

CRUISE REPORT

S-193

SCIENTIFIC ACTIVITIES UNDERTAKEN ABOARD THE

SSV Robert C. Seamans

Honolulu, HI – Prince Rupert, British Columbia - Victoria, British Columbia - Seattle, WA

8 May – 15 June 2004



Sea Education Association
Woods Hole, Massachusetts

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Ship's Complement for SSV *Robert C. Seamans S-193*

Nautical Staff

Jen Irving	Captain
Bihn Le	Chief Mate
John Freeman	Second Mate
Steve Kirk	Third Mate
Morgan Simmons	Engineer
Hillary Mendillo	Assistant Engineer
Laura Morrissey	Steward
Laura Sharpless	Deckhand
Heidi Miller	Deckhand
Ben Erne	Deckhand

Scientific Staff

Gary Jaroslow	Chief Scientist
Jim Watkins	First Assistant Scientist
Charles Soucheray	Second Assistant Scientist
Buffy Cushman	Third Assistant Scientist

Students

Andrew P. Ault	Carleton College
Barry L. Brown	Colby College
Polly E. Carden	Macalester College
Kelsey A. Dyck	Carleton College
Kiya R. Gornik	Lewis & Clark College
Sarah M. Green	SUNY, Oswego
Evan C. Hagen	University of Denver
Michael F. Ide	Carleton College
Alice M. Kunce	Wellesley College
Emma J. Levitt	Washington U. in St. Louis
Rebekah M. Lundquist	Carleton College
Kett C. Murphy	University of Chicago
Mark C. O'Brien	University of Denver
Abigail B. Pratt	Eugene Lang College
Grant M. Rozier	Carleton College
Katherine S. Villard-Howe	Simon's Rock College of Bard
Jeffrey W. Zethmayr	Macalester College

Data Description

This cruise report provides a record of data collected aboard the SSV *Robert C. Seamans* during Cruise S-193 during May and June of 2004. The cruise track transected the northeast Pacific Ocean from Hawaii to British Columbia (Fig. 1). The sea-going program is an extension of Sea Education Association (SEA) courses conducted for six weeks on shore in Woods Hole and emphasizes the application of theoretical concepts to the study of the oceans. Oceanographic research conducted during Cruise S-193 involved extensive data collection for individual student projects (Table 1) and ongoing SEA research programs. The student projects focused on current scientific problems in physical, chemical, biological, geological, and environmental oceanography, and stressed the interdisciplinary nature of the applied science. In particular, the complex interaction of oceanic processes was emphasized by interdisciplinary, regional, and temporal comparative analyses of the various data sets collected. Student research papers are available on request from SEA.

During the cruise, samples or data were collected at 87 discrete oceanographic stations (Table 2) in addition to continuously sampling water depth, sub-bottom acoustic profiling, Acoustic Doppler Current Profiles (ADCP) and flow-through sea surface temperature, salinity and *in-vivo* fluorescence. This report summarizes sea surface chemical properties (Table 3), subsurface physical, chemical and biological characteristics (Fig. 2, Tables 4 and 5), and surface sediment qualities (Table 6). Lengthy CTD, CHIRP, ADCP and flow-through data are not reported here. All unpublished data can be made available by arrangement with the SEA archivist (Contact information, p.2). The information contained 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.

