

PRELIMINARY CRUISE REPORT, W0212A
R/V WECOMA, 3-5 December 2002
GLOBEC NEP Long-Term Observations off Oregon

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P. Michael Kosro, P. A. Wheeler, W. T. Peterson Jack A. Barth, E. Sherr and B. Sherr

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 the Newport Hydro line, and to make continuous observations of currents using ADCP and of surface-layer temperature, salinity and fluorescence by means of the 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, PAR.
4. Rosette sampling: 5 liter bottles for nutrients, and chlorophyll.
5. Vertical net tows: 1/2 meter nets 100 m to surface; Horizontal net tows with 1 m² MOCNESS.

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 PST on 3 December 2002. CTD sampling started at NH-1. An old crab pot line was wrapped around the rosette when it was retrieved at NH-3, but the line was quickly cut off without damage to the CTD package. CTDs were completed at each station working out to NH-25, with vertical nets done at NH-1, NH-10 and NH-20. In order to complete the MOCNESS tows during darkness, a vertical net and MOCNESS tow only were done at at NH-35, and then the ship worked back in toward shore doing only the net tows at NH-25, 15 and 5. The tows were completed at 0201 PDT, 4 December, and the ship transited back to NH-35 to do a CTD cast at 0512 PDT. CTD's were continued out the Newport Line to NH-85, with a vertical net tow at NH-65. The ship then returned to NH-45 to do the vertical net and MOCNESS tows during darkness. The winds stayed under 30 kts., and the seas remained workable for the Newport line, allowing all of the sampling to occur as scheduled. After completing 12 CTD's and the net tows along the Newport Line at 1949 PST, 4 December, we began the transit to Newport. We arrived alongside the pier at Newport at 0130 PST on 5 December 2002.

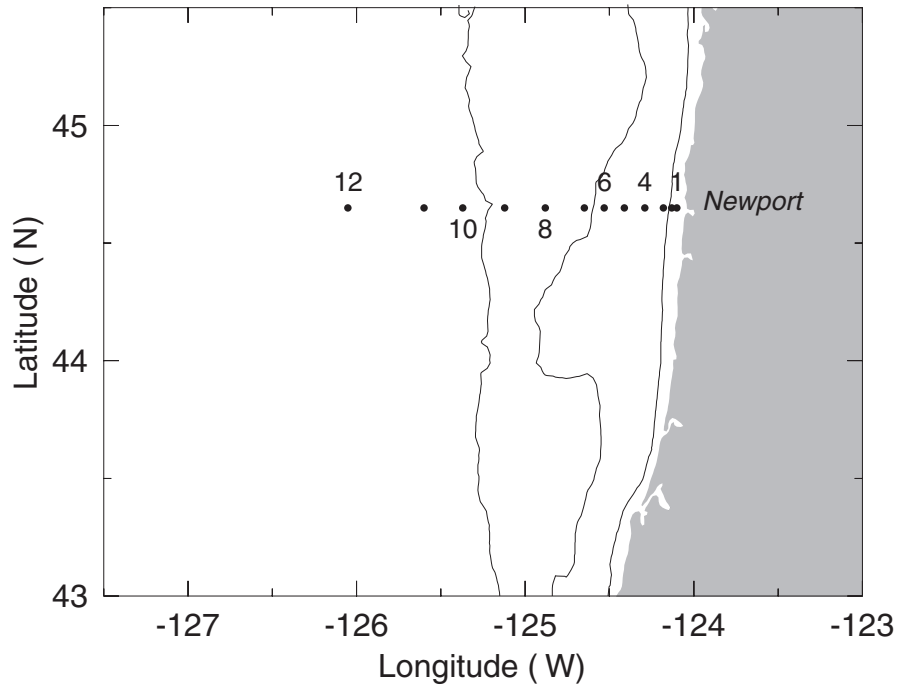


Figure 1. Location of CTD stations during W0212A.

PRELIMINARY RESULTS

Most of the autumn since the September cruise on Atlantis had been unusually dry, with winds from the north continuing longer than usual, with the result that coastal upwelling had continued through most of October and into November. This would tend to cause southward flow to persist later than normal, carrying Subarctic waters farther south than normal – and we had already observed anomalous southward displacement of Subarctic water in July and September 2002 (Freeland et al., 2002). On the other hand, a large pool of anomalously warm surface water had developed in the Gulf of Alaska, and El Niño continued to develop in the eastern Equatorial Pacific Ocean. The pool of warm water seen in the November 2002 global map of sea surface temperature anomaly (Figure 2) (available from http://www.emc.ncep.gov/research/cmb/sst_analysis/index.html) would likely be advected shoreward by seasonal downwelling. El Niño is usually associated with anomalous northward displacement of Subtropical waters along the Oregon coast. Data from the TAO/TRITON moored array (<http://www.pmel.noaa.gov/tao/jsdisplay/>) shows that the monthly mean sea surface temperature anomalies on the equator exceeded 1.5 C from 180 W to 105 W in November 2002 (Figure 3); temperatures near the equatorial eastern boundary were already 0.5 C above normal in October 2002 (Figure 4). We were thus very curious to see whether and how these competing phenomena were manifested on the NH-line.

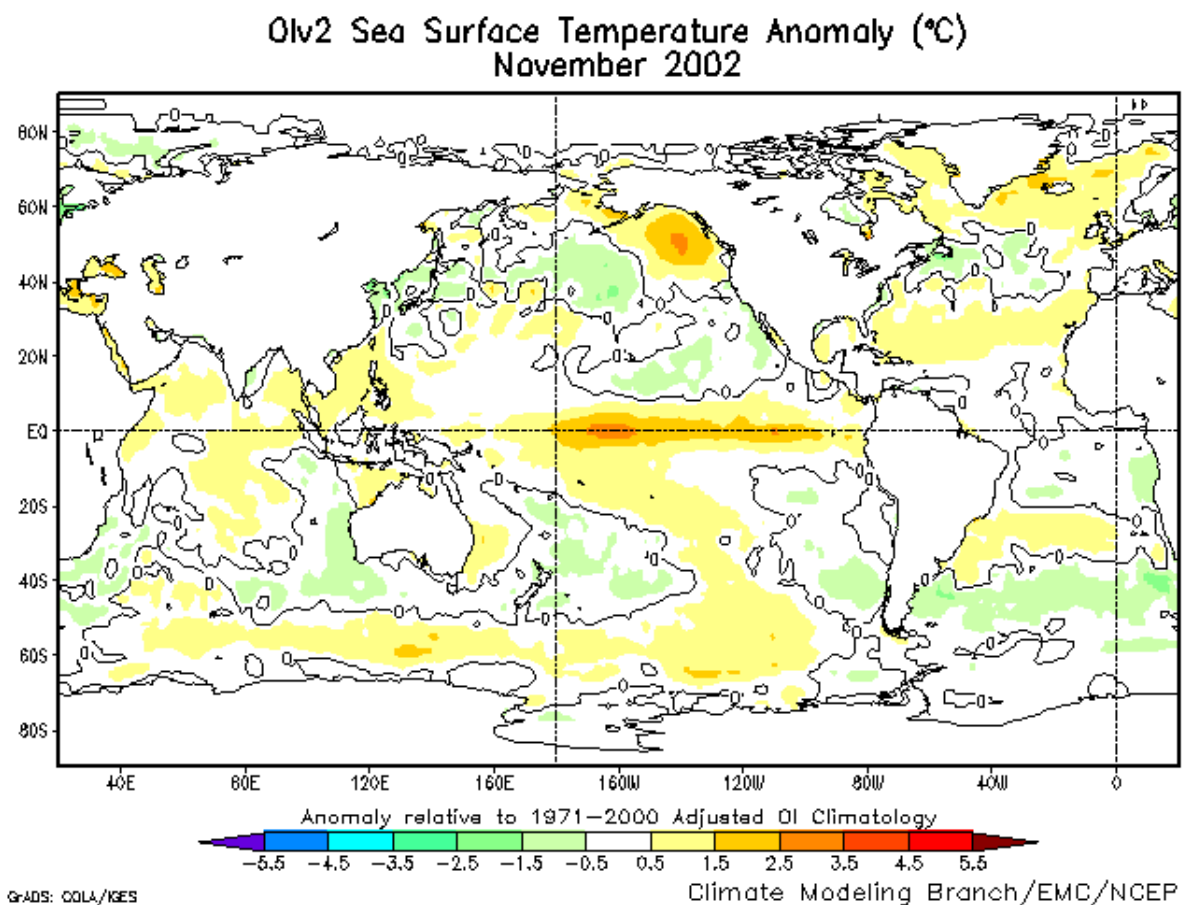
The sections of normalized temperature anomaly (Figure 5) show the surface layer to be warmer than normal, by about one standard deviation; this warm surface layer likely reflects onshore advection of the offshore warm pool. The halocline layer, lying between 50 and 150 m, was about one standard deviation cooler than normal over the continental shelf, and even cooler at the offshore end of the NH-line; this likely reflects the unusually late persistence of southward flow. The positive temperature anomaly that was present at the shelf-break in late September had weakened, or moved

