MOSS LANDING MARINE LABORATORIES

Technical Publication 79-1

CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS
HYDROGRAPHIC DATA REPORT
MONTEREY BAY
JANUARY TO JUNE 1978

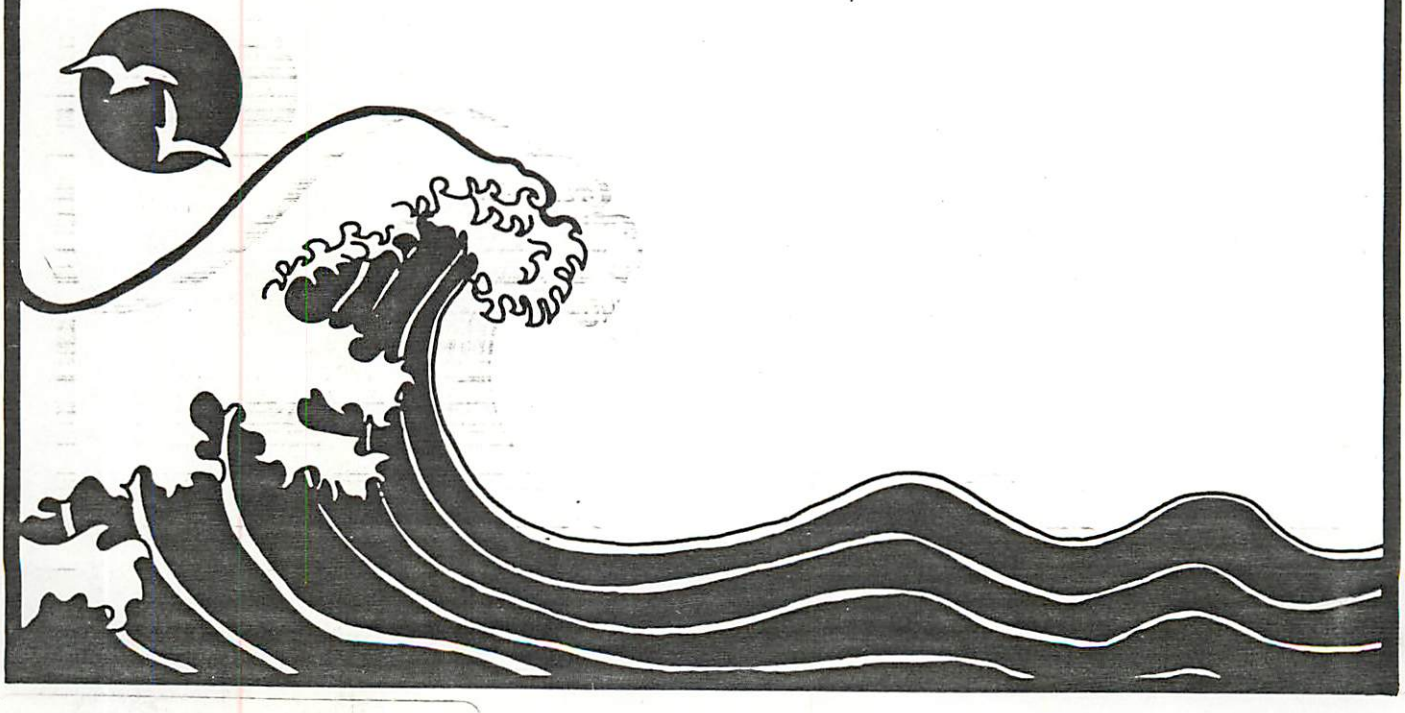
by

Susan J. Chinburg

1979

Supported by
STATE OF CALIFORNIA, MARINE RESEARCH COMMITTEE
CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS
via
UNIVERSITY OF CALIFORNIA SEA GRANT COLLEGE

MOSS LANDING MARINE LABORATORIES
California State University and Colleges
Fresno, Hayward, Sacramento, San Francisco, San Jose and Stanislaus



Contributions from Moss Landing Marine Laboratories No. 50
Technical Publication 79-1, CASUS-MLML-TP-79-1

CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

HYDROGRAPHIC DATA REPORT, MONTEREY BAY

January to June 1978

by
Susan J. Chinburg

1979

Supported by
State of California, Marine research Committee
California Cooperative Oceanic Fisheries Investigations

MOSS LANDING MARINE LABORATORIES
of the
California State University and Colleges

TABLE OF CONTENTS

	Page
Introduction.	1
Station Locations.	2
Explanation of Tables.	4
Methods.	6
References.	9
Cruise Data.	11

CALCOFI HYDROGRAPHIC DATA REPORT

MONTEREY BAY

January to June 1978

INTRODUCTION

The data contained in this report were obtained as a continuance of the nearly bi-weekly hydrographic observations initiated by personnel at Hopkins Marine Station over two decades ago. These observations have been supported through the years by the State of California Marine Research Committee, California Cooperative Oceanic Fisheries Investigations. Since July 1974, the hydrographic sampling program has been carried out by the investigators at Moss Landing Marine Laboratories. From July 1974 to June 1976, this work was done in conjunction with an interdisciplinary study of the squid, Loligo opalescens, supported by the National Office of Sea Grant via the University of California Sea Grant College Project Number R/F-15.

Five of the original CalCOFI stations (2201, 2202, 2203, 2204 and 2205) have been retained in our sampling routine and additional inner-bay stations have been added (1154 and 1121). Sampling was conducted monthly. All observations were made aboard R/V OCONOSTOTA.

