






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

FINAL Project Instructions

Date Submitted: July 20, 2015
Platform: NOAA Ship *Oscar Dyson*
Project Number: DY-15-07 (AFSC)
Project Title: EMA-FOCI age-0 groundfish and salmon recruitment processes
(formerly known as BASIS): Gulf of Alaska
Project Dates: August 20, 2015 to September 2, 2015

Prepared by:  Dated: 7/20/15
Steven Porter
Chief Scientist
AFSC/RACE

Approved by:  Dated: 7/20/15
Jeffery Napp
RACE Division Director
AFSC

Approved by:  Dated: 7/21/15
Douglas D. DeMaster, Director
Science and Research
AFSC

Approved by: _____ Dated: 22 July 2015
Captain Douglas D. Baird Jr., NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

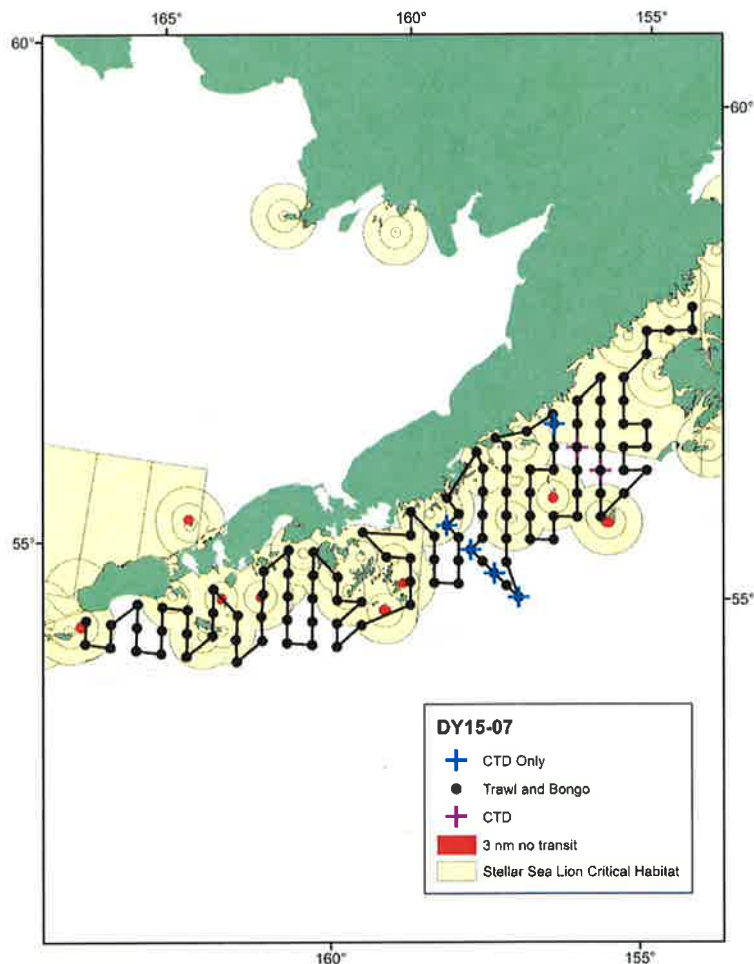
A. Brief Summary and Project Period

EMA-EcoFOCI Juvenile Walleye Pollock and Forage Fish Survey August 20 – September 2, 2015

B. Days at Sea (DAS)

Of the 14 DAS scheduled for this project, 14 days are funded by an OMAO allocation, 0 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency funded. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area – Gulf of Alaska



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 shall report incident to the vessel CO, Jon Kurland (jon.kurland@noaa.gov, 907-586-7638) or Robyn Angliss (robyn.angliss@noaa.gov, 206-526-4032), and guy.fleischer@noaa.gov and 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, include Shannon Fitzgerald in notification at shannon.fitzgerald@noaa.gov. If take involves ESA-listed bird, retain specimen and we will notify FWS (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 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.

2. 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 Office of Law Enforcement (OLE). For live injured/uninjured marine mammals, priority should be to release the animal before notifying stranding response networks. NOTE: If Coordinators are unreachable, collect pertinent PSIT information and release animal and/or retain carcass if logistically feasible.

3. 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.

