those animals would come into contact with any of the cables, and have determined that the risk of entanglement would be discountable.

4. Collisions with vessels

Sea turtles and marine mammals must surface to breathe, and they are known to rest or bask at the surface. Therefore, when at or near the surface, these animals are at risk of being struck by the vessel or its propellers during small boat operations and vessel transits to and from the monuments. Potential injuries and their severity will depend on the speed of the vessel, the part of the vessel that strikes the animal, and the body part impacted. Injuries may include bruising, broken bones or carapaces, and lacerations that can often result in death.

Existing information about sea turtle sensory biology suggests that sea turtles rely more heavily on visual cues, rather than auditory, to initiate threat avoidance. Research also suggests that sea turtles cannot be expected to consistently notice and avoid vessels that are traveling faster than 2 knots (kts) (Hazel et al., 2007). Vanderlaan and Taggart (2007) report that the severity of injury to large whales is directly related to vessel speed. They found that the probability of lethal injury increased from 21%, for vessels traveling at 8.6 kts, to over 79% for vessels moving at 15 kts or more. Additionally, since collisions with whales have been reported for both slow and fast moving craft, it appears that, in at least some situations, whales may either be unaware of a vessel's presence or unable to resolve the vessel's proximity and/or vector of approach based on

available acoustic cues. Consequently, vessel operators must be responsible to actively watch for and avoid sea turtles and marine mammals, and to adjust their speed based on expected animal density and on lighting and turbidity conditions to allow adequate reaction time to avoid marine animals.

All activities involving vessels and their tenders will comply with the BMPs associated with the Marine Wildlife Viewing Guidelines for PMNM and Boat Operations and Diving Activities, which require all individuals to maintain constant vigilance and avoid Federally-listed marine species. Further BMP requirements for boat operations include:

- Vessel operators shall alter course to remain at least 100 yards from humpback whales, and at least 50 yards from other marine mammals;
- Vessel speed will be reduced to 10 knots or less when operated in the vicinity of marine mammals;
- Vessel speed will be reduced to 5 knots or less when operated in the areas of known or suspected turtle activity;
- Vessels will be operated so as not to encircle or trap marine mammals and sea turtles between vessels or between vessels and the shore; and
- If a marine mammal or turtle approaches a vessel, the vessel's engine will be placed in neutral until the animal has passed.

The scalloped hammerhead shark is a circumglobal species that lives in coastal warm temperate and tropical seas. It occurs over continental and insular shelves, as well as adjacent deep waters, but is seldom found in waters cooler than 22° C (Compagno 1984, Schulze-Haugen and Kohler 2003). It ranges from the intertidal and surface to depths of up to 450-512 m (Sanches 1991, Klimley 1993), with occasional dives to even deeper waters (Jorgensen et al. 2009). Tagging studies indicate that the species rarely makes long-distance oceanic migrations, but instead disperses along continuous coastlines, continental margins, and submarine features, such as seamounts (Miller et al., 2013).

Although the species is present in much of the Pacific, ranging from Japan and China to New Caledonia in the west, to the Gulf of California to Ecuador in the east; the species range in the central Pacific Ocean is primarily comprised of the Hawaiian Archipelago, which includes the main islands and the Northwestern Hawaiian Islands (Miller et al, 2013). Johnston Atoll is also included in this range due to its proximity to the Hawaiian Archipelago (Miller et al., 2013). Individuals of the species may be found alone, in pairs, or in schools. Adult aggregations may be found offshore over seamounts and near islands, but are most common near the Galapagos, Malpelo, Cocos and Revillagigedo Islands, and within the Gulf of California (Compagno 1984, CITES 2010, Hearn et al. 2010, Bessudo et al. 2011).

Based on the low number of trips, expected adherence to established BMPs, the expectation that protected marine species would be widely scattered throughout the proposed areas of operation, and the limited populations of the protected species in these areas; we have determined that the risk of a vessel collision with a protected marine species would be discountable.

