PRELIMINARY CRUISE REPORT, W0202A
R/V WECOMA, 19-20 February 2002
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 the Newport Hydro line, to make continuous bio-acoustic observations between the 50-500m. isobath, 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 bio-chemical 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 m^2 MOCNESS.
6. 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 PST on 19 February 2002. CTD sampling started at NH-1, where it was found the CTD would not communicate with the rosette or record the secondary temperature data. After replacing CTD #253 with CTD #2843 and fixing an electrical short on the bridge, sampling resumed at NH-3. Following the cast, the HTI (bio-acoustic system) was deployed. CTD stations were occupied as usual, heading offshore out to station 7 at NH-25, with MOCNESS tows starting at NH-5. Vertical and MOCNESS tows only where done during the early am on February 20th (PST) to allow the MOCNESS tows to be completed in darkness. CTD casts resumed at NH-55 at 0822 PST, and stations NH-55 and NH-65 were completed running offshore, followed by NH-45 and NH-35 heading inshore. Due to a forecasted gale, NH-85 was skipped so most of the Newport Hydro Line could be finished before bad wearther arrived. After completing 11 CTD's along the Newport Line at 1550 PST, 20 February, we began the transit to Newport. We arrived alongside the pier at Newport at 1900 PST on 20 February 2002.

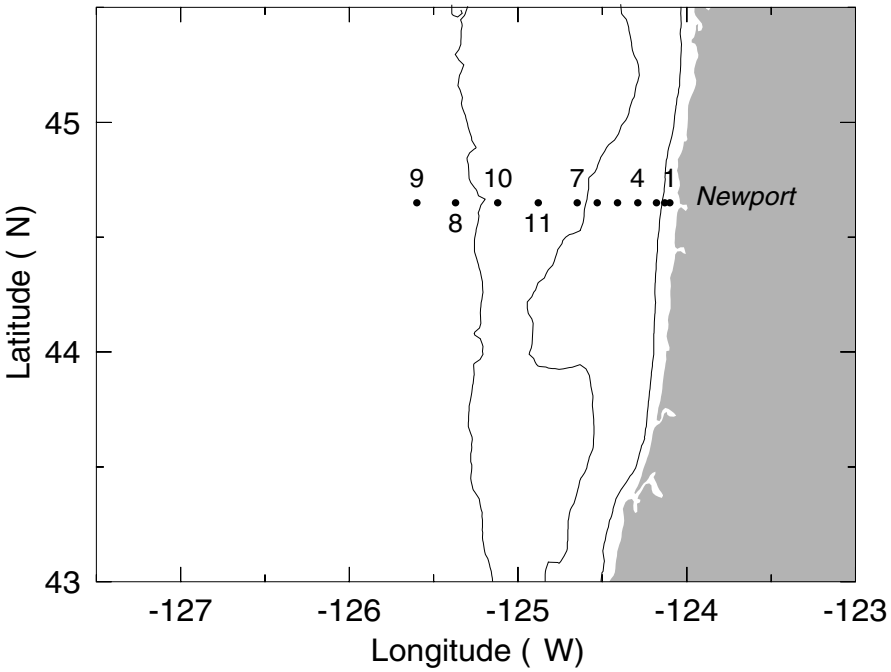


Figure 1. Location of CTD stations during W0202A.

PRELIMINARY RESULTS

Vertical sections of the parameters measured by the SBE CTD system (temperature, salinity, density, fluorescence voltage, percent light transmission and dissolved oxygen concentration) are presented at the end of this report. Also included is a vertical section of the alongshore currents measured by the shipborne Acoustic Doppler Current Profiler (ADCP).

This cruise was immediately preceded by a moderate winter storm, and a second, stronger storm was forecast to occur on the second night of our cruise. Winds at NDBC Buoy 46050 on Stonewall Bank had peaked at 37 kts at about 0200 UTC on 19 February. Wind speeds had fallen to about 15 kts by the time we sailed at 1800 UTC, and remained weak the remainder of our cruise, though a stronger storm was forecast for 20-21 February. Significant wave height reached a peak of 19 feet at 0600 UTC, fell to 11 feet by 1800 UTC, and reached a second peak of 17 feet at 2300 UTC on 19 February. The previous week had seen fair skies and upwelling-favorable winds.

