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 Jeffrey Taylor, NOAA
Commanding Officer, NOAA Ship *Henry B. Bigelow*

FROM: Captain Scott M. Sirois, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for HB-17-03
Northeast Deep-Water Coral Habitats: US and Canadian cross-border collaboration

Attached is the final Project Instruction for HB-17-03, Northeast Deep-Water Coral Habitats: US and Canadian cross-border collaboration, which is scheduled aboard NOAA Ship *Henry B. Bigelow* during the period of June 8 – June 22, 2017. Of the 15 DAS scheduled for this project, 15 days are funded by a Line Office Allocation. 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.

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: May 25, 2017

Platform: NOAA Ship *Henry B. Bigelow*

Project Number: HB-17-03 (OMAO)

Project Title: Northeast Deep-Water Coral Habitats: US and Canadian cross-border collaboration

Project Dates: June 08, 2017 to June 22, 2017

Prepared by: _____ Dated: _____
Martha Nizinski
Chief Scientist
NOAA Fisheries, National Systematic Lab

Approved by: _____ (for) Date: 5/24/17
Jonathan Hare, Ph.D.
Science and Research Director
Northeast Fisheries Science Center

Approved by: _____ Dated: 6/2/17
Captain Scott M. Sirois, NOAA
Commanding Officer
Marine Operations Center - Atlanti

I. Overview

A. HB 17-03 Northeast Deep-Water Coral Habitats: US and Canadian cross-border collaboration, 8-22 June 2017

B. Days at Sea (DAS)

Of the _15_ DAS scheduled for this project, _15_ DAS are funded by an OMAO allocation, _0_ DAS are funded by a Line Office Allocation, _0_ DAS are Program Funded, and _0_DAS are Other Agency funded. This project is estimated to exhibit a _Medium__ Operational Tempo.

C. Operating Area

Northern Gulf of Maine in both US and Canadian waters (approximately 43.5878° N 68.4015° W to 44.0625° N 67.3237° W to the east; 40.1756° N 66.5883° W to 41.7675° N 64.9464° W to the west; depth range 200-3000 m; Fig x).

Areas to be surveyed include minor canyons between Nygren and Heezen canyons (US), Georges Canyon (Canada), Corsair Canyon (Canada), Jordan Basin, northern Gulf of Maine (US, Canada).

D. Summary of Objectives

With the overall goal of surveying and investigating known or suspected deep-sea coral habitats off the coast of the northeastern US and Canada, a team of biological oceanographers, taxonomists, benthic biologists, modelers, and physical scientists will conduct a program having the following objectives:

1. Survey areas using the ROV *ROPOS*; 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 habitat suitability models and validate habitat suitability models
3. Assess deep-sea coral abundance, distribution, size
4. Classify coral and adjacent soft sediment habitats and document faunal affinities
5. Collect deep corals for taxonomic, reproduction, and age analyses
6. Collect deep corals and associated fauna for genetic studies (e.g., phylogenetic, phylogeographic, community genetics, and connectivity)
7. Conduct multibeam mapping in areas where data are missing or incomplete
8. Assemble a database of photographs, species identification, species abundances/distributions.

E. Participating Institutions

1. NOS/NCCOS
2. Delaware Museum of Natural History
3. USGS
4. Dalhousie University
5. Canada Department of Fisheries and Oceans
6. Memorial University

F. Personnel/Science Party: name, title, gender, affiliation, and nationality

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Nizinski, Martha	Chief Sci	6/5/2017	6/24/2017	F	NOAA	USA
Brake, Barry	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Girard, Luke	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Lee, Jonathan	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Lockhart, Peter	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Milne, Peter	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Tamburri, Keith	ROV Team	6/5/2017	6/24/2017	M	Canadian Scientific Submersible Facility	Canada
Metaxas, Anna	Co-Chief Sci	6/6/2017	6/22/2017	F	Dalhousie University	Canada/Greece
Snelgrove, Paul	Scientist	6/6/2017	6/22/2017	M	Memorial University	Canada
Balbar, Arieanna	Scientist	6/6/2017	6/23/2017	F	Dalhousie University	Canada
Miatta, Marta	Scientist	6/6/2017	6/23/2017	F	Memorial University	Italy
Verhoeven, Joost	Scientist	6/7/2017	6/23/2017	M	Memorial University	Netherlands
Shea, Elizabeth	Scientist	6/7/2017	6/22/2017	F	Del. Mus. Nat. Hist.	USA
Morrison, Cheryl	Scientist	6/7/2017	6/22/2017	F	USGS	USA
Packer, Dave	Scientist	6/7/2017	6/22/2017	M	NOAA	USA
Poti, Mathew	Scientist	6/7/2017	6/22/2017	M	NOAA	USA
Lawton, Peter	Scientist	6/7/2017	6/23/2017	M	DFO-Canada	Canada/UK

G. Administrative

1. Points of Contacts:

Martha.Nizinski@noaa.gov	{Chief Scientist}
ktamburri@ropos.com	{ROV ROPOS lead}
Susan.Gardner@noaa.gov	{Deputy Science and Research Director)
Jon.Hare@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

Canadian clearance has been requested and will be on board prior to sailing.

