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Estuarine Ecological Risk Assessment Case Study

for

Naval Shipyard Portsmouth
Kittery, Maine

Estuarine Dynamics and Water Quality Assessment

Draft Data Report

August 1993

Prepared By:

D.B. Chadwick
C.N. Katz
A.E. Patterson

Naval Command, Control, and Ocean Surveillance Center
Research, Development, Test, and Evaluation Division
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INTRODUCTION

In July 1992, a group from the Marine Environment Branch (Code 522) at the Naval Command, Control, and Ocean Surveillance Center Research, Development, Test, and Evaluation Division (NCCOSC RDTE DIV) acquired hydrographic, seawater fluorescence, and current meter data in the Piscataqua River Estuary. These data were acquired as part of a joint study with the Environmental Protection Agency's, Environmental Research Laboratory, Narragansett (EPA-ERLN), researchers from the University of New Hampshire, and from the Jackson Estuarine Laboratory. The intent of this effort was to gain knowledge into the processes that control the fate of contaminants within the Piscataqua River Estuary in general, and around the Naval Shipyard, Portsmouth in particular as part of an estuarine ecological risk assessment at Naval Shipyard, Portsmouth, Kittery, Maine.

This report describes the type of data collected, the techniques used for collection and processing, a graphical display of the results, and a description of the data files produced and stored on magnetic media (accompanying the report). Data collected by investigators from the University of New Hampshire (UNH) while on board the ECOS will only be discussed in the context of using their data for intercalibration. A final report will be produced at a later date attempting to interpret these data in the context of the project goals. The Point of Contact for this report and these data is Bart Chadwick:

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Andrew Patterson	CSC
Ken Richter	NCCOSC
Frank Shipp	NCCOSC

DATA COLLECTION

The RV ECOS, a 13-meter survey craft transported from NCCOSC San Diego, was used to collect all data. A picture of the ECOS is shown in Figure 1. The ECOS was outfitted with its Marine Environmental Survey Capability (MESC) equipment, a real-time data acquisition, display, and processing system. The MESC consists of a number of different physical and chemical seawater sensor systems and a navigation system linked to a central computer. The

ECOS was also outfitted with an acoustic doppler current profiler (ADCP) and its associated computer acquisition system. The ADCP was used to collect current velocity data while underway. These instruments are described in detail later.

Five types of surveys were performed on 13 different days between 8 and 22 July 1992 (a chronology of events is described in APPENDIX A). These included Cross-Channel Transects, Fixed Station Time Series, Longitudinal Surveys, Mapping Surveys, and Dye Release Surveys. Each type of survey was performed to answer a set of specific questions as well as to add insight into the overall physical, chemical, and biological dynamics. Cross-channel transects were performed to identify current velocities and volume discharge of seawater and suspended material through various cross-sections of the river. Fixed Stations were designed to look at areas thought to be most susceptible to low current velocities and therefore likely areas of particle deposition. Longitudinal surveys were performed to determine the estuarine dynamics during a flood and ebb tide throughout the length of the estuary. Mapping surveys were designed to look at the areal and temporal distribution of seawater parameters in the vicinity of Seavey Island at different stages of a tide. Finally, dye was released on three occasions near Seavey Island to measure the rate of longitudinal dispersion. The day and type of each survey are shown in Table 1. The location of each survey is shown in the RESULTS section.

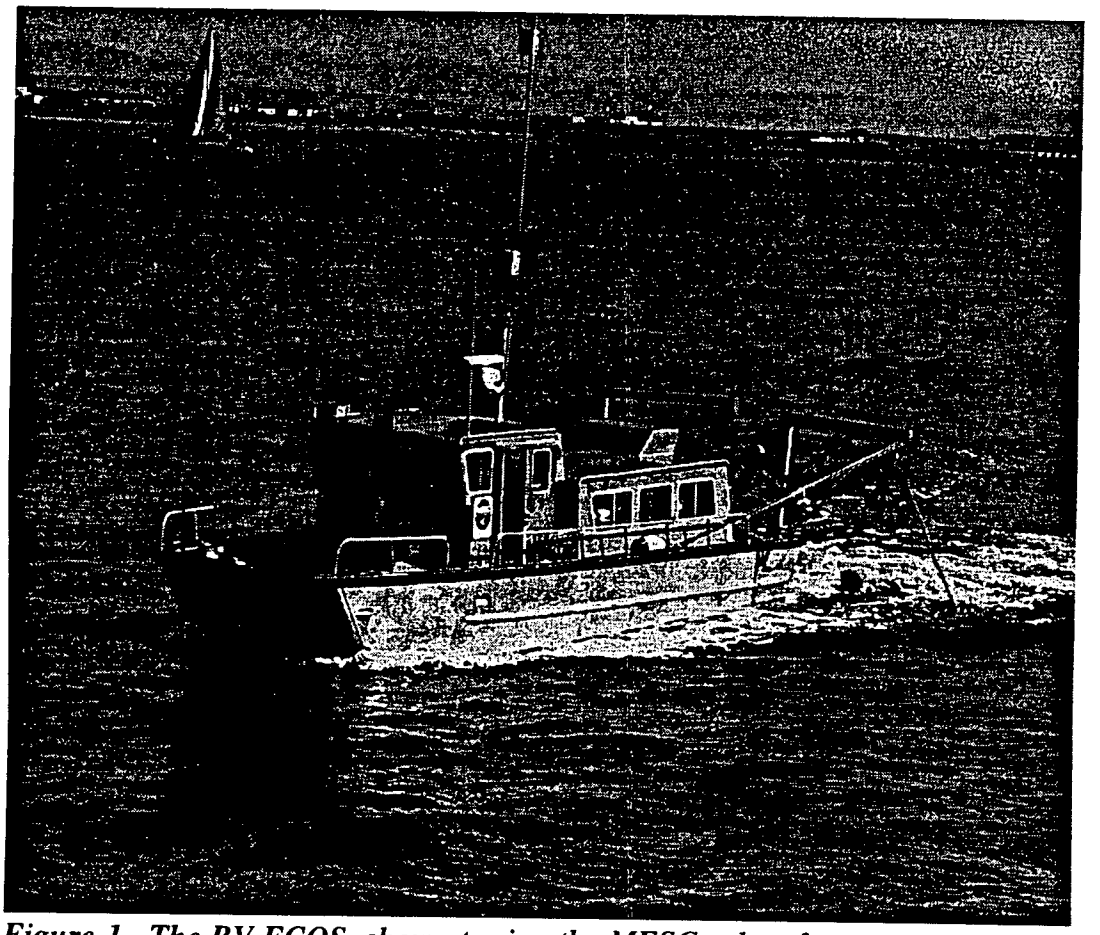


Figure 1. The RV ECOS shown towing the MESC subsurface sensor package.

TABLE 1. List of days (as Date and Julian Day) and types of surveys performed by NCCOSC.

Date	JD	Type	General Location
8 July	190	Cross-Channel	Mouth
9 July	191	Fixed Station	Fort Foster
10 July	192	Cross-Channel	Dover Point
11 July	193	Fixed Station	Police Dock
13 July	195	Fixed Station	Clark Cove
14 July	196	Cross-Channel	East Seavey Island
15 July	197	Longitudinal	Mouth-Great Bay
16 July	198	Longitudinal	Mouth-Great Bay
17 July	199	Cross-Channel	West Seavey Island
18 July	200	Fixed Station	Jamaica Island
19 July	202	Mapping Survey	Seavey Island
20 July	203	Dye Release	Seavey Island
21 July	204	Dye Release	Seavey Island/Clark Cove

MESC DATA

The MESC acquired data from both a towed sensor package and from a seawater flowthrough system that provided water to a suite of fluorometers on-board the ECOS. The package was typically towed near the surface, nominally at 1 m, although vertical profiles of the water column were made occasionally while underway, and at regular intervals at fixed stations. The sensor package consisted of a Sea-bird Electronics, Inc. Model SBE-19 Conductivity, Temperature, and Depth (CTD) profiler outfitted with pH and dissolved oxygen sensors. A Sea-Tec Inc. light transmissometer was also attached. An ENDECO Inc. V-Fin depressor was used to keep the instrument package stable and submerged to the appropriate depth. A Sea Mac Marine hydraulic winch was used to raise and lower the tow package to the desired water depth.

The on-board sensors included three Turner Inc. Model 10 fluorometers set up for seawater flowthrough, an Innerspace Technology Inc. Model 440 digital fathometer, and a Pronav Model 1000 Global Positioning System (GPS) navigation receiver. The fluorometers were independently set up to measure ultra-violet fluorescence (UVF), nephelometry, and

chlorophyll *a* throughout most of the study. During the mapping and dye studies, the chlorophyll *a* fluorometer was switched over to measure rhodamine fluorescence.

All data were collated at a 4-second sampling rate, pre-processed and displayed in real-time, and stored on magnetic media using IBM compatible personal computers and an Analog Devices Inc. MicroMac Model 5000 acquisition/control system. A software package designed specifically for this purpose called the Real-Time Acquisition and Processing System (RTAPS) was used to perform these tasks. RTAPS was also used to provide some of the initial steps in post-processing of the data sets. The spatial resolution of these data was approximately 12 m at a typical vessel speed of 3 m/s.

Towed Package Sensors in the towed package consisted of a CTD, pH and dissolved oxygen sensors, and a light transmissometer. The CTD measured seawater conductivity and pressure. Using measured temperature (degrees Centigrade), these data were converted into units of salinity (practical salinity units or psu), and sample depth (meters), respectively. The pH sensor measured the hydrogen ion content of the seawater in National Bureau of Standard (NBS) units and dissolved oxygen in milliliters Oxygen/Liter seawater respectively. During fixed-station surveys, the CTD utilized an add-on submersible pump to flush water through the conductivity cell and dissolved oxygen sensors to keep the sensors properly replenished. The individual sensor accuracies were as follows: Temperature- 0.01° C; Salinity- 0.01 psu; Depth- 0.1 m; pH- 0.1 NBS; and Dissolved Oxygen- 0.1 mL/L. The pH and oxygen sensors were calibrated using Sea-bird instructions just prior to the field work while recent factory calibrations were used for the other sensors.

The transmissometer was used to measure light transmission through a 25 cm path length of seawater in units of relative percent. Light transmission, in units of percent, was used as a measure of particles suspended in the water column. Measurement accuracy was on the order of 0.5%. Both the transmissometer and CTD digital data were taken in by the RTAPS for display and storage.

Seawater Flowthrough System The seawater flowthrough system consisted of a centrifugal pump mounted on the vessel pulling seawater through a 1.3 cm i.d. Teflon® tube embedded in the towed package telemetry cable. Seawater was continuously pulled up the sampling tube and pumped into the flowthrough sensors at a rate ranging from 2-10 L/min, but typically at 6 L/min.

The range in flow rates was an outcome of two effects. First was the fact that the standard tow cable was broken on the third survey day and the flowthrough system was altered to use short tow cable in its stead while repairs were made (over two survey days). The reduced resistance in the short tow cable resulted in a higher flow condition. The other reason for flow variation was that it was an outcome of trying to minimize the amount of bubbles in the water stream (particularly menacing to the nephelometry data), a result of high dissolved oxygen levels and the use of a centrifugal pumping system. This required, after the first two survey days, that a "bubble trap" be installed just prior to the input to the fluorometers. The

"trap" was a 5 cm i.d. by 25 cm long plexiglas cylinder in which water entered in at the top of the cylinder and flowed out to the fluorometers from the bottom, thereby removing many of the bubbles which were allowed to flow out the top. This design not only added some lag time, but also smeared the peak signal reaching the fluorometers slightly. The overall lag time between location of the water being sampled to measurement on the fluorometer was typically 90 seconds with the trap installed. This delay was measured daily and was taken into account in all subsequent processing.

Fluorometers All fluorometers were equipped with high-volume 25-mm path-length cuvettes. Water flowing through the cuvettes was exposed to an excitation light source and the resultant fluorescent emission was measured at a 90 degree angle to the excitation light path. The bandwidths of the excitation light and emitted light were controlled by fixed bandwidth filters. The emitted light spectrum was measured as an integrated voltage (over wavelength), and this voltage was converted in RTAPS as digital data. Each of the fluorometers was calibrated against standards or *in situ* measurements as appropriate (see Calibrations section below).

The "oil" fluorometer was equipped with Turner's short-wavelength oil accessory kit. In this configuration, seawater flowing through the fluorometer was exposed to a 254-nm excitation UV light source and the fluorescence intensity between 300 and 400 nm (360 nm maximum) was then monitored as an output voltage. The reason the word "oil" is placed in quotes is that the dissolved compounds causing fluorescence with the above wavelength conditions typically are associated with oil but can have other origins. This is further explained under calibrations. The chlorophyll *a* fluorometer utilized an excitation frequency band of 340-500 nm and measured an emission band between 665 and 880 nm (670 nm peak). The rhodamine fluorometer utilized a 546 nm excitation source and an emission band of 570-880 nm. In the case of the nephelometer, scattered light rather than fluorescence was measured. Here, an incident light source of 400-725 nm was scattered off particles present in the water and received by the detector. As was true for the other fluorometers, light reaching the detector was measured as a voltage and processed by the RTAPS software.

Navigation Navigation data were obtained using the GPS. The GPS allowed real-time positioning of the vessel in terms of latitude and longitude in the World Geodetic System 1984 coordinate system. Position accuracy of GPS, although variable with selective availability turned on, was typically less than 20 m based on visual checks against known points on National Oceanic and Atmospheric Administration nautical charts 13283 and 13285. Digital GPS data were used and recorded by the RTAPS.

Fathometer The digital fathometer operates with a transducer frequency of 208 kHz and measures water depth with an accuracy of 0.1 m. These data are sent to RTAPS via RS232 for display, processing, and storage.

ADCP DATA

An RD Instruments Model RD-SC/DR1200 ADCP was used to obtain current velocities throughout the study. Although these data were delivered directly to UNH for use in calibrating the hydrodynamic model, some data are reproduced here in graphical form to relate them to the MESC data. Briefly, the ADCP sends out short pulses of high frequency sound waves through the water column using four vertically inclined transducers. Backscattered sound from particles, plankton, and bubbles entrained in the water is received by the transducers with a Doppler frequency shift proportional to the relative velocity between the scatterers and the transducer. By tracking velocity of the boat over the bottom, and given the precise geometry of the sound beam paths, water current velocities relative to the bottom were then computed as a function of depth. The instrument was set up to give a measurement precision of about 1 cm/s, a vertical resolution of 1 m, and a horizontal (along-track) spatial resolution of about 15 m given a boat speed of 3 m/s.

DATA PROCESSING

GENERAL PROCEDURES

MESC. All MESC data were subjected to similar processing procedures although the exact methods and/or order of the processing steps may have varied for individual files. In general, RTAPS software was used to produce raw ASCII data files from which all subsequent processing ensued. Breaks in data gathering (eg., when tow cable broke on Day 192) were taken into account in this step as were time delays for those data collected from the seawater flowthrough system. Individual parameter data files were then brought into Microsoft® EXCEL where they were visually inspected for data integrity. Within EXCEL, checks were made for out-of-range data, exceptional noise, unusual trends, and missing records. EXCEL was also used to make basic statistical computations (eg., averages), group data by specific transects, compute data such as percent distance across a transect, and to generate calibration results as well as apply them to the appropriate data (see CALIBRATION section below).

Editing of data files was needed to correct such problems as missing records, noisy data, and out-of-range values. Typical causes of poor data were bubble entrainment in the flowthrough system as mentioned earlier, eelgrass collected on the towed package which blocked the light path of the transmissometer, bubbles collected along the fathometer transducer causing missing records, and poor water flow over the dissolved oxygen sensor. The most insidious problem was the bubble entrainment in the flowthrough system. This problem was sufficiently bad enough on days 190 and 191 that the complete fluorometer data set was thrown out.

In most cases, an objective derivative test or threshold test was used to filter out bad data. However, in some instances a subjective guideline was used to determine data quality, even

when an objective test was used to locate the bad data record. Time series plots of the data and statistical analysis were used to detect the effects (reasonableness) of the editing. Even though great care was taken to maintain data integrity, the large size of the data sets and the long period of time required to process them, may have resulted in some inadvertent removal of good records and survival of some bad data records. The final data discussed in this report and the ASCII data files delivered with this report are the edited, corrected, and calibrated version of the data.

ADCP The ADCP graphics data in this report were pre-processed into ASCII files using Transect© software provided by RD Instruments. North and east velocity vectors from the shallowest depth bin (either 1.0 or 1.7 m, depending on the setup) were extracted from these ASCII files using Microsoft® ACCESS, a database manager. A 15-point running average technique was then applied to smooth the data for graphing purposes. These smoothed data were then recombined to form single current vector plots that are used in the Mapping Surveys and in the time-series "stick" plots shown for the other survey days.

CALIBRATIONS

The fluorometers and transmissometer used in this study were calibrated to relate their relative voltage outputs (or percent transmission) into more meaningful numbers. This was done by either calibrating against known standard solutions, or by measuring discrete samples for the constituent of interest and correlating the data to the fluorometer measurements. The "oil" and rhodamine dye fluorometers were calibrated by the first method while the chlorophyll *a* and nephelometer fluorometers, and transmissometer were calibrated using the second method. These calibrations are described in detail below.

Oil Relative fluorescence intensity was converted into equivalent oil concentrations by calibrating intensity as a function of standard oil concentration. The oil used for calibration was Diesel Fuel Marine (DFM) obtained from the Navy. DFM was chosen because it is the most common fuel used by the Navy and has been used extensively in our previous studies (Katz, et. al., 1991). Although DFM was used as the standard, it must be made clear that DFM may not be the sole cause of the observed fluorescence. The compounds that fluoresce in this wavelength range are typically the polynuclear aromatic hydrocarbons (PAH) which have their origin in a variety of petroleum products, creosote, atmospheric fallout, sewage, and non-point source runoff. Although these fluorescence data are referred to as "oil", only a sophisticated assay of the water can truly identify the source of the fluorescence. Five discrete samples were collected for PAH analysis for this purpose.

Calibrations were performed on four occasions. A standard DFM/seawater solution was prepared fresh for each calibration by adding a known amount of DFM to seawater collected dockside at a Kittery Landing and shaking vigorously for at least half an hour prior to use. Known volumes of the standard DFM solution were then added serially to a beaker containing seawater collected dockside. The oil/water mixtures were pumped through the fluorometer in

a recirculating loop using a rotary vane pump. The voltage output approximately 1 min after each standard addition was then recorded along with the DFM concentration of the solution.

A linear regression of the calibration data was performed to calculate the fluorescence data as Diesel Fuel Marine Equivalents (DFME). This was done by combining all the blank corrected calibration data and computing average regression coefficients. The relationship was found to have an r^2 value of 0.90 and was linear over the environmental concentration range encountered throughout the surveys, 0-100 µg/L or parts-per-billion (ppb) DFME.

$$\text{Oil (ppb-DFME)} = 176.02 * \text{Fluorescence (volts)} - 53$$

Because of the variation in the fluorometer response over the four surveys (see Figure 2), and because the background water used had a non-zero and varying fluorescence value, the zero point of the calibration was ambiguous. This led to some oil data to be computed with slightly negative DFME values.

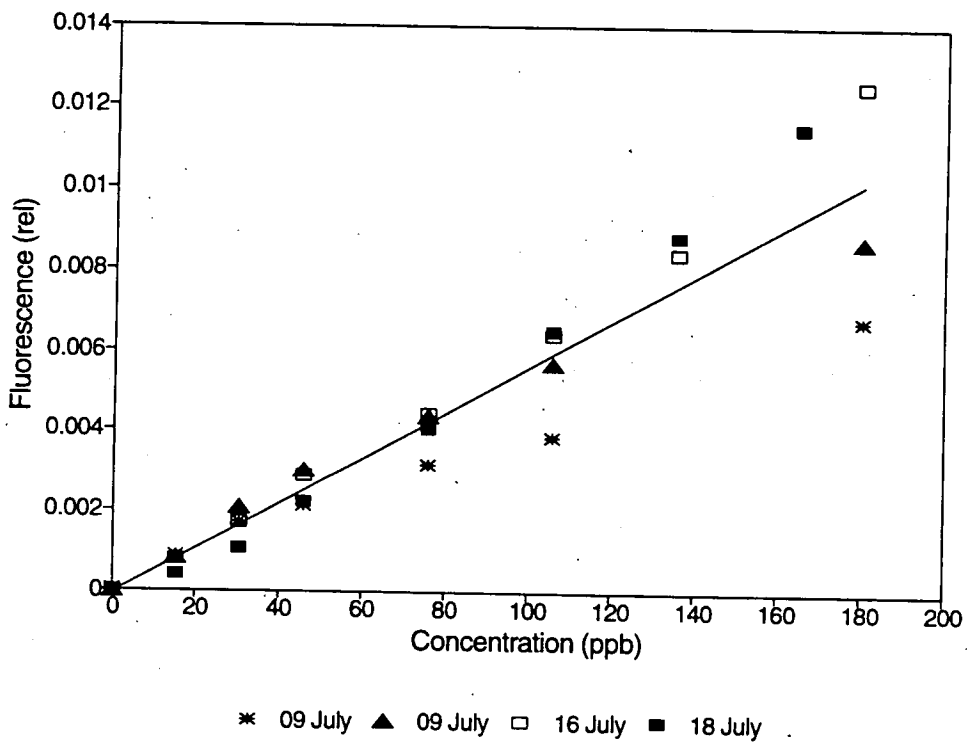


Figure 2. Fluorescence intensity as a function of DFM concentration. Regression line was based on data from all four calibrations.

Rhodamine WT The rhodamine fluorometer which was used during the last few survey days for the dye studies was calibrated using a Rhodamine WT dye standard. The standard was made by adding a known amount of a concentrated (20%) Rhodamine WT to a volume of seawater. The standard was then serially added to a beaker of seawater and recirculated through the fluorometer. The fluorescence output was then recorded as a function of rhodamine concentration.

Data from two calibrations were used to calculate a best-fit regression . The relationship was found to be quite linear to about 540 ppb Rhodamine WT ($r^2 = 0.99$) but fluorescence intensity began to fall off with concentration very quickly shortly thereafter. A ninth-order polynomial was used as a best-fit regression up to a concentration of 3.2 ppm (Figure 3). The polynomial used, with "F" = fluorescence volts was as follows:

$$\text{Rhodamine WT (ppb)} = 2258*F + 1.2781*10^{6}*F^{2} - 1.2064*10^{8}*F^{3} + 6.0421*10^{9}*F^{4} - 1.7248*10^{11}*F^{5} + 6.2896*10^{12}*F^{6} - 2.8098*10^{13}*F^{7} + 1.4447*10^{14}*F^{8} - 3.0116*10^{14}*F^{9} - .6254$$

Because rhodamine fluorescence has a significant temperature dependency (Replogle, Meyers, and Burst, 1976; Feunstein and Sellick, 1963),

$$\text{Fluorescence Intensity} = e^{[0.026*(\text{sample temp-calibration temp})]},$$

the voltage data were first corrected for this temperature effect before having the best-fit coefficients applied. The calibration temperature was 22° C. The final concentration data are in units of µg/L (or ppb) rhodamine.

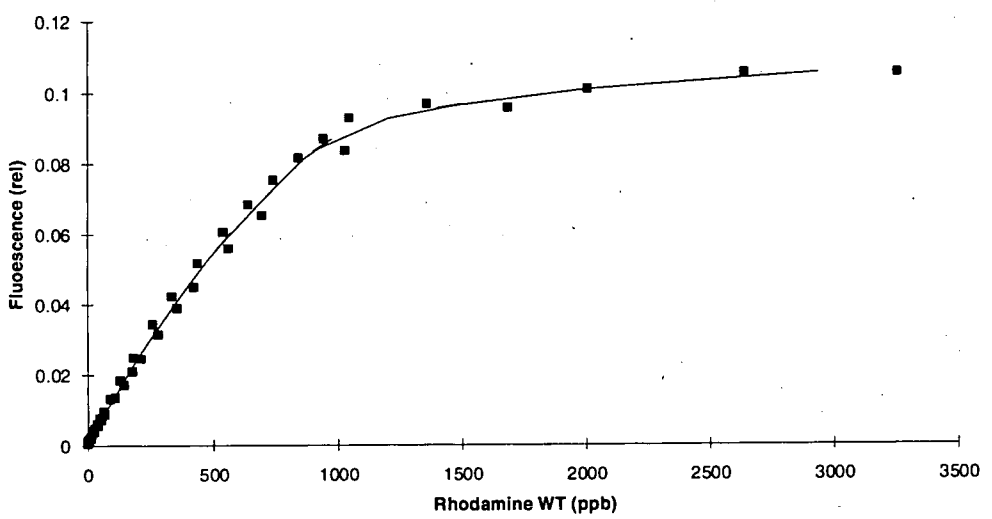


Figure 3. Fluorescence intensity as a function of Rhodamine WT concentration. A ninth-order polynomial regression line was used to fit the data to the two calibrations.

Chlorophyll *a* The chlorophyll *a* data were calibrated by regressing the fluorescence voltages against values determined through discrete sample analyses performed by Rich Langen at UNH. The discrete chlorophyll *a* samples were obtained from the seawater flowthrough system during most survey days on a regular time basis. There was a high degree of variability in the fluorometer response from day to day (see Figure 4), so calibrations were typically run for individual days. However, because some of the discrete data were too limited to produce reasonable regressions on a daily basis, and because some of the regressions were too poor to be useful ($r^2 < 0.6$), some subjectivity was used in deciding which calibrations were appropriate to produce the final data. Decisions were made to produce a data set that best matched the overall distribution of chlorophyll *a* in the estuary as determined by the discrete sample data. The final regression factors used for each day are shown in Table 2 below. The unit of measure was µg/L or ppb.

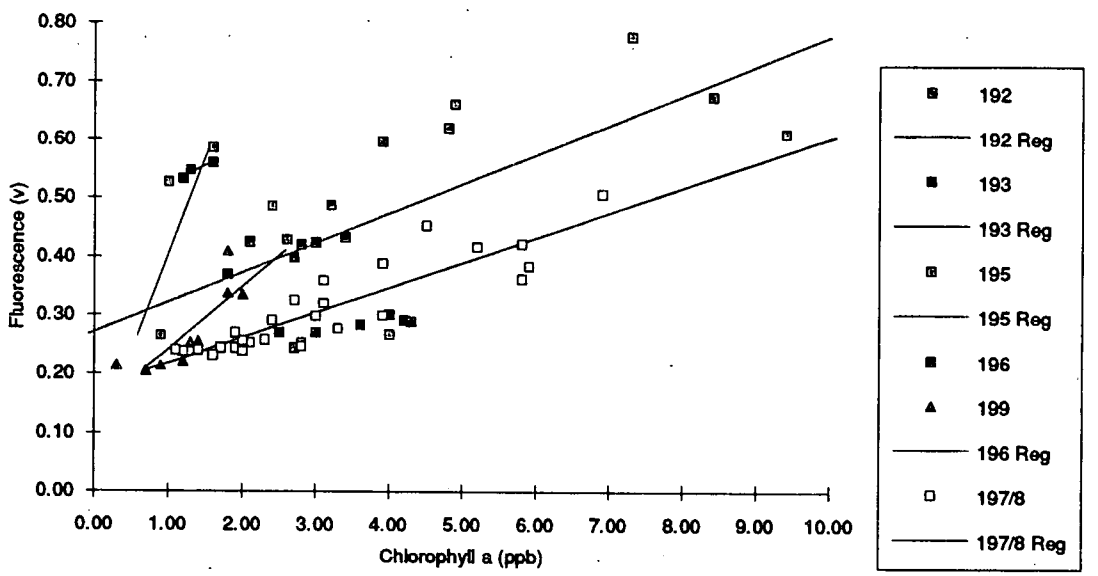


Figure 4. Fluorescence intensity as a function of discrete sample analyses for chlorophyll a. Regression lines indicate which days were used for calibration.

*TABLE 2. Regression coefficients used to compute chlorophyll a (mg/L) from fluorescence intensity using discrete samples for calibration. The coefficients follow the general equation: Fluorescence (volts) = m * Chlorophyll a (mg/L) + b.*

Day	Regression calculated using data for day:	m	b
192	197/8+	0.06674	0.1762
193	193	0.06376	0.4591
195	195	0.3316	0.0713
196	199	0.1062	0.1355
197	197/8	0.04267	0.1762
198	197/8	0.04267	0.1762
199	199	0.1062	0.1355
200	195	0.3316	0.0713

+ Calibration for Day 192 was corrected for background fluorescence.

Nephelometer/Transmissometer Data collected from the nephelometer and transmissometer, both measures of suspended particulates, were calibrated using comparisons to discrete sample measurements made by Larry Ward of UNH. Total Suspended Solids (TSS) were measured most every survey day on a regular time basis by filtering known volumes of seawater obtained from the seawater flowthrough system. Data collected during the two longitudinal survey days, which showed the full dynamic range of concentrations in the estuary, were used to perform the calibrations.

Both the transmission and nephelometer data were linearly regressed against the TSS data (see Figure 5 and regression equations below), even though transmission data are theoretically log-linearly dependent on particle concentration. A linear fit was the better regression for transmission for TSS values up to 12 mg/L. Because most of the data greater than 8 mg/L (see Figure 5) were also outside the instrument's dynamic range of 0.004-20 mg/L, and because very few data points altogether were outside this range (eg., TSS values > 8 mg/L occurred for time periods less than one hour each on surveys at Dover Point and during the Ebb Tide Longitudinal), the linear fit was used for the entire data set. The final particle concentration unit calculated was in mg/L.

$$\text{TSS (mg/L)} = 3.45544 * \text{Nephelometer (volts)} + 0.5759$$
$$\text{TSS (mg/L)} = -0.1507 * \text{Transmissometer (\%)} + 14.3133$$

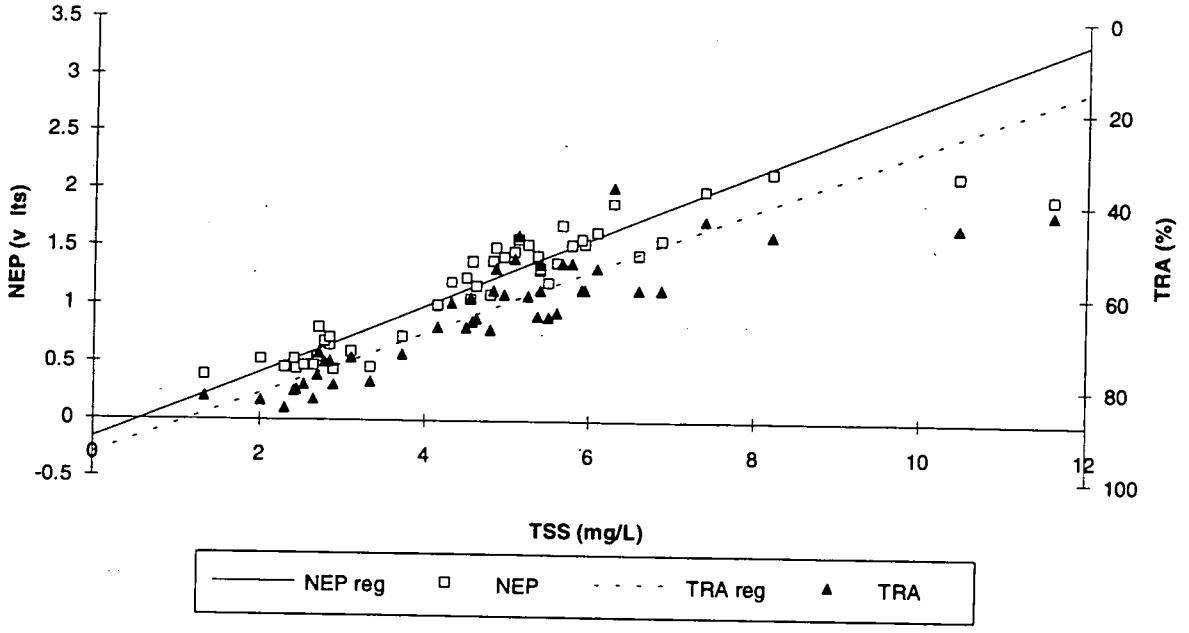


Figure 5. Nephelometer and transmissometer data as a function of discrete TSS data collected on days 197 and 198. A linear regression was used in the final calibration.

RESULTS

GENERAL DESCRIPTION

The following section displays the results of the data collected during this project by survey type. Each section is broken down by survey day, and if appropriate, by individual transects. A location track map typically starts out each section, followed by a statistical summary, and then a series of one or more of the following types of graphical displays: Longitudinal Maps, Time Series Plots, Vertical Profiles, Location Track Maps, Histogram Plots, Contour Maps, 3-D Cross-Section Plots, and/or Dye Plots. Although this report does not go into interpretation, some explanation for the data presentation follows.

