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

April 1, 2010

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
Marine Operations Center, Pacific
1801 Fairview Avenue East
Seattle, WA 98102-3767

FV FROSTI (Contractor)
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Vessel cell phone: 604-992-4050

PROJECT INSTRUCTIONS

VESSEL: FROSTI

DATES: May 1 - June 15, 2010

PROJECT: Rockfish Recruitment and Ecosystem Assessment

STUDY AREA: US/Mex Border to Cape Mendocino CA and out 100 nm

SPONSOR: NOAA National Marine Fisheries Service (NMFS)
Southwest Fisheries Science Center (SWFSC)
Fisheries Ecology Division (FED)

Prepared By: ***/S/Kenneth Baltz***
Kenneth Baltz
Cruise Leader, SWFSC, FED

Approved By: ***/S/Churchill Grimes***
Churchill Grimes
Director, SWFSC, FED

ITINERARY:

Leg 1: May 1 - May 15
Mobilize scientific personnel and survey equipment from NOAA NMFS SWFSC FED Santa Cruz, CA to the FROSTI at San Francisco on April 30. Depart San Francisco on May 1 to begin scientific operations and conduct trawling and CTD sea trials off central California during the daylight hours prior to the first night of trawling operations. Beginning the first night after sea trials and ending the morning of the last day of Leg 1: conduct nighttime mid-water trawls, CTD deployments, Tucker trawls, bongo tows, various oceanographic sampling, opportunistic Humboldt squid jigging, and seabird/marine mammal observations between Delgada and San Diego. The daily transect plan for each leg is listed in Appendix I. On May 15, arrive in port, San Francisco, upon the completion of Leg 1 operations. One day will be spent in port at a San Francisco Pier, on May 16. San Francisco Pier to be determined.

Leg 2: May 17 – May 31
Embark Leg 2 scientists and depart San Francisco Pier on May 17. Beginning the first night of Leg 2 and ending the morning of the last day of Leg 2: conduct nighttime mid-water trawls, CTD deployments, Tucker trawls, bongo tows, various oceanographic sampling, opportunistic Humboldt squid jigging, and seabird/marine mammal observations between Delgada and San Diego. The daily transect plan for each leg is listed in Appendix I. A scientists exchange via small boat is scheduled on May 23 at Santa Barbara Harbor. On May 31, arrive in port, San Francisco, upon the completion of Leg 2 operations. One day will be spent in port at a San Francisco Pier, on June 1. San Francisco Pier to be determined.

Leg 3: June 2 – June 13
Embark Leg 3 scientists and depart San Francisco Pier on June 2. Beginning the first night of Leg 3 and ending the morning of the last day of Leg 3: conduct nighttime mid-water trawls, CTD deployments, Tucker trawls, bongo tows, various oceanographic sampling, opportunistic Humboldt squid jigging, and seabird/marine mammal observations between Delgada and San Diego. The daily transect plan for each leg is listed in Appendix I. A scientists exchange via small boat is scheduled on June 8 at Horseshoe Cove, Sausalito. On June 13, arrive in port, San Francisco, upon the completion of Leg 3 operations to conclude the scientific operations of the survey. San Francisco Pier to be determined. Scientific gear will be demobilized and returned to the NOAA NMFS SWFSC FED Laboratory. All scientists will be disembarked on June 13 as well. The FROSTI will depart San Francisco, after disembarking gear and scientists, for a 2 day transit to Newport, OR. FROSTI will arrive into Newport, OR on June 15 and will remain inport in Newport through June 17.

CRUISE OBJECTIVES:

1. Sample for pelagic juvenile rockfish, *Sebastes* spp., and other epi-pelagic micronekton such as juvenile Pacific whiting (*Merluccius productus*), juvenile lingcod (*Ophiodon elongatus*), northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), market squid (*Loligo opalescens*), and krill (Euphausiacea), to determine their distribution and abundance.