5. Vessel waste and discharge

While operating within the PMNM, all vessels are required to comply with the following regulations (71 FR 51134, 50 CFR Part 404) with regards to permitted types of discharge:

- Discharging or depositing any material or other matter into the Special Preservation Areas (SPAs) or the Midway Atoll Special Management Area (MASMA) except vessel engine cooling water, weather deck runoff, and vessel engine exhaust;
- Discharging or depositing any material or other matter into the Monument, or discharging or depositing any material or other matter outside the Monument that subsequently enters the Monument and injures any resources of the Monument, except fish part used in and during authorized fishing operations, or discharges incidental to vessel use such as deck wash, approved marine sanitation device effluent, cooling water, or engine exhaust.

While an accidental release of waste or discharge may occur which might put protected species at risk to exposure, based on the low number of vessels that operate within the waters of the monuments, expected adherence to above mentioned discharge regulations during all project operations, the expectation that protected marine species are widely scattered throughout the project area and the limited populations of ESA-listed species in these areas, we have determined that the risk of protected species being exposed to vessel waste and discharge would be insignificant.

6. Effects to designated & proposed Hawaiian monk seal critical habitat

Critical habitat for the Hawaiian monk seal was designated under the ESA (53 FR 18990) on April 30, 1986 and revised on May 26, 1988 (53 FR 18988). In the PMNM, critical habitat for monk seals includes all beach areas, lagoon waters, and ocean waters out to a depth of 20 fathoms around Kure Atoll, Midway Islands (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island. On June 2, 2011, NMFS proposed revising critical habitat for monk seals (76 FR 32026) by extending the current designation out to the 500 meter depth contour and

including Sand Island at Midway Island. Using the best available scientific information, the proposed revision to critical habitat identifies six essential features for the conservation of monk seals that may require special management consideration or protection:

1. Areas With Characteristics Preferred by Monk Seals for Pupping and Nursing;
2. Shallow, Sheltered Aquatic Areas Adjacent to Coastal Locations Preferred by Monk Seals for Pupping and Nursing;
3. Marine Areas From 0 – 500 m in Depth Preferred by Juvenile and Adult Monk Seals for Foraging;
4. Area With Low Levels of Anthropogenic Disturbance;
5. Marine Area With Adequate Prey Quantity and Quality; and
6. Significant Areas Used by Monk Seals for Hauling Out, Resting, or Molting.

The proposed actions include activities that would occur within three essential features (numbers 3,4 and 5 above) of existing and proposed critical habitat, but the level of human activity that may occur annually in these areas is minimal and any disturbances caused by human presence would be temporary. Also, all permitted personnel are required to adhere to the Monument BMPs previously described that effectively prevents or minimizes interactions with monk seals and with critical habitat essential features. There is no Hawaiian monk seal critical habitat designated for the PRIMNM (Johnston Atoll).

Based on adherence to proposed BMPs, no known record of previous impacts to monk seal critical habitat, and the temporary introduction of human presence to conduct activities that would have minimal impact to the environment, we expect the likelihood of destruction or adverse modification to the current Hawaiian monk seal critical habitat and those habitats that are proposed to be insignificant

Effects Determination

We have evaluated the effects of the proposed actions on the following ESA-listed marine species: green sea turtle, hawksbill sea turtles, leatherback sea turtles, North Pacific loggerhead sea turtle DPS, olive ridley sea turtles, Main Hawaiian Islands false killer whale DPS, blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, sperm whales, the Indo-West Pacific distinct population segments of the scalloped hammerhead shark, and Hawaiian monk seals. Based on our analysis of the potential effects of the proposed action on ESA-listed marine species presented above the proposed action would have insignificant effects