3. Licenses and Permits

Canada's Foreign Fishing Vessel License has been requested. Pursuant to 50 CFR 600.745 a Scientific Research Permit exempts this vessel from U.S. federal fishing regulations. A Species at Risk Act permit (Canada) issued by GARFO (U.S.) and Department of Fisheries and Oceans, Canada on _____ (date) to NEFSC and P. Lawton, DFO, St. Andrews.

Active marine mammal and endangered species incidental take permits can be found at: http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#nefsc. Dead sea birds can be salvaged under US Fish and Wildlife permit # MB043513-0

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.

A. Project Itinerary:

5 June: Begin mobilization of *ROPOS* and scientific equipment. Mobe will continue through 7 Jun.

6 June: Load additional scientific gear, embark scientific personnel.

7 June: Complete mobilization. Load additional scientific gear, embark remaining scientific personnel.

8 June: Depart Naval Station Newport, RI. Transit to minor canyon between Nygren and Heezen canyons.

9 June: Arrive minor Canyon, conduct ROV, CTD, multibeam operations.

10 June: Transit to second minor canyon.
ROV, CTD and multibeam operations in second minor Canyon.
Transit to Georges Canyon. Conduct multibeam operations upon arrival.

11 June: Conduct ROV, CTD and multibeam operations in Georges Canyon.

12 June: Conduct ROV, CTD and multibeam operations in Georges Canyon.
Transit to Corsair Canyon.

13 June: Conduct ROV, CTD and multibeam operations in Corsair Canyon.

14 June: Conduct ROV, CTD and multibeam operations in Corsair Canyon.
Transit to canyon NE of Northeast Channel.

15 June: Conduct ROV, CTD, and multibeam operations in canyon NE of Northeast Channel.

16 June: Conduct ROV, CTD, and multibeam operations canyon NE of Northeast Channel.
Transit to Lindenkohl Knoll.

17 June: Conduct ROV, CTD, and multibeam operations at Lindenkohl Knoll.
Transit to Central Jordan Basin.

18 June: Conduct ROV, CTD, and multibeam operations in Central Jordan Basin.
Transit to Outer Schoodic Ridge.

19 June: Conduct ROV, CTD, and multibeam operations at Outer Schoodic Ridge.
Transit to Mount Desert Rock.

20 June: Conduct ROV, CTD, and multibeam operations at Mount Desert Rock.
Begin transit to Naval Station Newport.

21 June: Transit to Naval Station Newport.

22 June: Arrive Newport Naval Station, offload scientific collections and equipment; disembark scientific personnel. Offload heavy equipment; disembark scientific personnel.

23 June: Complete demobilization.

24 June: Disembark remaining scientific personnel

B. Staging and Destaging:

- Staging will occur at Naval Station Newport.
- ROV crew will arrive 5 Jun to begin mob.
- Commercial haulers carrying ROV and associated equipment will stage at the dock. Ops will notify and clear all loading activities through proper Navy channels.
- A contract crane barge will be needed to load items that exceed ship crane lifting capacity on Jun 5.
- Permission is requested for ROV team members to stay onboard ship during mob. Science personnel with begin arriving 7 Jun.
- Permission is also requested for science personnel to stay onboard ship before departure.
- Destaging will occur at Newport Naval Station.

- A contract crane barge will be required to unload items that exceed ship crane lifting capacity on Jun 22.

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 ROV ops.

The following is an operational summary: The cruise will target known or suspected deep-sea coral locations in priority areas marked in Figure 1 for surveys. Bottom depths in area of operation range from 200 – 3000 m. The primary sampling equipment will be the ROV ROPOS. Multibeam sonar mapping will be conducted in areas where bathymetry and backscatter data are missing or incomplete when ROV is on deck or not operational. Additionally, CTD will be deployed in conjunction with multibeam operations and opportunistically to collect water samples at depth.

Precise ROV locations will be based on available multibeam sonar data, priority sampling needs of participating scientists, and information needs of the fishery management councils. Output from a habitat suitability model will also be used to select survey targets. Target sites for ROV ops 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 principal activities involve measurement of abundance of benthic invertebrates and characterization of spatial patterns in benthic ecosystem structure. ROV ROPOS will be the primary sampling tool. Sampling will include: (1) video transects; (2) digital photographic quadrats; (3) benthic faunal collections (1-2 individuals of species not readily identifiable on video) for morphological or molecular identification; (4) collection of fragments of coral colonies for taxonomic identification, reproductive analyses, and genetic analyses; (5) collection coral-associated fauna for taxonomic identification and genetic (phylogenetic, connectivity, population genetics) analyses; and (6) sediment coring of small areas.

The survey approach will consist of choosing transect lines between points or along areas of interest within a target site. We plan to conduct 12 hr operations when on site regardless of site arrival time. Multiple deployments will be made in each priority area. Five-hour deployments of the ROV will be planned to maximize the bottom time and thus number of images and specimens collected. Four hours are needed on deck to recharge batteries and process collections. The number of transects conducted in each location will be dependent on depth, length of transect, and bottom topography. Transects will be prioritized and provided to the ship before sailing. When ROPOS is on deck to recharge batteries, multibeam sonar operations or CTD casts may be conducted.

Days at sea will be divided between priority areas. Specifically, 2 days are scheduled for work in each of the four priority submarine canyons (Nygren/Heezen, Georges, Corsair, and NE of Northeast Channel); 1 day each at the remaining priority areas in the northern Gulf of Maine (Jordan Basin, Outer Schoodic Ridge, Lindenkohl Knoll, Georges Basin).

