

PRELIMINARY CRUISE REPORT, W0007A  
R/V WECOMA, 7-13 July 2000  
GLOBEC/ENSO Long-Term Observations off Oregon

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PRINCIPAL INVESTIGATOR(S): GLOBEC: Adriana Huyer, Robert L. Smith, P. Michael Kosro, P. A. Wheeler, W. T. Peterson and Jack A. Barth

PURPOSE: To determine physical, plankton and nutrient/chemical conditions over the continental margin for climate change studies in NE Pacific. In particular, to make CTD and CTD/rosette and net tow stations along 5 lines (off Newport, Heceta Head, Coos Bay, the Rogue River, OR. and Crescent City, CA., to make continuous bio-acoustic observations between the 50-500m. isobaths along the 5 lines, to deploy drifters at selected locations on the Newport line, and to make continuous observations of currents using ADCP and of surface-layer temperature, salinity and fluorescence by means of ship's thru-flo system. Figure 1 shows the location of the CTD stations. Table 1 shows the CTD station positions, and Table 2 shows the biochemical sampling depths.

SAMPLING PLAN:

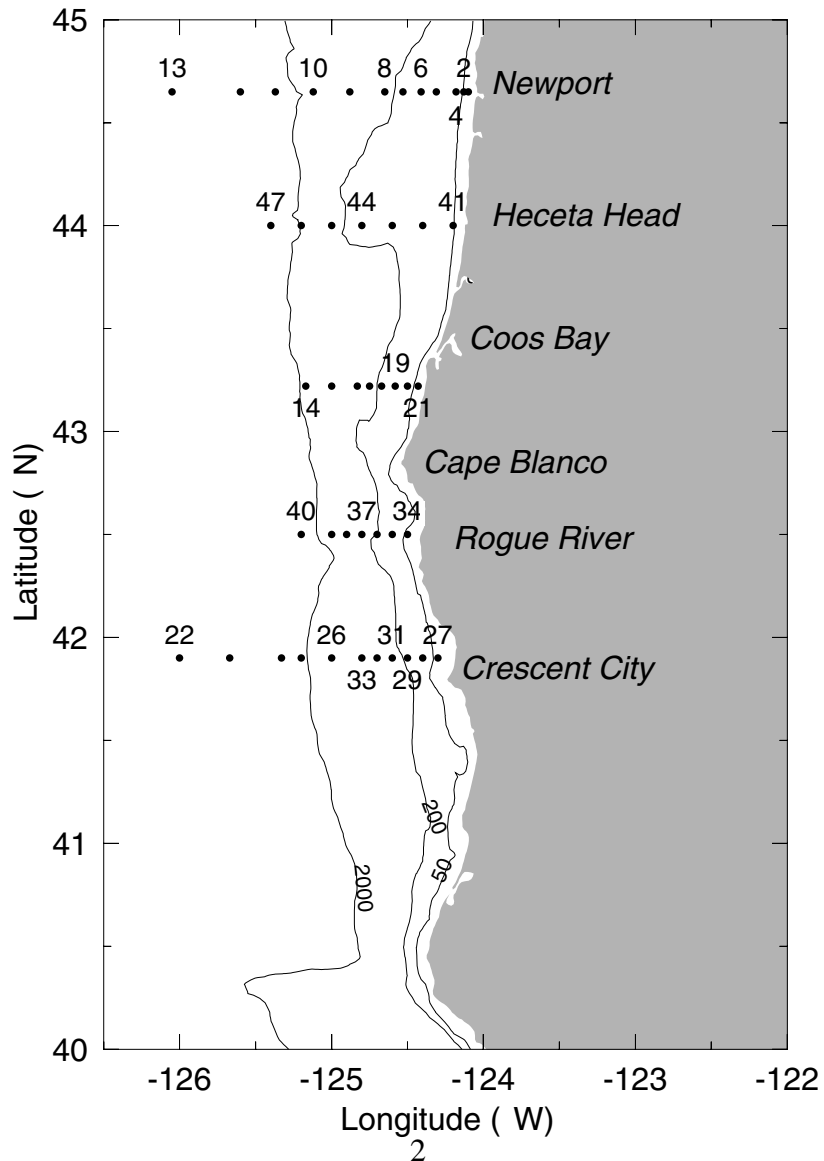
1. Use ship's intake continuously for Temperature, Salinity, and Fluorescence
2. Continuous ADCP Profiling (150 kHz transducer) for water velocity and backscattering for bio-acoustics.
3. Standard CTD Stations using SBE 9/11 plus CTD system for Temperature, Salinity, Fluorescence, Light Transmission, Oxygen.
4. Rosette sampling: 5 liter bottles for nutrients, and chlorophyll.
5. Deploy surface drifters after selected NH-line stations.
6. Vertical net tows: 1/2 meter nets 100 m to surface; Horizontal net tows with 1 m<sup>2</sup> MOCNESS.
7. Continuous bio-acoustic observations between the 50-500m isobath along 5 sections using a Hydroacoustics Technology, Inc., system towed alongside the ship.

CRUISE NARRATIVE

A brief overview of the cruise is presented here. An event log is provided in Table 3, and the participating personnel are listed in Table 4. Wecoma departed Newport at 1000 PDT on 7 July 2000. CTD sampling started at NH-1. Following the CTD at NH-3, both the MOCNESS and HTI (bio-acoustic system) were deployed, malfunctioned, and retrieved. The MOCNESS was re-terminated prior to being deployed at NH-5. The HTI was found to have a loose power connection, and was deployed following the CTD at NH-5. The CTD cast at NH-5 was done twice due to the rosette misfiring. The rosette was thoroughly washed with fresh water and the bottle firing mechanism was tested on deck. The rosette fired correctly for the next three casts, and then had problems only at NH-

25 and HH-7. After releasing five drifters and completing CTD's and net tows along the Newport Line at 1521 PDT, 8 July, we transited to FM-9, arriving at 2328 PDT, 8 July. At FM-7, the MOCNESS was damaged on deployment, so it was recovered, repaired and re-deployed. Following FM-1 at 1442 PDT, 9 July, we headed to the offshore end of the Crescent City line, arriving at CR-11 at 2350 PDT. By the end of the CTD cast at CR-7, the winds had increased to 35-40 knots and all operations were secured. The ship transited to CR-1 where the weather improved, and sampling was resumed at 1600 PDT, 10 July. The MOCNESS was omitted for the rest of the CR line due to strong winds, and the CTD cast was aborted at CR-3 after the hydro wire jumped the sheave during rough weather. The ship hove to at the station while the CTD wire was re-terminated. A vertical net tow was completed, and CTD sampling resumed at 2306 PDT, 10 July at CR-3. The CTD cast and vertical net at CR-6 were completed at 0407 PDT, 11 July and the ship transited to RR-1, arriving 0920 PDT. High winds continued and following RR-3, the ship hove to for 2 1/2 hours waiting for better weather. The Rogue River line was finally completed at 0645 PDT, 12 July. The ship transited to the Heceta Head line, beginning HH-1 at 1647 PDT, 12 July, finishing HH-9 at 0724, 13 July, and at 0730 began the transit to Newport. We arrived alongside the pier at Newport at about 1340 PDT on 13 July 2000.

Figure 1. W0007A CTD stations along the Newport, Heceta Head, Five Mile, Rogue River and Crescent City Hydrographic Lines.



## PRELIMINARY RESULTS

Vertical sections of the parameters measured by the SBE CTD system (temperature, salinity, density, fluorescence voltage and transmissometer voltage and dissolved oxygen concentration) are presented at the end of this report. Also included are vertical sections of the alongshore currents measured by the shipborne Acoustic Doppler Profiler during both the outbound and inbound legs of the cruise and a map showing the trajectory of the five drifters deployed during this cruise. Finally, we show maps of the 5 m temperature and salinity, and time series of the wind speed and direction.

In all sections, we observed a typical response to the seasonal upwelling-favorable winds: on all sections, isotherms, isohalines and isopycnals slope generally upward from depths of 100 – 150 m offshore to depths of 0-50 inshore over the inner shelf. Winds during our cruise were from the north (except on the last day), and very strong while we were south of Cape Blanco, but moderate farther north. The Columbia River Plume extended past the NH-Line at 44.6° N; only small areas of  $S < 32.5$  psu were observed on the HH and CR lines. The band of cold, saline upwelled water adjacent to the coast was much narrower off Newport than off Crescent City.

The ADCP sections show an equatorward jet coincident with these regions of sloping isopycnals. On the CC-line at 41.9° N, the equatorward flow seems to be enhanced by a cyclonic eddy whose core lies near 125.3° W, inshore of the jet. All ADCP sections also show a strong poleward undercurrent along the continental slope; its core seems to lie near the 7° C isotherm, at a depth of 150-250 m.

As during our April cruise, there was a pool of remarkably cold and saline ( $<7^{\circ}$  C,  $S >34.0$  psu) just inshore of Heceta Bank on the HH-line. These properties are observed at shallower depths on the HH-line than on any of the other sections.

The attached zooplankton report was provided by Dr. Wm. Peterson.

Table 4. Names, affiliations, and responsibilities of scientific personnel participating on W0007A.

Robert L. Smith	Chief Scientist	OSU	CTD
Adriana Huyer	Co-Chief Scientist	OSU	CTD
Jane Fleischbein	Technician	OSU	CTD
Andy Ross	Technician	OSU	CTD, oxygen
Margaret Sparrow	Technician	OSU	CTD
Julie Arrington	Technician	OSU	nuts, chl
Nobuyuki Kawasaki	Technician	OSU	nuts, chl
Erin Clark	Undergraduate Student	OSU	nuts, chl
Jennifer Harman	Undergraduate Student		
Woody Moses	Graduate Student	OSU	nuts, chl
William T. Peterson	Co-Chief Scientist	NOAA	
Julie Keister	Technician	HMSC	zooplankton
Leah Feinberg	Technician	HMSC	zooplankton
Anders Roestad	Technician	ODFW	zooplankton
Linda Fayler	Technician	OSU	martec
Daryl Swensen	Technician	OSU	martec

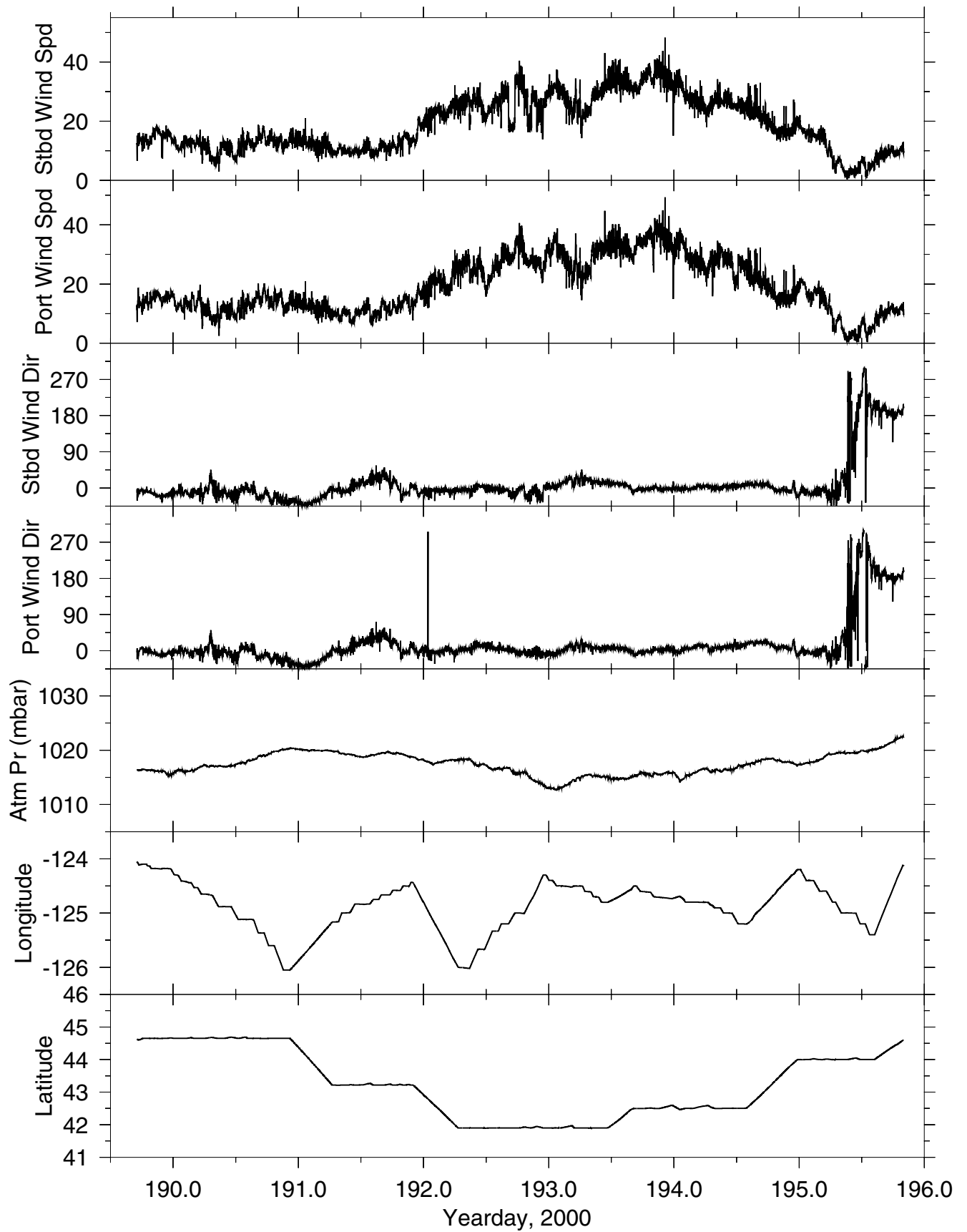


Table 1. CTD station positions during W0007A, and sampling at each station (C: Bio/Chem bottle sampling, N:half-meter vertical net tows, M:Mocness, D:drifter, P:Pigment, O:Oxygen samples)