STATION LOCATIONS

Number	Latitude N.	Longitude W.	Depth (m)
2201	36°37.6'	121°53.7'	46
2202	36°41.2'	121°57.9'	104
2203	36°46.7'	122°01.3'	988
2204	36°50.9'	122°01.6'	82
2205	36°55.8'	122°00.7'	26
1121	36°37.6'	121°51.1'	18
1154	36°55.2'	121°52.8'	16

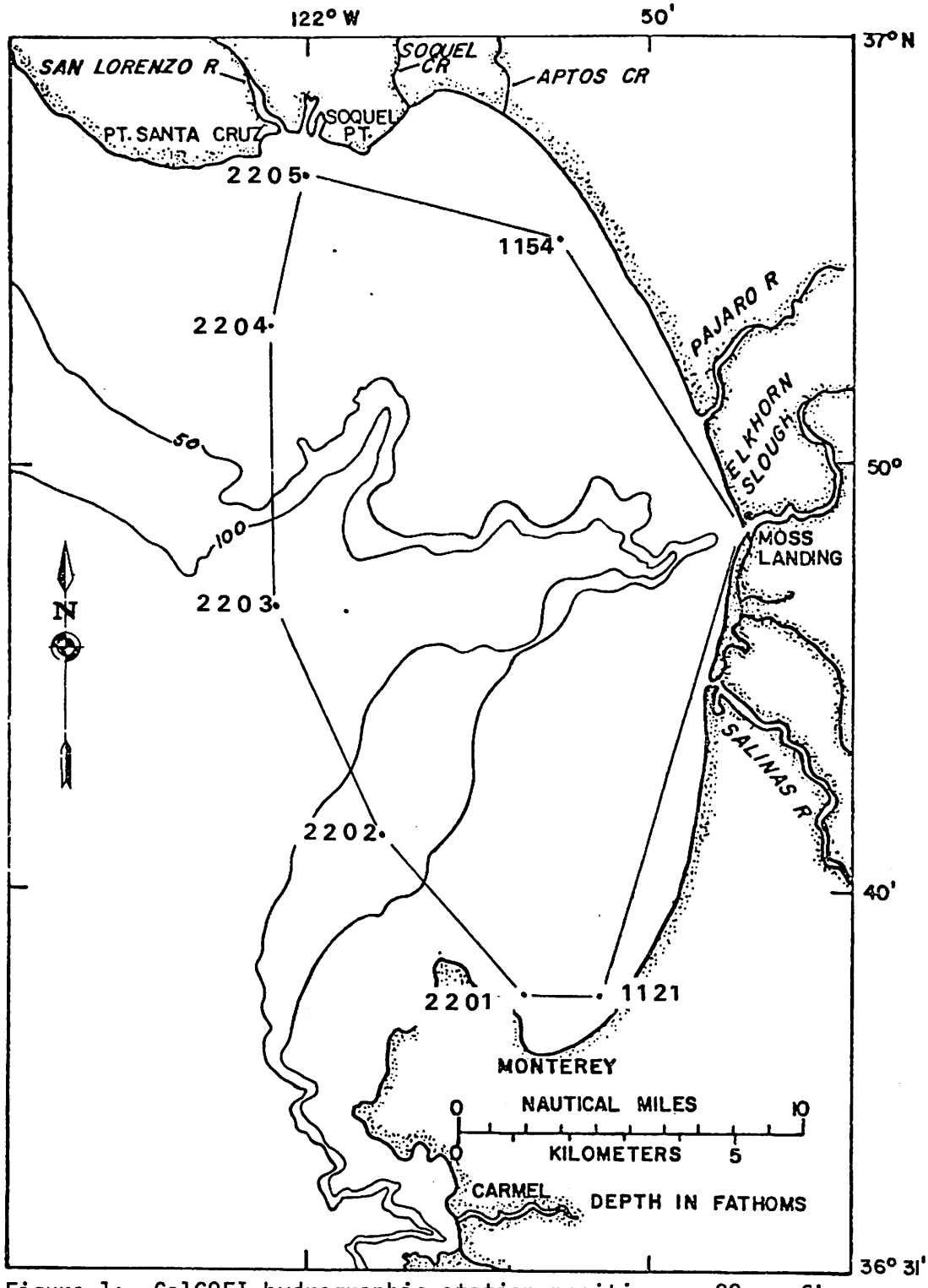


Figure 1: CalCOFI hydrographic station positions. 22 prefixes designate stations originated by Hopkins Marine Station; 11 prefixes designate stations originated by Moss Landing Marine Laboratories.

EXPLANATION OF TABLES

CRUISE	Moss Landing Marine Laboratories consecutive hydrographic cruise number
STATION	Permanent hydrographic station numbers. IIxx designates Moss Landing Marine Laboratories; 22xx CalCOFI numbers as originated by Hopkins Marine Station
DATE	Local date of sampling
HOUR	Local sampling time (Pacific Standard Time). Time of messenger release is given for one-cast stations; median time on-station is given for multi-cast stations. For two-cast stations, the time on-station was generally two hours.
N LATITUDE, W LONGITUDE	Observed station positions corresponding to sampling time given above. Drift while on-station was generally less than 0.5 miles. When greater drift was experienced, the ship was brought back to the station for subsequent casts.
TRANSP	Secchi disk depth, meters (not observed at night)
WAVES dir	Direction from which dominant waves were coming, in tens of degrees according to WMO Code 0885
ht	Height of dominant waves according to WMO Code 1555
p	Period of dominant waves according to WMO Code 3155
WIND dir	Direction from which wind was blowing, in tens of degrees according to WMO Code 0877
speed	Wind speed, in knots
BAROM	Pressure, in millibars
AIR TEMP °C	Air temperatures were obtained about 2 m above surface
dry	Dry-bulb air temperature, in degrees centigrade
wet	Wet-bulb air temperature, in degrees centigrade
WEATH	Present weather according to WMO Code 4677
CLOUDS typ	Cloud type according to WMO Code 0500
amt	Cloud amount in eights according to WMO Code 2700

VISIB	Sea-level visibility according to WMO Code 4300
DEPTH	Accepted depth in meters from which sample was obtained, determined from wire length, wire angle and thermometric depth calculations
TEMP	In situ water temperature, in degrees centigrade
SALINITY	Salinity in grams/kilogram (°/$_{oo}$ or ppt)
SIGMA T	Potential density anomaly computed from equations in Knudsen's Hydrographical Tables (1901)
OXYGEN	Dissolved oxygen concentration in mi(STP)/liter
AOU	Apparent oxygen utilization in µg-atoms O_2-O/liter: the difference between the observed oxygen concentration and the oxygen solubility computed from the in situ temperature and salinity using the equations of Truesdale, et al. (1955).
SAT	Percent of oxygen saturation computed from the in situ temperature and salinity using the equations of Truesdale, et al. (1955)
PHOSPHATE	Concentration of reactive phosphate in µg-atoms PO_4-P/liter
NITRATE	Concentration of dissolved nitrate in µg-atoms NO_3-N/liter
NITRITE	Concentration of dissolved nitrite in µg-atoms NO_2-N/liter
AMMONIA	Concentration of dissolved ammonia in µg-atoms NH_3-N/liter
SILICA	Concentration of reactive silica in µg-atoms SIO_2-Si/liter
*	Questionable data point. These values are suspect based upon preliminary analysis of the data and should be used with caution.

