# Project Instructions

**Date Submitted:** February 29, 2019

**Platform:** NOAA Ship *Reuben Lasker*

**Project Number:** SH-19-02 (OMAO), 1904RL (SWFSC)

**Project Title:** Spring CalCOFI and Fisheries Resources Division Gear Selectivity Trials

**Project Dates:** April 2, 2018 to April 29, 2019

Prepared by: _____ Dated: February 25, 2019
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SWFSC

Approved by: _____ for Dated: 3/13/2019
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Fisheries Resources Director
SWFSC

Approved by: _____ Dated: 3/15/19
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SWFSC

Approved by: _____ Dated: _____
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Commanding Officer
Marine Operations Center - Pacific

## I. Overview

### A. Brief Summary and Project Period

Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between San Francisco, California and San Diego, California during the period of April 1 to April 29, 2019.

### B. Days at Sea (DAS)

Of the 25 DAS scheduled for this project, 25 are funded by a Line Office Allocation according to the Fleet Allocation Plan. This project is estimated to exhibit a High Operational Tempo.

### C. Operating Area

The area covered during this survey will be from San Diego to San Francisco and extend approximately 200 miles offshore (please see **Appendices 2.a.** and **2.b.**).

### D. Summary of Objectives

Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between San Francisco, California and San Diego, California.

The following are specific objectives for the spring CalCOFI.

I.D.1. Continuously sample pelagic fish eggs using the Continuous Underway Fish Egg Sampler (CUFES). The data will be used to estimate the distributions and abundances of spawning hake, anchovy, mackerel, and Pacific sardine.

I.D.2. Continuously sample sea-surface temperature, salinity, and chlorophyll-a using a thermosalinometer and fluorometer. These data will be used to estimate the physical oceanographic habitats for target species.

I.D.3. Continuously sample air temperature, barometric pressure, and wind speed and direction using an integrated weather station.

I.D.4. Sample profiles of seawater temperature, salinity, chlorophyll-a, nutrients, and phytoplankton using a CTD with water-sampling rosette and other instruments at prescribed stations. Measurements of extracted chlorophyll and phaeophytin will be obtained with a fluorometer. Primary production will be measured as $C^{14}$ uptake in a six hour in situ incubation. Nutrients will be measured with an auto-analyzer. These data will be used to estimate primary productivity and the biotic and abiotic habitats for target species.

I.D.5. Sample the light intensity in the photic zone using a standard Secchi disk at all daytime stations in conjunction with daytime CTD station. These data will be used to interpret the measurements of primary production.

I.D.6. Sample plankton using a CalBOBL (CalCOFI Bongo Oblique) at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton and zooplankton species.

I.D.7. Sample plankton using a Manta (neuston) net at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton species.

I.D.8. Sample the vertically integrated abundance of fish eggs using a Pairovet net at prescribed stations. These data will be used to quantify the abundances and distributions of fish eggs.

I.D.9. Sample plankton using a PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems) net at all prescribed CalCOFI stations on lines 90.0 and 80.0 as well as stations out to and including station 70.0 on lines 86.7 and 83.3 and station 81.8 46.9. PRPOOS will not be towed on SCCOOS stations. These data will be used in analyses by the LTER (Long Term Ecological Research) project.

I.D.10. Continuously sample profiles of currents using the RDI/Teledyne Acoustic Doppler Current Profiler.

I.D.11. Continuously observe, during daylight hours, seabirds and mammals. These data will be used to estimate the distributions and abundances of seabirds and marine mammals.

I.D.12. Gear selectivity trawl sampling using a modified Nordic 264. Trawl stations will be determined by observed CUFES egg densities and acoustic backscatter from the EK60.

I.D.13. Promoting a safe, positive and productive work environment.

All personnel that embark NOAA Ship Reuben Lasker are to fully support and comply with NOAA Administrative Order 202-1106: NOAA Sexual Assault and Sexual Harassment Prevention and Response Policy. The at-sea working/living environment is particularly sensitive and it is incumbent upon all personnel to uphold a positive and professional workplace dynamic in order to successfully accomplish cruise objectives

E. Participating Institutions

I.E.1 Southwest Fisheries Science Center (SWFSC)

I.E.2 Scripps Institution of Oceanography (SIO)

I.E.3 Farallon Institute Advanced Ecosystem Research (FIAER)

I.E.4 California Department of Fish and Wildlife (CDF&W)

I.E.5 TBD

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

| Name (Last, First) | Title | Date Aboard | Date Disembark | Gender | Affiliation | Nationality |
|---|---|---|---|---|---|---|
| Bryan Overcash | Chief Scientist | April 1, 2019 | April , 29 2019 | M | SWFSC | US |
| Amy Hays | Biologist | April 1, 2019 | April , 29 2019 | F | SWFSC | US |
| Lanora Vasquez-Del Mercado | Biologist | April 1, 2019 | April , 29 2019 | F | SWFSC | US |
| Emily Gardner | Biologist | April 1, 2019 | April , 29 2019 | F | SWFSC | US |
| James Wilkinson | Oceanographer | April 1, 2019 | April 18, 2019 | M | SIO | US |
| David Faber | Oceanographer | April 1, 2019 | April 18, 2019 | M | SIO | US |
| Angela Klemmedson | Oceanographer | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Daniel Schuller | Chemist | April 1, 2019 | April 18, 2019 | M | SIO | US |
| Shonna Dovel | LTER | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Megan Roadman | LTER | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Alice Levasque | Oceanographer | April 1, 2019 | April 18, 2019 | F | SIO | CANA |
| Katherine Whitaker | Marine Mammal Observer | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Eden Borsack | Marine Mammal Acoustician/Observer | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Brian Hoover | Bird Observer | April 1, 2019 | April 18, 2019 | M | FIAER | US |
| Monisha Sugla | Volunteer | April 1, 2019 | April 18, 2019 | F | SIO | US |
| Dave Griffith | Biologist | April 23, 2019 | April , 29 2019 | M | SWFSC | US |
| TBD | Biologist | April 23, 2019 | April , 29 2019 | | | US |

G. Administrative

1. Points of Contacts:

Chief Scientist/alternate: Bryan Overcash/Amy Hays (858-546-7126/858-546-7130); 8901 La Jolla Shores Drive, La Jolla, CA, 92037 (Bryan.Overcash@noaa.gov/Amy.Hays@noaa.gov)

Project Operation Lead: Gerard DiNardo (858-546-7106); 8901 La Jolla Shores Drive, La Jolla, CA, 92037 (Gerard.Dinardo@noaa.gov)

Ops Officer: LT James Europe NOAA Ship *Reuben Lasker* (OPS.Reuben.Lasker@noaa.gov)

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

a. All marine mammal work is covered under a federal research permit NMFS Permit 17312 issued to Dr. John Hildebrand of SIO.

b. CDFW on March 30, 2015 (expires March 2021) NOAA-SWFSC-FRD-Kristen Koch (SC-013886)

## II. Operations

A. Project Itinerary

| | |
|---|---|
| Leg I: | April 1: Depart San Diego, CA – CalCOFI |
| | April 18: Arrive San Diego, CA |
| Leg II: | April 23: San Diego, CA – Start Gear Selectivity Trials |
| | April 29: Arrive San Diego, CA |

B. Staging and Destaging

Staging and destaging will be conducted at the NOAA facility at the Tenth Avenue Marine Terminal in San Diego, CA.

We request one SWFSC MMTD Acoustic Hydraulic Winch to be craned onto the afterdeck and secured in San Diego prior to departure. Please see **Appendix 3.a.** *Marine Mammal Acoustics Lasker Shakedown Report* document for additional details. Specifications are as follows:

- Custom winch on 48" drum, 72" rim, approx 30-" wide
- Winch is attached to a larger steel based that can be bolted to the deck. Screw spacing for larger steel space is 48" (square) with the screw size of 1 5/8"
- Footprint for entire unit approximately 6'x6'
- Approximate weight (with cable): 1200 lbs
- Current motor: Sauer Danfoss DH-200 (hydraulics are engaged only when winch is actively being used (releases to neutral)
- Hansen-style quick disconnects
- PSI 1500

We request the ship to load its portable HPU unit that is currently stored in the warehouse. The portable HPU unit will be installed, as per **Appendix 3.a**

- 12 GPM (gals per minute of oil flow)
- 1200lb Pressure
- 440V Power, to be installed/operated on the back deck near the winch
- Water cooling system installation.
- Hydraulic hoses will be installed at the beginning of the project, and not disconnected until the end of the project. This best management practice will mitigate the leaking of hydraulic oil through the hoses.
- Efforts will be coordinated between the ship and the scientific compliment to ensure proper measures are in place to reduce environmental impacts in the event of a spill casualty.

C. Operations to be Conducted

II.C.1. Underway Operations

II.C.1.a. Thermosalinometer sampling - The ship will provide and maintain a thermosalinometer (TSG), which is calibrated and in working order, for continuous measurement of surface water temperature and salinity. A backup unit (calibrated and in working order) will also be provided by the vessel and remain aboard during the project. The Scientific Computing System (SCS) will serve as the main data collection system. All SCS data will be provided to SWFSC personnel at the completion of the project.

II.C.1.b. Acoustics: Calibration of the EK60 is not requested or planned. EK60 echosounder data will not be collected during the survey.

II.C.1.c. ADCP: The ship's ADCP should run continuously and be logged to a data acquisition system. Complete system settings will be provided by the oceanographer, but will include 5-minute averaging of currents, AGC and 4 beam returns in 60 8-meter bins.

II.C.1.d. CUFES: The egg pump will be mounted inside the ship's hull drawing water from a depth of three meters. The pump will run continuously between stations to sample any pelagic fish eggs. Approximately 640 liters/minute is sent through a concentrator which filters all material larger than 505µm. The sieved material is then collected and identified. All fish eggs are identified to lowest taxa, counted and entered into the data acquisition software. Each sample entry is coupled with sea surface temperature, geographical position, wind speed and direction, date and time, pump speed and surface salinity. Sampling intervals will vary in length, depending on the number of fish eggs seen, from five to 30 minutes.

It is requested that prior to departure on April 1 that the CUFES intake be cleared from all marine growth.

II.C.1.e. Bird Observations: During daylight hours a bird observer will be posted on the flying bridge to identify and count birds while the ship is underway during project transects.