Station		Distance	Lat.	Long.	Bottom	Cast	Sampling
Name	No.	from shore	°N	°W	Depth	Depth	Type
NH-1	1	3	44.65	-124.10	27	22	N
NH-3	2	5.4	44.65	-124.13	46	40	P
NH-5	3	9.3	44.65	-124.18	60	56	
NH-5	4	9.3	44.65	-124.18	60	55	C,M,N
NH-10	5	18.5	44.65	-124.30	83	75	P,N,D
NH-15	6	27.8	44.65	-124.41	94	85	P,M,N,D
NH-20	7	37	44.65	-124.53	144	138	P,N
NH-25	8	46.5	44.65	-124.65	296	288	C,N,M,D
NH-35	9	64.8	44.65	-124.88	436	426	C,N,M
NH-45	10	83.5	44.65	-125.12	702	664	C,N,M,D
NH-55	11	103.2	44.65	-125.37	2866	1006	P,O
NH-65	12	121.5	44.65	-125.60	2858	1006	C,D
NH-85	13	157.2	44.65	-126.05	2882	1007	C
FM-1	21	3.3	43.22	-124.43	35	30	N
FM-3	20	8.7	43.22	-124.50	58	54	C,N,M
FM-4	19	15.4	43.22	-124.58	87	83	C,N,M
FM-5	18	22	43.22	-124.67	154	150	C,M,N
FM-6	17	28.9	43.22	-124.75	313	307	C,N,M
FM-7	16	35.7	43.22	-124.83	342	320	C,M,N
FM-8	15	49.1	43.22	-125.00	1079	1005	C,N
FM-9	14	62.6	43.22	-125.17	1658	1005	C,N
CR-1	27	7.8	41.90	-124.30	41	36	C,N
CR-2	28	15.9	41.90	-124.40	69	64	N
CR-3	29	24.4	41.90	-124.50	136	42	
CR-3	30	24.4	41.90	-124.50	138	128	C,N
CR-4	31	32.8	41.90	-124.60	510	506	C,N
CR-5	32	40.9	41.90	-124.70	657	651	C
CR-6	33	49.3	41.90	-124.80	697	690	N
CR-7	26	65.7	41.90	-125.00	837	824	C
CR-8	25	82.2	41.90	-125.20	2713	1006	
CR-9	24	93.3	41.90	-125.33	3098	1005	C,N
CR-10	23	120.8	41.90	-125.67	2933	1006	
CR-11	22	148.5	41.90	-126.00	3321	1006	C,N
RR-1	34	7.2	42.50	-124.50	38	33	C,N
RR-2	35	15.6	42.50	-124.60	88	84	C,N,M
RR-3	36	23.7	42.50	-124.70	132	123	C,N
RR-4	37	31.7	42.50	-124.80	578	560	C,N,M
RR-5	38	40.2	42.50	-124.90	1160	1006	O
RR-6	39	48.2	42.50	-125.00	1766	1005	C,N
RR-7	40	64.6	42.50	-125.20	2962	1005	C,N
HH-1	41	5	44.00	-124.20	54	48	C,N
HH-2	42	20.9	44.00	-124.40	121	115	C,N,M
HH-3	43	36.9	44.00	-124.60	155	145	C,N,M
HH-4	44	53	44.00	-124.80	112	107	N
HH-5	45	68.9	44.00	-125.00	926	920	C,M,N
HH-7	46	84.8	44.00	-125.20	1698	1006	C
HH-9	47	100.9	44.00	-125.40	3022	1005	C

Table 2. Actual sample depths and types of subsamples for biochemical sampling during W0007A.

<b>Station, Depth, Dist. From Shore</b>	<b>Sample Collection Depths (m)</b>	<b>Type of Sample Collected</b>
NH-03, 47m, 5km	35, 9, 2	Slide Samples and Pigments at 9m and 2 m
NH-05, 58m, 9km	55, 50, 45, 40, 30, 26, 20, 15, 10, 7, 5	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
NH-10, 80m, 18km	55, 6, 1	Slide Samples and Pigments at 6m and 1 m
NH-15, 89m, 28km	85, 76, 70, 60, 50, 40, 30, 27, 20, 10, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
NH-20, 140m, 37km	120, 16, 2	Slide Samples and Pigments at 16 m and 2 m
NH-25, 234m, 46km	230, 200, 150, 100, 70, 50, 40, 30, 20, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 230m, 200m and 150m)
NH-35, 673m, 65km	425, 397, 150, 100, 70, 50, 40, 32, 30 20, 15, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 425m, 397m and 150m)
NH-45, 670m, 84km	664, 500, 150, 100, 70, 50, 40, 30, 25, 20, 10, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 664m, 500m and 150m)
NH-55, 2885m, 102km	899, 700, 450, 300, 200, 100, 36, 2	Slide Samples and Pigments at 36 m and 2 m
NH-65, 2851m, 120km	1004, 860, 150, 100, 70, 60, 50, 40, 31, 20	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1004m, 860m and 150m)
NH-85, 2839m, 157km	1006, 800, 150, 100, 70, 60, 50, 40, 30, 10, 1	TOC (all depths), Nutrients, TN (all depths), Chl, Chl<10µm, POC/PON (except 1000m, 800m and 150m)

<b>Station, Depth, Dist. From Shore</b>	<b>Sample Collection Depths (m)</b>	<b>Type of Sample Collected</b>
HH-1, 52m	48, 40, 30, 25, 19, 15, 10, 8, 5, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
HH-2, 115m	115, 100, 70, 60, 50, 40, 30, 20, 15, 10, 5, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
HH-3, 150m	145, 100, 70, 60, 50, 40, 30, 20, 10, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
HH-4, 100m	95, 70, 60, 50, 40, 30, 20, 10, 8, 5, 1	
HH-5, 950m	885, 500, 150, 100, 70, 50, 40, 36, 30, 20, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 885m, 500m and 150m)
HH-7, 1600m	1006, 890, 149, 100, 70, 50, 40, 44, 30, 20, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1006m, 890m and 149m)
HH-9, 3000m	1005, 740, 150, 100, 70, 50, 40, 38, 30, 20, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1006m, 890m and 149m)

Table 2. cont.

<b>Station, Depth, Dist. From Shore</b>	<b>Sample Collection Depths (m)</b>	<b>Type of Sample Collected</b>
FM-3, 60m, 9km	53, 50, 40, 30, 25, 20, 15, 10, 8, 5, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
FM-4, 84m, 15km	78, 70, 60, 50, 45, 40, 30, 20, 12, 10, 5, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
FM-5, 158m, 22km	149, 104, 100, 70, 60, 50, 40, 30, 20, 15, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
FM-7, 336m, 35km	320, 300, 150, 100, 70, 50, 40, 30, 23, 20, 10, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 320m, 300m and 150m)
FM-8, 1078m, 49km	1005, 830, 150, 100, 70, 50, 40, 30, 20, 15, 10, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1005m, 830m and 150m)
FM-9, 1722m, 63km	1005, 737, 150, 100, 70, 50, 40, 35, 30, 20, 10, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 1005m, 737m and 150m)

<b>Station, Depth, Dist. From Shore</b>	<b>Sample Collection Depths (m)</b>	<b>Type of Sample</b>
RR-1, 35m, 7km	32, 30, 24, 20, 17, 15, 9, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
RR-2, 80m, 15km	82, 71, 60, 50, 41, 31, 20, 17, 12, 5, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
RR-3, 130m, 23km	123, 70, 60, 50, 40, 30, 25, 20, 10, 5, 3	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
RR-4, 550m, 33km	500, 445, 150, 100, 70, 50, 40, 30, 28, 20, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 500m, 445m and 150m)
RR-6, 1800m, 47km	1005, 880, 150, 100, 70, 50, 40, 30, 25, 20, 10, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1005m, 880m and 150m)
RR-7, 3060m 64km	1005, 440, 150, 100, 70, 50, 40, 32, 30, 20, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 1005m, 880m and 150m)

Table 2. cont.

<b>Station, Depth, Dist. From Shore</b>	<b>Sample Collection Depths (m)</b>	<b>Type of Sample</b>
CR-1, 39m, 8km	36, 30, 25, 21, 15, 11, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
CR-3, 117m, 23km	100, 95, 70, 60, 50, 40, 30, 25, 20, 10, 5, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON
CR-4, 495m, 31km	450, 295, 150, 70, 50, 40, 33, 30, 20, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 450m, 295m and 150m)
CR-5, 645m, 41km	650, 150, 100, 70, 50, 40, 30, 25, 20, 10, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 650m, and 150m)
CR-7, 852m, 66km	500, 360, 150, 100, 70, 50, 40, 30, 20, 15, 10, 1	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 500m, 360m, and 150m)
CR-9, 3089m, 93km	1005, 150, 100, 70, 50, 40, 30, 25, 20, 10, 1	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON (except 1005m and 150m)
CR-11, 3400m, 147km	720, 500, 150, 100, 70, 50, 39, 35, 30, 20, 9, 2	TOC (surface), Nutrients, TN (surface), Chl, POC/PON (except 720m, 500m, and 150m)

<b>Subsample</b>	<b>Replicates</b>
TOC	3
Nutrients	1
TN	3
Chl	2
POC/PON	1
Pigments	3
Slides	2



Table 3. Event Log for W0007A

	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
7-Jul	1700												Depart Newport	
													Start DAS	
													Start flo-thru	
													Start ADCP	
	1825		1	NH-1	44	39.1	-124	06.0	27	1017.4	000	14	CTD	WE18900.01
	1846	1848			44	39.1	-124	06.0					vertical net tow, 22 m	WE18900.02
	1914		2	NH-3	44	39.0	-124	07.8	46	1017.2	355	15	CTD with pigments at 1m, 9m	WE18900.03
	1957		3	NH-5	44	39.1	-124	10.7	60	1017.4	355	15	CTD (biochem aborted, rosette misfired)	WE18900.04
	2035		4	NH-5	44	39.1	-124	10.7	60				CTD with biochem (misfired)	WE18900.05
	2108				44	39.1	-124	10.9					HTI deployed	WE18900.06
	2207	2211			44	39.1	-124	10.6					vertical net tow, 55 m	WE18900.07
	2304				44	39.4	-124	10.8					Mocness deployed	WE18900.08
		2326			44	39.9	-124	11.1					Mocness aboard	WE19000.01
8-Jul	0023		5	NH-10	44	39.1	-124	17.8	83	1016.9	340	16	CTD with pigments at 1m, 6m	WE19000.02
	0043				44	39.1	-124	18.0					vertical net tow, 78 m	WE19000.03
	0055				44	39.11	-124	18.22					drifter 15902	WE19000.04
	0144		6	NH-15	44	39.1	-124	24.8	94	1017.0	340	16	CTD with biochem	WE19000.05
	0205				44	39.1	-124	24.9					secchi disk	WE19000.06
	0207	0210			44	39.1	-124	24.9					vertical net tow, 85 m	WE19000.07
	0236				44	39.2	-124	25.6					Mocness deployed	WE19000.08
		0322			44	40.3	-124	26.8					Mocness aboard	WE19000.09
	0327				44	40.4	-124	26.9					drifter 15903	WE19000.10
	0411		7	NH-20	44	39.1	-124	31.8	144	1017.4	350	11	CTD with pigments at 2m, 15 m	WE19000.11
	0430	0436			44	39.0	-124	31.9					vertical net tow, 100 m	WE19000.12
	0535		8	NH-25	44	39.2	-124	39.0	296	1018.1	345	8	CTD with biochem (misfired)	WE19000.13
	0603	609			44	39.2	-124	39.0					vertical net tow, 100 m	WE19000.14
	0627				44	39.5	-124	39.2					Mocness deployed	WE19000.15
		722			44	40.9	-124	40.4					Mocness aboard	WE19000.16
	0731				44	40.76	-124	40.66					drifter 15904	WE19000.17
	0736												Cleaned flo-thru filters	
	0859		9	NH-35	44	39.2	-124	52.9	436	1018.0	355	10	CTD with biochem	WE19000.18
	0937	943			44	39.1	-124	52.9					vertical net tow, 100 m	WE19000.19
	0959				44	39.2	-124	52.9					Mocness deployed	WE19000.20
		1102			44	41.2	-124	53.0					Mocness aboard	WE19000.21
	1237			NH-45	44	39.2	-125	07.1		1018.5	355	10	Mocness deployed	WE19000.22
		1347			44	41.3	-125	07.0					Mocness aboard	WE19000.23
	1354				44	41.3	-125	07.0					HTI recovered	WE19000.24

