FINAL Project Instructions

Date Submitted: June 16, 2014

Platform: NOAA Ship *Bell M Shimada*

Project Number: SH 14-05 (OMAO)

Project Title: 2014 California Current Ecosystem (CCE14): Acoustic-Trawl Survey of Coastal Pelagic Fishes (Legs I and II); and Investigations of hake survey methods, life history, and associated ecosystem (Legs III, IV, and V)

Project Dates: June 24, 2014 to September 14, 2014

Prepared by _____ Dated 6/17/14
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Approved by _____ Dated: 6/17/14
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Title: Division Director
Affiliation: SWFSC/FRD

Approved by _____ Dated 6/17/14
Center Director: Francisco Werner
Title: Science and Research Director
Affiliation: SWFSC

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Title:
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Approved by _____ Dated 6/16/14
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Approved by _____ Dated 6/17/14
Center Director: John Stein
Title: Science and Research Director
Affiliation: NWFSC

Approved by _____ Dated 6/20/14
CAPT Douglas D. Baird, NOAA
Title: Commanding Officer
Affiliation: Marine Operations Center - Pacific

I. Overview

A. Brief Summary and Project Period: The 2014 acoustic-trawl method (ATM) project aboard *Bell M. Shimada* represents a joint effort between the SWFSC and the NWFSC in investigating elements of the California Current Ecosystem (CCE). The overall 2014 effort, hereafter referred to as CCE14, consists of five project legs:

Legs I and II: A SWFSC-led survey of coastal pelagic fishes (CPS), demersal fishes, zooplankton, and their oceanographic habitats within the California Current Ecosystem will be conducted during Leg I (24 June to 11 July 2014) and Leg II (15 July to 5 August). This ATM survey will assess biomasses, distributions, and biological compositions of multiple species and trophic levels within the adaptively sampled region spanning the northern subpopulation of Pacific sardine (*Sardinops sagax*). Also during Legs I and II, as time permits (at the discretion of the Chief Scientist), age-1 hake will be sampled and the western extent of adult hake will be characterized. The NWFSC will participate in this sampling remotely during Legs I and II.

Legs III, IV, and V: NWFSC-led investigations of Pacific hake (*Merluccius productus*) and joint survey methods, life history, and associated ecosystem components (trophic structure and oceanography) will be conducted during CCE14 Leg III (9 August to 13 August), Leg IV (17 August-29 August), and Leg V (1 September to 14 September).

B. Days at Sea (DAS)

Of the 80 DAS scheduled for this project, 80 DAS are funded by a Line Office Allocation, and 72 DAS are provided by the ship. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area (include optional map/figure showing op area)

Legs I and II will potentially span the west coast from ~51°N (the north end of Vancouver Island, Canada) to ~32.8°N (the U.S.-Mexican border (**Fig.1**; **Table 1**). The eastern extent will be as close to shore as safely navigable, at the discretion of the command. The western extent will be ordinarily to the 1,500-m isobath or 35 nmi west of the inshore waypoint, whichever is farther offshore. The exact operating area will depend on the distributions of: CPS fishing activity (evaluated before and during the survey), modeled potential sardine habitat (evaluated before and during the survey), CPS and hake backscatter, trawl catches, fish-egg samples (evaluated during the survey), and, if time allows, the western extension of adult hake. See the detailed adaptive sampling protocol below.

Legs III–V will potentially span the West Coast from ~36°N (Monterey Bay area) to ~51°N (the north end of Vancouver Island, Canada) with a focus on the

southern portion of that area in leg III (CA, OR) and the northern portion of that area in legs IV and V (OR, WA, BC). The exact locations will depend on the locations of suitable hake schools with desired densities and age-class characteristics. For the fixed-area-focused research on legs IV and V, we will choose two to three locations with desired hake school characteristics and spend time in those areas, possibly transiting between them frequently. The eastern extent of the work is planned to be no shallower than the 50-m isobath. The sampling may extend up to 65 nmi offshore, if hake are detected there; most sampling is anticipated to be closer to shore, however.

D. Summary of Objectives

Summary of Objectives, <u>Legs I and II:</u>

- The primary goal is to use the ATM to estimate the biomasses, distributions, and biological compositions of the northern sub-population of sardine, other CPS (e.g., mackerels, anchovy, herring, and smelts), hake, krill, and gelatinous zooplankton within the survey region. The adaptive sampling may span the northern sub-population of sardine, probably between Cape Flattery to Point Conception, but potentially from the northern end of Vancouver Island, Canada to the U.S.-Mexican border, as safely navigable in the east, and to the western extent of CPS and hake backscatter in the west (see the detailed adaptive sampling plan below).
- Before the survey, calibrate the EK60 echosounder system using measures of transducer impedance, and backscatter from standard spheres..
- Continuously sample multi-frequency acoustic backscatter data using the ship's Simrad EK60 and ME70 (when operational) scientific echo sounder systems. These data will be used to estimate the distributions and abundances of CPS, hake, gelatinous zooplankton, and krill.
- Conduct nighttime (i.e., between sunset and sunrise) surface trawling with the NWFSC's Aleutian Wing Trawl 24/20 (AWT) fitted with a marine mammal excluder device (MMED) and SWFSC floatation-filled doors and floats to collect specimens of CPS and other organisms. These data will be used to classify observed backscatter to species and estimate their size distributions.
- Conduct daytime trawling, as time permits (at the discretion of the Chief Scientist, up to one daytime trawl per day), with a second AWT without MMED and Fishbuster doors to classify observed backscatter to species and size composition, particularly age-1 and adult hake. These data, and the echosounder data, will be used to establish an index of age-1 hake and explore the western extent of adult hake.
- Image fish using a portable X-radiograph machine for the purpose of target strength modeling and estimation (See **Appendix 1**).
- Optically verify CPS backscatter while underway conducting acoustic transects, using a towed and a cast stereo-camera system.
- Optically observe fish behavior inside nighttime and daytime trawls using cameras and lights mounted inside the net.

- Collect a variety of other acoustic, biological, and oceanographic samples relevant to CPS and hake, ichthyoplankton, and zooplankton. These data will be used to characterize the biotic and abiotic environments and predator-prey interactions of the surveyed species.
- Continuously sample sea-surface temperature, salinity, and chlorophyll a using the ship's thermosalinograph and fluorometer.
- Continuously sample air temperature, barometric pressure, and wind speed and direction using the ship's integrated weather station.
- Continuously sample pelagic fish eggs using the ship's Continuous Underway Fish Egg Sampler (CUFES).
- Adaptively sample pelagic fish egg profiles using a Vertical Egg Tow net (Pairovet).
- Sample profiles of temperature and salinity using an underway conductivity-temperature-depth (CTD) system during the day, and a standard CTD system with water-sampling rosette and other instruments at night.
- Sample plankton using a CalBOBL (CalCOFI Bongo) net at night.

Summary of Objectives, Legs III, IV, and V:

- Leg III will focus on NWFSC net-intensive research, while Legs IV and V will focus on trawl sampling strategies and fixed-area ecosystem investigations. Additional objectives for legs III–V will include exploring the western extent of hake, making target strength measurements, and running designated reference transects.
- Continuously sample multi-frequency backscatter using the ship's EK60 scientific echosounder systems, with ME70 sampling as available. These data will be used to estimate or investigate the distributions of hake, rockfish, krill, and myctophids and may be used for CPS estimates, if applicable.
- Investigate near-field calibration techniques.
- Continuously sample with a 75-kHz Acoustic Doppler Current Profiler (ADCP) system.
- Conduct day-time trawling using an Aleutian wing trawl 24/20 (AWT).
- Investigate catches of smaller organisms (including young-of-the-year hake, myctophids, and possibly age-1 hake) by using net pockets attached to the AWT.
- Use net pockets for verifying the identity of acoustic targets suspected to be mesopelagic fish (myctophids, bathylagids) and squid and to obtain specimens for species identification and lengths
- Test a stereo camera system for quantifying fish species and length on the AWT.
- Quantify new trawl metrics for the AWT since its update with spectra rigging.
- Possibly test surface trawl capabilities of the Fishbuster doors with an AWT 24/20, equipped with a MMED insert and accompanying floats.
- Conduct an inter-vessel comparison between *Bell M. Shimada* and Canadian Coast Guard Ship *W.E. Ricker* (if opportunity arises).