Surface temperatures were generally cool, between 8.5 and 9.5 C. Surface salinities inshore were low, less than 32.0, as usual for this time of year. The permanent halocline (32.6 to 33.8 psu) and the permanent pycnocline (26 to 26.5 kg/m^3) was nearly level. The fluorescence voltage inshore was relatively high for this time of year: peak values were 2-3 V in Feb 2002, compared to peak values of <1 V in 2000 and 2001; this may reflect the fair weather of the preceding week. Light transmission values were anomalously low, particularly in the deep water over the continental slope: these low values may be due to instrument malfunction.

Currents over the shelf were poleward, as is normal at this time of year; the poleward flow was particularly strong at the shelf-break. The current pattern over the slope suggests that a cyclonic eddy was centered at 125.1 W.

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

Table 1. CTD station positions during W0202A, and sampling at each station (C: Bio/Chem bottle sampling, N:half-meter vertical net tows, M:Mocness, O:Oxygen samples).

Station		Distance	Lat.	Long.	Bottom	Cast	Sampling
Name	No.	from shore	°N	°W	Depth	Depth	Type
NH-1	1	3.0	44.65	-124.10	29	25	N
NH-3	2	5.4	44.65	-124.13	47	42	
NH-5	3	9.1	44.65	-124.18	58	55	C,N,M
NH-10	4	18.3	44.65	-124.29	81	77	N
NH-15	5	27.6	44.65	-124.41	92	88	C,N,M
NH-20	6	36.7	44.65	-124.53	140	137	N
NH-25	7	46.5	44.65	-124.65	295	286	C,N,M
NH-55	8	103.2	44.65	-125.37	2867	1007	N,M,O
NH-65	9	121.5	44.65	-125.60	2860	1007	C,N
NH-45	10	83.3	44.65	-125.12	701	701	
NH-35	11	65.0	44.65	-124.88	439	437	C,N

Table 4. Names, affiliations, and responsibilities of scientific personnel participating on W0202A.

Adriana Huyer	Chief Scientist	OSU	CTD
Robert L. Smith	Co-Chief Scientist	OSU	CTD
Jane Fleischbein	Technician	OSU	CTD
David Lett	Observer		CTD
Julie Arrington	Technician	OSU	nuts, chl
Mike Wetz	Graduate Student	OSU	nuts, chl
Jennifer Harmon	Technician	OSU	nuts, chl
Christie Walker	Teacher-at-sea		nuts, chl
Carlos López	Technician	OSU	microzooplankton
Anders Roestad	Technician	HMSC	zooplankton
Mitch Vance	Technician	HMSC	zooplankton
Carolyn Tracy Shaw	Technician	HMSC	zooplankton
Jesse Lamb	Technician	HMSC	zooplankton
Linda Fayler	Technician	OSU	martec
Daryl Swensen	Technician	OSU	martec

Table 2: Actual sample depths and types of sub samples for biochemical sampling during the February 02 LTOP GLOBEC cruise.

Station, Depth, Dist. From Shore	**Sample Collection Depths (m)**	**Type of Sample Collected**
NH-05, 58m, 9km	53, 50, 40, 30, 25, 21, 15, 10, 5, 3	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON Note: No samples from 50 m
NH-15, 92m, 28km	85, 70, 60, 50, 40, 34, 30, 20, 10, 6, 2	TOC (all depths), Nutrients, TN (all depths), Chl, POC/PON
NH-25, 295m, 46km	250, 200, 149, 100, 70, 50, 40, 30, 20, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl (except 250, 200), POC/PON
NH-35, 439m, 65km	420, 365, 150, 100, 70, 51, 40, 30, 25, 20, 10, 3	TOC (surface), Nutrients, TN (surface), Chl (except 420, 365), POC/PON (except 420, 365)
NH-45, 701m, 83km	656, 620, 501, 150, 99, 70, 49, 40, 30, 20, 10, 2	TOC (surface), Nutrients, TN (surface), Chl (except 656, 620), POC/PON
NH-65, 2860m, 121km	1007 (*2), 784, 151, 100, 70, 50, 38, 30, 21, 10, 2	TOC (all depths), Nutrients, TN (all depths), Chl (except 1007, 784), POC/PON (except 1007, 784)