METHODS

Station Position

Station positions were determined using radar ranges with an accuracy of about ±0.2 n mile near shore and ± 0.5 n mile at Station 2203, and recently by Loran-C with an accuracy of ± 0.1 n mile.

Hydrographic Sampling

Eight 5-liter Niskin plastic sampling bottles were used to obtain discrete water samples at the standard sampling depths: 0, 5, 10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 500, 600 and 800 m. Accepted sampling depths were determined from wire angle for depths less than 100 m and from a combination of wire angle and thermometric depth calculations for depths greater than 100 m.

Temperature

The *in situ* temperature was determined from paired reversing thermometers. The average temperature is recorded when the thermometer agreed to within 0.05° C.

Salinity

Salinity was determined using a Beckman RS-7B precision induction salinometer. Analyses were made in the laboratory and salinity was computed from conductivity ratio using the equations of Cox, *et al*. (1967). Substandard sea water was used to calibrate the salinometer before and after each set of twenty-four or fewer samples. Standard water was used each month to standardize the sub-standard water.

Dissolved Oxygen

Water samples were treated aboard ship to fix the oxygen in the basic

form. The samples were acidified and titrated in the laboratory within thirty-six hours of the sampling time using Carpenter's (1965) modification of the Winkler method. The total sample is titrated with approximately 0.010 N sodium thiosulfate to the starch endpoint. Precision of the analyses is about ± 0.06 ml/liter (2 SD).

Nutrient Ions

At each station, 500 ml samples were filtered and quick-frozen aboard ship and refrigerated at -10° C until analyzed ashore within three weeks of collection. Groups of forty-three samples were quick-thawed in the laboratory just prior to the analyses for phosphate, nitrate, nitrite, ammonia and silica. Standards and reagent blanks were prepared fresh daily and were determined with each set of samples. The standard and blanks were read before and after each set of samples. A linear drift correction was added to each reading to correct for electronic and chemical drift over the 30-minute reading time using the PC-1000 and the 40-minute reading time using the DU-2 spectrophotometer.

Dissolved reactive phosphate was determined by the methods of Murphy and Riley (1962) described in Strickland and Parsons (1972). The method uses ascorbic acid to reduce the phospho-molybdate complex. The sample absorbance at 880 nm was determined with a 10 cm pathlength. The precision of the analyses was about ± 0.05 µg-at/l (2 SD).

The concentration of dissolved nitrate was determined by cadmium reduction of nitrate to nitrite (Wood, et al., 1967). This was followed by the measurement of nitrite as described below. The sample absorbance at 545 nm was determined with a 1 cm pathlength. The precision of the analyses was

about ± .5 ug-at/liter (2 SD).

Nitrite was determined by the method of Bendschneider and Robinson (1952) described by Strickland and Parsons (1972). The absorbance of the diazo color was determined with a 10 cm path length at 545 nm. The precision of this method is about ± 0.03 ug-at/liter (2 SD).

Ammonia was determined by the indophenol method of Solorzano (1969) with the color absorbance determined with a 10 cm path length at 650 nm. The precision of this method is about ± 0.1 ug-at/liter (2 SD).

Reactive silica was determined by the method of Mullin and Riley (1955) as modified by Strickland and Parsons (1972). The silicomolybdate complex was reduced by a metol-sulfite, oxalic acid solution. The precision of this method was about ±1 ug-at/liter (2 SD). The color absorbance at 810 nm was determined with a 1 cm path length.

The Brinkman PC-1000 with a changeable probe was routinely used to measure color development of the above-mentioned nutrients. A Beckman DU-2 spectrophotometer was used as a back-up system.

REFERENCES

Bendschneider, K. and R.J. Robinson. 1952. A new spectrophotometric determination of nitrite in sea water. J. Mar. Res. 24:446-449.

Carpenter, J.H. 1965. The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. Limnol. Oceanogr. 10:141-143.

Cox, R.A., F. Culkin and J.P. Riley. 1967. The electrical conductivity/chlorinity relationship in natural sea water. Deep-Sea Res. 14: 203-220.

Knudsen, M. 1901. Hydrographical tables. Tutein and Kock, Copenhagen, 63 pp.

Mullin, J.B. and J.P. Riley. 1955. The colorimetric determination of silicate with special reference to sea and natural waters. Anal. Chim. Acta 12:162-176.

Murphy, J. and J.P. Riley. 1962. A modified single solution method for the determination of phosphate in natural waters. Anal. Chim. Acta 27:31-36.

Solorzano, L. 1969. Determination of ammonia in natural waters by the phenolhypochlorite method. Limnol. Oceanogr. 14:799-801.

Strickland, J.D.H. and T.R. Parsons. 1972. A practical handbook of sea water analysis. Bull. 167. Fish. Res. Bd. Canada, 311 pp.

Truesdale, G.A., A.L. Downing and G.F. Lowden. 1955. Solubility of oxygen in pure water and sea water. J. Appl. Chem. 5:53-62.

Wood, E.D., F.A.J. Armstrong and F.A. Richards. 1967. Determination of nitrate in sea water by cadmium-copper reduction to nitrite. J. Mar. Biol. Assn. U.K. 47:23-31.