- Investigate pre-determined trawl sampling strategies using the AWT to fish at objectively determined locations.
- Repeatedly sample a set of fixed areas to investigate hake school structure and ecosystem components (trophic structure and oceanography) over time.
- If Humboldt squid (*Dosidicus gigas*) appear in the survey/research area, jig for Humboldt squid samples and do target identification trawls with the AWT.
- Collect a variety of other acoustic, optical, biological and oceanographic samples relevant to California Current Ecosystem dynamics, especially how they relate to hake and their habitat and prey. Use night operations time to conduct hydrographic measurements with a CTD, collect water samples for chemical analyses with a rosette, collect zooplankton samples with towed plankton nets, and conduct zooplankton experiments with collected subsamples.
- Continuously sample sea-surface temperature, salinity, and fluorescence (chlorophyll) with the ship's thermosalinograph and fluorometer.
- Continuously sample air temperature, barometric pressure, and wind speed and direction using the ship's integrated weather station.
- Continuously sample pelagic fish eggs using the ship's Continuous Underway Fish Egg Sampler (CUFES).
- Sample profiles of temperature and salinity using both an underway conductivity-temperature-depth (CTD) system (day ops) or a standard CTD system with water-sampling rosette and other instruments (video plankton recorder, dissolved oxygen meter, night ops).
- Sample larval and juvenile fish using a Methot trawl.
- Conduct Methot net tows to verify the identity of acoustic targets suspected to be euphausiids and obtain specimens for species identification and length
- At the beginning of Leg V, the EK60 and ME70 echosounder systems will be calibrated using backscatter from standard spheres and potentially a near-field technique.

E. Participating Institutions

NOAA/NMFS/SWFSC, 8901 La Jolla Shores Drive, La Jolla, CA 92037

NOAA/NMFS/NWFSC, 2725 Montlake Blvd. E, Seattle, WA 98112

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

Leg I: 24 June to 11 July 2014

Name	Title	Embark	Disembark	Gender	Affiliation	Nationality
George	Chief Scientist	6/23/14	7/12/14	M	SWFSC	U.S.

Randall Cutter						
Elliott, Brian	Acoustician	6/23/14	7/12/14	M	SWFSC	U.S.
Sue Manion	Trawl Lead	6/23/14	7/12/14	F	SWFSC	U.S.
Bryan Overcash	Biologist	6/23/14	7/12/14	M	SWFSC	U.S.
Bev Macewicz	Biologist	6/23/14	7/12/14	F	SWFSC	U.S.
Sherri Charter	Biologist	6/23/14	7/12/14	F	SWFSC	U.S.
Sam McClatchie	Biologist	6/23/14	7/12/14	M	SWFSC	U.S.
Emily Gardner	Biologist	6/23/14	7/12/14	F	SWFSC	U.S.
Sherri Charter	Biologist	6/23/14	7/12/14	F	SWFSC	U.S.
Brittany Schwartzkopf	Biologist	6/23/14	7/12/14	F	SWFSC	U.S.

Leg II: 15 July to 5 August 2014

Name	Title	Embark	Disembark	Gender	Affiliation	Nationality
Sue Manion	Chief Scientist / Trawl Lead	7/15/14	78/295/14	F	SWFSC	U.S.
Elliott, Brian	Acoustician	7/15/14	8/5/14	M	NOAA Corps	U.S.
Scott Mau	Acoustician	7/15/14	8/5/14	M	SWFSC	U.S.
Noelle Bowlin	Biologist	7/15/14	8/5/14	F	SWFSC	U.S.
Bill Watson	Biologist	7/15/14	8/5/14	M	SWFSC	U.S.
Bev Macewicz	Biologist	7/15/14	8/5/14	F	SWFSC	U.S.
Brittany Schwartzkopf	Biologist	7/15/14	8/5/14	F	SWFSC	U.S.
Heather Colley	Biologist	7/15/14	8/5/14	F	SWFSC	U.S.
Anne Friere	Biologist	7/15/14	8/5/14	F	SWFSC	U.S.

Julia Clemons	Acoustician	7/15/14	8/5/14	F	NWFSC	U.S.
Steve de Blois	Acoustician	7/15/14	8/5/14	M	NWFSC	U.S.

Leg III: 9 August to 13 August 2014

Name	Title	Embark	Disembark	Gender	Affiliation	Nationality
Larry Hufnagle	Chief Scientist	8/8/14	8/13/14	M	NWFSC	U.S.
John Pohl	Acoustician	8/8/14	8/13/14	M	NWFSC	U.S.
Alicia Billings	Trawl Lead	8/8/14	8/13/14	F	NWFSC	U.S.
Doug Draper	Biologist	8/8/14	8/13/14	M	NWFSC	U.S.
Tim Peretti	Biologist	8/8/14	8/13/14	M	NWFSC	U.S.
TBD	Biologist	8/8/14	8/13/14	M	NWFSC	U.S.
TBD	Biologist	8/8/14	8/13/14	M	NWFSC	U.S.
Jennifer Fisher	Biologist	8/8/14	8/13/14	F	NWFSC	U.S.
TBD	Biologist	8/8/14	8/13/14	F	NWFSC	U.S.
TBD	Biologist	8/8/14	8/13/14	F	NWFSC	U.S.
TBD	Biologist	8/8/14	8/13/14	M	NWFSC	U.S.
TBD	TBD	8/8/14	8/13/14	M	NWFSC	U.S.

Leg IV: 17 August to 29 August 2014

Name	Title	Embark	Disembark	Gender	Affiliation	Nationality
Julia Clemons	Chief Scientist	8/16/14	8/29/14	F	NWFSC	U.S.
Rebecca Thomas	Acoustician	8/16/14	8/29/14	F	NWFSC	U.S.
Sandy Parker-Setter	Acoustician	8/16/14	8/29/14	F	NWFSC	U.S.
Alicia Billings	Trawl Lead	8/16/14	8/29/14	F	NWFSC	U.S.
Miako Ushio	Biologist	8/16/14	8/29/14	F	NWFSC	U.S.
Bo Whiteside	Biologist	8/16/14	8/29/14	M	NWFSC	U.S.
Bill Peterson	Biologist	8/16/14	8/29/14	M	NWFSC	U.S.
Tracy	Biologist	8/16/14	8/29/14	F	NWFSC	U.S.

Shaw						
TBD	Biologist	8/16/14	8/29/14	X	NWFSC	U.S.
TBD	Biologist	8/16/14	8/29/14	X	NWFSC	U.S.
TBD	Biologist	8/16/14	8/29/14	X	NWFSC	U.S.
TBD	TBD	8/16/14	8/29/14	X	NWFSC	U.S.

Leg V: 1 September to 14 September 2014

Name	Title	Embark	Disembark	Gender	Affiliation	Nationality
Steve de Blois	Chief Scientist	8/31/14	9/14/14	M	NWFSC	U.S.
Dezhang Chu	Acoustician	8/31/14	9/14/14	M	NWFSC	U.S.
Cassie Whiteside	Trawl Lead	8/31/14	9/14/14	F	NWFSC	U.S.
Lance Sullivan	Biologist	8/31/14	9/14/14	M	NWFSC	U.S.
Jason Eibner	Biologist	8/31/14	9/14/14	M	NWFSC	U.S.
TBD	Biologist	8/31/14	9/14/14	M	NWFSC	U.S.
Jay Peterson	Biologist	8/31/14	9/14/14	M	NWFSC	U.S.
Tracy Shaw	Biologist	8/31/14	9/14/14	F	NWFSC	U.S.
TBD	Biologist	8/31/14	9/14/14	F	NWFSC	U.S.
TBD	Biologist	8/31/14	9/14/14	F	NWFSC	U.S.
TBD	Biologist	8/31/14	9/14/14	M	NWFSC	U.S.
TBD	TBD	8/31/14	9/14/14	M	NWFSC	U.S.

Note: If approved by the Chief Scientist and the CO, personnel transfers via a chartered small craft may occur during any or all of the project legs.

G. Administrative

SWFSC:

David Demer, Joint Survey Co-Lead, 8901 La Jolla Shores Drive, La Jolla, CA 92037, (858) 546-5603, david.demer@noaa.gov

Alternate: Juan Zwolinski, 8901 La Jolla Shores Drive, La Jolla, CA 92037, (858) 546-5654, juan.zwolinski@noaa.gov

NWFSC:

Larry Hufnagle, Joint Survey Co-Lead, 2725 Montlake Blvd. E, Seattle, WA 98112, (206) 860-3346, lawrence.c.hufnagle@noaa.gov

Alternate: Rebecca Thomas, 2725 Montlake Blvd. E, Seattle, WA 98112, (206) 302-2412, rebecca.thomas@noaa.gov

Ops Officer *Bell M. Shimada*:

LT Patrick Sweeney, 2002 SE Marine Science Dr., Newport, OR 97365, (541) 867-8775, ops.bell.shimada@noaa.gov

2. Diplomatic Clearances:

   This project involves Marine Scientific Research in waters under the jurisdiction of Canada. Diplomatic clearance has been approved 11JUN2014

3. Licenses and Permits:

   This project will be conducted under the Scientific Research Permits (U.S.) issued by:

   a. NMFS/NWR on May 1, 2013 to Larry Hufnagle (SRP-09-2013)

   b. NOAA/ONMS on April 28, 2014 (MULTI-2014-010)

   c. NOAA/SWR on 11 June 2014 to David Demer (SRP--6/08-2014)

   d. CDFW on April 21, 2013 to John Stein (SC-11678)

   e. CDFW ON 11 April, 2013 to NOAA-SWFSC-FRD (SC-12372)

   f. ODFW on April 25, 2014 to Larry Hufnagle (STP #18785)

   g. ODFW on June 17, 2014 to Dale Sweetnam (STP# 18831)

   h. NMFS/NWR on May 2, 2014 to the NWFSC (ESA Section 10(a)(1)(A), #16337-2M)

II. Operations

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

A. Project Itinerary

A multi-species survey will be conducted during Legs I and II. Hake investigations will be conducted during Legs III, IV, and IV. All Legs occur aboard the NOAA Ship *Bell M. Shimada*. The project will begin and end at Newport, OR. Between-leg ports of call are indicated below.

