



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Fisheries Science Center
2725 Montlake Boulevard East
Seattle, WA 98112-2097

Project Instructions

Date Submitted: August 16, 2016


Platform: NOAA Ship *Bell M. Shimada*

Project Number: SH-16-12 (NWFSC)

Project Title: Northern California Current Ecosystem Survey

Project Dates: October 5, 2016 to October 16, 2016

Prepared by:  Dated: 10/3/16
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Chief Scientist
Cooperative Institute for Marine Resources Studies/Oregon State University

Approved by:  Dated: 9/30/16
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Approved by:  Dated: 9/30/2016
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Science & Research Director
Northwest Fisheries Science Center

Approved by: _____ Dated: _____
Commander Brian W. Parker, NOAA
Commanding Officer
NOAA Marine Operations Center – Pacific



I. Overview

A. **Brief Summary and Project Period.** This project continues long-term studies of the Northern California Current (NCC) pelagic ecosystem and includes study of broad-scale patterns of hydrography, phytoplankton and zooplankton and ocean acidification/hypoxia in the NCC Large Marine Ecosystem off Oregon and Washington. Ecosystem studies were initiated in 1996, and studies of ocean acidification/hypoxia were initiated in 2010.

B. Days at Sea (DAS)

Of the 12 DAS scheduled for this project, 12 DAS are funded by a Line Office Allocation. This project is estimated to exhibit a medium Operational Tempo.

C. **Operating Area.** Transect sampling in continental shelf and slope waters from Bodega Bay (38.3°N) to Cape Meares (45.5°N) including long transect lines out to 200 nm off Crescent City, CA and Newport, OR.

D. **Summary of Objectives.** Our routine ecosystem survey will make hydrographic measurements with a CTD, collect water samples for chemical analyses with a Niskin bottle rosette, and collect zooplankton samples with towed plankton nets at an array of stations along transect lines extending across the Oregon and the northern California coast.

E. **Participating Institutions.** Scientists are from NOAA/NMFS/NWFSC, NOAA/PFEL, Oregon State University, and Pacific States Marine Fisheries Commission.

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

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Jennifer Fisher	Chief Sci.	Oct 4 2016	Oct 16 2016	F	Oregon State Univ.	USA
Toby Auth	Scientist	Oct 4 2016	Oct 16 2016	M	Pacific States Marine Fish Comm	USA
Sam Zeman	Scientist	Oct 4 2016	Oct 16 2016	F	Oregon State Univ.	USA
Kelly Curtis	volunteer	Oct 4 2016	Oct 17 2016	F	WA Dept of Health	USA
Holly Calvert	volunteer	Oct 4 2016	Oct 17 2016	F	WA Dept of Health	USA
Anthony Odell	HAB scientist	Oct 4 2016	Oct 17 2016	M	Univ. WA	USA

G. Administrative

1. Points of Contacts: (1) Jennifer Fisher, Oregon State University, Hatfield Marine Science Center, Newport Oregon 541 867 0349 (o), 541 961 4437 (mobile), jennifer.fisher@noaa.gov (2) William Peterson, NOAA/NWFSC, Hatfield Marine Science Center, Newport Oregon. Contact Info: 541 867 0201 (o), 541 961 2972 (mobile), bill.peterson@noaa.gov

Operations Officer: LT Sara Sheehan (541-867-8923) NOAA Ship *Bell M. Shimada* (OPS.Bell.Shimada@noaa.gov)

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

None Required, project is collecting plankton, not vertebrates.

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.

Project Itinerary: We will conduct standard CTD casts and plankton net tows at each station. Station locations are listed at the end of this project plan;

05 Oct 2016 Depart San Diego and transit to first sampling location at 38.3°N where we will begin our sampling grid.

16 Oct 2016 Arrive in Newport, OR

B. Staging and Destaging:

Will be done partially at MOC-P in Newport with final loading in San Diego.

Loading at MOC-P Newport will occur August 18 and in San Diego Oct 4. Unloading will occur after an Oct 16 arrival (high tide) at approximately 1400 MOC-P Newport.

C. Operations to be conducted:

The following operations will occur throughout the day (i.e. 24 hr. operations). CTD, vertical net, and bongo net will be sampled once at each station. Stations will be sampled sequentially and the order of stations (onshore to offshore, or offshore to onshore) and transects will be dependent on weather and determined the day prior to departure and might be modified underway. The number of stations sampled within each day will be dependent on the water depth (wire time) and transit time between stations (some stations are close together while others are farther apart).

