



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Science Center  
Fisheries Ecology Division  
110 Shaffer Road  
Santa Cruz, California 95060

## Project Instructions

**Date Submitted:** March 18, 2016  
**Platform:** NOAA Ship *Reuben Lasker*  
**Project Number:** RL-16-03 (OMAO)  
**Project Title:** Rockfish Recruitment and Ecosystem Assessment  
**Project Dates:** April 26 – June 12, 2016

Prepared by: Keith M. Sakuma Dated: March 18, 2016  
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Chief Scientist  
NOAA NMFS SWFSC FED

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NOAA NMFS SWFSC

Approved by: \_\_\_\_\_ Dated: April 11, 2016  
Commander Brian W. Parker, NOAA  
Commanding Officer  
Marine Operations Center - Pacific

## **I. Overview**

### **A. Project period:** April 26 – June 12, 2016

**Leg 1:** April 26 – May 19

**Leg 2:** May 23 – June 12

### **B. Service level agreements**

Of the 45 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 45 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0DAS are Other Agency funded. This project is estimated to exhibit a high Operational Tempo.

### **C. Operating area**

San Diego, CA to Flint Rock Head, CA (see Appendix I and II for station sample dates and locations).

### **D. Summary of objectives**

1. Sample for pelagic juvenile rockfish (*Sebastes* spp.) and other epi-pelagic micronekton.
2. Characterize prevailing ocean conditions and examine prominent hydrographic features.
3. Map the distribution and abundance of krill (Euphausiacea).
4. Observe seabird and marine mammal distribution and abundance.
5. Collect Humboldt squid (*Dosidicus gigas*).
6. Collections for stable isotope analysis.
7. Sample for juvenile salmon (*Oncorhynchus* spp.).
8. Collect hydrographic data to support modeling harmful algal blooms (HABs).
9. Collect water samples for environmental DNA (eDNA) study in the Monterey Bay area.
10. Collect adult rockfish.

### **E. Participating organizations**

NOAA National Marine Fisheries Service (NMFS) South West Fisheries Science Center (SWFSC) Fisheries Ecology Division (FED)

University of California Santa Cruz (UCSC)

Farallon Institute for Advanced Ecosystem Research (FIAER)

Pacific States Marine Fisheries Commission (PSMFC)

Monterey Bay Area Research Institute (MBARI)

Hopkins Marine Station, Stanford University (HMSSU)

Humboldt State University (HSU)

Center for Stock Assessment Research (CSTAR)

California Department of Fish and Wildlife (CDFW)

California State University Monterey Bay (CSUMB)

Romberg Tiburon Center for Environmental Studies (RTCES)

#### F. Personnel

<b>Name (Last, First)</b>	<b>Title</b>	<b>Date Aboard</b>	<b>Date Disembark</b>	<b>Gender</b>	<b>Affiliation</b>	<b>Nationality</b>
Adams, Thomas	Fishery Intern	May 23	June 12	Male	HSU/NMFS SWFSC FED	USA
Andruszkiewicz, Elizabeth	Ecologist	April 26, May 12, and May 31	May 4, May 19, and June 7	Female	HMSSU	USA
Belcher, Ryan	NOAA Corp. Officer	May 23	June 12	Male	NMFS SWFSC FED	USA
Beyer, Sabrina	Fishery Technician	May 12	May 19	Female	NMFS SWFSC FED	USA
Carrion, Cynthia	Krill Biologist	April 26	May 4	Female	UCSC	USA
Clark, Kit	Krill Biologist	May 23	May 31	Male	UCSC	USA
Closek, Collin	Ecologist	April 26, May 12, and May 31	May 4, May 19, and June 7	Male	HMSSU	USA
Coll, Kevin	Volunteer	May 23	June 7	Male	UCSC	USA
Dick, Edward	Fishery	April 26	May 4	Male	NMFS	USA

	Biologist				SWFSC FED	
Elsmore, Kristen	Graduate Student	May 23	May 31	Female	UC DAVIS	USA
Field, John	Principal Investigator	April 26 and June 7	May 4 and June 12	Male	NMFS SWFSC FED	USA
Fish, Heidi	Fishery Biologist	April 26	May 4	Female	NMFS SWFSC FED	USA
Force, Michael	Ornithologist	April 26	May 31	Male	FIAER	CANADA
Friedlander, Cherisa	NOAA Corp. Officer	May 23 and June 7	May 31 and June 12	Female	NMFS SWFSC FED	USA
Graham, Elizabeth	Volunteer	May 4	May 12	Female	CSUMB	USA
Grunloh, Nick	Statistician	June 7	June 12	Male	CSTAR	USA
Howard, Ryan	Krill Biologist	May 31	June 12	Male	UCSC	USA
Ivens-Duran, Morgan	Environmental Scientist	May 12	May 19	Female	CDFW	USA
Krumbholz, Hillary	Krill Biologist	May 4	May 12	Female	UCSC	USA
Lee, Tricia	Graduate Student	May 23	May 31	Female	RTCES	USA
Lefebvre, Lyndsey	Fishery Technician	May 4 and May 31	May 19 and June 7	Female	NMFS SWFSC FED	USA
Miller, Rebecca	G.I.S. Specialist	May 31	June 19	Female	NMFS SWFSC FED	USA
Nickols, Kerry	Assistant Professor	May 23	May 31	Female	CSUMB	USA
Pearson, Don	Fishery Biologist	April 25	May 19	Male	NMFS SWFSC FED	USA
Pytak, Richard	Krill Biologist	May 12	May 19	Male	UCSC	USA
Sakuma, Keith	Chief Scientist	April 26	June 12	Male	NMFS SWFSC FED	USA
Santora, Jarrod	Ecologist	May 23	June 7	Male	NMFS SWFSC FED	USA
Slesinger, Emily	Fishery Intern	May 4	May 19	Female	NMFS SWFSC	USA

					FED	
Sogard, Susan	Fishery Biologist	May 31	June 7	Female	NMFS SWFSC FED	USA
Stacy, Brett	Technician	April 26	May 19	Male	HSU	USA
Starks, Hilary	Ecologist	April 26, May 12, and May 31	May 4, May 19, and June 7	Female	HMSSU	USA
Sturtevant, Lindsay	Fishery Technician	April 26	May 4	Female	PSMFC	USA
Wells, Brian	Fishery Biologist	May 23	May 31	Male	NMFS SWFSC FED	USA

### Scientist duty hours

Nighttime Shift      1800-0600 (5-7 scientists on duty)  
Daytime Shift          0600-1800 (1-3 scientists on duty)

### G. Administrative

#### 1. Points of contact

Keith Sakuma, Fishery Biologist, Chief Scientist  
NOAA NMFS SWFSC FED  
110 Shaffer Road  
Santa Cruz, CA 95060  
Phone: 831-420-3945  
Email: [keith.sakuma@noaa.gov](mailto:keith.sakuma@noaa.gov)

Amber Payne, Operations Officer  
NOAA Ship *Reuben Lasker*  
10th Ave Marine Terminal  
1839 Water street  
San Diego, CA 92101  
Phone: 541-272-9094  
Email: [ops.reuben.lasker@noaa.gov](mailto:ops.reuben.lasker@noaa.gov)

#### 2. Diplomatic clearances – N/A

This project involves Marine Scientific Research in waters under the jurisdiction of the United States of America.

### **3. Licenses and permits**

This project will be conducted under the NMFS Scientific Research Permit number 19320, the California Department of Fish and Wildlife permit SC-12372, as well as SWFSC's MMPA LOA for the CA Current 80 FR 58982 and ESA section 7 biological opinion and associated incidental take statement WCR ESA consultation 2015-2455. Chief Scientist Keith Sakuma.

Operations within the Channel Islands National Marine Sanctuary (CINMS) are approved under permit CINMS-2015-007, Principal Investigator John Field. Permitted activities include the use of midwater sampling gear as well as CTDs. All other activities are subject to CINMS regulations. Operations within any other National Marine Sanctuary are covered under the ONMS concurrence 304(d) received by SWFSC April 14, 2015.

