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 G. Mark Miller, NOAA
Commanding Officer, NOAA Ship *Henry B. Bigelow*

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

SUBJECT: Project Instruction for HB-14-04
Deep-Sea Corals

Attached is the final Project Instruction for HB-14-04, Deep-Sea Corals, which is scheduled aboard NOAA Ship *Henry B. Bigelow* during the period of 5 to 16 August 2014. Of the 12 DAS scheduled for this project, 12 days are Program Funded. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

Final Project Instructions

Date Submitted:	8 July 2014
Platform:	NOAA Ship *Henry B. Bigelow*
Project Number:	HB 14-04
Project Title:	Deep-Sea Corals: Ground-truthing and exploration in deepwater canyons off the Mid-Atlantic
Project Dates:	5-16 August 2014

Approved by: Russell W. Brown for Date: 7-10-2014
William A. Karp, Ph.D.
Science and Research Director
Northeast Fisheries Science Center

Approved by: Anne K Lynch CAPT NOAA Date: 8-1-2014
Captain Anne K. Lynch, NOAA
Commanding Officer
Marine Operations Center – Atlantic

I. Overview

A. HB 14-04 Deep-Sea Corals: Ground-truthing and exploration in deepwater canyons off the Mid-Atlantic, 5-16 Aug 2014

B. Days at Sea (DAS)

Of the _12_ DAS scheduled for this project, _0_ DAS are funded by an OMAO allocation, _0_ DAS are funded by a Line Office Allocation, _12_ DAS are Program Funded, and _0_DAS are Other Agency funded. This project is estimated to exhibit a medium_ Operational Tempo.

C. Area of Operation:

Deepwater canyons of the northern Mid-Atlantic region (approximately 37° 24′ N 74° 29′ W to 38° 52′ N 72° 55′ W; depth range 200-2000 m).

D. Objectives:

With the overall goal of surveying and ground-truthing known or suspected deep-sea coral habitats associated with deepwater canyons off the coast of the northeastern US, a team of biological oceanographers, taxonomists, modelers, and scientists will conduct a program having the following objectives:

1. Survey canyon area and intercanyon slope habitats using *TowCam*; with concurrent sampling of environmental factors (i.e. depth, hydrography) to characterize benthic habitats and identify areas of coral presence;
2. Ground-truth areas predicted to be coral hotspots based on data provided from a habitat suitability model;
3. Ground-truth newly collected multibeam data;
4. Ground-truth historical coral records;
5. Conduct multibeam mapping in areas where data are missing or incomplete;
6. Assemble a database of photographs, species identification, species abundances/distributions;
7. Assemble maps of geo-referenced coral locations and associated data;
8. Provide research opportunities for teachers and professional researchers.

E. Participating Institutions

1. Woods Hole Oceanographic Institution
2. NOS/NCCOS
3. NOAA Teacher at Sea Program

F. Science Party:

Name	Title	Organization	Nationality
Martha Nizinski	Chief Scientist	NMFS, NEFSC, NSL, Washington, DC	USA
Tim Shank	Scientist	Woods Hole Oceanographic Institute	USA
Brian Kinlan	Scientist	NOS/NCCOS, Silver Spring, MD	USA
Taylor Heyl	Scientist	Woods Hole Oceanographic Institute	USA
Matt Poti	Scientist	NOS/NCCOS, Silver Spring, MD	USA
Greg Kurras	Engineer	Seafloor Investigations, Seattle, WA	USA
Marshall Swartz	Engineer	Woods Hole Oceanographic Institute	USA
Joan Le	Teacher	Washington-Lee HS, Arlington, VA	USA
TBA			
TBA			

G. Administrative

1. Points of Contact

Email Contact: The following should be included as recipients of the daily e-mail message:

Wendy.Gabriel@noaa.gov	{FEMAD Branch Chief}
Fred.Serchuk@noaa.gov	{READ Branch Chief}
Russell.Brown@noaa.gov	{Deputy Science and Research Director)
Bill.Karp@noaa.gov	{Science and Research Director}
Nathan.Keith@noaa.gov	{NEFSC Vessel Coordinator}
CO.Henry.Bigelow@noaa.gov	{Commanding Officer – HENRY B. BIGELOW}
ops.Henry.Bigelow@noaa.gov	{Operations Officer – HENRY B. BIGELOW}
Michael.S.Abbott@noaa.gov	{NEFSC Port Captain}

2. Diplomatic Clearances: This project does not involve Marine Scientific Research outside of U.S. jurisdiction.

3. Licenses and Permits: This project is covered under the blanket NEPA permit and Scientific Research Permit for the Northeast Fisheries Science Center

II. Operations

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

Key Changes and Points of Emphasis:

1. **Due to maintenance work on the vessel's Simrad ME-70 this past dockside period, a patch test and calibration of the system is required during the Deepsea corals cruise. This will be done opportunistically between TOWCAM dives and will not significantly affect cruise operations.**

2. **Science watches will be on a 12 "on", 12 "off" schedule.**

3. **All departures will be from the Newport Naval Station (Newport, RI).**

4. ***TowCam* will begin mobilization 1Aug 2014**

5. **Megger testing of Aft Starboard CTD cable must be completed by late July.**

6. **Aft Starboard CTD winch must be operational and in working order.**

7. **Live tank must be removed from starboard sampling station.**

A. Planned Itinerary:
The cruise will target two priority areas approximately 80 nm off the coast of the northeastern US, approximately 37° 24′ N 74° 29′ W to 38° 52′ N 72° 55′ W (see Figure 1).

1 Aug: Begin mobilization of *TowCam* and scientific equipment. Will continue work on 2-3 Aug if deemed necessary by *TowCam* team.

4 Aug: Finish *TowCam* mob. Load additional scientific gear, embark scientific personnel.

5 Aug: Embark remaining scientific personnel and depart Newport Naval Station, Newport, RI.
Transit to Washington Canyon.

6 Aug: Conduct *TowCam*, CTD and multibeam operations in Washington Canyon

7 Aug: Conduct *TowCam*, CTD and multibeam operations in Washington Canyon. Underway to Wilmington Canyon; conduct *TowCam* operations upon arrival.

8-9 Aug: Conduct *TowCam*, CTD and multibeam operations at Wilmington Canyon; Underway to Lindenkohl Canyon

10-11Aug: Conduct *TowCam*, CTD and multibeam operations at Lindenkohl Canyon; Underway to Spencer Canyon.

12 Aug: Conduct *TowCam*, CTD and multibeam operations at Spencer Canyon. Underway to Carteret Canyon.

13-14 Aug: Conduct *TowCam*, CTD, and multibeam operations at Carteret Canyon.

15 Aug: Underway to Newport

16 Aug: Arrive Newport Naval Station, offload scientific collections and equipment; disembark scientific personnel.

B. Staging and Destaging:
- Staging will begin on 1 Aug.

- Live tank must be removed from the starboard CTD deck.
- Stanchions and small stainless door along stbd side below stbd A-frame need to be removed.
- A crane and crane operator will be needed to position camera below the stbd A-frame.
- Several pallets of equipment and supplies will need to be craned aboard
- CTD cable termination and testing of TowCam, including testing the remote winch control from the dry lab will be done on 1 Aug.
- Destaging will occur on 15 Aug.
- Crane and crane operator will be needed to move TowCam and supplies off the ship.

C. Operations to be Conducted:

Operational Plans: A detailed protocol will be provided to the vessel prior to departure. This protocol will describe the operating guidelines. However, sampling schedules and locations will be assessed and adjustments made while at sea to maximize data collection from *TowCam* ops.

The following is an operational summary: The cruise will target known or suspected deep-sea coral locations in priority canyons circled in Figure 1 for surveys. Table 1 lists latitude/longitude for these priority areas. Bottom depths in area of operation range from 200 – 2000 m. The primary sampling equipment will be the *TowCam* system. Multibeam sonar mapping will be conducted in areas where bathymetry and backscatter data are missing or incomplete.

Precise *TowCam* locations will be based on recently collected multibeam sonar data, including data collected by NOAA ships *Okeanos Explorer* in June and November 2012 and March 2013 and *Ferdinand R. Hassler* in June 2012. Output from a habitat suitability model will also be used to select survey targets. Target sites for *TowCam* will be prioritized and provided to the ship before sailing. It is requested that the vessel's Navigation Officer plot and examine stations, and identify any stations that are problematic for the vessel in terms of depth, obstructions or other issues in advance of the cruise. Specific sampling problems and requirements may necessitate the planning of additional stations during the actual operation of the cruise.

The survey approach will consist of picking "points" on the sea floor within a target site and also choosing transect lines between points or along areas of interest. We will plan two 8-hour deployments of the *TowCam* to maximize the number of images collected in hard-bottom areas. The remaining 8 hrs will be used for recharging camera batteries and downloading data. *TowCam* will make single or multiple passes over a target, either as a series of parallel lines spaced appropriately to cover a larger target, or using a series of lines that intersect over a central point to provide highest density of coverage over smaller areas of greatest potential interest. The number of passes will depend on the size of the target and whether or not the ship is in transit between higher priority targets. Transects between "points" of interest within a site will be run while the camera is deployed, gathering near-bottom image data while in transit. When appropriate these transects will include other areas of interest and in some cases long transect

lines will be the most appropriate way to survey a particular feature (such as a long ridge crest, or up a slope with changing reflectivity). The *TowCam* is connected to the end of the CTD wire using either a molded termination or a 'Chinese-finger' termination. A 'weak-link' system has been designed to prevent damage to the cable and release of the frame from the seafloor if it snags on the bottom. The *TowCam* uses a SeaBird SBE25 CTD system as the primary real-time depth/altitude sensing and control system. The CTD provides standard depth, altimetry, temperature, turbidity, and conductivity data for the entire tow.

