Cruise Report
S-194

Scientific data collected aboard
SSV *Robert C. Seamans*

Seattle, WA – San Francisco, CA
12 July 2004 – 8 August 2004

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To obtain unpublished data, contact the SEA data archivist: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-194

Nautical Staff

Steve Tarrant	Captain
Pamela Coughlin	Chief Mate
Sara Rusche	Second Mate
Gretchen Stuppy	Third Mate
Dusty Smith	Engineer
Maggie McCullough	Steward
Jill Faustine	Deckhand

Scientific Staff

Lisa Graziano	Chief Scientist
Dave Carlson	First Assistant Scientist
Cina Loarie	Second Assistant Scientist
Allison LaFerriere	Third Assistant Scientist

Maritime Studies Staff

Matt McKenzie	Maritime Studies Instructor

Students

Jason M. Addams	Ithaca College
Lynn K. Asbeck	Stanford University
Ashley D. Ayres	Macalester College
Richard D. Chewning	Furman University
Chelsea A. Fairbank	Northeastern University
Ryan A. Fields	Colgate University
Ryan B. Gritzke	Roger Williams University
Jesse H. Hamilton	University of Massachusetts, Boston
Catherine C. Harris	University of Virginia
Erika M. Hasle	Roger Williams University
Jason Helyer	University of Rhode Island
Meghan E. Kallman	Smith College
Eula L. Kozma	Franklin & Marshall College
Melanie K. Leung	Wellesley College
Mira B. MacLennan	Cornell University
Alexis R. Mann	Hamilton College
Sara L. Marcks	Syracuse University
Lauren M. Pozefsky	Trinity University
Kyle C. Pustola	Fairfield University
Philippe R. Rosier	University of San Diego
Eugene T. Sarren	University of California, Santa Cruz
Michael G. Sussman	Hamilton College
Xiaoyu Wang	Amherst College
Amanda S. Whitehurst	College of Charleston

Table 1: Student research projects, cruise S-194.

Title	Student Investigators
Mapping the topography of the Juan de Fuca Ridge, and short study of the water column above.	Jason Addams
Vertical convection along the thermocline between the Alaska and North Pacific subtropical gyres	Lynn Asbeck
Size and Age Distribution of the Myctophid *Tarletonbeania Cenularis* in the Subarctic Waters of the Northeastern Pacific Ocean	Ashley Ayres and Meghan Kallman
Characterization of Copepods South of the Queen Charlotte Islands and West of Vancouver Island	Richard Chewning II
Sediments near the mouth of the Columbia River	Chelsea Fairbank
Topography & Sediments of the Pacific-American-Juan de Fuca Triple Junction West of Vancouver Island	Ryan Fields and Eugene Sarren
Investigations of salinity, nutrients, phytoplankton health and abundance in the Columbia River Plume	Ryan Gritzke
Areas of High Macronutrients and Low Chlorophyll in the Pacific Northeast Ocean	Jesse Hamilton and Sara Marcks
A Study of the California Current: Depth, Salinity, Temperature, and Direction	Catherine Harris and Eula Kozma
Zooplankton abundance in the NE Pacific and over the Endeavor hydrothermal vent	Erika Hasle
Apparent Oxygen Utilization, nutrients, and other water characteristics near the Queen Charlotte Islands	Jason Helyer and Mira MacLennan
Phytoplankton biomass, size, photosynthetic rate and efficiency on the Vancouver shelf	Melanie Leung
Phytoplankton productivity	Alexis Mann
Euphausiids off the coast of Vancouver Island, B. C.	Lauren Pozefsky and Amanda Whitehurst
Nitrate and bacteria distribution in the water column off the Oregon coast	Kyle Pustola
Deep ocean currents around the Dellwood Seamount Chain	Phillipe Rosier
Zooplankton near the Queen Charlotte Islands	Michael Sussman
Profiling and analyzing the plate tectonics of the Queen Charlotte Fault Zone	Elena (Xiaoyu) Wang

Data Description

This section provides a record of data collected aboard the SSV *Robert C. Seamans* during cruise S-194 (U.S. State Department Cruise 2004-048), which departed from Seattle, WA and ended at San Francisco, CA. Leg I sampled Puget Sound, the shelf off Vancouver Island, and the waters between Vancouver and the Queen Charlotte Islands (Figure 1). Leg II sampled waters from Tahsis, Vancouver to San Francisco, including extensive study of the Columbia River Plume.

