Final Project Instructions

Date Submitted: February 7, 2017

Platform: NOAA Ship *Bell M. Shimada*

Project Number: SH-17-04 (OMAO), 1704SH (SWFSC)

Project Title: Spring CalCOFI and Saildrone Ground Truthing, SWFSC/PMEL

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Project Dates: March 19, 2017 to April 21, 2017

Prepared by: Amy E. Hays Dated: 7 February 2017

Amy E. Hays
Chief Scientist
SWFSC

Approved by: Dated: 3/20/17

Gerard DiNardo, Ph.D.
Fisheries Resources Director
SWFSC

Approved by: Dated: 3/20/17

Francisco E. Werner, Ph.D.
Science and Research Director
SWFSC

Approved by: Digitally signed by PARKER.BRIAN.W.1076514042 Date: 2017.03.20 15:08:31 -07'00' Dated: March 20, 2017

Commander Brian Parker, NOAA
Commanding Officer
Marine Operations Center - Pacific

I. Overview

A. Brief Summary and Project Period

I.A.1. 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 March 28 to April 21, 2017.

I.A.2. Ground truth the Saildrone UAS instrument suite with the Shimada.

B. Days at Sea (DAS)

I.B.1. Of the 31 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.

I.B.2. 1 UxS day is funded for OAR-PMEL to run instrument comparisons between the SHIMADA and a Carbon Saildrone.

I.B.3 5 days are funded for OMAO for transit from Newport, Oregon to San Diego, California.

C. Operating Area

I.C.1. The area covered during this survey will be from San Diego to San Francisco and extend approximately 200 miles offshore (please see appendices 1b & 2a).

I.C.2. UxS Saildrone: The SHIMADA – Saildrone comparison will take place somewhere along the CA coast between San Francisco and Santa Barbara in less than 300m water depth. The exact location will be determined based on observations from SH-17-02. The requirements are an area with fish aggregates in the water column in less than 300m.

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 once per day in conjunction with a 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. Conduct 24 hrs of Saildrone comparison operations to validate carbon, fisheries acoustics, ADCP, oceanographic, and meteorological sensors integrated onto the Saildrone UAS.

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 Monterey Bay Aquarium Research Institution (MBARI)

I.E.6 J. Craig Venter Institute (JCVI)

I.E.7. Pacific Marine Environmental Laboratory (PMEL)

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

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Julian Herndon	Research Scientist (UxS Chief Sci)	March 19, 2017	March 24, 2017	M	JISAO/ PMEL	US
Amy Hays	Chief Scientist	March 28, 2017	April 21, 2017	F	SWFSC	US
Bryan Overcash	Biologist	March 28, 2017	April 21, 2017	M	SWFSC	US
David Wolgast*	Oceanographer	March 28, 2017	April 14, 2017	M	SIO	US
Jennifer Rodgers-Wolgast*	Oceanographer	March 28, 2017	April 14, 2017	F	SIO	US
James Wilkinson*	Oceanographer	March 28, 2017	April 14, 2017	M	SIO	US
Megan Roadman	LTER	March 28, 2017	April 21, 2017	F	SIO	US
Shonna Dovel*	LTER	March 28, 2017	April 14, 2017	F	SIO	US
Daniel Schuller*	Chemist	March 28, 2017	April 14, 2017	M	SIO	US
Matthias Scheer	Marine Mammal Observer	March 28, 2017	April 21, 2017	M	SIO	US
Melody Baran	Marine Mammal Observer	March 28, 2017	April 21, 2017	F	SIO	US
Regina Guazzo	Marine Mammal Acoustician/Observer	March 28, 2017	April 21, 2017	F	SIO	US
Sophie Webb	Bird Observer	March 28, 2017	April 21, 2017	F	FIAER	US
Stephanie Ostresh	Volunteer	March 28, 2017	April 21, 2017	F	SIO	US
Hailey Rosenthal	Volunteer	March 28, 2017	April 21, 2017	F	SIO	US
Dovi Kacev	Geneticist	April 14, 2017	April 21, 2017	M	NOAA	US

Luke Thompson	Geneticist	April 14, 2017	April 21, 2017	M	NOAA	US
Lisa Zeigler	Geneticist	April 14, 2017	April 21, 2017	F	JCVI	US