Subsample	Replicates
TOC	3
Nutrients	2
TN	3
Chl	2
POC/PON	1

Table 3. R/V WECOMA Cruise W0202A

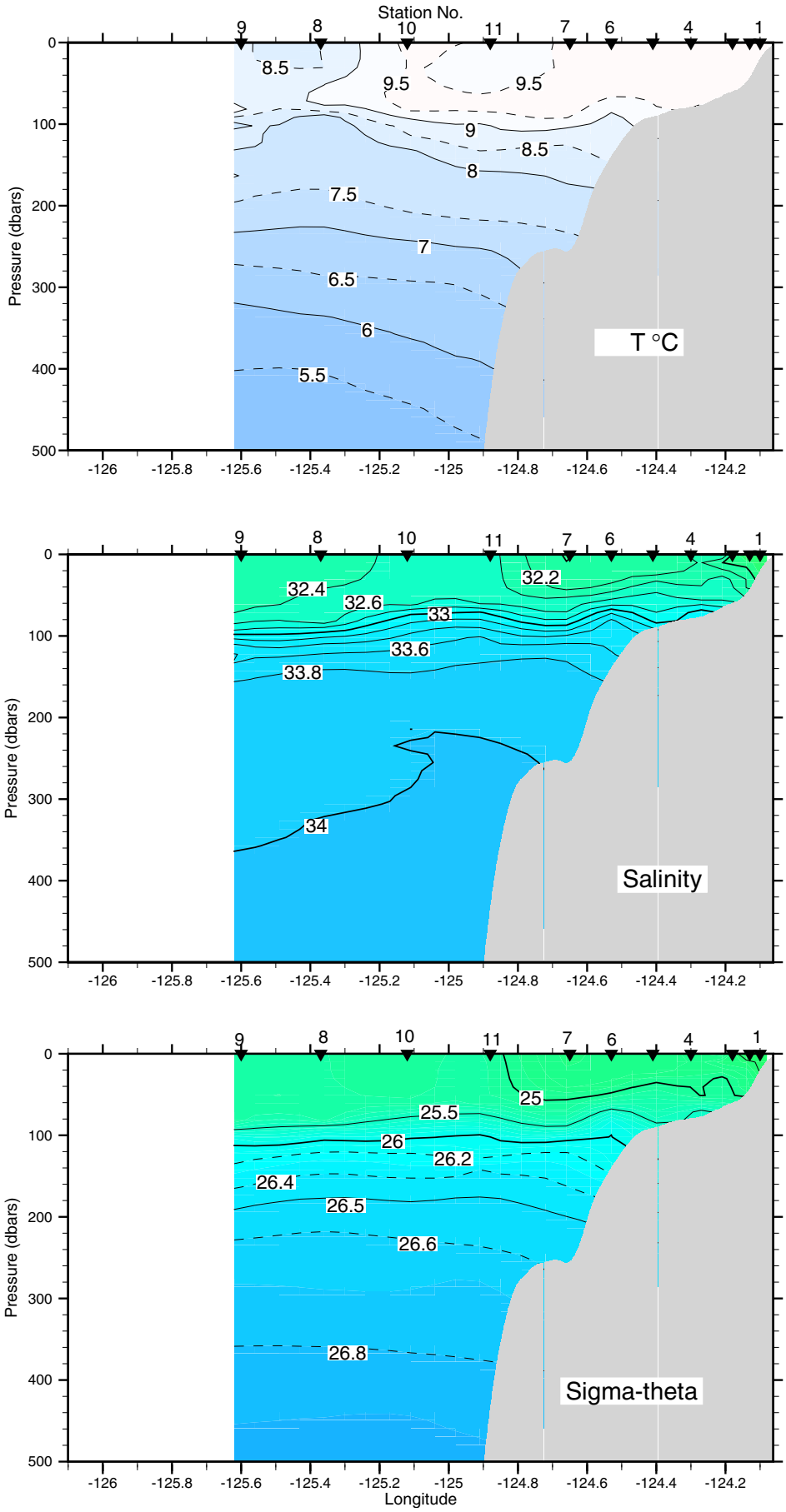
	Start	End	Sta.	Sta.	Latitude		Longitude		Bottom	Atmos	Wind	Wind	Event	Event ID
(UT)	Time	Time	No.	Name	(deg)	(min)	(deg)	(min)	Depth	Press	Dir.	Speed		
	(UT)	(UT)							(m)	(mbar)	(deg T)	(kts)		
19-Feb	1730												air calibration of transmissometer	
	1800												Depart Newport	
													Start echosounder	
	1809												Start DAS	
													Start ADCP	
	1857												Start flo-thru	
	1945			NH-1									attempted CTD, failed to communicate	
													with rosette; aborted	
	2003	2005		NH-1	44	39.2	-124	06.1					vertical net tow,	WE05002.1
	2037		1	NH-1	44	39.2	-124	06.0	29	1015.4	250	10	CTD without rosette	WE05002.2
	2110	2350											hove to at NH-3 to correct electrical	
													problems on bridge	
	2120	2155											replaced CTD fish with spare	
20-Feb	0030	0038	2	NH-3	44	39.2	-124	07.8	47	--	280	8	CTD with few mzp	WE05002.3
	0050				44	39.3	-124	07.8		1017.2	280	8	HTI deployed	WE05102.4
	0123	0135	3	NH-5	44	39.1	-124	10.6	58	--	300	6	CTD with biochem, mzp	WE05102.5
	0149	0152			44	39.4	-124	10.7					vertical net tow, 55 m	WE05102.6
	0232				44	39.8	-124	11.8					Mocness deployed	WE05102.7