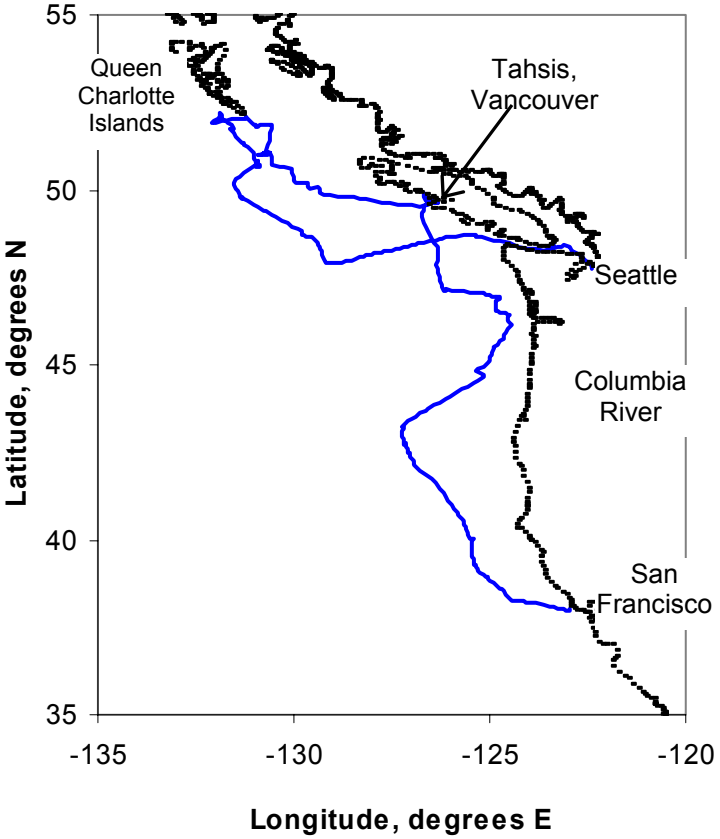

Figure 1: S-194 cruise track plotted from hourly

During the four week voyage we collected samples or data at 60 discrete oceanographic stations (Figure 3), surface samples at 30 locations, 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; Figure 2). This report summarizes sea surface chemical and biological characteristics, and chemical and biological properties with depth. 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).

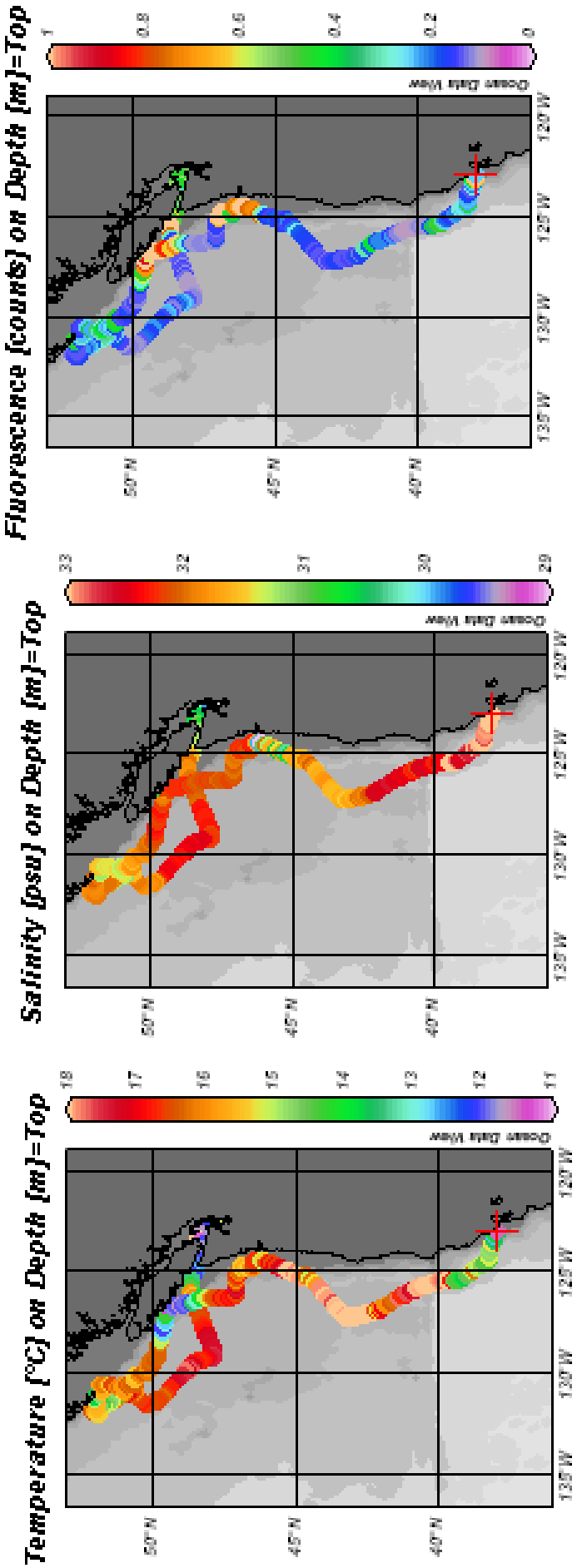

Figure 2. A) Temperature, B) Salinity, and C) Chl-a Fluorescence plotted from hourly data.