If hook and line fishing is permitted, the fisher must have a valid CA recreational fishing license in order to be allowed to retain their catch. All fishing regulations, including daily bag limits and prohibited closed area restrictions must be followed. No fish or invertebrates taken aboard NOAA vessels may be sold, or bartered, although consumption of captured species aboard the vessel is allowed if regulations (area/species/bag limits) are followed.

## **II. Operations**

### **A. Project itinerary**

#### **Leg 1: April 26-May19**

Mobilize scientific gear from NOAA NMFS SWFSC FED Santa Cruz, CA to the ship at the Pier 50 D in San Francisco, CA on April 25 and load and setup. On April 26, embark all scientific personnel and depart San Francisco, CA to begin scientific operations and conduct trawling and CTD sea trials off central California during the daylight hours prior to the first night of operations. Beginning the first night after sea trials and ending the morning of the last day of Leg 1, conduct nighttime midwater trawls, CTD deployments, bongo tows, paironet tows, various oceanographic sampling, seabird/marine mammal observations, hook and line fishing for adult rockfish, and opportunistic Humboldt squid jigging between San Diego, CA and Flint Rock Head, CA. There will be a transfer of scientific personnel via skiff/small boat on May 4 (tentatively at Santa Cruz, CA) and again on May 12 (tentatively at Santa Barbara, CA). Arrive in port at Pier 30/32 in San Francisco, CA upon the completion of Leg 1 operations on May 19. Three full days will be spent in port at Pier 30/32 in San Francisco from May 20-22.

#### **Leg 2: May 23 – June 12**

Embark Leg 2 scientists on May 23. Beginning the first night of Leg 2 and ending the morning of the last day of Leg 2, conduct nighttime midwater trawls, CTD deployments,

bongo tows, paironet tows, various oceanographic sampling, seabird/marine mammal observations, and opportunistic Humboldt squid jigging between San Diego, CA and Flint Rock Head, CA. The daily transect plan for Leg 2 is listed in Appendix I and is subject to change. Juvenile salmon sampling is tentatively scheduled for May 24, which requires the modified Cobb midwater trawl to be switched out to the Nordic 264 rope trawl after completing the May 23 nighttime midwater trawl operations. Upon completion of juvenile salmon sampling, the Nordic 264 rope trawl will need to be switched to the modified Cobb midwater trawl in order to resume nighttime midwater trawl operations. In addition, during the first week of Leg 2 a daytime surface trawl maybe conducted once a day using the modified Cobb midwater trawl to collect juvenile salmon. There will be a transfer of scientific personnel via skiff/small boat on May 31 (tentatively at Bodega Bay, CA) and again on June 7 (tentatively at Avila, CA). Arrive in Ship's home port in San Diego, CA upon the completion of Leg 2 operations on June 12.

## **B. Staging and de-staging**

On April 25 scientific survey equipment from NOAA NMFS SWFSC FED will be loaded and secured aboard the ship while in port in San Francisco, CA prior to departure and the start of Leg 1. Scientists request the ability to stay aboard the ship on the night in port in San Francisco, CA prior to departure on April 26 (i.e., night of April 25) and during the San Francisco, CA in port period. Frozen specimens and miscellaneous gear will be offloaded upon arriving in San Francisco, CA at the in port. Miscellaneous gear may be loaded prior to departing San Francisco, CA after the in port. On June 12 at the conclusion of the survey, the NOAA NMFS SWFSC FED equipment will be off-loaded from the ship at San Diego, CA and arrangements will be made to ship all cruise gear back to the NOAA NMFS SWFSC FED in Santa Cruz, CA.

A skiff/small boat will be needed to embark/disembark scientists and miscellaneous gear if operational or staffing needs require exchanges. Skiff exchanges may occur at the following locations off CA: San Diego, Los Angeles/Long Beach, Channel Islands Harbor in Oxnard, Santa Barbara, Morro Bay, Avila Beach, Monterey Harbor, Santa Cruz Harbor, Pillar Point Harbor in Half Moon Bay, San Francisco, Horseshoe Cove at Sausalito, Drake's Bay Pier, Bodega Bay Harbor, and Eureka. Exchange locations will depend upon operational status and/or location adjustments due to weather.

## **C. Operations to be conducted (*also see Section E.1 Mitigating interaction with protected species*)**

### **1. Sample for pelagic juvenile rockfish and other epi-pelagic micronekton**

Four to seven midwater trawls of 15 minute duration each, will be conducted each night along a transect. Note that for trawl stations within Marine Protected Areas (MPAs) (see Appendix II for MPA stations), whenever possible, trawl deployment should commence outside the boundary of the MPA within 1 nautical mile of the station and the tow direction should head away from the MPA (subject to weather and navigation, etc.). In

addition, at least one night will be spent sampling offshore Monterey Bay or the Point Arena area (weather dependent) to examine the epi-pelagic community present beyond the normal survey boundary. Additional offshore trawls may be opportunistically conducted at other areas. Furthermore, trawls of 5 minute tow duration will periodically be conducted in conjunction with the standard 15 minute duration tow at the same station to examine catch variability. A modified-Cobb midwater trawl with a 26 m (86') headrope and a 9.5 mm (3/8") codend liner will be used. Trawling operations will commence just after dusk and conclude just before dawn. Target headrope depths is 30 m except in areas with shallow bottom depths, in which case the target headrope depth is 10 m,. Wire out will initially be 25 and 85 m with adjustments made if target depths are not obtained, as determined from depth recordings collected from TDRs and the ship's acoustic trawl net monitoring system. The TDR and acoustic sensors will be attached to the net during each tow. Ship speed during trawling should be ~2.0 knots. Ship's speed will be adjusted while trawling to maintain target headrope depth (using the acoustic trawl net monitoring system) while the amount of wire out will initially remain fixed (some adjustments to wire out may be made on a case by case basis). Two STM Products Dolphin Dissuasive Device (DDD 03) acoustic pingers will be attached to the trawl to mitigate encounters with marine mammals. Fish and select invertebrates from each trawl will be sorted, identified and enumerated. Length measurements will be taken on adult and pelagic juvenile northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific herring (*Clupea pallasii*) Pacific sanddab (*Citharichthys sordidus*), Pacific whiting (*Merluccius productus*), and salmon as well as pelagic juvenile lingcod (*Ophiodon elongatus*), speckled sanddab (*Citharichthys stigmaeus*), and sablefish (*Anaplopoma fimbria*). Mantle lengths will be recorded on select squids including Humboldt squid, market squid (*Doryteuthis opalescens*, blacktip squid (*Abraliopsis felis*), armhook squids (*Gonatus* spp.), boreal clubhook squid (*Onychoteuthis borealijaponica*), and robust clubhook squid (*Onykia robusta*). Length measurements will also be taken on a subsample of mesopelagics including California headlightfish (*Diaphus theta*), *Nannobrachium* spp., California lanternfish (*Symbolophorus californiensis*), northern lampfish (*Stenobranchius leucopsarus*), blue lanternfish (*Tarletonbeania crenularis*), California smoothtongue (*Leuroglossus stilbius*), and blacksmelts (*Bathylagidae*). In addition, gobies (Gobiidae), medusafish (*Icichthys lockingtoni*), plainfin midshipman (*Porichthys notatus*), and king-of-the-salmon (*Trachipterus altivelis*) will be measured. Size information will also be recorded for *Chrysaora* spp., *Aurelia* spp., *Pyrosoma* spp., *Thetys* spp., and *Carinaria* spp. All pelagic juvenile rockfish will be frozen for later laboratory analyses.