II.C.1.f. Acoustic hydrophone: During transit between most daylight stations, an acoustic hydrophone array will be towed from the stern at a distance of 300 meters with a deck loaded winch to record sounds from marine mammals. The winch is a hydraulic Sauer Danfoss DH-200 with a deck pattern of 6 by 6 feet. Upon approaching a station, sonobuoys (1 – 2) will be deployed one nautical mile prior to stopping for station work.

II.C.2. Station Operations

Each standard station will include the following:

II.C.2.a. CTD/Rosette consisting of 24 10-liter hydrographic bottles will be lowered to approximately 500 meters (depth permitting) at each station to measure physical parameters and collect water at discrete depths for analysis of: salinity, nutrients, oxygen, chlorophyll, etc.

NOTE: SIO will provide their own CTD sensor and 24 bottle (10 liter) rosette unit for use on legs I. Please record CTD deployed, CTD at depth and CTD recovered for SCS.

II.C.2.b. CalBOBL (CalCOFI Bongo): standard oblique plankton tow with 300 meters of wire out, depth permitting, using paired 505 μm mesh nets with 71 cm diameter openings. The technical requirements for this tow are: Descent wire rate of 50 meters per minute and an ascent wire rate of 20 meters per minute. All tows with ascending wire angles lower than 38° or higher than 51° in the final 100 meters of wire will be repeated. Additionally, a 45° wire angle should be closely maintained during the ascent and descent of the net frame. The port side sample will be preserved in buffered ethanol at every station.

Please record Bongo deployed and Bongo recovered for SCS.

II.C.2.c. Manta net (neuston) tow: using a 505 μm mesh net on a frame with a mouth area of 0.1333 $m^2$. Tows are 15 minutes in duration at towing speed of approximately 1.5 - 2.0 knots. Wire angles should be kept between 15° and 25°.

Please record Manta deployed and Manta recovered in SCS.

II.C.2.d. Pairovet net: will be fished from 70 meters to the surface (depth permitting) using paired 25 cm diameter 150 μm mesh nets. The technical requirements for Pairovet tows are: Descent rate of 70 meters per minute, a terminal depth time of 10 seconds and an ascent rate of 70 meters per minute. All tows with wire angles exceeding 15° during the ascent will be repeated.

Please record Pairovet deployed and Pairovet recovered for SCS.

II.C.2.e. PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems) net will be taken at all stations on line 90.0 and 80.0 as well as stations out to and including station 70.0 on lines 86.7 and 83.3 and station 81.8 46.9. These stations are occupied as part of the LTER (Long Term Ecological Research) project. The mesh of the PRPOOS net is 202 μm and the tow is a vertical cast up from 210 meters. The technical requirements for the PRPOOS tows are: Decent rate of 40 meters per minute, a terminal depth time of 20 seconds and an ascent rate of 50 meters per minute.

Please record PRPOOS deployed and PRPOOS recovered for SCS.

II.C.2.f. Primary productivity: at about 1100 hours on each day a primary productivity CTD cast consisting of six 10-liter hydrographic bottles (mounted on CTD frame) will be carried out. The cast arrangement will be determined by a Secchi disc observation. This cast will be in conjunction with an already scheduled station. The purpose of the cast is to collect water from six discrete depths for daily *in situ* productivity experiments. Measurements of extracted chlorophyll and phaeophytin will be obtained with a fluorometer. Primary production will be measured as $C^{14}$ uptake in a six hour *in situ* incubation. Nutrients will be measured with an auto-analyzer. All radioisotope work areas will be given a wipe test before the departure of the SIO technical staff. Primary productivity on leg I after line 76.7 will not be measured.

II.C.2.g. A light meter (Secchi disk) will be used to measure the light intensity in the euphotic zone once a day with the primary productivity cast and all daytime stations.

Please record Secchi deployed and Secchi recovered for SCS.

II.C.2.h. Weather observations.

II.C.3.a. Order of Operations for each standard CalCOFI station:

1) CTD to 515 meters with 24 bottle rosette (depth permitting).

2) Secchi disk (daylight stations only, Secchi will be first prior to CTD on Primary Productivity station of the day which is typically 0900-1100). Secchi disk will not be measured on Leg I after completion of line 76.7.

3) PRPOOS net tow [lines 90.0, 86.7 (out to station 70), 83.3 (out to station 70) and 80.0 ; station 81.8 46.9]. No PRPOOS on near shore SCCOOS stations. Total of 35 stations).

4) Pairovet net tow (on all lines out to station 100 but not to include near shore SCCOOS on Leg I).

5) Manta net tow (on all stations except for near shore SCCOOS).

6) Bongo net tow (on all stations).

II.C.3.b. Plankton Nets, Oceanographic Sampling Devices, Video Camera and ROV Deployments: The SWFSC deploys a wide variety of gear to sample the

marine environment during all of their research projects. These types of gear are not considered to pose any risk to protected species and are therefore not subject to specific mitigation measures. However, the OOD and crew monitor for any unusual circumstances that may arise at a sampling site and use their professional judgment and discretion to avoid any potential risks to protected species during deployment of all research equipment.

Marine mammal watches are now a standard part of conducting fisheries research activities, particularly those that use gear (e.g., longlines and mid-water trawls) known to interact with marine mammals or that we believe have a reasonable likelihood of doing so in the future. Marine mammal watches are conducted in two ways. First, watches are conducted by lookouts (those navigating the vessel and other crew) at all times when the vessel is being operated. Second, marine mammal watches and monitoring occur for 30 minutes prior to deployment of gear, and they continue until gear is brought back on board, for longlines and mid-water trawl gear. Watches in the first category are not done by dedicated staff; these personnel primary duties as lookout according to the Rules of the Road are "maintaining a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision." Watches in the second category are done by dedicated scientists with no other responsibilities during the watch period. If marine mammals are sighted within 1 nm of the planned set location then the sampling station is either moved or canceled. Watch-standers record the estimated species and number of animals present and their behaviors. This information can be valuable in understanding whether some species may be attracted to vessels or gear. While underway:

We will have a bird observer on the flying bridge during all daylight transects.

We will have 1-2 marine mammal observers on the flying bridge during all daylight transects.

We will have a marine mammal acoustician with a towed hydrophone. The hydrophone will be towed off the stern at a distance of 300 meters between daylight stations. The hydrophone will be deployed while leaving a station. The hydrophone can be retrieved at ship's full speed.

At 1 mile prior to each daylight station marine mammal observers will deploy 2 sonobuoys. The hydrophone will be retrieved at this time.

Communication will be open to bridge during all hydrophone deployments and retrievals.

II.C.4.a **Leg II** Standard Daytime/Nighttime Trawl Operations

Each standard nighttime station will include the following:Surface trawling: Two to four surface tows will be conducted each night. The first set will be approximately one hour after sunset, and the last set will be concluded prior to sunrise. Trawl locations will be determined based on CPS egg density, daytime CPS backscatter, and other factors. Each trawl tow will be fished on the surface for a 30-min duration at a towing speed of approximately 3.5-4.5 knots. The duration

of trawls shall be reduced only when necessary to avoid protected species or ensure the safety of the ship or its crew, in which cases a minimum duration of 30 min is preferred but may be reduced at the discretion of the CL/CS. In an attempt keep the footrope from sinking too deep during deployment, it is requested that once the tom weights are in the water, the ship's speed is increased to 3.0-3.5 knots. The trawl will be fitted with cameras and lights to observe the behaviors of target species and to assess the performance of the MMED. The catch from each tow will be processed according to the SFWSC mid-water trawl abbreviated sampling protocol. The acoustic trawl mensuration system (Simrad ITI) may be used to monitor the performance of the trawl net, but shall be secured when not in use to avoid interference with the scientific echosounders.

When possible (weather permitting), a trawl catch greater than five baskets will be lifted on to the sorting table with the ship's crane. Smaller catches can be dumped into either plastic trash cans or a fish tote.

The OOD or ST shall record the time of station arrival and departure in the SCS event logger (**Button labels: Arrive Station, Depart Station**) and the time that the trawl is deployed and recovered (**Button labels: Shoot Doors, Net in Water, Begin Fishing (EQ), Haul Back, Net on Deck**).

It is requested that the OOD note the locations and times when the acoustic sampling starts and stops each day in the SCS event logger (**Button labels: Resume Transect, Break Transect**) and for each transect (**Button labels: Start Transect, End Transect**).

Protected Species Watches

For the nighttime trawl operations, protected species (e.g. marine mammals and turtles) watches are now a standard part of conducting fisheries research activities, particularly those that use gear (e.g., long-lines and mid-water trawls) known to interact with protected species or that we believe have a reasonable likelihood of doing so in the future.

a) 30-min pre-set protected species watches

Protected species watches (visual observation) will be initiated by a designated person/s from the science party no less than 30 min prior to deployment of gear for sampling in order to determine if any protected species are near the proposed trawl set location. This watch can occur during transit leading up to arrival at the sampling station. If stations are less than 5-nmi apart (or less than a 30-min transit time at typical transit speed) then pre-set watch should be conducted for the duration of the transit. Upon arrival at a sampling station, trawl operations shall be conducted immediately except when it is necessary to conduct a bongo plankton tow or CTD deployment prior to deploying trawl gear. Protected species watches will be conducted using any binocular or monocular sighting instrument, with a means to estimate the distance to protected species during the daytime. During nighttime operations, visual observation shall be conducted using the naked eye and available vessel lighting.

b) Move-on rule

If marine mammals, sea turtles or other protected species are sighted within 1 nmi of the planned set location prior to setting the gear, the vessel will transit to a

different section of the sampling area to maintain a minimum distance of 1 nmi between the set location and estimated location of sighted protected species. If, after moving on, protected species remain within the 1-nmi exclusion zone, the CL/CS or watch leader may decide to move again or to skip the station, but in any case, may not set while protected species are in the 1-nmi exclusion radius.