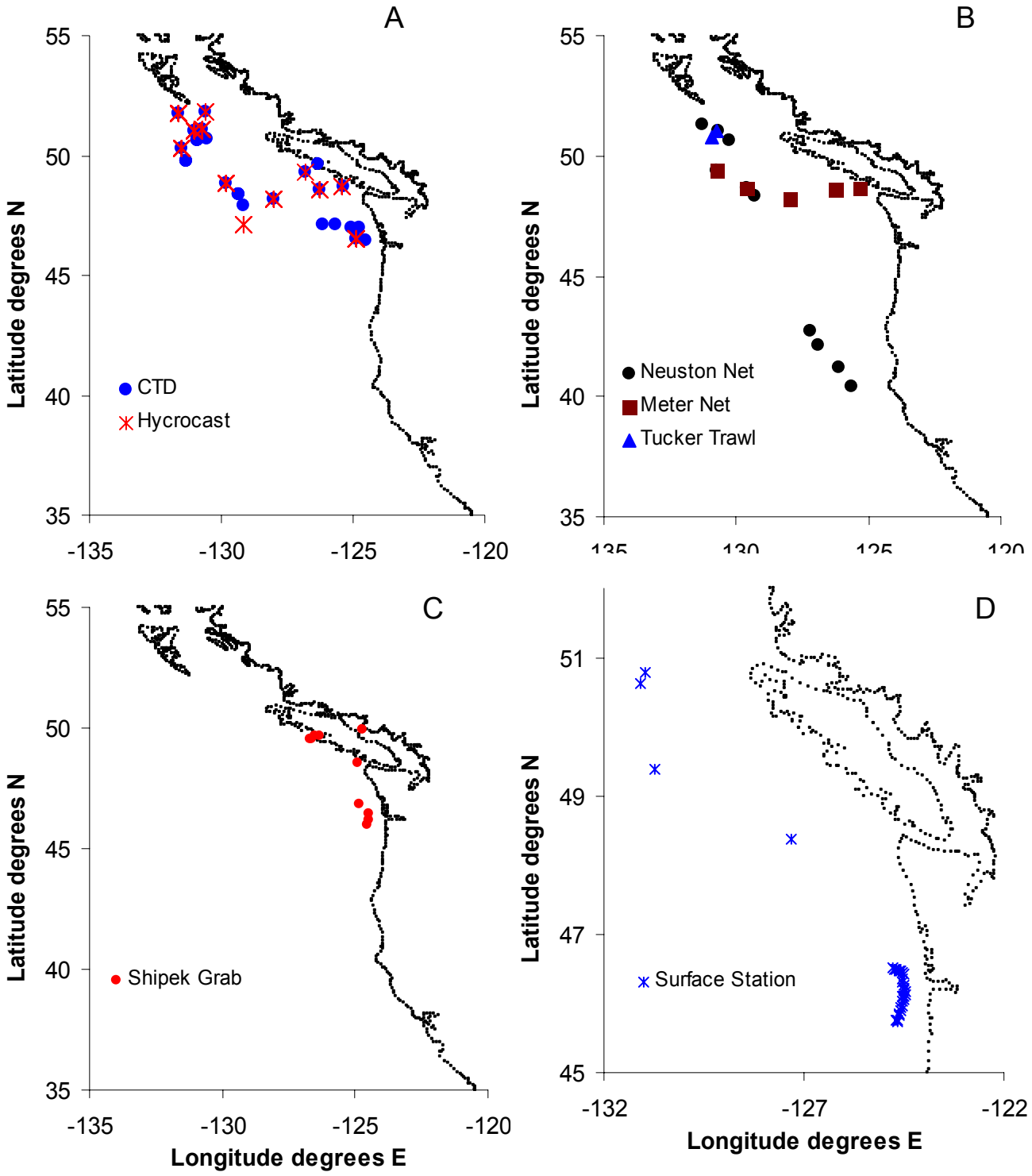

Figure 3: Locations of oceanographic sampling stations. A) Hydrographic equipment B) Net tows C) Sediment collection D) Surface stations.