deeper into the water column. This warm anomaly might be associated with El Niño, but if so, it is only a very weak signal. The T-S curve for NH-25 at the shelf-break showed a strong cool (low-spiciness) anomaly in the halocline, centered at a density of about 25.3 kg/m^3 . The temperature at this density was only about 0.5 C warmer than it had been in July 2002, and about 1.5 C below normal for autumn. It appears that the invasion of Subarctic Water into the northern California Current region (Freeland et al., 2003) had not yet receded.

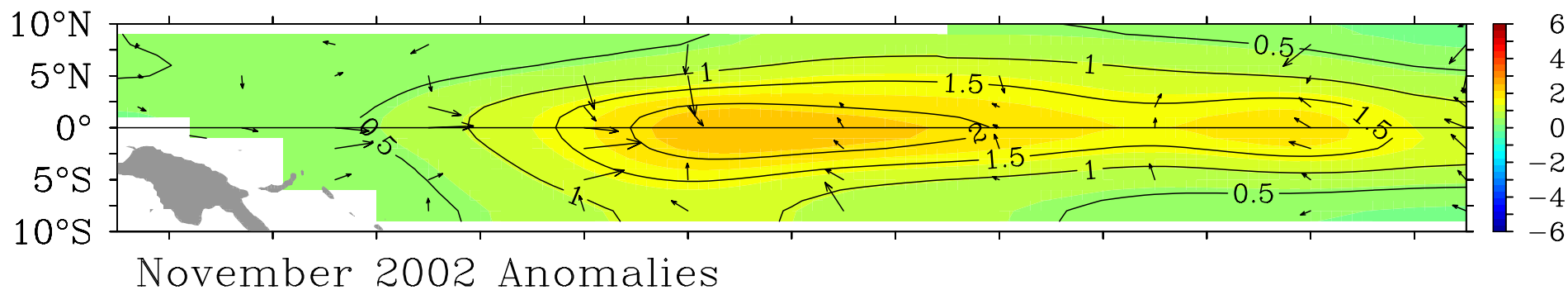
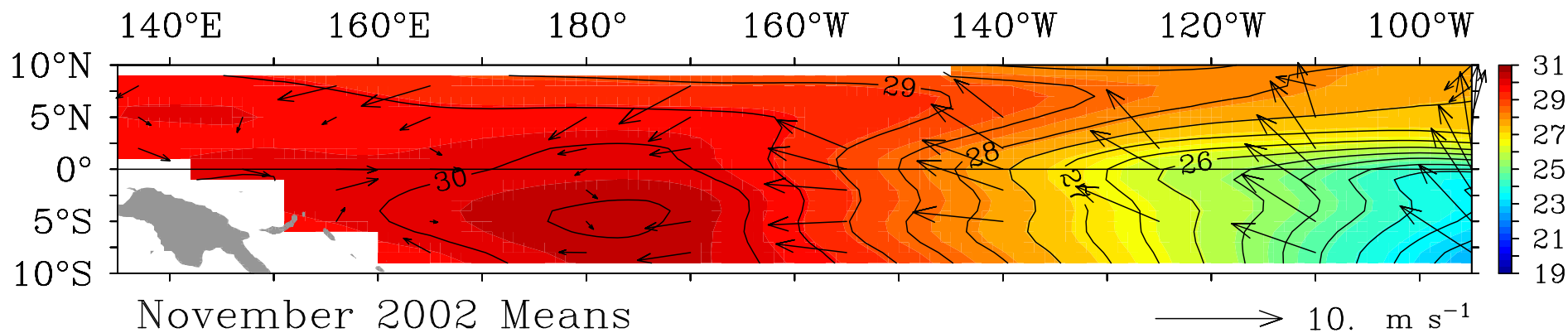
Winds during the cruise were predominantly from the south and southwest, as is normal for this time of year. Winds from this direction cause downwelling, and drive northward flow along the coast. The inbound and outbound ADCP sections both show predominantly northward currents, with a local maximum over the continental slope.

The attached zooplankton report was provided by Dr. Wm. Peterson, and the attached microzooplankton report was provided by Drs. Evelyn and Barry Sherr.

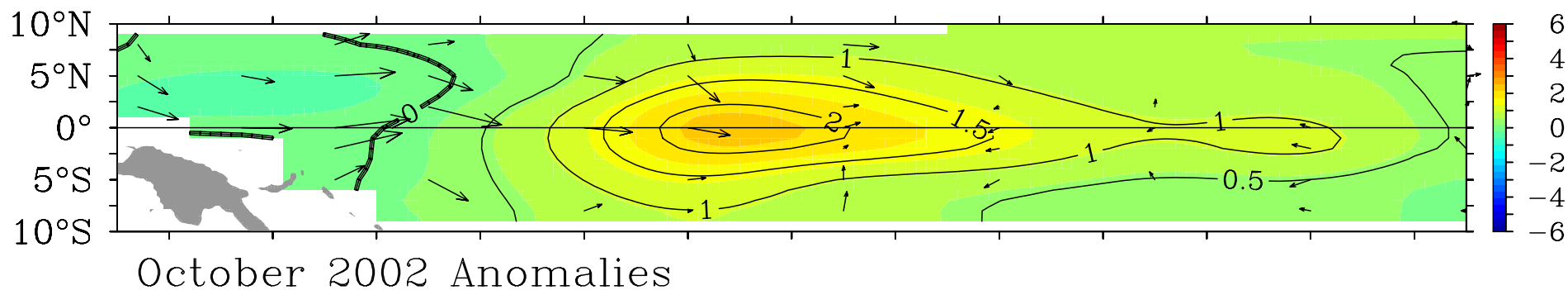
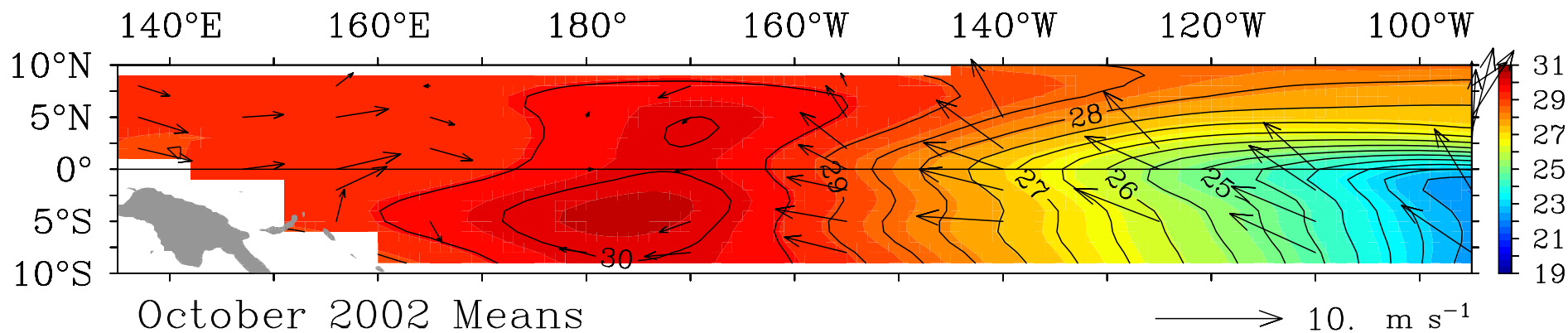
Figure 2.