Unless otherwise noted, the displayed data come directly from the data files generated as a part of this report. Although TSS data files were generated using both the transmissometer (TSST) and nephelometer (TSSN), the transmission data were generally the more stable measurement and are thus used throughout the results section. Significant differences between these two data sets occurred only at very high suspended loads such as those encountered in the southern reaches of Great Bay. At high TSS concentrations (> 12 mg/L), the nephelometer data were probably a more accurate measurement.

Final graphics showing the data plotted as a function of position in the estuary were produced in VersaCad® Design (Versacad Corporation). The map outline was generated by digitizing the coastline on NOAA nautical charts 13283 and 13285. Data files generated with other software (such as contours in Golden Software, Inc. Surfer® software) were merged with the VersaCad files to produce the final presentation graphics.

Statistical Summaries Summary statistics for each day (or transect) were generated using PRODAS© database software (Conceptual Software, Inc.). Value for minimum, maximum, average, range, standard deviation, and number of samples (records) were produced for surface water data (ie., at depths less than 2 m). A Pearson correlation matrix was also produced using PRODAS©. The first row of numbers under each variable in the matrix are the correlation coefficient values r. The values in the second row under each variable in the matrix are the significance level of the correlation, given the correlation value r and sample size n.

Longitudinal Maps Longitudinal transects performed on Day 197 and 198 attempted to follow a flood and ebb tide, respectively, up the estuary. The data presented for these transects are presented as color coded concentrations of each parameter as a function of position in the estuary. The color codes were generated by dividing the full concentration range into seven equally spaced units. Because all data are shown on these maps, regardless of sample depth, some variation in concentration may be a result of vertical differences observed when vertical profiles were performed each day at five UNH sites. The locations of the vertical profiles can be determined from the time series plots (sample depth).

Time Series Plots Time Series Plots show all the data measured for each of the parameters as a function of time. In instances where there are no data (edited, lost etc.), an absolutely straight line spans the gap, although this can sometimes be difficult to see. Included in these plots are the predicted current velocities as a function of time based on Marine Computer Systems, Inc., Tide Prediction Package software. Also included are the measured current velocities using the ADCP. For clarity, the ADCP data were plotted at 1-2 minute intervals, depending on the size of the data set.

Vertical Profiles Vertical profiles data were collected throughout the project. Profiles were typically performed while maintaining station at specific sites, although those done during cross-channel transects were performed while underway. The profile data shown in the plots were produced using a 3-point running average of the original downcast data.

Location Track Maps When required, the location track map shows either the nominal trackline covered by the vessel (cross-channel transects), the site of the fixed stations, or the actual track covered by the vessel (mapping surveys).

Histogram Plots The histogram plots of predicted tidal current velocity (Mapping Surveys) were generated using data from Marine Computer Systems, Inc., tide prediction software

package. The bars outlined in color show the time period when the mapping data acquisition transpired.

Contour Maps Contour maps of each parameter measured during the mapping surveys (Day 202) were developed using Surfer® software. Contours were produced by creating a regularly spaced rectangular grid of the survey area and interpolating the original concentration data as a function of position within the grid. Concentration ranges of the color contours were set to produce relatively equal number of contours of each color.

3-D Cross-Section Plots Cross-channel survey data are displayed in 3-D where the cross-channel distance (in percent) is one axis (x), time is the second axis (y), and parameter concentration is the third axis (z). The percent distance across was determined by locating the typical transect position endpoints, calculating the straight-line distance between the two points, calculating the distance from the measured position to one endpoint after adjusting the position to be on the transect line (moved perpendicular to the line), and then calculating the percentage across as: measured distance/total transect distance. Percent distance across a transect is a variable included in each of the cross-channel data files and can range from slightly less than 0% to slightly greater than 100%. These variables were gridded in Surfer® and plotted using StatSoft™ CSS Statistica® software. The approximate compass position (N, S, E etc.) of transect endpoints is located along the x-axis as a guide.

Dye Plots A variety of plots were used to display Rhodamine WT dye concentration data measured during the dye studies. The first of the dye plots estimates the size and shape of the dye patches using aerial photographs obtained from UNH (Day 203 only) as a guide. The subsequent dye plots for Day 203 are the measured dye concentrations as a function time. Because the photographic record did not include a usable time record, it must be emphasized that matching the concentration data to the areal position data (Dye Patch profiles) is only a best guess approximation. Results for the Day 204 dye studies include only a plot showing the overall dye concentration as a function of time.

LONGITUDINAL SURVEYS

FIGURE 6 Vertical Profile Station Locations

Day 197- Flood Tide

TABLE 3 Statistical Summary
FIGURE 7 Chlorophyll *a*
FIGURE 8 Dissolved Oxygen
FIGURE 9 Oil
FIGURE 10 pH
FIGURE 11 Salinity
FIGURE 12 Temperature
FIGURE 13 Total Suspended Solids
FIGURE 14 Time Series Plot
FIGURE 15 Vertical Profile, Station 1
FIGURE 16 Vertical Profile, Station 3
FIGURE 17 Vertical Profile, Station 7
FIGURE 18 Vertical Profile, Station 8
FIGURE 19 Vertical Profile, Station 9

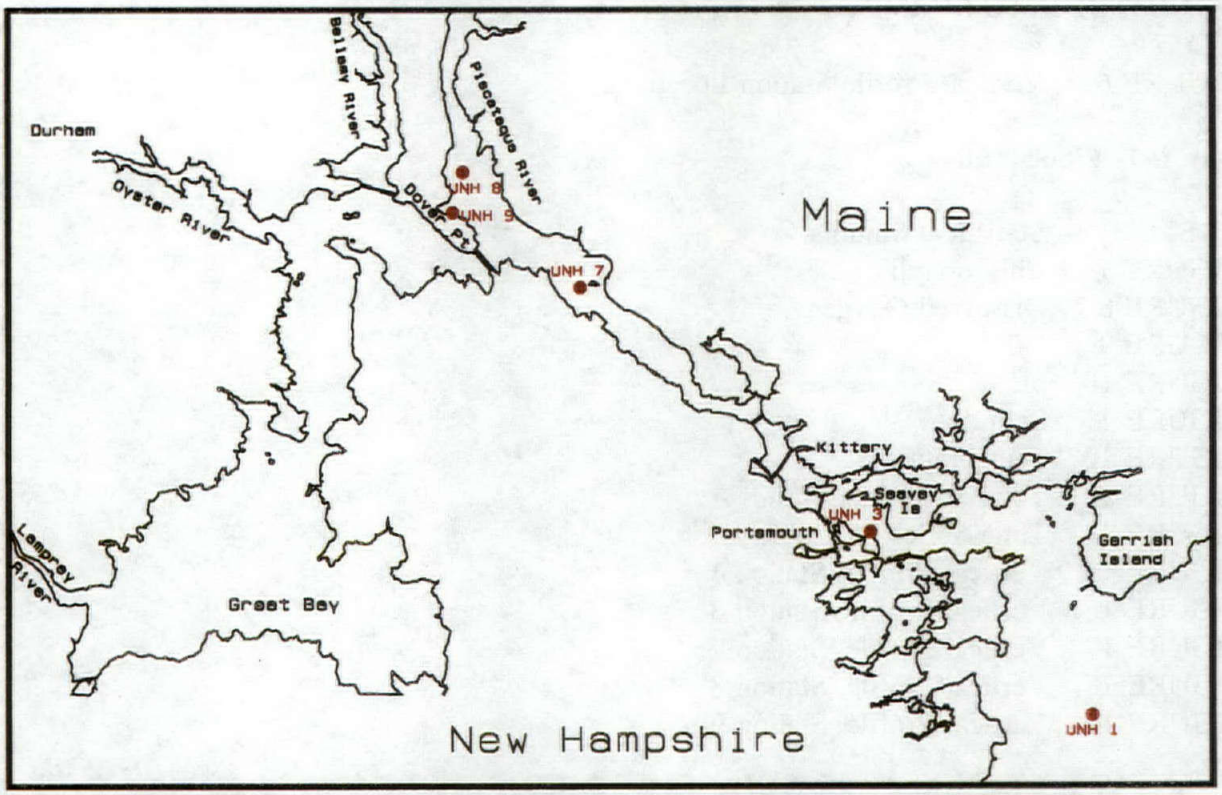


Figure 6. Location map of UNH stations where vertical profiles were obtained.

TABLE 3. Day 197 Longitudinal Transect Statistical Summary. Sample Depth <= 2.0 m.

variable	n	mean	std	min	max	range
Sample Depth	3481	1.169	0.266	0.131	1.999	1.868
Salinity	3481	29.551	1.427	24.786	31.109	6.323
Temperature	3481	16.013	2.129	13.343	20.256	6.913
pH	3477	8.098	0.069	7.859	8.266	0.407
Dissolved Oxygen	3481	5.997	0.808	3.121	7.052	3.931
Chlorophyll	3458	2.702	1.360	1.127	6.170	5.043
Oils Florescence	3448	14.124	13.672	-3.369	69.044	72.413
Nephelometry	3457	1.009	0.543	0.331	4.958	4.627
Transmittance	3465	64.177	14.771	11.029	84.040	73.012
Bottom Depth	3402	-11.992	5.364	-26.000	-1.500	24.500
TSS Neph	3456	4.060	1.866	1.720	17.708	15.988
TSS Trans	3464	4.642	2.223	1.652	12.652	11.000

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.95473	0.83592	0.71493	-0.92706	-0.91308	-0.85375	0.94290	-0.85344	-0.94178
	0.00000	0.80770	0.63013	0.50708	0.75534	0.73260	0.65136	0.78382	0.65097	0.78169
tem	-0.95473	1.00000	-0.76015	-0.76665	0.94567	0.92690	0.83605	-0.92356	0.83708	0.92311
	0.80770	0.00000	0.54975	0.55616	0.78918	0.75507	0.63029	0.74946	0.63148	0.74873
ph	0.83592	-0.76015	1.00000	0.68283	-0.74424	-0.79554	-0.80273	0.88074	-0.80098	-0.87896
	0.63013	0.54975	0.00000	0.47850	0.53438	0.58562	0.59324	0.68591	0.59137	0.68352
do2	0.71493	-0.76665	0.68283	1.00000	-0.66901	-0.76168	-0.70194	0.72362	-0.70239	-0.72290
	0.50708	0.55616	0.47850	0.00000	0.46656	0.55125	0.49536	0.51505	0.49577	0.51438
chl	-0.92706	0.94567	-0.74424	-0.66901	1.00000	0.91920	0.81539	-0.87137	0.81542	0.87248
	0.75534	0.78918	0.53438	0.46656	0.00000	0.74233	0.60695	0.67353	0.60699	0.67497
oil	-0.91308	0.92690	-0.79554	-0.76168	0.91920	1.00000	0.84210	-0.89005	0.84257	0.89119
	0.73260	0.75507	0.58562	0.55125	0.74233	0.00000	0.63737	0.69867	0.63791	0.70025
nep	-0.85375	0.83605	-0.80273	-0.70194	0.81539	0.84210	1.00000	-0.90282	0.99486	0.90397
	0.65136	0.63029	0.59324	0.49536	0.60695	0.63737	0.00000	0.71701	0.93539	0.71872
tra	0.94290	-0.92356	0.88074	0.72362	-0.87137	-0.89005	-0.90282	1.00000	-0.90216	-0.99873
	0.78382	0.74946	0.68591	0.51505	0.67353	0.69867	0.71701	0.00000	0.71605	0.96792
tssn	-0.85344	0.83708	-0.80098	-0.70239	0.81542	0.84257	0.99486	-0.90216	1.00000	0.90331
	0.65097	0.63148	0.59137	0.49577	0.60699	0.63791	0.93539	0.71605	0.00000	0.71774
tsst	-0.94178	0.92311	-0.87896	-0.72290	0.87248	0.89119	0.90397	-0.99873	0.90331	1.00000
	0.78169	0.74873	0.68352	0.51438	0.67497	0.70025	0.71872	0.96792	0.71774	0.00000

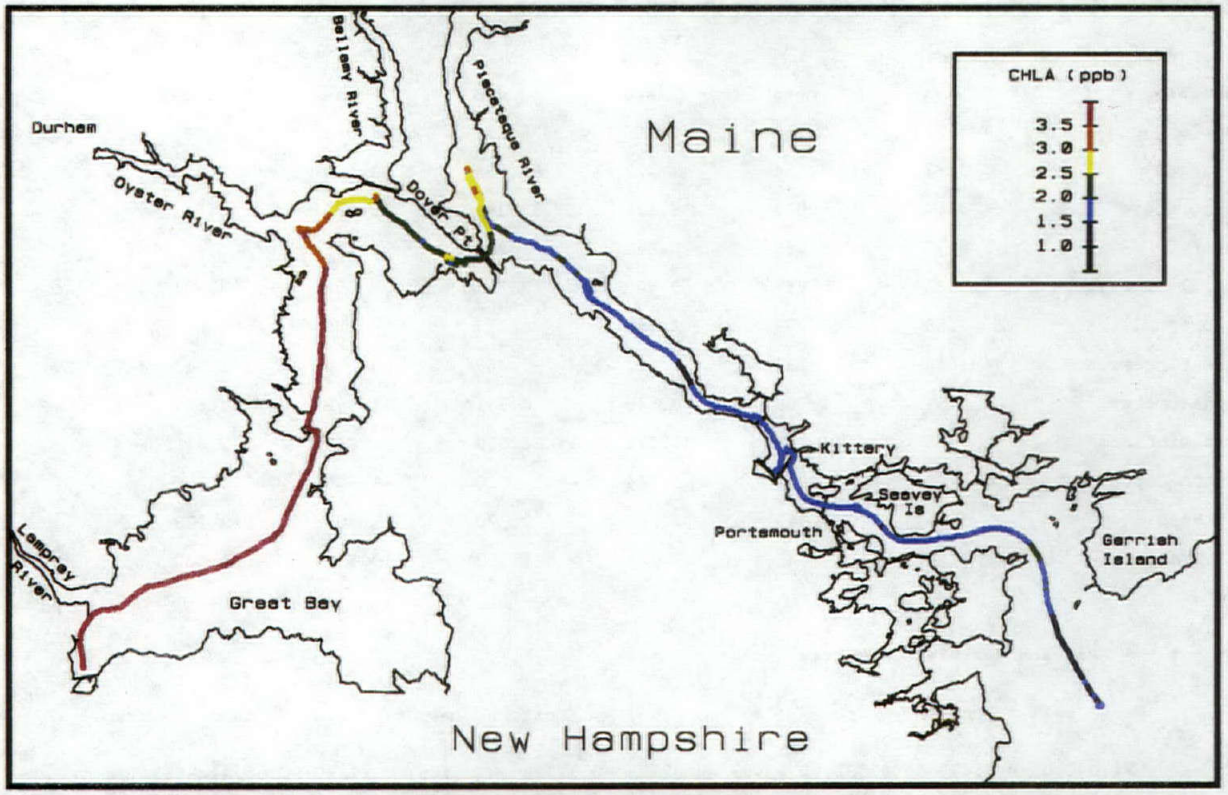


Figure 7. Chlorophyll a concentration (ppb) during flood tide.

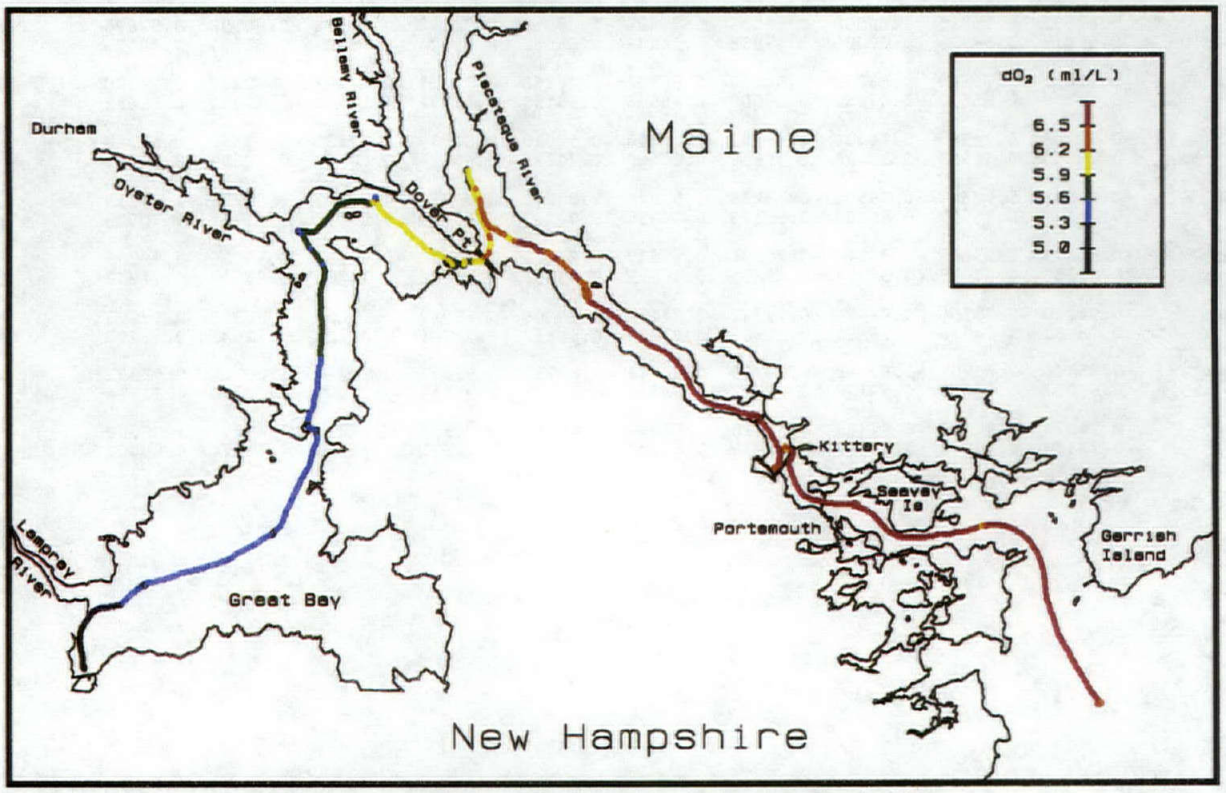


Figure 8. Dissolved Oxygen (mL/L) concentration during flood tide.

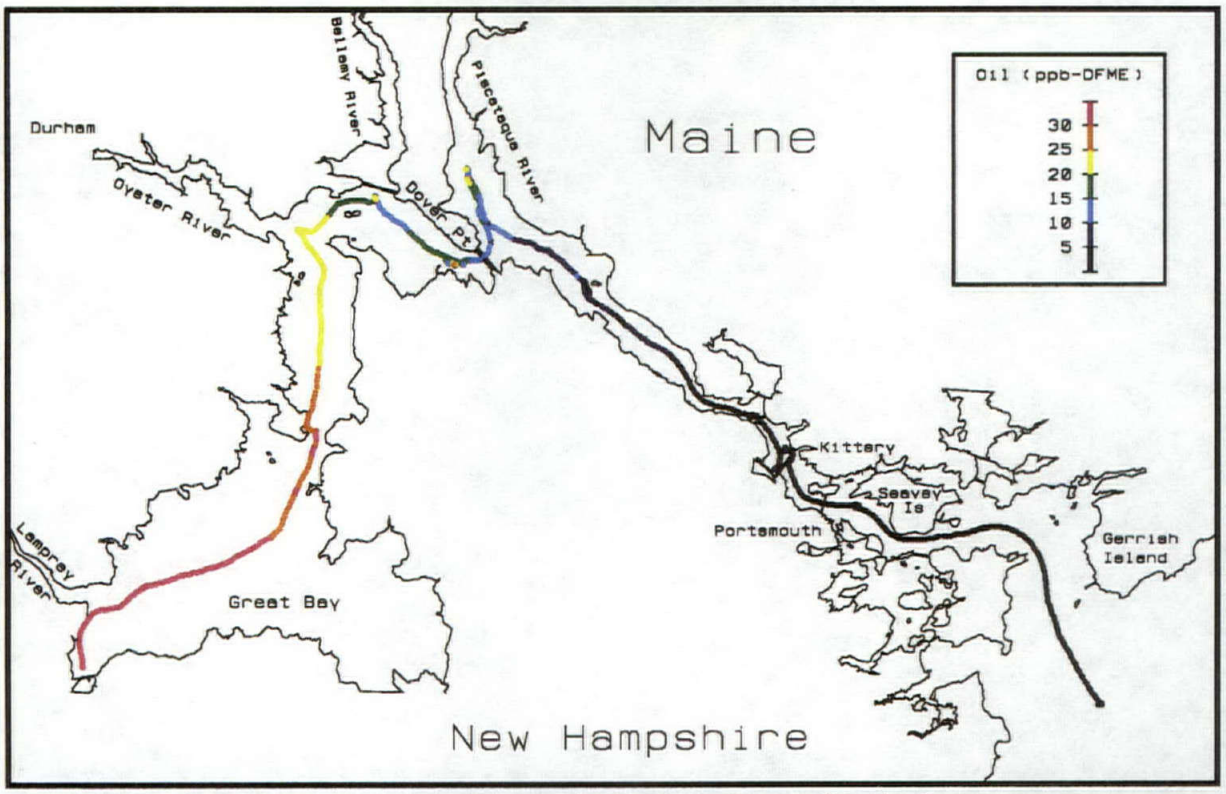


Figure 9. Dissolved oil concentration (ppb-DFME) during flood tide.

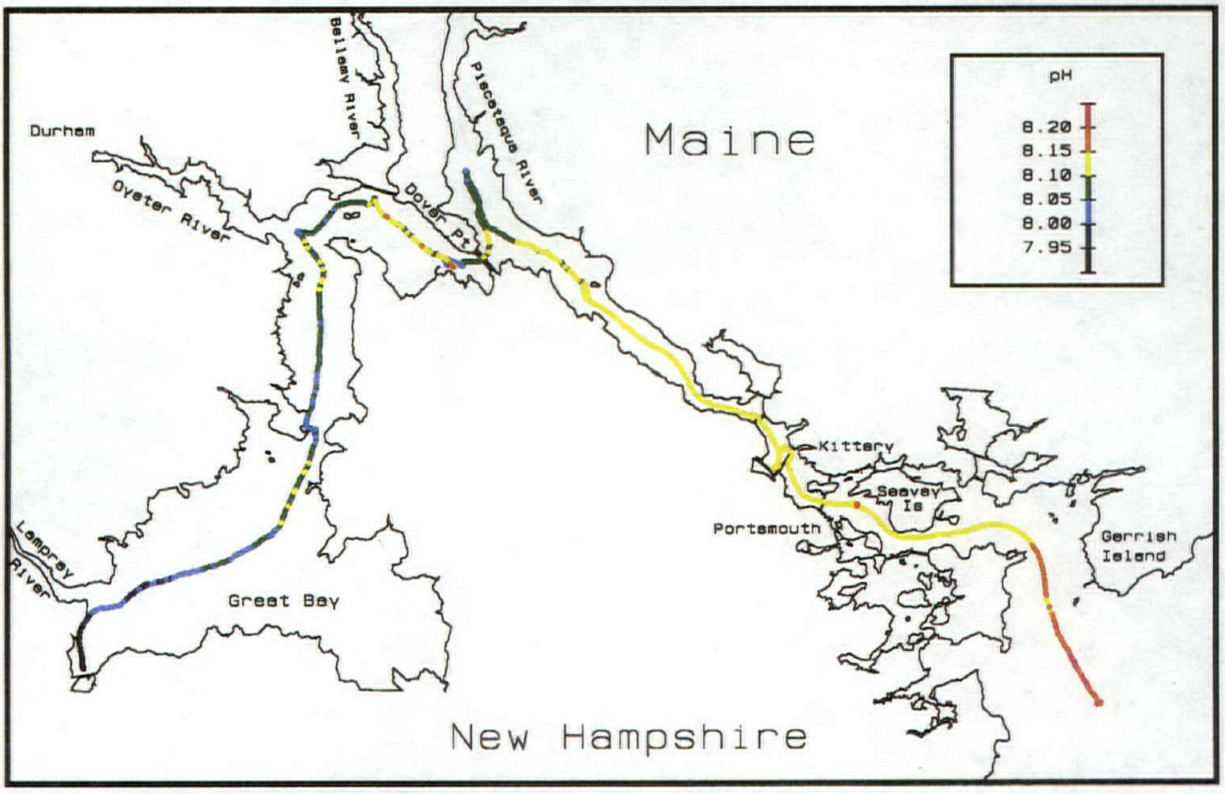


Figure 10. Flood tide pH (NBS).

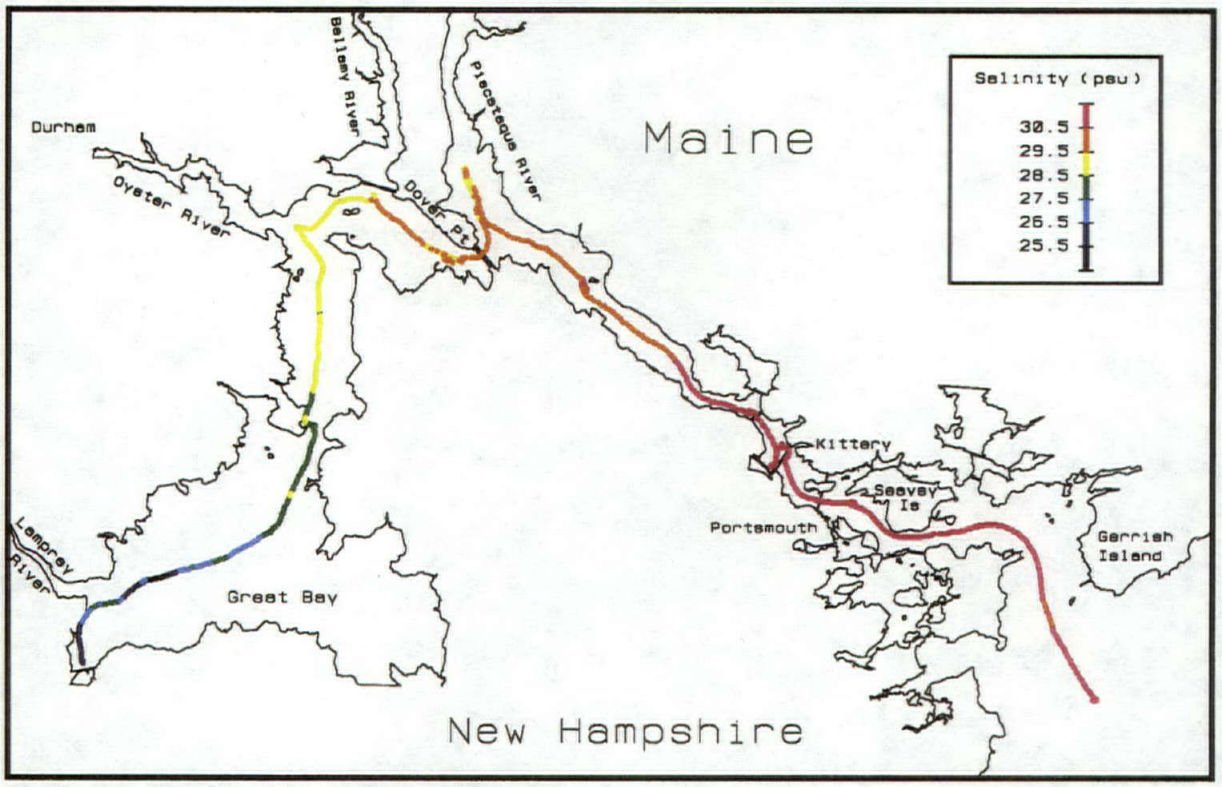


Figure 11. Salinity (psu) during flood tide.

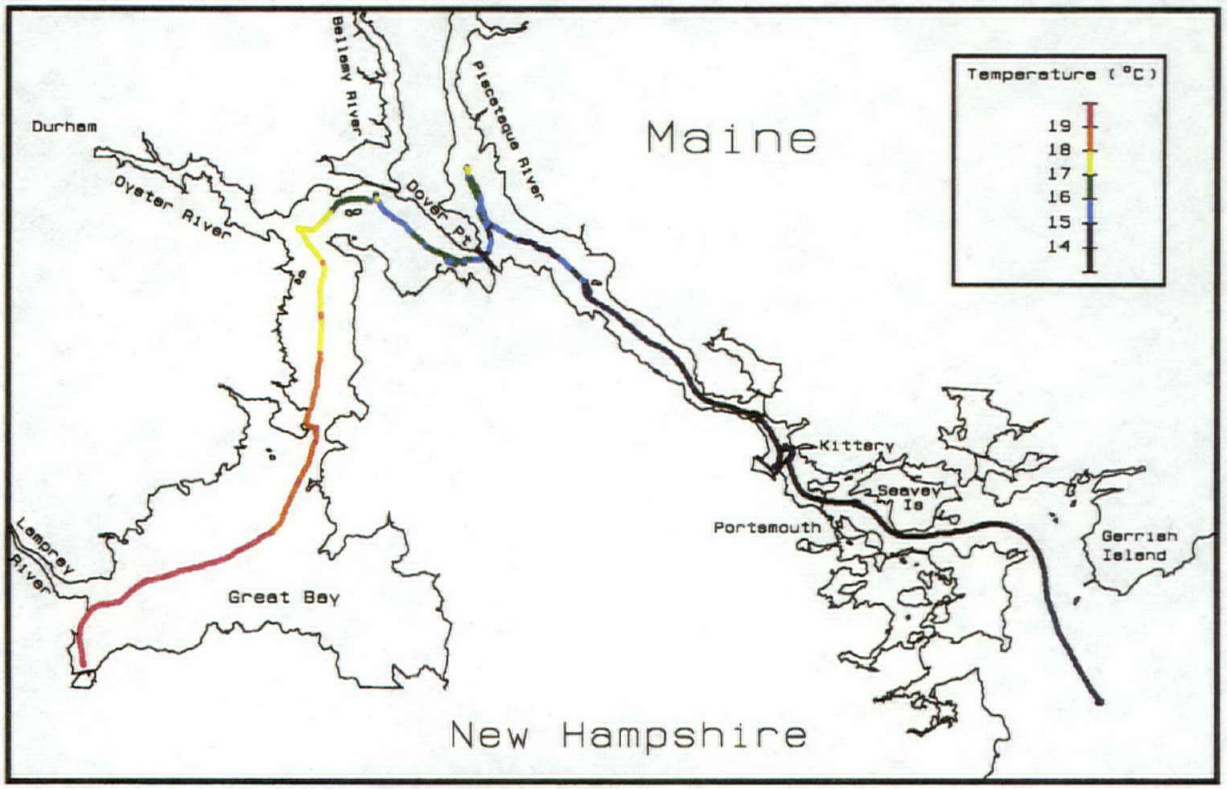


Figure 12. Temperature (°C) during flood tide.

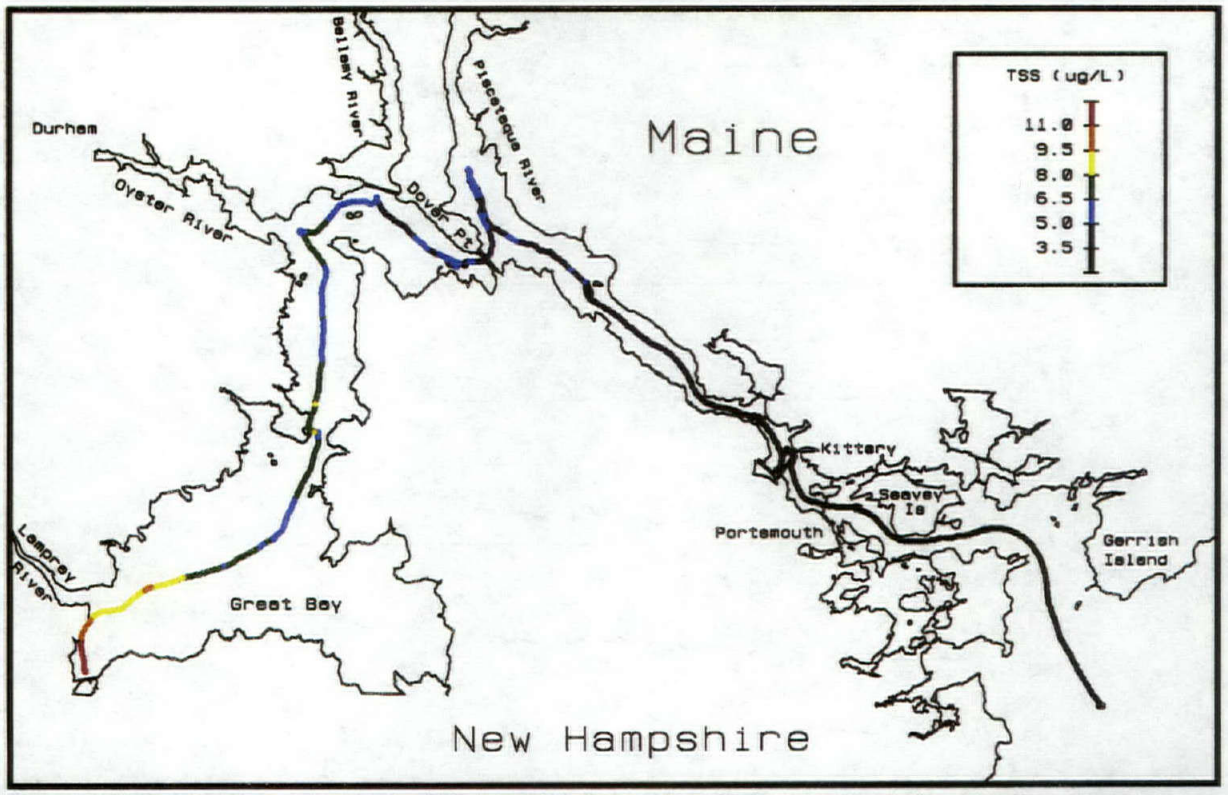


Figure 13. Total suspended solids (mg/L) based on light transmission during flood tide.

