

data report

CalCOFI Cruise 1004
27 April – 17 May 2010

CC Reference 10-06
8 October 2010

UNIVERSITY OF CALIFORNIA, SAN DIEGO
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PHYSICAL, CHEMICAL AND BIOLOGICAL DATA

CalCOFI Cruise 1004
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INTRODUCTION

The data presented in this report were collected during cruise 1004* of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program aboard the NOAA vessel RV *Miller Freeman*. The CalCOFI program was organized in the late 1940's to study the causes of variations in population size of fishes of importance to the State of California. It is carried out by NOAA's National Marine Fisheries Service Southwest Fisheries Science Center, the California Department of Fish and Game, and the Integrative Oceanography Division (IOD) at Scripps Institution of Oceanography (SIO). IOD contributes to this program by investigations of the physical, chemical and biological structure of the California Current. Data from the cruises were collected and processed by personnel of the Integrative Oceanography Division and the Southwest Fisheries Science Center. SIO staff members from the Ocean Data Facility participate in the chemical analysis of nutrient samples at sea. CalCOFI data presented in this report and collected on previous cruises can be accessed at <http://www.calcofi.org>.

STANDARD PROCEDURES

CTD/Rosette Cast Data

A Sea-Bird Electronics, Inc., Conductivity-Temperature-Depth (CTD) instrument (Seabird 911, Serial number 1049) with a rosette was deployed at each station on these cruises. Weight restrictions prevented the use of the 24-bottle rosette typically employed on CalCOFI cruises. The substitute rosette was equipped with 12 ten-liter plastic (PVC) bottles equipped with epoxy-coated springs. A shortage of Viton o-rings resulted in them being installed in only half of the bottles; the remainder of the bottles had neoprene o-rings. Every effort was made to insure that primary productivity samples were taken from bottles containing Viton o-rings, however an on board study (not included) determined that any potential toxic effect on the phytoplankton resulting in the use of neoprene o-rings was negligible. Therefore, some primary productivity samples were taken from these bottles. Each CTD/rosette cast usually sampled 12 depths to a maximum sampling depth of 525 meters, bottom depth permitting. Because of limitations with the 12 bottle rosette and the need to sample specific target depths, a second cast was often necessary to collect water for the primary productivity assay. Occasional stations have multiple bottles tripped at the same depth to provide more water for ancillary programs. The sample spacing was designed to sample depth intervals as close as 10 meters around the sharp upper thermocline features such as the chlorophyll, oxygen, nitrite maxima and the shallow salinity minimum. Salinity, oxygen and nutrients were determined at sea for all depths sampled. Chlorophyll-*a* and phaeopigments were determined at sea on samples from the top 200 meters, bottom depth permitting.

Pressures and temperatures assigned to the water sample data were derived from the CTD signals recorded just prior to the bottle trip. Pressures have been converted to depths by the Saunders (1981) pressure-to-depth conversion technique. CTD temperatures reported with the bottle data have been rounded to the nearest hundredth of a degree Celsius.

Salinity samples were collected from all rosette bottles and analyzed at sea using a Guildline model 8410 Portasal salinometer. Salinity samples were drawn into 200 ml Kimax high-alumina borosilicate bottles that were rinsed three times with sample prior to filling. The results were compared with the CTD salinity to verify that the rosette bottle did not mis-trip or leak. The salinometer was standardized before and after each group of samples with standardized seawater. Periodic checks on the conductivity of the standardized seawater were made by comparison with IAPSO Standard Seawater batch P150. Salinity values were calculated using the algorithms for the Practical Salinity Scale, 1978 (UNESCO, 1981a) and are reported to three decimal places, provided that accepted standards were met.

* The first two digits represent the year and the last digits the month of the cruise.

Dissolved oxygen analyses were performed with an Ocean Data Facility of Scripps Institution of Oceanography designed automated oxygen titrator using photometric end-point detection based on the absorption of 365nm wavelength ultra-violet light. A computer using PC software controlled the titration of the samples and the data logging. The method used a modified-Winkler titration following the technique of Carpenter (1965) with modifications by Culbertson (1991), but with higher concentrations of thiosulfate solution (50 g/l). Standard KIO₃ solutions prepared ashore were run at the beginning of each run. Reagent and sea water blanks were determined to account for presence of oxidizing or reducing materials.

Nutrient samples were analyzed at sea by the Scripps Ocean Data Facility for dissolved silicate, phosphate, nitrate, nitrite, and ammonium using procedures similar to those described in Gordon et al. (1993) and Koroleff (1969, 1970). Samples were collected in 45 ml high-density polypropylene screw-capped tubes which were acid washed and rinsed with sample three times prior to filling. Daily standardizations and drift corrections were accomplished by running freshly prepared mid-range standards at the beginning and end of each group of samples. Samples not analyzed immediately after collection were refrigerated and run the following day. In addition to daily standardizations, periodic full calibrations were performed with sets of six different concentration standards.

Samples for chlorophyll-*a* and phaeopigments were collected in calibrated 138 ml polyethylene bottles and filtered onto Whatman GF/F filters. The pigments were extracted in cold 90% acetone (Venrick and Hayward, 1984) for a minimum of 24 hours. Chlorophyll *a* and phaeopigment concentrations were determined from fluorescence readings before and after acidification with a Turner Designs Fluorometer Model 10-AU-005-CE (Yentsch and Menzel, 1963; Holm-Hansen *et al.*, 1965).

Evaluation of the water sample data involved comparisons with the CTD data, adjacent stations and consideration of the variation of a property as a function of density or depth and the relationships with other properties (Klein, 1973). Precision estimates for routine analyses were made on CalCOFI cruise 9003 and are reported in SIO Ref. 91-4.

Primary Productivity Sampling

Primary productivity samples were taken each day shortly before local apparent noon (LAN). Primary production was estimated from ¹⁴C uptake using a simulated *in situ* technique. Light penetration was estimated from the Secchi depth (assuming that the 1% light level is three times the Secchi depth). The depths with ambient light intensities corresponding to light levels simulated by the on-deck incubators were identified and sampled on the rosette up-cast. Occasionally an extra bottle or two were tripped in addition to the usual 20 levels sampled in the combined rosette-productivity cast in order to maintain the normal sampling depth resolution. Triplicate samples (two light and one dark control) were drawn from each productivity sample depth into 250 ml polycarbonate incubation bottles. Samples were inoculated with 25.6 μCi of ¹⁴C as NaHCO₃ (200 μl of 102.4 μCi/ml stock) prepared in a 0.3 g/liter solution of sodium carbonate (Fitzwater *et al.*, 1982). Samples were incubated from LAN to civil twilight in seawater-cooled incubators with neutral-density screens which simulate *in situ* light levels. At the end of the incubation, the samples were filtered onto Millipore HA filters and placed in scintillation vials. One half ml of 10% HCl was added to each sample. The sample was then allowed to sit, without a cap, at room temperature for 12 hours (after Lean and Burnison, 1979). Following this, 10 ml of scintillation cocktail were added to each sample and the samples were returned to SIO where the radioactivity was determined with a scintillation counter. Salinity, oxygen, nutrients, chlorophyll-*a* and phaeopigments were determined from all rosette productivity bottles.

Macrozooplankton Net Tows

Macrozooplankton was sampled with a 71 cm mouth diameter paired net (bongo net) equipped with 0.505mm plankton mesh. Bottom depth permitting, the nets were towed obliquely from 210 meters to the surface. The tow time for a standard tow was 21.5 minutes. Volumes filtered were determined from flowmeter readings and the mouth area of the net. Only one sample of each pair was retained and preserved. The biomass, as wet displacement volume, after removal of large (>5 ml) organisms, was determined in the laboratory ashore. These procedures are summarized in greater detail in Kramer *et al.* (1972). An Optical Plankton Counter (OPC, Dave Checkley, SIO) was routinely used in one side of the paired bongo net frame. The purpose of the OPC is to obtain information on the vertical distributions of size categories of zooplankton, using data from the counter, without affecting the ongoing

ongoing time series of data obtained from the catches of the integrative bongo net.

Avifauna Observations (Farallon Institute of Advanced Ecosystem Research)

Sea birds were counted within a 300-meter wide strip off to one side of the ship. Counts were made while underway between stations during periods of daylight. These counts were summed over 20 nautical mile (nm) intervals, or the distance between consecutive stations, whichever was less. Included at the end of this report are individual maps of the most numerous bird species (individuals/nm).

Ancillary Programs

Several ancillary programs produced data on these cruises that are not presented in this report. These programs include:

- 1) *Underway Data.* Continuous near surface measurements of temperature and salinity were recorded from seawater pumped through the ship's uncontaminated seawater system. Water was drawn from a depth of approximately 3 meters. The data were logged in one-minute averages using a Sea-Bird Electronics, Inc., SBE-21 TSG Thermosalinograph.
- 2) *ADCP.* Continuous profiles of ocean currents and acoustic backscatter between 20 and 500 meters deep were measured along the shiptrack from a hull-mounted 150 kHz Acoustic Doppler Current Profiler (ADCP). The ADCP data were averaged over 3-minute intervals. Sixty 8-meter depth bins were recorded. (T. Chereskin, SIO)
- 3) *Underway pCO₂ System:* The Pacific Marine Environmental Laboratory's underway pCO₂ system measures the partial pressure of CO₂ in the air and surface water while the ship is underway. The pCO₂ values, along with temperature and salinity data from the shipboard TSG are used to calculate the flux of CO₂ at the air-sea interface. The system determines CO₂ content with a Licor infrared detector and is calibrated with 4 gas cylinders provided by the Earth System Research Laboratory.
- 4) *California Current Ecosystem Long Term Ecological Research Program:* The CCE-LTER program augments standard CalCOFI measurements to further characterize the lower trophic levels as well as the carbon system. These additional samples, taken at all CalCOFI stations, are for measurements of particulate organic carbon and nitrogen, dissolved organic carbon and nitrogen, taxon-specific phytoplankton pigments, flow-cytometric counts of bacteria and picoautotrophs, microscopic counts of nano- microplankton, determination of mesozooplankton size structure using a Laser Optical Plankton Counter, and mesozooplankton community structure. (M. Ohman, SIO)
- 5) *SCCOOS Nearshore Observations:* The objective of these observations is to extend CalCOFI time series to the nearshore. Nearshore observations consist of 9 stations at the ends and interspersed with current CalCOFI lines on the 20 m isobath with a standard set of CalCOFI observations. (R. Goericke, SIO)
- 6) *Inorganic Carbon System:* The CalCOFI group collected samples for the characterization of the inorganic carbon system at selected locations along the cruise track. Total inorganic carbon and alkalinity will be measured which will allow the calculation of pH and pCO₂. The objectives of these measurements are first the long-term characterization of the inorganic carbon system and its response to changing ocean climate and second measurements of pH in the coastal zone in order to monitor the impact of 'corrosive' waters on benthic ecosystems in the Southern California Bight. (R. Goericke, SIO)
- 7) *Marine mammal observations.* During daylight transits, visual line-transect surveys were conducted by marine mammal observers focusing on cetaceans. Acoustic line-transect surveys were performed using a towed hydrophone array which consists of multiple hydrophone elements that sample sounds up to 100 kHz allowing for localization of calling animals. Acoustic monitoring also takes place on individual stations using sonobuoys. (J.

(J. Hildebrand, SIO)

8) *Drifting Buoys*. Surface Velocity Program (SVP) drifters, drogued at 15 meters depth, were deployed at 7 stations. The drifter observations (position and SST every hour to every few hours following the 15-meter currents) supplement Eulerian current profiles, and will provide new insight into the connection between continental shelf flows and the larger scale California Current located further offshore. Drifter pairs were deployed at 6 of the 7 stations. Assessing the relative motion of drifter pairs gives an understanding of energy as a function of spatial scale. A subset of the drifter tracks are displayed in near real-time on the web (<http://www.icess.ucsb.edu/drifter/realtime-SVP/index.php>). (C. Ohlmann, UCSB)

9) *ALF (Advanced Laser Fluorometer)*. Continuous underway analysis of phytoplankton pigment groups and variable fluorescence (F_v/F_m). ALF, developed by A. Chekalyuk at Lamont-Doherty Earth Observatory, uses laser stimulated emission at 405 and 532 nm together with spectral deconvolution analysis to distinguish fluorescence from three types of phycoerythrin, chlorophyll-*a*, and chromophoric dissolved organic matter (CDOM). The ALF is useful for differentiating the contribution of cyanobacteria and cryptophytes from other phytoplankton taxa present in natural phytoplankton assemblages, as well as for assessing phytoplankton photophysiological status.

TABULATED DATA

CTD/Rosette Cast Data

The time reported is the Coordinated Universal Time (UTC) of the first rosette bottle trip on the up cast. The rosette bottles tripped on the up cast are reported as cast 2, where cast 1 is considered to be the down CTD profile. The sample number reported is the cast number followed by a two-digit rosette bottle number. Bottom depths, determined acoustically, have been corrected using British Admiralty Tables (Carter, 1980) and are reported in meters. Weather conditions have been coded using WMO code 4501. Secchi depths are reported for most daylight stations.

Data values from discreet sampled CTD rosette were interpolated and are reported for standard depths. Interpolated or extrapolated standard level data are noted by the footnote "ISL" printed after the depth. Multiple bottles tripped at the same depth to provide water for ancillary programs are not used in the calculation of standard depth data. Density-related parameters have been calculated from the International Equation of State of Seawater 1980 (UNESCO, 1981b). Computed values of potential temperature, sigma-theta, specific volume anomaly (SVA), and dynamic height or geopotential anomaly are included with both observed and interpolated standard depth levels.

On stations where primary productivity samples were drawn a footnote appears after each productivity depth sampled. The corresponding primary productivity data are reported in a separate section following the tabulated rosette cast data.

Primary Productivity Data

In addition to the normal hydrographic data that are reported in the rosette cast data section, the tabulated data include: the *in situ* light levels at which the samples were collected, the uptake from each of the replicate light bottles, uptake 1 and uptake 2 (which have been corrected for dark uptake by subtracting the dark value), the mean of the two uptake values and the dark uptake. The uptake values are totals for the incubation period. Also shown are the times of LAN, civil twilight, and the value of the mean uptake integrated from the surface to the deepest sample, assuming the shallowest value continues to the surface and that negative values (when dark uptake exceeds light uptake) are zero. The uptake data are reported to two significant digits (values <1.00) or one decimal (values >1.00). Incubation time, LAN, and civil twilight are given in local Pacific Standard Time (PST); to convert to UTC, add eight hours to the PST time. Incubation light intensities are listed in a footnote at the bottom of each page.

Macrozooplankton Data

Macrozooplankton biomass volumes are tabulated as total biomass volume ($\text{cm}^3/1000\text{m}^3$ strained) and as the total volume minus the volume of larger organisms under the heading "Small." Tow times are given in local PST (+8) time.

FOOTNOTES

In addition to footnotes, special notations are used without footnotes because the meaning is always the same:

- D: CTD salinity value listed in place of normal shipboard salinity analysis.
- ISL: After a depth value indicates that this is an interpolated or extrapolated standard level.
- U: Uncertain value. Values which are not used in interpolation because they seem to be in error without apparent reason.

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FIGURES

Cruise 1004

1. CalCOFI Cruise 0911 track and station positions.
2. Horizontal distribution of dynamic height anomaly (0 over 500m). In areas shallower than 500 m, the dynamic heights were extrapolated on the basis of the offshore deeper steric height as described in Reid and Mantyla (1976).
3. Horizontal distributions at 10 meters: A) chlorophyll-*a*; B) potential density; C) temperature; and D) salinity.
4. Horizontal distributions at 200 meters: A) dynamic height anomaly (200 over 500 m); B) potential density; C) temperature; and D) salinity.
5. Sections along CalCOFI line 90 (vertical exaggeration, 1000): A) potential density; B) temperature; C) salinity; D) silicate; E) nitrate; F) phosphate; G) chlorophyll-*a*; H) oxygen saturation; I) oxygen; J) nitrite; and K) phaeopigments.