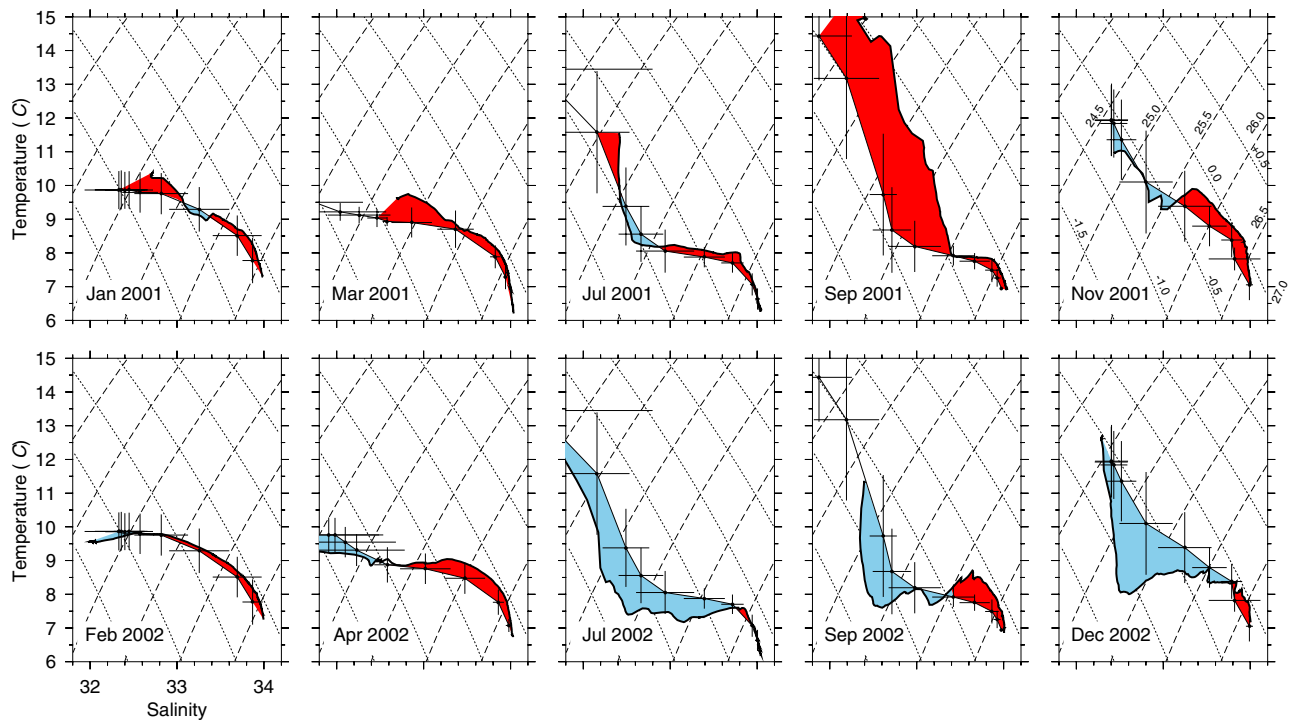
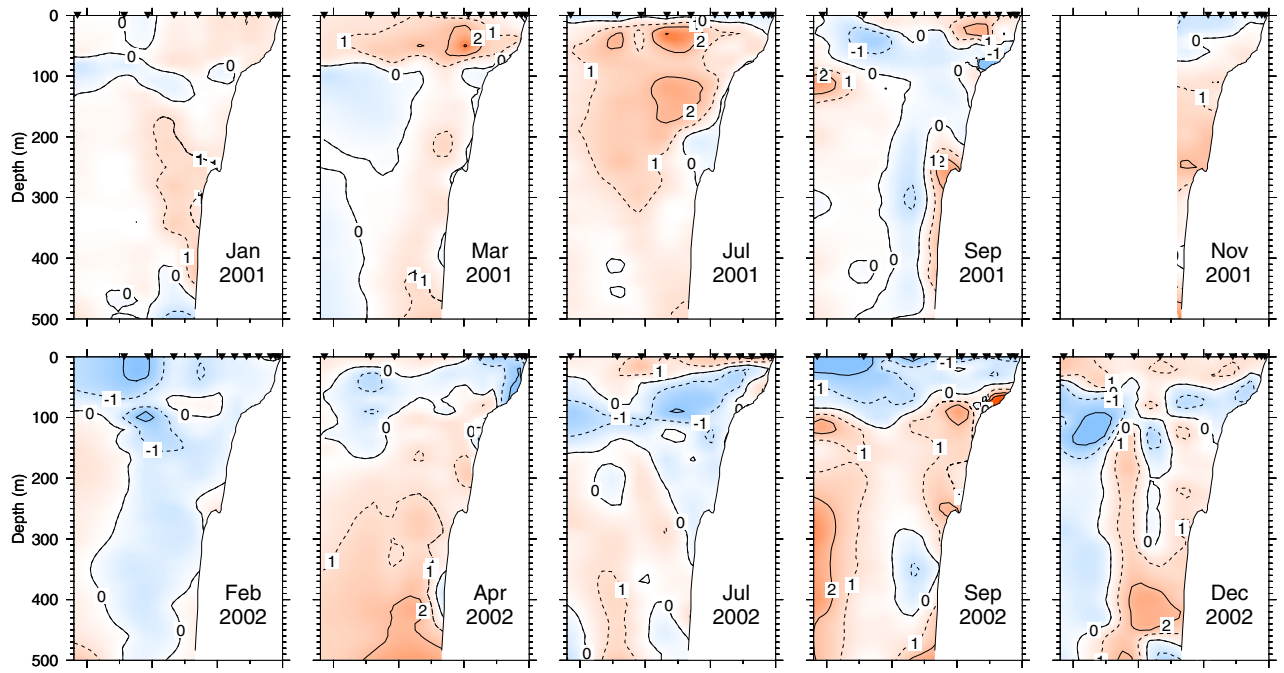


TAO/TRITON Monthly SST ($^{\circ}\text{C}$) and Winds (m s^{-1})



TAO/TRITON Monthly SST ($^{\circ}\text{C}$) and Winds (m s^{-1})