Table 3. Event Log for W0007A

	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
	1419		10		44	39.1	-125	07.1	702				CTD with biochem	WE19000.25
	1503				44	39.0	-125	07.0					vertical net tow, 100 m	WE19000.26
	1514				44	39.03	-125	07.18					drifter 19505	WE19000.27
	1627		11	NH-55	44	39.1	-125	22.0	2866	1020.0	340	16	CTD with pigments and O2 samples	WE19000.28
	1824		12	NH-65	44	39.1	-125	36.0	2858	1020.6	335	15	CTD with biochem	WE19000.29
	1921				44	39.09	-125	36.33					drifter 19506	WE19000.30
	2115		13	NH-85	44	39.1	-126	03.1	2882	1021.3	335	13	CTD with biochem	WE19000.31
	2221												begin transit to FM-9	
9-Jul	0226												Cleaned flo-thru filters	
	0637		14	FM-9	43	13.0	-125	10.0	1658	1021.0	000	7	CTD with biochem	WE19100.01
	0730	0736			43	12.8	-125	07.8					vertical net tow, 100 m	WE19100.02
	0826		15	FM-8	43	13.0	-125	00.0	1079	1021.0	000	10	CTD with biochem	WE19100.03
	0922	0927			43	13.0	-124	59.8					vertical net tow, 100 m	WE19100.04
	0939				43	13.0	-124	59.7		1021.0	350	15	deploy HTI	WE19100.05
	1102		16	FM-7	43	13.0	-124	50.0	342	1020.0	000	10	CTD with biochem	WE19100.06
	1142	1144			43	13.2	-124	50.1					aborted Mocness (damaged, repaired)	WE19100.07
	1154	1201			43	13.3	-124	50.2					vertical net tow	WE19100.08
	1224				43	13.4	-124	50.3					Mocness deployed	WE19100.09
		1336			43	16.0	-124	49.9					Mocness aboard	WE19100.10
	1459		17	FM-6	43	13.0	-124	45.0	313	1020.0	015	10	CTD	WE19100.11
	1559		18	FM-5	43	13.0	-124	39.9	154	1020.8	035	14	CTD with biochem	WE19100.12
	1620	1626			43	13.0	-124	39.9					vertical net tow, 100 m	WE19100.13
	1640				43	13.2	-124	39.9					Mocness deployed	WE19100.14
		1726			43	14.6	-124	40.0					Mocness aboard	WE19100.15
	1812		19	FM-4	43	13.0	-124	35.0	87	120.6	020	12	CTD with biochem	WE19100.16
	1833	1837			43	12.9	-124	34.9					vertical net tow	WE19100.17
	1849				43	13.0	-124	34.9					Mocness deployed	WE19100.18
		1927			43	14.3	-124	35.1					Mocness aboard	WE19100.19
	2012		20	FM-3	43	13.0	-124	30.0	58	1020.1	355	15	CTD with biochem	WE19100.20
	2029	2034			43	13.1	-124	30.1					vertical net tow	WE19100.21
	2033												Cleaned flo-thru filters	
	2044				43	13.3	-124	30.2					Mocness deployed	WE19100.22
		2102			43	13.9	-124	30.3					Mocness aboard	WE19100.23
	2109				43	14.0	-124	30.3					HTI recovered	WE19100.23
	2142		21	FM-1	43	13.0	-124	26.0	35		355	16	CTD	WE19100.23
													begin transit to CR-Line	
10-Jul	0650		22	CR-11	41	54.0	-126	00.1	3321	1019.2	355	25	CTD with biochem	WE19200.01
	0748	0755			41	54.0	-126	00.5					vertical net tow, 100m	WE19200.02
	1044	1135	23	CR-10	41	53.9	-125	39.9	2933	1018.0	355	30	CTD with oxygen	WE19200.03

Table 3. Event Log for W0007A

	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
	1102												Cleaned flo-thru filters	
	1319	1407	24	CR-9	41	54.1	-125	20.0	3098	1016.9	000	25	CTD with biochem	WE19200.04
	1409	1414			41	54.1	-125	20.0					vertical net tow	WE19200.05
	1516	1608	25	CR-8	41	54.0	-125	11.9	2713	1017.3	355	30	CTD	WE19200.06
	1615				41	54.0	-125	12.0					deploy HTI	WE19200.07
	1738	1826	26	CR-7	41	54.0	-125	00.0	837	1016.3	350	34	CTD with biochem	WE19200.08
	1831				41	54.2	-125	00.0					HTI recovered	WE19200.09
	1835												too rough to continue working, transit to CR-1, hoping for shelter inshore	
	2303		27	CR-1	41	54.0	-124	18.0	41	1013.9	350	29	CTD with biochem	WE19200.06
	2317	2320			41	54.0	-124	18.0					vertical net tow, 30 m	WE19200.06
	2348												Cleaned flo-thru filters	
11-Jul	0010	0019	28	CR-2	41	53.9	-124	23.9	69	1013.9	000	30	CTD	WE19300.01
	0030	0035			41	53.8	-124	23.9					vertical net tow, 62 m	WE19300.01
	0153		29	CR-3	41	54.1	-124	30.0	136	1013.4	355	38	CTD, aborted at 40 m (weather, wire) hove-to, awaiting weather, retermination	WE19300.02
	0316	0321			41	53.8	-124	30.2		1015.3	005	25	vertical net tow, 100 m	WE19300.03
	0507												Cleaned flo-thru filters	
	0606		30	CR-3	41	54.0	-124	30.1	138				CTD with biochem	WE19300.04
	0706	0743	31	CR-4	41	53.9	-124	36.1	510	1016.1	020	21	CTD with biochem	WE19300.05
	0749	0756			41	53.7	-124	36.5					vertical net tow, 100m	WE19300.06
	0841	0924	32	CR-5	41	54.0	-124	42.0	657	1016.0	020	20	CTD with biochem	WE19300.07
	1015	1050	33	CR-6	41	54.1	-124	48.0	697	1015.9	010	31	CTD	WE19300.08
	1103	1107			41	54.0	-124	48.0					vertical net tow, 100m	WE19300.09
	1457												begin transit to RR-1 Cleaned flo-thru filters	
	1625	1636	34	RR-1	42	30.0	-124	30.0	38	1016.1	350	27	CTD with biochem	WE19300.10
	1639	1641			42	29.8	-124	30.2					vertical net tow, 32 m	WE19300.11
	1743	1802	35	RR-2	42	30.0	-124	36.0	88	1016.6	355	33	CTD with biochem	WE19300.12
	1812	1818			42	29.7	-124	36.4					vertical net tow, 82 m	WE19300.13
	1835				42	30.0	-124	36.6					Mocness deployed	WE19300.14
		1835			42	30.1	-124	36.8					Mocness aboard	WE19300.15
	2015	2037	36	RR-3	42	30.0	-124	42.0	132	1016.8	005	33	CTD with biochem	WE19300.16
	2046	2052			42	29.8	-124	42.4					vertical net tow, 100 m	WE19300.17
	2100												hove-to, awaiting weather	
	2236												Cleaned flo-thru filters	
12-Jul	0225	0315	37	RR-4	42	30.0	-124	47.9	578	1016.0	000	30	CTD with biochem	WE19400.01
	0323				42	30.0	-124	48.0		1016.4	000	27	HTI deployed	WE19400.02
	0325	0330			42	30.0	-124	48.0					vertical net tow, 100 m	WE19400.03

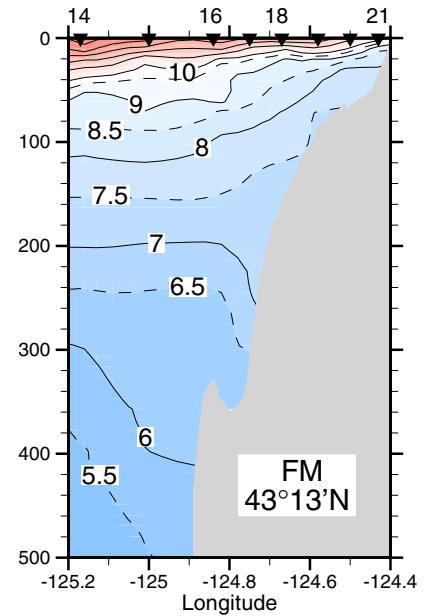
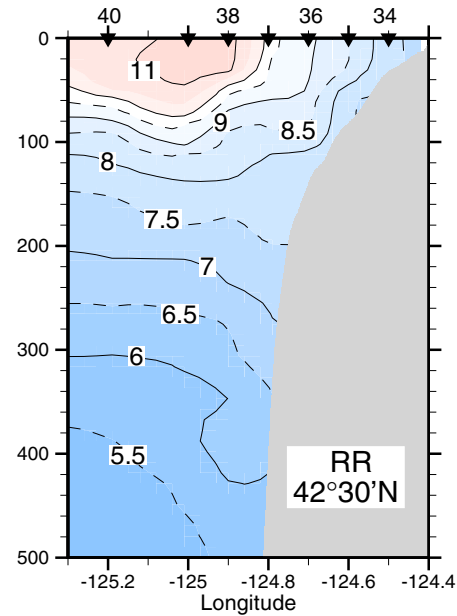
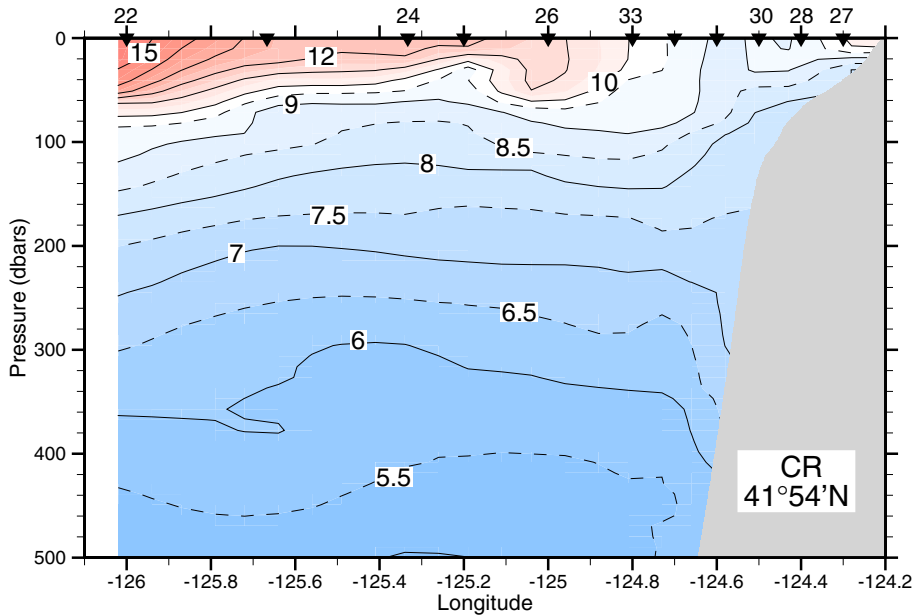
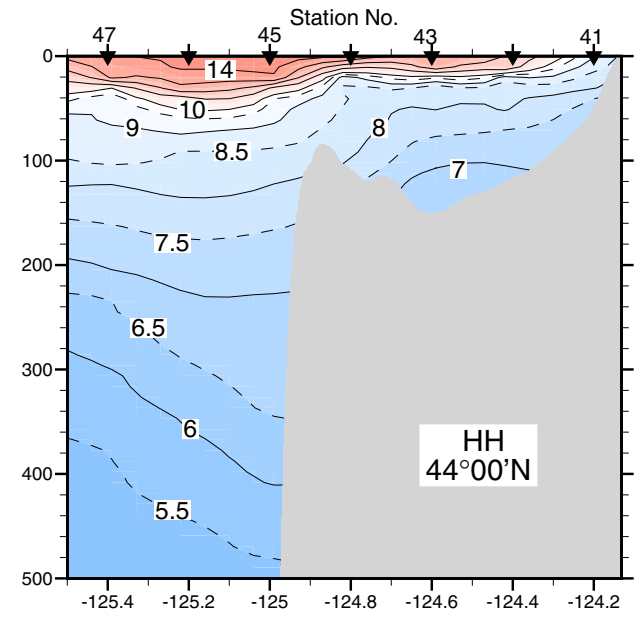
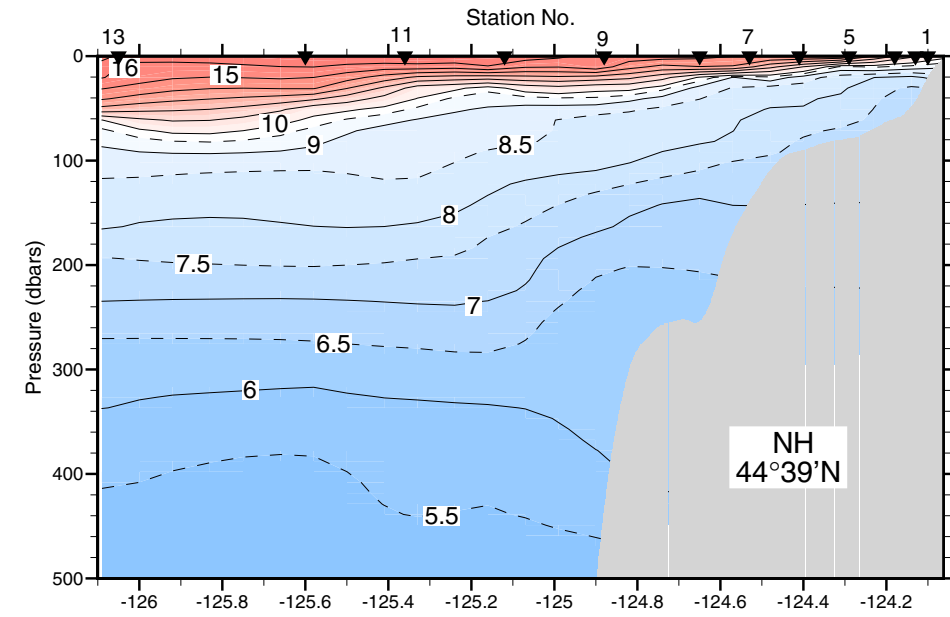
Table 3. Event Log for W0007A