## **2. Characterize prevailing ocean conditions and examine prominent hydrographic features**

CTD casts will be conducted throughout the day at pre-determined stations in the vicinity of the trawl transects and at each trawl station at night. The scientific party may exclude some CTD casts during daytime and/or nighttime operations in order to complete the planned midwater trawls. A Seabird Electronics CTD and water sampling system with conductivity, temperature, depth, fluorometer, transmissometer, photosynthetically active radiation (PAR), and dissolved oxygen sensors will be used. The CTD will be lowered to



a maximum depth of 520 meters, as bottom depth allows. Deployment rate: soak for 2 minutes at 10 meters depth, then beginning at the surface - 45 meters/minute on the downcast, and 60 meters/minute for the upcast. Water samples will be taken during the upcast for chlorophyll and nutrient samples from at least two casts during the day and one at night throughout the survey area. A scientist from the Romberg Tiburon Center for Environmental Studies will be taking additional water samples from the area around Point Reyes and the Farallones to examine chlorophyll, primary productivity, and inorganic nutrients. An incubation table will be setup outside on the aft deck requiring a flow-through seawater source. The acoustic echosounder will be used to acoustically characterize the distribution and abundance of macrozooplankton and micronekton, meroplankton and zooplankton associated at prominent oceanographic features and locations.

### **3. Map the distribution and abundance of krill**

A series of daytime transects will be run, during which the Ship's EK60 acoustic echosounder will be used to record and geo-reference the presence and abundance of krill. The acoustic echosounder will be operated at 38, 70, 120 and 200 kHz and interfaced to a data acquisition system to estimate small pelagic and krill biomass between 10 and a maximum of 750 m. Three areas of particular interest are Monterey Bay, Ascension Canyon (off Davenport), and Pioneer Canyon (between Pescadero and the Farallones). Seabird and marine mammal observations will be recorded concurrently along set transect lines in these areas (see Appendix I and II). An additional acoustic transect line may be sampled off Point Sal if time allows. Prior to the first midwater trawl of the night and after the last midwater trawl in the morning, a vertical tow using a pairovet net will be conducted. The net will be lowered to a depth of 70 meters at a rate of 70 meters per minute (or as fast as possible if less than that). At depth it will be allowed to rest for 10 seconds and then it will be retrieved at a rate of 70 meters per minute (or as fast as possible if less than that). The sample from one cod end will be preserved in 10% buffered formalin/seawater and the other in 95% alcohol. Bongo tows will be conducted at Monterey Bay and Gulf of Farallones stations prior to midwater trawl operations. The bongo net will be lowered to a depth of either 10 or 30 m (depending upon bottom depth) and towed for a period of 15 minutes. Up to four Monterey Bay stations will be sampled with water depths of 100 meters or more and up to 3 Gulf of Farallones stations will be sampled. Samples will be preserved in 10% buffered formalin/seawater. Additional bongo tows may be conducted at night depending upon krill catches and time constraints.

### **4. Observe seabird and marine mammal distribution and abundance**

Ornithologists/marine mammal biologists from the Farallon Institute for Advanced Ecosystem Research will visually survey and estimate abundance and distribution of seabirds and marine mammals from the Ship's flying bridge during daylight hours while underway. If species of particular interest are encountered, the Ship may be asked to alter course accordingly.

## **5. Collect Humboldt squid**

As time allows, hook and line fishing for Humboldt squid will be conducted within the survey area at depths down to 300 meters. Ideally, this would occur during nighttime CTD deployment. Large weighted squid jigs will be used as lures, and gaffs and spear/handline will be used to bring the squid aboard after the squid is reeled to the surface. Whole specimens will be frozen for later processing.

## **6. Collections for stable isotope analysis**

Collect samples of zooplankton, krill and other micronekton to provide baseline samples at multiple trophic levels to explore the potential for developing an “isoscape” analysis of the California Current. This will include saving samples (frozen) from one cod-end for each of the bongo tows (ideally with 333 um mesh) conducted and tissue samples from krill, market squid (ideally in 50 to 100 mm size range, with larger preferred over smaller), adult northern anchovy, Pacific sardine, Pacific hake, shortbelly rockfish, Pacific sanddab, and also northern lampfish and California headlightfish. Tissue samples should also be collected from any Humboldt squid encountered (although most likely any squid encountered will be frozen whole), and a small number of opportunistic samples from jellyfish (*Chrysaora* spp.) and salps (*Thetys* spp.) should be collected several times over the course of the survey. The overall idealized objective will be to collect net and krill samples from each station, and up to five individuals or tissue samples of each species at each station, although it is recognized that this will not be practicable for most stations and species. For larger fish, samples can be taken from muscle tissue and combined in a single bag (as five individual pieces), smaller individuals can simply be frozen whole. There will be a spreadsheet with stations and species listed in order to track collections. Tissue from pelagic juvenile shortbelly rockfish and potentially other rockfish species will be sampled during routine analysis of those specimens following completion of the cruise.

## **7. Sample for juvenile salmon.**

One to two days will be dedicated for juvenile salmon collection with the Nordic 264 rope trawl. After completing nighttime trawl operations, the modified Cobb midwater trawl will need to be switched out to the Nordic 264 rope trawl. Three replicate trawls will then be conducted with the Nordic 264 rope trawl at the same station (see Appendix II) during daylight hours. Trawls will be conducted at the surface with a tow duration of 30 minutes with a tow speed of ~3.5 knots. Six large polyform floats (size A5) will be attached to the net (two on the headrope kite and two on each wingtip) during each layout to help insure that the net fishes at the surface. Typical footrope depth during tows is 18-23m, and a few meters deeper during layout and haulback. TDRs will be attached to the headrope and footrope to verify deployment depth and measure vertical spread. A flowmeter will be lowered into the water alongside the boat at the start of each tow and retrieved at the end, to measure total distance traveled through water during the tow. Catches will be sorted after each trawl. Upon completion of the daytime surface trawls,

the Nordic 264 will need to be switched out to the modified Cobb midwater trawl in order to continue with nighttime trawl operations. In addition from May 23-31, opportunistically a 15 minute daytime surface tow with the modified Cobb midwater trawl will be conducted at either the first nighttime trawl station prior to night operations, or at the last nighttime trawl station at the end of night operations (station must be close to shore to catch juvenile salmon).

## **8. Collect hydrographic data to support modeling harmful algal blooms (HABs)**

For the HABs study, water bottle samples from the CTD will be taken from 2-3 depths per station, ideally at the surface, just above the thermocline, and just below the thermocline. Water samples will be for: nutrient and dissolved phycotoxin analysis (frozen 20 mL scintillation vials), *Pseudo-nitzschia* cell counts (~100-200 mL), and domoic acid analysis (~500 mL filtered onto a GF/F). The only post-processing of samples would be filtration for phycotoxins. Oceanographic data will also be collected while underway by a Turner Designs SCUFA fluorometer and SeaBird thermosalinometer.

## **9. Collect water samples for environmental DNA (eDNA) study in the Monterey Bay area**

Water samples from CTDs will be collected at both nighttime trawl stations and during the day coincident with visual seabird and marine mammal surveys in and around the Monterey Bay area. Three replicate water samples will be collected from an individual CTD cast. An average of 10 liters of water will be collected per CTD at the selected stations. Samples will be filtered and processed at sea for later analysis.

## **10. Collection of adult rockfish**

Hook and line fishing will be conducted at select locations to collect genetic samples of adult rockfish. A fingernail size tissue sample will be removed from the caudal fin and saved on blotter paper and stored in sample envelopes. In addition, fish will be measured (fork length), sexed (when possible), and otoliths will be removed. Select specimens will be bagged, frozen, and brought back to the NOAA NMFS SWFSC Fisheries Ecology Division for further analysis (e.g. the fish will not be processed at sea). Locations of the fishing activity will be determined by current location of the vessel, available time, and operational constraints.