c) Monitoring during trawl deployment, fishing, and retrieval

In addition to the 30 min protected species watch, visual monitoring efforts for protected species are required throughout the entire period of time that trawl gear is in the water. These watches will occur from deployment through gear retrieval and will be conducted by the watch leader, CL/CS, or other designated person/s. If protected species are sighted before the gear is fully retrieved, the most appropriate response to avoid incidental take will be determined by the professional judgment of the CL/CS, watch leader and other experienced crew as necessary. This judgment will be based on his/her past experience operating gears around marine mammals and SWFSC training sessions that will facilitate dissemination of CL/CS expertise that is used when operating in these situations (e.g., factors that contribute to marine mammal gear interactions and those that aid in successfully avoiding these events). These professional judgment decisions will be recorded in the provided visual monitoring watch logs. If trawling efforts have been suspended due to the presence of marine mammals, trawl operations may only resume when sighted protected species are estimated to be at least 1 nmi away from the trawl set location. If mammals are observed in or near the net, the trawl survey lead or CL/CS may request immediate retrieval of the net which should be done as rapidly and as safely possible so as to prevent lethal takes.

d) Data collection for visual watches

The visual monitoring watches (from 30 min prior to set through gear retrieval) and any data gathered during these watches will be recorded in the watch logs provided for each survey and in the SCS.

e) Marine mammal excluder device (MMED)

At all times, Nordic 264 trawl nets must be fitted with a marine mammal excluder device to allow marine mammals caught during trawling operations an opportunity to escape.

f) Acoustic deterrent devices

Pingers must be deployed during all trawl operations and on all types of trawl nets. Two to four pingers (3 kHz @ 135 dB, 10 kHz @ 132 dB, and 70 kHz @ 145 dB) will be placed along the footrope and/or headrope and will be tested at the conclusion of every trawl to check if they are operating properly – pinger function will be noted in the data collection watch logs.

g) Other standard trawl survey protocols

The gear will be emptied as quickly as possible upon retrieval in order to determine whether or not protected species are present.

Care will be taken when emptying the trawl to avoid damage to protected species that may be caught in the gear but are not visible during retrieval.

h) Reporting, Data Collection, and Handling Procedures for Protected Species

All protected species (marine mammals, sea turtles, seabirds, and fish) lethal and non-lethal interactions with fisheries research gear will be reported to [Protected Species Incidental Take Database (PSIT)] within 48 hours and via the Incidental Take Authorization account: SWFSC.ITA@noaa.gov **immediately.** These interactions will be immediately relayed to the SWFSC Director and Environmental Compliance Specialist. If >3 marine mammal takes, or any lethal sea turtle takes occur, call the SWFSC Director or Deputy Director immediately.

In addition, for take of marine mammals and sea turtles, the CL/CS or watch leader will call [the EC-ITA coordinator] immediately at (770-792-2802; cell – anytime) or (858-334-2863; work – daytime only) to provide a detailed report of the event. Catch of eulachon and salmon will only be reported to SWFSC.ITA@noaa.gov at the conclusion of every survey day; no call is necessary. Appropriate communications on all authorized takes will occur in a timely manner to allow [the EC-ITA coordinator] to report the event to the PSIT in the required 48 hours.

i) Lethal take of marine mammal or sea turtle

If a lethal take of a marine mammal or sea turtle occurs, priority should be placed on removing the animal from the gear as quickly and safely as possible so photographs and measurements can be taken according to the protocol (PSIT-002.02; **Appendix 3**). After documentation and sampling, the animal(s) should be wrapped in bag(s) (trash bags or provided body bag) and placed in the scientific freezer. Concurrently, as stated above, [the EC-ITA coordinator] should be notified **immediately via the SWFSC.ITA@noaa.gov accoun**t and reported to PSIT within 48 hours. (Call Kristen Koch or Toby Garfield if >3 marine mammals or lethal sea turtle take.

j) Non-lethal take of any protected species

Priority for any non-lethal take is to release the animal as quickly as possible according to (3) Protected Species Handling instructions (below) to maximize the chances of post-release survival. First and foremost, please take into consideration safety of all crew and staff. Concurrently, as stated above, [the EC-ITA coordinator] should be notified immediately. For live or lethal takes of protected seabirds (protocol attached below), USFWS is to be notified immediately for instructions (PSIT 007.01).

k) Protected Species Handling

In general, following a "common sense" approach to handling protected species will present the best chance of minimizing injury to the animal and of decreasing risks to scientists, officers and crew. There are inherent safety concerns associated with handling/disentangling protected species, so using good judgment and ensuring human safety is paramount. SWFSC researchers should refer to PSIT-004.02 (**Appendix 3**), SWFSC Marine Mammal Handling Guidelines, and the Pacific Islands Region's Identification, Handling and Release of Protected Species (PSIT-005.01, **Appendix 3**), and SWFSC's marine mammal and sea turtle sampling protocol (PSIT-002.01, **Appendix 3**) for more specific guidance on protected species handling and sampling (e.g., species identification, safe removal of fishing gear, etc.).

For all marine mammal and sea turtle incidental interactions, SWFSC researchers will record interaction information using the Trawl Incidental Take Form and the Marine Mammal and Sea Turtle Specimen Data form. For any incidental takes of protected fish species (salmon, eulachon and bull trout), SWFSC researchers will fill out the Protected Fish & Seabird Specimen Data form.

l) Protected Species Sampling and Data Collection

SWFSC scientists are authorized under MMPA regulation 50 CFR 216.22 and encouraged to collect samples from authorized protected species **(**see **Appendix 3**) incidentally captured or killed during fisheries research activities. For sampling, follow guidelines in PSIT-002.02, SWFSCs Detailed Sampling Protocol for Marine Mammal and Sea Turtle Incidental Takes (**Appendix 3**) and fill out the Marine Mammal and Sea Turtle Biological Sampling form.

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.

A dive is requested for clearing the CUFES intake of attached mussels or marine growth.

E. Applicable Restrictions

Conditions which preclude normal operations:

In the event of poor weather conditions, we will work with the ship's officers on developing the best strategy for completion of all stations safely.

We have replacement gear for all operations. Equipment failure should not impact our project.

## III. Equipment

A. Equipment and Capabilities provided by the ship

We request the following systems and their associated support services, sufficient consumables, back-up units, and on-site spares. All measurement instruments are assumed to have current calibrations and we request that all pertinent calibration information be included in the data package.

Starboard winches with 0.375" cable for standard CTD and Pairovet, Manta, Bongo and PRPOOS tows

Port and starboard trawl winches fitted with 1.0" mechanical trawl cable

Stern gantries with blocks to accommodate 1.0" trawl cable

Starboard A-frame w/blocks to accommodate 0.375" cable

Stern A-frame with block to handle Spectra line from Gilson winch

Constant temperature room set at 22°C ± 1°C (71.5°F ± 2°F)

Winch monitoring system

EK60 18 kHz depth recorder or comparable to measure bottom depth to 4000+ meters

Acoustic Doppler Current Profiler

Scientific computing system

24-bottle rosette frame capable of carrying 10-liter niskin bottles, fitted with SBE911+ CTD unit (spare only to be used in case of equipment loss or failure)

Pump, collector and concentrator unit for CUFES water sampling

GPS feed to flying bridge for use by bird observer

110V power to science van on main deck

1500 PSI hydraulic power to science winch on main deck

-80$^{o}$C Freezer

Calibrated, cleaned and functioning underway flow through systems (TSG and Florometer)

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

30 cc and 50 cc syringes (SWFSC)

Canulas (SWFSC)

(30) Pint jar cases (SWFSC )

(15) Quart jar cases (SWFSC)

(4) Gallon jar cases (SWFSC)

(8) Scintillation vial flats (SWFSC)

Inside and outside labels (SWFSC)

CalCOFI net tow data sheets (SWFSC)

(2) 71 cm CalCOFI Bongo frames (SWFSC)

(5) 71 cm CalCOFI 505 μm mesh nets (SWFSC)

(5) CalCOFI 150 μm Pairovet nets and codends (SWFSC)

(2) CalCOFI Pairovet frames (SWFSC)

333 μm mesh codends (SWFSC)

(6) Digital flowmeters (SWFSC)

(2) PRPOOS frames (SIO)

(1) 170 lb PRPOOS weight (SIO)

(2) 202 μm mesh PRPOOS nets and codends (SIO)

(2) 75 lb Bongo weight (SWFSC)

(1) 100 lb hydro weight (SWFSC)

(2) CalCOFI Manta net frames (SWFSC)

(3) 60 cm CalCOFI 505 μm mesh Manta nets (SWFSC)

(4) Standard CalCOFI tool boxes (SWFSC)

Bucket thermometers and holders (SIO)

Hand held inclinometer for Pairovet and Bongo tows (SWFSC)

(1) Oxygen auto-titration rig (SIO)

(6) Oxygen flask cases (SIO)

(2) Guildline Portasal (SIO)

(12) Salinity bottles (SIO)

(2) Standard sea water (SIO)

Data sheets for scheduled hydrographic work (SIO)

Weather observation sheets (SIO)

(1) Primary productivity incubation rack (SIO)

(24) Niskin bottles (10 liter) for rosette (SIO)

(2) SBE911+ CTD unit with necessary sensors (SIO)

(2) Turner fluorometer (SIO)

(1) Nutrient auto analyzer (SIO)

(1) Isotope van (SIO) – 6500 pounds

(1) Winch for acoustic array (SIO) – 1200 pounds

(2) Dissecting microscopes (SWFSC)

(150) Sonobuoys (SIO)

(2) NETS Nordic 264 midwater trawl (6000 lbs.)

(2) NETS 3.0 m X Lite trawl doors (2400 lbs.)

(2) Trawl rigging (1000 lbs.)

(4) Fish measuring boards (20 lbs.)

(4) Motion compensated scales (100 lbs.)