	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
	0344				42	30.2	-124	47.9					Mocness deployed	WE19400.04
		0536			42	34.1	-124	48.0					Mocness aboard	WE19400.05
	0753	0847	38	RR-5	42	30.0	-124	54.1	1160	1017.5	000	20	CTD with oxygen	WE19400.06
	0939	1030	39	RR-6	42	30.1	-124	59.9	1766	1017.0	350	28	CTD with biochem	WE19400.07
	1041	1047			42	30.1	-125	00.1					vertical net tow, 100 m	WE19400.08
	1232	1322	40	RR-7	42	30.1	-125	12.0	2962	1017.9	000	25	CTD with biochem	WE19400.08
	1325	1331			42	30.2	-125	12.0					vertical net tow, 100 m	WE19400.08
	1342				42	30.4	-125	12.1					HTI recovered	WE19400.09
	1345												begin transit to HH-1	
	1422												Cleaned flo-thru filters	
	2234												Ship's power shut off, flo-thru pump off	
	2235												power restored	
	2334												Flo-thru pump on	
	2337												Cleaned flo-thru filters	
	2347		41	HH-1	44	00.0	-124	12.0	54	1018.2	000	15	CTD with biochem	WE19400.10
13-Jul	0001	0005			44	00.0	-124	11.9					vertical net tow, 42 m	WE19500.01
	0011				44	00.0	-124	11.9		1018.2	005	15	HTI deployed	WE19500.02
	0129		42	HH-2	44	00.0	-124	24.0	121	1018.5	355	16	CTD with biochem	WE19500.03
	0149	0154			44	00.0	-124	24.0					vertical net tow, 100 m	WE19500.04
	0205				44	00.2	-124	24.0					Mocness deployed	WE19500.05
		0242			44	01.4	-124	24.0					Mocness aboard	WE19500.06
	0402	0418	43	HH-3	44	00.0	-124	35.9	155	1019.3	350	17	CTD with biochem	WE19500.07
	0424	0429			43	59.9	-124	35.8					vertical net tow, 100 m	WE19500.08
	0437				44	00.0	-124	35.8					Mocness deployed	WE19500.09
		0508			44	00.9	-124	35.8					Mocness aboard	WE19500.10
	0516												Cleaned flo-thru filters	
	0630	0645	44	HH-4	44	00.0	-124	48.0	112	1020.1	340	6	CTD with biochem	WE19500.11
	0649	0656			43	59.9	-124	48.0					vertical net tow, 100 m	WE19500.12
	0813	0902	45	HH-5	44	00.1	-125	00.0	926	1020.2	000	5	CTD with biochem	WE19500.13
	0906	0912			44	00.0	-124	59.8					vertical net tow, 100 m	WE19500.14
	0922				44	00.2	-124	59.8					Mocness deployed	WE19500.15
		1040			44	02.6	-125	00.1					Mocness aboard	WE19500.16
	1048				44	02.8	-125	00.1					HTI recovered	WE19500.17
	1148	1235	46	HH-7	44	00.0	-125	12.0	1698	1020.8	var	8	CTD with biochem	WE19500.18
	1336	1424	47	HH-9	44	00.0	-125	24.0	3022	1020.8	225	6	CTD with biochem	WE19500.19
	1430												begin transit to Newport	
	1941												air-calibration of transmissometer	
	1953												shut down flow through system	
	2001												shut down ADCP	

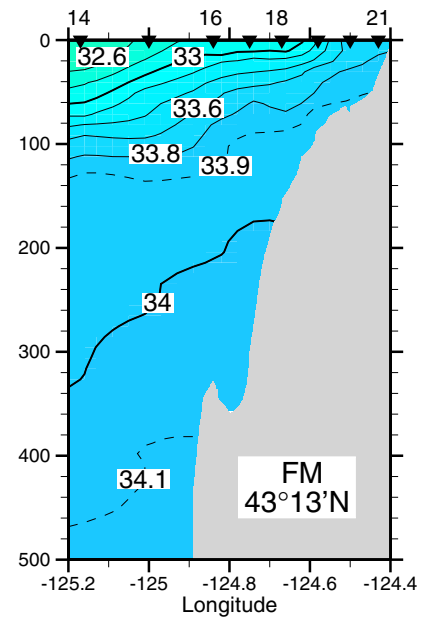
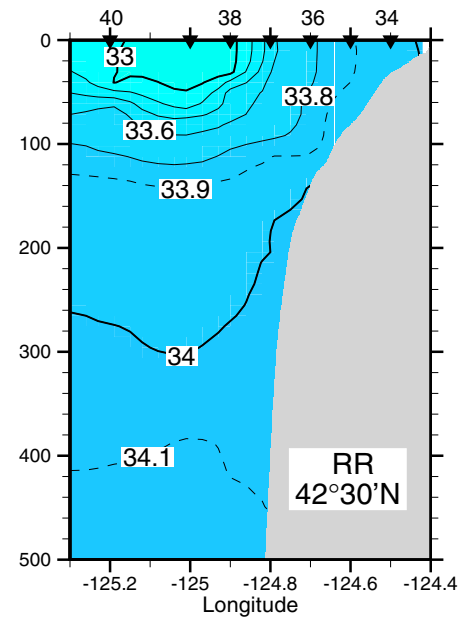
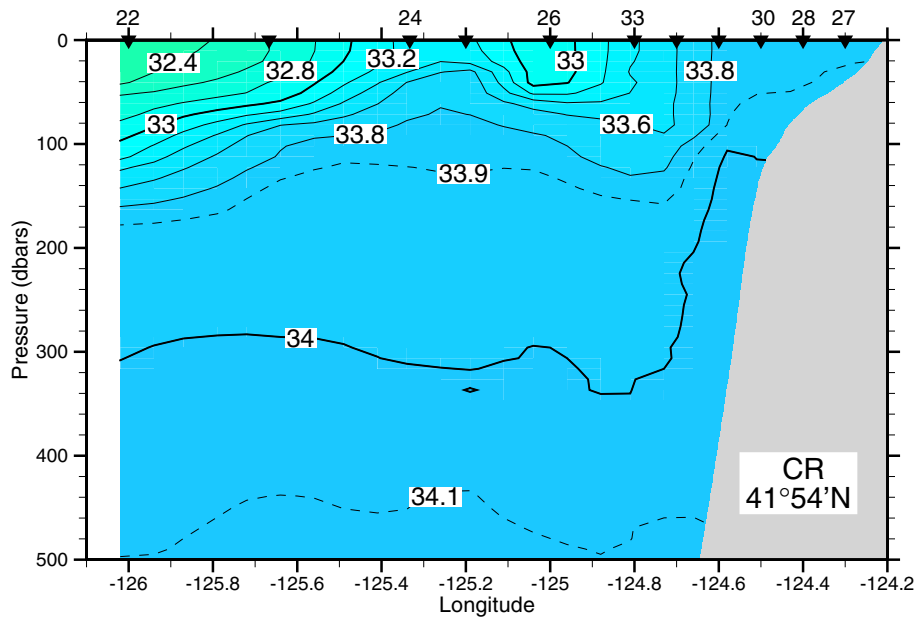
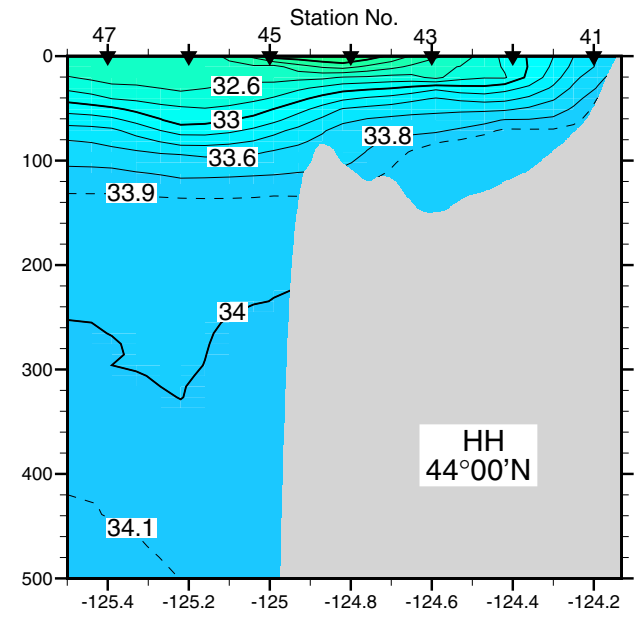
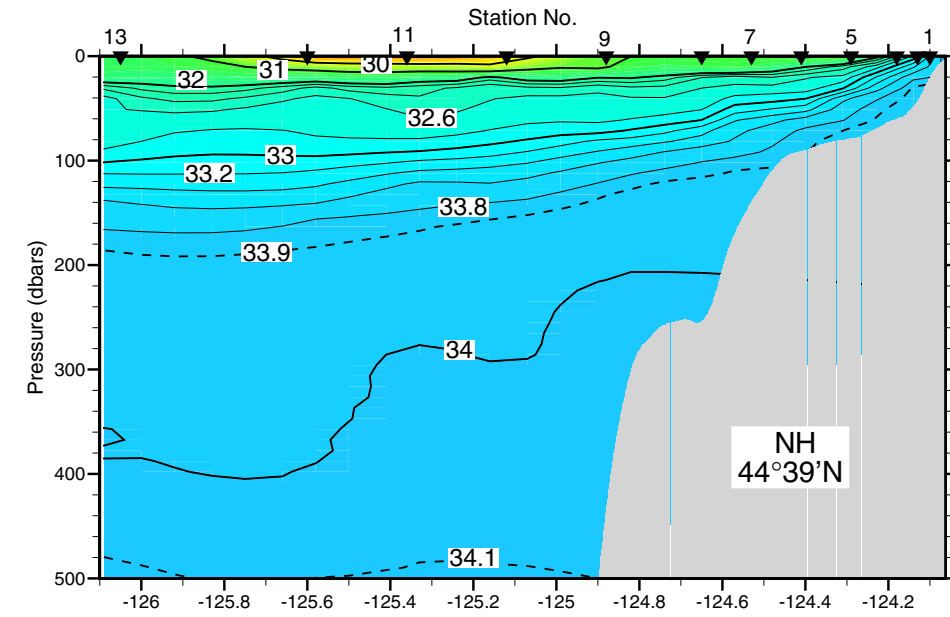
Table 3. Event Log for W0007A

	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
	2002												shut down DAS	
	2040												arrive at pier in Newport	