Gary E. Jaroslow
Chief Scientist
S-193

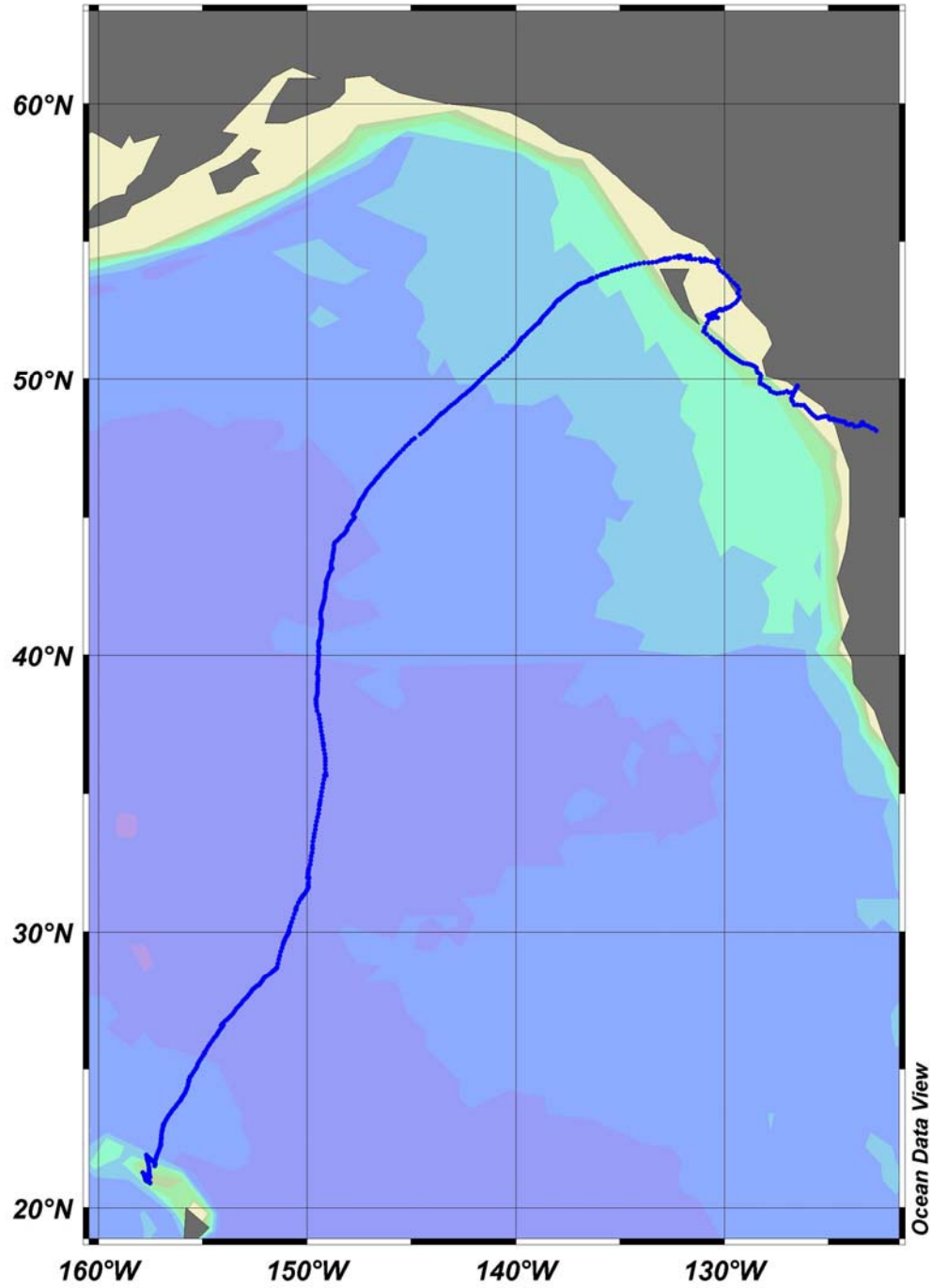


Figure 1. Cruise-track map for Cruise S-193 of the SSV *Robert C. Seamans* from May 8 to June 15, 2004. The cruise began in Honolulu, HI, USA, made port stops in Prince Rupert and Victoria, BC, Canada, Port Townsend, WA, USA and ended in Seattle, WA.