W0212A Wind Speed and Direction

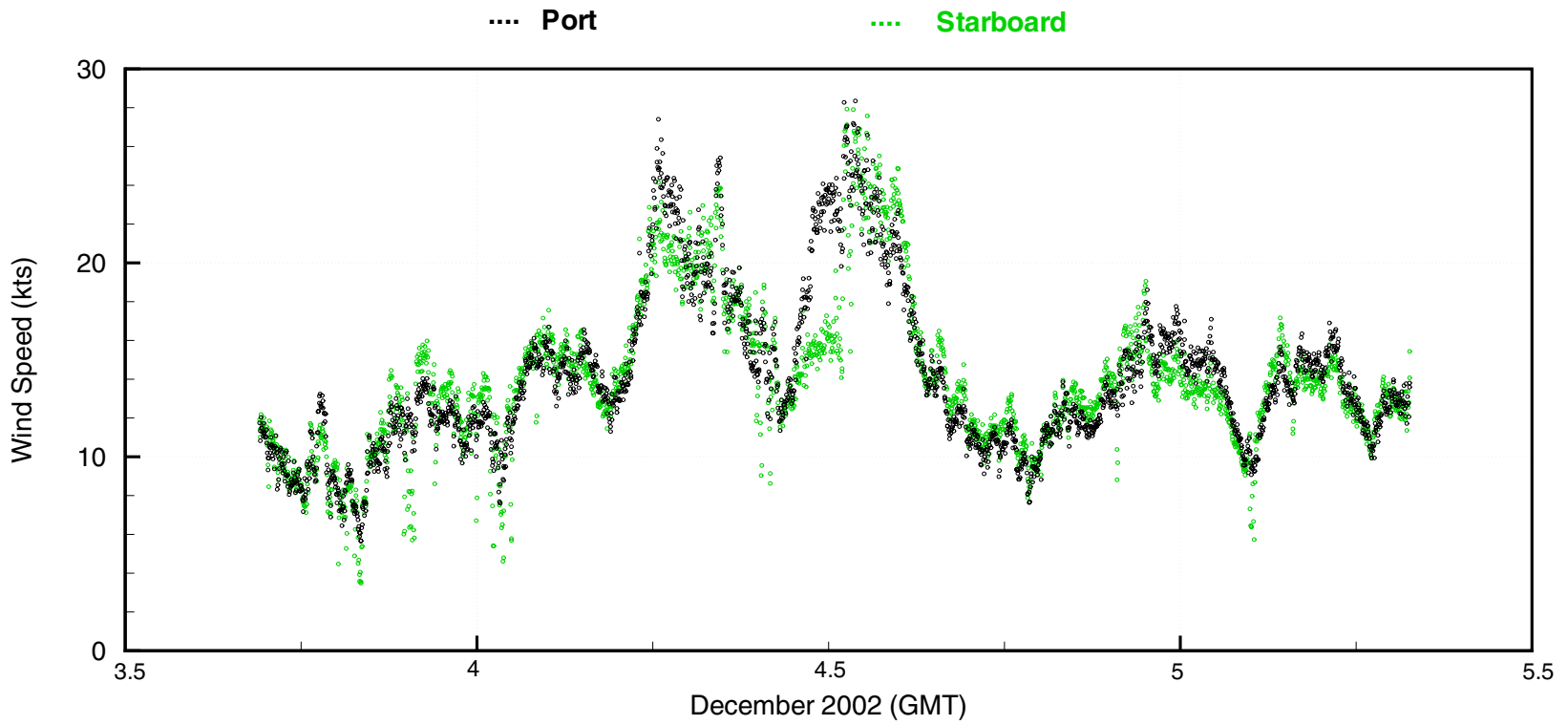
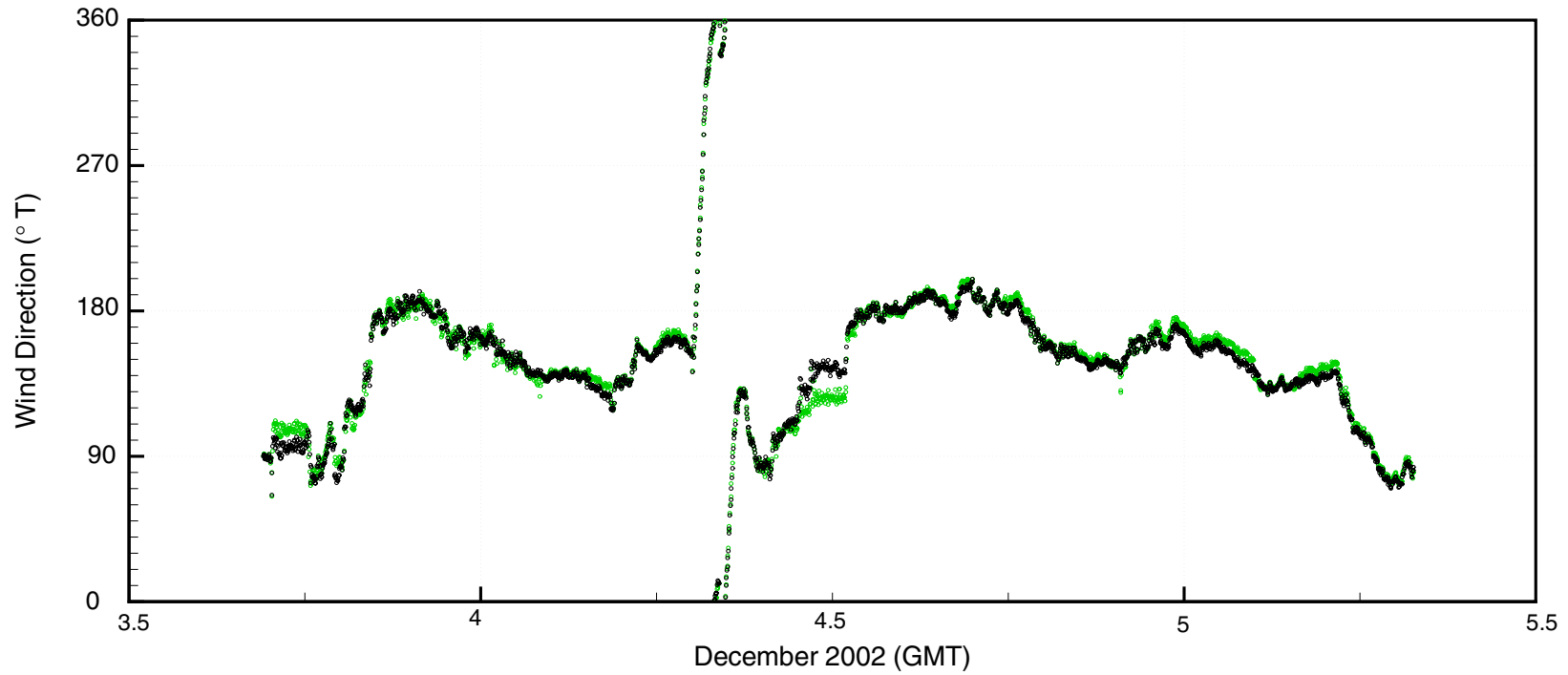


Table 1. CTD station positions during W0212A, and sampling at each station (C: Bio/Chem bottle sampling, N:half-meter vertical net tows, M: Moccness, O2:Oxygen samples, Z:Microzooplankton bottle sampling).

Station		Distance	Lat.	Long.	Bottom	Cast	Sampling
Name	No.	from shore	°N	°W	Depth	Depth	Type
		(km)			(m)	(db)	
NH-1	1	3	44.65	-124.10	30	25	Z,N
NH-3	2	5.6	44.65	-124.13	50	45	Z
NH-5	3	9.1	44.65	-124.18	60	53	C,Z,N,M
NH-10	4	18.3	44.65	-124.29	82	75	N
NH-15	5	27.6	44.65	-124.41	92	85	C,Z,N,M
NH-20	6	36.9	44.65	-124.53	141	135	N
NH-25	7	46.5	44.65	-124.65	296	285	C,Z,N,M
NH-35	8	64.8	44.65	-124.88	435	423	C,Z,N,M
NH-45	9	83.3	44.65	-125.12	702	695	C,Z,N,M
NH-55	10	103.2	44.65	-125.37	2875	1006	O2
NH-65	11	121.5	44.65	-125.60	2871	1006	C,Z,N
NH-85	12	157.2	44.65	-126.05	2895	1005	C

Table 4. Names, affiliations, and responsibilities of scientific personnel participating on W0212A.