### **D. Dive plan – N/A**

### **E. Applicable restrictions**

#### **1. Mitigating interaction with protected species**

The ship's lookout watch and the scientists will visually scan the area for protected species (marine mammals, sea turtles, short-tailed albatross) for a period of no less than 30 minutes before setting the trawl gear. If protected species are observed within one nautical mile of the planned set location during the initial visual scan, then the vessel will

relocate to a distance one nautical mile away and another visual scan will be conducted at the new location. If protected species are still observed after the vessel has moved from the original station location, then trawl operations for that particular station will be cancelled and the vessel will proceed to the next planned trawl station. Trawl operations may not be conducted while a protected species is in this one nautical mile exclusion radius.

Whenever the trawl is in the water, the scientists and ship's crew standing watch will continue to monitor the waters around the vessel and maintain a lookout for protected species presence as far away as environmental conditions allow. The Chief Scientist should be notified if any protected species are observed by the CO/OOD, deckhands, and scientists. If the trawl net is deployed (but not yet fishing) after an "all clear" visual scan and protected species are then observed during trawl deployment then the gear will immediately be retrieved to avoid further interaction with the animals. The vessel will relocate to a distance one nautical mile away and follow the visual scanning protocols noted in the previous paragraph. If the trawl net is fishing and marine mammals are observed, then the appropriate action should be taken based upon the individual circumstances with consultation between the scientists and CO/OOD (in some cases the net will be immediately retrieved, while in others it may be kept at depth to avoid marine mammals at the surface).

Every effort should be made to deploy and retrieve the trawl net as quickly as possible (following all safety measures) to avoid possible interactions with marine mammals, which tend to aggregate at the surface.

At all times the Nordic 264 trawl net must be fitted with a marine mammal excluder devices (MMED) to allow any marine mammals caught during trawling operations the opportunity to escape.

A further measure to mitigate marine mammal encounters is to install acoustic pingers on the trawl net. Two STM Products Dolphin Dissuasive Device (DDD 03) acoustic pingers will be attached to the trawl net whenever it is deployed to mitigate marine mammal encounters.

## **2. Reporting, Data Collection and Handling Procedures for Protected Species Interactions**

All protected species (marine mammals, sea turtles, seabirds and fish) lethal and non-lethal interactions with fisheries research gear will be reported to Krista Catelani via the Incidental Take Authorization account: [SWFSC.ITA@noaa.gov](mailto:SWFSC.ITA@noaa.gov). These interactions will be immediately relayed to the SWFSC Director and recorded in the Protected Species Incidental Take Database within 48 hours of the event.

In addition, for take of marine mammals and sea turtles, the Chief Scientist or designated watch leader will call Krista Catelani immediately at 707-293-3563 (cell) or 858-546-7166 (work) to provide a detailed report of the event. Catch of eulachon and salmon will only be reported to [SWFSC.ITA@noaa.gov](mailto: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 Krista Catelani to report the event to the PSIT in the required 48 hours.

### *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 *SWFSC Marine Mammal Handling Guidelines*, Pacific Islands Region’s *Identification, Handling and Release of Protected Species*, and SWFSC’s marine mammal and sea turtle sampling protocols 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 Protected Species Incidental Take Form and the Marine Mammal and Sea Turtle Biological Sampling form. For any incidental takes of protected fish species (salmon and eulachon) SWFSC researchers will fill out the Protected Fish Specimen Data form.

### *Protected Species Sampling and Data Collection*

Under the incidental take authorization SWFSC scientists are authorized and encouraged to collect samples from protected species incidentally captured or killed during fisheries research activities. For sampling, follow guidelines in SWFSC’s *Detailed Sampling Protocol for Marine Mammal and Sea Turtle Incidental Takes* (PSIT-002.01) and fill out the Marine Mammal and Sea Turtle Biological Sampling form.

## **2. Adverse weather conditions**

Operations will be suspended under adverse weather conditions. High winds (e.g. greater than 35 knots) and seas (e.g. greater than 4 m) can negatively impact the scientific sampling and could potentially pose a safety issue for personnel.

## **3. Equipment failure**

Operations may be suspended/alterd if the scientific gear is damaged. If the midwater trawl is damaged, the Chief Scientist requests that the ship’s crew assist in repairs. However, if the damage is deemed too extensive, the spare midwater trawl will be used in lieu of repairing the damaged net.

## **4. Unforeseen circumstances**

The Chief Scientists can alter the scientific portion of this project with the concurrence of the CO, provided that the proposed changes will not: (1) jeopardize the safety of personnel or the ship; (2) exceed the time allotted for the project; (3) result in undue additional expense; or (4) change the general intent of the project.

### **III. Equipment**

#### **A. Equipment and capabilities provided by the ship**

Crane for loading heavy/bulky gear  
Trawl winches, and gantries with trawl blocks  
Net reel for modified Cobb midwater trawl net  
Modified Cobb midwater trawl net (1)  
1.5 m x 2.1 m (5' x 7') steel V-doors for midwater trawl, mounted (1 pair)  
Bridle cables for modified Cobb midwater trawl (4)  
Transfer cables (2) and door legs (2) for modified Cobb midwater trawl  
Cowbells for securing codend of modified Cobb midwater trawl  
Nordic 264 rope trawl net with Marine Mammal Excluder Device (MMED)  
Doors for Nordic 264 rope trawl (1 pair)  
Bridle cables for Nordic 264 rope trawl (4)  
Transfer cables (2) and door legs (2) for Nordic 264 rope trawl  
Large floats for Nordic 264 rope trawl (6)  
Seabird CTD with carousel and water bottles interfaced with the SCS  
Fluorometer and dissolved oxygen sensors for the CTD  
Winch and conductive cable for CTD deployments  
Scientific Computer System (SCS) and Electronic MOA  
EK60 echosounder connected to SCS system  
Acoustic Doppler Current Profiler, interfaced with SCS  
Thermosalinometer connected to SCS  
SCUFA fluorometer connected to SCS  
Regular freezer and  $-80^{\circ}\text{C}$  freezer space for water and organism samples  
Inclinometer for Tucker trawls and bongo tows  
Simrad ITI net sounder system with display monitor and SCS interface  
SCS interface on the flying bridge for ornithologists/marine mammal biologists  
Long-handled gaffs for Humboldt squid  
Covered/protected wet laboratory space for sample sorting  
Counter space for microscope work (2 scopes)  
Counter space for water filtration setups (2)  
Small boat for transfer of scientific personnel

#### **B. Equipment and capabilities provided by the scientists**

Modified-Cobb midwater trawl net (1)  
STM Products DDD 03 acoustic pingers  
Bongo net frame, nets, weight, and codends  
Flowmeters  
Pairovet frame, nets, weight, and codends  
Inclinometers for plankton tows (backup)  
Specimen sorting, enumeration, and preservation equipment  
ReefNet TDRs  
Bucket thermometer and seawater sample buckets  
Seawater/chlorophyll sample filtering and preservation equipment

eDNA water sample filtering and preservation equipment  
GAST vacuum pumps  
PC laptop computers running Microsoft Windows OS  
Microscopes, dissecting equipment, and field guides  
Krill sorting and enumeration equipment  
Electronic calipers and measuring boards  
Fishing poles, tackle, and jigs  
Humboldt squid processing/preservation gear  
Large coolers  
Float coats and foul weather gear  
Quart and pint canning jars  
Ethanol (19 liters)  
Formalin (19 liters)  
Formaldehyde (8 liters)  
MSDS sheets for all chemicals

#### **IV. Hazardous materials**

##### **A. Policy and Compliance**

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. . Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

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

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

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

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material

- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

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

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

#### B. Inventory

<b>Common Name of Material</b>	<b>Qty</b>	<b>Notes</b>	<b>Trained Individual</b>	<b>Spill control</b>
Formaldehyde solution (4%)	1 x 19000ml	Alkalinity	Keith Sakuma	A
Formaldehyde solution (37%)	1 x 8000ml	Alkalinity, Stored in ship chem. lkr	Keith Sakuma	A
Ethanol (100%)	1 x 19000ml	Flammable, Stored in ship chem. lkr	Keith Sakuma	A.