2. Characterize prominent oceanographic features between San Diego and Delgada.

3. Map the distribution and abundance of krill and other micronekton along the continental shelf and shelf break.

4. Observe seabird and marine mammal distribution and abundance.

5. Collect Humboldt squid, *Dosidicus gigas*.

OPERATIONAL METHODS:

1. Pelagic juvenile rockfish survey:
37 transects of nighttime mid-water trawls are planned during the cruise. Five to seven midwater trawls of 15 minute duration will be conducted each night along each transect. A modified-Cobb midwater trawl with a 26 meter headrope and a 9.5 millimeter codend liner will be used. Trawling operations will commence just after dusk and conclude just before dawn. Target headrope depth is 30 meters except in areas with shallow bottom depths, in which case the target headrope depth is 7 meters. We will start with 25 and 85 meters of wire out, with adjustments made if target depths are not obtained, as determined from depth recordings collected from a VemCo TDR and the FROSTI's acoustic trawl net monitoring system. The TDR and FROSTI sensors will be attached to the net during each tow. Two marine mammal pingers (DDD model 03H) will be attached to the footrope bridles as well. Ship speed will be maintained at approximately 2.0 knots while trawling. Ship's speed will be adjusted while trawling to maintain target headrope depth while the amount of wire out will remain fixed. Fish and certain invertebrates from each trawl will be sorted, identified and enumerated. Length measurements will be taken on adult northern anchovy, Pacific sardine, Pacific herring (*Clupea pallasii*), and Pacific whiting, as well as pelagic juvenile Pacific whiting, lingcod, and sablefish, and all life maturity stages of market squid and Humboldt squid. All pelagic juvenile rockfish will be frozen for later laboratory analyses.

2. Survey of prominent oceanographic features:
CTD casts will be conducted throughout the day 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 mid-water trawls. A Seabird Electronics Seacat (model 19+ and/or model 19) CTD will be used in conjunction with a Seabird Electronics Model 55 ECO Carousel Water Sampling System. The CTD will be lowered to a maximum

depth of 520 meters, as bottom depth allows. Occasionally CTD casts will be made to a target depth of 1000 meters. Deployment rate for all CTD casts: 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 consistently for chlorophyll and nutrient samples. Water samples will be collected during the upcast with Niskin Bottles attached to the Seabird carousel. Seawater samples will be filtered on to glass filters. Glass filters will be frozen in capped test tubes for post-cruise chlorophyll analysis. The 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. Choice of sites will depend on logistics and weather.

3. Map the distribution and abundance of krill:

A series of daytime transects will be run, during which the SIMRAD acoustic echosounders will be used to record and geo-reference the presence and abundance of krill. Target identification will be periodically accomplished by daytime net sampling with a 1 meter^2 Tucker trawl near acoustic signatures in order to verify species of krill and to collect live specimens. The Tucker trawl will use 0.5 millimeter mesh nets and 0.5 millimeter mesh codends. Samples will be preserved in glass jars with 100% ethanol, or with 10% buffered formalin. Additionally, bongo tows will be conducted at sunset each night at the first nighttime trawl station. Bongo tows will not follow standard CalCOFI protocols, but will instead attempt to replicate the midwater trawls with a 15 minute tow duration at either 30 or 7 meters depth. The bongo net will use 0.5 millimeter mesh nets and 0.5 millimeter mesh codends.

4. Seabird and marine mammal distribution and abundance:

Ornithologists/marine mammal biologists will visually survey and estimate abundance and distribution of seabirds and marine mammals from the Ship's bridge during daylight hours while underway.

5. Collection of Humboldt squid:

As time allows, hook and line fishing for Humboldt squid will be conducted within the survey area at depths down to 300 meters. Ideally, we would like to fish for the squid during each nighttime CTD deployment. Large weighted squid jigs will be used as lures, and gaffs and handline will be used to bring the squid aboard after the squid is reeled to the surface. Once the squid is aboard, the morphometrics will be recorded, gender determined, stomach removed, and head removed. The stomach and head will be bagged and frozen as soon as possible. When possible, a subsample of captured adult squid will be tagged with a satellite pop-up tag and released alive. A subsample of whole specimens will be frozen.

MISCELLANEOUS REQUIREMENTS:

The Chief Scientist/Cruise leader is authorized to alter the scientific portion of this cruise plan with the concurrence of the Master of the vessel, provided that the proposed changes will not: jeopardize the safety of personnel or the ship; exceed the time allotted for the cruise; result in undue additional expense; or change the general intent of the cruise.

A pre-cruise meeting between the Scientific Party Leaders and the charter vessel will be held prior to commencement of operations to identify operational and logistic requirements. A post-cruise meeting will be held between the scientific party and the charter vessel owners at the termination of the cruise.

