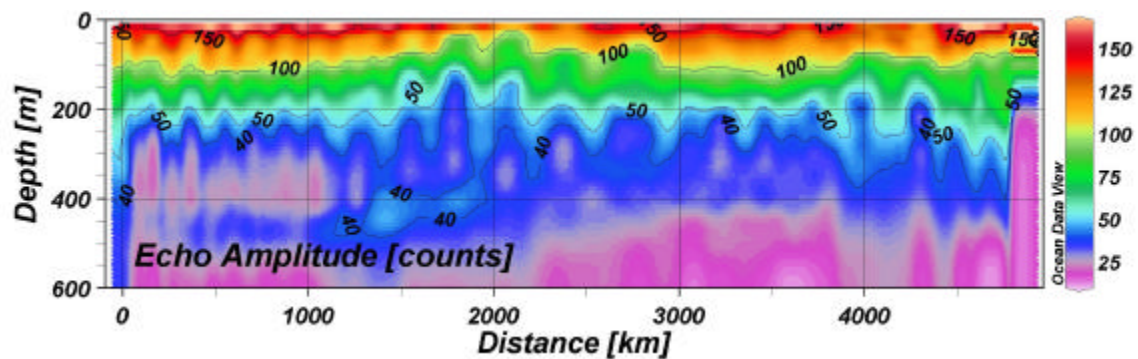


# Cruise Report S-200

Scientific data collected aboard  
*SSV Robert C. Seamans*

Honolulu, Hawaii – San Francisco, California

5 July – 2 August 2005



Sea Education Association  
Woods Hole, Massachusetts



**To obtain unpublished data, contact the SEA data archivist:**

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## **Ship's Company, SSV Robert C. Seamans, Cruise S-200**

### **Nautical Staff**

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Sara Rusche	2 <sup>nd</sup> Mate
Jullie Jackson	3 <sup>rd</sup> Mate
Danielle Rioux	Steward
Dusty Smith	Engineer
Kate Haber	Assistant Engineer
Meghan Donohue	Deckhand
Wynne Kandur	Deckhand
Doreen Remillard	Deckhand
Juliette White	Deckhand

### **Scientific Staff**

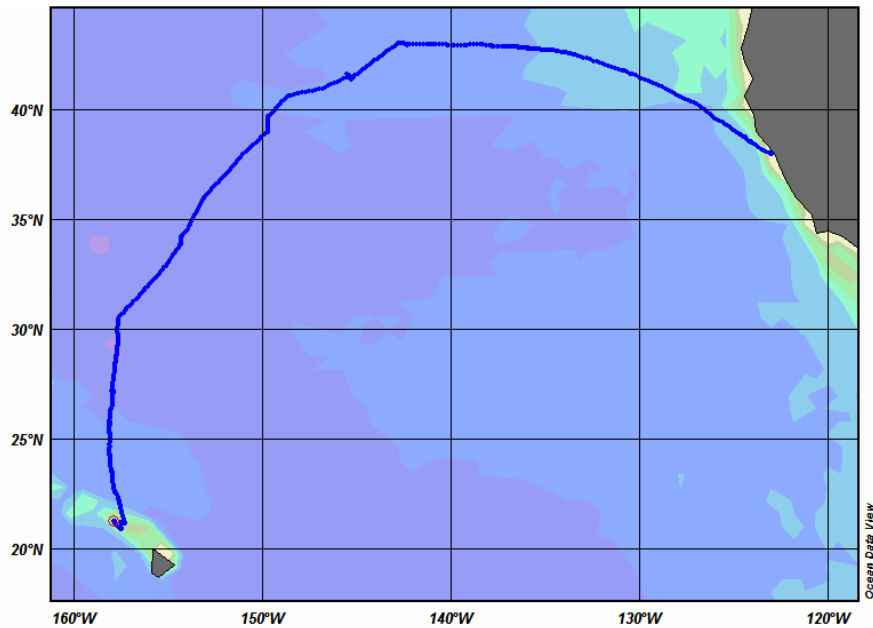
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Lauren Heinen	Northeastern University
Sean Kim	Johns Hopkins University
Kathryn MacDonald	Eckerd College
Lisa Matragrano	University of Miami
James Matschulat	St. Lawrence University
Kian Merchant-Borna	Alfred University
Alex Sise	Rollins College

## Data Description

This cruise report provides a record of data collected during S-200 aboard the SSV *Robert C. Seamans* on her voyage from Honolulu, Hawaii to San Francisco, California (Figure 1). We collected samples or data at 69 discrete oceanographic stations (Table 1). Continuous measurements included sea surface temperature, salinity, and *in vivo* fluorescence from the ship's flow through system, and subsurface currents with a hull-