#### C. Chemical safety and spill response procedures

##### A. Formalin/Formaldehyde/Ethanol

- 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. Radioactive Materials

No Radioactive Isotopes are planned for this project.

#### V. Additional projects – N/A

There are no additional projects.



## 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.

### Data responsibilities

Every effort will be made to fulfill requests for specimens and data. However, if the request is too large we may require the requestor to provide a person to collect the samples and/or data. Please provide requests at the earliest possible date to Keith Sakuma (831) 420-3945 [keith.sakuma@noaa.gov](mailto:keith.sakuma@noaa.gov).

The Chief Scientist in coordination with the ship's Survey Tech will transfer all appropriate data from the SCS to the scientific computers for data analysis and archiving.

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

- A. Pre-Project Meeting: A conference call between the scientists and the ship was held on February 22, 1016 to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting was conducted before the beginning of the project to allow for sufficient time for preparation of the ship and project personnel.
- B. Vessel Familiarization Meeting: The CO 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 CO is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.
- D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at

<http://www.oma.noaa.gov/fleeteval.html> and provides a “Submit” button at the end 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 with the majority of the scientific personnel working at night, adequate food and beverages (for example a variety of sandwich items, cheeses, salads, fruit, milk, juices) during what are not typically meal hours (1800-0600) will be required. Also, upon request from the night watch scientists, the Ship’s galley may be asked to save a meal from breakfast, lunch, and/or dinner on a daily basis. Special dietary requirements for scientific participants will be made available to the ship’s command at least seven days prior to the project.

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

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

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

Vessels.

### **B. Medical Forms and Emergency Contacts**

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website

<http://www.corporateservices.noaa.gov/noaforms/eforms/nf57-10-01.pdf>.

All NHSQs submitted after March 1, 2014 must be accompanied by [NOAA Form \(NF\) 57-10-02](#) - Tuberculosis Screening Document in compliance with [OMAO Policy 1008](#) (Tuberculosis Protection Program).

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance ([http://ocio.os.doc.gov/ITPolicyandPrograms/IT\\_Privacy/PROD01\\_008240](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](mailto: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](mailto:MOP.Health-Services@noaa.gov)

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

### C. Shipboard Safety

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

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to

participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship's Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

#### D. Communications

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

#### E. IT Security

Any computer that will be hooked into the ship's network must comply with the *OMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

- (1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
- (2) Installation of the latest critical operating system security patches.
- (3) No external public Internet Service Provider (ISP) connections.
- (4) 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.

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

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking. Any computer or device connected through the Government network and internet is subject to NOAA IT shore based monitoring.

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

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

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

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

#### Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office email granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

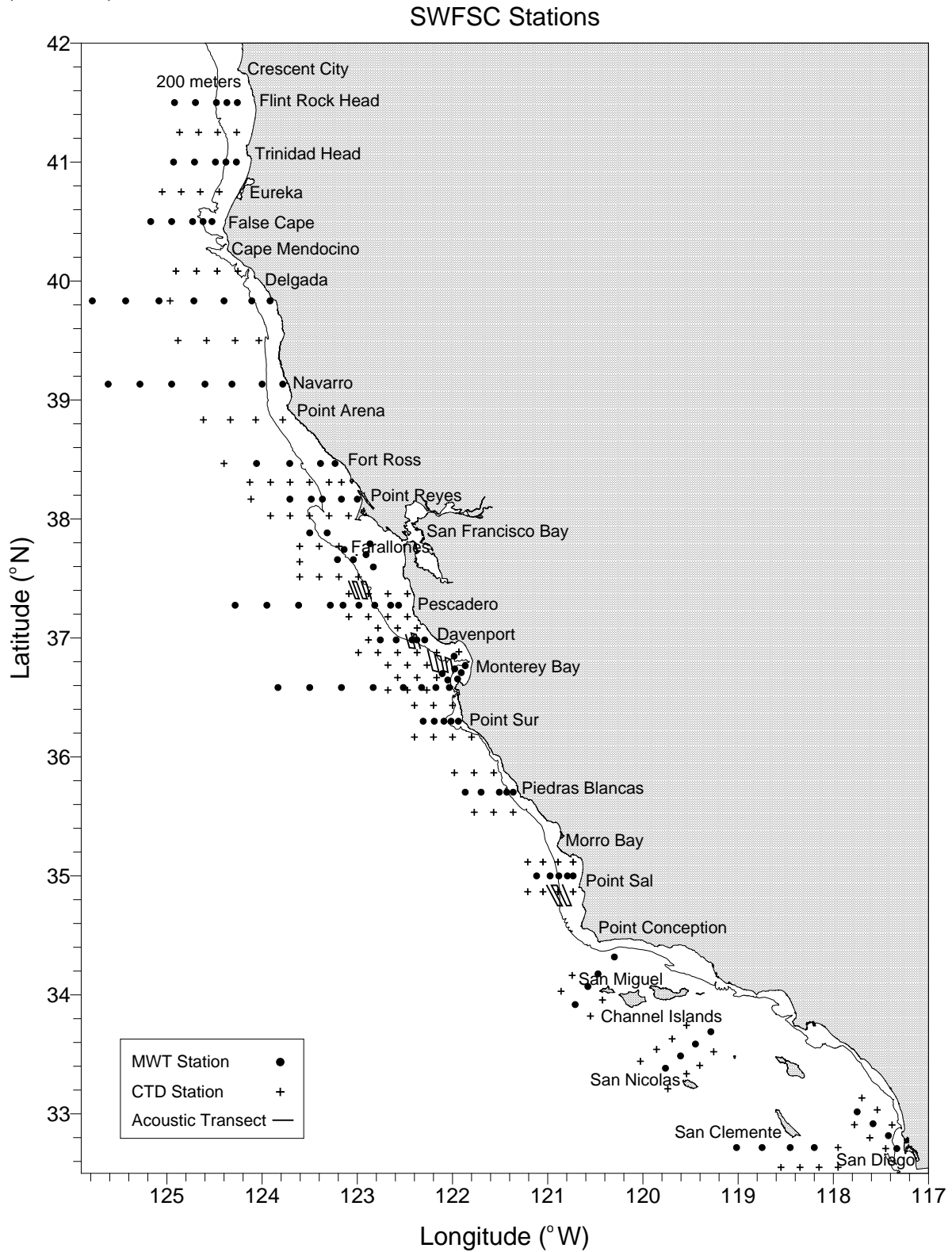
#### Responsibilities of the Foreign National Sponsor:

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

## Appendix I: Daily transect schedule (subject to change)

Date	Transect Location	# Sampled	Notes
25-Apr	<b>S.F. Port</b>		Load and Set Up Gear
26-Apr	Gulf of Farallones	1	Depart S.F., CA, Begin Leg 1
27-Apr	Fort Ross	1	
28-Apr	Delgada	1	
29-Apr	Navarro	1	
30-Apr	Point Reyes	1	Saturday
1-May	Outside Farallones	1	Sunday
2-May	Gulf of Farallones	1	
3-May	Pescadero	1	
4-May	Davenport	1	Skiff Transfer Santa Cruz, CA
5-May	Monterey Outside	1	
6-May	Monterey Inside	1	
7-May	Piedras Blancas	1	Saturday
8-May	San Miguel	1	Sunday
9-May	San Clemente	1	
10-May	San Diego	1	
11-May	San Nicolas	1	
12-May	San Miguel	2	Skiff Transfer Santa Barbara, CA
13-May	Point Sal	1	
14-May	Point Sur	1	Saturday
15-May	Monterey Outside	2	Sunday
16-May	Monterey Inside	2	
17-May	Davenport	2	
18-May	Pescadero	2	
19-May	<b>End Leg 1</b>	2	Begin In Port S.F., CA
20-May	<b>S.F. Port</b>	2	
21-May	<b>S.F. Port</b>	1	Saturday
22-May	<b>S.F. Port</b>	1	Sunday
23-May	Gulf of Farallones	2	Depart S.F., CA, Begin Leg 2
24-May	No nighttime MWT		Juvenile salmon work/switch trawl nets
25-May	Navarro	2	Switch trawl nets
26-May	False Cape	1	
27-May	Flint Rock Head	1	
28-May	Trinidad Head	1	Saturday
29-May	Delgada	2	Sunday
30-May	Fort Ross	2	Memorial Day
31-May	Point Reyes	2	Skiff Transfer-Bodega Bay, CA
1-Jun	Outside Farallones	2	
2-Jun	Davenport	3	
3-Jun	Monterey Outside	3	
4-Jun	Monterey Inside	3	Saturday
5-Jun	Point Sur	2	Sunday
6-Jun	Piedras Blancas	2	
7-Jun	Point Sal	2	Skiff Transfer-Avila, CA
8-Jun	San Miguel	3	
9-Jun	San Nicolas	2	
10-Jun	San Clemente	2	
11-Jun	San Diego	2	Saturday
12-Jun	<b>Cruise Ends</b>		Sunday-Dock San Diego, CA

