



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

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
Marine Operations Center, Pacific
2002 SE Marine Science Drive
Newport, Oregon 97365

Project Instructions

Date Submitted: March 27, 2017
Platform: NOAA Ship *Reuben Lasker*
Project Number: RL-17-03 (OMAO)
Project Title: Rockfish Recruitment and Ecosystem Assessment
Project Dates: April 26 – June 13, 2017

Prepared by: Keith M. Sakuma _____ Dated: March 20, 2017
Keith Sakuma
Chief Scientist
NOAA NMFS SWFSC FED

Approved by: Steve Lindley _____ Dated: March 22, 2017
Steve Lindley
Laboratory Director
NOAA NMFS SWFSC FED

Approved by: Kristen Koch _____ Dated: March 27, 2017
Kristen Koch
Acting Science and Research Director
NOAA NMFS SWFSC

Approved by: _____ Dated: _____
Captain Brian W. Parker, NOAA
Commanding Officer
Marine Operations Center - Pacific

I. Overview

A. Project period: April 26 – June 13, 2017

Leg 1: April 26 – May 17

Leg 2: May 22 – June 13

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 0 DAS are Other Agency funded. This project is estimated to exhibit a high Operational Tempo.

C. Operating area

San Diego, CA to Willapa Bay, WA (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 off California.
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 fronts for juvenile salmon (*Oncorhynchus* spp.) and their potential prey.
8. Sample for pelagic juvenile rockfish and other epi-pelagic micronekton at NWFSC stations off Oregon and Washington.
9. Collect water samples for eDNA study in the Monterey Bay area, and conduct joint water sample collections with MBARI
10. Collect adult rockfish.

E. Participating organizations

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

NOAA NMFS North West Fisheries Science Center (NWFSC)

University of California Santa Cruz (UCSC)

Farallon Institute for Advanced Ecosystem Research (FIAER)

Monterey Bay Area Research Institute (MBARI)

Hopkins Marine Station, Stanford University (HMSSU)

Center for Ocean Solutions (COS)

Humboldt State University (HSU)

California Polytechnic State University (CPSU)

Ernest F. Hollings Undergraduate Scholar Program (EFHUSP)

J. Craig Venter Institute (JCVI)

Oregon State University (OSU)

Pacific States Marine Fisheries Commission (PSMFC)

Ocean Associates (OA)

F. Personnel

Leg 1

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Adams, Thomas	Fishery Intern	May 6	May 17	Male	HSU/NMFS SWFSC FED	USA
Carrion, Cynthia	Krill Biologist	April 26	May 6	Female	UCSC	USA
Closek, Collin	Ecologist	April 26	May 6	Male	COS	USA
Coale, Tyler	Ecologist	April 26	May 6	Male	JCVI	USA

Elsmore, Kristen	Graduate Student	May 6	May 17	Female	UC DAVIS	USA
Field, John	Principal Investigator	May 6	May 17	Male	NMFS SWFSC FED	USA
Fish, Heidi	Fishery Biologist	April 26	May 6	Female	NMFS SWFSC FED	USA
Force, Michael	Ornithologist	April 26	May 17	Male	FIAER	CANADA
Friedman, Whitney	Fishery Technician	April 26	May 6	Female	NMFS SWFSC FED	USA
Harding, Jeff	Fishery Biologist	April 26	May 6	Male	NMFS SWFSC FED	USA
Hewitt, Kate	Graduate Student	May 6	May 17	Female	UC DAVIS	USA
Howard, Rebecca	Fishery Intern	April 26	May 6	Female	NMFS SWFSC FED	USA
Kane, Mary	Krill Biologist	May 6	May 17	Female	UCSC	USA
Lefebvre, Lyndsey	Fishery Technician	April 26	May 6	Female	NMFS SWFSC FED	USA
McKechnie, Matt	Student	May 6	May 17	Male	CPSU	USA
Miller, Rebecca	G.I.S. Specialist	May 6	May 17	Female	NMFS SWFSC FED	USA
Monk, Melissa	Fishery Biologist	April 26	May 6	Female	NMFS SWFSC FED	USA
Pearson, Don	Fishery Biologist	April 26	May 17	Male	NMFS SWFSC FED	USA
Rogers, Tanya	Fishery Intern	April 26	May 6	Female	NMFS SWFSC FED	USA
Sakuma, Keith	Chief Scientist	April 26	May 17	Male	NMFS SWFSC FED	USA
Wells, Brian	Fishery Biologist	April 26	May 6	Male	NMFS SWFSC	USA