**Personnel will be transferred ashore in Monterey or Santa Cruz, California by small boat at the completion of line 70.0.*

***Personnel will be transferred from Monterey or Santa Cruz, California by small boat to the Shimada for Leg II.*

G. Administrative

1. Points of Contacts:

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

UxS Saildrone Chief Scientist/ alternate: Julian Herndon / Noah Lawrence-Slavas (206-526-6256 / 206-498-4666); 7600 Sand Point Way NE, Seattle, WA 98115
(julian.herndon@noaa.gov / noah.lawrence-slavas@noaa.gov)

Project Operation Lead: Sam McClatchie (858-546-7183); 8901 La Jolla Shores Drive, La Jolla, CA, 92037 (Sam.McClatchie@noaa.gov)

Ops Officer: LT Sara Sheehan (808-684-5457) NOAA Ship *Bell M. Shimada* (OPS.Bell.Shimada@noaa.gov)

Saildrone: Contact: Richard Jenkins, (510-326-0946),
E-mail: richard@saildrone.com

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 April 2, 2015 to NOAA-SWFSC-FRD-Cisco Werner(SC-12372)

II. Operations

A. Project Itinerary

Leg II: March 19: Depart Newport, OR – UxS and Transit

March 24: Arrive San Diego, CA

Leg II: March 28: Depart San Diego, CA – CalCOFI

April 14: Small boat transfer via Monterey or Santa Cruz, CA

April 14: Complete Small boat transfer in Depart Monterey or Santa Cruz, CA – continue CalCOFI

April 21: Arrive San Francisco, CA

B. Staging and Destaging

Staging will be conducted in San Diego, CA at the 10th Ave Marine Terminal. Staging will require at least two full days. Destaging will be conducted in San Francisco, CA at Pier 30/32, San Francisco.

We request one laboratory van to be craned onto the afterdeck and secured in San Diego prior to departure. The dimension of the van is approximately 8x8x10 feet weighing 6500 lbs. Power requirement is 110V.

We request one SWFSC MMTD Acoustic Hydraulic Winch and Portable HPU be craned onto the afterdeck and secured in San Diego prior to departure. 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 use of the ship's hydraulic connection to the winch via the portable HPU unit in winch room. Project will bring own Portable

HPU as backup to ship's HPU. 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. UxS Saildrone Comparison Operations

1. The objective is to ground truth the Saildrone's scientific payload using the *Bell M. Shimada.* We would like to do this under a variety of Saildrone operating conditions, which will replicate different wind approach angles, water speeds, heel angles, and wave approach angles. During the inter-comparison, the ship will follow the Saildrone, behind, and if possible downwind, at distances ranging from 100 to 500 meters. The procedure will be as follows: The Saildrone will be placed on a course, either a straight run or a box course by the Saildrone operator.
2. The ship will verify, with the Saildrone operator over the phone & e-mail (Contact: Richard Jenkins, Phone: 510 326 0946, E-mail: richard@saildrone.com), the box waypoint positions and that the Saildrone is on the box course. Additional information, such as the width of the corridor between the waypoints, nominally 200m that the sail drone will stay within while tacking, current position, speed through water, etc. will also be relayed.
3. The ship will then approach the Saildrone to a comfortable distance and the ship will shadow the Saildrone as it moves around the box course. The ship will verify with the Saildrone operator, via e-mail & phone, when they are making their approach and are in position with visual ID. The Saildrone will then maintain its current operating scheme, until the ship calls again to disengage or ask the Saildrone to change its operation mode.

II.C.1.a. Underway pCO_2 Comparison. During the entire 24 hours of comparison work the ship will run the underway pCO_2 system and follow as closely as practical to the Saildrone.

II.C.1.b. Water sample collection. Every 6 hours during the comparison period the ship will take surface water samples with either the ship's CTD rosette, or a Van Dorn sampler supplied by PMEL. The ship should approach to within 100m of the Saildrone to collect these samples. Water samples will be collected by the PMEL scientist.

II.C.1.c. Oceanographic and Meteorological sensor comparison. During the entire 24 hour period the ship will log the scientific sensors as requested.

II.C.1.d. EK60 Comparison. During the first 12 hours of the comparison the ship will conduct an EK60 comparison with the Saildrone. The frequency we are interested in collecting is 38 khz. The ship should secure all other active acoustics during this time as they will interfere with the Saildrone's and the Ship's EK60.