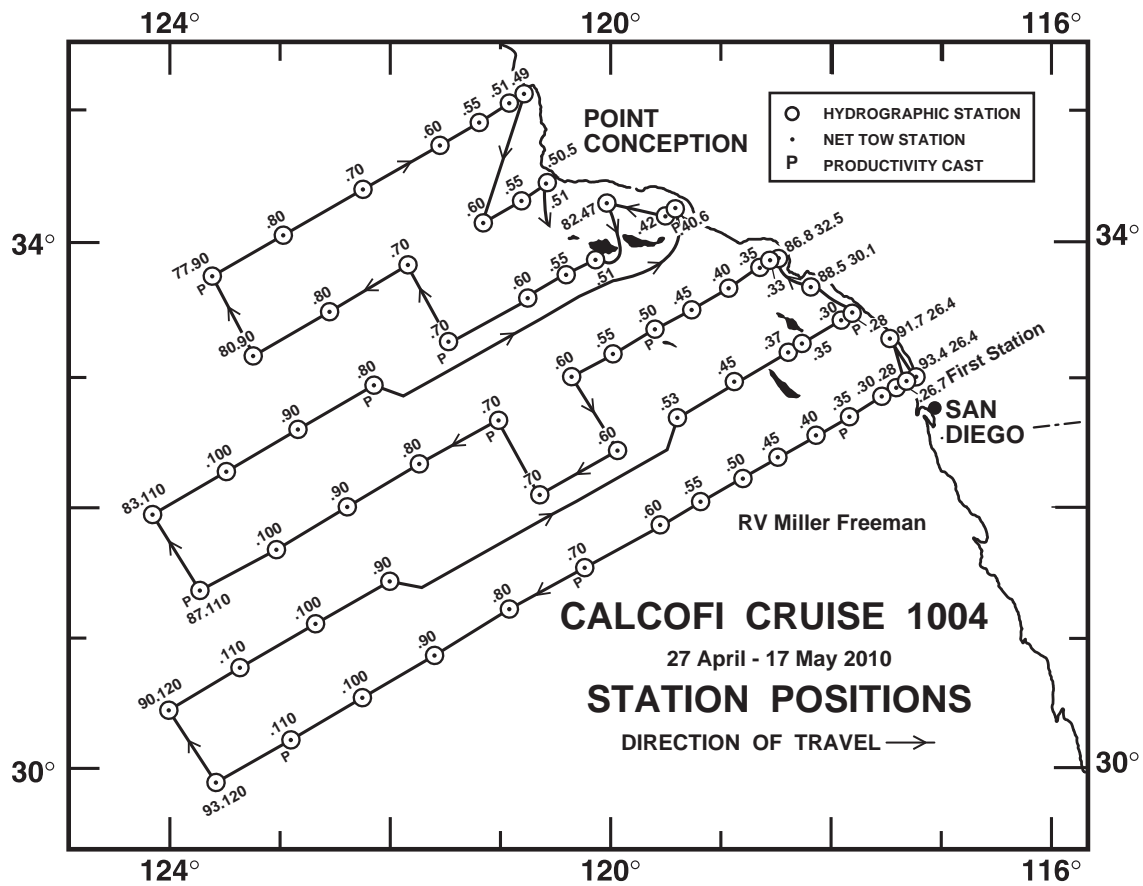


FIGURE 1

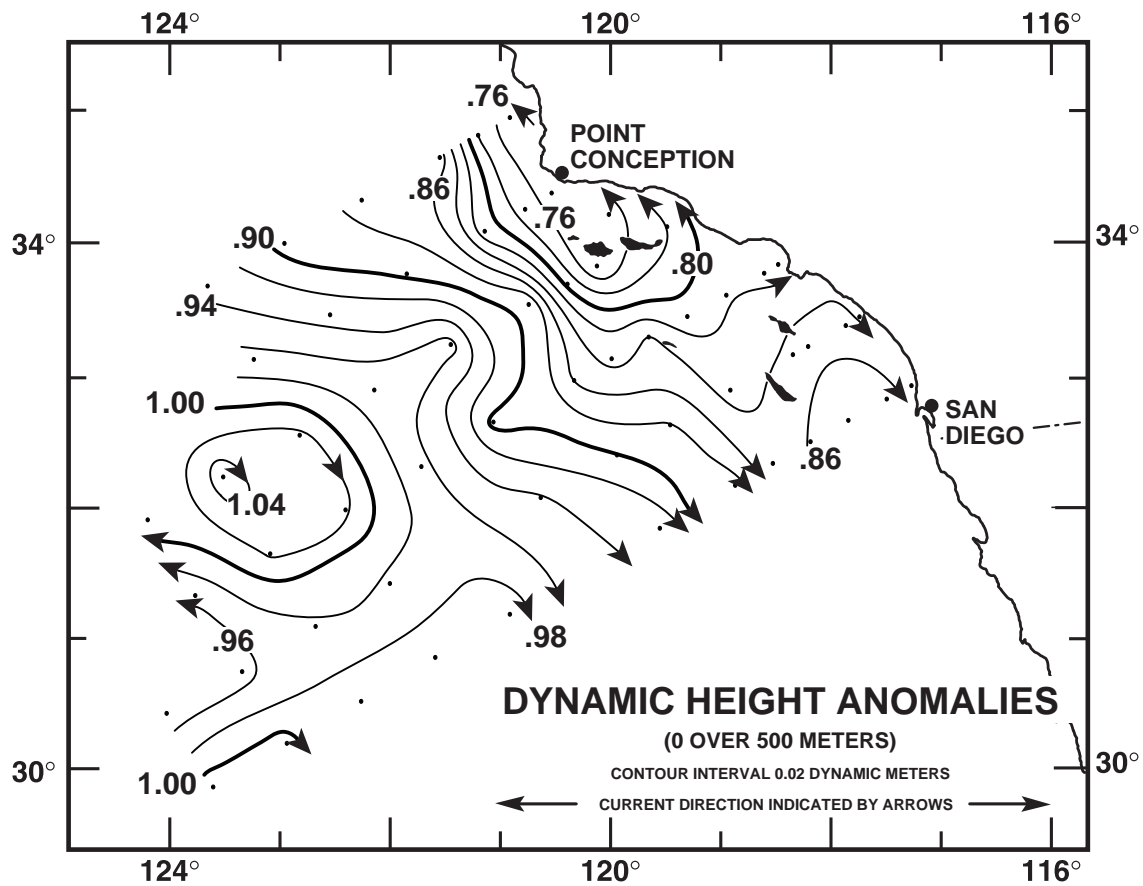


FIGURE 2

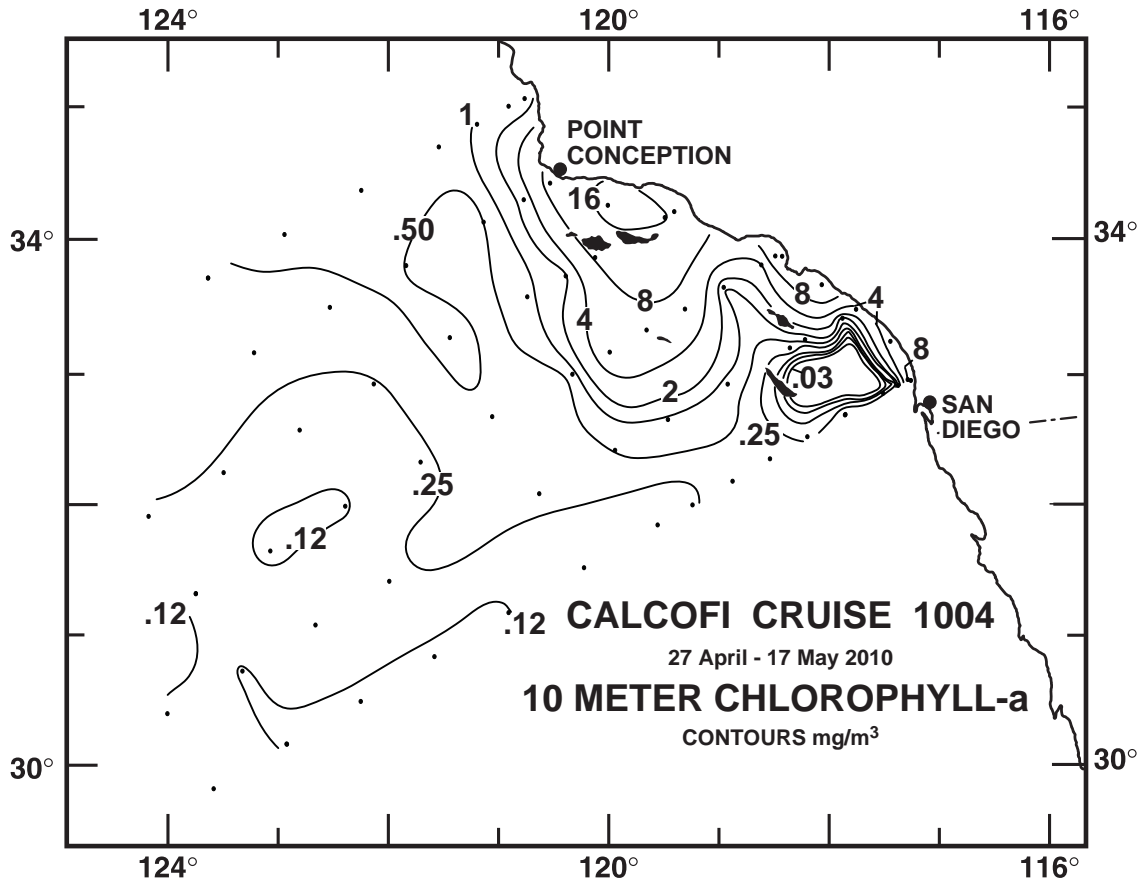


FIGURE 3A

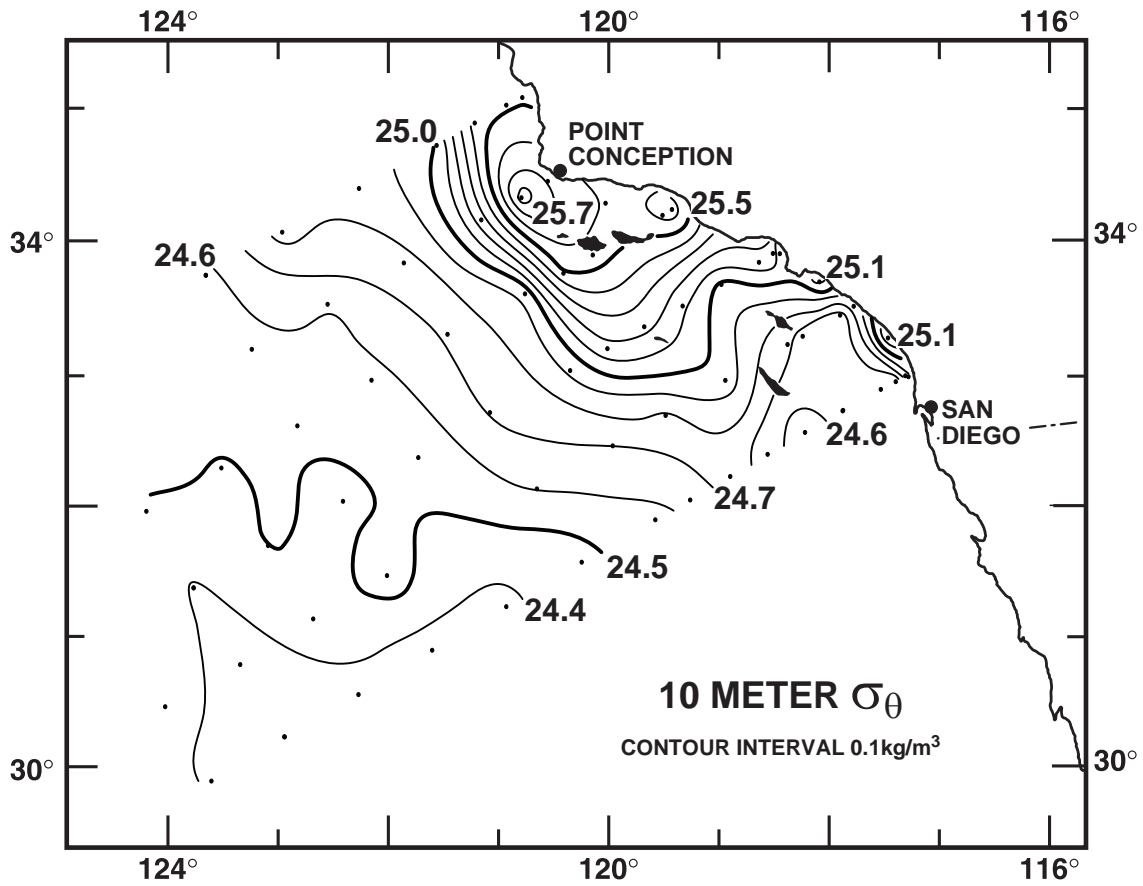


FIGURE 3B

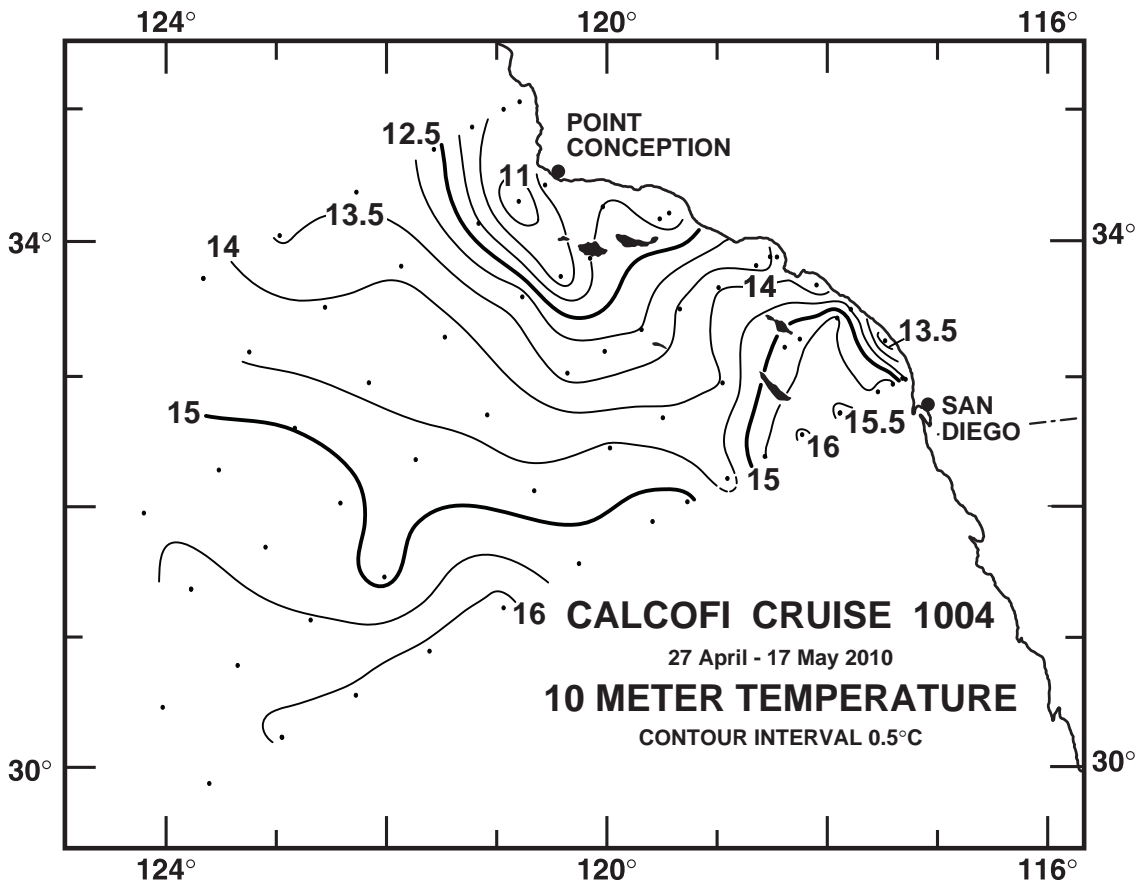


FIGURE 3C

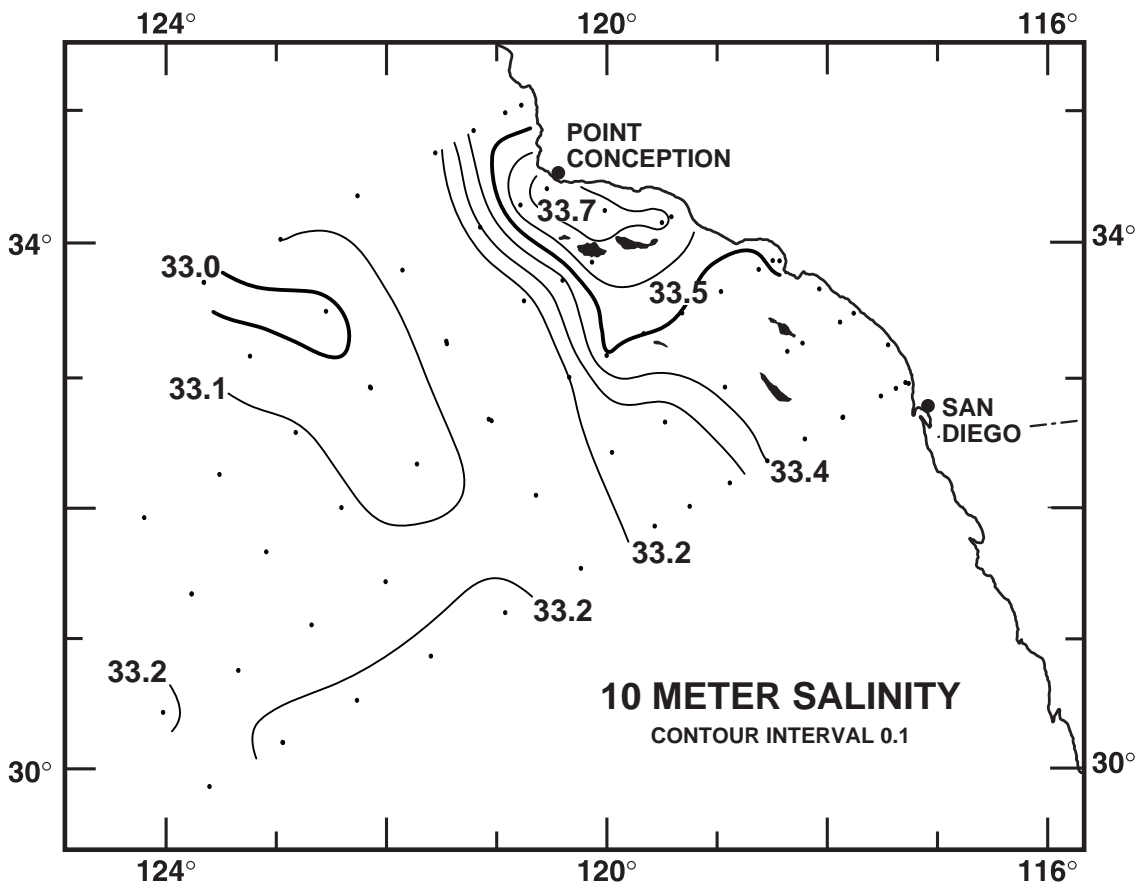


FIGURE 3D

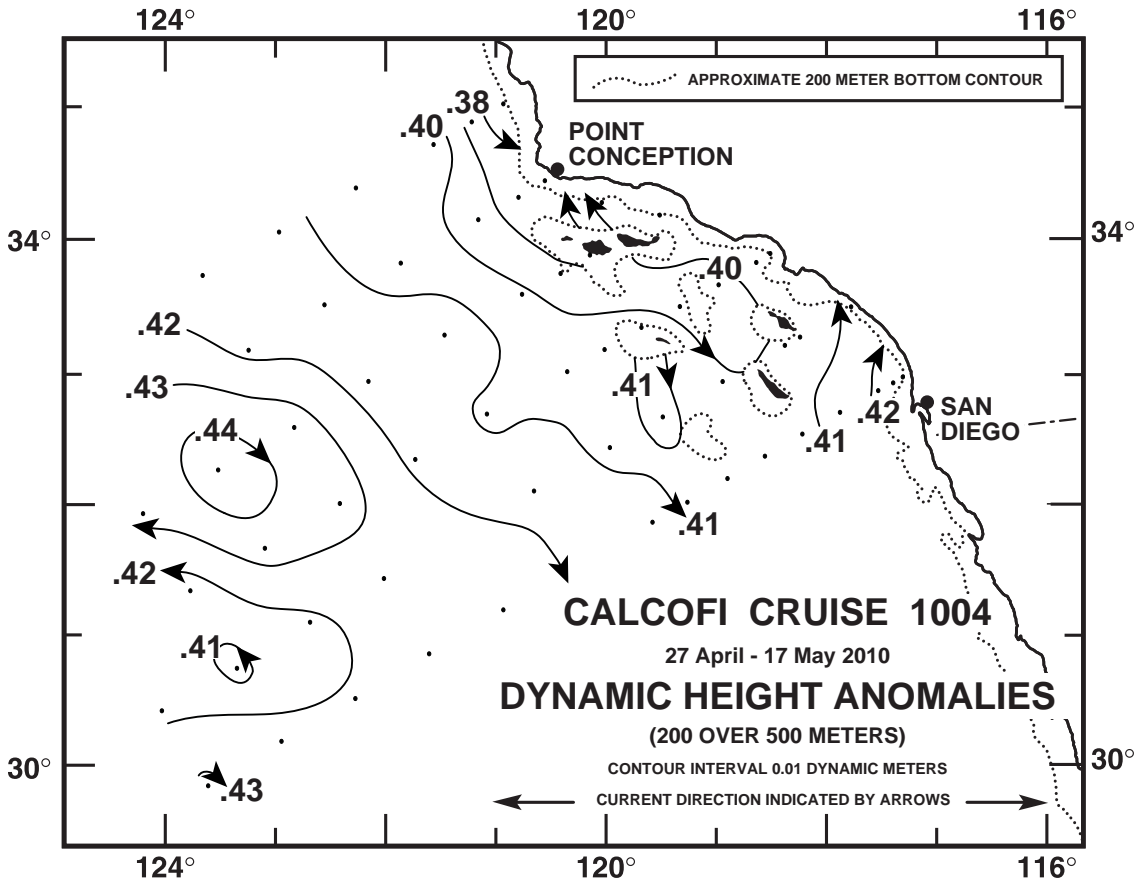


FIGURE 4A

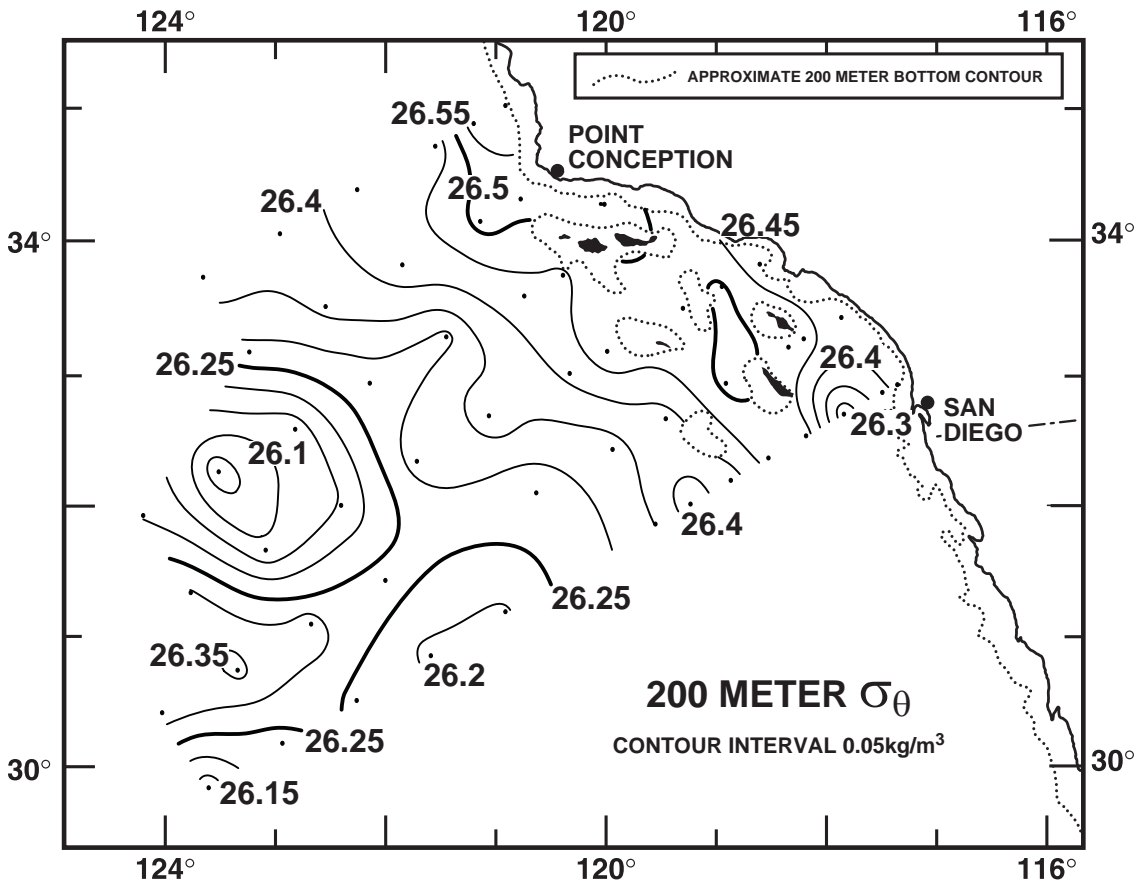


FIGURE 4B

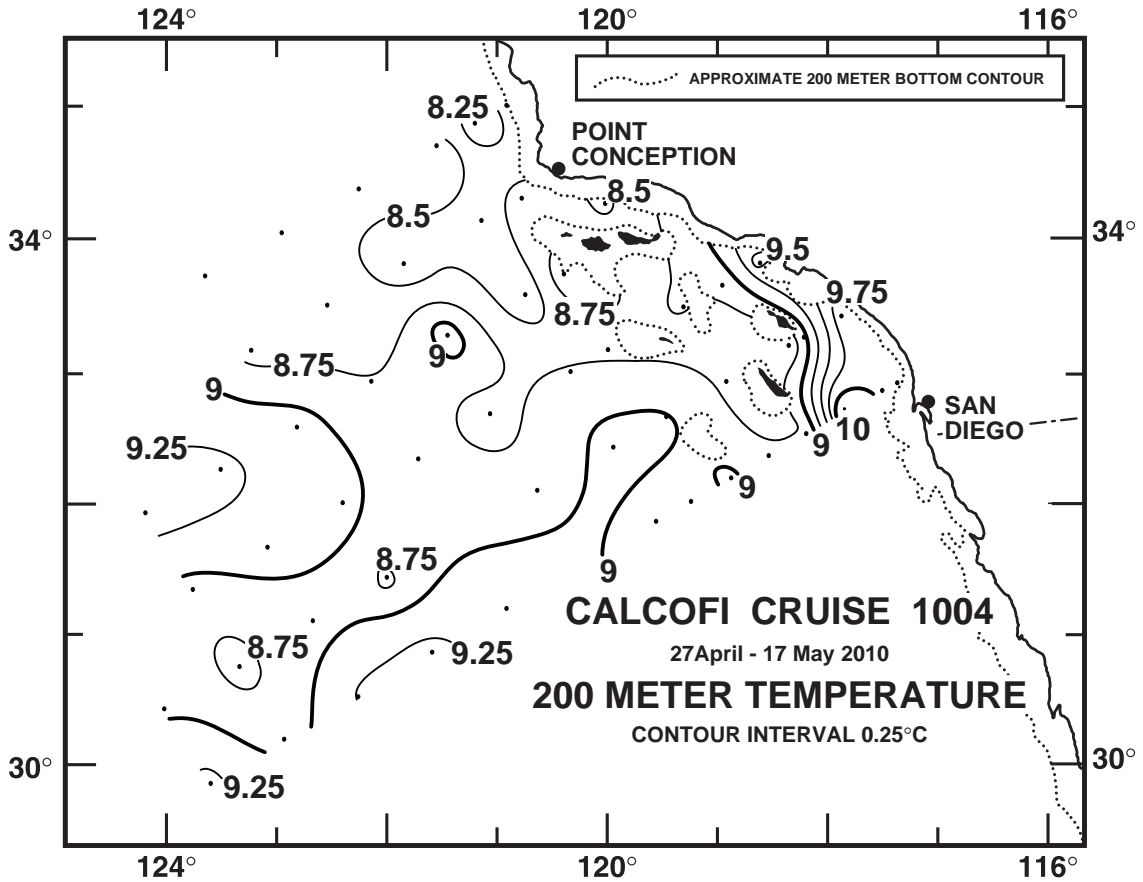


FIGURE 4C

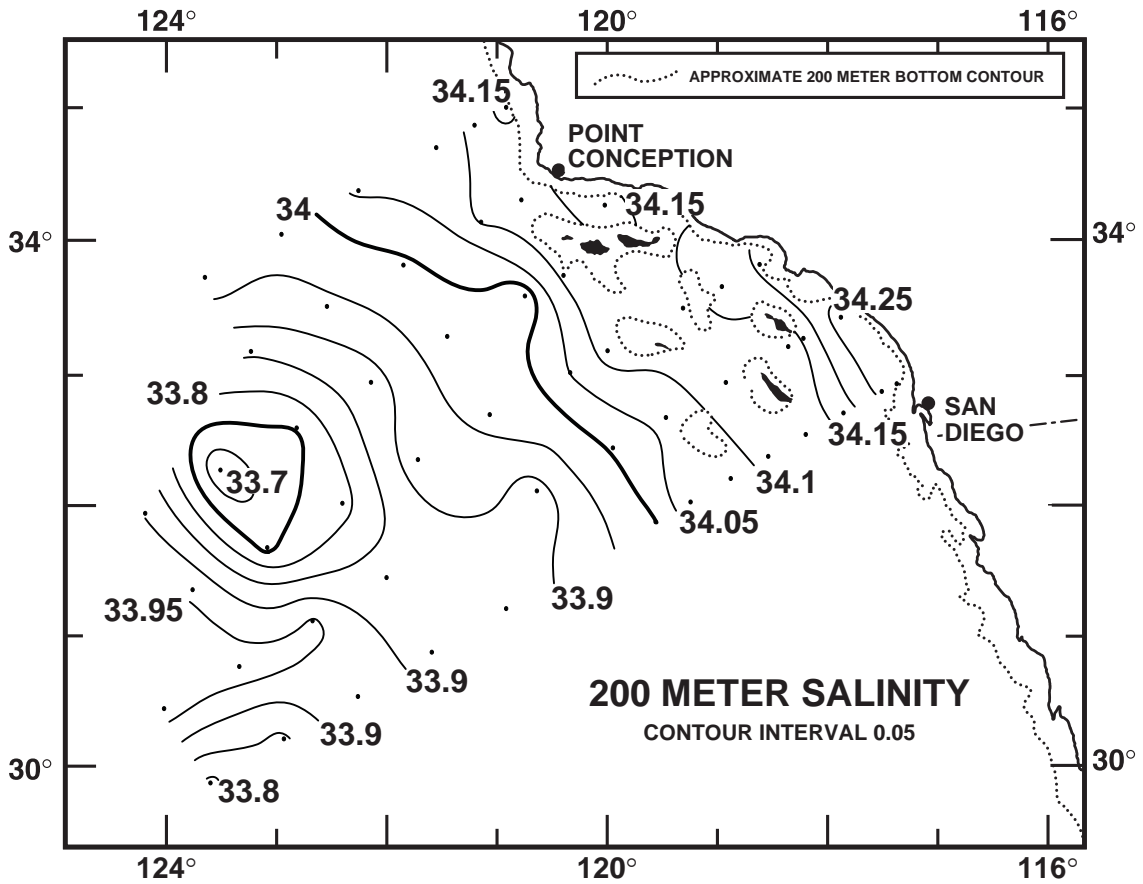


FIGURE 4D

CALCOFI CRUISE 1004

30 April - 4 May 2010

POTENTIAL DENSITY (σ_θ) ALONG CALCOFI LINE 90

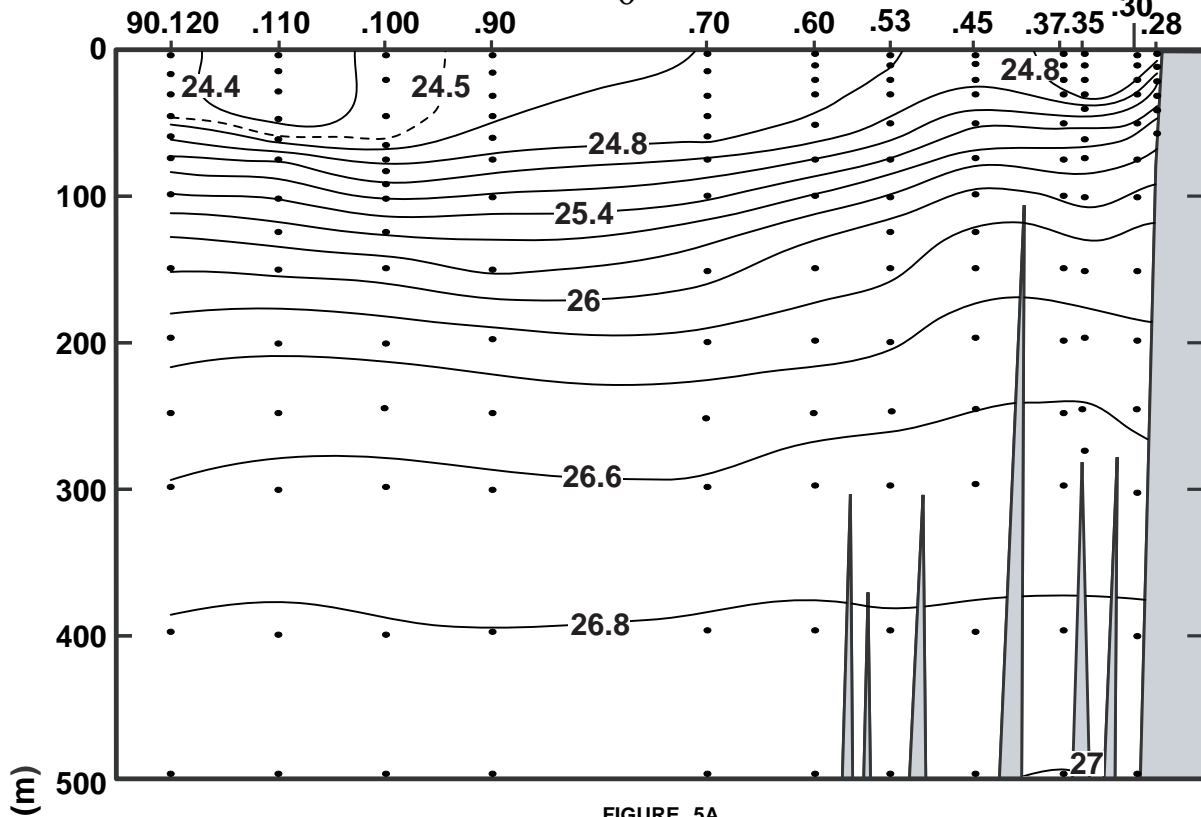


FIGURE 5A

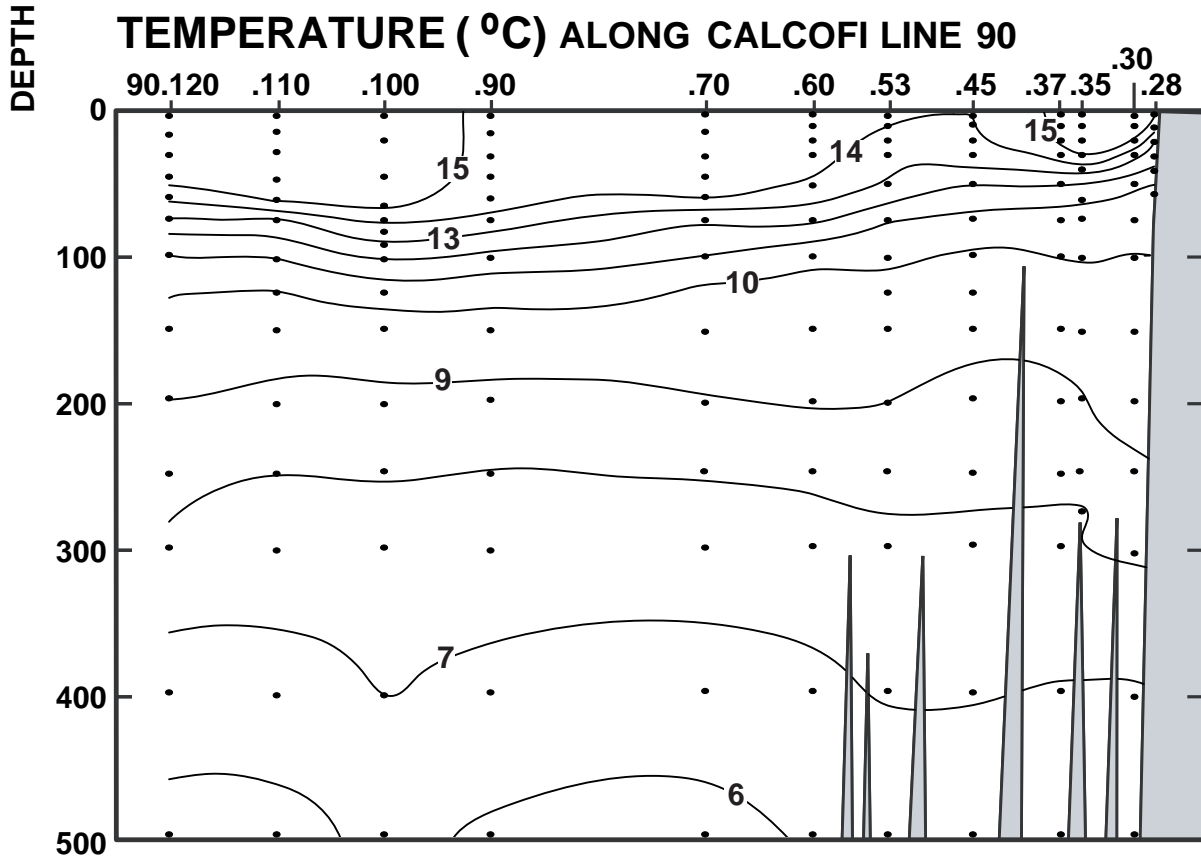


FIGURE 5B

CALCOFI CRUISE 1004

30 April - 4 May 2010

SALINITY ALONG CALCOFI LINE 90

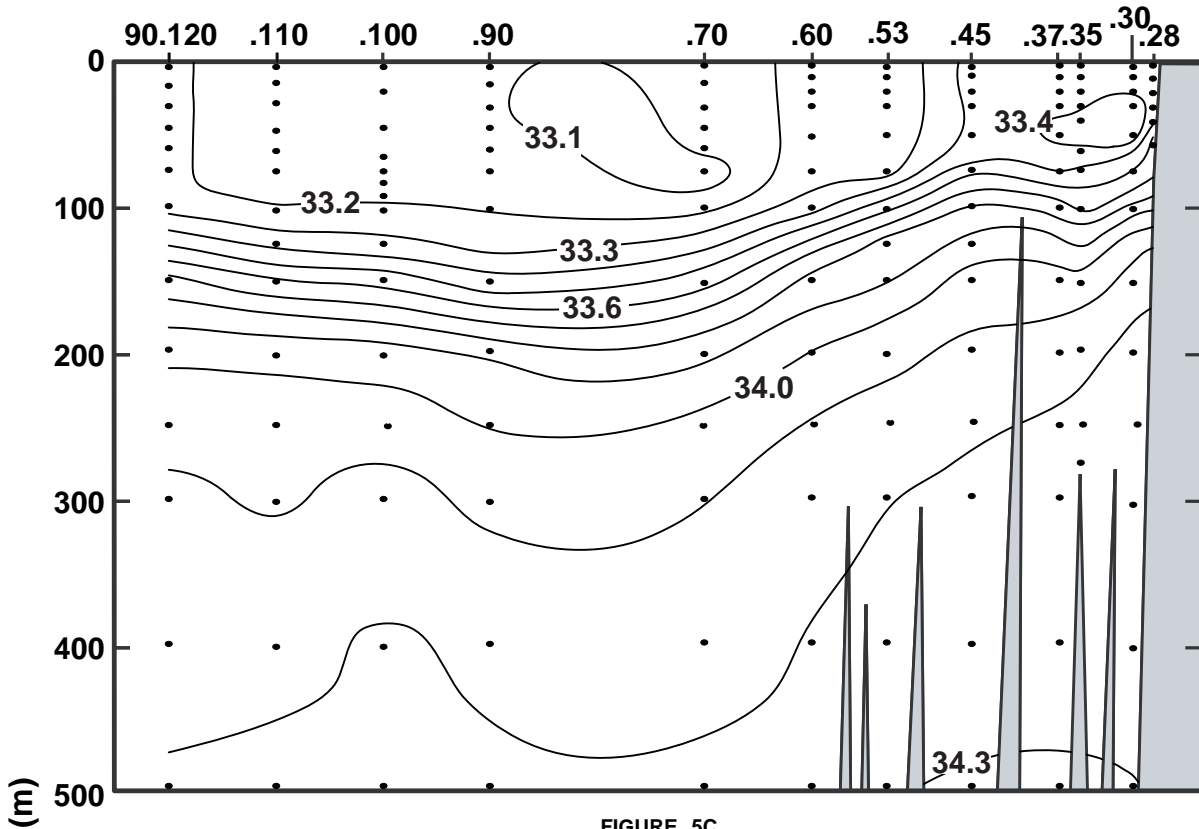


FIGURE 5C

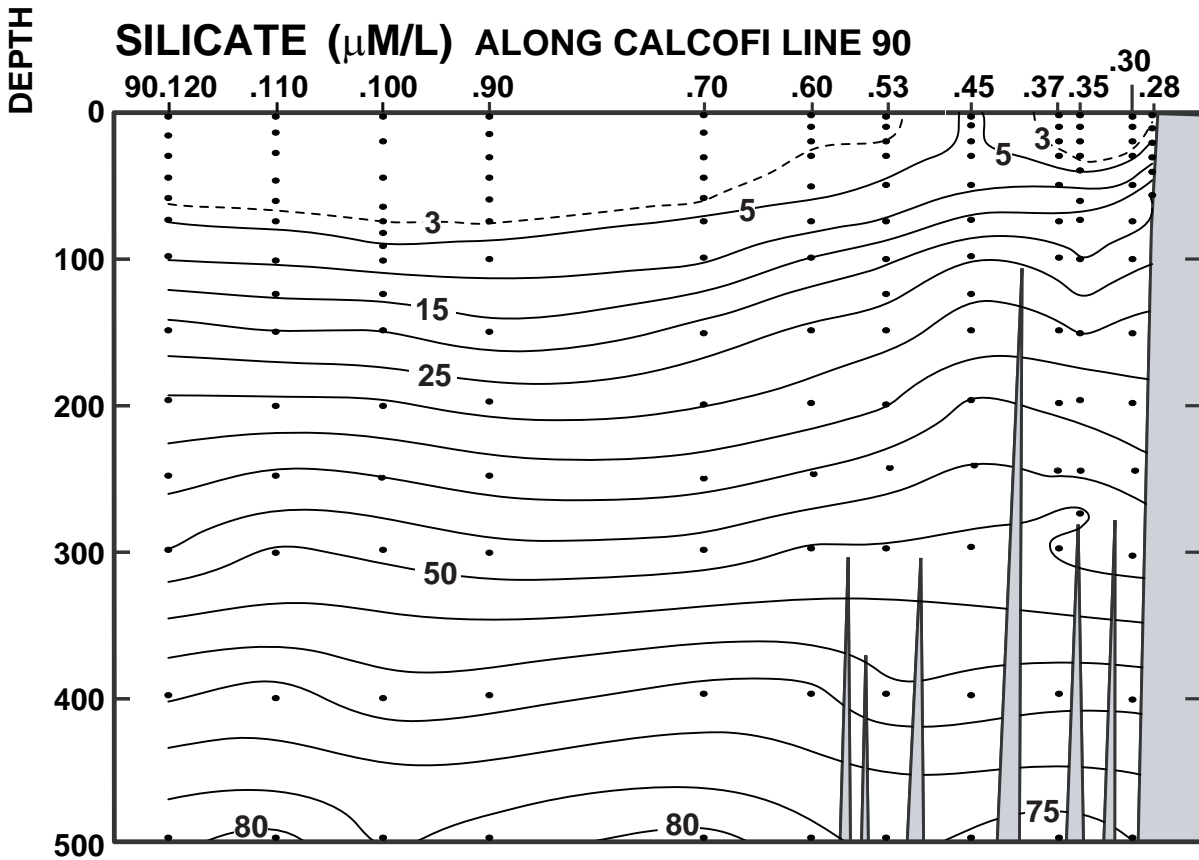


FIGURE 5D

CALCOFI CRUISE 1004

30 April - 4 May 2010

NITRATE ($\mu\text{M/L}$) ALONG CALCOFI LINE 90