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Leg 2

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Adams, Thomas	Fishery Intern	May 22	June 13	Male	HSU/NMFS SWFSC FED	USA
Auth, Toby	Fishery Biologist	May 22	June 2	Male	PSMFC	USA
Batzl, Ken	Oceanographer	May 22	June 13	Male	NMFS SWFSC FED	USA
Belcher, Ryan	NOAA Corp. Officer	May 22	June 13	Male	NMFS SWFSC FED	USA
Brodeur, Richard	Fishery Biologist	May 25	June 2	Male	NMFS NWFC	USA
Chittaro, Paul	Ecologist	May 25	June 2	Male	OA	USA
Drzewicki, Maya	Hollings Scholar	June 2	June 13	Female	EFHUSP	USA
Fennie, Will	Graduate Student	May 25	June 2	Male	OSU	USA
Force, Michael	Ornithologist	May 22	June 13	Male	FIAER	CANADA
Freed, Jim	Fishery Intern	May 22	June 2	Male	UCSC	USA
Friedlander, Cherisa	NOAA Corp. Officer	June 2	June 13	Female	NMFS SWFSC FED	USA
Howard, Ryan	Krill Biologist	June 2	June 13	Male	UCSC	USA
Phillips, Jason	Fishery Biologist	May 22	June 2	Male	OSU	USA
Sakuma, Keith	Chief Scientist	April 26	June 13	Male	NMFS SWFSC FED	USA
Zuercher, Rachel	Ph.D. Student.	June 2	June 13	Female	UCSC	USA

Scientist duty hours

Night Shift (names in bold) 1800-0600 (6-9 scientists on duty)
Day Shift 0600-1800 (1-7 scientists on duty)

G. Administrative

1. Points of contact

Keith Sakuma, Fishery Biologist, Chief Scientist
NOAA NMFS SWFSC FED
110 McAllister Way
Santa Cruz, CA 95060
Phone: 831-420-3945
Email: keith.sakuma@noaa.gov

LT Klavon, 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

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 off Oregon will be conducted under the Oregon Department of Fish and Wildlife Scientific Taking Permit 21254. Principal Investigator Richard Brodeur.

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 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-May17

Mobilize scientific gear from NOAA NMFS SWFSC FED Santa Cruz, CA to the ship at the Pier TBD 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. Methot-Isaac-Kidd (MIK) net, and CTD casts with sea trials off central California during the daylight hours prior to the first night of operations. Surface trawls and MIK net tows will be conducted during daylight hours from April 26-May 6. Beginning the first sea day and ending the morning of the last day of Leg 1, conduct nighttime midwater trawls, CTD casts, bongo tows, pairovet tows, various oceanographic sampling (e.g., acoustic transects), daytime seabird/marine mammal observations, daytime 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 6 (tentatively at Santa Cruz, CA). Arrive in port at Pier TBD in San Francisco, CA upon the completion of Leg 1 operations on May 17. Four full days will be spent in port at Pier TBD in San Francisco from May 18-21.

Leg 2: May 22 – June 13

Embark Leg 2 scientists on May 22. 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, pairovet tows, various oceanographic sampling, seabird/marine mammal observations, and opportunistic Humboldt squid jigging between San Diego, CA and Willapa Bay, WA. The daily transect plan for Leg 2 is listed in Appendix I and is subject to change. There will be a transfer of scientific personnel via skiff/small boat on May 25 at Eureka, CA to embark additional NWFSC personnel. A second transfer of personnel via skiff/small boat will occur on June 2 at Eureka, CA. Arrive in Ship's home port in San Diego, CA upon the completion of Leg 2 operations on June 13.

