U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Pacific Islands Fisheries Science Center
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808) 983-5300 • Fax: (808) 983-2902

Final Project Instructions

Date Submitted: March 13, 2013

Platform: NOAA Ship *Oscar Elton Sette*

Project Number: SE-13-02 (PIFSC)

Project Title: Fisheries Research

Project Dates: April 16, 2013 to April 30, 2013

Prepared by: _____ Dated: 4/4/2013
Donald R. Kobayashi, Ph.D.
Chief Scientist
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 04 Apr 13
Jeffrey J. Polovina, Ph.D.
Chief, Ecosystems and Oceanography Division
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 4/4/2013
Samuel G. Pooley, Ph.D.
Center Director
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 4/5/2013
Commander Robert A. Kamphaus
Commanding Officer
Pacific Islands Area Command

I. Project Overview

A. Project Period

The NOAA Ship *Oscar Elton Sette* will be engaged as support for a Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), NOAA, project from 16 April to 30 April 2013 for a total of 15 sea days.

B. Service Level Agreements

Of the 15 DAS scheduled for this project 0 DAS are funded by the program and 15 DAS are funded by OMAO. This project is estimated to exhibit a Medium Operational Tempo.

C. Operating Area

The area of operations will be weather-dependent but will generally include waters off the lee coasts of the islands of Maui, Lanai, Molokai, and Kahoolawe. (see Appendix 1, Fig. 1).

D. Summary of Objectives

The NOAA Ship *Oscar Elton Sette* will be engaged as support for the Ecosystems and Oceanography Division (EOD) and Fisheries Research and Monitoring Division (FRMD), Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS) fisheries research programs. The principal scientific objectives of the project are:

1. Research and development of methods to cross-compare or calibrate fishery-dependent (extractive) and fishery-independent (non-extractive) sampling methodologies for use in stock assessment.

3. Estimate deepwater bottomfish abundance using a variety of extractive and non-extractive methods including:

    a. EK60 Active acoustics conducted from Sette
    b. AUV and ROV camera systems deployed from Sette including BlueView imaging sonar unit
    c. Baited underwater video camera systems (BotCam) from charter vessel and Sette
    d. Hook and line fishing from charter vessels and Sette

E. Participating Institutions

The Pacific Islands Fisheries Science Center (PIFSC), Northwest Fisheries Science Center (NWFSC), University of Hawaii at Manoa (UHM), Joint Institute for Marine and Atmospheric Research at the University of Hawaii at Manoa (JIMAR), Pacific Islands Fisheries Group (PIFG), and NOAA Teacher at Sea (TAS) program are participating in the project.

F. Personnel

	Name	*Title*	*Date Aboard*	*Date Disembark*	*Gender*	*Affiliation*	*Nationality*
1	Kobayashi, Donald	Chief Scientist	April 16, 2013	April 30, 2013	M	PIFSC	USA
2	Domokos, Reka	Acoustics lead	April 16, 2013	April 30, 2013	F	PIFSC	USA
3	Taylor, Jeremy	AUV/ROV lead	April 16, 2013	April 30, 2013	M	JIMAR	USA
4	Rooney, John	AUV/ROV support	April 16, 2013	April 30, 2013	M	JIMAR	USA
5	Hoover, Aimee	Acoustics support	April 16, 2013	April 30, 2013	F	JIMAR	USA
6	Copeland, Adrienne	Acoustics support	April 16, 2013	April 30, 2013	F	JIMAR	USA
7	Chen, Jessica	Acoustics support	April 16, 2013	April 30, 2013	F	JIMAR	USA
8	Wong, Scott	IT lead	April 16, 2013	April 30, 2013	M	PIFSC	USA
9	Jeff Anderson	GIS support	April 16, 2013	April 30, 2013	M	JIMAR	USA
10	Clarke, Elizabeth	AUV support	April 16, 2013	April 30, 2013	F	NWFSC	USA
11	Whitmire, Curt	AUV/GIS support	April 16, 2013	April 30, 2013	M	NWFSC	USA
12	Fruh, Erica	AUV support	April 16, 2013	April 30, 2013	F	NWFSC	USA
13	Salisbury, Rita	Cruise support	April 16, 2013	April 30, 2013	F	TAS	USA
14	Moffitt, Robert	Cruise support	April 16, 2013	April 30, 2013	M	PIFG	USA
15	Ebisui, Eddie	Cruise support	April 16, 2013	April 23, 2013	M	PIFG	USA
16	Tam, Brealand	Cruise support	April 16, 2013	April 23, 2013	M	PIFG	USA

G. Administrative

I.G.1. Points of Contact

Donald Kobayashi, Chief Scientist
2570 Dole Street
Honolulu, HI 96822
Donald.Kobayashi@noaa.gov

Kyle Koyanagi, Co-Operational Lead
1125B Ala Moana Boulevard
Honolulu, HI 96814
Kyle.Koyanagi@noaa.gov

Jeremy Taylor, Co-Operational Lead
1125B Ala Moana Boulevard
Honolulu, HI 96814
Jeremy.Taylor@noaa.gov

LT Justin Keesee, NOAA, Operations Officer
NOAA Ship *Oscar Elton Sette*
1897 Ranger Loop, Building 184
Honolulu, HI 96818
Ops.Sette@noaa.gov

Agent – NA

I.G.2. Diplomatic Clearances – NA

I.G.3. Licenses and Permits – NA

II. Operations

A. Project Itinerary

Based on a ship speed of 9.5 knots.

16 April	0800. Start of project. Embark Kobayashi, Domokos, Taylor, Rooney, Hoover, Copeland, Chen, Wong, Anderson, Clarke, Whitmire, Fruh, Salisbury. Depart Pearl Harbor and proceed to Oahu acoustic calibration site. Conduct calibration of Simrad EK60 system. Depart acoustic calibration site. Test ROV in deep waters off Oahu. Upon conclusion of ROV testing, proceed to first survey location Maui. These calibration and testing activities may continue through April 17.
17 April	Continuation of acoustic calibration or ROV testing off Oahu if needed. Proceed to first survey location (Maui, Lanai, Molokai, or Kahoolawe). Begin survey operations.
18 -26 April	Conduct Simrad EK60 acoustic and AUV surveys around Maui, Lanai, Molokai, or Kahoolawe in coordination with PIFG charter fishing fleet and UH BotCam vessel. The priority survey site will be in the Maui triangle region (sheltered area between Maui, Lanai, Molokai, and Kahoolawe) for the project duration, with backup sites in adjacent

weather-dependent areas. During daily operations with partner vessels, there will be daily deployments and returns of Moffitt, Ebisui, Eguchi, and Tam from the Sette to the PIFG charter fishing fleet using small boat.

27-29 April — Conduct ROV operations in conjunction with Simrad EK60 acoustic surveys for ground-truthing of acoustic targets. Upon conclusion of ROV operations, depart for Pearl Harbor.

30 April — 0800 Arrive Pearl Harbor. Upon arrival, disembark Kobayashi, Domokos, Taylor, Rooney, Hoover, Copeland, Chen, Wong, Anderson, Clarke, Whitmire, Fruh, Salisbury. End of project.

B. Staging and Destaging

1. Staging

Prior to departing Pearl Harbor on 16 April, the ship's crew will inspect the port- and starboard-side J-frames and associated oceanographic winches, conducting cable and DESH-5 winch for conductivity-temperature-depth (CTD) operations, the RD Instruments acoustic Doppler current profiler (ADCP) and associated computer and software, the thermosalinograph, the Simrad EK60 echosounder, the Scientific Computing System (SCS), the Global Positioning System (GPS) navigational systems, and the scientific freezer to ensure that they are in proper working order. The SeaBird 9/11+CTD system, carousel rosette water bottle sampler, and backup SEACAT portable CTD will be installed and inspected ensuring that they are fully operational. Electrical continuity of the J-frame conducting cable, the winch's slip ring assembly, and connections to the electronic laboratory will be confirmed by the Chief Electronics Technician before sailing. The ship's crew will also ensure that a gyro-gps feed is provided to the wet lab and that a video feed (VGA is provided from the wet lab to the bridge (such that the bridge officers can reference the AUV position during operations). Further, the ship's crew will make sure that the bridge's display of the EK60 38 kHz frequency is working properly as the EK60 will provide depth information for the bridge throughout the cruise. The scientific ships small boats (17' Northwind, 18' Achilles) will be operational and ready to be deployed prior to sailing. The ship should also plan to provide a survey technician to participate in ADCP-CTD operations or as needed to augment research duties.

Prior to departing Pearl Harbor 16 April, scientists and crew will load all AUV, ROV, and all other cruise related equipment for SE-13-02. The Over-the-Side-Pole (OTSP) will also need to be mounted 3 days prior to departure on the starboard quarter (Ship will need to be port side in). Ship's crane and small boat operations will be required for the installation of the OTSP. After the installation of the OTSP is completed one (1) day prior to departure will be needed to test AUV functionality.

200 gallons of Unleaded small boat fuel will be transferred and stored in the ship's hip tanks with the option of fueling runs to replenish fuel from the nearest port if needed.