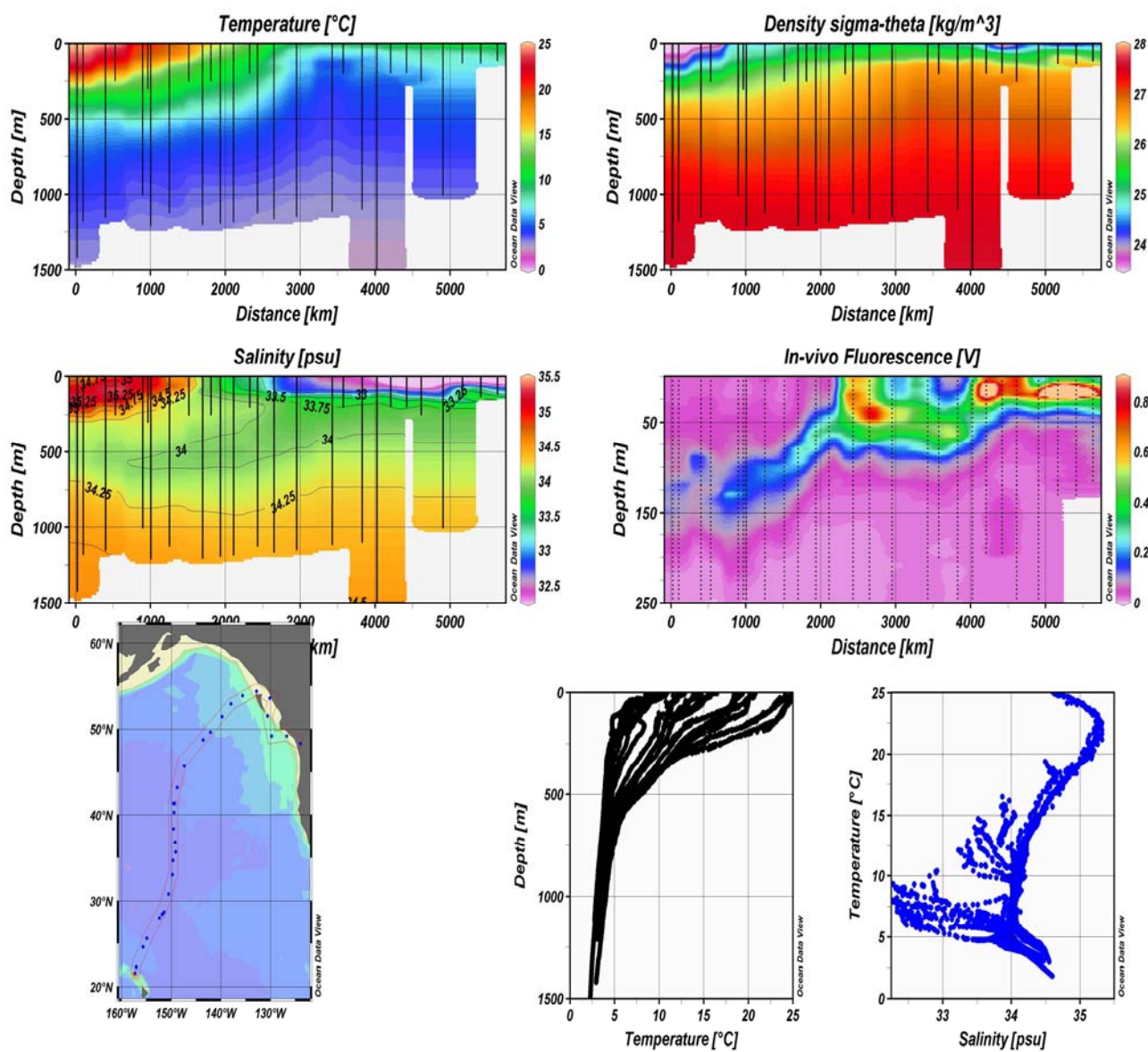


Figure 2. Data collected at CTD stations located in map (lower left, stations shown by blue dots). Along-track water temperature, salinity, density and *in-vivo* fluorescence (top and middle sections). Plots of water-column temperature and temperature versus salinity (lower right).

Table 1. Student Research Projects

Title	Student Researcher(s)
Current variability of the Northeast Pacific	Barry Brown Conor Hagen
Geostrophic flow in the eastern North Pacific	Kett Murphy
North Pacific Intermediate Water: Its presence and composition	Polly Carden Jeff Zethmayr
A comparison between subtropical and subpolar water masses as related to the vertical distribution of oxygen and chlorophyll- <i>a</i> concentrations	Andrew Ault Rebekah Lundquist
Phytoplankton patchiness in the North Pacific Subtropical and Alaskan Gyres	Kelsey Dick
Species distribution of <i>Halobates</i> in the North Pacific Ocean	Alice Kunce
Biogeographical environments and euthecosome pteropods species distribution in the North Pacific	Kiya Gornik
Zoogeographic distribution of pelagic foraminifera as a function of physical, chemical and biological water-mass qualities in the northeast Pacific Ocean	Abigail Pratt
Species variation, feeding habits and health of northeastern Pacific myctophidae	Mark O'Brien Kate Villard-Howe
Marine sediment transport and its relationship to hydrodynamic energy: a study of Penguin Bank	Grant Rozier Sarah Green
Anthropogenic effects of the ocean: pelagic plastic distribution and abundance in the northeastern Pacific Ocean	Michael Ide Emma Levitt

