NBP-89-24

SPRAY Cruise Dissolved Oxygen and

Chlorophyll (HYDROX) 95 pp

Doering, Oviatt, & Pilson (URI)

Narragansett Bay Estuary Program

Current Report

The Narragansett Bay Project

SPRAY Cruise Dissolved Oxygen and Chlorophyll

P.H. Doering, M.E.Q. Pilson and C.A. Oviatt

Marine Ecosystems Research Laboratory
University of Rhode Island
Graduate School of Oceanography
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Narragansett, RI 02882-1197

July 1988

Revised November 1988

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The Narragansett Bay Project is sponsored by
the U.S. Environmental Protection Agency and
the R.I. Department of Environmental Management

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FOREWORD

The United States Congress created the National Estuary Program in 1984, citing its concern for the "health and ecological integrity" of the nation's estuaries and estuarine resources. Narragansett Bay was selected for inclusion in the National Estuary Program in 1984 and designated an "estuary of national significance" in 1988. The Narragansett Bay Project (NBP) was established in 1985. Under the joint sponsorship of the U.S. Environmental Protection Agency and the Rhode Island Department of Environmental Management, the NBP's mandate is to direct a five-year program of research and planning focussed on managing Narragansett Bay and its resources for future generations. The NBP will develop a comprehensive management plan by December, 1990, which will recommend actions to improve and protect the Bay and its natural resources.

The NBP has established the following seven priority issues for Narragansett Bay:

* management of fisheries
* nutrients and potential for eutrophication
* impacts of toxic contaminants
* health and abundance of living resources
* health risk to consumers of contaminated seafood
* land-based impacts on water quality
* recreational uses

The NBP is taking an ecosystem/watershed approach to address these problems and has funded research that will help to improve our understanding of various aspects of these priority problems. The Project is also working to expand and coordinate existing programs among state agencies, governmental institutions, and academic researchers in order to apply research findings to the practical needs of managing the Bay and improving the environmental quality of its watershed.

This report represents the technical results of an investigation performed for the Narragansett Bay Project. The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement #CX812680 to the Rhode Island Department of Environmental Management. It has been subject to the Agency's and the Narragansett Bay Project's peer and administrative review and has been accepted for publication as a technical report by the Management Committee of the Narragansett Bay Project. The results and conclusions contained herein are those of the author(s), and do not necessarily represent the views or recommendations of the NBP. Final recommendations for management actions will be based upon the results of this and other investigations.

Executive Summary

The primary goal of the SPRAY Cruises was to determine if the concentrations of inorganic plant nutrients and selected trace metals observed in the Providence and Seekonk Rivers were a function of inputs from rivers and sewage treatment plants. Coincidentally, dissolved oxygen and chlorophyll a were also measured in the Providence and Seekonk Rivers. Inputs were not monitored for these parameters. Biological and physical processes such as production, respiration, diffusion, sinking, and grazing which may affect either or both of these variables were likewise not measured. Thus, the data allow some description of oxygen and chlorophyll in the Providence and Seekonk Rivers, but do not permit an adequate assessment of causative factors.

The six Spray Cruises occupied ten stations at both high and low tide. Dissolved oxygen and chlorophyll a were measured on samples taken from within one meter of the surface and one meter of the bottom.

Oxygen concentration varied spatially and temporally. Surface waters were always more oxygenated than bottom waters. On average this difference amounted to 2.0 mg O_2/l. Tidal differences averaged 0.2 mg O_2/l and were not statistically significant. Highest concentrations were recorded at Station 1 in the Seekonk River, located just below the dam on the Blackstone River. Lowest concentrations occurred at Station 4 (surface) at

the head of the Providence River and Station 5 (bottom) off Field's Point. Concentrations steadily increased from Stations 4 and 5 to Station 10 in upper Narragansett Bay.

Multiple regression analysis indicated that oxygen concentration in surface water may be a function of solubility, biological production and respiration. Respiration appeared to be a major controlling process in bottom waters.

Seasonally, oxygen concentrations were highest in Dec., Mar., and April and lower in Oct., June and August. Lowest concentrations occurred in June and August when bottom waters averaged between 3 and 4 mg O_2/1. Warm summer temperatures and low fresh water discharge into the system coincided with these low oxygen conditions in bottom waters. Both appeared to be necessary for development of these conditions.

The distribution of chlorophyll a showed few consistent patterns. Comparatively low concentrations observed in Oct., Dec., and Mar., contrasted with higher concentrations in April, June and August suggests a seasonal pattern, but the data are too infrequent to make conclusions. Some differences in vertical distribution may be related to the rate of freshwater input to the system. Again, however, the data are not adequate to make a firm judgement.

With regard to future research in the Providence and Seekonk Rivers, the following is offered. Both temporal and spatial variability in oxygen (as well as chlorophyll) were only coarsely defined by the SPRAY Cruises.

A higher sampling frequency over more refined vertical, longitudinal, and horizontal spatial scales could answer several questions. For example, how long do low oxygen conditions persist in the summer? What is the areal extent? What volume of water is affected? Finally, low oxygen conditions may result from eutrophication due to nutrient loading and from the respiratory demands of organic matter loading. The Providence and Seekonk Rivers are subject to both. Which is more important to control? How much might conditions improve if only one kind of loading were reduced?

Introduction

In this report we summarize the results of a year long investigation of water quality in the Providence and Seekonk Rivers, together with a one-time synoptic survey of Narragansett Bay. The report focuses on dissolved oxygen and chlorophyll a. The purpose of the Spray Cruises in the Providence and Seekonk Rivers was to measure the concentration of oxygen and chlorophyll seasonally, in surface and bottom waters and to contrast concentrations at high and low tide. The purpose of the synoptic survey of Narragansett Bay was to measure oxygen in the Bay at a time when low concentrations were to be expected.

Methods

A total of 10 stations in the Seekonk and Providence Rivers were occupied at both high and low tide during the six SPRAY Cruises (Table 1, Fig. 1). Water samples were taken from within 1.0 m of the surface and 1.0 m of the bottom with a Kemmerer Water Sampler. Dissolved oxygen was determined (n=3) by the Winkler titration after Carritt and Carpenter (1966). All samples were analyzed within 24 hours of collection.

Table 1. Schedule of Cruises

Cruises	Date
SPRAY I	October 11, 1986
II	December 15, 1986
III	March 11, 1987
IV	April 22, 1987
V	June 27, 1987
VI	August 12, 1987
Hydrox Cruise	August 19-20, 1987

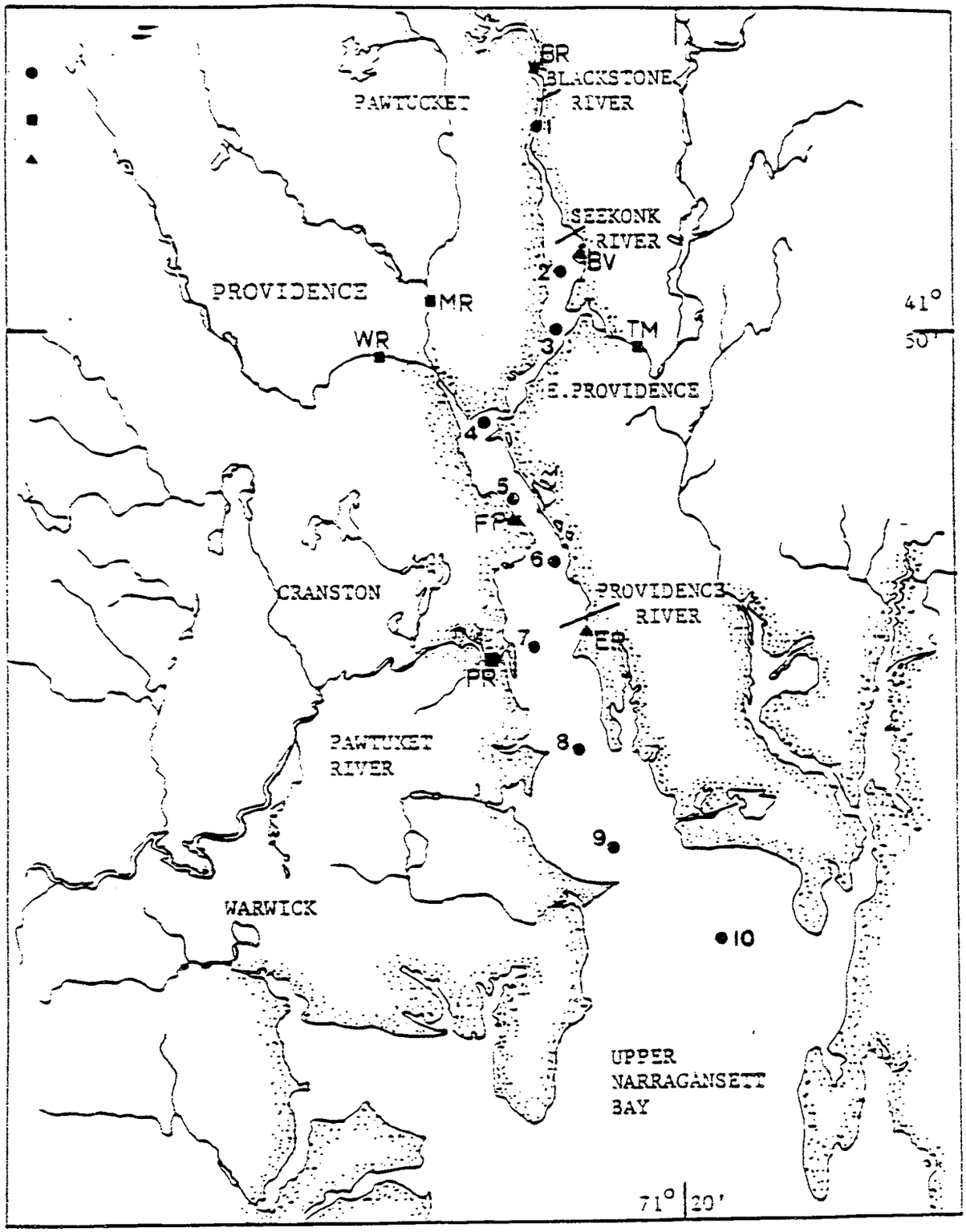

Figure 1. Station Locations for the SPRAY Cruises. BR=Blackstone River, TM=Ten Mile River, MR=Moshassuck River, WR=Woonasquatucket River, PR=Pawtuxet River, FP=Field's Point Sewage Treatment Plant, BV=Blackstone Valley Sewage Treatment Plant, EP= East Providence Sewage Treatment Plant.

Discrete samples for chlorophyll, particulate carbon and salinity were pumped (bellow or hand) from within 1.0 m of the surface and 1.0 m of the bottom through acid rinsed (1% HCL) teflon tubing. Particulate carbon samples were passed manually (60 ml plastic syringe) through 13 mm diameter Whatman GF/F glass fiber filters (nominal pore size 0.7 um) which had been previously combusted at 425 °C. Duplicate filters were stored on ice until returned to the laboratory where they were dried (40 °C) and stored until analysis. Carbon retained on the filters was determined on a Carlo Erba Model 1106 Elemental Analyzer. Chlorophyll a samples (10 ml) were passed (vacuum, 5 psi) through Whatman GF/F glass fiber filters (25 mm diameter). These were wrapped in foil and stored frozen, in the dark, over desiccant until analysis. Filters were ground, extracted in 90% acetone and analyzed by the method of Yentsch and Menzel (1963) as modified by Lambert and Oviatt (1986). Salinity was determined on an Autosal Model 8400 Inductive Salinometer.

An additional survey was conducted in lower Narragansett Bay over a two-day period in August, 1987. Water samples were taken from within 1.0 m of the surface and 1.0 m of the bottom with a plastic Niskin Bottle. Dissolved oxygen was analyzed as above. In all 25 stations were sampled (Fig. 2).

Freshwater input from rivers was estimated from river flow data furnished by the U.S. Geological Survey and sewage treatment plant discharge records.

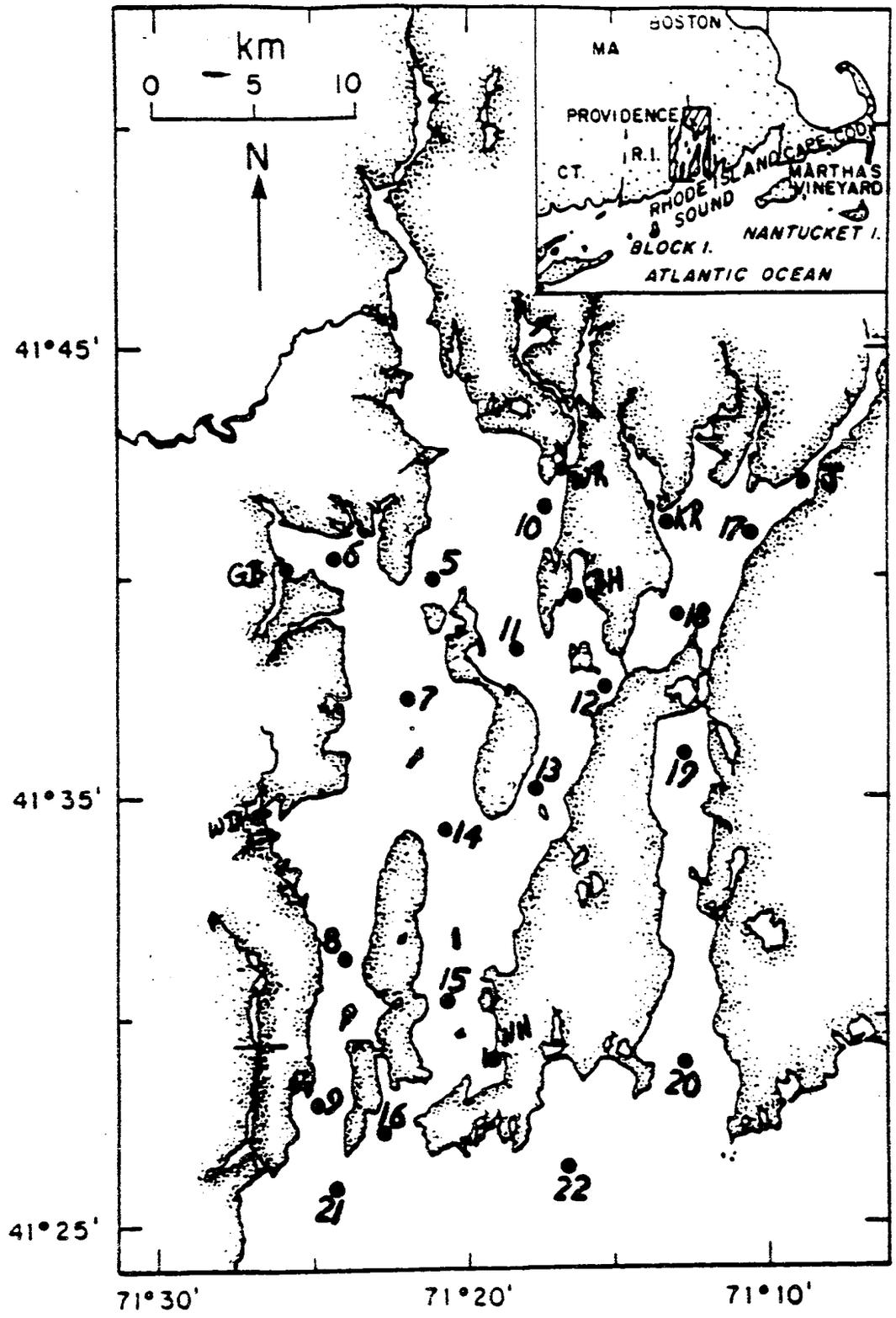

Figure 2. Station Locations for the Hydrox Cruise. GB= Greenwich Bay, WR=Warren River, BH=Bristol Hbr., KR=Kickamuit River, J=Tauton River, WD=Wickford Hbr., NH=Newport Hbr.

Data Analysis:

Oxygen and chlorophyll *a* data from the Providence and Seekonk Rivers were analyzed by standard analysis of variance to examine effects of tide, depth, season, and station location on concentration. In order to identify factors that might be important in controlling oxygen concentration, stepwise multiple regression techniques were employed. Both oxygen concentration and percent saturation were regressed against four independent variables: temperature, salinity, particulate carbon and the difference between surface and bottom salinity. Both temperature and salinity affect the solubility of oxygen in seawater. Particulate carbon was included as an indication of biomass and the salinity difference was taken as a measure of stratification. Oxygen saturation was calculated using the equations of Weiss (1970).

Results

Providence and Seekonk Rivers.

The six SPRAY Cruises fell into two groups with respect to freshwater flow into the system (Table 2). Cruises I,V, and VI (Oct., June, August) were characterized by relatively low freshwater input, while the remaining cruises (II, III, IV; Dec, Mar, April) occurred during periods of relatively high freshwater inflow. With respect to temperature (Table 2) both surface and bottom waters were warmest during cruises V and VI in June and August, coldest during cruises II, III, and IV in Dec., March and April, and intermediate in October (Cruise I).

Distribution of Oxygen:

The concentration of oxygen varied both spatially and temporally. Surface water concentrations always exceeded bottom water concentrations ($p<0.05$). For all cruises this difference averaged 2 mg O_2/l (Fig. 3). Concentrations appeared to vary tidally being higher at low tide than at high tide. The difference, about 0.2 mg O_2/l, was not statistically significant and was an order of magnitude lower than the difference between surface and bottom water. In general, minimum concentrations occurred at Station 4 (surface) and Station 5 (bottom) giving the horizontal

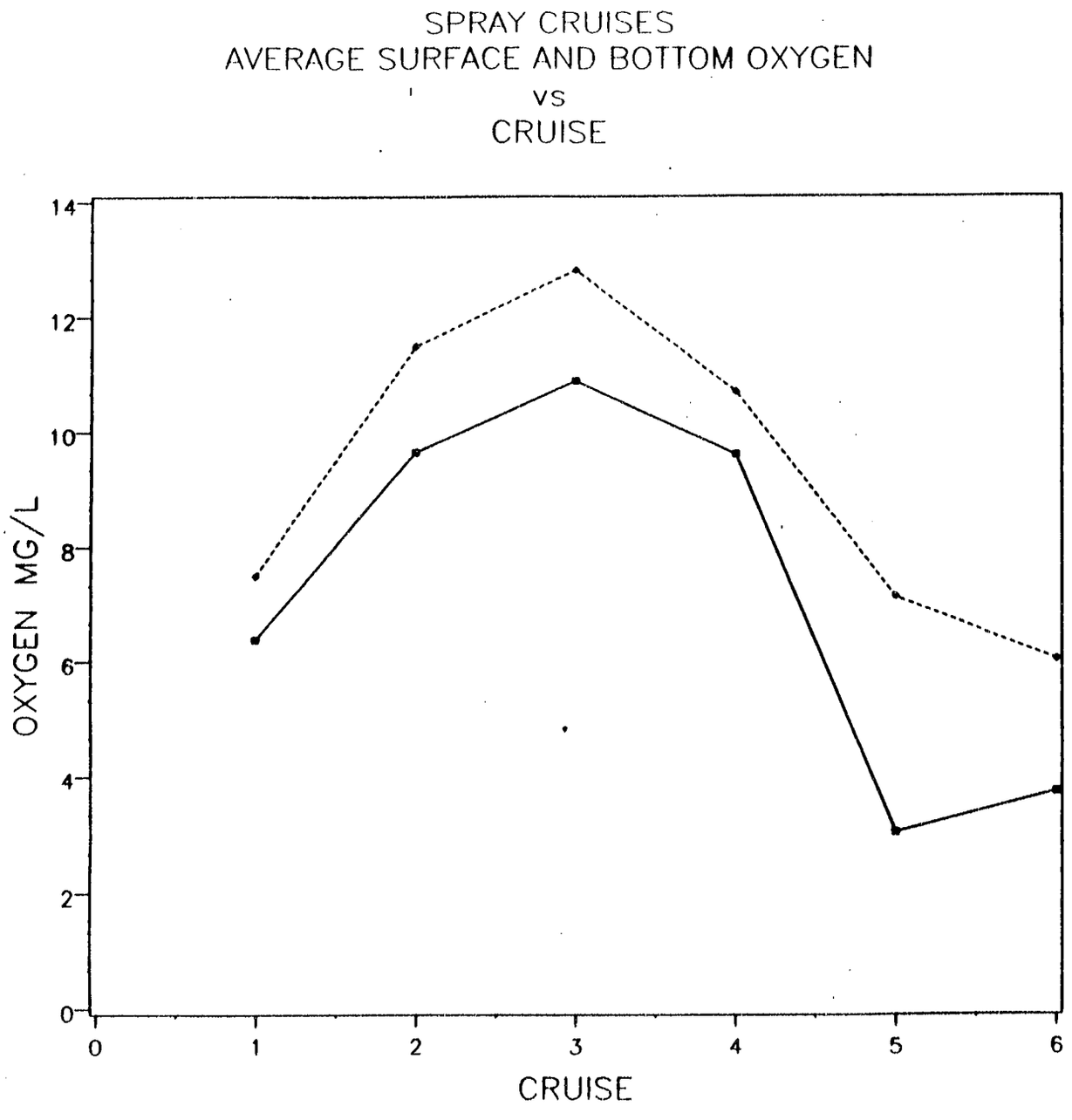

Figure 3. Average Surface and Bottom Concentrations of Dissolved Oxygen in the Providence and Seekonk Rivers for each of Six SPRAY Cruises. Dotted line=surface solid line=bottom.

Total Freshwater Input and Average Temperature of Surface and Bottom Water in the Providence and Seekonk Rivers

CRUISE	FRESHWATER INPUT (m^3/sec)	AVERAGE TEMPERATURE ($^{\circ}C$) SURFACE WATER	BOTTOM WATER
I-OCT	15.66	14.4	14.2
II-DEC	68.98	3.4	6.0
III-MAR	90.22	2.6	2.9
IV-APRIL	121.34	10.6	7.0
V-JUNE	16.81	19.5	17.3
VI-AUG	14.02	22.6	21.5

distribution a concave shape. Highest concentrations generally occurred at Station 1 and decreased to Station 4 or 5, thereafter steadily increasing to Station 10 in upper Narragansett Bay (Fig. 4).

Concentrations also varied seasonally (Fig. 3). Highest concentrations occurred during the colder weather months (Cruises II, III, IV; Dec., Mar., April). Conversely, lowest concentrations occurred during the warmer months (Cruises I, V, VI; Oct., June, Aug.). Bottom water concentrations averaged between 3 and 4 mg O_2/l in June and August. Values below 1.0 mg O_2/l were encountered only once in bottom water at Station 5 in June. An idea of the magnitude of seasonal variation can be had by comparing Fig. 5 and Fig. 6, which show the distribution of oxygen in the system during Cruise III (Mar., highest concentrations) and Cruise V (June, lowest concentrations).

Factors Controlling Oxygen Concentration:

Results of the multiple regression analysis showed that for bottom water, fluctuation in temperature explained most of the variability in oxygen concentration (81% Table 3). Salinity itself and the strength of stratification (as measured by the difference in salinity between surface and bottom waters) together explained an additional 4%. Regression

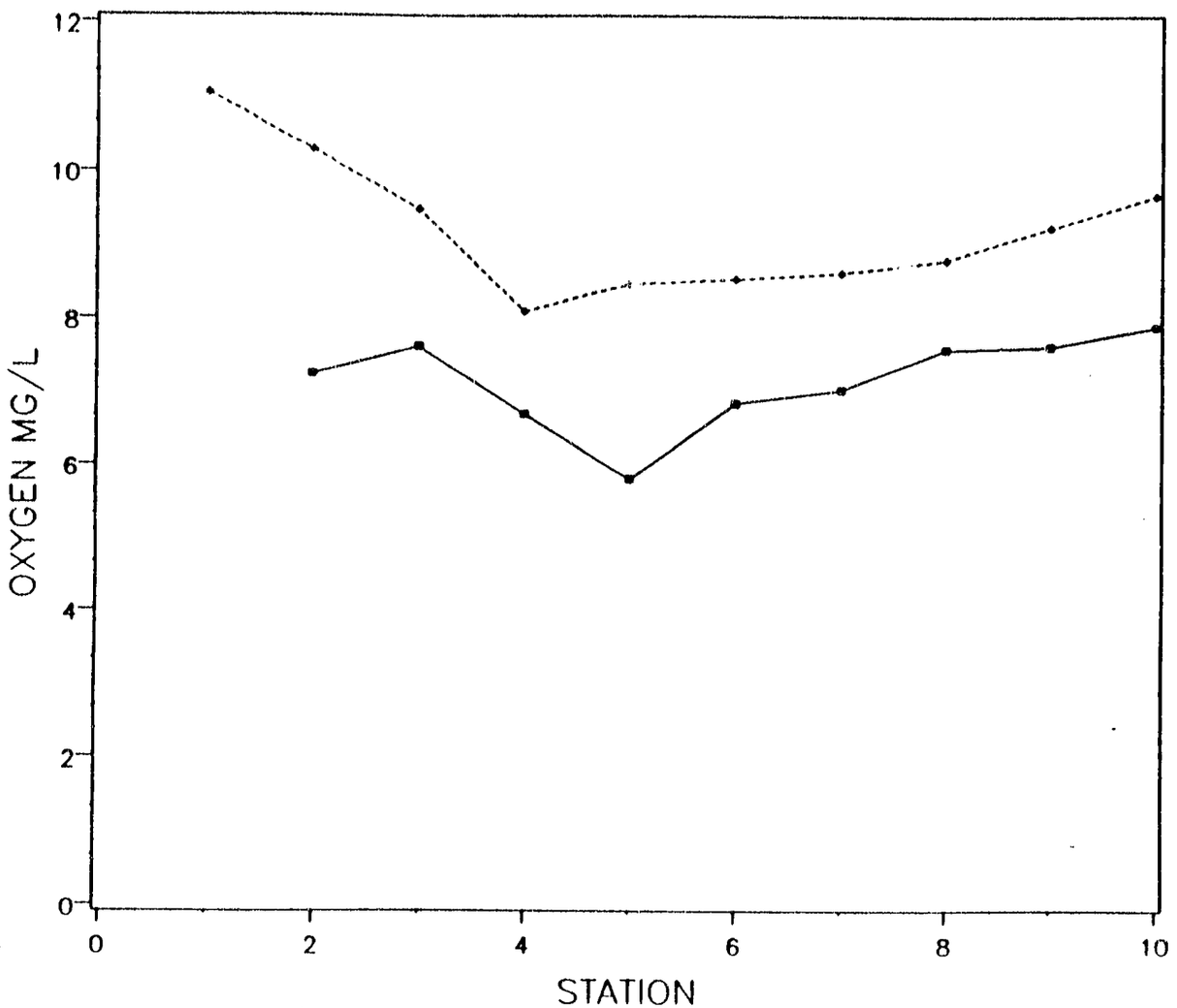

Figure 4. Average Surface and Bottom Concentrations of Dissolved Oxygen by Station for the Six SPRAY Cruises. Dotted line= surface Solid line= bottom.