We are requesting a minimum of 2 terabytes of shared network space for scientists to communally store and access project data collected. This could be either accessed through the temporary shared network disk space provided by the ship or by the ability to network an external hard drive provided by the science party into the full or a sandboxed local area network. We also request to make nightly backups of this network drive using external hard drives provided by the science party. This would provide the ability for scientists to store and access one common data set from all science computers on either the complete or a subset of the local area network.

Additional dates and equipment/personnel needed for loading of scientific equipment will be provided to the ship no later than 30 days prior to sailing.

2. Destaging

Dates and equipment/personnel needed for off-loading scientific equipment will be provided to the ship no later than 30 days prior to sailing.

C. Operations to be Conducted

Operations will support comparison and calibration between different methodologies used to assess deepwater bottomfish populations.

The Sette will serve as the command and control center for all operations associated with SE-13-02 aiding in the coordination and communication with charter vessels working in tandem. A NOAA Pacific Islands Fisheries Small Boat Mission Plan will be filed and attached to final SE-13-02 project instructions for small boat charter operations and communication plan.

It is requested that the Chief Survey Technician be available 12 hours per day and a coxswain for the *Sette* 17' Northwind be available 8 hours per day. The following operational plans can be considered only a guide as to how the Chief Scientist expects the surveys to progress without being able to predict the weather, operational and scheduling problems, and equipment failures. In particular, it should be noted that the amount of time required at each of the working areas is approximate and maybe altered based on weather or the progress of the survey. The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses, provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not: (1) jeopardize the safety of personnel or the ship, (2) exceed the overall time allotted for the project, (3) result in undue additional expenses, and (4) alter the general intent of the cruise instructions. In addition, the Chief Scientist must notify the Office of the Director of the Pacific Islands Fisheries Science Center at the earliest opportunity prior to making: (1) deviations from the general cruise track or area of operations noted in the cruise instructions, (2) significant changes or additions of research operations to those specified in the cruise instructions, or (3) port calls not specifically identified in the cruise instructions.

1. Calibration of the EK60 system

For calibration, the Sette will be anchored (optionally both at the bow and stern depending on conditions and advice of acousticians) as early as possible in waters 15-40 m depth. Before the bow anchor is set, a rope will be pulled across the bow under the ship which will aid in the placement of the metallic calibration ball below the transducers. The calibration sphere will be attached to three fishing lines guided by 3 outriggers forming a triangle that centers on the transducers. The position of the sphere will be electronically controlled from the electronics lab. As calibration requires calm waters with minimal currents, it is imperative to start calibration in the early morning hours as conditions tend to deteriorate, making the calibration difficult in the afternoon. During calibration, the engine and all other acoustics systems on the Sette will be turned off and small-boat operations will cease so as not to interfere with the calibration. Calibration of both the hull-mounted transducer pod on the Sette and the OTSP transducer pod will be accomplished. Alternative calibration methodologies to the standard procedure will be attempted on this project, including the above-described shallow-water approach as well as drifting approaches if conditions allow.

2. Underway Operations

Current velocity will be continuously monitored with an ADCP, while surface temperature, salinity, and chlorophyll-a will be monitored with a hull-mounted thermosalinograph and flow-through fluorometer throughout the duration of the project.

Except during specific interference tests (or unless it has been determined through testing that interference is no longer an issue) all other acoustic equipment will be turned off during EK60 surveys and for the entirety of AUV operations as to minimize interference.

General ship husbandry operations that have the potential to harm or interfere with sensitive scientific equipment but which are not required for the immediate safety of the ship (including but not limited to acid washing and needle gunning) shall be avoided during survey operations.

This project will be primarily daytime operations with only occasional opportunistic nighttime operations. It is anticipated that ship sewage pumping and slop dumping will occur during nighttime hours.

3. Station Operations

Station operations will consist of coordinated multiple daytime or nighttime fishery-dependent and fishery-independent methodologies for near-simultaneous surveys of deep reef fish or bottomfish resources. Survey effort will generally be focused in a survey area chosen from the region in Appendix 1 and described in Appendix 2. Specific survey areas will be chosen shortly before or during the cruise based on weather conditions. Acoustic surveys with the Simrad EK60 will be undertaken using the transect pattern shown in Appendix 3. An untethered AUV (see Appendix 4 for AUV standard operating procedure or SOP) and a tethered ROV (see Appendix 5 for ROV SOP) will be deployed from the *Sette*. A tethered BotCam unit will serve as backup gear aboard the *Sette*. The exact acoustic transects, AUV survey track lines, ROV, and BotCam deployment sites will be based on weather conditions.

The draft deployment plan will be the morning deployment of the AUV followed by acoustic transects over selected survey areas, using a path as shown in Appendix 3, which allows for 6 non-overlapping passes over the survey area. 2-3 such patterns will be undertaken while the AUV is deployed for its 2 km transect (estimated to take approximately 2 hours). The AUV will be recovered, the ship will reposition, and the entire process will be repeated in the afternoon of the same day. Therefore, each operational day will include 2 deployments of the AUV and approximately 5-6 acoustic patterns.

On selected days, acoustic surveys will be combined with ROV deployments to ground-truth acoustic targets. The ROV will be outfitted with its standard cameras, stereo low-light cameras, and a BlueView imaging sonar unit.

Operations will coordinate with 3 chartered Pacific Islands Fisheries Group (PIFG) fishing vessels and a University of Hawaii chartered vessel (Huki Pono operated by Sea Engineering) deploying surface-tethered BotCam units. The ship's 17' Northwind will be required to standby to assist in equipment (AUV, ROV, BotCam) deployment and recovery as well as routine deployments and recovery of the PIFG observers who will be overnighting on the Sette during the approximately 10 days of partnered activity early in the cruise duration. Approximately 200 gallons of program-provided fuel for the small boat will be carried in the ship's fuel hip tank. The ship should plan to provide a coxswain and crew for the Northwind as required during daylight operations for these personnel and equipment transfer and other operations as directed by the Chief Scientist.

The AUV and ROV operations will follow the SOPs as described in Appendix 4 and Appendix 5. Other deployment and recovery configurations will be evaluated and attempted based on input from ship officers, deck staff, and scientific party, if it is deemed that the SOPs can be improved.

A single tethered BotCam unit equipped with an acoustic release will be deployed from the ship at certain locations, with EK60 surveys conducted over the unit and in the immediate vicinity, followed by acoustic release and retrieval of the BotCam unit. The surface tether functions as retrieval backup in the event of acoustic release malfunction. BotCam operation from the Sette are considered a backup operation in the event that other Sette operations are terminated and that there is extra project time during daylight hours.

During EK60 operations, all depth sounders will remain turned off and needle gunning or other onboard operations that transmit sound to the hull of the ship will cease as they interfere with EK60 data collection.

The *Sette* will occasionally serve as a bottomfishing platform for ground-truthing of acoustic targets.

D. Dive Plan – NA

E. Applicable Restrictions – NA

III. Equipment

A. Equipment and Capabilities Provided by the Ship

- CTD system and heavy duty cage assembly
- 12 complete Niskin bottles, with at least enough spare parts to replace 4 bottles
- J-frames and blocks for CTD
- J-frames(port) and winch for ROV operations
- 120v, 50amp outlet in/near the wet lab for ROV operations
- Oceanographic winches and cables (port and starboard)
- SEACAT portable CTD with backup
- Deck cranes with 600-lb static-lift block (for AUV/ROV/BotCam deployment/recovery)
- Thermosalinograph
- RD Instruments ADCP and associated computer and software
- EK60 and ES60 echosounder system at the frequencies of 38 kHz, 70 kHz, 120 kHz, and 200 kHz
- GPS navigational system
- Depth sounders and recorders
- Scientific freezer, kept between -30° and -20°C at all times
- Two-way radios for communication from the electronics lab to the winch operator
- Operational Scientific Computing System (SCS)
- Navigational equipment and course plotter
- One small monitor with RCA jack inputs for BotCam DVR display
- Supplies necessary for at least two reterminations of the J-frame conducting cable
- SE NorthWind with coxswain
- Adequate fresh water for gear wash down
- Iridium phone
- VHF radios for ship's small boat
- Global Positioning System (GPS) for ship's small boat
- Unleaded gasoline storage
- A minimum of 2 terabyte shared network space.
- Three hydraulic reel fishing stations along portside rail.

B. Equipment and Capabilities Provided by the Scientists

- Hooks, line, weights, and other fishing supplies for Sette handline fishing
- Frozen squid and fish bait for Sette fishing
- Fuel for small boats
- Weight scales and measuring calipers
- Knives and other tools for processing fish
- Fish tags
- Water filtration equipment (vacuum pump, filtering ring, filters, forceps, etc.)
- WetLabs profiling and SeaPoint flow-through fluorometers
- Redundant dissolved oxygen sensors
- Sample collection jars
- Turner 10-AU Fluorometer
- Laboratory glassware (e.g., Erlenmeyer flasks, graduated cylinders)
- External hard drives (at least 1-2 TB) for data common storage and backup
- capabilities.

- 1 BotCam (baited remote underwater stereo-video camera system)
- BotCam bait, anchors, acoustic release, and other BotCam accessories
- Hazardous materials spill and reagent kits
- Food and bait for Huki Pono resupply

  The following BotCam bait, ice, and food items are to be transported from Oahu to Maui aboard the Sette and transferred to the Huki Pono on one occasion at some point in the interval April 20-23.