Transit between priority areas will occur when ROV ROPOS is on deck.

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 "ROV Events" using established software applications to capture SCS data streams during ROV 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. CTD casts will be made in conjunction with multibeam ops for sound velocity profiling.

3. CTD casts will be conducted when ROV 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 small rosette sampler for water sampling. The survey technicians, with help from the science team, will be responsible for CTD operations.

D. Dive Plan

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations: Bad weather conditions, high sea states, equipment failure, safety

concerns, and unforeseen circumstances. The ship's officers and chief scientist will assess and address any concerns or issues affecting normal operations.

Protected Resource Requirements:
The NEFSC is fully permitted under the MMPA and ESA to conduct research data collection activities. Active permits are effective September 12, 2016 through September 9, 2021. Permits and applicable information are available online at:
http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#nefsc

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 866-755-6622; 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 (http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Right_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 live and well may be reported using the Platforms of Opportunity (POP) forms and protocols. To information regarding the WhaleALERT application http://stellwagen.noaa.gov/protect/whalealert.html. For information on reporting a dead whale
http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Dead_Whale.pdf

III. Equipment

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

ADCP
Dynamic Positioning
EK-60
ME-70
CTD
Working winches, A-frame

ROPOS operations Requirements: Launch and Recovery protocols for ROPOS operations have been submitted to the Bigelow crew prior to the cruise instructions (see ROPOS launch and recovery procedures in appendix 2); however, these procedures will need to be finalized during a pre-cruise briefing between ROPOS team lead K. Shepherd, *Bigelow* crew, vessel coordinator Nathan Keith, and Chief Scientist M. Nizinski. Ship modifications necessary to support ROV operation must be completed prior to mobilization. Ship's crew will work closely with ROV team during over-the-side operations.

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

ROPOS ROV: The ROPOS ROV (The Remotely Operated Vehicle for Ocean Sciences; Figure 2), (http://www.ropos.com/index.php/ropos-rov), operated through the Canadian Scientific Submersible Facility, is a 40 hp science/work class ROV capable of operating at depths up to 3000 m in its mid-depth configuration. Two HD cameras, six pilot and tooling cameras, 12.1 megapixel digital still camera and over 3700 watts of lighting. The system weighs ~3393 kg and is 3.05 m in long, 1.64 m wide, and 2.17 m high. See Appendix 1 for ROPOS specifications. System will be launched with ship's A-frame. Detailed list of equipment will be provided in Addendum 1.

Multibeam mapping: Science party will have CARIS license and plan to do limited data processing onboard.

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

Common Name of Material	**Qty**	**Notes**	**Trained Individual**	**Spill control**
Formaldehyde solution (5%)	2 x 1 gal;	Alkalinity, Stored in chem. lkr	Marta Miatta; Martha Nizinski	F
Ethanol (98%)	4x5 gal	Alkalinity, Stored in ship chem. lkr	Martha Nizinski	E
Mercuric Chloride	1 x 2 g	Located in chem. lkr.	Marta Miatta	M

C. Chemical safety and spill response procedures

E: Ethanol

- Ventilate area of leak or spill. Remove all sources of ignition.
- Wear appropriate personal protective equipment.
- Stop the flow of material. Dike the spilled material.
- Carefully cover the area with spill absorbent material.
- Sweep up the residue using spark-proof tools and place the residue into a labeled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags). Store for disposal as hazardous waste.
- Mop the affected area using detergent and water.

M: Mercuric Chloride

- Wear appropriate personal protective equipment.
- Work in well ventilated area.
- Isolate hazard area.
- Spills: Pick up spillage with absorbent, inert, material and place in a suitable, well-marked container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Wash the area clean with water and detergent, observing environmental requirements. Use Mercury Spill Kit if need be.

F: Formalin/Formaldehyde

- Ventilate area of leak or spill. Remove all sources of ignition.
- Wear appropriate personal protective equipment.
- Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible.

- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container.
- Do not use combustible materials, such as saw dust.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") 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*

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 conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and shortcomings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the 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.

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 https://sites.google.com/a/noaa.gov/omao-intranet-dev/operations/marine/customer-satisfaction-survey and provides a "Submit" button at the end of the form. It is also located at https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbJp9g/viewform. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ship, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least 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 makeup 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.

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 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
Email 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.

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. 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.

D. 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 email 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 through the ship's Commanding Officer at least 30 days in advance.

E. 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.

F. Foreign National Guests Access to OMAO Facilities and Platforms

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FNRS) to submit requests for access to NOAA facilities and ships. The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated Line Office Deemed Export point of contact to assist with the process.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the email generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this email will be transmitted by FNRS.) This email will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.
4. Export Control - Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office email granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.

2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

VIII. Appendices

Figure 1. General planned area of operations for NOAA Ship *Henry B. Bigelow*, Cruise HB 17-03, Deep-Sea Corals: US Canadian cross-border collaboration, 8 June - 22 June 2017.