Days at sea will be divided between priority areas with 1-3 days in each area. Transit between priority areas will occur when *TowCam* is on deck for battery charging and data downloads. Multiple *TowCam* deployments will be made in each priority area. Target sites for *TowCam* will be prioritized and provided to the ship before sailing. When *TowCam* is on deck to download data and recharge batteries, multibeam sonar operations may be conducted.

Scientific Computer System (SCS): *Henry B. Bigelow*'s SCS system is a PC-based server, which continuously collects and distributes scientific data from various navigational, oceanographic, meteorological, and sampling sensors throughout the cruise. Date and time for data collections from computers, instrumentation, and log sheet recordings will be synchronized using the vessel's GPS master clock. The NEFSC and *Henry B. Bigelow*'s Survey Techs are responsible for ensuring data collection.

The ship's Scientific Computer System (SCS) will be required for logging data on a routine basis and data requirements will be coordinated with the Commanding Officer and Electronics Technician at the beginning of the cruise. The bridge officers will be requested to execute "TowCam Events" using established software applications to capture SCS data streams during *TowCam* operations. Detailed information on data collection protocols will be supplied to the ship prior to sailing. Collection of ship sensor data through sampling events is a critical requirement to support this work. It is requested that the time server/time date be imbedded into the SCS files. Global Positioning System (DGPS or P-code GPS) provides data on vessel towing speed and direction to be recorded at a frequency of 0.01 Hz. A list of the requested SCS sensors is provided in Table 2. It is requested that the sensors be operational, calibrated and that logging capabilities be enabled.

EK60 and ME70 Data Acquisition: The Simrad EK60 echo sounder, (18-, 38-, 70-, 120-, and 200-kHz with split-beam transducers mounted on the retractable center-board) will acquire data continuously throughout the cruise. The EK60 will be interfaced to the SCS to record bottom depth and vessel log values. The EK60 will be interfaced to the POSMV motion sensor. When operational, the EK60 will be synchronized with the Simrad ES60 bridge sounder, Simrad ME70 multibeam (operating within the frequency band 70–120 kHz), and the ship's ADCP. The EK60 is not synchronized with the other sounders and Doppler speed log on the vessel. To minimize acoustic and electrical interference, whenever possible we request deactivating other sounders on the vessel. The survey technicians will be responsible for EK60 data acquisition and storage.

Additional operations:

1. Physical oceanographic parameters will be monitored through CTD casts, and the ship's flow-through thermosalinograph and fluorometer instruments.

2. Multibeam sonar mapping, using the ship's Simrad EK60 (at 18 kHz frequency) and ME70 (operating within the frequency band 70–120 kHz) systems, will be conducted. Survey technicians with help from the science team will be responsible for multibeam operations.

3. CTD casts will be conducted when *TowCam* is on deck or is non-operational. The ship will supply SBE19+ and SBE911+ and have these ready for use. The Center's Oceanography Branch will supply a Seacat 19+ rated for 3500 dbar. The survey technicians, with help from the science team, will be responsible for CTD operations.

D. 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.

Dives are not planned for this project.

E. Applicable Restrictions

Bad weather conditions, high sea states, equipment failure, safety concerns, and unforeseen circumstances can preclude normal operations. The ship's officers, chief scientist, and *TowCam* engineers will assess and address any concerns or issues affecting normal operations.

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

ADCP
Dynamic Positioning
EK-60
ME-70
CTD
Oxygen sensor
Working winches

B. Equipment and Capabilities provided by the scientists (itemized)

WHOI *TowCam* System: The WHOI *TowCam* (Figure 2), (http://www.whoi.edu/page.do?pid=17619), operated through the WHOI-MISO Facility, is an internally recording, 6000 m rated, digital, deep-sea camera system that also acquires CTD water properties data. The system weighs ~1300 pounds in air and ~800 pounds in water. The *TowCam* is towed from a standard 0.322" 3-conductor CTD sea cable, that permits real-time

acquisition of digital depth and altitude used to aid analysis of the digital images, and in creating accurate near-bottom topographic profiles. A forward-looking altimeter is used for obstacle avoidance during the tows.