**Appendix II: Midwater trawl and CTD station locations and operation order by transect (tentative)**





## SWFSC TRAWL AND CTD STATIONS

### SAN DIEGO-DAY

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	32° 42.5'	117° 27'	582	520	4041
CTD	32° 47.9'	117° 37'	1020	520	4042
CTD	32° 54.5'	117° 46.7'	1040	520	4043
CTD	33° 08'	117° 42'	810	520	4045
CTD	33° 02'	117° 32.3'	700	520	4046
CTD	32° 54.4'	117° 23'	550	520	4047

### SAN DIEGO-NIGHT

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	33° 01'	117° 45'	798	520	481
Trawl	33° 01'	117° 45'	798	85	481
Trawl	32° 55'	117° 35'	865	85	482
CTD	32° 55'	117° 35'	865	520	482
Trawl	32° 49'	117° 25.3'	555	85	483
CTD	32° 49'	117° 25.3'	555	520	483
Trawl	32° 42.5'	117° 20'	94	85	484
CTD	32° 42.5'	117° 20'	94	84	484

### SAN CLEMENTE-DAY

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	32° 43'	117° 57'	520	510	4048
CTD	32° 33'	117° 57'	963	520	4049
CTD	32° 33'	118° 09'	1900	520	4050
CTD	32° 33'	118° 21'	1385	520	4051
CTD	32° 33'	118° 33'	1111	520	4052

### SAN CLEMENTE-NIGHT

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	32° 43'	118° 12'	1586	520	401
Trawl	32° 43'	118° 12'	1586	85	401
Trawl	32° 43'	118° 27.2'	222	85	402
CTD	32° 43'	118° 27.2'	222	212	402
Trawl	32° 43'	118° 44.9'	1253	85	403
CTD	32° 43'	118° 44.9'	1253	520	403
Trawl	32° 43'	119° 01'	777	85	404
CTD	32° 43'	119° 01'	777	520	404

**SAN NICOLAS-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	33° 24.4'	119° 24.2'	963	520	4002
CTD	33° 20.2'	119° 32.5'	85	75	4003
CTD	33° 12.6'	119° 44.3'	460	450	4004
CTD	33° 32.5'	119° 51.4'	330	320	4006
CTD	33° 37.8'	119° 41.6'	1366	520	4007
CTD	33° 44.6'	119° 32.5'	1930	520	4008

**SAN NICOLAS-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	33° 41.4'	119° 17.2'	892	520	411
Trawl	33° 41.4'	119° 17.2'	892	85	411
Trawl	33° 35.2'	119° 26.9'	1874	85	412
CTD	33° 35.2'	119° 26.9'	1874	520	412
Trawl	33° 29.2'	119° 36.3'	775	85	413
CTD	33° 29.2'	119° 36.3'	775	520	413
Trawl	33° 23'	119° 45.8'	103	85	414(MPA)
CTD	33° 23'	119° 45.8'	103	93	414

**SAN MIGUEL-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	33° 49.3'	120° 33.1'	1819	520	4010
CTD	34° 01.8'	120° 51.6'	948	520	4011
CTD	34° 09.8'	120° 44.6'	738	520	4012

**SAN MIGUEL-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	33° 55.1'	120° 42.7'	1848	520	425
Trawl	33° 55.1'	120° 42.7'	1848	85	425
Trawl	34° 04.2'	120° 34.7'	190	85	424(MPA)
CTD	34° 04.2'	120° 34.7'	190	180	424
Trawl	34° 10.6'	120° 28.3'	122	85	423
CTD	34° 10.6'	120° 28.3'	122	112	423
Trawl	34° 19.1'	120° 18'	380	85	422
CTD	34° 19.1'	120° 18'	380	370	422

**POINT SAL-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	35° 07'	120° 44'	38	30	4070
CTD	35° 07'	120° 53.5'	154	144	4069
CTD	35° 07'	121° 03'	457	447	4068
CTD	35° 07'	121° 12.6'	579	520	4067
CTD	34° 52'	121° 12.6'	564	520	4066
CTD	34° 52'	121° 03'	415	105	4065
CTD	34° 52'	120° 53.5'	221	211	4064
CTD	34° 52'	120° 44'	62	52	4063

**POINT SAL-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	35° 00'	120° 44'	55	45	491
Trawl	35° 00'	120° 44'	55	25	491
Trawl	35° 00'	120° 47.6'	94	85	492
CTD	35° 00'	120° 47.6'	94	84	492
Trawl	35° 00'	120° 53'	192	85	493
CTD	35° 00'	120° 53'	192	182	493
Trawl	35° 00'	120° 58.5'	374	85	494
CTD	35° 00'	120° 58.5'	374	364	494
Trawl	35° 00'	121° 07'	532	85	495
CTD	35° 00'	121° 07'	532	520	495

**PIEDRAS BLANCAS-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	35° 32.1'	121° 21.8'	516	506	4023
CTD	35° 32.1'	121° 34.1'	848	520	4024
CTD	35° 32.1'	121° 46.3'	1007	520	4025
CTD	35° 52'	121° 58.8'	1353	520	4027
CTD	35° 52'	121° 46.4'	968	520	4028
CTD	35° 52'	121° 34'	510	500	4029

**PIERAS BLANCAS-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	35° 42.2'	121° 21.8'	60	50	441
Trawl	35° 42.2'	121° 21.8'	60	85	441(MPA)
Trawl	35° 42.2'	121° 25.8'	167	85	442
CTD	35° 42.2'	121° 25.8'	167	155	442
Trawl	35° 42.2'	121° 30.5'	557	85	443
CTD	35° 42.2'	121° 30.5'	557	520	443
Trawl	35° 42.2'	121° 42'	885	85	444
CTD	35° 42.2'	121° 42'	885	520	444
Trawl	35° 42.2'	121° 52'	1050	85	445
CTD	35° 42.2'	121° 52'	1050	520	445

**POINT SUR-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 10'	121° 48'	498	488	1100
CTD	36° 10'	122° 00'	984	520	1101
CTD	36° 10'	122° 12'	1289	520	1102
CTD	36° 10'	122° 24'	1773	520	1103
CTD	36° 26'	122° 24'	1785	500	1104
CTD	36° 26'	122° 12'	1041	520	1105
CTD	36° 26'	122° 00'	560	550	1106

**POINT SUR-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 18'	121° 56.3'	65	55	101
Trawl	36° 18'	121° 56.3'	65	85	101(MPA)
Trawl	36° 18'	122° 00.9'	102	85	103
CTD	36° 18'	122° 00.9'	102	155	103
Trawl	36° 18'	122° 05.4'	354	85	104
CTD	36° 18'	122° 05.4'	354	344	104
Trawl	36° 18'	122° 11.5'	828	85	105
CTD	36° 18'	122° 11.5'	828	520	105
Trawl	36° 18'	122° 18.5'	928	85	106
CTD	36° 18'	122° 18.5'	928	520	106