SPRAY CRUISE III
AVERAGE SURFACE AND BOTTOM OXYGEN
vs
STATION

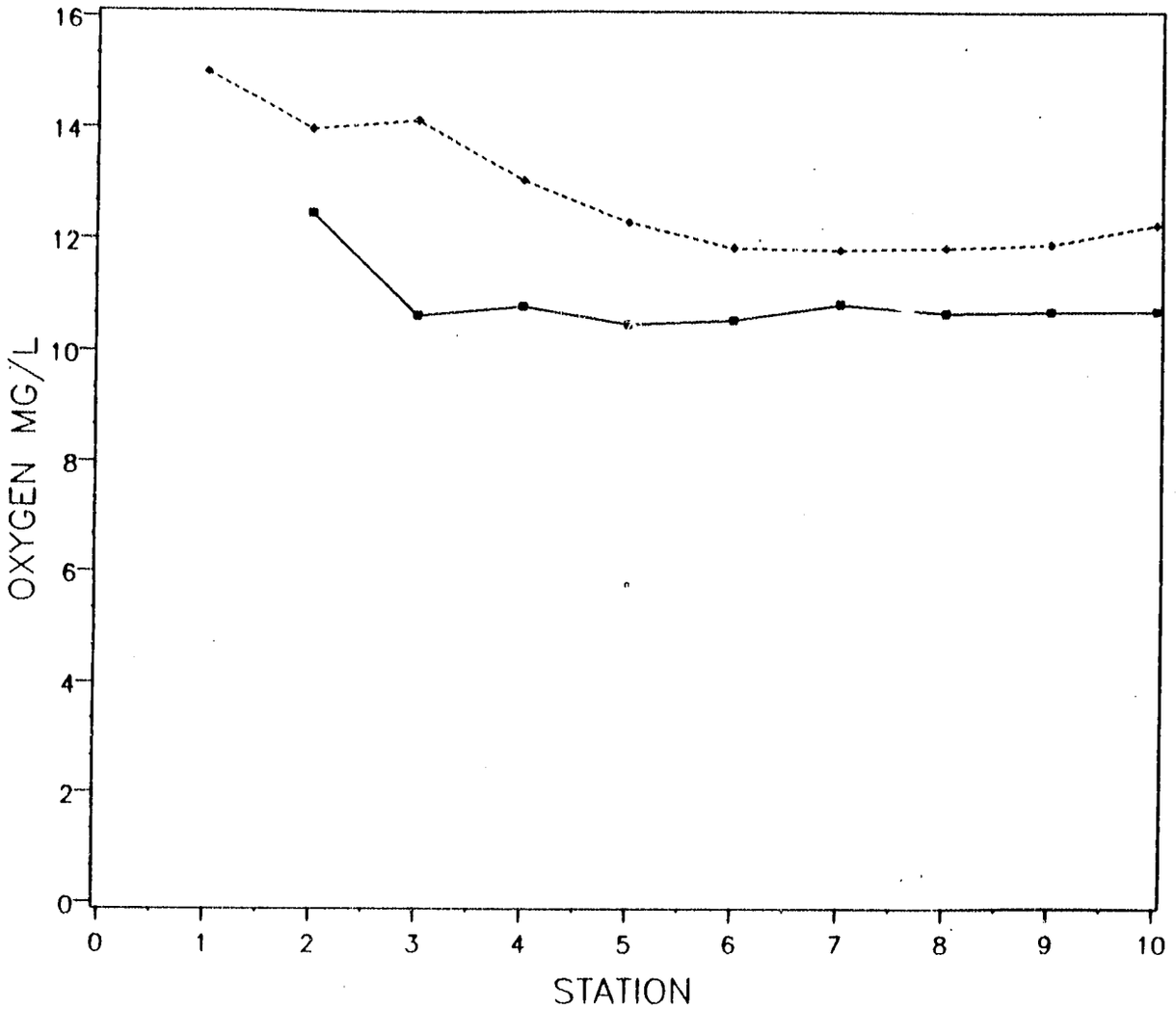

Figure 5. Average Dissolved Oxygen Concentration Observed During SPRAY Cruise III in March 1987. Dotted line=Surface Solid line= Bottom.

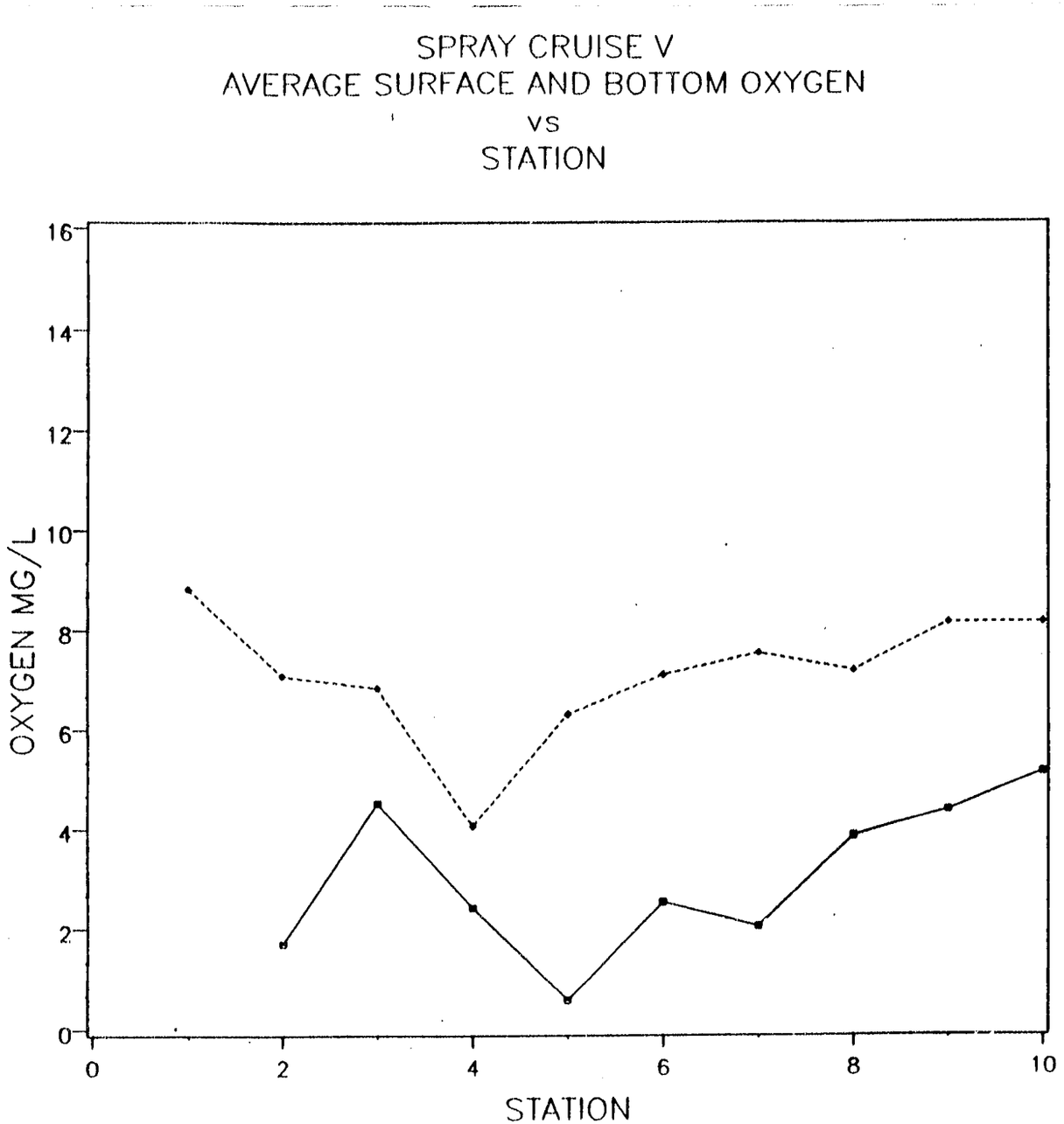

Figure 6. Average Dissolved Oxygen Concentration Observed During SPRAY Cruise V in June 1987. Dotted line=surface Solid line= Bottom.

Table 3.

Results of stepwise multiple regressions relating oxygen concentration and percent saturation ot four independent variables.

		Regression	
Bottom water	Factor	Coefficient	R-Square
Oxygen Concentration			
	Temperature	-0.486	0.814*
	Salinity	-0.089	0.027*
	Stratification	-0.074	0.015*
	Particulate Carbon	--	ns
Surface Water	Temperature	-0.351	0.701*
	Particulate Carbon	2.66	0.137*
	Salinity	-0.037	0.009*
	Stratification	—	ns
Oxygen Saturation			
Bottom Water	Temperature	-3.704	0.658*
	Stratification	-0.834	0.030*
	Others	--	ns
Surface Water	Temperature	-1.581	0.155*
	Particulate Carbon	29.802	0.252*
	Salinity	0.300	0.014*
	Others	--	ns

* - Statistically significant

ns - Not statistically significant

coefficients were all negative indicating that as either temperature, salinity or degree of stratification increase, oxygen concentration in the estuary declines.

Surface water concentrations were also primarily a function of temperature. Salinity explained a small amount of variability (0.9% Table 3), while particulate carbon accounted for almost 14%. In total about 85% of the variability in oxygen concentration could be ascribed to the three factors.

The degree of oxygen saturation in bottom waters was also primarily a function of temperature (R^2 = 0.657, Table 3). Stratification explained an additional 3%. The signs of the regression coefficients indicate that both factors had a negative effect upon percent saturation.

Percent saturation of surface waters depended mainly on temperature (R^2 = 0.155) and concentration of particulate carbon (R^2 = 0.407). The former had a negative effect while the latter had a positive effect. Salinity had a slight positive effect (Table 2).

Chlorophyll a:

The tidally averaged concentration of chlorophyll a for the six SPRAY cruises is shown in Figures 7-12. In general, concentrations were higher during cruises IV, V, and VI (April, June, and August) than during the

first three cruises (Oct., Dec., Mar.). Although the data are not shown, there was no consistent difference between high and low tide that appeared correlated with freshwater input or season. One pattern which may be significant is that when freshwater input was low (Cruises I, V, VI; Oct., June and Aug.) surface concentrations were higher than bottom water concentrations in the lower Providence River (Station 7-9). During periods of high freshwater inflow, bottom water concentrations tended to be higher than near the surface. This was especially evident for Cruises III and IV (March, April). Concentrations were quite low in both surface and bottom waters during Cruise II and patterns are difficult to discern.

Survey of Narragansett Bay

The survey of oxygen concentration in the lower portion of Narragansett Bay occurred in August (see Appendix A). In general, surface water concentrations exceeded bottom water concentrations. Only one value below 4 mg O_2/l was recorded (Sta. 21, bottom water). Values between 4 and 5 mg O_2/l were measured in bottom water from Station 10, Station 17, the mouth of Greenwich Cove, and offshore waters (Stations 2 and 22).

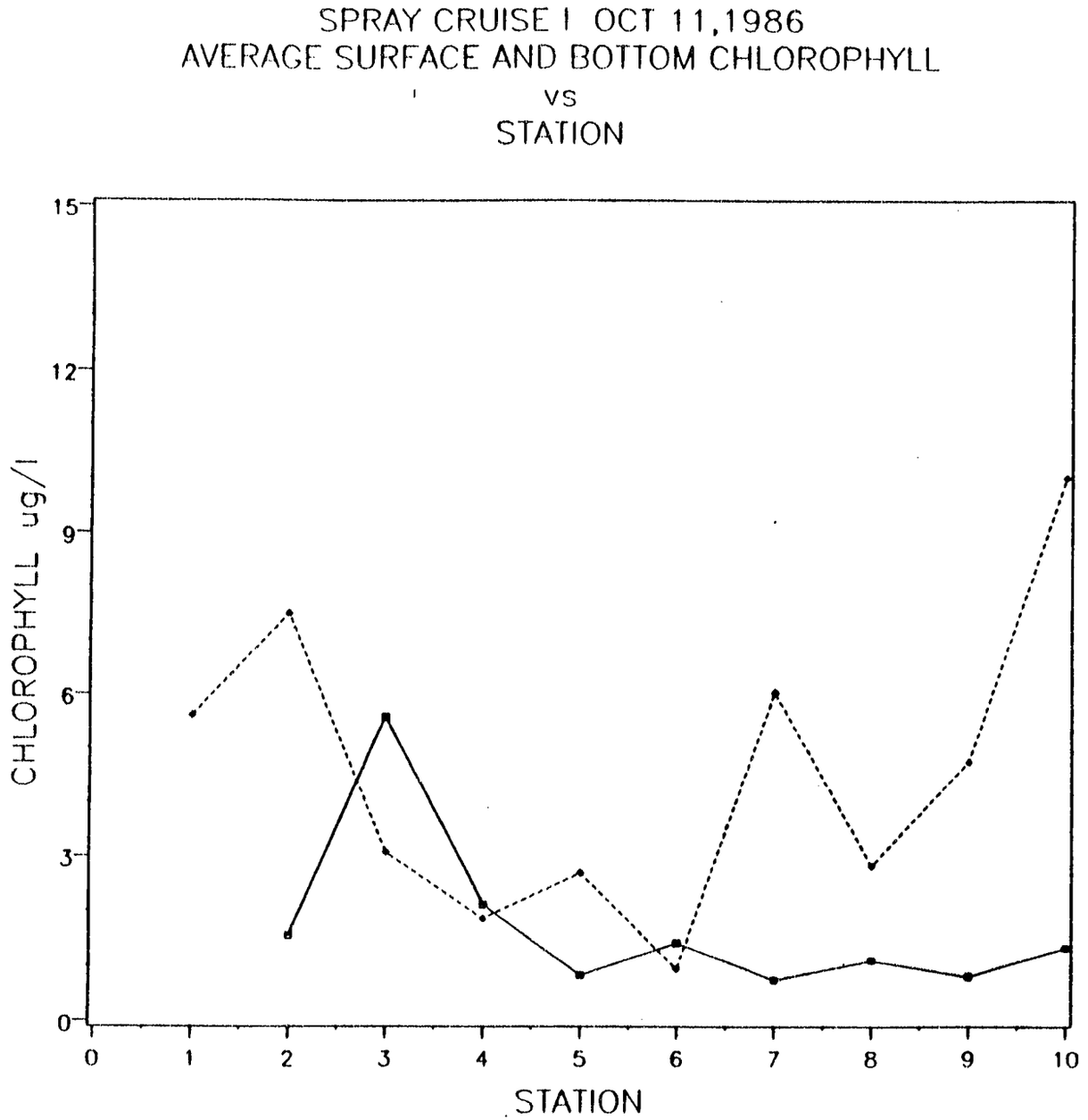

Figure 7. Average Chlorophyll a Concentration Observed During SPRAY Cruise I. Dotted line=surface, solid line=bottom.

SPRAY CRUISE II DEC 15,1986
AVERAGE SURFACE AND BOTTOM CHLOROPHYLL
VS
STATION

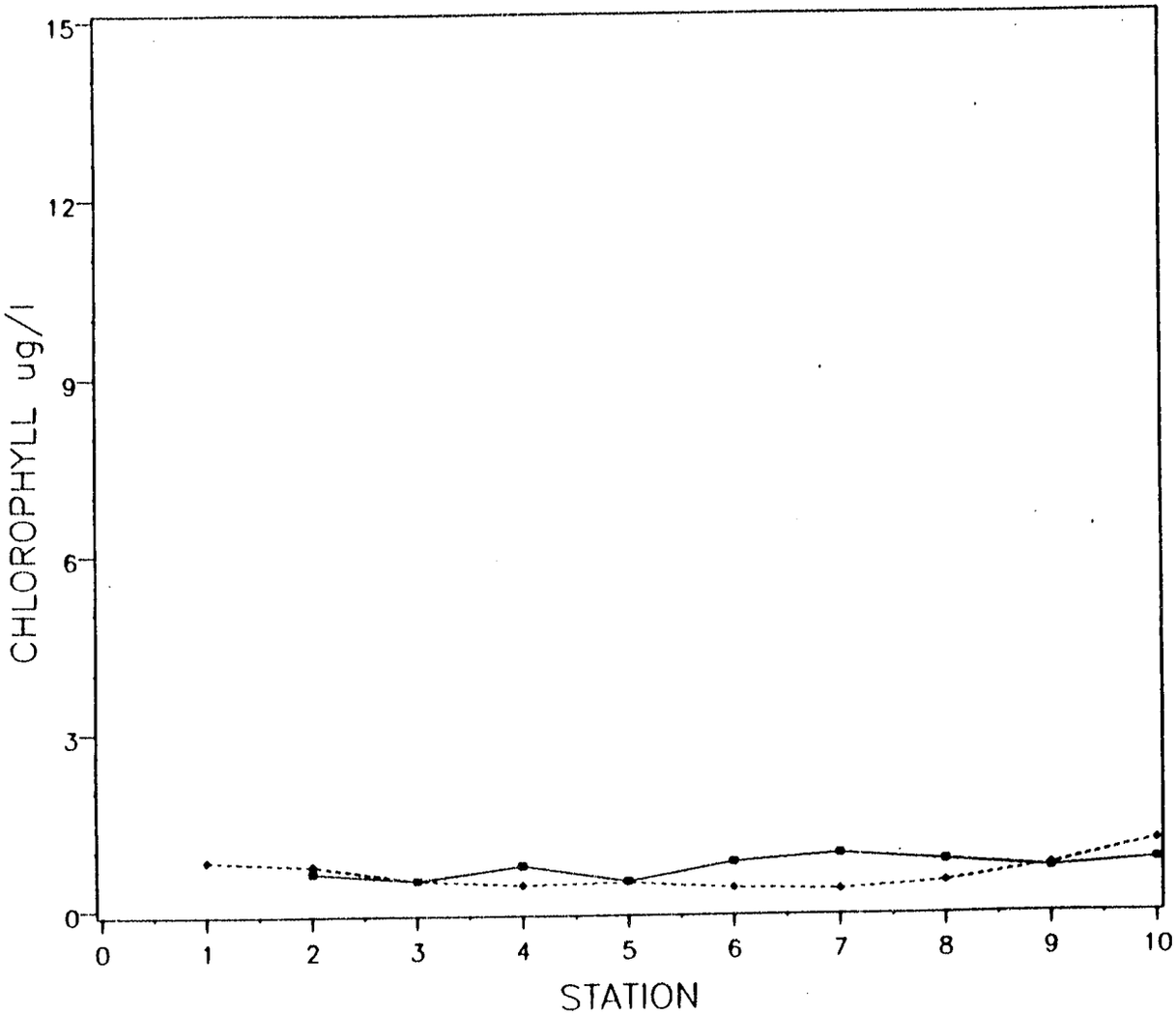

Figure 8. Average Concentration of Chlorophyll a Observed During SPRAY Cruise II. Dotted line=surface, Solid line=Bottom.

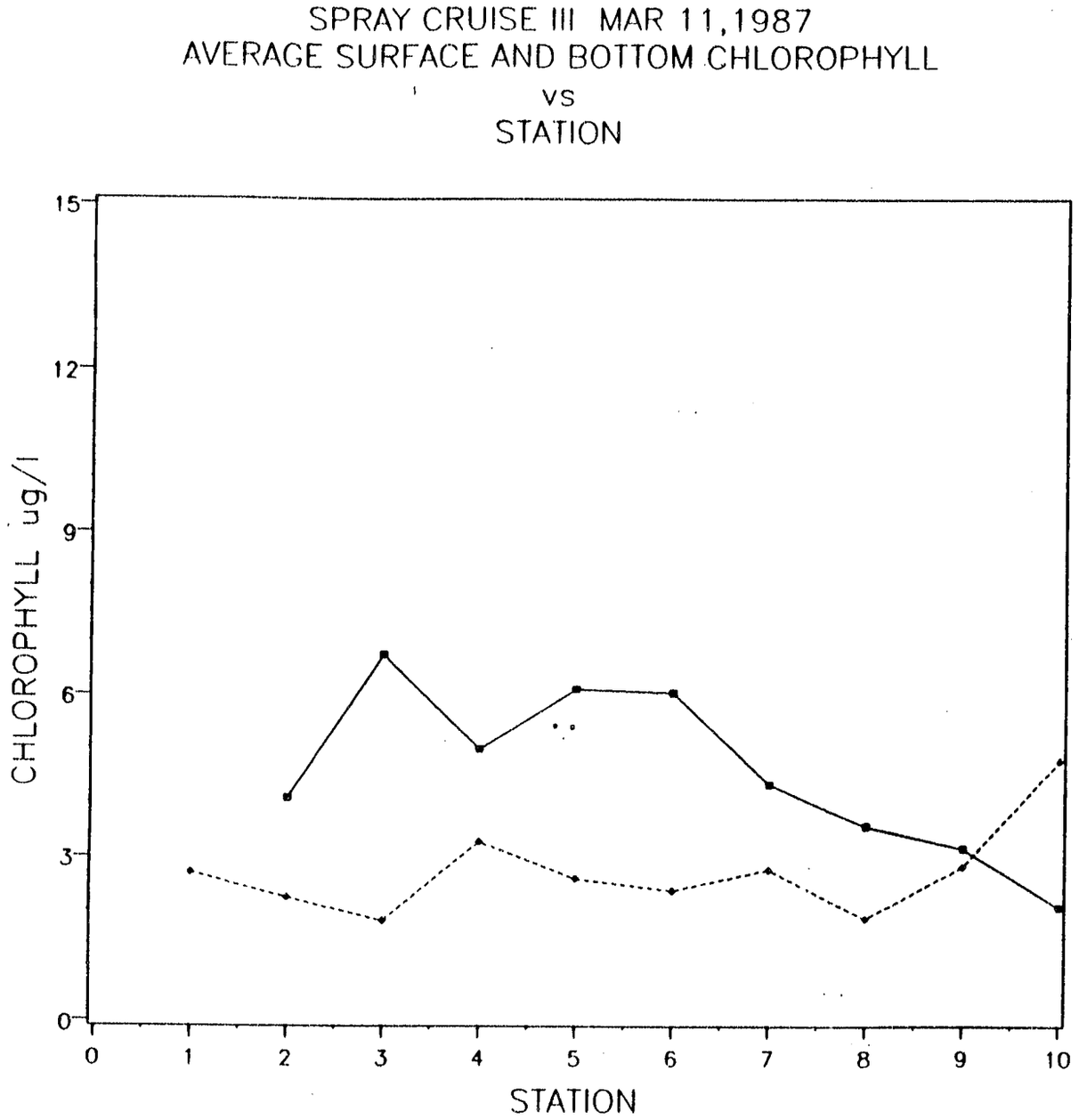

Figure 9. Average Concentration of Chlorophyll a Observed During SPRAY Cruise III. Dotted line=surface Solid line=bottom.

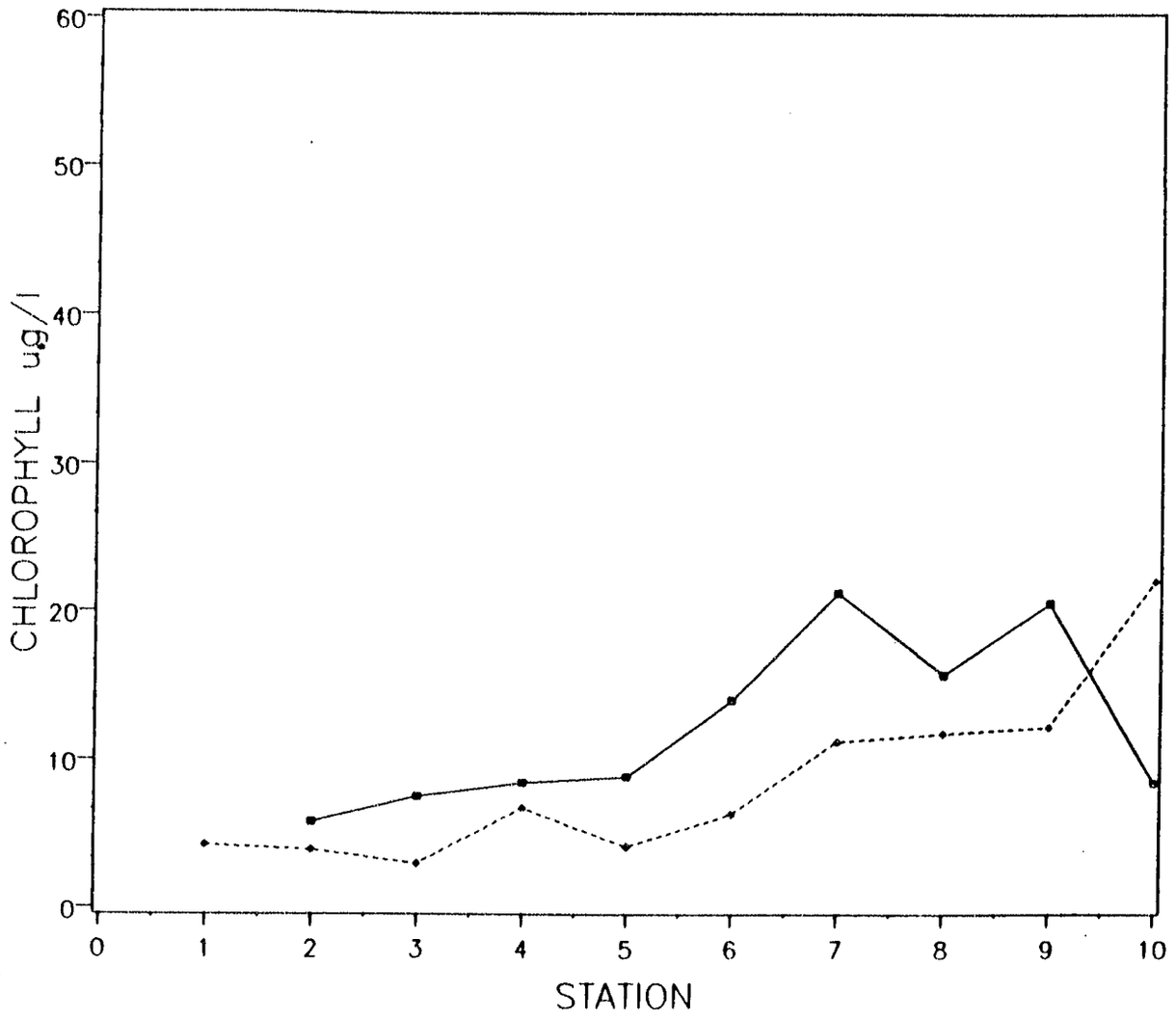

Figure 10. Average Concentration of Chlorophyll a Observed During SPRAY Cruise IV. Dotted line=surface Solid line=bottom.

