UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering
7600 Sand Point Way NE
Seattle, WA 98115

Project Instructions

Date Submitted:	March 17, 2016
Platform:	NOAA Ship *Oscar Dyson*
Project Number:	DY-16-08 (OMAO)
Project Title:	Acoustic-trawl survey of the eastern Bering Sea shelf and Cape Navarin area of Russia.
Project Dates:	12 June - 17 August 2016

Prepared by: Taina Honkalehto Dated: 3/17/2016
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Approved by: Douglas DeMasters Dated: 3/18/16
Dr. Douglas P. DeMaster,
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Alaska Fisheries Science Center

Approved by: Digitally signed by PARKER.BRIAN.W.1076514042 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=PARKER.BRIAN.W.1076514042 Date: 2016.05.05 16:03:59 -07'00' Dated: May 5, 2016
Commander Brian Parker, NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

A. Brief Summary and Project Period: Acoustic-trawl survey, 12 June -17 August 2016

B. Days at Sea (DAS)

1. Of the 62 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 62 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency Funded. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area: Eastern Bering Sea shelf from north of Port Moller, AK to Cape Navarin area, Russia (see Appendix A).

D. Summary of Objectives: (1) collect acoustic-trawl (AT) data necessary to determine the distribution, biomass, and biological composition of walleye pollock, including regularly deploying a stereo-camera system (CamTrawl) in the midwater trawl to optically sample fish; (2) collect target strength data using hull-mounted transducers for use in converting acoustic data to estimates of absolute abundance; (3) calibrate the shipboard EK60 and a temporarily-installed broadband system using standard sphere calibration techniques; (4) collect physical oceanographic data (temperature, salinity, fluorescence and oxygen profiles with associated water samples) at selected sites, and continuously collect sea surface temperature, salinity, fluorescence and oxygen data; (5) conduct trawl hauls (AWT, 83-112, the twice modified Marinovich, hereafter mod2-Marinovich, and Methot) to ground truth multi-frequency acoustic data collection; (6) conduct additional Methot trawl, shipboard, and *in situ* camera sampling of euphausiids (krill); (7) collect broadband acoustic data to evaluate whether detectable differences may exist to estimate pollock sizes and distinguish among major fish taxa; (8) test a Saildrone autonomous acoustic data collection system; (9) collect ambient light measurements (shipboard, underwater) to associate with fish vertical distributions patterns.

E. Participating Institutions: Alaska Fisheries Science Center, Seattle, WA, Pacific Fisheries Research Institute (TINRO-Center), Vladivostok, Russia, Stony Brook University, Stony Brook, NY, University of New Hampshire, Durham, NH

F. Personnel/Science Party:

Leg 1

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Furnish, Scott	IT Specialist	9 June	5 July	Male	AFSC	USA
Jones, Darin	Chief Scientist	9 June	3 July	Male	AFSC	USA

McKelvey, Denise	Fish Biologist	9 June	3 July	Female	AFSC	USA
Phillips, Matthew	Observer	9 June	17 August	Male	AFSC	USA
Ressler, Patrick	Fish Biologist	11 June	3 July	Male	AFSC	USA
Lucca, Brandyn	Graduate Student	11 June	3 July	TBD	Stony Brook University	USA
Warren, Joe	Assistant Professor	11 June	3 July	Male	Stony Brook University	USA
Lauffenburger, Nate	Fish Biologist	9 June	3 July	Male	AFSC	USA

Leg 2 - note roster is preliminary

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Bassett, Chris	Fish Biologist	4 July	25 July	Male	AFSC	USA
De Robertis, Alex	Fish Biologist	4 July	25 July	Male	AFSC	USA
Gallagher, Michael	Oceanographer	4 July	25 July	Male	AFSC	USA
Levine, Robert	IT Specialist	4 July	25 July	Male	AFSC	USA
Loranger, Scott	Graduate Student	4 July	25 July	TBD	UNH	USA
Phillips, Matthew	Observer	12 June	17 August	Male	AFSC	USA
Weber, Tom	Acoustician	4 July	25 July	Male	UNH	USA
Wilson, Chris	Chief Scientist	4 July	25 July	Male	AFSC	USA

Leg 3 - note roster is preliminary

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Honkalehto, Taina	Chief Scientist	27 July	17 August	Female	AFSC	USA
Jones, Darin	Fish Biologist	27 July	17 August	Male	AFSC	USA
Lauffenburger, Nate	Fish Biologist	27 July	17 August	Male	AFSC	USA
McKelvey, Denise	Fish Biologist	27 July	17 August	Female	AFSC	USA
Phillips, Matthew	Observer	12 June	17 August	Male	AFSC	USA
Smirnov, Anatoli	Fish Biologist	2 July	17 August	Male	TINRO	Russia
Towler, Rick	IT Specialist	27 July	17 August	Male	AFSC	USA

G. Administrative

1. Point of Contact: Darin Jones (Chief Scientist leg 1, 206-526-4166, darin.jones@noaa.gov) and Taina Honkalehto (Chief Scientist leg 3, 206-526-4237, Taina.Honkalehto@noaa.gov), 7600 Sand Point Way NE, Seattle, WA 98115.

2. Diplomatic Clearances: Received diplomatic note and clearance pending.

3. Licenses and Permits: This Project will be conducted under a Scientific Research Permit issued by the Alaska Regional Office, National Marine Fisheries Service (SRP 2016-B1), and a Fish Resource Permit issued by the State of Alaska (CF-16-010(1)). The Chief Scientist will be included as an authorized participant on both permits. Prohibited species (Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and Tanner crab) are not to be retained, and will be identified, measured, and returned to sea as soon as possible.

II. Operations

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

A. Project Plan/Itinerary:

Jun 12	Standard sphere calibration Captains Bay, AK.
Jun 12-Jul 3	Leg 1 AT survey of EBS shelf, transit back to Dutch Harbor, AK.
Jul 3-5	In port Dutch Harbor, AK.
Jul 6-25	Transit to survey resume point. Leg 2 AT survey of EBS shelf.
Jul 25-28	In port Dutch Harbor, AK.
Jul 29-Aug 16	Transit to survey resume point. Leg 3 AT survey of remaining EBS shelf transects and Cape Navarin area.
Aug 16	Arrive Dutch Harbor, AK; sphere calibration in Captains Bay, AK.
Aug 17	Debark scientists and offload gear. Project end.

B. Staging and Destaging: Some scientific gear is aboard the vessel already. The remaining gear will need to be transferred from OSI warehouse in Dutch Harbor, AK to the vessel, or will arrive with the science party immediately prior to departure on Leg 1 (10-12 June 2016). Loading this gear at the OSI dock facility would be expeditious. A crane operator from the Dyson's deck crew will be needed. These operations will be coordinated with the Operations Officer and

C.

Commanding Officer. Destaging will take place in Dutch Harbor, AK on or about 17 August 2016; we request that some gear be allowed to remain aboard as has been past practice, but most gear will need to be offloaded for return shipping to Seattle and/or transfers to OSI storage. A crane operator from the Dyson's deck crew will be needed. These operations will be coordinated with the ships Operations Officer and Commanding Officer.