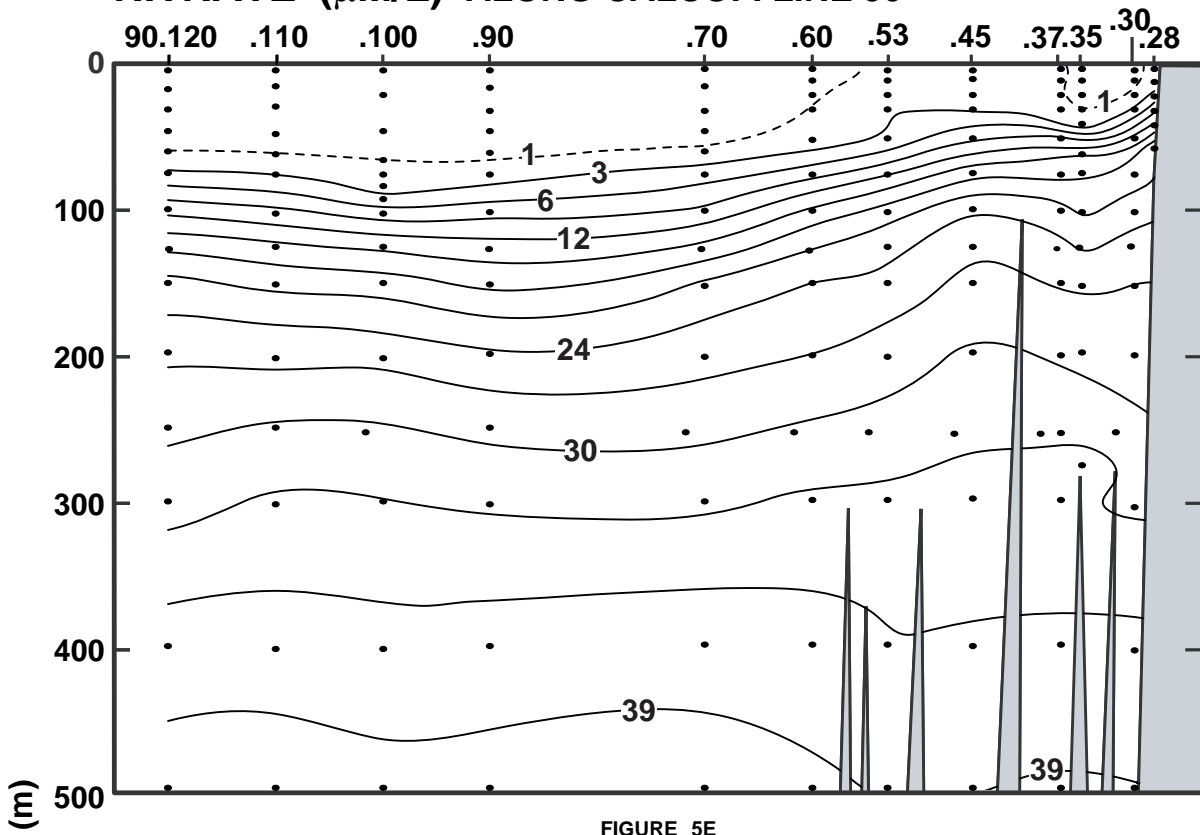


FIGURE 5E

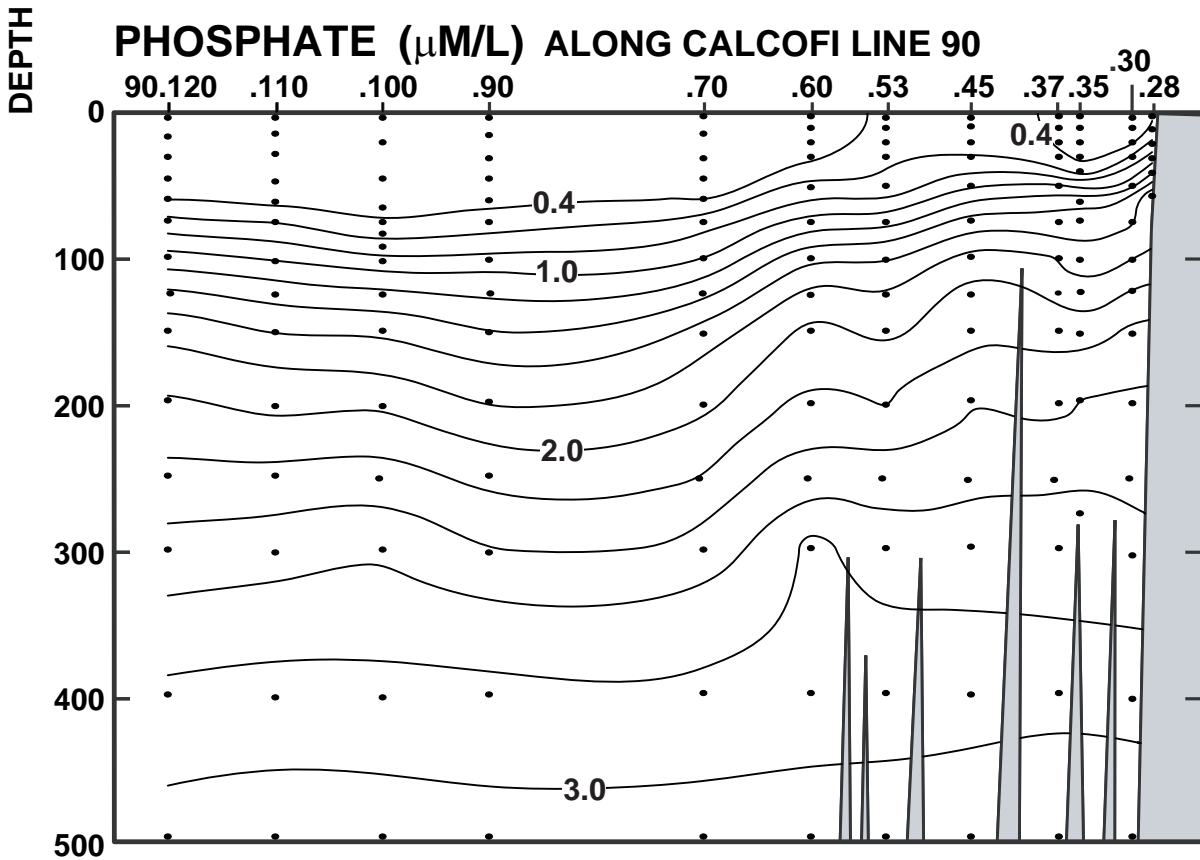


FIGURE 5F

CALCOFI CRUISE 1004

30 April - 4 May 2010

CHLOROPHYLL-a ($\mu\text{g/L}$) ALONG CALCOFI LINE 90

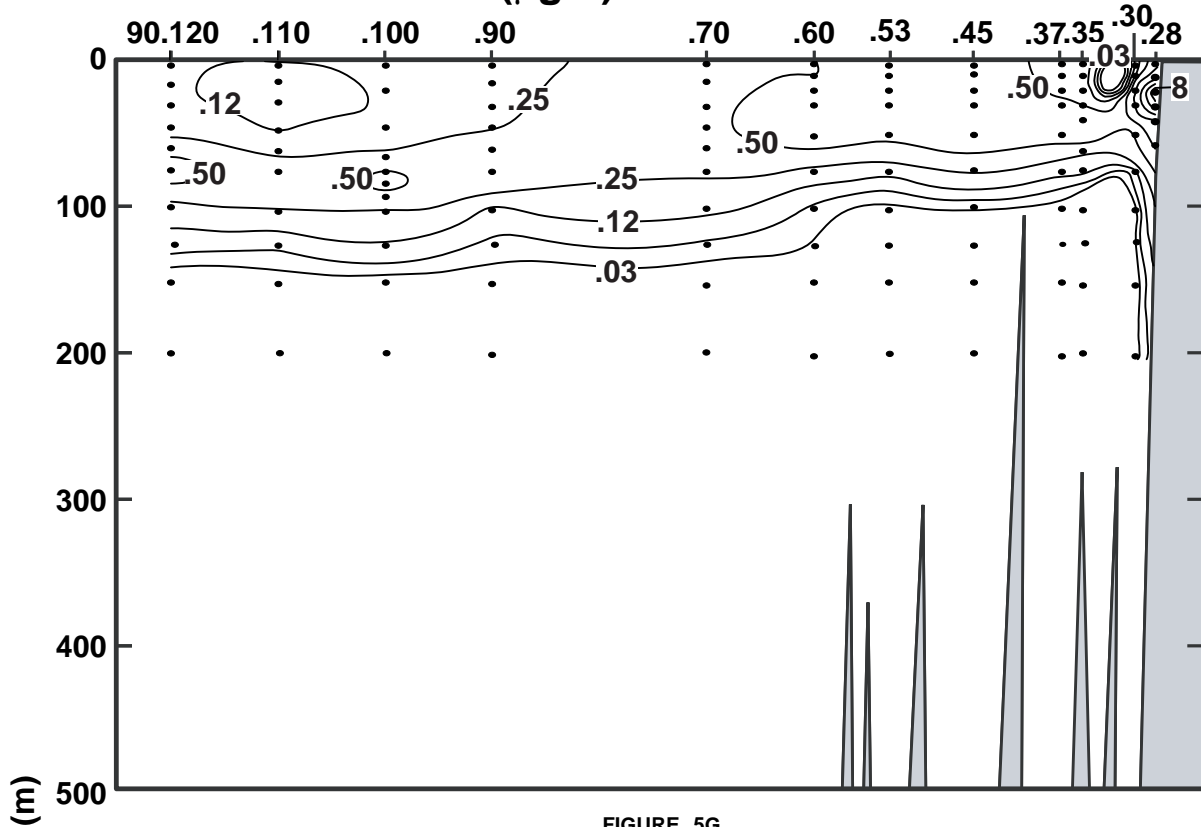


FIGURE 5G

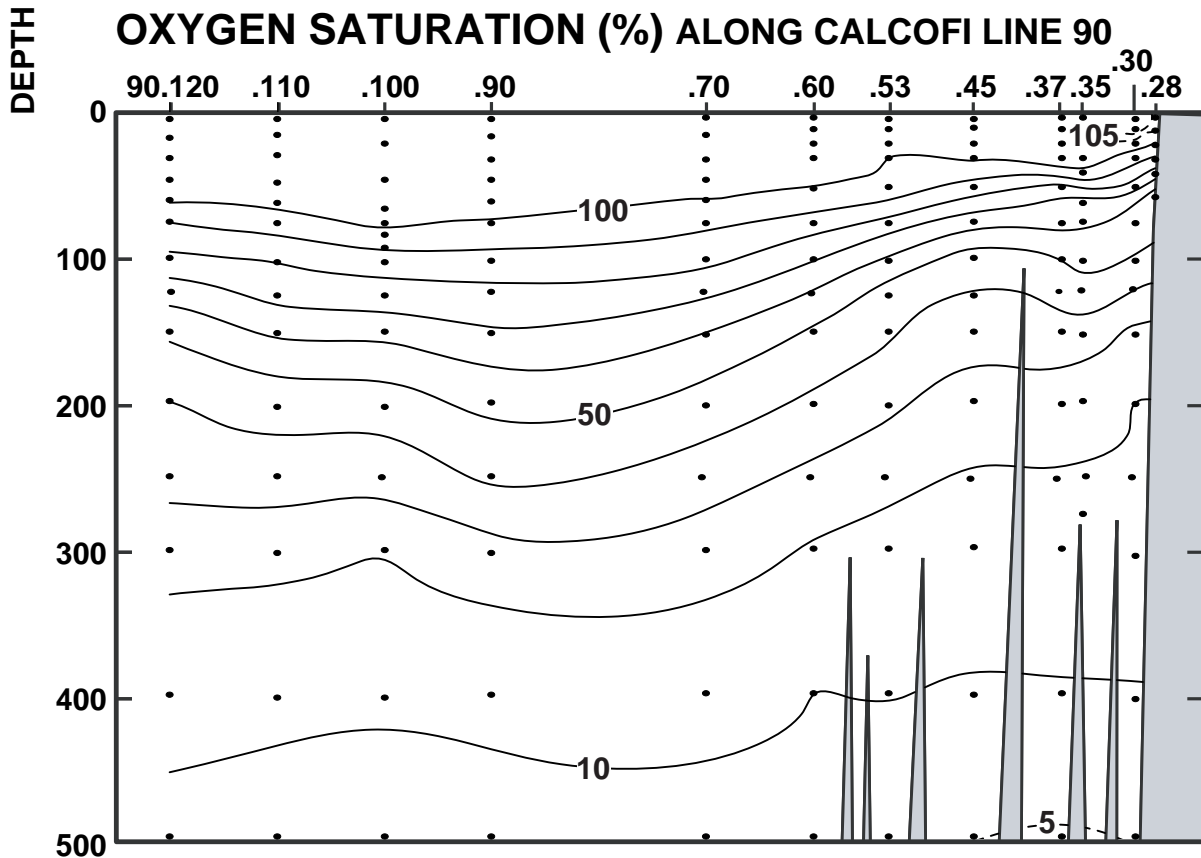


FIGURE 5H

CALCOFI CRUISE 1004

30 April - 4 May 2010

OXYGEN (mL/L) ALONG CALCOFI LINE 90

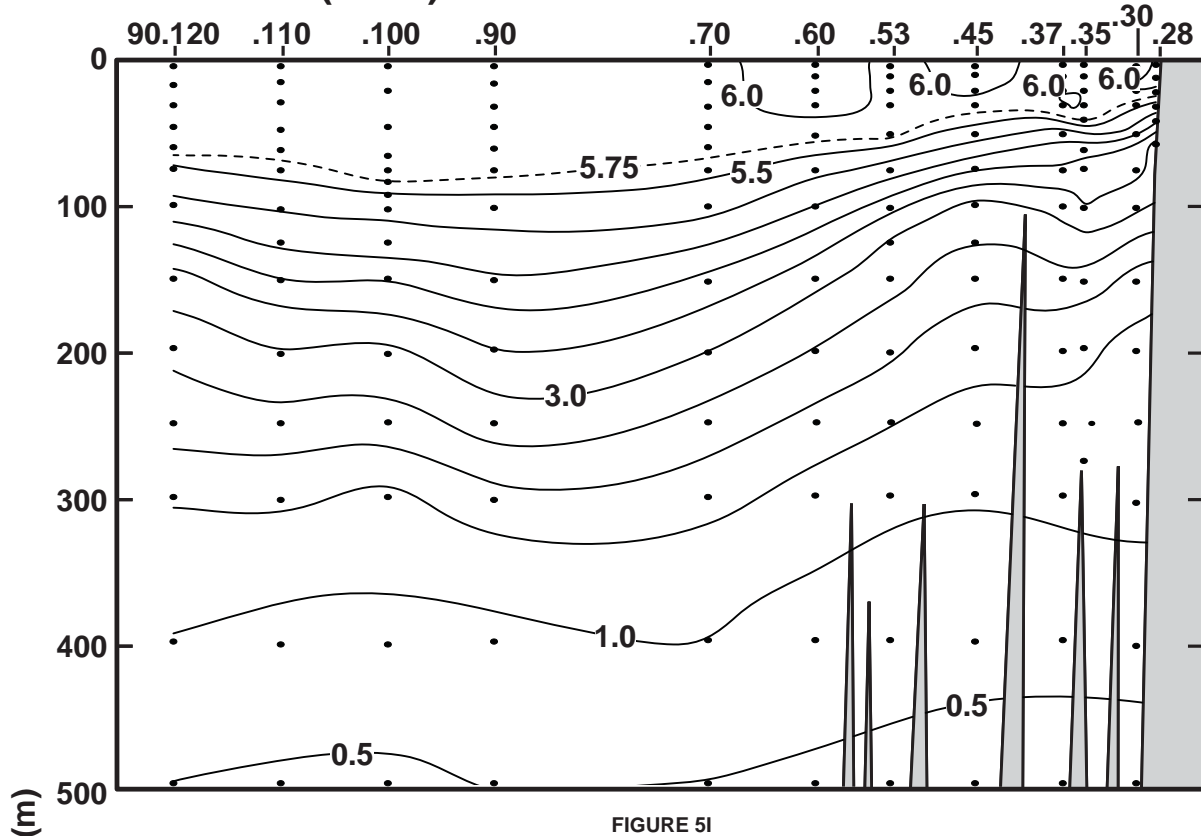


FIGURE 5I

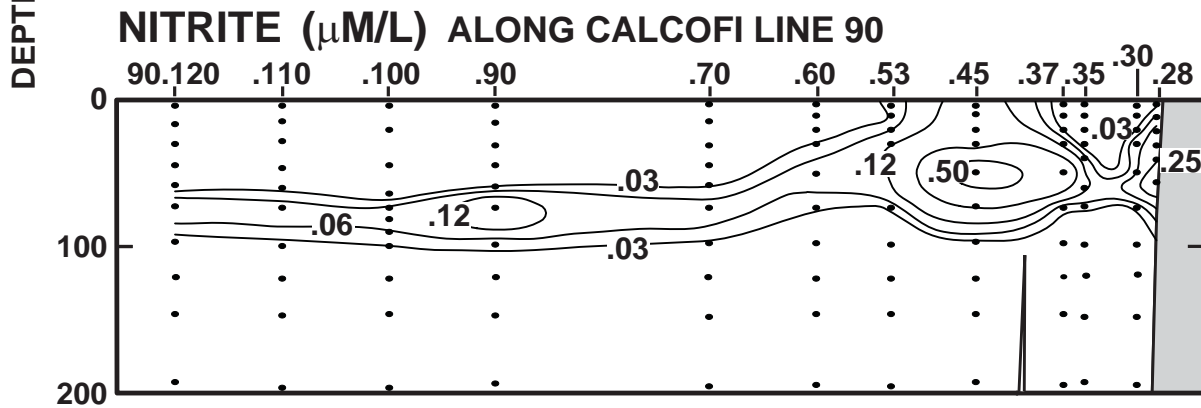


FIGURE 5J

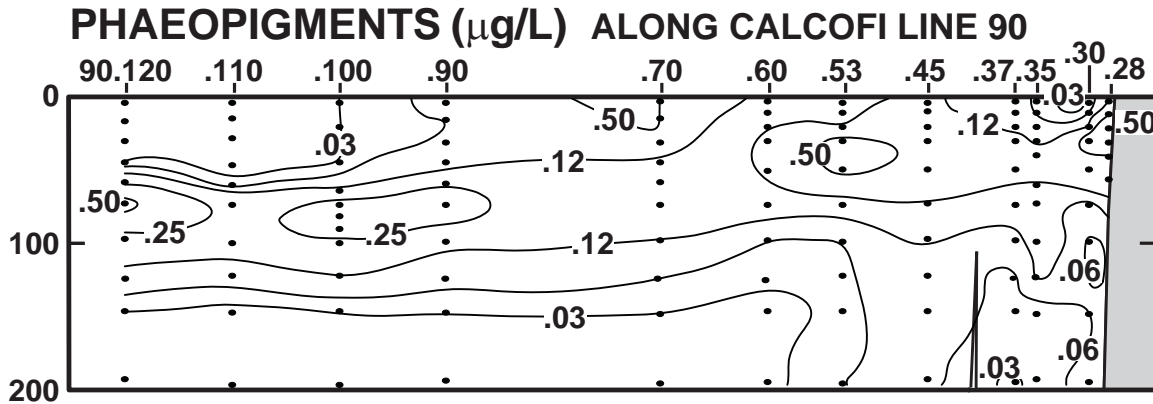


FIGURE 5K

PERSONNEL

CalCOFI Cruise 1004

SHIP'S CAPTAIN

Mike Hopkins, *RV Miller Freeman*

PERSONNEL PARTICIPATING IN THE COLLECTION OF DATA

Griffith, Dave (Chief Scientist)	Fishery Biologist, NMFS
Becker, Susan	Staff Research Associate, SIO
Breese, Dawn	Bird Observer, FIAER
Dovel, Shonna	Staff Research Associate, SIO
Faber, David N.	Staff Research Associate, SIO
Manion, Sue	Fishery Biologist, NMFS
Overcash, Bryan	Staff Research Associate, SIO
Renfree, Josiah	Acoustic Technician, SWFSC