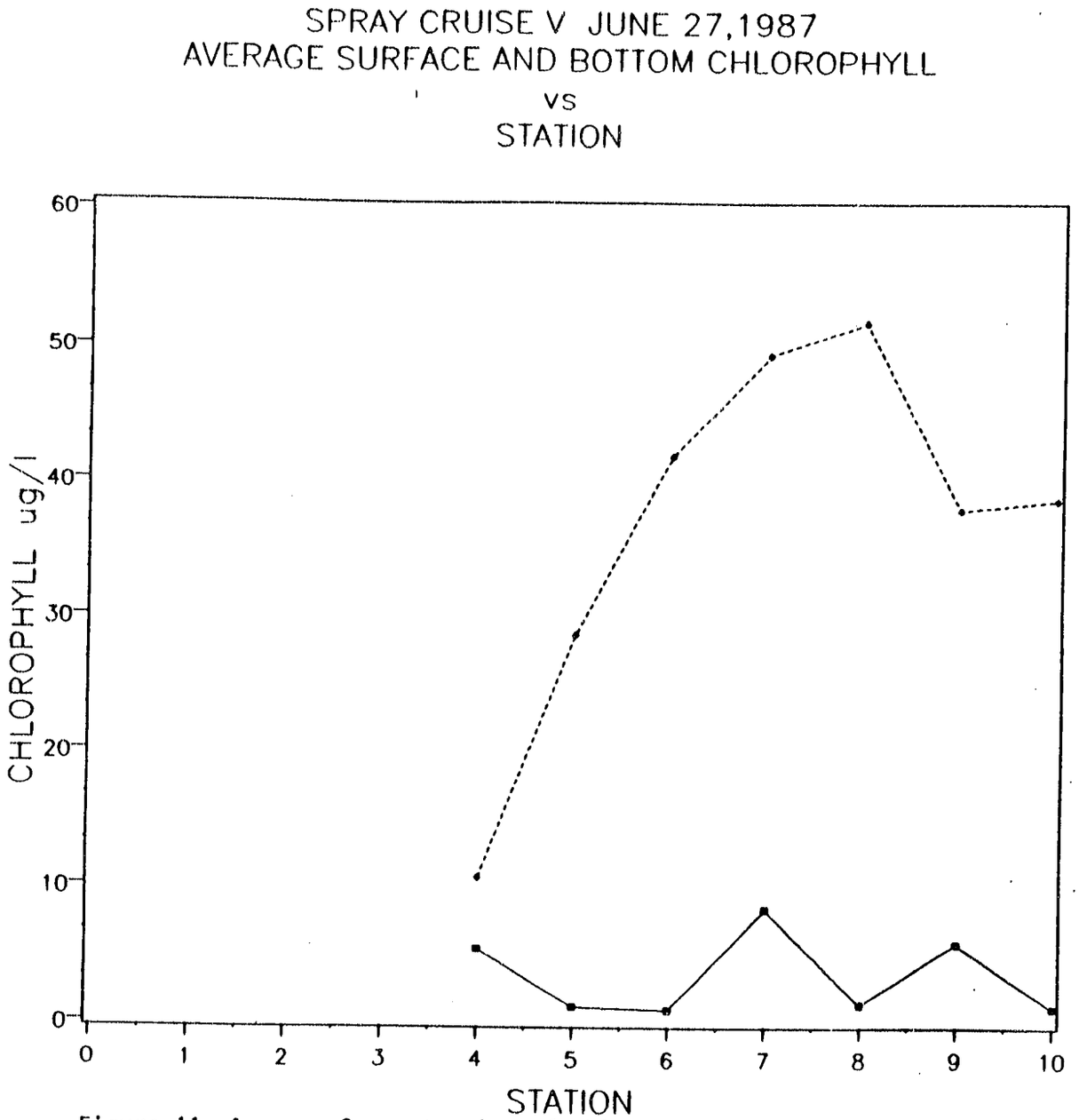

Figure 11. Average Concentration of Chlorophyll a Observed During SPRAY Cruise V. Dotted line=surface, Solid line=bottom.

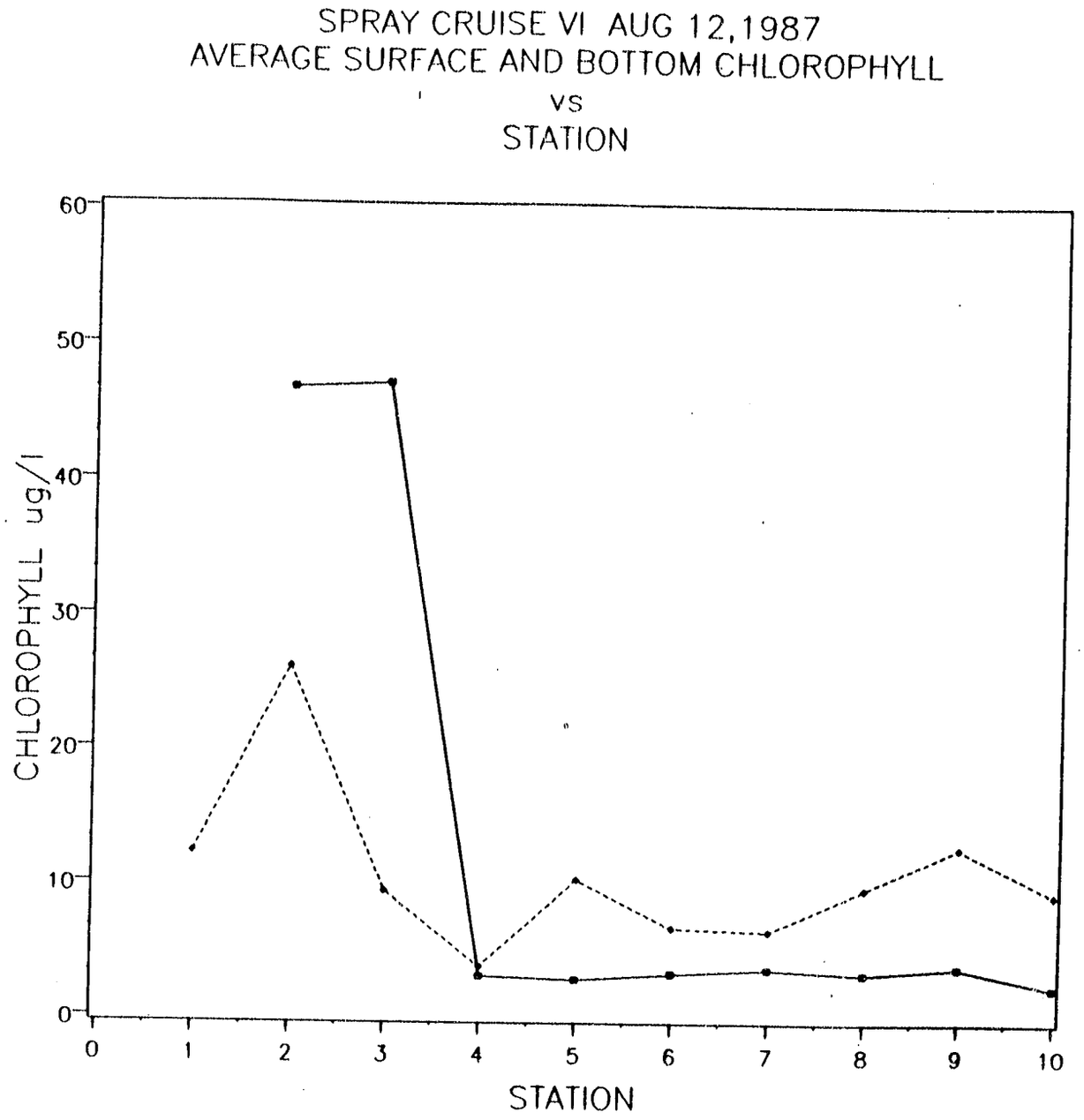

Figure 12. Average Concentration of Chlorophyll a Observed During SPRAY Cruise VI. Dotted line=surface, Solid line=bottom.

Discussion

Providence and Seekonk Rivers

Oxygen:

The distribution of oxygen throughout the Providence and Seekonk Rivers is concave in shape with a minimum at Stations 4 (surface) and 5 (bottom). Such a distribution may result from a number of processes. The high concentrations at Station 1 may be caused by oxygenation of water as it passes over the dam, located several hundred yards upstream. The low concentrations in bottom waters at Station 5 may be attributable to discharge from the Fields Point sewage treatment facility.

The multiple regression analysis represented an attempt to determine what factors control the concentration of oxygen in the Providence and Seekonk Rivers. This is a statistical technique and thus should not be interpreted as establishing a direct cause and effect relationship. Rather the results are useful as guideposts, pointing to possible important factors.

The analysis was conducted for both oxygen concentration and percent saturation. The concentration of oxygen reflects the combined effects of

solubility, mixing, consumption and production. Percent saturation expresses concentration relative to solubility at a given temperature and salinity. Fluctuations in percent saturation are not due to changing solubility, but to other processes.

The four independent variables employed in the model were temperature, salinity, stratification (taken as the difference between surface and bottom salinity) and particulate carbon. Temperature influences oxygen concentration both through its effect on solubility and its control of biological processes, especially respiration. Salinity may affect concentration directly through its negative effect on solubility or indirectly as a reflection of mixing. Stratification inhibits mixing of surface and bottom waters and may prevent bottom waters from exchanging oxygen with the atmosphere. Particulate carbon was chosen as a factor because it may reflect biologically active biomass, which produces and consumes oxygen.

Much of the variability in oxygen concentration could be explained by some combination of the four variables. In both surface and bottom waters about 85% of the variability was explained. As might be expected, bottom water concentration depended on temperature, salinity and stratification while surface water concentrations depended on temperature, salinity and particulate carbon. The positive effect of the latter variable indicates that biological production was a significant source of oxygen in surface waters.

The degree of saturation in surface waters depended on particulate

carbon and to a lesser extent temperature. Salinity explained a significant but minor proportion of variability. The sign of the regression coefficient for particulate carbon suggests a positive effect of biological production, while the negative sign of temperature suggests that respiration is also important. The percent saturation in surface waters may represent a balance between biological production and respiration.

In bottom waters, temperature explained about 65% of the variation in saturation. The negative sign of the regression coefficient suggests that respiration is an important process.

The most striking seasonal signal in the oxygen data is the low oxygen concentration in bottom waters observed in June and August(Cruises V and VI). These two cruises were characterized by relatively high temperature and low freshwater input. The latter attribute implies a low flushing rate for the system. Both conditions appear necessary for the onset of low concentrations. Although low fresh water input prevailed during October (Cruise I), temperature was moderate (about 14 ^{o}C) and oxygen concentrations were not drastically low.

Chlorophyll:

The distribution of chlorophyll *a* in the Providence and Seekonk Rivers showed few consistent patterns. The difference between the first three and last three cruises may be interpreted as a seasonal pattern but the data are far too infrequent to conclude this with confidence. The observation that surface water concentrations exceeded bottom water concentrations

during periods of low freshwater input, while the opposite obtained during periods of high freshwater input, is suggestive. Perhaps during low flow periods, the flushing rate of surface waters is slow enough to allow biomass to accumulate. During periods of high freshwater flow, flushing might decrease biomass in surface water, while phytoplankton cells that have sunk below the pycnocline are entrained. There are many factors which affect phytoplankton population dynamics and therefore biomass as measured by chlorophyll a (eg. sinking, grazing, production, respirarion, flushing rate). Although chlorophyll a was measured, the SPRAY Cruises were not intended to fully explain its distribution.

Narragansett Bay:

Oxygen:

The data suggest that in Narragansett Bay, the Providence and Seekonk Rivers are areas which experience low oxygen (3.0 mg O_2/l) conditions. These conditions prevail during the summer.

It should be noted however, that small, semi-enclosed embayments were not routinely sampled. Therefore there may be localized areas with low oxygen which have yet to be identified.

Acknowledgements

We thank J. Allan, R. Tombarri, and M. Gustafson of the R/V Laurie Lee. E. Klos and E. Requintina of the R/B MERL Boat. Thanks to all who participated in these cruises: W. Warren, L. Weber, C. Brown, D. Cullen, E. Hoffman, G. Hoffman, K. Schweitzer, R. Lapan, V. Banzon, N. Craig, J. Frithsen and J. Boucher, D. Luketic, A. Keller and L. Beatty.

Literature Cited

Carritt, D.E. and J.H. Carpenter. 1966.
Comparison and evaluation of currently employed modifications of the Winkler Method for determining dissolved oxygen in seawater. J. Mar. Res. 24: 286-318.

Doering, P.H., C.A. Oviatt and M.E.Q. Pilson. 1988.
Monitoring of the Providence and Seekonk Rivers for trace metals and associated parameters. Final Report to the Narragansett Bay Project. 59 pp.

Lambert, C.E. and C.A. Oviatt. 1986.
Manual of biological and geochemical techniques in coastal areas. MERL Series, Report No. 1, Second Edition. University of Rhode Island, Kingston, 319 pp.

Weiss, R.F. 1970. The solubility of nitrogen, oxygen and argon in water and seawater. Deep-Sea Res. 17: 721-735.

Yentsch, C.S. and D.W. Menzel. 1963.
A method for the determination of phytoplankton chlorophyll and phaeophytin by fluorescence. Deep-Sea Res. 10:221-231.

APPENDIX A

DATA COLLECTED DURING THE HYDROX CRUISE

Providence and Seekonk River System Survey

Cruise Report

The Hydrox Cruise

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Co-Principal Investigator

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Narragansett, RI 02882-1197

August 26, 1987

Introduction

The Hydrox Cruise spanned two days, August 19-20, 1987. Its purpose was to measure dissolved oxygen concentration in the surface and bottom waters of Narragansett Bay as well as to collect hydrographic profile data. In all 26 stations were samples: 14 on August 19th and 12 on August 20, 1987. All samples were taken aboard the R/V Laurie Lee.

Personnel and Equipment:

R/V Laurie Lee: J. Allan (Captain), R. Tombarri (Engineer).

Crew -- August 19, 1987: C. Oviatt, J. Frithsen, L. Weber, W. Warren and P. Doering.

Crew -- August 20, 1987: J. Boucher, D. Luketic, K. Kipp, L. Weber, W. Warren, P. Doering, "Survival of the Sea" movie people (2).

Stations:

The stations visited during the Hydrox Cruise are listed in Tables 1, 2 and 3. Tables 1 and 2 show the date and time of day each station was occupied. Table 3 summarizes station locations. In general, stations in the upper Bay (see Figure 1) were sampled within 4 hours of sunrise which occurred at about 06:00 on both days.

Profiles:

On the first day of the cruise (August 19, 1987) the STD-12 again experienced problems yielding reliable salinity data. For the most part other sensors on the instrument appeared to function normally. At most stations, where spurious salinity data were observed, whole water samples were taken at surface, mid-depth and bottom for later salinity analysis in the laboratory. The extent of salinity data taken on the cruise is summarized in Table 4. New batteries were placed in the STD-12 before the second day of work. The instrument functioned adequately all day except for some minor exceptions noted in Table 4.

Oxygen Samples:

Oxygen samples were withdrawn from 1.7 l Niskin Bottles. Samples were taken 0.5 meter from the surface and from within 0.5 meter of the bottom. The bottom sample depths have been calculated as the depth sounded with the ships echo sounder less 0.5 meter. These appear in Table 4 and the column summarizing the bottle salanity samples. Both surface and mid-depth distances were determined from marks on the line used to deploy the Niskin Bottle. Sufficient weight was employed on the end of the line so that "wire angle" was not a problem.

Analysis:

The pH of all water samples taken with the Niskin Bottles were analyzed aboard ship using a Nester pH pen. The use of this pen is described in SPRAY Cruise Reports IV-VI.

Three BOD bottles were filled from the Niskin bottles, fixed and stored in the dark until they could be analyzed for dissolved oxygen concentration by the Winkler titration in the laboratory. All oxygen samples were titrated within 24 hours of collection. Doug Cullen, A. Keller and L. Beatty kindly completed this work in the laboratory.

Two 60 ml polyethylene bottles were also filled from each Niskin water sample for later salinity analysis in the laboratory. These will be analyzed on the Autosal Instrument located at the NMFS Laboratory in Narragansett.

Summary:

Although actual oxygen concentrations have not yet been calculated, a qualitative notion of concentration can be had from the mls of thiosulfate used in the titrations and from the color of the precipitate formed upon addition of reagents aboard ship. Qualitative evaluation of oxygen concentration in this way does not indicate that oxygen was in short supply at any of the stations sampled during the Hydrox Cruise. Although we did not find any "problem" areas, it should be noted that conclusions based on a one time synoptic survey should be viewed with caution. Additionally, many of the statiens we sampled lie in areas of maximal water movement and exchange within the Bay. Such areas are unlikely to experience "low oxygen" except in the most severe circumstances. The more enclosed bodies of water in the Bay with small volume and potentially high organic loading are more likely candidates for hypoxia or anoxia. These were undersampled on the Hydrox Cruise.

This cruise was rather arduous, especially for those who participated on both days. We thank everyone for their time, effort and lost sleep.

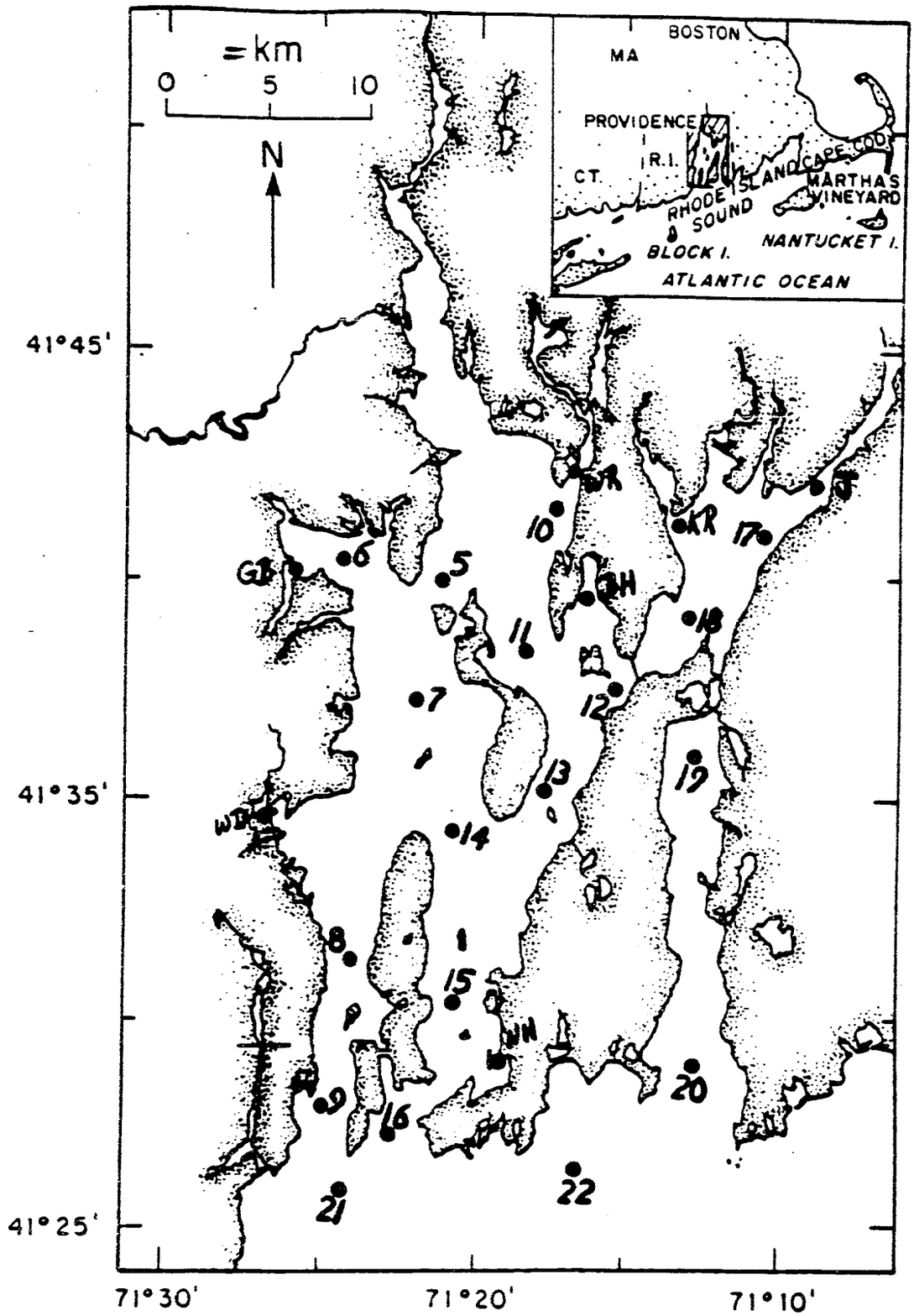


FIGURE 1. STATION LOCATIONS FOR THE HYDROX CRUISE

Table 1. Hydrox Cruise Stations
August 19, 1987
(Day 1)

Station	Time Start	Finish	Sounded Depth (m)
WD	04:40	04:45	2.8
7	05:27	05:33	6.1
GB	06:00	06:04	3.5
6	06:09	06:14	4.5
5	06:26	06:32	8.0
10	06:52	06:56	5.6
WR	07:05	07:10	6.2
BH	07:39	07:44	5.4
11	07:58	08:07	13.0
15	08:40	--	36.0
16	10:27	10:42	36.0
21	10:50	11:08	28.0
9	11:16	11:25	14.0
8	11:48	11:56	12.0

Table 2. Hydrox Cruise Stations
August 20, 1987
(Day 2)

Station	Time Start	Finish	Sounded Depth (m)
WD	04:45	05:25	3.0
14	05:51	06:07	9.7 - 9.8
NH	06:47	06:55	6.1
13	07:53	08:10	32.0
12	08:28	08:44	20 - 24
18	08:58	09:07	11
KR	09:34	09:40	2.2
17	09:53	10:07	10
J	10:19	10:29	8.8 - 9.5
19	11:12	11:20	6.1
20	11:46	11:55	11 - 12
22	12:14	12:27	24

Table 3.
Location of Stations Sampled During the Hydrox Cruise

Station	Lat 41°	Long 71°
WD	34' 38"	23' 09"
GB	40' 12"	23' 34"
WR	42' 40"	18' 53"
BH	40' 23"	17' 00"
NH	29' 00"	19' 20"
KR	41' 49"	14' 39"
J	41' 43"	10' 42"
5	40' 14"	21' 31"
6	40' 42"	25' 40"
7	38' 00"	22' 18"
8	31' 56"	23' 48"
9	27' 48"	24' 47"
10	41' 53"	17' 54"
11	38' 58"	18' 37"
12	37' 58"	15' 53"
13	35' 32"	18' 12"
14	34' 56"	20' 50"
15	30' 34"	21' 00"
16	27' 25"	22' 46"
17	41' 42"	11' 13"
18	39' 39"	13' 56"
19	36' 14"	13' 00"
20	29' 30"	13' 07"
21	25' 36"	23' 38"
22	25' 57"	16' 40"

Table 4.
Summary of STD-12 Profiles

Station	Date	Profile Depth	Salinity	Bottle Salinity (m)*
WD	8/19/87	2.8	yes	0.5, 2.3
7	"	6.9	yes	0.5, 6.4
GB	"	3.2	yes	0.5, 3.0
6	"	4.3	yes	0.5, 4.0
5	"	6.9	yes	0.5, 7.5
10	"	5.3	yes	0.5, 5.1
WR	"	5.2	yes	0.5, 5.7
BH	"	5.3	yes	0.5, 4.9
11	"	-	yes	0.5, 12.5
15	"	-	No	0.5, 35.5
16	"	34.6	to 9 m	0.5, 20, 35
21	"	27.6	no	0.5, 15, 27.5
9	"	13.2	no	0.5, 7, 13.5
8	"	11.9	no	0.5, 6.0, 11.5
WD	8/20/87	2.9	yes	0.5, 2.5
14	"	9.4	yes	0.5, 9.7
NH	"	6.0	yes	0.5, 5.6
13	"	31.2	yes	0.5, 15, 31.5
12	"	19.5	yes	0.5, 10, 22.0
18	"	10.7	yes	0.5, 10.5
KR	"	2.3**	yes	0.5, 1.7
17	"	9.1**	yes	0.5, 9.5
J	"	8.1	yes	0.5, 9.0
19	"	5.5	yes	0.5, 5.6
20	"	10.6	yes***	0.5, 11.5
22	"	23.6	yes	0.5, 23.5

*Bottom depth taken as sounded depth less 0.5 meters.

**Depth reading questionable.

***Salinity data noisey but acceptable.

Table 5.