By Federal regulations the vessel may not sail without a complete inventory of all hazardous materials by name and the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemicals brought aboard and a chemical hygiene plan. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the Chief Scientist/Cruise Leader.

Prior to departure, the Chief Scientist/Cruise Leader will provide a listing of emergency contacts to the Ship for all members of the scientific party.

The Scientists request that the Ship provide hot meals during the nighttime shift between 1800 and 0600 since most of the scientific party will be working from 1900 – 0600. If a hot meal can't be prepared during the night shift, then the scientific party requests that the Chief Steward set aside (refrigerate) individual lunches for all scientists working during the nighttime hours.

To be allowed to keep hook and line caught fish and/or invertebrates, the fisher must have a valid California recreational fishing license. All fishing regulations, including daily bag limits must be followed. In addition, some areas are closed to recreational fishing and no fish will be kept for personal use from those areas. No fish or invertebrates taken during recreational fishing aboard NOAA vessels may be sold, or bartered, although consumption of captured species aboard the vessel is allowed if regulations (area/species/bag limits) followed.

SMALL BOAT OPERATIONS:

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

PARTICIPATING ORGANIZATIONS

NOAA NMFS SWFSC FED, Santa Cruz, CA
University of California Santa Cruz (UCSC)
Farallon Institute for Advanced Ecosystem Research
Humboldt State University

SPECIMEN & DATA REQUESTS:

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 your requests at the earliest possible date to the NOAA NMFS SWFSC FED, Keith Sakuma (831)420-3945, keith.sakuma@noaa.gov, or Ken Baltz (831)420-3943, ken.baltz@noaa.gov.

EQUIPMENT:

Requested from the FROSTI:

Trawl winches, and gantries with trawl blocks
Net reel for modified-Cobb mid-water trawl net
Cowbells for securing codend of trawl net
Winch with cable for CTD deployments via Seabird model 55 ECO carousel
Winch with cable for Tucker trawls and bongo tows
Echosounder, interfaced with PC and recording to hard drive
Freezer for water and organism samples
Trawl net sounder system with display monitor and NMEA output
Long-handled gaffs for Humboldt squid
Plumbing and electrical outlet for SCUFA (Turner Designs) connection to flow-through seawater

Supplied by the Scientists from NOAA NMFS SWFSC Santa Cruz, CA:

Modified-Cobb mid-water trawl nets (2) and 1/2" x 30 fathom, V-shaped midwater trawl bridles
5x7' steel V-doors
Tucker trawl, Tucker weights, plankton nets, messengers, codends, and inclinometer
Bongo net, plankton nets, and codends
Specimen sorting, enumeration, and preservation equipment
Seabird Electronics SBE Seacat 19 and Seacat 19+ CTDs
Seabird Electronics SBE32 compact carousel
General Oceanics Niskin Bottles
Wet lab toolbox, CTD toolbox and CTD spare parts
Vemco TDRs
Bucket thermometer and seawater sample buckets
Seawater/chlorophyll sample filtering equipment

Thermosalinometer and fluorometer seawater flow-through system
PC laptop computers running Windows OS and LAN hubs
Microscopes, dissecting equipment, and field guides
Krill sorting and enumeration equipment
Portable tables, chairs
Fishing poles, tackle, and jigs
Humboldt squid processing/preservation gear
Large coolers
Mustang float coats and foul weather gear
Quart and pint canning jars
Ethanol (20 liters)
Formalin (20 liters)
MSDS sheets for all chemicals

MOBILIZATION & DE-MOBILIZATION PLAN:

On April 30 scientific survey equipment from NOAA NMFS SWFSC Santa Cruz CA will be driven to, and secured within the Ship while the Ship is in San Francisco CA. There is a possibility that scientific equipment may be loaded at the same time the NOAA NMFS SWFSC La Jolla Laboratory personnel are demobilizing from the previous sardine survey. Plastic shipping containers will need to be secured and remain aboard during the survey for post-cruise shipment of gear.

Some of the scientists request to stay aboard the Ship during each San Francisco inport periods.

On or about June 13, at the conclusion of the scientific operations, the NOAA NMFS SWFSC FED equipment and specimens will be off-loaded from the FROSTI at San Francisco, and driven back to Santa Cruz CA. Scientists will disembark the vessel at San Francisco after scientific gear is unloaded from the vessel. Demobilization may happen as early as June 12, if weather conditions are such that it would require 3 days for the FROSTI to transit from San Francisco to Newport, OR.

