

Cruise Report S-199

Scientific data collected aboard
SSV Robert C. Seamans

Honolulu – Christmas Island – Fanning Island
Palmyra Atoll – Honolulu

8 May 2005 to 11 June 2005



Sea Education Association
Woods Hole, Massachusetts

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To obtain unpublished data, contact the SEA data archivist:

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Table of Contents

Ship's Company	4
Data Description	5
Figure 1: Cruise track	5
Table 1: Oceanographic sampling stations	7
Table 2: Surface station data	9
Table 3: Neuston net tow data	10
Table 4: Meter net tow data	10
Table 5: Hydrocast bottle data	11
Table 6: Student research projects, cruise S-199	16

Ship's Company

SSV *Robert C. Seamans*, Cruise S-199, Stanford at SEA

Nautical Staff

Phil Sacks	Captain
Jeremy Law	Chief Mate
Sara Rusche	Second Mate
Carter Cassel	Third Mate
Aaron Barker	Engineer
Kate Haber	Assistant Engineer
Chris Wang	Steward

Scientific Staff

Kara Lavender	Chief Scientist, SEA
Barbara Block	Chief Scientist, Stanford University
Robert Dunbar	Chief Scientist, Stanford University
Fiorenza Micheli	Chief Scientist, Stanford University
Meg Estapa	First Assistant Scientist, SEA
Mary Engels	Second Assistant Scientist, SEA
Cina Loarie	Third Assistant Scientist, SEA
Chris Perle	Teaching Assistant, Stanford University
Matt Long	Teaching Assistant, Stanford University
Kimberly Heiman	Teaching Assistant, Stanford University

Students, Stanford University

Seth Bushinsky	Megan Kelso
Shannon Donahue	Ashley Maloney
Karin Donhowe	Nicholas Markman
Logan Egan	Kevin McLean
Harris Fienberg	Okorie Puryear
Guy Grazier G'Sell	Rebecca Schwartz
David Gudai	Ryan Schwartz
Noah Hawthorne	Jesús Javier Téllez
Jina Hyun	Simon Yang
Laure Katz	

Visitors

William Wulsin, N.D.	Medical officer, Seattle, WA
Jane Ellen Stevens	Multimedia journalist, Davis, CA

Data Description

This cruise report provides a record of data collected aboard the SSV *Robert C. Seamans* during Cruise S-199 (U.S. State Department Cruise 2005-002), the sea component of the “Stanford at SEA” program carried out in conjunction with Stanford University. The cruise departed from Honolulu, Hawaii and transited west to Kealahou Bay, Hawaii, south to Christmas and Fanning Islands (Republic of Kiribati) and Palmyra Atoll, before returning to Honolulu (Figure 1).

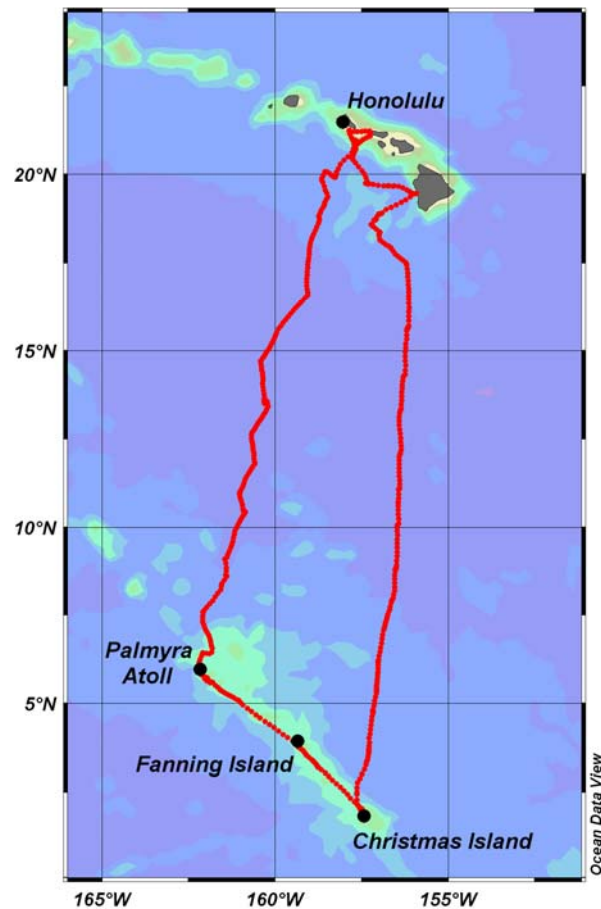


Figure 1: S-199 cruise track plotted from hourly positions.