The *TowCam* frame is made of stainless steel with a bridle and lift point suitable for connection to standard UNOLS CTD terminations. The frame is constructed to withstand moderate abuse in order to protect the camera components from contact with the ocean bottom or the ship and shipboard equipment. The design and large sail area of the 'tail' provide towing stability to the sled. (The *TowCam* orientation during a traverse is within ~5° of the course over ground of the ship.) The *TowCam* is connected to the end of the CTD wire using either a molded termination or a 'Chinese-finger' termination. A 'weak-link' system has been designed to prevent damage to the cable and release of the frame from the seafloor if it snags on the bottom. **The system is towed at speeds of between ¼ to ½ knot** depending on bottom roughness and sea state. A Dynamic Positioned vessel is preferred so that slow-speed transits can be performed in moderate winds and sea states (20-25 kts wind and seas to 8 ft).

TowCam uses four (4) 24 VDC 42 amp/hr batteries to power the camera, strobe and lasers onboard the frame. The CTD is powered via the CTD cable. Battery charging post-tow is done using specially designed battery chargers that operate on 110VAC 20 amp current.

TowCam is both internally recording as well as streamed live up the CTD cable, digital, deep-sea camera system, with co-registered CTD sensor and altimeter that can provide accurate depth and altitude for each image, that is operated from a vessel's standard CTD winch and 0.322" conducting cable. The *TowCam* captures images that are recorded on board the vehicle and downloaded for analysis upon return to the ship. WHOI and appropriate *Bigelow* personnel are responsible for setting up *TowCam*.

TowCam operations Requirements: Protocols for TowCam operations will be discussed during a meeting of WHOI *TowCam* team lead D. Fornari, Chief Scientist M.Nizinski and *Bigelow* crew (4 Apr 2014). D. Fornari prepared the following list of instructions to the *Bigelow* crew (Appendix 1). All issues must be addressed before sailing to ensure *TowCam* operations can be conducted.

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist 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). 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

The following chemicals will be placed aboard *Henry B. Bigelow* prior to departure:

ITEM	QUANTITY	FURNISHED BY
90% Ethyl alcohol (ethanol)	10 gal	NMFS, NEFSC, Washington, DC

C. Chemical safety and spill response procedures (example)

E: Ethanol

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data:

B. Responsibilities: Under Development

Data Management: *TowCam* data will be processed by science team following WHOI/*TowCam* standard protocol. Data from the CTD will be processed at the NEFSC Woods Hole Laboratory. All station data will be electronically recorded. Samples and data collected for specific individuals, agencies or organizations will be processed by same.

Protected Resources:

North Atlantic right whale protection: The vessel is requested to adhere to right whale protection regulations. Information on Seasonal Management Area (SMA) and Dynamic Management Area (DMA) regulations and information for protecting right whales from collisions with vessels are provided through the NOAA Protected Resources website (http://www.nmfs.noaa.gov/pr/shipstrike/), Right Whale Sighting Advisory System (SAS) website (http://www.nefsc.noaa.gov/psb/surveys/), the U.S. Coast Guard's "Notices To Mariners" and NOAA weather radio.

Mariners are urged to use caution and proceed at safe speeds in areas where right whales occur. U.S. Law (50 CFR 224.105) prohibits operating vessels 65 feet (19.8 meters) or greater in excess of 10 knots in Seasonal Management Areas (SMAs) along the U.S. east coast. Mariners are also requested to route around voluntary speed restriction zones, Dynamic Management Areas (DMAs) or transit through them at 10 knots or less. Approaching within 500 yards of right whales is prohibited, unless the Chief Scientist is in possession of an ESA/MMPA permit allowing such approaches.

Whale sightings: Sightings of right whales, or dead or entangled whales of any species, are extremely valuable and reports are urgently requested. Please report all right whale sightings north of the Virginia-North Carolina border to 866-755-NOAA; right whale sightings south of that border should be reported to 877-WHALE-HELP. Right whale sightings in any

location may be reported to the U.S. Coast Guard via VHF channel 16. Protocols for reporting sightings are described in the Guide to Reporting Whale Sightings placard. The placard is available online (www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Right_Whale.pdf and http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Dead_Whale.pdf) and laminated copies will be provided by the Protected Species Branch upon request. It is requested that this placard be kept on the bridge for quick reference and to facilitate rapid reporting (via satellite phone if necessary). Opportunistic sightings of other marine mammal species that are alive and well may be reported using the Platforms of Opportunity (POP) forms and protocols

Endangered Species Act and Marine Mammal Protection Act reporting requirements: This reporting is required and is in addition to the reports in the above two sections. If the ship has an interaction with any protected species such as a sturgeon, whale, dolphin, porpoise, marine turtle or seal (e.g., collision with a whale or bycatch of a sturgeon or sea turtle), then the NMFS Greater Atlantic Regional Fisheries Office must be notified via e-mail within 24 hours of the interaction. All e-mail correspondences should be made to the following e-mail address: incidental.take@noaa.gov. Please indicate in the subject line which protected species was encountered. If the take involves a marine mammal or sea turtle that is alive, injured and in need of assistance or monitoring, please call the NOAA Northeast Region marine animal hotline at: 866-755-NOAA. The chief scientist will be notified before reports are made.