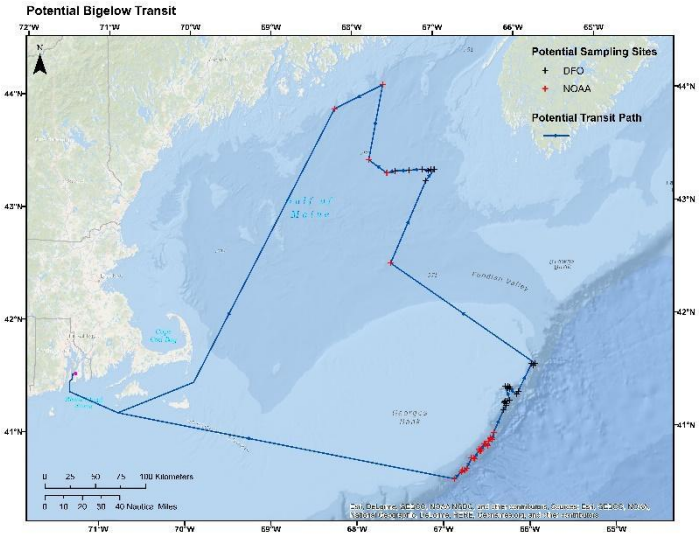


Figure 2. Image of ROV ROPOS

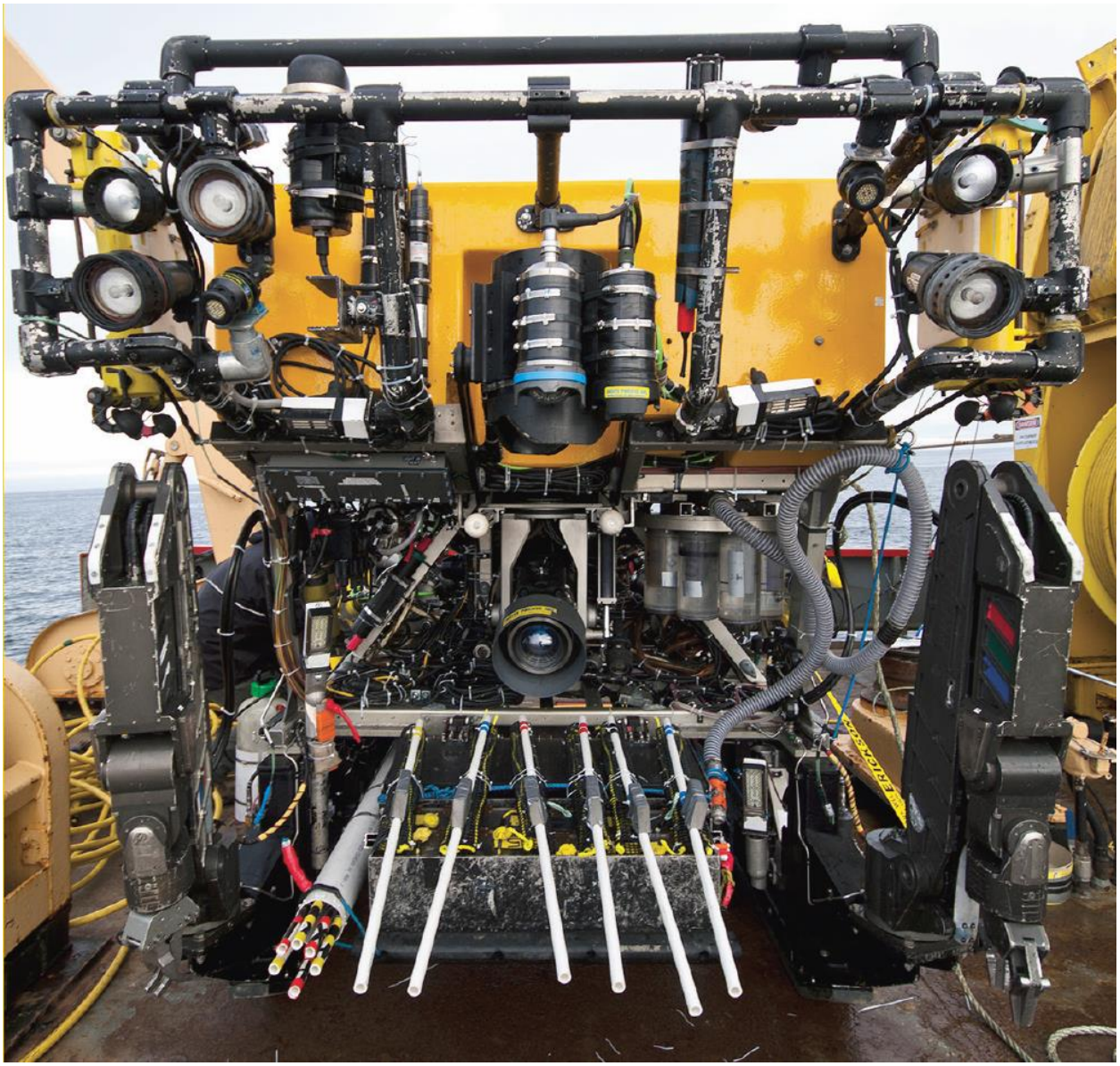
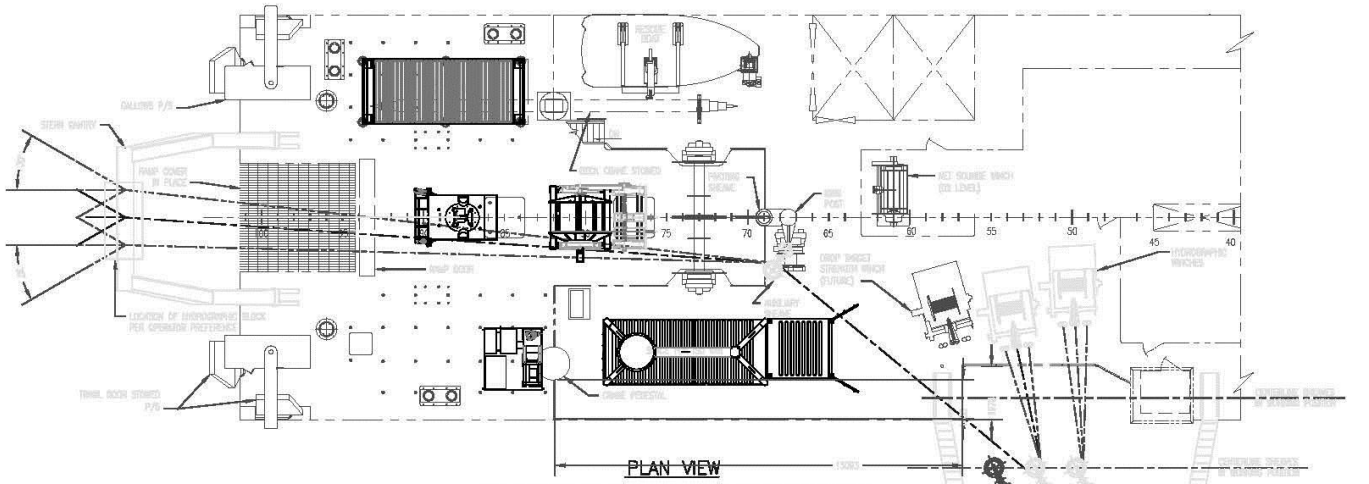
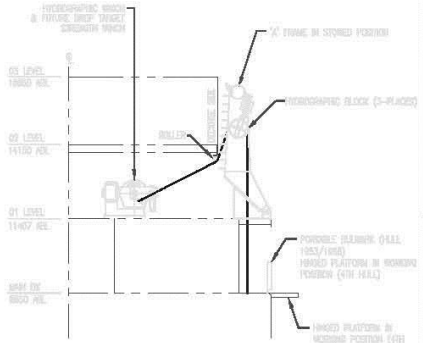