Salinity, dissolved oxygen and pH for
HYDROX Cruise Stations

Variable	Definition
T_ Depth	Total depth of station in meters
P_ Depth	Sample depth in meters
Diss_ O_2	Concentration of dissolved oxygen in mg/l
O_{2}_ AV	Average of 3 replicates
Sal	In parts per thousand
Sal_ AV	Average of 3 replicates

SALINITY, DISSOLVED OXYGEN, AND PH
FOR BAY STATIONS AUG. 20,1987

STA	T_DEPTH meters	DATE	TIME_ON hours	TIME_OFF hours	P_DEPTH meters	PH	DIS_O2 mg/l	O2_AV mg/l	SAL 0/00	SAL_AV 0/00
WD-1	3.0	870819	0440	0455	0.5	7.7	.	6.55	30.534	30.541
							6.51		30.544	
							6.59		30.544	
WD-1	.	870819	.	.	2.8	7.7	6.32	6.38	30.546	30.538
							6.38		30.534	
							6.44		30.534	
7	7.0	870819	0527	0533	0.5	7.9	6.94	6.95	30.279	30.275
							6.96		30.273	
							6.94		30.273	
7	.	870819	.	.	6.9	7.7	6.02	6.03	30.795	30.799
							6.03		30.801	
							6.04		30.801	
GB	3.5	870819	0600	0604	0.5	7.8	5.50	5.54	29.486	29.505
							5.56		29.515	
							5.57		29.515	
GB	.	870819	.	.	3.2	7.7	5.02	4.94	29.538	29.513
							4.77		29.501	
							5.04		29.501	
6	4.5	870819	0609	0614	0.5	7.9	7.07	7.15	29.705	29.708
							7.19		29.709	
							7.19		29.709	
6	.	870819	.	.	4.3	7.9	7.22	7.22	29.836	29.826
							7.23		29.821	
							7.21		29.821	
5	8.0	870819	0626	0632	0.5	8.2	9.34	9.37	29.294	29.277
							9.38		29.269	
							9.40		29.269	
5	.	870819	.	.	6.9	7.8	5.98	5.92	30.314	30.310
							5.92		30.308	
							5.86		30.308	
10	5.6	870819	0652	0656	0.5	8.0	7.50	7.64	29.496	29.509
							7.67		29.515	
							7.74		29.515	
10	.	870819	.	.	5.3	7.7	4.85	4.55	30.447	30.438
							4.35		30.434	
							4.44		30.434	

SALINITY, DISSOLVED OXYGEN, AND PH
FOR BAY STATIONS AUG. 20,1987

STA	T_DEPTH meters	DATE	TIME_ON hours	TIME_OFF hours	P_DEPTH meters	PH	DIS_02 mg/l	02_AV mg/l	SAL 0/00	SAL_AV 0/00
WR	6.2	870819	0705	0710	0.5	7.9	7.11	7.15	29.567	29.582
							7.15		29.590	
							7.20		29.590	
WR	.	870819	.	.	5.2	7.7	5.32	5.26	29.886	29.853
							5.27		29.836	
							5.19		29.836	
BH	5.4	870819	0739	0744	0.5	7.9	6.44	6.45	30.354	30.348
							6.45		30.345	
							6.47		30.345	
BH	.	870819	.	.	5.3	7.7	5.24	5.23	30.437	30.432
							5.23		30.430	
							5.23		30.430	
11	13.0	870819	0758	0807	0.5	8.1	8.47	8.49	30.005	30.003
							8.52		30.002	
							8.48		30.002	
11	.	870819	.	.	12.5	7.7	5.67	5.67	31.362	31.390
							5.68		31.404	
							5.65		31.404	
15	36.0	870819	0840	.	0.5	8.0	8.35	8.32	30.679	30.672
							8.29		30.669	
							8.32		30.669	
15	.	870819	.	.	35.5	7.5	6.18	6.19	31.803	31.790
							6.19		31.783	
							6.21		31.783	
16	35.5	870819	1027	1042	0.5	7.9	8.04	8.03	31.141	31.142
							8.04		31.143	
							8.02		31.143	
16	.	870819	.	.	20.0	.	.	.	31.535	31.487
							.		31.438	
16	.	870819	.	.	34.6	7.3	4.38	4.37	31.812	31.811
							4.37		31.810	
							4.35		31.810	
21	28.0	870819	1050	1108	0.5	8.0	8.45	8.47	31.294	31.312
							8.48		31.321	
							8.47		31.321	

SALINITY, DISSOLVED OXYGEN, AND PH
FOR BAY STATIONS AUG. 20,1987

STA	T_DEPTH meters	DATE	TIME_ON hours	TIME_OFF hours	P_DEPTH meters	PH	DIS_O2 mg/l	O2_AV mg/l	SAL 0/00	SAL_AV 0/00
21	.	870819	.	.	15.0	7.8	.	.	31.626	31.616
							.		31.605	
21	.	870819	.	.	27.6	7.4	3.98	3.99	31.861	31.857
							3.98		31.855	
							4.00		31.855	
9	14.0	870819	1116	1125	0.5	8.0	7.58	7.59	30.714	30.7
							7.61		30.712	
							7.57		30.712	
9	.	870819	.	.	7.0	.	.	.	31.310	31.310
							.		31.310	
9	.	870819	.	.	13.2	7.7	6.60	6.58	31.643	31.554
							6.59		31.510	
							6.55		31.510	
8	12.0	870819	1148	1156	0.5	8.1	7.94	7.92	30.569	30.569
							7.87		30.569	
							7.95		30.569	
8	.	870819	.	.	6.0	7.9	.	.	30.723	30.722
							.		30.721	
8	.	870819	.	.	11.9	7.8	6.16	6.18	31.215	31.196
							6.21		31.186	
							6.16		31.186	
WD-2	3.0	870820	0445	0525	0.5	7.9	6.87	6.83	31.559	30.900
							6.77		30.571	
							6.84		30.571	
WD-2	.	870820	.	.	2.9	7.9	6.89	6.88	31.549	31.531
							6.87		31.522	
							.		31.522	
14	9.7	870820	0551	0607	0.5	8.0	8.02	8.06	30.640	30.633
							8.01		30.629	
							8.14		30.629	
14	.	870820	.	.	9.4	7.7	5.89	5.92	31.387	31.381
							5.97		31.378	
							5.89		31.378	

SALINITY, DISSOLVED OXYGEN, AND PH
FOR BAY STATIONS AUG. 20,1987

STA	T_DEPTH meters	DATE	TIME_ON hours	TIME_OFF hours	P_DEPTH meters	PH	DIS_O2 mg/l	O2_AV mg/l	SAL 0/00	SAL_AV 0/00
NH	7.0	870820	0647	0655	0.5	8.0	8.36	8.36	31.143	31.110
							8.37		31.093	
							8.35		31.093	
NH	.	870820	.	.	6.5	7.9	8.03	7.63	31.155	31.148
							7.35		31.145	
							7.52		31.145	
13	32.0	870820	0753	0810	0.5	8.0	8.18	8.16	30.306	30.303
							8.17		30.302	
							8.14		30.302	
13	.	870820	.	.	15.0	7.6	.	.	31.482	31.478
							.		31.473	
13	.	870820	.	.	31.2	7.6	6.04	6.02	31.610	31.615
							6.01		31.618	
							6.00		31.618	
12	23.0	870820	0828	0844	0.5	8.0	7.48	7.50	30.217	30.216
							7.50		30.216	
							7.51		30.216	
12	.	870820	.	.	10.0	7.7	.	.	31.392	31.354
							.		31.316	
12	.	870820	.	.	19.5	7.6	5.50	5.50	31.376	31.379
							5.50		31.381	
							5.50		31.381	
18	11.0	870820	0858	0907	0.5	8.1	7.98	8.00	30.067	30.054
							8.01		30.048	
							8.00		30.048	
18	.	870820	.	.	10.7	7.7	5.19	5.21	31.207	31.226
							5.23		31.236	
							5.20		31.236	
KR	2.2	870820	0934	0940	0.5	7.9	5.27	5.56	29.688	29.693
							5.69		29.696	
							5.73		29.696	
KR	.	870820	.	.	2.3	7.9	5.68	5.71	29.715	29.694
							5.75		29.684	
							5.71		29.684	

SALINITY, DISSOLVED OXYGEN, AND PH
FOR BAY STATIONS AUG. 20,1987

STA	T_DEPTH meters	DATE	TIME_ON hours	TIME_OFF hours	P_DEPTH meters	PH	DIS_O2 mg/l	O2_AV mg/l	SAL 0/00	SAL_AV 0/00
17	10.0	870820	0958	1007	0.5	8.0	7.72	7.72	29.250	29.260
							7.75		29.265	
							7.69		29.265	
17	.	870820	.	.	9.1	7.7	4.73	4.74	30.853	30.848
							4.75		30.845	
							4.73		30.845	
J	8.8	870820	1019	1029	0.5	.	7.78	7.90	27.228	27.228
							7.97		.	
							7.94		.	
J	.	870820	.	.	8.1	.	5.07	5.11	29.780	29.780
							5.12		.	
							5.14		.	
19	7.0	870820	1112	1120	0.5	7.9	6.12	6.13	30.480	30.479
							6.15		30.478	
							6.11		30.478	
19	.	870820	.	.	5.5	7.8	5.30	5.29	30.760	30.739
							5.30		30.729	
							5.28		30.729	
20	12.0	870820	1146	1155	0.5	8.1	8.16	8.15	31.254	31.251
							8.10		31.250	
							8.20		31.250	
20	.	870820	.	.	10.6	7.9	7.17	7.13	31.484	31.487
							7.13		31.488	
							7.10		31.488	
22	24.0	870820	1214	1227	0.5	8.0	8.11	8.16	31.447	31.477
							8.18		31.492	
							8.19		31.492	
22	.	870820	.	.	23.6	7.6	4.82	4.78	31.737	31.738
							4.73		31.739	
							.		31.739	

HYDROGRAPHIC TABLES

Variable	Description
Depth	Meters
Seconds	Sample time
Temperature	°C
Turbidity	% absorbance
Salinity	parts per thousand
Sigma_t	potential density

THE HYDROX CRUISE SPRAY 7
WICKFORD HARBOR STATION HYDROGRAPHIC DATA
AUGUST 19, 1987 04:40 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.2	3	23.788	41.2	30.473	20.306
2	0.2	8	23.797	41.3	30.477	20.307
3	0.2	13	23.795	41.1	30.489	20.316
4	0.2	18	23.800	40.7	30.486	20.313
5	0.2	23	23.807	40.5	30.489	20.313
6	0.2	28	23.802	40.7	30.492	20.317
7	0.2	33	23.800	40.7	30.491	20.317
8	0.3	38	23.807	40.9	30.478	20.305
9	0.4	43	23.805	41.1	30.485	20.310
10	0.8	48	23.788	41.1	30.504	20.330
11	0.9	53	23.775	41.1	30.502	20.332
12	1.1	58	23.764	41.2	30.494	20.329
13	1.2	63	23.744	41.4	30.505	20.343
14	1.4	68	23.700	41.9	30.511	20.361
15	1.5	73	23.660	42.4	30.520	20.379
16	1.6	78	23.633	43.2	30.533	20.397
17	1.7	83	23.598	43.7	30.534	20.407
18	1.9	88	23.533	43.8	30.552	20.440
19	2.0	93	23.452	44.8	30.550	20.461
20	2.1	98	23.334	46.4	30.559	20.502
21	2.3	103	23.121	48.7	30.590	20.585
22	2.5	108	22.809	54.4	30.657	20.724
23	2.9	113	22.668	56.7	30.688	20.787
24	2.9	122	22.633	58.5	30.704	20.809
25	2.9	127	22.627	58.3	30.706	20.812
26	2.9	132	22.629	57.7	30.707	20.813
27	2.9	137	22.629	57.7	30.705	20.811
28	2.9	142	22.632	57.8	30.703	20.808
29	2.9	147	22.634	58.3	30.698	20.804
30	2.5	152	22.654	57.3	30.700	20.800
31	2.4	157	22.678	56.6	30.700	20.793
32	2.2	162	22.691	55.6	30.696	20.787
33	2.0	167	22.695	54.6	30.696	20.786
34	1.8	172	22.710	53.6	30.699	20.783
35	1.6	177	22.805	45.7	30.684	20.746
36	1.6	182	22.877	45.4	30.634	20.688
37	1.5	187	22.868	43.2	30.691	20.733
38	1.1	192	23.180	42.3	30.637	20.604
39	0.6	197	23.466	42.1	30.625	20.514
40	0.4	202	23.599	41.2	30.576	20.438
41	0.4	207	23.669	40.8	30.565	20.410
42	0.3	212	23.757	41.2	30.526	20.355

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 7 HYDROGRAPHIC DATA
AUGUST 19, 1987 05:27 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.5	3	23.132	36.3	30.238	20.316
2	0.4	8	23.138	36.3	30.253	20.326
3	0.4	13	23.146	36.1	30.250	20.321
4	0.4	18	23.142	36.4	30.256	20.327
5	0.4	23	23.144	36.3	30.255	20.325
6	0.9	28	23.152	36.5	30.251	20.321
7	1.2	33	23.145	35.8	30.245	20.318
8	1.4	38	23.149	36.3	30.256	20.325
9	1.8	43	23.162	36.0	30.255	20.320
10	2.1	48	23.165	36.2	30.253	20.318
11	2.3	53	23.162	36.0	30.255	20.320
12	2.7	58	23.156	36.3	30.253	20.321
13	3.0	63	23.158	36.1	30.258	20.324
14	3.3	68	23.155	35.8	30.251	20.320
15	3.6	73	23.153	36.2	30.258	20.325
16	3.9	78	23.158	36.2	30.263	20.327
17	4.3	83	23.148	36.2	30.267	20.333
18	4.4	88	23.124	36.2	30.278	20.349
19	4.8	93	23.091	36.9	30.300	20.374
20	5.2	98	22.584	41.1	30.336	20.544
21	5.3	103	21.954	44.9	30.649	20.955
22	5.8	108	21.660	47.1	30.726	21.093
23	6.3	113	21.564	48.1	30.767	21.150
24	6.4	118	21.531	49.0	30.782	21.170
25	6.8	123	21.501	51.8	30.792	21.187
26	6.9	128	21.499	52.4	30.788	21.184
27	7.0	133	21.495	54.7	30.794	21.189
28	6.9	138	21.495	55.2	30.791	21.187
29	6.8	143	21.497	52.9	30.793	21.188

THE HYDROX CRUISE SPRAY 7
GREENWICH BAY STATION HYDROGRAPHIC DATA
AUGUST 19, 1987 06:00 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	24.716	70.5	29.449	19.264
2	0.3	8	24.745	70.9	29.449	19.255
3	0.2	13	24.693	70.5	29.454	19.274
4	0.3	18	24.744	70.6	29.462	19.265
5	0.3	23	24.722	70.4	29.464	19.273
6	0.3	28	24.731	70.7	29.455	19.264
7	0.5	33	24.734	70.5	29.466	19.271
8	0.7	38	24.732	70.4	29.470	19.274
9	0.9	43	24.754	70.9	29.466	19.265
10	1.1	48	24.772	70.8	29.482	19.272
11	1.3	53	24.774	71.0	29.471	19.263
12	1.5	58	24.774	71.0	29.476	19.267
13	1.6	63	24.802	71.5	29.470	19.254
14	1.8	68	24.807	71.9	29.465	19.248
15	1.9	73	24.744	70.4	29.457	19.261
16	2.1	78	24.721	70.4	29.464	19.273
17	2.3	83	24.662	68.4	29.474	19.298
18	2.4	88	24.646	68.2	29.479	19.307
19	2.6	93	24.642	68.7	29.479	19.308
20	2.9	98	24.638	69.1	29.482	19.311
21	3.1	103	24.632	69.3	29.486	19.315
22	3.3	108	24.629	69.3	29.490	19.320
23	3.3	113	24.625	69.5	29.493	19.323

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 6 HYDROGRAPHIC DATA
AUGUST 19, 1987 06:09 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	24.439	61.9	29.665	19.507
2	0.2	8	24.439	62.0	29.667	19.509
3	0.2	13	24.432	61.7	29.662	19.507
4	0.2	18	24.425	61.9	29.659	19.507
5	0.3	23	24.425	61.9	29.661	19.509
6	0.5	28	24.445	61.6	29.676	19.514
7	0.7	33	24.456	61.6	29.682	19.515
8	1.0	38	24.450	61.5	29.683	19.518
9	1.2	43	24.463	61.6	29.685	19.515
10	1.4	48	24.450	61.6	29.685	19.520
11	1.6	53	24.469	61.1	29.699	19.524
12	1.8	58	24.362	55.6	29.765	19.605
13	2.0	63	24.338	57.7	29.788	19.630
14	2.2	68	24.403	59.8	29.740	19.574
15	2.5	73	24.450	61.3	29.706	19.535
16	2.9	78	24.430	59.1	29.732	19.560
17	3.0	83	24.362	56.3	29.772	19.611
18	3.2	88	24.370	55.8	29.769	19.606
19	3.4	93	24.239	54.9	29.827	19.688
20	3.6	98	24.218	54.5	29.839	19.703
21	3.8	103	24.231	54.6	29.833	19.695
22	4.0	108	24.258	54.8	29.817	19.675
23	4.1	113	24.098	53.5	29.838	19.737
24	4.4	118	23.880	52.9	29.926	19.866
25	4.5	123	23.795	55.7	29.951	19.910

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 5 HYDROGRAPHIC DATA
AUGUST 19, 1987 06:26 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	24.192	40.0	29.259	19.273
2	0.2	8	24.189	40.0	29.263	19.277
3	0.2	13	24.189	40.0	29.266	19.279
4	0.2	18	24.189	40.1	29.261	19.275
5	0.3	23	24.191	40.3	29.262	19.276
6	0.4	28	24.192	40.3	29.267	19.279
7	1.0	33	24.209	40.3	29.268	19.275
8	1.3	38	24.211	40.4	29.270	19.276
9	1.6	43	24.211	40.3	29.272	19.278
10	1.9	48	24.205	40.2	29.276	19.282
11	2.1	53	24.196	39.5	29.271	19.281
12	2.4	58	24.205	39.3	29.312	19.310
13	2.6	63	24.215	38.9	29.334	19.323
14	2.9	68	24.239	38.9	29.331	19.314
15	3.1	73	24.239	39.0	29.360	19.336
16	3.3	78	24.242	38.1	29.441	19.396
17	3.5	83	24.219	37.0	29.596	19.520
18	3.7	88	24.189	37.0	29.611	19.539
19	4.0	93	24.154	36.7	29.616	19.553
20	4.2	98	24.147	36.6	29.615	19.555
21	4.4	103	24.128	37.3	29.627	19.570
22	4.7	108	24.064	39.2	29.678	19.626
23	4.9	113	23.855	42.4	29.843	19.811
24	5.1	118	23.710	43.1	29.943	19.928
25	5.4	123	23.639	43.8	29.998	19.991
26	5.6	128	23.575	43.4	30.076	20.067
27	5.8	133	23.503	42.6	30.130	20.129
28	6.0	138	23.359	42.6	30.218	20.236
29	6.3	143	23.312	41.7	30.284	20.300
30	6.5	148	23.302	42.1	30.301	20.316
31	6.7	153	23.301	42.7	30.305	20.319
32	7.0	158	23.301	43.7	30.310	20.323
33	7.0	163	23.303	42.9	30.308	20.321
34	6.9	168	23.308	43.1	30.303	20.315
35	6.9	173	23.303	43.1	30.311	20.323
36	6.9	178	23.305	43.1	30.313	20.314
37	6.9	183	23.305	43.4	30.313	20.324
38	6.8	188	23.305	43.4	30.310	20.322

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 10 HYDROGRAPHIC DATA
AUGUST 19, 1987 06:52 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.2	3	24.286	35.8	29.454	19.393
2	0.2	8	24.293	35.8	29.468	19.401
3	0.2	13	24.262	35.9	29.465	19.408
4	0.2	18	23.878	35.0	29.593	19.616
5	0.3	23	23.912	35.2	29.602	19.613
6	0.5	28	23.929	35.8	29.580	19.592
7	0.9	33	24.027	35.3	29.547	19.538
8	1.3	38	24.004	34.9	29.528	19.530
9	1.5	43	23.412	33.4	29.746	19.864
10	1.8	48	23.265	33.4	29.829	19.969
11	2.0	53	23.254	33.4	29.842	19.982
12	2.2	58	23.271	33.7	29.841	19.976
13	2.5	63	23.214	33.1	29.826	19.981
14	2.9	68	22.967	32.3	29.977	20.165
15	3.1	73	22.570	31.0	30.217	20.458
16	3.3	78	22.354	30.9	30.326	20.600
17	3.5	83	22.274	32.7	30.333	20.627
18	3.9	88	22.121	36.9	30.358	20.688
19	4.1	93	22.003	41.2	30.399	20.752
20	4.3	98	21.967	41.5	30.417	20.775
21	4.6	103	21.954	41.2	30.414	20.777
22	4.9	108	21.947	41.2	30.408	20.774
23	5.1	113	21.911	41.2	30.420	20.783
24	5.4	118	21.884	43.3	30.420	20.800
25	5.5	123	21.869	43.2	30.419	20.804

THE HYDROX CRUISE SPRAY 7
WARREN RIVER STATION HYDROGRAPHIC DATA
AUGUST 19, 1987 07:05 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	24.568	37.4	29.526	19.365
2	0.3	8	24.566	37.5	29.532	19.370
3	0.3	13	24.562	37.8	29.535	19.373
4	0.3	18	24.550	37.9	29.540	19.381
5	0.4	23	24.550	37.6	29.540	19.381
6	0.6	28	24.543	37.7	29.544	19.386
7	1.0	33	24.533	37.3	29.540	19.386
8	1.4	38	24.492	82.1	29.557	19.411
9	1.6	43	24.476	37.0	29.557	19.415
10	1.8	48	24.460	36.5	29.562	19.424
11	2.0	53	24.439	35.9	29.571	19.437
12	2.2	58	24.416	35.8	29.581	19.451
13	2.4	63	24.422	35.5	29.580	19.448
14	2.6	68	24.379	34.6	29.574	19.456
15	2.9	73	24.295	34.3	29.609	19.507
16	3.2	78	24.178	33.5	29.621	19.550
17	3.4	83	23.853	31.9	29.703	19.706
18	3.6	88	23.702	30.8	29.731	19.771
19	3.9	93	23.577	30.6	29.783	19.845
20	4.1	98	23.541	30.6	29.788	19.859
21	4.3	103	23.310	31.8	29.792	19.928
22	4.5	108	23.180	35.6	29.856	20.014
23	4.8	113	23.168	35.8	29.862	20.022
24	5.1	118	23.149	36.0	29.866	20.030
25	5.3	123	23.107	36.4	29.882	20.054
26	5.3	128	23.094	35.9	29.893	20.066
27	5.2	133	23.153	36.0	29.869	20.031
28	4.8	138	23.179	34.7	29.876	20.029

THE HYDROX CRUISE SPRAY 7
BRISTOL HARBOR STATION HYDROGRAPHIC DATA
AUGUST 19, 1987 07:39 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.4	3	22.956	28.3	30.317	20.426
2	0.4	8	22.963	27.8	30.312	20.420
3	0.4	13	22.959	29.3	30.320	20.427
4	0.4	18	22.963	29.5	30.315	20.422
5	0.5	23	22.960	29.6	30.319	20.426
6	0.6	28	22.961	29.3	30.321	20.427
7	0.9	33	22.961	28.8	30.321	20.427
8	1.0	38	22.963	29.9	30.317	20.424
9	1.1	43	22.956	31.4	30.322	20.429
10	1.3	48	22.953	32.9	30.321	20.430
11	1.5	53	22.946	35.7	30.326	20.435
12	1.6	58	22.942	34.9	30.324	20.435
13	1.8	63	22.826	37.9	30.339	20.479
14	2.0	68	22.739	37.9	30.378	20.533
15	2.2	73	22.724	40.0	30.361	20.524
16	2.4	78	22.695	39.0	30.362	20.533
17	2.6	83	22.677	38.7	30.370	20.544
18	2.7	88	22.641	37.7	30.381	20.562
19	3.0	93	22.627	36.5	30.382	20.567
20	3.2	98	22.558	34.5	30.390	20.592
21	3.4	103	22.513	33.8	30.399	20.612
22	3.6	108	22.511	34.0	30.401	20.614
23	3.9	113	22.506	32.4	30.396	20.611
24	4.1	118	22.488	33.4	30.395	20.615
25	4.3	123	22.460	40.8	30.401	20.627
26	4.5	128	22.446	42.1	30.403	20.633
27	4.7	133	22.443	43.4	30.405	20.635
28	4.9	138	22.443	44.9	30.404	20.635
29	5.2	143	22.443	45.4	30.404	20.635
30	5.4	148	22.444	50.0	30.403	20.634

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 11 HYDROGRAPHIC DATA
AUGUST 19, 1987 07:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	23.476	26.1	29.912	19.972
2	0.3	8	23.460	25.5	29.938	19.996
3	0.3	13	23.436	25.3	29.944	20.007
4	0.3	18	23.421	26.0	29.941	20.010
5	0.3	23	23.426	25.6	29.935	20.003
6	0.8	28	23.429	25.1	29.920	19.991
7	1.2	33	23.408	25.0	29.915	19.994
8	1.6	38	23.410	25.0	29.917	19.994
9	1.8	43	23.404	24.9	29.913	19.993
10	2.2	48	23.408	25.2	29.918	19.996
11	2.5	53	23.410	24.8	29.914	19.992
12	2.7	58	23.402	24.9	29.913	19.994
13	3.0	63	23.391	25.2	29.934	20.013
14	3.2	68	23.373	25.2	29.952	20.031
15	3.5	73	23.384	25.1	29.926	20.008
16	3.7	78	23.374	25.4	29.964	20.040
17	4.0	83	23.344	25.4	30.003	20.078
18	4.2	88	23.319	25.5	30.022	20.100
19	4.5	93	23.262	25.5	30.071	20.153
20	4.7	98	23.231	25.0	30.108	20.190
21	5.0	103	23.217	25.5	30.123	20.205
22	5.2	108	23.209	25.4	30.134	20.216
23	5.5	113	23.193	25.4	30.145	20.228
24	5.8	118	23.187	25.9	30.154	20.237
25	5.9	123	23.189	26.0	30.153	20.236
26	6.2	128	23.186	25.8	30.152	20.236
27	6.5	133	23.189	26.2	30.161	20.241
28	6.7	138	23.187	25.8	30.167	20.247
29	6.9	143	23.177	25.9	30.187	20.265
30	7.2	148	23.040	26.3	30.243	20.346
31	7.4	153	22.747	26.8	30.303	20.474
32	7.6	158	22.065	28.2	30.399	20.735
33	7.9	163	19.779	32.7	30.962	21.768
34	8.3	168	19.169	33.0	31.138	22.056
35	8.7	173	18.984	33.5	31.137	22.102
36	9.1	178	18.675	35.8	31.211	22.235
37	9.4	183	18.551	37.9	31.249	22.294
38	9.6	188	18.525	38.5	31.246	22.298
39	9.9	193	18.450	41.2	31.252	22.321
40	10.2	198	18.396	46.3	31.269	22.347
41	10.4	203	18.377	48.9	31.269	22.352
42	10.7	208	18.349	52.4	31.272	22.361
43	10.9	213	18.331	52.8	31.277	22.369
44	11.2	218	18.320	52.1	31.273	22.369
45	11.4	223	18.316	51.9	31.274	22.370
46	11.7	228	18.308	49.3	31.271	22.370
47	11.9	233	18.304	48.4	31.271	22.371