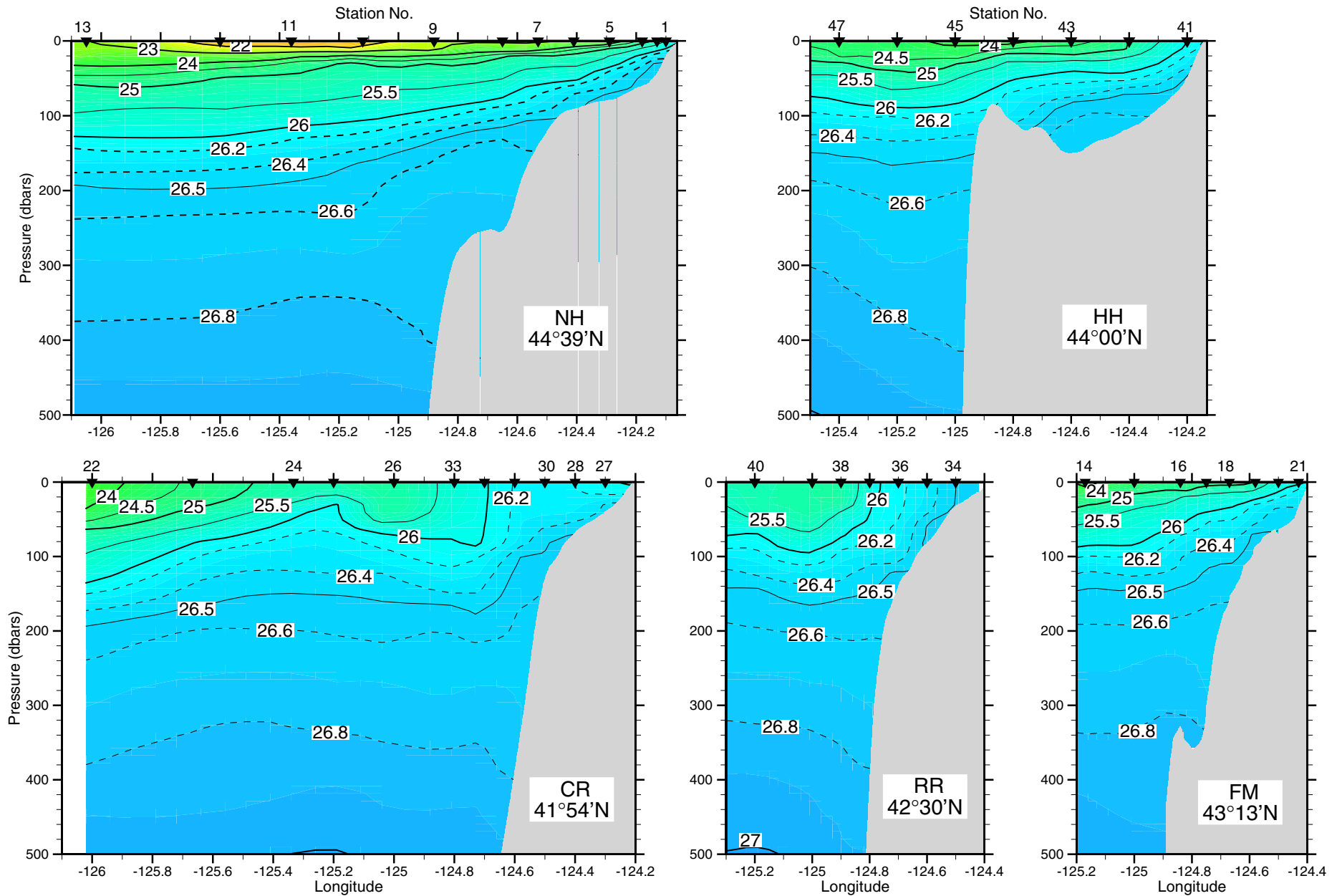
# Temperature, July 2000



# Salinity, July 2000

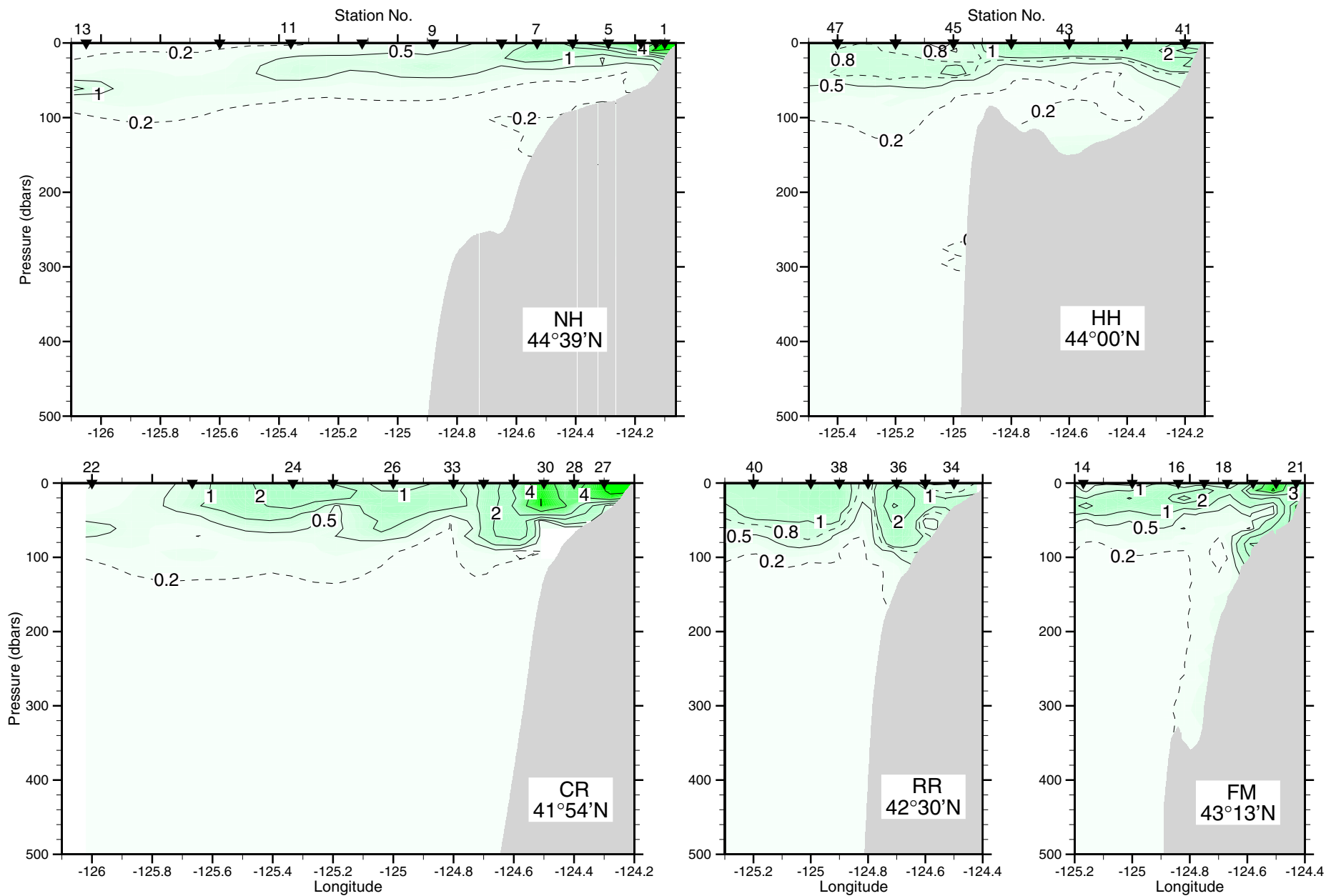


# Sigma-theta, July 2000

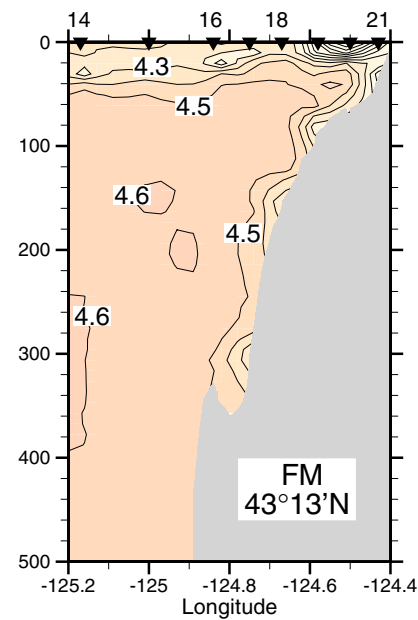
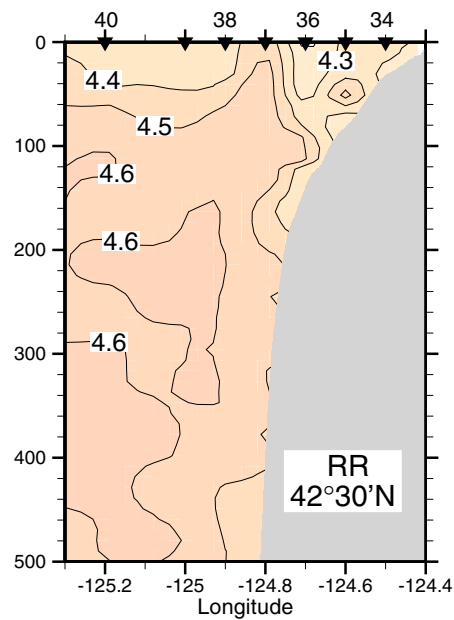
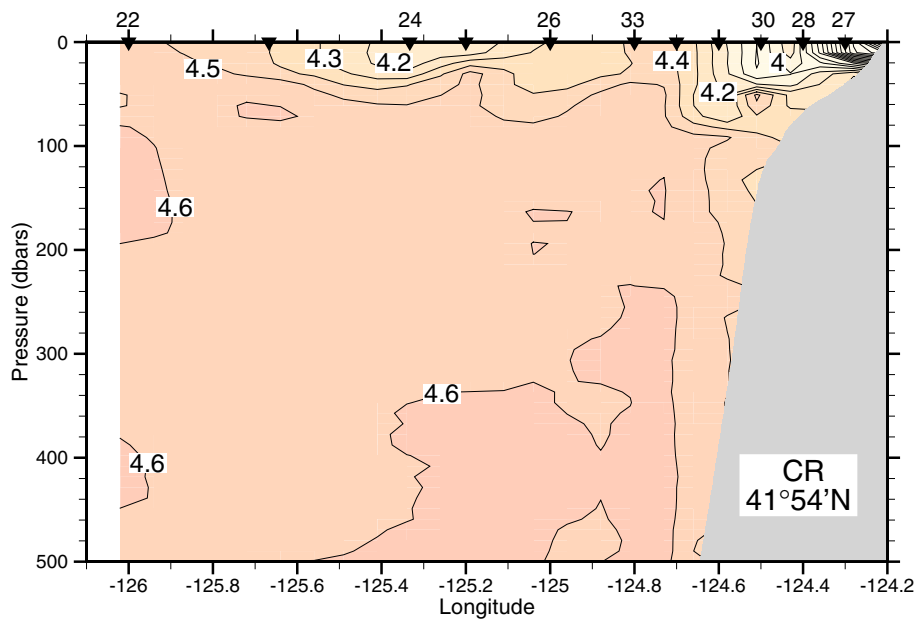
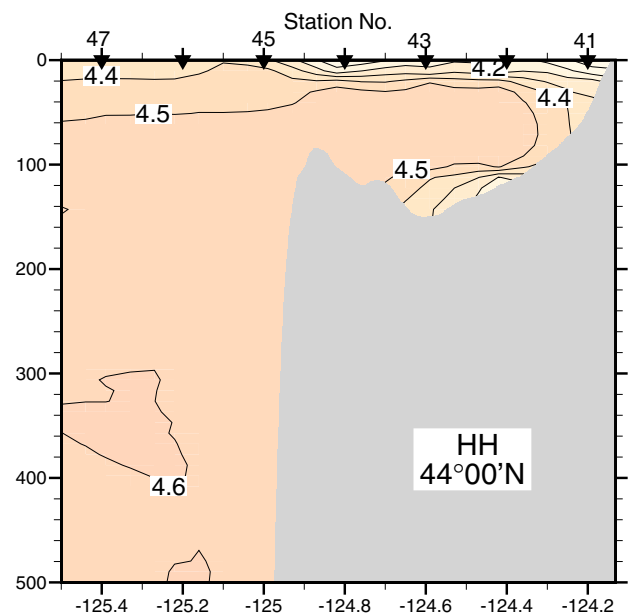
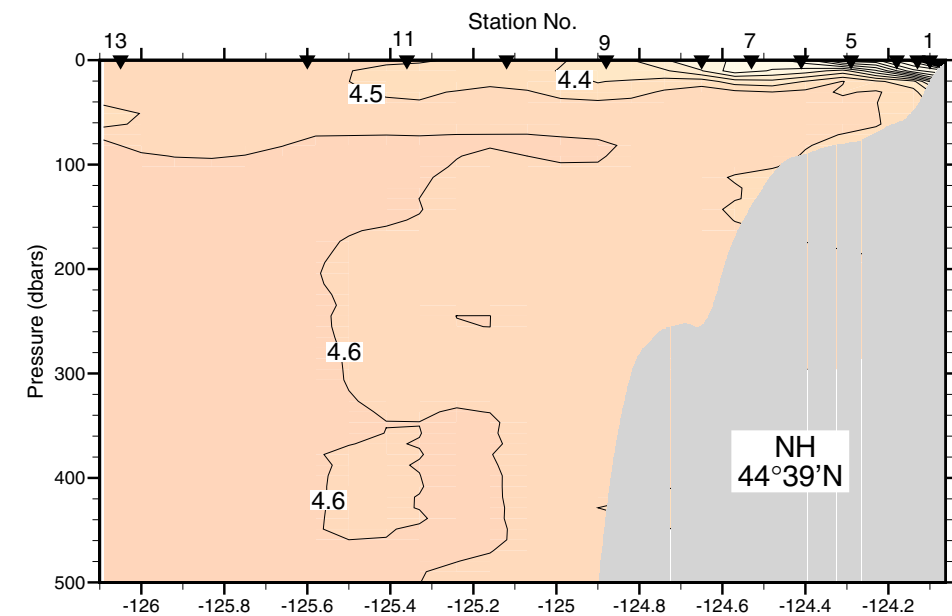