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 13 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 when 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, Santa Cruz Warf, 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 off California

Four to seven midwater trawls of 15 minute duration 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 (i.e. the SIMRAD ITI). 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. Size information

will be recorded on select species. 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. The ship's 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 samples from at least two casts during the day and one at night throughout the survey area. 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

Throughout the project, EK60 and EK80 echosounders will be operated at 18, 38, 70, 120, 200 and 333 kHz and interfaced to a data acquisition system to estimate the biomass of krill between 10 and 350 m depth. An "EK-MUX" multiplexer will be used to alternate transmissions from the EK60 and EK80 echosounders. The Survey Tech with assistance from the scientists will verify the correct date and time on the echosounder computers and track total kilometers surveyed by EK60 and EK80. While not required for the current project, if the ship is running the ME70, MS70, and SX90 then the total kilometers surveyed by these sensors must also be tracked. The total track distance of the aforementioned acoustic sensors must be submitted to swfsc.ita@noaa.gov no later than 14 days following the conclusion of the project. These distances are required for environmental compliance as directed by SWFSC's Letter of Authorization for the California Current Research Area, (LOA CCRA -80 FR 58982) under the Marine Mammal Protection Act (valid until 29 October 2020). In addition to the standard acoustic data acquisition, a series of daytime transects will be run at three areas of particular interest off 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 paironet 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.

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. 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 fronts for juvenile salmon (*Oncorhynchus* spp.) and their potential prey

Data from the ship's thermosalinometer will be used to identify and target fronts during daylight hours. Once a front is identified, the following operations will be conducted on either side of the front (i.e. replicate operations on the two sides of the front): CTD cast, MIK net tow, and surface trawl. CTD deployments will follow the standard procedures listed previously. The MIK net will be deployed to a predetermined depth, and then retrieved at a rate of 20 m/minute while maintaining a wire angle of 45° (an oblique tow similar to a CalCOFI bongo). A ReefNet TDR will be attached to the MIK net to determine actual depths fished and a flowmeter will be attached to determine the volume filtered. Surface trawls will be conducted using the modified Cobb midwater trawl. Additional large polyform floats (size A5) will be attached in order for the net to fish effectively at the surface. A ReefNet TDR will be attached to the center of the footrope to determine the vertical opening of the net. Trawling speed will be ~3 knots. Catches from both the MIK net and surface trawls will be sorted at sea as much as possible, with the remainder of the samples frozen for identification back at the laboratory.

8. Sample for pelagic juvenile rockfish and other epi-pelagic micronekton at NWFSC stations off Oregon and Washington.

Four to five midwater trawls will be conducted at night off Oregon and Washington using the same midwater trawl protocols listed above. The fixed stations sampled are part of the NWFSC's ongoing pre-recruitment survey. In addition to sorting the trawl catch, size measurements will be recorded on up to 30 specimens per species/taxon per trawl. Bongo tows will be conducted each night at dusk, midnight, and dawn. One side of the bongo will be preserved in ethanol and the other frozen for stable isotope work. Note that due to the shorter nighttime period off Oregon and Washington, CTD casts will only be conducted during daylight hours, typically at the corresponding night's trawl stations. CTD deployments will follow the same protocols listed above.

9. Collect water samples for eDNA study in the Monterey Bay area, and conduct joint water sample collections with MBARI

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 of environmental DNA (e-DNA), a developing analytical approach for sampling marine populations and biodiversity.

On May 4 and 5 these eDNA collections will be coordinated with the MBARI, to compare measurements made by the NOAA ship with measurements made from the R/V Western Flyer and MBARI's long-range autonomous underwater vehicle (LRAUV) with

a newly designed Environmental Sample Processor (ESP) developed to collect eDNA samples. During the May 4 and 5th daytime and nighttime sampling (including operations already listed under Operation 7, sample fronts for juvenile salmon and their potential prey) will be coordinated with the MBARI ships and LRAUV. Coordination will be planned in advance by the scientific teams, although some modest level of communication between the ship and the MBARI vessel regarding operations will likely be necessary in real time.

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

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

Move-on rule

If marine mammals, sea turtles or other protected species are sighted within 1 nautical mile (nm) of the planned set location prior to setting the gear, the vessel will transit to a different section of the sampling area to maintain a minimum distance of 1 nm between the set location and estimated location of sighted protected species. If, after moving on, protected species remain within the 1 nm exclusion zone, the CS or watch leader may decide to move again or to skip the station, but in any case **may not set while a**

protected species is in the 1 nm exclusion radius.

Monitoring during trawl deployment, fishing and retrieval

Also as part of the protected species watch, there will be a dedicated scientist on watch whenever the trawl is in the water (i.e., deployment, fishing, and retrieval). The scientist on watch will notify the Chief Scientist immediately if any protected species are observed within one nautical mile of the ship. If the trawl net is deployed (but not yet fishing) after an “all clear” visual scan and protected species are observed, then the gear will immediately be retrieved to avoid further interaction. The ship will then relocate to a distance one nautical mile away and the area will be scanned for any protected species presence. If the trawl net is fishing and protected species 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 protected species at the surface).