SCIENTIFIC PERSONNEL:

Leg 1 (May 1 – May 15)
Ken Baltz, Oceanographer, NMFS SWFSC FED (Cruise Leader)
Keith Sakuma, Fish Biologist, NMFS SWFSC FED (Chief Scientist)
John Field, Fish Biologist, NMFS SWFSC FED
Don Pearson, Fish Biologist, NMFS SWFSC FED
Cynthia Carrion, Krill Biologist, UC Santa Cruz
Mike Force, Farallon Institute for Advanced Ecosystem Research

Leg 2 (May 17 – May 31)
Ken Baltz, Oceanographer, NMFS SWFSC FED (Cruise Leader)
Keith Sakuma, Fish Biologist, NMFS SWFSC FED (Chief Scientist)
Bill Matsubu, Humboldt State University (May 17-23 Day work , May 23-31 Night work)
Edward Dick, Fish Biologist, NMFS SWFSC FED (May 23-31)
Patrick Kilduff, UC Davis (Lou Botsford's student) (May 17-23)
Sam Parker, Humboldt State University (May 23-31)
Krill Biologist, UC Santa Cruz – person TBD
Mike Force, Farallon Institute for Advanced Ecosystem Research

Leg 3 (June 2 –13)
Ken Baltz, Oceanographer, NMFS SWFSC FED (Cruise Leader)
Keith Sakuma, Fish Biologist, NMFS SWFSC FED (Chief Scientist)
Steve Ralston, Fish Biologist, NMFS SWFSC FED (June 2-8 Day work)
Heidi Fish, Fish Biologist, NMFS SWFSC FED (June 2 – 8)
John Field, Fish Biologist, NMFS SWFSC FED (June 8-13 Day work)
Bill Matsubu, Humboldt State University (June 8-13)
Sam Parker, Humboldt State University
Krill Biologist - TBD, UC Santa Cruz

SCIENTISTS DUTY HOURS:

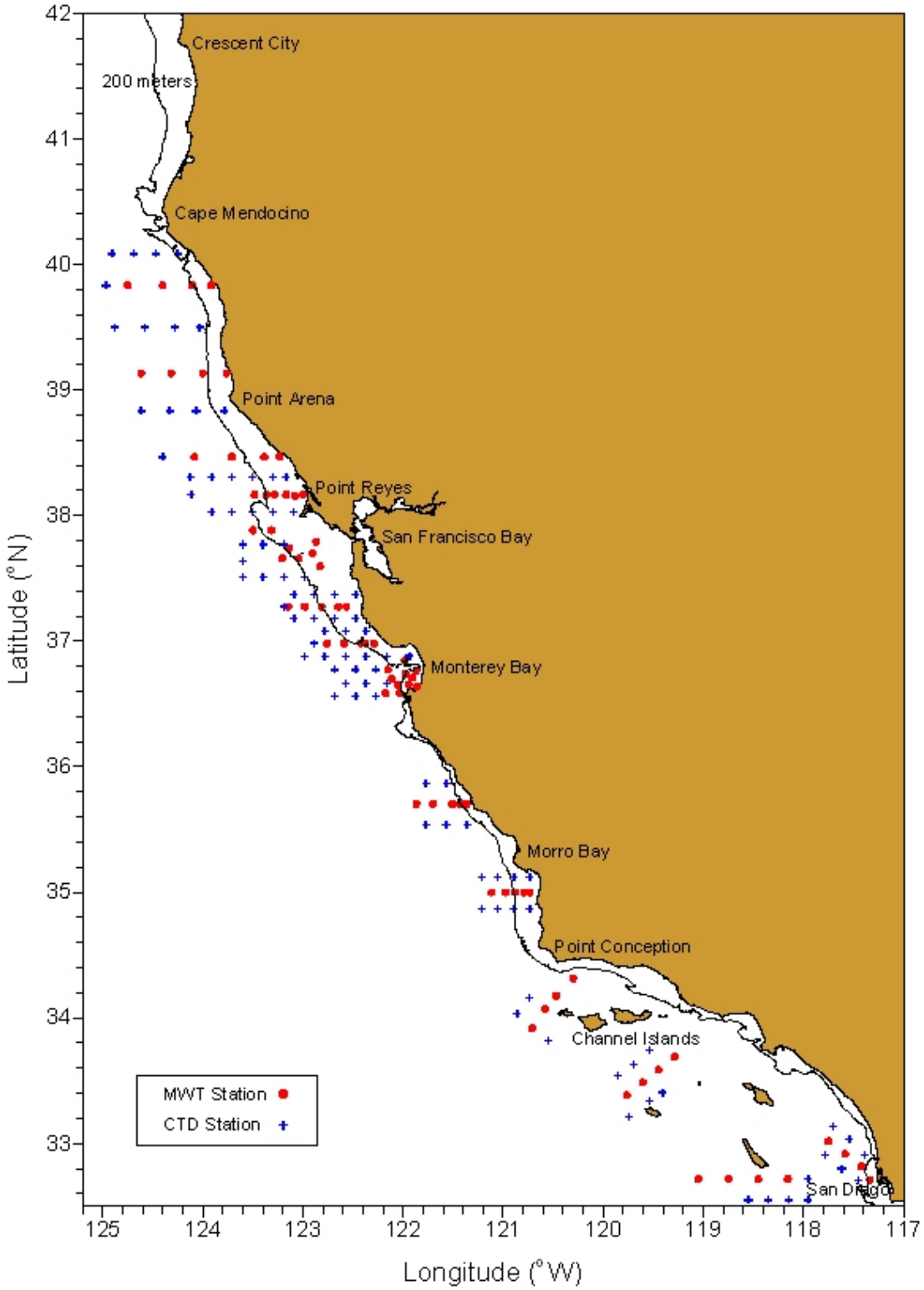
Nighttime Trawling & CTD	2000-0600
Daytime CTD	0600-1800