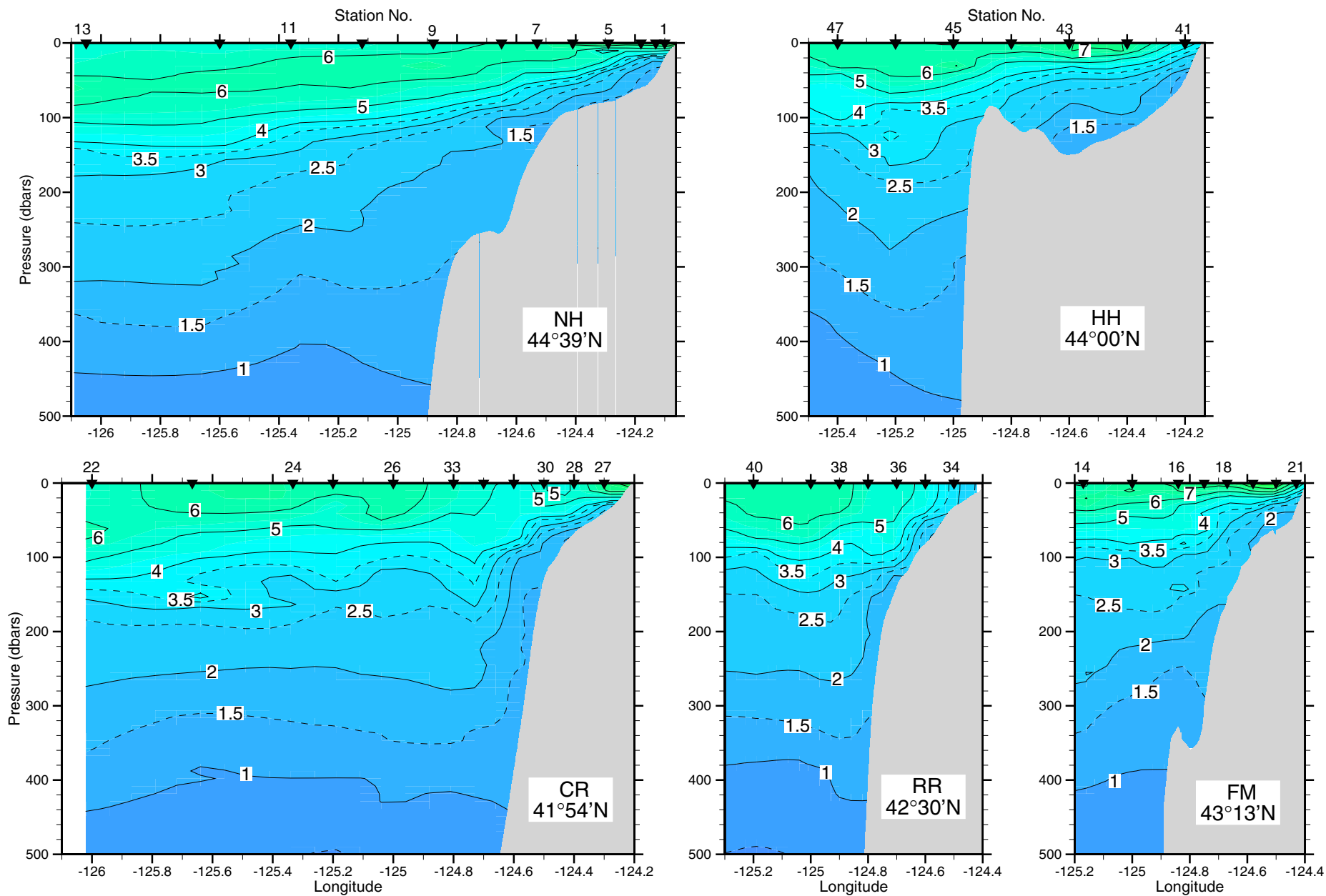
### Fluorescence Voltage, July 2000



# Transmissometer Voltage, July 2000



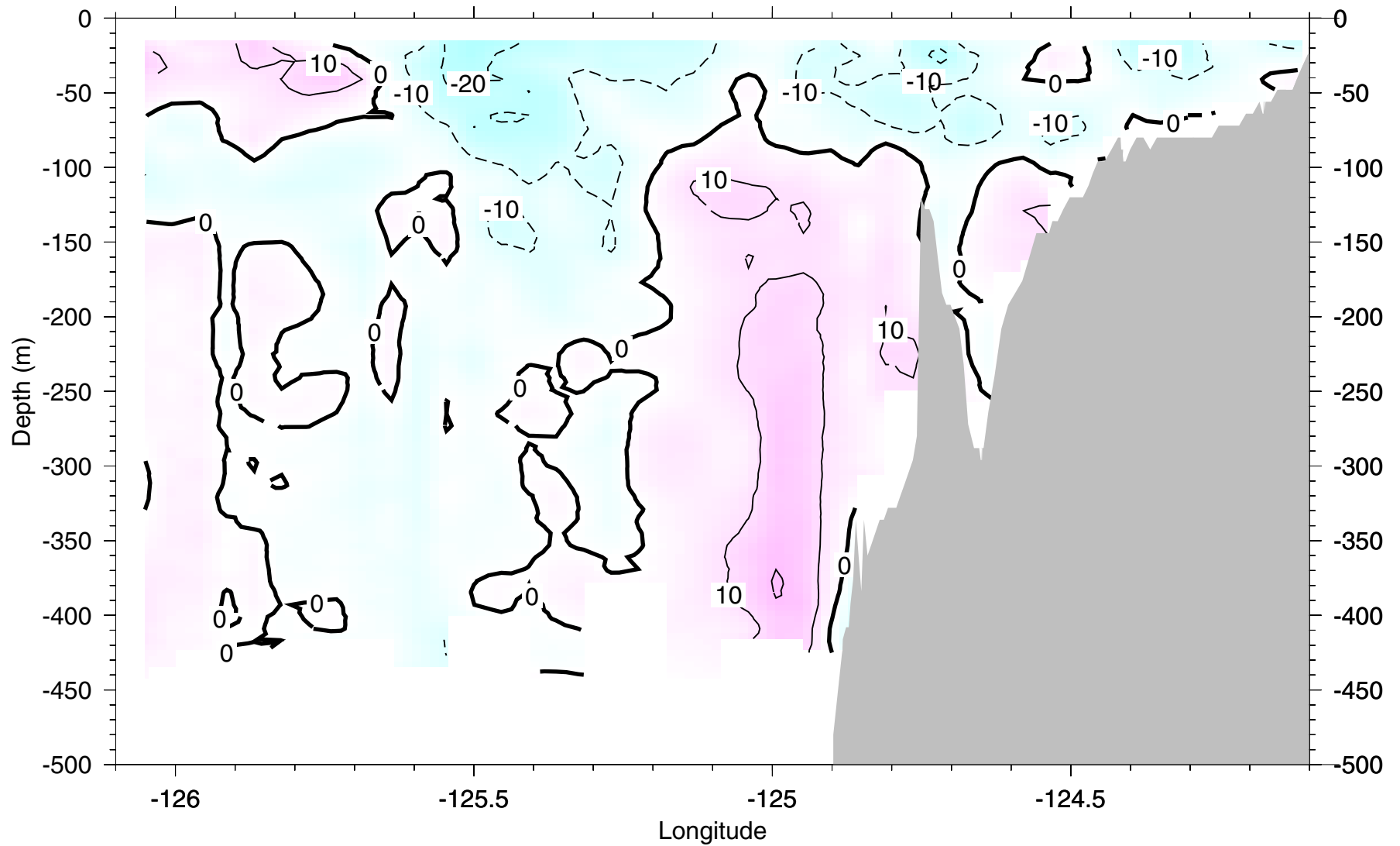
# Oxygen, July 2000



Newport Hydrographic Line 44.6°N

7-8 July 2000

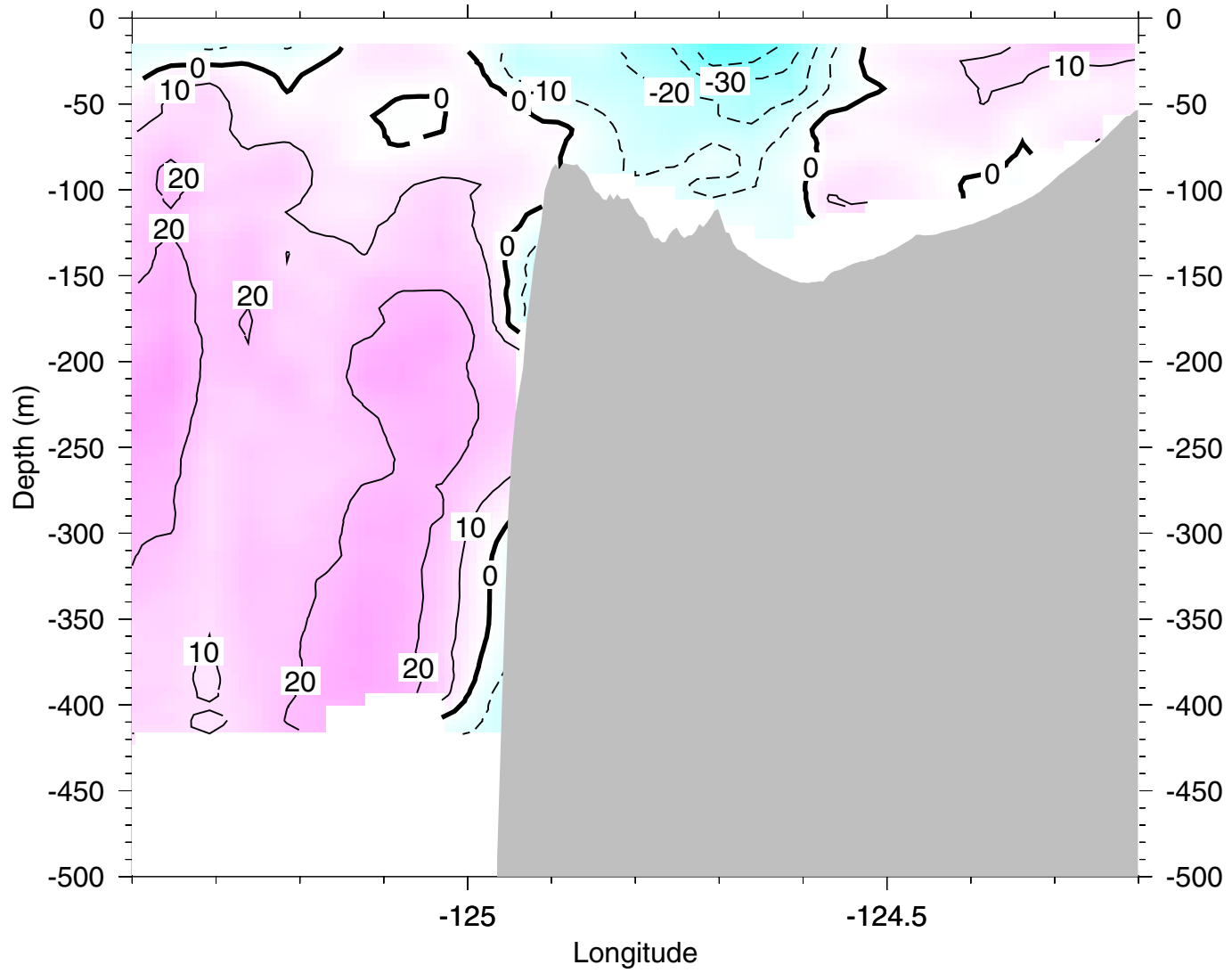
ADCP: Northward current (cm/s)



Heceta Head ADCP Line 44.0°N

12-13 July 2000

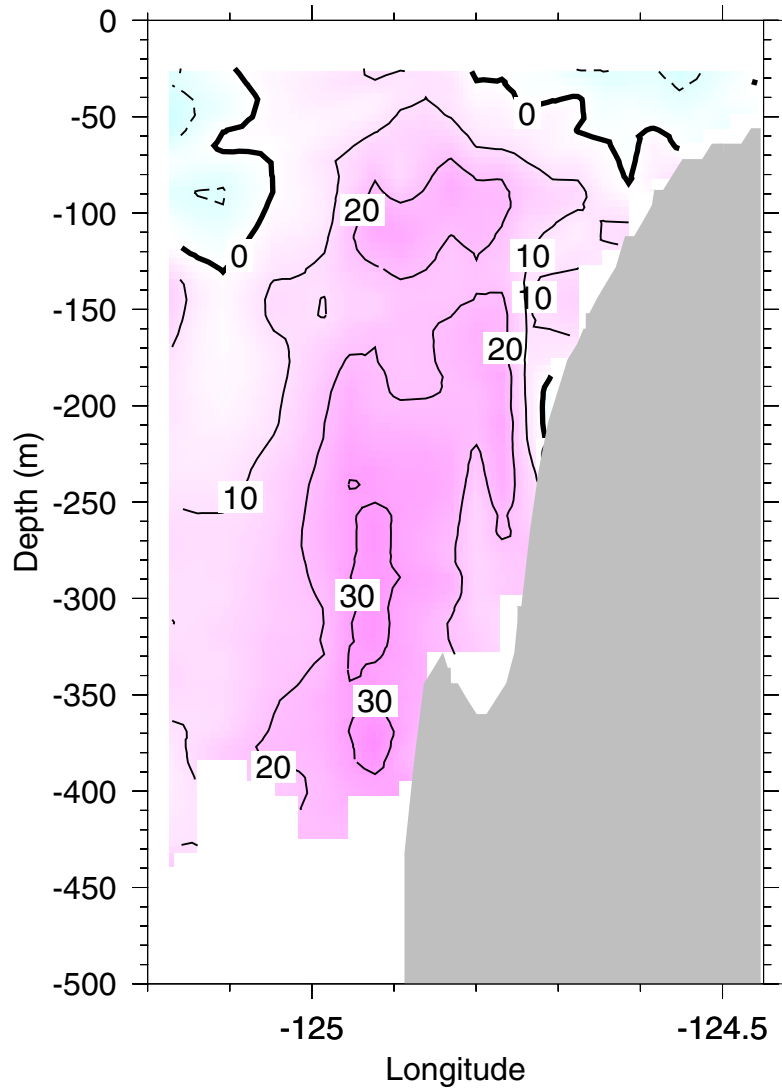
ADCP: Northward current (cm/s)



Five Mile Hydrographic Line 43.2°N

9 July 2000

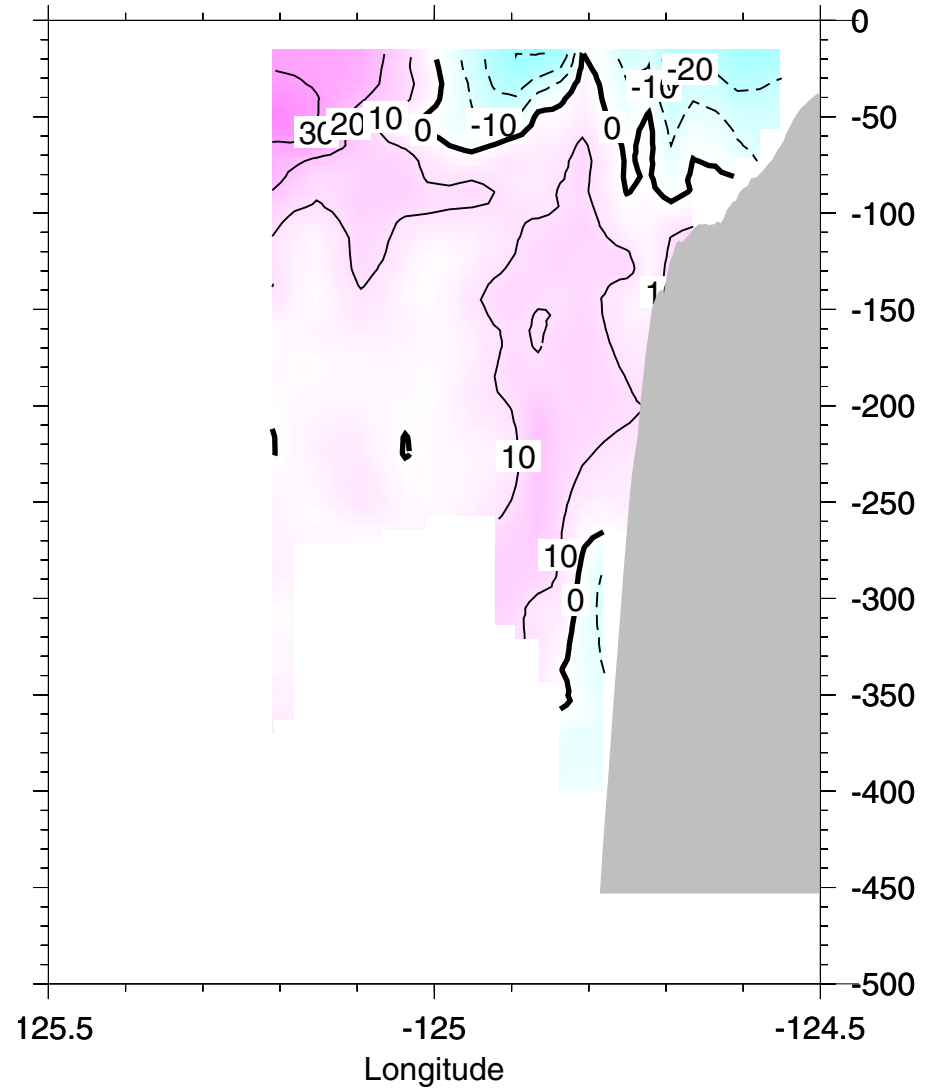
ADCP: Northward current (cm/s)