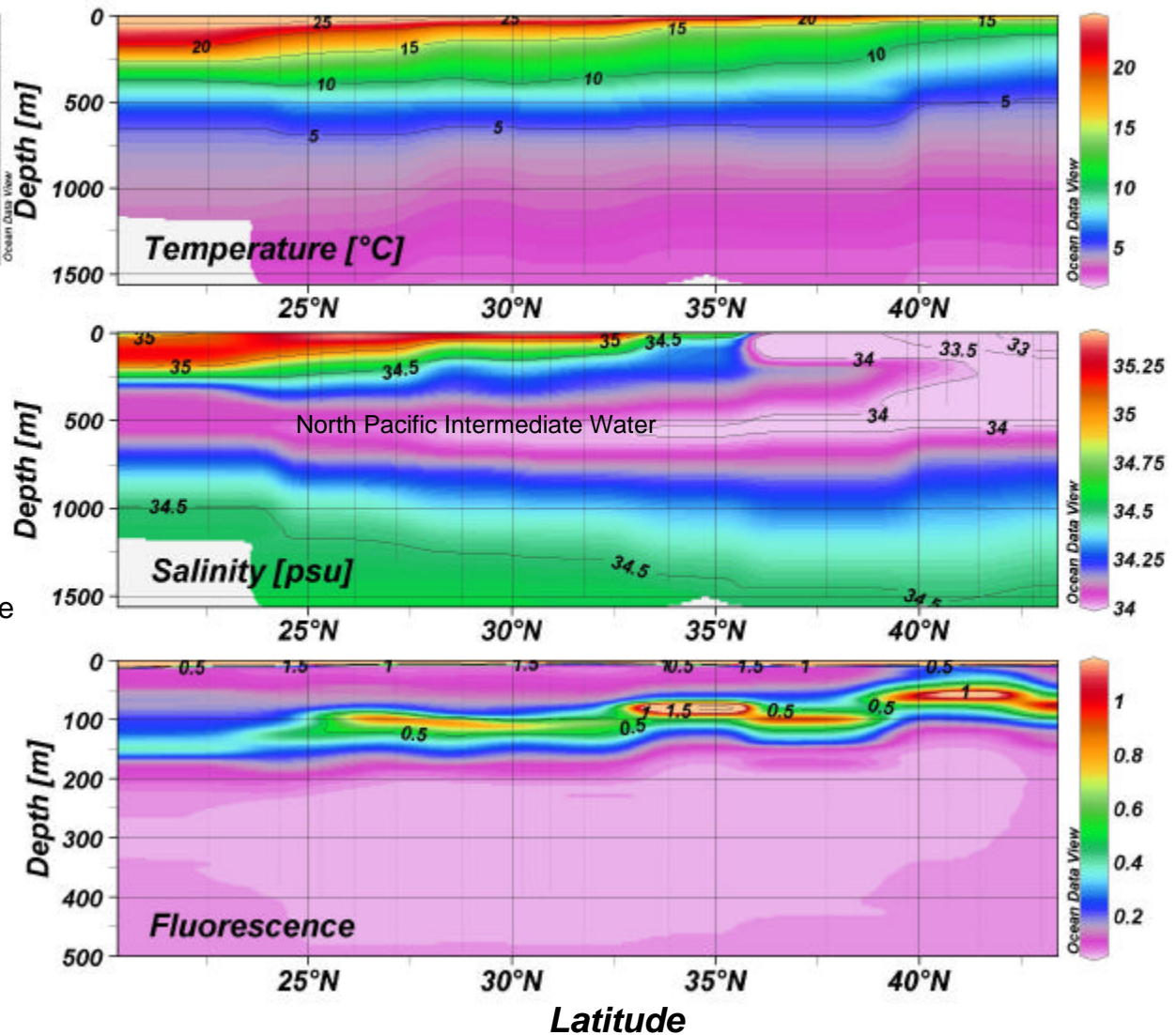
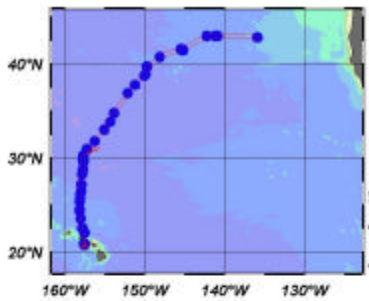


**Figure 1: S-200 cruise track.**

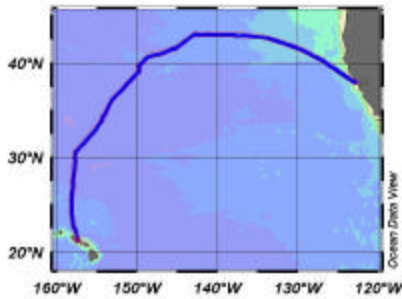
mounted Acoustic Doppler Current Profiler (ADCP). This report summarizes sea surface chemical and biological characteristics (Tables 2-4), subsurface biological samples (Table 4), chemical properties with depth (Table 5), and sediment grain size (Table 6). Large-scale hydrography of the NE Pacific shows low salinity intermediate water masses and both thermocline and deep chlorophyll maximum shoaling eastward (Figure 2). ADCP data reveal locations and sizes of mesoscale eddies in the NE Pacific, and the strength and depth of zooplankton vertical migration (Figure 3). Lengthy CTD, ADCP, and flow-through data are not reported here. All unpublished data can be made available by arrangement with the Sea Education Association (SEA) archivist (contact information, p.2). The information in this report is not intended to represent final interpretation of the data and should not be excerpted or cited without written permission from SEA.

As part of SEA's educational program, undergraduates conduct student-designed oceanographic research during the cruise. Project topics include physical, chemical, biological and geological oceanography (Table 7). Student research efforts culminate in a written paper and poster presentation to the ship's company. These papers are available on request from SEA.