Data collection for visual watches

All visual monitoring watches (30 min prior to set, deployment, fishing, and retrieval) and any data gathered during these watches will be recorded in the watch logs provided for each survey.

The scientific party requests the ship’s cooperation in implementing the scientist’s mitigation measures.

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.

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. 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 CS, watch leader, or OOD will call Krista Catelani immediately at 707-293-3563 (cell - anytime) or 858-546-7166 (work - day) to provide a detailed report of the event. Catch of eulachon and salmon will only be reported to SWFSC.ITA@noaa.gov at the conclusion of every survey day; no call is necessary. Appropriate communications on all authorized takes will occur in a timely

manner to allow Krista Catelani to report the event to the PSIT in the required 48 hours.

Lethal take of Marine Mammal or Sea Turtle

If a lethal take of a marine mammal or sea turtle occurs, priority should be placed on removing animal from gear as quickly and safely as possible so photographs and measurements can be taken according to protocol, PSIT-002.02, and then the animal should be wrapped in bag/s (trash bags or provided body bag) and placed in the scientific freezer. Concurrently, as stated above, Krista Catelani should be notified immediately.

Non-lethal take of any protected species

Priority for any non-lethal take is to release the animal as quickly as possible according to instructions below for its best chance of survival post-release. First and foremost, please take into consideration safety of all crew and staff. Concurrently, as stated above, Krista Catelani should be notified immediately

Protected Species Handling

In general, following a “common sense” approach to handling protected species will present the best chance of minimizing injury to the animal and of decreasing risks to scientists, officers and crew. There are inherent safety concerns associated with handling/disentangling protected species, so using good judgment and ensuring human safety is paramount. SWFSC researchers should refer to PSIT-004.02, SWFSC Marine Mammal Handling Guidelines, and the Pacific Islands Region's Identification, Handling and Release of Protected Species (PSIT-005.01), and SWFSC's marine mammal and sea turtle sampling protocol (PSIT-002.01) 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

SWFSC scientists are authorized under MMPA regulation 50 CFR 216.22 and encouraged to collect samples from authorized protected species (see Table 1.) incidentally captured or killed during fisheries research activities. For sampling, follow guidelines in PSIT-002.02, SWFSC's Detailed Sampling Protocol for Marine Mammal and Sea Turtle Incidental Takes and fill out the Marine Mammal and Sea Turtle Biological Sampling form.

3. 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.

4. 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.

5. 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.

6. Mitigating interaction with crab fishing gear

Interaction with crab fishing gear should be avoided. For inshore stations (less than 100 fathoms) north of Monterey, ship's force will scout out a viable trawl path within 1 nm diameter of the station point. When possible, the scouting will be done during daylight hours. If a daylight scouting line is not possible, the ship's searchlights will be used to attempt to identify a viable path. If a viable trawl path cannot be identified after 60 minutes, the chief scientist will be notified and the station will be canceled.

If there is an interaction with crab fishing gear, note the time and location and take photos of any evidence of the interaction and if possible collect tags for follow-up with gear owners. If a crab fisherman calls the ship on the radio, collect any information they provide, explain our operations if asked, and contact the watch leader, CO, and chief scientist if necessary. If the crab fisherman reports gear in our operating area, contact watch leader to assess the area and along with consultation with the chief scientist, cancel the station if necessary. If they report a gear loss based on ship's activities, collect the vessel name, owner/operator name, and position of gear loss in OPS log and pass information to the chief scientist. If the crab fisherman request shore side contact information, refer them to the project shore side support person: Roger Hewitt, Phone (858)546-5602, Email roger.hewitt@noaa.gov. The ship may request time to send divers over the side to inspect prop and rudder for evidence of interactions.

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

Rigging hardware for bridles and transfer cables
Cowbells for securing codend of modified Cobb midwater trawl
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 and EK80 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°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)
Spare rigging hardware for modified Cobb midwater trawl net
STM Products DDD 03 acoustic pingers
MIK net frame, depressor, nets, and codend (2)
Rigging hardware for MIK net (2)
Bongo net frame, nets, weight, and codends (2)
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 (76 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

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Formaldehyde solution (4%)	1 x 19 liters	Alkalinity	Keith Sakuma	A
Formaldehyde solution (37%)	1 x 8 liters	Alkalinity, Stored in ship chem. lkr	Keith Sakuma	A
Ethanol (100%)	4 x 19 liters = 76 liters	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.