  To be stored in SE Freezer:

  ● Beef: 5lbs
  ● Chicken: 5lbs
  ● Pork: 5lbs
  ● Hamburger Patties: 5 lbs
  ● Ground Turkey: 4lbs
  ● Cold cuts: 4lbs
  ● Lasagna: 5lbs
  ● Frozen vegetables: 6lbs
  ● Bait: 50pcs in 1 cooler
  ● 240lbs of ice (6-40# bags)

  To be stored in Sette Refrigerator:

  ● Salad mix: 3lbs
  ● Head lettuce: 2lbs
  ● Apples: 10lbs
  ● Oranges: 10lbs
  ● Frozen and Refrigerated food will be stored in 2-3 storage containers, 13 in x 22 in x 16 in, ~25 lbs ea. Bait will be stored in a 48-50qt cooler ~ 50lbs.
  ● Bait, ice, and frozen food can be stored in the scientific freezer. It is requested that some food can be stored in the ship's refrigerator in a single container.

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist shall be responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements for Visiting Scientists, released July 2002. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, by request.

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 the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemicals brought aboard. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the Chief Scientist.

MSDS will be provided in hardcopy or electronic PDF as well as via MSDS-online.

B. Radioactive Isotopes – NA

C. Inventory
Unleaded gasoline, 200 gallons
Formalin, 5 gallons
Ethanol, 15 gallons
Sodium borate for buffering, 1 pound
Liquid nitrogen, 60 L
90% acetone, 4 gallons
10% hydrochloric acid, 1 quart

V. Additional Projects

A. Supplementary ("Piggyback") Projects

The PIFSC bird, aquatic marine mammal, and fish school sightings log, per Chief Scientist instructions.

B. NOAA Fleet Ancillary Projects

Ancillary tasks will be accomplished in accordance with the NOAA Fleet Standing Ancillary instructions as long as they do not interfere with primary mission objectives.

VI. Disposition of Data and Reports

A. Data Responsibilities

Marine Observations Log: A Marine Observations Log will be maintained during the project. Other forms required by the Chief Scientist for each of the operations will be integrated into the Marine Operations Log.

Station Plot: The position of each operation and station will be plotted on charts generated by Nobletec navigation software. Ship's personnel will supply the Chief Scientist with copies of these charts at the end of the project.

Data Disposition: The Chief Scientist shall be considered to be the representative of the NMFS PIFSC Science Director for purpose of data disposition. A single copy of all data gathered by the vessel will be delivered to the Chief Scientist upon request for forwarding to the Science Director, who in turn shall be responsible for distribution of data to other investigators desiring copies.

B. Pre and Post Project Meeting

Pre-Project Meetings: A pre-project meeting between the Chief Scientist, the Commanding Officer, the Chief Marine Engineer, and their respective staffs will be held prior to commencement of operations to identify operational and logistic requirements. Additionally, prior to departure, the Chief Scientist will conduct a meeting of the scientific party for training in sample collection and to inform them of project objectives. General vessel protocols (e.g., meals, watches, etiquette, etc.) will be presented by the ship's Operations Officer on the first day of sailing.

Post-Project Meeting: Upon completion of the project, a meeting will be held (unless prior alternate arrangements are made) and attended by the ship's officers, the Chief Scientist and members of the scientific party, the Vessel Coordinator and the Port Captain to review the project. Concerns regarding safety, efficiency, and suggestions for improvements for future projects should be discussed. Minutes of the post-project meeting will be distributed to all participants by e-mail, and to the Commanding Officer and Chief of Operations, Marine Operations Center.

C. Ship Operations Evaluation Report

Within 7 days of the completion of the project, a Ship Operations Evaluation form is to be completed by the Chief Scientist. The preferred method of transmittal of this form is via e-mail to OMAO.Customer.Satisfation@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

D. Immediate Reporting of Marine Mammal or Endangered Species Incidental Takes: In the event of an incidental take of a marine mammal of federally listed wildlife species during the course of the project, the Chief Scientist will report the incident to the PIFSC Science Director and Deputy Science Director IMMEDIATELY via IRIDIUM, INMARSAT and e-mail.

The following definitions apply:

Take – Under section 3(18) of the ESA, "…to harass, harms, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct."

Incidental Take – Take that is incidental to, but not the purpose of, otherwise lawful activities.

VII. 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. The 4 PIFG observers will be deployed each day after breakfast and shall return before dinner; therefore it is requested that during the partnering operations (likely first 10 days of surveys upon reaching Maui area) that lunches be prepared and packed for these 4 observers (who will each be aboard different small vessels) for them to eat while working during the day. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the survey.

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 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02 JAN 2012) 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. The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the project to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the 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.
Contact information:

Regional Director of Health Services
Marine Operations Center – Pacific
2002 SE Marine Science Dr.
Newport, OR 97365
Telephone 541-867-8822
Fax 541-867-8856

Email MOP.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

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. Protective footwear is required and steel-toed shoes are recommended when participating in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.
All scientists will comply with standing safety regulations of PIFSC and that of the vessel's standing orders from the Commanding Officer.

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 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 it must be arranged at least 30 days in advance.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *NMAO 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 these requirements prior to boarding the ship is required. Clearance for non-NOAA computers should be coordinated with PIFSC ITS.

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 prior to boarding the ship. Arrangements to take the Course should be coordinated with PIFSC/CRED administration.

F. Foreign National Guests Access to OMAO Facilities and Platforms

There are no foreign national participants for project SE-13-02.

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 (FRNS) 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 NMFS Deemed Exports point of contact to assist with the process.

Foreign National access must be sought not only for access to the ship involved in the project, it must also be sought and approved for the dates of any DOC facilities (marine centers or port offices) that foreign nationals might have to traverse to access to and from the ship.

The following are basic requirements. Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:
1. Provide the Commanding Officer with the e-mail generated by the FRNS granting approval for the foreign national guest's visit. This e-mail 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 Regional Security Officer.
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.

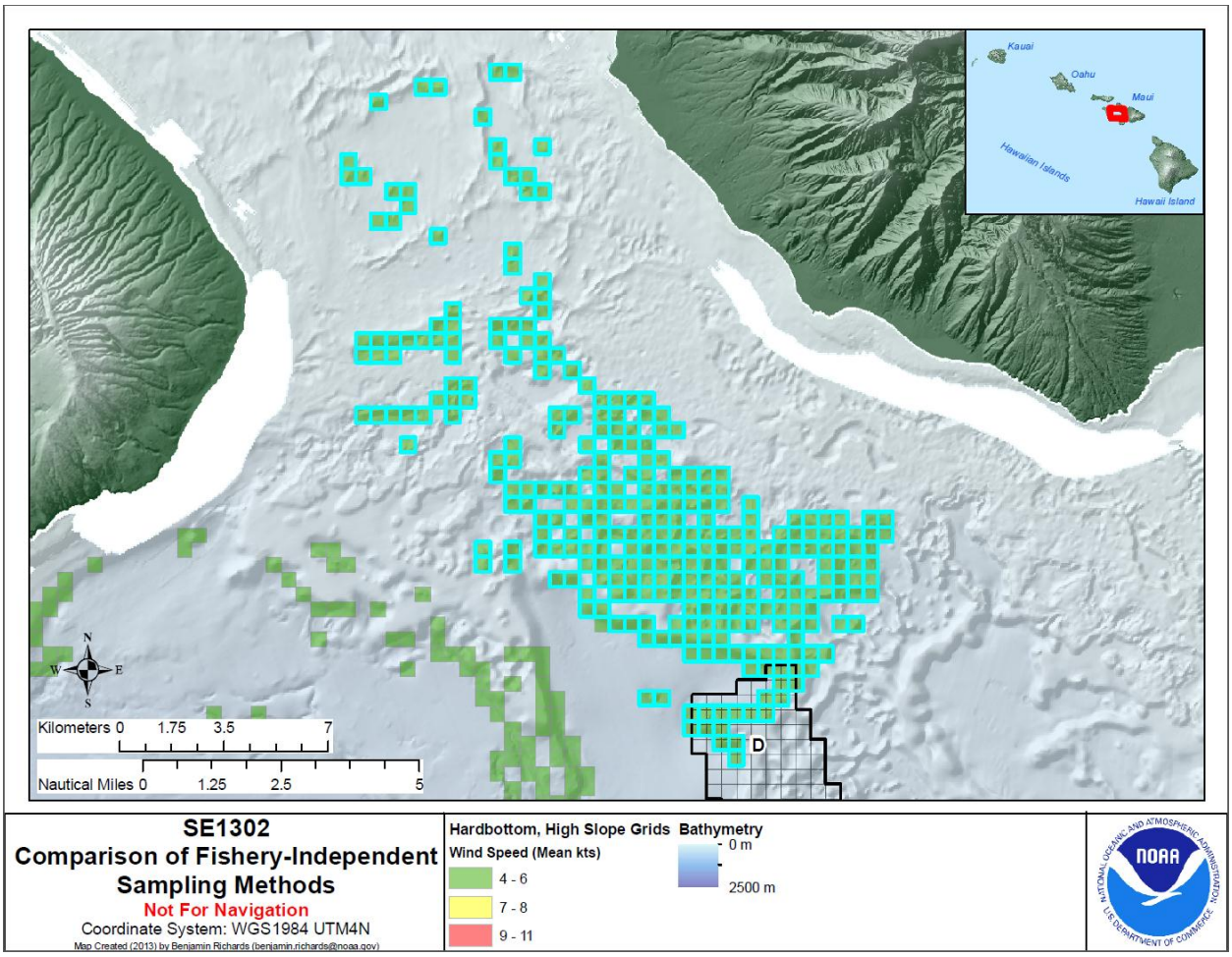
Responsibilities of the Commanding Officer:

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 NMAO approval 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 FRNS e-mail 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 Regional Security Officer.