II.C.1.e. ADCP Current Comparison. During the second 12 hours of the comparison the ship will conduct an ADCP comparison to validate Saildrone's ADCP system. The ship should secure the EK60 and all other active acoustics during this time so they do not interfere with the Saildrone's ADCP.

II.C.2. Underway Operations

II.C.2.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.2.b. Acoustics: Calibration of the EK60 is not requested or planned. EK60 echosounder data will not be collected during the survey.

II.C.2.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.2.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 March 28 that the CUFES intake be cleared from all marine growth.

- Dive completed dockside in Newport on March 3. CUFES intake was cleared of all marine growth. Acceptable to chief scientist.

II.C.2.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.2.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, a sonobuoy will be deployed one nautical mile prior to stopping for station work.

II.C.3. Station Operations

Each standard station will include the following:

II.C.3.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.Please record CTD deployed, CTD at depth and CTD recovered for SCS.

II.C.3.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. A self-contained LOPC (Laser Optical Particle Counter) will be mounted in the port side opening during each tow. The port side sample will be preserved in buffered ethanol at every station.

Please record Bongo deployed and Bongo recovered for SCS.

II.C.3.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.3.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.3.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.3.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 II after line 76.7 will not be measured.

II.C.3.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.3.h. Weather observations.

II.C.4.a. Order of Operations for each standard 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 II 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).

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

6) Bongo net tow (on all stations).

II.C.4.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 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 at a ship speed of 5 knots while leaving a station. Once deployed, ship can travel at full speed. The hydrophone can be retrieved at ship's full speed. If the ship must make sudden course changes, notify the marine mammal acoustician and marine mammal observers.

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.

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.

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 hydro winch with 0.375" cable for standard Pairovet, Manta, Bongo and PRPOOS tows

A-frame w/blocks to accommodate 0.375" cable

Constant temperature room set at $22^{o}C \pm 1^{o}C$ ($71.5^{o}F \pm 2^{o}F$)

NOTE: The vessel has no constant temperature room. The constant environment room is sufficient if we are allowed to open and close the door to control temperature and ventilation.

Winch monitoring system

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

Acoustic Doppler Current Profiler

Scientific computing system

12-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 for use as backup

440V power hookup for project's Portable HPU

-80^{o}C Freezer

For UxS Saildrone comparison operations we request the following measurement systems. All measurement instruments are assumed to have current calibrations and we request that all pertinent calibration information be included in the data package.

1. The Underway pCO_2 system
2. The EK-60 fish finder (38 khz),
3. The ADCP with associated POS-MV, Gyro and GPS systems to get current information.
4. The ship should log the scientific sensors listed below for comparison with the Saildrone at a 60-second SCS logging rate. Please make sure that the filters are cleaned on the ship's underway seawater system and that the flow rate is reasonable. Please Bleach the intake and pipes just before the cruise
    a. Wind Speed & Direction
    b. Near-surface (i.e. from ship's underway seawater system) water temperature
    c. Near-surface salinity
    d. Near-surface dissolved oxygen
    e. Atmospheric LWR and SWR from ship's mast
    f. Air temperature/relative humidity
    g. Barometric pressure
    h. Near-surface chlorophyll-a concentration
    i. GPS data

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

(10) 30 cc and (10) 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) LOPC (SIO)

(1) Isotope van (SIO) – 6500 pounds

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

(1) Portable HPU unit for acoustic array (SWFSC) – backup for ship's system

- 12 GPM (gals per minute of oil flow)
- 1200lb Pressure
- 440V Power, to be installed/operated inside wetlab
- Water cooling system installation

(2) Dissecting microscopes (SWFSC)

(150) Sonobuoys (SIO)

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 preservation alcove and cabinet under fume hood	Amy Hays, Bryan Overcash	F
Formaldehyde solution (37%)	20L	No waste, Stored in preservation alcove fume hood	Amy Hays, Bryan Overcash	F
Tris buffer	500ml	Stored in Chem lab	Amy Hays, Bryan Overcash	F