During the five week voyage we collected samples or data at 42 discrete oceanographic stations (Table 1), surface samples at 42 locations (Table 2), and we continuously sampled water depth and sub-bottom profiles (CHIRP system), upper ocean currents (Acoustic Doppler Current Profiler, or ADCP), and sea surface temperature, salinity and in vivo fluorescence (seawater flow-through system). This report summarizes sea surface chemical and biological characteristics (Tables 2 and 3), and subsurface

biological and chemical properties with depth (Tables 4 and 5). Lengthy CTD, CHIRP, ADCP, and flow-through data are not reported here. All unpublished data can be made available by arrangement with the Sea Education Association (SEA) data 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 and Stanford University.

As part of SEA's educational program, students conduct oceanographic research at sea for studies they have designed prior to the cruise. Student projects span the four major disciplines of oceanography – physical, chemical, biological, and geological oceanography (Table 6). Student research efforts culminate in a written paper and an oral presentation to the ship's company. The student research papers from cruise S-199 are available upon request from SEA.

Kara Lavender
SEA Chief Scientist, S-199

Table 1: Oceanographic sampling stations.

Station Number	Date	Local Time	Log (nm)	Latitude (N)	Longitude (W)	Cast Depth (m)	General Locale
CTD							
S199-001-CTD	9-May-05	2038	41.1	20°43.8'	157°43.4'	515	South of Hawaii
S199-004-CTD	12-May-05	0438	231.0	18°53.0'	156°57.0'	798	South of Hawaii
S199-005-CTD	12-May-05	1132	245.0	18°44.2'	157°05.3'	794	South of Hawaii
S199-006-CTD	12-May-05	1521	253.1	18°35.7'	157°13.0'	799	South of Hawaii
S199-007-CTD	12-May-05	2148	275.7	18°19.6'	157°00.1'	642	South of Hawaii
S199-008-CTD	13-May-05	0738	304.5	17°54.6'	156°39.4'	648	South of Hawaii
S199-009-CTD	13-May-05	1535	344.3	17°29.6'	156°13.6'	650	South of Hawaii
S199-010-CTD	14-May-05	1206	460.0	15°38.8'	156°04.8'	521	Central Pacific
S199-013-CTD	15-May-05	1200	597.6	13°19.7'	156°22.5'	560	Central Pacific
S199-016-CTD	16-May-05	1140	730.0	11°05.6'	156°22.5'	533	Central Pacific
S199-020-CTD	17-May-05	1156	853.9	8°50.5'	156°30.8'	517	Central Pacific
S199-023-CTD	18-May-05	1232	943.5	7°06.2'	156°51.5'	547	Central Pacific
S199-026-CTD	19-May-05	1208	1040.1	5°23.4'	157°04.0'	551	Central Pacific
S199-029-CTD	20-May-05	1200	1139.9	3°38.8'	157°17.9'	556	Central Pacific
S199-032-CTD	24-May-05	1200	1358.0	3°15.2'	158°47.7'	539	Central Pacific
S199-039-CTD	2-Jun-05	1132	1831.5	8°37.6'	161°23.8'	504	Central Pacific
S199-042A-CTD	5-Jun-05	1114	2155.9	13°32.4'	160°14.8'	1320	Central Pacific
Hydrocast							
S199-004-HC	12-May-05	0438	231.0	18°53.0'	156°57.0'	798	South of Hawaii
S199-005-HC	12-May-05	1132	240.0	18°44.2'	157°05.3'	794	South of Hawaii
S199-006-HC	12-May-05	1420	253.1	18°35.7'	157°13.0'	799	South of Hawaii
S199-007-HC	12-May-05	2148	275.7	18°19.6'	157°00.1'	642	South of Hawaii
S199-008-HC	13-May-05	0738	304.5	17°54.6'	156°39.4'	648	South of Hawaii
S199-009-HC	13-May-05	1535	344.3	17°29.6'	156°13.6'	650	South of Hawaii
S199-010-HC	14-May-05	1206	460.0	15°38.8'	156°04.8'	521	Central Pacific
S199-013-HC	15-May-05	1200	597.6	13°19.7'	156°22.5'	560	Central Pacific
S199-016-HC	16-May-05	1140	730.0	11°05.6'	156°22.5'	533	Central Pacific
S199-020-HC	17-May-05	1156	853.9	8°50.5'	156°30.8'	517	Central Pacific
S199-023-HC	18-May-05	1232	943.5	7°06.2'	156°51.5'	547	Central Pacific
S199-026-HC	19-May-05	1208	1040.1	5°23.4'	157°04.0'	551	Central Pacific
S199-029-HC	20-May-05	1200	1139.9	3°38.8'	157°17.9'	556	Central Pacific
S199-032-HC	24-May-05	1200	1358.0	3°15.2'	158°47.7'	539	Central Pacific
Neuston Net							
S199-004-NT	12-May-05	0619	231.2	18°52.9'	156°59.9'	0	South of Hawaii
S199-005-NT	12-May-05	0934	240.0	18°43.5'	157°05.8'	0	South of Hawaii
S199-006-NT	12-May-05	1418	253.1	18°36.2'	157°12.4'	0	South of Hawaii
S199-007-NT	12-May-05	2012	275.7	18°21.6'	156°58.6'	0	South of Hawaii
S199-008-NT	13-May-05	0630	304.0	17°55.4'	156°39.8'	0	South of Hawaii
S199-009-NT	13-May-05	1617	344.3	17°30.5'	156°14.2'	0	South of Hawaii
S199-011-NT	15-May-05	0022	540.7	14°19.2'	156°16.1'	0	Central Pacific
S199-014-NT	16-May-05	0020	673.0	12°05.2'	156°23.5'	0	Central Pacific
S199-019-NT	17-May-05	0005	785.0	10°02.7'	156°28.7'	0	Central Pacific
S199-020-NT	17-May-05	1049	853.2	8°52.4'	156°30.4'	0	Central Pacific