Leg	Activity / Location	DAS	Start Date	End Date

Staging	Newport, OR	2	6/22/14	6/23/14
Leg I	Calibrate EK60/ME70, location TBD	1	6/24/14	6/24/14
	Transit	2	6/25/14	6/26/14
	Transects	12	6/27/14	7/8/14
	Contingency	2	7/9/14	7/10/14
	Transit	1	7/11/14	7/11/14
Inport	Newport, OR	3	7/12/14	7/14/14
Leg II	Transit	0.5	7/15/14	7/15/14
	Transects	18.5	7/15/14	8/2/14
	Contingency	2	8/3/14	8/4/14
	Transit	0.5	8/5/14	8/5/14
Inport	San Francisco, CA	3	8/6/14	8/8/14
Leg III	Transit	0.5	8/9/14	8/9/14
	Experiments	11	8/9/14	8/12/14
	Transit	0.5	8/13/14	8/13/14
Inport	Newport, OR	3	8/14/14	8/16/14
Leg IV	Transit	0.5	8/17/14	8/17/14
	Experiments	11	8/18/14	8/28/14
	Transit	0.5	8/29/14	8/29/14
Inport	Seattle, WA	2	8/30/14	8/31/14
Leg V	Calibrate EK60/ME70, potential near-field experiment	1.0	9/1/14	9/1/14
	Transit	0.5	9/2/14	9/2/14

	Experiments	11	9/3/14	9/13/14
	Transit	1	9/14/14	9/14/14
Inport	Newport, OR	2	9/15/14	9/16/14
Destaging	Newport, OR	2	9/15/14	9/16/14

The survey conducted during Legs I and II will use an adaptive-sampling strategy. The potential waypoints (**Table 1**) span from northern Vancouver Island (VI), Canada to the U.S.-Mexican border (**Fig. 1**). The actual waypoints and transects will be selected by the Chief Scientists based on the following decision criteria:

Northernmost transect: Prior to the start of the survey, the Chief Scientist will identify the northern-most transect line based on the latest reports of any sardine fishing off VI. For example, if sardine are not being landed off VI (even if the modeled potential sardine habitat is present there), the survey will begin at Cape Flattery, WA and progress southwards.

Transect density: The default transect spacing will be 20 n.mi. When CPS are observed in the trawls or acoustic backscatter along a transect, the Chief Scientist will decide to backtrack one transect and then increase the transect density to 10 n.mi. spacing for at least the next five transects. The Chief Scientist will decide when to resume sampling at the default transect spacing. This adaptive sampling scheme will continue throughout the survey at the discretion of the Chief Scientist.

Nearshore and offshore: The transects will be sampled as close to shore as safely navigable. Generally, transects will extend offshore to the 1,500-m isobath or to a distance 35 n.mi. from the eastern extent of the transect, whichever is farther offshore. At the discretion of the Chief Scientist, if CPS or hake echoes are observed within 1 nmi of the western end of a transect, that transect will be incrementally extended another 1 nmi westward until the last nmi of the transect is devoid of CPS or hake backscatter. In such cases, the next transect north will begin at the longitude where the previous transect ended. This is to assure that the sampling includes the western extent of the target sardine population and, as time permits, the adult hake.

Southernmost transects: The survey will continue south, following the adaptive sampling plan (see **Fig. 1**), until the available time is used. Depending on the distribution of CPS, there may be no sampling in the Southern California Bight.

B. Staging and Destaging

Staging will be in Newport, OR on 22-23 June 2014. Destaging will be in Newport, OR on 15-16 September 2014.

C. Operations

a. Acoustic data collection:

Acoustic backscatter data will be collected continuously with EK60s operating at 18, 38, 70, 120, and 200 kHz, and the ME70 (when operational).

The EK60 and ME70 transducers will be cleaned prior to or during staging for Leg I.

The EK60 and ME70 echosounders will be calibrated at the beginning of Leg I and the beginning of Leg V. Calibrations will be conducted using the standard-sphere method while at anchor (single-point, bow) in ~20- to 50-m deep, calm water with low current and biological backscatter. The precise locations of the calibrations will be determined by the Chief Scientists in consultation with the Operations Officer. Before and after each calibration, CTD casts will be required to determine local sound speed and absorption values.

Throughout Legs I and II, the EK60 transmit interval will be optimized; and an impedance analyzer will be used to measure the EK60 transducer impedances. The optimization and measurements are done automatically, with computer control.

The split-beam transducers are mounted on the ship's retractable centerboard. During Legs I and II, the centerboard will be extended to mid-depth, which extends the transducers to ~7.2 m below the surface, to reduce the unsampled region near the sea surface. During Legs III to V, the centerboard may be fully extended, at the discretion of the Commanding Officer and Chief Scientist. Any changes to the centerboard depth will be reported to the Chief Scientist and recorded in the SCS. The echosounder calibrations and collections of EK60 data take priority over all other daytime operations.

The .raw files from the EK60 and ME70 will be telemetered continuously, as collected, to the SWFSC via a Matlab script, secure ftp, and the ship's VSAT. The protocol for data transfers meets NOAA IT security requirements. Adequate VSAT bandwidth must be available.

The survey is comprised of adaptively sampled parallel transects. Acoustic transects will be run only during the daytime (approximately 14.5 hours per day). Vessel speed will be nominally 10 kts on the transects and 12 kts on the connecting segments.

The ship's echo sounders and Doppler velocity log (DVL) should be secured as much as possible. When their use is necessary, the crew shall inform the Chief Scientist of any use of the vessel's sounders or DVL. They interfere with the signals received on the EK60s.

Only if the ship's ADCP can be configured not to crosstalk with the EK60 and ME70 will it be used to collect acoustic backscatter and water velocity data throughout the survey. In this case, the ADCP transmissions must be triggered by, and thereby synchronized with, the EK60. ADCP data will be collected with the assistance of the ship's survey technicians and monitored by a member of the science party.

b. Biological data collection:

Biological data provides information about fish species and their sizes for interpreting the acoustic data. During Legs I and II nighttime, the NWFSC's AWT with SWFSC's doors and floats will be used to sample dispersed CPS near the water surface. During Legs I and II, daytime, if time permits (at the discretion of the Chief Scientist, maximum one daytime trawl per day), a second AWT trawl without the MMED and with the NWFSC's Fishbuster doors, will be used to target midwater aggregations, particularly age-1 and adult hake. The CPS AWT trawl has been modified with a marine mammal excluder device (MMED) designed to expel marine mammals and other large animals (e.g., turtles, sharks) before they are swept to the rear of the net. The MMED consists of a rigid aluminum grid in the intermediate section forward of the codend. On select tows during Legs III-V, the AWT will be equipped with pocket recapture nets to simultaneously sample yoy hake and myctophids.

The performances of the trawl gear will be monitored for depth, net opening, and other parameters with a Simrad FS70 third-wire trawl sonar attached to the headrope, a temperature-depth recorder (Sea-Bird SBE39) attached to the headrope, and a digital video camera mounted inside the net.

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

the number of fish eggs seen, from five to 30 minutes. At any time during legs I and II when the CUFES detects sardine egg concentrations of 0.5 egg min^{-1} per minute or higher in two consecutive samples, the ship will begin conducting pairovet tows at four mile intervals until the egg concentration falls below a density of 0.5 egg min^{-1} in two consecutive samples. This information will be relayed to the bridge by scientists monitoring the CUFES system.

The pairovet net will be fished from 70 meters to the surface (depth permitting) using paired 25 cm diameter 150 mm mesh nets at all stations. If sardine eggs are present at the western end of a transect, that line will be extended and pairovet sampling will continue as long as more than one egg per sample is counted. The technical requirements for Pairovet tows are: descent rate of 70 m min^{-1}, 10 sec to terminal depth, and ascent at 70 m min^{-1}. All tows with wire angles exceeding 15° during the ascent will be repeated.

Each nighttime trawl, as many as time allows, will be fished at the discretion of the Trawl Lead, for 30–45 minutes at a towing speed of approximately 3.5 to 5 kts. Trawl locations will be selected each day by the Acoustician and Trawl Lead based on nearby acoustic backscatter. Nighttime sampling must be completed in time for the ship to be back on the acoustic transect at sunrise.