## 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 the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and a chemical hygiene plan. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

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

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

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

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

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

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

B. Inventory

| Common Name of Material | Qty | Notes | Trained Individual | Spill control |
|---|---|---|---|---|
| Ethyl alcohol (95%) | 80L (in 20L cans) | UN1170, Waste contained and disposed of by SWFSC at end of project Stored in Fume hood and cabinet under fume hood | Bryan Overcash | F |
| Formaldehyde solution (37%) | 20L | No waste, Stored in the wet lab fume hood | Bryan Overcash | F |
| Tris buffer | 500ml | Stored in Chem lab | Bryan Overcash | F |
| Sodium borate powder | 500gr | Stored in Chem lab | Bryan Overcash | F |
| HCL (1.2N) | 4L | UN1789, No waste, Stored in Radiation van on aft deck | Dan Schuller | A |
| Sulfuric acid (10 Normal) | 4L | Stored in Chem lab, waste neutralized by base in assay | Dan Schuller | A |
| Acetone (90%) | 7L | UN1090, Waste contained and disposed of by SIO at end of project, Stored in Rad van | Dan Schuller | F |
| Manganous Chloride | 4L | No waste, stored in the wet lab | Dan Schuller | A |
| Sodium Hydroxide/Sodium Iodide | 4L | UN1824, Waste neutralized by acid in assay, stored in the wet lab | Dan Schuller | A |

| Common Name of Material | Qty | Notes | Trained Individual | Spill control |
|---|---|---|---|---|
| Ethanol (95%) | 1L | UN1170, No waste, Stored in Constant environment room | Dan Schuller | F |
| Ecolume Scintillation Fluid | 2.5L | No waste, Stored in Rad van | Dan Schuller | F |
| 14C Sodium Bicarbonate (5.0mCi) | 20ml | Waste contained and disposed of by SIO at end of project, UCSD EH&S, Stored in Rad van | Dan Schuller | Waste remains in Rad van vacuum jugs in secondary containment |
| HCL (12N) | 150ml | No waste, Stored in wet lab/Dropper bottles with secondary containment | Shonna Dovel | A |
| Isopropyl Alcohol (91%) | 30ml | No waste, Stored in wet lab/Dropper bottles with secondary containment | Shonna Dovel | A |
| Liquid Nitrogen | 50L Dewar | No waste, Stored wet lab | Shonna Dovel | A |
| Acetone (90%) | 7L | No waste, Stored in wet lab and -80 freezer with secondary containment | Shonna Dovel | F |
| HCL (1N) | 400ml | No waste, Stored in wet lab/Dropper bottles with secondary containment | Shonna Dovel | A |
| 0.01 mg/ml DAPI 4’,6-Diamidino-2-Phenylindole,Dihydrochloride | 4x1-ml aliquots | Stored in Chem lab. Concentrated DAPI in freezer with secondary containment | Shonna Dovel | A |

| Common Name of Material | Qty | Notes | Trained Individual | Spill control |
|---|---|---|---|---|
| Buffered Formalin (10%) | 2L | Stored in Chem lab fume hood with secondary containment | Shonna Dovel | F |
| Alkaline Lugol's fixative (100%) | 250ml | Stored in Chem lab refer with secondary containment | Shonna Dovel | F |
| Paraformaldehyde (10%) | .5L | Stored in Chem lab refer with secondary containment | Shonna Dovel | F |
| Proflavin (0.033%) | 250ml | Stored in Chem lab refer with secondary containment | Shonna Dovel | F |
| Sodium Thiosulfate (0.190M) | 250ml | Stored in Chem lab refer with secondary containment | Shonna Dovel | F |
| Basic Lugol's fixative (100%) | 500ml | Stored in Chem lab fume hood with secondary containment | Shonna Dovel | F |
| Ammonium Molybdate | 75g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Ammonium Sulfate | 0.1322g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Ascorbic acid | 46g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Brij-35 (15%) | 15g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Imidazole | 8g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Copper Sulfate | 2g | No waste, Stored in Chem lab | Daniel Schuller | D |
| N-(1-naphthyl) ethylenediamine dihydrochloride | 2g | No waste, Stored in Chem lab | Daniel Schuller | D |

| Common Name of Material | Qty | Notes | Trained Individual | Spill control |
|---|---|---|---|---|
| Cadmium Coil | 3g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Oxalic acid | 100g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium dodecyl sulfate | 24g | No waste, Stored in Chem lab | Daniel Schuller | A |
| Potassium antimony tartrate | 0.34g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Potassium Phosphate | 0.8g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium chloride | 850g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium Nitrite | 1.4g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium hydrogen carbonate | 15g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium Hydroxide | 10g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sodium Hydroxide | 0.1L | No waste, Stored in Chem lab | Daniel Schuller | A |
| Ammonia Sulphate | 1L | No waste, Stored in Chem lab | Daniel Schuller | A |
| Sodium sulfite | 2.4g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Sulfanilamide | 20g | No waste, Stored in Chem lab | Daniel Schuller | D |
| O-phthalaldehyde | 4g | No waste, Stored in Chem lab | Daniel Schuller | D |
| Ethanol | 1500ml | No waste, Stored in Chem lab | Daniel Schuller | F |
| HCL (dilute 1.2N) | 2.5L | No waste, Stored in Chem lab | Daniel Schuller | A |
| HCL (conc. 12N) | 4L | No waste, Stored in Chem lab | Daniel Schuller | A |

C. Chemical safety and spill response procedures

**A: ACID/Bases**

- 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.

**F: Formalin/Formaldehyde/Ethanol/Acetone**

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

**D: Powdered and granular chemicals**

- Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.
- Sweep up dry chemical and place in a doubled zip lock bag.
- If contact with water occurs, use proper neutralizing agent prior to cleanup.
- Store in sealed container to be returned and disposed by UCSD EH&S.

Inventory of Spill Kit supplies

| Product Name | Amount | Chemicals it is useful against | Amount it can clean up |
|---|---|---|---|
| Chemical Spill pads | 100 | Formaldehyde, Alcohols | 110L |
| Uni-Safe spill binder | 14 kg | Formaldehyde, alcohols, acids | 120L |

Note: Please see attached **Appendix 1**. Detailing spill control efforts for Scripps Institution of Oceanography.

D. Radioactive Materials

The Chief Scientist is responsible for complying with OMAO 0701-10 Radioactive Material aboard NOAA Ships. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

At least three months in advance of a domestic project and eight months in advance of a foreign project start date the shall submit required documentation to MOC-CO, including:

1. NOAA Form 57-07-02, Request to Use Radioactive Material aboard a NOAA Ship
2. Draft Project Instructions
3. Nuclear Regulatory Commission (NRC) Materials License (NRC Form 374) or a state license for each state the ship will operate in with RAM on board the ship.
4. Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Federal Jurisdiction, or Offshore Waters (NRC Form 241), if only state license(s) are submitted).
5. MSDS
6. Experiment or usage protocols, including spill cleanup procedures.

Scientific parties will follow responsibilities as outlined in the procedure, including requirements for storage and use, routine wipe tests, signage, and material disposal as outline in OMAO 0701-10.

All radioisotope work will be conducted by NRC or State licensed investigators only, and copies of these licenses shall be provided per OMAO 0701-10 at least three months prior to the start date of domestic projects and eight months in advance of foreign project start dates.

E. Inventory (itemized) of Radioactive Materials

| **Common Name Radioactive Material** | **Concentration** | **Amount** | **Notes** |
|---|---|---|---|
| 14C Sodium Bicarbonate | 5.0mCi | 20ml | To be used and stored in Science provided Rad van on main deck of ship. All waste contained and offloaded on Apr. 18 by UCSD,EH&S |
| 14C Sodium Bicarbonate | 100mCi | 20ml | To be used and stored in Science provided Rad van on main deck of ship. All waste contained and offloaded on Apr. 18 by UCSD,EH&S |

## V. Additional Projects

A. Supplementary ("Piggyback") Projects

Upper Trophic Level Opportunistic Research (**Appendix 4**).

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

## VI. Disposition of Data and Reports

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

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data

B. Responsibilities: *Under Development*

## VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Pre-Project Meeting: The Chief Scientist and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting: The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for 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

E. 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 survey.

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

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

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

### B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, 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 form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the project to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the form, and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:

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

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required it must be arranged at least 30 days in advance.

F. IT Security

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

(4) Any computer or device connected through the Government network and internet is subject to NOAA IT shore based monitoring.

(5) For connections to the ship's Public Network, personnel are limited to one personal device. No phones will be allowed on the ship's Network.

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

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

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written NMAO approval and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS e-mail granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign

nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

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

Responsibilities of the Foreign National Sponsor:

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

## IX. Appendices

**Appendix 1.** Detailed list of Scripps Oceanography Chemicals and spill control plan.

Scripps Oceanography, CalCOFI Chemical Spill Kit List, Reuben Lasker 2019

The main concern here is the 10Normal Sulfuric Acid which is secured to the bench in wooden box to prevent spill. We bring a 13.5 lbs bag of Baking soda to neutralize acid in the event of a spill. This is treated as an Acid/Base as explained in the previous chemical safety and spill response section.

Our Radiation van has a spill kit that consists of 2 x 1/2 gallon of Safety Sorbent, the spill kits listed below were just ordered along with additional baking soda:

Safety Sorbent 8 x 1/2 gallon (http://wyksorbents.com/anti-slip-safety-sorbent/)

Sodium Bicarbonate (Arm & Hammer baking soda) 2 x 13.5 lbs bag for Acid Spills

Portable Allwik Economy Spill Kit in Yellow Bag x2
(http://www.fastenal.com/web/products/detail.ex?sku=1007705)