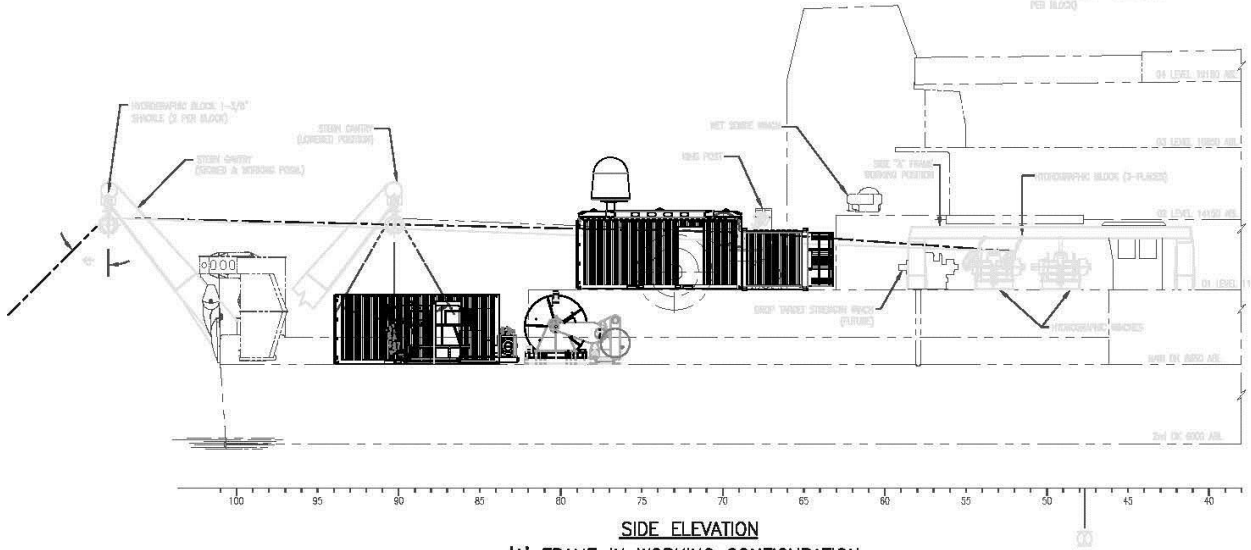
Figure 3. Bigelow – ROPOS Layout.