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 will be held 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.omaο.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/noaaforms/eforms/nf57-10-01.pdf>.

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

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document

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

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

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

Contact information:

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

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

C. Shipboard Safety

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

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

Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

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

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.

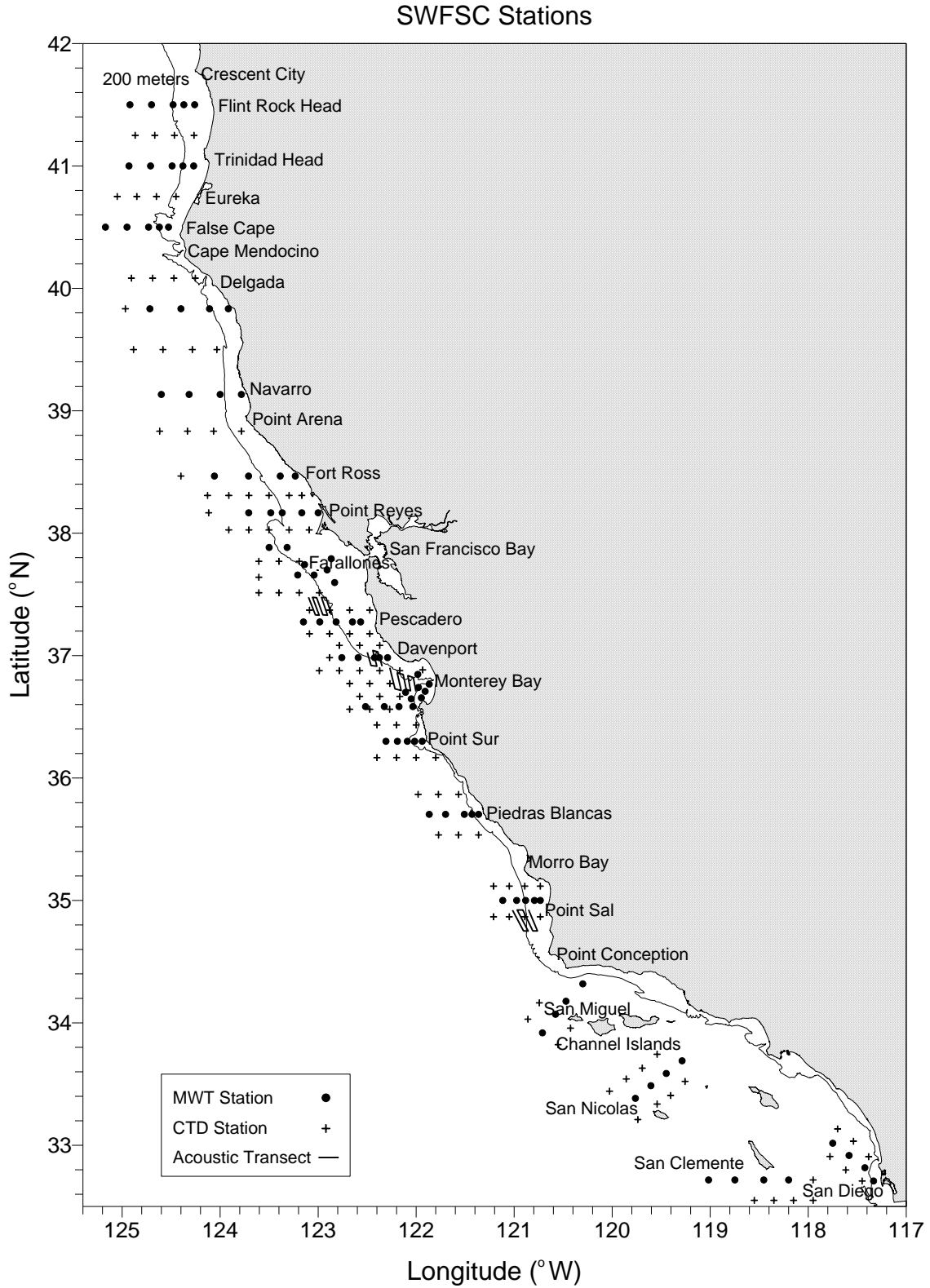
Responsibilities of the Foreign National Sponsor:

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)

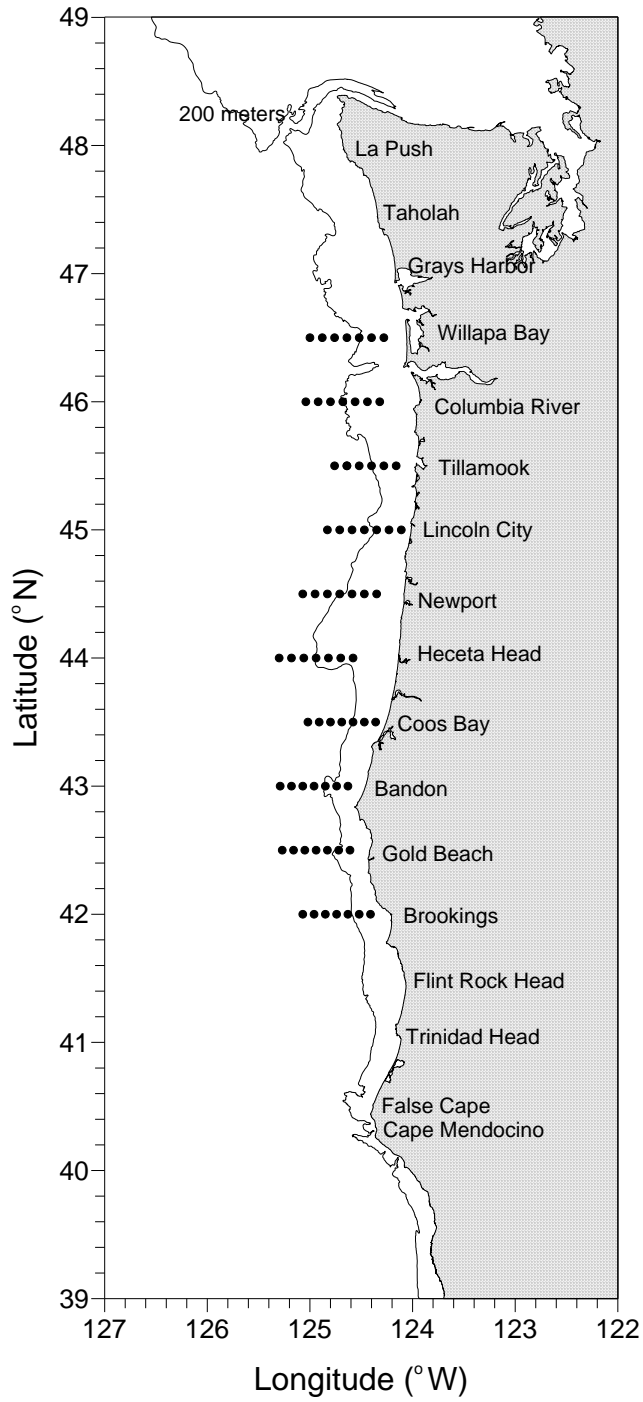
Appendix I: Daily transect schedule (subject to change)

Date	Transect Location	# Sampled	Notes
25-Apr	S.F. Port		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	Saturday
30-Apr	Point Reyes	1	Sunday
1-May	Outside Farallones	1	
2-May	Pescadero	1	Acoustic Transect
3-May	Davenport	1	
4-May	Monterey Outside	1	MBARI LRAUV work
5-May	Monterey Inside	1	MBARI LRAUV work
6-May	Point Sur	1	Saturday-Skiff Transfer Santa Cruz, CA
7-May	Poin Sal	1	Sunday
8-May	San Nicolas	1	
9-May	San Diego	1	
10-May	San Clemente	1	
11-May	San Miguel	1	
12-May	Point Sal	2	Acoustic Transect
13-May	Piedras Blancas	1	Saturday
14-May	Monterey Outside	2	Sunday
15-May	Monterey Inside	2	Acoustic Transect
16-May	Davenport	2	Acoustic Transect
17-May	End Leg 1		Begin In Port S.F., CA
18-21-May	S.F. Port		In Port
22-May	Gulf of Farallones	2	Depart S.F., CA, Begin Leg 2
23-May	Navarro	2	
24-May	False Cape	2	
25-May	Flint Rock Head	1	Skiff Transfer-Eureka, CA pick up NWFSC
26-May	Gold Beach	1	Begin NWFSC Stations
27-May	Heceta Head	1	Saturday
28-May	Tillamook	1	Sunday
29-May	Columbia River	1	Memorial Day
30-May	Newport	1	
31-May	Coos Bay	1	
1-Jun	Brookings	1	End NWFSC Stations
2-Jun	Trinidad Head	1	Skiff Transfer-Eureka, CA
3-Jun	Delgada	1	Saturday
4-Jun	Point Reyes	2	Sunday
5-Jun	Outside Farallones	2	
6-Jun	Pescadero	2	
7-Jun	Monterey Outside	3	
8-Jun	Piedras Blancas	2	
9-Jun	Point Sal	3	
10-Jun	San Nicolas	2	Saturday
11-Jun	San Clemente	2	Sunday
12-Jun	San Diego	2	
13-Jun	Cruise Ends		Dock In Port San Diego, CA