Marine turtle bycatch: All marine turtles taken incidental to fishing activities must 1) be handled and resuscitated according to established procedures, 2) be clearly photographed (multiple views if possible, including at least one photograph of the head scutes), 3) be identified to the species level, 4) have width and length (carapace notch to notch, and notch to tip) measured in centimeters, 5) have supporting data recorded including GPS or Loran coordinates recorded describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive); the condition of the animal upon return to the water; GPS or Loran coordinates of the location at which it was released; and a description of the care or handling provided. Live animals shall then be returned to the sea. Dead animals shall, if feasible, be frozen and returned to the Woods Hole Laboratory.

Marine mammal bycatch: All marine mammals taken incidental to fishing activities must 1) be clearly photographed (multiple views if possible, including at least one photograph of the head, 2) be identified to the species level, 3) have body length (snout to tail (seals), beak to the notch in the fluke/tail (whales, dolphins and porpoises)), measured in centimeters, 4) have supporting data recorded including GPS or Loran coordinates recorded describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive). Live animals shall then be returned to the sea. Dead animals shall, if feasible, be frozen and returned to the Woods Hole Laboratory.

Stellwagen Bank: Any artifacts brought aboard the vessel due to fishing in the Stellwagen Bank National Marine Sanctuary must be immediately returned, as near as possible, to the location of

interception. An artifact is defined as anything of man-made origin with the exception of modern fishing gear. Stations located within Stellwagen Bank will be identified prior to the cruise and reported to the chief scientist.

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Pre-Project Meeting: The Chief Scientist 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 Chief Scientist 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 7 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 Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

Upon completion of the cruise, a post-cruise meeting will be held (unless prior alternate arrangements are made) and attended by the ship's officers, the Chief Scientist, members of the scientific party, the Vessel Coordinator and the Port Captain to review the cruise. Concerns regarding safety, efficiency, and suggestions for improvements for future cruises should be discussed. Minutes of the post-cruise meeting will be distributed to all participants via email and to the CO.MOC.Atlantic@noaa.gov and ChiefOps.MOA@noaa.gov. The Port Captain, if attending, is responsible for the recording and distributing the minutes. In his/her absence, the Operations Officer shall be responsible for the minutes.

D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. 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.

VIII. Miscellaneous

A. Watches

Vessel operations will be conducted 24 hours per day. The scientific watch schedule will be determined and submitted as part of the Addendum one week prior to sailing. Scientific personnel will stand 12 hour watches.

B. 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 seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding 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 Chief Scientist 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 Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist 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 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

C. 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 Chief Scientist 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 4 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 1 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

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

D. 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. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

E. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged at least 30 days in advance.

F. IT Security

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:

(1) 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 the above 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 3 days of embarking.

G. Foreign National Guests Access to OMAO Facilities and Platforms

Foreign National access to the NOAA ship or Federal Facilities is not required for this project.

VIV. Appendices

1. Figures, maps, tables, images, etc.

Table 1. Station locations (Priority Areas) within the Area of Operations.

Priority areas locations	Longitude	Latitude	Depth

Washington Canyon	74° 28′ 54.68" 74° 29′ 48.53" 74° 24′ 22.63" 74° 25′ 08.33"	37° 26′ 58.01" 37° 24′ 24.35" 37° 24′ 31.08" 37° 21′ 55.64"	800-2000 m
Wilmington Canyon	73° 30′ 48.58" 73° 35′ 51.08" 73° 30′ 45.13" 73° 31′ 34.27"	38° 29′ 06.95" 38° 24′ 05.76" 38° 22′ 50.68" 38° 19′ 16.65"	700-2000 m
Carteret/Lindenkohl/Spencer Canyon	72° 55′ 31.14" 73° 12′ 12.85" 72° 50′ 56.74" 73° 10′ 34.61"	38° 52′ 31.14" 38° 33′ 30.41" 38° 53′ 17.44" 38° 33′ 56.73"	500-2000 m

Figure 1: Photos of the system, as configured for the 2012-2013 Canyons cruises on *Bigelow*, are shown below. 5-liter Niskin sampling bottles may be used this year.