on the ESA-listed species under consideration, or the likelihood of exposure would be discountable. Therefore, we have determined that the proposed activities are not likely to adversely affect those species. We have also determined that the proposed activities would have insignificant effects on the essential features of designated and proposed critical habitat for Hawaiian monk seals, and therefore is not likely to adversely affect critical habitat. Therefore, we request informal consultation per Section 7(a)(2) of the ESA, and your concurrence with our determination that the proposed action may affect, but is not likely to adversely affect, green sea turtles, hawksbill sea turtles, leatherback sea turtles, North Pacific loggerhead sea turtle DPS, olive ridley sea turtles, Main Hawaiian Islands false killer whale DPS, blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, sperm whales, the Indo-West Pacific distinct population segments of the scalloped hammerhead shark, Hawaiian monk seals or existing or proposed Hawaiian monk seal critical habitat.

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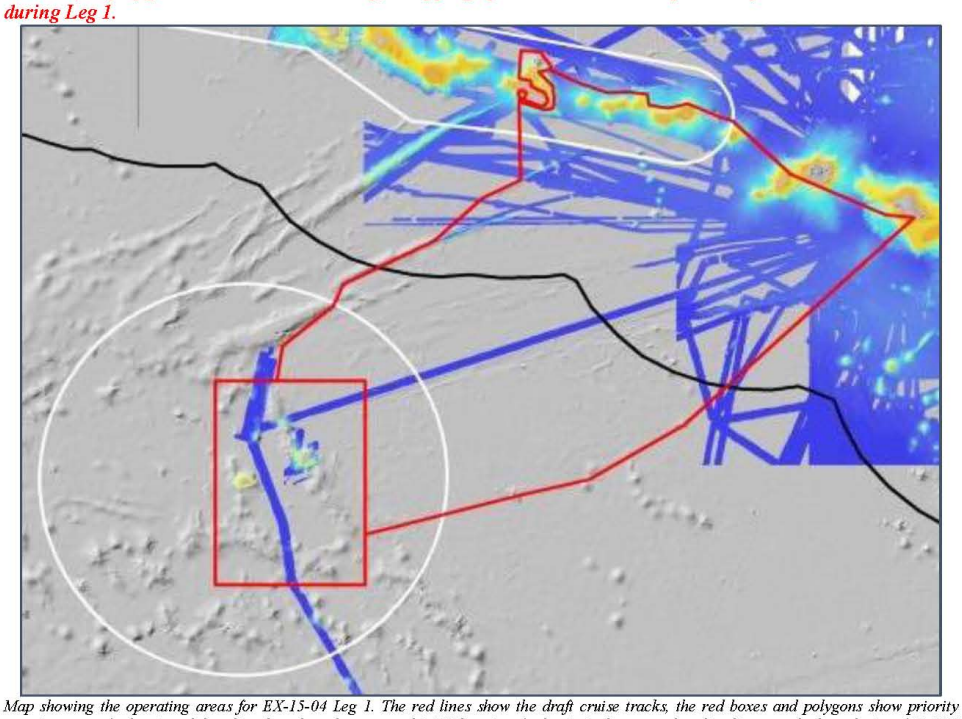
Appendix A. Cruise Operating Area Maps

EX-15-04 Cruise Leg 1:
North West Hawaiian Islands & Johnston Atoll Exploration
July 10 – 24, 2015

Note: Due to emergency dry dock repairs needed for Okeanos Explorer, the cruise is delayed by 7 days. The cruise is now planned to start on July 10th at the earliest, resulting in the loss of the mapping area shown within PMNM (the polygon to the north in this map). Mapping operations will instead focus only around Johnston Atoll during Leg 1.