D. Operations to be conducted

1. Underway Operations:

1 A. Survey operations will be conducted 24-hours per day. The primary AT survey operations will be conducted during daylight hours (approximately 17-18 hours per day). Acoustic data will be continuously collected along a series of parallel transects with a Simrad EK60 scientific echo integration system incorporating five centerboard-mounted transducers (18-, 38-, 70-, 120-, and 200-kHz). Operating the following equipment will degrade the quality of the acoustic data:

• Other echosounders or acoustic equipment including the Doppler speed log and bridge Furuno depth sounder

• Bow thruster

It is requested that this equipment not be operated unless necessary to ensure the safe navigation of the vessel or at the discretion of the command. If the equipment is operated, these times will be noted in the ships SCS/electronic MOA.

Parallel transect spacing will be 20 nautical miles (Appendix A). Pending approval to enter Russian territorial waters, transects on leg 3 will extend across the treaty convention US-Russian territorial line into Russian territorial waters near Cape Navarin. If diplomatic clearance is not granted transects will not be extended into Russian territorial waters. Trackline start and end points will be provided in an electronic file to the Navigation Officer. Because the start point of the first trackline of each survey is selected randomly, tracklines will not necessarily match those from prior surveys. The ship is expected to maintain a shaft speed of no less than 105 RPM (averaging 11 to 12 knots) in favorable conditions (as weather, safe operation, and system load of the vessel allow).

Acoustic trawl survey operations require that an Aleutian wing trawl (AWT) midwater and 83-112 bottom trawl be loaded onto the net reels. A spare AWT and 83-112 will serve as backups. Codend liner mesh size will be 0.5" for both the AWT and the 83-112. Fishbuster doors will be used with all trawls. Small fishes or zooplankton may be sampled using fine-mesh nets (e.g. Methot net, mod2-Marinovich trawl). We request that the Chief Boatswain keep a trawl gear logbook to record any modifications made to trawl gear during the Project.

Trawl hauls will be made to identify acoustic backscatter and provide pollock samples and other biological data. Haul duration will be kept to the minimum necessary to ensure an adequate sample. We anticipate that on average 2-3 tows will be conducted during a 24-hour period. Biological data collected from each haul will include species composition, sex composition, length frequencies, whole fish and ovary weights, maturities, and otoliths. Walleye pollock tissue samples will be taken from selected hauls for aging and fecundity studies.

A CamTrawl camera system will be deployed in the intermediate of the midwater trawl to optically sample fish. Prior to being loaded, the AWT will have been modified with an opening in the starboard side panel allowing the attachment of the camera. When the CamTrawl is not attached, the opening shall be sewn shut to prevent fish escapement.

The Scientific Computing System (SCS) will run continuously throughout the Project and will be configured to log data from various sensors at a rate of 1-Hz.

When all trawl operations have been completed for the survey, sufficient time should be allotted for streaming of all trawl nets used during the survey. Trawl nets should be streamed behind the vessel with the codend open to ensure nets are clean and free of fish and other debris for storage. Nets should be visually inspected as they are brought in and any debris still entangled in webbing should be removed.

1B. Target strength data collection will occur on an opportunistic basis. These data are used to validate the relationship between fish length and target strength. Data will be collected when certain conditions (i.e., low fish densities, single species) are encountered. Collecting target strength data typically involves repeated passes over an aggregation of fish at a vessel speed of less than 3 knots. One or two trawl hauls are made to provide species composition and biological data. When calm seas are encountered along with the above-mentioned conditions, a second approach to collecting target strength data may be attempted: with the vessel stopped, a "drop TS" assembly containing a 38-kHz transducer will be lowered to a depth just above the fish sign.

1C. A standard sphere calibration of the centerboard-mounted scientific acoustic systems (18-, 38-, 70-, 120-, and 200-kHz) will be conducted at the start and end of the Project in Captains Bay, AK. This requires anchoring the vessel at the bow and stern or holding position using the ship's dynamic positioning system, and suspending a calibration sphere assembly directly beneath the vessel's centerboard. Which method to use for stabilizing the vessel will be discussed between the Chief Scientist and the Commanding Officer and decided after

evaluating conditions at the calibration site. A CTD cast will be conducted prior to the calibration.

1D. Conductivity-temperature-depth (CTD) data and chlorophyll fluorescence data will be collected with ship's Seabird 911-plus system at selected locations during the daytime and once each night (see Appendix B), including collection of water samples from Niskin bottles. Temperature and depth profile data will be collected with a Seabird SBE39 micro-bathythermograph attached to the trawl headrope. Locations for planned CTD stations will be provided in an electronic file to the Navigation Officer. Sea surface temperature, salinity, and relative fluorescence from the scientific seawater system will be collected continuously throughout the Project and logged with the vessel's Scientific Collection System (SCS). A salinity bottle sample should be taken from the scientific seawater system every other day.

1E. Ifsingle-species aggregations are encountered (e.g. rockfish, euphausiid, capelin), opportunistic trawl hauls (AWT, 83-112, mod2-Marinovich or Methot) may be conducted to ground truth multi-frequency acoustic data collection.

1F. Broadband acoustic backscatter measurements will target pollock aggregations composed of small, medium, or large sized fish as well as non-pollock fish aggregations to determine whether detectable acoustic differences exist among these aggregations as a function of fish size or species composition. Data will be collected with a deadweight broadband echosounder package, which weighs 175 kg. The broadband package will be lowered to just below the ocean surface using the aft hero deck winch during on-station operations or towed at the minimum speed to maintain vessel steerage. Most deployments will occur at night. Broadband transceivers for this package will be mounted on a rack in the Survey Tech office near the splitbeam EK60 transceivers. Echosign will be sampled with confirmation trawling.

1G. Small, self-contained light meters will be attached to a rail on the ship's flying bridge and to the sled for the trawl-mounted sonar(s) (AWT or 83-112) to measure light at the surface and at depth. Mounting hardware will be provided, and equipment will be mounted and downloaded periodically by trained MACE personnel. This project should not impact science operations, or place an additional burden on the deck crew.

1H. On several occasions during the survey, but primarily during Leg 2, the ship will cease survey operations and conduct operations in coordination with a Saildrone autonomous sailing vehicle (see also Appendix C). This work is supported by 2 UxS sea days. The goal of this work is to compare data from ship-

based measurements (EK60, oceanographic and meteorological sensors) as closely as possible with Saildrone systems. This will generally require *Dyson* to follow alongside or behind a Saildrone as closely as conditions and operations safely allow for periods of ~6 hours. In the rare event of a catastrophic failure of a Saildrone which renders one inoperable, *Dyson* may be asked to recover any surviving parts. The work will follow a similar protocol as the one used for work with the Saildrone vehicle in spring 2015.

11. In addition to standard Methot tows as described in 1E, we wish to conduct: a) additional Methot trawls during night time operations in short shallow deployments to collect live euphausiid (krill) specimens for onboard acoustic and laboratory measurements, b) paired oblique Methot deployments with and without a strobe light to measure avoidance of the trawl by krill, and c) measurement of krill *in situ* with lowered stereo camera (see also Appendix D).

E. Dive Plan

It is requested that divers inspect the propeller and hull sensors, either dockside prior to the start of leg 1, or while anchored at the leg 1 calibration site, and record their observations in the most recent MACE-supplied Oscar_Dyson_ acoustic_ sensor_ inspection.xis spreadsheet.

It may be requested to deploy divers during the survey if it is suspected that the propeller has been fouled, at the discretion of the Commanding Officer. If deemed necessary, the ship may return to port or safe anchorage to conduct dive.

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (http://www.ndc .noaa.gov/d r .htm l) and require the approval of the ship's Commanding Officer.