CRUISE DATA

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 63	1154	18 JAN 1978	8.5	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
1	23	4	3	21	2	1015.2	10.8	10.2	3	2	5	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.90	31.018	23.16	6.36	-51	110	1.47	13.2	.55	1.7	22
5	14.25	33.105	24.69	6.42	-67	113	.45	1.8	.86	.5	4
10	14.25	33.127	24.71	5.50	15	97	.43	1.6	.74	.4	3

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 63	2205	18 JAN 1978	10.1	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
2	22	3	4	21	3	1014.9	11.6	11.0	3	7	8	6

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN .ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.12	32.403	24.18	6.14	-39	108	1.01	6.5	.89	1.2	13
5	14.15	32.887	24.55	5.97	-25	105	.48	8.5	.73	.5	4
10	14.15	32.919	24.57	6.00	-28	106	.42	1.9	.60	.6	4
20	14.18	33.114	24.72	5.99	-28	106	.69	3.3	.78	2.1	7

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 63	2204	18 JAN 1978	11.2	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
3	27	4	5	21	3	1013.5	13.2	11.2	2	7	8	6

DEPTH	TEMP	SALINITY	SIGMA-T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.87	32.151	24.04	6.13	-34	107	.78	4.0	.55	1.4	14
5	14.02	33.064	24.71	6.25	-50	110	.47	2.9	.57	.3	5
10	14.04	33.112	24.74	5.99	-27	105	.53	2.3	.64	.6	5
20	14.01	33.132	24.76	5.98	-26	105	.52	2.6	.67	.4	5
30	14.02	33.153	24.78	5.95	-23	105	.48	2.3	.67	.3	6
54	14.05	33.174	24.79	5.91	-20	104	.60	2.4	1.00	.4	4

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 63	2203	18 JAN 1978	13.4	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
6	22	5	X	15	1	1012.2	14.9	12.8	2	7	8	6

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.17	32.825	24.50	6.13	-40	108	.53	1.7	.52	.0	6
5	14.19	33.039	24.66	6.08	-36	107	.53	8.1	.35	2.9*	11
10	14.24	33.126	24.71	5.96	-26	105	.46	3.3	.33	.0	6
20	14.26	33.145	24.72	5.93	-24	105	.59	3.8	.37	.0	5
30	14.27	33.073*		5.94	-25	105	.58	6.6	.39	.0	6
49	14.35*	33.146	24.70	5.86	-18	104	.46	2.4	.62	.0	3
74	14.18	33.162	24.75	5.87	-18	103	.50	3.7	.83	.0	6
97	13.93	33.171	24.81	5.80	-9	102	.43	2.0	1.05	.0	1
146	9.50	33.695	26.04	2.91	298	47	1.76	21.6	.02	1.4	29
192	9.61	33.750	26.06	2.92	296	47	1.57	17.8	.05	.4	24
240	8.76	33.842	26.27	2.70	326	43	2.09	28.5	.06	.8	38
287	7.88	33.953	26.49	1.98	401	31	1.95	21.3	.01	1.0	36
386	6.78	34.048	26.72	1.01	503	15	2.93	32.7	.05	.0	70
485	6.18	34.083	26.83	.74	536	11	3.12	41.1	.01	1.1	81
584	5.70	34.134	26.93	.59	556	9	3.11	42.3	.01	.4	87
782	4.83	34.237	27.11	.48	579	7	3.27	43.3	.03	.0	97

Ammonia appears anomalously high
Salinity appears anomalously low
Temperature appears anomalously high

* indicates questionable data

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
HL 63	2201	18 JAN 1978	16.1	36° 37.6'	121° 53.7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
4	21	3	X	14	2	1009.8	13.1	13.1	62	7	8	6

DEPTH	TEMP	SALINITY	SIGMA-T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.47	32.784	24.40	6.25	-52	110	.51	2.5	.32	.5	6
5	14.59	32.889	24.46	6.18	-49	110	.50	1.8	.31	.4	4
10	14.55	32.908	24.48	6.12	-43	109	.55	2.3	.36	.5	7
20	14.57	32.931	24.49	6.14	-45	109	.53	3.4	.38	.6	6
30	14.54	32.951	24.51	6.08	-39	108	.51	1.9	.35	.5	2

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	1154	2 FEB 1978	8.3	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
2	21	1	2	11	0	1020.7	10.2	8.6	0	0	2	7

DEPTH	TEMP	SALINITY	SIGMA-T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.68	33.106	24.81	6.22	-44	109	.50	7.5	1.17	.8	10
5	13.63	33.210	24.90	5.72	1	100	.52	6.6	.78	.5	10
10	13.49	33.348	25.04	5.27	45	91	.81	5.9	.85	.6	11

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	2205	2 FEB 1978	9.4	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
3	18	1	2	11	1	1021.3	12.1	10.5	0	0	2	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.70	33.052	24.77	6.12	-35	107	.34	.7	.51	.6	6
5	13.69	33.048	24.77	6.14	-36	107	.30	.9	.07	.2	5
10	13.69	33.054	24.77	6.39	-59	111	.40	1.0	.14	.5	6
20	13.46	33.295	25.00	5.57	16	97	.72	5.7	.65	.4	14

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	2204	2 FEB 1978	10.6	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
11	30	2	2	11	1	1022.0	12.1	10.4	3	0	2	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.04	33.217	24.82	6.30	-55	111	.26	1.4	.04	.4	3
5	14.01	33.214	24.83	6.44	-67	113	.32		.07	.1	4
10	14.00	33.207	24.82	6.22	-47	109	.26	1.3	.05	.4	4
20	14.01	33.230	24.84	6.23	-48	110	.36	.8	.09	.0	3
30	14.01	33.280	25.88	6.16	-42	108	.38	2.4	.22	.4	5
50	12.74	33.506	25.31	4.80	22	82	1.01	.7*	.34	.3	12