Vinyl gloves 20+ boxes (50-100) count

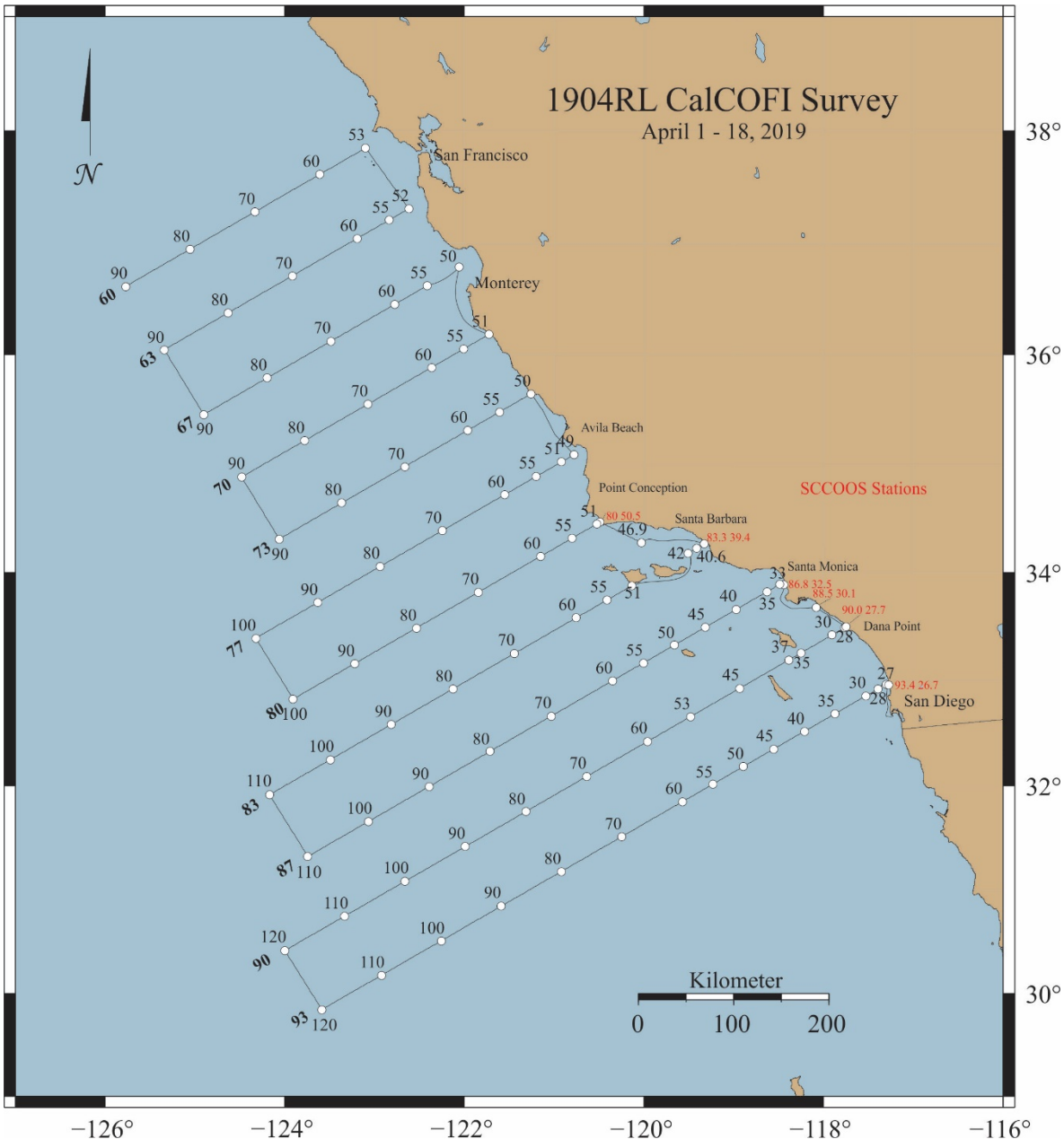
Containment bags 3 rolls of 50 each

Roll paper towels 12 each.

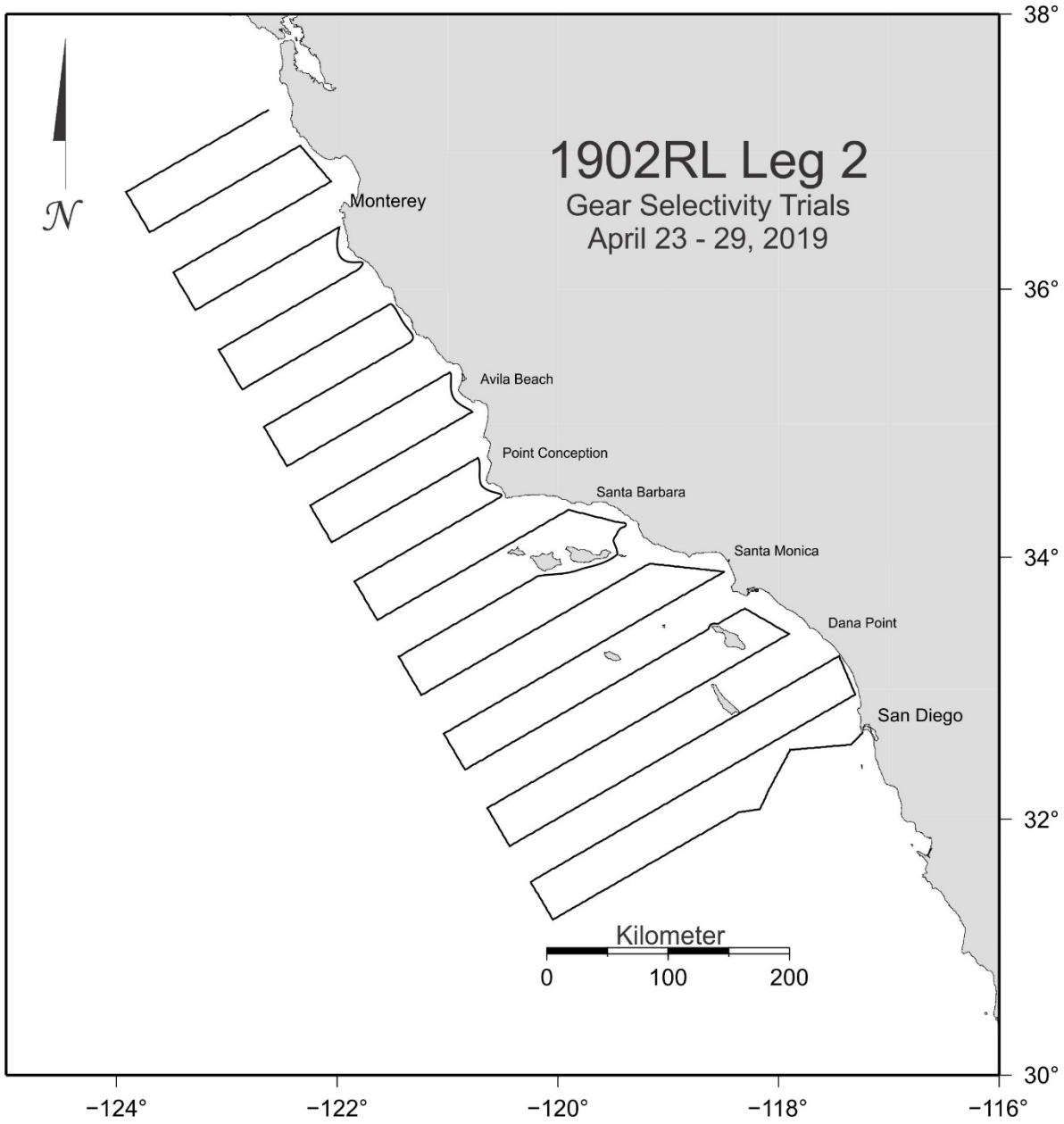
In addition to the spill kits in the Rad van we bring 6 x 1/2gallon additional cartons of Safety Sorbent

http://wyksorbents.com/anti-slip-safety-sorbent/

**Appendix 2.a.** Leg I projected project track and station locations for the spring CalCOFI survey.



**Appendix 2.b.** Leg II projected project track lines for the gear selectivity survey.



**Appendix 2.c**. CalCOFI Station/Waypoint List (coordinates in Latitude, Longitude: degree-minutes)

| Schedule Order | Line | Station | Deg Lat | Min Lat | Deg Lon | Min Lon |
|---|---|---|---|---|---|---|
| 1 | 93.3 | 26.7 | 32 | 57.36 | 117 | 18.3 |
| 2 | 93.4 | 26.4 | 32 | 56.94 | 117 | 16.38 |
| 3 | 93.3 | 28 | 32 | 54.78 | 117 | 23.64 |
| 4 | 93.3 | 30 | 32 | 50.76 | 117 | 31.86 |
| 5 | 93.3 | 35 | 32 | 40.74 | 117 | 52.32 |
| 6 | 93.3 | 40 | 32 | 30.78 | 118 | 12.78 |
| 7 | 93.3 | 45 | 32 | 20.76 | 118 | 33.24 |
| 8 | 93.3 | 50 | 32 | 10.74 | 118 | 53.58 |
| 9 | 93.3 | 55 | 32 | 0.78 | 119 | 13.98 |
| 10 | 93.3 | 60 | 31 | 50.76 | 119 | 34.26 |
| 11 | 93.3 | 70 | 31 | 30.78 | 120 | 14.76 |
| 12 | 93.3 | 80 | 31 | 10.74 | 120 | 55.14 |
| 13 | 93.3 | 90 | 30 | 50.76 | 121 | 35.34 |
| 14 | 93.3 | 100 | 30 | 30.78 | 122 | 15.42 |
| 15 | 93.3 | 110 | 30 | 10.74 | 122 | 55.38 |
| 16 | 93.3 | 120 | 29 | 50.76 | 123 | 35.16 |
| 17 | 90 | 120 | 30 | 25.02 | 123 | 59.88 |
| 18 | 90 | 110 | 30 | 45.06 | 123 | 19.86 |
| 19 | 90 | 100 | 31 | 5.04 | 122 | 39.72 |
| 20 | 90 | 90 | 31 | 25.02 | 121 | 59.4 |
| 21 | 90 | 80 | 31 | 45.06 | 121 | 18.9 |
| 22 | 90 | 70 | 32 | 5.04 | 120 | 38.28 |
| 23 | 90 | 60 | 32 | 25.02 | 119 | 57.54 |
| 24 | 90 | 53 | 32 | 39.06 | 119 | 28.92 |
| 25 | 90 | 45 | 32 | 55.02 | 118 | 56.1 |
| 26 | 90 | 37 | 33 | 11.04 | 118 | 23.22 |
| 27 | 90 | 35 | 33 | 15.06 | 118 | 14.94 |
| 28 | 90 | 30 | 33 | 25.02 | 117 | 54.3 |
| 29 | 90 | 28 | 33 | 29.04 | 117 | 46.08 |
| 30 | 90 | 27.7 | 33 | 29.64 | 117 | 44.82 |
| 31 | 88.5 | 30.1 | 33 | 40.44 | 118 | 4.98 |
| 32 | 86.8 | 32.5 | 33 | 53.28 | 118 | 26.64 |
| 33 | 86.7 | 33 | 33 | 53.34 | 118 | 29.4 |
| 34 | 86.7 | 35 | 33 | 49.32 | 118 | 37.68 |
| 35 | 86.7 | 40 | 33 | 39.36 | 118 | 58.44 |
| 36 | 86.7 | 45 | 33 | 29.34 | 119 | 19.14 |
| 37 | 86.7 | 50 | 33 | 19.32 | 119 | 39.78 |
| 38 | 86.7 | 55 | 33 | 9.36 | 120 | 0.36 |
| 39 | 86.7 | 60 | 32 | 59.34 | 120 | 20.94 |