BUNKING:

Staterooms	**Leg 1**	**Leg 2**	**Leg 3**
One person	Cynthia Carrion	Ken Baltz	Ken Baltz
One person	Keith Sakuma	Keith Sakuma	Heidi Fish(1st half) Keith Sakuma(2nd half)
Two person	John Field Don Pearson	Bill Matsubu Patrick Kilduff(1st half) Edward Dick(2nd half)	Keith Sakuma (1st half) Steve Ralston (1st half) John Field (2nd half) Bill Matsubu (2nd half)
Three person	Mike Force Ken Baltz	Krill Biologist Sam Parker Mike Force	Krill Biologist Sam Parker

APPENDIX I: DAILY SCHEDULE (Transects, Legs, Exchanges, Inports)

Date	Station Line	# of Samples	Notes
30-Apr	**In Port**		**Load Gear at S.F.**
1-May	Monterey Inside	1	**Saturday - Depart S.F.**
2-May	Monterey Outside	1	Sunday
3-May	Davenport	1	
4-May	Pescadero	1	
5-May	Outside Farallones	1	
6-May	Gulf of Farallones	1	
7-May	Point Reyes	1	
8-May	Navarro	1	Saturday
9-May	Delgada	1	Sunday
10-May	Fort Ross	1	
11-May	Outside Farallones	2	
12-May	Point Reyes	2	
13-May	Davenport	2	
14-May	Pescadero	2	
15-May	**End Leg 1**		**Saturday - Dock at S.F.**
16-May	**In Port**		**Sunday - In Port**
17-May	Gulf of Farallones	2	Depart S.F.
18-May	Outside Farallones	3	
19-May	Monterey Outside	2	
20-May	Monterey Inside	2	
21-May	Piedras Blancas	1	
22-May	Point Sal	1	Saturday
23-May	San Miguel	1	**Sunday - Scientist Exchange at Santa Barbara**
24-May	San Nicolas	1	
25-May	San Diego	1	
26-May	San Clemente	1	
27-May	San Miguel	2	
28-May	Point Sal	2	
29-May	Piedras Blancas	2	Saturday
30-May	Pescadero	3	Sunday
31-May	**End Leg 2**	1	**Memorial Day - Dock at S.F.**
1-Jun	**In Port**	1	**In Port**
2-Jun	Gulf of Farallones	3	**Depart S.F.**
3-Jun	Monterey Inside	3	
4-Jun	Monterey Outside	3	
5-Jun	Davenport	3	Saturday
6-Jun	Pescadero	4	Sunday
7-Jun	Outside Farallones	4	
8-Jun	Point Reyes	3	**Scientist Exchange at S.F. Horseshoe Cove**
9-Jun	Navarro	2	
10-Jun	Delgada	2	
11-Jun	Fort Ross	2	
12-Jun	Gulf of Farallones	4	Saturday
13-Jun	**End Cruise**		**Sunday - Dock at S.F.**