Table 2: CTD station locations

Station	Date	Time	Depth	Locale	Latitude	Longitude W
S194-003	15-Jul-04	0317	60	La Perouse Bank	48°41.1' N	125°22.3'
S194-005	15-Jul-04	1224	660	Head of Loudown Canyon	48°35.4' N	126°14.5'
S194-007	16-Jul-04	0621	2617	Between Vanc and Endeavor Ridge	48°9.8' N	128°0.5'
S194-008	16-Jul-04	1805		Endeavor Ridge	47°55.0' N	129°8.2'
S194-010	17-Jul-04	0220	1819	N of Endeavor Ridge Site	48°22.0' N	129°20.0'
S194-011	17-Jul-04	0236	1820	N of Endeavor Ridge Site	48°22.0' N	129°20.1'
S194-012	17-Jul-04	0247	1806	N of Endeavor Ridge Site	48°22.0' N	129°20.1'
S194-013	17-Jul-04	0304	1775	N of Endeavor Ridge Site	48°21.9' N	129°20.3'
S194-015	17-Jul-04	1837	2800	100nm S of Queen Charlotte Isl	48°49.2' N	129°49.0'
S194-017	18-Jul-04	0744	3050	120nm S of Queen Charlotte Isl	49°46.4' N	131°19.7'
S194-018	18-Jul-04	0756	3044	120nm S of Queen Charlotte Isl	49°46.4' N	131°19.7'
S194-019	18-Jul-04	0805	3047	120nm S of Queen Charlotte Isl	49°46.3' N	131°19.7'
S194-020	18-Jul-04	0813	3045	120nm S of Queen Charlotte Isl	49°46.3' N	131°19.7'
S194-021	18-Jul-04	0821	3043	120nm S of Queen Charlotte Isl	49°46.2' N	131°19.6'
S194-022	18-Jul-04	1627		S. Edge of Dellwood Knoll	50°18.2' N	131°29.7'
S194-023	19-Jul-04	0048	1663	S. Edge of Dellwood Knoll	50°40.0' N	130°53.2'
S194-024	19-Jul-04	0209	2337	S. Edge of Dellwood Knoll	50°39.1' N	130°55.9'
S194-025	19-Jul-04	0130	1873	S. Edge of Dellwood Knoll	50°39.5' N	130°54.3'
S194-026	19-Jul-04	0140	1964	S. Edge of Dellwood Knoll	50°39.4' N	130°54.7'
S194-027	19-Jul-04	0149	2039	S. Edge of Dellwood Knoll	50°39.3' N	130°55.1'
S194-028	19-Jul-04	0616	2404	North of Dellwood Knoll	50°49.2' N	130°54.3'
S194-029	19-Jul-04	0825	2188	North of Dellwood Knoll	50°48.4' N	130°54.8'
S194-031	19-Jul-04	2014	2503		51°0.6' N	131°1.9'
S194-033	20-Jul-04	0853			51°45.4' N	131°36.9'
S194-034	22-Jul-04	1351	308	"Mount 142"	51°50.8' N	130°34.6'
S194-035	22-Jul-04	2157	2062		51°5.7' N	130°43.2'
S194-038	23-Jul-04	2121	950	Dellwood Seamount	50°41.6' N	130°33.4'
S194-041	25-Jul-04	0956	282	Nootka Sound	49°38.5' N	126°21.0'
S194-043	25-Jul-04	1335	264	Nootka Sound	49°18.3' N	126°47.0'
S194-046	30-Jul-04	0435	2537	West of Grey's Harbor, WA	47°8.4' N	126°9.3'
S194-047	30-Jul-04	0920	1450	West of Grey's Harbor, WA	47°5.4' N	125°40.7'
S194-048	30-Jul-04	1622	1032	40nm West of Grey's Harbor	47°0.0' N	125°5.2'
S194-049	30-Jul-04	2150	136	40nm West of Grey's Harbor	46°57.3' N	124°45.3'
S194-052	31-Jul-04	0724	1180	Off Grey's Harbor	46°31.5' N	124°51.0'
S194-053	31-Jul-04	1332	154	Off Columbia River	46°26.7' N	124°30.3'