F. Applicable Restrictions:

Conditions which preclude normal operations include: poor weather conditions, equipment failure, safety concerns, and other unforeseen circumstances. The Chief Scientist will confer with the commanding officer to mitigate the impacts of these circumstances on the project goals.

III. Equipment

A. Equipment and Capabilities Provided by the Ship (number is 1 unless specified)

1. Acoustic Equipment
2.

GPS with NEMA 183 to EK60 (2)
50/200 kHz ES60 Bridge sounder
Furuno FE-700 fathometer

3. Trawling Equipment
   3rd wire FS-70 net sonar with winch and accessories (2)
   Simrad ITI net mensuration system (2)
   Furuno CN24 headrope transducer
4. Oceanographic Equipment
   Seabird SBE 911plus CTD System
5. Biological Sampling Equipment
   Fish lab conveyor system
   Catch sorting and weighing table
   Controlled environment room stable at 4°C
   -80°C scientific freezer
   -20°C scientific freezer
   (Due to the high volume of frozen samples collected over the course of the field season, scientific freezers should be solely reserved for storage of scientific samples.)
6. Computing equipment
   Scientific Computing System

B. Equipment and Capabilities Provided by the Scientists (number is 1 unless specified)

1. Acoustic Equipment
   Simrad EK60 system (2)
   Simrad ES18 transducer (2)
   Simrad ES38B transducer (2)
   Simrad ES38DD transducer
   Simrad ES70 transducer
   Simrad ES120-7C transducer (2)
   Simrad ES200-7C transducer (3)
   Standard target & suspension assembly
   Simrad ME70 system
   Deadweight broadband system
   Drop TS system housing and supplies

Note that some of this equipment is ship's equipment and some is supplied by the scientists, but the scientific party will operate and troubleshoot the equipment.

2. Trawling Equipment
3.

Aleutian wing trawl (AWT) w/accessories (e.g., 0.5" mesh liners) (2)
83-112 trawl w/accessories (e.g., 0.5" mesh liners) (2)
Methot net with accessories (2)
mod2-Marinovich trawl w/accessories (2)
Dandylines (bridles) (30 fm x 5/8 in.) for 83-112, mod2-Marinovich
Dandylines (bridles) (45 fm x 5/8 in.) for AWT
Fishbuster doors with accessories (2 sets) -door set with sensor pockets to be used as primary
Spare webbing & twine
Spare 0.5" mesh cod end liners (2)
Spare hardware
500 lb. tom weights (2)
250 lb. tom weights (2)
CamTrawl system
Miscellaneous supplies*

4. Oceanographic Equipment
   Seabird SBE39 (3)
   Seabird SBE 19plus CTD
5. Biological Sampling Equipment
   Dynamometer
   Marel M60 60 kg scale (2)
   Marel M60 6 kg scale (2)
   Fish length measuring boards and accessories (4)
   Fish baskets (30)
   Misc. biological supplies*
6. Computing equipment
   IBM compatibles w/Windows 7 Op. system*
   Dell PowerEdge MACEBASE Server
   Thermal label printer

Note: * indicates amount not specified.

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in

amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

• List of chemicals by name with anticipated quantity
• List of spill response materials, including neutralizing agents, buffers, and absorbents
• Chemical safety and spill response procedures, such as excerpts of the program's Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
• For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship's Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program.
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Please see Appendix E.

C. Chemical safety and spill response procedures

Please see Appendix E.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project

V. Additional Projects

A. Supplementary ("Piggyback") Projects: Secondary objectives of the Project include scientific research requested by AFSC and other investigators. Anticipated projects include specimen collections from standard trawl hauls such as ovary collection from pre-spawning walleye pollock and rockfish, and a seabird observer conducting visual census for seabirds from the bridge with binoculars during daylight hours. Detailed descriptions of additional ancillary projects will be provided as soon as received. Significant changes to these projects that affect vessel operations will be communicated as soon as they are known.

B. NOAA Fleet Ancillary Projects:

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

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

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data

B. Responsibilities:

1. An electronic Marine Operations Abstract (MOA) will be created to log all operations via daily transfers of position data from the ship's SCS system to

2.

MACE. An appropriate logging interval will be chosen for automated track position data. Specific events (and frequency) to be recorded will be decided at the beginning of the project. Globe software will be available to log operations data as a backup. All times should be recorded as Greenwich Mean Time (GMT)

3. The data sets requested by the Chief Scientist from the ship will include the following: electronic files (MOA) from the SCS of all operations logged during the project, and backup media (e.g., DVDs) with all sensor data logged to the Scientific Computer System (SCS).

4. The Chief Scientist will represent the AFSC Science Director for data disposition. A single copy of all data gathered by the vessel will be delivered to the Chief Scientist, who in tum will be responsible for distributing data to other investigators desiring copies.

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, per OMAO Procedure 1201-08, NOAA Ship Vessel Familiarization, and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for conducting a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

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

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

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

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug

and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

Leg III of this cruise will require the presence of a Medical Officer. OMAO procedure 1001-02 requires a medical officer aboard a ship operating for any period greater than 24 hours beyond 250 nautical miles from: the coast line of the contiguous United States; mainland Alaska, which includes southeast Alaska and the Alaska Peninsula, St. Paul, Alaska; Adak, Alaska; Honolulu, Hawaii; or San Juan, Puerto Rico. The eastern portion of this cruise will extend more than 250 nautical miles from St. Paul, Alaska.

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.

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 form should be sent to the Regional Director of Health Services at Marine Operations Center - Pacific. The NHSQ and Tuberculosis Screening Document 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 either form. Be sure 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 steel-toed 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. Ifincreased 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 *OMA0 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.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

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

Full compliance with NAO 207-12 is required. Responsibilities

of the Chief Scientist:

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

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

Responsibilities of the Commanding Officer:

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

8. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.
2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

G. Marine Mammal, Endangered, and Protected Species

During fishing operations, take all proactive steps to avoid deploying the gear in any situation where there is a high likelihood for an incidental take of protected species or marine mammals. This could mean delaying a set or moving to a suitable alternate site. Be on the look for marine mammals or other protected species prior to initiating a tow and also at haul back.

Within 24 hours of any incidental take of, or injuries or mortalities to, marine mammals as a result of operations, the Chief Scientist/Field Party Chief must forward the information described below to jeff.napp@noaa.gov with cc to john.c.clary@noaa.gov. This information will be entered into the Protected Species Incidental Take (PSIT) system per instructions below.

Seabirds can be sampled and retained for salvage -if take involves seabird, follow marine mammal procedure above but also include Shannon Fitzgerald in notification at shannon.fitzgerald@noaa.gov. If take involves an Endangered Species Act (ESA)-listed bird, retain specimen and we will notify the U.S. Fish and Wildlife Service (USFWS; to issue collection authority). Do not retain gulls -Except Kittiwakes. Albatross are high priority.

KEY ACTIONS IN RESPONSE TO ALL INCIDENTAL TAKES

1. Prior to the project, communicate and coordinate with vessel crew about established protected species incidental take reporting and handling procedures whether NOAA, charter, or partner project. Ensure regional ESA biologists and pertinent staff are in the PSIT email alert notification list. The Office of Law

2.

Enforcement (OLE) will be notified of takes via PSIT email alert system for all non-marine mammal takes including seabirds within 48 hours of the event.

3. Immediately notify bridge if incidental takes occur.

4. Notify the geographically-appropriate Regional Stranding Response Coordinator (numbers in this document) immediately following the incidental take of a marine mammal. Stranding Response Coordinator will contact OLE. For small live injured/uninjured marine mammals, priority should be to release the animal before notifying stranding response networks. If a large whale is entangled by the gear, contact entanglement response network before taking further action (Entanglement Response Network Number, Alaska Region: 1-877-925-7773).