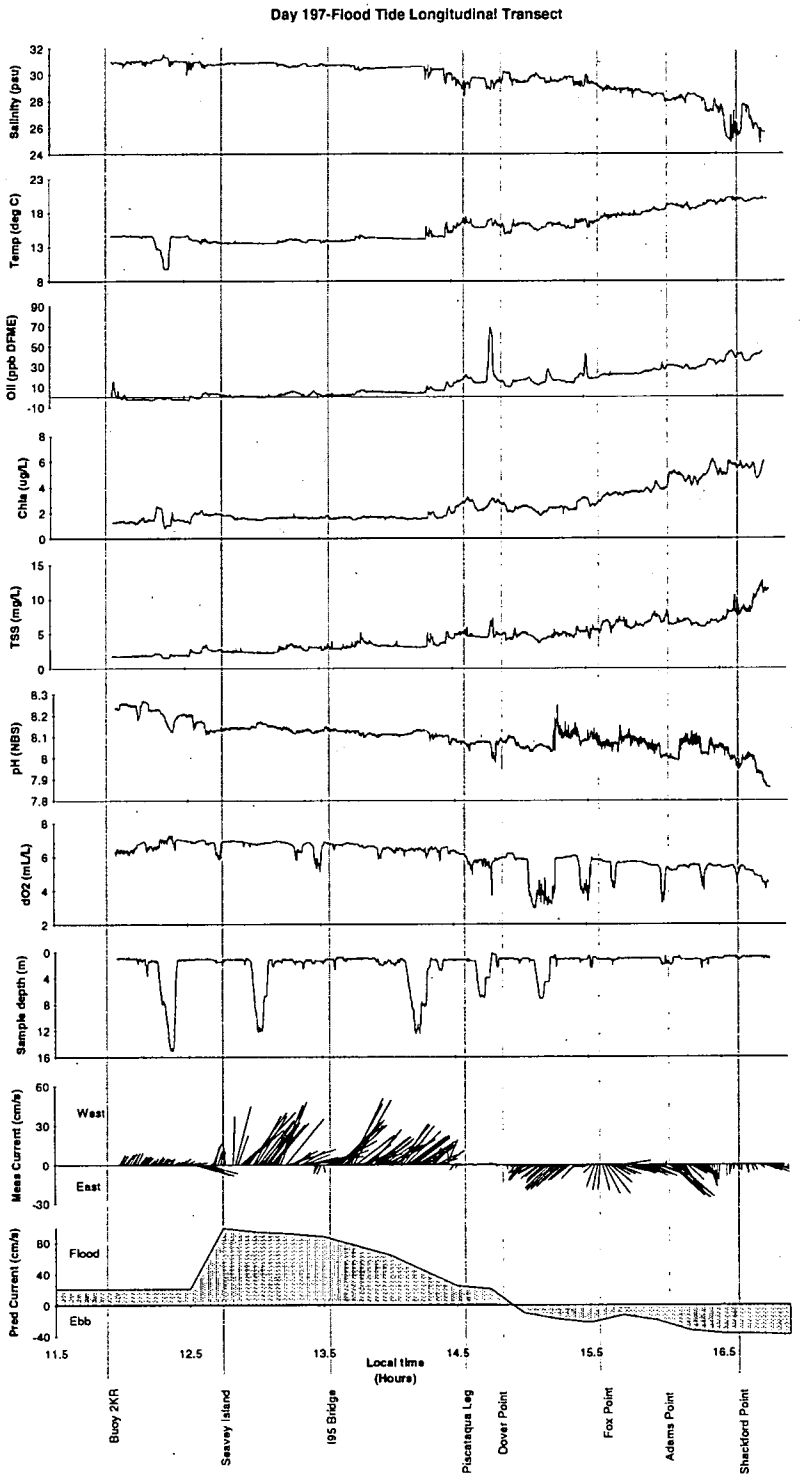


Figure 14. Time series plot of day 197 data.

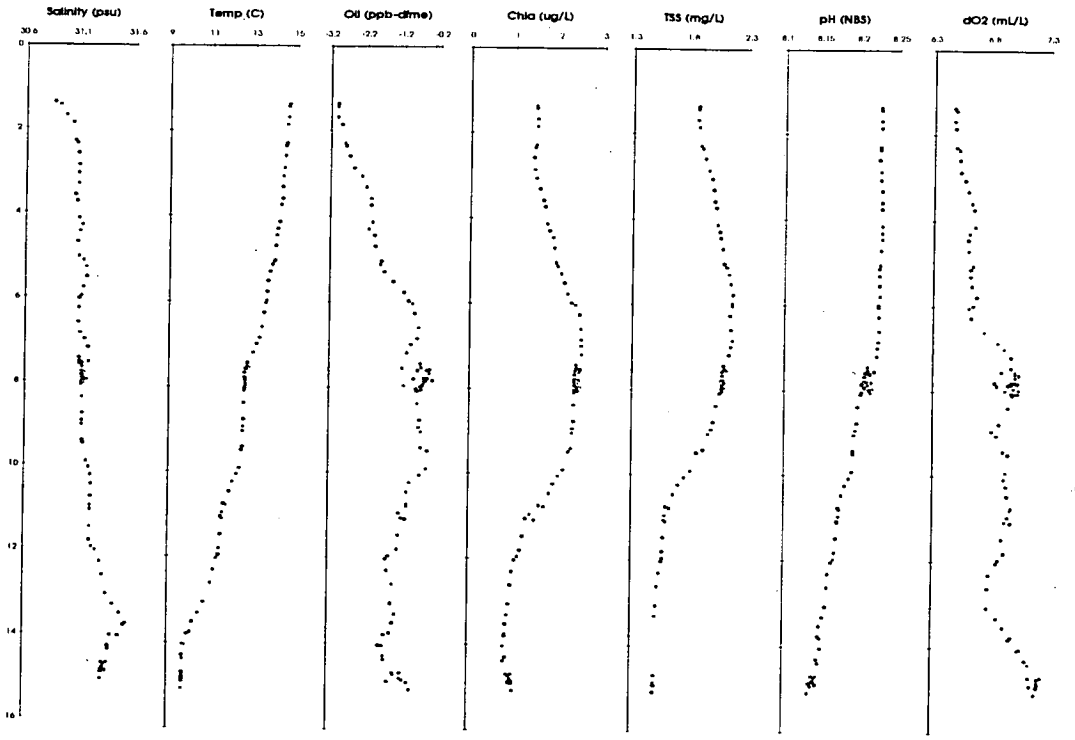


Figure 15. Vertical profile, Day 197, UNH Station 1.

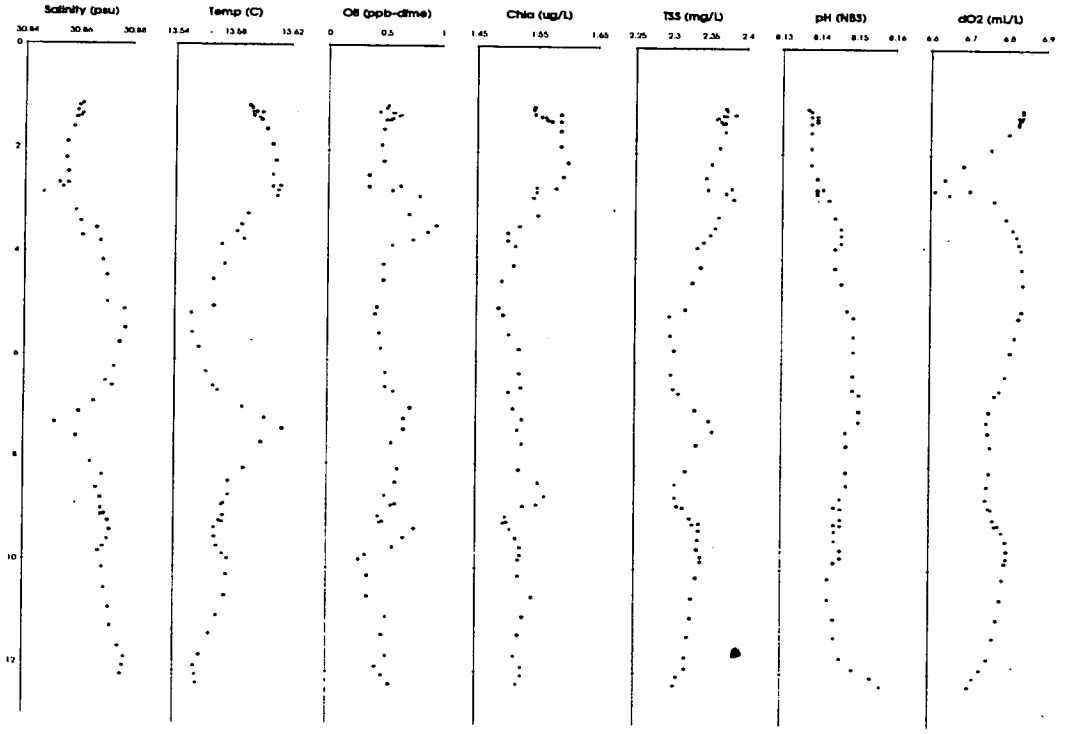


Figure 16. Vertical profile, Day 197, UNH Station 3.

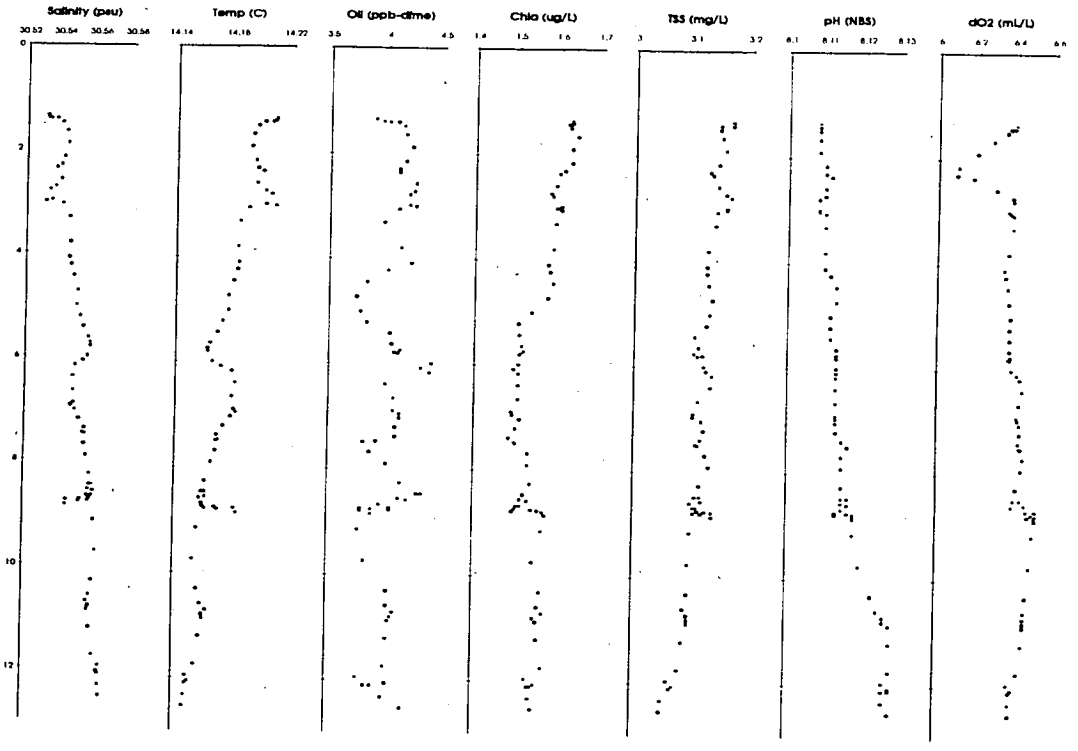


Figure 17. Vertical profile, Day 197, UNH Station 7.

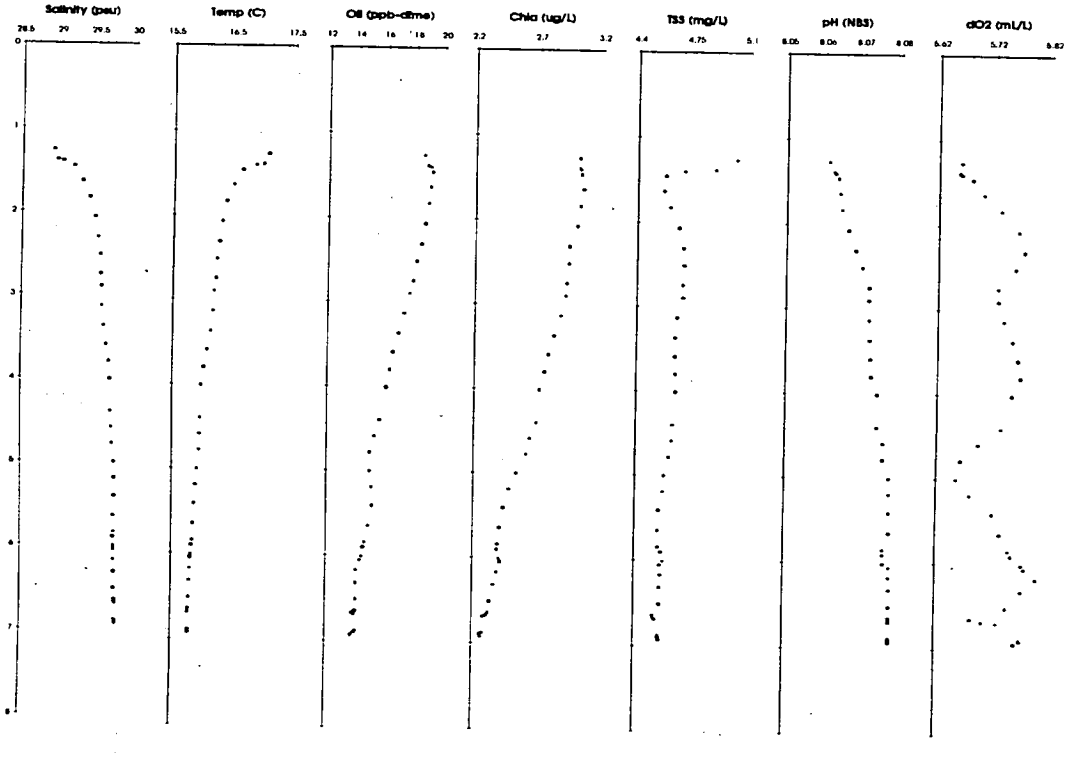


Figure 18. Vertical profile, Day 197, UNH Station 8.

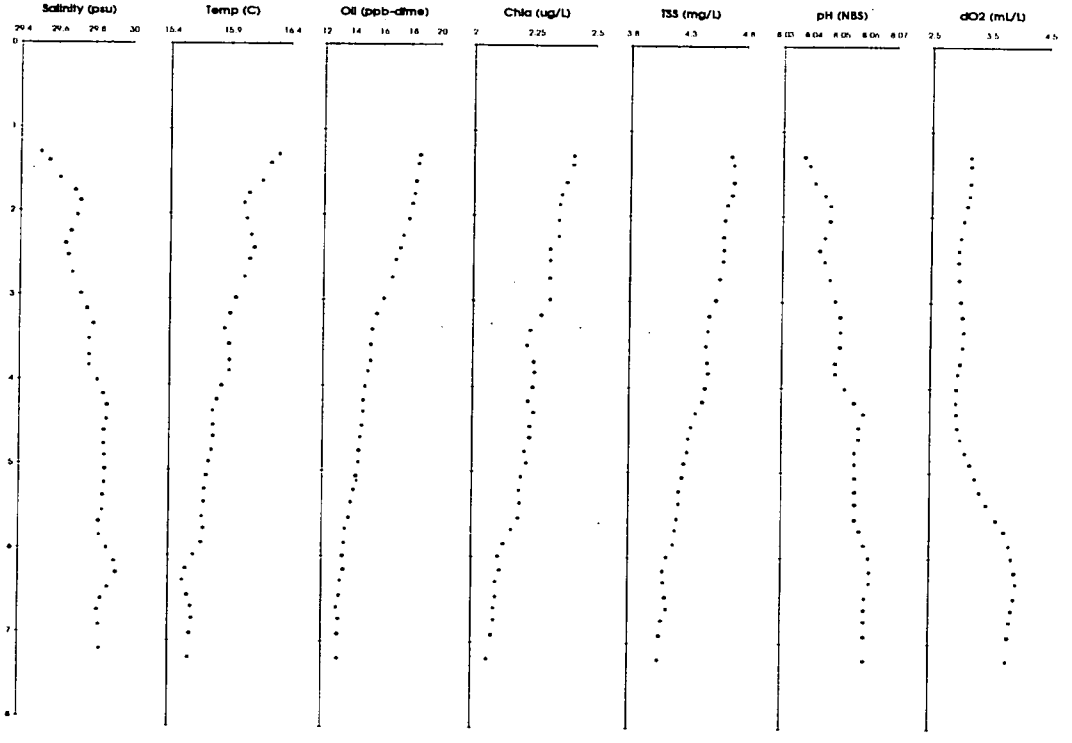


Figure 19. Vertical profile, Day 197, UNH Station 9.

LONGITUDINAL SURVEYS

Day 198- Ebb Tide

TABLE 4	Statistical Summary
FIGURE 20	Chlorophyll *a*
FIGURE 21	Dissolved Oxygen
FIGURE 22	Oil
FIGURE 23	pH
FIGURE 24	Salinity
FIGURE 25	Temperature
FIGURE 26	Total Suspended Solids
FIGURE 27	Time Series Plot
FIGURE 28	Vertical Profile, Station 1
FIGURE 29	Vertical Profile, Station 3
FIGURE 30	Vertical Profile, Station 7
FIGURE 30	Vertical Profile, Station 8
FIGURE 31	Vertical Profile, Station 9

TABLE 4. Day 198 Longitudinal Transect Statistical Summary. Sample Depth <=2.0 m.

variable	n	mean	std	min	max	range
Sample Depth	3583	1.132	0.261	0.324	1.999	1.675
Salinity	3581	28.091	1.933	22.307	31.070	8.763
Temperature	3585	17.407	1.946	12.324	20.745	8.421
pH	3576	8.045	0.133	7.765	8.439	0.675
Dissolved Oxygen	3505	5.731	0.499	4.919	7.226	2.307
Chlorophyll	3560	3.171	2.149	1.024	19.396	18.372
Oils Florescence	3553	24.715	13.336	-1.813	77.730	79.543
Nephelometry	3525	2.617	3.119	0.455	23.209	22.754
Transmittance	3495	48.433	19.070	1.010	82.947	81.937
Bottom Depth	3512	-10.483	5.674	-23.600	-1.500	22.100
TSS Neph	3524	9.618	10.779	2.149	80.773	78.623
TSS Trans	3495	7.016	2.873	1.817	14.161	12.345

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.82813	0.86667	0.79642	-0.77813	-0.90805	-0.58455	0.76623	-0.58474	-0.76623
	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
tem	-0.82813	1.00000	-0.88175	-0.92484	0.73689	0.83936	0.53753	-0.86668	0.53791	0.86668
	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
ph	0.86667	-0.88175	1.00000	0.85858	-0.69308	-0.84217	-0.50252	0.75259	-0.50294	-0.75259
	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
do2	0.79642	-0.92484	0.85858	1.00000	-0.57406	-0.83406	-0.38700	0.71668	-0.38747	-0.71668
	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
chl	-0.77813	0.73689	-0.69308	-0.57406	1.00000	0.66109	0.86301	-0.77728	0.86297	0.77728
	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000
oil	-0.90805	0.83936	-0.84217	-0.83406	0.66109	1.00000	0.40698	-0.74405	0.40726	0.74405
	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000
nep	-0.58455	0.53753	-0.50252	-0.38700	0.86301	0.40698	1.00000	-0.63661	0.99999	0.63661
	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000
tra	0.76623	-0.86668	0.75259	0.71668	-0.77728	-0.74405	-0.63661	1.00000	-0.63681	-1.00000
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000
tssn	-0.58474	0.53791	-0.50294	-0.38747	0.86297	0.40726	0.99999	-0.63681	1.00000	0.63681
	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000
tsst	-0.76623	0.86668	-0.75259	-0.71668	0.77728	0.74405	0.63661	-1.00000	0.63681	1.00000
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000

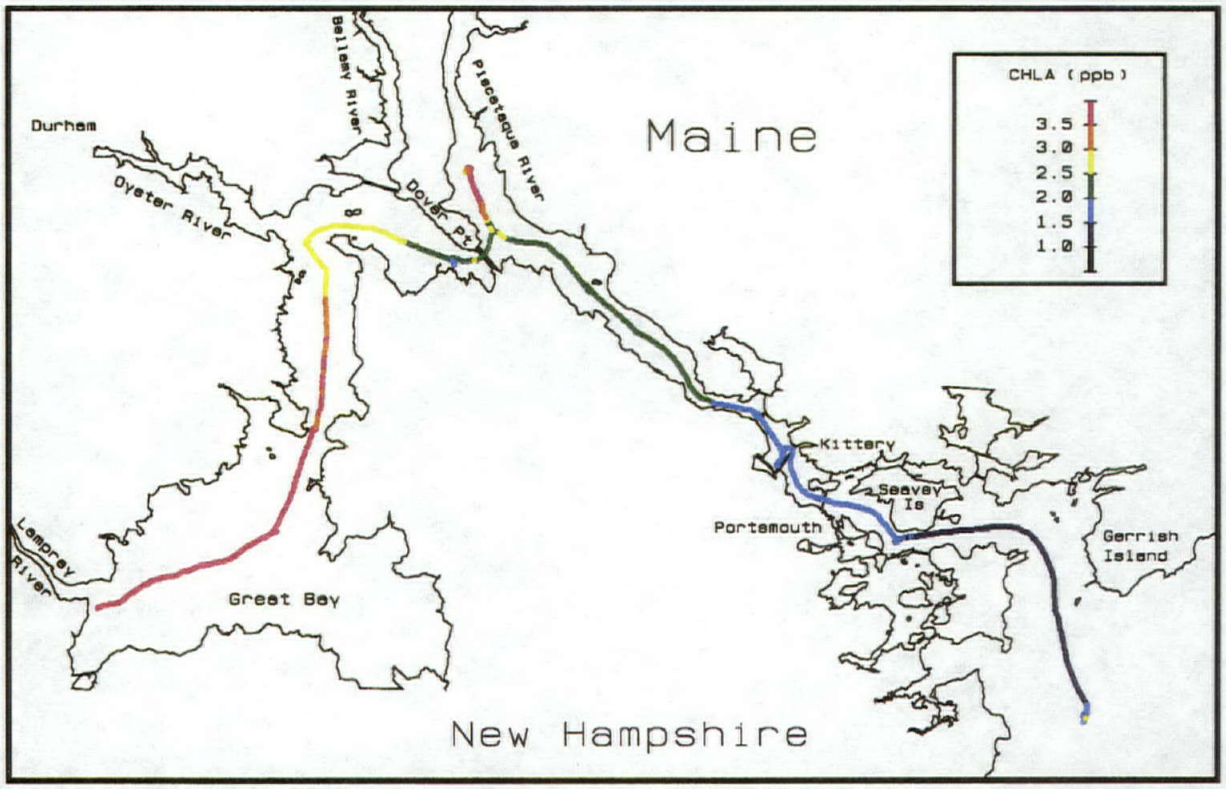


Figure 20. Chlorophyll a concentration (ppb) during ebb tide.

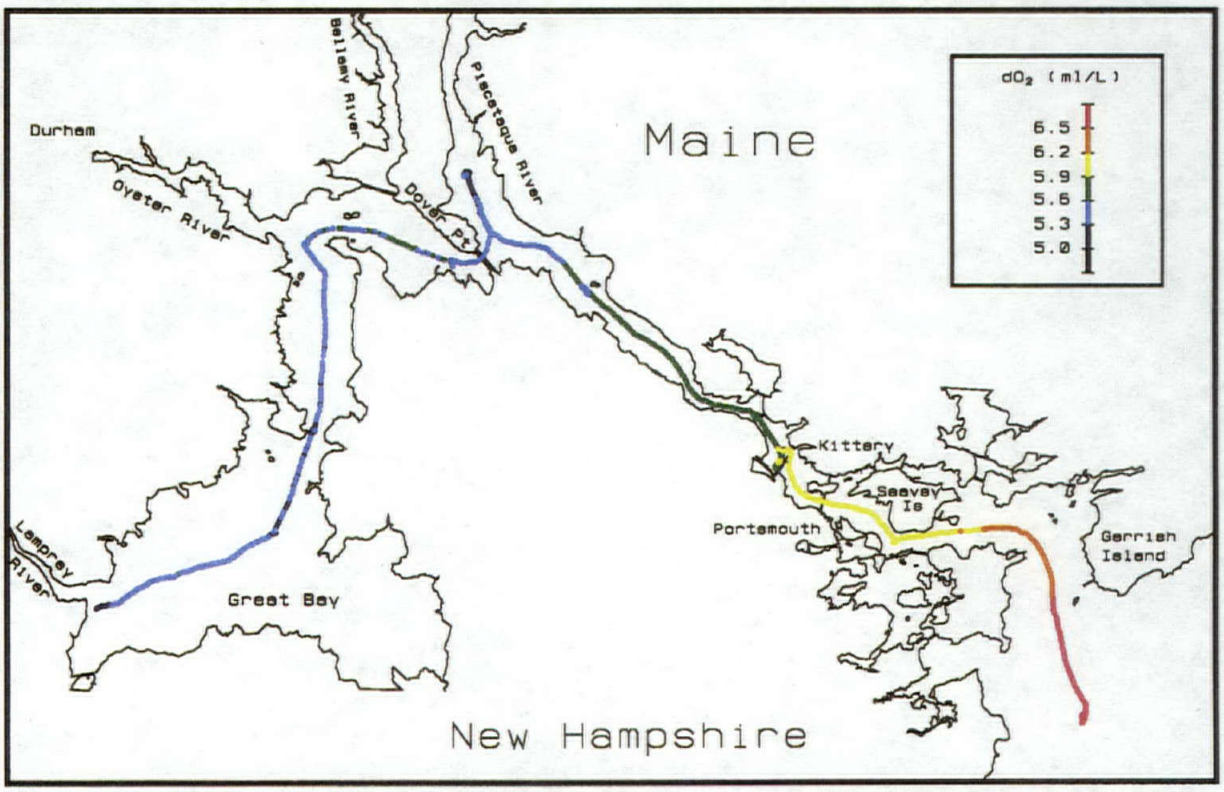


Figure 21. Dissolved oxygen concentration (mL/L) during ebb tide.

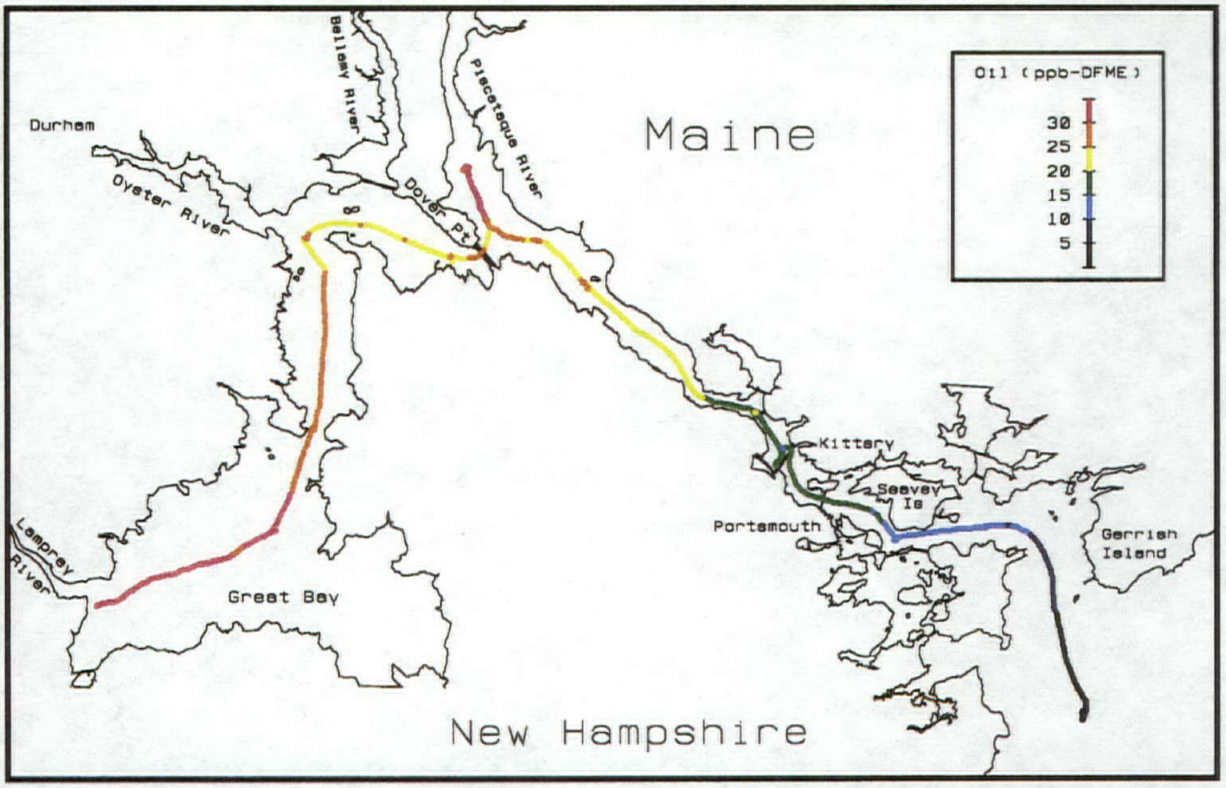


Figure 22. Dissolved oil concentration (ppb-DFME) during ebb tide.