| Schedule Order | Line | Station | Deg Lat | Min Lat | Deg Lon | Min Lon |
|---|---|---|---|---|---|---|
| 40 | 86.7 | 70 | 32 | 39.36 | 121 | 1.98 |
| 41 | 86.7 | 80 | 32 | 19.32 | 121 | 42.84 |
| 42 | 86.7 | 90 | 31 | 59.34 | 122 | 23.58 |
| 43 | 86.7 | 100 | 31 | 39.36 | 123 | 4.14 |
| 44 | 86.7 | 110 | 31 | 19.32 | 123 | 44.58 |
| 45 | 83.3 | 110 | 31 | 54.66 | 124 | 10.2 |
| 46 | 83.3 | 100 | 32 | 14.7 | 123 | 29.52 |
| 47 | 83.3 | 90 | 32 | 34.68 | 122 | 48.66 |
| 48 | 83.3 | 80 | 32 | 54.66 | 122 | 7.68 |
| 49 | 83.3 | 70 | 33 | 14.7 | 121 | 26.52 |
| 50 | 83.3 | 60 | 33 | 34.68 | 120 | 45.24 |
| 51 | 83.3 | 55 | 33 | 44.7 | 120 | 24.54 |
| 52 | 83.3 | 51 | 33 | 52.68 | 120 | 7.92 |
| 53 | 83.3 | 42 | 34 | 10.68 | 119 | 30.48 |
| 54 | 83.3 | 40.6 | 34 | 13.5 | 119 | 24.66 |
| 55 | 83.3 | 39.4 | 34 | 15.9 | 119 | 19.62 |
| **56** | 81.8 | 46.9 | 34 | 16.44 | 120 | 1.5 |
| 57 | 80 | 50.5 | 34 | 27.96 | 120 | 29.34 |
| 58 | 80 | 51 | 34 | 27 | 120 | 31.38 |
| 59 | 80 | 55 | 34 | 18.96 | 120 | 48.12 |
| 60 | 80 | 60 | 34 | 9 | 121 | 9 |
| 61 | 80 | 70 | 33 | 48.96 | 121 | 50.58 |
| 62 | 80 | 80 | 33 | 28.98 | 122 | 31.98 |
| 63 | 80 | 90 | 33 | 9 | 123 | 13.2 |
| 64 | 80 | 100 | 32 | 48.96 | 123 | 54.3 |
| 65 | 76.7 | 100 | 33 | 23.28 | 124 | 19.32 |
| 66 | 76.7 | 90 | 33 | 43.26 | 123 | 37.98 |
| 67 | 76.7 | 80 | 34 | 3.24 | 122 | 56.46 |
| 68 | 76.7 | 70 | 34 | 23.28 | 122 | 14.76 |
| 69 | 76.7 | 60 | 34 | 43.26 | 121 | 32.88 |
| 70 | 76.7 | 55 | 34 | 53.28 | 121 | 11.88 |
| 71 | 76.7 | 51 | 35 | 1.26 | 120 | 55.02 |
| 72 | 76.7 | 49 | 35 | 5.28 | 120 | 46.62 |
| 73 | 73.3 | 50 | 35 | 38.58 | 121 | 15.3 |
| 74 | 73.3 | 55 | 35 | 28.62 | 121 | 36.54 |
| 75 | 73.3 | 60 | 35 | 18.6 | 121 | 57.66 |
| 76 | 73.3 | 70 | 34 | 58.62 | 122 | 39.84 |
| 77 | 73.3 | 80 | 34 | 38.58 | 123 | 21.84 |
| 78 | 73.3 | 90 | 34 | 18.6 | 124 | 3.66 |
| 79 | 70 | 90 | 34 | 52.92 | 124 | 28.8 |
| 80 | 70 | 80 | 35 | 12.9 | 123 | 46.68 |
| 81 | 70 | 70 | 35 | 32.88 | 123 | 4.38 |
| 82 | 70 | 60 | 35 | 52.92 | 122 | 21.9 |
| 83 | 70 | 55 | 36 | 2.88 | 122 | 0.6 |

| Schedule Order | Line | Station | Deg Lat | Min Lat | Deg Lon | Min Lon |
|---|---|---|---|---|---|---|
| 84 | 70 | 51 | 36 | 10.92 | 121 | 43.5 |
| 85 | 66.7 | 50 | 36 | 47.16 | 122 | 3.36 |
| 86 | 66.7 | 55 | 36 | 37.2 | 122 | 24.84 |
| 87 | 66.7 | 60 | 36 | 27.18 | 122 | 46.32 |
| 88 | 66.7 | 70 | 36 | 7.2 | 123 | 29.1 |
| 89 | 66.7 | 80 | 35 | 47.16 | 124 | 11.7 |
| 90 | 66.7 | 90 | 35 | 27.18 | 124 | 54.12 |
| 91 | 63.3 | 90 | 36 | 2.52 | 125 | 20.46 |
| 92 | 63.3 | 80 | 36 | 22.5 | 124 | 37.74 |
| 93 | 63.3 | 70 | 36 | 42.54 | 123 | 54.78 |
| 94 | 63.3 | 60 | 37 | 2.52 | 123 | 11.7 |
| 95 | 63.3 | 55 | 37 | 12.54 | 122 | 50.04 |
| 96 | 63.3 | 52 | 37 | 18.54 | 122 | 37.02 |
| 97 | 60 | 53 | 37 | 50.82 | 123 | 5.94 |
| 98 | 60 | 60 | 37 | 36.84 | 123 | 36.48 |
| 99 | 60 | 70 | 37 | 16.8 | 124 | 19.92 |
| 100 | 60 | 80 | 36 | 56.82 | 125 | 3.18 |
| 101 | 60 | 90 | 36 | 36.84 | 125 | 46.2 |

**Appendix 3.** Marine Mammal and Sea Turtle Incidental Take and Sampling Documents
**Point of Contact:** Elise Kohli (elise.kohli@noaa.gov)

All of the marine mammal sampling protocols are available for download by NOAA employees from the SWFSC EC/ITA Document Repository (https://drive.google.com/drive/folders/0BxKoDRm1QXQ5NVRMUjFBYVN0Tnc).

Specific documents mentioned above:

PSIT-002.02 - Marine Mammal & Sea Turtle Sampling Protocol

(https://drive.google.com/a/noaa.gov/file/d/0BxKoDRm1QXQ5Unh0Q2o4eTJ3TmM/view?usp=sharing)

PSIT-004.02 SWFSC Marine Mammal Handling Protocol

(https://drive.google.com/a/noaa.gov/file/d/0BxKoDRm1QXQ5NXUxRVJYMEd2eWM/view?usp=sharing)

PSIT-005.01 PIRO Protected Species Handling Protocol

(https://drive.google.com/a/noaa.gov/file/d/0BxKoDRm1QXQ5VEJQZzlPOV9oTGM/view?usp=sharing)

List of Authorized Take Species for SWFSC Trawl Surveys

(https://drive.google.com/file/d/0BxKoDRm1QXQ5eDF2aEZfSHdOZzg/view)

**Seabird protocol (PSIT 007.01):** https://drive.google.com/drive/u/1/folders/1jYFNgR8EyuVZ7m2Hgdexw_QJrES1__vr

**Bull Trout protocol (PSIT 006.03)**: https://drive.google.com/drive/u/1/folders/1jYFNgR8EyuVZ7m2Hgdexw_QJrES1__vr

**Remaining incidental takes**: https://drive.google.com/drive/u/1/folders/1jYFNgR8EyuVZ7m2Hgdexw_QJrES1__vr

**Incidental take flow chart**: https://drive.google.com/drive/u/1/folders/1jYFNgR8EyuVZ7m2Hgdexw_QJrES1__vr

**Appendix 3a.** Summary of passive acoustic monitoring

## II. Reuben Lasker Shakedown Cruise: Summary of Passive Acoustic Monitoring

**Shannon Rankin**

**May 23, 2014**

**Objective:** Testing of all systems related to the passive acoustic monitoring (PAM) of cetaceans from the Reuben Lasker to prepare for shipboard marine mammal surveys. Systems tested include: hydraulic winch and power systems, deployment and retrieval of towed hydrophone arrays, maneuvering of vessel with towed hydrophone array deployed, acoustic lab setup, testing of noise on towed array system, detection and tracking of marine mammals using towed hydrophone array, testing of volumetric towed hydrophone arrays, deployment and retrieval of Drifting Autonomous Spar Buoy Recorders (DASBR), deployment of sonobuoys, and reception range of sonobuoy signals. A summary of observations and results, suggested modifications, and necessary improvements and repairs will be discussed.

**Hydraulic Winch and Power System:** The hydraulic power system (HPU, provided by the vessel) provides ~1200 lbs pressure to the hydraulic winch for the towed hydrophone array (owned by SWFSC).

The HPU is housed in the wet lab, and the hoses run through the roll-up door (Fig. 1). The HPU power is located at the side sampling station, and there is a water cooling system to prevent overheating. The acousticians have permission to run the HPU independent of ships' crew; however, if the unit fails to function, they should report to the bridge and/or the engineer on watch immediately. They should not attempt to test or repair it themselves (the HPU runs on 440 v and it is not intended for outdoor use). Prior

to using the HPU, the HPU hoses must be connected to the winch hoses. These quick-disconnect hoses release a reasonable amount of hydraulic oil when used, and so ideally these should remain connected for the entirety of the survey. If the quick-disconnects are difficult to connect, move the handle on the winch to release pressure. To use the HPU, the power to the water cooling system should be initiated (Fig. 2), then the power to the HPU. The pressure should read ~ 1200lbs.

Figure 1a. Photo from fantail of aft entrances to wet lab. The HPU hoses are currently run out of the roll-up door. The green arrow points to the bulkhead opening which would be the preferred route for the HPU hoses.

Figure 1b. Photo of HPU (with roll-up door behind it). The black button is the START, the red button is the STOP. The green arrow points to the pressure gauge. The red arrow points to the temperature gauge for the hydraulic fluid.