Jane Fleischbein	Scientist in Charge	OSU	CTD
Margaret Sparrow	Technician	OSU	CTD
Joe Jennings	Technician	OSU	CTD, Oxygen
Jennifer Jarrell-Wetz	Technician	OSU	nuts, chl
Julie Arrington	Technician	OSU	nuts, chl
Jennifer Harman	Technician	OSU	nuts, chl
Carlos López	Technician	OSU	microzooplankton
Julie Keister	Technician	HMSC	zooplankton
Leah Feinberg	Technician	HMSC	zooplankton
Carolyn Tracy Shaw	Technician	HMSC	zooplankton
Mitch Vance	Technician	HMSC	zooplankton
Mary Buthimethee	Technician	HMSC	zooplankton
Linda Faylor	Technician	OSU	martec
Daryl Swensen	Technician	OSU	martec

Table 2: Actual sample depths and types of sub samples for biological/chemical sampling during the December '02 LTOP GLOBEC cruise.

Station	Sample Collection Depths (m)	Type of Sample Collected
NH-05	53, 50, 40, 30, 25, 20, 15, 10, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl and POC/PON (all depths)
NH-15	85, 70, 60, 50, 40, 30, 20, 10, 5, 1	TOC (all depths), Nutrients, TN (all depths), Chl and POC/PON (all depths)
NH-20	100	Nutrients only
NH-25	284, 200, 151, 130, 101, 71, 49, 40, 30, 21, 10, 1.4	TOC (all depths), Nutrients, TN (all depths), Chl and POC/PON (all depths) (except 284 and 200 m)
NH-35	422, 360, 150, 100, 70, 50, 40, 29, 20, 18, 10, 1	TOC (surface), Nutrients, TN (surface), Chl and POC/PON (all depths) (except 422 and 360 m)
NH-45	684, 500, 150, 100, 70, 50, 40, 30, 20, 12, 10, 2	TOC (surface), Nutrients, TN (surface), Chl and POC/PON (all depths) (except 684 and 500 m)
NH-55	145, 80	Nutrients only
NH-65	1004, 876, 151, 100, 70, 50, 41, 30, 21, 11, 2.2	TOC (surface), Nutrients, TN (surface), Chl and POC/PON (except 1004 and 876 m)
NH-85	1003, 150, 100, 69, 50, 40, 30, 20, 10, 1.5, 1.2	TOC (all depths), Nutrients, TN (all depths), Chl and POC/PON (except 1003 m)

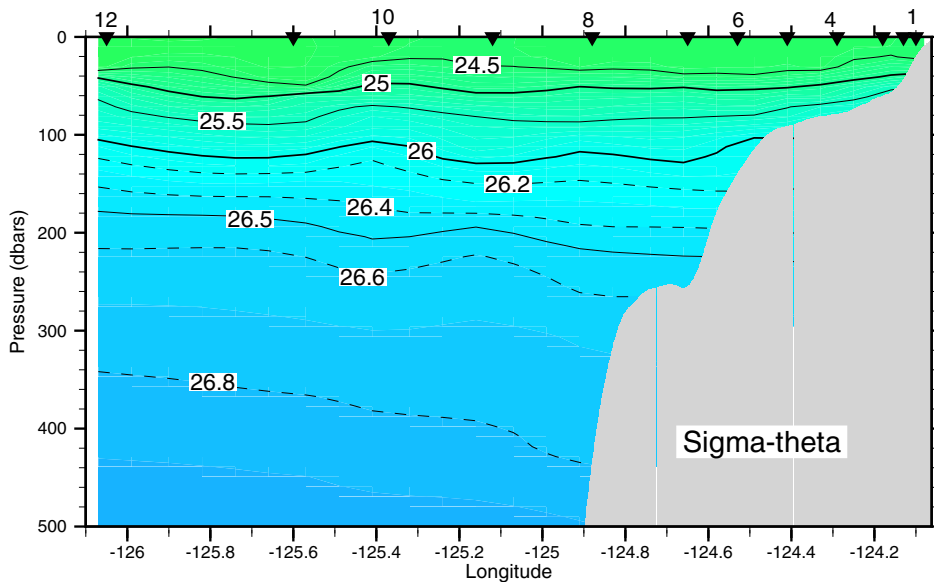
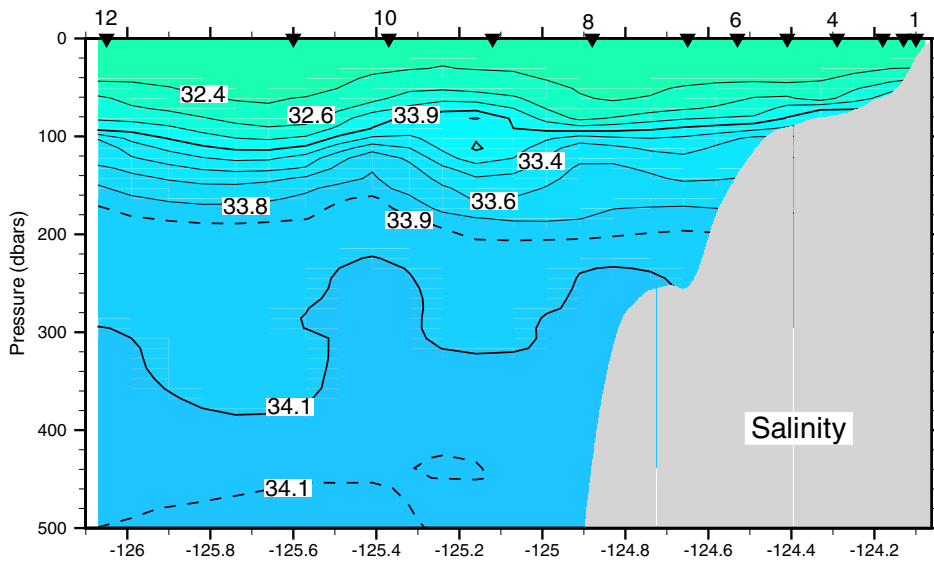
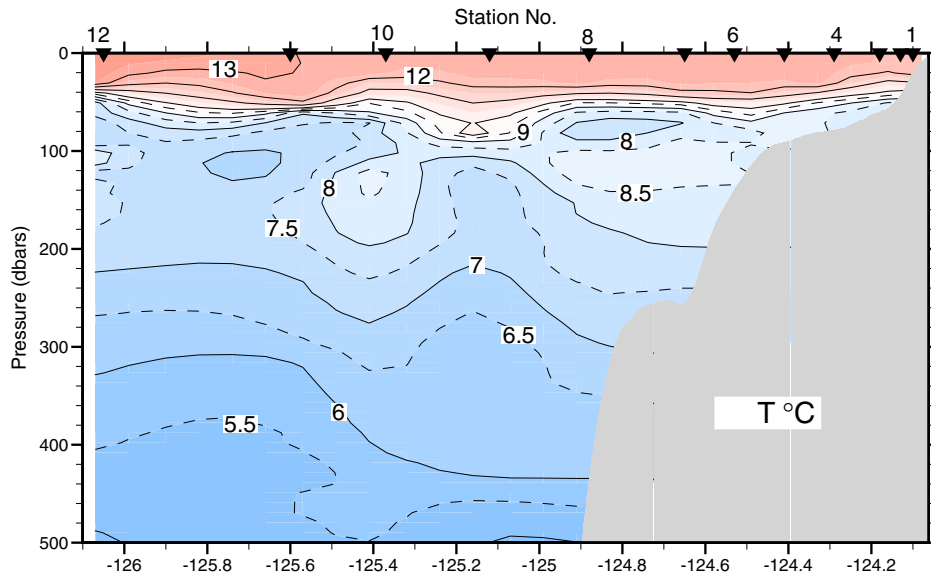
Table 3. R/V WECOMA Cruise W0212A Event Log