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, 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 Guest) as required by NAO 207-12 Section 5.03.h.

Appendix 1 Sampling location

Figure 1.--NOAA Ship *Oscar Elton Sette* project SE-13-02, proposed operation locations. Priority survey site regions are delineated small boxes, with previously-sampled Box "D" shown for reference. Exact project location TBD depending on weather conditions at time of project.



Appendix 2 Station/Waypoint List (309 candidate sites)

Grid ID	Depth (m)	Latitude	Longitude	Survey Box
14183	-267.33	20.674139	-156.650131	D
14304	-230.93	20.678719	-156.654858	D
14305	-180.7	20.678653	-156.650061	D
14426	-305.2	20.683363	-156.664382	D
14427	-199.3	20.683298	-156.659585	D
14428	-161.32	20.683233	-156.654789	D
14551	-301.42	20.687878	-156.664313	D
14552	-228.11	20.687812	-156.659516	D
14553	-226.87	20.687747	-156.654719	D
14554	-229.93	20.687682	-156.649922	D
14555	-223.98	20.687616	-156.645125	D
14556	-179.07	20.687551	-156.640328	D
14677	-290.36	20.692586	-156.678636	none
14678	-290.78	20.692522	-156.673839	none
14685	-244.18	20.692065	-156.640258	D
14686	-169.08	20.691999	-156.635461	D
14817	-228.68	20.696513	-156.635391	D
14818	-150.66	20.696447	-156.630594	D
14945	-260.64	20.701159	-156.644916	none
14946	-237.93	20.701093	-156.640119	D
14947	-197.28	20.701027	-156.635321	D
14948	-143.76	20.700961	-156.630524	D
14949	-192.49	20.700895	-156.625726	none
15071	-263.34	20.705934	-156.664037	none
15072	-258.92	20.705869	-156.659239	none
15073	-244.81	20.705804	-156.654441	none
15074	-202.8	20.705738	-156.649644	none
15075	-168.26	20.705673	-156.644846	none
15076	-152.46	20.705607	-156.640049	none
15077	-148.77	20.705541	-156.635251	none
15078	-157.03	20.705475	-156.630454	none
15079	-203.99	20.705409	-156.625656	none
15080	-169.07	20.705343	-156.620859	none
15198	-258.16	20.710643	-156.678361	none
15199	-193.14	20.710579	-156.673563	none
15200	-189.14	20.710514	-156.668765	none
15201	-168.71	20.710449	-156.663967	none
15202	-161.73	20.710383	-156.65917	none

15203	-151.39	20.710318	-156.654372	none
15208	-185.63	20.709989	-156.630383	none
15327	-207.36	20.715287	-156.687888	none
15328	-191.29	20.715222	-156.68309	none
15329	-202.74	20.715158	-156.678292	none
15331	-163.15	20.715028	-156.668696	none
15332	-153.52	20.714963	-156.663898	none
15333	-164.84	20.714898	-156.6591	none
15334	-152.09	20.714832	-156.654302	none
15335	-167.45	20.714767	-156.649505	none
15336	-150.92	20.714701	-156.644707	none
15338	-161.57	20.71457	-156.635111	none
15339	-166.23	20.714504	-156.630313	none
15340	-167.04	20.714437	-156.625515	none
15342	-202.55	20.714305	-156.61592	none
15343	-173.28	20.714238	-156.611122	none
15456	-215.92	20.71993	-156.697416	none
15457	-157.48	20.719866	-156.692618	none
15463	-153.35	20.719477	-156.663829	none
15464	-168.16	20.719412	-156.659031	none
15465	-145.24	20.719346	-156.654233	none
15466	-160.68	20.719281	-156.649435	none
15467	-139.54	20.719215	-156.644637	none
15468	-180.25	20.71915	-156.639839	none
15469	-197.05	20.719084	-156.635041	none
15470	-170.68	20.719018	-156.630243	none
15471	-138.4	20.718951	-156.625445	none
15587	-174.93	20.724444	-156.697348	none
15589	-132.49	20.724315	-156.687751	none
15590	-142.01	20.724251	-156.682953	none
15591	-152.79	20.724186	-156.678154	none
15592	-140.09	20.724121	-156.673356	none
15593	-174.64	20.724056	-156.668558	none
15594	-199.4	20.723991	-156.66376	none
15595	-166.13	20.723926	-156.658961	none
15596	-166.44	20.723861	-156.654163	none
15597	-137.58	20.723795	-156.649365	none
15598	-148.92	20.723729	-156.644567	none
15600	-192.3	20.723598	-156.634971	none
15601	-140.61	20.723532	-156.630173	none
15602	-160.12	20.723466	-156.625375	none

15603	-162.07	20.723399	-156.620577	none
15604	-161.56	20.723333	-156.615779	none
15605	-187.15	20.723266	-156.610981	none
15606	-192.88	20.7232	-156.606183	none
15715	-182.61	20.729087	-156.706876	none
15716	-176.56	20.729023	-156.702078	none
15718	-149.36	20.728894	-156.692481	none
15719	-159.71	20.72883	-156.687682	none
15720	-183.11	20.728765	-156.682884	none
15721	-196.08	20.7287	-156.678085	none
15722	-170.36	20.728635	-156.673287	none
15723	-164.8	20.728571	-156.668489	none
15724	-188.71	20.728505	-156.66369	none
15725	-179.58	20.72844	-156.658892	none
15726	-156.92	20.728375	-156.654094	none
15727	-153.76	20.728309	-156.649295	none
15729	-186.49	20.728178	-156.639699	none
15730	-130.11	20.728112	-156.634901	none
15731	-157.44	20.728046	-156.630102	none
15733	-180.85	20.727913	-156.620506	none
15734	-156.25	20.727847	-156.615708	none
15735	-177.52	20.72778	-156.61091	none
15736	-167.35	20.727714	-156.606112	none
15840	-128.23	20.733919	-156.730802	none
15842	-153.29	20.733792	-156.721204	none
15847	-145.28	20.733473	-156.697211	none
15848	-187.41	20.733408	-156.692412	none
15849	-200.7	20.733344	-156.687614	none
15850	-196.11	20.733279	-156.682815	none
15851	-196.94	20.733215	-156.678017	none
15852	-175.94	20.73315	-156.673218	none
15853	-133.47	20.733085	-156.66842	none
15854	-173.96	20.73302	-156.663621	none
15855	-149.36	20.732954	-156.658823	none
15856	-154.52	20.732889	-156.654024	none
15858	-170.31	20.732758	-156.644427	none
15859	-141.01	20.732692	-156.639629	none
15860	-151.4	20.732626	-156.634831	none
15863	-166.68	20.732427	-156.620435	none
15864	-149.52	20.732361	-156.615637	none
15865	-174.46	20.732294	-156.610839	none

15866	-138.86	20.732228	-156.606041	none
15968	-137.48	20.738434	-156.730734	none
15970	-148.62	20.738307	-156.721137	none
15972	-180.85	20.738179	-156.711539	none
15973	-174.09	20.738115	-156.70674	none
15974	-161.82	20.738051	-156.701941	none
15975	-162.64	20.737987	-156.697143	none
15976	-195.16	20.737923	-156.692344	none
15978	-193.98	20.737794	-156.682746	none
15979	-158.92	20.737729	-156.677948	none
15980	-144.07	20.737664	-156.673149	none
15981	-125.38	20.737599	-156.66835	none
15982	-134.83	20.737534	-156.663552	none
15983	-137.61	20.737468	-156.658753	none
15984	-147	20.737403	-156.653955	none
15985	-184.67	20.737338	-156.649156	none
15986	-144.63	20.737272	-156.644357	none
15987	-109.53	20.737206	-156.639559	none
15988	-137.36	20.73714	-156.63476	none
15989	-165.32	20.737074	-156.629962	none
15990	-166.96	20.737008	-156.625163	none
15991	-134.28	20.736941	-156.620365	none
15992	-144.22	20.736875	-156.615566	none
15993	-152.02	20.736808	-156.610768	none
15994	-126.74	20.736742	-156.60597	none
16088	-188.42	20.742694	-156.711471	none
16090	-179.23	20.742566	-156.701873	none
16092	-178.65	20.742437	-156.692275	none
16093	-184.44	20.742372	-156.687477	none
16094	-148.33	20.742308	-156.682678	none
16095	-117.16	20.742243	-156.677879	none
16096	-138.13	20.742178	-156.67308	none
16097	-132.99	20.742113	-156.668281	none
16098	-158.78	20.742048	-156.663482	none
16099	-149.51	20.741983	-156.658684	none
16100	-148.33	20.741917	-156.653885	none
16101	-176.29	20.741852	-156.649086	none
16102	-149.91	20.741786	-156.644288	none
16104	-107.48	20.741654	-156.63469	none
16105	-129.78	20.741588	-156.629892	none
16106	-147.74	20.741522	-156.625093	none