Table 1 continued

Station Number	Date	Local Time	Log (nm)	Latitude (N)	Longitude (W)	Cast Depth (m)	General Locale
Neuston Net continued							
S199-022-NT	17-May-05	2355	896.0	7°55.8'	156°38.6'	0	Central Pacific
S199-023-NT	18-May-05	1058	943.0	7°07.6'	156°50.9'	0	Central Pacific
S199-025-NT	19-May-05	0003	999.0	6°11.7'	157°01.6'	0	Central Pacific
S199-026-NT	19-May-05	1051	1039.8	5°25.0'	157°04.3'	0	Central Pacific
S199-028-NT	20-May-05	0037	1075.4	4°44.8'	157°10.9'	0	Central Pacific
S199-029-NT	20-May-05	1043	1136.5	3°40.6'	157°18.1'	0	Central Pacific
S199-030-NT	21-May-05	0008	1214.9	2°29.8'	157°38.1'	0	Central Pacific
S199-034-NT	24-May-05	2330	1379.0	3°33.5'	159°06.5'	0	Central Pacific
S199-037-NT	31-May-05	1943	1631.5	5°49.7'	162°08.3'	0	Central Pacific
S199-038-NT	1-Jun-05	2245	1752.0	7°35.1'	162°04.5'	0	Central Pacific
S199-039-NT	2-Jun-05	1340	1831.0	8°37.8'	161°24.5'	0	Central Pacific
S199-040-NT	3-Jun-05	1245	1942.4	10°25.3'	160°52.8'	0	Central Pacific
Meter Net							
S199-004-MN	12-May-05	0610	231.2	18°52.9'	156°59.9'	103	South of Hawaii
S199-005-MN	12-May-05	0918	240.0	18°44.0'	157°05.3'	150	South of Hawaii
S199-006-MN	12-May-05	1408	253.1	18°36.4'	157°12.0'	151	South of Hawaii
S199-007-MN	12-May-05	2000	275.7	18°21.6'	156°58.6'	102	South of Hawaii
S199-008-MN	13-May-05	0615	303.9	17°55.7'	156°39.8'	150	South of Hawaii
S199-009-MN	13-May-05	1617	344.3	17°30.5'	156°14.2'	125	South of Hawaii
S199-009A-MN	13-May-05	1847	345.0	17°29.5'	156°13.2'	125	South of Hawaii
S199-037-MN	31-May-05	1923	1631.5	5°49.7'	162°08.3'	52	Central Pacific
S199-039-MN	2-Jun-05	1308	1831.6	8°37.8'	161°24.5'	378	Central Pacific
S199-040-MN	3-Jun-05	1213	1942.4	10°26.2'	160°52.8'	379	Central Pacific
Squid Jigging							
S199-002-SJ	10-May-05	2059	124.5	19°40.8'	156°45.6'	0	South of Hawaii
S199-003-SJ	10-May-05	2245	124.5	19°40.3'	156°36.1'	0	South of Hawaii
S199-012-SJ	15-May-05	0130	540.7	14°19.2'	156°16.1'	0	Central Pacific
S199-015-SJ	16-May-05	0100	674.3	12°05.2'	156°23.5'	0	Central Pacific
S199-018-SJ	17-May-05	0005	785.0	10°02.7'	156°28.7'	0	Central Pacific
S199-021-SJ	17-May-05	2130	890.5	8°06.2'	156°34.7'	0	Central Pacific
S199-024-SJ	18-May-05	2100	998.8	6°12.7'	157°01.4'	0	Central Pacific
S199-027-SJ	19-May-05	2140	1071.0	4°46.3'	157°10.9'	0	Central Pacific
S199-041-SJ	3-Jun-05	2140	1979.5	10°57.5'	161°01.8'	0	Central Pacific