Order of operations at each station are as follows:

At each station we will conduct a CTD cast and collect water samples from 10 Liter Niskin bottles on the CTD Rosette. Maximum depth for CTD operations will be 1000 m in deep water stations although the majority will be only to 500 m. In shallow waters, CTD casts should be within 5 m of the bottom, weather permitting. Wire speed on the downcast is 30 m/min until 100 m and then can be increased as the Survey Tech allows.

Following the CTD cast, at each station, we will collect a 0.5 m vertical net sample while the ship is still stationary. This net will be deployed vertically to 100 m or within 3 meters of the bottom if shallower than 100 m with a wire speed on deployment and recovery of 30 m/min.

Following the vertical net, at each station, we will collect a bongo net tow while the ship is travelling approximately 1.5 kts. The bongo net is deployed obliquely to 100 m (approximately 140 m of wire out) then hauled back to the surface with a wire speed on deployment and recovery of 30 m/min. In water depths less than 100 m depth, the tows will be from within 5 m of the bottom to the surface. On the NH Line, we will do 'shallow' bongo net tows, sampling just the upper 30 m (40 m wire out) at the shelf stations (NH01 – NH25).

D. Dive Plan

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations: We expect to encounter poor weather conditions and will adjust our work accordingly. We understand that there may be equipment failures and other unforeseen circumstances that may lead to loss of opportunities to complete our work at sea. This is the nature of our business. All weather related decisions will be made in consult with the Commanding Officer. The Commanding Officer may require stations to be moved or delayed to maintain his/her comfort margin for safety. As the ship nears each station, the operation will be evaluated, along with prevailing weather, functionality of ship's systems, vessel traffic, and proximity to hazards. The Chief Scientist will be notified of all changes.

III. Equipment

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

1. Hydrographic winch with conducting cable, with CTD attached.
2. Seabird 9/11 CTD system with oxygen sensor (SBE-43) and Wetlabs fluorometer, and rosette with 10 Liter Niskin bottles. We would like to have 12 bottles mounted on the rosette if possible.
3. Hydrographic winch with bare wire operated over starboard side for vertical plankton net tows and Bongo tows.
4. Continuous underway measurements of conductivity, temperature and fluorescence using the ship's flow-through system.

5. Freezer space for storage of small plastic bottles (125 ml) frozen for later analysis of nutrient concentration in sea water and for storage of chlorophyll samples and other water samples. We will need access to the -80°C freezer as well as the regular -20°C freezer.
6. Saltwater hose with spray nozzle that will be used to wash down plankton nets.
7. Scientific Computing System for logging of all operations.
8. We would like the Simrad EK60 acoustics system and ADCP to be operational and to have all data logged.
9. We would like to use the temperature controlled room in the wet lab that must maintain constant temperatures of approximately 8-12°C.

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

Category	Shimada Oct 2016	Amt
Deck	cooler, rectangle (red)	1
Deck	hose	1
Deck	hose nozzles	2
Deck	sample processing, crate to hold supplies on deck	1
Deck	sample processing, funnels	3
Deck	sample processing, kneeling pads	1
Deck	sample processing, rulers	2
Deck	sample processing, sieve 150µm (vertical net)	1
Deck	sample processing, sieve 280µm (bongo net)	1
Deck	wire angleometer (mounted on cutting board) (in Office Box)	1
Deck (nets etc.)	1/2 m ring net, with codend and TSK #7179 flowmeter	1
Deck (nets etc.)	Bongo 60cm: net frame, nets, codends, GO #20227 flowmeter	1
Deck (nets etc.)	codend with collar, white, for 1m net or bongo	1
Deck (nets etc.)	net mending supplies: needles, dental floss, scissors (w/spare nets)	yes
Deck (nets etc.)	spare, 1/2 m net codend	1
Deck (nets etc.)	spare, Bongo codend (n=3) with collar (n=2)	yes
Deck (nets etc.)	spare, Bongo nets	2
Deck (nets etc.)	spare, flowmeter, GO #16943	1
Deck (nets etc.)	spare, flowmeter, TSK #7187	1
Deck (nets etc.)	stainless hardware - shackles (n=3), quick links (n=2) (w/spare nets)	yes
Deck (nets etc.)	weight, ~80lb, for bongo & 1/2m net	1
Electronics	freezer, portable -80C	1
Electronics	hard drive, portable, w/cord	1
Electronics	power strip	1
Electronics	SensusUltra pressure sensor for bongo net	1
Electronics	SensusUltra reader for uploading data & software	1
Jars 1	jar, 1/2 pint	90
Jars 2	jar, pint	55
Jars 3	jar, quart (skippy, 32 oz)	16
Jars 4	jar, 1/2 gallon	3
Lab	Jennifer's sorting supplies	1
Lab	microscope, dissecting, Leica #5178210 (designated cruise scope)	1