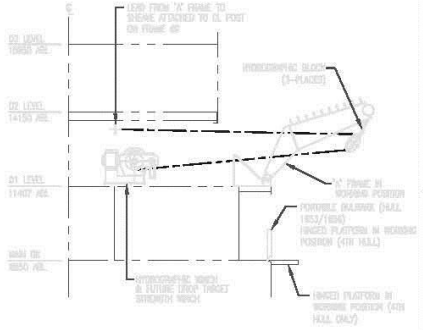
PLAN VIEW
'A' FRAME IN AFT WORKING CONFIGURATION



'A' FRAME AT POINT OF LIFT



SIDE ELEVATION
'A' FRAME IN WORKING CONFIGURATION



'A' FRAME IN AFT WORKING CONFIGURATION

			M282	591	FA17	002	03

Table 1. Locations of potential sampling stations during NOAA ship *Henry B. Bigelow* HB-17-03, Northeast Deep-water Coral Habitats: US and Canadian cross-border collaboration.

sampleID	Description	Latitude_DD	Longitude_DD
1	Georges Canyon	41.19570866	-66.26600557
2	Georges Canyon	41.23378032	-66.23160437
3	Georges Canyon	41.25137597	-66.23536396
4	Georges Canyon	41.26362385	-66.24818085
5	Georges Canyon	41.27535547	-66.24490593
6	Georges Canyon	41.27384385	-66.22104636
7	Georges Canyon	41.28200305	-66.18930242
8	Corsair Canyon	41.40494252	-66.23267194
9	Corsair Canyon	41.40675737	-66.2032532
10	Corsair Canyon	41.39334801	-66.2085719
11	Corsair Canyon	41.39649603	-66.18505702
12	Corsair Canyon	41.38408102	-66.1852582
13	Corsair Canyon	41.33336304	-66.10237316
14	Corsair Canyon	41.35608438	-66.08703976
15	Northeast Channel	41.60378799	-65.91500734
16	Northeast Channel	41.58407665	-65.89861755
17	Northeast Channel	41.60306058	-65.87653039
18	Jordan Basin	43.25041418	-67.11953506
19	Jordan Basin	43.3390676	-67.08578699
20	Jordan Basin	43.34782708	-67.05683945
21	Jordan Basin	43.34627979	-67.01624123
22	Jordan Basin	43.35440509	-67.1607961
23	Jordan Basin	43.34599711	-67.31982799
24	Jordan Basin	43.34456348	-67.48667125
25	Mount Desert Rock	43.90255667	-68.21906667
26	Outer Schoodic Ridge	44.11033333	-67.62420833
27	Lindenkohl Knoll	42.52522167	-67.56302833
28	Western Jordan Basin	43.44478167	-67.80855667
29	Central Jordan Basin	43.32525	-67.59131833
30	Munson Nygren Intercanyon 1	40.59748333	-66.8577
31	Munson Nygren Intercanyon 2	40.65936667	-66.78018333
32	Munson Nygren Intercanyon 3	40.67026667	-66.76525
33	Munson Nygren Intercanyon 3	40.67096667	-66.74018333
34	Munson Nygren Intercanyon 4	40.68885	-66.71593333
35	Nygren Heezen Intercanyon 1	40.77718333	-66.65626667
36	Nygren Heezen Intercanyon 2	40.77838333	-66.63156667
37	Nygren Heezen Intercanyon 2	40.77216667	-66.62126667
38	Nygren Heezen Intercanyon 3	40.85253333	-66.56376667
39	Nygren Heezen Intercanyon 3	40.84278333	-66.55766667

40	Nygren Heezen Intercanyon 3	40.8395	-66.5495
41	Nygren Heezen Intercanyon 3	40.8551	-66.53958333
42	Nygren Heezen Intercanyon 4	40.90415	-66.50233333
43	Nygren Heezen Intercanyon 4	40.90165	-66.48738333
44	Nygren Heezen Intercanyon 4	40.88503333	-66.45766667
45	Nygren Heezen Intercanyon 5	40.92376667	-66.4506
46	Nygren Heezen Intercanyon 6	40.94525	-66.4264
47	Nygren Heezen Intercanyon 6	40.9503	-66.42828333
48	Nygren Heezen Intercanyon 6	40.93816667	-66.40558333
49	Nygren Heezen Intercanyon 7	40.99983333	-66.39031667

Table 2. Scientific Computer Sensors, and logging rates of those sensors, required during NOAA ship *Henry B. Bigelow* HB-17-03, Northeast Deep-water Coral Habitats: US and Canadian cross-border collaboration.

Sensor Name	**Units**	**Log Rate (secs)**
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. ROV ROPOS Specifications.

GENERAL	
Maximum Operating Depth	5000m
Type	Electro-Hydraulic Work-class ROV
Sea State	Sea State 6 (Using LARS heave compensation system)
Weight	In air: 3393 kg In water: neutrally buoyant
Length	3.05 m
Width	1.64 m
Height	2.17 m
Motor and Pump	40 hp Impaq motor with Kawasaki K3VL80 HP controlled pump which provides 207 bar (3000 psi) @ 76 lpm
Fore-Aft Thrusters	2 x Sub-Atlantic SA300-20 (300 mm)
Vertical Thrusters	2 x Sub-Atlantic SA300-20 (300 mm)
Lateral Thrusters	1 x Sub-Atlantic SA300-20 (300 mm)
Max Fwd/Aft Bollard Pull	426 kgf using 2 thrusters
Max Lateral Bollard Pull	220 kgf using 1 thrusters
Max Lift from Thrusters	408 kgf using 2 thrusters
Maximum Forward Speed	2.5 knot