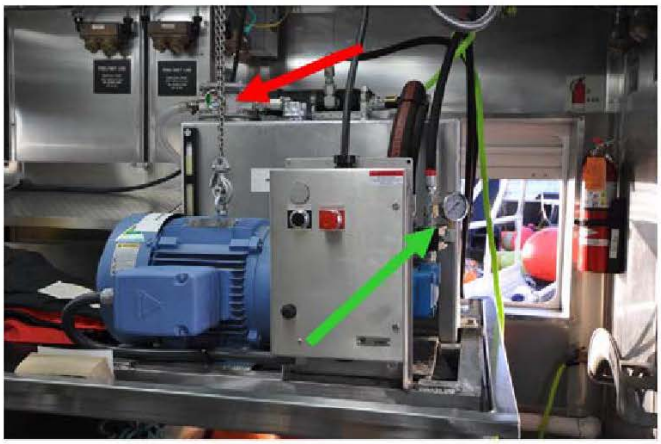


Figure 2. On/off for HPU seawater washdown is located in the wet lab near the doors to the side-sampling station.

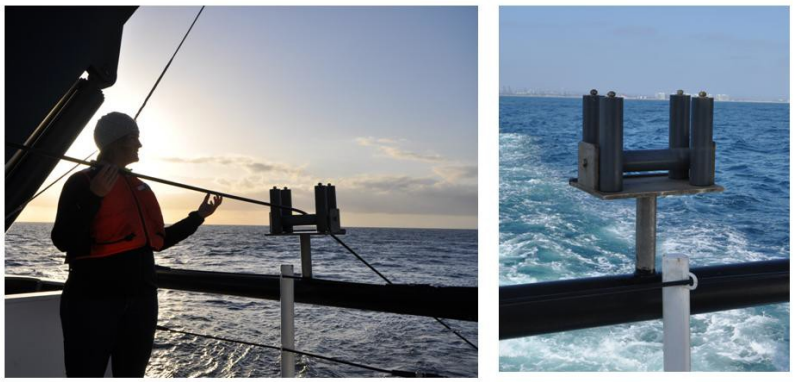
The hydraulic winch will be located on the grate on the fantail. The structure will be chained to the grate itself, and the hoses should be run to connect to the HPU. The hydraulic winch was recently serviced and runs slightly slower than in previous years, although it is less sensitive to movements and will be less 'jerky'. On the top of the hydraulic valve component, there is a screw that allows the speed of the unit to be increased/decreased. This component was not serviced and must be repaired. The dial at the top broke on first use, and when the screw was turned counter-clockwise to increase the speed, hydraulic oil began to seep from this part.

Figure 3. Photo of Winch Speed Adjuster (prior to failure) and close up of poor screw condition and leak.

*Suggestions: If the hydraulic hoses are long enough, they should be run through the bulkhead hole (where the deck cable runs) and remain attached to the winch hoses for the entirety of the survey. The HPU should be repaired so that it does not seep hydraulic fluid when the screw is moved.*

**Deployment and Retrieval of Towed Arrays:** Two acousticians are required to deploy the towed arrays: one to run the winch, the other to work with the cable. The winch/HPU worked well with the exception of the noted leak requiring maintenance. The speed of the winch was sufficient to deploy/retrieve in reasonable time (< 15 min). Ships' speed for retrieval should be no greater than 5 knots; while deployment was only tested at 5 knots, previous experience suggests that deployment speeds of up to 8 knots would be safe when needed. 'Jerking' of the winch was dampened, which allows for minimal training of personnel to run the winch (during the shakedown I showed someone how to run it in 30 seconds and felt safe enough to deploy with 1 experienced and 1 new person). The deck crew modified a roller to fit on the aft stanchion to facilitate deployment/retrieval (Fig. 4). This is the easiest and safest device we have used to date; however, the rollers do not meet the minimum bend radius of our tow cable. Ideally, we would like to modify the roller so that it meets the bend radius for our tow cable. When using a linear array, the entire array can be deployed/retrieved from this device (with the exception of the initial toss). The roller can be removed by lifting (very heavy, requires 2 people).

Figure 4. Roller to aid in deployment/retrieval of array from aft deck. Roller can be removed by lifting (requires 2 people).



Deployment of volumetric arrays (torpedo and x-array) was simple and required no additional assistance.

Cable distance out was measured at three points: 300m, 250m, and 200m. Three white stripes of electrical tape denote 300m, two stripes of white electrical tape denote 200m, and one stripe of electrical tape denote 250m out. We found that 250m was an ideal distance and we suggest this distance for the fall survey. The Reuben Lasker is an extremely quite vessel, and vessel speed was reasonable at all three distances.

With no weight attached to the tow cable, the array averaged 3-4m depth at 200m cable out and 5-6 m depth at 300m out. Five pounds of weight was added to the cable, which gave 6m depth at 200m cable out. I would suggest adding an additional 5 lbs of lead weight to the cable to increase the depth an additional few meters. I believe this will improve our detection distance of dolphin schools, and with the use of the roller it will not impact ease of deployment/retrieval. This will be necessary if the X-Array is deployed, as it maintained a more shallow depth.

*Suggestions: Add an additional 5 lbs lead weight to tow cable, forward of the existing section of lead weight. Modify roller to meet minimum bend radius of tow cable (minimum 12").*

**Vessel Maneuvering:** A maneuvering test was performed to identify the maximum turning point to minimize excessive tension/stress on the cable. At speeds above 10 knots, a maximum of 3° rudder angle is suggested. At speeds less than 8 knots, a rudder angle of 4° did not lead to excessive stress on the cable. As vessel speed decreases, the tension drops dramatically and there are no issues with rudder angle; however, to keep instructions simple we will only request a maximum of 3° rudder angle for speeds greater than 8 knots and a maximum rudder angle of 4° for speeds less than 8 knots. In discussion with the C.O., it can be slow to initiate a turn at these low rudder angles. He suggested starting a turn at a high rudder angle (well outside of our acceptable range) to initiate a turn and then dropping to our requested angles once the vessel has begun to turn. I think this type of maneuvering would greatly improve our ability to respond to sightings with little or no impact on the cable tension.

Maneuvering tests were not performed using either of the volumetric arrays. It is expected that there will be increased tension using these arrays, and this may lead to a required decrease in the turning radius. If a volumetric array is used, a maneuvering test should be repeated.

At full speed the towed hydrophone array trails behind the vessel at 250m. As the vessel speed decreases, the array sinks. If the vessel was to remain at all-stop for an extended period of time, the array would hang vertically from the stern, creating a potential hazard (could interfere with the propeller). A slow-speed test was performed to identify the slowest 'safe' speed the vessel could maintain without concern. At 3 knots there was absolutely no concern, and at speeds of 1-2 knots the array sank *very* slowly. For security,any time the vessel slows to speeds less than 3 knots, an acoustician should be

posted on the fantail to keep an eye on the array angle. If the array angle should sink less than 40° from the vertical, the acoustician should call the bridge and request the vessel increase speed. This increase in speed need only be temporary, and the acoustician can keep in close contact with the bridge to maintain a safe lower speed. In my experience this is a very safe method to allow for slow-speed maneuvering without retrieving the array. This should allow for maneuvering to pick up items in the water, including biopsy darts, the small boat, etc. If there is ever a concern due to miscommunication, etc, the acousticians can begin to retrieve the array immediately. As the array is retrieved, this effectively increases the ship's speed (from the perspective of the array), eliminating any problem with regards to the array going under the vessel.

*Suggestions: At the beginning of the fall survey, I suggest a brief discussion with all crew regarding the limits of vessel maneuvering to make sure that everyone is on the same page. This includes the high initial turning radius suggested by the C.O. as well as the fact that they can turn more sharply at very low speeds. These values are ONLY valid for a linear array. If a volumetric array is used, then these tests must be repeated and, if necessary, new limitations defined. Any time the vessel speed drops below 3 knots, an acoustician must be posted on the fantail to ensure that the array continues to flow BEHIND the vessel. If the array angle drops below 40°, the bridge should be notified to increase the speed temporarily for safety. If for any reason this is insufficient, the acousticians can begin to retrieve the array immediately, which would alleviate any issues related to slow vessel speed.*

**Acoustic Lab Setup:** The acoustics lab will be setup in the computer lab, on the peninsula table. The deck cable is run to this location, and there are 4 SES serial outputs for GPS available. The two rack systems will be mounted against the bulkhead (with the sonobuoy rack on top). There are eyes mounted to the wall for tie-down. Thick nonskid should be used under both racks. The towed array monitoring station will be setup as shown in Fig. 5.

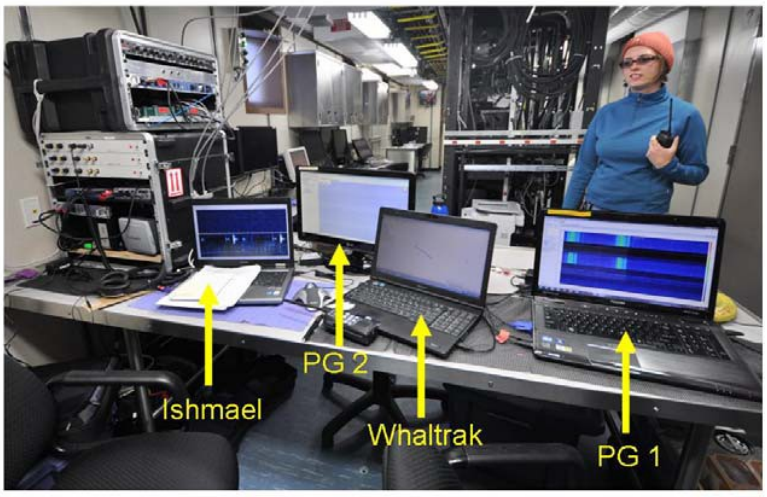



Figure 5. Acoustic Lab Setup. Rack systems are secured to bulkhead. Computers for real-time PAM are closest to rack systems, Pamguard recorder is at the far end with an extra rear monitor for the Pamguard click-detector and logger forms.