5. For a sea turtle or protected fish (injured/live/dead), follow the Terms and Conditions stated in your Fisheries Independent Monitoring Biological Opinion regarding reporting and data collection. If you do not have a current Biological Opinion, contact your designated Regional or Science Center Protected Species Point of Contact for instructions.

6. For handling, sampling and salvaging seabirds (ESA and non-ESA listed), contact regional USFWS points of contact or NMFS regional seabird coordinator. If you have a permit, report seabird takes to PSIT.

PRE-PROJECT ACTIONS

1) Prior to the project, communicate and coordinate with vessel crew about established protected species incidental take reporting and handling procedures whether NOAA, charter, or partner project.

2) Ensure regional ESA biologists and pertinent protected resources staff are in the PSIT email alert notification list.

3) The NMFS Chief Scientist or Designee shall contact the appropriate Regional Stranding Network and query about additional numbers or specific contacts to reach in case of an incidental take of a marine mammal.

WHAT TO DO WITH LIVE, INJURED OR UN-INJURED MARINE MAMMAL

Ifa live, injured or uninjured marine mammal is incidentally captured, the animal should be released immediately.

1) Considering human safety, work from the vessel as quickly and carefully as possible to free the animal from the gear. Ensure the animal can continue to breathe while freeing from the gear.

2)

3) If it can be done immediately without further harming the animal, photograph the animal (dorsal and ventral sides including dorsal fin, flanks, head/jaw) and gear interaction at time of capture and when free from gear prior to release and collect required PSIT information.

4) If animal is NOT brought aboard the vessel and taking photos is not an option, provide a comprehensive summary of the incident following requirements described under 'PSIT narrative in this document.

5) Notify Regional Stranding Response Coordinator about the incident.

6) Submit take information for submission to PSIT and attach any forms, photos, and narrative to the take record within a week of the event.

Note: Untrained personnel should not attempt to handle live injured/uninjured marine mammals or disentangle large whales. In the event of a large entangled whale, immediately call your regional entanglement response network.

WHAT TO DO WITH DEAD MARINE MAMMAL OR SEA TURTLE?

1) Notify Regional Stranding Network Coordinator about the take of a dead marine mammal.

2) For sea turtle takes, simply report the take/s to PSIT and follow the instructions listed in your Biological Opinion or follow Regional or Science Center Protected Species Point of Contact instructions.

3) Release animal after necessary information is collected as described below.

4) Photos of the carcass should be taken: Dorsal fin, ventral side, and flank for marine mammals, as well as signs of entanglement, scars, and injuries. This also includes collecting required PSIT data.

5) Submit take information for submission to PSIT and attach any forms, photos, and narrative to the take record.

PSIT Reporting

Report [1] Species involved, [2] number dead, number injured and released, or number uninjured and released, [3] date and time, [4] latitude and longitude, [5] any mitigation measures taken, [6] other comments or observations germane to this take. Note if photo was taken.

In addition to the required PSIT information please complete a narrative which includes the following information.

1) Animal Condition (include photos)

Code 1-Live Animal

Code 2 -Fresh Dead

Code 3 -Moderate Decomposition

Code 4 -Advanced Decomposition

2) Mention if animal escaped or was released.

3) Indicate if the animal or other marine mammals or sea turtles were seen in the vicinity of the vessel during fisheries operations.

4) Animal condition post-release: Describe any observed injuries, the condition and behavioral state of released or injured animal (e.g., no obvious injuries and animal swam away vigorously, did not swim away vigorously, animal surfaced to breathe, animal sank to bottom, or blood in water observed).

5) If gear was still attached to animal after release, describe how the gear was cut and approximately how much gear is left and where it is still entangled/injured.

6) Photos: Provide comprehensive photographic evidence or written description of live/dead or injured animal. Provide pictures (if possible) of how the animal was entangled in the gear, and any gear-related interactions such as wounds or constrictions.

7) Decision-making: Include rationale for any discretionary decisions taken by Chief Scientist/crew.

8) Describe possible causes for incidental capture of the animal and any additional mitigation measures that were taken, or might be taken to prevent similar captures in all subsequent operations.

ENTANGLEMENT RESPONSE NETWORK NUMBER

Alaska Region: 1-877-925-7773

VIII. Appendices

A. Proposed survey areas and track lines (final waypoints provided to the Navigation Officer 13 April,2016)

B. CTD locations

C. Sail Drone SOP

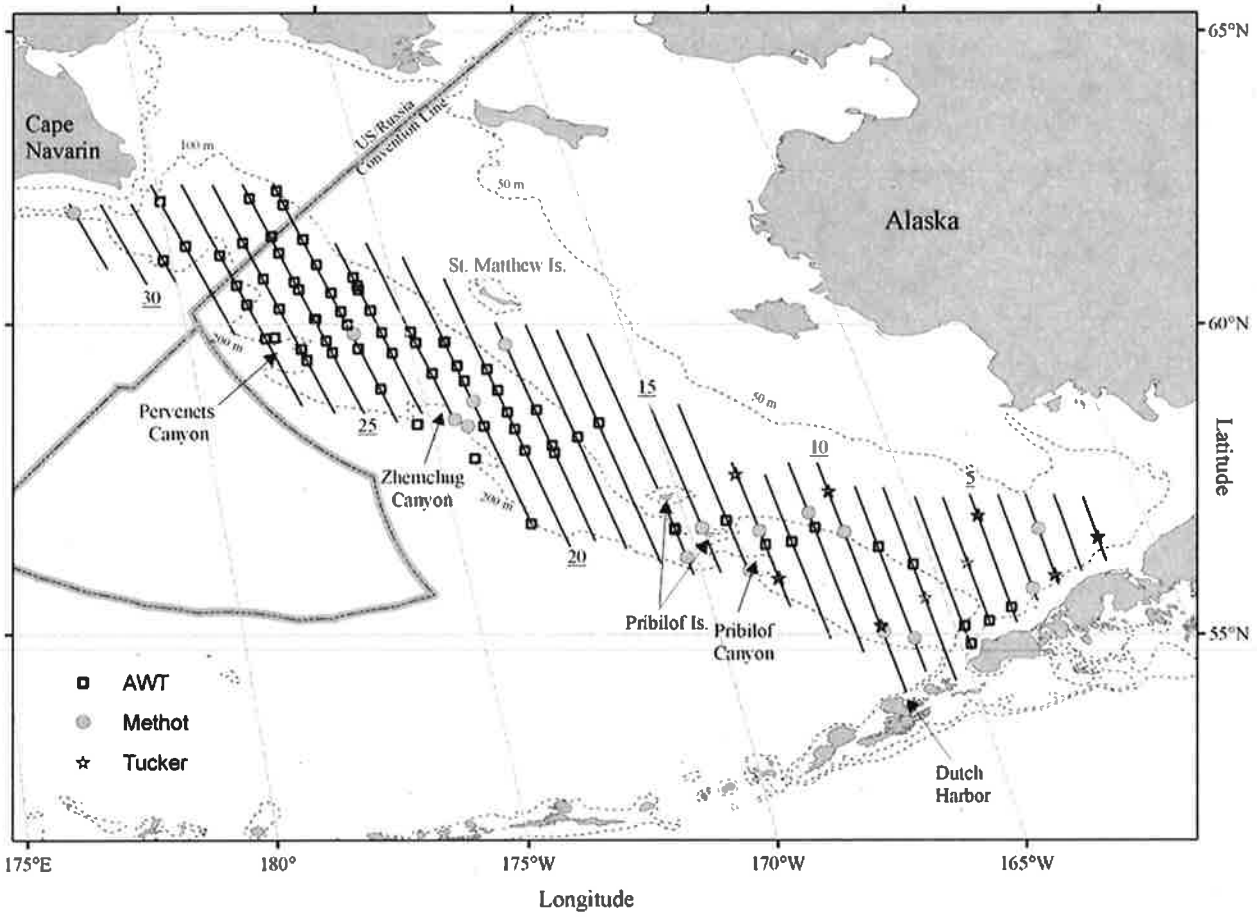
D.