4. For handling, sampling and salvaging seabirds (ESA and non-ESA listed), contact regional United States Fish and Wildlife Service (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 is 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 UNINJURED MARINE MAMMAL

If a 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) 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.
- 3) 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.
- 4) Notify Regional Stranding Response Coordinator about the incident.
- 5) 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) If logistically feasible, the animal should be hauled aboard the vessel and retained for pick up by the local Stranding Network. Develop a plan with Stranding Network Coordinator or regional ESA biologist and/or relevant Center scientist for carcass pickup and subsequent necropsy.
- 4) If the animal cannot be hauled aboard due to human safety consideration or there is no feasible way for carcass retention onboard, release animal after necessary information is collected as described below.

5) 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.

6) 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

D. Summary of Objectives

Fisheries (midwater trawl) and oceanographic survey to:

- 1) Extend time series of age-0 Walleye Pollock abundance in the western Gulf of Alaska;
- 2) Describe the community structure, biomass, energetic status of pelagic nekton;
- 3) Collect age-0 Walleye Pollock associated prey and measure environmental variables that potentially affect Walleye Pollock ecology; and
- 4) Occupy a series of cross-shelf transects of CTD stations to examine cross-shelf physical and chemical oceanography.

E. Participating Institutions

NOAA – Alaska Fisheries Science Center (AFSC)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

NOAA – Pacific Marine Environmental Laboratory (PMEL)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

NOAA – Alaska Fisheries Science Center (AFSC)
TSMRI
17109 Point Lena Loop Road, Juneau, AK, 99801

NOAA – Office of Science and Technology
1315 East West Hwy, Silver Spring, MD, 20910

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

| Name (Last, First) | Title | Date Aboard | Date Disembark | Gender | Affiliation | Nationality |
|---------------------------|--------------|--------------------|-----------------------|---------------|--------------------|--------------------|
| Porter, Steven | Chief Sci. | Aug 18 | Sept 2 | M | AFSC/Eco-FOCI | USA |
| Andrews, Alex | Sci. | Aug 18 | Sept 18 | M | AFSC/EMA | USA |
| Debenham, Casey | Sci. | Aug 18 | Sept 2 | M | AFSC/EMA | USA |
| Dougherty, Annette | Sci. | Aug 18 | Sept 2 | F | AFSC/Eco-FOCI | USA |
| Mier, Kathy | Sci. | Aug 18 | Sept 2 | F | AFSC/Eco-FOCI | USA |
| Nachman, Candace | Sci. | Aug 18 | Sept 2 | F | OST | USA |
| Paquin, Melanie | Sci. | Aug 18 | Sept 2 | F | AFSC/Eco-FOCI | USA |
| Proctor, Peter | Sci. | Aug 18 | Sept 18 | M | PMEL | USA |
| Salo, Sigrid | Sci. | Aug 18 | Sept 2 | F | PMEL | USA |

G. Administrative

1. Points of Contact:
Steven Porter (Chief Scientist)
NOAA – Fisheries, Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA 98115

Ph: 206-526-4271, Steve.Porter@noaa.gov

Janet Duffy-Anderson, AFSC, Eco-FOCI Supervisor
7600 Sand Point Way NE, Bldg 4
Seattle WA 98115
Ph: (206) 526-6465, Janet.Duffy-Anderson@noaa.gov

Phyllis Stabeno, PMEL, Eco-FOCI Supervisor
7600 Sand Point Way NE, Bldg 3
Seattle WA 98115
Ph: 206-526-6453, Phyllis.Stabeno@noaa.gov

Ed Farley, EMA Supervisor
TSMRI / 17109 Point Lena Loop Road
Juneau, AK, 99801
Ph: 907-789-6085, Ed.Farley@noaa.gov

Oscar Dyson
CO cell: 206-403-8433
XO cell: 206-295-0775
CME cell: 206-295-0670
Iridium: 808-659-0050
Underway VIOP: 301-713-7778
INMARSAT: 011-870-336-995-920 (voice)

Field Operations Officer, LT Carl Rhodes
ops.oscar.dyson@noaa.gov

2. Diplomatic Clearances - N/A
3. Licenses and Permits
This project will be conducted under the Blanket Scientific Research Permit #2015-B1 issued by the U.S. on December 3, 2014 effective January 31 – October 6, 2015 to AFSC research personnel and NOAA Ship *Oscar Dyson*. In addition, the State of Alaska Fish Resource Permit CF-13-002 has been granted and is effective February 5, 2013 to December 31, 2015.