* indicates questionable data Nitrate apperas anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	2203	2 FEB 1978	12.6	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
10	29	2	3	11	2	1021.0	12.8	11.2	2	0	3	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.14	33.216	24.80	6.22	-49	110	.38	2.2	.13	.0	7
5	14.00	33.213	24.83				.46	5.3	.16	.1	6
10	13.99	33.263	24.87	6.41	-64	113	.33		.14	.0	4
20	13.97	33.267	24.88	6.42	-65	113	.38		.20	.0	3
30	13.95	33.357	24.95	5.76	-6	101	.50	5.9	.39	.0	4
56	12.54	33.553	25.38	4.83	91	83	.92	16.3	.05	.0	14
84	11.21	33.637	25.70	4.37	147	73	1.22	21.0	.03	.0	13
110	10.80	33.704	25.82	4.16	171	69	1.39	21.7	.03	3.0*	19
152	9.88	33.845	26.09	3.11	275	50	1.80			.1	22
206	9.34	33.976	26.28	2.74	314	44	1.66	25.6	.03	.5	34
259	8.39	34.063	26.50	2.41	356	38	2.29	23.2	.03	.1	37
310	7.58	34.106	26.66	2.19	386	34	2.56	25.9	.19	.2	42
411	6.75	34.171	26.82	1.31	476	20	2.91	36.1	.02	.1	56
513	6.23	34.209	26.92	.95	516	14	3.07	37.6	.17	.1	64
614	5.69	34.264	27.03	.69	547	10	2.90	45.5	.03	.0	117
817	4.79	34.355	27.21	.56	572	8	3.06	51.1	.03	.7	128

* indicates questionable data

Ammonia appears anomalously high

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	2202	2 FEB 1978	14.4	36° 41.2'	121° 57.9'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
11	28	2	3	36	1	1019.3	14.5	12.8	3	1	6	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.21	33.387	24.92	6.24	-52	110	.33	3.6	.05	.0	3
5	14.12	33.391	24.94	6.23	-50	110	.37	2.7	.08	1.1	5
10	14.08	33.398	24.95	6.21	-48	109	.36	2.7	.09	.0	4
20	14.06	33.394	24.96	6.44	-68	113	.39	1.3	.09	.1	4
30	13.05*	33.444	25.18	5.42	32	94	.65	5.3	.14	.1	4
50	12.49	33.554	25.39	4.90	86	84	.96	13.5	.99	.0	10

* indicates questionable data

Paired thermometer read 13.14

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	2201	2 FEB 1978	15.3	36° 37.6'	121° 53.7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
	31	2	3	31	2	1020.0	15.8	13.0	2	0	6	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.16	33.321	24.88	6.51	-75	115	.63	3.6	.76	1.2	7
5	13.69	33.360	25.01	6.24	-46	109	.55	5.5	.46	1.3	6
10	13.73	33.409	25.04	6.05	-30	106	.43	7.4	.30	.7	2
20	13.46	33.460	25.13	5.47	25	95	.52	6.2	.46	.2	7
30	13.32	33.471	25.17	5.24	47	91	.75	6.2	.32	1.3	20

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 64	1121	2 FEB 1978	15.8	36° 37.7'	121° 51.1'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
	31	1	3	32	1	1019.3	16.0	13.3	2	0	6	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.06	33.305	24.89	6.63	-85	117	.45	4.4	.63	1.2	6
5	13.87	33.305	24.92	6.53	-74	115	.53	2.0	.64	.7	8
10	13.74	33.325	24.97	6.19	-42	108	.66	5.5	.66	.7	6

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	1154	16 MAR 1978	8.2	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
2	0	1	X	9	1	1021.0	16.7	14.3	0	X	0	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA-T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.77*	31.794	23.78	6.26	-43	108	.77	8.0	.47	.4	24
5	13.70	31.827	23.82	6.74	-86	117	.79	6.9	.30	.5	23
10	13.74	32.151	24.07	6.28	-46	109	.58	9.6	.44	.5	14

* indicates questionable data

Paired thermometer read 13.69

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	2205	16 MAR 1978	9.8	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
3	0	1	X	10	1	1021.0	17.2	14.9	0	X	0	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.98	32.174	24.03	6.42	-61	112	.53	6.4	.44	.8	13
5	13.53	32.464	24.35	6.08	-27	105	.71	2.8	.30	.3	15
10	13.12	32.844	24.72	5.91	-9	102	.61	3.4	.40	.3	9
20	12.96	32.941	24.83	5.74	8	99	.73	5.0	.51	.4	15

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	2204	16 MAR 1978	11.4	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
5	0	0	X	9	2	1020.7	19.3	15.6	0	X	0	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA-T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.39*	32.782	24.62	6.21	-38	107	.63	3.8	.17	.2	12
5	13.30	32.794	24.65	6.39	-54	110	.60	2.3	.14	.3	10
10	13.01	32.829	24.73	6.18	-32	106	.68	4.2	.38	.4	13
20	12.53	32.964	24.93	5.83	4	99	.77	4.8	.22	.6	13
30	11.75	33.017	25.12	5.67	27	95	.68	5.6	.30	.1	7
50	10.73	33.320	25.55	4.75	120	78	1.23	12.9	.29	.3	20

* indicates questionable data

Paired thermometer read 13.32

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	2203	16 MAR 1978	14.2	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS	
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt
6	0	1	X	4	1	1018.6	20.8	15.8	2	X	0

VISIB: 7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.47	32.559	24.46	6.08	-27	105	.69	4.8	.19	.3	12
5	13.12	32.576	24.52	6.15	-29	106	.55	10.4*	.23	.2	7
10	13.05	32.696	24.62	6.14	-28	105	1.26*	7.0	.33	.5	10
20	12.34	32.884	24.91	5.71	17	97	.81	14.7*	.36	.3	13
30	11.53	33.075	25.20	5.39	55	90	1.04	9.4	.33	.0	16
50	10.65	33.224	25.48	4.91	107	80	1.27	13.3	.05	.1	17
75	9.90	33.583	25.88	3.84	211	62	1.51	18.2	.05	.0	19
100	9.37	33.798	26.14	3.19	274	51	1.85	24.8	.02	.0	32
143	8.82	33.982	26.37	2.55	338	40	2.06	25.7	.01		42
191	8.60	34.037	26.45	2.38	356	37	2.17	28.0	.00	.1	51
233	7.84	34.082	26.60	2.08	393	32	2.31	29.4	.00	.2	
284	7.44	34.096	26.67	1.80	423	28		35.9*		.2	
380	6.79	34.147	26.80	1.25	481	19	2.63	29.5	.00	.0	58
476	6.23	34.147	26.87	.87	523	13	2.85	33.7	.01	.1	78
574	5.71	34.193	26.97	.69	547	10	3.03	35.9	.00	.1	91
770	4.91	34.327	24.17	.47	578	7	3.04	35.9	.06	.2	71