Lab	microscope, light source	yes
Lab	splitter, four-chamber	1
Office	binder, CTD/Net Tows	1
Office	binder, Event Log	1
Office	clipboards	3
Office	lead refills for automatic pencils (0.7 mm)	yes
Office	Post-It notes	yes
Office	tape, electrical, yellow & white	yes
Office	writing implements: pens, pencils, sharpies	yes
Safety	EPIRBs for all scientists	1
Safety	SDS binder (in Office Box)	yes
Safety	spill cleanup - Spillfyter, absorbent pillows (clear tote with blue lid)	yes
Set-up	tie-down supplies (screw eyes, bungis, nonskid mats, etc.)	yes
Water samples	aluminum foil	2
Water samples	bottles, 125ml, for whole-water phytoplankton samples	14
Water samples	bottles, 1L, brown, numbered, for collecting water from CTD	5
Water samples	bubble wrap to pack around filter rig vacuum bottle	yes
Water samples	filter forceps	1
Water samples	filter rig: manifolds	2
Water samples	filter rig: pump	1
Water samples	filter rig: spare connectors (in 8oz jar)	yes
Water samples	filter rig: spare tubing (in Ziploc bag)	yes
Water samples	filter rig: towers & bases	6
Water samples	filter rig: vacuum bottle w/tubing	1
Water samples	filters, GF/F, 2.5 cm	~220
Water samples	graduated cylinder, 100ml	2
Water samples	Kimwipes, small	2 boxes
Water samples	microscope bulbs, spare	1
Water samples	Nitrile gloves, large	1
Water samples	wash bottle for rinsing chl funnels	2
Water samples	Ziploc bags, gallon size	1
Water samples	Ziploc bags, quart size	1
Jelly sampling	Dip net	1
Plywood sheet	(approximately 6' in length)	1

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, SDS, 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 SDS 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. SDS 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. \

A. Inventory.

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Formaldehyde solution (37%)	6 x 900ml squeeze bottles	For preserving plankton samples	Jennifer Fisher	F
Lugol's Solution (4%)	1 liter	Plankton preservation	Jennifer Fisher	EL
mercuric chloride	<30 ml	Water preservative	Jennifer Fisher	MC

C. Chemical safety and spill response procedures

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 using “PIG Pillows”.
- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with vermiculite and place in a chemical waste container.
- We will use “Spilfyter 480001” absorbent material to contain the spill.

EL: Lugol’s

- Ventilate area. There is no “kit”; small spills (a few ml) may be wiped up with paper towels then towels placed in chemical hood until dry after which they can be disposed. Larger spill can be handled similarly except that we will also have an absorbent pillow or vermiculite that can be used.

MC: Mercuric chloride

- If spilled, wear gloves, soak up with paper towel and dispose in Ziploc bag

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Spilfyter 480001	3 x 2 lb bottles	Formaldehyde	> 12 liters
Respirators	2	Formaldehyde	
Gloves	2 pair	Formaldehyde, alcohol, acids	
Plastic bags	6	Storage and disposal of used absorbent materials	

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials.

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary (“Piggyback”) Projects

Opportunistic sampling of jellyfish. Our target species are 1) *Chrysaora fuscescens* (Sea nettles) 2) *Aurelia labiata* (Moon Jelly), and 3) *Aequorea spp.* (Crystal Jelly)

Jelly Collection: At station when the ship is stationary, scan for jellyfish for 5-10 minutes to. If jellies abundant, we will use a long-handled pole to dip-net any *Chrysaora fuscescens* or other target species from the surface. The jelly will be placed into an appropriate sized zip-lock bag and the bag will be filled with filtered seawater to completely submerge the jelly. Label appropriate station details on the bag. The jellies will be preserved in a -80°C freezer. I would like a maximum of 10 jellies per station chosen randomly with respect to size. If the ‘bite is on’ and time permits, it would be ideal to continue to dip-net jellies after operations are complete.