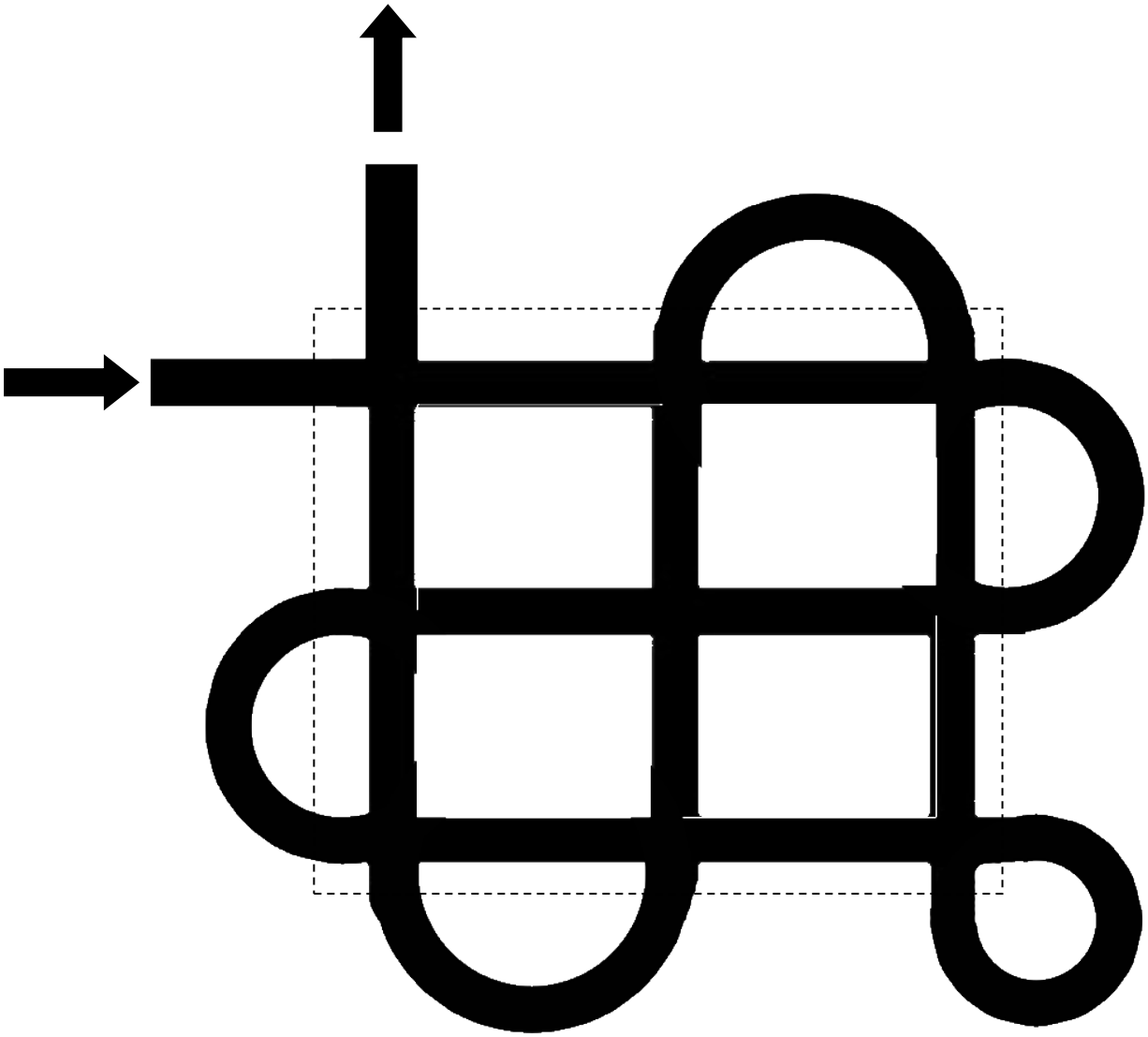
16107	-113.9	20.741455	-156.620294	none
16108	-103.51	20.741389	-156.615496	none
16109	-112.98	20.741322	-156.610697	none
16110	-123.5	20.741256	-156.605899	none
16111	-150.06	20.741189	-156.6011	none
16199	-178.05	20.747208	-156.711403	none
16200	-177.2	20.747144	-156.706604	none
16202	-155.31	20.747016	-156.697006	none
16203	-151.66	20.746951	-156.692207	none
16206	-143.59	20.746757	-156.67781	none
16207	-150.83	20.746692	-156.673011	none
16208	-133.19	20.746627	-156.668212	none
16210	-160.17	20.746497	-156.658614	none
16213	-136.22	20.7463	-156.644218	none
16216	-105.59	20.746102	-156.629821	none
16217	-109.14	20.746036	-156.625022	none
16218	-113.82	20.745969	-156.620224	none
16219	-109.25	20.745903	-156.615425	none
16221	-92.62	20.74577	-156.605827	none
16222	-95.28	20.745703	-156.601029	none
16304	-159.78	20.75185	-156.720934	none
16305	-153.64	20.751786	-156.716134	none
16308	-161.44	20.751594	-156.701737	none
16309	-110.19	20.75153	-156.696938	none
16310	-113.97	20.751466	-156.692138	none
16311	-119.36	20.751401	-156.687339	none
16312	-123.9	20.751336	-156.68254	none
16313	-115.31	20.751272	-156.677741	none
16314	-114.05	20.751207	-156.672942	none
16315	-112.39	20.751142	-156.668143	none
16316	-129.74	20.751076	-156.663344	none
16317	-150.12	20.751011	-156.658545	none
16318	-154.58	20.750946	-156.653746	none
16320	-119.51	20.750814	-156.644148	none
16409	-146.12	20.756364	-156.720866	none
16410	-147.37	20.7563	-156.716067	none
16411	-150.86	20.756237	-156.711267	none
16412	-123.15	20.756173	-156.706468	none
16413	-128.86	20.756108	-156.701668	none
16415	-114.34	20.75598	-156.69207	none
16416	-148.14	20.755915	-156.687271	none

16418	-120.33	20.755786	-156.677672	none
16419	-106.97	20.755721	-156.672873	none
16420	-121.58	20.755656	-156.668074	none
16421	-133.67	20.755591	-156.663274	none
16422	-143.45	20.755525	-156.658475	none
16423	-139.22	20.75546	-156.653676	none
16512	-118.48	20.760942	-156.725598	none
16518	-122.26	20.760558	-156.696801	none
16519	-129.22	20.760494	-156.692001	none
16521	-123.21	20.760365	-156.682402	none
16522	-111.54	20.7603	-156.677603	none
16524	-123.55	20.76017	-156.668004	none
16525	-137.7	20.760105	-156.663205	none
16526	-138.73	20.760039	-156.658406	none
16527	-124.7	20.759974	-156.653606	none
16611	-115.47	20.765457	-156.72553	none
16612	-107.84	20.765393	-156.720731	none
16618	-115.52	20.765008	-156.691933	none
16621	-135.74	20.764814	-156.677534	none
16622	-113.24	20.764749	-156.672734	none
16704	-108.25	20.77035	-156.754262	none
16711	-115.11	20.769907	-156.720663	none
16716	-126.96	20.769587	-156.696664	none
16718	-126.55	20.769458	-156.687064	none
16719	-132.64	20.769393	-156.682265	none
16720	-115.59	20.769328	-156.677465	none
16813	-110.61	20.77423	-156.706195	none
16816	-118.44	20.774037	-156.691795	none
16817	-120.87	20.773972	-156.686996	none
16818	-104.73	20.773907	-156.682196	none
16820	-121.03	20.773778	-156.672596	none
16821	-89.77	20.773712	-156.667796	none
16900	-94.99	20.779567	-156.768529	none
16901	-101.88	20.779504	-156.763729	none
16902	-107.17	20.779442	-156.758929	none
16903	-109.86	20.779379	-156.754129	none
16904	-89.58	20.779316	-156.749328	none
16906	-100.46	20.77919	-156.739728	none
16913	-85.29	20.778744	-156.706127	none
16914	-99.38	20.77868	-156.701327	none
16916	-105.51	20.778551	-156.691727	none