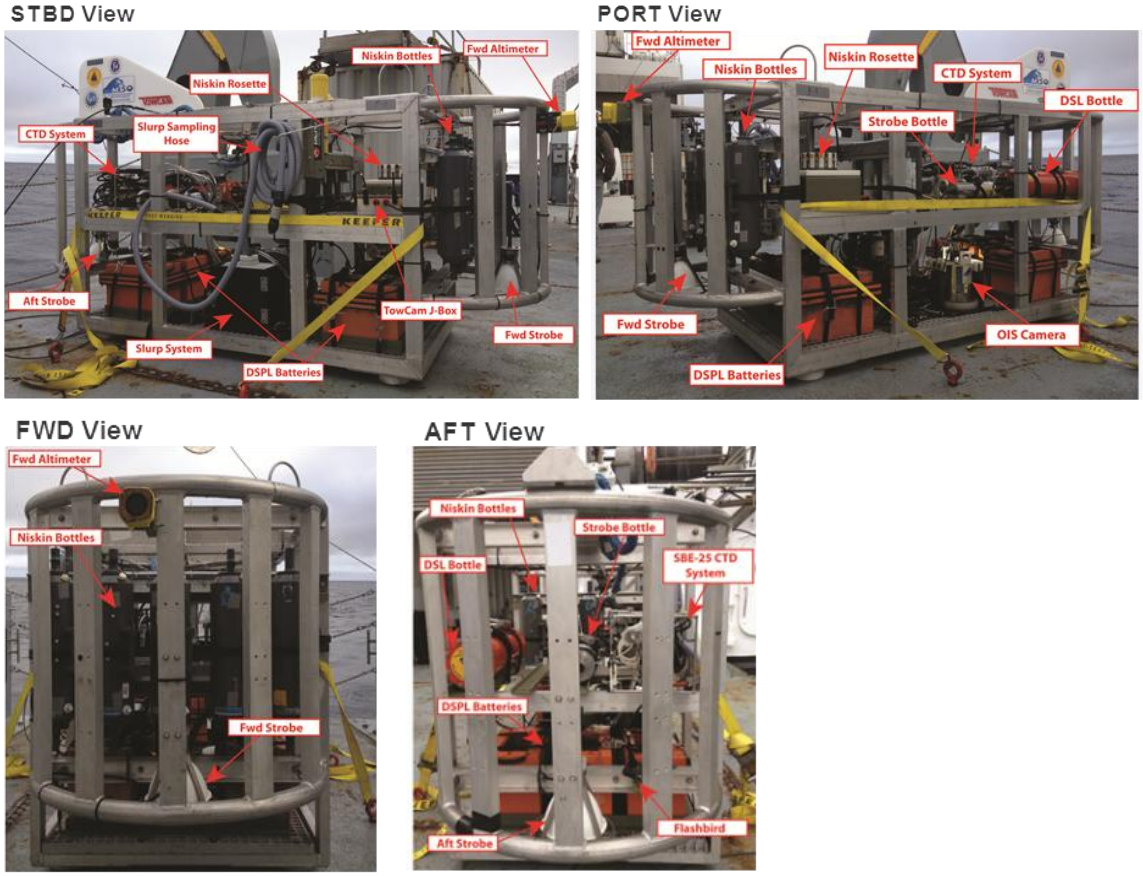

Figure 2. General planned area of operations for NOAA Ship *Henry B. Bigelow*, Cruise HB 14-04, Deep-Sea Corals: Ground-truthing and exploration in deepwater canyons off the Mid-Atlantic, 5-16 Aug 2014.

Figure 3. Image of deployment of Woods Hole Digital Towed Camera System (*TowCam*).

Table 2. Scientific Computer Sensors, and logging rates of those sensors, required during NOAA ship *Henry B. Bigelow* HB-14-02, Deep-Sea Corals: Ground-truthing and exploration in deepwater canyons off the Mid-Atlantic.