All fish, lengths > 75 mm, in each catch will be sorted to species, if possible, and the catch weighed and lengths measured. For large catches, the catch will be randomly sub-sampled. Standard length and body weight will be measured, fish sexed, maturity graded, otoliths collected, ovaries preserved in buffered formalin, for target species, and tails preserved in ethanol vials. Sardine samples will take priority, but measurements will also be made for northern anchovy, jack and Pacific mackerels, smelts, herring, salmon, hake, and other species, as time permits. For subsequent age determination, CPS otoliths will be rinsed and air dried, and hake otoliths will be preserved in 50% ethanol. For selected hake samples, stomachs and ovaries will be collected and preserved in 10% neutral-buffered formalin, and blood samples will be collected and frozen.

To the extent possible, all live juvenile and adult salmon will be immediately returned to the ocean, with minimal handling. All dead salmon caught in the trawl will measured (fork length), weighed, sampled for genetic analyses (dried fin clips), X-rayed, frozen (on Legs I and II only), and subsequently provided to Sean Hayes, SWFSC-SCL. Document all salmon caught, alive or dead. If more than 10 salmon are captured in the first or second trawl of the night, and trawling is nearshore, the next trawl that night should not occur in the same area. If more than 10 salmon are captured in a single trawl, or if more than 50 salmon total are captured, contact Josh Lindsay at 562-980-4034 or joshua.lindsay@noaa.gov.

Any takes of ESA listed species other than salmon must be reported immediately to the Office of Protected Resources (PRD) at 562-980-3209.

Nighttime sampling will also include a CalCOFI Bongo (CalBOBL). This plankton net is comprised of paired 505-µm mesh nets with 71-cm diameter openings. It is fished obliquely with 300 m of wire out, depth permitting. The wire rates for descent and ascent are 50 and 20 m/min, respectively. The wire angle should be 45° during the ascent and descent of the net frame. Tows will be repeated, if time permits, if the ascending wire angle is less than 38° or greater than 51° during the final 100 m of wire.

Each night, one of the nighttime trawl stations will also include a CTD-rosette cast, and a pairovet and a CalCOFI bongo (CalBOBL) tow. Samples in one CalBOBL net will be analyzed for krill species and their lengths, and preserved in ethanol.

Pairs of digital X-ray images, dorsal and lateral aspects, will be obtained for samples of sardine, jack mackerel, Pacific mackerel, anchovy, hake, and salmon spp. spanning their observed size ranges. These images will be paired with camera images of the individual fish on a length measurement board, dorsal and lateral aspects, and measurements of standard length, weight, and sex. The X-ray generator will be secured in the controlled environment room. A separate cassette reader/computer system will be located in the acoustics lab. A lead sheet will be placed below the generator to provide adequate protection for the deck below. The X-ray operator will wear a lead apron and thyroid shield and stand a minimum of two meters from the X-ray generator when making an exposure. During the X-ray exposure, all personnel other than the operator will be at least four meters from the X-ray generator. When not in use, the X-ray generator will be unplugged. X-ray procedures (Appendix) will be followed.

During Legs I and II, SWFSC marine mammal protocols will be followed prior to, during, and following any trawl deployment. During transit to each station, for a period of at least 30 minutes, all available scientists and designated personnel will visually scan the sea surface for marine mammals and other protected species (e.g., sea turtles). If marine mammals or other protected species are sighted during this period, or upon arrival at the station, the Chief Scientist, in consultation with the OOD and other knowledgeable members of the crew and scientific staff, will determine if trawling operations can commence without likelihood of interaction between the gear and the animals sighted. This determination will be based on the species and number of animals sighted, their behavior, their position, their vector relative to the path of the vessel, and the professional judgment of the Chief Scientist. If marine mammals or protected species are observed during this period and are determined to be at appreciable risk of interaction with gear, then the vessel will move away at least 0.5 n. mi. from the animals to a new location within the same general area. The visual scan for marine mammals and turtles will continue during each subsequent move until it is determined that trawling operations can safely commence, or until the station is abandoned.

To reduce the potential of attracting marine mammals and other protected species to the vessel, trawl operations will be the first activity undertaken upon arrival at a

new station. During each tow, designated individuals will keep a continuous watch for protected species. If animals are sighted while the net is in the water, the Chief Scientist will consult others and determine the best strategy to avoid potential takes. In some situations, the decision may be to retrieve the net immediately and move away from the area. In other situations, the decision may be to continue towing until the animal(s) are clear of the area and away from potential contact with the gear during haul back, when the risk of entanglement may be highest. Every effort will be made to deploy and retrieve the trawl net as quickly as safely possible to avoid possible interactions with marine mammals.

If one or more marine mammals or sea turtles are inadvertently caught in the trawl net and brought aboard, it will be our highest priority to release the animal back into the water as soon as is safely possible. After release, the designated SWFSC marine mammal point of contact will be responsible for recording the event, noting the status of the animal (e.g., healthy and alive, injured slightly), the species, and if possible other details such as sex and size. Any marine mammal capture will trigger an immediate telephone contact to the SWFSC leadership, regardless of the time of day, who will take immediate action. Specifically, the Chief Scientist or the SWFSC Trawl Lead will immediately notify Cisco Werner (858-334-3207; cisco.werner@noaa.gov) or Kristen Koch (858-546-7081; kristen.c.koch@noaa.gov) via telephone and email to convey all the pertinent information regarding the event.

During Legs III to V, the NWFSC will follow a Marine Mammal Protocol. Before deploying gear/nets that have a potential to cause a marine mammal "take" the Chief Scientist must ascertain if any marine mammals are within 500 m of the planned deployment.

The Chief Scientist must confirm with the Captain or the Bridge Watch that no marine mammals have been seen within 500 m for ten (10) minutes prior to deployment of any gear. This can be accomplished by having designated scientists make observations for a minimum of 10 minutes prior to a deployment to determine if any marine mammals have been observed.

If there are marine mammals in the vicinity, the vessel will remain on site for 10 minutes to see if they leave the vicinity. If the marine mammals leave, another 10-minute watch will be conducted (restarting the clock at the end of the first 10-minute watch). If no additional marine mammals are sighted, the gear/nets may be deployed. If the marine mammals do not leave the vicinity or if they reappear during the second 10-minute watch, the site may be abandoned and the vessel may proceed to an alternate site.

A log documenting the marine mammal watches is required and should contain: 1) Confirmation that the watch was completed prior to deployment of gear; 2) A record of any stations dropped because of the presence of marine mammals; and 3) Species or types of marine mammals observed, and wait times.

If science or deck personnel visually detect marine mammals while conducting non-trawling operations, they shall alert the Captain and the Chief Scientist of its distance and bearing.

Should a marine mammal take occur the Chief Scientist will notify Larry Hufnagle (206-310-6817, lawrence.c.hufnagle@noaa.gov), Michelle McClure (206-910-2270, michelle.mcclure@noaa.gov) or their designate at the FRAM Division.

c. Physical oceanographic data collection:

An underway CTD (UCTD) will be deployed during the day and night at locations indicated by the Chief Scientist (see Fig. 1 and Table 2). The UCTD requires a vessel speed less than or equal to 10 kts. The ship's Survey Tech is needed to assist with the operation and maintenance of this equipment.

At the discretion of the Chief Scientist, the CTD rosette, augmented with a video plankton recorder (VPR), will be cast during crepuscular periods for Legs I and II, at times and locations indicated by the Trawl Lead. The ship's Survey Tech is needed to assist with the operation and maintenance of this equipment.

During Legs III, IV, and V, the CTD rosette, augmented with the VPR, will be cast during night operations at stations appropriate for maintaining and enhancing previous ecosystem work along established transects perpendicular to the coast. Samples taken will consist of hydrographic measurements with the CTD, collected water samples via rosette for chemical analyses, and zooplankton samples captured with towed plankton nets, as well as zooplankton imaging from the VPR. Zooplankton samples will be collected via plankton net towed vertically from 100 m to the surface, and with a bongo net towed obliquely from 100 m to the surface (or within a few meters of the bottom in shallower water).

The ship's thermosalinograph (TSG), meteorological sensors, and scientific computing system (SCS) will be used continuously during the survey. The transect and station names and the contents of the MOA data will be specified by the Chief Scientists during the pre-project meeting. These data will be logged via the ship's computers and provided by the Survey Techs to the Chief Scientist at the end of each project leg on an external hard drive.

The ship's Continuous Underway Fish Egg Sampler (CUFES) will be used to continuously sample pelagic fish eggs at a depth of 3 m. The CUFES filters material larger than 505µm from ~640 liters of sea water/minute. The sieved material is then collected and identified. All fish eggs are identified to lowest taxon, counted, and entered into the data acquisition software. Each sample entry is coupled with sea surface temperature, geographical position, wind speed and direction, date and time, and surface salinity. Sampling intervals will vary in length, depending on the number of fish eggs seen, from five to 30 minutes.

During the staging of Leg I, the ship is needed to clear marine growth from the CUFES intake.

D. Dive Plan

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

The ship will dive during staging of Leg I to clean as best as possible the transducers and CUFES intake. All dives will be done in accordance with the NOAA Diving Program requirements.