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 11 HYDROGRAPHIC DATA
AUGUST 19, 1987 07:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	12.2	238	18.298	46.5	31.272	22.374
49	12.4	243	18.290	46.2	31.267	22.372
50	12.7	248	18.264	46.2	31.266	22.377
51	12.9	253	18.247	47.3	31.272	22.386
52	13.2	258	18.237	49.1	31.271	22.387
53	13.3	263	18.226	54.2	31.258	22.380
54	12.7	268	18.235	46.6	31.258	22.378
55	11.2	273	18.280	52.2	31.263	22.371
56	10.9	278	18.311	53.4	31.254	22.357
57	10.5	283	18.313	54.4	31.261	22.362
58	8.6	288	18.399	34.2	31.277	22.352
59	6.6	293	20.566	26.3	31.475	21.954
60	5.1	298	23.077	25.7	30.158	20.271
61	4.9	303	23.298	25.6	30.013	20.099
62	3.0	308	23.353	25.9	29.949	20.036
63	1.2	313	23.391	25.3	29.906	19.991
64	0.2	318	23.412	25.1	29.897	19.979
65	0.2	323	23.419	25.1	29.905	19.983
66	0.2	328	23.419	24.9	29.892	19.973
67	0.2	333	23.428	25.1	29.897	19.974

THE HYDROX CRUISE SPRAY 7
WICKFORD HARBOR STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 04:45 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	23.919	49.0	30.423	20.231
2	0.3	8	23.933	49.0	30.410	20.217
3	0.3	13	23.929	49.1	30.421	20.226
4	0.3	18	23.935	49.9	30.423	20.226
5	0.3	23	23.947	49.7	30.424	20.224
6	0.3	28	23.937	50.0	30.436	20.236
7	0.3	33	23.939	49.7	30.433	20.232
8	0.3	38	23.943	49.7	30.422	20.223
9	0.6	43	23.937	49.5	30.494	20.279
10	1.0	48	23.916	49.0	30.506	20.294
11	1.1	53	23.908	48.9	30.512	20.301
12	1.0	58	23.913	49.1	30.502	20.293
13	1.1	63	23.910	49.6	30.504	20.295
14	1.1	68	23.905	49.3	30.508	20.299
15	1.1	73	23.903	49.1	30.509	20.301
16	1.1	78	23.908	48.9	30.498	20.291
17	1.4	83	23.906	49.1	30.499	20.292
18	1.5	88	23.906	49.1	30.505	20.296
19	1.7	93	23.903	49.4	30.501	20.295
20	1.9	98	23.889	49.7	30.508	20.304
21	2.1	103	23.876	50.6	30.501	20.302
22	2.4	108	23.875	52.0	30.505	20.305
23	2.6	113	23.878	52.8	30.511	20.309
24	2.9	118	23.878	54.2	30.508	20.307
25	3.0	123	23.875	54.0	30.507	20.307
26	3.0	128	23.872	54.9	30.504	20.306
27	3.0	133	23.872	54.8	30.506	20.308
28	3.0	138	23.873	55.2	30.506	20.306
29	3.0	143	23.875	54.5	30.505	20.305
30	3.0	148	23.873	53.8	30.508	20.308
31	3.0	153	23.875	53.3	30.507	20.307
32	3.0	158	23.876	53.0	30.506	20.306
33	3.0	163	23.878	54.1	30.505	20.305
34	3.0	168	23.876	54.3	30.504	20.304
35	3.0	173	23.875	54.3	30.507	20.307

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 14 HYDROGRAPHIC DATA
AUGUST 20, 1987 05:51 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	22.932	17.5	30.604	20.649
2	0.3	8	22.929	17.6	30.606	20.652
3	0.3	13	22.930	17.6	30.602	20.648
4	0.4	18	22.929	17.1	30.606	20.652
5	0.3	23	22.930	17.2	30.597	20.645
6	0.3	28	22.926	18.1	30.608	20.654
7	0.3	33	22.928	17.5	30.604	20.651
8	0.4	38	22.925	17.4	30.606	20.653
9	0.5	43	22.920	17.4	30.612	20.658
10	0.6	48	22.923	17.4	30.610	20.656
11	0.6	53	22.923	17.6	30.612	20.658
12	0.8	58	22.923	17.4	30.612	20.658
13	1.1	63	22.923	17.5	30.618	20.662
14	1.4	68	22.923	17.6	30.612	20.658
15	1.6	73	22.912	17.3	30.612	20.661
16	1.9	78	22.911	17.5	30.624	20.670
17	2.2	83	22.923	17.5	30.612	20.658
18	2.6	88	22.920	17.3	30.616	20.662
19	3.2	93	22.922	17.4	30.621	20.665
20	3.5	98	22.926	17.8	30.626	20.668
21	3.9	103	22.920	17.7	30.624	20.668
22	4.4	108	22.915	17.6	30.623	20.668
23	5.1	113	22.881	17.8	30.630	20.683
24	5.3	118	22.770	17.9	30.648	20.729
25	5.3	123	22.805	18.1	30.659	20.727
26	5.3	128	22.799	18.2	30.633	20.709
27	5.3	133	22.803	18.1	30.654	20.724
28	5.3	138	22.791	18.0	30.644	20.720
29	5.3	143	22.755	18.0	30.661	20.742
30	5.3	148	22.760	17.8	30.653	20.735
31	5.3	153	22.755	18.0	30.656	20.738
32	5.3	158	22.744	18.0	30.658	20.743
33	5.6	163	22.660	18.0	30.666	20.773
34	6.2	168	22.579	18.5	30.687	20.811
35	6.3	173	22.513	17.9	30.693	20.834
36	6.2	178	22.485	17.9	30.715	20.859
37	6.3	183	22.491	18.3	30.714	20.856
38	6.6	188	22.165	19.0	30.642	20.892
39	7.4	193	21.159	22.8	30.763	21.256
40	8.0	198	20.382	23.2	31.023	21.659
41	8.3	203	20.001	22.3	31.076	21.798
42	8.4	208	19.714	24.3	31.142	21.922
43	8.7	213	19.340	27.0	31.118	21.998
44	9.1	218	18.682	35.6	31.271	22.278
45	9.2	223	18.518	36.7	31.328	22.362
46	9.2	228	18.457	36.8	31.341	22.388
47	9.4	233	18.384	39.2	31.356	22.417

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 14 HYDROGRAPHIC DATA
AUGUST 20, 1987 05:51 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	9.6	238	18.341	42.7	31.356	22.427
49	9.6	243	18.329	43.6	31.359	22.433
50	9.5	248	18.331	53.9	31.363	22.435
51	9.5	253	18.334	46.5	31.361	22.433
52	9.5	258	18.334	49.7	31.364	22.435
53	9.3	263	18.345	42.4	31.362	22.430
54	8.8	268	18.623	30.3	31.436	22.419
55	8.1	273	19.826	23.6	31.357	22.057
56	7.5	278	20.347	23.2	31.111	21.735
57	6.7	283	21.480	19.4	31.086	21.415
58	6.1	288	22.426	18.2	30.773	20.919
59	5.4	293	22.565	18.1	30.708	20.831
60	4.6	298	22.647	17.8	30.697	20.799
61	3.6	303	22.833	17.5	30.653	20.714
62	2.7	308	22.899	17.3	30.620	20.671
63	2.0	313	22.912	17.3	30.617	20.665
64	1.1	318	22.919	17.4	30.615	20.662
65	0.1	323	22.920	17.4	30.615	20.661

THE HYDROX CRUISE SPRAY 7
NEWPORT HARBOR STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 06:47 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	22.318	23.5	31.071	21.175
2	0.2	8	22.331	24.0	31.073	21.173
3	0.2	13	22.338	23.4	31.057	21.159
4	0.2	18	22.335	23.6	31.070	21.169
5	0.2	23	22.329	23.7	31.071	21.172
6	0.3	28	22.329	23.7	31.069	21.170
7	0.4	33	22.324	23.7	31.065	21.168
8	0.5	38	22.329	23.5	31.071	21.172
9	0.8	43	22.339	23.6	31.070	21.168
10	1.2	48	22.338	23.5	31.068	21.167
11	1.4	53	22.336	23.4	31.066	21.166
12	1.7	58	22.338	23.8	31.073	21.171
13	1.9	63	22.333	23.3	31.071	21.170
14	2.1	68	22.346	24.2	31.075	21.170
15	2.3	73	22.349	23.6	31.068	21.163
16	2.4	78	22.350	23.1	31.075	21.168
17	2.6	83	22.352	23.2	31.071	21.165
18	2.7	88	22.347	23.5	31.071	21.167
19	3.0	93	22.350	23.9	31.072	21.166
20	3.2	98	22.346	23.8	31.069	21.166
21	3.4	103	22.343	23.4	31.074	21.170
22	3.7	108	22.353	23.9	31.078	21.170
23	4.1	113	22.280	23.9	31.040	21.162
24	4.4	118	22.182	24.3	31.056	21.201
25	4.5	123	22.100	25.3	31.062	21.228
26	4.6	128	21.898	26.3	31.056	21.279
27	4.9	133	21.783	26.5	31.103	21.345
28	5.2	138	21.681	27.8	31.088	21.362
29	5.4	143	21.560	28.6	31.121	21.420
30	5.6	148	21.455	30.1	31.102	21.434
31	5.8	153	21.304	31.5	31.098	21.471
32	6.0	158	21.097	36.6	31.170	21.582
33	6.2	163	20.857	37.0	31.143	21.625
34	6.2	168	20.562	37.4	31.205	21.749
35	6.3	173	20.541	37.0	31.254	21.793
36	6.3	178	20.508	37.2	31.211	21.769
37	6.4	183	20.466	37.8	31.213	21.781
38	6.4	188	20.605	37.1	31.179	21.719
39	6.4	193	20.604	37.0	31.233	21.760
40	6.3	198	20.516	37.7	31.207	21.764
41	6.3	203	20.425	38.5	31.247	21.818
42	6.2	208	20.521	37.5	31.218	21.771
43	6.1	213	20.767	36.7	31.358	21.812
44	5.5	218	21.269	30.4	31.190	21.551
45	4.7	223	21.656	26.8	31.164	21.427
46	3.4	228	21.904	24.0	31.187	21.376
47	2.9	233	22.218	24.7	31.109	21.231

THE HYDROX CRUISE SPRAY 7
NEWPORT HARBOR STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 06:47 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	2.4	238	22.300	23.8	31.081	21.187
49	1.5	243	22.338	23.7	31.079	21.175
50	0.8	248	22.350	23.8	31.070	21.165

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 13 HYDROGRAPHIC DATA
AUGUST 20, 1987 07:53 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.2	3	23.193	21.0	30.279	20.330
2	0.2	8	23.192	20.9	30.270	20.323
3	0.2	13	23.192	20.9	30.278	20.329
4	0.2	18	23.193	20.9	30.277	20.328
5	0.2	23	23.193	20.8	30.279	20.330
6	0.2	28	23.190	20.8	30.281	20.333
7	0.3	33	23.187	21.4	30.270	20.325
8	0.4	38	23.187	20.6	30.270	20.324
9	0.9	43	23.185	20.8	30.266	20.323
10	1.3	48	23.117	21.2	30.361	20.413
11	1.4	53	23.074	20.8	30.382	20.441
12	1.5	58	23.035	20.8	30.388	20.457
13	1.8	63	22.992	20.7	30.409	20.485
14	1.9	68	22.964	20.5	30.423	20.504
15	2.2	73	22.960	20.5	30.434	20.513
16	2.3	78	22.944	20.6	30.434	20.517
17	2.6	83	22.915	20.5	30.446	20.535
18	2.9	88	22.898	20.5	30.455	20.546
19	3.1	93	22.888	20.5	30.459	20.552
20	3.4	98	22.877	20.6	30.459	20.555
21	3.7	103	22.871	20.5	30.457	20.556
22	3.9	108	22.854	20.5	30.461	20.563
23	4.1	113	22.853	23.8	30.465	20.566
24	4.3	118	22.836	20.7	30.468	20.574
25	4.5	123	22.829	21.1	30.476	20.581
26	4.8	128	22.820	21.4	30.476	20.584
27	5.0	133	22.805	21.5	30.484	20.595
28	5.2	138	22.788	22.0	30.499	20.610
29	5.3	143	22.772	21.9	30.515	20.627
30	5.5	148	22.730	22.3	30.525	20.646
31	5.7	153	22.717	22.5	30.531	20.655
32	5.8	158	22.667	22.8	30.532	20.669
33	6.0	163	22.636	23.3	30.542	20.686
34	6.2	168	22.571	22.6	30.571	20.726
35	6.3	173	22.516	22.7	30.577	20.746
36	6.5	178	22.543	23.0	30.580	20.741
37	6.7	183	22.378	23.5	30.590	20.793
38	6.8	188	22.276	24.0	30.605	20.833
39	7.0	193	22.224	24.3	30.619	20.859
40	7.2	198	22.134	24.5	30.609	20.875
41	7.4	203	22.022	24.6	30.694	20.970
42	7.6	208	21.810	25.6	30.679	21.017
43	7.8	213	21.652	25.9	30.734	21.101
44	8.0	218	21.564	26.1	30.769	21.152
45	8.2	223	21.530	25.9	30.771	21.163
46	8.4	228	21.560	25.9	30.742	21.132
47	8.7	233	21.504	25.9	30.762	21.163

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 13 HYDROGRAPHIC DATA
AUGUST 20, 1987 07:53 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	8.9	238	21.395	25.8	30.774	21.201
49	9.0	243	21.230	25.9	30.814	21.276
50	9.3	248	21.121	25.7	30.828	21.316
51	9.5	253	20.802	26.5	30.877	21.438
52	9.6	258	20.700	26.9	30.923	21.499
53	9.8	263	20.672	26.4	30.926	21.509
54	10.0	268	20.432	26.6	30.946	21.588
55	10.2	273	20.320	27.1	30.957	21.624
56	10.4	278	20.220	27.8	30.979	21.667
57	10.6	283	20.097	27.5	30.984	21.703
58	10.8	288	19.931	27.7	31.037	21.786
59	11.0	293	19.891	27.6	31.039	21.797
60	11.2	298	19.413	29.1	30.930	21.836
61	11.4	303	18.845	32.3	31.182	22.170
62	11.6	308	18.407	32.8	31.175	22.273
63	11.8	313	18.483	31.9	31.315	22.361
64	12.0	318	18.439	32.8	31.233	22.310
65	12.2	323	18.342	33.1	31.292	22.378
66	12.4	328	18.206	34.9	31.239	22.371
67	12.6	333	17.687	37.5	31.275	22.523
68	12.8	338	17.484	38.7	31.407	22.672
69	12.9	343	17.433	39.0	31.393	22.673
70	13.1	348	17.335	40.0	31.393	22.696
71	13.2	353	17.255	40.2	31.425	22.739
72	13.4	358	17.296	39.6	31.450	22.749
73	13.6	363	17.391	37.6	31.479	22.748
74	13.8	368	17.230	40.2	31.407	22.732
75	14.0	373	17.173	39.8	31.439	22.769
76	14.3	378	17.238	39.9	31.413	22.734
77	14.5	383	17.193	39.9	31.436	22.762
78	14.6	388	17.219	39.9	31.455	22.771
79	14.7	393	17.235	39.6	31.433	22.750
80	14.8	398	17.277	39.3	31.431	22.739
81	15.0	403	17.226	39.6	31.438	22.756
82	15.1	408	17.222	39.9	31.435	22.754
83	15.2	413	17.234	39.3	31.449	22.763
84	15.4	418	17.329	38.6	31.393	22.698
85	15.6	423	17.279	39.8	31.423	22.732
86	15.8	428	17.285	39.4	31.424	22.732
87	15.9	433	17.267	39.8	31.396	22.714
88	16.1	438	17.053	43.3	31.429	22.789
89	16.3	443	16.951	43.4	31.466	22.841
90	16.6	448	17.031	41.9	31.479	22.833
91	16.8	453	17.068	42.0	31.420	22.779
92	17.0	458	17.077	41.6	31.471	22.816
93	17.2	463	17.128	42.4	31.425	22.769
94	17.5	468	17.088	41.1	31.459	22.804

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 13 HYDROGRAPHIC DATA
AUGUST 20, 1987 07:53 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
95	17.7	473	17.213	39.9	31.455	22.772
96	18.0	478	17.274	39.6	31.426	22.736
97	18.3	483	17.380	38.9	31.428	22.712
98	18.6	488	17.348	39.9	31.401	22.699
99	18.9	493	17.361	39.9	31.425	22.714
100	19.2	498	17.333	39.9	31.410	22.709
101	19.9	503	17.353	39.8	31.410	22.705
102	20.1	508	17.348	39.6	31.410	22.706
103	20.4	513	17.306	39.9	31.413	22.718
104	20.6	518	17.297	39.7	31.422	22.727
105	20.8	523	17.306	39.7	31.419	22.723
106	21.1	528	17.319	39.4	31.423	22.723
107	21.3	533	17.304	39.6	31.414	22.719
108	21.5	538	17.271	40.0	31.421	22.732
109	21.8	543	17.281	40.1	31.426	22.734
110	22.1	548	17.212	40.4	31.418	22.744
111	22.3	553	17.228	40.9	31.424	22.744
112	22.5	558	17.282	40.6	31.433	22.739
113	22.7	563	17.284	40.0	31.447	22.750
114	22.9	568	17.405	39.4	31.401	22.686
115	23.2	573	17.401	39.6	31.383	22.673
116	23.5	578	17.260	41.7	31.402	22.720
117	23.9	583	17.391	40.2	31.427	22.709
118	24.2	588	17.317	40.9	31.370	22.682
119	24.5	593	17.233	41.1	31.423	22.743
120	24.8	598	17.249	40.6	31.458	22.766
121	25.3	603	17.376	41.2	31.390	22.684
122	25.6	608	17.238	40.9	31.400	22.724
123	26.0	613	17.176	41.6	31.442	22.771
124	26.2	618	17.184	42.0	31.420	22.752
125	26.5	623	17.141	42.0	31.454	22.788
126	26.8	628	17.204	41.2	31.417	22.745
127	27.1	633	17.093	42.3	31.427	22.779
128	27.4	638	16.863	43.5	31.473	22.867
129	27.6	643	16.853	42.9	31.474	22.870
130	28.0	648	16.776	44.0	31.486	22.897
131	28.2	653	16.787	44.5	31.483	22.892
132	28.5	658	16.773	44.5	31.488	22.899
133	28.8	663	16.763	44.4	31.489	22.902
134	29.1	668	16.744	45.1	31.489	22.906
135	29.5	673	16.741	44.7	31.488	22.906
136	29.8	678	16.706	45.2	31.491	22.917
137	30.0	683	16.685	45.6	31.501	22.929
138	30.1	688	16.704	45.9	31.504	22.928
139	30.2	693	16.719	45.3	31.489	22.913
140	30.4	698	16.711	45.3	31.496	22.920
141	30.6	703	16.712	45.4	31.492	22.916

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 13 HYDROGRAPHIC DATA
AUGUST 20, 1987 07:53 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
142	30.7	708	16.707	45.3	31.496	22.921
143	31.0	713	16.707	45.8	31.493	22.918
144	31.4	718	16.659	47.1	31.497	22.932
145	31.7	723	16.603	48.2	31.500	22.947
146	31.9	728	16.565	50.9	31.509	22.963
147	31.8	733	16.478	56.6	31.528	22.998
148	31.8	738	16.410	56.8	31.554	23.032
149	31.8	743	16.423	57.7	31.525	23.008
150	31.7	748	16.408	57.1	31.562	23.039

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 12 HYDROGRAPHIC DATA
AUGUST 20, 1987 08:28 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.1	3	23.930	33.7	30.189	20.051
2	0.2	8	24.020	32.5	30.194	20.029
3	0.2	13	23.973	31.7	30.189	20.039
4	0.2	18	23.886	33.4	30.180	20.057
5	0.1	23	23.967	31.9	30.217	20.061
6	0.4	28	23.871	32.3	30.204	20.079
7	0.9	33	23.940	31.9	30.175	20.037
8	1.1	38	23.905	32.9	30.172	20.046
9	1.5	43	23.835	34.5	30.154	20.052
10	2.1	48	23.511	37.2	30.265	20.229
11	2.6	53	23.317	35.6	30.281	20.296
12	3.1	58	23.088	34.4	30.372	20.429
13	3.3	63	23.028	34.1	30.400	20.468
14	3.5	68	22.984	33.5	30.396	20.477
15	3.7	73	22.813	35.8	30.428	20.549
16	4.0	78	22.712	34.9	30.466	20.607
17	4.2	83	22.688	36.9	30.469	20.616
18	4.5	88	22.664	35.7	30.477	20.629
19	4.7	93	22.626	35.6	30.482	20.643
20	5.1	98	22.627	37.3	30.489	20.648
21	5.4	103	22.577	35.0	30.479	20.654
22	5.7	108	22.503	34.0	30.489	20.682
23	6.0	113	22.419	35.8	30.488	20.705
24	6.3	118	21.513	34.8	30.519	20.976
25	6.8	123	20.145	36.3	30.797	21.548
26	7.2	128	19.330	38.9	31.085	21.976
27	7.6	133	19.178	38.9	31.103	22.027
28	8.0	138	19.031	39.6	31.172	22.117
29	8.3	143	18.816	40.0	31.158	22.159
30	8.7	148	18.586	40.4	31.238	22.277
31	9.1	153	18.463	40.8	31.266	22.329
32	9.4	158	18.436	40.8	31.274	22.342
33	9.8	163	18.389	41.1	31.278	22.355
34	10.2	168	18.352	41.3	31.285	22.370
35	10.6	173	18.326	41.5	31.284	22.376
36	10.9	178	18.295	41.5	31.298	22.394
37	11.2	183	18.225	41.1	31.325	22.432
38	11.6	188	18.197	40.6	31.299	22.418
39	11.9	193	18.181	40.2	31.282	22.409
40	12.4	198	18.141	40.7	31.342	22.465
41	12.6	203	18.215	40.8	31.303	22.417
42	12.9	208	18.171	40.1	31.295	22.422
43	13.2	213	18.091	39.9	31.317	22.458
44	13.6	218	18.085	40.0	31.330	22.470
45	13.9	223	18.076	40.0	31.329	22.470
46	14.4	228	18.102	40.1	31.326	22.462
47	14.7	233	18.084	40.3	31.325	22.466

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 12 HYDROGRAPHIC DATA
AUGUST 20, 1987 08:28 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	15.1	238	18.072	39.8	31.322	22.467
49	15.4	243	18.059	39.7	31.326	22.472
50	15.8	248	18.054	39.8	31.330	22.477
51	16.1	253	18.051	40.3	31.332	22.479
52	16.4	258	18.056	40.3	31.334	22.479
53	16.7	263	18.059	39.9	31.331	22.477
54	17.0	268	18.058	40.3	31.326	22.473
55	17.4	273	18.052	40.5	31.333	22.480
56	17.7	278	18.045	40.4	31.333	22.481
57	18.1	283	18.052	40.3	31.327	22.475
58	18.4	288	18.050	40.1	31.326	22.475
59	18.7	293	18.047	40.3	31.325	22.475
60	19.0	298	18.032	40.4	31.328	22.481
61	19.4	303	18.019	40.7	31.337	22.491
62	19.7	308	18.022	41.0	31.338	22.491
63	19.9	313	18.027	41.1	31.331	22.484
64	19.7	318	18.025	41.0	31.330	22.484
65	19.7	323	18.019	40.9	31.331	22.486
66	19.5	328	18.021	41.4	31.333	22.487
67	18.8	333	18.023	40.7	31.337	22.490
68	17.2	338	18.036	41.1	31.334	22.485
69	17.1	343	18.032	41.4	31.332	22.483
70	15.9	348	18.076	41.3	31.346	22.484
71	14.8	353	18.139	41.2	31.321	22.450
72	14.2	358	18.164	41.4	31.323	22.445
73	13.3	363	18.197	41.7	31.304	22.423
74	12.0	368	18.210	41.7	31.313	22.426
75	11.0	373	18.290	42.4	31.303	22.399
76	9.8	378	18.319	41.3	31.299	22.389
77	8.6	383	18.420	40.6	31.311	22.374
78	7.8	388	19.132	36.3	31.268	22.165
79	6.7	393	19.571	35.1	31.203	22.004
80	5.4	398	21.539	35.6	30.929	21.280
81	3.7	403	22.499	37.3	30.576	20.750
82	2.1	408	23.234	36.0	30.384	20.397
83	0.5	413	23.635	32.6	30.311	20.228

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 18 HYDROGRAPHIC DATA
AUGUST 20, 1987 08:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	24.646	38.8	30.034	19.725
2	0.3	8	24.638	38.6	30.032	19.726
3	0.3	13	24.676	38.6	30.012	19.699
4	0.3	18	24.689	38.9	30.003	19.689
5	0.3	23	24.693	38.6	30.016	19.697
6	0.3	28	24.692	38.5	30.001	19.687
7	0.3	33	24.688	38.5	30.017	19.700
8	0.3	38	24.701	38.6	30.013	19.693
9	0.7	43	24.711	38.8	30.012	19.689
10	1.0	48	24.708	38.9	30.011	19.690
11	1.4	53	24.716	39.1	30.013	19.689
12	1.8	58	24.719	38.9	30.016	19.690
13	2.2	63	24.709	38.5	30.012	19.690
14	2.6	68	24.689	38.6	30.018	19.700
15	3.1	73	24.682	37.7	30.023	19.706
16	3.5	78	24.673	37.8	30.023	19.709
17	3.9	83	24.672	37.6	30.024	19.710
18	4.3	88	24.652	37.5	30.022	19.714
19	4.6	93	24.202	36.1	30.003	19.831
20	4.9	98	23.388	32.2	30.328	20.311
21	5.3	103	23.166	30.9	30.363	20.401
22	5.7	108	22.966	33.8	30.405	20.489
23	6.1	113	22.833	39.5	30.430	20.545
24	6.4	118	22.753	43.7	30.442	20.577
25	6.7	123	22.477	43.1	30.486	20.687
26	7.0	128	22.374	43.0	30.533	20.751
27	7.2	133	22.338	43.7	30.548	20.773
28	7.5	138	22.307	45.7	30.548	20.781
29	7.8	143	22.260	48.1	30.545	20.792
30	8.2	148	21.887	50.7	30.559	20.905
31	8.6	153	21.388	57.9	30.710	21.154
32	9.0	158	21.187	64.4	30.748	21.237
33	9.3	163	20.618	57.0	30.775	21.408
34	9.7	168	19.943	50.7	30.884	21.667
35	10.0	173	19.631	53.2	31.091	21.904
36	10.4	178	19.529	54.6	31.091	21.930
37	10.8	183	19.477	55.2	31.110	21.958
38	10.9	188	19.414	55.3	31.131	21.989
39	10.9	193	19.439	55.4	31.121	21.975
40	10.9	198	19.428	55.9	31.120	21.978
41	10.9	203	19.376	55.5	31.134	22.001
42	10.9	208	19.352	56.1	31.145	22.016
43	10.6	213	19.394	55.3	31.149	22.008
44	10.1	218	19.457	56.1	31.116	21.967
45	9.8	223	19.758	52.0	31.183	21.942
46	9.6	228	20.298	51.7	30.999	21.662
47	9.2	233	20.430	68.5	30.962	21.600