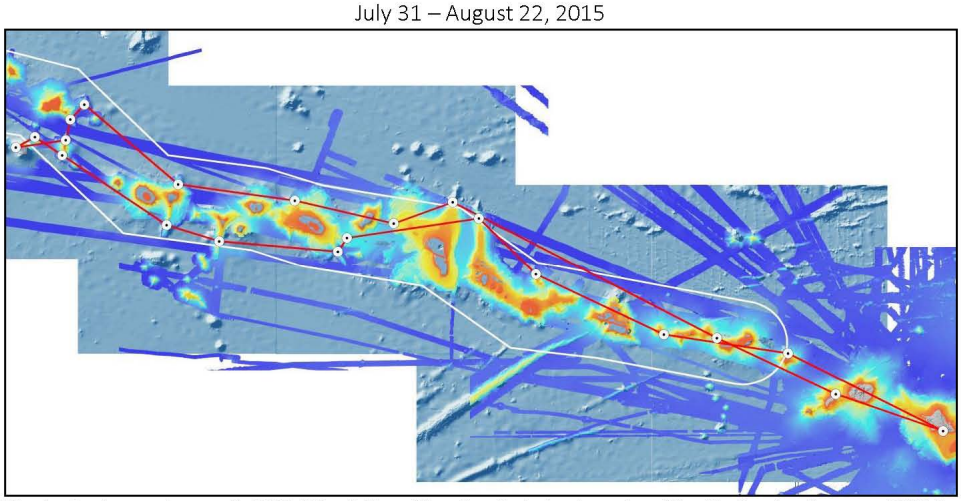


Map showing the operating areas for EX-15-04 Leg 1. The red lines show the draft cruise tracks, the red boxes and polygons show priority mapping areas for leg 1, and the white dots show the proposed ROV dive sites for leg 2. In the maps, the white lines are the boundaries of PMNM and the Johnston Atoll portion of the PRIMNM. The black line is the U.S. EEZ.

Leg 1 is a mapping exploration cruise that will conduct 24 hour mapping operations, including during transit, to address unmapped areas surrounding Johnston Atoll (PRIMNM). The ship will transit from Pearl Harbor, Oahu to the Johnston Atoll portion of PRIMNM. Mapping will take place along Horizon tablemount, down through the Karin seamount chain, then over to the

Johnston seamount chain before transiting back to Pearl Harbor, Oahu. Opportunistic CTD rosette operations may also be conducted.

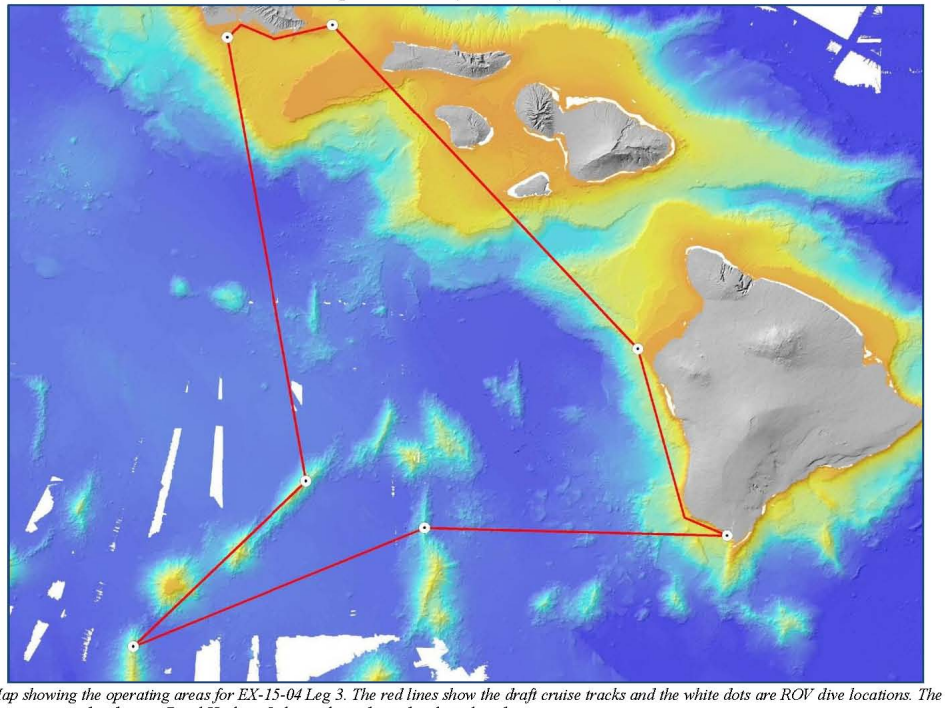
EX-15-04 Cruise Leg 2:
North West Hawaiian Islands Exploration
July 31 – August 22, 2015