E. Applicable Restrictions

Conditions which preclude normal operations: If sea conditions and vessel ride deteriorate to a point where the quality of collected acoustic data is compromised, or in the opinion of the command, the vessel may need to break from running acoustic transects and seek shelter until conditions improve enough for satisfactory collection of acoustic data.

III. Equipment

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

	Item Name
1	CTD (main unit plus spare), rosette, carousel, water sampling bottles, computer/deck unit, hydrographic winch
2	ADCP computer/deck unit
3	Underway sensors (SCS) and computer/deck unit
4	FSCS computer system
5	Trawl winch, net mensuration (e.g., Simrad third wire)
6	Ship's computer network (at least 4 static IP addresses on SH)
7	Centerboard-mounted transducers
8	Spaces needed: Fish Processing Lab, Chem Lab, Dry Lab, Hydro Lab, Constant Environment Room, and Preservation Alcove
9	Email, telephones, intercom system, handheld radios
10	VHF Radios with NOAA F-Channels
11	Simrad EK60: 18-, 38-, 70-, 120-, and 200-kHz GPTs
12	Simrad ME70 Multibeam echo sounder system

13	FS70 third-wire trawl sounder
14	Applanix POS MV position and attitude sensor system
15	Internal CUFES pump and concentrator
16	Large Marel fish lab scale
17	Freezers (-20 C and -80 C)

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

SWFSC Equipment:

	Category	**Brand & Quantity**
1	Computers	2 laptops
2	External hard drives	2 - 1-TB Western Digital drives with cables
3	Software	Software media
4	Trawl gear	2 midwater (Nordic 264) nets
		2 sets of 4-m^2 doors
		necessary spare components of trawling gear
5	Temperature-depth recorders	3 Sea-Bird SBE39s
6	Biological sampling gear	30 tubs / trays (to be shared with the NWFSC)
7		Fish measuring boards
8		2 small Marel motion-compensating scales
9	Net Cam	2 trawl cameras and associated hardware
10	Underway CTD system	1 Ocean Sciences system
11	Underwater Camera system	1 Custom stereo camera system
12	Impedance multiplexer	1 Custom Mux with Agilent LCR meter

NWFSC Equipment:

	Category	Brand & Quantity
1	Computers	8 laptops
2	Networking	2 16-port and 1 4-port Netgear switches
3	External hard drives	A number of assorted 250-GB, 750-GB, and 1-TB Western Digital drives with cables
4	Software	Software media
5	Trawl gear	2 midwater (AWT) nets
		2 sets of Fishbuster 4-m^2 doors
		necessary spare components of trawling gear
6	Video camera	1 digital video recorder with light array, scaling lasers, and pressure housing
7	Temperature-depth recorders	3 Sea-Bird SBE39s
8	Biological sampling gear	20 fish baskets and 12 tubs (to be shared with the SWFSC)
9		3 Scantrol fish measuring boards
10		2 large and 2 small Marel motion-compensating scales
11	Video plankton recorder (VPR)	1 SeaScan VPR
12	Calibration gear	5 downriggers (with clamps) and 4 battery packs
13		calibration spheres
14		ultrasonic cleaner
15	UnderwayCTD system	
16	Bongo nets/vertical nets	
17	Plankton sampling gear	Microscopes, plasticware, sampling jars

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 (37%)	7 1-liter plastic bottles	1-liter bottles are stored in chem lab; are diluted to 10% formalin solution in 5-gallon buckets in fish processing lab	Alicia Billings, Steve de Blois, Larry Hufnagle	F
Ethanol (95%)	3 x 5 gallons	5-gallon carboys, stored in chem lab	Alicia Billings, Steve de Blois	E
Formaldehyde solution (37%)	8 gallons	No waste, stored in preservation alcove fume hood	Dave Griffith Sue Manion Amy Hays Bill Peterson	F
Buffered formalin (10%)	40 gallons (in 4 oz. and 8 oz. jars)	Stored in wet lab, no waste	Dave Griffith Sue Manion Amy Hays	F
Sodium borate powder	500 gr	Stored in chem lab	Dave Griffith Sue Manion Amy Hays	
Buffered ethyl alcohol (95%)	40 liters (in 20 ml vials)	Stored in chem lab, no waste	Dave Griffith Sue Manion Amy Hays	F
Tris buffer	500 ml	Stored in chem lab	Dave Griffith Sue Manion Amy Hays	

C. Chemical safety and spill response procedures

SPILL CONTROL

F: Formalin/Formaldehyde

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

E: 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. Absorb spill with inert material, then place in suitable container.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Spill-X-FP	12 lbs	formalin/formaldehyde	13.6 gallons
absorbent pads	10	formalin/ethanol	10x its weight
Formaldehyde Eater	5 gallons	Formaldehyde	10 gallons

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 and are sufficient to contain and clean up all of the hazardous material brought aboard by the program.

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory of hazardous material indicating all materials have been used or 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 scientific chemicals is not permitted during projects aboard NOAA ships.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

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

A. Data Classifications: *Under Development*

a. OMAO Data

b. Program Data

B. Responsibilities: *Under Development*

VII. Meetings, Vessel Familiarization, and Project Evaluations

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

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

C. Post-Project Meeting: The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships', specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the project.

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

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

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

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/noaaforms/eforms/nf57-10-01.pdf.

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

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

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

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

Contact information:

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

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

C. Shipboard Safety

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

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

D. Communications

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

E. IT Security

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

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

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

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

F. Foreign National Guests Access to OMAO Facilities and Platforms

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

VIII. Appendices

Table 1. Potential waypoints for the 2014 ATM survey of CPS in the CCE (CCE14) aboard NOAA Ship *Bell M. Shimada*. Any of these transects may be adaptively sampled, depending on the CPS distributions at the time of the survey. For planning purposes, the survey will progress from north to south, likely including transects between Cape Flattery to Point Conception.

Waypoint	Order	Latitude	Longitude	lat	long
96.1	1	50 45.65 N	129 27.69 W	50.76083	-129.462
96	2	50 45.65 N	128 26.96 W	50.76083	-128.449
turn point 22	3	50 39.60 N	128 24.40 W	50.66	-128.407
95	4	50 35.65 N	128 18.18 W	50.59417	-128.303
95.1	5	50 35.65 N	129 13.32 W	50.59417	-129.222
94.1	6	50 25.65 N	128 56.85 W	50.4275	-128.948
94	7	50 25.65 N	128 01.91 W	50.4275	-128.032
turn point 21	8	50 18.40 N	128 01.90 W	50.30667	-128.032
93	9	50 15.65 N	127 51.17 W	50.26083	-127.853
93.1	10	50 15.65 N	128 45.92 W	50.26083	-128.765
92.1	11	50 05.65 N	128 48.16 W	50.09417	-128.803
92	12	50 05.65 N	127 53.60 W	50.09417	-127.893
turn point 20	13	50 02.80 N	127 49.60 W	50.04667	-127.827
91	14	49 55.65 N	127 16.66 W	49.9275	-127.278
91.1	15	49 55.65 N	128 11.03 W	49.9275	-128.184
90.1	16	49 45.65 N	127 53.96 W	49.76083	-127.899
90	17	49 45.65 N	126 59.78 W	49.76083	-126.996
turn point 19	18	49 42.90 N	126 59.20 W	49.715	-126.987
89	19	49 35.65 N	126 52.27 W	49.59417	-126.871
89.1	20	49 35.65 N	127 49.75 W	49.59417	-127.829
88.1	21	49 25.65 N	127 33.29 W	49.4275	-127.555
88	22	49 25.65 N	126 37.94 W	49.4275	-126.632
turn point 18	23	49 22.00 N	126 36.00 W	49.36667	-126.6
87	24	49 15.65 N	126 14.54 W	49.26083	-126.242
87.1	25	49 15.65 N	127 27.35 W	49.26083	-127.456
86.1	26	49 05.65 N	127 10.60 W	49.09417	-127.177
86	27	49 05.65 N	125 55.51 W	49.09417	-125.925
85	28	48 55.65 N	125 48.14 W	48.9275	-125.802
85.1	29	48 55.65 N	127 03.24 W	48.9275	-127.054
84.1	30	48 45.65 N	126 58.18 W	48.76083	-126.97
84	31	48 45.65 N	125 10.73 W	48.76083	-125.179
turn point 17	32	48 43.00 N	125 09.40 W	48.71667	-125.157
83	33	48 35.65 N	124 44.61 W	48.59417	-124.744
83.1	34	48 35.65 N	126 43.79 W	48.59417	-126.73
82.1	35	48 25.65 N	126 31.47 W	48.4275	-126.525