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 18 HYDROGRAPHIC DATA
AUGUST 20, 1987 08:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	9.0	238	20.940	68.6	30.845	21.377
49	8.8	243	20.975	66.9	30.828	21.355
50	8.2	248	21.244	53.3	30.896	21.334
51	7.8	253	21.900	49.1	30.742	21.040
52	7.3	258	22.123	42.7	30.652	20.911
53	6.9	263	22.383	42.5	30.541	20.755
54	6.5	268	22.647	42.7	30.516	20.662
55	6.1	273	22.792	39.9	30.493	20.605
56	5.3	278	23.008	41.1	30.475	20.530
57	4.6	283	23.301	34.1	30.390	20.384
58	4.0	288	24.246	36.8	30.231	19.991
59	3.3	293	24.592	38.2	30.077	19.774
60	2.6	298	24.711	39.3	30.019	19.695

THE HYDROX CRUISE SPRAY 7
KICKAMUIT RIVER STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 09:34 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.1	3	25.761	44.3	29.675	19.122
2	0.1	8	25.759	44.1	29.674	19.121
3	0.1	13	25.758	44.2	29.672	19.120
4	0.1	18	25.756	44.0	29.673	19.121
5	0.1	23	25.759	43.8	29.676	19.123
6	0.1	28	25.761	44.0	29.675	19.122
7	0.1	33	25.759	44.0	29.674	19.121
8	0.1	38	25.761	44.2	29.675	19.122
9	0.2	43	25.762	44.0	29.672	19.119
10	0.3	48	25.762	44.0	29.672	19.118
11	0.5	53	25.762	44.0	29.672	19.118
12	1.0	58	25.761	44.0	29.672	19.119
13	1.0	63	25.761	44.0	29.672	19.119
14	1.6	68	25.762	44.0	29.671	19.118
15	1.6	73	25.761	44.0	29.670	19.118
16	1.7	78	25.762	44.1	29.671	19.118
17	1.8	83	25.762	44.0	29.671	19.118
18	2.0	88	25.762	44.1	29.674	19.120
19	2.3	93	25.761	43.9	29.672	19.119
20	2.4	98	25.759	44.1	29.673	19.120
21	2.3	103	25.761	44.0	29.672	19.119
22	2.3	108	25.762	44.0	29.671	19.118
23	2.4	113	25.761	43.8	29.672	19.119
24	2.4	118	25.761	43.8	29.672	19.119
25	2.5	123	25.761	43.9	29.672	19.119

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 17 HYDROGRAPHIC DATA
AUGUST 20, 1987 09:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.2	58	21.901	45.7	31.882	21.904
2	0.3	60	24.840	45.0	29.888	19.558
3	0.3	62	25.662	44.7	29.357	18.912
4	0.3	64	25.849	44.6	29.236	18.764
5	0.3	68	25.897	44.1	29.200	18.723
6	0.3	73	25.898	44.0	29.202	18.724
7	0.3	78	25.900	44.4	29.201	18.723
8	0.3	83	25.901	44.5	29.205	18.725
9	0.3	88	25.903	44.4	29.207	18.726
10	0.5	93	25.903	44.0	29.206	18.726
11	0.8	98	25.905	44.3	29.235	18.746
12	1.0	103	25.953	44.6	29.282	18.767
13	1.2	108	26.001	45.7	29.397	18.839
14	1.4	113	26.111	48.1	29.457	18.851
15	1.6	118	26.142	49.6	29.465	18.847
16	1.8	123	26.175	49.5	29.518	18.878
17	2.0	128	26.209	48.9	29.539	18.883
18	2.3	133	26.219	47.6	29.560	18.896
19	2.5	138	26.246	46.0	29.603	18.919
20	2.9	143	26.223	44.5	29.567	18.900
21	3.1	148	26.119	42.7	29.584	18.944
22	3.3	153	26.088	42.1	29.589	18.957
23	3.6	158	26.024	42.0	29.600	18.985
24	3.9	163	25.852	41.2	29.550	19.000
25	4.1	168	25.334	40.1	29.642	19.225
26	4.4	173	24.784	40.2	29.829	19.530
27	4.7	178	24.296	41.5	29.989	19.794
28	4.9	183	23.942	42.2	30.055	19.946
29	5.2	188	23.692	42.7	30.174	20.108
30	5.4	193	23.588	45.5	30.218	20.171
31	5.6	198	23.551	46.8	30.229	20.190
32	5.8	203	23.509	47.7	30.232	20.205
33	6.0	208	23.429	49.4	30.244	20.236
34	6.2	213	23.346	51.5	30.271	20.281
35	6.4	218	23.285	51.8	30.294	20.315
36	6.5	223	23.282	52.3	30.291	20.314
37	6.7	228	23.268	52.7	30.287	20.315
38	6.9	233	23.199	53.5	30.303	20.346
39	7.0	238	23.163	53.0	30.319	20.369
40	7.2	243	23.162	52.7	30.317	20.368
41	7.3	248	23.127	52.6	30.315	20.376
42	7.4	253	22.949	50.9	30.333	20.440
43	7.6	258	22.823	50.6	30.396	20.522
44	7.7	263	22.806	50.7	30.397	20.528
45	7.8	268	22.775	50.5	30.407	20.545
46	7.9	273	22.796	50.3	30.401	20.534
47	8.0	278	22.726	50.1	30.412	20.562

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 17 HYDROGRAPHIC DATA
AUGUST 20, 1987 09:58 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	8.1	283	22.667	50.5	30.431	20.593
49	8.3	288	22.626	50.6	30.438	20.610
50	8.4	293	22.568	51.0	30.438	20.625
51	8.6	298	22.451	51.5	30.465	20.679
52	8.7	303	22.347	51.7	30.484	20.721
53	8.8	308	22.207	51.6	30.514	20.783
54	8.9	313	22.051	51.7	30.563	20.863
55	9.0	318	22.006	51.9	30.573	20.883
56	9.1	323	21.848	52.8	30.600	20.947
57	9.3	328	21.698	54.4	30.607	20.993
58	9.3	333	21.420	57.5	30.703	21.141
59	9.4	338	21.288	58.2	30.714	21.184
60	9.5	343	21.083	61.7	30.744	21.262
61	9.7	348	20.778	65.5	30.830	21.408
62	9.8	353	20.676	67.2	30.870	21.465
63	9.9	358	20.557	67.4	30.900	21.520
64	10.0	363	20.493	67.7	30.916	21.549
65	10.2	368	20.458	68.3	30.919	21.559
66	10.3	373	20.384	70.6	30.950	21.602

THE HYDROX CRUISE SPRAY 7
TAUNTON RIVER STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 10:19 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.3	3	25.618	49.1	27.369	17.430
2	0.3	8	25.634	48.8	27.430	17.471
3	0.3	13	25.629	48.9	27.467	17.500
4	0.3	18	25.658	49.0	27.350	17.403
5	0.3	23	25.700	49.0	27.240	17.308
6	0.3	28	25.700	48.9	27.245	17.312
7	0.4	33	25.697	49.1	27.177	17.262
8	0.4	38	25.745	49.2	27.089	17.181
9	0.3	43	25.720	49.2	27.283	17.334
10	0.4	48	25.661	49.1	27.381	17.426
11	0.4	53	25.648	49.3	27.496	17.516
12	0.6	58	25.632	49.0	27.398	17.447
13	0.8	63	25.560	49.2	27.709	17.703
14	1.1	68	25.543	49.4	27.886	17.841
15	1.2	73	25.427	49.6	28.062	18.008
16	1.4	78	25.358	49.8	28.200	18.133
17	1.7	83	25.285	48.9	28.274	18.209
18	2.0	88	25.221	48.7	28.419	18.338
19	2.2	93	25.138	47.9	28.598	18.498
20	2.3	98	25.076	47.4	28.670	18.570
21	2.6	103	25.029	46.7	28.800	18.682
22	3.0	108	24.934	45.9	28.898	18.784
23	3.2	113	24.910	46.1	28.913	18.803
24	3.4	118	24.895	46.2	28.928	18.817
25	3.6	123	24.834	46.6	28.982	18.877
26	3.8	128	24.792	46.6	29.037	18.930
27	4.1	133	24.788	46.6	29.035	18.930
28	4.2	138	24.745	46.4	29.085	18.981
29	4.5	143	24.715	46.4	29.115	19.012
30	4.7	148	24.469	47.3	29.401	19.300
31	5.0	153	24.368	47.3	29.477	19.387
32	5.3	158	24.330	47.9	29.530	19.438
33	5.5	163	24.235	48.2	29.609	19.525
34	5.7	168	24.172	48.6	29.660	19.582
35	6.0	173	24.102	49.1	29.720	19.646
36	6.3	178	24.070	49.0	29.744	19.675
37	6.5	183	24.071	50.6	29.748	19.677
38	6.7	188	24.018	51.5	29.791	19.725
39	7.0	193	23.950	55.4	29.818	19.765
40	7.2	198	23.852	58.2	29.873	19.835
41	7.2	203	23.690	59.6	29.966	19.952
42	7.5	208	23.582	61.7	30.012	20.018
43	7.7	213	23.421	61.7	30.090	20.122
44	7.8	218	23.412	62.3	30.098	20.131
45	7.9	223	23.377	61.5	30.112	20.151
46	8.0	228	23.351	59.3	30.126	20.169
47	8.0	233	23.334	56.9	30.133	20.179

THE HYDROX CRUISE SPRAY 7
TAUNTON RIVER STATION HYDROGRAPHIC DATA
AUGUST 20, 1987 10:19 HOURS

SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
48	8.1	238	23.313	55.2	30.142	20.192
49	7.8	243	23.339	60.3	30.143	20.186
50	6.7	248	23.669	56.7	29.994	19.979
51	5.9	253	24.028	48.4	29.769	19.705
52	5.3	258	24.159	46.1	29.659	19.584
53	3.9	263	24.645	44.6	29.361	19.218
54	2.5	268	25.012	46.6	29.022	18.854
55	1.6	273	25.367	46.7	28.554	18.396
56	0.9	278	25.433	47.1	28.172	18.089

THE HYDROX CRUISE SPRAY 7
SINBADD STATION 19 HYDROGRAPHIC DATA
AUGUST 20, 1987 11:12 HOURS

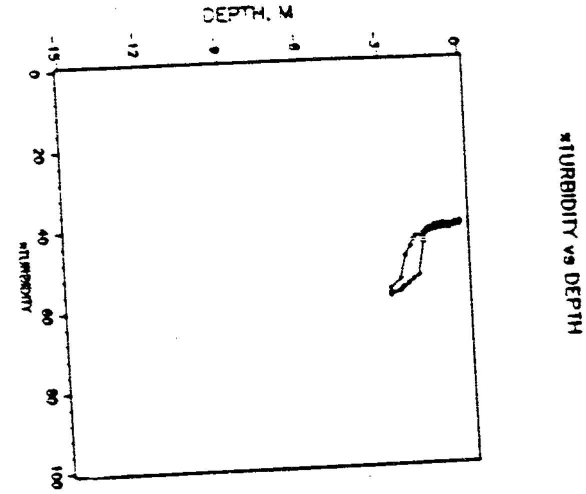
SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.5	3	24.246	32.4	30.474	20.175
2	0.5	8	24.251	32.4	30.474	20.173
3	0.5	13	24.253	32.3	30.475	20.173
4	0.5	18	24.255	32.3	30.476	20.174
5	0.5	23	24.261	32.1	30.475	20.171
6	0.9	28	24.258	32.0	30.472	20.169
7	1.1	33	24.253	32.1	30.475	20.173
8	1.4	38	24.239	32.3	30.474	20.176
9	1.6	43	24.231	32.2	30.477	20.181
10	1.9	48	24.224	32.5	30.482	20.187
11	2.2	53	24.206	32.4	30.485	20.195
12	2.4	58	24.137	32.4	30.502	20.227
13	2.7	63	24.077	32.3	30.534	20.269
14	3.1	68	24.036	32.6	30.547	20.291
15	3.4	73	23.962	33.3	30.561	20.322
16	3.7	78	23.849	35.4	30.588	20.375
17	3.9	83	23.801	38.2	30.602	20.401
18	4.2	88	23.777	41.4	30.608	20.412
19	4.5	93	23.713	45.1	30.628	20.446
20	4.9	98	23.591	41.3	30.665	20.508
21	5.1	103	23.289	44.6	30.741	20.652
22	5.4	108	21.704	61.0	30.901	21.214
23	5.6	113	20.990	75.2	31.254	21.674
24	5.6	118	20.919	76.8	31.283	21.715
25	5.6	123	20.902	76.7	31.307	21.738
26	5.6	128	20.896	77.7	31.308	21.740
27	5.3	133	21.032	59.3	31.553	21.890
28	4.0	138	23.377	38.6	30.840	20.702
29	2.2	143	23.893	32.5	30.618	20.386
30	0.8	148	24.167	32.4	30.505	20.221

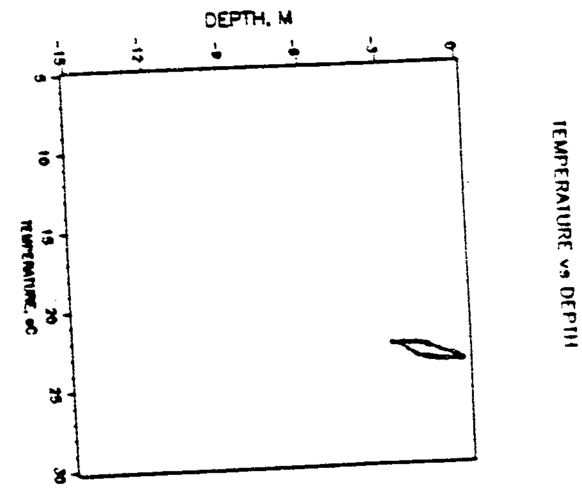
THE HYDROX CRUISE SPRAY 7
SINBADD STATION 20 HYDROGRAPHIC DATA
AUGUST 20, 1987 11:46 HOURS

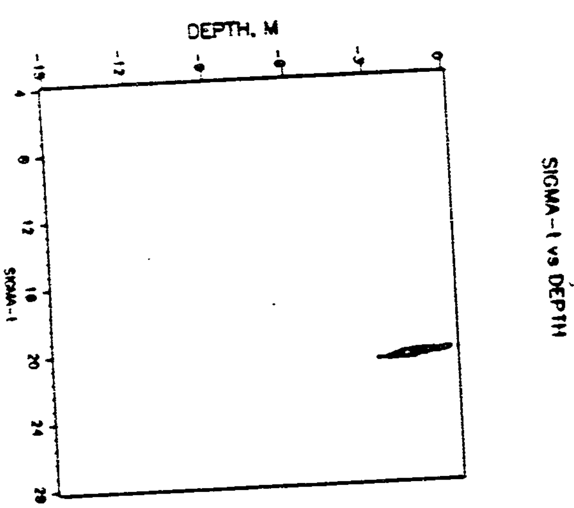
SCAN	DEPTH	SECONDS	TEMPERATURE	TURBIDITY	SALINITY	SIGMA-T
1	0.5	3	23.238	25.0	31.237	21.041
2	0.5	8	23.230	25.4	31.243	21.048
3	0.4	13	23.228	25.1	31.236	21.044
4	0.3	18	23.227	25.3	31.338	21.122
5	0.4	23	23.226	25.4	31.288	21.084
6	0.4	28	23.226	25.6	31.246	21.052
7	0.6	33	23.230	25.0	31.235	21.034
8	0.9	38	23.259	24.9	31.235	21.034
9	1.2	43	23.235	24.9	31.233	21.039
10	1.6	48	23.194	25.1	31.227	21.047
11	1.9	53	23.019	24.9	31.188	21.067
12	2.1	58	22.694	23.9	31.331	21.267
13	2.4	63	22.651	24.1	31.342	21.287
14	3.0	68	22.751	24.2	31.271	21.205
15	3.3	73	22.418	22.1	31.290	21.312
16	3.7	78	22.236	21.1	31.278	21.354
17	4.0	83	21.974	21.0	31.281	21.429
18	4.4	88	21.781	22.3	31.322	21.513
19	4.6	93	21.530	23.9	31.324	21.583
20	5.0	98	20.905	25.9	31.260	21.702
21	5.6	103	20.354	28.3	31.319	21.891
22	6.1	108	20.091	28.0	31.400	22.021
23	6.4	113	19.985	27.4	31.421	22.067
24	6.8	118	19.895	27.3	31.400	22.021
25	7.4	123	19.406	28.6	31.337	22.149
26	7.9	128	18.836	32.7	31.404	22.342
27	8.7	133	18.468	28.9	31.472	22.485
28	9.2	138	18.373	28.7	31.485	22.518
29	9.8	143	18.253	49.1	31.494	22.554
30	10.2	148	18.167	56.2	31.495	22.575
31	10.2	153	18.155	56.3	31.504	22.586
32	10.3	158	18.157	55.4	31.499	22.581
33	10.6	163	18.150	55.7	31.498	22.582
34	10.7	168	18.142	56.2	31.505	22.589
35	10.8	173	18.141	52.5	31.494	22.581
36	10.7	178	18.139	52.8	31.498	22.584
37	10.6	183	18.139	53.9	31.498	22.585
38	10.6	188	18.143	56.0	31.495	22.581
39	10.6	193	18.148	57.9	31.501	22.585

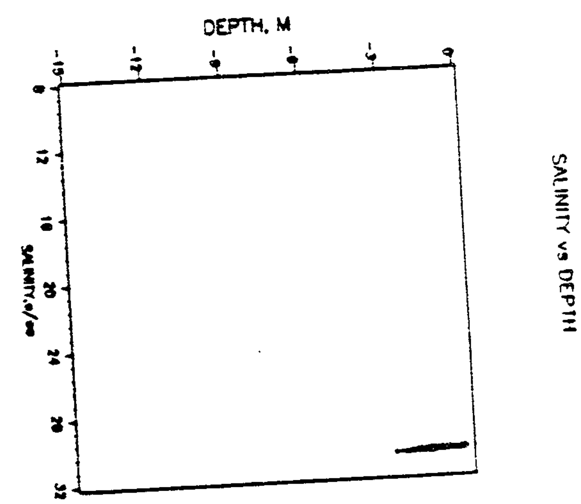
HYDROGRAPHIC PROFILES

HYDROX CRUISE WICKFORD HARBOR 04:40 8/19/87



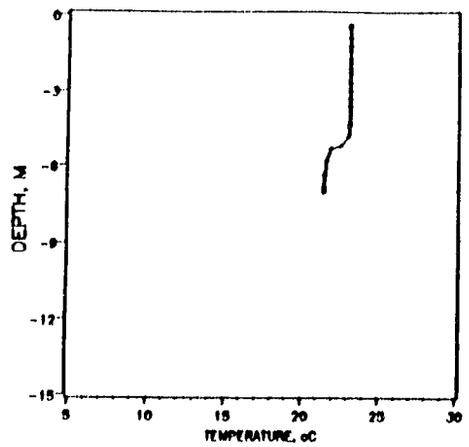




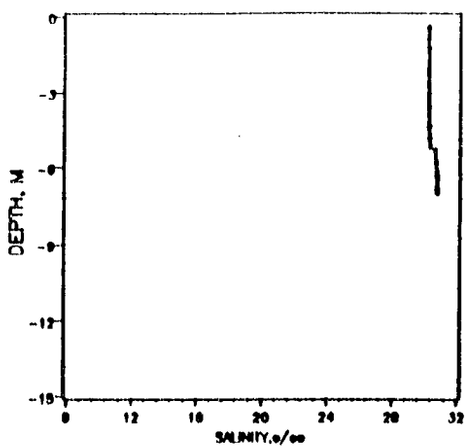


CYCLOPS CRUISE SINBAD STATION 7 05:27 8/ 9/87

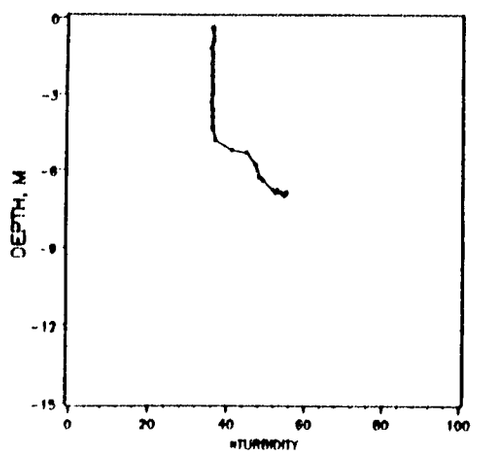
TEMPERATURE vs DEPTH



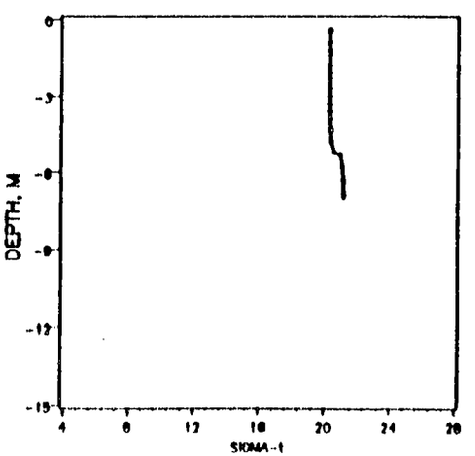
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