Table 3: Hydrocast station locations

Station	Date	Time	Locale	Latitude	Longitude
S194-003-HC	15-Jul-04	0317	La Perouse Bank, Vanc Shelf	48°41.13' N	125°22.31' W
S194-005-HC	15-Jul-04	1224	Head of Loudoun Canyon	48°35.4' N	126°14.5' W
S194-007-HC	16-Jul-04	0621	Between Vanc & Endeavour Ridge	48°9.8' N	128°0.5' W
S194-008-HC	16-Jul-04	1807	Endeavour Ridge	47°5.5' N	129°8.2' W
S194-015-HC	17-Jul-04	1837	N. of Endeavour Segment	48°49.18' N	129°49.5' W
S194-022-HC	18-Jul-04	1627	120 nm S of Queen Charlotte	50°18.2' N	131°29.7' W
S194-031-HC	19-Jul-04	2014	30 nm SW of Queen Charlotte Is	51°0.6' N	131°1.9' W
S194-033-HC	20-Jul-04	0853		51°45.4' N	131°36.9' W
S194-034-HC	22-Jul-04	1351	"Mount 142"	51°50.8' N	130°34.6' W
S194-035-HC	22-Jul-04	2157		51°5.7' N	130°43.2' W
S194-043-HC	25-Jul-04	1335	Nootka Sound	49°18.3' N	126°47.0' W
S194-052-HC	31-Jul-04	0724	Off Gray's Harbor	46°31.5' N	124°51.0' W

Table 4: Hydrocast data

Station	Bottle	Depth m	Temp deg.C	Salinity ppt.	Density	Oxygen mL/L	Phosphate µM	Nitrate µM	Chl-a µg/L
S194-003-HC	13	2				8.74	0.297	0.568	0.134
S194-003-HC	12	15.3	10.3	32.1	24.6	4.87	1.873	16.255	0.050
S194-003-HC	10	25.8	9.4	32.3	24.9	3.61	1.375	17.641	0.048
S194-005-HC	13					6.34	0.393	0.414	0.178
S194-005-HC	12	9.8	14.6	32	23.8	6.56	0.398	0.137	0.187
S194-005-HC	10	24.5	10.3	32.4	24.9		0.656	4.092	0.109
S194-005-HC	8	36.1	9.3	32.5	25.1		1.001	6.472	0.159
S194-007-HC	13					5.81	0.187	0.484	0.086
S194-007-HC	12	2.2	16.4	32.3	23.6		0.331	0.160	0.047
S194-007-HC	10	8.5	16.3	32.4	23.7	6.07	0.182	0.427	
S194-007-HC	8	23.9	13.9	32.6	24.4	6.37	0.388	0.568	0.053
S194-007-HC	6	48.6	9.8	32.6	25.1	7.00	0.608		
S194-007-HC	5	49.8	9.7	32.5	25.1	6.50	0.498		
S194-008-HC	13					5.67	0.273	0.704	0.016
S194-008-HC	2					1.99		52.743	
S194-008-HC	1					1.71	3.668	37.729	
S194-015-HC	13					6.97	0.201	0.717	0.030
S194-015-HC	12	10.6	16.1	32.4	23.7	6.34	0.240	0.151	0.025
S194-015-HC	11	25.3	13	32.5	24.5	6.30	0.369	1.315	0.019
S194-015-HC	10	39.4	10.8	32.7	25	6.72	0.594	2.756	0.025
S194-015-HC	9	54.7	9.3	32.6	25.2	7.50	0.647	6.550	0.036
S194-015-HC	8	74.7	8.4	32.6	25.3	7.93	0.972	10.971	0.027
S194-015-HC	7	99.5	7.7	33.1	25.8		1.078	10.081	
S194-015-HC	6	149.1	7	33.7	26.4		1.662	22.637	
S194-015-HC	5	198.9	6.7	33.9	26.6		1.614	30.484	
S194-015-HC	4	294.5	5.4	33.9	26.8		2.615	34.512	
S194-022-HC	13					6.12	0.245	0.271	0.044
S194-022-HC	12	10.5	15.4	31.8	23.4	6.05	0.412	0.282	0.189
S194-022-HC	11	24.7	12.3	32.1	24.3	6.40	0.599	0.699	0.096
S194-022-HC	10	39.5	10	32.3	24.9	6.23	0.925	7.989	0.092
S194-022-HC	9	54.9	8.7	32.4	25.1	6.40	0.968	12.514	0.065
S194-022-HC	8	74.4	7.9	32.6	25.4	5.45	1.044	13.430	0.056
S194-022-HC	7	99.1	7.5	32.9	25.7		1.26	20.126	
S194-022-HC	6	149.2	6.5	33.5	26.3		1.638	29.071	
S194-022-HC	5	198.9	6.4	33.8	26.5		1.964	37.311	