Table 2: Oceanographic sampling stations

Station	Date	Local Time	Log (nm)	Latitude	Longitude	Sampling Depth (m)	General Locale
CTD Casts							
S193-016-CTD	11-May-04	2220	102.0	21°34.7' N	157°16.8' W	1420	40 km N of Molokai
S193-018-CTD	12-May-04	1003	245.0	22°16.2' N	157°00.8' W	1179	67 km N of Molokai
S193-023-CTD	13-May-04	2115	390.8	24°35.7' N	155°39.8' W	1155	333 km NE of Oahu
S193-025-CTD	14-May-04	0923	460.6	25°34.8' N	154°55.1' W	250	537 km NNE of Oahu
S193-030-CTD	15-May-04	2300	659.9	28°01.5' N	152°22.2' W	1007	900 km NNE of Oahu
S193-032-CTD	16-May-04	1301	698.6	28°27.1' N	151°48.9' W	298	926 km NE of Oahu
S193-034-CTD	16-May-04	2152	721.8	28°41.3' N	151°27.9' W	1210	N Pacific Gyre
S193-038-CTD	18-May-04	0012	856.0	30°48.4' N	150°31.9' W	1134	N Pacific Gyre
S193-043-CTD	19-May-04	1055	988.4	33°00.8' N	149°44.2' W	253	Transition Zone
S193-044-CTD	19-May-04	2240	1081.4	34°39.3' N	149°23.5' W	1206	Transition Zone
S193-046-CTD	20-May-04	1026	1150.7	35°39.9' N	149°06.4' W	250	Transition Zone
S193-047-CTD	20-May-04	2015	1222.0	36°49.2' N	149°13.0' W	1196	Subpolar Front
S193-049-CTD	21-May-04	1004	1313.5	38°23.1' N	149°33.8' W	1184	Subpolar Front
S193-052-CTD	22-May-04	1000	1423.6	40°19.2' N	149°26.5' W	200	Subpolar Front
S193-053-CTD	22-May-04	2115	1478.6	41°17.3' N	149°33.8' W	1125	Subpolar Front
S193-055-CTD	23-May-04	2109	1587.3	43°08.8' N	148°47.9' W	1163	Subpolar Front
S193-061-CTD	25-May-04	1004	1749.0	45°40.6' N	147°22.9' W	1148	Subpolar Front
S193-063-CTD	26-May-04	2102	1985.0	48°44.6' N	143°32.9' W	1116	Subpolar Front
S193-065-CTD	27-May-04	1030	2060.5	49°39.7' N	142°50.1' W	250	Alaskan Gyre
S193-067-CTD	28-May-04	1011	2188.0	51°25.8' N	139°46.8' W	1100	Alaskan Gyre
S193-069-CTD	29-May-04	0900	2286.5	52°53.3' N	137°58.9' W	2125	Alaskan Gyre
S193-071-CTD	30-May-04	0915	2381.5	53°51.7' N	135°37.5' W	200	Alaskan Gyre
S193-072-CTD	31-May-04	0340	2479.9	54°20.8' N	132°47.4' W	194	Dixon Entrance
S193-074-CTD	5-Jun-04	0045	2749.0	52°33.1' N	130°90.4' W	250	Hecate Strait
S193-075-CTD	6-Jun-04	1104	2875.5	51°28.6' N	130°34.8' W	1005	75 km S of Q. Charlotte Is.
S193-076-CTD	6-Jun-04	2111	2891.0	51°16.2' N	130°12.7' W	800	51 km SE of Q. Charlotte Is.
S193-078-CTD	10-Jun-04	1120	3127.5	49°11.9' N	126°45.0' W	800	35 km SW of Nootka Sound
S193-079-CTD	12-Jun-04	1835	3264.5	48°20.9' N	123°58.3' W	800	Juan de Fuca Strait
Hydrocasts							
S193-025-HC	14-May-04	0923	460.6	25°34.8' N	154°55.1' W	250	537 km NNE of Oahu
S193-030-HC	15-May-04	2300	659.9	28°01.5' N	152°22.2' W	1007	900 km NNE of Oahu
S193-032-HC	16-May-04	1301	698.6	28°27.1' N	151°48.9' W	298	926 km NE of Oahu
S193-043-HC	19-May-04	1055	988.4	33°00.8' N	149°44.2' W	253	Transition Zone
S193-046-HC	20-May-04	1026	1150.7	35°39.9' N	149°06.4' W	250	Transition Zone
S193-052-HC	22-May-04	1000	1423.6	40°19.2' N	149°26.5' W	200	Subpolar Front
S193-053-HC	22-May-04	2115	1478.6	41°17.3' N	149°33.8' W	1125	Subpolar Front
S193-065-HC	27-May-04	1030	2060.5	49°39.7' N	142°50.1' W	250	Alaskan Gyre
S193-071-HC	30-May-04	0915	2381.5	53°51.7' N	135°37.5' W	200	Alaskan Gyre
S193-072-HC	31-May-04	0340	2479.9	54°20.8' N	132°47.4' W	194	Dixon Entrance
Meter Nets							
S193-020-MN*	12-May-04	2145	287.8	23°01.4' N	156°53.1' W	100	N of Oahu
S193-025-MN**	14-May-04	1004	460.6	25°35.4' N	154°55.7' W	200	537 km NNE of Oahu

S193-031-MN*	16-May-04	0039	659.9	28°01.4' N	152°21.5' W	100	900 km NNE of Oahu
S193-034-MN**	16-May-04	2230	721.8	28°41.0' N	151°27.7' W	200	N Pacific Gyre
S193-041-MN*	18-May-04	2143	924.8	31°58.6' N	149°56.4' W	100	N Pacific Gyre
S193-041-MN**	18-May-04	2143	924.8	31°58.6' N	149°56.4' W	100	N Pacific Gyre
S193-051-MN*	21-May-04	2240	1363.2	39°18.4' N	149°29.3' W	90	Transition Zone
S193-051-MN**	21-May-04	2240	1363.2	39°18.4' N	149°29.3' W	100	Transition Zone
S193-062-MN*	25-May-04	2125	1809.4	46°32.5' N	146°30.0' W	100	Subpolar Front
S193-062-MN**	25-May-04	2130	1809.4	46°32.5' N	146°30.0' W	100	Subpolar Front
S193-068-MN [†]	28-May-04	2020	2236.5	52°05.4' N	138°51.3' W	1000	Alaskan Gyre
S193-068-MN*	28-May-04	2117	2238.0	52°05.4' N	138°51.3' W	100	Alaskan Gyre
S193-068-MN**	28-May-04	2122	2238.0	52°05.4' N	138°51.3' W	100	Alaskan Gyre