E. Euphausiid (krill) target strength

F. Chemical Hygiene Plan

G.

Appendix A - Proposed survey area and tracklines.



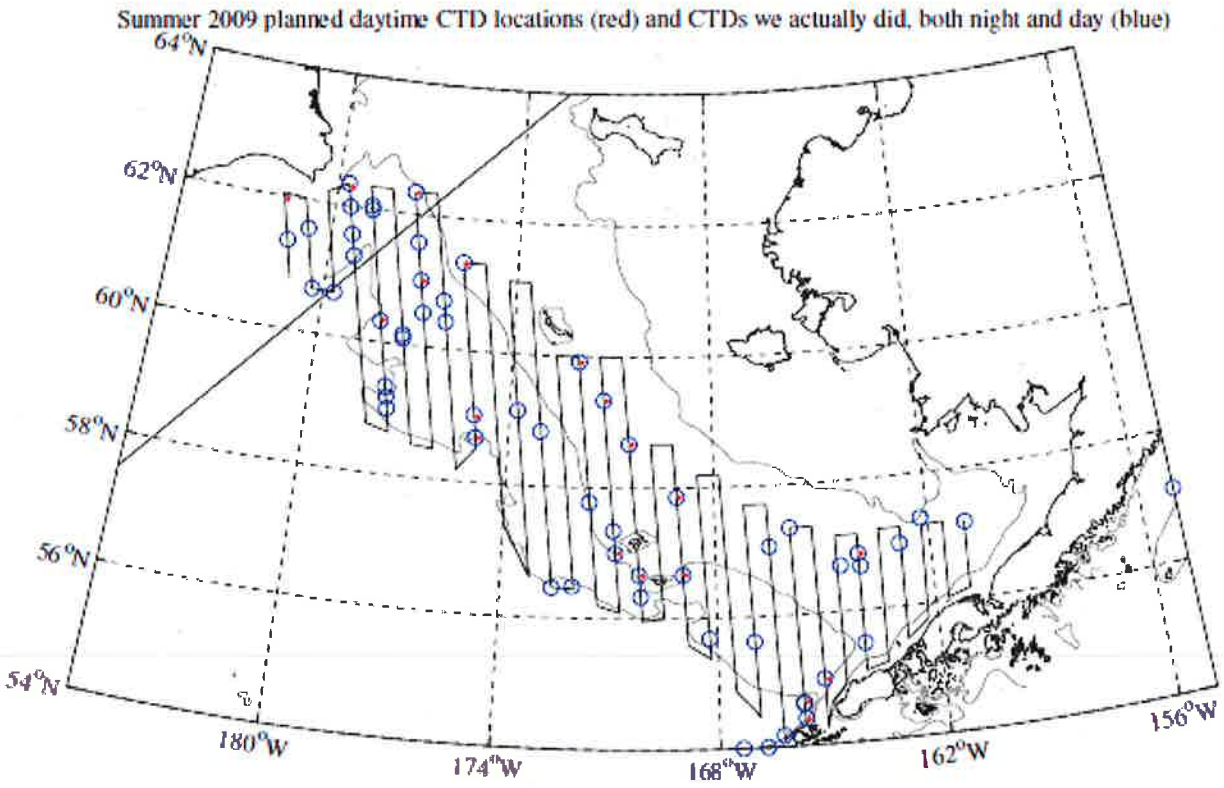
Appendix B - CTD locations

These CTD casts serve to describe the physical habitat of the pollock and euphausiids targeted by our survey. The ship should stop and do CTD casts (with the help of ship's Survey Tech) as near as practicable to the 19 listed must-have station locations, with an additional cast each night wherever the ship happens to be. The closest point along a survey transect to the must-have locations is close enough to do the cast. If nighttime operations are within 20nmi of must-have CTD locations then there is no need to do another nighttime CTD. A written log should be kept, and electronic data from all sensors and salinity bottle samples (take one bottle every other day, alternating at surface and bottom of cast) should be collected.

Nominal high priority, 'must-have' daytime CTD locations:

Latitude	Longitude	Station details
56.866	-164.046	PMEL M-2 mooring
57.857	-168.874	PMEL M-4 mooring
54.997	-165.166	Groundfish station A-05
54.399	-165.728	Groundfish station AA-04
54.663	-165.739	Groundfish station Z-04
56.664	-168.896	Groundfish station F-19
56.664	-170.116	Groundfish station F-21
57.000	-170.792	Groundfish station G-22
58.664	-170.439	Groundfish station L-21
59.335	-171.202	Groundfish station N-22
59.915	-171.918	Groundfish station P-23
58.687	-174.934	Groundfish station L-28
58.999	-175.020	Groundfish station M-28
60.331	-178.096	Groundfish station Q-32
60.998	-176.969	Groundfish station S-30
61.614	-175.780	Groundfish station U-28
If Russia		
62.328	-177.299	
62.333	-179.481	
61.570	-181.295	

As an example, the following plot shows the locations of CTDs conducted in summer 2009:



Appendix C - Saildrone SOP

Saildrone Basic Information

Length: 19 ft
Width: 7 ft
Height: 20 ft above water surface
Draft: 6 ft below water surface
Average speed: 1-3 knots Maximum
speed: 7 knots

Approx. Weight: 500 lbs (60 lb for wing (sail), most of weight in lead weight on keel
Various modes of operation: Can be trimmed for speed, tracking a course, holding station, etc. The Saildrone has navigation lights that are turned on during darkness.

Two saildrones will be controlled by a remote operator on shore. Science party will contact operator prior to any joint operations with the NOAA ship Oscar Dyson.

The saildrone's position is updated every 15 minutes on a web site (client.saildrone.com). We may add the Dyson's position to this map to facilitate navigation.

Saildrone Inc.
1050 W Tower Ave, Alameda,
California 94501
http://saildrone.com/

Operator is Richard Jenkins
Richard.Jenkins@mac.com
Tel. (510) 326-0946

Objective

Compare data from ship based measurements (EK60, oceanographic and meteorological sensors) as closely as possible with Saildrone systems. This will generally require *Dyson* following alongside or behind a Saildrone as closely as conditions and operations safely allow.

General Guidelines

The ship will follow behind or alongside the Saildrone when following a track line. The ship will maintain a nominal distance of 500 m from the Saildrone. The ship may approach closer at the discretion of the CO as conditions allow. The nominal distance may also be adjusted at the discretion of the CO after operations with the Saildrone are evaluated.
Any changes to either the ship's or Saildrone's operating protocol will be communicated between the remote operator and ship via Iridium or VOIP.
Only one Saildrone will be used at a time for near-ship comparisons
Operations will occur during daylight hours. Operations may be extended into periods of

darkness at the discretion of the CO after operations with the Saildrone are evaluated.