	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)		
3-Dec	1630												Start DAS	
	1658												air calibration of transmissometer	
	1800												Depart Newport	
	1802												Start echosounder	
	1803												Start ADCP	
	1830												Start flo-thru	
	1913		1	NH-1	44	39.1	-124	06.0	30	1019.9	075	9	CTD, mzp	WE33701.1
	1928			NH-1	44	39.1	-124	06.0					vertical net tow, 25 m	WE33701.2
	1952		2	NH-3	44	39.1	-124	08.0	50	1019.1	120	8	CTD, crab line hooked on retrieval, mzp	WE33701.3
	2023		3	NH-5	44	39.1	-124	10.6	60	1019.1	100	8	CTD with biochem, mzp	WE33701.4
	2138		4	NH-10	44	39.1	-124	17.7	82	1018.9	175	10	CTD	WE33701.5
	2123			NH-10	44	39.1	-124	17.6					vertical net tow, 75 m	WE33701.6
	2228		5	NH-15	44	39.1	-124	24.7	92	1018.3	180	15	CTD with biochem, mzp	WE33701.7
	2333		6	NH-20	44	39.1	-124	31.7	141	1018.2	170	13	CTD	WE33701.8
	2351			NH-20	44	39.1	-124	31.7					vertical net tow, 100 m	WE33701.9
4-Dec	0043		7	NH-25	44	39.1	-124	39.0	296	1019.0	160	11	CTD with biochem, mzp	WE33801.1
	0206			NH-35	44	39.1	-124	53.1		1018.8	140	15	vertical net tow, 100 m	WE33801.2
	0231			NH-35	44	38.9	-124	53.1					Mocness deployed	WE33801.3
		0333			44	38.9	-124	53.1					Mocness aboard	WE33801.4
	0436			NH-25	44	39.1	-124	39.0		1018.8	135	12	vertical net tow, 100 m	WE33801.5
	0446			NH-25	44	39.2	-124	39.0					vertical net tow, 100 m	WE33801.6
	0500			NH-25	44	39.0	-125	39.0					Mocness deployed	WE33801.7
		0554			44	36.9	-124	38.7					Mocness aboard	WE33801.8
	0703			NH-15	44	39.2	-124	24.7		1019.1			vertical net tow, 90 m	WE33801.9
	0711			NH-15	44	39.2	-124	24.7					vertical net tow, 90 m	WE33801.10
	~0715												Ship power outage for about 5 minutes	
	0738			NH-15	44	39.3	-124	24.6					Mocness deployed	WE33801.11
		0802			44	38.4	-124	25.3					Mocness aboard	WE33801.12
	0916			NH-5	44	39.1	-124	10.5		1018.8	160	15	vertical net tow, 55 m	WE33801.13
	0925			NH-5	44	39.2	-124	10.5					vertical net tow, 55 m	WE33801.14
	0937			NH-5	44	39.1	-124	10.7					Mocness deployed	WE33801.15
		1001			44	38.4	-124	11.6					Mocness aboard	WE33801.16
	1312		8	NH-35	44	39.1	-124	52.9	437	1017.5	180	25	CTD with biochem, mzp	WE33801.17
	1457		9	NH-45	44	39.1	-125	07.0		1018.8	180	21	CTD with biochem	WE33801.18
	1649		10	NH-55	44	39.1	-125	22.0	2875	1019.9	190	11	CTD with oxygen	WE33801.19
	1855		11	NH-65	44	39.1	-125	36.0	2871	1020.9	155	9	CTD with biochem, mzp	WE33801.20

	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)		
4-Dec	1950	1957		NH-65	44	39.1	-125	36.1					vertical net tow, 100 m	WE33801.21
	2003	2011		NH-65	44	39.1	-125	36.1					vertical net tow, 100 m	WE33801.22
	2200		12	NH-85	44	39.1	-126	03.0	2895	1019.9	150	14	CTD with biochem	WE33801.23
5-Dec	0225	0232		NH-45	44	41.2	-125	06.9		1022.2	150	12	vertical net tow, 100 m	WE33901.1
	0240			NH-45	44	41.2	-125	07.3					Mocness deployed	WE33901.2
	0300												air calibration of transmissometer	
		0349			44	38.5	-125	07.3					Mocness aboard	WE33901.3
	0349												begin transit to Newport	
	0750												shut down flow through system	
	0750												shut down echosounder	
	0750												shut down DAS	
	0750												shut down ADCP	
	~0800												arrive at pier in Newport	