II. Operations

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

A. Project Itinerary:

Departure: August 20, 2015 Kodiak, AK
Arrival: September 2, 2015 Dutch Harbor, AK

B. Staging and Destaging

The equipment necessary for the project will be stored in the Kodiak Pier 2 warehouse from the prior Eco-FOCI Spring Ichthyoplankton Survey, and will also be shipped to Kodiak from Seattle for loading onto NOAA Ship *Oscar Dyson* prior to departure from Kodiak on 20 August 2015. We request ship's assistance with loading on August 19, 2015, including access to the Pier 2 warehouse, a forklift and forklift operator, and use of the ship's crane and a crane operator. We will require dedicated use of the chemistry, hydrographic, wet, dry, and fish processing labs for sample and equipment preparation and request as much counter and cabinet space as possible. We will use the Dry lab for SEACAT operations. Gear will remain on board *Oscar Dyson* for use by projects DY15-08 and DY15-09.

C. Operations to be Conducted: Operations for this survey will be conducted 24/7.

1. Underway Operations –

The ship's Scientific Computer System (SCS) shall operate throughout the project, acquiring and logging data from navigation, meteorological, and oceanographic sensors. See FOCI Standard Operating Instructions (SOI 5.2 and SOI 5.3) for specific requirements. We request that the centerboard be LOWERED for the duration of the project.

2. Station Operations –

Please advise the science party if 2 survey technicians will not be available for the survey.

Juvenile Walleye Pollock and Forage Fish Survey: The project will begin upon departure from Kodiak, Alaska on 20 August, 2015. Prior to the time of departure the net reels will have been loaded with 1 Stauffer (anchovy) trawl (primary net) and 1 shrimp trawl (back-up net), and a pair of 5x7 trawl doors will have been prepared for trawling activities. We will proceed to the first grid station and begin sampling 110 pre-determined stations (see Operating Area – Gulf of Alaska, Appendix 1). At each grid location, a bongo tow will be conducted first to collect zoo- and ichthyoplankton followed by the midwater (Stauffer) trawl to sample age-0 Walleye Pollock and other forage fishes. A CTD cast to 10m off bottom will be conducted at the first station and at another near the end of the survey to confirm that the FastCat is operating properly, and that will be the first operation at those stations. Time permitting, a CTD cast may also be conducted at small number of grid stations that have a high abundance of age-0 pollock to collect water samples for an eDNA pilot study. The cast will occur after the trawl, and water samples will be collected at the surface, middle and near the bottom depths.

Bongo Tow

The standard gear for plankton sampling will be a 60-cm bongo (SOI 3.2.2) with 0.505-mm mesh netting paired with a 20-cm bongo with 0.153-mm mesh. A FastCat will be mounted above the bongo to provide depth, temperature, and salinity data. Tows will be to 200 meters or 10 meters off the bottom where water depth is shallower.

Two SCS buttons are required:

- 1) Surface (in/out),
- 2) EQ

Marks to the SCS will be made in the Survey Office (Dry Lab) by a scientist on-watch who will be monitoring the FastCat operation throughout the station occupation. The processing of FastCat files and CTD files will be the responsibility of the scientific personnel on watch.

The samples collected from the 20-cm and 60-cm bongos will be processed in the following manner. For each, Net 1 will be preserved in 1.8% formaldehyde, buffered with sodium borate, and boxed. Net 2 from both bongos will be discarded.

Midwater (Stauffer) trawl

The Stauffer trawl will be deployed to a footrope depth of 200 meters, or 10 meters off the bottom, whichever is shallowest. Net depth will be monitored using the ship's Simrad ITI (trawl eye) or FURUNO system. Standard trawl operations will be used for deployment. Once equilibrium is achieved, as determined by the fishing officer or scientist, ***the trawl will be retrieved at a wire rate of about 10 meters per minute.*** Thus, the trawl will be fished over a double-oblique path.