**MONTEREY BAY INSIDE-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
TBD					

**MONTEREY BAY INSIDE-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 50.8'	121° 59'	91	81	119
Trawl	36° 50.8'	121° 59'	91	85	119(MPA)
Trawl	36° 46'	121° 52'	73	85	114
CTD	36° 46'	121° 52'	73	63	114
Trawl	36° 44.4'	121° 58.6'	287	85	116
CTD	36° 44.4'	121° 58.6'	287	277	116
Trawl	36° 42.5'	121° 54.5'	91	85	115
CTD	36° 42.5'	121° 54.5'	91	81	115
Trawl	36° 39.3'	121° 56.8'	73	85	112
CTD	36° 39.3'	121° 56.8'	73	63	112
Trawl	36° 38.8'	122° 03'	900	85	113
CTD	36° 38.8'	122° 03'	900	520	113

**MONTEREY BAY OUTSIDE-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 40'	122° 10'	1134	520	1002
CTD	36° 46.3'	122° 16.1'	823	520	1003
CTD	36° 46.3'	122° 28.4'	2103	520	1004
CTD	36° 40'	122° 22.3'	1737	520	1005
CTD	36° 33.7'	122° 16.2'	2560	520	1006
CTD	36° 33.7'	122° 28.4'	2743	520	1007
CTD	36° 40'	122° 34.6'	2377	520	1008
CTD	36° 46.3'	122° 40.7'	2149	520	1009
CTD	36° 33.7'	122° 40.7'	2743	520	1010

**MONTEREY BAY OUTSIDE-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 42'	122° 06.5'	1920	520	117
Trawl	36° 42'	122° 06.5'	1920	85	117
Trawl	36° 35'	122° 02'	608	85	109
CTD	36° 35'	122° 02'	608	520	109
Trawl	36° 35'	122° 10.5'	2304	85	110
CTD	36° 35'	122° 10.5'	2304	520	110
Trawl	36° 35'	122° 19.5'	2516	85	211
CTD	36° 35'	122° 19.5'	2516	520	211
Trawl	36° 35'	122° 31'	2997	85	212
CTD	36° 35'	122° 31'	2997	520	212

**DAVENPORT-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 52.6'	122° 10'	91	81	1011
CTD	36° 52.6'	122° 22.3'	1180	520	1012
CTD	36° 52.6'	122° 34.6'	1600	520	1013
CTD	36° 52.6'	122° 47'	2286	520	1014
CTD	36° 52.6'	122° 59.3'	2697	520	1015
CTD	36° 59'	122° 53'	1411	520	1016
CTD	37° 05'	122° 47'	686	520	1017
CTD	37° 05'	122° 34.6'	119	110	1018
CTD	37° 05'	122° 22.3'	59	50	1019

**DAVENPORT-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	36° 59'	122° 17.5'	82	72	123
Trawl	36° 59'	122° 17.5'	82	85	123
Trawl	36° 59'	122° 22.5'	128	85	124
CTD	36° 59'	122° 22.5'	128	118	124
Trawl	36° 59'	122° 25.5'	446	85	125
CTD	36° 59'	122° 25.5'	446	436	125
Trawl	36° 59'	122° 35.5'	432	85	126
CTD	36° 59'	122° 35.5'	432	412	126
Trawl	36° 59'	122° 45.5'	1045	85	127
CTD	36° 59'	122° 45.5'	1045	520	127

**PESCADERO-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 10.7'	122° 28.4'	68	58	1020
CTD	37° 10.7'	122° 40.7'	110	100	1021
CTD	37° 10.7'	122° 53'	421	410	1022
CTD	37° 10.7'	123° 05.3'	869	520	1023
CTD	37° 16.5'	123° 11.4'	1189	520	1024
CTD	37° 22.3'	123° 05.3'	823	520	1025
CTD	37° 22.3'	122° 53'	201	190	1026
CTD	37° 22.3'	122° 40.7'	88	78	1027
CTD	37° 22.3'	122° 28.4'	27	20	1028

**PESCADERO-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 16.5'	122° 34'	82	72	131
Trawl	37° 16.5'	122° 34'	82	85	131
Trawl	37° 16.5'	122° 39'	95	85	132
CTD	37° 16.5'	122° 39'	95	85	132
Trawl	37° 16.5'	122° 49'	184	85	133
CTD	37° 16.5'	122° 49'	184	174	133
Trawl	37° 16.5'	122° 59'	518	85	134
CTD	37° 16.5'	122° 59'	518	508	134
Trawl	37° 16.5'	123° 09'	950	85	135
CTD	37° 16.5'	123° 09'	950	520	135

**GULF OF THE FARALLONES-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
TBD					

**GULF OF THE FARALLONES-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 47.5'	122° 52'	55	45	139
Trawl	37° 47.5'	122° 52'	55	25	139
Trawl	37° 42'	122° 54.5'	55	25	138
CTD	37° 42'	122° 54.5'	55	45	138
Trawl	37° 35.8'	122° 49.9'	74	25	237
CTD	37° 35.8'	122° 49.9'	74	64	237

**FARALLONES OUTSIDE-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 30.8'	122° 59.3'	229	220	1029
CTD	37° 30.8'	123° 11.6'	1280	520	1030
CTD	37° 30.8'	123° 24'	2415	520	1031
CTD	37° 30.8'	123° 36.3'	3215	520	1032
CTD	37° 38.4'	123° 36.3'	3338	520	1033
CTD	37° 46.2'	123° 36.3'	2697	520	1034
CTD	37° 46.2'	123° 24'	1509	520	1035
CTD	37° 46.2'	123° 11.6'	128	118	1036

**FARALLONES OUTSIDE\_NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	37° 39.5'	123° 02.5'	108	98	152
Trawl	37° 39.5'	123° 02.5'	108	85	152(MPA)
Trawl	37° 39.5'	123° 12.5'	1301	85	154
CTD	37° 39.5'	123° 12.5'	1301	520	154
Trawl	37° 44.6'	123° 08.3'	91	85	156
CTD	37° 44.6'	123° 08.3'	91	81	156
Trawl	37° 53'	123° 19'	91	85	160
CTD	37° 53'	123° 19'	91	81	160
Trawl	37° 53'	123° 30'	1328	85	162
CTD	37° 53'	123° 30'	1328	520	162

**POINT REYES-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38° 1.6'	123° 05.5'	64	54	1046
CTD	38° 1.6'	123° 17.8'	119	109	1045
CTD	38° 1.6'	123° 30.1'	137	127	1037
CTD	38° 1.6'	123° 42.4'	2560	520	1038
CTD	38° 1.6'	123° 54.7'	3475	520	1039
CTD	38° 10'	124° 07'	3658	520	1040

**POINT REYES-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38° 10'	123° 0'	55	45	165
Trawl	38° 10'	123° 0'	55	25	165
Trawl	38° 10'	123° 10'	91	85	167
CTD	38° 10'	123° 10'	91	81	167
Trawl	38° 10'	123° 22'	183	85	170
CTD	38° 10'	123° 22'	183	173	170
Trawl	38° 10'	123° 29'	400	85	171
CTD	38° 10'	123° 29'	400	390	171
Trawl	38° 10'	123° 29'	2063	85	174
CTD	38° 10'	123° 29'	2063	390	174

**FORT ROSS-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38° 28'	124° 24.0'	3500	520	4031
CTD	38° 18.5'	124° 07.7'	3600	520	4030
CTD	38° 18.5'	123° 54.7'	2835	520	1041
CTD	38° 18.5'	123° 42.4'	1463	520	1042
CTD	38° 18.5'	123° 30.1'	274	264	1043
CTD	38° 18.5'	123° 17.8'	110	100	1044
CTD	38° 18.5'	123° 10'	83	73	1048