Table 2: Surface station data

Station Number	Date	Local Time	Log (nm)	Latitude (N)	Longitude (W)	Chl a ⁺ (µg/l)	Chl a ⁺ (µg/l)	POC (µg/l)
SS-001	14-May-05	1703	486.0	15°11.6'	156°13.6'	0.026	0.042	19.37
SS-002	14-May-05	2010	510.9	14°48.5'	156°14.7'	0.024	0.020	19.66
SS-003	15-May-05	1230	540.7	14°18.4'	156°16.3'	0.013	0.022	18.72
SS-004	15-May-05	0410	550.0	14°07.1'	156°19.5'	0.020	0.014	15.30
SS-005	15-May-05	0750	574.4	13°43.7'	156°20.8'	0.025	0.016	17.49
SS-006	15-May-05	1604	616.8	13°00.0'	156°24.9'	0.006	0.011	15.24
SS-007	15-May-05	1953	646.0	12°32.5'	156°22.5'	0.015	0.019	16.48
SS-008	16-May-05	0021	673.0	12°05.1'	156°23.5'	0.019	0.016	14.86
SS-009	16-May-05	0432	684.6	11°50.4'	156°25.2'	0.014	0.030	13.68
SS-010	16-May-05	0800	707.8	11°27.4'	156°24.9'	0.032	0.023	18.85
SS-011	16-May-05	1725	751.1	10°40.1'	156°27.4'	0.026	0.023	14.69
SS-012	16-May-05	2025	769.9	10°19.2'	156°26.7'	0.042	0.007	14.37
SS-013	16-May-05	2335	784.8	10°03.4'	156°28.4'	0.021	0.025	20.39
SS-014	17-May-05	0400	806.7	9°39.8'	156°28.5'	0.100	0.066	24.60
SS-015	17-May-05	0800	834.4	9°10.6'	156°29.1'	0.145	0.114	26.83
SS-016	17-May-05	1615	890.5	8°30.1'	156°33.5'	0.148	0.105	31.84
SS-017	17-May-05	2000	No data	8°06.2'	156°34.7'	0.161	0.253	25.46
SS-018	18-May-05	0008	896.1	7°55.3'	156°38.6'	0.159	0.130	25.43
SS-019	18-May-05	0405	915.1	7°34.3'	156°44.1'	0.127	0.166	42.41
SS-020	18-May-05	0800	934.3	7°18.1'	156°48.6'	0.173	0.181	41.42
SS-021	18-May-05	1645	966.8	6°44.2'	156°55.5'	0.231	0.210	41.98
SS-022	18-May-05	2000	993.6	6°17.6'	157°00.3'	0.218	0.218	38.27
SS-023	19-May-05	0022	999.0	6°11.0'	157°01.5'	0.189	0.127	36.76
SS-024	19-May-05	0400	1013.8	5°42.2'	157°01.6'	0.097	0.142	38.89
SS-025	19-May-05	0814	1032.0	5°34.8'	157°03.8'	0.033	0.087	21.55
SS-026	19-May-05	1728	1046.2	5°14.5'	157°05.5'	0.109	0.102	33.58
SS-027	19-May-05	2000	1063.4	4°37.1'	157°00.4'	0.158	0.120	38.99
SS-028	20-May-05	0000	1075.0	4°45.8'	157°10.9'	0.079	0.079	43.57
SS-029	20-May-05	0405	1098.5	4°23.0'	157°13.9'	0.154	0.094	28.21
SS-030	20-May-05	0800	1127.5	3°54.0'	157°16.9'	0.236	0.180	27.13
SS-031	20-May-05	1600	1150.8	3°24.9'	157°20.3'	0.093	0.097	24.41
SS-032	20-May-05	1935	1174.0	3°04.3'	157°27.4'	0.152	0.101	35.03
SS-033	21-May-05	0000	1214.6	2°30.1'	157°38.2'	0.141	0.133	26.49
SS-034	21-May-05	0400	1239.3	2°07.2'	157°36.1'	0.125	0.090	27.24
SS-035	23-May-05	2020	1257.5	2°10.2'	157°38.4'	0.086	0.071	30.52
SS-036	24-May-05	0000	1291.0	2°32.5'	158°01.3'	0.113	0.069	30.52
SS-037	24-May-05	0406	1329.7	2°57.0'	158°28.1'	0.146	0.068	26.02
SS-038	24-May-05	0800	1355.0	3°12.2'	158°45.9'	0.119	0.171	27.51
SS-039	24-May-05	1700	1361.7	3°22.3'	158°54.3'	0.080	0.100	54.60
SS-040	24-May-05	2000	1370.2	3°28.7'	159°01.8'	0.150	0.054	37.55
SS-041	24-May-05	2353	1379.0	3°32.9'	159°06.0'	0.124	0.101	39.62
SS-042	25-May-05	0400	1389.5	3°42.1'	159°14.4'	0.096	0.056	29.33

* Replicate samples for chlorophyll-a were collected at each station

Table 3: Neuston net tow data. See Table 1 for station information.