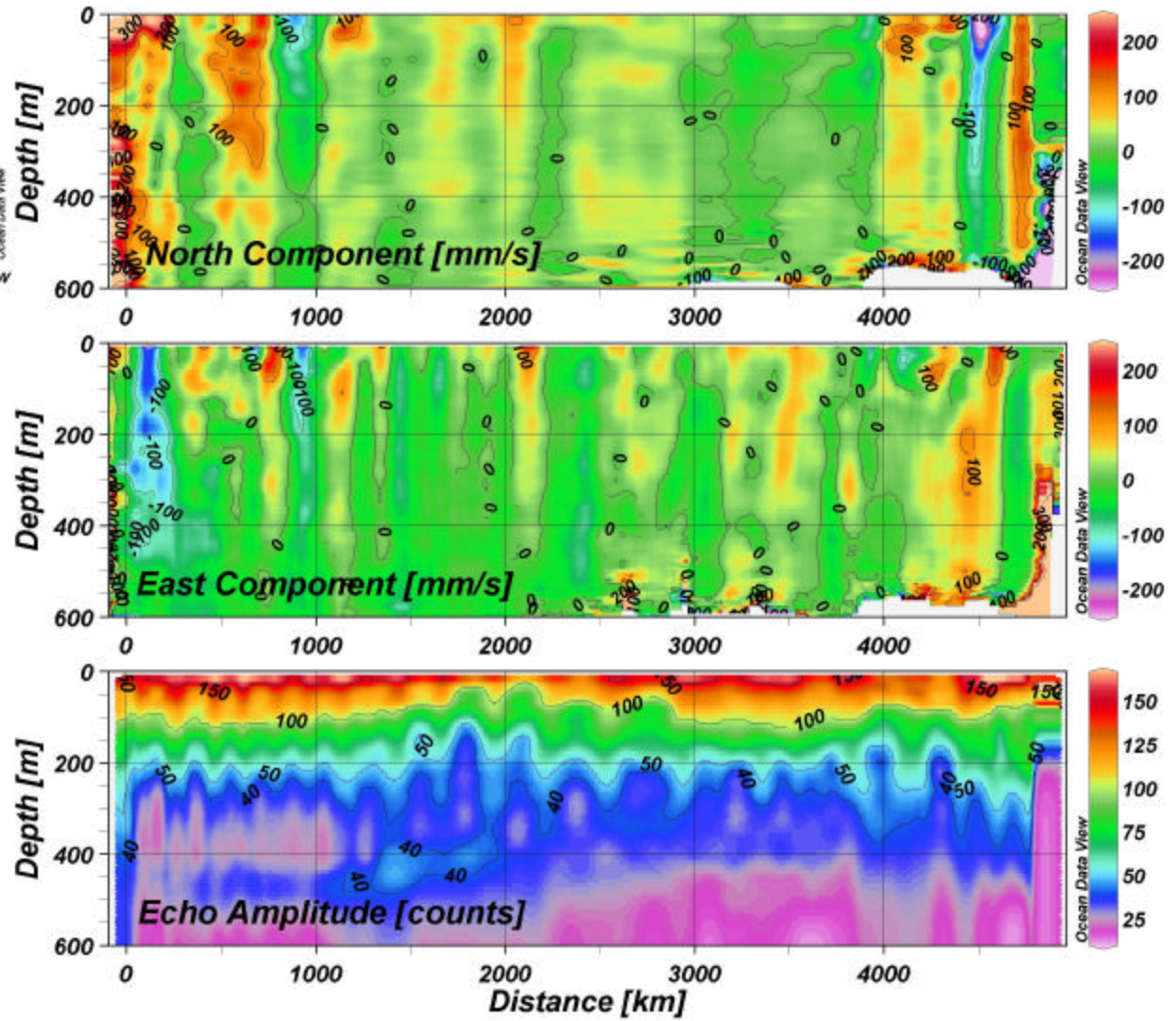
Sara Harris  
Chief Scientist  
S-200



**Figure 2:** Temperature, salinity, and *in vivo* fluorescence cross sections from cruise S-200. North Pacific Intermediate Water is the low salinity water mass at 400-600 m depth. Both the thermocline and the subsurface fluorescence peak shoal to the north. Electronic data are available on request.



**Figure 3:** Acoustic Doppler Current Profiler cross-sections from cruise S-200. The subtropical Pacific has several meso-scale eddies indicated by current directions alternating between north and south (top panel) or between east and west (middle panel). Echo amplitude shows changing depth and intensity of zooplankton diel vertical migration (bottom panel). Electronic data are available on request.





**Table 1: Oceanographic sampling stations.**

<b>Station #</b>	<b>Date</b>	<b>Local Time</b>	<b>Log (nm)</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Cast Depth (m)</b>	<b>General Locale</b>
<b>CTD</b>							
S200-017-CTD	8-Jul-05	0920	181.0	22°33.1' N	157°45.9' W	1143	N of Hawaii
S200-020-CTD	9-Jul-05	1014	275.8	24°18.1' N	158°6.1' W	381	NE of Hawaii
S200-022-CTD	9-Jul-05	2308	336	25°19.4' N	158°6.8' W	400	NE of Hawaii
S200-024-CTD	10-Jul-05	0902	361.3	25°46.1' N	158°4.4' W	65	NE of Hawaii
S200-026-CTD	10-Jul-05	1640	381.0	26°8.1' N	158°5.1' W	1565	NE of Hawaii
S200-026-CTD <sub>4043</sub>	10-Jul-05	1640	381.0	26°8.1' N	158°5.1' W	1480	NE of Hawaii
S200-028-CTD	11-Jul-05	0919	439.5	27°11.5' N	157°54.8' W	1295	NE Pacific
S200-031-CTD	12-Jul-05	0850	534.5	28°48.0' N	157°42.9' W	1550	NE Pacific
S200-037-CTD	13-Jul-05	1008	630.0	30°16.7' N	157°38.6' W	395	NE Pacific
S200-040-CTD	13-Jul-05	2325	677.1	30°56.1' N	157°11.4' W	396	NE Pacific
S200-042-CTD	14-Jul-05	0907	741.1	31°46.5' N	156°15.5' W	1515	NE Pacific
S200-045-CTD	15-Jul-05	0900	889.5	33°51.4' N	154°18.8' W	1425	NE Pacific
S200-049-CTD	17-Jul-05	0907	1154.9	37°44.7' N	151°12.9' W	1520	NE Pacific
S200-053-CTD	18-Jul-05	0827	1289.2	39°41.9' N	149°41.3' W	415	NE Pacific
S200-055-CTD	18-Jul-05	2332	1387.5	40°42.2' N	148°7.7' W	415	NE Pacific
S200-061-CTD	20-Jul-05	0945	1537.0	41°28.5' N	145°10.4' W	1495	NE Pacific
S200-064-CTD	22-Jul-05	0926	1739.9	42°58.0' N	140°52.4' W	1495	NE Pacific
S200-068-CTD	24-Jul-05	0830	1937.0	42°47.8' N	135°54.2' W	2060	NE Pacific
<b>Hydrocast</b>							
S200-017-HC	8-Jul-05	0920	181.0	22°33.1' N	157°45.9' W	1143	N of Hawaii
S200-020-HC	9-Jul-05	1014	275.8	24°18.1' N	158°6.1' W	381	NE of hawaii
S200-022-HC	9-Jul-05	2308	336	25°19.4' N	158°6.8' W	400	NE of Hawaii
S200-024-HC	10-Jul-05	0902	361.3	25°46.1' N	158°4.4' W	65	NE of Hawaii
S200-026-HC	10-Jul-05	1640	381.0	26°8.1' N	158°5.1' W	1565	NE of Hawaii
S200-028-HC	11-Jul-05	0919	439.5	27°11.5' N	157°54.8' W	1295	NE Pacific
S200-031-HC	12-Jul-05	0850	534.5	28°48.0' N	157°42.9' W	1550	NE Pacific
S200-037-HC	13-Jul-05	1008	630.0	30°16.7' N	157°38.6' W	395	NE Pacific
S200-040-HC	13-Jul-05	2325	677.1	30°56.1' N	157°11.4' W	396	NE Pacific
S200-042-HC	14-Jul-05	0907	741.1	31°46.5' N	156°15.5' W	1515	NE Pacific
S200-045-HC	15-Jul-05	0900	889.5	33°51.4' N	154°18.8' W	1425	NE Pacific
S200-049-HC	17-Jul-05	0907	1154.9	37°44.7' N	151°12.9' W	1520	NE Pacific
S200-053-HC	18-Jul-05	0827	1289.2	39°41.9' N	149°41.3' W	415	NE Pacific
S200-055-HC	18-Jul-05	2332	1387.5	40°42.2' N	148°7.7' W	415	NE Pacific
S200-061-HC	20-Jul-05	0945	1537.0	41°28.5' N	145°10.4' W	1495	NE Pacific
S200-064-HC	22-Jul-05	0926	1739.9	42°58.0' N	140°52.4' W	1495	NE Pacific
<b>Neuston Net</b>							
S200-008-NT	6-Jul-05	2105	29.3	20°56.65' N	157°33.6' W	0	Kaiwi Channel
S200-009-NT	6-Jul-05	2343	31.0	20°45.5' N	157°30.4' W	0	Kaiwi Channel
S200-010-NT	7-Jul-05	0338	40.0	20°59.0' N	157°33.3' W	0	Penguin Bank
S200-016-NT	8-Jul-05	0054	147.7	22°0.8' N	157°37.7' W	0	N of Hawaii
S200-018-NT	8-Jul-05	1142	181.2	22°32.5' N	157°49.0' W	0	N of Hawaii
S200-019-NT	9-Jul-05	0014	225.1	23°30.5' N	157°58.9' W	0	N of Hawaii
S200-021-NT	9-Jul-05	1107	275.8	24°17.2' N	158°6.6' W	0	NE of Hawaii
S200-023-NT	9-Jul-05	2352	336.0	25°18.4' N	158°7.0' W	0	NE of Hawaii