Two SCS buttons are required:

- 1) Doors (in/out),
- 2) EQ, (which is the same as haulback [HB])

Trawl catches will be processed and samples retained according to the following protocol outline:

- A) Select large fishes (approx. >1g/ind)
 - a. Capelin, eulachon, pollock, cod, rockfish, sablefish, flatfish
 - i. Weigh, count, length by species
 - ii. Length metric will vary by species and age/size
 1. Osmerids, all age-0 (~<140 mm SL) gadids
STANDARD LENGTH to nearest MM
 2. Age-1+ gadids
FORK LENGTH to nearest CM
 3. Rockfish, sablefish, and flatfish <100 mm TL
TOTAL LENGTH to nearest MM
 4. Rockfish, sablefish, and flatfish ≥100 mm TL
TOTAL LENGTH to nearest CM
 - b. Freeze flatfish <100 mm TL, age-0 pollock, age-0 cod
 - i. Haphazard selection of ~25 ind. by species
 - ii. Flash freeze in -80, then move to walk-in
- B) Other fish and invertebrates
 - a. Large fish (>1g/ind) by coarse taxon. grps (e.g., poacher, etc)
 - i. Weight by taxonomic group
 - ii. Count individuals in each taxonomic group
 - b. Large invertebrates (approx. ≥1g/ind)

- i. Weigh and count by taxonomic level
 - 1. Group scyphozoans (most jellyfish)
 - a. *Chrysaora melanaster*
 - b. *Cyanea capillata*
 - c. Other jellyfish
 - 2. Group other invertebrates by coarse taxon. grp (e.g., shrimp)
 - ii. No size measurements
 - iii. Discard
 - c. Small fish and invertebrates (approx. <1 g/ind)
 - i. Weigh as a group
 - ii. Record as miscellaneous small plankton (MSP)
 - iii. No size measurements
 - iv. Discard

CTD transects: Two transects will be occupied to examine cross-shelf physical and chemical oceanography (see Operating Area – Gulf of Alaska). At each transect location a CTD cast (with bottles) will be conducted. All hydrographic casts include high-resolution vertical profiling of water properties (including temperature, salinity, chlorophyll fluorescence, PAR, dissolved O₂) to within 10 m of the bottom using a Seabird 911Plus CTD. Oxygen samples will be collected at one station from each transect from the surface and 10m off bottom. Samples will be preserved with 1 ml solutions of MnCl₂ and sodium hydroxide (8 M) / sodium iodide (4 M), and stored on board for titration during the survey. This data will be used to calibrate the CTD oxygen sensors. Nutrient samples will be collected from all transect stations at depths 0, 10, 20, 30, 40, 50, 75, 100m, and 10m off bottom and frozen at –80C for analysis at a later date at the NOAA laboratories in Seattle. CTD transects will be occupied weather and time permitting.

Acoustics: The EK-60 (200-kHz) and EK-500 (38 and 120-kHz) may be used to continuously collect acoustic data during the project. We request that Survey monitor and adjust the system as needed.

D. Dive Plan

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

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which could preclude normal operations: poor weather and equipment failure. Poor weather would be waited out in a sheltered area until operations could be resumed and modifications would be made to the sampling grid. Sheltered areas are of scientific interest; therefore, while waiting out poor weather, the Chief Scientist may request sampling operations to assess local physical conditions, zooplankton, and fish populations. Equipment failure would have to be addressed immediately for the project to continue.

III. Equipment

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

1. Acoustic Equipment

- GPS with NEMA 183 to ER60 (2)
- 50/200 kHz ES60 Bridge sounder
- Furuno FE-700 fathometer
- Acoustic echosounders (5)

2. Trawling Equipment

- 3rd wire FS-70 net sonar with winch and accessories (2)
- Simrad ITI net mensuration system (2)
- Furuno CN24-40 headrope transducer
- Stern trawl capabilities for trawling

3. Oceanographic Equipment

- Both starboard oceanographic winches with conducting cable, slip rings and blocks. Forward winch terminated for CTD/rosette; aft winch terminated for FastCat.
- Seabird SBE 911+CTD System
- Seabird SBE19+CTD and PDIM for real time data on zooplankton tows
- Niskin Bottles 10 L (need 10 total+ spares)
- SBE45 Thermosalinograph with fluorometer
- Wire speed indicators and readout for both hydrographic winches visible in Dry Lab or where SEACAT operations occur
- Weather instr. for above surface PAR, wind speed/direction