*335- μ m-mesh 1-m diameter net

**200- μ m-mesh 1-m diameter net

[†]1000- μ m-mesh 2-m diameter net

Neuston Nets

S193-001-NT	9-May-04	1455	3.1	21°15.2' N	157°51.6' W	0	4 km. S of Waikiki, Oahu
S193-002-NT	9-May-04	2125	8.5	21°04.2' N	157°45.0' W	0	30 km. SE of Waikiki, Oahu
S193-014-NT	11-May-04	0024	102.0	21°07.0' N	157°32.9' W	0	25 km. SE of Oahu
S193-015-NT	11-May-04	1245	156.0	21°44.1' N	157°35.9' W	0	36 km. NE of Oahu
S193-017-NT	11-May-04	2301	201.9	21°33.7' N	157°17.6' W	0	41 km. NW of Molaikai
S193-019-NT	12-May-04	1102	245.0	22°16.3' N	157°01.7' W	0	67 km. NW of Molaikai
S193-021-NT	12-May-04	2234	288.2	23°00.1' N	156°53.0' W	0	365 km. NW of Molokai
S193-022-NT	13-May-04	1156	354.9	23°56.8' N	156°01.3' W	0	250 km. NW of Molokai
S193-024-NT	13-May-04	2206	390.8	24°36.4' N	155°40.5' W	0	333.3 km NE of Oahu
S193-026-NT	14-May-04	2205	533.3	26°35.5' N	154°00.7' W	0	333.3 km NE of Oahu
S193-027-NT	14-May-04	2306	535.5	26°34.6' N	154°03.0' W	0	670 km NNE of Oahu
S193-028-NT	14-May-04	2349	536.2	26°34.5' N	154°04.4' W	0	670 km NNE of Oahu
S193-029-NT	15-May-04	0029	537.1	26°34.5' N	154°05.6' W	0	670 km NNE of Oahu
S193-033-NT	16-May-04	1338	698.6	28°27.5' N	151°48.1' W	0	1000.1 km N of Oahu
S193-036-NT	17-May-04	1146	795.5	29°49.5' N	151°00.0' W	0	N Pacific Gyre
S193-039-NT	18-May-04	0120	856.0	30°49.5' N	150°32.0' W	0	N Pacific Gyre
S193-040-NT	18-May-04	1217	902.5	31°32.4' N	149°59.4' W	0	N Pacific Gyre
S193-042-NT	18-May-04	2309	926.0	31°57.6' N	149°58.8' W	0	N Pacific Gyre
S193-045-NT	19-May-04	2350	1087.0	34°40.0' N	149°23.1' W	0	N Pacific Gyre
S193-048-NT	20-May-04	2121	1222.0	36°49.3' N	149°13.4' W	0	Subpolar Front
S193-050-NT	21-May-04	1059	1313.6	38°23.7' N	149°34.3' W	0	Subpolar Front
S193-054-NT	22-May-04	2337	1479.0	41°18.5' N	149°20.0' W	0	Subpolar Front
S193-056-NT	23-May-04	2231	1587.5	43°10.1' N	148°09.3' W	0	Subpolar Front
S193-057-NT	24-May-04	2200	1705.3	44°58.9' N	147°44.3' W	0	Subpolar Front
S193-058-NT	24-May-04	2237	1706.3	45°00.1' N	147°44.2' W	0	Subpolar Front
S193-059-NT	24-May-04	2323	1707.3	45°01.7' N	147°44.6' W	0	Subpolar Front
S193-060-NT	25-May-04	0010	1708.5	45°03.0' N	147°45.2' W	0	Subpolar Front
S193-064-NT	26-May-04	2211	1985.1	48°45.2' N	143°31.9' W	0	Subpolar Front
S193-066-NT	27-May-04	2351	2122.8	50°33.5' N	140°53.3' W	0	Alaskan Gyre
S193-070-NT	30-May-04	0109	2351.1	53°35.6' N	136°28.3' W	0	Alaskan Gyre
S193-073-NT	31-May-04	0426	2479.9	54°21.4' N	132°50.2' W	0	Dixon Entrance

Phytoplankton Nets

S193-025-PN	14-May-04	0919	459.5	25°34.8' N	154°55.1' W	0	537 km NNE of Oahu
S193-032-PN	16-May-04	1230	698.6	28°27.1' N	151°48.9' W	0	926 km NE of Oahu
S193-046-PN	20-May-04	1035	1150.7	35°39.9' N	149°06.4' W	0	Transition Zone

S193-052-PN	22-May-04	1000	1423.6	40°19.2' N	149°26.5' W	0	Sub-polar Front
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Tucker Trawl

S193-037-TT-1	17-May-04	1555	805.4	30°00.0' N	150°52.6' W	0-550	N Pacific Gyre
S193-037-TT-2	17-May-04	1632	806.2	30°00.0' N	150°52.6' W	450-550	N Pacific Gyre
S193-037-TT-3	17-May-04	1712	807.0	30°00.0' N	150°52.6' W	300-400	N Pacific Gyre

Towed CTD

S193-035-TF-1	17-May-04	1028	793.0	29°47.4' N	151°02.7' W	0-1000	N Pacific Gyre
S193-035-TF-2	17-May-04	1046	793.5	29°47.8' N	151°01.7' W	0-1000	N Pacific Gyre
S193-035-TF-3	17-May-04	1113	794.2	29°48.5' N	151°01.0' W	0-1000	N Pacific Gyre
S193-035-TF-4	17-May-04	1142	795.0	29°49.4' N	151°00.2' W	0-1000	N Pacific Gyre
S193-080-TF	12-Jun-04	2042	3270.6	48°17.8' N	123°47.5' W	0-125	Juan de Fuca Strait