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Sodium borate powder	500gr	Stored in Chem lab	Amy Hays, Bryan Overcash	F
HCL (1.2N)	4L	UN1789, No waste, Stored in Radiation van on aft deck	David Wolgast	A
Sulfuric acid (10 Normal)	4L	Stored in Chem lab, waste neutralized by base in assay	David Wolgast	A
Acetone (90%)	7L	UN1090, Waste contained and disposed of by SIO at end of project, Stored in Rad van	David Wolgast	F
Manganous Chloride	4L	No waste, stored in CTD hanger	David Wolgast	A
Sodium Hydroxide/Sodium Iodide	4L	UN1824, Waste neutralized by acid in assay, Stored in CTD hanger	David Wolgast	A
Ethanol (95%)	1L	UN1170, No waste, Stored in Constant environment room	David Wolgast	F
Ecolume Scintillation Fluid	2.5L	No waste, Stored in Rad van	David Wolgast	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	David Wolgast	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

Common Name of Material	Qty	Notes	Trained Individual	Spill control
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
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

Common Name of Material	Qty	Notes	Trained Individual	Spill control
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
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

Common Name of Material	Qty	Notes	Trained Individual	Spill control
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.a. 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. 24 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. 24 by UCSD,EH&S

V. Additional Projects

A. Supplementary ("Piggyback") Projects

Note: We will have an additional project with JCVI, MBARI and NOAA scientists. Three scientists will board the Shimada on April 14 in the Monterey area. Details of the project are explained here:

Aquatic environments are surveyed for biological constituents for a variety of applications including seafood and swimming safety, determination of productivity, and assessment of environmental integrity. This project will field test an instrument designed by the Monterey Bay Research Institute (MBARI) to affordably increase spatial coverage compared to traditional collection methods. The instrument incorporates a 3rd Generation Environmental Sample Processor (3G ESP) into a long-range autonomous underwater vehicle (LAUV). The resulting 3G ESP-LRAUV ("eAUV") prototype enables autonomous, adaptive biological sampling of seawater over weeks-long missions. The instrument can recognize and sample ocean features, including ocean fronts that can be difficult to capture by traditional ship-board monitoring. Analytical targets for this

mission include the ocean microbiome (phytoplankton and other) and fish eDNA (DNA obtained from shed or excreted cells).

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 conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future

projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report

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.

E. IT Security

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

No foreign nationals are planned to participate on this survey.