Rogue River Line 42.5°N

12 July 2000

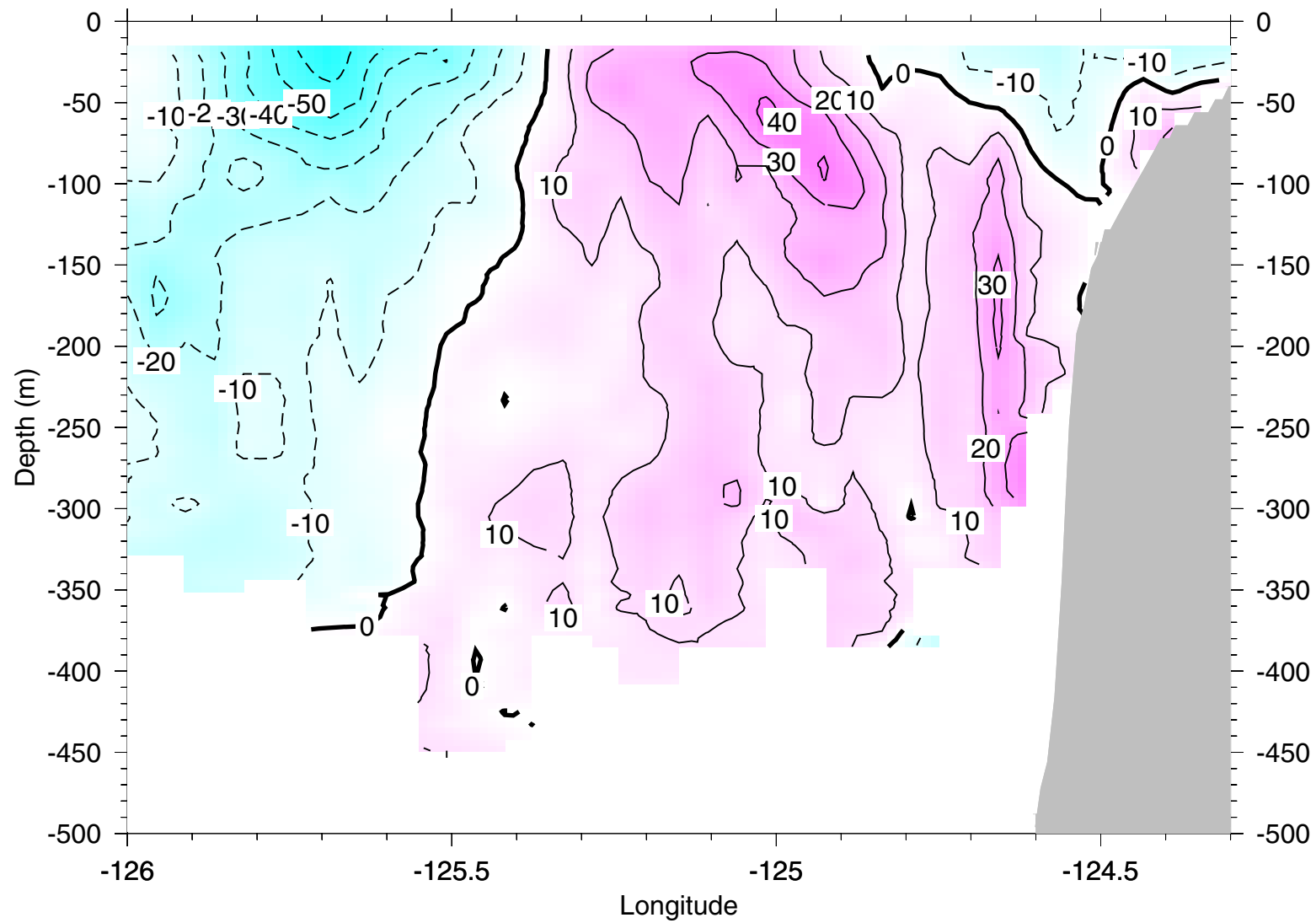
ADCP: Northward current (cm/s)



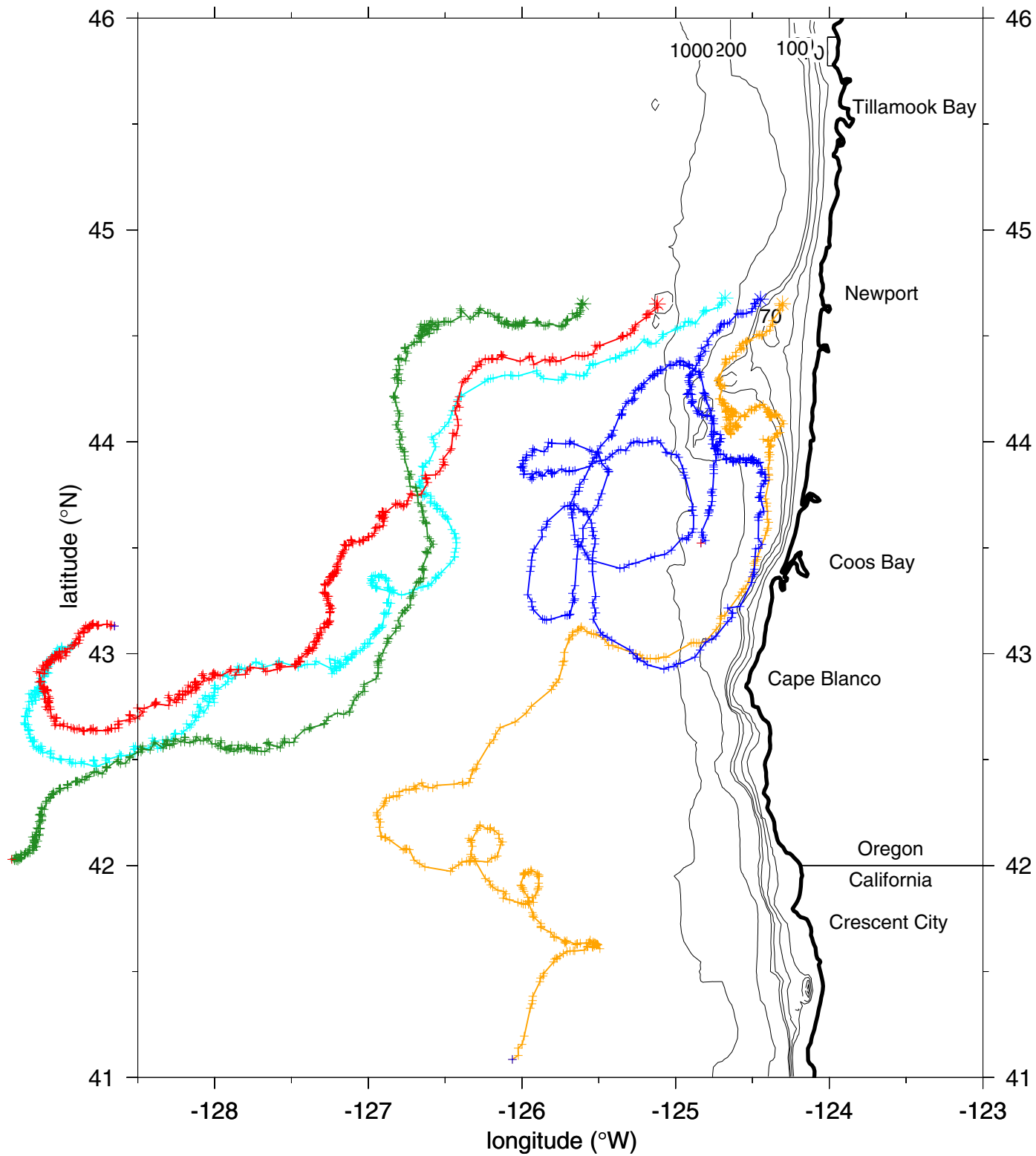
Crescent City Hydrographic Line 43.2°N

10-11 July 2000

ADCP: Northward current (cm/s)



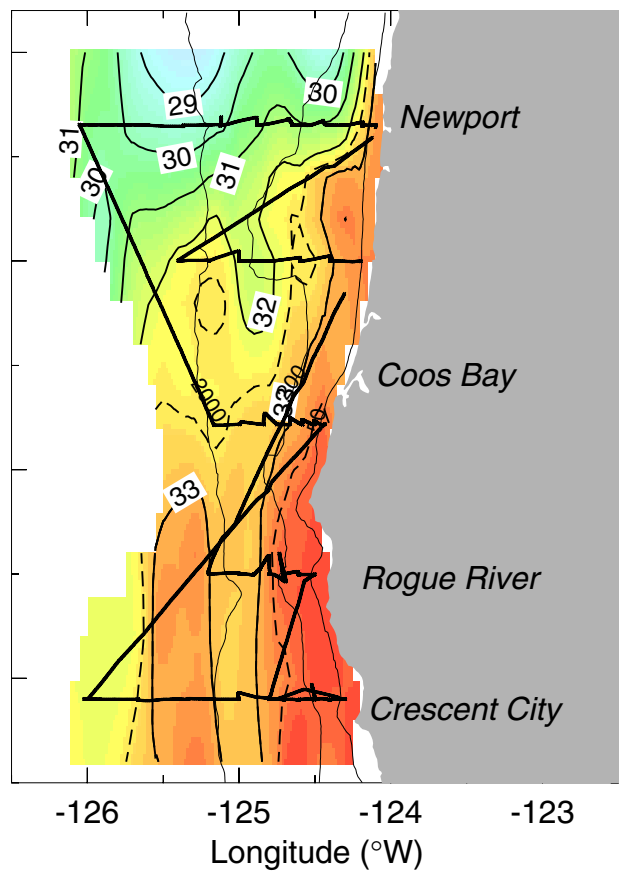
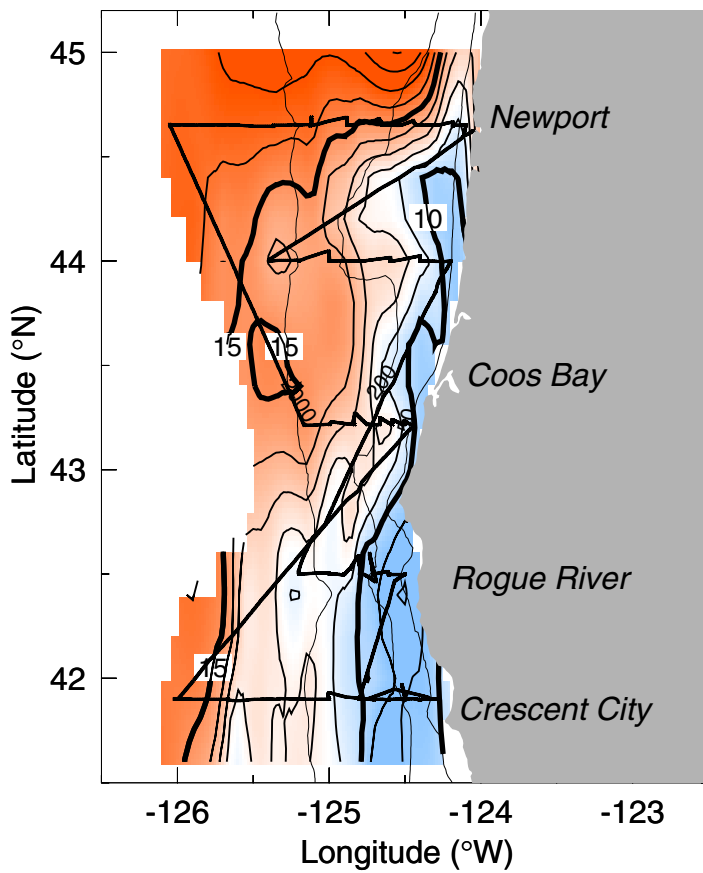
Drifter data from Jul 8 2000 to Aug 23 2000  
(dates on land indicate last transmission from failed drifters)





5 m Temperature

5 m Salinity



## Cruise Report - Wecoma 0007A - July 2000 L-TOP Cruise

### Zooplankton

**Methods.** Zooplankton was sampled along five transect lines across the continental shelf and slope off Oregon and Northern California from 7-12 July 2000, using a vertical plankton net, MOCESSS and high-frequency acoustics. Vertical net tows were made with a 1/2 m diameter 202 um mesh net hauled vertically from near the sea floor to the sea surface (at stations where water depth was less than 100 m) or from 100 m to the surface at deep water stations. All totaled, we completed 33 vertical tows. Depth-stratified sampling was carried out at a subset of stations with a 1 m<sup>2</sup> MOCNESS fitted with 333 um mesh nets. We attempted to sample along each transect but due to high winds along the Crescent City line, we were unable to sample any stations there. We were able to complete 14 MOCNESS tows. In addition, we sampled zooplankton with an HTI 244 high-frequency acoustics system fitted with four transducers (38, 120, 200 and 420 kHz). Acoustics measurements were made along selected portions of each of the five transect lines, usually spanning waters of 50 m depth out to approx. 800 m depth. We generated approximately 200 miles of along-trackline acoustics data.