Shipek Sediment Grabs

S193-003-SG	10-May-04	0000	9.9	21°01.0' N	157°44.5' W	430	Penguin Bank, Hawaii
S193-004-SG	10-May-04	0118	10	20°59.2' N	157°43.4' W	50	Penguin Bank, Hawaii
S193-005-SG	10-May-04	0315	15	20°57.4' N	157°40.0' W	48	Penguin Bank, Hawaii
S193-006-SG	10-May-04	0510	19.5	20°55.3' N	157°32.7' W	425	Penguin Bank, Hawaii
S193-007-SG	10-May-04	0610	19.5	20°54.7' N	157°31.7' W	1056	Penguin Bank, Hawaii
S193-008-SG	10-May-04	0927	34.8	20°59.6' N	157°43.0' W	109	Penguin Bank, Hawaii
S193-009-SG	10-May-04	1634	75.3	21°04.0' N	157°36.3' W	49	Penguin Bank, Hawaii
S193-010-SG	10-May-04	1726	78.3	21°05.3' N	157°37.6' W	120	Penguin Bank, Hawaii
S193-011-SG	10-May-04	1740	78.3	21°04.9' N	157°37.5' W	50	Penguin Bank, Hawaii
S193-012-SG	10-May-04	1840	78.3	21°05.0' N	157°37.7' W	70	Penguin Bank, Hawaii
S913-013-SG	10-May-04	1900	82.1	21°06.2' N	157°38.7' W	490	Ka'iwi Channel, Hawaii
S913-077-SG	9-Jun-04	0750	3084.3	49°45.1' N	126°31.1' W	24	Nootka Sound, BC

Table 3. Surface station data.

Station	Date	Time	Log	Latitude	Longitude	Temp (°C)	Salinity (PSU)	PO ₄ (mm)	Chl-a (mg/l)
SS-001	9-May-04	1515	3.1	21°14.8' N	157°51.1' W	25.9	34.4	0.243	0.019
SS-002	9-May-04	2140	8.5	21°03.9' N	157°45.0' W	26.7	34.4	0.266	0.011
SS-003	11-May-04	0040	102.2	21°06.6' N	157°32.7' W	25.9	34.6	0.658	0.019
SS-004	11-May-04	1300	156.4	21°43.6' N	157°35.8' W	25.9	34.6	0.294	0.024
SS-005	11-May-04	2320	201.9	21°32.9' N	157°18.1' W	25.7	34.8	0.234	0.016
SS-006	12-May-04	1107	246.0	22°16.4' N	157°01.7' W	25.7	34.8	0.234	0.010
SS-007	12-May-04	2240	288.2	22°59.9' N	156°52.9' W	25.5	34.6	0.257	0.010
SS-008	13-May-04	1200	354.9	23°56.8' N	156°01.5' W	25.3	34.9	0.182	0.026
SS-009	13-May-04	2200	390.8	24°36.4' N	155°40.6' W	25.4	34.7	0.168	0.018
SS-010	14-May-04	2214	533.3	26°35.4' N	154°00.8' W	23.6	35.2	0.206	0.025
SS-011	14-May-04	2300	535.5	26°34.6' N	154°03.0' W	23.3	35.2	0.154	0.070
SS-012	15-May-04	0016	536.6	26°34.4' N	154°05.3' W	23.2	35.2	0.136	0.016
SS-013	15-May-04	0145	538.5	26°34.9' N	154°07.6' W	23.2	35.2	0.257	0.036
SS-014	17-May-04	1208	795.9	29°50.3' N	150°59.4' W	20.3	34.9	0.040	0.025
SS-015	18-May-04	0135	856.2	30°49.2' N	150°32.3' W	19.8	34.6	0.000	0.006
SS-016	18-May-04	1235	903.2	31°32.7' N	149°59.1' W	19.2	34.2	0.000	0.017
SS-017	18-May-04	2313	926.0	31°57.6' N	149°58.7' W	19.7	34.6	0.000	0.013
SS-018	20-May-04	0000	1087.7	34°40.4' N	149°23.0' W	17.4	34.0	0.110	0.026
SS-019	20-May-04	2130	1222.8	36°50.4' N	149°13.9' W	15.5	33.6	0.160	0.015
SS-020	21-May-04	1104	1313.6	38°23.8' N	149°34.4' W	15.1	33.5	0.110	0.010
SS-021	23-May-04	2245	1587.5	43°10.2' N	148°49.7' W	10.9	32.9	0.780	0.130
SS-022	24-May-04	2210	1705.3	44°59.1' N	147°44.3' W	10.3	32.7	0.790	0.063
SS-023	24-May-04	2305	1706.8	45°00.7' N	147°44.2' W	10.3	32.8	0.830	0.112
SS-024	24-May-04	2345	1707.8	45°02.2' N	147°44.9' W	10.3	32.8	0.730	0.080
SS-025	25-May-04	0035	1709.4	45°03.7' N	147°45.7' W	10.2	32.8	0.760	0.061
SS-026	25-May-04	2135	1808.9	46°32.8' N	146°29.8' W	9.6	32.6	0.960	0.048
SS-027	26-May-04	2220	1985.2	48°45.3' N	143°31.6' W	9.3	32.5	0.950	0.057
SS-028	27-May-04	2355	2122.8	50°33.5' N	140°53.5' W	10.1	32.4	0.900	0.044
SS-029	28-May-04	2042	2237.2	52°05.9' N	138°51.2' W	10.0	32.4	0.890	0.032
SS-030	29-May-04	0118	2351.1	53°36.0' N	136°28.9' W	10.0	32.4	0.710	0.090

Table 4: Neuston tow data. Locations given in Table 1.