4. Biological Sampling Equipment

- Fish lab conveyor system
- Catch sorting and weighing table
- Calibrated Marel M60 60kg scale (2)
- Calibrated Marel M60 6kg scale (2)
- Large gray tubs for dumping catch into (2)
- Fish baskets
- Fish trays

5. Computing equipment

- Scientific Computing System

6. Sample storage equipment

- Supercold freezer (-80C)
- Walk in freezer (-10C)
- Stand up freezer (-20C)
- Hazmat storage cabinets

7. Laboratory and exterior working space

- Use of Pentium PC in Dry and/or Computer Lab for data analysis,
- Remote access in the computer lab to FastCat data stored in the survey lab.
- Scientific Computer System (SCS)
- Video monitors in Dry, Chemistry, and Wet labs for viewing SCS output

- Laboratory space with exhaust hood, sink, lab tables, and storage space
- Sea-water hoses and spray nozzles to wash nets (quarterdeck and aft deck),
- Adequate deck lighting for night-time operations,
- Navigational equipment including GPS and radar,
- Safety harnesses for working on starboard sampling station/hero platform and fantail
- Ship's crane(s) used for loading and/or deploying gear and supplies

C. Equipment and Capabilities Provided by the Scientists (itemized)

1. Trawling Equipment

- Small-mesh midwater trawl (Stauffer, a.k.a. anchovy) equipped with 3-mm (1/8") mesh codend liner
- Shrimp trawl
- Two pairs steel-v trawl doors (each door: 5'x7', 1250 lbs for Stauffer and shrimp trawls)
- All accessories to make trawls fishable

2. Plankton Equipment

- 60 cm bongo frames (2)
- 20 cm bongo frames (2)
- 60 cm bongo nets and cod-ends
- 20 cm bongo nets and cod-ends
- 50 kg bongo weights (2)
- Flow meters (10)
- Wire angle indicators (2)
- Miscellaneous supplies

3. Oceanographic Equipment (1,500lbs)

- Biospherical QSP2300 PAR sensor
- SBE 43 dissolved oxygen sensor (2)
- Secondary TC sensors for SBE 911+
- SBE 19Plus SeaCat
- SBE 49 FastCat
- Filter racks and pumps (2)

4. Biological Sampling Equipment (500lbs)

- Dynamometer
- 5-gal buckets (5)
- Two length boards for adult fish
- Three length boards for small fish
- 2000 Zip-loc bags (12")
- Sieves, jar holder, funnels, squirt bottles
- 22 cases of 32-oz jars, closures, and labels
- Preservative-dispenser equipment
- Hazardous materials spill kit

5. Computing equipment (50lbs)

- IBM compatibles

- Cruise Operations Database (COD) software
- Electronic (MS Excel) and paper forms: Haul, Catch, and Length

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

Dyson loaded 1/20 /2015 by FOCI and MACE personnel. All chemicals listed will be used for the entire 2015 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% | 8 – 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. |
| Lithium 3v Batteries Property of FOCI | | 12 | 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 |
| Lithium Transponder Batteries Property of MACE | | 3 | NA | Avoid heat and moisture during storage. Storage container will be provided by MACE. |
| 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 | 100% | 1 – 500 g | Gloves Wet paper towels | Not a regulated chemical. Stored |

| | | | | |
|--|--------|------------|-------------------|---|
| Property of FOCI | | | Plastic bag | in Spill Kit. |
| Sodium Iodide/NaOH Solution Property of PMEL | 0.11M | 1 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 | 1 liter | Spill Control: A | Used for oxygen titrations. |
| | | | | |
| 10% Hydrochloric Acid Property of FOCI | 10 % | 0.5 liters | Spill Control A | For use in cleaning productivity experiment equipment Store in Acid locker in Chem Lab |
| Decontamination Concentrate Solution Property of FOCI | 5.25 % | 40 ml | Spill Control A | For use in cleaning flow cytometer Store in Chem lab cabinets |
| Bacteriostatic Concentrate Solution Property of FOCI | | 36 ml | Spill control A | For use in cleaning flow cytometer Store in Chem lab cabinets |
| Extended Flow Cell Clean Property of FOCI | 5 % | 8 ml | Spill Control: A | For use in cleaning flow cytometer Store in Chem lab cabinets |
| Citric Acid, anhydrous Property of FOCI | >99% | 25 gm | Spill Control: A | For use in cleaning flow cytometer Store in Chem lab cabinets |
| Cleaning Concentrate | 10-30% | 37 ml | Spill Control: A | For use in cleaning flow |