Table 4: Hydrocast data continued

Station	Bottle	Depth m	Temp deg.C	Salinity ppt.	Density	Oxygen mL/L	Phosphate µM	Nitrate µM	Chl-a µg/L
S194-022-HC	4	294.4	5.4	34	26.8		2.912	48.035	
S194-031-HC	13					6.28	0.503	0.495	0.111
S194-031-HC	12	25.2	10.8	31.9	24.4	6.32	1.121	9.820	0.911
S194-031-HC	11	50.1	8.2	32.3	25.1	7.54	1.777	21.146	0.069
S194-031-HC	10	75	7.6	32.8	25.7	6.28	2.213	27.005	0.026
S194-031-HC	9	99.1	7.2	33.3	26.1	4.65	2.069	26.508	
S194-031-HC	8	123.6	6.8	33.6	26.4	3.47	2.529	33.701	
S194-031-HC	7	149.2	6.7	33.7	26.5	3.07	2.466	36.971	
S194-031-HC	6	198.6	6.5	33.9	26.6	2.61	3.434	37.991	
S194-031-HC	5	297.5	5.6	34	26.8	1.88	4.047	42.438	
S194-031-HC	4	397.7	5.1	34	26.9	1.32	3.913	46.230	
S194-031-HC	3	596.2	4.3	34.2	27.1	2.03	3.87	47.486	
S194-031-HC	2	794.3	3.7	34.3	27.3	1.66	4.832	44.373	
S194-031-HC	1	992.6	3.3	34.4	27.3	0.65	3.276	43.745	
S194-033-HC	13					6.33	0.47	0.493	0.247
S194-033-HC	12	25.3	11.1	32.2	24.6	6.48	0.733	7.623	0.545
S194-033-HC	11	48.9	10.3	32.3	24.8	6.26	1.068	10.971	0.069
S194-033-HC	10	74.6	9.7	32.4	25	5.62	1.193	13.587	0.022
S194-033-HC	9	99.6	9.3	32.5	25.1	5.61	1.197	15.104	
S194-033-HC	8	125	9	32.5	25.2	5.77	1.217	13.560	
S194-033-HC	7	149.5	8.3	32.8	25.5		1.485	20.440	

Table 5: Surface station locations

Station	Date	Time	Laitude	Longitude
SS-001	15-Jul-04	2141	48°22.4' 127	127°19.2' W
SS-002	18-Jul-04	0226	49°23.4' 130	130°43.9' W
SS-003	18-Jul-04	2108	50°37.3' 131	131°5.4' W
SS-004	19-Jul-04	1247	50°47.0' 130	130°57.6' W
SS-005	31-Jul-04	0925	46°30.5' 124	124°47.0' W
SS-006	31-Jul-04	1007	46°29.8' 124	124°43.8' W
SS-007	31-Jul-04	1049	46°29.2' 124	124°40.9' W
SS-008	31-Jul-04	1142	46°28.4' 124	124°37.5' W
SS-009	31-Jul-04	1226	46°27.6' 124	124°34.7' W
SS-010	31-Jul-04	1307	46°27.0' 124	124°31.8' W
SS-011	31-Jul-04	1503	46°25.0' 124	124°30.2' W
SS-012	31-Jul-04	1600	46°20.7' 124	124°31.4' W
SS-013	31-Jul-04	1635	46°18.1' 124	124°31.2' W
SS-014	31-Jul-04	1706	46°15.4' N	124°31.1' W
SS-015	31-Jul-04	1730	46°13.2' N	124°31.0' W
SS-016	31-Jul-04	1754	46°11.5' N	124°30.0' W
SS-017	31-Jul-04	1918	46°10.1' N	124°27.8' W
SS-018	31-Jul-04	2008	46°7.7' N	124°27.9' W
SS-019	31-Jul-04	2020	46°6.0' N	124°29.2' W
SS-020	31-Jul-04	2043	46°4.0' N	124°30.2' W
SS-021	31-Jul-04	2101	46°2.2' N	124°31.7' W
SS-022	31-Jul-04	2150	46°6.3' N	124°32.4' W
SS-023	31-Jul-04	2231	45°57.6' N	124°32.9' W
SS-024	31-Jul-04	2251	45°55.8' N	124°33.8' W
SS-025	31-Jul-04	2315	45°53.6' N	124°35.1' W
SS-026	31-Jul-04	2342	45°51.3' N	124°36.8' W
SS-027	1-Aug-04	0002	45°49.6' N	124°37.8' W
SS-028	1-Aug-04	0028	45°45.6' N	124°38.9' W
SS-029	1-Aug-04	0057	45°46.0' N	124°42.0' W
SS-030	1-Aug-04	0108	45°44.3' N	124°40.5' W