		0259			44	39.9	-124	13.2					Mocness aboard	WE05102.8
	0341	0353	4	NH-10	44	39.1	-124	17.7	81	1019.3	020	4	CTD with few mzp	WE05102.9
	0353	0404			44	39.2	-124	17.7					vertical net tow, 75 m	WE05102.10
	0455	0515	5	NH-15	44	39.1	-124	24.7	92	1019.5	020	3	CTD with biochem, mzp	WE05102.11
	0521	0526			44	39.1	-124	24.7					vertical net tow, 85 m	WE05102.12
	0537				44	39.2	-124	25.2					Mocness deployed	WE05102.13
		06.3			44	39.3	-124	26.5					Mocness aboard	WE05102.14
	0644	0700	6	NH-20	44	39.1	-124	31.6	140	1020.4	020	4	CTD with few mzp	WE05102.15
	0705	0711			44	39.1	-124	31.7					vertical net tow, 100 m	WE05102.16
	0804	0839	7	NH-25	44	39.1	-124	39.0	295	1020.0	035	2-3	CTD with biochem, mzp	WE05102.17
	0845	0851			44	39.1	-124	39.0					vertical net tow, 100 m	WE05102.18
	0858				44	39.2	-125	39.3					Mocness deployed	WE05102.19
		0952			44	39.4	-125	42.3					Mocness aboard	WE05102.20
	1100	1107		NH-35	44	39.1	-125	53.0		1021.0	030	5	vertical net tow, 100 m	WE05102.21
	1120				44	39.3	-125	53.6					Mocness deployed	WE05102.22
		1233			44	39.6	-125	57.3					Mocness aboard	WE05102.23
	1345	1352		NH-45	44	39.0	-125	07.0					vertical net tow, 100 m	WE05102.24
	1402				44	39.0	-125	07.4					Mocness deployed	WE05102.25
		1505			44	39.0	-125	10.4					Mocness aboard	WE05102.26