Map showing the operating areas for EX-15-04 Leg 2. The red lines show the draft cruise tracks and the white dots show the proposed ROV dive sites. The cruise start and end port – Pearl Harbor, Oahu is also indicated with a white dot. The white lines are the boundaries of PMNM and the Johnston Atoll portion of the PRIMNM.

Leg 2 is a telepresence-enabled ROV cruise with full shore-based science participation focused on priority ROV dive targets for PMNM, and to support HIHWNMS's interest in habitats and resources around the island of Niihau en route to the Monument. The ship will conduct 24 hour operations consisting of daytime ROV dives and nighttime mapping operations including during transit. Opportunistic CTD rosette operations may also be conducted. The ship will depart Pearl Harbor, Oahu and head to Middle Bank on the southern border of PMNM to conduct an ROV dive, and then enter PMNM where the majority of ROV dives will be conducted, reaching almost up to Pearl & Hermes Atoll. Rift zone ridges and other types of abrupt topography will be targeted due to their likelihood of hosting extensive communities of deepwater corals and sponges, as well as likely manganese crust habitats from 1,000-2,500m. The deepest extent of important coral and sponge groups will also be explored during dives to depths of 3,000-5,000 m. The ship will then depart PMNM and head to Niihau for another dive, before heading back into port in Pearl Harbor, Oahu to complete the cruise.

EX-15-04 Cruise Leg 3:
Main Hawaiian Islands and Geologists Seamounts
August 28 – September 3, 2015

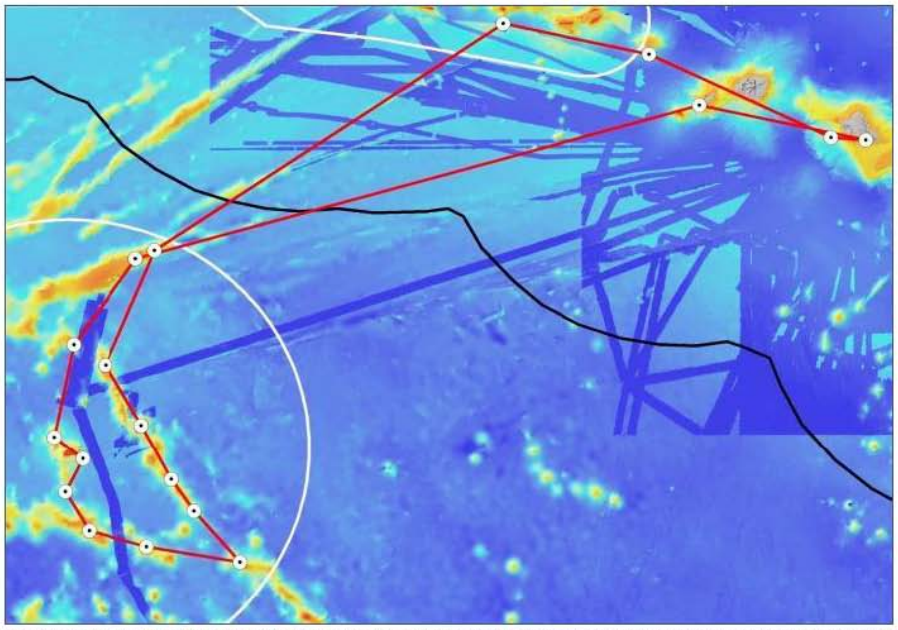


Map showing the operating areas for EX-15-04 Leg 3. The red lines show the draft cruise tracks and the white dots are ROV dive locations. The cruise start and end port – Pearl Harbor, Oahu is also indicated with a white dot.