**Table 1 continued**

<b>Station #</b>	<b>Date</b>	<b>Local Time</b>	<b>Log (nm)</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Cast Depth (m)</b>	<b>General Locale</b>
<b>Neuston Net continued</b>							
S200-025-NT	10-Jul-05	1103	361.0	25°45.9' N	158°6.6' W	0	NE Pacific
S200-027-NT	11-Jul-05	0006	400.2	26°30.7' N	157°58.3' W	0	NE Pacific
S200-029-NT	11-Jul-05	1112	439.5	27°11.1' N	157°57.8' W	0	NE Pacific
S200-030-NT	12-Jul-05	0004	496.9	28°16.0' N	157°48.9' W	0	NE Pacific
S200-032-NT	12-Jul-05	1042	533.4	28°46.9' N	157°44.3' W	0	NE Pacific
S200-033-NT	12-Jul-05	2057	587.0	29°37.4' N	157°40.1' W	0	NE Pacific
S200-034-NT	12-Jul-05	2341	596.3	29°44.4' N	157°39.1' W	0	NE Pacific
S200-035-NT	13-Jul-05	0132	599.4	29°46.8' N	157°39.9' W	0	NE Pacific
S200-036-NT	13-Jul-05	0343	604.4	29°51.4' N	157°40.5' W	0	NE Pacific
S200-038-NT	13-Jul-05	1103	630.0	30°16.2' N	157°38.8' W	0	NE Pacific
S200-041-NT	14-Jul-05	0008	677.1	30°56.6' N	157°11.5' W	0	NE Pacific
S200-043-NT	14-Jul-05	1052	742.2	31°47.9' N	156°14.7' W	0	NE Pacific
S200-044-NT	15-Jul-05	0013	838.1	32°59.8' N	155°1.0' W	0	NE Pacific
S200-046-NT	15-Jul-05	1055	889.4	33°50.2' N	154°21.6' W	0	NE Pacific
S200-047-NT	16-Jul-05	0005	950.0	34°45.0' N	153°49.5' W	0	NE Pacific
S200-048-NT	17-Jul-05	0004	1088.5	36°52.7' N	152°6.3' W	0	NE Pacific
S200-050-NT	17-Jul-05	1058	1155.4	37°45.1' N	151°12.8' W	0	NE Pacific
S200-051-NT	17-Jul-05	2118	1226.0	38°43.9' N	150°3.8' W	0	NE Pacific
S200-052-NT	17-Jul-05	2318	1238.0	38°52.0' N	149°52.0' W	0	NE Pacific
S200-054-NT	18-Jul-05	0926	1289.2	39°41.1' N	149°41.7' W	0	NE Pacific
S200-056-NT	19-Jul-05	0015	1388.0	40°43.2' N	148°7.3' W	0	NE Pacific
S200-057-NT	19-Jul-05	2102	1524.0	41°35.0' N	145°27.9' W	0	NE Pacific
S200-058-NT	19-Jul-05	2312	1525.1	41°32.5' N	145°23.6' W	0	NE Pacific
S200-059-NT	20-Jul-05	0107	1527.0	41°30.2' N	145°21.8' W	0	NE Pacific
S200-060-NT	20-Jul-05	0317	1528.9	41°26.6' N	145°19.1' W	0	NE Pacific
S200-062-NT	20-Jul-05	0945	1537.8	41°29.3' N	145°9.9' W	0	NE Pacific
S200-063-NT	22-Jul-05	0004	1683.5	42°57.5' N	142°15.2' W	0	NE Pacific
S200-065-NT	22-Jul-05	1117	1739.9	42°57.8' N	140°50.8' W	0	NE Pacific
S200-066-NT	23-Jul-05	1208	1878.9	42°51.3' N	137°31.5' W	0	NE Pacific
<b>Meter Net</b>							
S200-016-MN	8-Jul-05	0102	147.7	22°0.4' N	157°32.8' W	0	N of Hawaii
S200-019-MN	9-Jul-05	0017	225.2	23°30.5' N	157°58.9' W	0	N of Hawaii
S200-022-MN	9-Jul-05	2358	336.0	25°18.4' N	158°7.0' W	0	NE of Hawaii
S200-027-MN	11-Jul-05	0011	400.2	26°30.7' N	157°58.3' W	0	NE Pacific
S200-030-MN	12-Jul-05	0010	496.9	28°16.0' N	157°48.0.9' W	0	NE Pacific
S200-044-MN	15-Jul-05	0016	828.1	32°59.8' N	155°1.0' W	0	NE Pacific
S200-047-MN	16-Jul-05	0005	950.0	34°45.0' N	153°49.5' W	0	NE Pacific
S200-048-MN	17-Jul-05	0004	1088.5	36°52.7' N	152°6.3' W	0	NE Pacific
S200-052-MN	17-Jul-05	2318	1238.0	38°52.0' N	149°52.0' W	0	NE Pacific
S200-056-MN	19-Jul-05	0018	1388.0	40°43.2' N	148°7.3' W	0	NE Pacific
S200-057-MN	19-Jul-05	2102	1524.0	41°35.0' N	145°27.9' W	0	NE Pacific
S200-063-MN	22-Jul-05	0005	1683.5	42°57.5' N	142°15.2' W	0	NE Pacific
S200-067-MN	24-Jul-05	0042	1918.5	42°50.2' N	136°23.4' W	348	NE Pacific
S200-069-2MN	25-Jul-05	2145	2031.0	42°33.1' N	133°38.5' W	200	NE Pacific