16917	-104.38	20.778486	-156.686927	none
16919	-112.04	20.778357	-156.677327	none
16920	-91.02	20.778292	-156.672527	none
17001	-78.36	20.783767	-156.744461	none
17002	-100.83	20.783704	-156.739661	none
17003	-115.74	20.783641	-156.73486	none
17012	-101.98	20.783065	-156.691658	none
17013	-89.86	20.783001	-156.686858	none
17014	-100.09	20.782936	-156.682058	none
17015	-88.56	20.782871	-156.677258	none
17097	-87.82	20.788219	-156.739593	none
17098	-99.71	20.788155	-156.734793	none
17106	-86.69	20.787644	-156.69639	none
17195	-91.96	20.792351	-156.710723	none
17197	-83.91	20.792223	-156.701122	none
17271	-89.13	20.797625	-156.768264	none
17272	-85.52	20.797562	-156.763463	none
17273	-79.37	20.7975	-156.758662	none
17277	-74.51	20.797248	-156.739459	none
17281	-74.1	20.796993	-156.720256	none
17283	-79.94	20.796865	-156.710655	none
17284	-93.73	20.796801	-156.705854	none
17356	-58.88	20.802139	-156.768197	none
17357	-68.44	20.802077	-156.763396	none
17358	-71.56	20.802014	-156.758595	none
17359	-80.18	20.801951	-156.753794	none
17360	-72.29	20.801888	-156.748993	none
17361	-74.48	20.801825	-156.744193	none
17362	-72.85	20.801762	-156.739392	none
17365	-77.09	20.801571	-156.724989	none
17367	-107.88	20.801444	-156.715387	none
17368	-91.18	20.80138	-156.710586	none
17438	-75.44	20.80634	-156.744125	none
17439	-92.73	20.806276	-156.739324	none
17442	-80.62	20.806086	-156.724921	none
17443	-96.01	20.806022	-156.72012	none
17444	-101.59	20.805958	-156.715319	none
17509	-63.85	20.810791	-156.739257	none
17515	-96.91	20.810408	-156.71045	none
17586	-69.03	20.814987	-156.715183	none
17587	-66.39	20.814923	-156.710382	none

17658	-69.26	20.819437	-156.710314	none
17730	-72.97	20.824079	-156.719849	none
17801	-72.02	20.828594	-156.719781	none
17868	-65.41	20.833426	-156.743722	none
17945	-72.65	20.838192	-156.762863	none
17946	-70.14	20.83813	-156.758061	none
18035	-72.12	20.842581	-156.753192	none
18123	-67.53	20.847158	-156.757927	none
18124	-71.44	20.847095	-156.753125	none
18132	-62.04	20.846587	-156.714706	none
18133	-71.71	20.846523	-156.709904	none
18215	-62.73	20.851861	-156.772268	none
18216	-68.01	20.851798	-156.767465	none
18226	-60.62	20.851165	-156.71944	none
18227	-73.78	20.851101	-156.714638	none
18310	-68.57	20.856375	-156.772201	none
18320	-56.96	20.855743	-156.724175	none
18418	-71.04	20.860258	-156.724107	none
18421	-57.65	20.860066	-156.709699	none
18612	-54.22	20.86935	-156.728774	none
18708	-51.38	20.874308	-156.762329	none
18817	-57.3	20.878633	-156.747852	none
18818	-53.72	20.87857	-156.743048	none
18929	-59.76	20.882829	-156.723767	none
18930	-55.65	20.882765	-156.718963	none

Appendix 3 Acoustic Survey Path. For each 500 meter by 500 meter survey area (denoted by the dash line), the following acoustic pattern will be performed by the Sette. Start and end points of pattern can be interchanged and/or rotated as necessary.



Appendix 4. Standard Operating Procedures for Launch and recovery of SeaBED class Autonomous Underwater Vehicle from a Stalwart class (T-AGOS) NOAA Vessel

AUV specifications

The AUV is approximately 600 lbs and 6ft long and 5.5 ft high. While on deck the AUV sits in wooden cradle (Fig. 1). The AUV is tied to stanchions on deck or to rail in order to keep the AUV upright (Fig. 2).

Fig. 1. AUV Lucille being placed in cradle on deck.

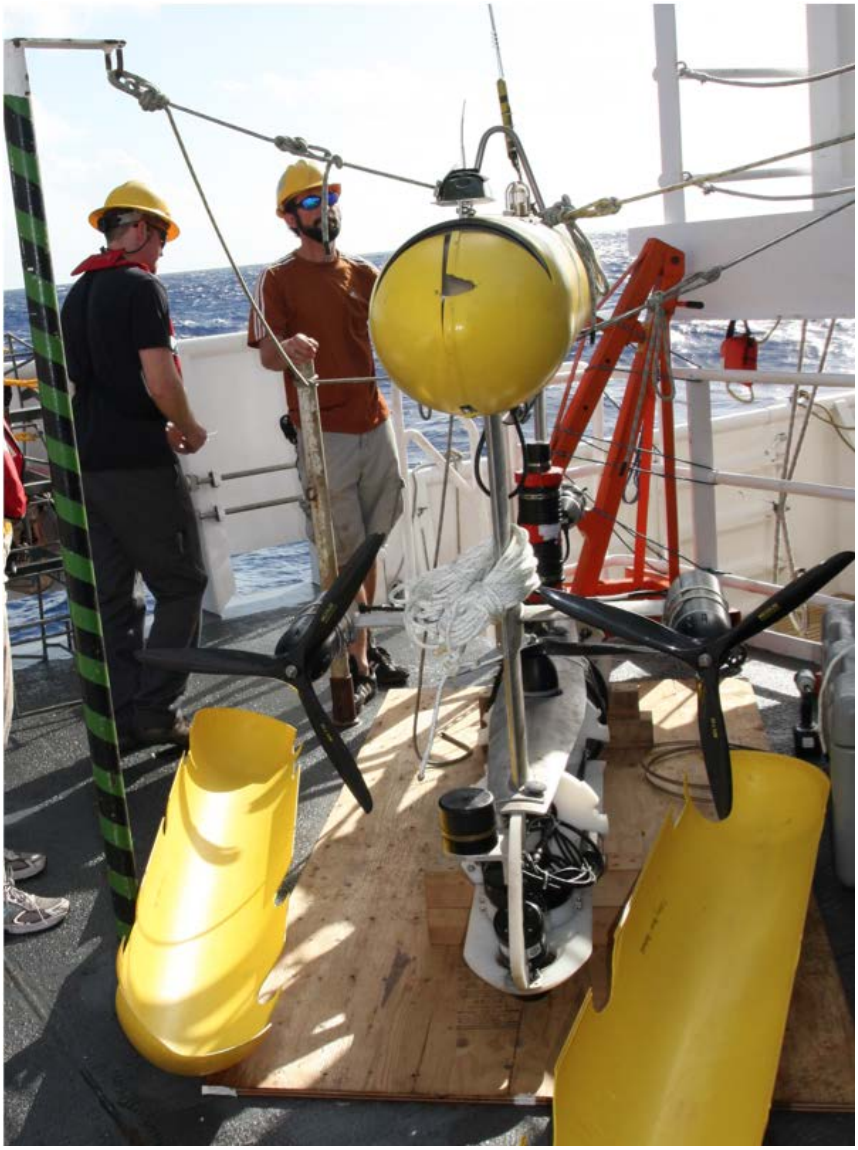


Fig. 2. AUV on deck tied to stanchions with lower skins off

Prior to Deployment

Prior to deploying the AUV each morning, a standard GAR Operational Risk Assessment is conducted with all parties involved in AUV deployment and recovery.

Deploying the AUV

Equipment needed on deck prior to deployment are:

- One pole with pusher attached (Fig. 3.)
- Safety hook or other vessel specific hook on with line attached for lifting the

AUV that can be released from the AUV once AUV is safely in water

- Two tag lines, one fed through forward bale and one wrapped around rear strut

In preparation for deployment, the Bridge should be asked to approach the deployment site with some room left to drift down onto the site after the AUV is in the water. During this time communications will be established with the AUV. The AUV is usually deployed with 15 -20 minutes remaining for drift to exact deployment site. The pole with transducers can be lowered into the water at this time. PROTOCOLS MUST BE SET UP WITH BRIDGE SO THAT THE SHIP KNOWS WHEN POLE IS IN WATER. SPEEDS OVER A FEW KNOTS WILL DAMAGE TRANSDUCERS SO MAKE SURE THE BRIDGE KNOW IT IS IN WATER AND SPEEDS SHOULD BE KEPT SLOW!

Fig. 3. Early version of "pusher" attached to boat hook.

Five people in addition to the crane operator are needed to safely deploy the AUV. One person (1) is assigned to "run the deck". This person should "man" no lines and should direct the crane operator and watch for safety issues on deck. A safety hook attached to the lifting crane wire should be attached to the bale. One tag line should be fed through the forward bale and one tag line wrapped around the rear strut. One person should man each tag line (2, 3). One person should man the release line to safety hook. (4) At least one person should steady the AUV as lifted and then man the "pusher" after the AUV is safely over the rail. (5). The person should carefully watch the front camera since it rests very close to the wooden cradle and can be bumped if the AUV moves back as it is lifted.

The crane operator will need to be called out one half hour before deployment to allow the deadweight to be attached as well as to attach the skins on the lower pontoon if needed.

Make sure that the pre-deployment checklist is complete. This includes making sure all dummy plugs are in place, the CTD is connected, the new corrodible link is in place, the transducer pole is in place, all on deck crew have on safety equipment (hard hat, life jacket, closed toe shoes).

The individual running the deck should communicate with the bridge and winch operator. Before deployment begins the person running deck should confirm with the bridge that the AUV can be safely deployed. Confirm that all tag lines are manned. Crane operator can then be asked to begin lifting AUV. (Fig. 4)

Fig. 4. Deploying the AUV from the fantail

Once the AUV is floating in the water the vessel can drift onto the deployment site communications are established. At this time the main hook to the crane is released and tag lines and pusher can control the AUV (Fig. 5). The AUV should drift off the starboard quarter at the end of the outrigger, just at or just below the surface. The RF radio antenna mounted on the bow of the AUV must remain above the surface until the mission has started. Once the vessel is on the deployment site the AUV should be started. As soon as the propellers begin to turn the remaining tag line should be slipped. This should be done carefully so that the lines are not caught in the props. Once the mission has started, ready the equipment for recovery.