Roadman, Megan	Staff Research Associate, SIO
Wilkinson, James R.	Programmer Analyst, SIO
Wolgast, David M.	Staff Research Associate, SIO

San Diego to San Diego, California, California, 27 April – 17 May, 2010

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 76.7 70.0

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAE0, PRES, SAMP. Includes data rows from 0 to 516 meters depth.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 76.6 80.0

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAE0, PRES, SAMP. Includes data rows from 0 to 515 meters depth.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 76.7 90.0

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAE0, PRES, SAMP. Includes data rows from 0 to 516 meters depth.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 76.7 90.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 43.3 N	123 38.0 W	15/05/10	1925 UTC	4208 m	350	13 kn	340 03 05	2	1019.2 mb	13.9 C	13.3 C	16m		8/8	SC		
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	14.26	14.26	32.956	24.555	337.2	0.000	5.99	102.4	2.8	0.36	0.0	0.00	0.00	0.24	0.07	0	
2 A	14.26	14.26	32.956	24.555	337.2	0.007	5.99	102.4	2.8	0.36	0.0	0.00	0.00	0.24	0.07	2	206
10 ISL	14.24 D	14.24	32.961 D	24.563	336.7	0.034	5.98	102.2	2.6	0.37	0.0	0.00	0.04	0.24	0.07	10	
12 A	14.24	14.24	32.954	24.558	337.2	0.040	5.98	102.2	2.6	0.37	0.0	0.00	0.05	0.24	0.07	12	205
20 ISL	14.20 D	14.20	32.961 D	24.572	336.1	0.067	5.99	102.3	2.6	0.36	0.0	0.00	0.02	0.25	0.07	20	
23 A	14.19	14.19	32.952	24.567	336.7	0.077	5.99	102.3	2.6	0.36	0.0	0.00	0.00	0.25	0.07	23	204
30 ISL	14.19 D	14.19	32.960 D	24.573	336.3	0.101	5.99	102.3	2.6	0.36	0.0	0.00	0.00	0.26	0.08	30	
34 A	14.19	14.19	32.964	24.576	336.1	0.114	5.99	102.3	2.6	0.36	0.0	0.00	0.00	0.27	0.08	34	203
44 A	14.16	14.15	32.952	24.574	336.6	0.148	5.98	102.0	2.6	0.35	0.0	0.00	0.00	0.28	0.08	44	202
50 ISL	14.14 D	14.13	32.963 D	24.586	335.6	0.168	5.98	102.0	2.6	0.35	0.0	0.00	0.00	0.31	0.09	50	
61 A	14.14	14.13	32.954	24.580	336.5	0.205	5.98	102.0	2.6	0.35	0.0	0.00	0.00	0.37	0.11	61	201