**Table 1 continued**

<b>Station #</b>	<b>Date</b>	<b>Local Time</b>	<b>Log* (nm)</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Cast Depth (m)</b>	<b>General Locale</b>
<b>Secchi Disk</b>							
S200-020-SD	9-Jul-05	1014	275.7	24°18.1' N	158°6.1' W	27.0	NE of Hawaii
S200-037-SD	13-Jul-05	1008	630.0	30°16.7' N	157°38.6' W	26.5	NE Pacific
S200-053-SD	18-Jul-05	0827	1289.2	39°41.9' N	149°41.3' W	20.0	NE Pacific
<b>Shipek Grab</b>							
S200-002-SG	6-Jul-05	1220		21°16.2' N	157°51.1' W	15	Waikiki Beach, HI
S200-003-SG	6-Jul-05	1237		21°16.0' N	157°50.5' W	32	Waikiki Beach, HI
S200-004-SG	6-Jul-05	1250		21°15.5' N	157°50.4' W	52	Waikiki Beach, HI
S200-005-SG	6-Jul-05	1309		21°15.0' N	157°50.2' W	180	Waikiki Beach, HI
S200-006-SG	6-Jul-05	1332		21°14.9' N	157°49.4' W	60	Waikiki Beach, HI
S200-007-SG	6-Jul-05	1343		21°15.1' N	157°49.4' W	27	Waikiki Beach, HI
S200-011-SG	7-Jul-05	1325	96.1	21°11.7' N	157°16.2' W	30	W. Side Molokai, HI
S200-012-SG	7-Jul-05	1340	96.1	21°11.4' N	157°16.4' W	30	W. Side Molokai, HI
S200-013-SG	7-Jul-05	1406	96.3	21°10.8' N	157°16.7' W	30	W. Side Molokai, HI
S200-014-SG	7-Jul-05	1418	96.4	21°10.5' N	157°16.9' W	30	W. Side Molokai, HI
S200-015-SG	7-Jul-05	1433	96.4	21°10.1' N	157°17.2' W	28	W. Side Molokai, HI

\*Blank spaces mean no data collected

**Table 2: Surface station data.**

Station #	Date	Local Time	Log* (nm)	Latitude	Longitude	Temp (°C)	Salinity (PSU)	PO <sub>4</sub> (mM)	Chl a (mg/l)
SS-001	6-Jul-05	2108	29.3	20°56.6' N	157°33.6' W	26.9	34.8	0.172	0.059
SS-002	6-Jul-05	2343	31.0	20°45.5' N	157°30.4' W	26.7	34.7	0.230	0.050
SS-003	7-Jul-05	0400	40.0	20°58.3' N	157°33.3' W	26.8	34.8	0.181	0.091
SS-004	8-Jul-05	0107	147.7	22°0.4' N	157°32.8' W	26.3	34.9	1.094	0.144
SS-005	9-Jul-05	0120		23°30.3' N	158°0.1' W	25.8	35.3	0.119	0.069
SS-006	9-Jul-05	1449	294.0	24°33.9' N	158°6.3' W	26.2	35.3	0.172	0.041
SS-007	10-Jul-05	0011	400.2	26°30.7' N	157°58.3' W	25.9	35.4	0.085	0.049
SS-008	12-Jul-05	0020	496.9	28°16.0' N	157°48.9' W	25.7	35.4	0.070	0.052
SS-009	12-Jul-05	2057	587.0	29°37.1' N	157°40.1' W	25.6	35.4	0.066	0.057
SS-010	13-Jul-05	0048	596.3	29°44.4' N	157°39.1' W	25.8	35.4	0.124	0.045
SS-011	13-Jul-05	0139	599.4	29°46.8' N	157°39.9' W	26.0	35.5	0.061	0.034
SS-012	13-Jul-05	0343	604.4	29°51.4' N	157°40.5' W	25.9	35.4	0.070	0.067
SS-013	15-Jul-05	0016	828.0	32°59.9' N	155°0.9' W	25.6	35.0	0.124	0.031
SS-014	16-Jul-05	0005	950.0	34°45.0' N	153°49.5' W	24.9	34.9	0.490	0.030
SS-015	17-Jul-05	0004	1088.5	36°52.7' N	152°6.3' W	23.2	34.0	0.066	0.022
SS-016	17-Jul-05	2120	1236.0	38°43.9' N	150°3.8' W	20.9	33.7	0.097	0.051
SS-017	17-Jul-05	2318	1238.0	38°52.0' N	149°52.0' W	20.2	33.6	0.132	0.027
SS-018	19-Jul-05	2102	1524.0	41°35.0' N	145°27.9' W	17.4	33.1	0.248	0.090
SS-019	19-Jul-05	2312	1525.1	41°32.5' N	145°23.6' W	17.4	33.1	0.051	0.087
SS-020	20-Jul-05	0107	1527.0	41°30.2' N	145°21.8' W	17.4	33.1	0.233	0.057
SS-021	20-Jul-05	0317	1528.9	41°26.6' N	145°19.1' W	17.4	33.1	0.076	0.092
SS-022	22-Jul-05	0015	1683.5	42°57.6' N	142°14.9' W	17.0	32.9	0.293	0.040