Station Number	Tow Length (m)	Temp. (°C)	Salinity (psu)	Zoop. Biomass (ml)	Zoop. Density (ml/m ²)	Gelatinous Biomass* (ml)	Gelatinous Density* (ml/m ²)
S199-004-NT	1852	25.7	34.5	35.0	0.019	0.5	0.0003
S199-005-NT	2907	25.7	34.5	4.0	0.001	<1.0	
S199-006-NT	1852	25.8	34.5	4.5	0.002		
S199-007-NT	1852	25.9	34.5	18.0	0.010	35.0	0.0189
S199-008-NT	1474	25.6	34.5	12.0	0.008	2.0	0.0014
S199-009-NT	1132	28.0	34.5	8.0	0.007	0.5	0.0004
S199-011-NT	1929	26.1	34.4	7.0	0.004	4.0	0.0021
S199-014-NT	1889	26.4	34.3	4.0	0.002	1.5	0.0008
S199-019-NT	1852	27.1	34.4	39.0	0.021		
S199-020-NT	2045	27.8	34.6	4.7	0.002	<0.5	
S199-022-NT	1667	28.2	34.7	28.0	0.017	5.0	0.0030
S199-023-NT	1111	28.4	34.7	13.0	0.012	0.5	0.0005
S199-025-NT	2253	28.4	34.7	67.0	0.030	9.0	0.0040
S199-026-NT	1707	28.4	34.7	4.5	0.003	1.4	0.0008
S199-028-NT	2130	28.6	34.9	59.0	0.028		
S199-029-NT	2230	28.6	34.9	10.0	0.004	<0.5	
S199-030-NT	1310	28.6	35.0	18.0	0.014	12.5	0.0095
S199-034-NT	1706	28.9	34.9	93.0	0.055	13.0	0.0076
S199-037-NT	1681	28.8	34.8	94.0	0.056	3.0	0.0018
S199-038-NT	1811	28.4	34.6	52.0	0.029	23.0	0.0127
S199-039-NT	1581	28.1	34.7	13.0	0.008	7.5	0.0047
S199-040-NT	1747	27.3	34.5	1.3	0.001	0.4	0.0002

* Blank spaces indicate no data collected

Table 4: Meter net tow data. See Table 1 for station information.

Station Number	Tow Length* (m)	Net Diameter (m)	Zoop. Biomass* (ml)	Zoop. Density* (ml/m ²)	Gelatinous Biomass* (ml)	Gelatinous Density* (ml/m ²)	Comments
S199-004-MN	6616	0.785	70.0	0.014	3	0.0006	
S199-005-MN	13371	0.785	102.0	0.010	55	0.0052	
S199-006-MN	3754	0.785	112.0	0.038			
S199-007-MN	9229	0.785	115.0	0.016	22	0.0030	
S199-008-MN	9793	0.785	100.0	0.013	20	0.0026	
S199-009-MN	16136	0.785	25.0	0.002	4	0.0003	
S199-009A-MN	10772	0.785	41.0	0.005	8	0.0010	
S199-037-MN	8669	0.785	238.0	0.027	8	0.0009	
S199-039-MN		2.490					Wire parted
S199-040-MN	4166	0.785	64.0	0.020	7	0.0021	

* Blank spaces indicate no data collected

Table 5: Hydrocast bottle data. See Table 1 for station information.