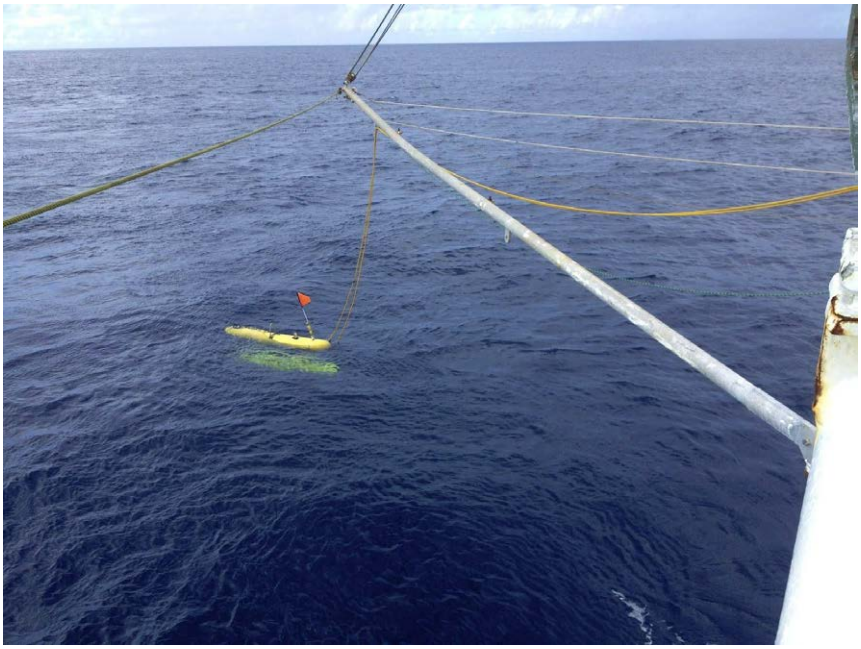


Fig. 5. AUV trailing off the starboard quarter using the outrigger while the Sette drifts to deployment site.

During Mission

One operator should attend the data acquisition software at all times and should monitor messages from AUV as well as the location relative to the vessel. In order to maintain communication it may be necessary to ask Bridge to position ship closer to AUV. The Matlab topside GUI can give an indication of the ship vs. AUV position and can be used to help guide the vessel.

Aborting a mission

Missions can self-abort unexpectedly. Be ready to inform bridge of any unexpected ascents.

If the AUV is not making progress for a considerable amount of time it may be necessary to manually abort mission. After aborting you can declare a new home in python GUI if necessary to maneuver the AUV. You will have to send messages in between its thinking time, usually about 35 seconds after the last message. Note that you can change how often the messages are sent in the sysconfig file.

AUV ascent

Whenever the AUV begins its ascent, whether it is a planned ascent or due to a self-abort by vehicle, inform the Bridge. The vessel should not be so close as to risk the possibility of the AUV surfacing under the vessel. If the water depth is very shallow (less that 250M) there will be very little time between the time the AUV begins its ascent and the time it reaches the surface, so act quickly.

Several individuals should be assigned to assist the bridge in spotting the AUV. The AUV is most easily seen at night by the flashing strobe. For day operations the best indicator is a brightly colored bicycle flag. This can be attached to RF antennae on AUV with cable ties. Once the AUV is at the surface the Matlab topside GUI should be monitored and information given to Bridge and crew as to the relative position of the AUV. Once the AUV is sighted preparations should be finalized for recovery.

Recovering AUV

Equipment Needed for Recovery are:

- One pole with “happy hooker” attached (Fig. 6).
- One pole with pusher attached
- Safety hook or other vessel specific hook either directly attached to a pole or attached to line to which is attached to a happy hooker.

(Note: this equipment should be readied immediately after deployment so all is ready for unplanned surfacing of AUV).

Fig. 6. Happy Hooker attached to pole

To recover the AUV, 5 people are needed on deck in addition to the crane operator. One person should “run the deck” (1) the person “running the deck” should communicate with bridge and winch operator. One person should hook the lifting hook on the main bale (2). One person should user the pusher steady AUV and/or fend off from vessel (3) Two people should hook tag lines on bales and “man” tag line (4,5).

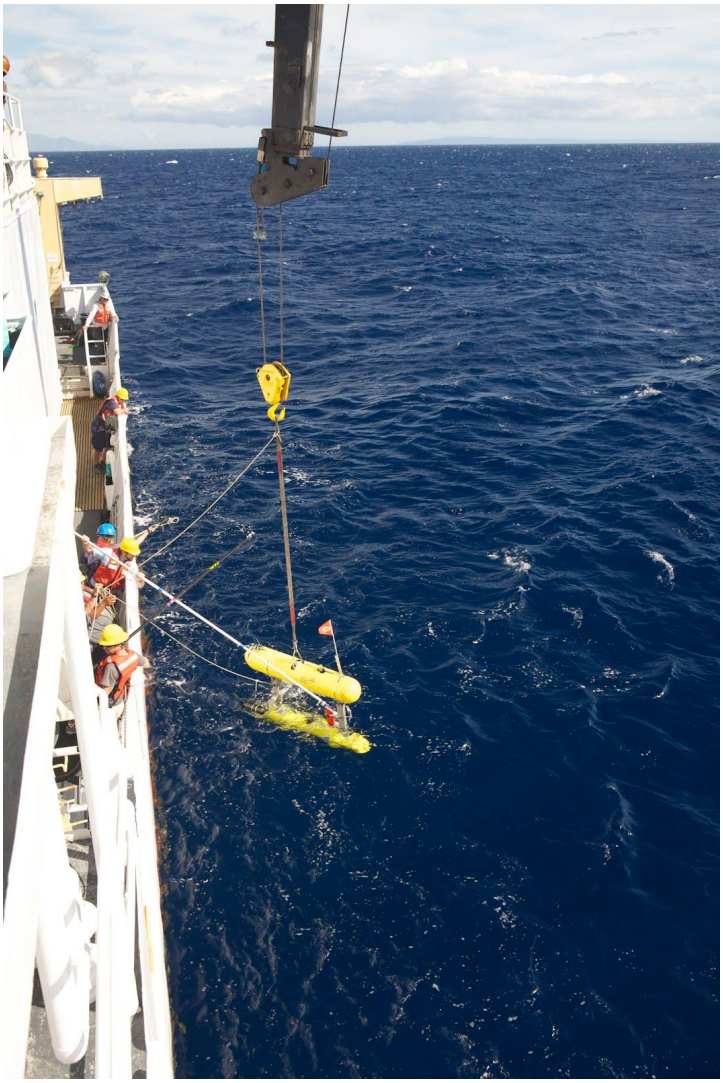


Fig. 7. Ready to lift AUV to recover.

To recover AUV a hook attached to crane or A frame should be hooked onto the main bale either by hooking onto the bale directly from end of boat hook or by hooking a line to the main bale with the happy hooker and pulling the safety hook securely onto the bale. Once the main bale is hooked securely the AUV should be lifted slightly from the water so that a tag line can be hooked on the forward bale and aft bales with happy hookers. The AUV should be steadied with a pusher while the bales are being hooked. The AUV can be lifted from the water with the tag lines and one pusher steadying the AUV (Fig. 7).