**FORT ROSS-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38° 28'	123° 14'	53	43	183
Trawl	38° 28'	123° 14'	53	25	183
Trawl	38° 28'	123° 23.2'	115	85	453
CTD	38° 28'	123° 23.2'	115	105	453
Trawl	38° 28'	123° 42.6'	910	85	454
CTD	38° 28'	123° 42.6'	910	520	454
Trawl	38° 28'	124° 03.5'	3263	85	455
CTD	38° 28'	124° 03.5'	3263	520	455

**NAVARRO-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	38° 50.0'	124° 37.0'	3500	520	4035
CTD	38° 50.0'	124° 20.0'	3300	520	4034
CTD	38° 50.0'	124° 04'	1805	520	4033
CTD	38° 50.0'	123° 47.0'	111	101	4032

**NAVARRO-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	39° 08'	123° 47'	73	63	461
Trawl	39° 08'	123° 47'	73	85	461
Trawl	39° 08'	124° 00'	404	85	463
CTD	39° 08'	124° 00'	404	394	463
Trawl	39° 08'	124° 19'	2153	85	464
CTD	39° 08'	124° 19'	2153	520	464
Trawl	39° 08'	124° 36'	3292	85	465
CTD	39° 08'	124° 36'	3292	520	465

**DELGADA-DAY, SOUTH**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	39° 30'	124° 53'	2807	520	4039
CTD	39° 30'	124° 35'	2300	520	4038
CTD	39° 30'	124° 17'	1800	520	4037
CTD	39° 30'	124° 02'	630	520	4036

**DELGADA-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	39° 50'	123° 55'	65	55	471
Trawl	39° 50'	123° 55'	65	85	471
Trawl	39° 50'	124° 06.5'	236	85	473
CTD	39° 50'	124° 06.5'	236	226	473
Trawl	39° 50'	124° 24'	1600	85	474
CTD	39° 50'	124° 24'	1600	520	474
Trawl	39° 50'	124° 43'	1344	85	475
CTD	39° 50'	124° 43'	1344	520	475



**DELGADA-DAY, NORTH**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	39° 50'	124° 58'	1830	520	4059
CTD	40° 05'	124° 54.3'	1200	520	4058
CTD	40° 05'	124° 41.3'	1000	520	4057
CTD	40° 05'	124° 28.3'	678	520	4056
CTD	40° 05'	124° 15.2'	160	150	4055

**FALSE CAPE-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	40° 30'	124° 31.6'	61	51	601
Trawl	40° 30'	124° 31.6'	61	85	601
Trawl	40° 30'	124° 37.2'	187	85	602
CTD	40° 30'	124° 37.2'	187	177	602
Trawl	40° 30'	124° 43.8'	1622	85	603
CTD	40° 30'	124° 43.8'	1622	520	603
Trawl	40° 30'	124° 57'	2565	85	605
CTD	40° 30'	124° 57'	2565	520	605
Trawl	40° 30'	125° 10.2'	2634	85	607
CTD	40° 30'	125° 10.2'	2634	520	607

**TRINIDAD HEAD-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	40° 45'	124° 27'	104	94	6001
CTD	40° 45'	124° 39'	768	520	6002
CTD	40° 45'	124° 51'	2326	520	6003
CTD	40° 45'	125° 03'	2704	520	6004

**TRINIDAD HEAD-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	41° 0'	124° 16.2'	79	69	611
Trawl	41° 0'	124° 16.2'	79	85	611
Trawl	41° 0'	124° 22.8'	192	85	612
CTD	41° 0'	124° 22.8'	192	182	612
Trawl	41° 0'	124° 29.4'	520	85	613
CTD	41° 0'	124° 29.4'	520	510	613
Trawl	41° 0'	124° 42.6'	743	85	615
CTD	41° 0'	124° 42.6'	743	520	615
Trawl	41° 0'	124° 55.8'	2804	85	617
CTD	41° 0'	124° 55.8'	2804	520	617

**FLINT ROCK HEAD-DAY**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	41° 15'	124° 16'	90	80	6011
CTD	41° 15'	124° 28'	643	520	6012
CTD	41° 15'	124° 40'	1145	520	6013
CTD	41° 15'	124° 52'	1241	520	6014

**FLINT ROCK HEAD-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
CTD	41° 30'	124° 15.6'	66	56	621
Trawl	41° 30'	124° 15.6'	66	85	621
Trawl	41° 30'	124° 22.2'	96	85	622
CTD	41° 30'	124° 22.2'	96	86	622
Trawl	41° 30'	124° 28.8'	169	85	623
CTD	41° 30'	124° 28.8'	169	159	623
Trawl	41° 30'	124° 42'	946	85	625
CTD	41° 30'	124° 42'	946	520	625
Trawl	41° 30'	124° 55.2'	690	85	627
CTD	41° 30'	124° 55.2'	690	520	627

**OFFSHORE STATIONS****MONTEREY BAY OUTSIDE-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
Trawl	36° 35'	122° 50'	2860	85	213
Trawl	36° 35'	123° 10'	3302	85	214
Trawl	36° 35'	123° 30'	3596	85	215
Trawl	36° 35'	123° 50'	3813	85	216

**PESCADERO-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
Trawl	37° 16.5'	123° 17'	2326	85	231
Trawl	37° 16.5'	123° 37'	3440	85	232
Trawl	37° 16.5'	123° 57'	3698	85	233
Trawl	37° 16.5'	124° 17'	3971	85	234

**NAVARRO-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
Trawl	39° 08'	124° 57'	3279	85	466
Trawl	39° 08'	125° 17'	3265	85	467
Trawl	39° 08'	125° 37'	3626	85	468

**DELGADA-NIGHT**

OPS	Latitude	Longitude	Depth(m)	Wire Out(m)	Station
Trawl	39° 50'	125° 05'	2037	85	476
Trawl	39° 50'	125° 26'	3251	85	477
Trawl	39° 50'	125° 47'	3475	85	478

**NORDIC 264 ROPE TRAWL STATION**

OPS	Latitude	Longitude	Depth(m)
Trawl	37° 50.39'	122° 41.47'	29

## SWFSC ACOUSTIC TRANSECT COORDINATES

### POINT SAL

Latitude	Longitude	Station
34° 55.16'	121° 00.83'	ks1
34° 44.97'	120° 55.08'	ks2
34° 44.92'	120° 51.21'	ks3
34° 55.26'	120° 57.96'	ks4
34° 55.26'	120° 54.52'	ks5
34° 44.97'	120° 48.41'	ks6
34° 45.03'	120° 45.54'	ks7
34° 55.37'	120° 50.96'	ks8

### MONTEREY BAY

Latitude	Longitude	Station
36° 54.00'	122° 15.98'	km1
36° 43.65'	122° 12.80'	km2
36° 42.83'	122° 09.00'	km3
36° 51.43'	122° 11.40'	km4
36° 50.72'	122° 07.80'	km5
36° 43.39'	122° 05.92'	km6
36° 42.68'	122° 03.25'	km7
36° 50.15'	122° 04.90'	km8
36° 49.18'	122° 01.57'	km9
36° 42.37'	121° 59.94'	km10

### ASCENSION CANYON

Latitude	Longitude	Station
37° 01.53'	122° 29.71'	ka1
36° 55.09'	122° 27.48'	ka2
36° 54.73'	122° 23.91'	ka3
37° 02.45'	122° 26.33'	ka4
37° 01.78'	122° 23.28'	ka5
36° 54.78'	122° 20.66'	ka6

### PIONEER CANYON

Latitude	Longitude	Station
37° 28.53'	123° 05.71'	kp1
37° 19.89'	123° 01.50'	kp2
37° 19.72'	122° 59.18'	kp3
37° 28.48'	123° 03.29'	kp4
37° 28.32'	123° 00.74'	kp5
37° 19.94'	122° 56.92'	kp6
37° 19.74'	122° 54.12'	kp7
37° 28.45'	122° 57.78'	kp8
37° 28.43'	122° 55.07'	kp9
37° 19.84'	122° 51.63'	kp10