\*Blank spaces mean no data collected

**Table 3: Neuston tow data. Locations are in Table 1.**

<b>Station #</b>	<b>Tow Length (m)</b>	<b>Temp (°C)</b>	<b>Salinity (PSU)</b>	<b>Zoop.* Biomass (ml)</b>	<b>Zoop.* Density (ml/m<sup>2</sup>)</b>	<b>Plastic Pieces (#)</b>	<b>Pellets (#)</b>	<b>Halobates (#)</b>
S200-008-NT	1852	26.9	34.7	7.0	0.0038	0	0	12
S200-009-NT	1852	26.7	34.7	2.0	0.0011	0	1	2
S200-010-NT	1852	26.9	34.8	11.0	0.0059	0	0	11
S200-016-NT	2037	26.3	34.9	7.0	0.0034	0	0	3
S200-018-NT	1852	26.0	35.1			0	2	3
S200-019-NT	1852	25.8	35.3	15.0	0.0081	0	0	162
S200-021-NT	1852	26.1	35.2	2.5	0.0013	8	0	18
S200-023-NT	1852	25.9	35.4	9.0	0.0049	1	0	10
S200-025-NT	1790	25.8	35.4	3.0	0.0017	17	14	138
S200-027-NT	1667	25.9	35.4	13.0	0.0078	19	0	14
S200-029-NT	1852	26.2	35.3	2.0	0.0011	14	0	71
S200-030-NT	1852	25.7	35.4	45.0	0.0243	5	0	188
S200-032-NT	1852	25.6	35.3	7.0	0.0038	57	0	85
S200-033-NT	1852	25.6	35.4	10.0	0.0054	5	0	48
S200-034-NT	1852	25.8	35.4	45.0	0.0243	1	0	46
S200-035-NT	1790	26.0	35.5	29.0	0.0162	6	0	64
S200-036-NT	1852	25.9	35.4	25.2	0.0136	3	0	86
S200-038-NT	1852	26.2	35.4	11.0	0.0059	94	0	155
S200-041-NT	1852	26.0	35.4	50.0	0.0270	23	0	130
S200-043-NT	1852	26.2	35.3	20.0	0.0108	77	0	178
S200-044-NT	2161	25.6	35.0	29.0	0.0134	43	0	131
S200-046-NT	1852	25.4	34.8	18.0	0.0097	28	6	57
S200-047-NT	1852	24.9	34.9	18.0	0.0097	51	0	184
S200-048-NT	1852	23.2	34.0	29.0	0.0157	106	0	56
S200-050-NT	1852	22.1	33.9	5.0	0.0027	367	0	18
S200-051-NT	1852	20.9	33.7	36.0	0.0194	79	0	53
S200-052-NT	1852	20.2	33.6	1020.0	0.5508	189	0	138
S200-054-NT	1852	18.5	33.4	34.0	0.0184	33	0	3
S200-056-NT	1852	17.6	32.2	200.0	0.1080	18	0	0
S200-057-NT	1852	17.4	33.1	64.0	0.0346	8	0	0
S200-058-NT	1852	17.4	33.1	63.0	0.0340	13	0	0
S200-059-NT	1852	17.4	33.1	22.0	0.0119	12	0	0
S200-060-NT	1852	17.4	33.1	39.0	0.0211	41	0	0
S200-062-NT	1852	17.7	33.1	1030	0.5562	31	0	0
S200-063-NT	1913	17.0	32.9	60	0.0314	5	0	0
S200-065-NT	1852	16.9	32.8	520	0.2808	14	0	0
S200-066-NT	1852	16.7	32.6	91	0.0491	4	0	0

\*Blank spaces mean no data collected

**Table 4: Meter net data. Locations are in Table 1.**

Station #	Tow Length (m)	Net Diameter (m)	Cast Depth (m)	Zoop.* Biomass (ml)	Zoop.* Density (ml/m <sup>3</sup> )
S200-016-MN	1852	1	0	35	0.0481
S200-019-MN	1852	1	0	41	0.0563
S200-022-MN	1482	1	0	26	0.0446
S200-027-MN	1852	1	0	4.5	0.0062
S200-030-MN	1852	1	0	50	0.0687
S200-044-MN	1852	1	0	50	0.0687
S200-047-MN	1852	1	0	28	0.0385
S200-048-MN	1852	1	0	35	0.0481
S200-052-MN	1852	1	0	492	0.6760
S200-056-MN	1852	1	0	175	0.2404
S200-057-MN	1852	1	0	84	0.1154
S200-063-MN	1790	1	0		
S200-067-MN	3274.9	1	348	290	0.1128
S200-069-2MN	1613.2	2	200	260	0.0647

**Table 5: Hydrocast station data. Locations are in Table 1.**

Station #	Bottle #	Depth (m)	O <sub>2</sub> * (ml/l)	PO <sub>4</sub> * (mM)	SiO <sub>2</sub> * (mM)	Chl-a* (mg/l)											
S200-017-HC	13	0.0	4.60	0.114		0.035											
	9	635.1															
	8	635.1					3.049										
	6	635.1															
	5	635.1					2.581										
	4	635.1						3.315									
	3	635.1					3.242										
	2	635.1						3.083									
	1	635.1					3.098										
S200-020-HC	13	0.0	0.070			0.068											
	12	31.0					0.059										
	11	50.0						0.062									
	10	71.0							0.076								
	9	84.0								0.141							
	8	100.0									0.180						
	7	114.0										0.243					
	6	130.0											0.225				
	5	145.0												0.164			
	4	160.0													0.101		
	3	175.0														0.073	
	2	199.0															0.026
	1	246.0															
S200-022-HC	13	0.0	0.032			0.037											
	12	30.0					0.013										
	11	50.0						0.031									
	10	70.0							0.041								