* indicates questionable data

Phosphate appears anomalously high
Nitrate appears anomalously high

* indicates questionable data

Phosphate appears anomalously high
Nitrate appears anomalously high

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
IL 65	2202	16 MAR 1978	15.6	36° 41.2'	121° 57.9'

TRANSP m	WAVES dir	WAVES ht	WAVES p	WIND dir	WIND speed	BAROM mb	AIR TEMP °C dry	AIR TEMP °C wet	WEATH	CLOUDS typ	CLOUDS amt	VISIB
3	0	X	X	26	1	1016.6	18.9	16.6	2	X	0	8

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE ug-atoms/liter	NITRATE ug-atoms/liter	NITRITE ug-atoms/liter	AMMONIA ug-atoms/liter	SILICA ug-atoms/liter
0	14.61	32.120	23.86	6.35	-61	112	.56	5.3	.17	.1	14
5	13.31*	32.607	24.50	6.42	-56	111	.73	2.2*	.15	.2	10
10	12.67	32.815	24.79	6.02	-14	103	.79	7.6	.49	.3	13
20	11.67	32.935	25.07	5.55	39	93	.84	8.6	.35	.1	10
30	10.93	33.079	25.32	5.38	62	88	.99	10.2	.05	.0	13
50	10.26	33.312	25.61	4.79	122	78	1.35	14.7	.01	.0	19

* indicates questionable data

Paired thermometer read 13.39
Nitrate appears anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	2201	16 MAR 1978	16.8	36° 37.6'	121° 51.1'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
4	0	X	X	28	1	1016.6	22.9	15.8	2	X	0	8

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.24*	33.535	25.03	5.87	-20	104	.75	3.5	.42	.5	14
5	12.56	33.173	25,09	5.18	61	88	.84	6.8	.45	.2	12
10	12.15	33.258	25.23	5.09	74	86	.91	9.3	.29	.0	15
20	11.28	33.376	25.48	4.49	137	75	1.23	13.7	.05	.2	21
30	10.68	33.478	25.67	4.12	176	68	.95*	13.1	.06	.1	11

* indicates questionable data

Paired thermometer read 14.33
Phosphate appears anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 65	1121	16 MAR 1978	17.2	36° 37.7'	121° 51.1'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
3	0	X	X	30	1	1021.0	16.7	14.3	2	X	0	.8

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	14.29	32.426	24.16	6.01	-29	106	.73	3.0	.02	.8	12
5	12.85*	32.994	24.89	5.26	52	90	.67	4.7	.05	.6	0
10		33.192		5.13			.64	4.6	.06	.2	7

* indicates questionable data

Paired thermometer read 12.93

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	1154	13 APR 1978	15.1	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
6	27	1	2	29	1	1013.2	18.3	15.0	1	7	4	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.54	32.391	24.08	7.05	-124	125		.7		.2	1
5	14.44	32.401	24.11	7.12	-129	126	.06	.6		.4	1
10	12.64	32.838	24.81	5.83	3	99	.54	4.8		.4	7

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	2205	13 APR 1978	14.1	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
3	24	2	3	26	2	1013.9	16.8	14.3	0	7	7	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.07	32.368	24.16	9.31	-321	163	.46	1.2	.29	.1	3
5	13.93*	32.302	24.14	9.22	-311	161	.17	1.0	.00*	.2	3
10	12.73	32.815	24.78	7.22	-122	123	.66	5.3	.20	1.8	9
20	12.28**	32.963	24.98	6.39	-43	108	1.01	12.5	.57	2.3	11

* indicates questionable data

* Paired thermometer read 14.08
** Paired thermometer read 12.35

Nitrite appears anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	2204	13 APR 1978	13.2	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
12	21	3	5	31	2	1013.9	15.7	13.4	2	7	7	7

DEPTH	TEMP	SALINITY	SIGMA·T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.14	32.687	24.40	9.48	-338	166	.29	.9	.29	.1	2
5	14.09	32.687	24.41	9.54	-343	167	.11	1.2	.02*	.1	2
10	14.07	32.691	24.41	9.56	-344	168	.11	5.7	.25	.1	1
20	12.63	32.949	24.90	8.41	-227	143	.85	7.0	.24	.9	7
30	11.36	33.175	25.31	7.34	-118	122	.99	11.7	.30	.3	12
50	10.30	33.406	25.68	6.06	8	99	1.38	17.8	.15	.6	19

* indicates questionable data Nitrite appears anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	2203	13 APR 1978	11.5	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
12	20	3	X	21	2	1013.9	15.0	12.6	2	7	7	7

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.50	32.602	24.46	9.28	-313	161	.34	1.4	.00	.3	4
5	13.46	32.639	24.50	9.28	-313	161	.29	14.2	.19*	.2	3
10	13.44	32.640	24.50	9.27	-312	160	.48	17.2	.01	.0	4
20	13.26	32.811	24.67	9.21	-305	159	.38	9.3	.05	.0	5
30	11.54	33.170	25.28	7.28	-115	121	1.17	11.0	.29*	.0	12
50	10.31	33.342	25.63	6.47	-28	105	1.43	18.5	.29*	.6	17
76	9.05	33.478	25.94	6.17	14	98	1.48	27.6	.04	.0	21
102	9.14	33.738	26.13	4.81	133	76	1.76	30.0	.06	.0	30
146	8.90	33.846	26.25	4.15	195	66	2.08	25.9	.09	1.9	27
191	8.40	34.024	26.47	3.26	280	51	2.58	34.5	.06	2.6	36
234	7.85*	34.061	26.58	2.83	326	44	2.17	37.4	.02	2.2	35
281	7.53	34.078	26.64	2.62	349	40	2.48	43.5	.00	.4	45
380	6.70	34.147	26.81	1.80	433	27	2.92	38.7*	.01	.1	56
478	6.16	34.190	26.91	1.44	475	21	3.14	56.7	.01	.6	65
577	5.45	34.257	27.06	.87	534	13	3.32	60.5	.02	.6	70
775	4.79	34.337	27.20	.65	564	9	3.23	57.2	.04	.7	82