Station Number	Bottle Number	Bottle Depth (m)	O ₂ * (ml/l)	PO ₄ * (µM)	Chl a** (µg/l)	Chl a** (µg/l)	POC* (µg/l)
S199-004-HC	13	0.0		0.452	0.063		
S199-004-HC	12	9.9	3.79	0.452	0.066		
S199-004-HC	11	19.9	3.35	0.538	0.071		
S199-004-HC	10	39.6	3.06	0.452	0.083		
S199-004-HC	9	59.7	3.32	0.471	0.080		
S199-004-HC	8	79.2	3.35	0.543	0.131		
S199-004-HC	7	99.3	3.10	0.409	0.214		
S199-004-HC	6	124.6	3.23	0.825	0.400		
S199-004-HC	5	173.6	2.90	1.035	0.057		
S199-004-HC	4	248.6	1.84	1.699	0.004		
S199-004-HC	3	348.2	2.40	2.530	0.004		
S199-004-HC	2	447.4	0.73	2.706	0.005		
S199-004-HC	1	596.0	0.69	3.418	0.005		
S199-005-HC	12	10.1	6.10	0.724	0.068		
S199-005-HC	11	19.8	4.82	0.801	0.072		
S199-005-HC	10	39.4	5.86	0.782	0.074		
S199-005-HC	9	60.2	4.60	0.772	0.096		
S199-005-HC	8	79.3	4.87	0.567	0.130		
S199-005-HC	7	99.7	5.03	0.710	0.238		
S199-005-HC	6	124.4	4.34	0.958	0.365		
S199-005-HC	5	174.3	3.84	1.555	0.040		
S199-005-HC	4	248.4	3.82	2.124	0.005		
S199-005-HC	3	347.8	3.14	2.740	0.005		
S199-005-HC	2	447.2	1.80	3.485	0.003		
S199-005-HC	1	596.1	1.14	3.031	0.002		
S199-006-HC	13	0.0		0.686	0.059		
S199-006-HC	12	10.1	4.61	0.581	0.071		
S199-006-HC	11	20.0		0.863	0.067		
S199-006-HC	10	40.1	5.55	0.810	0.094		
S199-006-HC	9	60.1	4.62	0.595	0.123		
S199-006-HC	8	80.2	4.68	0.701	0.181		
S199-006-HC	7	100.2	4.62	0.758	0.257		
S199-006-HC	6	125.3	4.12	1.063	0.361		
S199-006-HC	5	175.4	3.68	1.536	0.040		
S199-006-HC	4	250.5	3.56	1.980	0.005		
S199-006-HC	3	350.8	1.80	3.241	0.004		
S199-006-HC	2	447.3	1.08	3.647	0.003		
S199-006-HC	1	595.2	0.61	3.895	0.002		
S199-007-HC	13	0.0		0.538	0.052		
S199-007-HC	12	9.9		0.763	0.058		
S199-007-HC	11	20.0	4.30	0.610	0.057		
S199-007-HC	10	39.7	4.75	0.815	0.057		

* Blank spaces indicate no data collected

* Replicate samples for chlorophyll-*a* were collected at each station

Table 5 continued

Station Number	Bottle Number	Bottle Depth (m)	O ₂ * (ml/l)	PO ₄ * (µM)	Chl a** (µg/l)	Chl a** (µg/l)	POC* (µg/l)
S199-007-HC	9	59.2	4.89	0.753	0.124		
S199-007-HC	8	79.6	4.53	0.605	0.138		
S199-007-HC	6	124.1	4.55	0.748	0.375		
S199-007-HC	5	174.1	4.30	2.291	0.085		
S199-007-HC	4	248.9	3.17	2.095	0.004		
S199-007-HC	3	348.1	2.09	3.236	0.005		
S199-007-HC	2	446.3	1.60	3.604	0.005		
S199-007-HC	1	596.8		4.101	0.002		
S199-008-HC	13	0.0		0.772	0.077		
S199-008-HC	12	10.2		0.858	0.076		
S199-008-HC	11	20.0	5.10	0.791	0.084		
S199-008-HC	10	39.4		0.648	0.076		
S199-008-HC	9	58.8	4.53	0.619	0.085		
S199-008-HC	8	80.1	4.62	0.839	0.158		
S199-008-HC	7	99.3	4.62	0.619	0.235		
S199-008-HC	6	123.9	4.49	0.806	0.302		
S199-008-HC	5	174.2	2.86	2.100	0.047		
S199-008-HC	4	248.5	3.19	2.472	0.007		
S199-008-HC	3	347.4	1.78	3.265	0.004		
S199-008-HC	2	447.0	1.12	3.762	0.003		
S199-008-HC	1	596.0		4.120	0.005		
S199-009-HC	13	0.0		0.720	0.054		
S199-009-HC	12	9.8		0.681	0.046		
S199-009-HC	11	19.6	4.54	0.810	0.035		
S199-009-HC	10	39.4		0.610	0.054		
S199-009-HC	9	59.7	4.53	0.553	0.068		
S199-009-HC	8	79.2	4.54	0.629	0.103		
S199-009-HC	7	99.8	4.35	0.643	0.167		
S199-009-HC	6	124.4	4.51	0.806	0.378		
S199-009-HC	5	173.9	4.23	0.958	0.023		
S199-009-HC	4	248.7	4.15	1.594	0.007		
S199-009-HC	3	347.5	2.59	2.859	0.004		
S199-009-HC	2	446.5	1.59	3.752	0.005		
S199-009-HC	1	595.9		4.349	0.003		
S199-010-HC	13	0.0			0.019	0.028	
S199-010-HC	12	24.5			0.029	0.040	13.84
S199-010-HC	11	24.7			0.029	0.040	
S199-010-HC	10	48.6			0.060	0.032	27.11
S199-010-HC	9	50.1			0.060	0.032	
S199-010-HC	8	72.3			0.070	0.072	25.81
S199-010-HC	7	74.2			0.070	0.072	
S199-010-HC	6	97.7			0.133	0.081	29.17
S199-010-HC	5	99.3			0.133	0.081	