| | | | | |
|---------------------------------|-------------------------------------|---|--|---|
| Solution Property of FOCI | | | | cytometer Store in Chem lab cabinets |
| 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 formaldehyde. |
| 3 M Pads | 10 pads | Ethanol cleanup | 10 pads=10 - 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 | N/A | Gloves will be restocked by each survey group. |
| Eye Protection | 4 pairs goggles 1 face shield | Formaldehyde cleanup | N/A | Eye protection will be cleaned before re-use. |
| Tyvex Lab Coats | 2 coats | Formaldehyde cleanup | N/A | Coats will be cleaned with Fan- Pads and Formalex before reuse. |
| Plastic Bags | 2 | Formaldehyde cleanup/Fan Pads | N/A | Bags may be packed full and sealed. |

| | | | | |
|---|---------------|---|---|--------------|
| Acid-Base Spill Kit Contents | Amount | Use | Total Spill Volume Controllable | Notes |
| Spilfyter Acid Neutralizer | 1 box | Clean up acid spill—H ₂ SO ₄ | 1.5l of 5M Sulfuric Acid 5.57l of 10% (1N) HCl | |
| Spilfyter Base Neutralizer | 1 box | Clean up base spill--NaOH | 2.0l of Sodium Hydroxide | |
| Vinyl Gloves | 1 box | Protect hands during cleanup | N/A | |
| Foxtail/Dustpan | 1 each | Pick up | N/A | |

| | | | | |
|--------------------|---------------|-------------------------------|------------|--|
| | | absorbed neutralizer | | |
| Rubber apron | 1 each | Protect during cleanup | N/A | |
| Paper Towels | 1 roll | Absorb liquids | N/A | |
| Goggles | 2 pair | Protect eyes | N/A | |
| Chemical absorbent | 1 liter | Absorb liquids | 0.5l | |
| Plastic Bags | 2 each | Contain used absorbents/waste | N/A | |

C. Chemical safety and spill response procedures

A: ACID

- ☐ Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.
- ☐ Ventilate closed spaces before entering them.
- ☐ Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
- ☐ **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.
- ☐ **Small Spills:** Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
- ☐ Never return spills in original containers for re-use.
- ☐ Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.
- ☐ J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

B:Base

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

M: Mercury

- ☐ Spills: Pick up and place in a suitable container for reclamation or disposal in a method 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

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

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

PI:Potassium Iodate

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

MC:Mercuric Chloride

- ☐ Vacuum or sweep up material and place into suitable disposable container (plastic bag).
- ☐ Wear SCBA or other appropriate breathing apparatus and PPE.
- ☐ Avoid breathing dust.
- ☐ Keep in closed container for disposal.

ST: Sodium Thiosulfate

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

- ☐ Absorb the liquid and wash with water
- ☐ Wear PPE

E: Ethanol

- ☐ Eliminate all ignition sources
- ☐ Wear PPE

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials

N/A

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

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.omaon.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

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 email and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to

the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged through the ship's Commanding Officer at least 30 days in advance.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN.

Requirements include, but are not limited to:

- (1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
- (2) Installation of the latest critical operating system security patches.
- (3) No external public Internet Service Provider (ISP) connections.

Completion of the above requirements prior to boarding the ship is required.