\*Blank spaces mean no data collected

Table 5 continued

Station #	Bottle #	Depth (m)	O <sub>2</sub> * (ml/l)	PO <sub>4</sub> * (mM)	SiO <sub>2</sub> * (mM)	Chl-a* (mg/l)
S200-022-HC	9	85.0				0.044
	8	98.0				0.135
	7	114.0				0.111
	6	129.0				0.080
	5	143.0				0.136
	4	159.0				0.096
	3	174.0				0.058
	2	199.0				0.013
	1	228.0				0.000
S200-024-HC	13	0.0		0.124		0.053
S200-026-HC	13	0.0	5.06	0.008	3.421	
	12	99.2	5.01	0.177	4.105	
	11	224	5.00	0.626	6.289	
	10	347.4	4.77	1.123	10.421	
	9	472.1	3.59	1.992	21.105	
	8	571.8	2.71	2.475	50.368	
	7	670.1	1.94	2.958	40.395	
	6	744.9	1.12	3.262	60.395	
	5	818.8	0.98	3.320	67.763	
	4	942.2	1.14	3.204	56.579	
S200-028-HC	3	1091.5	1.38	3.093	66.974	
	2	1239.2	1.52	3.585	64.342	
	1	1387.5	1.54	3.276	63.947	
	13	0.0	4.70	0.066	2.737	0.051
	12	100.0	5.02	0.177	4.921	
	11	224.0	4.84	0.674	5.079	
	10	348.0	4.70	1.171	10.132	
	9	472.0	3.78	1.833	35.263	
	8	572.0	2.52	2.499	51.184	
	7	671.0	1.78	2.861	49.737	
S200-031-HC	6	745.0	1.26	3.165	68.289	
	5	819.0	1.08	3.281	58.026	
	4	943.0	1.17	3.310	78.421	
	3	1091.0	1.61	3.247	53.947	
	2	1239.0	1.39	3.223		
	1	1284.0	1.51	3.151	76.447	
	13	0.0	4.94	0.085		0.075
	12	99.0	5.30	0.278		
	11	223.0	5.11	0.785		
	10	348.0	5.01	1.118	16.500	
9	472.0	3.55	1.881	38.421		
8	571.0	2.72	2.542	55.789		
7	671.0	1.63	2.948	75.658		
6	745.0	0.92	3.252	83.684		
5	817.0	0.68	3.363	84.079		
4	943.0	0.55	3.489	118.816		
3	1090.0	0.73	3.508	107.105		

\*Blank spaces mean no data collected

**Table 5 continued**

Station #	Bottle #	Depth (m)	O <sub>2</sub> * (ml/l)	PO <sub>4</sub> * (mM)	SiO <sub>2</sub> * (mM)	Chl-a* (mg/l)
S200-031-HC	2	1239.0	1.06	3.329	138.684	
	1	1388.0	1.55	3.247	136.184	
S200-037-HC	13	0.0		0.085		0.055
	12	25.0				0.065
	11	50.0				0.058
	10	65.0				0.076
	9	80.0				0.122
	8	90.0				0.136
	7	100.0				0.210
	6	110.0				0.370
	5	120.0				0.100
	4	134.0				0.065
S200-040-HC	3	149.0				0.049
	2	174.0				0.007
	1	200.0				0.001
	13	0.0		0.090		0.034
	12	24.7				0.057
	11	49.6				0.082
	10	64.8				0.127
	9	79.7				0.193
	8	89.4				0.186
	7	99.6				0.300
S200-042-HC	6	109.9				0.280
	5	119.3				0.246
	4	134.6				0.108
	3	149.5				0.082
	2	174.1				0.043
	1	199.1				0.017
	13	0.0	4.60	0.196	4.211	0.035
	12	149.0	5.17	0.437	7.053	
	11	298.0	5.01	0.993	13.842	
	10	447.0	4.08	1.596	31.053	
9	547.0	3.06	2.427	52.632		
8	646.0	1.82	2.789	73.553		
7	744.0	1.06	3.131	85.395		
6	844.0	0.54	3.223	93.947		
5	943.0	0.61	3.300	110.921		
4	1042.0	0.78	3.329	63.026		
3	1140.0	0.90	3.465	75.526		
2	1264.0	1.16	3.382	82.237		
1	1388.0	1.53	3.315	89.342		
S200-045-HC	13	0.0	4.73	0.095		0.031
	12	150.0	4.94	0.703	9.158	
	11	298.0	5.02	1.070	18.605	
	10	447.0	3.78	1.818	36.842	
	9	547.0	2.97	2.335	55.263	
	8	646.0	2.53	2.528	64.605	

\*Blank spaces mean no data collected



**Table 5 continued**

Station #	Bottle #	Depth (m)	O <sub>2</sub> * (ml/l)	PO <sub>4</sub> * (mM)	SiO <sub>2</sub> * (mM)	Chl-a* (mg/l)
S200-045-HC	7	745.0	1.83	2.774	75.921	
	6	844.0	0.77	3.238	104.211	
	5	943.0	0.43	3.411	98.421	
	4	1042.0	0.43	3.407	104.211	
	3	1140.0	0.45	3.445	109.737	
	2	1264.0	0.52	3.460		
	1	1388.0	0.62	3.358	132.500	
S200-049-HC	13	0.0	5.14	0.006	7.526	0.033
	12	149.0	5.13	0.656	8.500	
	11	298.0	5.04	0.918	19.263	
	10	447.0	3.58	1.851	35.263	
	9	546.0	3.19	1.498	57.105	
	8	646.0	1.40	2.239	88.421	
	7	744.0	1.07	2.128	75.526	
	6	844.0	0.61	2.370	96.974	
	5	943.0	0.43	2.587	112.895	
	4	1042.0	0.39	2.420	128.947	
	3	1140.0	0.32	3.303	105.658	
	2	1264.0	0.38	3.076	126.842	
	1	1388.0	0.58	3.151	129.079	
S200-053-HC	13	0.0		0.137		0.062
	12	25.0				0.079
	11	50.0				0.285
	10	65.0				0.434
	9	79.0				0.168
	8	89.0				0.090
	7	100.0				0.036
	6	110.0				0.029
	5	120.0				0.029
	4	134.0				0.006
	3	149.0				0.002
	2	174.0				0.003
	1	199.0				0.004
S200-055-HC	13	0.0		0.187		0.056
	12	25.0				0.121
	11	38.0				0.300
	10	49.0				0.468
	9	58.0				0.454
	8	65.0				0.196
	7	72.0				0.105
	6	79.0				0.094
	5	90.0				0.053
	4	100.0				0.019
	3	110.0				0.029
	2	120.0				0.011
	1	134.0				0.006