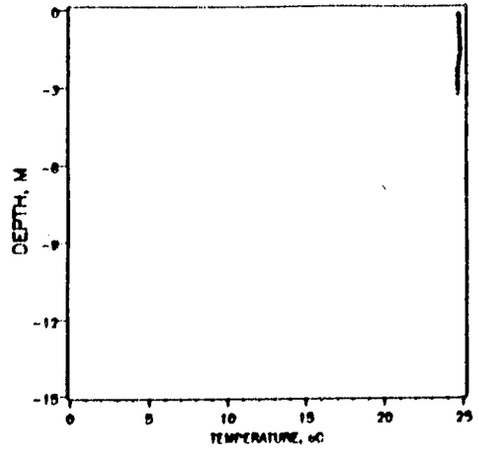


SIGMA-t vs DEPTH

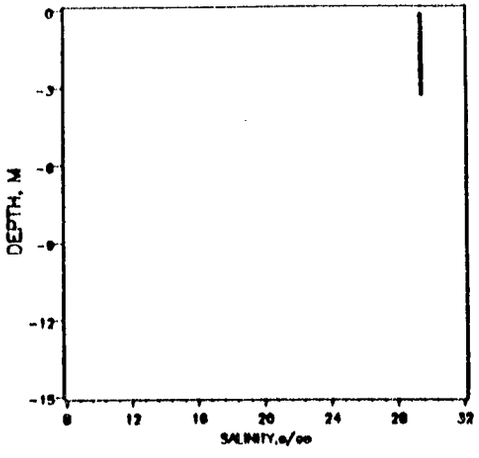


HYDROX CRUISE GREEN BAY 08:00 8/13/87

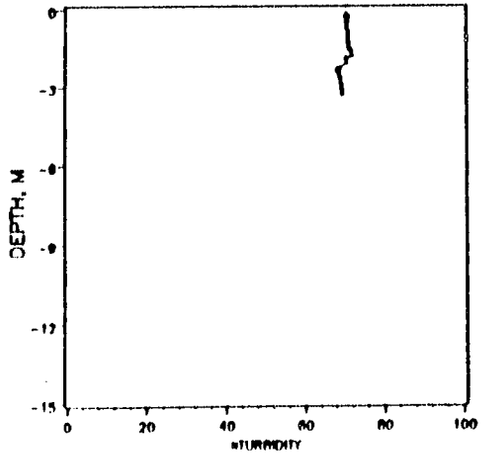
TEMPERATURE vs DEPTH



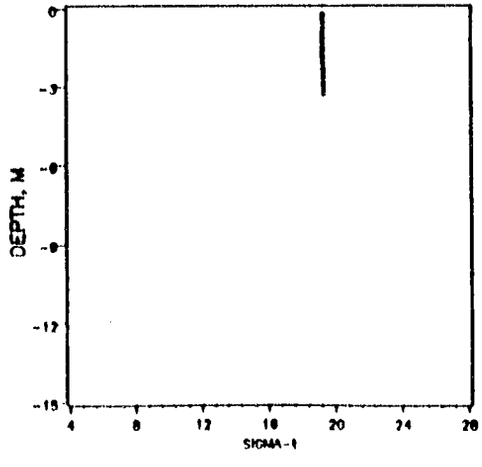
SALINITY vs DEPTH



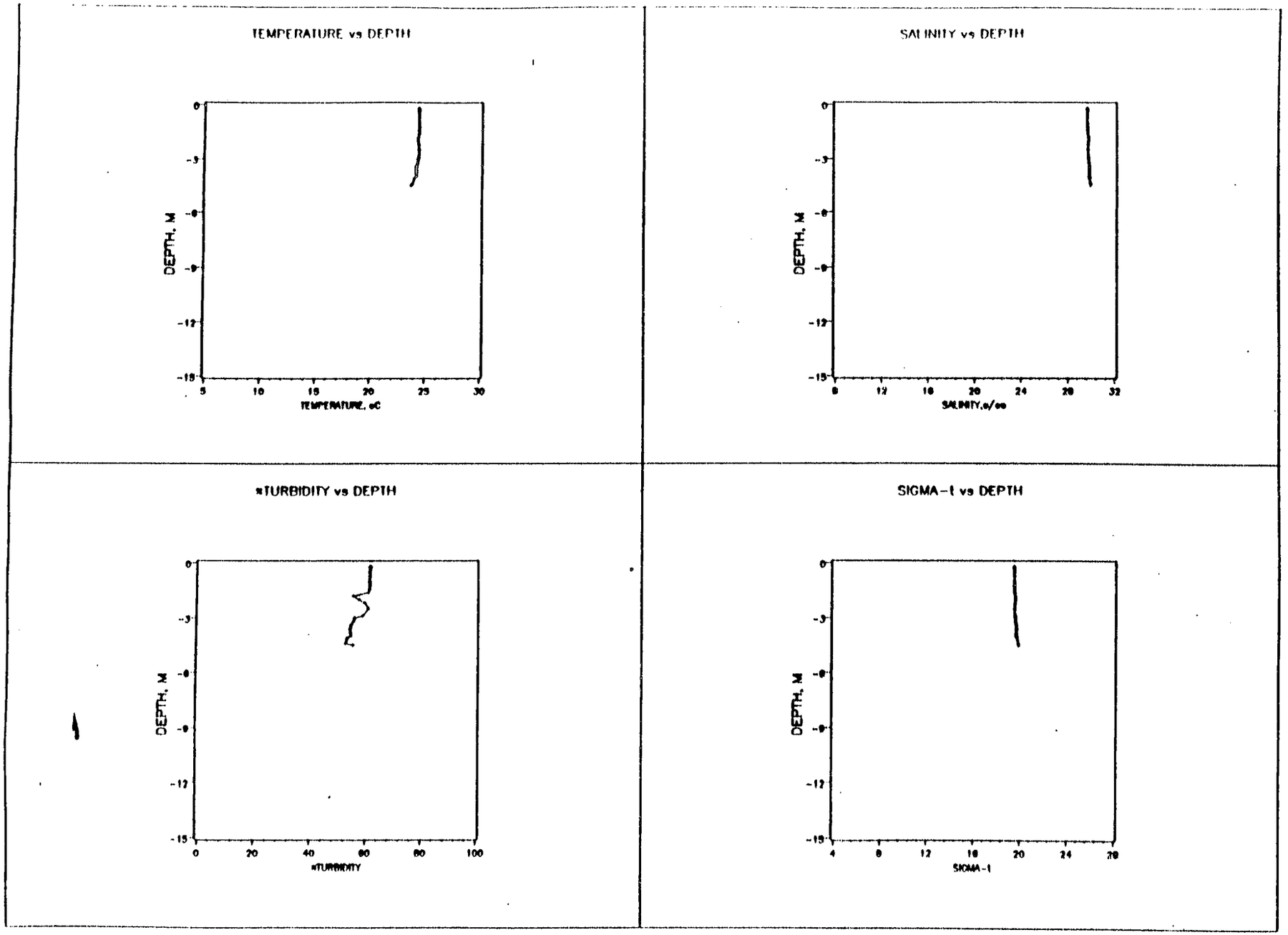
xTURBIDITY vs DEPTH



SIGMA-t vs DEPTH

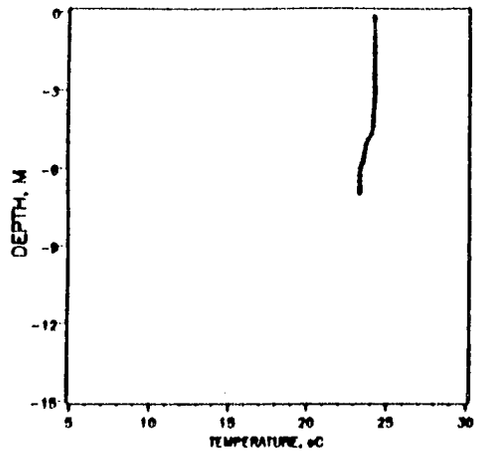


HYDROCK CRUISE SINBAD STATION 6 06:09 8/19/87

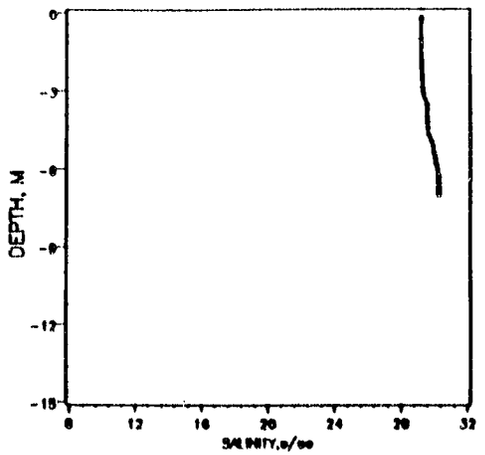


HYDROX CRUISE SINBAD STATION 5 06:26 8/13/87

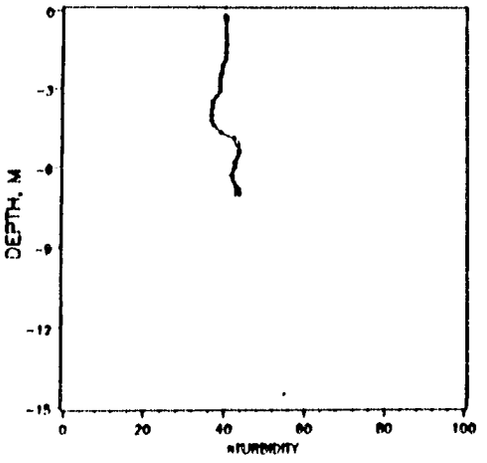
TEMPERATURE vs DEPTH



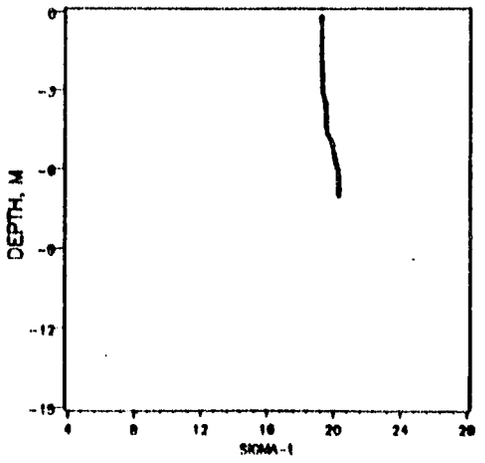
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

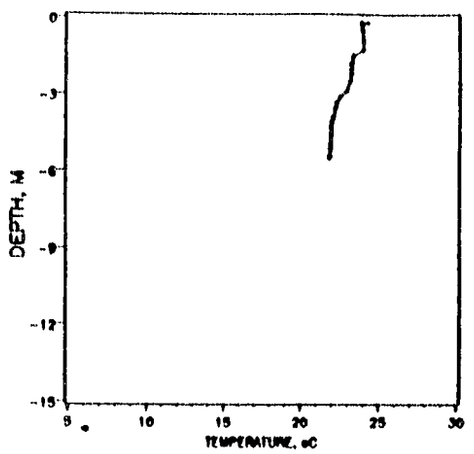


SIGMA-t vs DEPTH

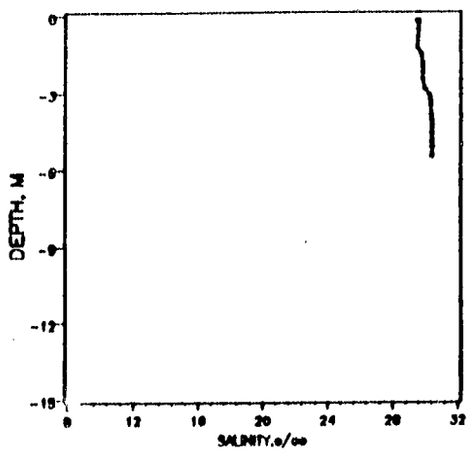


HYDROX CRUISE SINBAD STATION 10 06:52 8/13/87

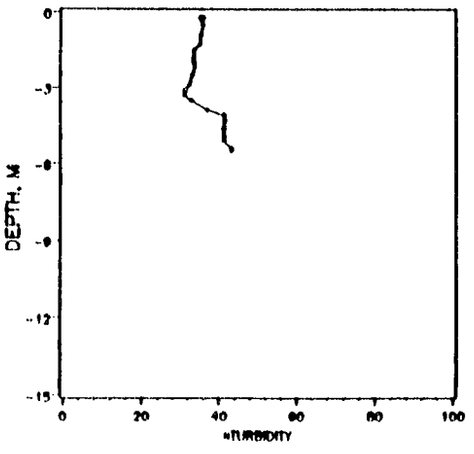
TEMPERATURE vs DEPTH



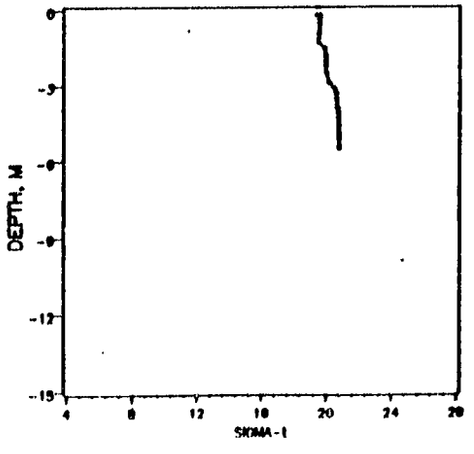
SALINITY vs DEPTH



xTURBIDITY vs DEPTH

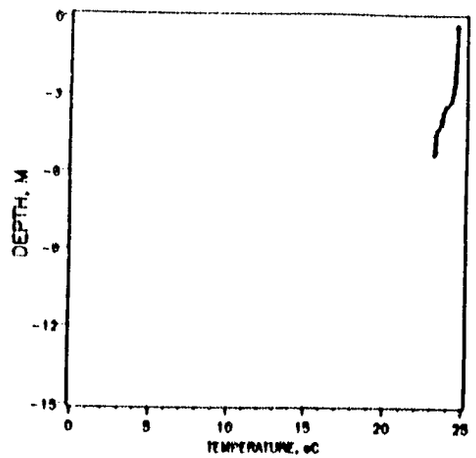


SIGMA-t vs DEPTH

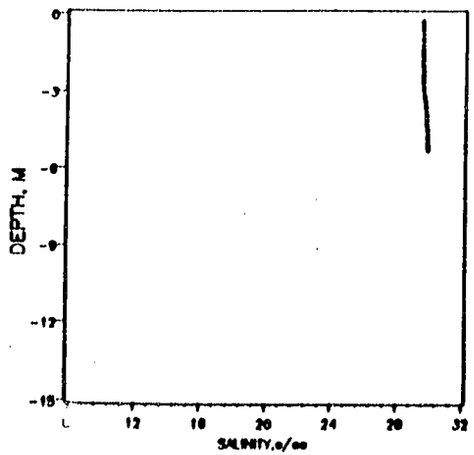


TYDROX CRUISE WARREN RIVER 07:06 8/13/87

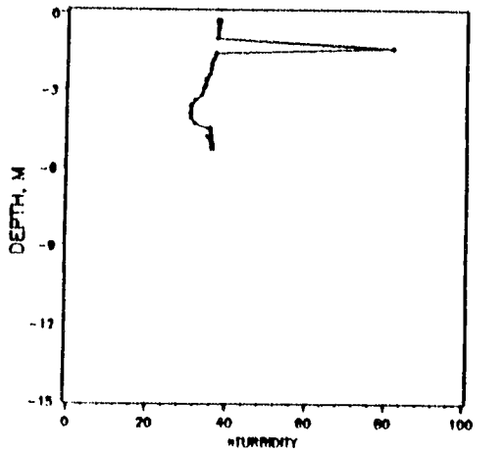
TEMPERATURE vs DEPTH



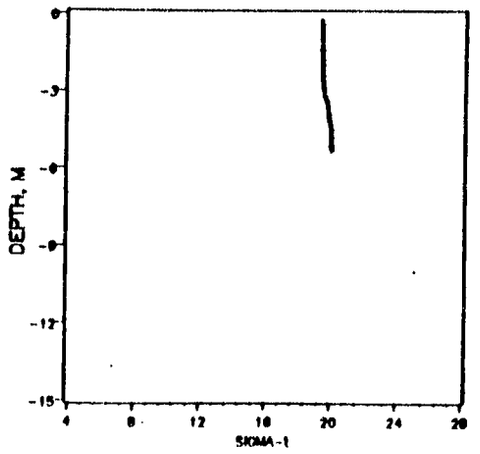
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

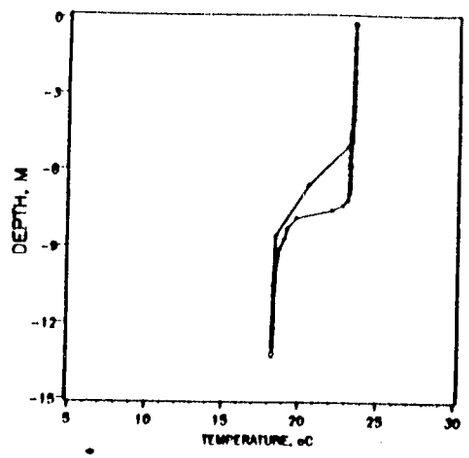


SIGMA-t vs DEPTH

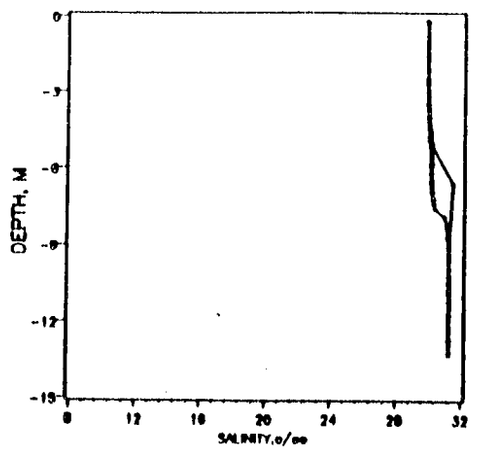


HYDROX CRUISE SNEAD STATION 1 07:58 8/13/87

TEMPERATURE vs DEPTH



SALINITY vs DEPTH



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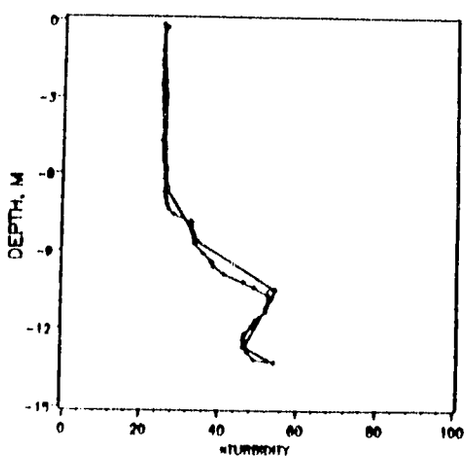
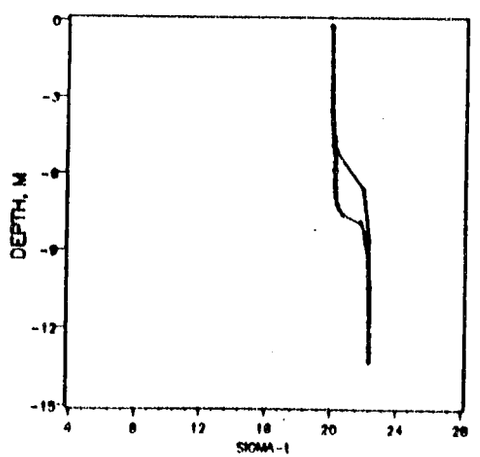
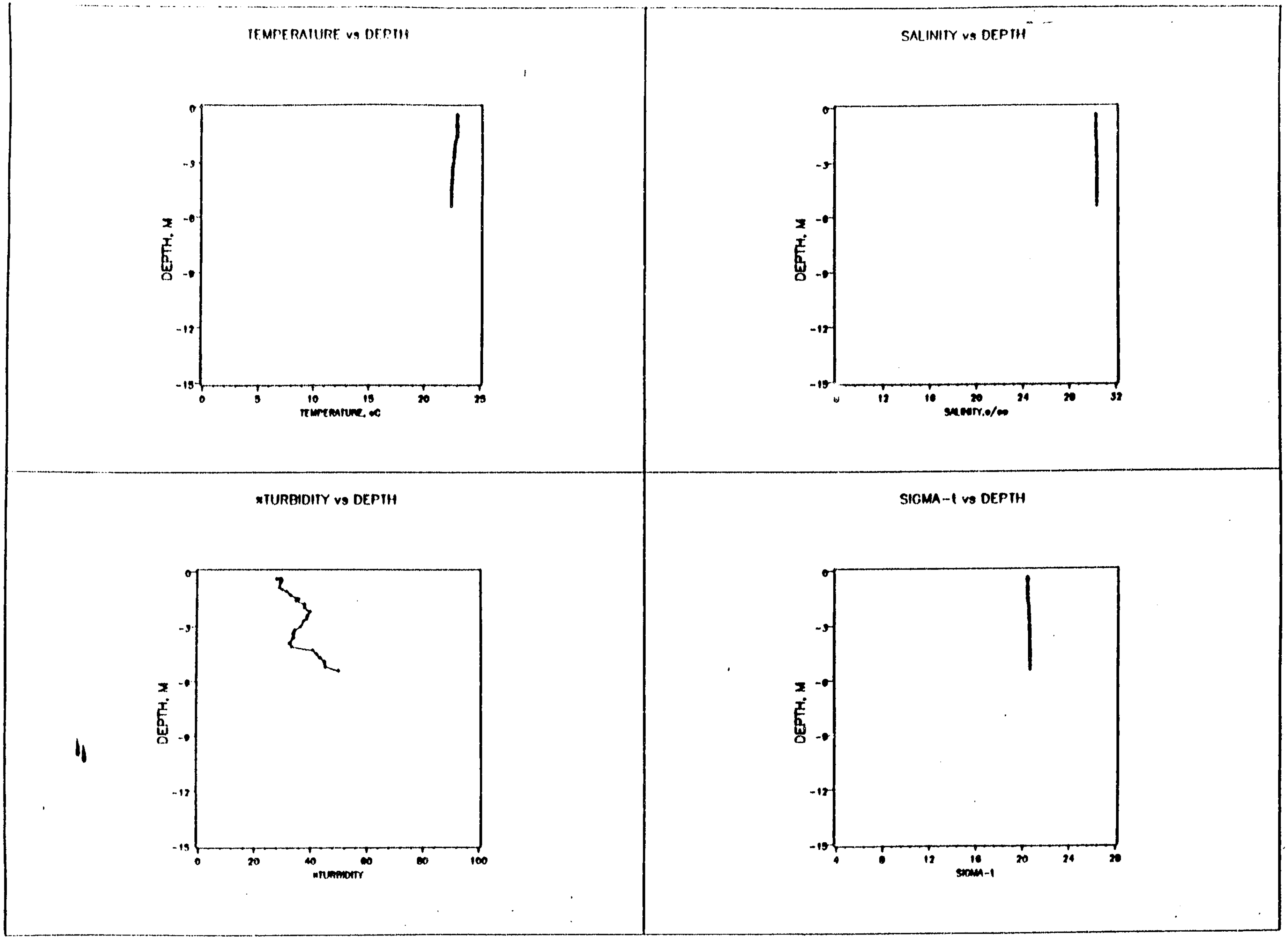


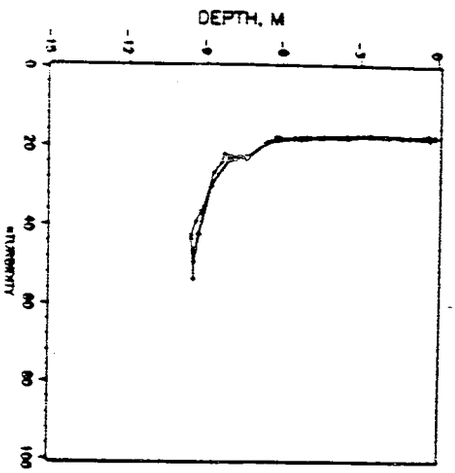
SIGMA-t vs DEPTH



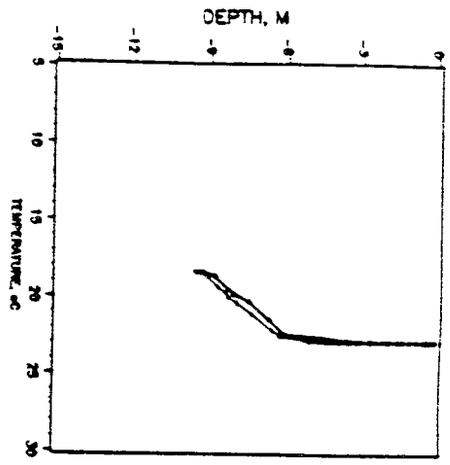
HYDROX CRUISE BRISTOL-ARBOR 07:39 8/13/87



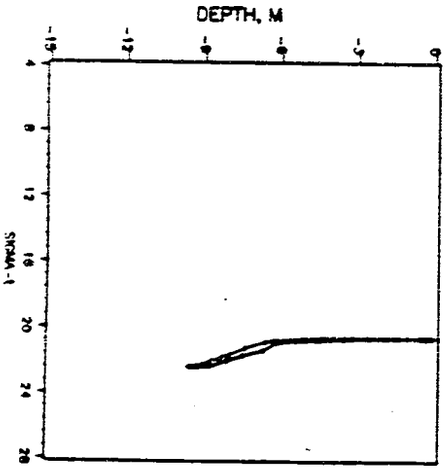
HYDROX CRUISE SINBADD STATION 14 05:51 3/20/87



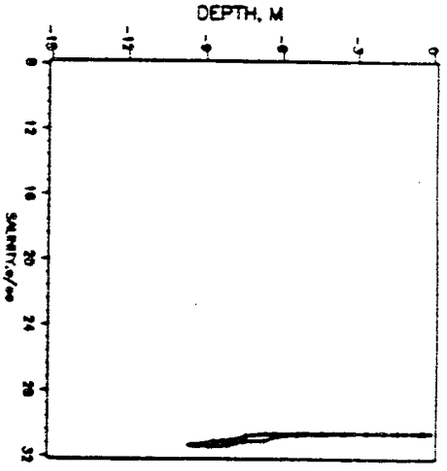
%TURBIDITY vs DEPTH



TEMPERATURE vs DEPTH



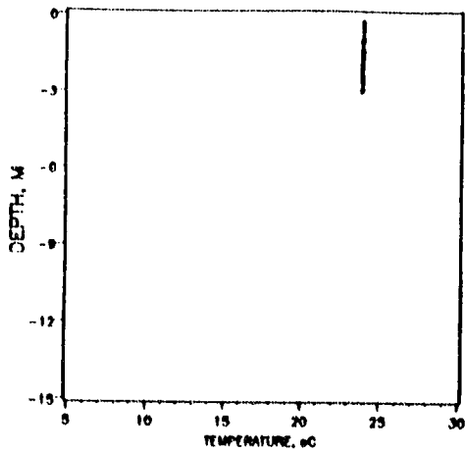
SIGMA-t vs DEPTH



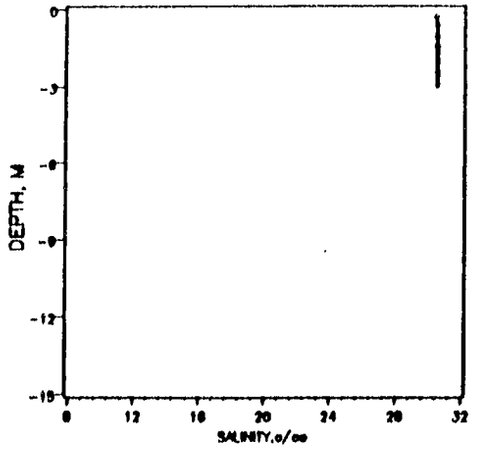
SALINITY vs DEPTH

HYDROX CRUISE WICKFORD-ARBOR 04:45 8/22/87

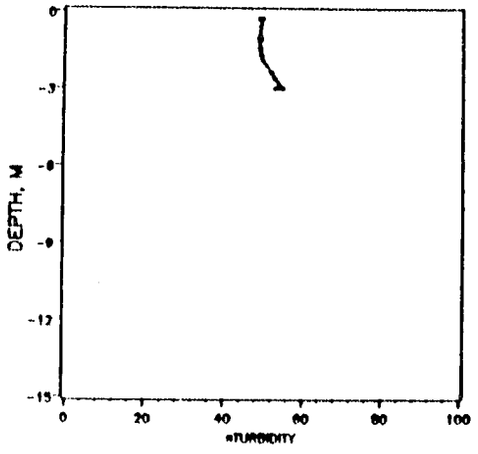
TEMPERATURE vs DEPTH



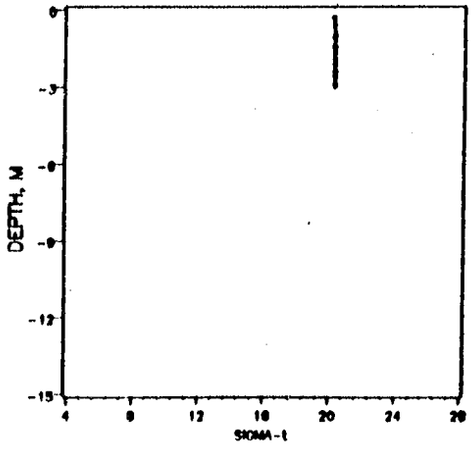
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