Sensor Name	**Units**	**Log Rate**
ADCP-Depth	(Meters)	1
ADCP-F/A-GroundSpeed	(Knots)	1
ADCP-F/A-WaterSpeed	(Knots)	1
ADCP-P/S-GroundSpeed	(Knots)	1
ADCP-P/S-WaterSpeed	(Knots)	1
Air-Temp	(Degrees C)	1
Baro-Press	(Millibars)	1
CenterBoardPos-Value	(Position)	1
Date	(Date)	1
Doppler-Depth	(Meters)	1
Doppler-KeelOffset	(Meters)	1
Doppler-P/S-BottomSpeed	(Knots)	1
Doppler-P/S-WaterSpeed	(Knots)	1
EK60-18kHz-Depth	(Meters)	1
EK60-38kHz-Depth	(Meters)	1
ES60-200hz-Depth	(Meters)	1
ES60-50hz-Depth	(Meters)	1
GYRO	(Degrees)	1
ME70-Depth	(Meters)	1
Mid-SeaTemp-C	(Degrees C)	1
MX420-COG	(Degrees)	1
MX420-Lat	(DEGMIN)	1
MX420-Lon	(DEGMIN)	1
MX420-SOG	(Knots)	1
MX420-Time	(Time)	1
PASHR-Hdg-Qual	(Value)	1
PASHR-Hdg-True	(Degrees)	1
PASHR-Heave	(Centimeters)	1
PASHR-Pitch	(Degrees)	1
PASHR-Pitch-Qual	(Value)	1
PASHR-Roll	(Degrees)	1
PASHR-Roll-Qual	(Value)	1
PASHR-Time	(Time)	1
PI32-DEPTH300-VAL	(Meters)	1
PI32-DS-VAL	(Meters)	1
PI32-HR-VAL	(Meters)	1
PI32-WS-VAL	(Meters)	1
PORTTrawlWinchLineOut	(Meters)	1
PORTTrawlWinchLinespeed	(Meters/sec)	1
PORTTrawlWinchTension	(Kilos)	1

POSMV-COG	(Degrees)	1
POSMV-Elevation	(Value)	1
POSMV-hdops	(Value)	1
POSMV-Heading	(Degrees)	1
POSMV-Lat	(DEGMIN)	1
POSMV-Lon	(DEGMIN)	1
POSMV-Quality	(Value)	1
POSMV-Sats	(Value)	1
POSMV-SOG	(Knots)	1
POSMV-Time	(Time)	1
SAMOS-AirTemp-Value	(Degrees C)	1
SAMOS-TRUE-WIND-DIR-Value	(Degrees)	1
SAMOS-TRUE-WIND-Spd-Value	(Knots)	1
Shaft-RPM-Value	(Value)	1
STBDTrawlWinchLineOut	(Meters)	1
STBDTrawlWinchLinespeed	(Meters/sec)	1
STBDTrawlWinchTension	(Kilos)	1
YOUNG-TWIND-Direction	(Degrees)	1
YOUNG-TWIND-Speed	(Knots)	1

APPENDIX 1.

Summary of Action Items

Summary of Key Operational Questions for *Bigelow* Related to WHOI-MISO TowCam Operations for 5-16 Aug 2014 Deep-Sea Coral Cruise
M. Nizinski & T. Shank
(prepared by Dan Fornari (WHOI-MISO), March 31 2014)

1. System Summary and Mobilization

TowCam operations on the NOAA ship *Bigelow* during the planned 5-16 Aug 2014 Canyons Cruise off US east coast will acquire high resolution digital images of the seafloor at 10 sec intervals along seafloor survey tracks that are ~1 to 5 km long, or cover shorter tracks that may include dangling and position moves in Dynamic Positioning (DP) on steep slopes. Each camera tow/lowering can last as long as 6-7 hrs on the bottom. TowCam speed over ground of ~1/4 to 1/3 kt will be controlled by using the ship's Dynamic Positioning System. Battery recharge and image download/processing time between tows is expected to be ~8 hrs. In addition one slurp – suction sample can be collected if TowCam is hovering above the bottom (usually the last operation done during each tow).
Information about the TowCam system can be viewed at this URL:
http://www.whoi.edu/page.do?pid=17619
The TowCam will weigh approx. 1200# in air and ~800# in seawater. (See figure 1 in appendices)

We plan to mobilize TowCam and equipment on the ship starting first thing in the morning on Friday Aug 1. We will drive TowCam ---fully configured--- over to the ship from Woods Hole. A **crane and crane operator will be needed** to position camera below the stbd A-frame at ~0900hrs on Aug 1. We would also like to crane onboard several palettes of equipment/supplies for science operations that will go in the lab.

On Aug 1 we will focus on the CTD cable termination and testing of TowCam, including testing the remote winch control from the dry lab. We will continue mobilization on Aug 4. We may need access to the ship on Aug 2-3 to complete mobilization before the ship sails on Aug 5.

2. Key Questions/Requirements for *Bigelow* Officers and Crew

2.1) Aft Stbd Hydrowinch & Controls in Dry Lab

- We plan to use the aft stbd hydrowinch for our operations, like in 2012 & 2013. During the mobilization for previous cruise we encountered several problems with the CTD winch slip rings and wiring. We would like to be sure that the ship's ET and survey tech have done the following:
  a. fully tested the system, similar to the testing done in both years,
  b. verified that all of the CTD cable conductors are in good shape,
  c. verified that slip rings are performing normally with no signal loss
  d. that Megger testing of all the conductors is above several gig ohms.