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



NWFSC Stations



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

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

NWFSC STATIONS

BROOKINGS

Latitude	Longitude	Station
42° 0'	124° 24.6'	631
42° 0'	124° 31.2'	632
42° 0'	124° 37.8'	633
42° 0'	124° 44.4'	634
42° 0'	124° 51'	635
42° 0'	124° 57.6'	636
42° 0'	125° 4.2'	637

GOLD BEACH

Latitude	Longitude	Station
42° 30'	124° 36.6'	641
42° 30'	124° 43.2'	642
42° 30'	124° 49.8'	643
42° 30'	124° 56.4'	644
42° 30'	125° 3'	645
42° 30'	125° 9.6'	646
42° 30'	125° 16.2'	647

BANDON

Latitude	Longitude	Station
43° 0'	124° 37.8'	651
43° 0'	124° 44.4'	652
43° 0'	124° 51'	653
43° 0'	124° 57.6'	654
43° 0	125° 4.2'	655
43° 0	125° 10.8'	656
43° 0	125° 17.4'	657

COOS BAY

Latitude	Longitude	Station
43° 30	124° 21.6'	661
43° 30	124° 28.2'	662
43° 30	124° 34.8'	663
43° 30'	124° 41.4'	664
43° 30'	124° 48'	665
43° 30'	124° 54.6'	666
43° 30'	125° 1.2'	667

HECETA HEAD

Latitude	Longitude	Station
44° 0'	124° 34.8'	671
44° 0'	124° 42'	672
44° 0'	124° 49.2'	673
44° 0'	124° 56.4'	674
44° 0'	125° 3.6'	675
44° 0'	125° 10.8'	676
44° 0'	125° 18'	677

NEWPORT

Latitude	Longitude	Station
44° 30'	124° 21'	681
44° 30'	124° 28.2'	682
44° 30'	124° 35.4'	683
44° 30'	124° 42.6'	684
44° 30'	124° 49.8'	685
44° 30'	124° 57'	686
44° 30'	125° 4.2'	687

LINCOLN CITY

Latitude	Longitude	Station
45° 0'	124° 6.6'	691
45° 0'	124° 13.8'	692
45° 0'	124° 21'	693
45° 0'	124° 28.2'	694
45° 0'	124° 35.4'	695
45° 0'	124° 42.6'	696
45° 0'	124° 49.8'	697

TILLAMOOK

Latitude	Longitude	Station
45° 30'	124° 9.6'	701
45° 30'	124° 16.8'	702
45° 30'	124° 24'	703
45° 30'	124° 31.2'	704
45° 30'	124° 38.4'	705
45° 30'	124° 45.6'	706
45° 30'	124° 38.4'	707

COLUMBIA RIVER

Latitude	Longitude	Station
46° 0'	124° 19.2'	711
46° 0'	124° 26.4'	712
46° 0'	124° 33.6'	713
46° 0'	124° 40.8'	714
46° 0'	124° 48'	715
46° 0'	124° 55.2'	716
46° 0'	125° 2.4'	717

WILLAPA BAY

Latitude	Longitude	Station
46° 30'	124° 16.8'	721
46° 30'	124° 24'	722
46° 30'	124° 31.2'	723
46° 30'	124° 38.4'	724
46° 30'	124° 45.6'	725
46° 30'	124° 52.8'	726
46° 30'	125° 0'	727