IX. Appendices

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

Scripps Oceanography, CalCOFI Chemical Spill Kit List, Bell M. Shimada 2017

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

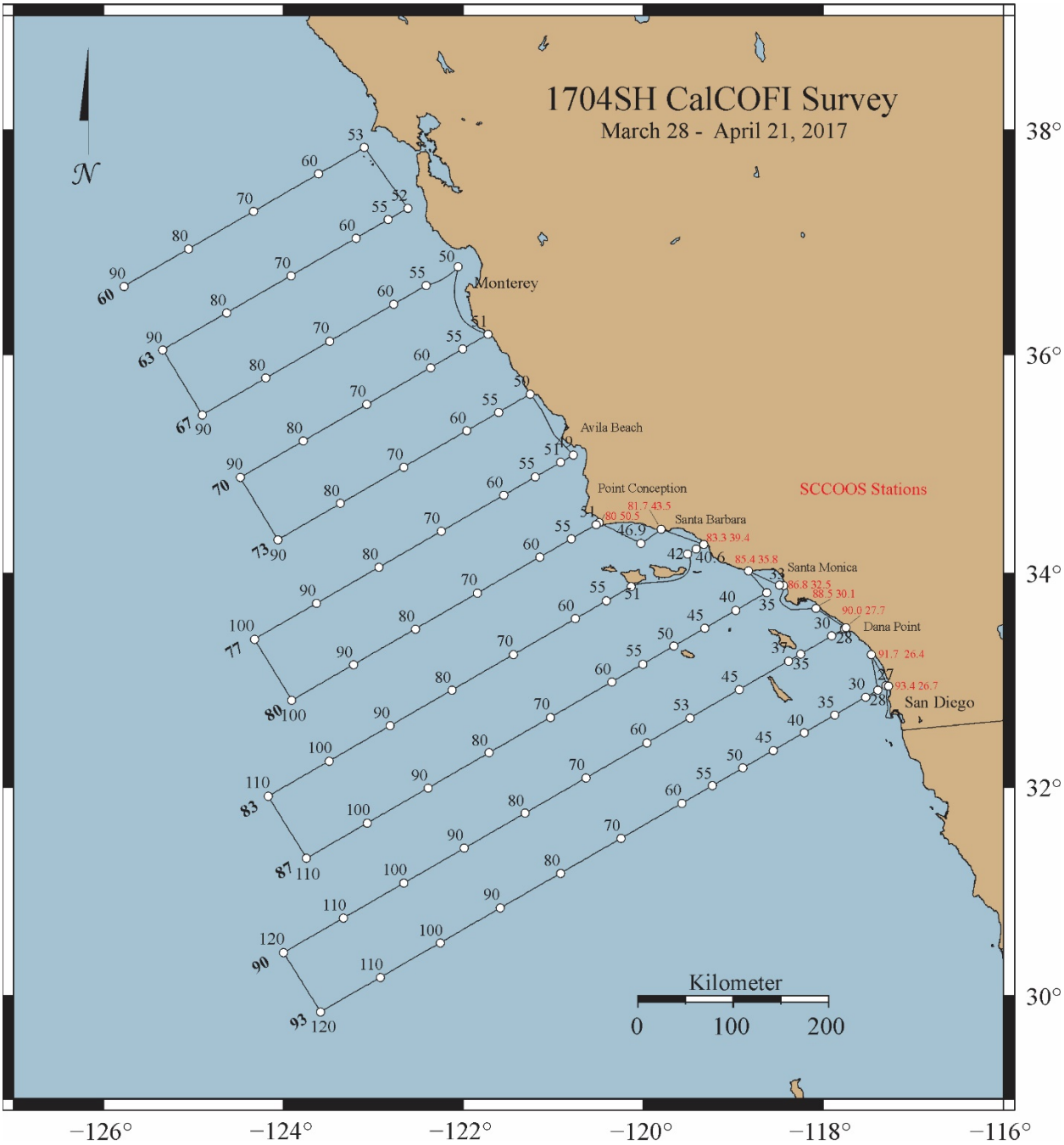
Containment bags 3 rolls of 50 each

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 1.b. Projected project track and station locations for the spring CalCOFI survey.



Appendix 2.a. 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	91.7	26.4	33	14.58	117	27.9
4	93.3	28	32	54.78	117	23.64
5	93.3	30	32	50.76	117	31.86
6	93.3	35	32	40.74	117	52.32
7	93.3	40	32	30.78	118	12.78
8	93.3	45	32	20.76	118	33.24
9	93.3	50	32	10.74	118	53.58
10	93.3	55	32	0.78	119	13.98
11	93.3	60	31	50.76	119	34.26
12	93.3	70	31	30.78	120	14.76
13	93.3	80	31	10.74	120	55.14
14	93.3	90	30	50.76	121	35.34
15	93.3	100	30	30.78	122	15.42
16	93.3	110	30	10.74	122	55.38
17	93.3	120	29	50.76	123	35.16
18	90	120	30	25.02	123	59.88
19	90	110	30	45.06	123	19.86
20	90	100	31	5.04	122	39.72
21	90	90	31	25.02	121	59.4
22	90	80	31	45.06	121	18.9
23	90	70	32	5.04	120	38.28
24	90	60	32	25.02	119	57.54
25	90	53	32	39.06	119	28.92
26	90	45	32	55.02	118	56.1
27	90	37	33	11.04	118	23.22
28	90	35	33	15.06	118	14.94
29	90	30	33	25.02	117	54.3
30	90	28	33	29.04	117	46.08
31	90	27.7	33	29.64	117	44.82
32	88.5	30.1	33	40.44	118	4.98
33	86.8	32.5	33	53.28	118	26.64
34	86.7	33	33	53.34	118	29.4
35	85.4	35.8	34	1.26	118	50.04
36	86.7	35	33	49.32	118	37.68
37	86.7	40	33	39.36	118	58.44
38	86.7	45	33	29.34	119	19.14
39	86.7	50	33	19.32	119	39.78