Crescent City
200 meters
Cape Mendocino
Point Arena
Point Reyes
San Francisco Bay
Monterey Bay
Morro Bay
Point Conception
Channel Islands
San Diego
MWT Station
CTD Station
Latitude (°N)
Longitude (°W)
42
41
40
39
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118
117

APPENDIX II: MID-WATER TRAWL AND CTD STATIONS INFORMATION

DAY: CTD - SAN DIEGO

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	32° 42.5'	117° 27'	350	340	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

NIGHT: TRAWL & CTD - SAN DIEGO

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	33° 01'	117° 45'	750	520	481
trawl	33° 01'	117° 45'	750	85	481
CTD	32° 55'	117° 35'	850	520	482
trawl	32° 55'	117° 35'	850	85	482
CTD	32° 49'	117° 25.3'	700	520	483
trawl	32° 49'	117° 25.3'	700	85	483
trawl	32° 42.5'	117° 20'	100	85	484
CTD	32° 42.5'	117° 20'	100	90	484

DAY: CTD - SAN CLEMENTE

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

NIGHT: TRAWL & CTD - SAN CLEMENTE

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
CTD	32° 43'	118° 27.2'	270	260	402
trawl	32° 43'	118° 27.2'	270	85	402
CTD	32° 43'	118° 44.9'	1284	520	403
trawl	32° 43'	118° 44.9'	1284	85	403
trawl	32° 43'	119° 01'	777	85	404
CTD	32° 43'	119° 01'	777	520	404

DAY: CTD - SAN NICOLAS

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	400

NIGHT: TRAWL & CTD - SAN NICOLAS

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	33° 41.4'	119° 17.2'	886	520	411
trawl	33° 41.4'	119° 17.2'	886	85	411
CTD	33° 35.2'	119° 26.9'	1874	520	412
trawl	33° 35.2'	119° 26.9'	1874	85	412
CTD	33° 29.2'	119° 36.3'	769	520	413
trawl	33° 29.2'	119° 36.3'	769	85	413
trawl	33° 23'	119° 45.8'	107	85	414
CTD	33° 23'	119° 45.8'	107	97	414

DAY: CTD - SAN MIGUEL

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

NIGHT: TRAWL & CTD - SAN MIGUEL

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
CTD	34° 04.2'	120° 34.7'	159	150	424
trawl	34° 04.2'	120° 34.7'	159	85	424
CTD	34° 10.6'	120° 28.3'	149	140	423
trawl	34° 10.6'	120° 28.3'	149	85	423
trawl	34° 18.9'	120° 18'	355	85	422
CTD	34° 18.9'	120° 18'	355	345	422

DAY: CTD – PT. SAL

OPS	*Latitude*				
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

NIGHT: TRAWL & CTD – PT. SAL

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
CTD	35° 00'	120° 47.6'	94	84	492
trawl	35° 00'	120° 47.6'	94	85	492
CTD	35° 00'	120° 53'	192	182	493
trawl	35° 00'	120° 53'	192	85	493
CTD	35° 00'	120° 58.5'	374	364	494
trawl	35° 00'	120° 58.5'	374	85	494
trawl	35° 00'	121° 07'	543	85	495
CTD	35° 00'	121° 07'	543	520	495

DAY: CTD - PIEDRAS BLANCAS

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° 46.4'	968	520	4028
CTD	35° 52'	121° 34'	510	500	4029

NIGHT: TRAWL & CTD - PIERAS BLANCAS

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
CTD	35° 42.2'	121° 25.8'	167	155	442
trawl	35° 42.2'	121° 25.8'	167	85	442
CTD	35° 42.2'	121° 30.5'	557	520	443
trawl	35° 42.2'	121° 30.5'	557	85	443
CTD	35° 42.2'	121° 42'	885	520	444
trawl	35° 42.2'	121° 42'	885	85	444
trawl	35° 42.2'	121° 52'	1040	85	445
CTD	35° 42.2'	121° 52'	1040	520	445