- 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. We will allocate data as required once protocols are developed by OMAO.

- 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 short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.
- D. Project Evaluation Report: Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at <http://www.oma.noaa.gov/fleeteval.html> and provides a "Submit" button at the end. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. 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. There are no special dietary requirements for the science party.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

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 – 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

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 e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged at least 30 days in advance.

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

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

IX. Appendices

1. List of station locations

Transect	Station	Depth (m)	Latitude	Longitude
Bodega Bay	BB01	39	38.310	-123.088
Bodega Bay	BB1.5	80	38.290	-123.136
Bodega Bay	BB02	100	38.272	-123.188
Bodega Bay	BB03	120	38.234	-123.289
Bodega Bay	BB04	230	38.196	-123.401
Trinidad Head	TH01	35	41.05833	-124.204
Trinidad Head	TH02	75	41.05833	-124.267
Trinidad Head	TH03	140	41.05833	-124.342
Trinidad Head	TH04	410	41.05833	-124.433
Trinidad Head	TH05	780	41.05833	-124.583
Crescent City	CC01	39	41.903	-124.301
Crescent City	CC02	63	41.897	-124.392
Crescent City	CC03	117	41.899	-124.502
Crescent City	CC04	495	41.899	-124.607
Crescent City	CC05	645	41.899	-124.701
Crescent City	CC06	687	41.899	-124.801
Crescent City	CC07	852	41.900	-125.000
Crescent City	CC08	2745	41.897	-125.197
Crescent City	CC10	2948	41.901	-125.666
Crescent City	CC11	3400	41.901	-125.999
Crescent City	CC125	3259	41.903	-126.505
Crescent City	CC150	3000	41.901	-126.999
Rogue River	RR07	3013	42.500	-125.203
Rogue River	RR06	1866	42.503	-125.000
Rogue River	RR05	1000	42.501	-124.900
Rogue River	RR04	550	42.501	-124.800
Rogue River	RR03	160	42.500	-124.699
Rogue River	RR02	88	42.500	-124.601
Rogue River	RR01	38	42.501	-124.499
Coos Bay	FM01	36	43.221	-124.432
Coos Bay	FM03	60	43.220	-124.498
Coos Bay	FM04	84	43.225	-124.590
Coos Bay	FM05	158	43.221	-124.670
Coos Bay	FM06	310	43.212	-124.745
Heceta Head	HH07	1600	44.001	-125.198
Heceta Head	HH05	950	44.000	-125.001
Heceta Head	HH04	100	44.001	-124.798
Heceta Head	HH03	150	44.001	-124.604
Heceta Head	HH02	115	44.001	-124.399
Heceta Head	HH01	52	44.001	-124.199
Newport Hydrographic	NH01	30	44.652	-124.100
Newport Hydrographic	NH03	48	44.652	-124.130
Newport Hydrographic	NH05	60	44.652	-124.175
Newport Hydrographic	NH10	80	44.652	-124.295

Newport Hydrographic	NH15	90	44.652	-124.412
Newport Hydrographic	NH20	140	44.652	-124.528
Newport Hydrographic	NH25	296	44.652	-124.650
Newport Hydrographic	NH35	700	44.652	-124.883
Newport Hydrographic	NH45	670	44.652	-125.117
Newport Hydrographic	NH65	1600	44.652	-125.600
Newport Hydrographic	NH85	2850	44.652	-126.050
Newport Hydrographic	NH105	2900	44.652	-126.551
Newport Hydrographic	NH125	2900	44.650	-127.000
Newport Hydrographic	NH150	3000	44.651	-127.590
Newport Hydrographic	NH175	2900	44.651	-128.178
Newport Hydrographic	NH200	3000	44.650	-128.772
Cape Meares	CM05	80	45.480	-124.090
Cape Meares	CM10	135	45.480	-124.200
Cape Meares	CM15	179	45.480	-124.320
Cape Meares	CM20	238	45.480	-124.440
Cape Meares	CM25	457	45.480	-124.560

2. Rudimentary map of sample stations