Maximum Lateral Speed	1.0 knot
Maximum Vertical Speed	1.5 knot
Through Frame Lift	1815 kg with a 5:1 safety factor, tested to 3629 kg. Uses four point attachment for under-slung payload or skid interface
Payload	130 kg (in water weight)
Auto Functions	Depth, Heading, Altitude, Cruise
Manipulators	2 x Kraft Predator spatially correspondent 7-function with force feedback

POWER REQUIREMENTS	
ROV	100 A @ 380-480 VAC at 50/60 Hz
Winch/LARS	200 A @ 380-480 VAC at 50/60 Hz
Consoles/Control	3x 15 A @ 115-120 VAC at 50/60 Hz

INTERFACING	
RS-232	10 ports at up to 115 Kbps
RS-485/RS-422	7 ports at up to 2.5 Mbps
Ethernet	10/100 Mbps
TTL	One TTL Link
Optical	5 single-mode fibres (2 available for interfacing)
Power	5 VDC, 12 VDC, 24 VDC, 115 VAC

HYDRAULIC	9 spare bi-directional hydraulic rate functions, 1 spare servo function.

TOOLS AND SAMPLING	
SWING ARMS	2 x Swing arms which can be fitted with baskets, core tubes, or custom payload
SAMPLING STORAGE	Bio-box [80 cm x 30 cm x 30 cm] and boot [26 cm x 37 cm x 17 cm]
SUCTION SAMPLER	Variable speed, capable or pumping 300 litres per minute. Samples stored in 8 discrete 2 L sample cylinders
TEMPERATURE PROBE	4 x High temperature probes
CUTTERS	Various hydraulic cutters
TOOL BASKET	2 m x 2 m tool basket that latches to through-frame lift and is capable of holding a 500 kg payload
OTHER	Other tools available to meet your project's requirements

VIDEO	
PRIMARY HD CAMERA	Insite Pacific Zeus-Plus HD camera (10x Zoom) mounted on a pan and tilt with extend function
PILOT CAMERA	WATEC Wide Angle low light camera (tilt function)
SECONDARY HD CAMERA	Insite Pacific Mini-Zeus HD Camera (tilt function)
DIGITAL STILL CAMERA	12.1 megapixel Nikon D700 digital still camera with 14-24 mm AFS f2.8 lens (tilt function)
AUXILIARY CAMERAS	DSPL Nano Seacam 3 x Bowtech L3C-550 colour camera WATEC Wide Angle
VIDEO SCALING	2 pairs of 10 cm spacing scaling lasers
VIDEO RECORDING	2 x Digital Rapids StreamZHD recorders with closed-caption encoders (geo-referencing)

LIGHTING	3 x 400 W HMI, 3 x 350 W LED, 2 x 150 W HID, 8 x 150 W LED

SENSORS	
HEADING	FOG/OCTANS 3000 Gen4 TCM2 Solid state flux-gate (backup)
PITCH AND ROLL	FOG/OCTANS 3000 Gen4
DEPTH	Digiquartz 8B7000-I
ALTIMETER	Kongsberg Simrad 1007-200 kHz
SONAR	Simrad MS1071 675 kHz Digital
DOPPLER VELOCITY LOG	RDI Navigator Workhorse 1200 kHz with shallow bottom tracking
USBL	IXSEA GAPS, responder on ROPOS
SOUND VELOCITY	Valeport miniSVS (100 mm sensor)
CTD	SBE 19plusV2 CTD profiler
RF BEACON	MetOcean RF-7000A1
STROBE BEACON	MetOcean ST-400A

AUX. EQUIPMENT	
DECK HPU	3600 kg
OPERATIONS CONTAINER	9090 kg [20' ISO Container]
WORKSHOP CONTAINER	9090 kg [20' ISO Container]

SPARES CONTAINER	9090 kg [20' ISO Container]
LARS	13,636 kg [Footprint varies]
MID-DEPTH WINCH [3000M]	15,068 kg [20' ISO Flat rack]
SHALLOW WINCH	8318 kg [1.7 m x 3.6 m x 4.65 m(H)]

OTHER SYSTEMS	
CABLE LAYING	Proprietary ROCLS (Remotely Operated Cable Laying System)
DATA-MANAGEMENT	Proprietary Integrated Real-time Logging System for real-time and geo-referenced dive annotations
COMMUNICATIONS	1.15 m Ku-Band stabilized marine satellite communication system
MULTI-BEAM	Reason Seabat 7125 ROV2 mounting skid

Appendix 2. ROPOS Launch and Recovery Procedures.

ROPOS on board Henry Bigelow June 2017

Please review and comment. This draft document will vary for different vessels and is based upon a different ship at this point.

Notes:

- It is assumed that the ship will be facing into the wind
- With the propeller clutched in (rotating) there will always be some wash pushing the cable and floats away from the transom
- The ROPOS operations manager will be continuously watching the ROV and transom during the entire operation and will be in direct radio contact with the Henry Bigelow deck officer. For this part of the launch and recovery this is their sole responsibility.
- If the cable comes in toward the transom the ops manager can ask the bridge for a bump ahead to keep the cable from the stern.