* Blank spaces indicate no data collected

* Replicate samples for chlorophyll-a were collected at each station

Table 5 continued

Station Number	Bottle Number	Bottle Depth (m)	O ₂ * (ml/l)	PO ₄ * (μM)	Chl a** (μg/l)	Chl a** (μg/l)	POC* (μg/l)
S199-010-HC	4	123.3			0.251	0.233	20.62
S199-010-HC	3	124.9			0.251	0.233	
S199-010-HC	2	147.2			0.260	0.131	21.05
S199-010-HC	1	148.5			0.260	0.131	
S199-010-HC	0	192.0			0.041	0.049	25.28
S199-013-HC	13	0.0			0.024	0.028	11.87
S199-013-HC	12	23.5			0.005	0.026	15.54
S199-013-HC	11	25.7			0.005	0.026	
S199-013-HC	10	48.8			0.031	0.037	17.80
S199-013-HC	9	50.5			0.031	0.037	
S199-013-HC	8	73.4			0.084	0.073	16.69
S199-013-HC	7	74.8			0.084	0.073	
S199-013-HC	6	107.5			0.073	0.036	18.46
S199-013-HC	5	108.8			0.073	0.036	
S199-013-HC	4	142.6			0.162	0.140	11.61
S199-013-HC	3	143.7			0.162	0.140	
S199-013-HC	2	167.5			0.118	0.120	7.93
S199-013-HC	1	169.1			0.118	0.120	
S199-013-HC	0	285.0			0.002	0.002	22.26
S199-016-HC	13	0.0			0.042	0.029	13.18
S199-016-HC	12	23.6			0.042	0.038	16.82
S199-016-HC	11	25.6			0.042	0.038	
S199-016-HC	10	47.9			0.044	0.038	18.10
S199-016-HC	9	50.6			0.044	0.038	
S199-016-HC	8	72.3			0.090	0.056	16.80
S199-016-HC	7	74.5			0.090	0.056	
S199-016-HC	6	98.3			0.153	0.150	19.27
S199-016-HC	5	99.2			0.153	0.150	
S199-016-HC	4	123.0			0.167	0.297	15.33
S199-016-HC	3	124.7			0.167	0.297	
S199-016-HC	2	147.0			0.236	0.233	10.79
S199-016-HC	1	148.7			0.236	0.233	
S199-016-HC	0	244.0			0.003	0.007	14.52
S199-020-HC	13				0.100	0.133	22.72
S199-020-HC	12	24.0			0.100	0.119	31.12
S199-020-HC	11	25.2			0.100	0.119	
S199-020-HC	10	48.6			0.078	0.119	40.38
S199-020-HC	9	49.7			0.078	0.119	
S199-020-HC	8	74.3			0.148	0.144	26.42
S199-020-HC	7	74.3			0.148	0.144	
S199-020-HC	6	98.3			0.142	0.220	26.31
S199-020-HC	5	99.1			0.142	0.220	
S199-020-HC	4	122.3			0.116	0.153	14.61
S199-020-HC	3	123.8			0.116	0.153	