82	36	48 25.65 N	124 44.50 W	48.4275	-124.742
turn point 16	37	48 22.60 N	124 46.50 W	48.37667	-124.775
81	38	48 15.65 N	124 43.73 W	48.26083	-124.729
81.1	39	48 15.65 N	126 20.00 W	48.26083	-126.333
80.1	40	48 05.65 N	126 01.57 W	48.09417	-126.026
80	41	48 05.65 N	124 45.48 W	48.09417	-124.758
79	42	47 55.65 N	124 44.17 W	47.9275	-124.736
79.1	43	47 55.65 N	125 51.67 W	47.9275	-125.861
78.1	44	47 45.65 N	125 52.71 W	47.76083	-125.879
78	45	47 45.65 N	124 36.46 W	47.76083	-124.608
77	46	47 35.65 N	124 31.34 W	47.59417	-124.522
77.1	47	47 35.65 N	126 04.40 W	47.59417	-126.073
76.1	48	47 25.65 N	125 43.64 W	47.4275	-125.727
76	49	47 25.65 N	124 28.73 W	47.4275	-124.479
75	50	47 15.65 N	124 20.93 W	47.26083	-124.349
75.1	51	47 15.65 N	125 17.10 W	47.26083	-125.285
74.1	52	47 05.65 N	125 09.86 W	47.09417	-125.164
74	53	47 05.65 N	124 16.61 W	47.09417	-124.277
73	54	46 55.65 N	124 15.01 W	46.9275	-124.25
73.1	55	46 55.65 N	125 16.26 W	46.9275	-125.271
72.1	56	46 45.65 N	125 18.65 W	46.76083	-125.311
72	57	46 45.65 N	124 10.61 W	46.76083	-124.177
71	58	46 35.65 N	124 09.80 W	46.59417	-124.163
71.1	59	46 35.65 N	125 09.60 W	46.59417	-125.16
70.1	60	46 25.65 N	125 00.40 W	46.4275	-125.007
70	61	46 25.65 N	124 09.62 W	46.4275	-124.16
69	62	46 15.65 N	124 10.25 W	46.26083	-124.171
69.1	63	46 15.65 N	125 03.16 W	46.26083	-125.053
68.1	64	46 05.65 N	125 10.06 W	46.09417	-125.168
68	65	46 05.65 N	124 01.31 W	46.09417	-124.022
67	66	45 55.65 N	124 00.34 W	45.9275	-124.006
67.1	67	45 55.65 N	125 03.52 W	45.9275	-125.059
66.1	68	45 45.65 N	124 55.23 W	45.76083	-124.921
66	69	45 45.65 N	123 59.90 W	45.76083	-123.998
65	70	45 35.65 N	123 58.84 W	45.59417	-123.981
65.1	71	45 35.65 N	124 59.10 W	45.59417	-124.985
64.1	72	45 25.65 N	125 02.09 W	45.4275	-125.035
64	73	45 25.65 N	124 00.01 W	45.4275	-124
turn point 15	74	45 21.20 N	124 01.50 W	45.35333	-124.025
63	75	45 15.65 N	124 00.12 W	45.26083	-124.002
63.1	76	45 15.65 N	125 02.26 W	45.26083	-125.038
62.1	77	45 05.65 N	125 06.01 W	45.09417	-125.1
62	78	45 05.65 N	124 01.73 W	45.09417	-124.029
61	79	44 55.65 N	124 02.89 W	44.9275	-124.048
61.1	80	44 55.65 N	125 08.74 W	44.9275	-125.146
60.1	81	44 45.65 N	125 08.15 W	44.76083	-125.136
60	82	44 45.65 N	124 05.70 W	44.76083	-124.095
59	83	44 35.65 N	124 06.75 W	44.59417	-124.113
59.1	84	44 35.65 N	125 12.73 W	44.59417	-125.212
58.1	85	44 25.65 N	125 14.38 W	44.4275	-125.24
58	86	44 25.65 N	124 06.87 W	44.4275	-124.115
57	87	44 15.65 N	124 08.54 W	44.26083	-124.142
57.1	88	44 15.65 N	125 09.16 W	44.26083	-125.153
56.1	89	44 05.65 N	125 07.81 W	44.09417	-125.13

56	90	44 05.65 N	124 09.39 W	44.09417	-124.157
55	91	43 55.65 N	124 10.93 W	43.9275	-124.182
55.1	92	43 55.65 N	125 07.40 W	43.9275	-125.123
54.1	93	43 45.65 N	125 07.61 W	43.76083	-125.127
54	94	43 45.65 N	124 12.92 W	43.76083	-124.215
53	95	43 35.65 N	124 15.14 W	43.59417	-124.252
53.1	96	43 35.65 N	125 08.62 W	43.59417	-125.144
52.1	97	43 25.65 N	125 08.04 W	43.4275	-125.134
52	98	43 25.65 N	124 19.85 W	43.4275	-124.331
turn point 14	99	43 19.70 N	124 25.30 W	43.32833	-124.422
51	100	43 15.65 N	124 25.10 W	43.26083	-124.418
51.1	101	43 15.65 N	125 13.16 W	43.26083	-125.219
50.1	102	43 05.65 N	125 15.52 W	43.09417	-125.259
50	103	43 05.65 N	124 27.59 W	43.09417	-124.46
49	104	42 55.65 N	124 31.72 W	42.9275	-124.529
49.1	105	42 55.65 N	125 19.52 W	42.9275	-125.325
48.1	106	42 45.65 N	125 20.97 W	42.76083	-125.35
48	107	42 45.65 N	124 33.30 W	42.76083	-124.555
turn point 13	108	42 40.00 N	124 29.50 W	42.66667	-124.492
47	109	42 35.65 N	124 25.56 W	42.59417	-124.426
47.1	110	42 35.65 N	125 13.10 W	42.59417	-125.218
46.1	111	42 25.65 N	125 16.80 W	42.4275	-125.28
46	112	42 25.65 N	124 29.38 W	42.4275	-124.49
45	113	42 15.65 N	124 26.22 W	42.26083	-124.437
45.1	114	42 15.65 N	125 13.51 W	42.26083	-125.225
44.1	115	42 05.65 N	125 08.75 W	42.09417	-125.146
44	116	42 05.65 N	124 21.58 W	42.09417	-124.36
43	117	41 55.65 N	124 17.53 W	41.9275	-124.292
43.1	118	41 55.65 N	125 07.05 W	41.9275	-125.118
42.1	119	41 45.65 N	125 04.04 W	41.76083	-125.067
42	120	41 45.65 N	124 17.12 W	41.76083	-124.285
41	121	41 35.65 N	124 09.10 W	41.59417	-124.152
41.1	122	41 35.65 N	125 02.25 W	41.59417	-125.038
40.1	123	41 25.65 N	124 59.01 W	41.4275	-124.984
40	124	41 25.65 N	124 08.51 W	41.4275	-124.142
39	125	41 15.65 N	124 09.08 W	41.26083	-124.151
39.1	126	41 15.65 N	124 55.64 W	41.26083	-124.927
38.1	127	41 05.65 N	124 57.47 W	41.09417	-124.958
38	128	41 05.65 N	124 11.03 W	41.09417	-124.184
37	129	40 55.65 N	124 10.75 W	40.9275	-124.179
37.1	130	40 55.65 N	124 57.07 W	40.9275	-124.951
36.1	131	40 45.65 N	125 02.98 W	40.76083	-125.05
36	132	40 45.65 N	124 16.77 W	40.76083	-124.28
35	133	40 35.65 N	124 23.75 W	40.59417	-124.396
35.1	134	40 35.65 N	125 09.84 W	40.59417	-125.164
34.1	135	40 25.65 N	125 12.48 W	40.4275	-125.208
34	136	40 25.65 N	124 26.50 W	40.4275	-124.442
33	137	40 15.65 N	124 22.68 W	40.26083	-124.378
33.1	138	40 15.65 N	125 16.50 W	40.26083	-125.275
32.1	139	40 05.65 N	125 09.12 W	40.09417	-125.152
32	140	40 05.65 N	124 07.60 W	40.09417	-124.127
turn point 12	141	39 57.70 N	124 05.40 W	39.96167	-124.09
31	142	39 55.65 N	123 58.73 W	39.9275	-123.979
31.1	143	39 55.65 N	124 54.61 W	39.9275	-124.91