SOP

Before the start of the cruise, the remote operator will be provided with *Dyson's* station track lines. *Dyson* will later be provided with various potential Saildrone track lines and waypoints based on *Dyson's* trackline (Saildrone track lines and waypoints may have different parameters, such as track width or spacing between waypoints to plan for variable conditions.)

Before commencing Saildrone comparison operations, the Operations Officer and Chief Scientist will communicate with the remote operator via Iridium or VOIP to establish a protocol for the Saildrone. This may involve the Saildrone following a track parallel to the ship's course, proceeding along the ship's track directly ahead of it, or similar procedure.

After approval by the OOD, the remote operator will initiate the Saildrone's protocol, at which point the ship will attempt to follow the Saildrone as conditions and operations allow.

The bridge will monitor the Saildrone continuously, both visually and via a read-only web interface which will provide the Saildrone's updated GPS position and status approximately every 5 minutes. (If high solar conditions allow, the Saildrone's AIS transmitter may be turned on for a short time, but power requirements make doing so for long periods unfeasible).

The remote operator will contact the ship via Iridium or VOIP before making any changes to the Saildrone's protocol or in the event of an equipment malfunction. The ship will also contact the remote operator if the protocol needs to be adjusted for any reason.

Emergency Recovery

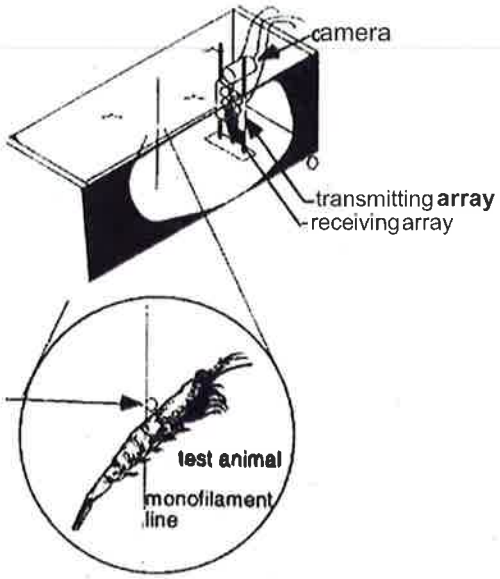
In the rare event of a catastrophic failure of a Saildrone which renders one inoperable, *Dyson* may be asked to recover any surviving parts. If an emergency recovery takes place, the primary goal will be to get as much of the Saildrone on board in the safest manner possible for later damage assessment -NOT necessarily to recover the vehicle in working condition. The Saildrone weighs approximately 500 lbs and is fitted with two pick points for easy recovery. The 20 ft wing (sail) above the surface is constructed of carbon fiber and weighs approximately 60 lbs. Most of the weight of the Saildrone is contained in a lead weight on the 6 ft keel. During recovery, the primary dangers are the length of the vehicle causing it to swing out of control and the possibility of carbon fiber splinters from broken parts. Personnel should use taglines and wear hard-hats and gloves.

Appendix D - Euphausiid (krill) target strength

Target strength (TS) is the echo from a single animal. That's what is needed to convert backscatter we measure with the EK60 to number of animals in the water. We have a good model of this for pollock, but we need better TS information for krill.

Goal- measure TS of euphausiids with known length, material properties, and orientation in a controlled setting, compare to modelled TS, evaluate relationship of euphausiid lipid content to TS.

a) Leg 1, nighttime: each night, conduct a short, shallow Methot tow with a modified codend to collect live euphausiids. We did this previously, summer BBS 2008. Conduct a CTD. Measure material properties (controlled environment room), target strength (in a fish box on back deck or hero deck; a suitable location will be discussed with DY personnel) of live euphausiids. Submit frozen euphausiid samples for determination of lipid content (which may affect TS) subsequent to cruise.



Goal- i) Generate a net-based euphausiid abundance estimate to compare to acoustic estimate and ii) empirically estimate difference in catch rate due to the light (literature indicates the light will increase catch rate due to reduced avoidance).

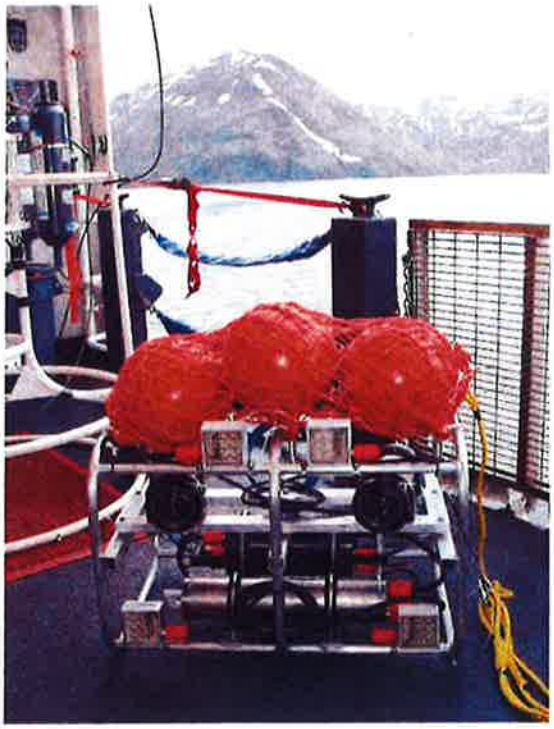
b) Leg 1, nighttime: conduct two oblique Methot tows from surface to within 5 m of seafloor with a standard cod end, wherever the ship stops at night. Process and preserve a subsample per usual MACE procedure. Both tows should have the same EQ and tow strategy. Randomly add a flashing strobe to either the first or the second oblique tow.

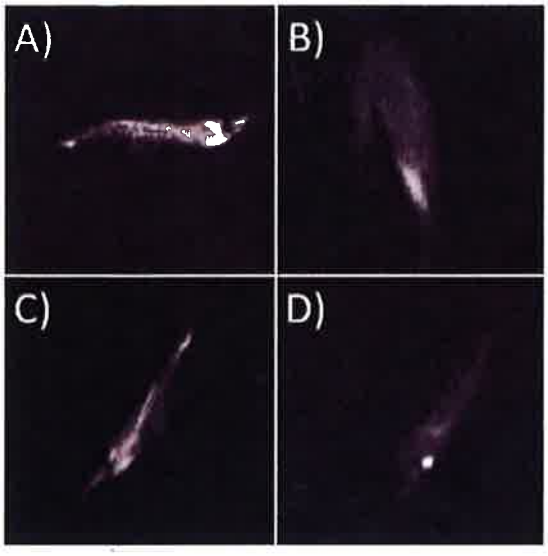
c) All 3 legs, nighttime: If time allows given other special studies, conduct two oblique Methot tows from surface to within 5 m of seafloor, wherever convenient, as in b).

d) Leg 1, daytime: rather than the standard goal of 12 targeted Methot tows at 1.5 hours each (18 daylight hours or 1 daylight day), exchange some of these for pairs of targeted tows at 2.5 hours for the pair (18 daylight hours or 1 daylight day) with a flashing strobe light randomly added to one of the pair to evaluate daytime avoidance, same EQ and tow strategy should be followed for each pair.

Goal- Measure *in situ* orientation (tilt) of krill, which affects TS

e) Leg 1, nighttime or daytime: conduct stereo camera drops if time allows at night to make *in situ* measurements of krill orientation (based on good results from Mike Levine work this past winter). The instrument can be deployed using aft hero deck winch. If successful, exchange some daytime Methot tow time for daytime lowered stereo cam drops.