Table 3 cont.

	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)		
					44	39.0	-125	12.3					HTI recovered (malfunctioning)	WE05102.27
	1622	1714	8	NH-55	44	39.1	-125	22.0	2867	1023.5	080	6	CTD with oxygen	WE05102.28
	1745												flo-thru filters cleaned	
	1811	1817		NH-65	44	39.1	-125	36.0					vertical net tow, 100 m	WE05102.29
	1827	1918	9	NH-65	44	39.1	-125	36.0	2860	1024.9	095	8	CTD with biochem, mzp	WE05102.30
	2108	2202	10	NH-45	44	39.1	-124	07.0	708	1025.0	080	6	CTD with biochem, mzp	WE05102.31
	2309	2345	11	NH-35	44	39.1	-124	53.0	439	1024.5	085	8	CTD with biochem, mzp	WE05102.32
	2350												Begin transit to Newport	
21-Feb	0235												shutdown flo-thru, ADCP, DAS,	
													echosounder	
	0300												alongside pier, Newport	

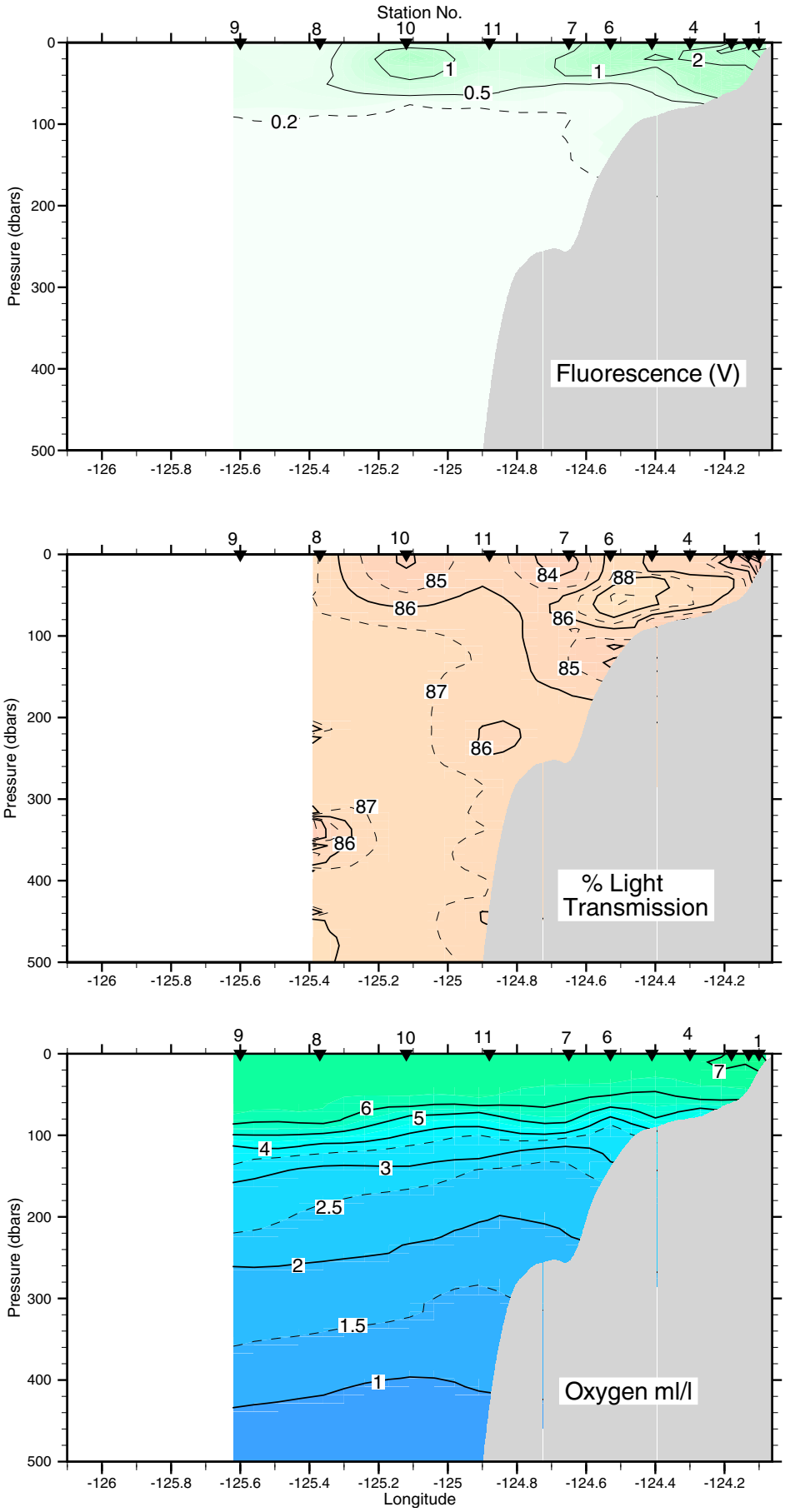
Newport Hydro Line 44° 39'N

19-20 February 2002



Newport Hydro Line 44° 39'N

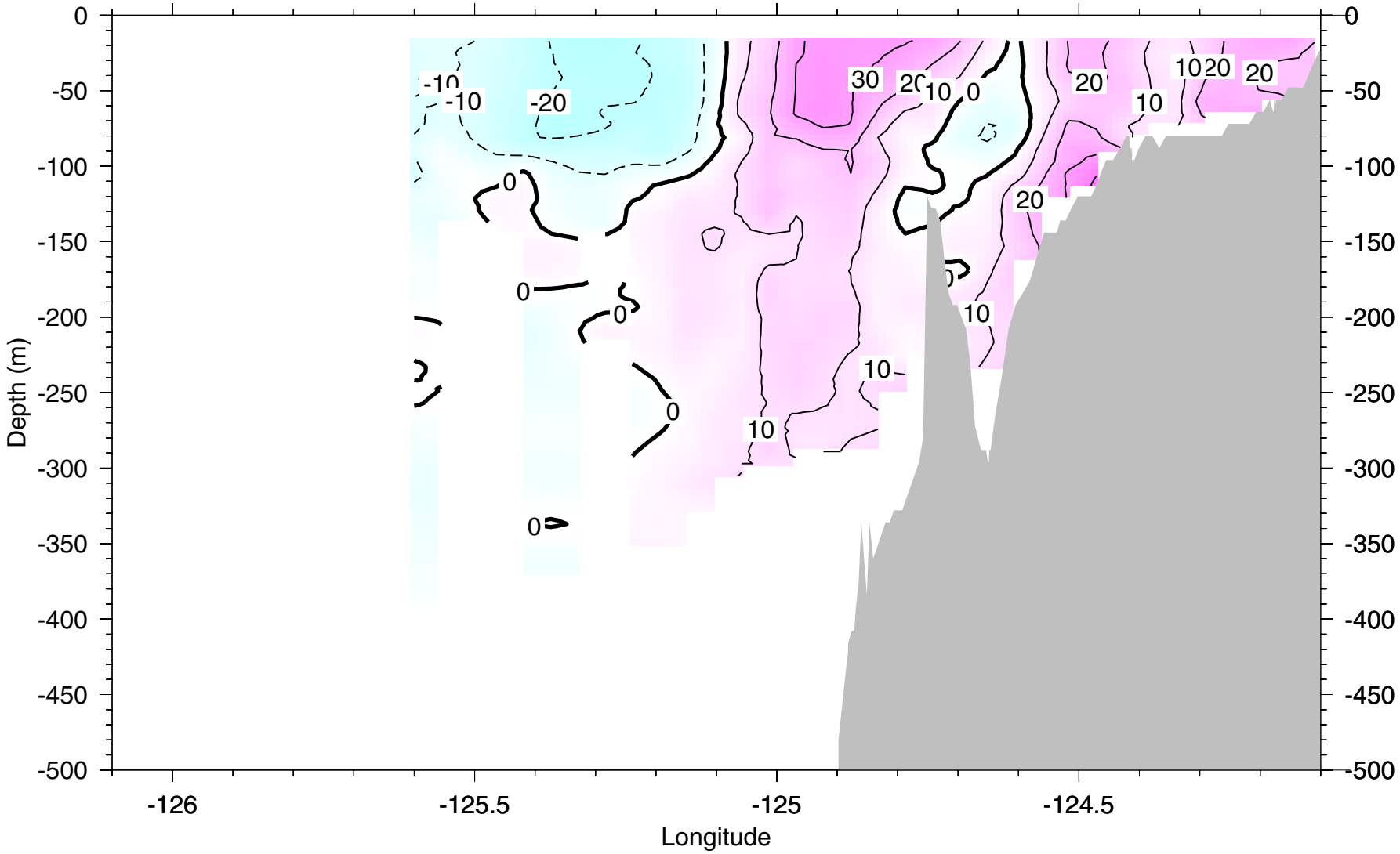
19-20 February 2002



Newport Hydrographic Line 44.6°N

19-20 Feb 2002

ADCP: Northward current (cm/s)



Microzooplankton Sampling

(Submitted by Drs. E. and B. Sherr, Oregon State University)

February 2002 GLOBEC CRUISE W0202A:

Primary goal: MICROZOOPLANKTON ABUNDANCE, BIOMASS, AND GENERAL TAXONOMIC COMPOSITION:

MICROPROTIST (10 – 200 µm sized) BIOMASS -

A) Epifluorescence samples: preserve with Lugol's +Na thiosulfate+ formalin, filter 100 ml subsamples onto 3 µm black filters, stain with DAPI, mount on labeled slide, freeze in slide box.