30.1	144	39 45.65 N	124 36.63 W	39.76083	-124.611
30	145	39 45.65 N	123 51.10 W	39.76083	-123.852
29	146	39 35.65 N	123 48.02 W	39.59417	-123.8
29.1	147	39 35.65 N	124 33.44 W	39.59417	-124.557
28.1	148	39 25.65 N	124 35.02 W	39.4275	-124.584
28	149	39 25.65 N	123 49.71 W	39.4275	-123.829
turn point 11	150	39 23.80 N	123 50.70 W	39.39667	-123.845
turn point 10	151	39 19.80 N	123 50.40 W	39.33	-123.84
turn point 9	152	39 16.10 N	123 48.80 W	39.26833	-123.813
27	153	39 15.65 N	123 47.95 W	39.26083	-123.799
27.1	154	39 15.65 N	124 33.15 W	39.26083	-124.553
26.1	155	39 05.65 N	124 28.70 W	39.09417	-124.478
26	156	39 05.65 N	123 43.60 W	39.09417	-123.727
turn point 8	157	38 58.00 N	123 45.60 W	38.96667	-123.76
25	158	38 55.65 N	123 44.68 W	38.9275	-123.745
25.1	159	38 55.65 N	124 29.67 W	38.9275	-124.495
24.1	160	38 45.65 N	124 17.88 W	38.76083	-124.298
24	161	38 45.65 N	123 32.99 W	38.76083	-123.55
23	162	38 35.65 N	123 21.64 W	38.59417	-123.361
23.1	163	38 35.65 N	124 06.42 W	38.59417	-124.107
22.1	164	38 25.65 N	123 54.27 W	38.4275	-123.905
22	165	38 25.65 N	123 09.59 W	38.4275	-123.16
way point 7	166	38 17.00 N	123 04.50 W	38.28333	-123.075
21	167	38 15.65 N	123 01.21 W	38.26083	-123.02
21.1	168	38 15.65 N	123 45.79 W	38.26083	-123.763
20.1	169	38 05.65 N	123 43.45 W	38.09417	-123.724
20	170	38 05.65 N	122 58.98 W	38.09417	-122.983
turn point 6	171	37 59.40 N	123 03.20 W	37.99	-123.053
19	172	37 55.65 N	122 47.01 W	37.9275	-122.784
19.1	173	37 55.65 N	123 31.70 W	37.9275	-123.528
18.1	174	37 45.65 N	123 25.89 W	37.76083	-123.432
18	175	37 45.65 N	122 41.62 W	37.76083	-122.694
17	176	37 35.65 N	122 34.00 W	37.59417	-122.567
17.1	177	37 35.65 N	123 18.17 W	37.59417	-123.303
16.1	178	37 25.65 N	123 15.97 W	37.4275	-123.266
16	179	37 25.65 N	122 28.38 W	37.4275	-122.473
15	180	37 15.65 N	122 26.97 W	37.26083	-122.45
15.1	181	37 15.65 N	123 14.76 W	37.26083	-123.246
14.1	182	37 05.65 N	123 05.83 W	37.09417	-123.097
14	183	37 05.65 N	122 20.24 W	37.09417	-122.337
turn point 5	184	36 57.90 N	122 10.90 W	36.965	-122.182
13	185	36 55.65 N	122 02.55 W	36.9275	-122.043
13.1	186	36 55.65 N	122 46.33 W	36.9275	-122.772
12.1	187	36 45.65 N	122 33.81 W	36.76083	-122.564
12	188	36 45.65 N	121 50.12 W	36.76083	-121.835
turn point 4	189	36 37.30 N	121 58.10 W	36.62167	-121.968
11	190	36 35.65 N	121 58.48 W	36.59417	-121.975
11.1	191	36 35.65 N	122 42.07 W	36.59417	-122.701
10.1	192	36 25.65 N	122 39.04 W	36.4275	-122.651
10	193	36 25.65 N	121 55.54 W	36.4275	-121.926
turn point 3	194	36 18.20 N	121 55.80 W	36.30333	-121.93
9	195	36 15.65 N	121 51.87 W	36.26083	-121.865
9.1	196	36 15.65 N	122 35.28 W	36.26083	-122.588
8.1	197	36 05.65 N	122 21.13 W	36.09417	-122.352

8	198	36 05.65 N	121 37.82 W	36.09417	-121.63
turn point 2	199	36 00.70 N	121 36.10 W	36.01167	-121.602
7	200	35 55.65 N	121 29.04 W	35.9275	-121.484
7.1	201	35 55.65 N	122 12.26 W	35.9275	-122.204
6.1	202	35 45.65 N	122 12.93 W	35.76083	-122.216
6	203	35 45.65 N	121 20.36 W	35.76083	-121.339
turn point 1	204	35 40.30 N	121 19.20 W	35.67167	-121.32
5	205	35 35.65 N	121 09.30 W	35.59417	-121.155
5.1	206	35 35.65 N	122 03.84 W	35.59417	-122.064
4.1	207	35 25.65 N	121 53.59 W	35.4275	-121.893
4	208	35 25.65 N	120 57.84 W	35.4275	-120.964
3	209	35 15.65 N	120 54.68 W	35.26083	-120.911
3.1	210	35 15.65 N	121 47.75 W	35.26083	-121.796
2.1	211	35 05.65 N	121 42.88 W	35.09417	-121.715
2	212	35 05.65 N	120 41.56 W	35.09417	-120.693
1	213	34 55.65 N	120 42.13 W	34.9275	-120.702
1.1	214	34 55.65 N	121 41.60 W	34.9275	-121.693
SCB_r3_25	215	34 13.3038 N	121 05.0652 W	34.22167	-121.084
SCB_r3_24	216	34 29.7252 N	120 31.2618 W	34.49533	-120.521
SCB_r3_23	217	34 25.6230 N	120 29.5992 W	34.427	-120.493
SCB_r3_22	218	34 24.3792 N	119 54.0078 W	34.40617	-119.9
SCB_r3_21	219	34 08.0370 N	120 29.8092 W	34.13383	-120.497
SCB_r3_20	220	34 06.6912 N	120 23.3310 W	34.1115	-120.389
SCB_r3_19	221	34 05.5968 N	119 54.9318 W	34.09317	-119.916
SCB_r3_18	222	34 04.0368 N	119 48.4002 W	34.06717	-119.807
SCB_r3_17	223	34 15.9618 N	119 23.4438 W	34.266	-119.391
SCB_r3_16	224	34 07.0242 N	119 18.9960 W	34.117	-119.317
SCB_r3_15	225	34 03.5382 N	119 01.3212 W	34.05883	-119.022
SCB_r3_14	226	33 53.7978 N	119 19.9494 W	33.8965	-119.332
SCB_r3_13	227	33 40.9746 N	119 00.2736 W	33.68283	-119.005
SCB_r3_12	228	33 55.9902 N	118 29.2410 W	33.93317	-118.487
SCB_r3_11	229	33 47.1378 N	118 27.7440 W	33.7855	-118.462
SCB_r3_10	230	33 43.8090 N	118 25.9902 W	33.73	-118.433
SCB_r3_09	231	33 40.0188 N	118 14.6562 W	33.66683	-118.244
SCB_r3_08	232	33 32.4090 N	118 29.8128 W	33.54	-118.497
SCB_r3_07	233	33 19.3092 N	118 09.0552 W	33.32167	-118.151
SCB_r3_06	234	33 30.8268 N	117 46.1790 W	33.51367	-117.77
SCB_r3_05	235	33 26.5950 N	117 44.8170 W	33.44317	-117.747
SCB_r3_04	236	33 16.0290 N	117 29.1768 W	33.267	-117.486
SCB_r3_03	237	33 03.4584 N	117 53.4174 W	33.0575	-117.89
SCB_r3_02	238	32 48.0174 N	117 40.4736 W	32.80017	-117.675
SCB_r3_01	239	32 58.8720 N	117 17.4288 W	32.98117	-117.29

Table 2. Nominal locations for underway CTD sampling during Legs I and II. Any of these locations may be modified by the Chief Scientist in consultation with the Survey Tech and the Command.