Appendix E - Chemical Hygiene Plan

Hazardous materials sections B (Inventory) and C (Chemical safety spill kit contents and response procedures.)

Inventory (itemized)

Dyson was loaded 1/28/2016 by FOCI and MACE personnel. All chemicals listed will be used for the entire 2016 Dyson field season. Chemical volumes will be reported to the Ops Officer and the designated contact for each survey will be required to report to chemical owners. The name of the group responsible for each of the chemicals is designated after the chemical name in the table. MSDS, chemical hygiene plan, and SOPs will be provided to the Dyson before the loading of the vessel.

Common Name	**Concentration**	**Amount**	**Spill Response (all FOCI/MACE/PMEL/EMA personnel)**	**Notes**
Dihydrogen Oxide Property of PMEL		20 liters	Spill Control: W Gloves Paper towels	Not a regulated chemical/solution. Used for oxygen titrations.
Ethanol Property of FOCI	100%	4 -1 gal. plastic Jugs	Gloves 3M Sorbent Pads Plastic bag	Store in Chem. Lab yellow flammables cabinet.
Ethylene Glycol Property of FOCI	100%	1 -500 ml	Gloves Paper towels Plastic bag	Not a regulated chemical. Store in Spill Kit.
Formaldehyde Property of FOCI	37%	5 - 5 gal. barrels	Gloves Eye Protection Fan-Pads Formalex PolyForm-F Plastic bags	Store in Fish Lab flammable cabinets. Will need to place 2-3 in each cabinet.
Formaldehyde Property of Sandi Neidetcher	37%	8 - 1 liter plastic bottles	Gloves Eye Protection Fan-Pads Formalex PolyForm-F Plastic bag	Store in Fish Lab flammable cabinet.

Formaldehyde Property of Troy Buckley	37%	16-1 liter plastic bottles	Gloves Eye Protection Fan-Pads Formalex PolyForm-F Plastic bag	Store in Fish Lab flammable cabinet.
Glycerol/Thymol Solution Property of MACE	50 %	2-5 gal. buckets	Gloves Paper towels Kitty litter	Not a regulated chemical/solution . Store in Fish Lab under sink.
Hydrochloric Acid Property of PMEL		1-500 ml	Gloves 1-1 Spilfyter Acid Neutralizer	Stored in over-pack bucket.
Lithium 3v Batteries Property of FOCI		9	NA	Store in Survey Office for Spring Mooring Multi-Net use
Lithium 9v Batteries Property of PMEL		8	NA	In SeaBird and Wetlabs instruments
Lithium AA Batteries Property of PMEL		96	NA	In SeaBird instruments and MicroCats Saft LS14500
Lithium D Cell Batteries Property of PMEL		150	NA	In RCM9 & Peggy Mooring
Manganese Chloride Property of PMEL	3M	1 liter		Not a regulated chemical/solution. Used for oxygen titrations.
Potassium Iodate Property of PMEL	0.00167 M	1 liter	Spill Control: PI Gloves Plastic bag	Used for oxygen titrations.

Sodium Borate Solution Property of FOCI	5-6%	1-5 gal.	Gloves Paper towels Plastic bag	Not a regulated chemical. Working container will be secured on Fish Lab counter.
Sodium Borate Powder Property of FOCI	100%	1-500 g	Gloves Wet paper towels Plastic bag	Not a regulated chemical. Stored in Spill Kit.
Sodium Iodide/NaOH Solution Property of PMEL	O.11M	I liter	Spill Control: B	Used for oxygen titrations.
Sodium Thiosulfate Property of PMEL	0.11 M	1 liter	Spill Control: ST	Used for oxygen titrations.
Sulfuric Acid Property of PMEL	5 M	I liter	Spill Control: A	Used for oxygen titrations.

FOCI Spill Kit Contents	Amount	Use	Total Spill Volume Controllable	Notes
Formalex	1-5 gallon 2 -1 gallon	Formaldehyde cleanup (all concentrations)	1:1 control	Formalex will be used in conjunction with Fan-Pads to reduce spill volume.
Fan-Pads	2 rolls (50 sheets each roll) ,	Formaldehyde cleanup (all concentrations)	50 sheets = 50 - 150 ml spills	Formalex will be used in conjunction with Fan-Pads to reduce total spill volume.
PolyForm-F	1-5 gal. bucket	Formaldehyde cleanup (all concentrations)	1:1 control	"Pour onto large spill immediately to deactivate formaldehvde.

3 M Pads	10 pads	Ethanol cleanup	10 pads=1O - 250ml spills	Pads may be reused if dried out under fume hood.
Nitrile Gloves	8 pairs each S,M,L,XL	For all cleanup procedures	NIA	Gloves will be restocked by each survey group.
Eye Protection	4 pairs goggles 1 face shield	Formaldehyde cleanup	NIA	Eye protection will be cleaned before re-use.
Tyvex Lab Coats	2 coats	Formaldehyde cleanup	NIA	Coats will be cleaned with Fan-Pads and Formalex before reuse.
Plastic Bags	2	Formaldehyde cleanup/Fan Pads	NIA	Bags may be packed full and sealed.

PMEL Acid-Base Spill Kit Contents	Amount	Use	Total Spill Volume Controllable	Notes
Spilfyter Acid Neutralizer	1 box	Clean up acid spill-H2S04	1.51 of 5M Sulfuric Acid 5.571 of 10% (lN) HCI	
Spilfyter Base Neutralizer	1 box	Clean up base spill--NaOH	2.01 of Sodium Hydroxide	
Vinyl Gloves	1 box	Protect hands during cleanup	NIA	
Foxtail/Dustpan	1 each	Pick up absorbed neutralizer	NIA	
Rubber apron	1 each	Protect during cleanup	NIA	
Paper Towels	1 roll	Absorb liquids	NIA	
Glasses	2 pair	Protect eyes	NIA	
Chemical absorbent	1 liter	Absorb liquids	0.51	
Plastic Bags	2 each	Contain used absorbents/waste	NIA	

SPILL CONTROL

A: ACID

D Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.

0 Ventilate closed spaces before entering them.

D Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
D **Large Spills:** Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite,
sand or earth to soak up the product and place into a container for later disposal.
D **Small Spills:** Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove
residual contamination.
D Never return spills in original containers for re-use.
D Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for
prompt disposal.
D J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

B:Base

CJ Use proper PPE.
CJ Ventilate area.
D Neutralize with dilute acid such as HCl if possible.
D Absorb with cat litter or vermiculite.
D Vacuum or sweep up material and place into suitable disposal container.
D Do not breath dust.
D Do not get water on spilled substances.

M: Mercury

D Spills: Pick up and place in a suitable container for reclamation or disposal in a inethod that does not
generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Use Mercury Spill Kit
if need be.

F: Formalin/Formaldehyde

D Ventilate area of leak or spill. Remove all sources of ignition.
D Wear appropriate personal protective equipment.
D Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover
liquid when possible.
D Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert
material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container.
::J Do not use combustible materials, such as saw dust.

PI:Potassium Iodate

D Avoid Contact with combustibles (wood, paper, clothing ...).
D Keep substance damp with water spray.
D Vacuum or sweep up material and place into suitable disposable container (plastic bag).