All computers were run off an Isobar surge protector from shipboard power. The hydrophone array and rack system was run off battery power. The sonobuoy system was run off ships power. The GPS input were from the SES cables (hanging from above). This setup is sufficiently close to the observer computer (to allow for the wincruz-

pamguard connection). This setup worked reasonable well; however some modifications are suggested to minimize electrical noise input to the system and to improve access to computers/components. We plan to construct a simple wooden structure (5'x 5"x 5") to run along the center of the table to house cables and AC adaptors, as well as to mount the PG 2 monitor. We need to install an under-table keyboard/mouse tray below the Ishmael computer, so that the pamguard computer can be accessed by the primary acoustician while they are working with the real-time localization using Ishmael/Whaltrak. The raised metal lip of the lab tables leads to bruising, so keyboard cushions should be purchased for the extended survey.

Batteries to run the array rack system were manually charged during the sea trial; however, a more secure and automated battery bank (of 2-3 new batteries) should be built for the fall cruise. Chief ET Kim Belveal approved the location of the battery bank, as long as they were housed in a box in the rare case of a spill. The battery bank will be housed below the rack-system (against the bulkhead) and the size will be either 1'x3' OR 18" x 18".

The rack-system itself will be re-built at the lab prior to the fall survey. The 3rd Magrec appears to have increased gain on the 2nd channel. The thru-voltage for all components should be checked. All cables should be isolated to the greatest extent possible, and the depth gauge should be both isolated and protected.

We will need to a dedicated handheld radio, programmed to NOAA frequencies, for the duration of the cruise (cannot be VHF). This will need to be kept in the acoustics lab for acoustics personnel. The acoustics team has one set of UHF handheld radios, and these should be used for communications between the 1° and 2° acousticians (or, during sonobuoy ops). A radio w/ mounted antenna is located directly behind the acoustics station and can be accessed when needed to communicate with the small boat (or, to monitor small boat communications).

The sonobuoy computer and monitoring will be on the other side of the peninsula, and a single computer will be used for recording and monitoring.

*Suggestions: Build wooden housing for cables to run along center of table. Install under-table keyboard/mouse tray. Build battery bank to fit in space below rack-system (on floor against bulkhead). Purchase 3-4 keyboard wrist cushions. Obtain a dedicated handheld radio tuned to NOAA frequencies.*

**Noise Tests:** Noise tests include radiated ship noise and electrical noise picked up by the cable and hardware in the acoustics lab.

The Reuben Lasker is a very, very, very quiet ship. There is absolutely no concern whatsoever about radiated ship noise. In fact, we may consider changing the high-pass filters on the inline pre-amps and the Magrec to consider detection of baleen whales from

this platform.

Electrical noise, although less of a problem than on most vessels, does remain a problem. The deck cable was run along a path to minimize potential interference from other cables (including moving it above fluorescent lights when possible). We will need to wrap bubble wrap around any sections touching other cables or metal (per Kim's suggestion). The lab-end of the deck cable needs to be rebuilt again (there appear to be bad wires on HP 2, 5). Shannon Rankin will arrange with the vessel during their port repairs to spend a day in the lab repairing this section of the deck cable. Insulative caps should be made for the connectors at the lab-end of the deck cable to minimize noise interference.

Care should be taken to make sure NO part of our system touches any metal on the ship, as this introduces noise. The tables in the lab are edged with metal. The wide sections of metal on the tables should be covered with non-skid.

The computers could be run off ships power when used with an ISOBAR. The cables were run along the center of the peninsula table, and movement of cables near metal or noisy devices introduced noise. We will build a wooden structure to house cables and AC adaptors. These can be arranged to minimize noise, and the housing will prevent movement of the cables which may inadvertently introduce noise. The PG 2 monitor can be mounted to the top of this wooden structure.

The GPS inputs were routed through the SES. Because these are actually serial port outputs from a computer (and not directly from the GPS), they are low- or no- noise. We did not test our independent GPS as the SES input was found to be sufficient. The optically isolated USB to Serial port connectors were extremely quiet and are suggested for ALL USB to Serial port connections.

Different noise bands showed up at different times, and on different hydrophones. After the suggested changes noted in this report and implemented, we will need to conduct more noise tests to eliminate any remaining noise bands. It was suggested that we consider using electro-static matting for our lab equipment to minimize noise.

The active acoustics are run on an EK-60 and include 18kHz, 38kHz, 70kHz, 120kHz, 200kHz, and 333kHz frequencies. These can be turned on/off by the acoustician using the computers directly behind the acoustics station. The 18 and 38 kHz pingers directly interfere with passive acoustic detection, although they are helpful when testing and troubleshooting. We should test detection of the 70 kHz pinger. The cruise will likely develop standard requirements for if/when the frequencies will be used, although we strongly request that the 18 and 38 kHz be off when the array is in the water.

*Suggestions: Request permission to work on the Lasker for 1 day during port repairs in June to rebuild lab-end of deck cable, and cushion deck cable with bubble wrap. Build*

*wooden housing for cables on table. Cap ends of connectors on medusa (lab end of deck cable).*

**Detection and Tracking:** Limited detection and tracking tests were conducted. In general, the systems appeared to perform well. Both the Ishmael and the Pamguard computers could benefit from trackball mousse. Pamguard computer was limited by USB inputs and we need to find a low-noise USB multiplier to allow for all the required inputs. This may require a docking station. An under-table keyboard tray will be necessary to use both the real-time tracking computers as well as the pamgaurd/data logging computers.

*Suggestions: Install under-table keyboard. PG computer requires either a docking station or a low-noise USB multiplier.*

**Volumetric Arrays:** Both the Torpedo (TT) and the X-Array (XT) were briefly tested during the shakedown cruise. Deployment and retrieval of both arrays were simple and required no additional precautions. The Torpedo array was mis-wired at HP4 and should be re-wired if it will be used with the big tow cable. The X-Array requires modification due to noise and then further testing. A thorough report on the X Array is in the works.

**DASBRs:** The Drifting Autonomous Spar Buoy Recorders were deployed from the Lasker and retrieved the following day from the small boat. There were a large number of problems with this deployment and therefore a large number of suggested changes.

The DASBRs were deployed while the Lasker was going downwind at 2-3 knots speed. There was a misunderstanding regarding the deployment speed, and all future deployments should be conducted at less than 1 knot speed or else deployed from the small boat. Deployment should occur at the centerline of the aft deck, on the grating, to provide more space for equipment and personnel.

Several changes should be made to the DASBR to allow for deployment/retrieval from the Lasker. A length of 5m buoyant line with a large float should be attached to the DASBR. This would allow for slow lowering of the spar buoy to the water (the Lasker has a high freeboard), and this would also allow for use of a grapple to retrieve the device. The float should be large to improve visual detection. The MOB poles failed, and alternative fishing poles should be considered.

*Suggestions: Modify DASBRs to improve success of deployment/retrieval from Lasker. Ship speed should be less than 1 knot for deployment. Deployment should occur from centerline of aft deck (on grating).*

**Sonobuoys:** Sonobuoys were not tested on this survey, as the VHF antenna cable was not yet ready. This system is relatively simple and a test can be completed during the first

day of the fall survey.

The sonobuoy antenna cable will be run through the mast during the June repair period. We suggest that a pre-amp be connected inline, preferable in a location that is accessible in the event of repairs (Kim suggested the bridge). Because we were unable to test the range of detection, and because modifications cannot be performed at sea, we will need a pre-amplifier in the sonobuoy cable. We have provided the sonobuoy attenna, and the ship will provide the sonobuoy cable (low loss). We have received word that the ship will supply the pre-amp as long as it stays on the ship (which is fine with us). If this changes, we hope to be notified, as a pre-amp is necessary for the fall cruise.

*Suggestions: Run cable from lab up mast to sonobuoy antenna, with a pre-amplifier (preferably in a location with easy access).*

**Conclusions:** The Reuben Lasker will be an ideal platform for passive acoustic monitoring using a towed hydrophone array. I am particulary interested in the possibility for monitoring baleen whales using a towed hydrophone array. Relatively few modifications are required to allow for successful implementation of these methods during the fall survey. We will need to re-examine the cruise instructions to make sure that they are thorough.

Most tests were completed during the shakedown survey. Exceptions include: sonobuoy deployment and detection, test of 70 kHz pingers (and higher frequencies). Some tests will need to be repeated during the first week of the fall survey after improvements have been made. These include: maneuvering tests using volumetric arrays, maneuvering tests, testing the wincruz-pamguard connection, test electronic noise.

**Appendix 4.** Upper Trophic Level Opportunistic Research (UTLOR)

# Upper Trophic Level Opportunistic Research Proposal

California Cooprative Oceanographic Fisheries Investigation (CalCOFI) cruises present a unique opportunity to collect samples from upper trophic level fish species. The cruise pattern takes the ship and its crew far offshore of California where many highly migratory species (HMS) can be found. These offshore areas tend to be difficult to sample with regularity due to their remote loaction. The Fisheries Resource Division (FRD) Life History group at the Southwest Fisheries Science Center (SWFSC) in La Jolla California USA has interest in obtaining samples from these offshore specimens. CalCOFI cruises visit these offshore areas four times yearly. If utilized, sampling these areas would require little to no extra funding and could be performed on all annual CalCOFI cruises.

## Standard Operating Procedure and Safety

- Fish on opposite side of the ship of the array.
- Fish only when the weather does not cause lines to encroach on the marine mammal acoustic array.
- Never leave lines unattended.
- Use appropriate gear/tackle to recover the fish quickly (80 lbs or greater, no light tackle permitted). This will help to keep sampling time to a minimum.
- When recovering a fish slow the ship to 2 knots, **DO NOT STOP THE SHIP**.
- Cruise leader and chief scientist may end opportunistic fishing at their discretion if deemed necessary.
- If fish are overly abundant sampling will cease to prevent excessive use of ship time.
- If a fishing interaction occurs with the array appropriate mitigation actions will be taken to avoid future incidence.
- When possible fishermen will assist with the recovery of array.

## Sampling Protocol

On a provided label and paperwork record the following:

- Latitude, longitude and time (PST) the sample was taken.
- Environmental factors: SST, sea surface condition, salinity, chlorophyll conc.
- Estimated time on hook.
- Type of fish (both scientific and common names) and take a length/weight frequency (Kg and standard length).
- Record the type of gear and tackle used to catch the sample (i.e. hand line, rod and reel, type of lure).
- Save the head and viscera of the specimen immediately in a sturdy plastic bag. Attach the specimen label/ID tag to the bag and place in a freezer.
- A delegated person will be in charge of organizing the samples and getting them to the lab at the end of the cruise.