The test protocols were provided to ET Henry Jenkins last year. Did he pass on that information to his replacement? Please let us know. A Megger test and inspection of the winch and cable should be done by late July, please provide the results to the WHOI TowCam team (Dan Fornari, email: dfornari@whoi.edu). We understand that the CTD cable may be a new one so it would be important to establish its characteristics.

- **Please provide information on the status of the CTD winch and when it was last used, as well as the total meters of cable on the winch currently.**

The WHOI team will work with the survey tech and ET to install the termination for the TowCam system. **We require access to all 3 conductors and the armor for the termination.** 2 conductors will be used for our DataLink system to relay real-time images up the CTD cable, and 1 conductor and the cable's armor will be used for the real-time CTD data that also provide altimeter data to assist with flying the system.

As was done for the 2012 & 2013 cruises, we require the controls for the CTD winch to be installed in the dry lab on the central bench like in past years. **Is the CTD control box still present in the dry lab? Is this box still operational?** We also will need the real-time display of meters out and tension at this location.

2.2) Launch and Recovery Over the Starboard Side
As in 2012 & 2013, we require that TowCam be **launched/recovered mid-ship over the stbd side using the A-frame**.

The **stanchions and small stainless door along stbd side below stbd A-frame need to be removed** so TowCam and be launched/recovered without impediments.

We plan to use deck eyes for restraints during launch / recovery and need to use recovery poles with quick release hooks (happy – hookers) for recovery, WHOI will supply those.

Last year we requested to remove the large tank aft of the CTD landing area to help give more space for launch/recovery operations. **Is there a large tank aft of CTD landing area? If so, that tank will need to be removed.**

We plan to use deck eyes for tie downs for TowCam using large ratchet straps.

2.3) TowCam Operations
We plan to have ship personnel deploy/recover TowCam with assistance from WHOI personnel as needed, and to turn over control of winch to TowCam engineers within ~500 m of the seafloor.

2 TowCam engineers (Marshall Swartz and Greg Kurras– both experienced WHOI-MISO TowCam operators) plus T. Shank (experienced TowCam flyer) will be onboard to support system operation and maintenance and data provision to science party.

A TowCam engineer will be at the remote winch controls in dry lab at all times when towing near the bottom and will keep the Bridge informed of operational status frequently.

They and science watch standers will monitor tension carefully and log data and will be alert in case of potential hang up so that Bridge can be notified to stop ASAP.

If the system gets hung up the operator will pay out wire to reduce tension until ship stops and a plan is determined to free the system from the bottom. A weak-link will be inserted in the main lift line to provide a shear bolt rated at 5500---6000# (~1/2 the yield strength of the wire) to ensure we do not damage the wire and so that the camera system is not lost.

During launch/recovery operations the past two (2) years on the first lowerings, there were significant problems in the handling of TowCam that resulted in damage to the system and termination that had to be repaired. These could have been avoided with better communication and coordination between the Bridge and deck ops and the winch operator.

NOTE THE FOLLOWING PLEASE:

2.3.1) The crew must practice TowCam launch/recovery in the harbor this year prior to transiting to the first work area. This must be done at least once and to the satisfaction of the TowCam engineers so that we have confidence in how the launch/recovery operations will be handled by the ship's crew.

2.3.2) The first launch/recovery must be done during daylight hours to help ensure that all ship's personnel can see the sea state, swell direction and optimize ship handling and recovery operations.

2.4) TowCam Navigation

Will use layback navigation based on system depth and wire out geometry – at slow 1/4 to 1/3 kt towing speeds we expect the package to be 50-200 m behind the ship based on previous experience.

A feed of ship's GPS navigation tagged with GMT time will be merged with TowCam data by the science party to produce TowCam navigation for each tow, so data can be entered into a GIS system for analysis. **Please provide the status of the ship's dynamic positioning capability and offshore GPS capabilities.**

Responsibility for TowCam navigation will be with the science party with assistance from TowCam engineers.

2.5) Lab Space Use

We anticipate utilizing the Dry Lab for remote winch and TowCam operations including: mapping annotations on hard copy maps, electronic logging, and flying the camera system over the bottom.

The Chem Lab will be used to download TowCam imagery from the camera and work on equipment if needed, as well as general lab space for data processing/computer analysis.

The Wet Lab will be used to house the battery chargers given its proximity to the CTD over-boarding area.

2.6) Bathymetry and Plotting

We expect to do multibeam bathymetry surveys along proposed tow tracks to verify bathymetry and get best data available to correlate to near-bottom profile acquired by TowCam on each lowering to help refine navigation.