NIGHT: TRAWL & CTD - MONTEREY BAY INSIDE

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	36° 50.8'	121° 59'	91	81	119	
trawl	36° 50.8'	121° 59'	91	85	119	MI
CTD	36° 46'	121° 52'	73	63	114	
trawl	36° 46'	121° 52'	73	85	114	MI
CTD	36° 44.4'	121° 58.6'	238	228	116	
trawl	36° 44.4'	121° 58.6'	238	85	116	MI
CTD	36° 42.5'	121° 54.5	91	81	115	
trawl	36° 42.5'	121° 54.5	91	85	115	MI
CTD	36° 38.7'	121° 51.8'	46	36	111	
trawl	36° 38.7'	121° 51.8'	46	25	111	MI
trawl	36° 39.3'	121° 56.8'	73	85	112	MI
CTD	36° 39.3'	121° 56.8'	73	63	112	

DAY: CTD - MONTEREY BAY OUTSIDE

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

NIGHT: TRAWL & CTD - MONTEREY BAY OUTSIDE

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	36° 35'	122° 10.5'	2323	520	110	
trawl	36° 35'	122° 10.5'	2323	85	110	MO
trawl	36° 35'	122° 10.5'	2323	25	110	MO
CTD	36° 35'	122° 02'	530	520	109	
trawl	36° 35'	122° 02'	530	85	109	MO
CTD	36° 38.8'	122° 03'	914	520	113	
trawl	36° 38.8'	122° 03'	914	85	113	MO
CTD	36° 42'	122° 06.5'	1920	520	117	
trawl	36° 42'	122° 06.5'	1920	85	117	MO
trawl	36° 46.4'	122° 09'	914	85	118	MO
CTD	36° 46.4'	122° 09'	914	520	118	

DAY: CTD - DAVENPORT

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'	823	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'	1372	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

NIGHT: TRAWL & CTD - DAVENPORT

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	36° 59'	122° 17.5'	82	72	123	
trawl	36° 59'	122° 17.5'	82	85	123	SS
CTD	36° 59'	122° 22.5'	128	118	124	
trawl	36° 59'	122° 22.5'	128	85	124	DS
CTD	36° 59'	122° 25.5'	457	445	125	
trawl	36° 59'	122° 25.5'	457	85	125	DS
CTD	36° 59'	122° 35.5'	402	390	126	
trawl	36° 59'	122° 35.5'	402	85	126	DS
trawl	36° 59'	122° 45.5'	1006	85	127	DS
CTD	36° 59'	122° 45.5'	1006	520	127	

DAY: CTD - PESCADERO

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

NIGHT: TRAWL & CTD - PESCADERO

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	37° 16.5'	122° 34'	82	75	131	
trawl	37° 16.5'	122° 34'	82	85	131	SS
CTD	37° 16.5'	122° 39'	95	85	132	
trawl	37° 16.5'	122° 39'	95	85	132	SS
CTD	37° 16.5'	122° 49'	165	155	133	
trawl	37° 16.5'	122° 49'	165	85	133	DS
CTD	37° 16.5'	122° 59'	549	520	134	
trawl	37° 16.5'	122° 59'	549	85	134	DS
trawl	37° 16.5'	123° 09'	1006	85	135	DS
CTD	37° 16.5'	123° 09'	1006	520	135	

NIGHT: TRAWL & CTD - GULF OF THE FARALLONES

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
CTD	37° 42'	122° 54.5'	55	45	138
trawl	37° 42'	122° 54.5'	55	25	138
CTD	37° 35.8'	122° 49.9'	55	45	237
trawl	37° 35.8'	122° 49.9'	55	25	237

DAY: CTD – FARALLONES OUTSIDE

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'	2377	520	1031
CTD	37° 30.8'	123° 36.3'	2652	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

NIGHT: TRAWL & CTD - FARALLON OUTSIDE

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	37° 39.5'	123° 02.5'	119	110	152	
trawl	37° 39.5'	123° 02.5'	119	85	152	DN
CTD	37° 39.5'	123° 12.5'	1244	520	154	
trawl	37° 39.5'	123° 12.5'	1245	85	154	DN
CTD	37° 44.6'	123° 08.3'	91	81	156	
trawl	37° 44.6'	123° 08.3'	91	85	156	SN
CTD	37° 53'	123° 19'	91	81	160	
trawl	37° 53'	123° 19'	91	85	160	SN
trawl	37° 53'	123° 30'	1463	85	162	DN
CTD	37° 53'	123° 30'	1463	520	162	