Station	Tow length (m)	Temp (°C)	Salinity (PSU)	Zoopl. Biomass (ml)	Zoopl. Density (ml/m²)	Plastic Pieces (#)	Plastic Pellets (#)	Tar (yes/no)	Halobates (#)	Myctophids (#)
S193-001-NT	1759	26.9	34.4	14.0	0.008	2	0	no	0	0
S193-002-NT	1805	26.7	34.4	23.5	0.013	4	0	no	20	0
S193-014-NT	2111	25.9	34.6	13.0	0.006	0	0	no	39	0
S193-015-NT	1389	25.9	34.6	6.5	0.005	6	0	no	3	0
S193-017-NT	1111	25.7	34.8	44.0	0.040	9	0	no	22	7
S193-019-NT	1482	25.7	34.7	4.5	0.003	30	0	no	4	0
S193-021-NT	1667	25.5	34.6	6.5	0.004	0	0	no	11	0
S193-022-NT	1778	25.3	34.9	19.0	0.011	14	0	no	26	0
S193-024-NT	1111	25.4	34.6	27.5	0.025	0	0	no	60	8
S193-026-NT	1667	23.6	35.3	26.0	0.016	0	0	no	95	1
S193-027-NT	1667	23.1	35.2	30.0	0.018	0	0	no	30	1
S193-028-NT	1815	23.2	35.2	28.0	0.015	0	0	no	69	1
S193-029-NT	4130	23.2	35.2	82.5	0.020	0	0	no	320	2
S193-033-NT	1852	21.2	35.1	4.0	0.002	52	0	no	6	0
S193-036-NT	1852	20.3	34.9	7.4	0.004	152	0	no	10	0
S193-039-NT	1482	19.8	34.6	87.0	0.059	8	0	no	49	12
S193-040-NT	2037	19.2	34.2	19.0	0.009	142	0	no	0	0
S193-042-NT	1852	19.7	34.6	76.0	0.041	22	0	no	7	5
S193-045-NT	1852	17.4	34.0	705.0	0.380	1360	0	yes	0	9
S193-048-NT	1852	15.5	33.6	3635.0	1.960	30	0	no	0	4
S193-050-NT	1850	15.1	33.5	85.0	0.046	148	0	yes	0	0
S193-054-NT	1852	12.6	33.2	228.0	0.123	0	0	no	0	3
S193-056-NT	1389	10.9	32.9	60.0	0.043	0	0	no	0	17
S193-057-NT	1667	10.3	32.7	56.0	0.034	0	0	no	0	36
S193-058-NT	1296	10.3	32.8	85.0	0.066	0	0	no	0	45
S193-059-NT	1759	10.3	32.8	75.0	0.043	0	0	no	0	84
S193-060-NT	6019	10.2	32.8	112.0	0.019	4	0	no	0	262
S193-064-NT	2130	9.3	32.5	310.0	0.146	0	0	no	0	18
S193-066-NT	2778	7.4	32.5	219.0	0.079	0	0	no	0	18
S193-070-NT	1482	10.9	32.2	255.0	0.170	0	0	no	0	2

Table 5. Hydrocast station data. Locations given in Table 1.*

Station	Bottle (#)	Depth (m)	O2 (ml/l)	PO4 (μM)	Chl a (μg/l)
S193-025-HC	13	0.0	5.12	0.10	0.018
	12	29.6	5.24	0.09	0.014
	11	60.0	5.31	0.07	0.021
	10	79.7	5.11	0.10	0.028
	9	99.0	5.06	0.12	0.03
	8	109.3	5.13	0.10	0.031
	7	120.2	5.18	0.14	0.026
	6	129.3	5.52	0.11	0.027
	5	139.5	4.98	0.20	0.024
	4	148.3	5.07	0.14	0.027
	3	158.8	4.90	0.13	0.02
	2	179.3	4.49	0.28	0.007
	1	198.6	4.69	0.28	0.007
S193-030-HC	13	5.0	5.42	0.14	0.015
	12	49.9	5.61	0.18	0.01
	11	99.1	5.46	0.16	0.019
	10	198.2	5.19	0.64	0.008
	9	298.5	5.19	1.15	
	8	348.4	5.00	1.15	
	7	397.3	5.00	1.74	
	6	447.8	4.52	1.41	
	5	497.0	3.93	1.28	
	4	595.5	2.89	2.33	
	3	694.6	1.93	2.34	
	2	794.7	1.32	2.46	
	1	893.3	0.66	2.54	
S193-032-HC	13	5.0	5.25	0.02	0.027
	12	34.8	5.18	0.07	0.001
	11	60.2	5.42	0.09	0.017
	10	79.0	5.37	0.10	0.027
	9	94.5	5.31	0.20	0.026
	8	104.2	5.38	0.18	0.028
	7	114.4	5.54	0.17	0.036
	6	124.8	5.40	0.18	0.044
	5	133.9	5.32	0.22	0.021
	4	144.4	5.28	0.29	0.019
	3	159.0	5.12	0.32	0.026
	2	179.2	5.13	0.48	0.013
	1	203.8	5.25	0.58	0.007
S193-043-HC	13	5.0	5.36	0.00	0.010
	12	155.2	6.18	0.00	0.013
	11	183.7	6.18	0.03	0.018
	10	202.9	6.51	0.00	0.028
	9	213.6	5.55	0.00	0.099
	8	223.3	5.40	0.09	0.097
	7	233.8	5.34	0.09	0.028