Table 6: Surface Station data

Station	Temp Deg. C	Salinity ppt	Phosphate µM	Silicate µM	Chl-a µg/L	In vivo Fluoresc	Nitrate µM
SS-001	16.5	32.1	0.450		0.012		0.194
SS-002	16.9	32.4			0.064		
SS-003	16.1	31.7	0.369		0.022		0.058
SS-004	16.6	31.6			0.015		
SS-005	16.2	32.1	0.079	7.978	1.100	0.425	1.551
SS-006	16.4	32.1	0.162	6.198	1.536	0.469	0.843
SS-007	16.5	32.1	-0.085	6.286	1.536	0.497	
SS-008	16.6	32.2			1.081	0.423	0.650
SS-009	16.7	32.2	-0.188	6.503	1.953	0.454	1.128
SS-010	16.7	32.3	0.007	5.672	3.061	0.646	0.761
SS-011	16.7	32.3	-0.029	6.589	4.266	0.772	0.917
SS-012	16.5	32.2	0.069	2.971	2.547	0.548	0.848
SS-013	16.6	32.1		4.514	4.042	0.700	0.600
SS-014	16.4	31.8	0.461	7.721	4.067	0.773	0.922
SS-015	16.1	31.7			5.804	0.943	
SS-016	16.2	31.6	0.538	8.509	5.598	1.140	0.742
SS-017	14.5	28.5	0.625	20.345		1.704	1.036
SS-018	15.7	26.6	0.311	27.683	4.884	1.293	0.457
SS-019	15.9	27.2	0.419	23.019	5.877	1.283	0.871
SS-020	16.1	27.7	0.069		5.913	1.182	0.604
SS-021	16.1	29.5	0.090	22.174	5.804	1.290	0.544
SS-022	16.8	31.5	0.085		4.484	0.961	0.397
SS-023	17.0	32.1	0.146	6.100	1.772	0.662	0.774
SS-024	16.8	32.1	-0.049	5.577	1.069	0.720	0.567
SS-025	16.4	31.9	0.069	3.854	3.176	0.799	0.862
SS-026	16.5	31.3			3.098	0.741	
SS-027	16.5	31.3		7.583	2.196	0.732	
SS-028	16.8	31.4	0.322	7.823	2.535	0.697	
SS-029	17.0	31.4	0.116	5.595	2.535	0.738	0.512
SS-030	16.7	31.8	0.033	4.986	1.814	0.727	0.471

Table 7: Net tow station locations

Neuston Net

Station	Date	Time	Locale	Latitude	Longitude
S194-009	17-Jul-04	0111	North Of Endeavour Ridge Site	48°20.0' N	129°19.0' W
S194-014	17-Jul-04	1036	North of endeavour ridge site	48°38.4' N	129°36.0' W
S194-016	18-Jul-04	0217		49°23.8' N	130°43.8' W
S194-032	20-Jul-04	0223	S of Queen Charlotte Isl	51°19.2' N	131°17.8' W
S194-036	23-Jul-04	0228		51°2.3' N	130°42.5' W
S194-039	24-Jul-04	0008	Dellwood Knoll Round 2	50°38.5' N	130°17.1' W
S194-057	2-Aug-04	2115	West of Oregano	42°44.4' N	127°10.4' W
S194-058	3-Aug-04	1110	West Coast of Nothern Cali	42°7.4' N	126°55.3' W
S194-059	4-Aug-04	0000	West of Northern California	41°11.8' N	126°6.8' W
S194-060	4-Aug-04	1119	58nm off coast of Mendicino CA	40°24.2' N	125°38.0' W

Meter Net

S194-002	15-Jul-04	0215	La Perouse Bank	48°41.2' N	125°21.3' W
S194-004	15-Jul-04	1123	Head of Loudown Canyon	48°36.4' N	126°13.5' W
S194-006	16-Jul-04	0520	Halfway to Endeavor Ridge	48°10.4' N	127°59.2' W
S194-014	17-Jul-04	1009	North of Endeavor Segment	48°38.8' N	129°34.5' W
S194-016	18-Jul-04	0209		49°23.7' N	130°43.8' W