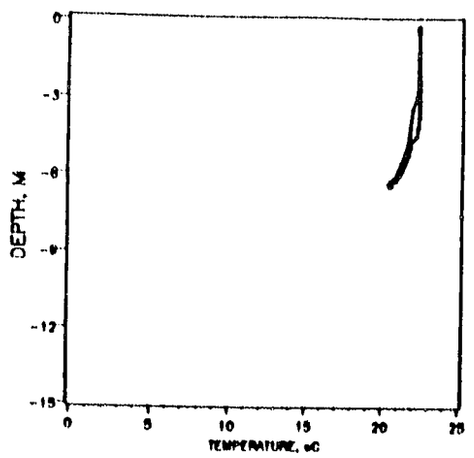


SIGMA-t vs DEPTH

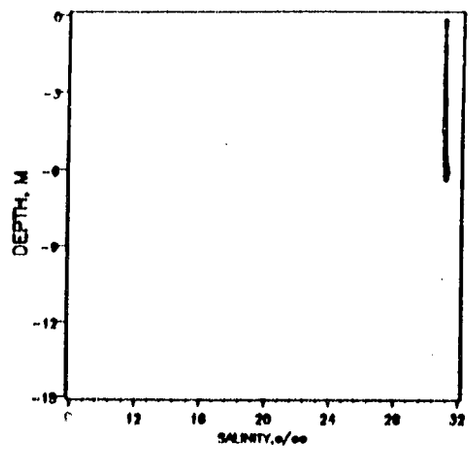


HYDROX CRUISE NEWPORT -ARBOR 06:47 8/20/87

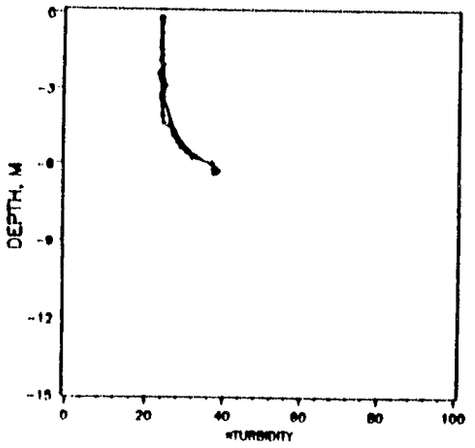
TEMPERATURE vs DEPTH



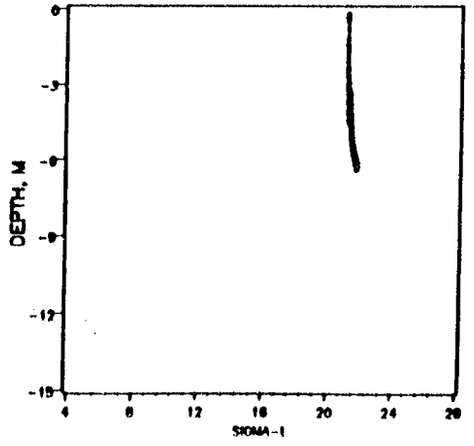
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

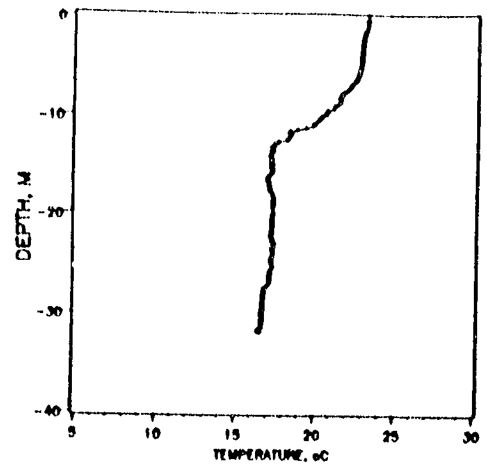


SIGMA-t vs DEPTH

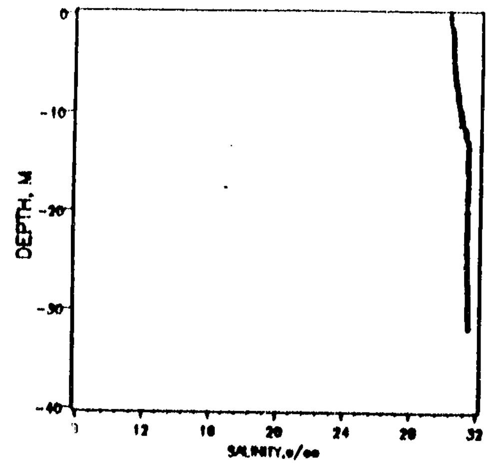


HYDROX CRUISE SINBAD STATION 13 07:53 8/20/87

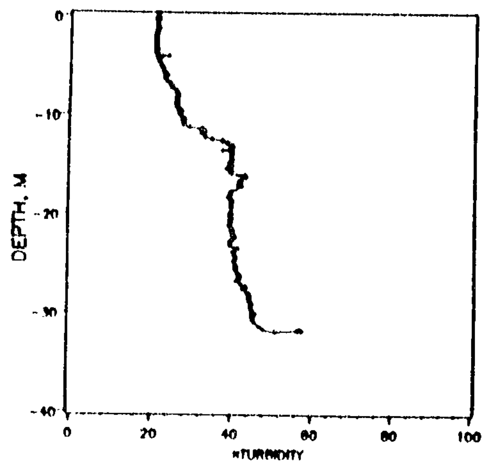
TEMPERATURE vs DEPTH



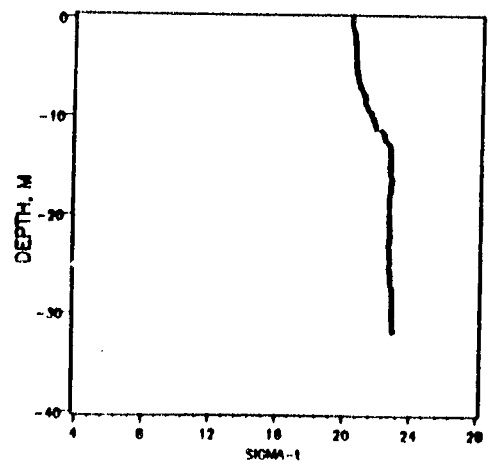
SALINITY vs DEPTH



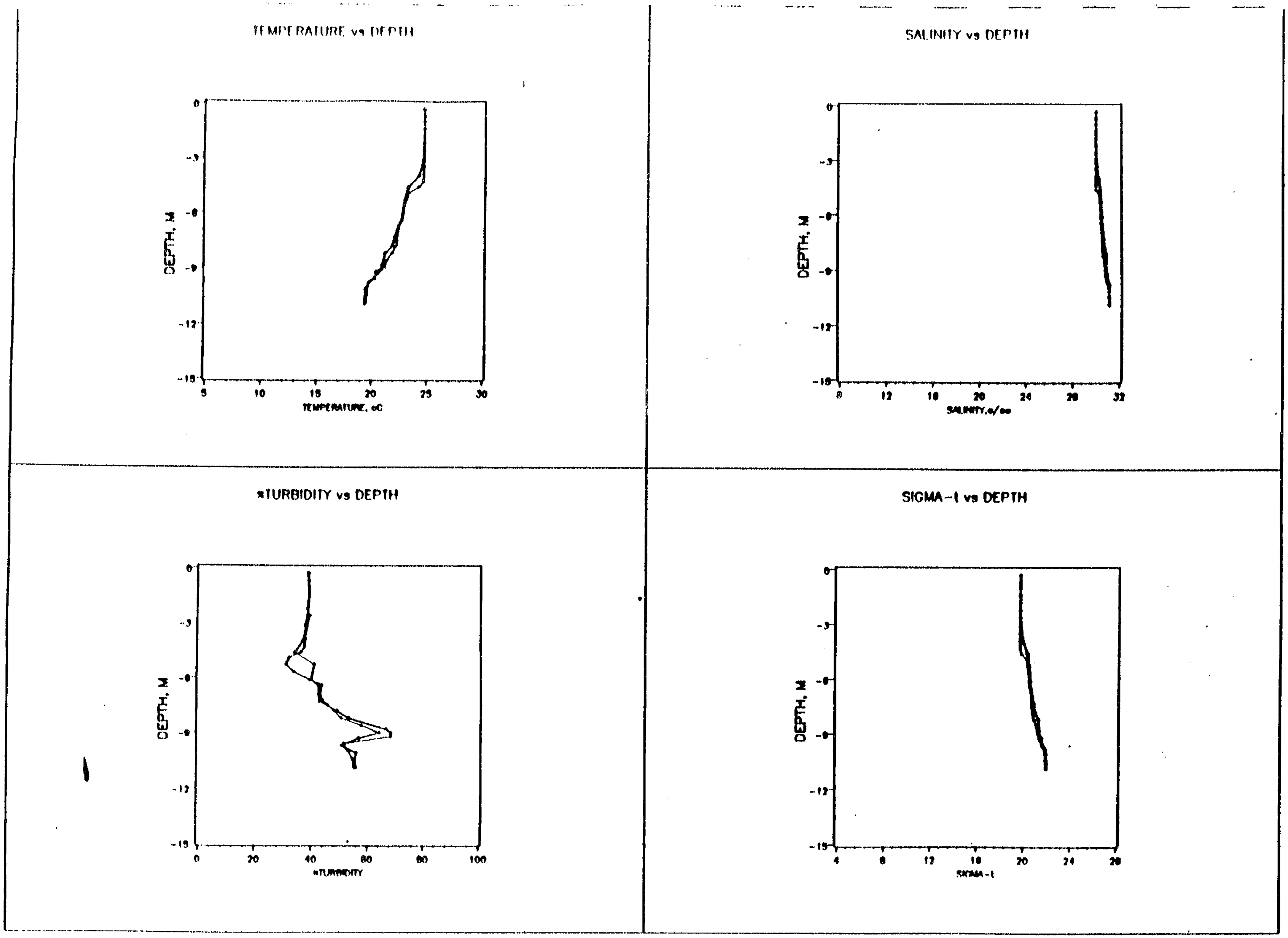
%TURBIDITY vs DEPTH



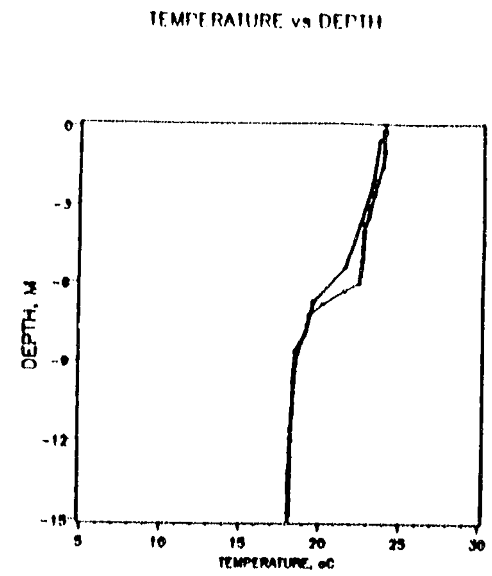
SIGMA-t vs DEPTH

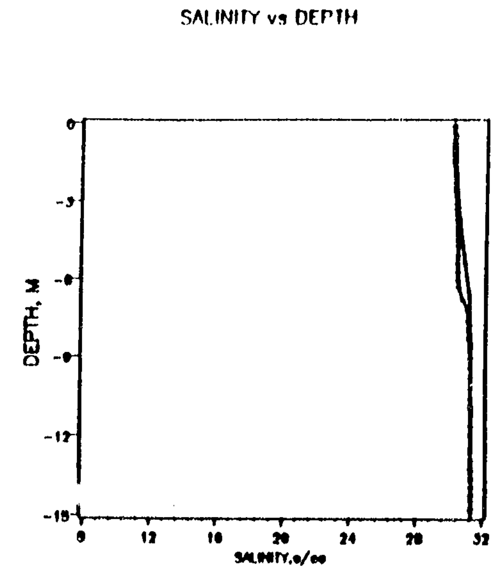


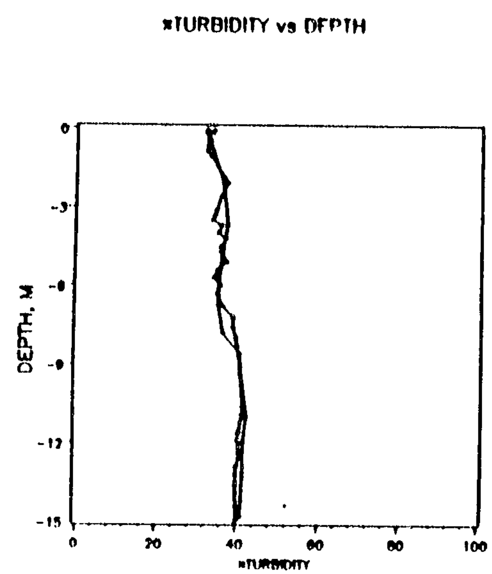
HYDROX CRUISE SINBADD STATION 18 08:58 8/20/87

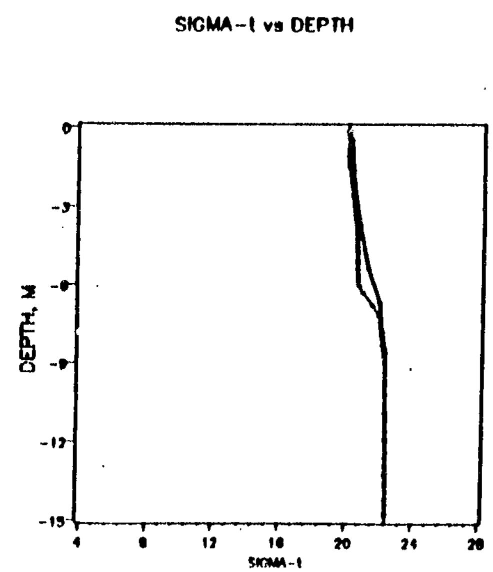


HYDROX CRUISE SINBADD STATION 12 08:28 8/20/87



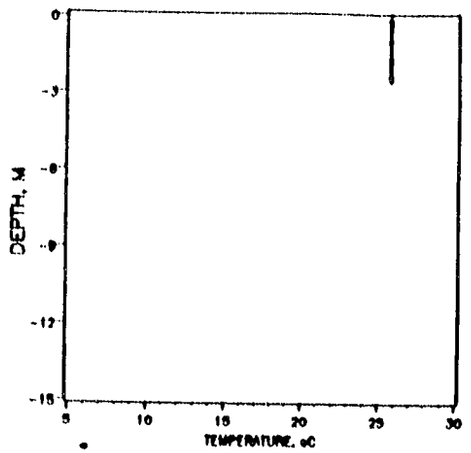




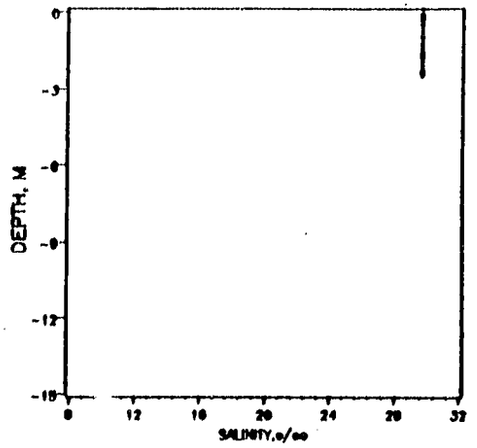


HYDROX CRUISE KICKAMUIT RIVER 09:34 8/20/37

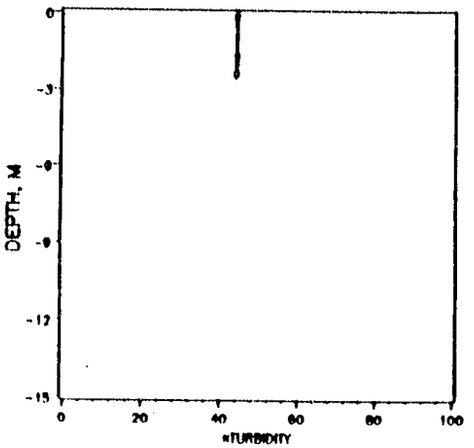
TEMPERATURE vs DEPTH



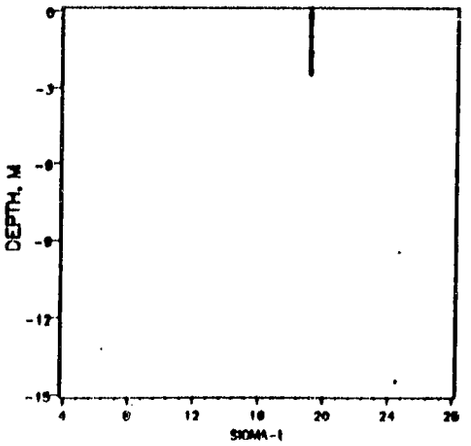
SALINITY vs DEPTH



*TURBIDITY vs DEPTH

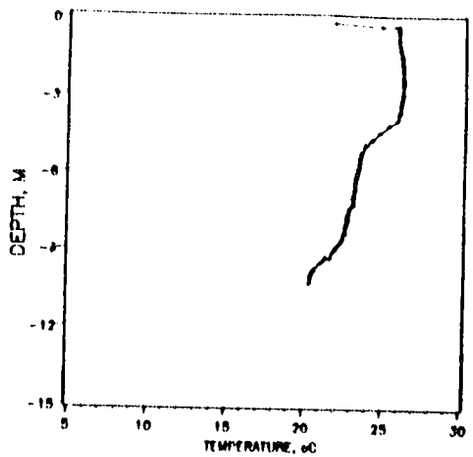


SIGMA-t vs DEPTH

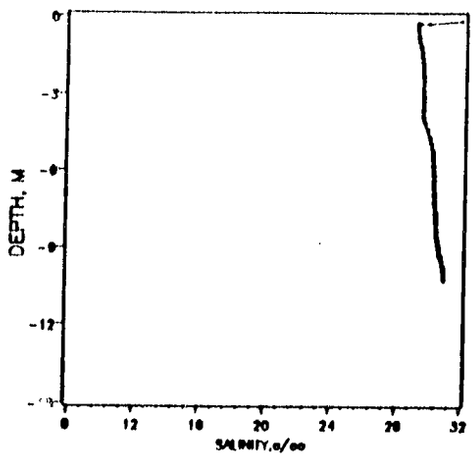


TYCROX CRUISE SINEACO STATION 17 08:58 8/20/81

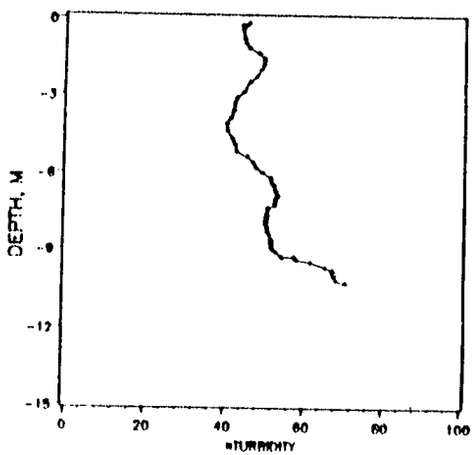
TEMPERATURE vs DEPTH



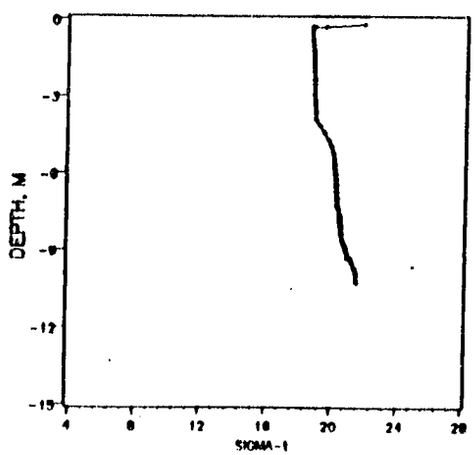
SALINITY vs DEPTH



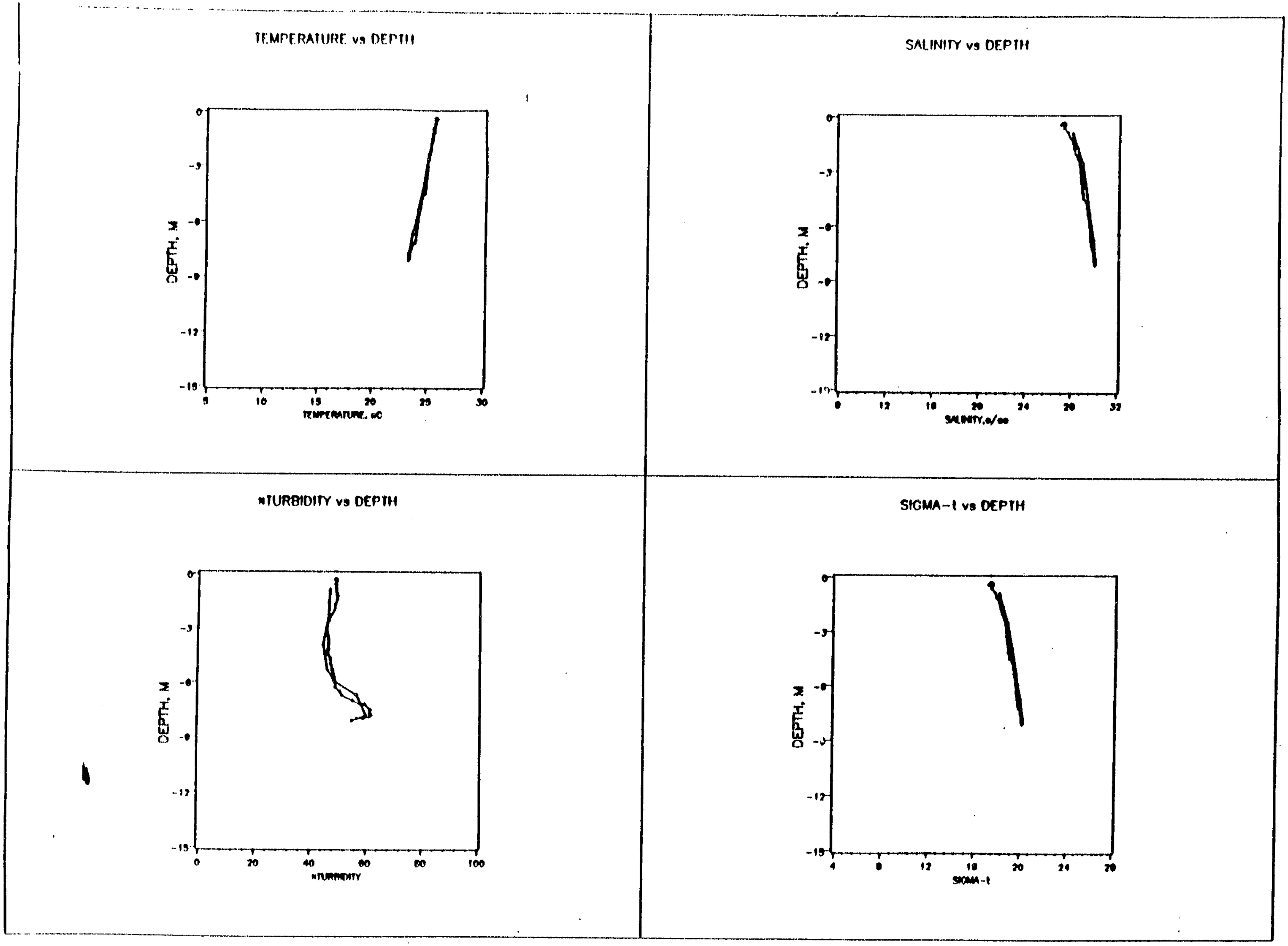
*TURBIDITY vs DEPTH



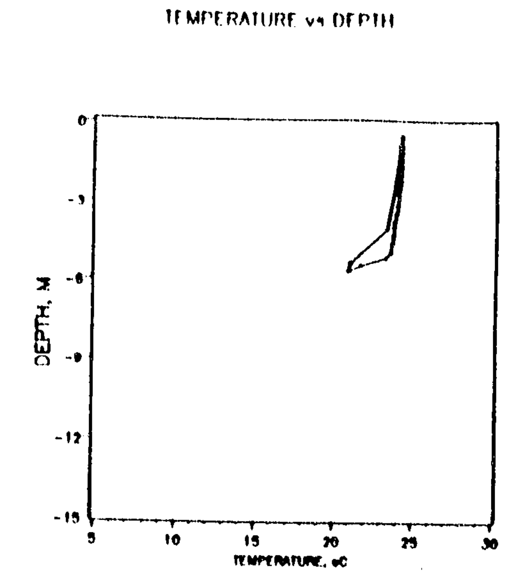
SIGMA-t vs DEPTH

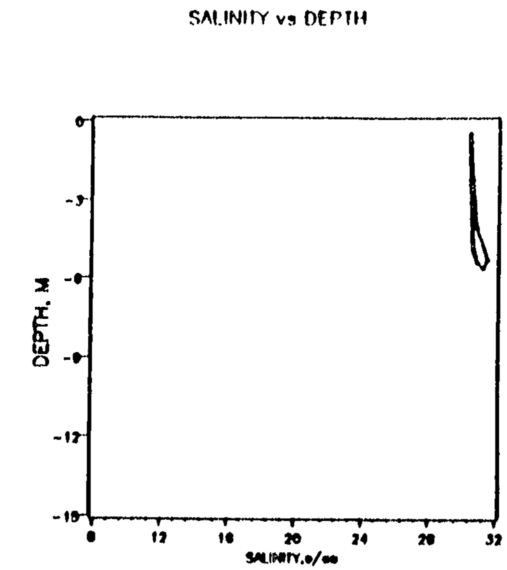


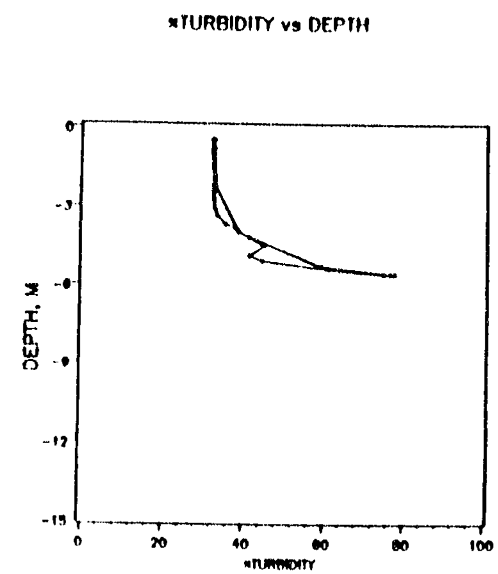
HYDROX CRUISE TAUNTON RIVER 10:19 8/20/87

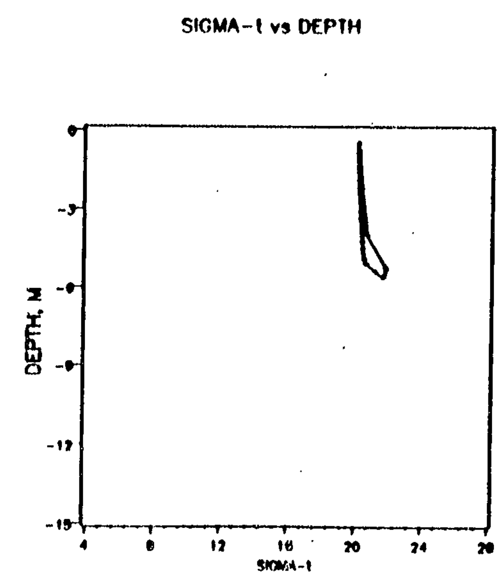


HYDROX CRUISE SINBADD STATION 19 11:12 8/20/87









HYDROX CRUISE SINBADD STATION 20 11:46 8/20/87