B) Settling samples: Add 23 ml acid Lugol solution to 240 ml (8 oz) labeled amber bottle, add 207 ml seawater sample, gently mix, cap tightly, store in boxes.

Secondary goal: ABUNDANCE OF PICOEUKARYOTES AND BACTERIA

Flow cytometry samples: pipette 3 ml of sample into 4 ml labeled cryovial, add 120 l µof unfrozen, 25% glutaraldehyde (0.5% final conc), cap & mix using vortex mixer, store in liquid nitrogen shipper.

SAMPLING STRATEGY:

Focus on upper 100 m, with emphasis on 0-50 m depth zone, including chlorophyll-a maximum.

Depths to sample: 6 depths per cast

- Depth of Chlorophyll-a maximum (will vary from cast to cast)
- 70 m depth
- 4 other depths in upper 50 m, don't sample the 1 m depth, more or less evenly spaced; may want to sample the depth nearest the chlorophyll maximum depth

PROTOCOL FOR EPIFLUORESCENCE SAMPLES

1) Preserve the sample: **to each 230 ml seawater sample :**

- **add 3 drops of alkaline Lugol solution, gently mix by capping & inverting bottle**
- **add 6 drops of 3% sodium thiosulfate, gently mix** (sample color should go from pale golden to clear)
- **add 6 ml of formalin (2 squirts from the 3-ml Oxford dispensor**
- **refrigerate for 6-12 hours before filtration to harden and shrink cells (probably can let the samples sit 24+ hours, but its best to stain, settle on filters, mount & freeze as soon after ~ 6 hours as possible**

2) **Filter and stain with DAPI:** Prepare filtration bases with 0.45 µm backing filters, wetted, lay on top a 3.0 µm black membrane filter, and clamp tower over the filters on the base. (Note: *If the filtration clamp isn't on securely, the sample will leak out of the tower down the side of the base - check for leaks after pouring the sample into the tower).* Filter appropriate volume of preserved sample (usually 100 ml). *Filter down to about 5 ml* of sample, relieve the vacuum by turning the

manifold valve to the off position, quickly taking off and then replacing the filtration unit (including the stopper) on, the manifold, (if you don't do this, there will be enough residual vacuum for the sample to keep dripping into the manifold during the staining procedure). Turn off pump and relieve all vacuum when last sample is down to 5 ml.

Note: A problem with filtration of multiple samples at a time is that usually some samples filter more quickly than others. You'll have to keep a sharp watch on the samples, and when each sample in turn reaches the 5 ml mark on the tower, turn the valve for the filtration unit to the off position and then remove & replace the stopper to ensure all the vacuum in that filtration unit is relieved. When all of the samples have gone down to 5 ml, then turn off the pump and relieve all the vacuum in the system by taking off & replacing one of the tower stoppers, or the stopper on the first vacuum trap.

2) Add 30 l μof 500 μg/ml DAPI to each of the samples in the towers, let sit ~ 7 minutes (longer is OK).

3) Prepare labeled slides: While waiting for the samples to incubate with the DAPI stain, prepare the glass slides for mounting the samples. Use consecutive slide numbers with number codes listed in log sheets with sample information. Mount two replicate filters onto each slide. Put a drop of immersion oil onto the slide and smear flat with the edge of a cover slip.

4) Filter samples down, mount onto glass slides and freeze: Turn on the pump, open all the manifold valves, and filter down the stained samples to dryness. *Remove the filters while vacuum is still on.* Lay duplicate filters side by side on the glass slide, put a drop of immersion oil on each, put a glass cover slip on top of each filter, put in a labeled slide box and store in -20oC freezer until returned to COAS (on ice to keep cold).