	6	243.6	5.28	0.11	0.022
	5	251.6	5.19	0.29	0.017
	4	245.9	5.31	0.28	0.015
	3	235.1	5.36	0.23	0.024
	2	215.0	5.28	0.34	0.007
	1	195.1	5.31	0.48	0.003
S193-046-HC	13	5.0	5.58	0.26	0.006
	12	30.4	6.06	0.25	0.017
	10	79.8	5.93	0.35	0.173
	9	89.9	6.04	0.32	0.031
	8	99.4	5.95	0.34	0.040
	7	110.0	5.63	0.50	0.010
	6	119.7	5.66	0.59	0.014
	5	129.8	5.57	0.60	0.004
	4	139.9	5.57	0.71	0.009
	3	149.4	5.66	0.61	0.003
	2	169.0	5.61	0.84	0.004
	1	188.8	5.45	0.70	0.001
S193-052-HC	13	5	6.28	0.41	0.024
	12	9.9	6.32	0.360	0.014
	11	20.4	6.41	0.510	0.016
	10	30.1	6.39	0.440	0.018
	9	39.6	6.41	0.390	0.030
	8	49.8	6.37	0.450	0.019
	7	59.4	6.30	0.560	0.200
	6	69.9	6.37	0.560	0.085
	5	80	6.49	0.450	0.020
	4	89.9	6.37	0.620	0.021
	3	100	6.00	0.620	0.009
	2	109.2	5.90	0.630	0.008
	1	120	5.61	0.660	0.008
S193-053-HC	13	5.0	6.01	0.537	0.100
	12	20.7	6.90	0.523	0.077
	11	45.5	6.45	0.630	0.043
	10	69.9	6.12	0.532	0.025
	9	100.3	5.75	0.690	0.008
	8	198.5	5.05	1.250	0.047
	7	298.4	4.76	1.623	
	6	398.0	3.49	1.422	
	5	496.8	2.60	2.410	
	4	596.5	2.00	2.452	
	3	695.2	1.28	2.736	
	2	794.2	0.82	2.401	
	1	992.5			
S193-65-HC	13	0	6.57	1.310	0.046
	12	11.2	6.54	1.306	0.029
	11	19.7	6.56	1.352	0.021
	10	29.3	6.69	1.329	0.051
	9	39.7	6.78	1.334	0.045
	8	49.9	6.86	1.683	0.044
	7	59.4	6.84	1.473	0.088
	6	70.5	6.77	1.571	0.098

	5	78.6	6.98	1.646	0.072
	4	89.5	7.22	1.525	0.075
	3	100.2	6.23	1.75	0.042
	2	120.2	5.03	2.08	0.009
	1	148.6	4.20	2.27	0.009
S193-071-HC	13	0.0	6.75	0.67	0.537
	12	9.9	6.94	0.62	1.167
	11	20.4	6.61	0.67	0.682
	10	25.9	6.49	0.99	
	9			1.14	
	8				
	7	39.7	6.51	0.950	0.055
	6	50.6	6.46	1.160	0.079
	5	60.3	6.40	0.800	0.066
	4	68.3	6.34	0.910	0.045
	3	80.1	6.46	1.060	0.022
	2	89.5	5.26	1.150	0.023
	1	99.8	4.65	1.310	0.021
S193-072-HC	13	0.0	6.83	0.530	0.241
	12	5.1	7.05	0.50	0.425
	11	10.1	7.08	0.53	0.246
	10	15.6	6.82	0.58	0.282
	9	20.3	6.46	1.07	0.152
	8	24.7	6.14	1.04	0.139
	7	30	5.55	1.36	0.121
	6	35.2	5.47	1.43	0.104
	5	40.3	5.22	1.30	0.120
	4	50.7	5.12	1.67	0.044
	3	59.8	5.17	1.76	0.073
	2	70.4	4.71	1.80	0.041
	1	90	4.27	2.15	0.033

*Blank spaces = no data collected.

Table 6. Sediment composition data. Locations given in Table 1.

Station	Qualitative description
S193-003-SG	very fine sand to silt
S193-004-SG	medium to fine sand, coral and shell fragments
S193-005-SG	fine to coarse rounded sand, shell fragments
S193-006-SG	fine sand to med fine sand, shell and coral fragments 40% of sample
S193-007-SG	No sample
S193-008-SG	medium grain size. Coralline to fine grain, shell and coral pieces
S193-009-SG	sand, round and angular
S193-010-SG	sand, round and angular fragments
S193-011-SG	silty sand, little sample
S193-012-SG	cobbly sand, coralgal chunks up to 3-4 cm, Halimeda platelets, red algae nodules
S913-013-SG	sand, no organics
S913-077-SG	silty clay, green, strong organic smell