CTD No.	Lat. Deg.	Lat. Min.		Lon Deg.	Lon. Min.	
1	50	45.9892071	N	128	35.92484009	W
2	50	45.81711566	N	128	57.87313433	W
3	50	45.9892071	N	129	27.55730277	W
4	50	25.68241693	N	128	43.12100213	W
5	50	25.68241693	N	128	21.35261194	W
6	50	5.719809637	N	127	58.50479744	W
7	50	5.891901079	N	128	10.37846482	W
8	50	5.547718195	N	128	47.79850746	W
9	49	45.5851109	N	127	45.37180171	W
10	49	45.75720235	N	127	17.30676972	W
11	49	25.79459505	N	126	44.38432836	W
12	49	25.62250361	N	127	4.713486141	W
13	49	25.79459505	N	127	33.31823028	W
14	49	5.65989632	N	126	53.91924307	W
15	49	5.65989632	N	126	23.69536247	W
16	48	45.69728903	N	125	21.80836887	W
17	48	45.69728903	N	126	3.006396588	W
18	48	45.69728903	N	126	57.8771322	W
19	48	25.56335515	N	125	2.191791045	W
20	48	25.80428316	N	125	46.82238806	W
21	48	25.80428316	N	126	31.35223881	W
22	48	5.807257585	N	125	39.66940299	W
23	48	5.807257585	N	125	10.15074627	W
24	47	45.810232	N	124	45.87089552	W
25	47	45.810232	N	125	17.20298507	W
26	47	45.810232	N	125	52.56492537	W
27	47	25.81320642	N	125	16.49776119	W
28	47	26.05413444	N	124	48.89328358	W
29	47	5.816180845	N	124	25.52014925	W
30	47	5.816180845	N	124	48.49029851	W
31	47	5.816180845	N	125	9.747761194	W
32	46	45.81915526	N	124	59.97537313	W
33	46	45.81915526	N	124	32.37089552	W
34	46	25.82212968	N	124	18.87089552	W
35	46	25.82212968	N	124	39.02014925	W
36	46	25.58120167	N	125	0.378358209	W
37	46	5.584176086	N	125	10.05	W
38	46	5.584176086	N	124	35.89701493	W
39	46	5.825104105	N	124	13.22910448	W
40	45	45.82807852	N	124	18.77014925	W
41	45	45.82807852	N	124	37.30746269	W
42	45	26.07198096	N	125	1.889552239	W
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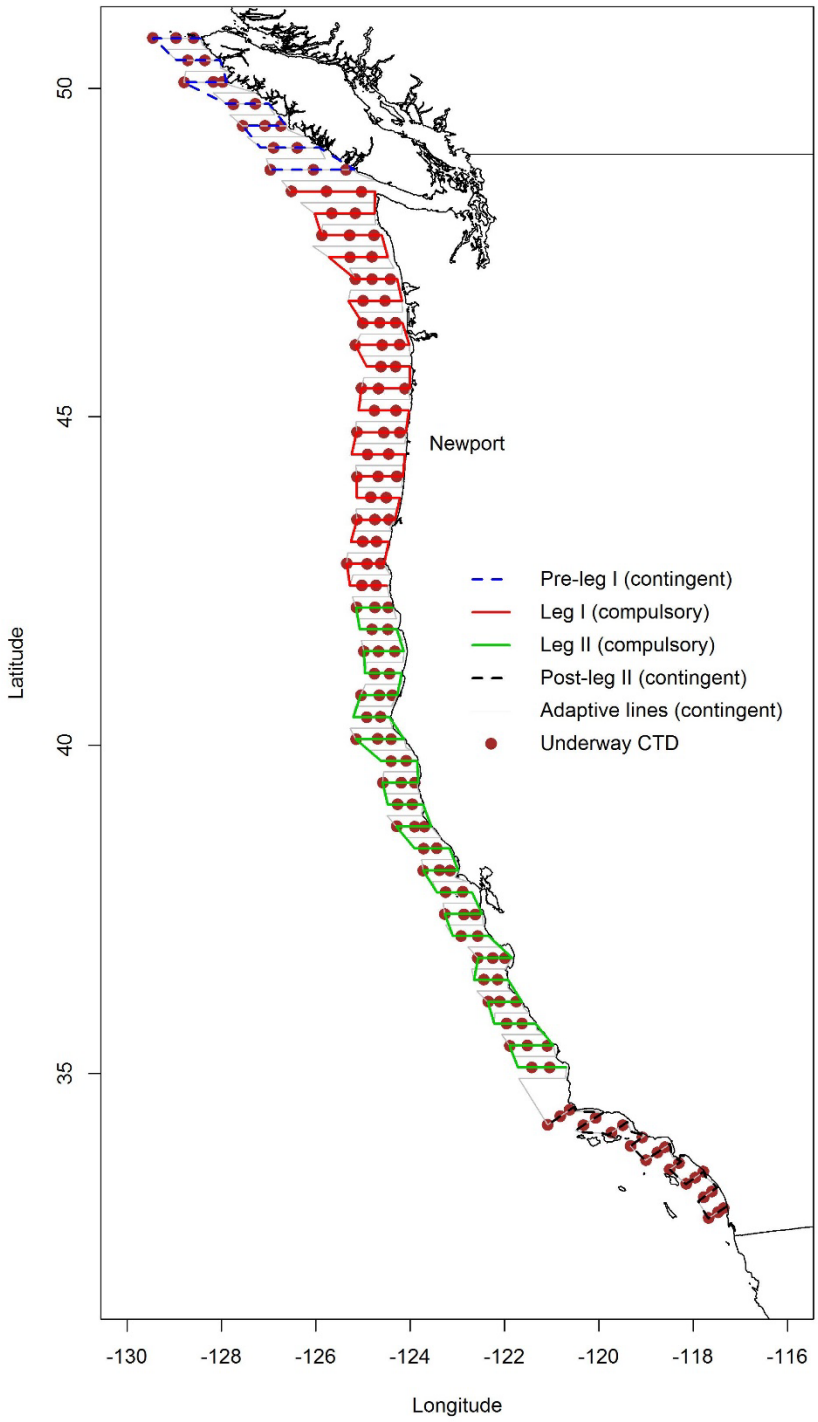

Figure 1. Potential survey transects for the 2014 ATM survey of CPS in the CCE aboard NOAA Ship *Bell M. Shimada* (Legs I and II). Any of these transects (blue, red, green, black, or grey) may be adaptively sampled, depending on the CPS distributions at the time of the survey. For planning purposes, the survey will progress from north to south, likely from Cape Flattery to Point Conception. Waypoints are listed in Table 1; nominal Uctd locations are listed in Table 2.

Appendix 1

X-Ray Procedures aboard NOAA Ship *Bell M. Shimada*

1. X-Ray Generator will be secured in the controlled environment room, with the separate cassette reader/computer system in the acoustics lab.

2. X-ray operator is required to wear a lead apron and thyroid shield, and to stand a minimum of 6 feet away from the x-ray generator when making an exposure, the operator will stand outside the controlled environment room.

3. Following best practices recommended by MinXray, a lead vest will be placed on the deck below the unit. This will ensure no stray X-rays are transmitted through the deck to the space below.

4. During the x-ray exposure, all personnel other than the operator are required to stay at least 12 feet away from the generator.

5. When not in use the X-ray generator will be unplugged and secured at all times.

6. SWFSC safety policies and Standard Operating Procedures must be followed at all times.

Appendix II

4. SWFSC X-Ray Basics

Reminders:

- Save original image in ImagePilot before manipulating. Cassettes are automatically erased when read.
- Always re-erase cassettes before first use of the day, as they acquire background noise while sitting. (To erase plate, press and hold erase button until the reader prompts you for the erase mode, once the reader starts its erase mode you will see it on the reader screen. Once the mode is on you can start loading the plates to erase them. Once you are done you can let the mode time out or push button twice and it will exit the erase mode.)
- Always rehang apron and thyroid shield. They should not be bent/folded, as this will create weaknesses where X-rays can penetrate in the future.
- Turn off x-ray head when not in use.
- Store cassettes vertically, not flat.
- When working on an unstable platform, ie. ship, KEEP LOCKED AT ALL TIMES. Also orient length bow to stern.

Taking X-rays

- Close door to room
- Turn on 'X-ray in use' light next to door (far right switch).
- Turn on x-ray head – flip switch located on top left back area on head (when facing front of machine).
- Choose appropriate cassette.
- If the specimen is gooey, runny, etc. cover cassette with protective bag (try to reuse bags if possible), but always use caution when using formalin.
- Place cassette (black side up) on table, under head.
- If using in an unshielded area, ie field, ship, etc., place lead shielding sheet under the cassette.
- Place specimen(s) on cassette.
- Turn on Collimare light -- press black button on center top of black box face (move plate in center of cross hairs, adjust beam appropriately).
- Note distance from head to specimen (for your records).

There is a tape measure that you can pull down from the bottom of Collimare (note: tape does not start at zero).

- Adjust kV
- Adjust mAs/sec as needed (note: choose one of these settings to adjust, the head will automatically change the other. Note settings for your records).
- Move lead shielding into place, don apron and thyroid shield, and make sure you are wearing the dosimeter on outside of clothing/apron.
- Take X-ray
    - Press plunger half way until the green 'ready' light on head illuminates (look through window)
    - Step behind shield, press and hold plunger all the way down
- If error displays, turn head off and on again, and repeat x-ray steps.
- Remove specimen(s) and plastic cover from cassette.
- Record settings in Green Log Book for future reference.
- Turn off X-ray head.
- Turn off 'X-ray in use' light, switch by door.
- Open room door, if you wish.

Acquiring images from cassette

- Look for "READY" in display on cassette reader.

If not, is the reader on? Is it plugged in? Is there an error message?--> may need to turn off and on again, if necessary see manual on desktop.

- In ImagePilot, select the "CR" button (Cassette Read). The button on the screen will change from deep grey to blue indicating that the system is ready to acquire your image from the cassette. Remember, once the cassette is read, the reader will immediately erase it.
- Gently place cassette in slot, see diagram on reader for positioning. Be patient, it will take a few minutes to read and return the cassette to you. The image will automatically display on the screen.
- Save this image as original, by selecting "Save as original" on right, under the "Image Tools" heading, to preserve your original image before annotating and manipulating.
- If you have taken multiple images of the same "study", proceed reading the other cassettes.

If you are not satisfied with an image, you can designate it as "NG" (No Good) by selecting the NG button in upper right corner of image to dispose the x-ray.

Finishing

- Turn off computer.
- Turn off cassette reader, press and hold down ‘Operation’ button. Display will start counting down, you can release the button.
- Rehang apron and shield. It should not be bent/folded, as this will create weaknesses where X-rays can penetrate in the future.
- Turn off x-ray head (if not previously turned off)