PROTOCOL for Utermohl inverted microscopy method

Settle 50 mls of acid Lugol's preserved sample in a graduate cylinder for 24 hrs. Pipette off the top 30 mls and then pour the rest into an Utermohl settling chamber followed by 5 mls of acid Lugol's containing filtered seawater used to rinse the graduate cylinder. Let the sample settle for another 12 hrs. Then prepare the bottom portion of the chamber for enumerating ciliates using DIC or brightfield inverted microscopy.

Station and Depths sampled are listed in Table 1 below:

Table 1: Actual sample depths for microzooplankton samples (epifluorescence slide preparations and acid Lugol-fixed samples) during the February-'02 LTOP GLOBEC cruise: W0202a.

Station, Depth, Dist. From Shore	Cast no	Sample Collection Depths (m)
NH-03, 29m, 5km	2	40, 16, 4
NH-05, 58m, 9km	3	53, 41, 31, 20, 10, 1.8
NH-10, 81m, 18km	4	74, 40, 3
NH-15, 92m, 28km	5	87, 60, 41, 30, 20, 10, 2.5
NH-20, 140m, 37km	6	133, 43, 20, 3
NH-25, 295m, 46km	7	74, 50, 39, 30, 20, 10
NH-35, 439m, 65km	11	100, 71, 50, 40, 30, 17, 10, 2
NH-45, 701m, 83km	10	100, 70, 50, 40, 30, 20, 10, 2
NH-65, 2860m, 65km	9	100, 70, 50, 38, 30, 21, 10, 2

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MOCNESS DESCRIPTIONS

NH5 18:38 h (local time) water depth= 60m

50-20 m	~50 Pleurobrachia, furcilia, copepods, phytoplankton
20-10 m	~ 50 Pleurobrachia, copepods, phytoplankton
10-0 m	~ 9 Pleurobrachia, copepods, chaetognaths, phytoplankton

NH15 21:35 h water depth=100m

85-50 m	~300 euphausiids, copepods, ~20 Pleurobrachia, phytoplankton
50-20 m	~150 euphausiids, ~60 Pleurobrachia, Limacina, phytoplankton
20-10 m	~10 euphausiids, copepods, Limacina, phytoplankton
10-0 m	copepods, amphipods, Limacina, phytoplankton

NH25 01:00 h water depth=300m

290-200	copepods, chaetognaths
200-150	copepods, furcilia, Limacina, 3 shrimp
150-100	~40 euphausiids, copepods, chaetognaths
100-50	~1500 euphausiids, copepods
50-20	~500 adult and juvenile euphausiids, furcilia, copepods, Limacina
20-10	euphausiids all stages, copepods, amphipods, Limacina
10-0	~50 euphausiids, amphipods, Pleurobrachia, Limacina

NH35 03:30 h water depth=450m

350-300	chaetognaths, amphipods, Pleurobrachia, Muggiaea, 2 myctophids
300-200	copepods, chaetognaths, 5 shrimp, ~60 Muggiaea, 1 myctophid
200-150	~10 euphausiids, copepods, 4 myctophids, ~30 Muggiaea
150-100	5 euphausiids, copepods, amphipods, chaetognaths, 6 shrimp
100-50	~75 euphausiids, copepods, amphipods, 7 shrimp, 3 myctophids
50-20	~500 euphausiids, copepods, chaetognaths, 2 myctophids
20-10	~100 euphausiids, ~1000 juvenile euphausiids, copepods, Limacina
10-0	~100 adult and ~500 juvenile euphausiids, ~1000 furcilia, copepods

NH45 06:02 h water depth=670m

350-300	copepods, chaetognaths, 4 myctophids
300-200	chaetognaths, copepods, amphipods, 2 shrimp
200-150	3 euphausiids, chaetognaths, amphipods, 2 myctophids, Limacina
150-100	10 euphausiids, copepods, 4 myctophids, ~40 Muggiaea, 2 Beroe
100-50	~25 adult and ~30 juvenile euphausiids, copepods, chaetognaths
50-20	~400 adult and ~300 juvenile euphausiids, copepods, Limacina
20-10	~400 euphausiids, copepods, ~6 Pleurobrachia, phytoplankton
10-0	~50 euphausiids, copepods, chaetognaths, Pleurobrachia

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, NH65.

Euphausiids were incubated for egg production at station NH15 and at NH35 for molting rates. Euphausiids were preserved for gut fluorescence measurements at NH15 and at NH45 for lipofuscin study.