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

E. 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.

Appendices

1. Station List (station order and number of stations occupied may vary).

| Activity | Grid | Latitude (N) | Longitude (W) |
|---------------------|-------|--------------|---------------|
| CTD, Bongo, Trawl | gx183 | 57.9721 | 154.1612 |
| Bongo, Trawl | gz181 | 57.7364 | 154.1629 |
| Bongo, Trawl | gx179 | 57.7302 | 154.5927 |
| Bongo, Trawl | gv177 | 57.7241 | 155.0237 |
| Bongo, Trawl | gx175 | 57.4883 | 155.0212 |
| Bongo, Trawl | gx171 | 57.2464 | 155.4469 |
| Bongo, Trawl | gz169 | 57.0107 | 155.4403 |
| Bongo, Trawl | hb167 | 56.7749 | 155.4324 |
| Bongo, Trawl | hd169 | 56.7811 | 155.0054 |
| Bongo, Trawl | hfl67 | 56.5454 | 154.9975 |
| Bongo, Trawl | hd165 | 56.5392 | 155.4231 |
| Bongo, Trawl | hfl63 | 56.3034 | 155.4126 |
| Bongo, Trawl | hh165 | 56.3096 | 154.9883 |
| Bongo, Trawl | hh161 | 56.0677 | 155.4009 |
| Bongo, Trawl | hh157 | 55.8258 | 155.8109 |
| Bongo, Trawl | hfl59 | 56.0615 | 155.8251 |
| CTDB, Bongo, Trawl | hd161 | 56.2973 | 155.8382 |
| Bongo, Trawl | hb163 | 56.5330 | 155.8500 |
| Bongo, Trawl | gz165 | 56.7687 | 155.8606 |
| Bongo, Trawl | gx167 | 57.0045 | 155.8698 |
| Bongo, Trawl | gv169 | 57.2402 | 155.8778 |
| Bongo, Trawl | gv165 | 56.9983 | 156.3007 |
| Bongo, Trawl | gx163 | 56.7626 | 156.2900 |
| CTDB*, Bongo, Trawl | gz161 | 56.5268 | 156.2781 |
| Bongo, Trawl | hb159 | 56.2911 | 156.2650 |
| Bongo, Trawl | hd157 | 56.0554 | 156.2506 |
| Bongo, Trawl | hfl55 | 55.8196 | 156.2350 |
| Bongo, Trawl | hd153 | 55.8134 | 156.6605 |
| Bongo, Trawl | hfl51 | 55.5777 | 156.6424 |
| Bongo, Trawl | hd149 | 55.5715 | 157.0678 |
| Bongo, Trawl | hb151 | 55.8073 | 157.0871 |
| Bongo, Trawl | gz153 | 56.0430 | 157.1053 |
| Bongo, Trawl | gx155 | 56.2787 | 157.1224 |
| Bongo, Trawl | gz157 | 56.2849 | 156.6930 |
| Bongo, Trawl | gx159 | 56.5207 | 156.7075 |

| | | | |
|--------------|-------|---------|----------|
| CTDB | gv161 | 56.7564 | 156.7208 |
| Bongo, Trawl | gt163 | 56.8500 | 156.7500 |
| Bongo, Trawl | gu158 | 56.6667 | 157.2167 |
| Bongo, Trawl | 6E | 56.5850 | 157.7870 |
| Bongo, Trawl | gt155 | 56.5083 | 157.5702 |
| Bongo, Trawl | gv153 | 56.2726 | 157.5530 |
| Bongo, Trawl | gx151 | 56.0368 | 157.5346 |
| Bongo, Trawl | gz149 | 55.8011 | 157.5150 |
| Bongo, Trawl | hb147 | 55.5654 | 157.4944 |
| Bongo, Trawl | hd145 | 55.3296 | 157.4726 |
| CTDB | hh143 | 54.9790 | 157.2260 |
| Bongo, Trawl | hfl43 | 55.0939 | 157.4497 |
| CTDB | hd143 | 55.2090 | 157.6740 |
| Bongo, Trawl | hb143 | 55.3234 | 157.8991 |
| CTDB* | gz143 | 55.4380 | 158.1250 |
| Bongo, Trawl | gz145 | 55.5592 | 157.9222 |
| Bongo, Trawl | gx147 | 55.7949 | 157.9442 |
| Bongo, Trawl | gv149 | 56.0307 | 157.9651 |
| Bongo, Trawl | gt151 | 56.2664 | 157.9849 |
| Bongo, Trawl | 5E | 56.4280 | 158.1220 |
| Bongo, Trawl | 3E | 55.9440 | 158.6060 |
| Bongo, Trawl | gv145 | 55.7888 | 158.3747 |
| CTDB | gv143 | 55.6670 | 158.5790 |
| Bongo, Trawl | gx143 | 55.5530 | 158.3513 |
| Bongo, Trawl | gz141 | 55.3173 | 158.3269 |
| Bongo, Trawl | hb139 | 55.0815 | 158.3014 |
| Bongo, Trawl | gz137 | 55.0754 | 158.7291 |
| Bongo, Trawl | gx139 | 55.3111 | 158.7560 |
| Bongo, Trawl | gv141 | 55.5468 | 158.7818 |
| Bongo, Trawl | gr141 | 55.7764 | 159.2395 |
| Bongo, Trawl | gt139 | 55.5407 | 159.2135 |
| Bongo, Trawl | gp135 | 55.5283 | 160.0808 |
| Bongo, Trawl | gt135 | 55.2988 | 159.6180 |
| Bongo, Trawl | gv137 | 55.3049 | 159.1863 |
| Bongo, Trawl | gx135 | 55.0692 | 159.1581 |
| Bongo, Trawl | gz133 | 54.8334 | 159.1289 |
| Bongo, Trawl | gx127 | 54.5854 | 159.9552 |
| Bongo, Trawl | gx123 | 54.3434 | 160.3502 |
| Bongo, Trawl | gv125 | 54.5792 | 160.3854 |
| Bongo, Trawl | gv129 | 54.8211 | 159.9881 |
| Bongo, Trawl | gt127 | 54.8149 | 160.4196 |