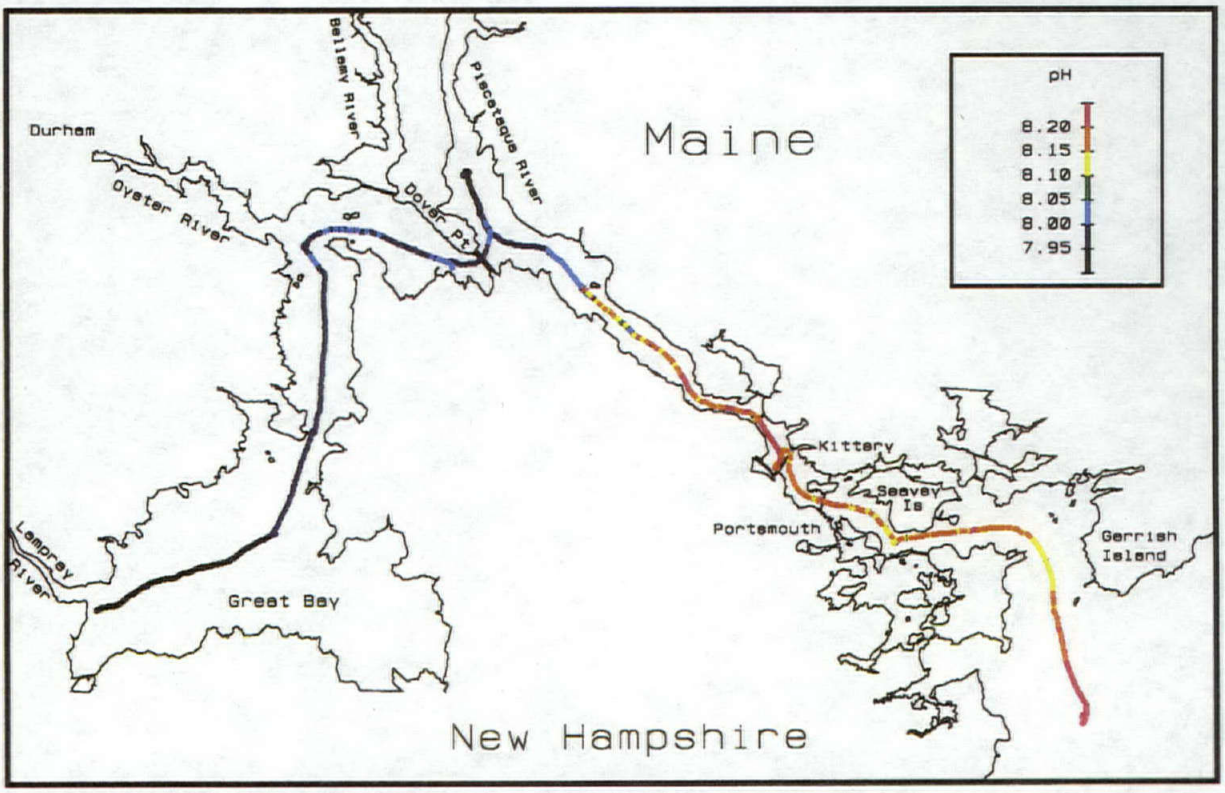


Figure 23. Ebb tide pH (NBS).

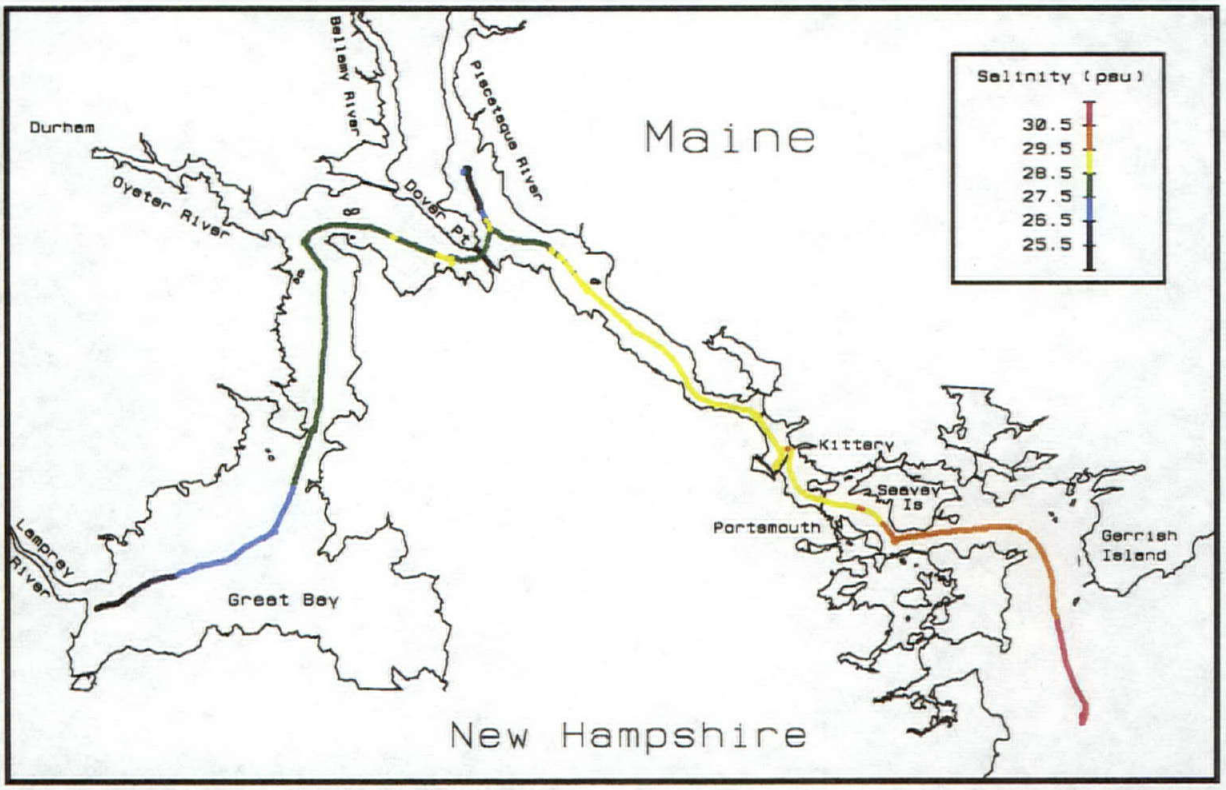


Figure 24. Salinity (psu) during ebb tide.

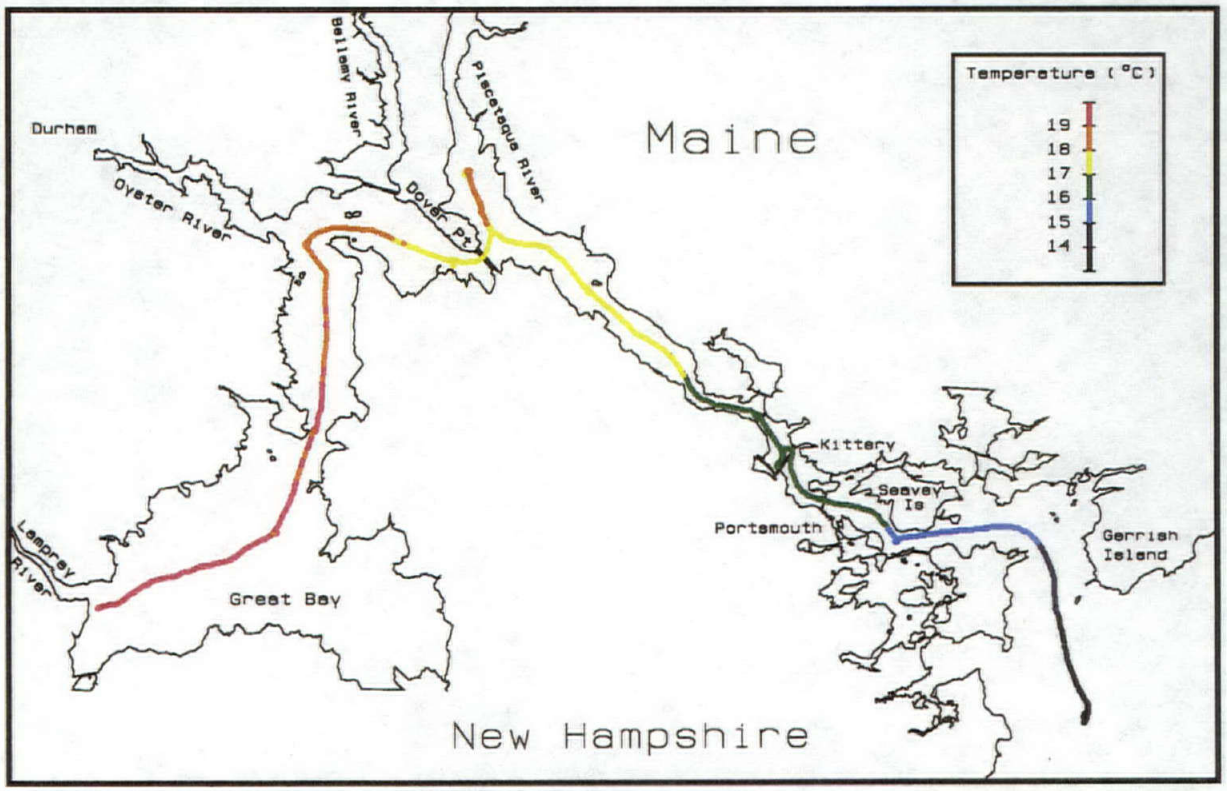


Figure 25. Temperature (°C) during ebb tide.

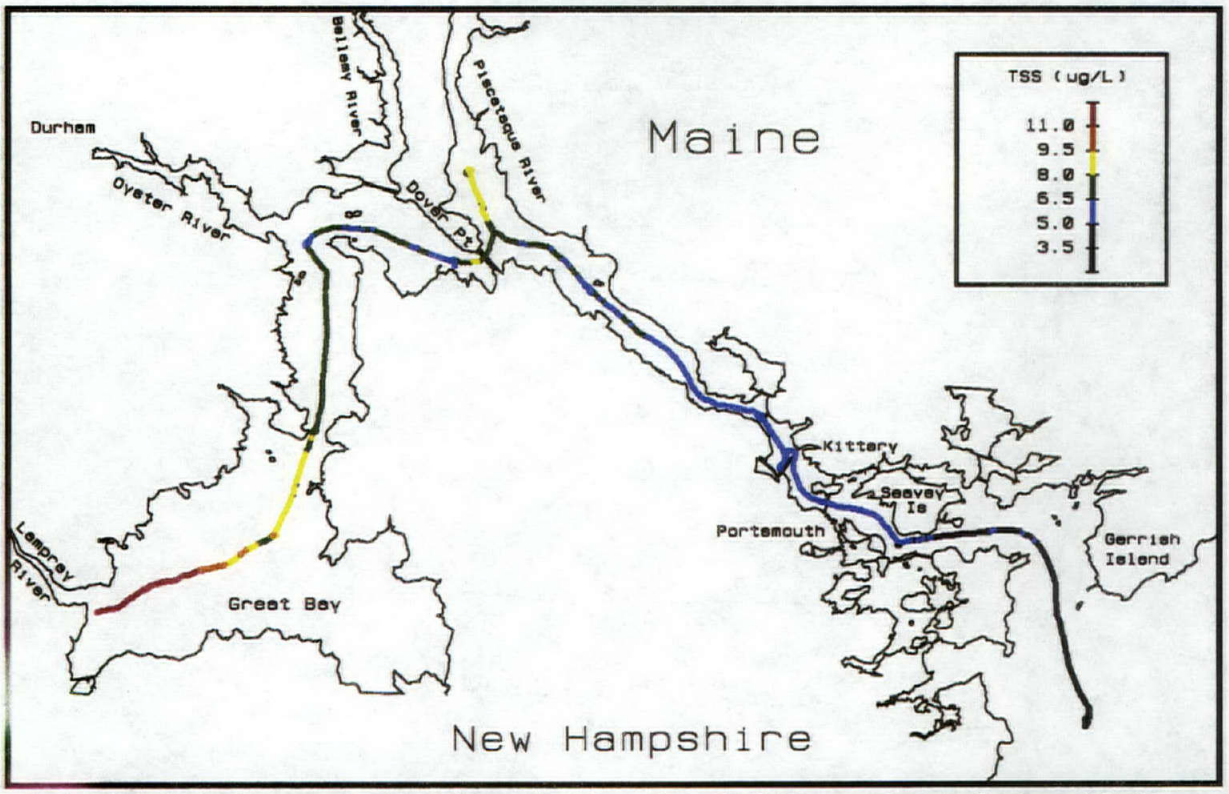


Figure 26. Total suspended solids (mg/L) based on light transmission during ebb tide.

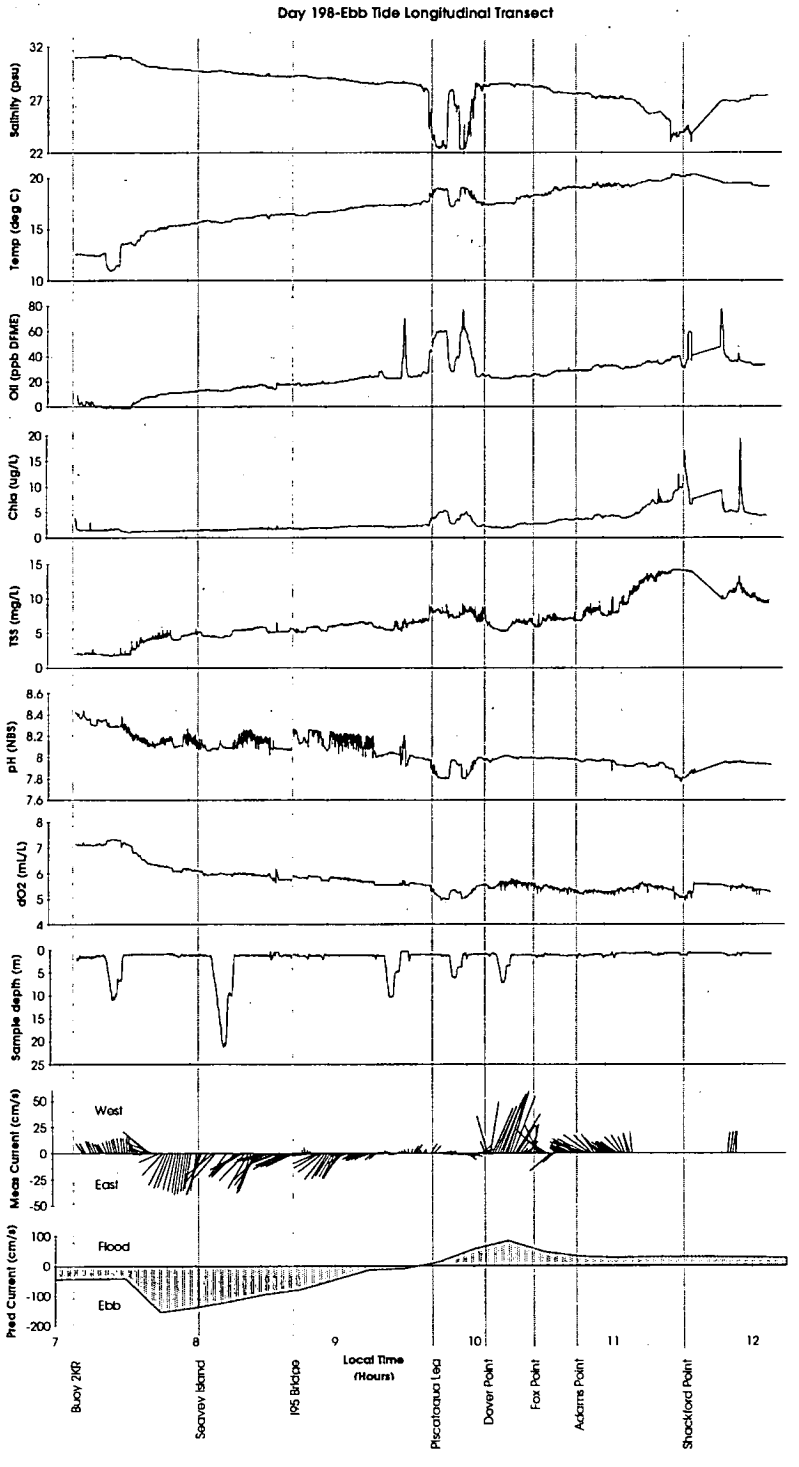


Figure 27. Time series plot of Day 198 data.

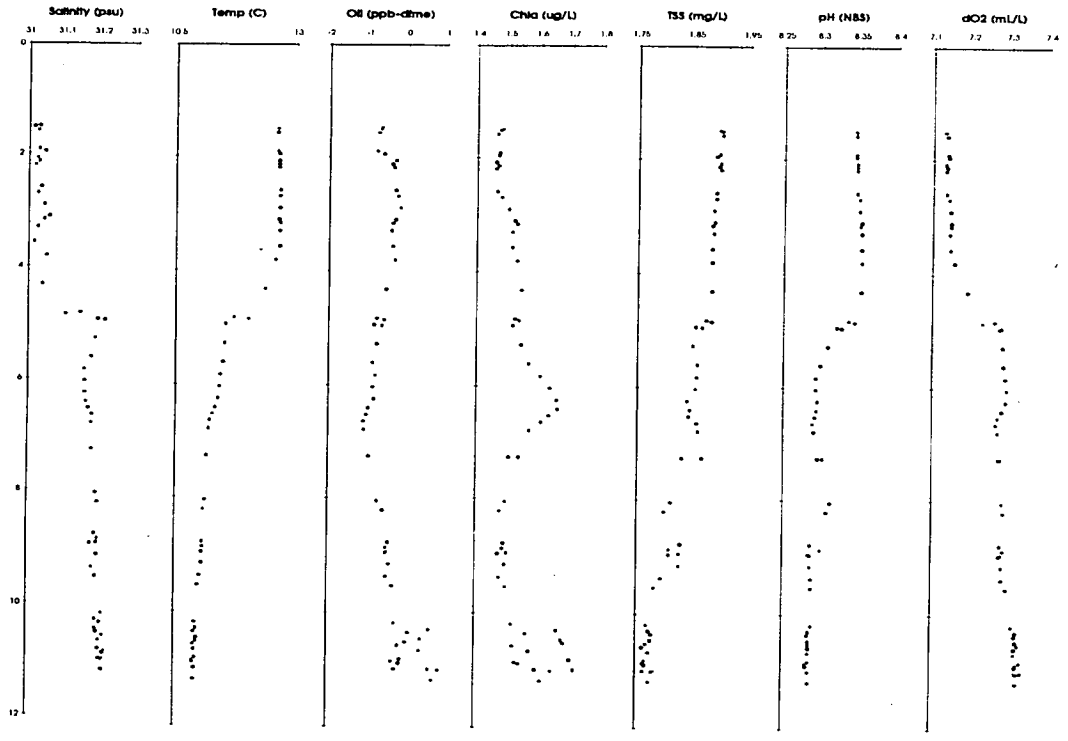


Figure 28. Vertical profile, Day 198, UNH Station 1.

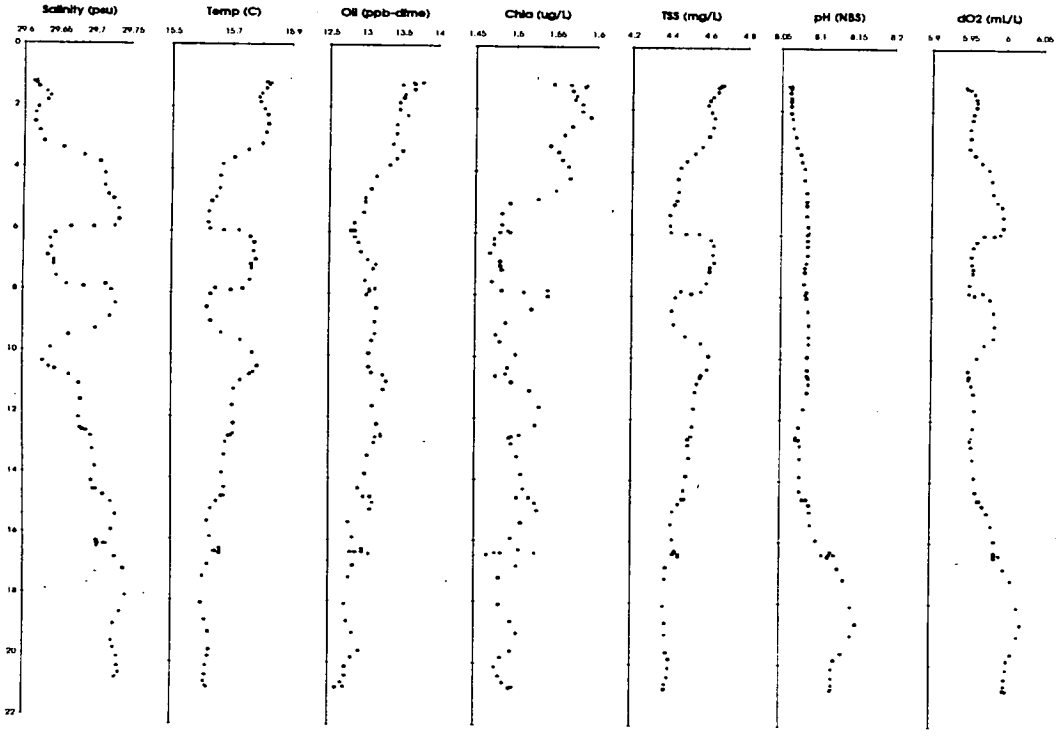


Figure 29. Vertical profile, Day 198, Station 3.

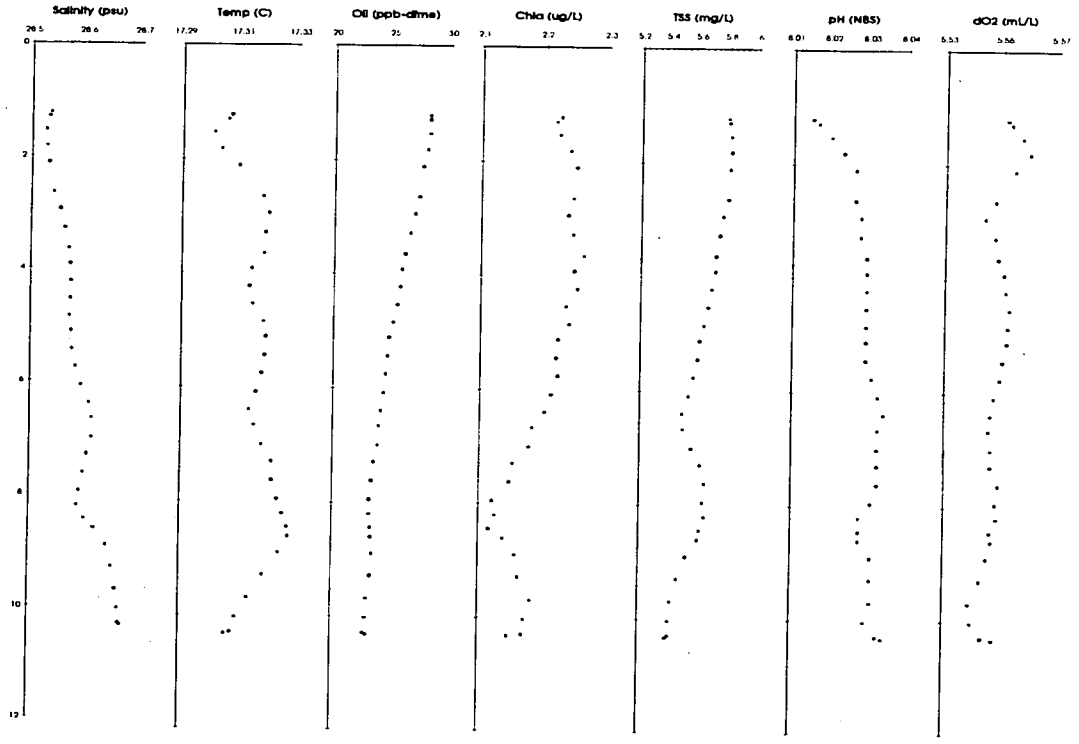


Figure 30. Vertical profile, Day 198, UNH Station 7.

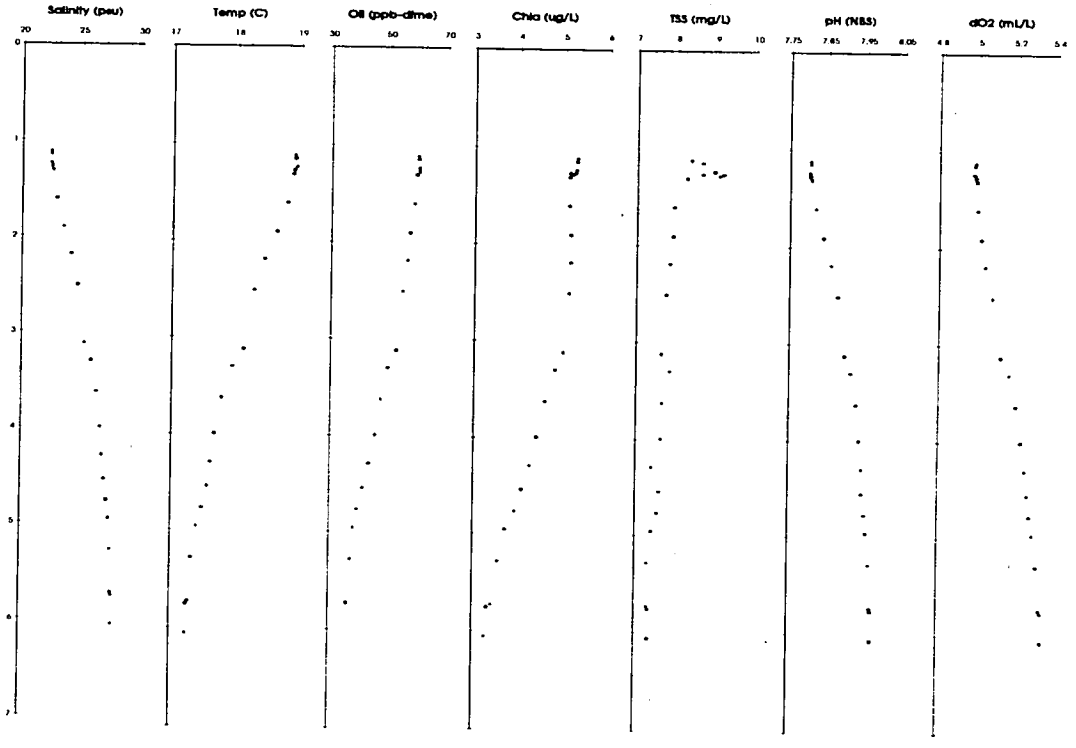


Figure 31. Vertical profile, Day 198, UNH Station 8.

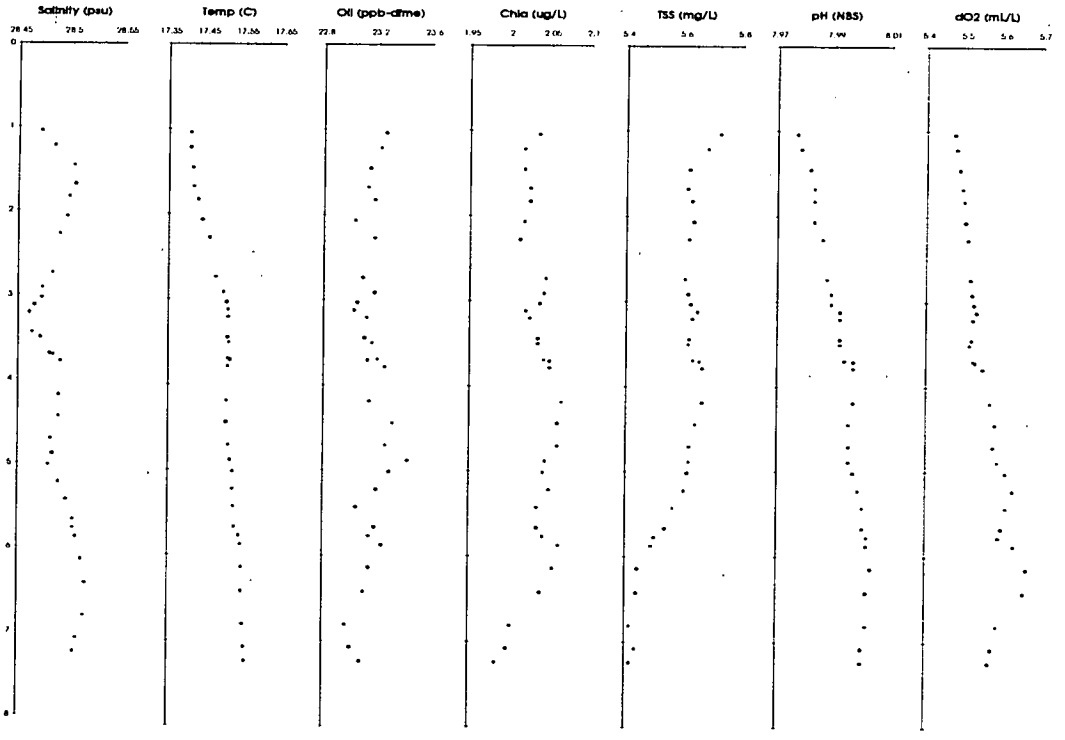


Figure 32. Vertical profile, Day 198, UNH Station 9.

MAPPING SURVEYS

FIGURE 33 Location Track Map
TABLE 5 Statistical Summary

Day 202- Ebb Tide

FIGURE 34 Predicted Tide Stage Histogram
FIGURE 35 Surface Current
FIGURE 36 Dissolved Oxygen
FIGURE 37 Oil
FIGURE 38 pH
FIGURE 39 Salinity
FIGURE 40 Temperature
FIGURE 41 Total Suspended Solids

Day 202- Low Slack

FIGURE 42 Predicted Tide Stage Histogram
FIGURE 43 Surface Current
FIGURE 44 Dissolved Oxygen
FIGURE 45 Oil
FIGURE 46 pH
FIGURE 47 Salinity
FIGURE 48 Temperature
FIGURE 49 Total Suspended Solids

Day 202- Flood Tide

FIGURE 50 Predicted Tide Stage Histogram
FIGURE 51 Surface Current
FIGURE 52 Dissolved Oxygen
FIGURE 53 Oil
FIGURE 54 pH
FIGURE 55 Salinity
FIGURE 56 Temperature
FIGURE 57 Total Suspended Solids

MAPPING SURVEYS (cont)

Day 202- High Slack

FIGURE 58 Predicted Tide Stage Histogram
FIGURE 59 Surface Current
FIGURE 60 Dissolved Oxygen
FIGURE 61 Oil
FIGURE 62 pH
FIGURE 63 Salinity
FIGURE 64 Temperature
FIGURE 65 Total Suspended Solids

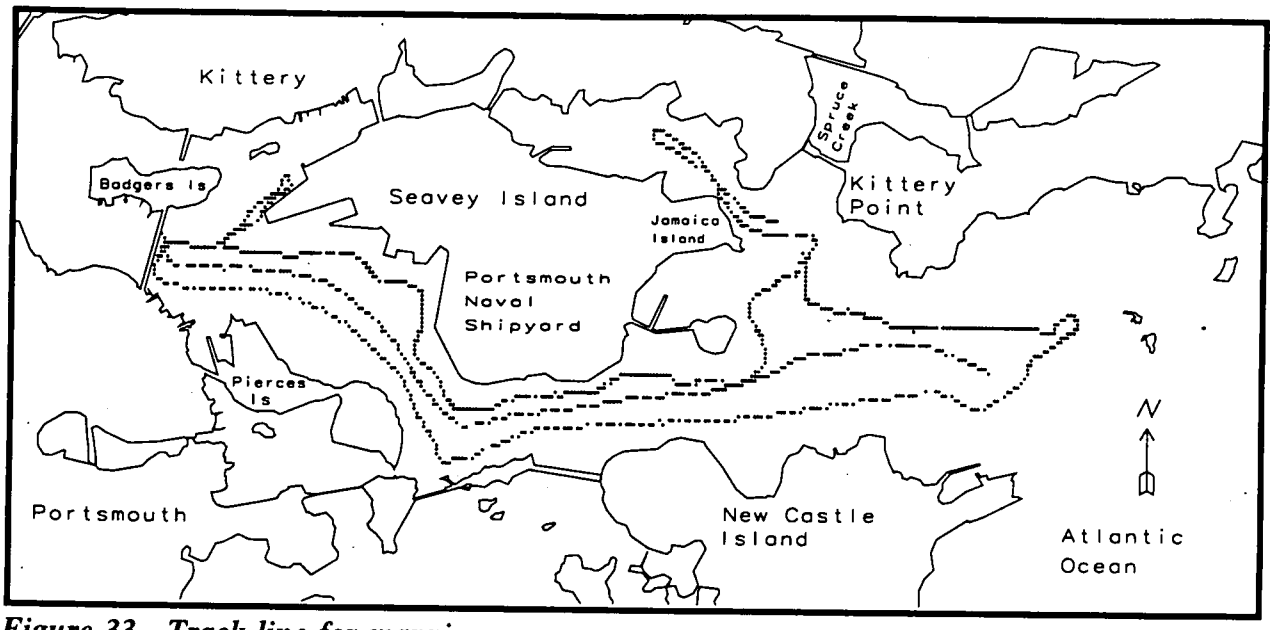


Figure 33. Track line for mapping surveys.