\*Blank spaces mean no data collected

**Table 5 continued**

<b>Station #</b>	<b>Bottle #</b>	<b>Depth (m)</b>	<b>O<sub>2</sub>* (ml/l)</b>	<b>PO<sub>4</sub>* (mM)</b>	<b>SiO<sub>2</sub>* (mM)</b>	<b>Chl-a* (mg/l)</b>
S200-061-HC	13	0.0	5.64	0.344		
	12	149.0	5.11	0.570		
	11	299.0	4.24	1.543		
	10	447.0	2.69	2.375		
	9	547.0	1.97	2.189		
	8	645.0	1.60	2.501		
	7	744.0	0.92	2.637		
	6	844.0	0.61	3.151		
	5	943.0	0.55	3.464		
	4	1042.0	0.53	3.439		
	3	1141.0	0.49	3.121		
	2	1264.0	0.49	3.499		
	1	1388.0	0.62	3.247		
S200-064-HC	13	0.0	5.73	0.001		0.034
	12	50.0	5.92	0.000		
	11	100.0	5.89	0.444		
	10	149.0	5.11	1.034		
	9	199.0	4.67	1.518		
	8	248.0	3.91	1.528		
	7	397.0	2.88	2.541		
	6	497.0	1.99	2.315		
	4	794.0	0.83	2.763		
	3	992.0	0.42	3.046		
	2	1190.0	0.64	3.242		
	1	1388.0	0.64	2.975		

\*Blank spaces mean no data collected

**Table 6: Sediment grain size data. Shipek locations are in Table 1.**

<b>Station #</b>	<b>ml sieved</b>	<b>&gt;4000 mm (%)</b>	<b>2000-4000 mm (%)</b>	<b>1000-2000 mm (%)</b>	<b>500-1000 mm (%)</b>	<b>250-500 mm (%)</b>	<b>125-250 mm (%)</b>	<b>63-125 mm (%)</b>	<b>&lt;63 mm (%)</b>	<b>Qualitative description</b>
S200-002-SG	100.0	39.6	5.0	12.6	22.3	8.1	6.6	5.1	0.8	yellowish gray 5Y 7/2, granular and sandy, very angular, slight organic odor
S200-003-SG	94.7	6.9	2.3	9.0	28.2	24.4	17.1	10.1	2.0	between dark & pale yellowish brown - not moderate 10YR 4/2 & 10YR 6/2, sandy, larger pieces of shells & algae, rounded & angular, no organic odor
S200-004-SG	100.0	1.0	2.5	8.9	28.7	20.0	25.1	12.6	1.1	dusty yellowish brown (some is lighter) 10YR 2/2, sandy - granular pieces larger than previous samples, rounded, very angular, no organic odor
S200-005-SG	120.0	9.9	6.2	13.9	15.5	11.2	34.7	7.3	1.4	pale yellowish brown -grayish orange, main sediment is sand with many larger pieces of shells and pebbles, rounded - angular, no organic odor
S200-006-SG	100.0	0.9	1.5	2.0	4.5	24.5	63.4	2.2	0.9	brownish gray 5YR 4/1, sandy - silty, a few larger sediments, rounded - very angular, no odor
S200-007-SG	100.0	10.1	4.7	3.8	4.6	32.9	36.9	4.5	2.5	brownish gray 5YR 4/1, sandy - silty, a few larger sediments, rounded - angular, no odor
S200-011-SG	44.0	18.8	12.4	15.3	38.5	7.0	4.5	2.6	0.9	pale yellowish brown 10YR 6/2, granular - sandy, no organic odor
S200-012-SG	40.0	13.4	3.4	4.4	21.1	32.7	17.8	6.2	1.0	grayish orange 10YR 7/4 & moderate yellowish brown 10YR 5/4, sandy-silty, organic odor
S200-013-SG	55.0	34.9	4.2	4.4	25.6	20.0	4.4	5.9	0.6	grayish orange 10YR 7/4 & moderate yellowish brown 10YR 5/4, sandy-silty, strong organic odor
S200-014-SG	100.0	18.9	4.2	9.2	35.7	18.5	6.5	5.7	1.2	between grayish orange 10YR 7/4 and moderate yellowish brown 10YR 5/4, sandy - silty, extremely strong organic odor - much coral, algae, detritus, etc.
S200-015-SG	44.0	23.4	4.4	5.6	25.7	24.8	10.5	4.7	0.9	between grayish orange 10YR 7/4 and moderate yellowish brown 10YR 5/4, sandy with many larger organic pieces, organic odor

**Table 7: Student research projects, S-200**

<b>Title</b>	<b>Student Researchers</b>
The Distribution and Abundance of Plastic Debris in the North Pacific Subtropical Gyre	Frank Anderson James Matschulat
Tracking North Pacific Intermediate Water Based on Chemical Signatures	Kristi Cashman
The Effects of Sea Surface Temperatures on Distribution of Myctophidae Species Found in the Pacific Ocean Between Hawaii and San Francisco	Josh Feider Kevin Dorsey
Pigment Variation of Copepods in Relation to Vertical Migratory Patterns	Mara Fox Kian Merchant-Borna
The Distribution of Pteropod Species Relative to Environment	Shauna Gore Lauren Heinen
A Comparison of Benthic Materials from Offshore of O'ahu's Waikiki Shoreline and Molokai's Penguin Bank	Erin Hazen
Diel Cycle In-vivo Fluorescence as it Varies with Depth and Time of Day	Sean Kim
Controls on Maximum Migration Depth of the Deep Scattering Layer	Kathryn MacDonald
Grazing Rates of Copepods in the Subtropical Pacific Ocean at Night	Lisa Matragrano
The Biological and Physical Characteristics of Eddies in the North Subtropical Gyre	Alex Sise