In addition, euphausiids with a "purple band" were picked from selected tows and incubated for measurement of egg production rates, and other individual euphausiids were also picked for measurement of gut pigment content. We also incubated batches of euphausiids eggs in 500 ml jars which were subsequently preserved every 12-24 hours for estimation of embryonic and larval development times

**Miscellaneous Comments.** In general, in continental shelf waters, euphausiid numbers were lower than during the previous L-TOP cruise in April. Copepods dominated all catches, with *Calanus marshallae* and *Pseudocalanus mimus* the dominant species in both shelf waters and slope waters. The euphausiid, *Euphausia pacifica*, was very abundant in offshore waters. Ctennophores were common in all samples from coastal stations.

Euphausiid vertical distributions. *Euphausia pacifica* tended to be found at shallower daytime depths during the July cruise as compared to the April cruise. During the daytime, April animals were spread evenly between 200-300 m depth, but in July, they were found between 100 and 200 m and by night in the 0-50 m layer during both cruises.

Cross-shelf Zonation. We did see clear evidence for cross-shelf zonation between the two dominant euphausiid species, but only along the Newport line. *Thysanoessa spinifera* was present only in inner-mid-outer shelf waters (NH 5, 15 and 25) and *Euphausia pacifica* in offshore deep waters along all transects. We observed on Hecate Bank that *Euphausia pacifica* was the most abundant euphausiid (rather than *T. spinifera*). We made the same observation in April. .

Unusual observations. At FM8 and again at HH5, we saw swarms of bright red euphausiids clustered beneath the nightlight at the CTD A-frame. We sampled them with a bucket and found that within 10 minutes of capture, they literally exploded. We put several of them in a dish with seawater on our dissecting microscope and observed that when they exploded, billions and billions

of tiny ciliates were released from the body cavity. This X-file has us completely baffled. We did preserve the ciliates (as well as whole euphausiids) in formalin and lugols solution and returned them to Newport for later analysis of the ciliates. We suspected that they were parasitic ciliates so we made a point to bring some living ciliates back to the lab for our resident parasitologist to examine (Dr. Kym Jacobsen). She studied them then spent the rest of the day in the library. We also filtered the water from the bucket samples and found hordes of *Metridia pacifica* (a copepod). We wonder if they weren't feeding on the ciliates that were released by the exploding euphausiids. Apparently this parasite, the association with euphausiids and the possible food chain interaction with *Metridia* are all new to science and we are contemplating whether or not to submit a MS describing these observations to Nature or just to Marine Biology.

#### Summary of 14 MOCNESS Tows.

Station	Time	Depth	Day/Night
NH 5	1625	60	D
NH 15	2020	90	D
NH 25	0020	300	N
NH 35	0300	433	N
NH 45	0540	666	D
FM 7	0525	335	D
FM 5	0940	156	D
FM 4	1145	85	D
FM 3	1345	60	D
RR 2	1130	90	D
RR 4	2230	610	N
HH 2	1940	120	D
HH 3	2140	156	D
HH 5	0221	940	N

#### Summary of 33 Vertical Plankton Tows:

NH 1, 5, 10, 15, 20, 25, 35, 45  
 FM 1, 3, 4, 5, 7, 8, 9  
 CR 1, 2, 3, 4, 6, 9, 11  
 RR 1, 2, 3, 4, 6, 7  
 HH 1, 2, 3, 4, 5

Bird and Mammal Observations: Very few birds were seen on this trip due in large part to the generally high winds during the entire cruise. One humpback whale was seen at FM 3 (60 m water depth).

July 2000 L-TOP Cruise

MOCNESS Sample Descriptions

NH 5 7 July 00

- Net 0 A few *Thysanoessa spinifera*; phytoplankton, copepods, some jellies
- Net 1 3 *T. spinifera*, 1 *Aequorea*, siphonophores, *Calanus marshallae*
- Net 2 *Calanus marshallae*, 2 *T. spinifera*, small *Limacina*, 4 *Aequorea*
- Net 3 Massive numbers of *Calanus marshallae*; little else
- Net 4 Phytoplankton + small copepods

NH 15

- Net 0 copepods, furcilia, *Pleurobrachia*, 4 silver dollars, amphipods, pteropods
- Net 1 1 *Aequorea*, silver dollar jellies, furcilia galore
- Net 2 circle salps, furcilia, *Calanus marshallae*
- Net 3 copepods, furcilia, amphipods
- Net 4 1 *Beroe*, *Limacina*, 2 *Pleurobrachia*, furcilia, *marshallae*
- Net 5 1 silver dollar jelly, 1 *Beroe*, 24 *Pleurobrachia*, a few copepods
- Net 6 40 *Pleurobrachia*, small copepods, 1 *Aequorea*
- Net 7 small copepods

NH 25

- Net 0 3 mega-huge shrimp, 1 myctophid, 5 silver dollars, small copepod
- Net 1 1 *Pandalus*, 2 *Pyrosomes*, 5 silver dollars, big chaetognaths, 20 *Muggia*, 1 Myctophid
- Net 2 chaetognaths, 1 shrimp, amphipods, small copepods
- Net 3 3 *Sergestes*, a few copepods, not much else
- Net 4 1 *Beroe*, megalopa, 2 ad. *T. spinifera*, copepods
- Net 5 1 purple female euphausiid, 2 other adult euphausiids, copepods
- Net 6 4 purple females removed, 100 *E. pacifica*, 20 *Pleurobrachia*, 1 myctophid, megalopes, *Pseudocalanus*, *Calanus marshallae*
- Net 7 45 *Pleurobrachia*, adult *T. spinifera*, copepods
- Net 8 juvenile euphausiids, copepods, small *pleurobrachia*, megalopae

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- Net 0 adult euphausiids, *Muggea*, *Pleurobrachia*, copepods
- Net 1 5 silver dollars, *Muggea*, 1 myctophid, chaetognaths
- Net 2 *Muggia*, 2 myctophids, 1 squid, chaetognaths
- Net 3 chaetognaths, *Muggea*, euphausiids, 1 sergestid, copepods
- Net 4 4 sergestids, 2 squid, 5 euphausiids, few furcilia, little else
- Net 5 7 sergestids, 1 myctophid, 2 squid, megalopes, krill
- Net 6 300 *Euphausia pacifica* adults, 10 *Pleurobrachia*, copepods

Net 7 250 *E. pacifica* adults, (7 purple females removed), 100 *Pleurobrachia*, 2 silver dollars  
Net 8 200 small *Pleurobrachia*, some adult euphausiids, copepods

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Net 0 1 “Corolla”, 5 myctophids, *Calanus cristatus*, *Limacina*, *Euphausia pacifica* adults, copepods  
Net 1 Red amphipods, 5 *Muggea*, 3 euphausiids, *Limacina*, a few copepods  
Net 2 5 Euphausiids, 1 myctophid, miscellaneous amphipods, mesopelagic copepods  
Net 3 60 adult *Euphausia pacifica* (1 purple female), 30 *Sagitta scrippsae*, *Muggia*  
Net 4 15 *S. scrippsae*, 50 *Muggia*, 90 adult *Euphausia pacifica*, copepods  
Net 5 18 *E. pacifica*, 1 *Beroe*, 1 Myctophid, *Calanus marshallae*  
Net 6 5 *Beroe*, many fish larvae, circle salps, *C. cristatus*  
Net 7 50 *Pleurobrachia*, *Calanus marshallae*, nothing else.  
Net 8 100 *Pleurobrachia*, small copepods

FM 3

Net 0 20 *Pleurobrachia*, circle salps, 20 *Phialidium*, small copepods, large polychaete trochophores  
Net 1 1 silver dollar, 20 *Phialidium*, 10 *Pleurobrachia*, small copepods  
Net 2 40 *Pleurobrachia*, 10 silver dollars, copepods, amphipods  
Net 3 30 *Pleurobrachia*, 3 *Phialidium*, copepod, amphipods

FM 4

Net 0 20 *Pleurobrachia*, 10 amphipods, *Calanus marshallae*, 1 dungeness megalops  
Net 1 50 euphausiids, many circle salps, *C. marshallae*, small copepods  
Net 2 *C. marshallae*, small copepods, 50 euphausiids, 1 squid  
Net 3 lots of *marshallae*, 30 amphipods, circle salps, a few *Euphausia pacifica*  
Net 4 20 *Pleurobrachia*, small copepods, hyperiids  
Net 5 3 *Pleurobrachia*, small copepods (*Acartia*?), amphipods, euphausiid eggs  
Net 6 euphausiid eggs, a few *pleurobrachia*

FM 5

Net 0 many types of copepods; chaetognths, *pleurobrachia*, amphipods  
Net 1 chaetognaths, small copepods, small pteropods, 3 *T. spinifera*, 1 *E. pacifica*  
Net 2 *Pseudocalanus*, 1 *T. spinifera*  
Net 3 *Pseudocalanus*, 1 megalopa  
Net 4 chock-full-'o copepods, 5 *Beroe*, 2 *Pleurobrachia*  
Net 5 5 *Beroe*, 3 *Pleurobrachia*, small copepods, few pteropods, 8 amphipods  
Net 6 11 *Pleurobrachia*, copepods, chaetognaths, plumb-bobs  
Net 7 10 *Pleurobrachia*, some *Pseudocalanus*, nothing else  
Net 8 greenish, *Acartia*, no *Pseudocalanus*, 10 *Pleurobrachia*

## FM 7

- Net 0 chains of circle salps (one saved for Claudia Mills), 2 myctophids, *E. pacifica*, copepods
- Net 1 3 myctophids, 4 sergestids, chaetognaths, large copepods
- Net 2 7 megalopa, 6 myctophids, 50 muggia, 81 *E. pacifica*, 103 *Limacina* (8 of the 81 *E. pacifica* were purple)
- Net 3 200 *E. pacifica* adults, chaetognaths, *Limacina*
- Net 4 700 *E. pacifica* adults (removed 7 purple adults), *Calanus cristatus*, fish larvae, hyperiids, corolla
- Net 5 30 *Pleurobrachia*, 150 *E. pacifica*, c'est tout!
- Net 6 35 *Pleurobrachia*, 15 *Phialidium*, *Calanus marshallae*, nada mas
- Net 7 *Calanus marshallae* exclusively
- Net 8 approximately 10<sup>12</sup> female *Pseudocalanus mimus*

## RR 2

- Net 0 150 *Pleurobrachia*, *Calanus marshallae*, *Pseudocalanus*, small *Limacina*
- Net 1 1 large Dover sole larva, 50 *Pleurobrachia*, *Calanus marshallae*
- Net 2 25 *Pleurobrachia*, 2 silver dollars, amphipods, 4 euphausiids, copepods
- Net 3 3 *Pleurobrachia*, 2 *Phialidium*, both large and small copepods, 1 amphipod, eggs
- Net 4 1 *Phialidium*, 1 *Pleurobrachia*, few copepods
- Net 5 5 *Pleurobrachia*, euphausiid eggs, small copepods

## RR 4

- Net 0 20 *Pleurobrachia*, shrimp, chaetognath, 1 16" "hagfish", 10 myctophids
- Net 1 3 myctophids, 4 large shrimp, 20 *Sergestes*, 1 *Atolla*, many plumb-bobs, *Sagitta scrippsae*
- Net 2 Chaetognaths, *Limacina*, fish eggs, 2 squid, 4 *Sergestes*, 10 euphausiids
- Net 3 1 Myctophid, 10 euphausiids, 10 squid, *Limacina*
- Net 4 10<sup>9</sup> *Limacina*, 5 squid, 15 euphausiids, 1 myctophid, *Sagitta scrippsae*, juv. fish of some sort
- Net 5 150 *E. pacifica*, 1 small myctophid, many many *Limacina*
- Net 6 400 *E. pacifica*, *Limacina*, 3 myctophids, 4 *Phialidium*
- Net 7 20 *Pleurobrachia*, 300 *E. pacifica*, 2 *Sergestes*
- Net 8 500 *E. pacifica*, 3 Corolla, some copepods

## HH-2

- Net 0 8 *Pleurobrachia*, 150 *E. pacifica*, gobs of small copepods
- Net 1 2 silver dollars, 100 *E. pacifica*, copepod, siphonophores
- Net 2 40 *E. pacifica*, a few *T. spinifera*, *Limacina*
- Net 3 10 *Pleurobrachia*, 3 silver dollars, the rest is pure copepods (*Pseudocalanus* and *marshallae*)
- Net 4 3 silver dollars, eggs, copepods, *Limacina*

### HH-3

- Net 0 Pseudocalanus, Cal. marshallae, furcilia, 20 E. pacifica, 10 Pleurobrachia, 5 silver dollars
- Net 1 1 silver dollar, 3 Sagitta, 1 E. pacifica, 10<sup>6</sup> copepods
- Net 2 a few chaetognaths, Muggia, 3 E. pacifica, 10<sup>9</sup> copepods
- Net 3 150 E. pacifica, 5 big silver dollars, half-moon jellies, very few copepods, Limacina
- Net 4 Limacina, copepods, furcilia, 40 small Pleurobrachia
- Net 5 30 small Pleurobrachia, 4 E. pacifica, 10<sup>9</sup> copepods

### HH-5

- Net 0 No notes
- Net 1 1 myctophid, chaetognaths, 1 squid, Limacina, 50 E. pacifica
- Net 2 1 myctophid, chaetognaths, 70 E. pacifica, 1 Beroe, 1 silver dollar, amphipods
- Net 3 4 big ol' myctophids, 1 squid, Limacina, euphausiids
- Net 4 8 myctophids, 2 Beroe, 20 E. pacifica, Limacina, 1 juv. Hake, Sergestes
- Net 5 9 myctophids, 2000 E. pacifica, 20 tiny Pleurobrachia, amphipods
- Net 6 3 myctophids, 2 Beroe, several Pleurobrachia, 1000 E. pacifica, 3 Sergestes
- Net 7 3 myctophids, 2000 E. pacifica
- Net 8 500 E. pacifica, 2000 black-eyed amphipods, 40 Pleurobrachia