TABLE 5. Day 202 Mapping Survey Statistical Summary. Sample Depth <= 2.0 meters

variable	n	mean	std	min	max	range
Sample Depth	4585	1.158	0.127	0.739	1.984	1.245
Salinity	4598	30.033	0.550	28.901	30.883	1.983
Temperature	4598	16.682	0.666	14.722	18.389	3.668
pH	4598	7.949	0.043	7.880	8.045	0.165
Dissolved Oxygen	4598	6.247	0.358	5.640	6.937	1.297
Rhodamine	4594	0.882	0.218	0.532	1.847	1.315
Oils Fluorescence	4598	14.021	7.339	0.968	29.098	28.130
Nephelometry	4595	0.925	0.285	0.390	1.841	1.451
Transmittance	4597	70.297	4.478	56.123	79.964	23.841
Bottom Depth	4531	-15.838	4.904	-25.400	-4.700	20.700
TSS Neph	4591	3.774	0.983	1.923	6.937	5.014
TSS Trans	4593	3.722	0.675	2.266	5.858	3.592

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	rho	oil	nep	tra	tssn	tsst
sal	1.00000	-0.98512	0.67502	0.96099	-0.04654	-0.43299	-0.08465	0.84070	-0.08433	-0.84070
	0.00000	0.89004	0.47173	0.82160	0.01064	0.00000	0.00000	0.63571	0.00000	0.63571
tem	-0.98512	1.00000	-0.66877	-0.97662	0.04670	0.35200	0.08459	-0.83473	0.08422	0.83473
	0.89004	0.00000	0.46636	0.86207	0.01038	0.00000	0.00000	0.62875	0.00000	0.62875
ph	0.67502	-0.66877	1.00000	0.62399	0.12151	-0.18784	0.04584	0.78443	0.04608	-0.78443
	0.47173	0.46636	0.00000	0.42898	0.00000	0.00000	0.01188	0.57409	0.01145	0.57409
do2	0.96099	-0.97662	0.62399	1.00000	-0.07250	-0.24542	-0.10316	0.77262	-0.10282	-0.77262
	0.82160	0.86207	0.42898	0.00000	0.00007	0.00000	0.00000	0.56211	0.00000	0.56211
rho	-0.04654	0.04670	0.12151	-0.07250	1.00000	0.08585	0.29914	0.07130	0.29913	-0.07130
	0.01064	0.01038	0.00000	0.00007	0.00000	0.00000	0.00000	0.00009	0.00000	0.00009
oil	-0.43299	0.35200	-0.18784	-0.24542	0.08585	1.00000	0.05825	-0.36260	0.05825	0.36260
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00138	0.00000	0.00139	0.00000
nep	-0.08465	0.08459	0.04584	-0.10316	0.29914	0.05825	1.00000	0.00169	0.99999	-0.00169
	0.00000	0.00000	0.01188	0.00000	0.00000	0.00138	0.00000	0.92601	0.00000	0.92601
tra	0.84070	-0.83473	0.78443	0.77262	0.07130	-0.36260	0.00169	1.00000	0.00196	-1.00000
	0.63571	0.62875	0.57409	0.56211	0.00009	0.00000	0.92601	0.00000	0.91457	1.00000
tssn	-0.08433	0.08422	0.04608	-0.10282	0.29913	0.05825	0.99999	0.00196	1.00000	-0.00196
	0.00000	0.00000	0.01145	0.00000	0.00000	0.00139	0.00000	0.91457	0.00000	0.91457
tsst	-0.84070	0.83473	-0.78443	-0.77262	-0.07130	0.36260	-0.00169	-1.00000	-0.00196	1.00000
	0.63571	0.62875	0.57409	0.56211	0.00009	0.00000	0.92601	1.00000	0.91457	0.00000

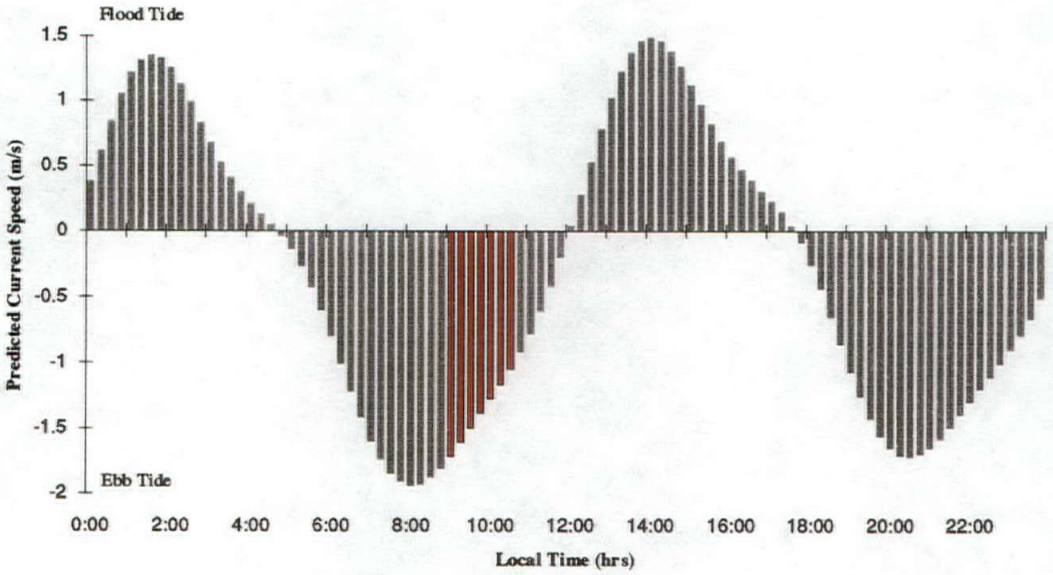


Figure 34. Predicted tide stage histogram, ebb tide.

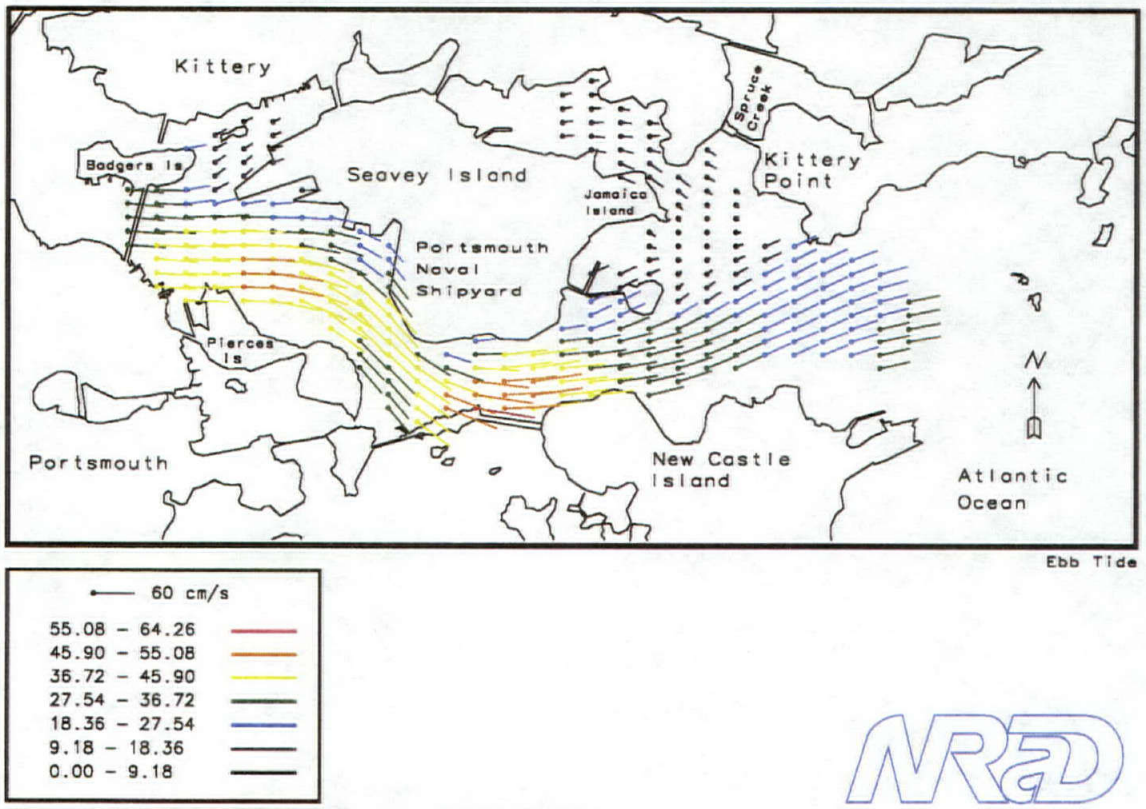


Figure 35. Ebb tide surface currents (cm/s).

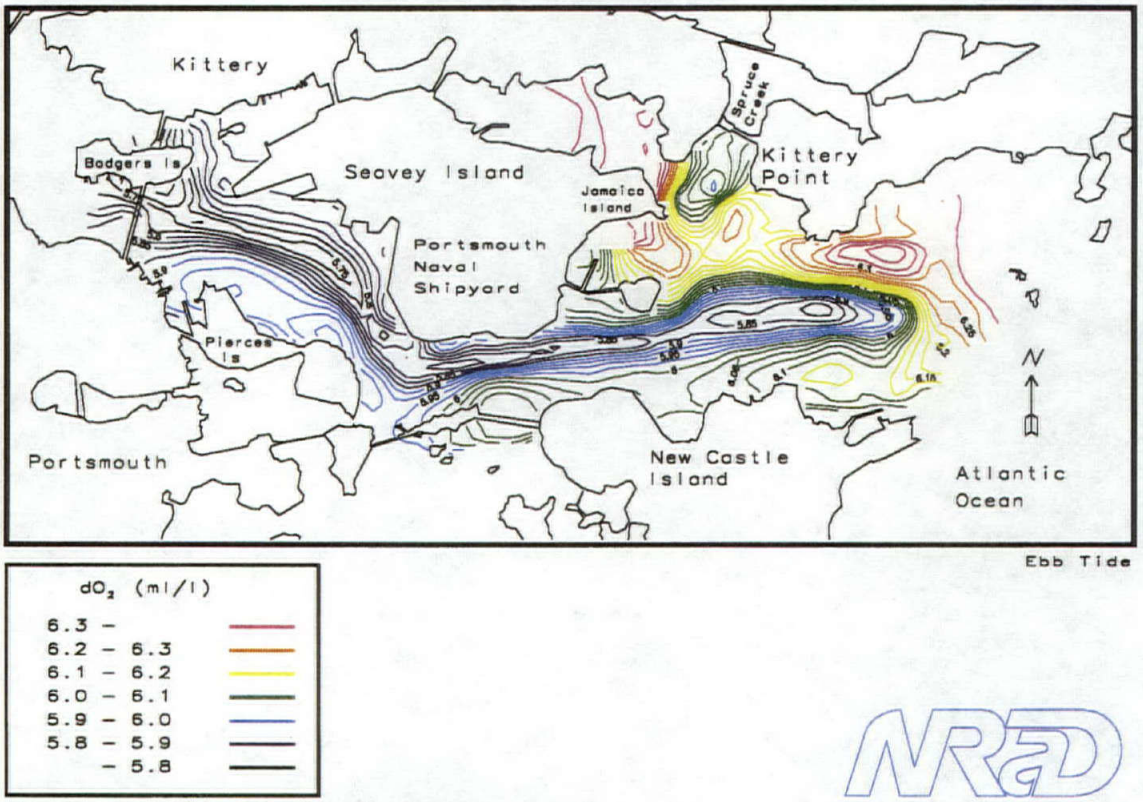


Figure 36. Ebb tide dissolved oxygen (mL/L).

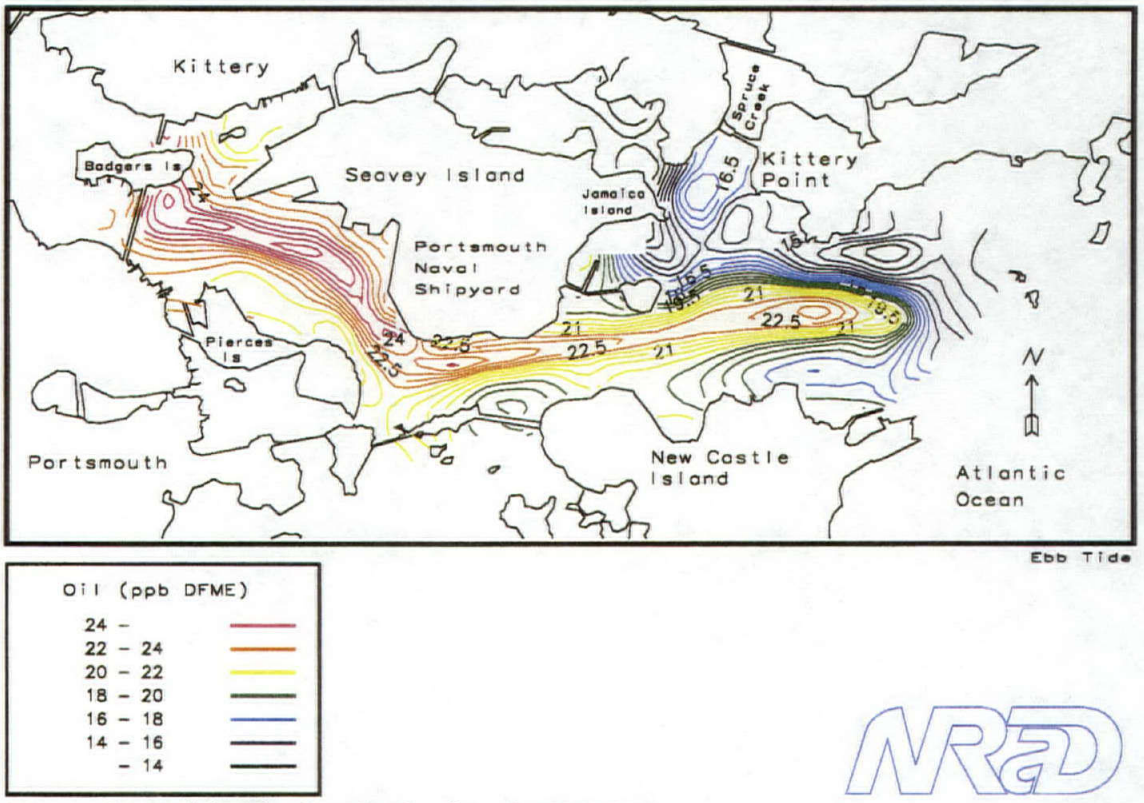


Figure 37. Ebb tide dissolved oil (ppb-DFME).

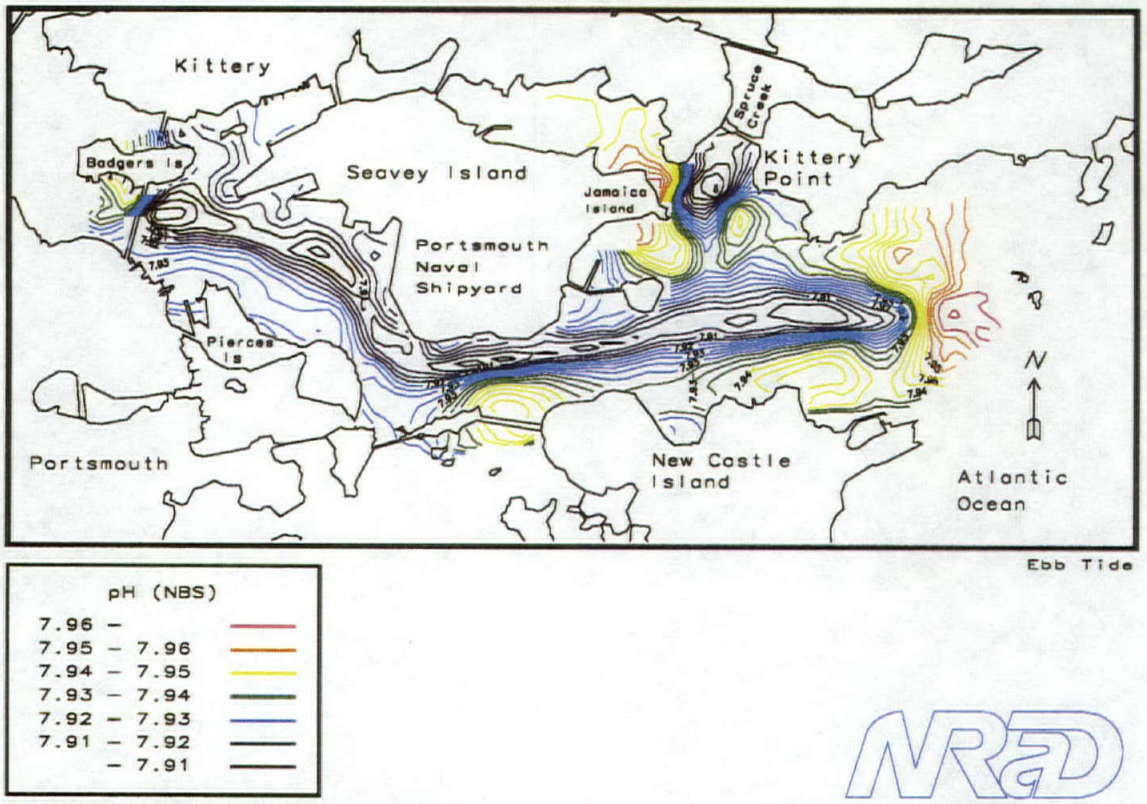


Figure 38. Ebb Tide pH (NBS).

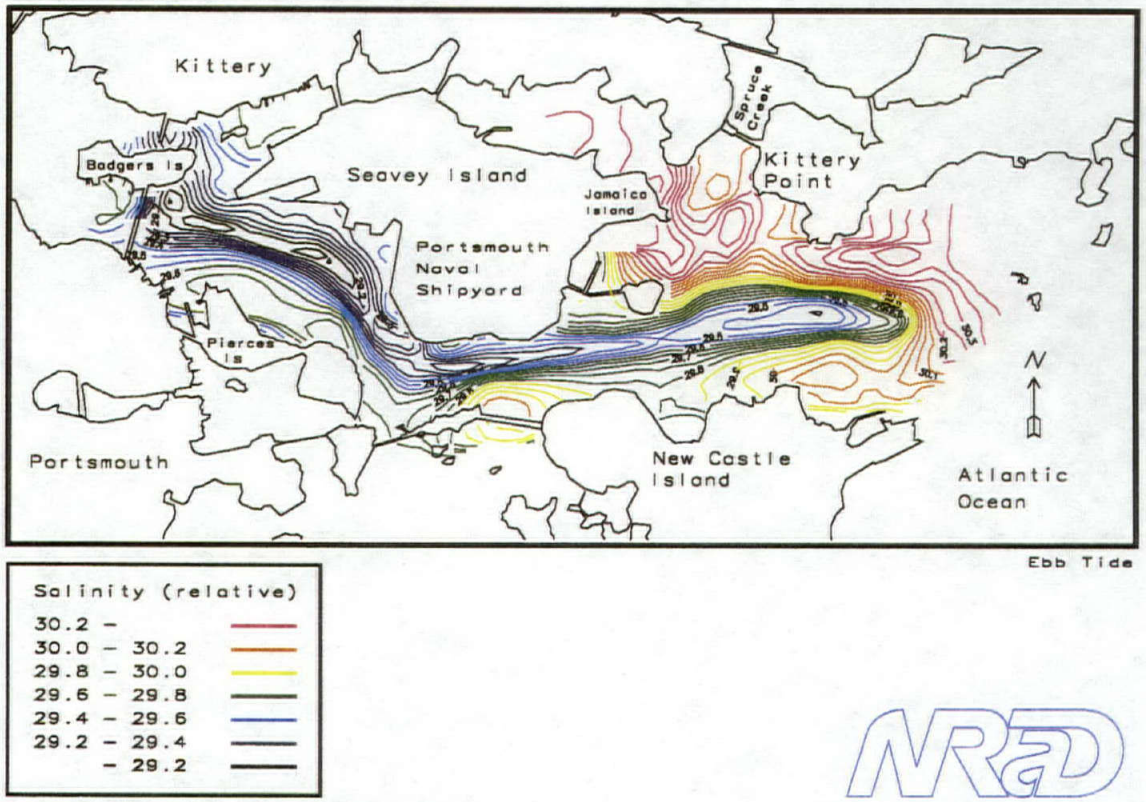


Figure 39. Ebb tide salinity (psu).

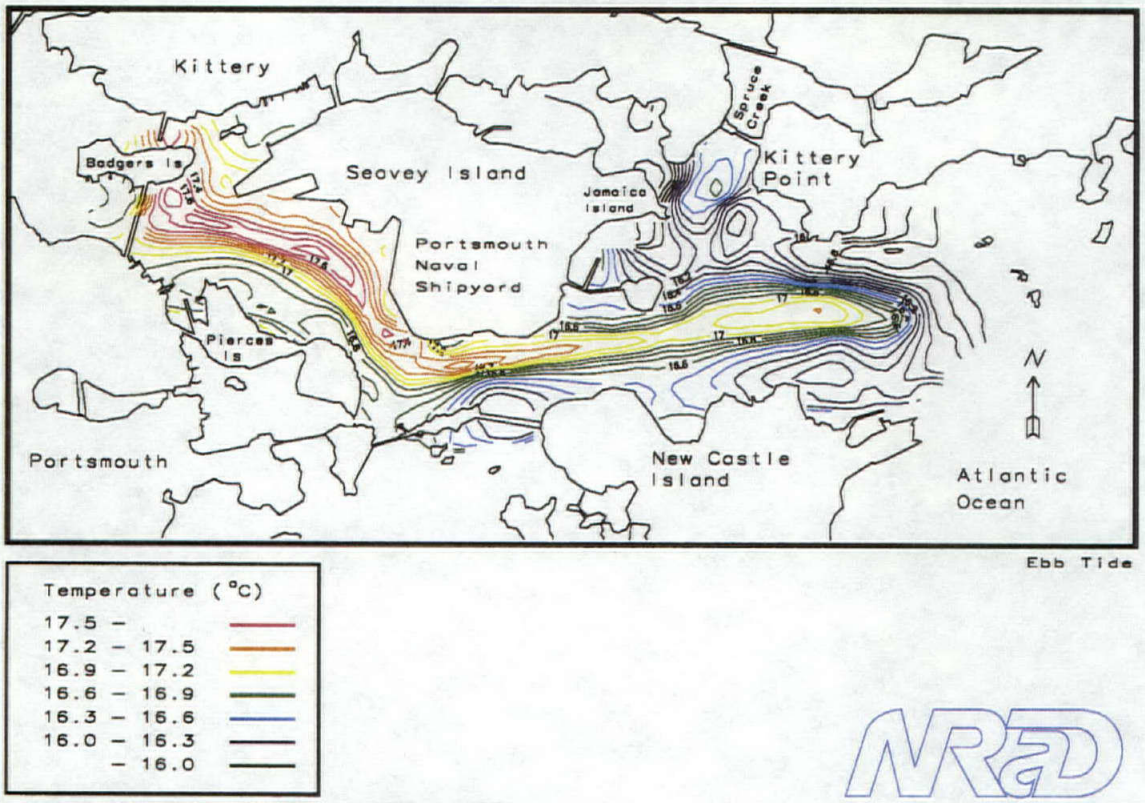


Figure 40. Ebb tide temperature (°C).

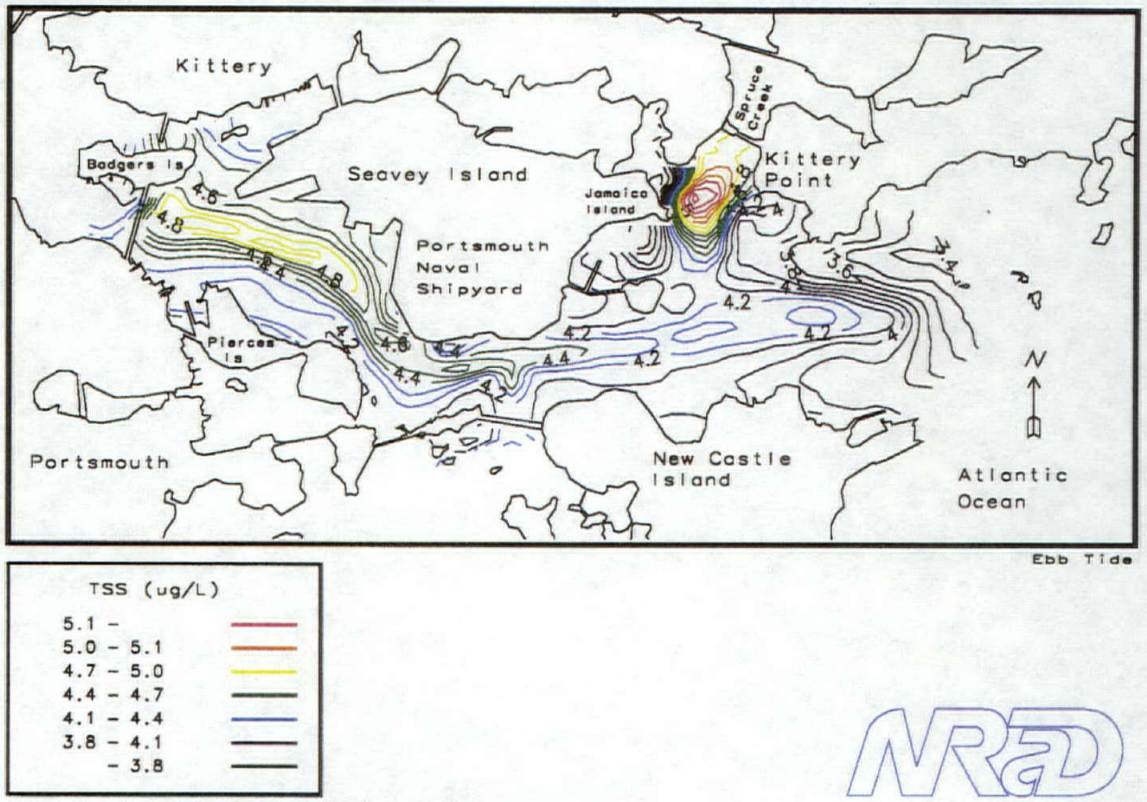


Figure 41. Ebb tide TSS (mg/L).

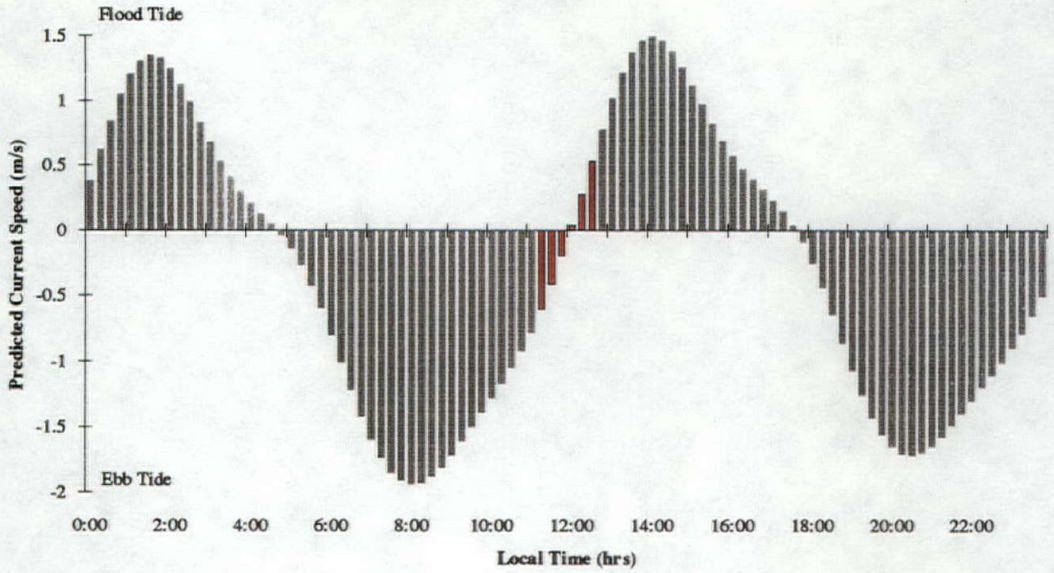


Figure 42. Predicted tide stage histogram, low slack tide.

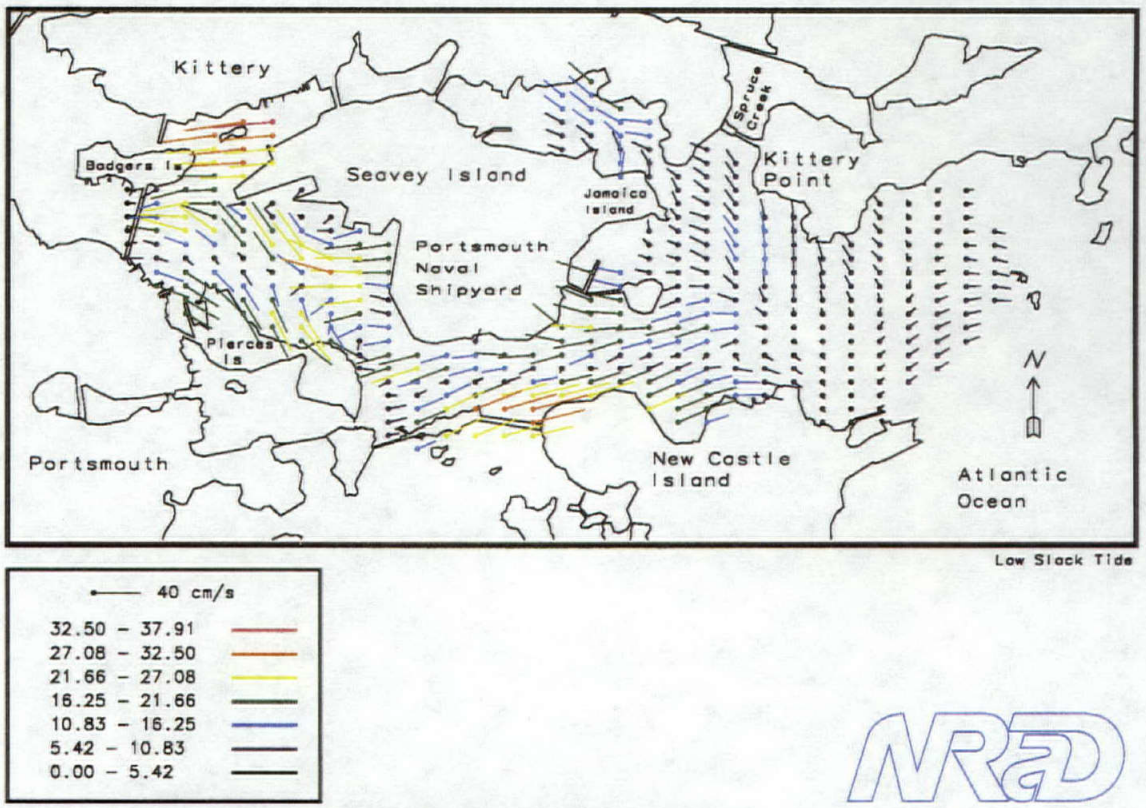


Figure 43. Low slack tide surface currents (cm/s).

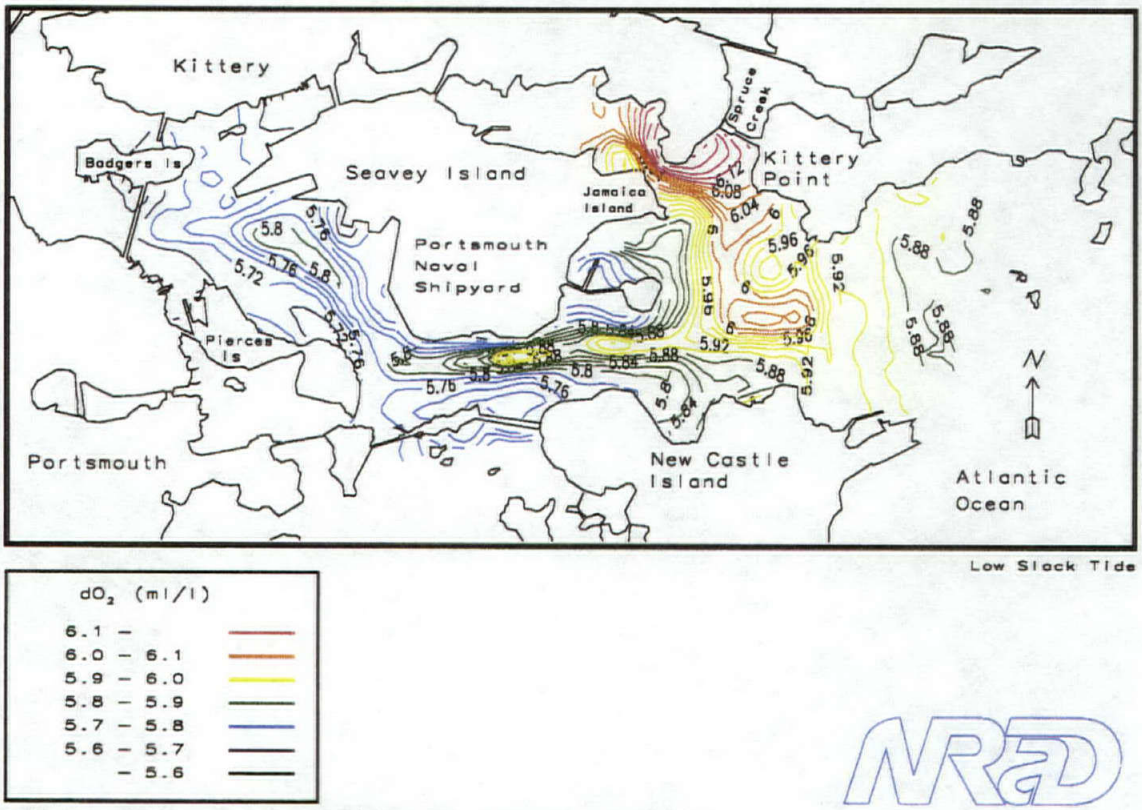


Figure 44. Low slack tide dissolved oxygen (mL/L).