A) PRIMARY PRODUCTIVITY SAMPLES WERE TAKEN FROM THESE LEVELS.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 80.0 51.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
34 26.6 N	120 32.5 W	17/05/10	0848 UTC	91 m	340	11 kn			1013.3 mb	11.8 C	11.2 C						
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	11.70	11.70	33.772	25.692	228.9	0.000	6.16	100.4	6.6	0.93	7.4	0.19	0.61	9.76	2.19	0	
2	11.70	11.70	33.772	25.692	229.0	0.005	6.16	100.4	6.6	0.93	7.4	0.19	0.61	9.76	2.19	2	210
5	11.70	11.70	33.765	25.687	229.6	0.011	6.18	100.7	6.5	0.91	7.4	0.19	0.61	9.82	2.08	5	209
10	11.69	11.69	33.767	25.690	229.4	0.023	6.14	100.0	6.6	0.93	7.4	0.19	0.61	9.79	1.87	10	208
20	11.45	11.45	33.766	25.734	225.4	0.046	5.41	87.7	9.7	1.15	10.7	0.22	0.91	7.89	2.05	20	207
30	10.46	10.46	33.859	25.983	202.0	0.067	3.09	49.0	22.7	1.89	21.5	0.30	0.81	2.82	2.27	30	206
40	10.32	10.32	33.893	26.034	197.3	0.087	2.84	44.9	25.2	1.95	23.0	0.29	0.56	2.14	0.94	40	205
50	10.00	9.99	33.934	26.121	189.3	0.106	2.26	35.5	26.8	2.06	25.1	0.28	0.14	1.24	0.94	50	204
60	9.90	9.89	33.966	26.163	185.5	0.125	2.07	32.5	27.6	2.12	25.8	0.27	0.07	1.32	1.24	60	203
70	9.85	9.84	33.987	26.188	183.4	0.144	2.04	32.0	29.1	2.14	26.0	0.26	0.07	1.02	0.97	70	202
75 ISL	9.78 D	9.77	34.005 D	26.214	181.0	0.153	2.02	31.6	29.7	2.15	26.2	0.25	0.07	0.93	0.99	75	
86	9.73	9.72	34.007	26.224	180.3	0.173	1.98	30.9	30.9	2.17	26.5	0.23	0.08	0.72	1.04	86	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 80.0 55.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
34 19.0 N	120 46.8 W	17/05/10	0549 UTC	726 m	310	12 kn			1014.1 mb	11.5 C	11.0 C						
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	10.82	10.82	33.698	25.794	219.2	0.000	5.38	86.0	20.8	1.52	18.0	0.23	0.33	2.11	0.76	0	
2	10.82	10.82	33.698	25.794	219.3	0.004	5.38	86.0	20.8	1.52	18.0	0.23	0.33	2.11	0.76	2	212
10 ISL	10.45 D	10.45	33.671 D	25.838	215.3	0.022	5.19	82.3	20.6	1.52	18.2	0.21	0.31	2.50	1.59	10	
15	10.44	10.44	33.667	25.837	215.5	0.033	5.03	79.7	20.5	1.52	18.4	0.19	0.31	2.67	2.30	15	211
20 ISL	10.41 D	10.41	33.670 D	25.844	214.9	0.043	4.91	77.7	20.8	1.54	18.7	0.19	0.34	2.21	2.74	20	
29	10.38	10.38	33.679	25.857	213.9	0.063	4.78	75.6	21.3	1.58	19.1	0.20	0.39	1.38	3.23	29	210
30 ISL	10.39 D	10.39	33.685 D	25.860	213.7	0.065	4.79	75.8	21.3	1.58	19.1	0.20	0.39	1.41	3.21	30	
45	10.42	10.41	33.704	25.870	213.1	0.097	4.94	78.3	21.2	1.55	18.9	0.20	0.40	2.22	2.86	45	209
50 ISL	10.36 D	10.35	33.724 D	25.896	210.7	0.107	4.88	77.2	21.3	1.56	19.0	0.20	0.41	2.23	2.15	50	
60	10.34	10.33	33.727	25.902	210.4	0.128	4.77	75.4	22.2	1.61	19.7	0.19	0.42	2.24	0.79	60	208
75	10.23	10.22	33.815	25.990	202.4	0.159	4.08	64.4	26.0	1.82	22.2	0.29	0.62	0.80	0.76	75	207
100	9.62	9.61	33.827	26.102	192.2	0.209	2.83	44.1	28.0	1.96	25.4	0.11	0.00	0.12	0.63	101	206
125 ISL	9.20 D	9.19	33.940 D	26.259	177.7	0.255	2.24	34.6	30.6	2.08	27.1	0.06	0.00	0.06	0.47	126	
150	9.28	9.26	34.005	26.297	174.6	0.299	1.94	30.0	34.1	2.20	28.3	0.02	0.00	0.01	0.33	151	205
200	8.59	8.57	34.145	26.516	154.6	0.381	1.20	18.3	44.7	2.51	31.5	0.01	0.00	0.00	0.24	201	204
250 CSL	7.26 D	7.24	34.093 D	26.672	140.1	0.455	1.45	21.4	52.2	2.64	34.2	0.00	0.00			252	
299	6.90	6.87	34.101	26.728	135.3	0.522	1.20	17.6	58.0	2.71	36.2	0.00	0.00			301	203
300 ISL	6.88 D	6.85	34.113 D	26.740	134.2	0.524	1.19	17.4	58.1	2.71	36.2	0.00	0.00			302	
400	6.59	6.55	34.243	26.883	122.0	0.652	0.55	8.0	69.1	2.97	38.0	0.00	0.00			403	202
500 ISL	5.91 D	5.87	34.297 D	27.014	110.4	0.768	0.34	4.9	80.5	3.11	40.0	0.00	0.00			504	
515	5.86	5.82	34.301	27.024	109.7	0.785	0.31	4.4	82.2	3.13	40.3	0.00	0.00			519	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 60.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 34.8 N	120 44.9 W	14/05/10	1253 UTC	1265 m	310	20 kn			1014.3 mb	12.6 c	12.1 c						
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/l	PCT	uM/l	uM/l	uM/l	uM/l	uM/l	ug/l	ug/l	db	
0 ISL	13.27	13.27	33.158	24.913	303.0	0.000	6.06	101.7	5.0	0.53	2.7	0.08	0.12	0.93	0.29	0	
3	13.27	13.27	33.158	24.913	303.1	0.009	6.06	101.7	5.0	0.53	2.7	0.08	0.12	0.93	0.29	3	212
10 ISL	13.27	D 13.27	33.148	D 24.906	304.0	0.030	6.05	101.5	5.0	0.54	2.7	0.08	0.12	0.87	0.27	10	
15	13.27	13.27	33.152	24.909	303.9	0.046	6.05	101.5	5.0	0.54	2.7	0.08	0.12	0.83	0.26	15	211
20 ISL	13.27	D 13.27	33.148	D 24.906	304.3	0.061	6.05	101.5	5.1	0.54	2.7	0.08	0.12	0.84	0.28	20	
30	13.27	13.27	33.150	24.908	304.4	0.091	6.06	101.7	5.2	0.53	2.7	0.08	0.13	0.88	0.32	30	210
45	13.27	13.26	33.150	24.908	304.7	0.137	6.05	101.5	5.2	0.53	2.7	0.08	0.12	0.85	0.29	45	209
50 ISL	13.27	D 13.26	33.149	D 24.908	304.9	0.152	6.05	101.5	5.2	0.53	2.7	0.08	0.13	0.88	0.27	50	
60	13.27	13.26	33.152	24.910	304.9	0.183	6.05	101.5	5.2	0.53	2.7	0.08	0.14	0.93	0.24	60	208
74	13.27	13.26	33.148	24.907	305.6	0.225	6.05	101.5	5.2	0.54	2.7	0.08	0.13	0.88	0.32	74	207
75 ISL	13.26	D 13.25	33.150	D 24.911	305.3	0.228	6.03	101.1	5.3	0.55	2.9	0.08	0.13	0.85	0.32	75	
100	10.18	10.17	33.057	25.407	258.2	0.299	5.28	82.8	10.0	1.00	10.3	0.04	0.00	0.14	0.14	100	206
125 ISL	9.38	D 9.37	33.426	D 25.828	218.6	0.358	4.47	69.1	17.5	1.41	17.3	0.01	0.00	0.08	0.06	126	
149	8.97	8.95	33.691	26.101	193.1	0.408	3.75	57.5	24.9	1.72	22.9	0.00	0.00	0.02	0.04	150	205
150 ISL	9.00	D 8.98	33.781	D 26.167	186.9	0.410	3.73	57.3	25.1	1.73	23.0	0.00	0.00	0.02	0.04	151	
200	8.28	8.26	33.970	26.426	162.9	0.497	2.80	42.3	34.3	2.03	27.9	0.00	0.00	0.01	0.02	201	204
250 ISL	7.61	D 7.59	34.044	D 26.584	148.6	0.575	1.96	29.2	44.0	2.34	31.8	0.00	0.00			251	
300 ISL	7.28	D 7.25	34.117	D 26.689	139.3	0.647	1.28	18.9	53.0	2.61	34.7	0.00	0.00			302	
301	7.28	7.25	34.116	26.688	139.4	0.648	1.27	18.8	53.2	2.62	34.7	0.00	0.00			303	203
400	6.68	6.64	34.217	26.851	125.2	0.779	0.64	9.3	66.5	2.92	37.4	0.00	0.00			403	202
500 ISL	5.96	D 5.92	34.262	D 26.980	113.7	0.899	0.37	5.3	79.6	3.09	39.8	0.00	0.00			503	
515	5.85	5.81	34.270	27.000	111.8	0.916	0.33	4.7	81.6	3.12	40.2	0.00	0.00			519	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 70.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 16.2 N	121 26.9 W	14/05/10	2009 UTC	3790 m	330	20 kn	310 04 05	2	1017.4 mb	13.5 c	13.1 c						
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/l	PCT	uM/l	uM/l	uM/l	uM/l	uM/l	ug/l	ug/l	db	
0 ISL	14.22	14.22	33.145	24.709	322.5	0.000	5.98	102.3	3.1	0.35	0.0	0.01	0.17	0.55	0.18	0	
2	14.22	14.22	33.145	24.709	322.6	0.006	5.98	102.3	3.1	0.35	0.0	0.01	0.17	0.55	0.18	2	212
10	14.22	14.22	33.144	24.708	322.8	0.032	5.99	102.5	3.1	0.37	0.0	0.02	0.32	0.57	0.19	10	211
20	14.21	14.21	33.149	24.715	322.5	0.065	6.00	102.6	3.0	0.36	0.0	0.01	0.11	0.58	0.19	20	210
30	14.22	14.22	33.144	24.709	323.3	0.097	5.98	102.3	3.0	0.35	0.0	0.01	0.11	0.54	0.19	30	209
50	14.21	14.20	33.146	24.713	323.5	0.162	5.97	102.1	3.1	0.35	0.0	0.01	0.07	0.53	0.18	50	208
75	13.99	13.98	33.152	24.764	319.3	0.242	5.93	101.0	3.2	0.41	0.4	0.06	0.37	0.29	0.14	75	207
100 ISL	13.53	D 13.52	33.167	D 24.871	309.8	0.321	5.77	97.3	4.4	0.53	2.2	0.21	0.35	0.16	0.12	100	
101	13.43	13.42	33.169	24.892	307.8	0.324	5.76	96.9	4.5	0.54	2.3	0.22	0.35	0.16	0.12	101	206
125 ISL	10.33	D 10.32	33.276	D 25.553	244.9	0.390	4.86	76.6	11.6	1.03	10.6	0.15	0.18	0.07	0.11	126	
150	9.99	9.97	33.548	25.823	219.7	0.448	3.74	58.6	20.5	1.59	20.2	0.01	0.00	0.02	0.10	151	205
200 ISL	9.18	D 9.16	33.971	D 26.287	176.5	0.547	2.53	39.0	31.3	2.01	26.5	0.00	0.00	0.03	0.07	201	
201	9.18	9.16	33.974	26.290	176.3	0.549	2.51	38.7	31.5	2.01	26.6	0.00	0.00	0.03	0.07	202	204
250 CSL	8.11	D 8.08	34.017	D 26.490	157.8	0.631	2.38	D 35.9	40.5	2.26	30.3	0.00	0.00			251	
299	7.56	7.53	34.082	26.621	145.9	0.705	1.71	25.5	48.3	2.44	32.7	0.00	0.00			301	203
300 ISL	7.53	D 7.50	34.081	D 26.625	145.5	0.707	1.70	25.3	48.4	2.44	32.7	0.00	0.00			302	
400 ISL	6.93	D 6.89	34.193	D 26.798	130.4	0.844	0.84	12.3	61.5	2.81	36.3	0.00	0.00			403	
402	6.88	6.84	34.194	26.806	129.6	0.847	0.83	12.2	61.7	2.82	36.4	0.00	0.00			405	202
500 ISL	5.98	D 5.94	34.215	D 26.941	117.4	0.968	0.50	7.2	75.4	3.03	39.5	0.00	0.00			503	
519	5.89	5.84	34.235	26.968	115.0	0.990	0.44	6.3	78.0	3.07	40.1	0.00	0.00			522	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 70.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 15.0 N	121 26.6 W	14/05/10	1825 UTC	3798 m	330	20 kn	310 04 05	2	1017.4 mb	13.5 c	13.1 c						
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	NO3	NO2	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/l	PCT	uM/l	uM/l	uM/l	uM/l	uM/l	ug/l	ug/l	db	
0 ISL	14.22	14.22	33.145	24.709	322.5	0.000	5.97	102.1	3.0	0.37	0.1	0.02	0.09	0.51	0.19	0	
2 A	14.22	14.22	33.145	24.709	322.6	0.006	5.97	102.1	3.0	0.37	0.1	0.02	0.09	0.51	0.19	2	207
10 A	14.22	14.22	33.145	24.709	322.8	0.032	5.96	102.0	2.8	0.36	0.1	0.02	0.07	0.52	0.19	10	205
10	14.22	14.22	33.144	24.708	322.8	0.032										10	206
20 A	14.22	14.22	33.144	24.709	323.1	0.065	5.96	102.0	2.9	0.36	0.1	0.02	0.05	0.51	0.21	20	204
30 A	14.22	14.22	33.150	24.714	322.9	0.097	5.95	101.8	2.9	0.36	0.0	0.02	0.06	0.55	0.18	30	203
37 A	14.22	14.21	33.144	24.709	323.5	0.119	5.95	101.8	2.7	0.35	0.1	0.01	0.08	0.51	0.18	37	202
50 ISL	14.22	D 14.21	33.144	D 24.710	323.9	0.162	5.95	101.8	3.0	0.35	0.1	0.02	0.09	0.50	0.18	50	
55 A	14.22	14.21	33.146	24.711	323.8	0.178	5.95	101.8	3.1	0.35	0.1	0.02	0.10	0.49	0.18	55	201

A) PRIMARY PRODUCTIVITY SAMPLES WERE TAKEN FROM THESE LEVELS.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP. Data rows for depth 0 to 515.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP. Data rows for depth 0 to 676.

A) SANTA MONICA BASIN STATION. D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND, SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT TYPE, DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP. Data rows for depth 0 to 516.

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS;PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 86.7 110.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
31 19.5 N	123 44.6 W	05/05/10	1713 UTC	3941 m	350	24 kn	330 06 06	0	1021.6 mb	14.9 c	14.1 c	20m		0/8			
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	15.65	15.65	33.124	24.384	353.4	0.000	5.80	102.1	2.9	0.37	0.0	0.00	0.00	0.14	0.04	0	
4 A	15.65	15.65	33.124	24.384	353.5	0.014	5.80	102.1	2.9	0.37	0.0	0.00	0.00	0.14	0.04	4	207
10	15.65	15.65	33.130	24.389	353.3	0.035										10	206
15 A	15.65	15.65	33.123	24.384	353.9	0.053	5.79	101.9	2.8	0.35	0.0	0.00	0.00	0.14	0.04	15	205
20 ISL	15.64 D	15.64	33.123 D	24.386	353.8	0.071	5.79	101.9	2.7	0.35	0.0	0.00	0.00	0.14	0.04	20	204
29 A	15.65	15.65	33.124	24.385	354.2	0.103	5.80	102.1	2.4	0.35	0.0	0.00	0.00	0.13	0.05	29	204
30 ISL	15.65 D	15.65	33.124 D	24.385	354.3	0.106	5.80	102.1	2.4	0.35	0.0	0.00	0.00	0.16	0.07	30	
43 A	15.65	15.64	33.124	24.386	354.6	0.152	5.80	102.1	2.4	0.35	0.0	0.00	0.06	0.49	0.26	43	203
50 ISL	15.65 D	15.64	33.124 D	24.386	354.8	0.177	5.79	101.9	2.2	0.34	0.0	0.00	0.09	0.40	0.14	50	
56 A	15.65	15.64	33.142	24.400	353.6	0.198	5.79	101.9	2.1	0.34	0.0	0.00	0.10	0.29	0.03	56	202
75 ISL	14.25 D	14.24	33.159 D	24.716	324.0	0.263	5.91	101.2	2.3	0.39	0.0	0.00	0.06	0.45	0.24	75	
77 A	14.24	14.23	33.158	24.717	323.9	0.269	5.92	101.3	2.3	0.39	0.0	0.00	0.06	0.47	0.26	77	201

A) PRIMARY PRODUCTIVITY SAMPLES WERE TAKEN FROM THESE LEVELS.
 D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 88.5 30.1

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 40.3 N	118 5.2 W	02/05/10	2110 UTC	19 m	190	09 kn	150 01 04	0	1015.4 mb	16.5 c	15.6 c			0/8			
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	13.69	13.69	33.486	25.082	287.0	0.000	7.59	128.7	3.5	0.46	1.3	0.18	0.12	14.64	1.34	0	
2	13.69	13.69	33.486	25.082	287.0	0.006	7.59	128.7	3.5	0.46	1.3	0.18	0.12	14.64	1.34	2	204
5	13.64	13.64	33.487	25.093	286.1	0.014	7.60	128.8	3.2	0.43	1.1	0.18	0.12	14.66	1.68	5	203
10	13.34	13.34	33.491	25.157	280.1	0.028	7.48	125.9	3.1	0.42	1.6	0.19	0.16	15.49	1.84	10	202
15	11.88	11.88	33.539	25.478	249.7	0.042	5.00	81.7	8.2	1.08	11.0	0.37	0.36	18.67	4.02	15	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 86.8 32.5

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 53.3 N	118 26.7 W	03/05/10	0044 UTC	24 m	270	10 kn	270 01 03	0	1015.3 mb	15.5 c	14.5 c			0/8			
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	14.33	14.33	33.515	24.971	297.5	0.000	7.34	126.1	1.6	0.28	0.2	0.03	0.11	9.87	1.69	0	
2	14.33	14.33	33.515	24.971	297.6	0.006	7.34	126.1	1.6	0.28	0.2	0.03	0.11	9.87	1.69	2	205
5	14.45	14.45	33.506	24.939	300.7	0.015	8.02	138.2	0.4	0.18	0.1	0.01	0.08	8.27	1.33	5	204
10	14.31	14.31	33.523	24.982	296.8	0.030	7.31	125.6	1.5	0.27	0.1	0.02	0.10	11.28	1.60	10	203
14	14.07	14.07	33.525	25.034	291.9	0.042	6.83	116.8	3.1	0.40	0.8	0.06	0.16	10.92	1.65	14	202
20	13.80	13.80	33.527	25.092	286.6	0.059	6.61	112.4	3.1	0.40	1.2	0.06	0.16	10.47	1.58	20	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 90.0 28.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD	AMT	TYPE		
33 29.1 N	117 46.6 W	02/05/10	1749 UTC	87 m	140	08 kn	240 01 05	1	1015.8 mb	16.0 c	15.1 c	15m		2/8	AS		
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			ml/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	15.11	15.11	33.434	24.742	319.4	0.000	6.04	105.4	2.7	0.39	0.3	0.02	0.09	1.53	0.25	0	
2 A	15.11	15.11	33.434	24.742	319.4	0.006	6.04	105.4	2.7	0.39	0.3	0.02	0.09	1.53	0.25	2	206
10 ISL	14.54 D	14.54	33.412 D	24.848	309.6	0.032	6.13	105.7	3.3	0.42	0.7	0.06	0.08	3.00	0.44	10	
11 A	14.39	14.39	33.421	24.886	305.9	0.035	6.14	105.6	3.4	0.42	0.8	0.07	0.08	3.18	0.48	11	205
20 ISL	13.05 D	13.05	33.435 D	25.172	279.0	0.061	5.94	99.4	5.1	0.65	4.1	0.15	0.10	9.68	0.93	20	
21 A	13.01	13.01	33.438	25.182	278.0	0.064	5.90	98.6	5.4	0.68	4.6	0.16	0.10	10.29	0.97	21	204
30 ISL	12.34 D	12.34	33.446 D	25.319	265.2	0.088	5.37	88.5	8.1	0.90	8.3	0.19	0.14	7.46	0.93	30	
31 A	12.32	12.32	33.447	25.324	264.8	0.091	5.30	87.3	8.4	0.92	8.7	0.19	0.15	7.15	0.92	31	203
41 A	11.85	11.84	33.482	25.440	253.9	0.117	4.57	74.6	12.6	1.19	12.9	0.23	0.32	1.46	0.45	41	202
50 ISL	10.91 D	10.90	33.623 D	25.721	227.4	0.138	3.83	61.3	16.9	1.52	17.3	0.38	1.06	1.25	0.47	50	
57 A	10.87	10.86	33.632	25.735	226.2	0.154	3.25	52.0	20.2	1.77	20.8	0.49	1.64	1.08	0.48	57	201

A) PRIMARY PRODUCTIVITY SAMPLES WERE TAKEN FROM THESE LEVELS.
 D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT, TYPE. Includes depth data (DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP).

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02';

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT, TYPE. Includes depth data (DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP).

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02';

Table with columns: LATITUDE, LONGITUDE, DAY/MO/YR, CAST TIME, BOTTOM, WIND SPEED, WAVES, WEA, BAROMETER, DRY, WET, SECCHI, CLD AMT, TYPE. Includes depth data (DEPTH, TEMP, POT TEMP, SALINITY, SIGMA THETA, SVA, DYN HT, OXYGEN, OXY, SI03, P04, N03, N02, NH4, CHL-A, PHAEO, PRES, SAMP).