Schedule Order	Line	Station	Deg Lat	Min Lat	Deg Lon	Min Lon
40	86.7	55	33	9.36	120	0.36
41	86.7	60	32	59.34	120	20.94
42	86.7	70	32	39.36	121	1.98
43	86.7	80	32	19.32	121	42.84
44	86.7	90	31	59.34	122	23.58
45	86.7	100	31	39.36	123	4.14
46	86.7	110	31	19.32	123	44.58
47	83.3	110	31	54.66	124	10.2
48	83.3	100	32	14.7	123	29.52
49	83.3	90	32	34.68	122	48.66
50	83.3	80	32	54.66	122	7.68
51	83.3	70	33	14.7	121	26.52
52	83.3	60	33	34.68	120	45.24
53	83.3	55	33	44.7	120	24.54
54	83.3	51	33	52.68	120	7.92
55	83.3	42	34	10.68	119	30.48
56	83.3	40.6	34	13.5	119	24.66
57	83.3	39.4	34	15.9	119	19.62
58	81.7	43.5	34	24.3	119	48
59	81.8	46.9	34	16.44	120	1.5
60	80	50.5	34	27.96	120	29.34
61	80	51	34	27	120	31.38
62	80	55	34	18.96	120	48.12
63	80	60	34	9	121	9
64	80	70	33	48.96	121	50.58
65	80	80	33	28.98	122	31.98
66	80	90	33	9	123	13.2
67	80	100	32	48.96	123	54.3
68	76.7	100	33	23.28	124	19.32
69	76.7	90	33	43.26	123	37.98
70	76.7	80	34	3.24	122	56.46
71	76.7	70	34	23.28	122	14.76
72	76.7	60	34	43.26	121	32.88
73	76.7	55	34	53.28	121	11.88
74	76.7	51	35	1.26	120	55.02
75	76.7	49	35	5.28	120	46.62
76	73.3	50	35	38.58	121	15.3
77	73.3	55	35	28.62	121	36.54
78	73.3	60	35	18.6	121	57.66
79	73.3	70	34	58.62	122	39.84

Schedule Order	Line	Station	Deg Lat	Min Lat	Deg Lon	Min Lon
80	73.3	80	34	38.58	123	21.84
81	73.3	90	34	18.6	124	3.66
82	70	90	34	52.92	124	28.8
83	70	80	35	12.9	123	46.68
84	70	70	35	32.88	123	4.38
85	70	60	35	52.92	122	21.9
86	70	55	36	2.88	122	0.6
87	70	51	36	10.92	121	43.5
88	66.7	50	36	47.16	122	3.36
89	66.7	55	36	37.2	122	24.84
90	66.7	60	36	27.18	122	46.32
91	66.7	70	36	7.2	123	29.1
92	66.7	80	35	47.16	124	11.7
93	66.7	90	35	27.18	124	54.12
94	63.3	90	36	2.52	125	20.46
95	63.3	80	36	22.5	124	37.74
96	63.3	70	36	42.54	123	54.78
97	63.3	60	37	2.52	123	11.7
98	63.3	55	37	12.54	122	50.04
99	63.3	52	37	18.54	122	37.02
100	60	53	37	50.82	123	5.94
101	60	60	37	36.84	123	36.48
102	60	70	37	16.8	124	19.92
103	60	80	36	56.82	125	3.18
104	60	90	36	36.84	125	46.2

Appendix 3. Saildrone information

- The Saildrone is a sailing vessel, and thus will be tacking and gybing when sailing up / down wind. However, it will not leave the corridor set between the waypoints. If we keep the corridor narrow, at say 200m, the ship can get close with some comfort.
- Under 10knts of wind the Saildrone will be moving at ~2 knts. In 15-20 knots of wind the Saildrone will do 3-5 knots.
- During the approach, The Saildrone operator will be able to 'see' the near real-time *Bell M. Shimada* position on their command console via AIS. After visual ID has been established and while the comparison is underway, the Saildrone will need to turn off their AIS as it compromises sensor data quality. In addition to AIS and being 20' tall and bright orange, see figure #2 below, the Saildrone has a tricolor light on it mast.
- The Saildrone's real time position and information can be seen on a website, the web address and a login password will be given to the ship at the beginning of the cruise.
- The ship should log sea state information and ship's speed during the tests. If there is a better ship speed indicator than GPS available, i.e. speed through water or Doppler, we would like to record it as well to see if we can extrapolate current information from the Saildrone's water speed sensor.