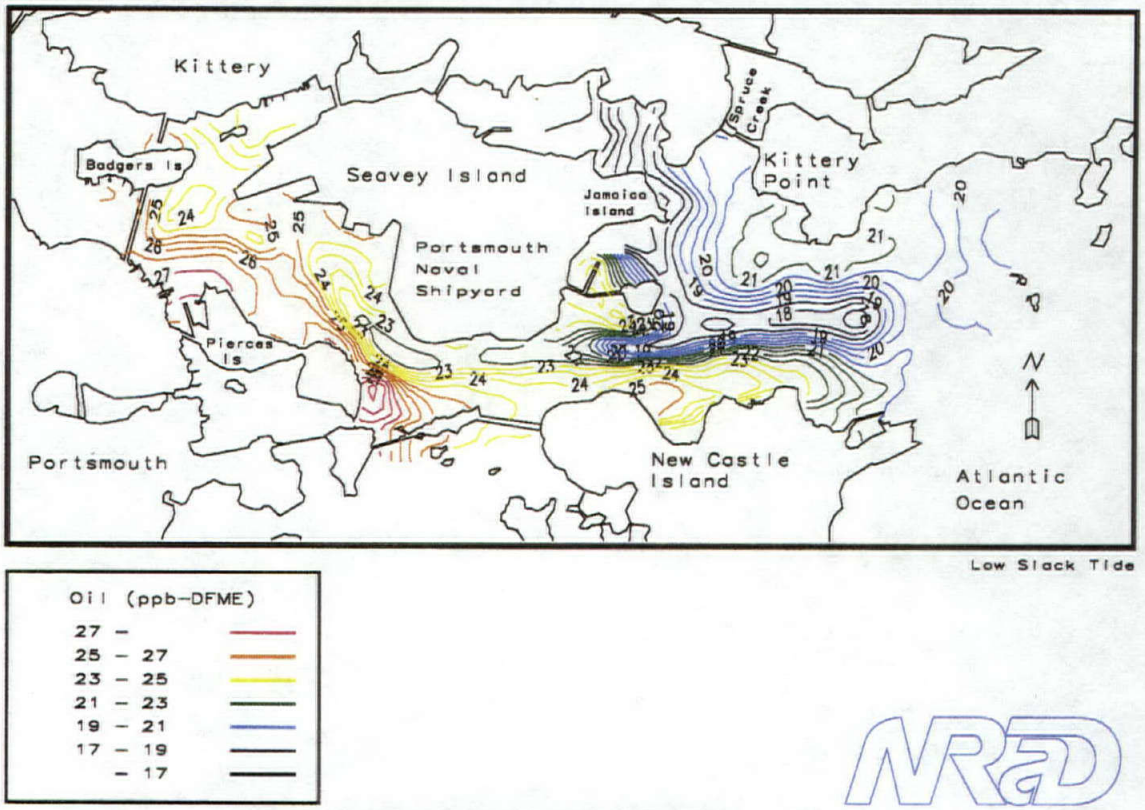
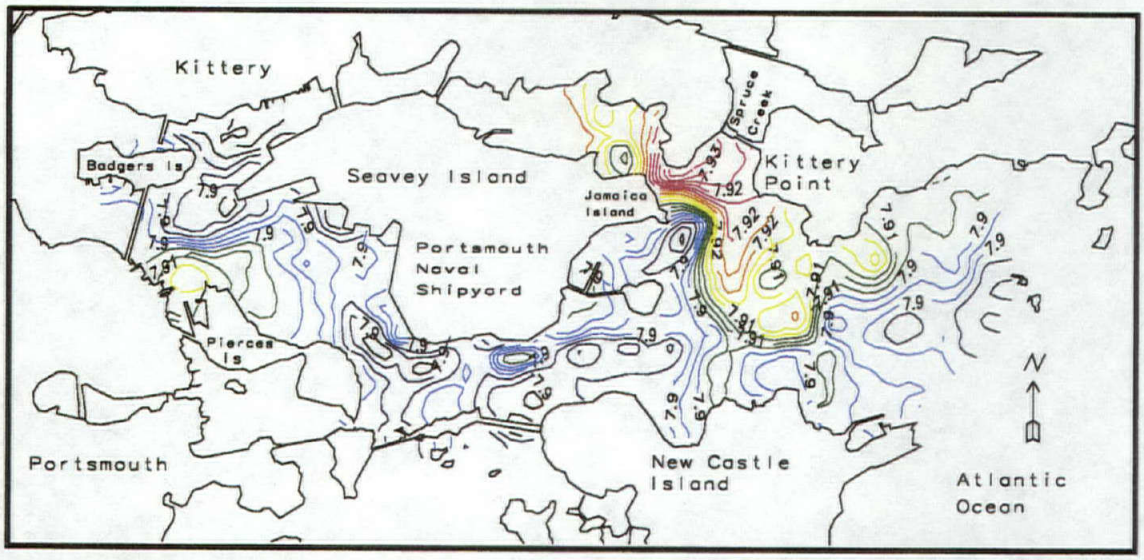


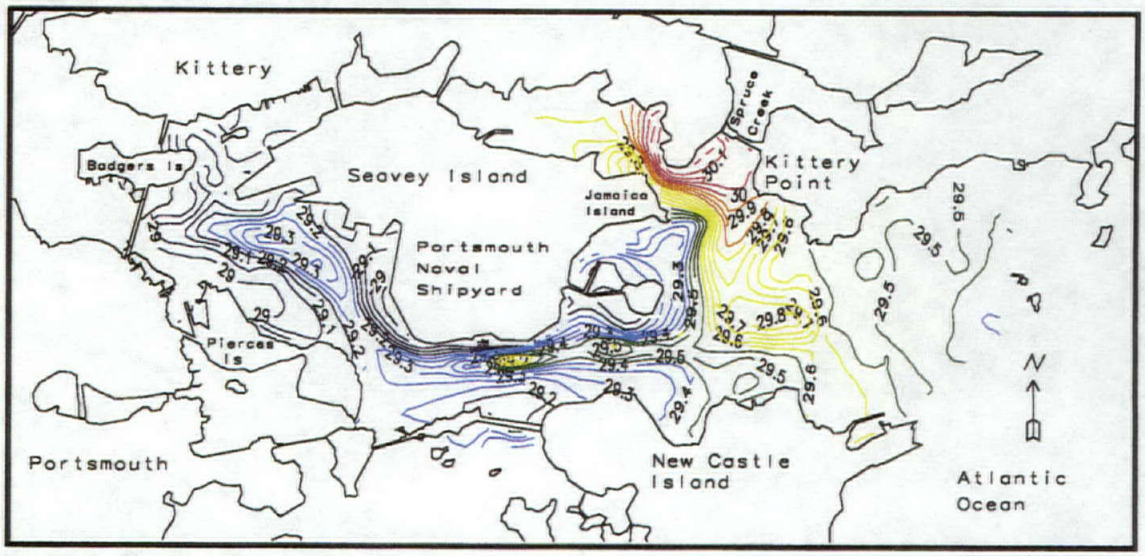
Figure 45. Low slack tide dissolved oil (ppb-DFME).



pH (NBS)

7.920 –	
7.915 – 7.920	
7.910 – 7.915	
7.905 – 7.910	
7.900 – 7.905	
7.895 – 7.900	
– 7.895	

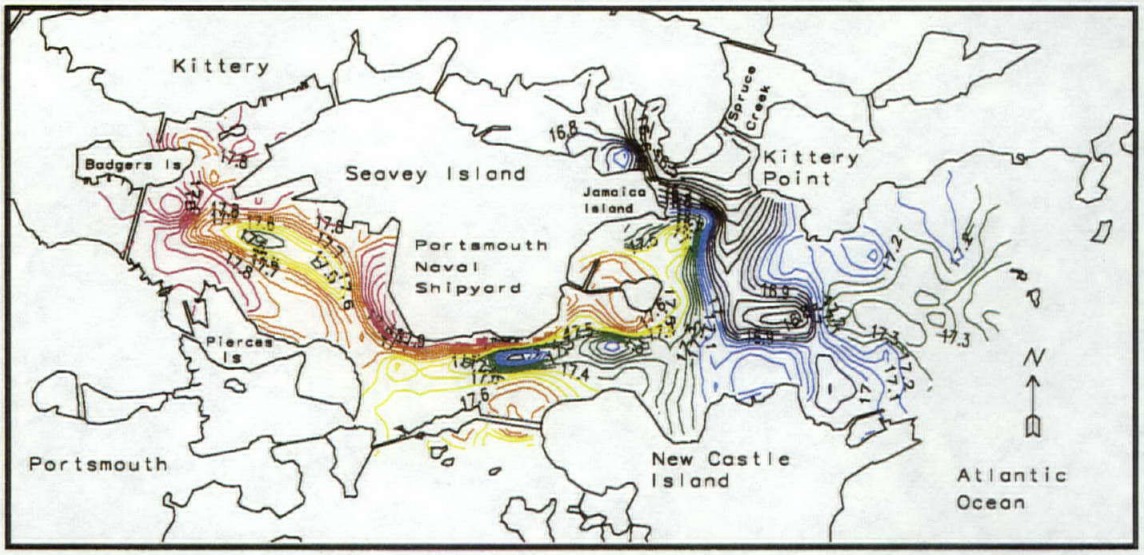
Figure 46. Low slack tide pH (NBS).



Salinity (relative)

30.0 –	
29.8 – 30.0	
29.6 – 29.8	
29.4 – 29.6	
29.2 – 29.4	
29.0 – 29.2	
– 29.0	

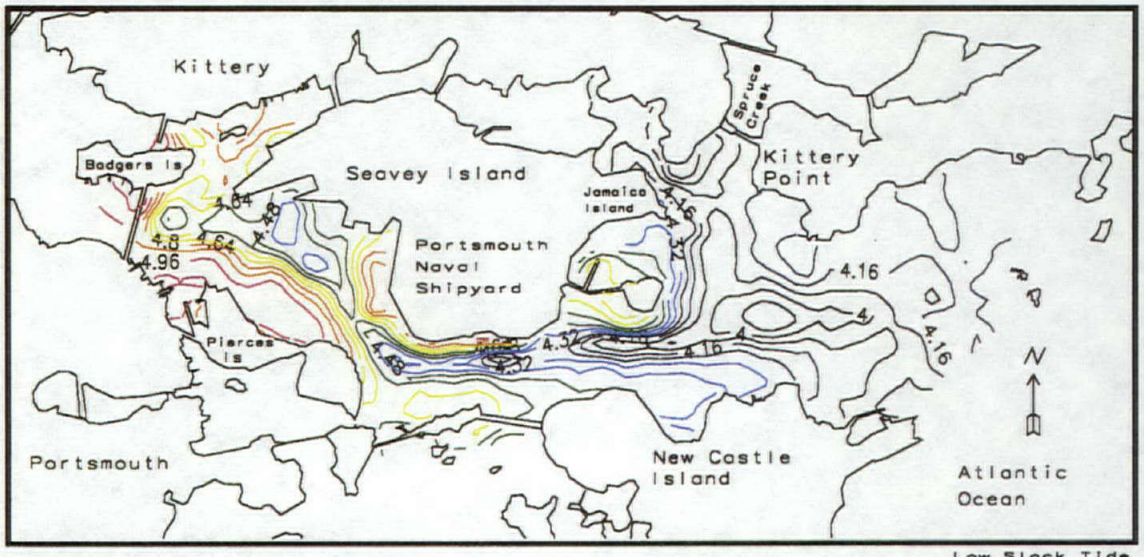
Figure 47. Low slack tide salinity (psu).



Temperature (°C)

17.8 –	
17.6 – 17.8	
17.4 – 17.6	
17.2 – 17.4	
17.0 – 17.2	
16.8 – 17.0	
– 16.8	

Figure 48. Low slack tide temperature (°C).



TSS (ug/L)

4.90 –	
4.74 – 4.90	
4.58 – 4.74	
4.42 – 4.58	
4.26 – 4.42	
4.10 – 4.26	
– 4.10	

Figure 49. Low slack tide TSS (mg/L).

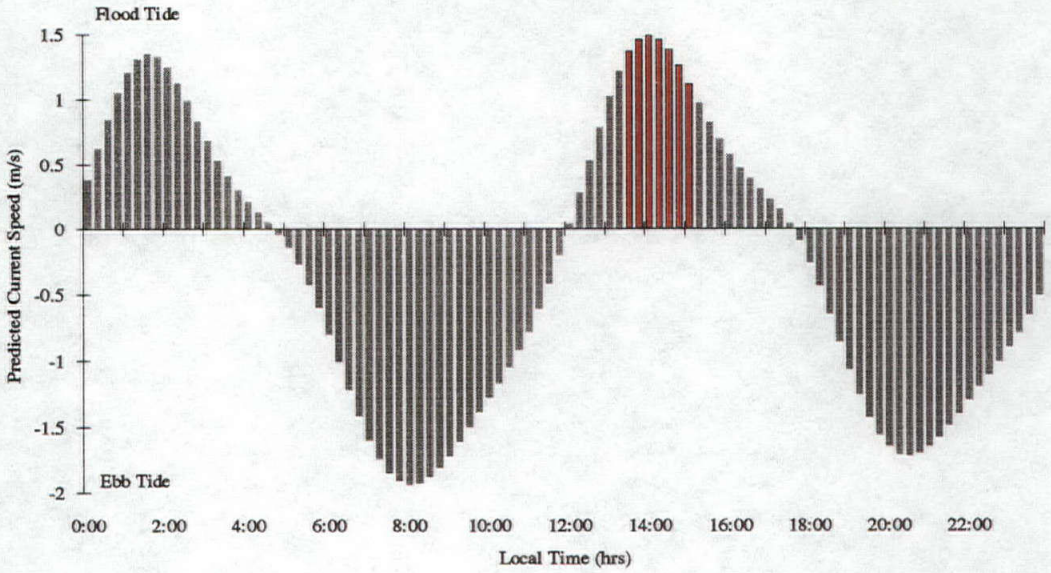


Figure 50. Predicted tide stage histogram, flood tide.

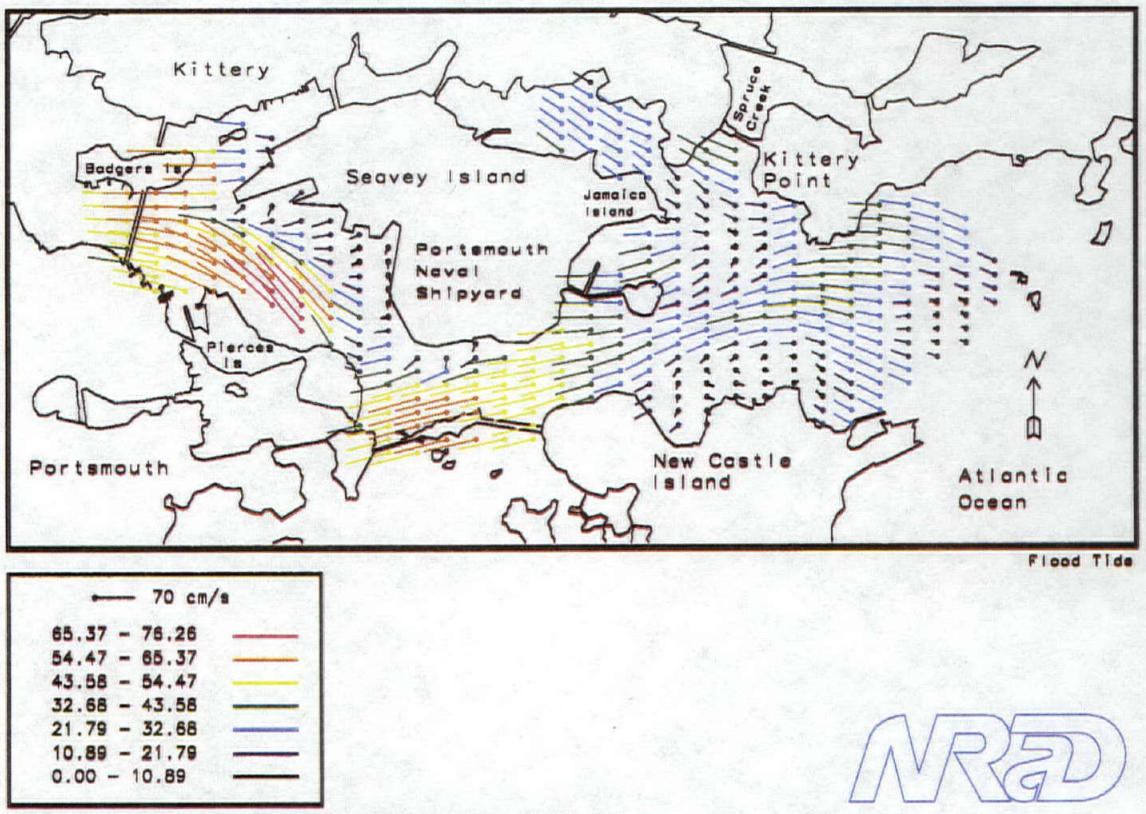


Figure 51. Flood tide surface currents (cm/s).

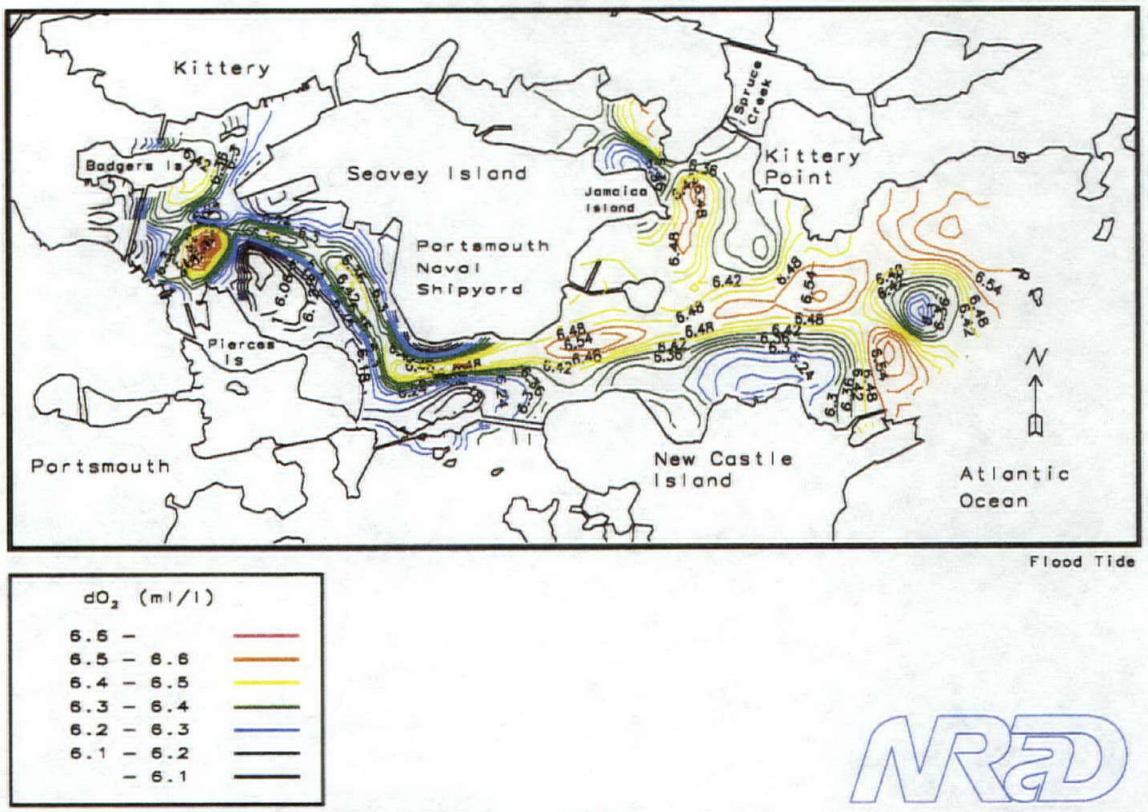


Figure 52. Flood tide dissolved oxygen (mL/L).

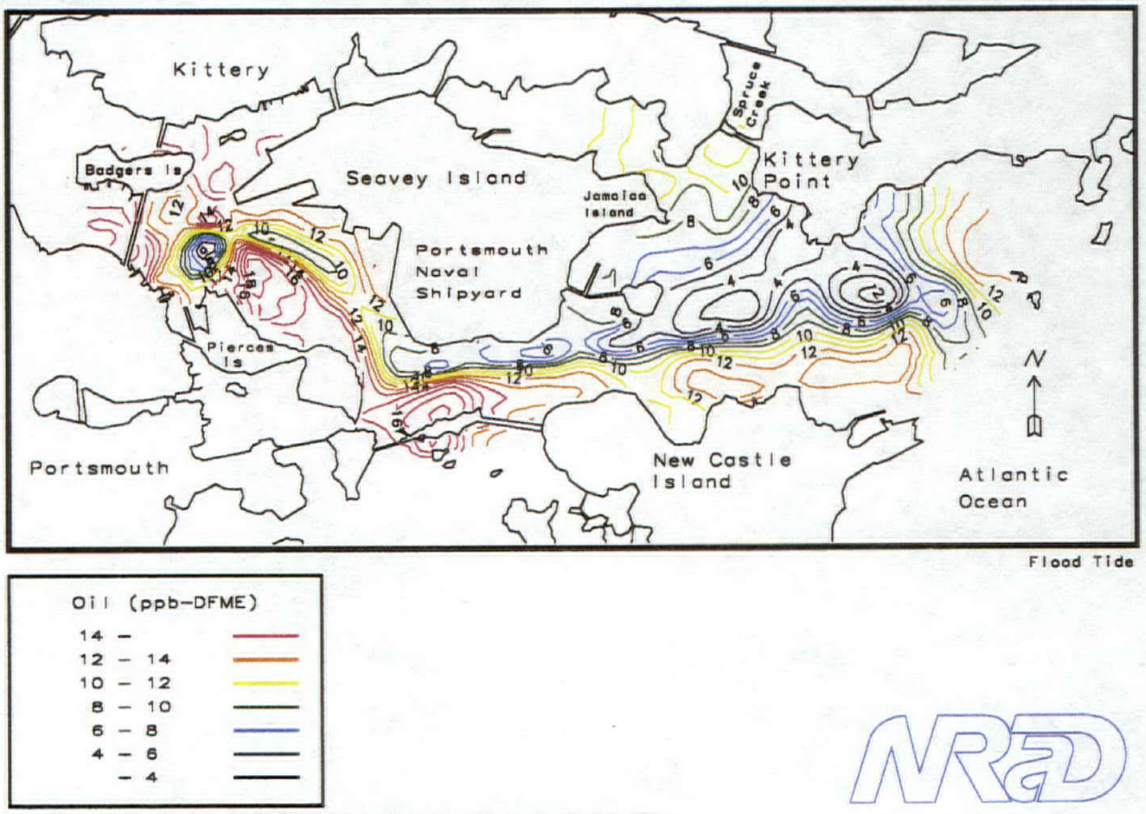


Figure 53. Flood tide dissolved oil (ppb-DFME).

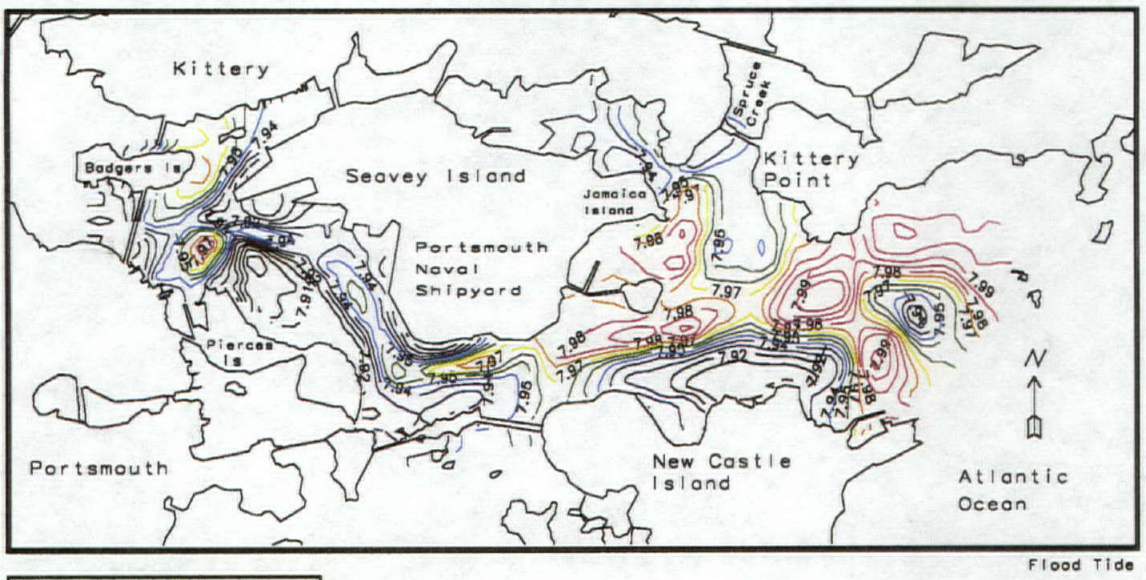


Figure 54. Flood tide pH (NBS).

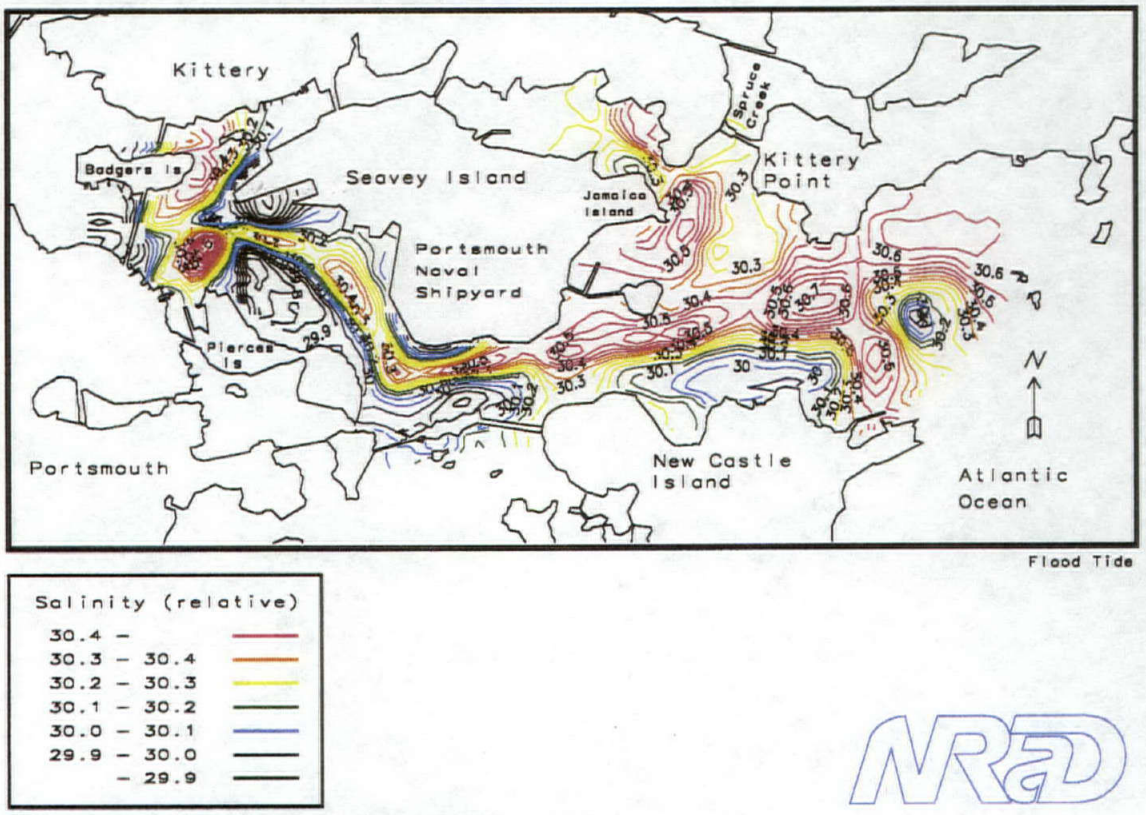
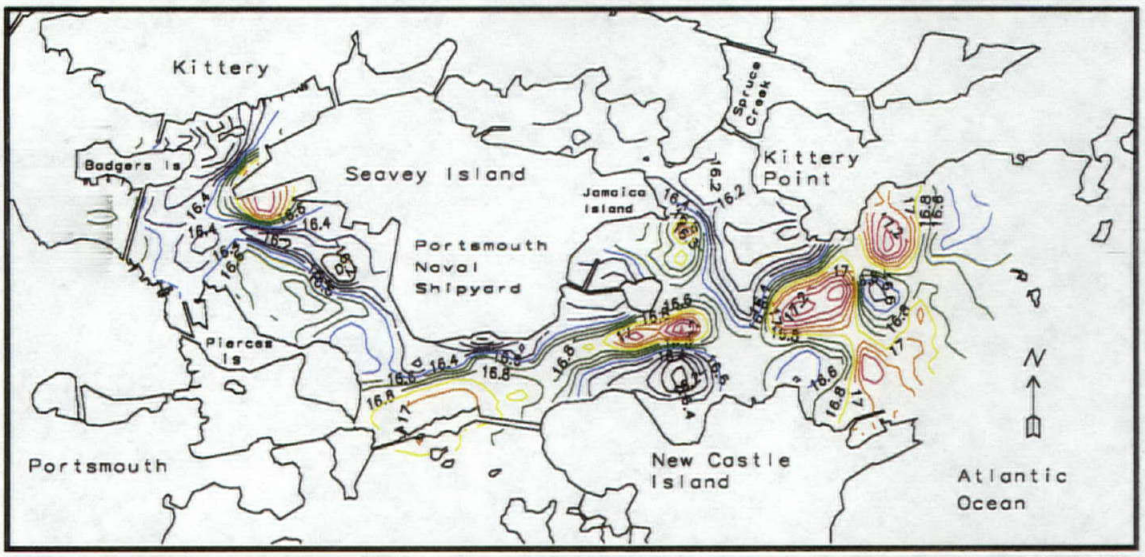
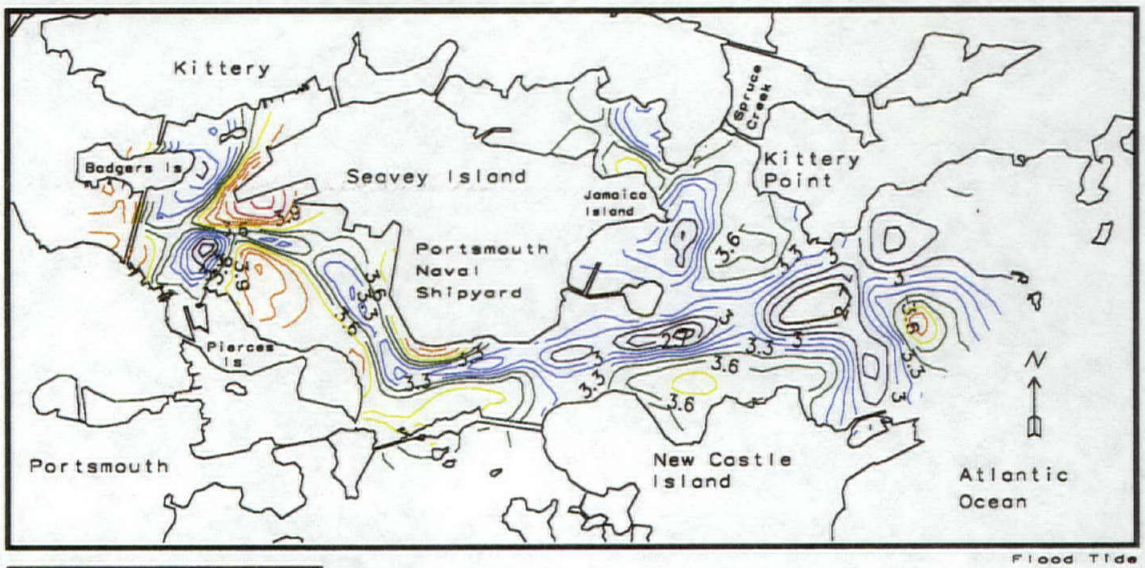


Figure 55. Flood tide salinity (psu).