* indicates questionable data

Paired thermometer read 7.92
Nitrite appears anomalously high
Nitrate appears anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	2202	13 APR 1978	9.5	36° 41.2'	121° 57.9'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
13	33	2	3	22	2	1013.2	14.2	12.3	2	7	7	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.38	32.500	24.41	9.12	-297	157	.46	.5	.21	.2	4
5	13.36	32.499	24.41	9.22	-306	159	.43	.3	.01	.1	2
10	13.31	32.567	24.47	9.25	-308	160	.64	.1	.02	.2	3
20	12.59	32.793	24.79	8.85	-265	151	.56	2.1	.07	.4	4
30	11.64	33.085	25.19	7.31	-118	122	.99	12.4	.20	.2	11
50	10.21	33.329	25.63	6.32	-14	102	1.53	22.3	.22	1.3	17

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	2201	13 APR 1978	8.4	36° 37.6'	121° 53.7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
15	31	1	3	11	0	1013.2	14.3	12.2	2	7	7	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.88	32.608	24.39	10.27	-405	179	.49	3.4	.01	.2	1
5	13.67	32.603	24.43	9.39	-325	163	.46	.4	.17	.2	1
10	13.58	32.684	24.51	9.24	-311	160	.36	.4	.01	.1	1
20	13.03	32.818	24.72	8.79	-256	151	.57	1.5	.06	.1	2
30	11.52	33.130	25.25	7.22	-109	120	1.28	9.3	.48	.4	11

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 66	1121	13 APR 1978	7.7	36° 37.7'	121° 51.1'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
11	31	1	3	15	1	1013.2	14.7	12.3	0	7	7	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.64	32.564	24.20	9.28	-325	164	.31	2.8	.19	.3	1
5	14.58	32.574	24.22	9.06	-305	160	.68	5.9	.00*	.3	1
10	13.59	32.725	24.54	9.29	-315	161	.41	.5*	.13	.1	1

* indicates questionable data

Nitrate apperas anomalously low
Nitrite apperas anomalously low

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 67	1154	4 MAY 1978	9.3	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
4	25	2	2	0	0	1010.8	12.3	11.5	44	7	6	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.53	32.879	24.67	9.30	-66	113	.34	1.7	.31		6
5	12.87	32.926	24.84	8.71	-23	104	.47	4.0	.13		7
10	10.33	33.468	25.72	5.95	17	97	1.39	17.4	.42		20

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 67	2205	4 MAY 1978	10.7	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
4	25	2	3	0	0	1012.5	13.3	11.6	3	7	7	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.45	32.832	24.65	7.17	-125	124	.27	.6	.26		3
5	13.17	32.923	24.77	7.23	-128	125	.17	.0	.08		1
10	10.62	33.322	25.56	4.51	143	74	1.01	11.4	.46		16
20	10.27	33.423	25.70	3.99	193	65	1.98	15.2	.65		18

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 67	2204	4 MAY 1978	11.8	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
6	11	5	3	11	0	1012.5	11.9	11.0	2	7	7	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	10.98	33.333	25.50	5.91	14	97	.74	5.4	.18		8
5	10.88	33.346	25.53	5.79	25	95	.74	8.3	.42	2.0	12
10	10.31	33.476	25.73	4.86	115	79	1.07	11.4	.24	.7	16
20	9.18	33.658	26.06				1.72	23.5	.13	.3	24
30	8.91	33.751	26.18	3.32	269	52	1.82	27.1	.14	3.4	25
50	8.79	33.831	26.26	2.97	301	47	1.82	22.4	.20	.0	28

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 67	2203	4 MAY 1978	13.1	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
7	29	6	3	32	4	1012.5	14.6	11.7	3	7	6	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	10.81	33.427	25.61	4.86	109	80	1.07	12.5	.36	.7	17
5	10.78	33.427	25.61	5.28	72	87	1.10	15.9	.21	.8	27
10	10.73	33.429	25.62	5.30	71	87	1.08	21.4	.20	.0	20
20	9.56	33.553	25.87	3.93	203	63	1.50	20.8	.16	.6	21
30	9.36	33.630	26.01	3.86	215	62					
50	8.79	33.824	26.25	2.35	357	37					
77	8.56	33.908	26.35	2.73	326	43	2.09	24.1	.30	.6	30
103	8.32	33.941	26.42	2.59	341	40	2.00	27.1	.07	.4	30
143	8.05	34.033	26.52	2.45	357	38	2.14	26.3	.14	.5	36
193	7.93	34.061	26.57	2.19	382	34	2.35	31.8	.11	.1	39
241	7.57	34.085	26.64	1.67	433	26	2.44	40.0*	.09	.9	43
289	7.29	34.135	26.72	1.49	465	22	2.57	29.6	.25	.7	48
385	6.47	34.150	26.84	1.11	498	17	2.73	32.2	.04	.3	58
479	5.58	34.249	27.02	.62	555	9	2.99	38.7	.08	.0	69
572	5.15	34.279	27.11	.53	569	8	2.80	43.4*	.09	.5	64
767	4.44	34.369	27.26	.47	585	7	2.95	30.7	.10	.0	71

* indicates questionable data Nitrate appears anomalously high

* indicates questionable data Nitrate appears anomalously high

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 67	2201	4 MAY 1978	15.8	36° 37.6'	121° 53.7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
5	33	5	3	27	2	1012.5	12.7	10.5	2	7	6	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	11.40	33.267	25.38	5.88	12	98	.79	13.1	.27	3.3	10
5	9.62	33.544	25.90	3.62	234	58	1.60	18.5	.37	2.6	21
10	9.19	33.684	26.08	3.09	286	49	1.91	21.0	.30	.8	26
20	8.93	33.811	26.22	2.89	307	46	1.92	26.0	.19	.6	29
30	8.82	33.841	26.26	2.66	329	42	2.46	32.2	.25	.6	29