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02';

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD AMT	TYPE			
30 11.1 N	122 55.4 W	29/04/10	1742 UTC	3817 m	340	27 kn	340 07 06	1	1023.8 mb	14.9 c	13.8 c	20m	7/8	SC			
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			mL/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	16.11	16.11	33.253	24.380	353.8	0.000	5.81	103.3	2.3	0.34	0.1	0.00	0.00	0.08	0.02	0	
3 A	16.11	16.11	33.253	24.380	353.9	0.011	5.81	103.3	2.3	0.34	0.1	0.00	0.00	0.08	0.02	3	206
10 ISL	16.11 D	16.11	33.247	24.376	354.5	0.035	5.76	102.4	2.3	0.34	0.1	0.00	0.00	0.08	0.02	10	
16 A	16.10	16.10	33.253	24.383	354.1	0.057	5.72	101.7	2.2	0.33	0.0	0.00	0.00	0.08	0.02	16	205
20 ISL	16.11 D	16.11	33.248	24.377	354.7	0.071	5.74	102.1	2.1	0.33	0.0	0.00	0.00	0.08	0.02	20	
29 A	16.11	16.11	33.255	24.383	354.5	0.103	5.78	102.8	1.9	0.33	0.0	0.00	0.00	0.07	0.02	29	204
30 ISL	16.11 D	16.11	33.247	24.377	355.1	0.106	5.78	102.8	1.9	0.33	0.0	0.00	0.00	0.07	0.02	30	
43 A	16.11	16.10	33.242	24.373	355.8	0.153	5.72	101.7	1.9	0.32	0.0	0.00	0.00	0.07	0.02	43	203
50 ISL	16.09 D	16.08	33.245	24.380	355.4	0.177	5.73	101.8	1.8	0.32	0.0	0.00	0.00	0.08	0.02	50	
55 A	15.95	15.94	33.249	24.415	352.2	0.195	5.73	101.6	1.8	0.32	0.0	0.00	0.00	0.09	0.02	55	202
75 ISL	15.60 D	15.59	33.236	24.484	346.2	0.265	5.81	102.2	1.8	0.32	0.0	0.00	0.00	0.13	0.05	75	
77 A	15.61	15.60	33.247	24.490	345.7	0.272	5.82	102.4	1.8	0.32	0.0	0.00	0.00	0.13	0.05	77	201

A) PRIMARY PRODUCTIVITY SAMPLES WERE TAKEN FROM THESE LEVELS.
 D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	BOTTOM	WIND	SPEED	WAVES	WEA	BAROMETER	DRY	WET	SECCHI	CLD AMT	TYPE			
29 50.7 N	123 34.9 W	29/04/10	2154 UTC	4079 m	340	22 kn	350 10 05	1	1023.7 mb	15.5 c	12.5 c	19m	4/8	SC			
DEPTH	TEMP	POT TEMP	SALINITY	SIGMA	SVA	DYN HT	OXYGEN	OXY	SI03	P04	N03	N02	NH4	CHL-A	PHAE0	PRES	SAMP
m	DEG C	DEG C		THETA			mL/L	PCT	uM/L	uM/L	uM/L	uM/L	uM/L	ug/l	ug/l	db	
0 ISL	15.76	15.76	33.124	24.360	355.8	0.000	5.83	102.9	2.3	0.33	0.0	0.00	0.08	0.10	0.02	0	
4	15.76	15.76	33.124	24.360	355.9	0.014	5.83	102.9	2.3	0.33	0.0	0.00	0.08	0.10	0.02	4	212
10 ISL	15.76 D	15.76	33.117	24.355	356.6	0.036	5.86	103.4	2.2	0.33	0.0	0.00	0.08	0.10	0.02	10	
19	15.72	15.72	33.120	24.366	355.7	0.068	5.92	104.4	2.0	0.33	0.0	0.00	0.07	0.10	0.02	19	211
20 ISL	15.72 D	15.72	33.114	24.362	356.2	0.071	5.92	104.4	2.0	0.33	0.0	0.00	0.07	0.10	0.02	20	
30 ISL	15.63 D	15.63	33.108	24.377	355.0	0.107	5.90	103.8	2.1	0.33	0.0	0.00	0.04	0.11	0.02	30	
45	15.26	15.25	33.091	24.446	348.9	0.160	5.87	102.5	2.3	0.33	0.0	0.00	0.00	0.13	0.03	45	210
50 ISL	15.19 D	15.18	33.084	24.456	348.1	0.177	5.87	102.4	2.3	0.33	0.0	0.00	0.00	0.15	0.06	50	
63	14.84	14.83	33.084	24.532	341.2	0.222	5.87	101.6	2.4	0.34	0.0	0.00	0.00	0.26	0.13	63	209
75 ISL	13.97 D	13.96	33.107	24.734	322.3	0.262	5.90	100.4	2.0	0.37	0.1	0.07	0.04	0.53	0.50	75	
81	13.91	13.90	33.134	24.767	319.2	0.281	5.91	100.4	1.9	0.40	0.1	0.11	0.05	0.59	0.62	81	208
91	13.59	13.58	33.200	24.884	308.4	0.312	5.73	96.8	2.6	0.50	1.3	0.18	0.00	0.28	0.38	91	207
100	13.10	13.09	33.207	24.988	298.6	0.340	5.58	93.3	4.1	0.61	3.3	0.01	0.00	0.19	0.22	100	206
125 CSL	11.03 D	11.01	33.167	25.346	264.7	0.410	5.16	82.5	8.5	0.95	9.2	0.01	0.00	0.11	0.13	126	
150 ISL	10.33 D	10.31	33.370	25.627	238.5	0.473	4.58	72.2	13.3	1.28	14.8	0.00	0.00	0.03	0.04	151	
151	10.36	10.34	33.357	25.612	239.9	0.475	4.56	72.0	13.5	1.29	15.0	0.00	0.00	0.03	0.04	152	205
200	9.34	9.32	33.781	26.113	193.1	0.581	3.46	53.5	24.1	1.74	23.1	0.00	0.00	0.00	0.02	201	204
250 CSL	8.39 D	8.36	33.988	26.425	164.1	0.671	2.78	42.1	34.0	2.06	28.0	0.00	0.00			251	
300 ISL	7.75 D	7.72	34.053	26.571	150.7	0.749	2.02	30.2	43.4	2.31	31.3	0.00	0.00			302	
302	7.74	7.71	34.056	26.575	150.4	0.752	2.00	29.9	43.8	2.32	31.4	0.00	0.00			304	203
399	6.62	6.58	34.122	26.784	131.4	0.889	1.05	15.3	61.7	2.78	37.0	0.00	0.00			401	202
400 ISL	6.61 D	6.57	34.127	26.789	130.9	0.890	1.05	15.3	61.8	2.78	37.0	0.00	0.00			402	
500 ISL	5.80 D	5.76	34.193	26.945	116.7	1.014	0.63	9.0	76.0	3.00	39.8	0.00	0.00			503	
515	5.75	5.71	34.202	26.959	115.6	1.032	0.57	8.1	78.1	3.03	40.2	0.00	0.00			518	201

D) CTD DATA USED ON STANDARD LEVELS AND MISSING FIELDS; PRIMARY T; PRIMARY CORRECTED S; STATION CORRECTED 2° 02;

PRIMARY PRODUCTIVITY CASTS

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 76.7 90.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
33 43.3 N		123 38.0 W		15/05/10	1925 UTC	16 m	1208 - 1920 PST					1211 PST	1934 PST	113.7 mg C/m ²			
DEPTH m	TEMP DEG C	SALINITY	SIGMA THETA	OXYGEN mL/L	OXY PCT	SI03 uM/L	P04 uM/L	N03 uM/L	N02 uM/L	CHL-A ug/L	PHAE0 ug/L	LIGHT PCT	UPTAKE (mg C/m ³)				
													1	2	MEAN	DARK	
2	14.26	32.956	24.555	5.99	102.4	2.8	0.36	0.0	0.00	0.24	0.07	83. A	3.7	3.8	3.7	0.11	
12	14.24	32.954	24.558	5.98	102.2	2.6	0.37	0.0	0.00	0.24	0.07	32.	4.1	4.0	4.1	0.12	
23	14.19	32.952	24.567	5.99	102.3	2.6	0.36	0.0	0.00	0.25	0.07	11.	2.7	2.5	2.6	0.13	
34	14.19	32.964	24.576	5.99	102.3	2.6	0.36	0.0	0.00	0.27	0.08	3.8	1.1	0.87	0.97	0.11	
44	14.16	32.952	24.574	5.98	102.0	2.6	0.35	0.0	0.00	0.28	0.08	1.5	0.36	0.43	0.40	0.10	
61	14.14	32.954	24.580	5.98	102.0	2.6	0.35	0.0	0.00	0.37	0.11	0.29	0.07	0.06	0.07	0.05	

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 40.6

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
34 13.6 N		119 25.2 W		13/05/10	1859 UTC	5 m	1154 - 1906 PST					1154 PST	1922 PST	3322.6 mg C/m ²			
DEPTH m	TEMP DEG C	SALINITY	SIGMA THETA	OXYGEN mL/L	OXY PCT	SI03 uM/L	P04 uM/L	N03 uM/L	N02 uM/L	CHL-A ug/L	PHAE0 ug/L	LIGHT PCT	UPTAKE (mg C/m ³)				
													1	2	MEAN	DARK	
3	12.47	33.719	25.505	7.13	118.0	6.8	0.62	3.3	0.25	19.13	0.21	40. A	256.3	264.6	260.4	1.2	
4	12.33	33.725	25.537	7.05	116.4	7.1	0.63	3.7	0.25	16.88	0.75						
7	12.24	33.716	25.547	6.73	110.9	8.1	0.81	5.3	0.26	16.89	0.35	12.	257.7	234.1	245.9	1.3	
11	11.52	33.700	25.670	5.46	88.6	12.2	1.12	11.1	0.31	12.70	1.27	3.4	185.4	161.4	173.4	1.0	
14	11.51	33.698	25.670	5.41	87.7	12.4	1.13	11.2	0.31	13.00 B	0.83 B	1.4	47.4	51.3	49.4	0.31	
19	11.51	33.693	25.666	5.41	87.7	12.2	1.14	11.3	0.30	14.44	0.41	0.29	27.9	28.3	28.1	0.32	
30	11.06		4.47			17.1	1.47	15.0	0.38	5.86	1.53	0.01	0.90	1.8	1.4	0.23	

B) FIRST FLUOROMETER READING NOT RECORDED, CHLOROPHYLL AND PHAEOPIGMENT CALCULATED WITH ASSUMED ACID RATIO INTERPOLATED FROM ADJACENT LEVELS.

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 70.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
33 15.0 N		121 26.6 W		14/05/10	1825 UTC	14 m	1205 - 1918 PST					1202 PST	1930 PST	307.8 mg C/m ²			
DEPTH m	TEMP DEG C	SALINITY	SIGMA THETA	OXYGEN mL/L	OXY PCT	SI03 uM/L	P04 uM/L	N03 uM/L	N02 uM/L	CHL-A ug/L	PHAE0 ug/L	LIGHT PCT	UPTAKE (mg C/m ³)				
													1	2	MEAN	DARK	
2	14.22	33.145	24.709	5.97	102.1	3.0	0.37	0.1	0.02	0.51	0.19	80. A	13.2	12.4	12.8	0.07	
10	14.22	33.145	24.709	5.96	102.0	2.8	0.36	0.1	0.02	0.52	0.19	33.	13.5	13.5	13.5	0.08	
20	14.22	33.144	24.709	5.96	102.0	2.9	0.36	0.1	0.02	0.51	0.21	11.	7.2	6.7	6.9	0.06	
30	14.22	33.150	24.714	5.95	101.8	2.9	0.36	0.0	0.02	0.55	0.18	3.7	2.9	2.5	2.7	0.06	
37	14.22	33.144	24.709	5.95	101.8	2.7	0.35	0.1	0.01	0.51	0.18	1.7	1.1	1.1	1.1	0.04	
55	14.22	33.146	24.711	5.95	101.8	3.1	0.35	0.1	0.02	0.49	0.18	0.24	0.41	0.43	0.42	0.05	

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 83.3 80.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
32 54.6 N		122 7.7 W		06/05/10	1836 UTC	17 m	1204 - 1908 PST					1205 PST	1919 PST	130.4 mg C/m ²			
DEPTH m	TEMP DEG C	SALINITY	SIGMA THETA	OXYGEN mL/L	OXY PCT	SI03 uM/L	P04 uM/L	N03 uM/L	N02 uM/L	CHL-A ug/L	PHAE0 ug/L	LIGHT PCT	UPTAKE (mg C/m ³)				
													1	2	MEAN	DARK	
4	14.43	33.012	24.562	5.95	102.1	2.1	0.33	0.1	0.00	0.19	0.06	70. A	2.1	2.2	2.2	0.07	
12	14.43	33.014	24.564														
13	14.43	33.015	24.565	5.96	102.3	2.5	0.34	0.0	0.00	0.19	0.07	31.	4.3	4.3	4.3	0.08	
24	14.41	33.013	24.568	5.95	102.1	1.7	0.34	0.0	0.00	0.19	0.06	11.	3.6	3.6	3.6	0.04	
36	14.38	33.015	24.576	5.98	102.5	2.0	0.33	0.0	0.00	0.21	0.07	3.9	1.4	1.2	1.3	0.07	
47	14.36	33.014	24.580	5.95	102.0	2.6	0.32	0.0	0.00	0.21	0.08	1.4	0.80	0.78	0.79	0.07	
65	14.34	33.012	24.583	5.96	102.1	2.8	0.32	0.0	0.00	0.23	0.09	0.28	0.05	0.15	0.10	0.05	

A) INCUBATION LIGHT INTENSITIES WERE 94, 32, 11, 3.8, 1.5, 0.28 PERCENT RESPECTIVELY.

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 86.7 50.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE				
33 19.7 N	119 40.2 W	03/05/10	1609 UTC	8 m	1151 - 1912 PST					1203 PST	1905 PST	2035.5 mg C/m2				
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	ML/L	PCT	UM/L	UM/L	UM/L	UM/L	UG/L	UG/L	PCT	1	2	MEAN	DARK
3	13.49	33.499	25.133	6.64	112.1	2.1	0.43	1.3	0.14	8.61	1.10	56. A	132.9	116.4	124.7	0.38
6	13.35	33.502	25.163	6.47	109.0	3.1	0.50	2.4	0.20	7.30	1.10	32.	165.2	161.3	163.2	0.38
11	12.96	33.503	25.242	6.12	102.2	4.9	0.63	4.4	0.22	6.09	1.08	12.	92.8	91.8	92.3	0.37
18	12.72	33.506	25.292	5.70	94.7	7.5	0.77	6.6	0.25	4.27	0.85	3.2	33.1	30.8	31.9	0.17
22	12.63	33.506	25.309	5.60	92.9	7.9	0.80	7.0	0.27	3.78	0.77	1.5	12.6	13.1	12.9	0.13
32	11.37	33.556	25.586	4.47	72.2	13.5	1.20	13.6	0.22	1.53	0.58	0.22	0.32	0.48	0.40	0.07

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 86.7 70.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE				
32 39.5 N	121 2.4 W	04/05/10	1811 UTC	15 m	1206 - 1904 PST					1201 PST	1918 PST	412.0 mg C/m2				
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	ML/L	PCT	UM/L	UM/L	UM/L	UM/L	UG/L	UG/L	PCT	1	2	MEAN	DARK
2	14.34	33.186	24.715	6.00	102.9	2.6	0.37	0.0	0.02	0.47	0.20	81. A	4.9	4.9	4.9	0.10
11	14.33	33.185	24.717	5.99	102.7	2.5	0.37	0.0	0.02	0.47	0.19	32.	14.1	13.8	14.0	0.11
21	14.30	33.186	24.724	5.99	102.7	2.4	0.37	0.0	0.02	0.53	0.19	12.	11.9	12.1	12.0	0.12
31	14.29	33.189	24.729	5.98	102.5	2.4	0.36	0.0	0.02	0.56	0.25	4.2	6.9	5.6	6.3	0.09
42	14.21	33.186	24.744	5.92	101.3	2.4	0.39	0.1	0.06	0.52	0.24	1.4	4.6	4.4	4.5	0.05
57	12.29	33.059	25.029	5.58	91.6	5.3	0.68	4.6	0.11	0.27	0.30	0.29	0.39	0.28	0.34	0.03

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 86.7 110.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE				
31 19.5 N	123 44.6 W	05/05/10	1713 UTC	20 m	1218 - 1915 PST					1212 PST	1924 PST	74.7 mg C/m2				
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	ML/L	PCT	UM/L	UM/L	UM/L	UM/L	UG/L	UG/L	PCT	1	2	MEAN	DARK
4	15.65	33.124	24.384	5.80	102.1	2.9	0.37	0.0	0.00	0.14	0.04	74. A	1.2	1.0	1.1	0.08
10	15.65	33.130	24.389													
15	15.65	33.123	24.384	5.79	101.9	2.8	0.35	0.0	0.00	0.14	0.04	32.	2.8	2.7	2.7	0.08
29	15.65	33.124	24.385	5.80	102.1	2.4	0.35	0.0	0.00	0.13	0.05	11.	1.3	1.3	1.3	0.07
43	15.65	33.124	24.386	5.80	102.1	2.4	0.35	0.0	0.00	0.49	0.26	3.7	0.61	0.58	0.59	0.07
56	15.65	33.142	24.400	5.79	101.9	2.1	0.34	0.0	0.00	0.29	0.03	1.4	0.22	0.19	0.20	0.06
77	14.24	33.158	24.717	5.92	101.3	2.3	0.39	0.0	0.00	0.47	0.26	0.27	0.08	0.09	0.09	0.04

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 90.0 28.0

LATITUDE	LONGITUDE	DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME					LAN	CIVIL TWILIGHT	INTEGRATED VALUE				
33 29.1 N	117 46.6 W	02/05/10	1749 UTC	15 m	1148 - 1906 PST					1155 PST	1900 PST	2815.0 mg C/m2				
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	ML/L	PCT	UM/L	UM/L	UM/L	UM/L	UG/L	UG/L	PCT	1	2	MEAN	DARK
2	15.11	33.434	24.742	6.04	105.4	2.7	0.39	0.3	0.02	1.53	0.25	81. A	40.5	40.9	40.7	0.20
11	14.39	33.421	24.886	6.14	105.6	3.4	0.42	0.8	0.07	3.18	0.48	32.	96.8	90.9	93.8	0.15
21	13.01	33.438	25.182	5.90	98.6	5.4	0.68	4.6	0.16	10.29	0.97	12.	132.5	122.4	127.5	0.27
31	12.32	33.447	25.324	5.30	87.3	8.4	0.92	8.7	0.19	7.15	0.92	4.2	31.9	34.8	33.4	0.17
41	11.85	33.482	25.440	4.57	74.6	12.6	1.19	12.9	0.23	1.46	0.45	1.5	3.8	3.5	3.7	0.06
57	10.87	33.632	25.735	3.25	52.0	20.2	1.77	20.8	0.49	1.08	0.48	0.29	0.22	0.33	0.28	0.13

A) INCUBATION LIGHT INTENSITIES WERE 94, 32, 11, 3.8, 1.5, 0.28 PERCENT RESPECTIVELY.