Temperature (°C)	
17.2 –	
17.0 – 17.2	
16.8 – 17.0	
16.6 – 16.8	
16.4 – 16.6	
16.2 – 16.4	
– 16.2	

Figure 56. Flood tide temperature (°C).



TSS (ug/L)	
4.2 –	
3.9 – 4.2	
3.6 – 3.9	
3.3 – 3.6	
3.0 – 3.3	
2.7 – 3.0	
– 2.7	

Figure 57. Flood tide TSS (mg/L).

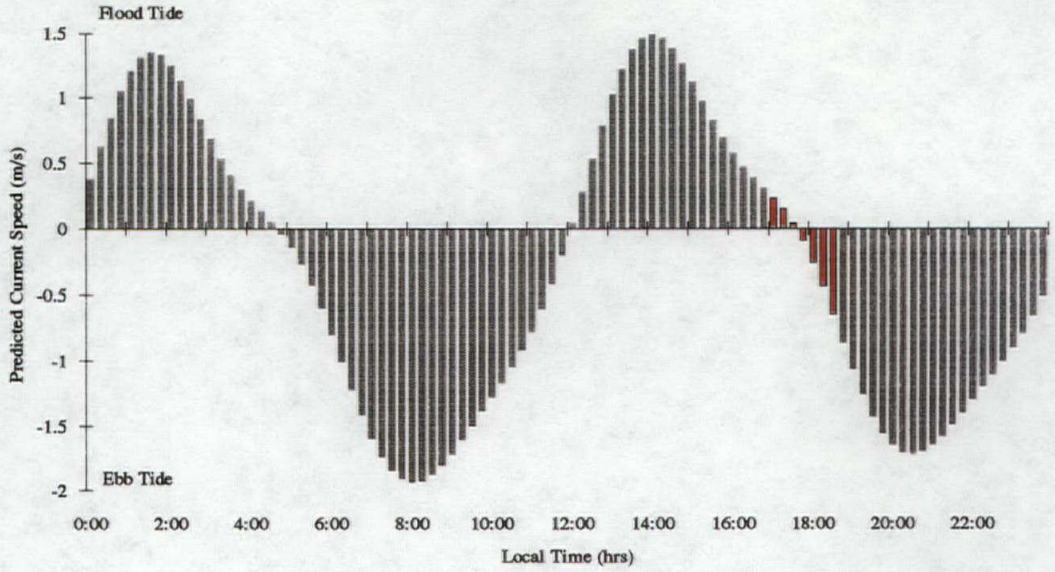


Figure 58. Predicted tide stage histogram, high slack tide.

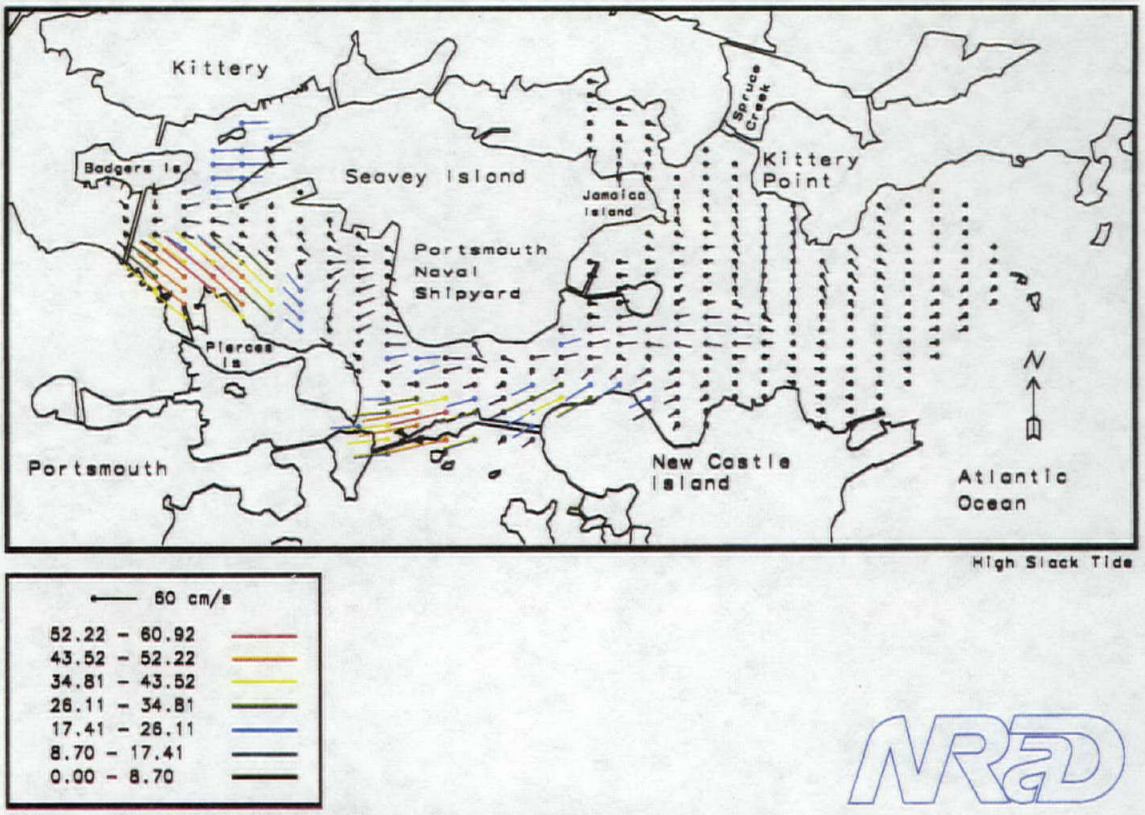


Figure 59. High slack tide surface currents (cm/s).

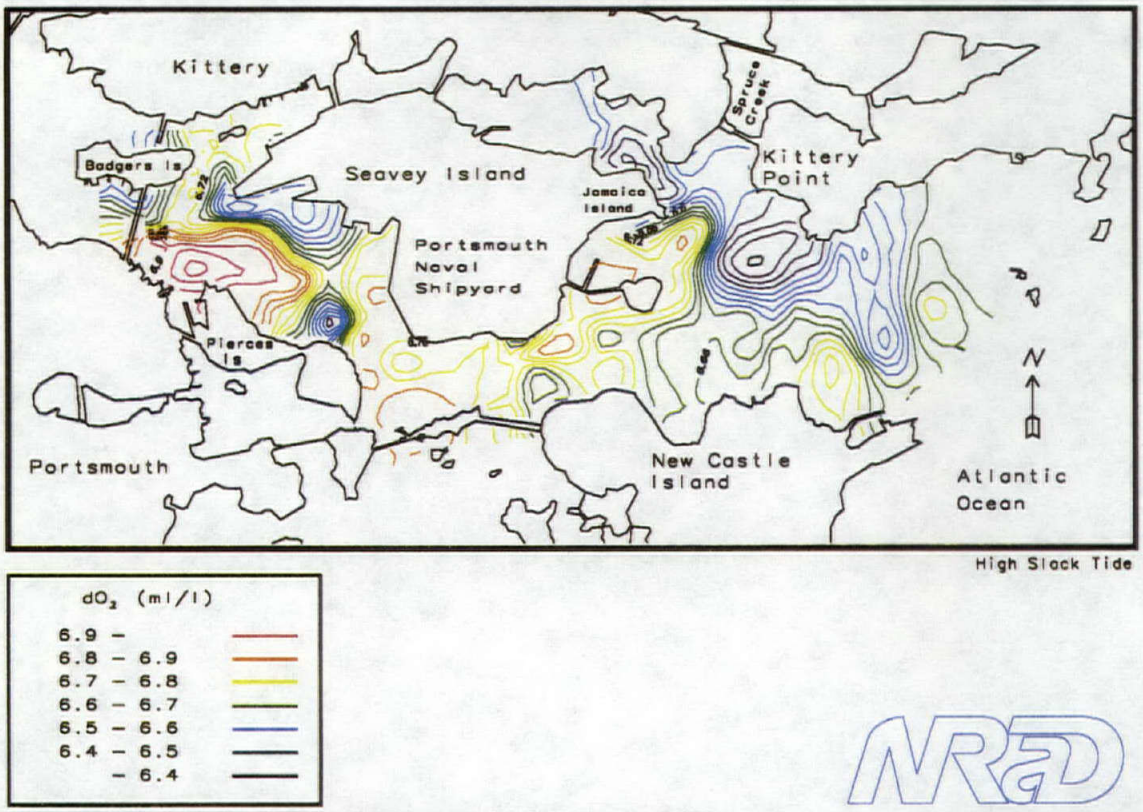


Figure 60. High slack tide dissolved oxygen (mL/L).

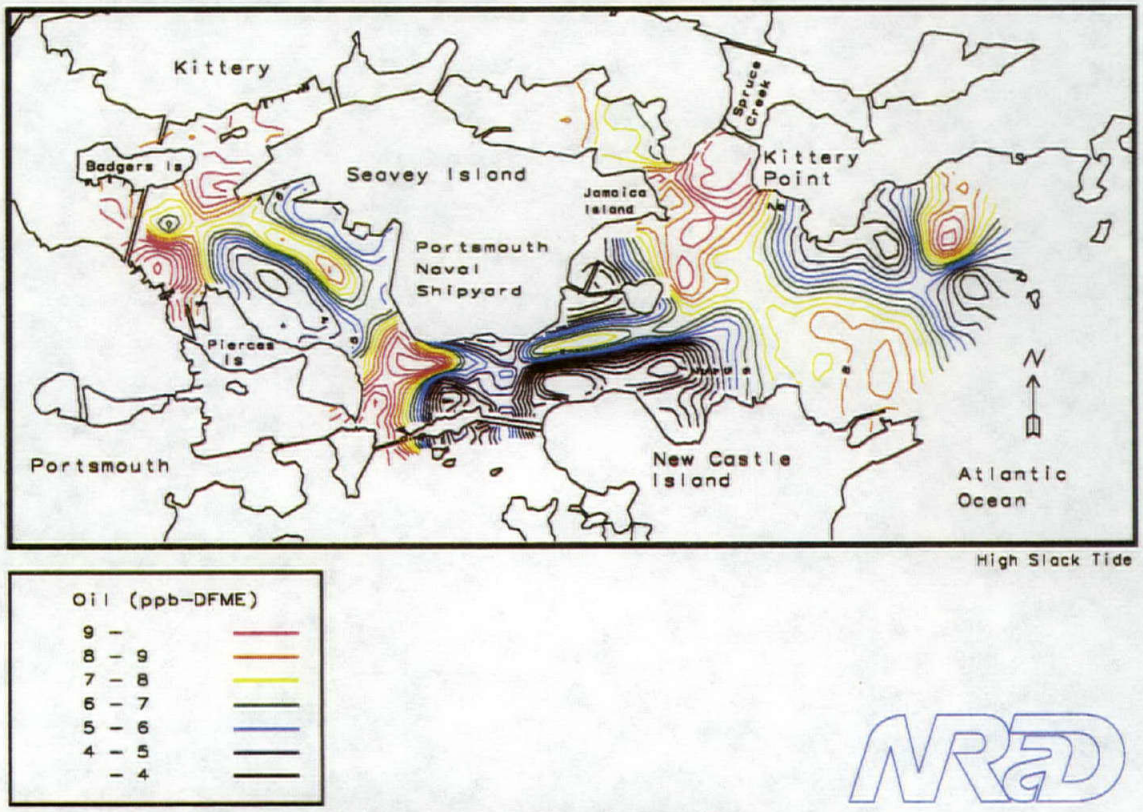


Figure 61. High slack tide dissolved oil (ppb-DFME).

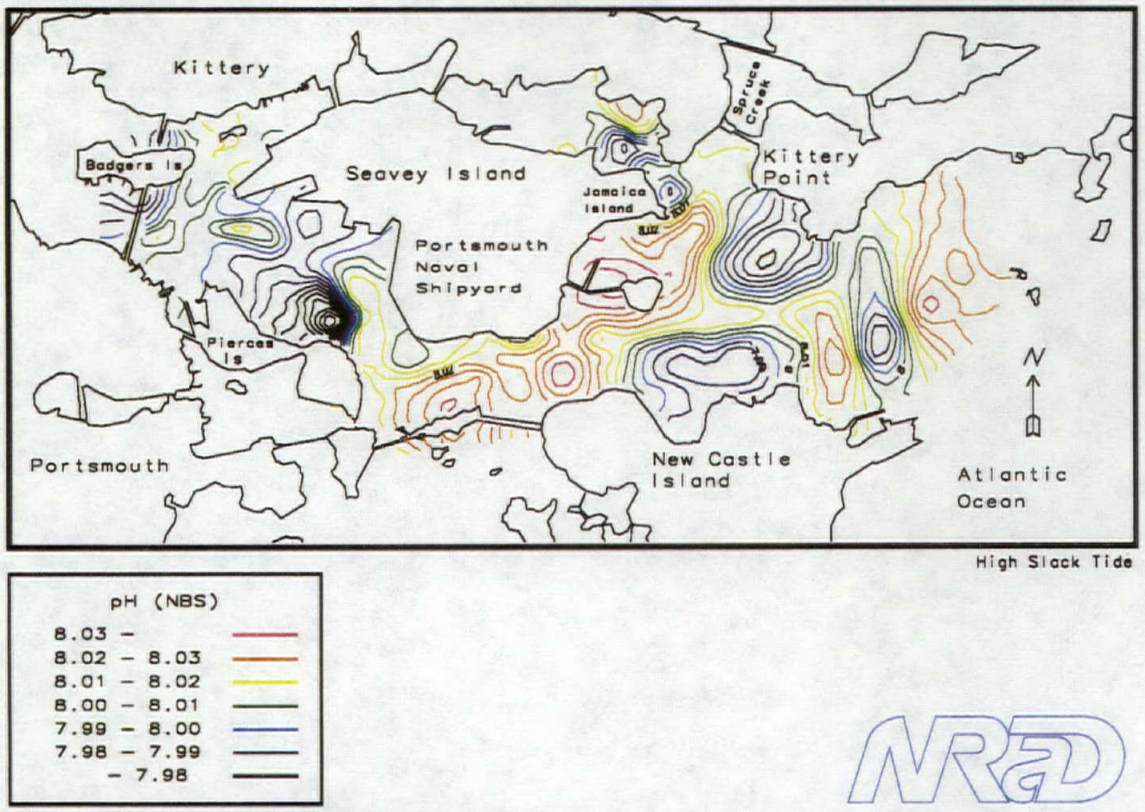


Figure 62. High slack tide pH (NBS).

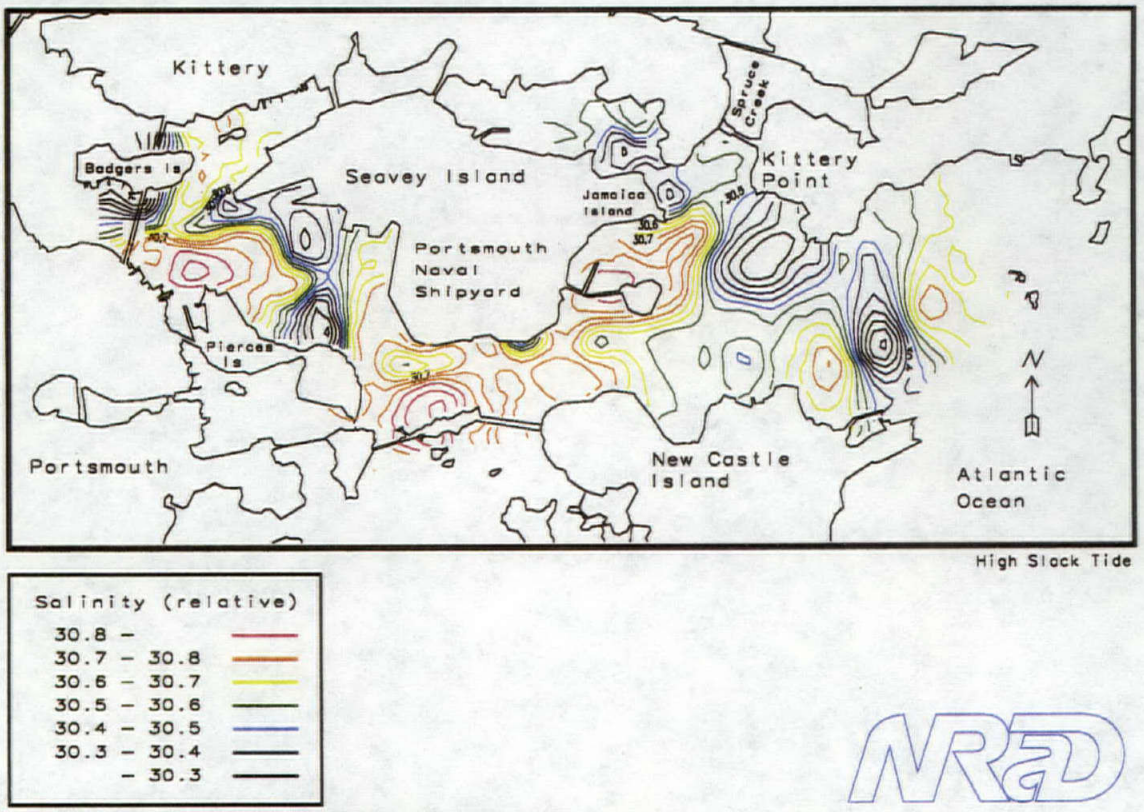


Figure 63. High slack tide salinity (psu).

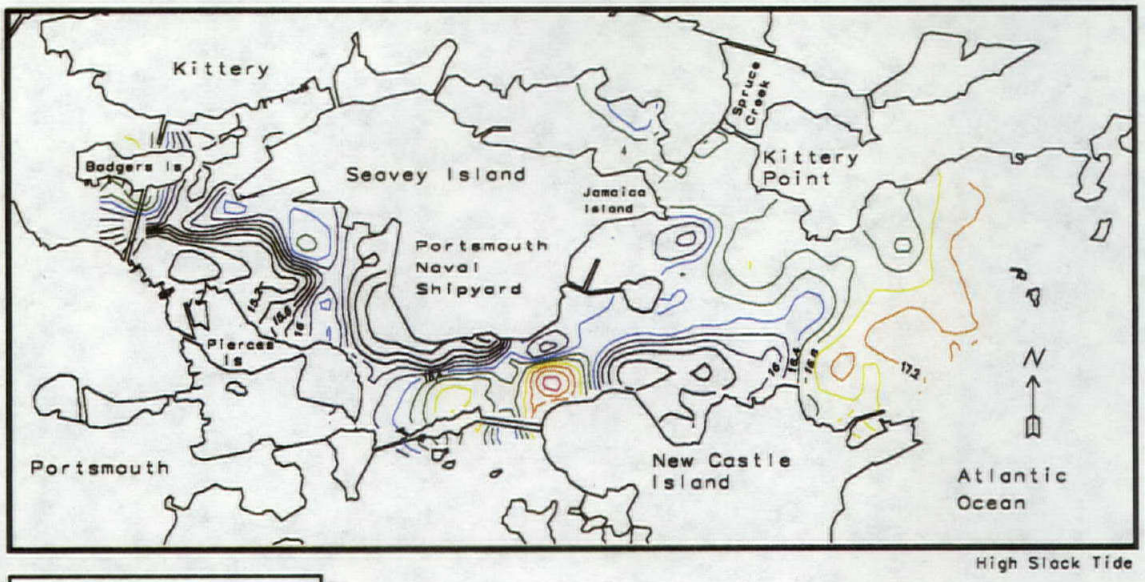


Figure 64. High slack tide temperature (°C).

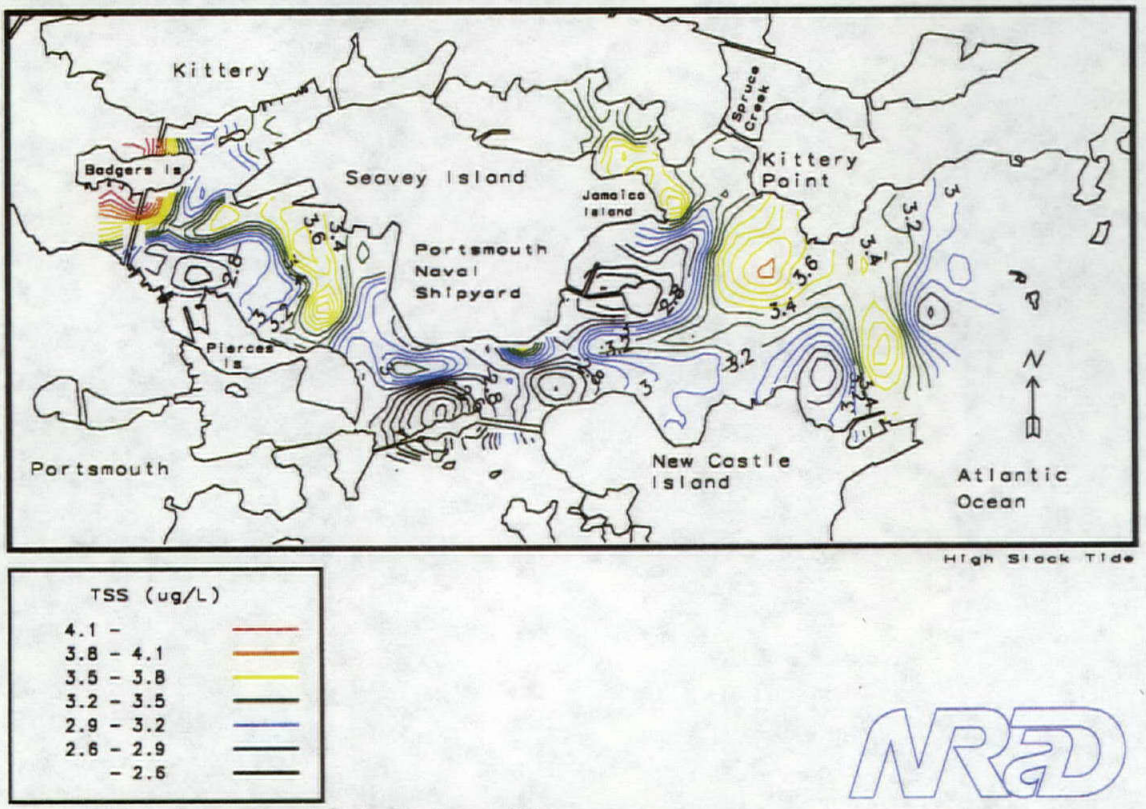


Figure 65. High slack tide TSS (mg/L).

CROSS-CHANNEL SURVEYS

FIGURE 66 Location map of cross-channel surveys performed on Day 190, 192, 196, and 199.

Day 190- Mouth

TABLE 6 Statistical Summary
FIGURE 67 Dissolved Oxygen
FIGURE 68 pH
FIGURE 69 Salinity
FIGURE 70 Temperature
FIGURE 71 Total Suspended Solids

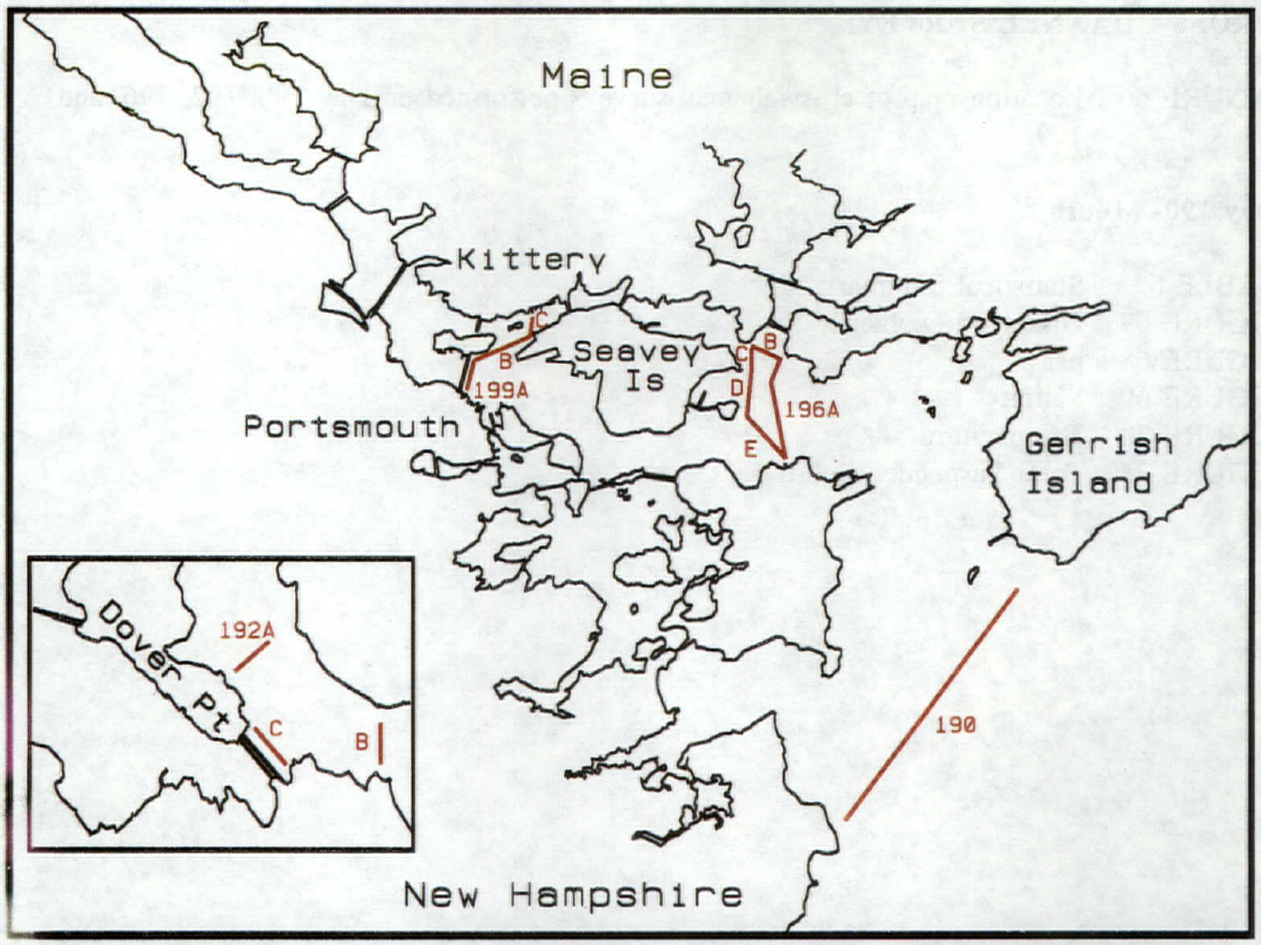


Figure 66. Location map for cross-channel surveys performed on Day 190, 192, 196, and 199.

TABLE 6. Day 190 Cross-Channel Transect Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	7879	1.229	0.168	0.205	1.999	1.794
Salinity	7847	30.996	0.130	30.535	31.535	1.000
Temperature	7879	13.400	0.672	11.441	14.695	3.254
pH	7879	7.996	0.039	7.909	8.141	0.231
Dissolved Oxygen	6690	7.160	0.150	6.440	7.750	1.310
Transmittance	6927	80.638	3.306	67.284	84.936	17.652
TSS Trans	6926	2.164	0.498	1.517	4.176	2.659
Bottom Depth	7655	-10.801	3.501	-17.100	-1.600	15.500

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	tsst	tra
sal	1.00000	-0.04599	0.33884	0.46803	-0.70785	0.70782
	0.00000	0.00004	0.00000	1.00000	1.00000	1.00000
tem	-0.04599	1.00000	0.65715	-0.28038	-0.25539	0.25549
	0.00004	0.00000	1.00000	0.00000	0.00000	0.00000
ph	0.33884	0.65715	1.00000	0.12565	-0.46341	0.46355
	0.00000	1.00000	0.00000	0.00000	1.00000	1.00000
do2	0.46803	-0.28038	0.12565	1.00000	-0.26757	0.26750
	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
tsst	-0.70785	-0.25539	-0.46341	-0.26757	1.00000	-0.99998
	1.00000	0.00000	1.00000	0.00000	0.00000	1.00000
tra	0.70782	0.25549	0.46355	0.26750	-0.99998	1.00000
	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000

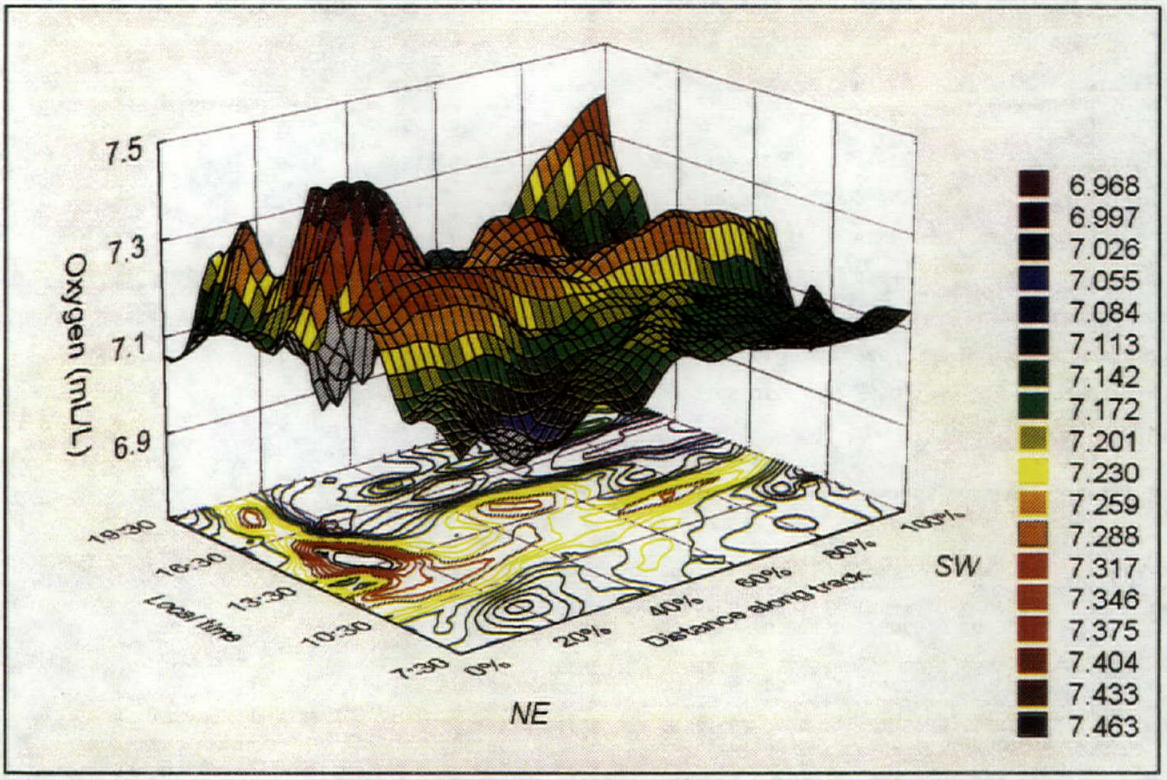


Figure 67. Cross-sectional time series of dissolved oxygen on Day 190.