Tucker Trawl

Station	Date	Time	Net #	Depth m	Latitude	Longitude
S194-030	19-Jul-04	1110	1	0-300	50°47.0'	130°55.7'
			2	300-200		
			3	200-0		
S194-037	23-Jul-04	0939	1	0-225	51°0.5'	130°45.1'
			2	225-175		
			3	175-0		

Table 8: Net tow data

Neuston Net

Station	Temp	Salinity	Zooplankton Density mL/m^2	Myctophids #	Copepods %
S194-009	16.9	32.5	0.041	20	96
S194-014	16.9	32.5	0.125	0	91
S194-016	16.5	32.4	0.018	1	108
S194-032	15.6	31.5	1.800	11	52
S194-036	16.1	31.2	0.027	38	69
S194-039	15.5	31.6	0.006	3	51
S194-057	19.2	31.8		0	42
S194-058	15.9	32.5		0	96
S194-059	16.8	32.5	0.017	74	91
S194-060	18.2	32.5	0.042	0	108

Meter Net

	Zooplankton Density mL/m^3	Copepods %
S194-002	0.3310	95
S194-004	0.1870	84
S194-006	0.3440	78
S194-014	0.0836	80
S194-016	0.0778	67

Tucker Trawl

Station	Net #	Depth m	Zooplankton Density mL/m^3	Copepods %
S194-030	1	0-300	0.0973574	
	2	300-200	0.4144144	87
	3	200-0	0.0320166	75
S194-037	1	0-225	0.1172266	
	2	225-175	0.0377358	69
	3	175-0	0.0211521	84

Table 9: Shipek Grab stations

Station	Date	Time	Locale	Latitude	Longitude
S194-001-SG	14-Jul-04	22:00	Juan de Fuca	48°33.4' N	124°52.7' W
S194-040-SG	25-Jul-04	6:28	Nootka Sound	49°34.1' N	126°37.1' W
S194-042-SG	25-Jul-04	10:30	Nootka Sound	49°38.5' N	126°21.4' W
S194-044-SG	25-Jul-04	14:10	Nootka Sound	49°41.6' N	126°31.1' W
S194-045-SG	29-Jul-04	5:39	Outside Nootka Sound	49°31.2' N	126°43.2' W
S194-050-SG	30-Jul-04	22:25	Off Gray's Harbor	49°56.9' N	124°44.2' W
S194-051-SG	31-Jul-04	1:46	Off Gray's Harbor	46°49.5' N	124°50.7' W
S194-054-SG	31-Jul-04	13:55	near Columbia River	46°26.7' N	124°30.3' W
S194-055-SG	31-Jul-04	18:49	near Columbia River	46°10.6' N	124°28.5' W
S194-056-SG	31-Jul-04	21:31	Off Columbia River	46°1.0' N	124°33.0' W

Summary of Student Research Projects

Student research covered the range of topics including biological, chemical, geological, and physical oceanography.

Geological studies included mapping a section of the Juan de Fuca Ridge, with a study of the water column directly above it (Jason Addams); a look at the triple-junction of the Pacific-American-Juan de Fuca plates (Ryan Fields and Eugene Sarren); profiling the Queen Charlotte fault zone (Elena Wang); and a study of the sediments near the Columbia River (Chelsea Fairbank).

Physical oceanography projects included a study of the thermocline where the Alaska and N. Pacific Gyres meet (Lynn Asbeck); deep ocean currents around the Dellwood Seamount (Phillipe Rosier); and a study of the California Current (Catherine Harris and Eula Kozma).

Chemical/ Biological water column studies included a look at nutrients and phytoplankton health near the Columbia River plume (Ryan Gritzke); sampling of an HNLC (high nutrient, low chlorophyll) area (Jesse Hamilton and Sara Marcks); deep profiling of oxygen and nutrients near the Queen Charlotte Islands (Jason Helyer and Mira MacLennan); and a look at nitrate and bacteria in the water column off the Oregon coast (Kyle Pustola).

Several biological projects focused on phytoplankton: an in-depth study was done over the Vancouver shelf (Melanie Leung), and another in off-shore water (Alexis Mann). Biological studies focusing on animals included one on Myctophids, looking at size and age distribution (Ashley Ayres and Meghan Kallman); a study of copepods between Vancouver and Queen Charlotte (Richard Chewning); a look at zooplankton over the Endeavor Ridge hydrothermal vent (Erika Hasle); a study of zooplankton near the Queen Charlotte Islands (Michael Sussman); and a detailed look at euphausiids off the coast of Vancouver.

All students wrote a final research paper including introduction, methods, analysis of data, and discussion section. Results were also presented to the ship's company in a poster session on board the *Seamans*.