Leg 3 is a seven day telepresence-enabled ROV cruise with shore-based science participation funded entirely by DSCRTP. The ship will conduct 24 hour operations consisting of daytime ROV dives and nighttime mapping operations including during transit. The first three and last ROV dives will be used to recover instruments that are presently monitoring environmental conditions on precious coral beds off the islands of Oahu and the Big Island, and to conduct a dive in support of a coral disturbance/recovery study. The remaining three days will be used to explore for deep sea coral and sponge communities, as well as manganese crust communities in the Geologist seamounts located about 100 miles south of Honolulu. Mapping operations would

be conducted between dives at the Geologists seamounts (McCall, Ellis and Swordfish) primarily to acquire multibeam backscatter data.

EX-15-04 Cruise Leg 4:
North West Hawaiian Islands & Johnston Exploration
September 7 – 30, 2015



Map showing the operating areas for EX-15-04 Leg 4. The red lines show the draft cruise tracks and the white dots are ROV dive locations. The cruise start and end port – Pearl Harbor, Oahu is also indicated with a white dot. The white lines are the boundaries of PMNM and Johnston Atoll portion of PRIMNM. The black line is the U.S. EEZ.

Leg 4 is a telepresence-enabled ROV cruise with full shore-based science participation focused on conducting ROV dives during transit into PMNM then moving south to focus exploration activity offshore of Johnston Atoll (PRIMNM). The ship will conduct 24 hour operations consisting of daytime ROV dives and nighttime mapping operations including during transit. Opportunistic CTD rosette operations may also be conducted. After departing Pearl Harbor, Oahu to commence the cruise, an ROV dive may be conducted at an archaeology site offshore of Oahu,

followed by a dive at Middle Bank and then Twin Banks rift in PMNM. Then the ship will transit down to Horizon seamount where a loop of dives are planned through the Karin seamounts, the Johnston seamounts, and up near the atoll, before returning to Horizon for a second dive. Actual dive locations on seamounts in Johnston Atoll (PRIMNM) will be further refined after mapping data is acquired during EX1504 Leg 1. Transiting back to Pearl Harbor, Oahu, a final ROV dive would be conduct offshore Niihau.

Appendix B. Case Study: Okeanos Explorer - EM 302 - Hawaii

Case study: Okeanos Explorer – EM 302 – Hawaii

The field is plotted as the peak sound pressure level (SPL). In the horizontal plane (Figure A), the depth is 10; 50; 200 m. The field is plotted on an area 1000x6000 m. In the vertical plane (Figure B), it is computed down to 4000 m (6000 m on each side) then zoomed to 1000-m depth (1500 m on each side). 140, 160, and 180 dB isopleths shown.

Figure A: Horizontal plane views of sound pressure levels at three different receive depths within the water column directly below transducer: 10m, 50m, and 200m.