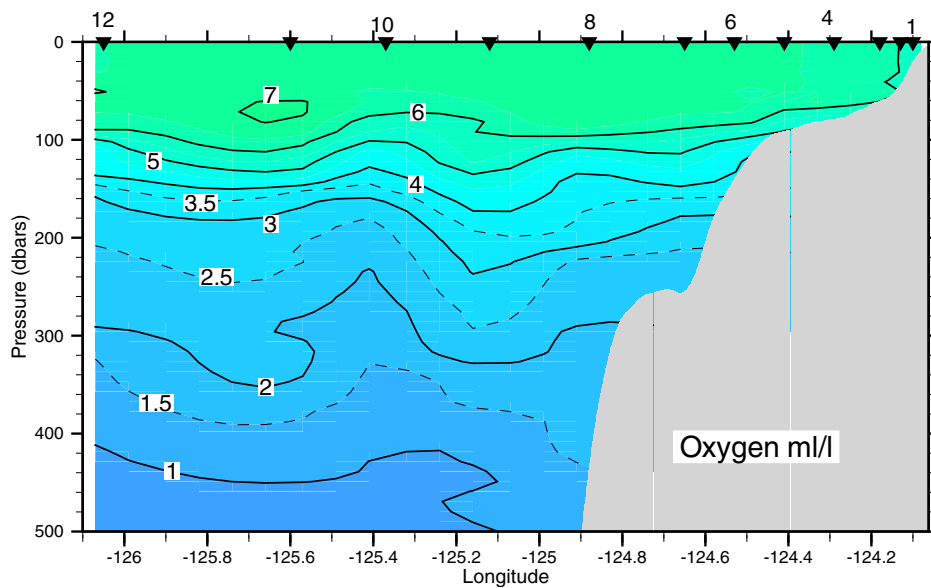
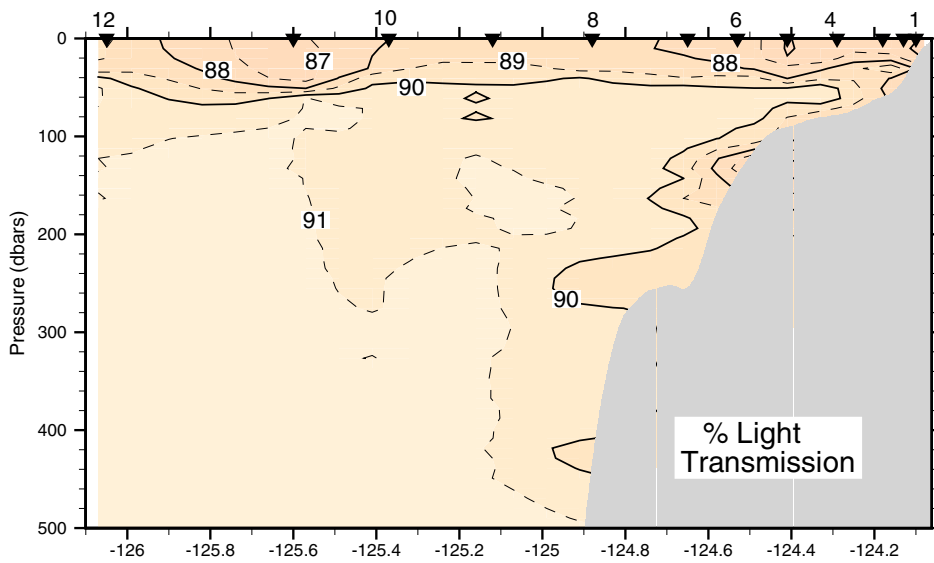
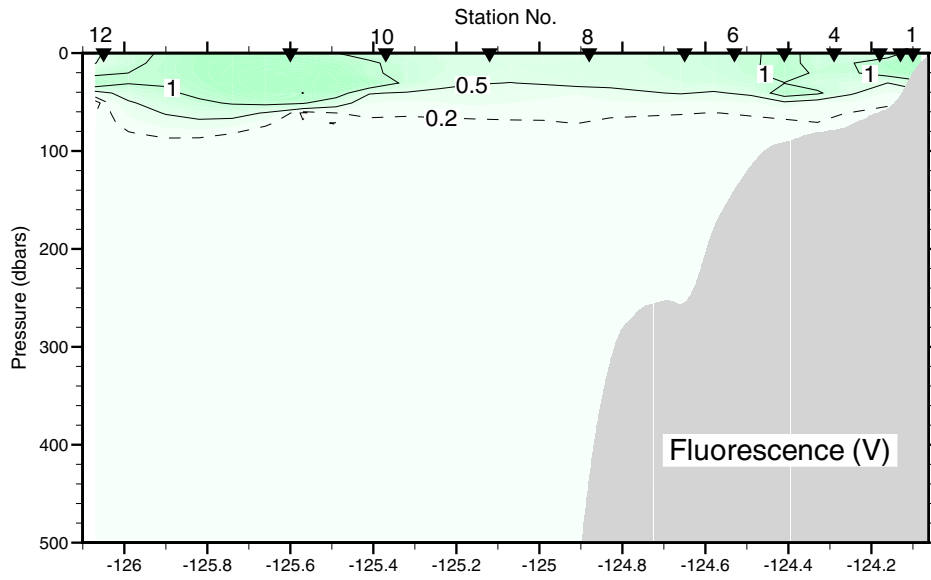
Newport Hydro Line 44° 39'N