* Blank spaces indicate no data collected

* Replicate samples for chlorophyll-a were collected at each station

Table 5 continued

Station Number	Bottle Number	Bottle Depth (m)	O ₂ * (ml/l)	PO ₄ * (μM)	Chl a** (μg/l)	Chl a** (μg/l)	POC* (μg/l)
S199-020-HC	2	148.0			0.077	0.055	12.52
S199-020-HC	1	149.0			0.077	0.055	
S199-020-HC	0	248.0			0.011	0.008	33.38
S199-023-HC	13	0.0			0.243	0.235	27.46
S199-023-HC	12	24.0			0.359	0.362	49.18
S199-023-HC	11	24.8			0.359	0.362	
S199-023-HC	10	48.2			0.295	0.352	42.38
S199-023-HC	9	49.6			0.295	0.352	
S199-023-HC	8	73.8			0.337	0.297	28.82
S199-023-HC	7	74.9			0.337	0.297	
S199-023-HC	6	98.9			0.137	0.099	15.06
S199-023-HC	5	99.5			0.137	0.099	
S199-023-HC	4	123.5			0.039	0.023	8.90
S199-023-HC	3	124.8			0.039	0.023	
S199-023-HC	2	147.0			0.025	0.044	9.20
S199-023-HC	1	148.3			0.025	0.044	
S199-023-HC	0	259.7			0.006	0.006	33.71
S199-026-HC	13				0.188	0.242	22.94
S199-026-HC	12	18.3			0.188	0.331	41.59
S199-026-HC	11	21.1			0.188	0.331	
S199-026-HC	10	40.0			0.362	0.331	32.25
S199-026-HC	9	39.8			0.362	0.331	
S199-026-HC	8	59.7			0.355	0.405	23.82
S199-026-HC	7	59.7			0.355	0.405	
S199-026-HC	6	88.4			0.291	0.282	14.19
S199-026-HC	5	89.3			0.291	0.282	
S199-026-HC	4	119.0			0.086	0.095	10.22
S199-026-HC	3	119.3			0.086	0.095	
S199-026-HC	2	149.5			0.029	0.023	10.35
S199-026-HC	1	149.3			0.029	0.023	
S199-026-HC	0	302.0			0.006	0.004	25.01
S199-029-HC	13	0.0			0.164	0.167	28.09
S199-029-HC	12	19.0			0.164	0.190	33.16
S199-029-HC	11	20.2			0.164	0.190	
S199-029-HC	10	38.6			0.195	0.190	34.38
S199-029-HC	9	40.2			0.195	0.190	
S199-029-HC	8	58.8			0.239	0.233	30.62
S199-029-HC	7	59.8			0.239	0.233	
S199-029-HC	6	87.7			0.317	0.230	21.59
S199-029-HC	5	90.3			0.317	0.230	
S199-029-HC	4	117.6			0.068	0.063	11.21
S199-029-HC	3	120.2			0.068	0.063	
S199-029-HC	2	148.2			0.008	0.009	8.12
S199-029-HC	1	150.1			0.008	0.009	

* Blank spaces indicate no data collected

* Replicate samples for chlorophyll-a were collected at each station

Table 5 continued

Station Number	Bottle Number	Bottle Depth (m)	O₂* (ml/l)	PO₄* (μM)	Chl a** (μg/l)	Chl a** (μg/l)	POC* (μg/l)
S199-029-HC	0	222.9			0.003	0.004	20.44
S199-032-HC	13	0.0			0.163	0.175	33.36
S199-032-HC	12	19.3			0.162	0.192	41.25
S199-032-HC	11	20.3			0.162	0.192	
S199-032-HC	10	38.9			0.263	0.311	40.60
S199-032-HC	9	39.8			0.263	0.311	
S199-032-HC	8	58.8			0.342	0.349	33.11
S199-032-HC	7	60.2			0.342	0.349	
S199-032-HC	6	88.7			0.249	0.279	30.31
S199-032-HC	5	89.4			0.249	0.279	
S199-032-HC	4	118.3			0.094	0.117	13.40
S199-032-HC	3	119.7			0.094	0.117	
S199-032-HC	2	148.1			0.021	0.024	12.30
S199-032-HC	1	149.1			0.021	0.024	
S199-032-HC	0	260.0			0.006	0.004	

* Blank spaces indicate no data collected

* Replicate samples for chlorophyll-a were collected at each station

Table 6: Student research projects, cruise S-199.

Title	Student Investigators
Validating remote sensing data along S-199 cruise track using <i>in situ</i> chlorophyll, carbon and irradiance measurements	Seth Bushinsky, Okorie Puryear, and Simon Yang
Corallivore abundance and biomass and coral reef degradation in the Line Islands: Christmas Island, Fanning Island, and Palmyra Atoll	Shannon Donahue
Circulation around a deep seamount in the subtropical Pacific	Karin Donhowe
Effects of preferential primary consumer fishing on lower trophic level herbivores in the Line Islands	Logan Egan and Jesús Javier Téllez
Genetic difference in the Cytochrome C Oxidase I gene between “typical” and equatorial forms of <i>Sthenoteuthis oualaniensis</i>	Harris Fienberg
<i>Title not available</i>	Guy Grazier G'Sell
The impact of bleaching on coral strength	David Gudai
Assessment of coral reef disturbance histories in the Line Islands using coral damage and morphological dominance patterning	Noah Hawthorne
A cross-comparison of lagoonal properties in Christmas Island, Fanning Island, and Palmyra Atoll	Jina Hyun
A comparison of the community structure of coral reef fish along a gradient of fishing pressure in the Line Islands: An apex predator dominated ecosystem	Laure Katz
The effects of a deep seamount on nutrient, oxygen and chlorophyll distributions in the water column	Megan Kelso
Temporal variability in current structure, thermocline and zooplankton of the eastern equatorial Pacific	Ashley Maloney
Characterizing productivity of geostrophic eddies: Implications for leatherback habitat	Nicholas Markman and Rebecca Schwartz
Tropical scombrid feeding habits in the central Pacific	Kevin McLean
The effect of a deep seamount on zooplankton abundance and diversity	Ryan Schwartz