DAY: CTD - PT. REYES

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	110	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

NIGHT: TRAWL & CTD - PT. REYES

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire(m)*	*Station#*	*Strata*
CTD	38° 10'	123° 0'	55	45	165	
trawl	38° 10'	123° 0'	55	25	165	SN
CTD	38° 9.5'	123° 5'	73	63	166	
trawl	38° 9.5'	123° 5'	73	85	166	SN
CTD	38° 10'	123° 10'	91	81	167	
trawl	38° 10'	123° 10'	91	85	167	SN
CTD	38° 10'	123° 17'	128	118	168	
trawl	38° 10'	123° 17'	128	85	168	DN
CTD	38° 10'	123° 22'	183	173	170	
trawl	38° 10'	123° 22'	183	85	170	DN
trawl	38° 10'	123° 29'	411	85	171	DN
CTD	38° 10'	123° 29'	411	400	171	

DAY: CTD - FORT ROSS

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	38° 18.5'	123° 10'	83	73	1048
CTD	38° 18.5'	123° 17.8'	110	100	1044
CTD	38° 18.5'	123° 30.1'	275	265	1043
CTD	38° 18.5'	123° 42.4'	1463	520	1042
CTD	38° 18.5'	123° 54.7'	2835	520	1041
CTD	38° 18.5'	124° 07.7'	3600	520	4030
CTD	38° 28'	124° 24.0'	3500	520	4031

NIGHT: TRAWL & CTD - FORT ROSS

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

DAY: CTD - NAVARRO

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	38° 50.0'	123° 47.0'	111	100	4032
CTD	38° 50.0'	124° 04'	1805	520	4033
CTD	38° 50.0'	124° 20.0'	3300	520	4034
CTD	38° 50.0'	124° 37.0'	3500	520	4035

NIGHT: TRAWL & CTD - NAVARRO

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	39° 08'	124° 36'	3292	520	465
trawl	39° 08'	124° 36'	3292	85	465
CTD	39° 08'	124° 19'	2000	520	464
trawl	39° 08'	124° 19'	2000	85	464
CTD	39° 08'	124° 00'	500	490	463
trawl	39° 08'	124° 00'	500	85	463
trawl	39° 08'	123° 47'	73	25	461
CTD	39° 08'	123° 47'	73	63	461

DAY: CTD – DELGADA SOUTH

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

NIGHT: TRAWL & CTD - DELGADA

OPS	*Latitude*	*Longitude*	*Depth(m)*	*Wire Out(m)*	*Station#*
CTD	39° 50'	124° 43'	1344	520	475
trawl	39° 50'	124° 43'	1344	85	475
CTD	39° 50'	124° 24'	1500	520	474
trawl	39° 50'	124° 24'	1500	85	474
CTD	39° 50'	124° 06.5'	300	290	473
trawl	39° 50'	124° 06.5'	300	85	473
trawl	39° 50'	123° 55'	60	85	471
CTD	39° 50'	123° 55'	60	50	471

DAY: CTD – DELGADA NORTH

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

APPENDIX III: POTENTIAL HUMBOLDT SQUID CATCH AREAS OTHER THAN STANDARD MID-WATER TRAWL STATIONS

9 Mile Bank
32 38.0 117 28.0

Carmel Canyon
36 33.5 122 02.0

Pioneer Canyon
37 25.0 122 53.0

Rittenburg Bank
37 50.0 123 20.0

Cordell Bank
38 00.0 123 29.0 (SW Cordell Bank)
38 04.0 123 32.0 (NW Cordell Bank)
38 06.9 123 26.5 (North Cordell Bank)

Arena Canyon
39 00.0 124 00.0

Wind–to-Whales Stations - Monterey Bay Area:

Deep Stations (>100m)

T301	36 45.6	121 55.8
T401	36 43.8	122 03.6
T501	36 40.2	122 00.6
T601	36 37.8	122 01.2
T701	36 36.6	122 04.8

Shallow Stations (<100m)

T100	36 57.05	122 11.91
T101	36 54.66	122 05.90
T102	36 51.90	121 52.29
T402	36 42.60	121 51.23
T702	36 35.55	121 59.03