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 93.3 35.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME				LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
32 41.2 N		117 52.4 W		27/04/10	1803 UTC	21 m	1155 - 1900 PST				1149 PST	1859 PST	826.6 mg C/m2			
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	mL/L	PCT	uM/L	uM/L	uM/L	uM/L	ug/L	ug/L	PCT	1	2	MEAN	DARK
2	15.87	33.452	24.587	6.06	107.4	3.0	0.32	0.1	0.00	0.41	0.17	86. A	16.9	17.1	17.0	0.20
15	15.27	33.421	24.697	6.16	107.8	2.0	0.30	0.0	0.00	0.54	0.17	33.	19.7	19.1	19.4	0.33
30	14.89	33.396	24.761	6.10	105.9	2.1	0.34	0.0	0.00	0.64	0.30	11.	14.9	14.6	14.8	0.37
45	12.56			5.16		7.6	0.83	6.4	0.19	0.89	0.77	3.7	10.2	9.7	9.9	0.08
57	11.66	33.450	25.451	4.19	68.1	13.5	1.28	13.2	0.41	0.51	0.51	1.6	3.0	3.2	3.1	0.05
80	10.75	33.897	25.963	2.28	36.4	25.4	2.01	23.2	0.00	0.08	0.19	0.29	0.05	0.06	0.05	0.03

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 93.3 70.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME				LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
31 31.4 N		120 14.1 W		28/04/10	1805 UTC	25 m	1203 - 1905 PST				1158 PST	1907 PST	101.3 mg C/m2			
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	mL/L	PCT	uM/L	uM/L	uM/L	uM/L	ug/L	ug/L	PCT	1	2	MEAN	DARK
3	15.39	33.113	24.433	5.82	101.9	2.7	0.37	0.1	0.00	0.09	0.02	83. A	0.05	0.04	0.04	0.00
18	15.32	33.103	24.442	5.82	101.8	2.7	0.35	0.0	0.00	0.09	0.02	33.	3.1	3.6	3.3	0.10
36	15.16	33.089	24.466	5.84	101.8	2.3	0.35	0.0	0.00	0.11	0.03	11.	1.9	1.9	1.9	0.10
53	14.93			5.87		2.4	0.34	0.0	0.00	0.20	0.07	3.9	0.59	0.47	0.53	0.06
67	14.54	33.130	24.632	5.95	102.4	2.6	0.37	0.0	0.00	0.35	0.21	1.6	0.20	0.22	0.21	0.05
95	11.47	33.103	25.217	5.41	87.3	6.9	0.80	6.7	0.00	0.21	0.21	0.29	0.04	0.04	0.04	0.04

RV MILLER FREEMAN

CALCOFI CRUISE 1004

STATION 93.3 110.0

LATITUDE		LONGITUDE		DAY/MO/YR	CAST TIME	SECCHI	INCUBATION TIME				LAN	CIVIL TWILIGHT	INTEGRATED VALUE			
30 11.1 N		122 55.4 W		29/04/10	1742 UTC	20 m	1209 - 1907 PST				1209 PST	1918 PST	42.0 mg C/m2			
DEPTH	TEMP	SALINITY	SIGMA	OXYGEN	OXY	SI03	P04	N03	N02	CHL-A	PHAE0	LIGHT	UPTAKE (mg C/m3)			
m	DEG C		THETA	mL/L	PCT	uM/L	uM/L	uM/L	uM/L	ug/L	ug/L	PCT	1	2	MEAN	DARK
3	16.11	33.253	24.380	5.81	103.3	2.3	0.34	0.1	0.00	0.08	0.02	79. A	1.2	1.1	1.1	0.02
16	16.10	33.253	24.383	5.72	101.7	2.2	0.33	0.0	0.00	0.08	0.02	29.	1.4	1.4	1.4	0.02
29	16.11	33.255	24.383	5.78	102.8	1.9	0.33	0.0	0.00	0.07	0.02	11.	0.62	0.62	0.62	0.02
43	16.11	33.242	24.373	5.72	101.7	1.9	0.32	0.0	0.00	0.07	0.02	3.7	0.24	0.20	0.22	0.04
55	15.95	33.249	24.415	5.73	101.6	1.8	0.32	0.0	0.00	0.09	0.02	1.5	0.11	0.11	0.11	0.00
77	15.61	33.247	24.490	5.82	102.4	1.8	0.32	0.0	0.00	0.13	0.05	0.27	0.01	0.02	0.02	0.01

A) INCUBATION LIGHT INTENSITIES WERE 94, 32, 11, 3.8, 1.5, 0.28 PERCENT RESPECTIVELY.

CalCOFI Cruise 1004

MACROZOOPLANKTON BIOMASS

Net Mesh Size: 0.505mm

Line	Sta.	Latitude N	Longitude W	Date Mo/Day	Time (PST)		Water Volume Strained (m ³)	Max. Tow Depth (m)	Volume per 1000 m ³ Strained	
					Start	End			Total (cm ³)	Small (cm ³)
66.7	50.0	36 47.0	122 03.2	04-18	1135	1156	386	209	549	549
66.7	55.0	36 37.1	122 24.9	04-18	1757	1818	418	213	105	105
66.7	60.0	36 27.2	122 46.3	04-18	2245	2305	419	210	45	45
66.7	70.0	36 07.2	123 29.1	04-19	0818	0839	449	211	42	42
66.7	80.0	35 47.3	124 11.6	04-19	2225	2245	392	214	94	94
73.3	55.0	35 28.8	121 36.6	04-17	1900	1920	383	209	115	115
73.3	60.0	35 19.1	121 58.2	04-17	1433	1454	411	213	34	34
73.3	70.0	34 58.7	122 39.9	04-17	0718	0739	440	212	55	55
73.3	80.0	34 38.5	123 21.9	04-16	1841	1901	401	210	97	97
73.3	90.0	34 19.4	124 03.4	04-16	1403	1424	458	208	39	39
75.8	51.0	35 10.4	121 01.0	04-15	0234	0255	375	215	80	80
75.8	55.0	35 02.7	121 18.4	04-15	0623	0645	453	213	40	40
75.8	60.0	34 52.7	121 39.4	04-15	0914	0934	441	216	66	66
75.8	70.0	34 32.6	122 21.4	04-15	1410	1432	439	212	43	43
75.8	80.0	34 12.5	123 03.3	04-15	1853	1913	432	200	72	72
75.8	90.0	33 52.6	123 44.7	04-16	0955	1016	428	213	28	28
76.7	49.0	35 05.2	120 46.5	05-16	1236	1241	109	46	394	339
76.7	51.0	35 01.3	120 55.1	05-16	1020	1042	398	203	116	116
76.7	55.0	34 53.2	121 11.9	05-16	0715	0736	423	210	184	128
76.7	60.0	34 43.2	121 32.8	05-16	0334	0354	397	210	156	156
76.7	70.0	34 23.3	122 14.8	05-15	2208	2230	432	210	93	93
76.7	80.0	34 03.3	122 56.5	05-15	1620	1641	383	209	123	123
76.7	90.0	33 43.3	123 38.0	05-15	1030	1050	401	211	25	25
78.3	51.0	34 44.7	120 43.6	04-14	2220	2225	112	48	587	587
78.3	55.0	34 36.7	121 00.4	04-14	1828	1847	388	210	108	108
78.3	60.0	34 26.4	121 21.1	04-14	1522	1541	379	211	98	98
78.3	70.0	34 06.6	122 03.0	04-14	1021	1041	404	210	59	59
78.3	80.0	33 46.7	122 44.7	04-14	0555	0616	430	205	33	33
78.3	90.0	33 26.7	123 25.9	04-13	2344	0004	416	202	43	43
80.0	55.0	34 18.8	120 47.0	05-16	2259	2320	386	209	161	161
80.0	60.0	34 08.8	121 08.8	05-16	1908	1929	359	218	125	125
80.0	70.0	33 48.9	121 50.6	05-14	1820	1842	424	210	50	50
80.0	80.0	33 29.9	122 32.0	05-14	2349	0010	403	215	30	30
80.0	90.0	33 09.3	123 13.1	05-15	0515	0536	405	212	35	35
81.7	45.0	34 21.4	119 54.3	04-12	1332	1352	403	212	419	419
81.7	50.0	34 11.1	120 15.2	04-12	1623	1642	388	209	175	175
81.7	55.0	34 01.4	120 37.1	04-12	2127	2146	417	215	137	137
81.7	60.0	33 51.9	120 57.6	04-13	0145	0207	449	206	310	310
81.7	70.0	33 31.5	121 38.1	04-13	0841	0903	446	213	22	22
81.7	80.0	33 11.1	122 19.4	04-13	1320	1341	430	212	28	28
81.7	90.0	32 51.4	122 59.8	04-13	1756	1817	435	204	28	28
81.8	46.9	34 16.4	120 01.2	05-13	1715	1736	329	215	182	182
83.3	40.6	34 13.6	119 24.9	05-13	1147	1150	57	24	141	141
83.3	42.0	34 10.8	119 30.3	05-13	1332	1340	121	73	710	710
83.3	51.0	33 52.6	120 08.0	05-13	2301	2310	144	78	244	244
83.3	55.0	33 44.3	120 24.2	05-14	0215	0236	358	213	179	179
83.3	60.0	33 34.8	120 45.2	05-14	0611	0632	380	204	87	87
83.3	70.0	33 14.8	121 26.6	05-14	1122	1143	424	210	73	73
83.3	80.0	32 54.6	122 07.6	05-06	1107	1128	377	215	34	34
83.3	90.0	32 34.1	122 48.3	05-06	0440	0502	440	210	16	16
83.3	100.0	32 14.6	123 29.6	05-05	2207	2227	400	214	15	15
83.3	110.0	31 54.6	124 10.3	05-05	1613	1635	448	214	16	16
85.0	40.0	33 57.1	119 10.4	04-09	0701	0721	362	212	246	246
85.0	45.0	33 45.5	119 27.5	04-09	0215	0236	413	211	373	298
85.0	50.0	33 37.0	119 51.7	04-08	2105	2125	414	207	244	244
85.0	55.0	33 26.2	120 12.2	04-08	1703	1722	360	217	170	170
85.0	60.0	33 16.9	120 33.0	04-08	1350	1411	456	209	57	57
85.0	70.0	32 56.8	121 14.3	04-08	0906	0928	461	209	13	13
85.0	80.0	32 37.3	121 55.2	04-08	0424	0445	450	211	18	18
86.7	33.0	33 53.3	118 30.4	05-02	1851	1856	105	47	181	181
86.7	35.0	33 49.4	118 37.7	05-02	2110	2131	425	204	144	115
86.7	40.0	33 39.2	118 58.5	05-03	0055	0116	426	213	178	178
86.7	45.0	33 29.3	119 18.8	05-03	0532	0552	422	204	173	173
86.7	50.0	33 19.5	119 40.0	05-03	0915	0920	130	43	169	169
86.7	55.0	33 09.5	120 00.1	05-03	1426	1447	423	212	114	114
86.7	60.0	32 59.3	120 20.7	05-03	1857	1918	363	203	314	314
86.7	70.0	32 39.3	121 02.0	05-04	1108	1131	450	220	36	36
86.7	80.0	32 19.4	121 42.8	05-04	1716	1737	407	213	20	20
86.7	90.0	31 59.4	122 23.4	05-04	2222	2243	408	218	20	20
86.7	100.0	31 39.0	123 04.1	05-05	0343	0403	437	215	18	18
86.7	110.0	31 19.4	123 44.7	05-05	0816	0838	478	213	33	33
86.8	32.5	33 53.3	118 26.7	05-02	1700	1703	80	16	50	50
88.3	33.0	33 34.9	118 18.6	04-06	1745	1804	372	209	83	83
88.3	40.0	33 22.7	118 47.6	04-06	2243	2304	424	214	210	210
88.3	45.0	33 12.8	119 08.4	04-07	0253	0314	435	208	237	237
88.3	50.0	33 02.7	119 28.4	04-07	0550	0611	438	209	87	87
88.3	55.0	32 52.7	119 49.1	04-07	0843	0904	445	213	112	112
88.3	60.0	32 42.7	120 09.6	04-07	1137	1158	448	212	45	45
88.3	70.0	32 22.8	120 50.4	04-07	1601	1620	418	204	86	86
88.3	80.0	32 03.1	121 31.7	04-07	2134	2155	414	212	31	31
88.5	30.1	33 40.2	118 05.2	05-02	1325	1327	37	20	54	54
90.0	28.0	33 29.1	117 46.1	05-02	1050	1101	224	90	120	120
90.0	30.0	33 25.3	117 54.2	05-02	0809	0830	431	214	325	262

90.0	35.0	33 15.3	118 14.1	05-02	0412	0432	413	207	198	198
90.0	37.0	33 11.5	118 22.7	05-02	0057	0116	388	213	294	294
90.0	45.0	32 54.9	118 56.2	05-01	1952	2013	439	209	155	155
90.0	53.0	32 38.7	119 28.7	05-01	1505	1525	408	212	69	69
90.0	60.0	32 24.9	119 57.3	05-04	0015	0035	408	219	135	135
90.0	70.0	32 05.0	120 38.3	05-04	0533	0554	452	209	44	44
90.0	70.0	32 05.0	120 38.3	05-01	0528	0548	455	208	35	35
90.0	80.0	31 45.0	121 18.9	04-30	2054	2115	411	219	34	34
90.0	90.0	31 25.0	121 59.6	04-30	1430	1452	448	212	63	63
90.0	100.0	31 05.3	122 39.8	04-30	0746	0804	427	214	80	80
90.0	110.0	30 44.3	123 19.2	04-30	0225	0245	472	212	40	40
90.0	120.0	30 24.9	123 59.9	04-29	2108	2128	425	210	97	97
91.7	26.4	33 14.4	117 27.8	04-26	2108	2110	55	21	73	73
91.7	30.0	33 07.4	117 42.4	04-06	1254	1314	365	215	164	164
91.7	35.0	32 57.4	118 03.3	04-06	1004	1025	406	212	180	168
91.7	40.0	32 45.8	118 22.6	04-06	0701	0722	424	212	290	290
91.7	45.0	32 38.5	118 44.6	04-06	0320	0342	435	212	352	303
91.7	50.0	32 28.4	118 29.8	04-05	2205	2225	406	210	113	113
91.7	55.0	32 17.6	119 25.7	04-05	1635	1657	458	202	118	118
91.7	60.0	32 07.4	119 44.9	04-05	1352	1412	405	205	62	62
91.7	70.0	31 47.4	120 26.3	04-05	0920	0940	439	212	55	55
91.7	80.0	31 27.4	121 06.8	04-05	0323	0344	473	212	42	42
91.7	90.0	31 07.5	121 47.1	04-04	1906	1924	397	210	58	58
93.3	26.7	32 57.2	117 18.5	04-27	0014	0036	419	221	62	62
93.3	28.0	32 54.5	117 23.6	04-27	0234	0253	392	209	153	153
93.3	30.0	32 50.9	117 31.9	04-27	0512	0533	398	211	186	186
93.3	35.0	32 40.7	117 52.4	04-27	0900	0919	369	215	336	336
93.3	40.0	32 30.9	118 12.8	04-27	1337	1358	409	212	406	406
93.3	45.0	32 20.8	118 33.2	04-27	1715	1737	418	214	86	86
93.3	50.0	32 10.8	118 53.6	04-27	2041	2102	379	205	103	103
93.3	55.0	32 00.8	119 13.8	04-28	0013	0035	446	214	76	76
93.3	60.0	31 50.7	119 34.3	04-28	0500	0520	415	207	246	246
93.3	70.0	31 30.8	120 14.7	04-28	1056	1117	390	215	33	33
93.3	80.0	31 10.8	120 55.1	04-28	1710	1731	412	214	39	39
93.3	90.0	30 50.8	121 35.3	04-28	2213	2234	418	215	67	67
93.3	100.0	30 30.5	122 15.3	04-29	0326	0346	424	211	40	40
93.3	110.0	30 10.8	122 55.5	04-29	0842	0903	478	206	31	31
93.3	120.0	29 50.6	123 35.2	04-29	1502	1522	426	211	143	143
93.4	26.4	32 56.6	117 16.9	04-26	1850	1852	56	19	392	392
93.9	36.3	32 32.2	117 52.9	04-03	0323	0345	429	203	100	65
94.8	40.6	32 13.9	118 04.9	04-03	0628	0649	420	213	179	152
94.9	29.9	32 34.5	117 20.6	04-02	2133	2145	240	118	225	225
95.0	45.0	32 03.5	118 21.6	04-03	1049	1110	440	209	250	250
95.0	50.0	31 53.1	118 41.3	04-03	1347	1407	486	190	99	78
95.0	55.0	31 43.4	119 02.1	04-03	1650	1710	380	207	82	82
95.0	60.0	31 33.1	119 22.3	04-03	2130	2149	403	216	228	228
95.0	70.0	31 13.1	120 02.8	04-04	0432	0453	436	211	234	234
95.0	80.0	30 53.1	120 42.9	04-04	0929	0950	444	213	9	9
95.0	90.0	30 38.3	121 25.7	04-04	1446	1505	483	184	23	23
95.3	42.7	32 04.7	118 10.3	04-03	0843	0906	452	212	624	606