- The ROV can gently drive ahead, away from the ship, to keep the cable off the transom. This is our normal method of keeping the cable clear of the ship
- If the ROV loses power or control then the ship can drive slowly ahead (1/4 or 1/2 knot) therefore keeping the ROV streaming astern
- With this procedure we have two different ways to control the cable near the transom; ship moving ahead and ROV moving ahead (away from the stern)
- Personnel:
    - ROPOS operations manager– directs deck operations and communicates directly with the Henry Bigelow deck officer
    - ROPOS winch operator – operates the winch and docking head as directed by the ROPOS operations manager
    - ROPOS pilot – is in control room and operates the ROV as directed by the ROPOS operations manager
    - ROPOS navigator – assists on deck and with float line securing as directed by the ROPOS operations manager
    - Henry Bigelow deck officer – is in ultimate charge of the deck and works with ROPOS operations manager. He communicates with the Henry Bigelow bridge
    - Henry Bigelow deckhands (2) Assist as directed by ROPOS operations manager in liaison Henry Bigelow deck officer

Assumptions:

1. The Henry Bigelow will keep all drives engaged during launch and recovery (unless emergency arises)
2. The Henry Bigelow will assess the sea conditions and discuss the proposed heading and drive with the ROV supervisor
3. The Henry Bigelow will need to minimize way THROUGH THE WATER. If this means that the ship moves over ground this is acceptable. We can pre-plan a standoff for launch to have us near site when the ship is free to manoeuver. If currents allow we can be in DP over the operation site. But if there is current then the ship must move with the water while maintaining a fixed heading. If there is any ship movement it will be dead slow ahead through the water. Thus the discussion stated in point 2.

Do not start HPU without permission from the Bridge. ROPOS staff will contact Henry Bigelow engineers to ensure a second generator is on line, and will inform ROPOS once power is available. Once the HPU is started, Henry Bigelow may choose to reduce to one generator, so a restart of the HPU still requires Henry Bigelow bridge permission. They will want about 20 minutes to bring up a generator.

ROV Launch Please review and comment.

- ROPOS Predive checks complete, ready to dive
- ROPOS contact Henry Bigelow bridge and ask for one half hour call out for deck crew and second generator and air compressors are online.
- Discuss ship setup with bridge. Wind fine on the port bow, escape path discussed
- Discuss dive plan with bridge and expectations for ship movement
- Start HPU and Latch ROV . Remove deck securing straps

- When deck crew (2) and bridge officer are present, request permission from Henry Bigelow bridge to launch and *confirm that appropriate drives are secure*. Probably not required in this case
- Lift ROV and ensure that LATCH CLOSED light is illuminated
- Rotate A-frame with Docking head and latched ROV out over the stern to pre-determined height.
- Tension cable on winch while monitoring load cell and winch drum – ensure cable is not dislodged from sheaves.
- Open latches and inform ROV pilot of launch and pay out cable.
- While launching, ROV pilot watches the deck cameras to monitor winch and level wind
- Ensure that LARS air drive is on and piston is energised
- Pay out winch to drop ROV into the trough of wave
- When ROV lands in water, have it move full ahead out from under the docking head, then slow down to half ahead. Advise on heading and provide course corrections
- Pay out winch briskly and try to maintain slack in the umbilical.
- Winch operator to pay attention to the winch wire and do not overrun the cable.
- Once there is enough slack in the cable, dive the ROV
- ROV pilot to maintain slight slack in cable using look-back camera
- At 25 metres payout bring the LARS head in next to the rail and attach two (lemon) floats, two metres apart
- Move docking head slightly away from rail and pay out winch to 50 metres.
- At 50 metres bring LARS head back to rail and attach remaining floats to umbilical. Continue with the two metre spacing. The number of floats is determined by the operating depth. Generally speaking, past 200 metres operating depth, all 22 floats will be attached.
- Once past 120 metres depth (30 metres above floats), contact the bridge and advise that it is safe to use the drives Probably not required in this case
- Once past 150 metres depth (depending upon conditions) secure the air drive, lock docking head and ensure that docking head is in appropriate position for long term operations.
- Contact the bridge when the ROV is on the bottom

ROV recovery

- Contact bridge when ROV is off the bottom
- Provide bridge with one half hour warning of lemons on surface
- When ROV is at 200 metres contact the bridge and ensure that the appropriate drive is secure. Probably not required in this case
- Remove floats from umbilical, ROV pilot ensures that there is about two metres of slack in the umbilical cable
- Move docking head outboard so that it is approximately 1.5 times vehicle height above the highest wave, astern of the ship
- Align the ROV under the docking head, heading is away from the ship
- Attach stern line to ROV with long pole and removable hook and line
- Ensure that ROV pilot secures lights
- Come in on the winch smoothly and rapidly when the ROV is in the trough of a wave. This action will end up with plucking the vehicle from the wave top. Try to minimize snatches as the cable comes tight

- Once ROV is out of the water, secure sub motor
- Slow down the winch as the ROV comes up to the docking head
- Slowly pull up on winch until cushion bags are mostly collapsed
- Watch load on tensiometer. Do not pass vehicle weight
- Close latches. If necessary pay out on winch until light comes on
- If necessary adjust vehicle and docking head position until latch closed light is illuminated
- Pay out winch to provide approximately ten feet of slack
- Rotate A-frame inboard
- Recover ROV to deck
- Secure ROV to deck
- Unlatch ROV and stow A-frame for extended deck time
- Advise bridge that ROV is secure on deck
- Advise bridge of status of USBL pole (being raised, remaining lowered overside)