| | | | |
|-------------------|-------|---------|----------|
| Bongo, Trawl | gr129 | 55.0507 | 160.4529 |
| Bongo, Trawl | gn129 | 55.2802 | 160.9207 |
| Bongo, Trawl | gp127 | 55.0445 | 160.8870 |
| Bongo, Trawl | gr125 | 54.8088 | 160.8524 |
| Bongo, Trawl | gt123 | 54.5730 | 160.8168 |
| Bongo, Trawl | gv121 | 54.3373 | 160.7803 |
| Bongo, Trawl | gt119 | 54.3311 | 161.2117 |
| Bongo, Trawl | gr121 | 54.5668 | 161.2496 |
| Bongo, Trawl | gp123 | 54.8026 | 161.2865 |
| Bongo, Trawl | gn125 | 55.0383 | 161.3226 |
| Bongo, Trawl | gl127 | 55.2741 | 161.3576 |
| Bongo, Trawl | gl123 | 55.0322 | 161.7594 |
| Bongo, Trawl | gn121 | 54.7964 | 161.7220 |
| Bongo, Trawl | gp119 | 54.5683 | 161.7086 |
| Bongo, Trawl | gr117 | 54.3249 | 161.6444 |
| Bongo, Trawl | gr113 | 54.0830 | 162.0369 |
| Bongo, Trawl | gp115 | 54.3030 | 162.0987 |
| Bongo, Trawl | gn117 | 54.5545 | 162.1190 |
| Bongo, Trawl | gj117 | 54.7841 | 162.5969 |
| Bongo, Trawl | gl115 | 54.5483 | 162.5558 |
| Bongo, Trawl | gn113 | 54.3126 | 162.5137 |
| Bongo, Trawl | gn109 | 54.0707 | 162.9061 |
| Bongo, Trawl | gl111 | 54.3064 | 162.9504 |
| Bongo, Trawl | gj113 | 54.5422 | 162.9938 |
| Bongo, Trawl | gh111 | 54.5360 | 163.4332 |
| Bongo, Trawl | gj109 | 54.3002 | 163.3884 |
| Bongo, Trawl | gl107 | 54.0645 | 163.3427 |
| Bongo, Trawl | gj105 | 54.0583 | 163.7806 |
| Bongo, Trawl | gh107 | 54.2941 | 163.8277 |
| Bongo, Trawl | gf109 | 54.5298 | 163.8740 |
| Bongo, Trawl | gf105 | 54.2879 | 164.2684 |
| Bongo, Trawl | gh103 | 54.0522 | 164.2199 |
| CTD, Bongo, Trawl | gf101 | 54.0460 | 164.6606 |
| Bongo, Trawl | gd103 | 54.2817 | 164.7105 |

*Oxygen and salt sample also taken at the surface and at 10m off bottom.