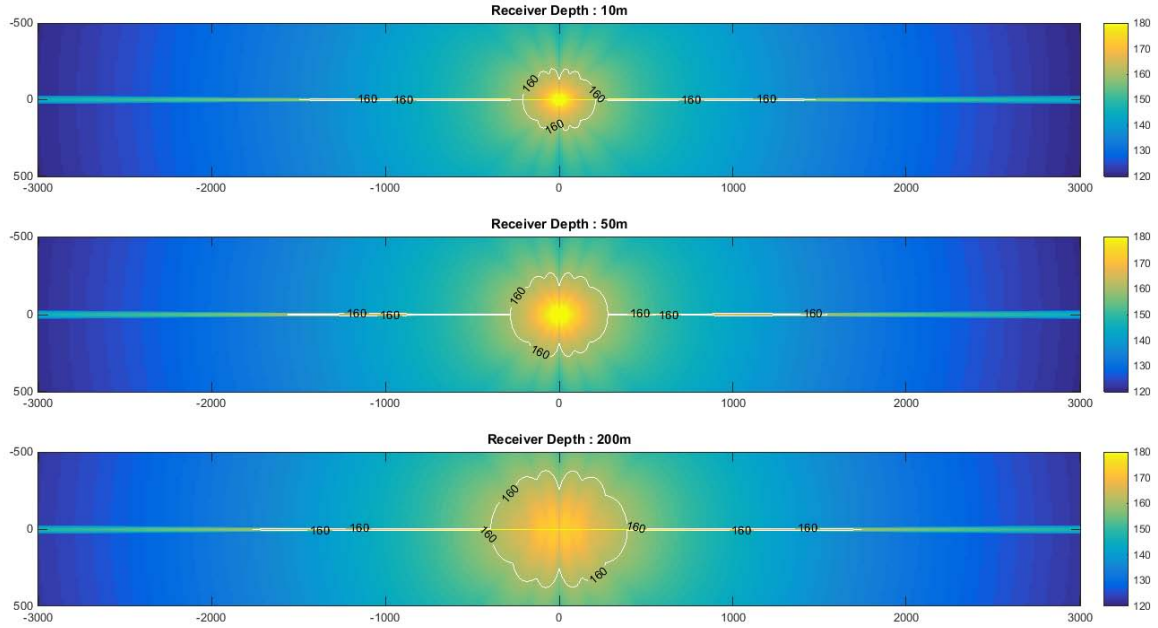
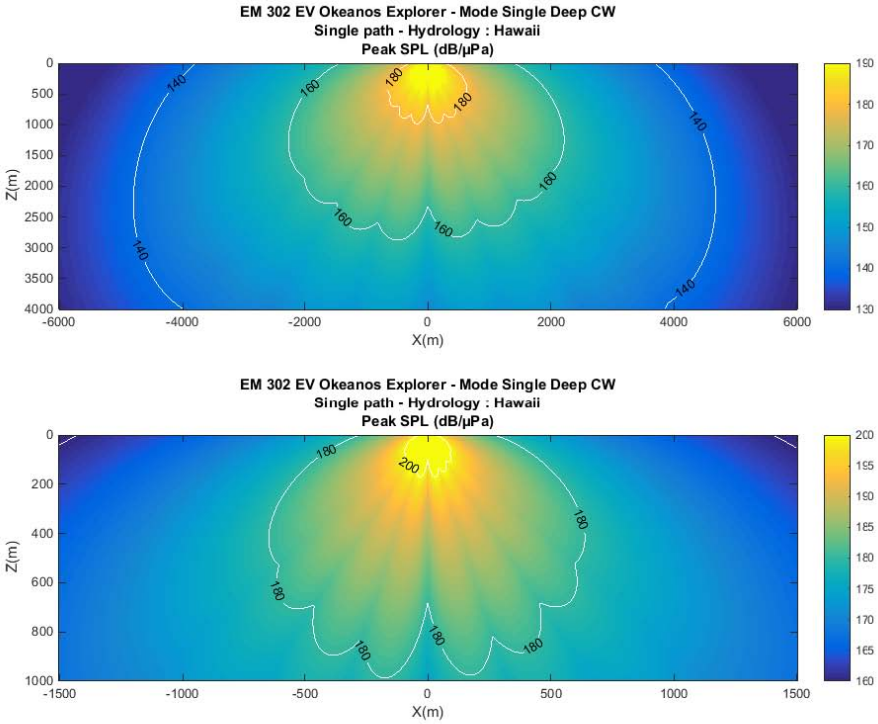


Figure B: Vertical plane view of sound pressure levels in the water column directly below the EM302 sonar transducer.



Model and Figures Provided by Dr. Xavier Lurton

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Appendix F: NASA Maritime Aerosols Network Survey of Opportunity

Survey or Project Name

Maritime Aerosol Network

Points of Contact (POC)

Lead POC or Principle Investigator (PI & Affiliation)	*Supporting Team Members ashore*
POC: Dr. Alexander Smirnov	*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.