ST: Sodium Thiosulfate

D Ventilate area of leak or spill.
D Wear protective gloves and clean body-covering
D Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

D Recover liquid or particulate in 5 gallon bucket. Absorb with a kitty litter and place in disposable bag. Do
not use combustible materials, such as saw dust to absorb.

W: Water

IJ Absorb the liquid and wash with water

CJ Wear PPE

E: Ethanol

D Eliminate all ignition sources

D Wear PPE

Chemical Hygiene Plan and Standard Operating Procedures (SOPs)

Chemical Hygiene Plan

Previous sections of the Project Instructions include a list of hazardous materials by name and anticipated quantity. Chemicals will be transported, stored and used in a manner that will avoid any spills and adequate containment, absorbents and cleanup materials will be available in the event of a chemical spill.

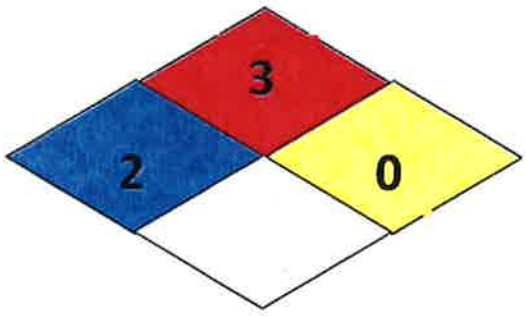
The scientific chemicals to be used for this project are: (1) ethyl alcohol (100%) and (2) formaldehyde (37%). Other chemicals brought aboard are consumer products in consumer quantities. Dilutions of the scientific chemicals will be used to preserve in faunal organisms collected with benthic grab samplers, as described in the Operations section of these Project Instructions. Use of these chemicals and the specified dilutions will only occur in exterior locations on the ship away from air intakes. Scientific chemicals shall not be disposed over the side.

Standard Operating Procedures and Information Sheets are provided here for the scientific chemicals. Included are details concerning personal protective equipment, work area precautions, special handling and storage requirements, spill and accident procedures/first aid, waste disposal and other pertinent information. Both small and large spills are of particular concern. In both cases, the spill response is intended to first contain the spill and then neutralize it. This may be easily accomplished for small spills depending on the degree of vessel motion and the prevailing environmental conditions. In all cases, the first responder should quickly evaluate the risks of personal exposure versus the potential impacts of a delayed response to the spill and act accordingly. For example, if the spill is small and it is safe to do so, a neutralizing agent should be rapidly applied to encircle/contain the spill and then cover it. However, a large formaldehyde spill (> 1 L) is extremely hazardous and individuals at risk of exposure should immediately leave the area. The CO or OOD should be notified immediately so that a response team with self-contained breathing apparatus (SCBA) can be deployed to complete the cleanup operation or dispense the hazard with a fire hose directed overboard. The vessel's course should be adjusted to minimize exposure of personnel to wind-driven vapors and to limit spread of the spill due to vessel motion. The reportable quantity (RQ) of formaldehyde is 1,000 pounds and the RQ for ethyl alcohol is 5,000 pounds which greatly exceed the quantities brought aboard for this project.

Standard Operating Procedures -Formaldehyde At-Sea

Chemical Name: 37% Formaldehyde
UN Number: 1198
Hazard Ratings: (on a scale of 0 to 4)
Health (blue): 3 Flammability (red): 2
Reactivity (yellow): 2 Special (white):
Personal Protection Gear Needed
*gloves
*goggles or face shield
Special Handl ing In
tructions
* If a ventilation hood is not available, then pouring of chemical must be done outside. At least two people should be involved with large chemical transfers in case of an emergency.
* Chemical must be stored at temperatures above 15° c to prevent polymerization of paraformaldehyde.
First Aid
* If swallowed, give large amounts of drinking water and induce vomiting.
*If vapors inhaled, get out into fresh air immediately. Give oxygen if breathing is difficult.
* If spilled on skin or splashed in eyes, flush with water for at least 15 minutes.
Spill Cleanup Procedures
For small spills (500-1000 mls):
Cover spill quickly with a Fan Pad and spray on Formalex to deactivate and absorb chemical. Let material sit for 10 - 15 minutes. Dispose of materials in plastic bag.
For large spills (1000 mls - ?):
Use a combination of Fan Pads and Formalex as quickly as possible to contain spill and deactivate it. Vacate area and try to ventilate room, if possible. Call Bridge immediately.
Deactivation/Disposal Procedures At Sea
*Formalex is a greenish liquid that is to be used to insure proper chemical deactivation. Formalex should also be used in conjunction with Fan Pads. Place used Fan Pad in plastic bag, seal, and put in bottom of Spill Kit.
*Fan Pads may be used to absorb small spills alone but these pads work best when used with f ormalex to immediately control the vapor layer.
Shipping Procedures and Restrictions
37% formaldehyde cannot be ship by air due to its flammability rating.
All quantities should be over-packed with absorbency material in case the original container is damaged. When shipping by barge or land, labels are not required for quantities under 110 gallons by D.O.T. but the container should have MSDSs and the UN number readily available.

Standard Operating Procedures - Ethanol At-Sea



Chemical Name: 100% Alcohol
UN Number: 1170
Hazard Ratings: (on a cale of 0 to 4)
Health (blue): 2 Flammability (red): 3
Reactivity (yellow): 1 Special (white):

Personal Protection Gear Needed

*gloves
*goggles or face shield when pouring Special

I andling Instructions

* Keep away from heat, flame, and other potential ignition sources.
* Store in a well ventilated area or in a flammable cabinet.

First Aid

* Ifswallowed, give large amounts of drinking water and induce vomitting.
* If vapors inhaled, get out into fresh air immediately. Give oxygen if breathing is difficult.
* Ifspilled on skin or splashed in eyes, flush with water for at least 15 minutes.

Spill Cleanup Procedure

Absorb ethanol with 3M Sorbent Pads and allow to dry in a well ventilated area away from ignition source.

Deactivation/Disposal Procedures At Sea

Use 3M Sorbent Pads to absorb the ethanol. Put used pads outside to dry (secure from blowing overboard and exposure to flame). Once dry, the pads may be reused or burned.

Shipping Procedmes and Restrictions

Due to the flammability rating of 95% ethanol, this chemical cannot be shipped by air. Transportation by barge or land vehicle will require the ethanol container to be over-packed with absorbent materials such as clumping kitty litter or shredded paper. Include MSDSs and the UN number with the shipment for reference in the event of a spill.

ALASKA FISHERIES SCIENCE CENTER STANDARD OPERATING PROCEDURES FOR HAZARDOUS CHEMICALS
RACE/MACE
Dec 2013

Glycerin (50%)/Thymol(0.3%) solution

#1 Process	General use in the field or on research vessels for otolith preservation
#2 Hazardous Chemicals/Class of Hazardous Chemicals	100% Glycerin may cause eye or skin irritation
#3 Personal Protective Equipment/ Decontamination	Gloves, splash goggles, lab coat or rain gear. For small spills dilute with water and mop up. For larger spills, absorb with inert material. In case of skin/eye contact: flush with running water for at least 15 mm. In case of ingestion: Do not induce vomiting. In case of inhalation: move to fresh air.
#4 Engineering/ Ventilation Controls	Provide exhaust ventilation to keep airborne concentrations of vapors low.
#5 Special Handling Procedures and Storage Requirements	Store at room temp in tightly closed container.
#6 Waste Disposal	Dispose of waste and residues in accordance with local authority requirements. Incinerate. When released into water, this material is expected to readily biodegrade and is not expected to significantly bio-accumulate.