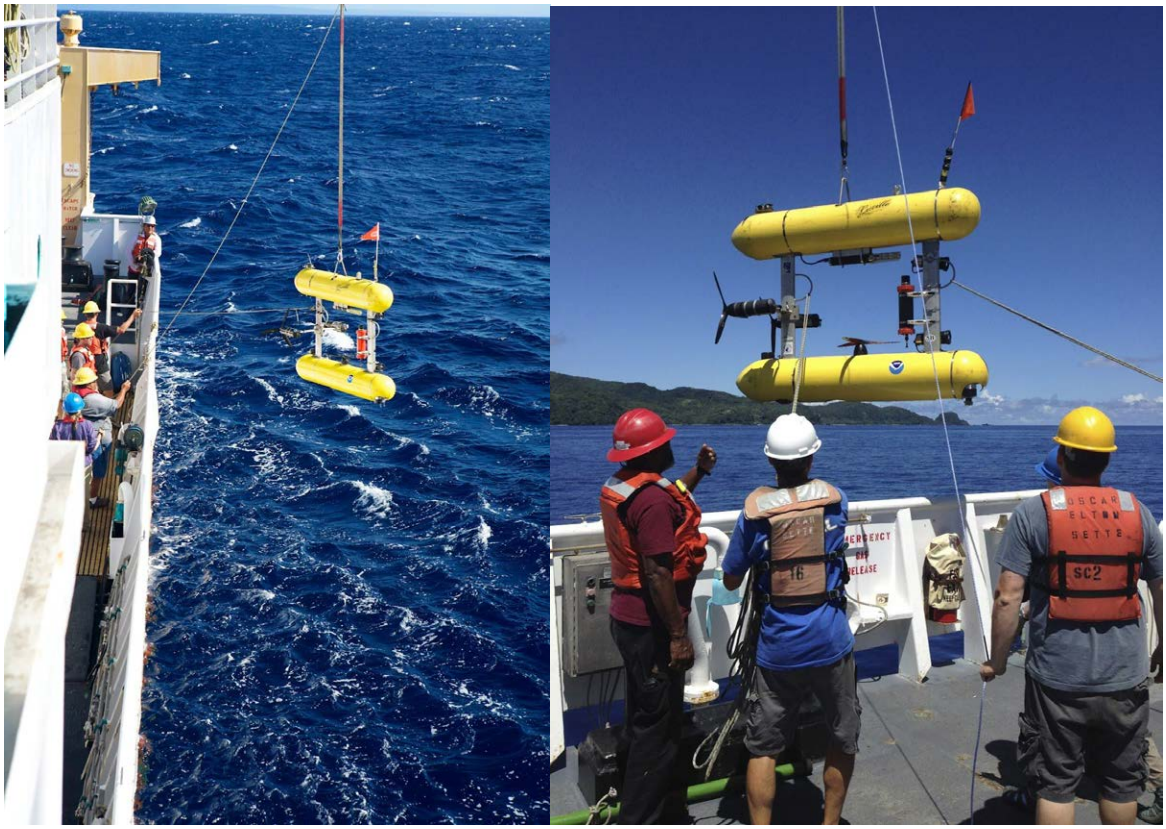


Fig. 7. AUV being brought aboard Oscar Elton Sette.

Watch your feet and hands as the AUV comes over the rail. Be particularly careful to keep feet away from the dead weight that can release unexpectedly during rough recoveries. Watch you don't trip over the AUV cradle as you back away from the rail. Steady the AUV and lower it carefully in the cradle. Watch the forward camera carefully but the AUV must only rest on the areas that are support by the white plastic discs. This is forward disc is slightly aft of the forward camera. Two inches between the block and camera should be ok and will allow for some room for the AUV to move aft during the next deployment. Tie the AUV down!

Injury Response

Any injuries incurred during AUV deployment and recovery operations are handled under the standard vessel Injury Response Plan for the deployment vessel.

Appendix 5. Standard Operating Procedures for Launch and Recovery of a Phantom Class Remotely Operated Vehicle from a Stalwart Class (T-AGOS) NOAA Vessel

ROV and remote control

Narrative

In general, the launch and recovery of the Phantom ROV described in this SOP is similar to a typical survey CTD cast ...

ROV Specifications:

- Deep Ocean Phantom DHD2+2
- Powered by the ship (120v, 50 amp)
- Tether 300m
- Navigation tilt camera
- Depth rated to 1000 FSW (305 meters)

Personnel (Ship crew: 2-5, Science:2-4, Total: 7)

- ROV operation (on deck and wetlab)(science)
- wetlab ROV assistant (watching ROV coms/data collection/position)(science)
- crane operator (deployments and recovery)(ship's crew)
- port side oceanographic winch operator (on winch for the entire survey)(ship's crew)
- tether management at rail also help in ROV deployment/recovery(ship's crew or science)
- tether management at tote and to assist at rail also help in ROV deployment/recovery(ship's crew or science)
- officer on deck to relay coms (ship's crew)

Totals:

Deployment/recovery:

ship's crew: 3-5

science: 2-4

total: 7

During mission:

ship's crew: 2-4

science: 2-4

total: 6

Equipment

- ROV, tether, remote control, deck units, monitors
- monitor on the bridge relaying depth/location information of the ROV and clump weight
- hand held radios (bridge, ROV pilot, deck)
- ship crane
- ship port side oceanographic winch
- clump weight (~250lbs, have 2)
- Over the side pole
- Tracklink USBL receivers and 2 transmitters

Deployment

- determine survey starting depth and check with the bridge to verify location and depth is acceptable
- lower over the side pole (OTSP) into the water and secure
- ready the crane operator, port side oceanographic winch operator and two personnel to launch ROV
- lifting the ROV into the water using ships crane and release with release hook.
- drive ROV to a safe distance away from the ship and maintain distance (~10m)
- lower clump weight into water using port side oceanographic winch(~5m)
- attach ROV tether to oceanographic winch wire (~5m) give the ROV approximately 10m of working distance around the port side oceanographic winch wire
- slowly lower clump weight and ROV to desired survey depth attaching ROV tether to oceanographic winch wire approximately every 5m (depth/location will be displayed on the bridge and ROV control center)

Survey

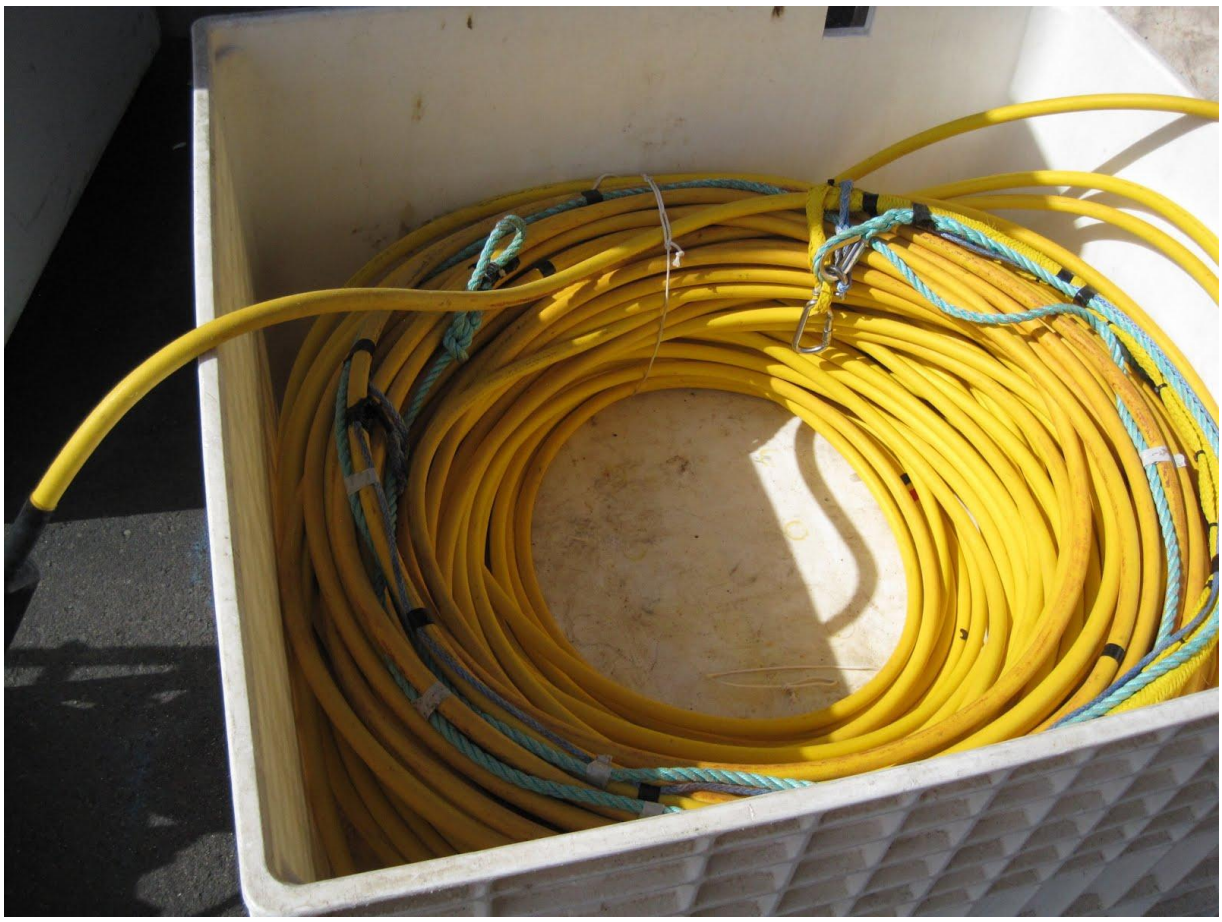
- Water depth, ROV depth, and clump weight depth will be monitored to maintain safe working distance
- the ship will be asked to maintain a directed drift over survey (safe top speed has not been determined) area keeping the oceanographic winch wire from going under the ships hull
- one person will need to remain at the ships rail to attach/detach ROV tether from port side oceanographic winch wire
- one person will be needed to maintain the ROV tether
- one person will need to remain at the winch control maintaining the clump weight depth
- ROV pilot will be inside controlling the ROV, monitoring clump weight/ROV depth/location and relaying depth changes to the winch operator

Recovery

- communicate to the bridge and winch operator that the survey to over and the ROV is ready to ascend
- allow bridge time to set up for recovery
- winch operator will slowly bring the clump weight to the surface
- one person will be detaching the ROV tether from the oceanographic winch wire
- one person will be coiling the ROV tether into its tote
- ROV pilot will drive the ROV to the surface maintaining the same depth as the clump weight and located on the seaward side of the clump weight
- when the ROV and clump weight reach the surface, detach ROV tether from port side oceanographic winch wire and bring clump weight aboard/stow
- ROV will remain at a safe distance until tether is connected to the crane and ready to be craned aboard
- crane ROV aboard and stow, will require cane operator and two people to steady the ROV

Photos:

Remote control



ROV Tether

ROV deck unit and monitors