3-4 December 2002



Newport Hydro Line 44° 39'N

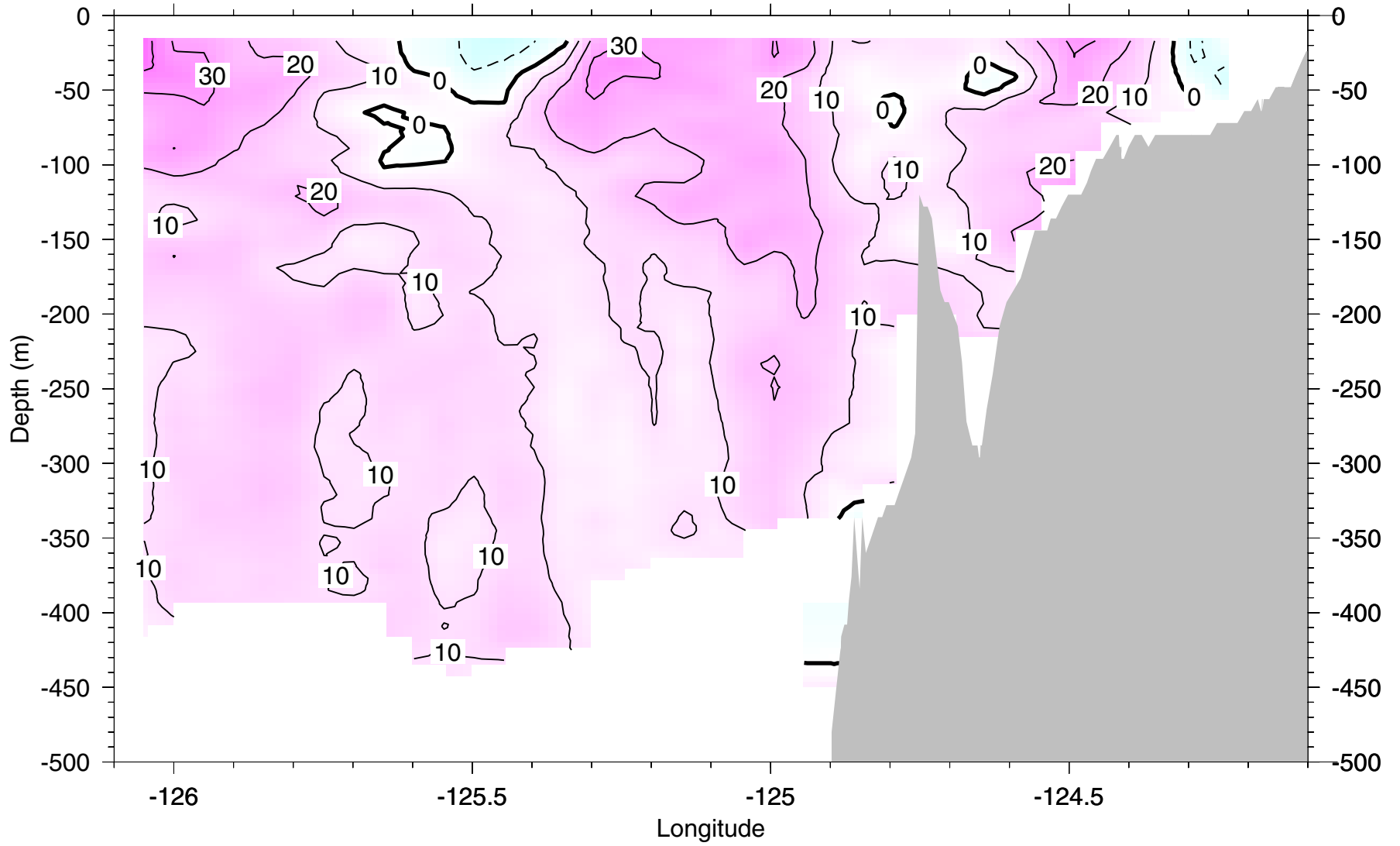
3-4 December 2002



Newport Hydrographic Line 44.6°N

4 December 2002

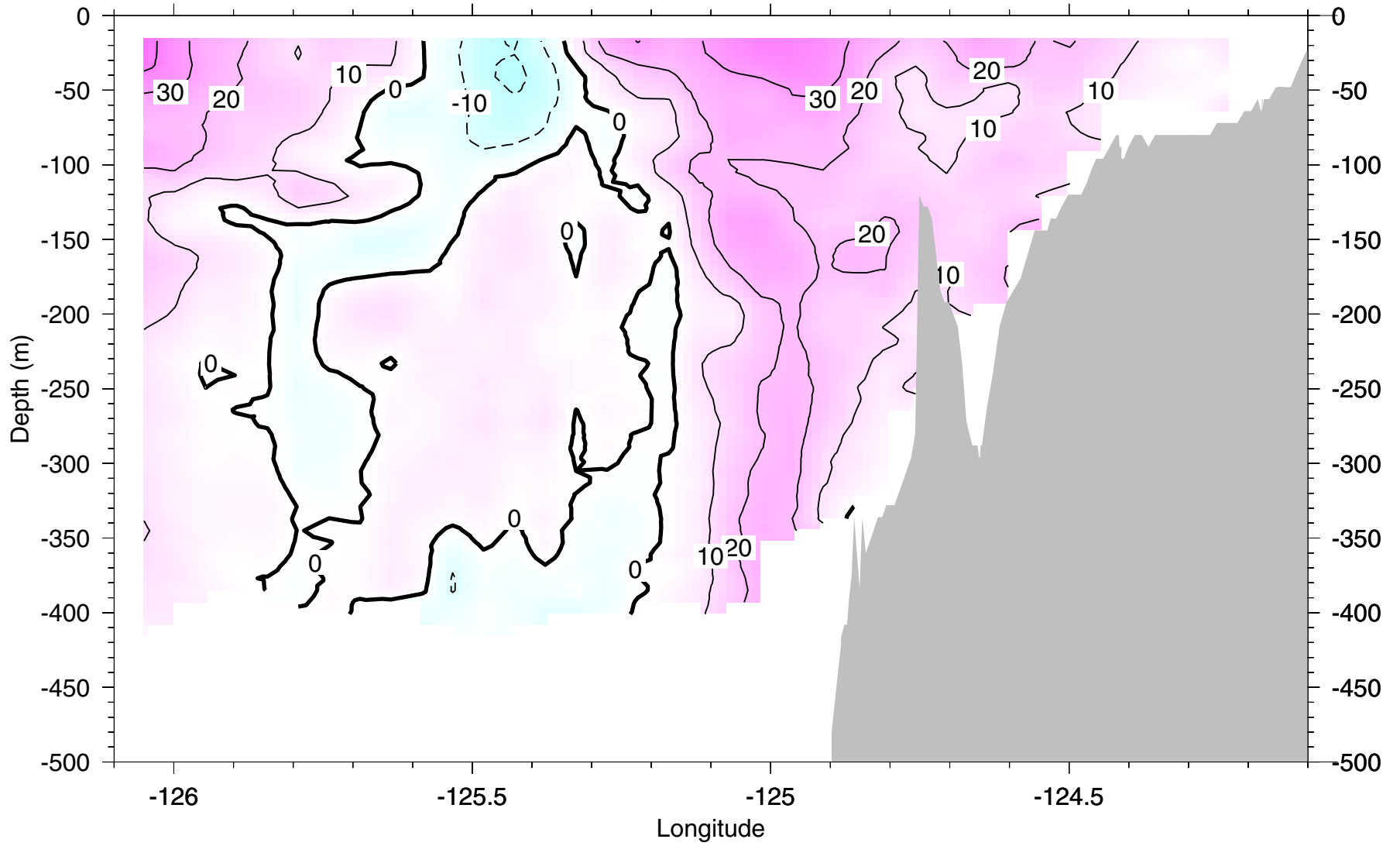
ADCP: Northward current (cm/s)



Newport Hydrographic Line 44.6°N

4-5 December 2002

ADCP: Northward current (cm/s)



Zooplankton Report

(Submitted by Julie Keister and Dr. Wm. Peterson, Oregon State University and NOAA)

MOCNESS DESCRIPTIONS

- NH5** 01:40 h (local time) water depth= 60m
- 50-35 m jellies, 2 shrimp, amphipods, furcilia, green goop, copepods
35-20 m jellies, amphipods, copepods, 2 Pleurobrachia, worms
20-10 m jellies, amphipods, copepods, Pleurobrachia
10-0 m 2 fried egg jellies, amphipods, furcilia
- NH15** 23:40 h water depth=100m
- 75-50 m copepods, juvenile euphausiids, 2 squat lobsters, amphipods,
 chaetognaths, cumaceans
50-35 m 10 squat lobsters, chaetognaths, amphipods, juvenile euphausiids
35-20 m Pleurobrachia, euphausiid furcilia, copepods, juvenile euphausiids,
 amphipods
20-10 m Pleurobrachia, furcilia, Limacina, copepods, jellies, 2 squat lobsters
10-0 m amphipods, ~2000 juvenile euphausiids, copepods, Limacina
- NH25** 21:00 h water depth=298m
- 270-250 ~80 adult euphausiids, chaetognaths, 5 Sergestids, amphipods, copepods,
 1 myctophid
250-200 ~300 adult euphausiids, juvenile euphausiids, chaetognaths, 5 Sergestids,
 Pleurobrachia
200-150 100 adult euphausiids, 1 myctophids, 3 Sergestids, chaetognaths, copepods
150-100 1 myctophid, 50 adult euphausiids, 1 flatfish, 200 juvenile euphausiids,
 amphipods, copepods
100-50 250 adult euphausiids, juvenile euphausiids, copepods
50-35 >200 adult euphausiids, juvenile euphausiids, jellies, chaetognaths,
 amphipods
35-20 >1000 adult euphausiids, juvenile euphausiids, Sergestids, Limacina,
 copepods
20-10 1000 adult euphausiids, juvenile euphausiids, Sergestids, Limacina,
 copepods
10-0 1 quart adult euphausiids, juvenile euphausiids, Limacina, copepods, 5
 Sergestids

NH35	18:30 h	water depth=450m
350-250	5 Sergestid shrimp, chaetognaths, 3 myctophids, 20 adult euphausiids	
250-200	chaetognaths, Muggiaea, 10 adult euphausiids, 5 Sergestid shrimp	
200-150	4 myctophids, Pleurobrachia, 12 Sergestid shrimp, 10 adult euphausiids	
150-100	30 adult euphausiids, 1 myctophid, copepods, 5 Sergestid shrimp, 3 juvenile squat lobsters	
100-50	copepods, 75 adult euphausiids, 15 Sergestid shrimp, 2 myctophids	
50-35	8 Sergestid shrimp, copepods, 15 adult euphausiids, amphipods, juvy euphausiids	
35-20	200 adult euphausiids, 4 myctophids, 25 Sergestid shrimp, Neocalanus	
20-10	150 adult euphausiids, 10 myctophids, euphausiid furcilia, Sergestids	
10-0	400 adult euphausiids, jellies, amphipods, euphausiid furcilia, 2 myctophids	

NH45	18:38 h	water depth=670m
350-250	jellies, 2 myctophids, chaetognaths	
250-200	~100 adult euphausiids, chaetognaths, Muggiaea, Sergestids	
250-200	~2000 adult euphausiids, 6 myctophids, Limacina, copepods, furcilia	
200-150	radiolarians, ~200 juvenile euphausiids, ~50 adult euphausiids, Limacina, 1 Sergestid, 1 squat lobster	
150-100	radiolarians, ~150 adult euphausiids, 7 Sergestids, Limacina, amphipods, copepods, 2 myctophids	
100-50	adult euphausiids, 8 fish larvae, Sergestids, Pleurobrachia, copepods	
50-20	~1500 adult euphausiids, juvenile euphausiids, 10 Sergestids, 2 myctophids, copepods	
20-10	jellies, ~100 adult euphausiids, chaetognaths, copepods	
10-0	juvenile euphausiids, furcilia, amphipods, 3 myctophids, copepods	

Other zooplankton sampling:

Vertical tows (200µm mesh) from 100 meters (or from just above bottom) to surface were completed at stations NH1, NH5, NH10, NH15, NH20, NH25, NH35, NH45, and NH65. Replicates for EtOH preservation were taken at NH5, NH15, NH25, and NH65.

Euphausiids from station NH25 were incubated for molting rates.