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	1154	5 JUN 1978	17.4	36° 55.2'	121° 52.8'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
7	26	1	X	15	2	1011.9	13.8	13.1	2	7	1	7

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	14.38	33.735	25.15	7.71	-186	137	.25	.7	.00	.2	4
5	12.44	33.735	25.54	8.69	-253	148	.26	4.8	.00	.2	7
10	11.60	33.744	25.71	8.56	-232	144	.40	4.6	.00	.4	6

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	2205	5 JUN 1978	16.5	36° 55.8'	122° .7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
10	26	1	X	15	2	1011.9	13.8	13.1	1	7	1	6

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	13.97	33.736	25.24	11.22	-495	198	.22	1.4	.04	.2	6
5	12.31*	33.736	25.57	11.32	-486	193	.45	1.2	.08	.4	7
10	10.42	33.773	25.94	8.79	-239	144	1.21	13.9	.15	.5	16
20	10.06	33.790	26.02	6.43	-23	104	1.75	14.3	.24	2.2	19

* indicates questionable data

Paired thermometer read 12.22

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	2204	5 JUN 1978	15.4	36° 50.9'	122° 1.6'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
8	32	3	2	31	3	1012.5	13.6	12.4	1	7	2	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	11.98	33.717	25.62	6.65	-66	112	.35	9.9	.13	.7	13
5	10.86*	33.702	25.81	6.38	-28	105	.99	11.4	.15	.9	10
10	10.52	33.689	25.86	5.58	47	91	1.38	13.8	.20	1.3	11
20	9.75	33.681	25.99	4.79	127	77	1.53	14.9	.21	1.9	14
30	9.31	33.696	26.07	4.04	200	64	1.75	19.3	.23	1.6	25
44	8.89	33.880	26.28	2.85	311	45	2.06	23.1	.25	1.4	33

* indicates questionable data

Paired thermometer read 10.53

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	2203	5 JUN 1978	14.1	36° 46.7'	122° 1.3'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
6	33	2	2	31	2	1013.2	12.5	11.7	2	7	7	6

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	11.83	33.612	25.56	7.62	-150	128	.31	2.2	.08	1.8	2
5	11.69	33.622	25.60	7.17	-108	120	.44	9.3	.10	.6	1
10	11.52	33.622	25.63	7.30	-118	122	.37	5.7	.06	.4	1
20	9.69	33.591	25.93	4.68	138	75	1.61	15.3	.21		16
30	9.52*	33.626	25.98	4.36	162	70	1.89	13.5	.23	2.6	19
47	8.80	33.730	26.18	3.37	269	53	1.39	23.0	.07	.1	25
71	8.67	33.918	26.34	3.03	297	48	2.05	25.3	.14	.1	29
95	8.62	34.010	26.42	2.67	330	42	2.24	25.4	.17	1.3	33
143	8.41	34.033	26.47				2.32	27.1	.00	.4	34
189	8.29	34.058	26.51	2.35	362	37	2.35	27.5	.00	.3	35
235	7.73	34.117	26.64	1.58	439	24	2.62	30.6	.13		47
282	7.14	34.168	26.77	1.13	487	17	2.79	32.0	.09	.0	50
379	6.55	34.201	26.87	.87	518	13	3.03	33.9	.06	.1	61
477	5.73	34.249	27.02	.55	559	8	3.33	38.1	.03	.0	61
574	5.00	34.312	27.15	.54	576	8	3.04	34.0	.04		70
768	4.36	34.385	27.28	.51	583	7	3.41	38.9	.04	.2	93

* indicates questionable data

Paired thermometer read 9.59

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	2202	5 JUN 1978	11.7	36° 41.2'	121° 57.9'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
7	32	2	3	32	2	1013.2	13.8	12.3	2	7	7	6

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	11.77	33.656	25.61	7.80	-166	131	.35	2.0	.03	.3	1
5	11.72	33.641	25.61	7.45	-134	125	.43	2.7	.00	.2	3
10	10.32	33.551	25.79	5.15	89	84	1.33	18.5	.00	2.3	10
20	9.78	33.563	25.89	4.59	145	74	1.63	11.2	.00	5.0	14
30	9.53	33.617	25.97	3.74	224	60	1.79	18.7	.00	2.5	18
50	9.28	33.751	26.12	3.74	227	60	1.98	21.7	.01	1.8	22

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	2201	5 JUN 1978	10.5	36° 37.6'	121° 53.7'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
8	32	1	X	30	1	1014.2	12.5	11.9	2	7	8	3

DEPTH m	TEMP °C	SALINITY ppt	SIGMA T	OXYGEN ml/l	AOU ug-at/l	SAT %	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
							ug-atoms/liter				
0	12.61	33.624	25.43	7.75	-170	133	.45	.6	.04	.4	3
5	12.59	33.674	25.47	7.76	-171	133	.29	.2	.04	.3	3
10	11.28	33.682	25.72	7.13	-100	119	.57	4.1	.17	.6	3
20	10.29	33.706	25.91	5.99	13	98	1.32	12.0	.24	1.4	11
30	10.13	33.789	26.00	5.34	73	87	1.49	14.4	.23	1.5	14

CRUISE	STATION	DATE	HOUR	N LATITUDE	W LONGITUDE
ML 68	1121	5 JUN 1978	10.0	36° 37.7'	121° 51.1'

TRANSP	WAVES			WIND		BAROM	AIR TEMP °C		WEATH	CLOUDS		VISIB
m	dir	ht	p	dir	speed	mb	dry	wet		typ	amt	
8	32	0	2	31	1	1014.2	13.1	12.2	0	7	8	3

DEPTH	TEMP	SALINITY	SIGMA T	OXYGEN	AOU	SAT	PHOSPHATE	NITRATE	NITRITE	AMMONIA	SILICA
m	°C	ppt		ml/l	ug-at/l	%	ug-atoms/liter				
0	13.60	33.612	25.22	7.38	-148	129	.28	4.8	.03	.7	2
5	13.28	33.637	25.30	8.31	-228	144	.17	5.6	.07	.2	1
10	12.51	33.660	25.47	7.18	-119	123	.24	3.6	.06	.4	1