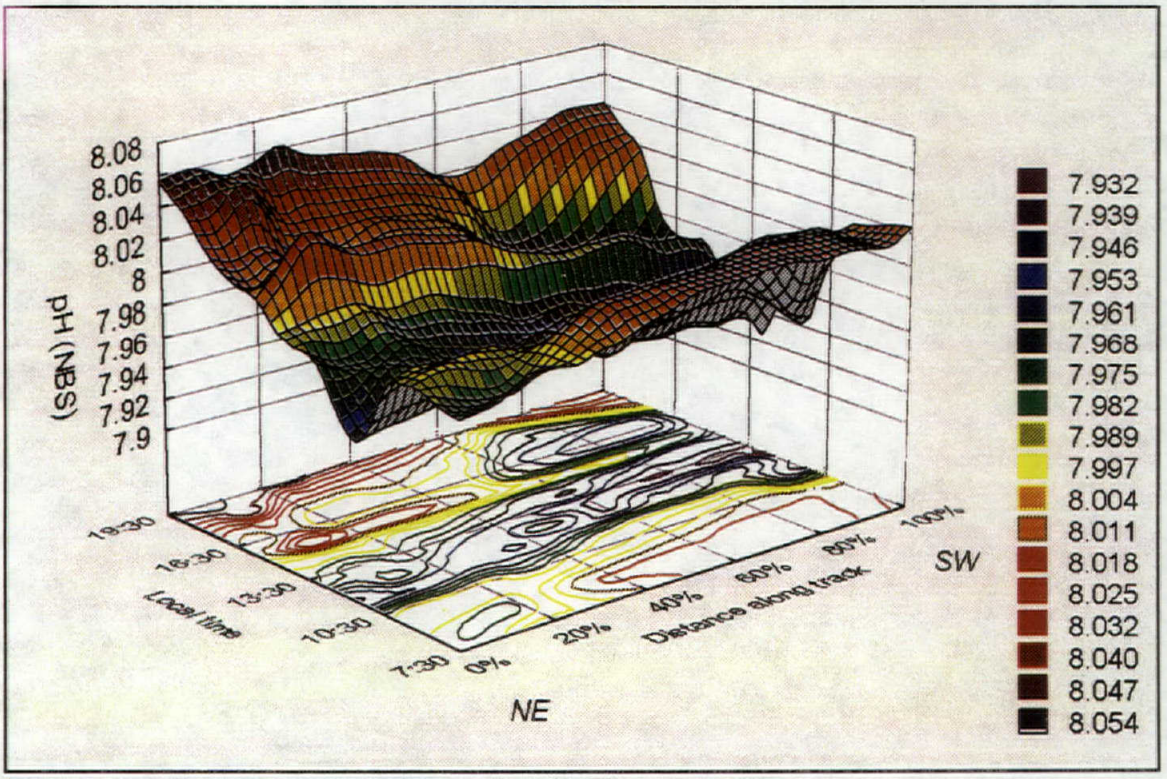


Figure 68. Cross-sectional time series of pH on Day 190.

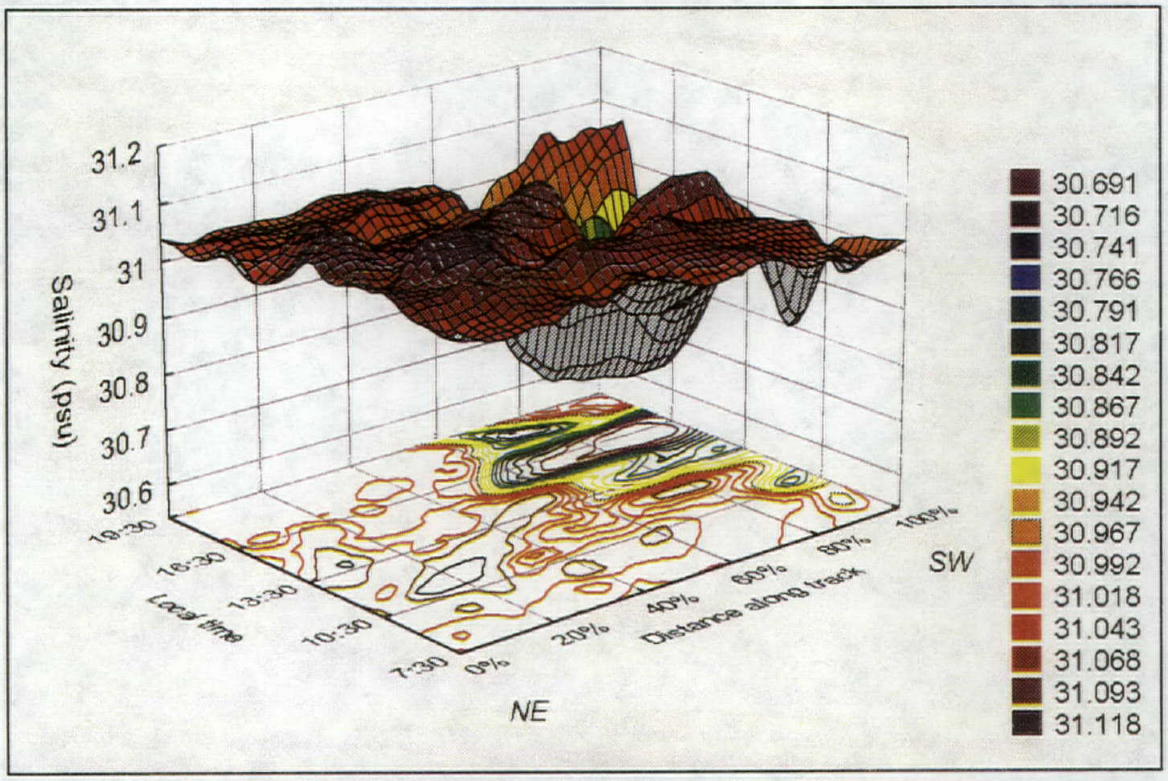


Figure 69. Cross-sectional time series of salinity on Day 190.

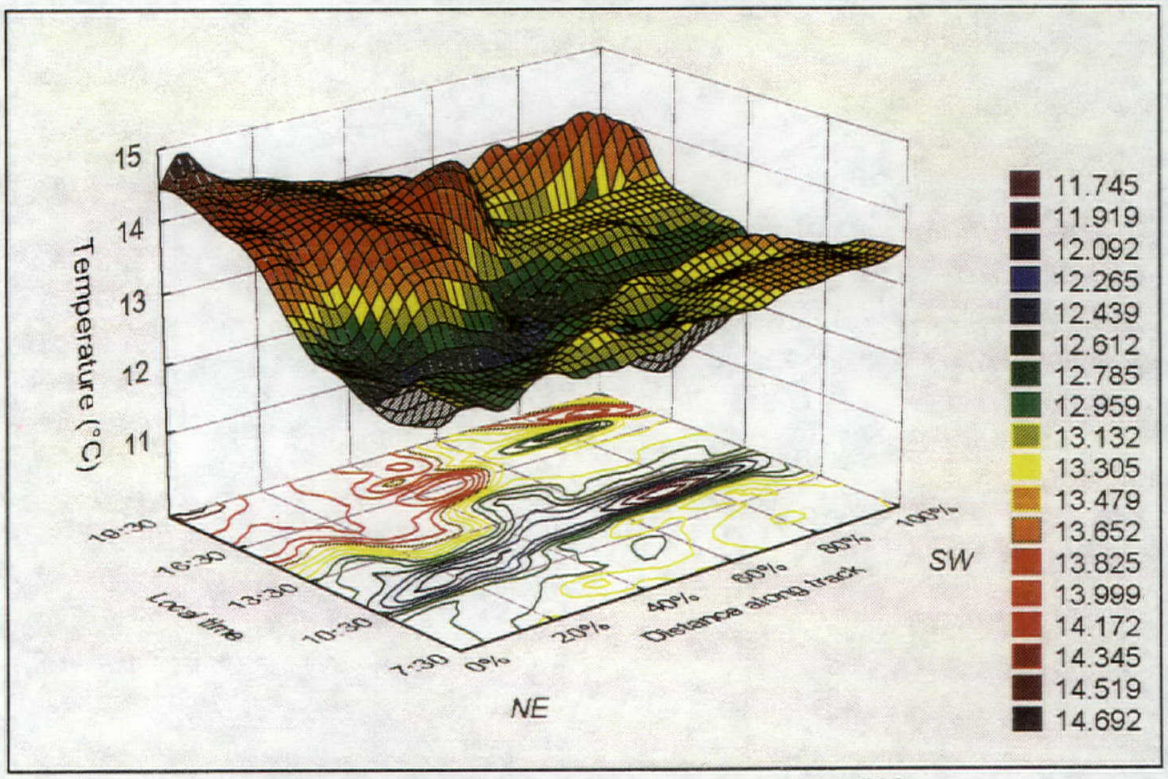


Figure 70. Cross-sectional time series of temperature on Day 190.

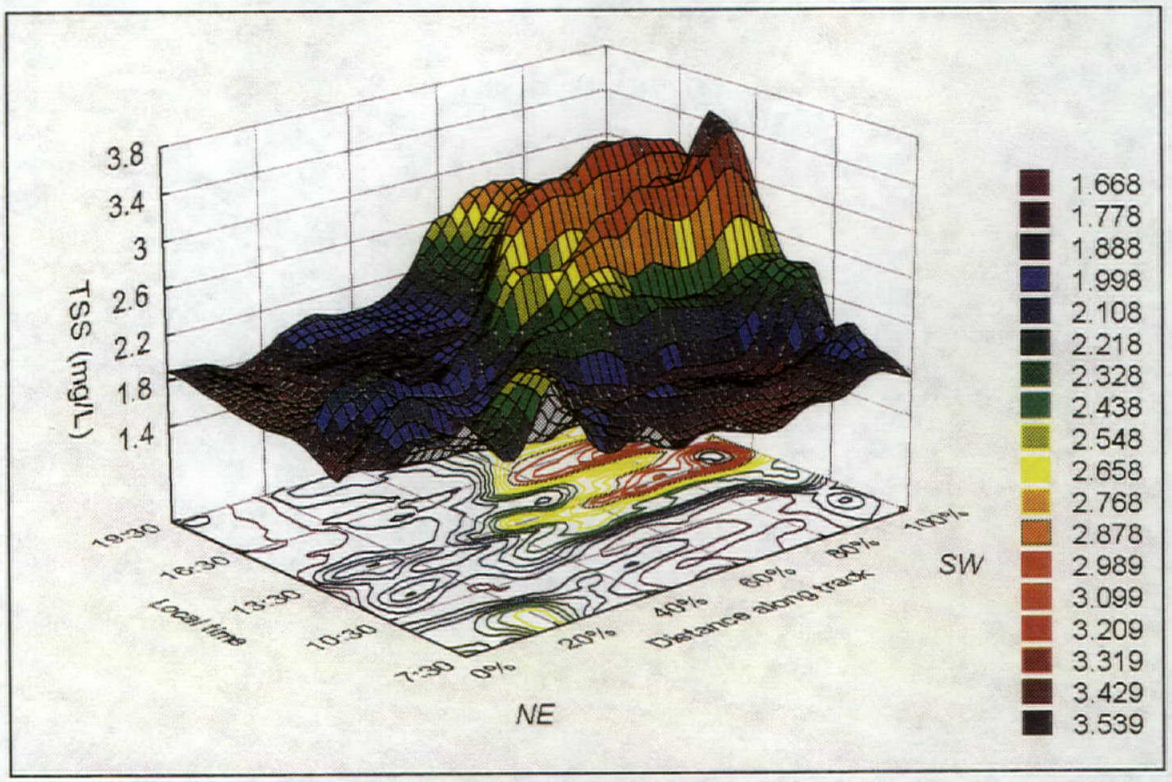


Figure 71. Cross-sectional time series of TSS on Day 190.

Day 192- Dover Point

A Transect

TABLE 7 Statistical Summary
FIGURE 72 Chlorophyll *a*
FIGURE 73 Dissolved Oxygen
FIGURE 74 Oil
FIGURE 75 pH
FIGURE 76 Salinity
FIGURE 77 Temperature
FIGURE 78 Total Suspended Solids

B Transect

TABLE 8 Statistical Summary
FIGURE 79 Chlorophyll *a*
FIGURE 80 Dissolved Oxygen
FIGURE 81 Oil
FIGURE 82 pH
FIGURE 83 Salinity
FIGURE 84 Temperature
FIGURE 85 Total Suspended Solids

C Transect

TABLE 9 Statistical Summary
FIGURE 86 Chlorophyll *a*
FIGURE 87 Dissolved Oxygen
FIGURE 88 Oil
FIGURE 89 pH
FIGURE 90 Salinity
FIGURE 91 Temperature
FIGURE 92 Total Suspended Solids

TABLE 7. Day 192 Cross-Channel Transect A Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	354	1.188	0.226	0.828	1.999	1.171
Salinity	548	27.863	2.519	21.839	29.924	8.086
Temperature	548	17.463	1.957	14.987	21.215	6.228
pH	548	7.930	0.021	7.897	7.984	0.087
Dissolved Oxygen	548	5.964	0.273	5.484	6.337	0.852
Chlorophyll	564	5.296	2.758	1.228	10.281	9.052
Oils Florescence	409	21.252	5.701	12.952	34.787	21.835
Nephelometry	437	1.609	0.195	1.263	1.999	0.736
Transmittance	524	50.768	13.788	19.978	67.410	47.432
Bottom Depth	633	-5.866	0.947	-9.400	-3.500	5.900
TSS Neph	436	6.135	0.674	4.941	7.484	2.542
TSS Trans	523	6.663	2.079	4.157	11.303	7.146

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000 0.00000	-0.94124 0.78068	-0.23263 0.00000	0.67151 0.00000	-0.74420 0.00000	-0.11000 0.00483	-0.38626 0.00000	0.87039 0.00000	-0.38025 0.00000	-0.87100 0.00000
tem	-0.94124 0.78068	1.00000 0.00000	0.47802 0.00000	-0.82524 0.00000	0.87111 0.00000	0.33429 0.00000	0.39336 0.00000	-0.93556 0.00000	0.38616 0.00000	0.93547 0.00000
ph	-0.23263 0.00000	0.47802 0.00000	1.00000 0.00000	-0.58757 0.00000	0.67790 0.00000	0.42954 0.00000	0.07069 0.07060	-0.47978 0.00000	0.07182 0.06623	0.47858 0.00000
do2	0.67151 0.00000	-0.82524 0.00000	-0.58757 0.00000	1.00000 0.00000	-0.74159 0.00000	-0.33744 0.00000	-0.33227 0.00000	0.85393 0.00000	-0.31867 0.00000	-0.85262 0.00000
chl	-0.74420 0.00000	0.87111 0.00000	0.67790 0.00000	-0.74159 0.00000	1.00000 0.00000	0.38625 0.00000	0.20077 0.00000	-0.81454 0.00000	0.20243 0.00000	0.81394 0.00000
oil	-0.11000 0.00483	0.33429 0.00000	0.42954 0.00000	-0.33744 0.00000	0.38625 0.00000	1.00000 0.00000	0.29448 0.00000	-0.29832 0.00000	0.28557 0.00000	0.29685 0.00000
nep	-0.38626 0.00000	0.39336 0.00000	0.07069 0.07060	-0.33227 0.00000	0.20077 0.00000	0.29448 0.00000	1.00000 0.00000	-0.38930 0.00000	0.99775 0.95730	0.38941 0.00000
tra	0.87039 0.00000	-0.93556 0.00000	-0.47978 0.00000	0.85393 0.00000	-0.81454 0.00000	-0.29832 0.00000	-0.38930 0.00000	1.00000 0.00000	-0.38083 0.00000	-0.99971 0.98464
tssn	-0.38025 0.00000	0.38616 0.00000	0.07182 0.06623	-0.31867 0.00000	0.20243 0.00000	0.28557 0.00000	0.99775 0.95730	-0.38083 0.00000	1.00000 0.00000	0.38094 0.00000
tsst	-0.87100 0.00000	0.93547 0.00000	0.47858 0.00000	-0.85262 0.00000	0.81394 0.00000	0.29685 0.00000	0.38941 0.00000	-0.99971 0.98464	0.38094 0.00000	1.00000 0.00000

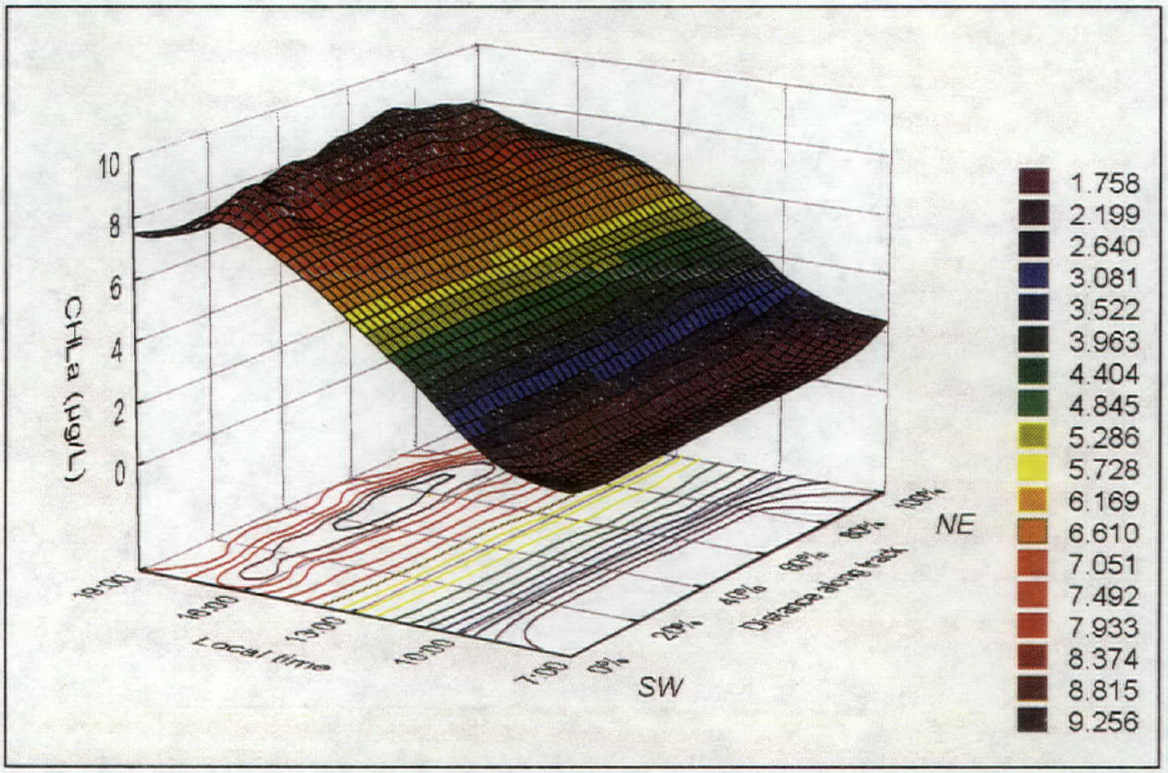


Figure 72. Cross-sectional time series of chlorophyll a on Day 192, Transect A.

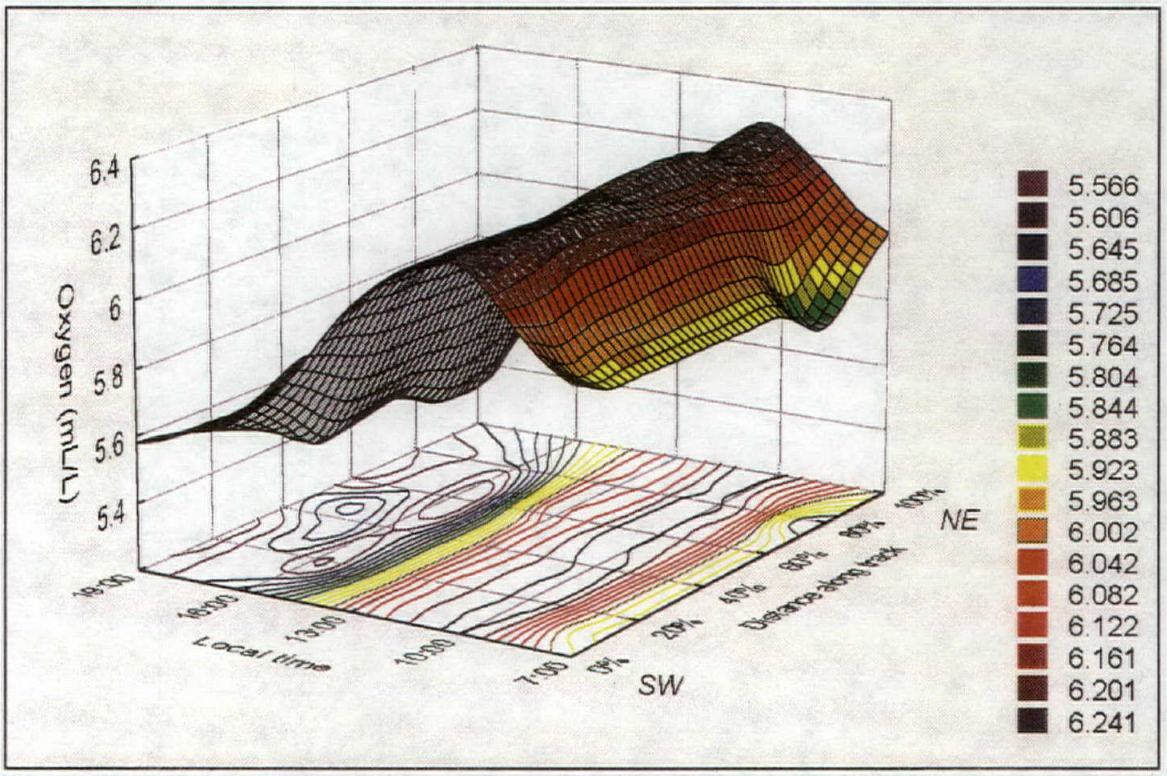


Figure 73. Cross-sectional time series of dissolved oxygen on Day 192, Transect A.

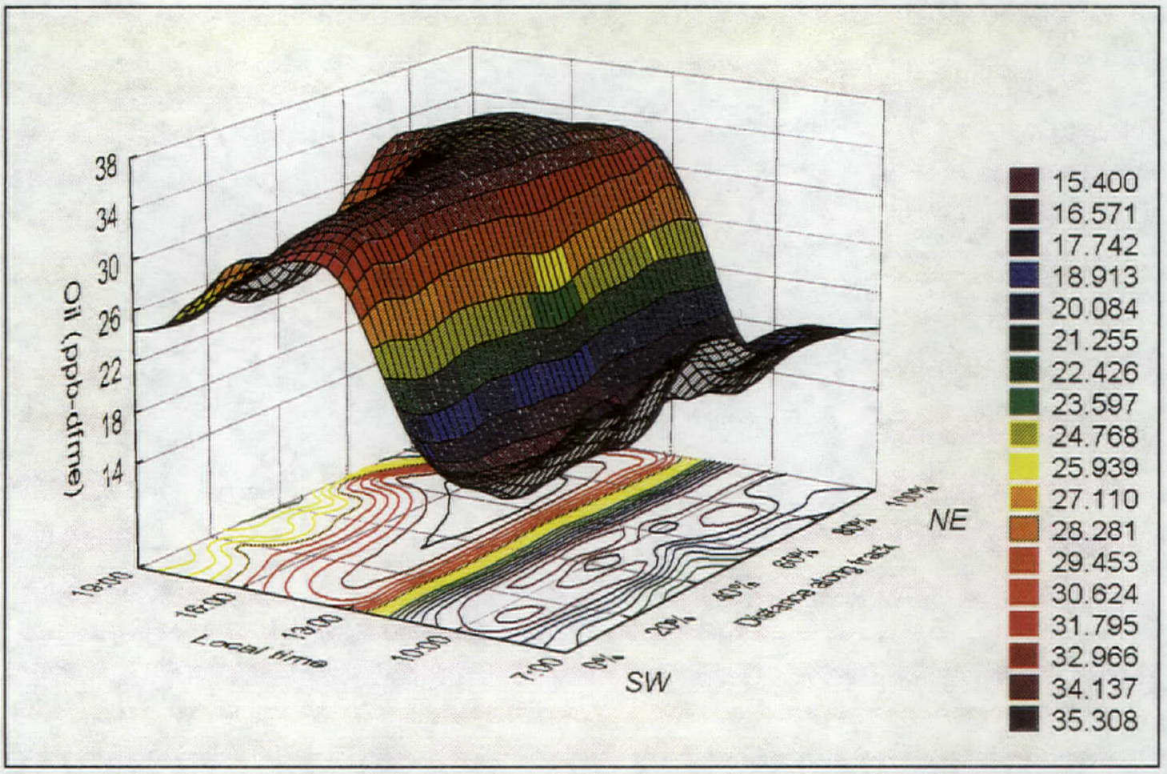


Figure 74. Cross-sectional time series of dissolved oil on Day 192, Transect A.

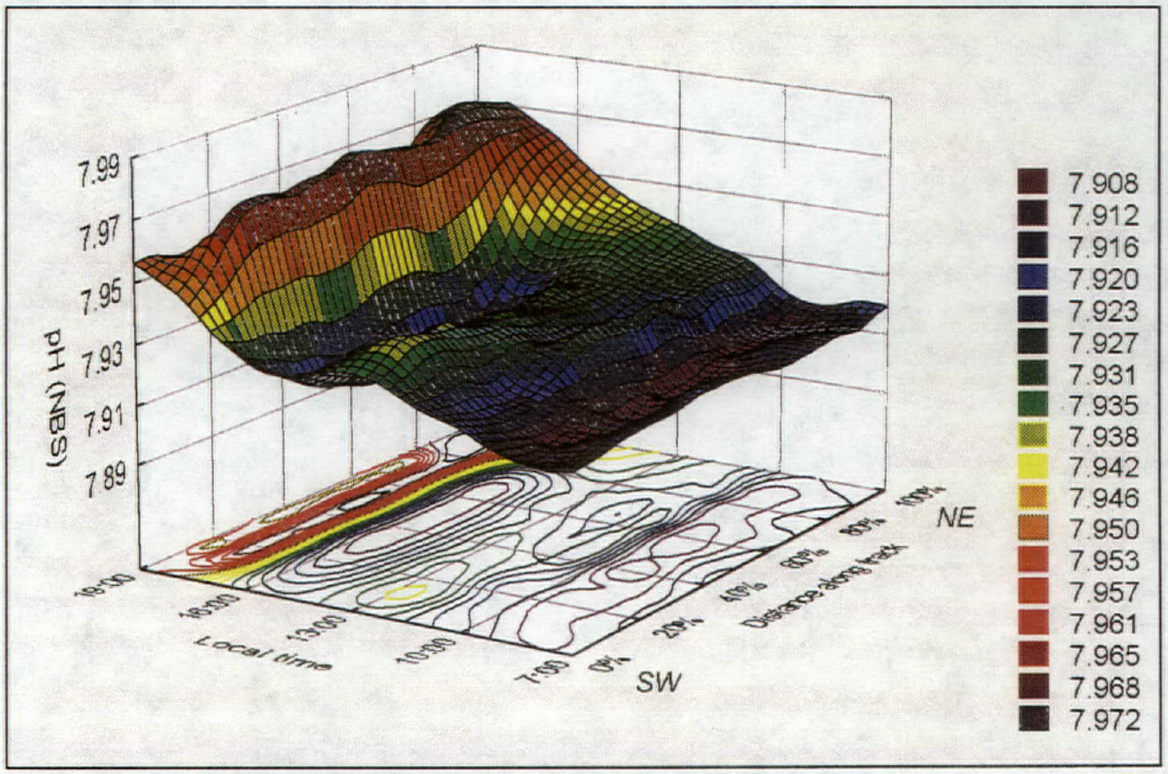


Figure 75. Cross-sectional time series of pH on Day 192, Transect A.

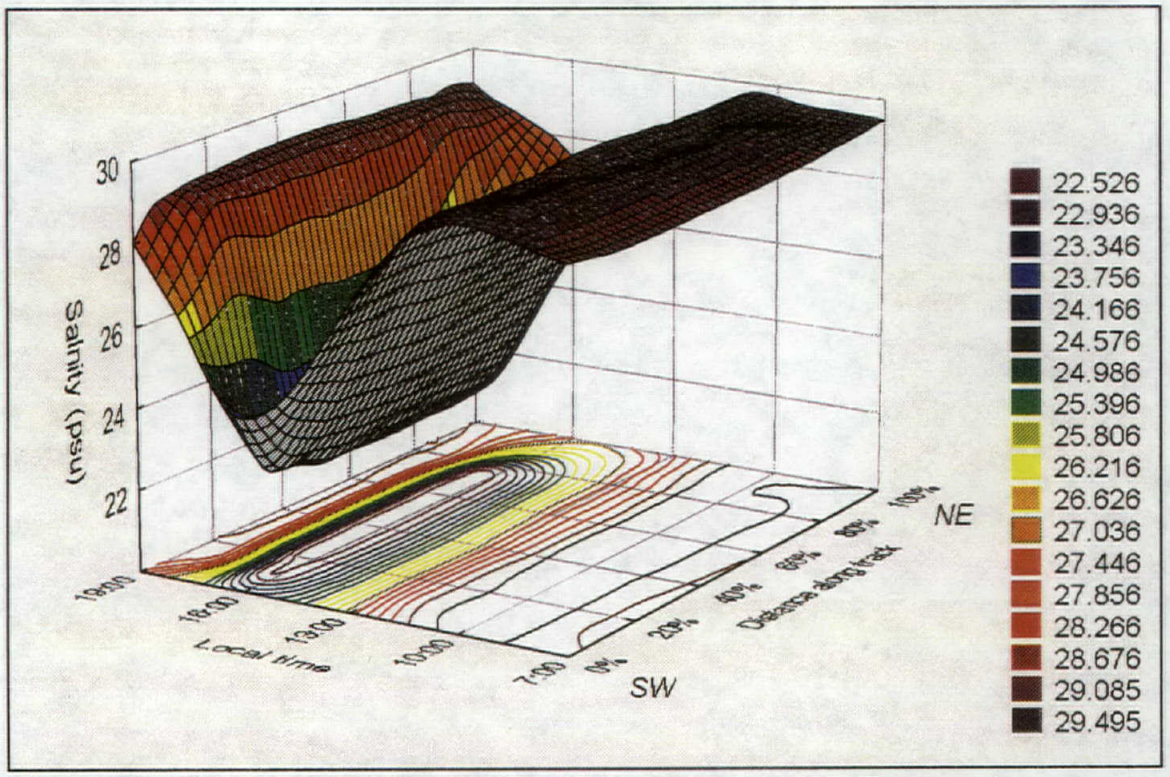


Figure 76. Cross-sectional time series of salinity on Day 192, Transect A.

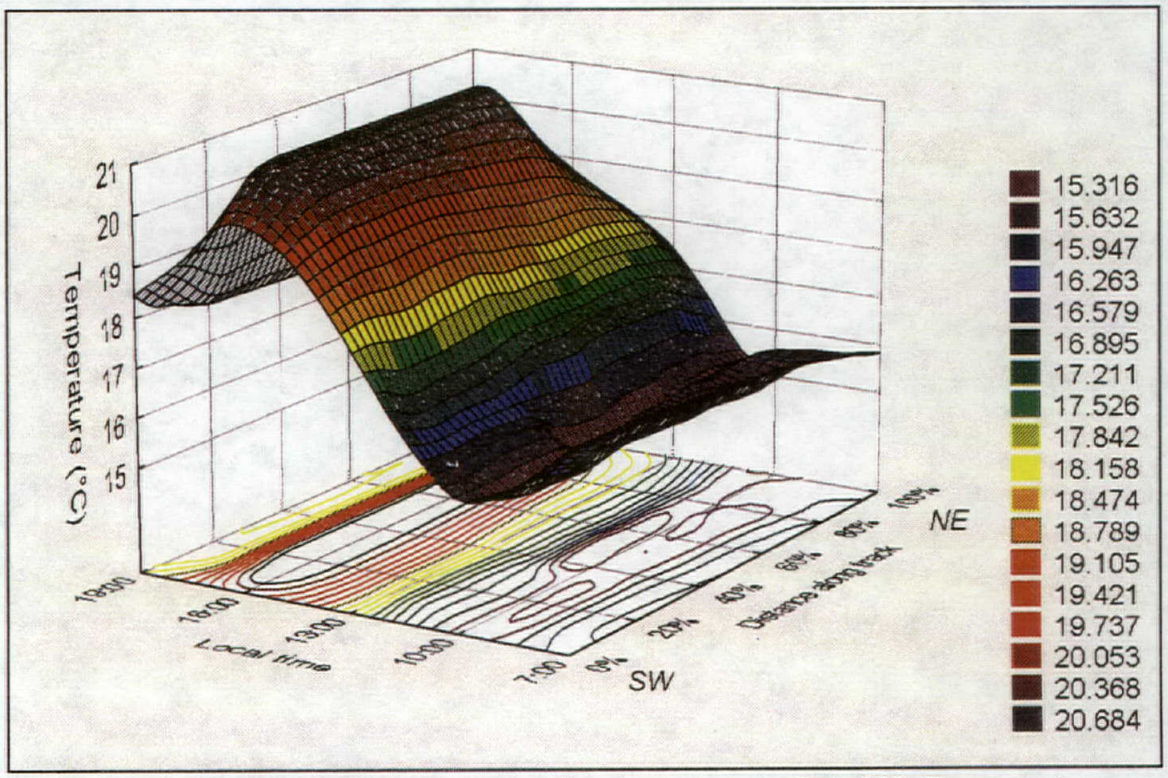


Figure 77. Cross-sectional time series of temperature on Day 192, Transect A.

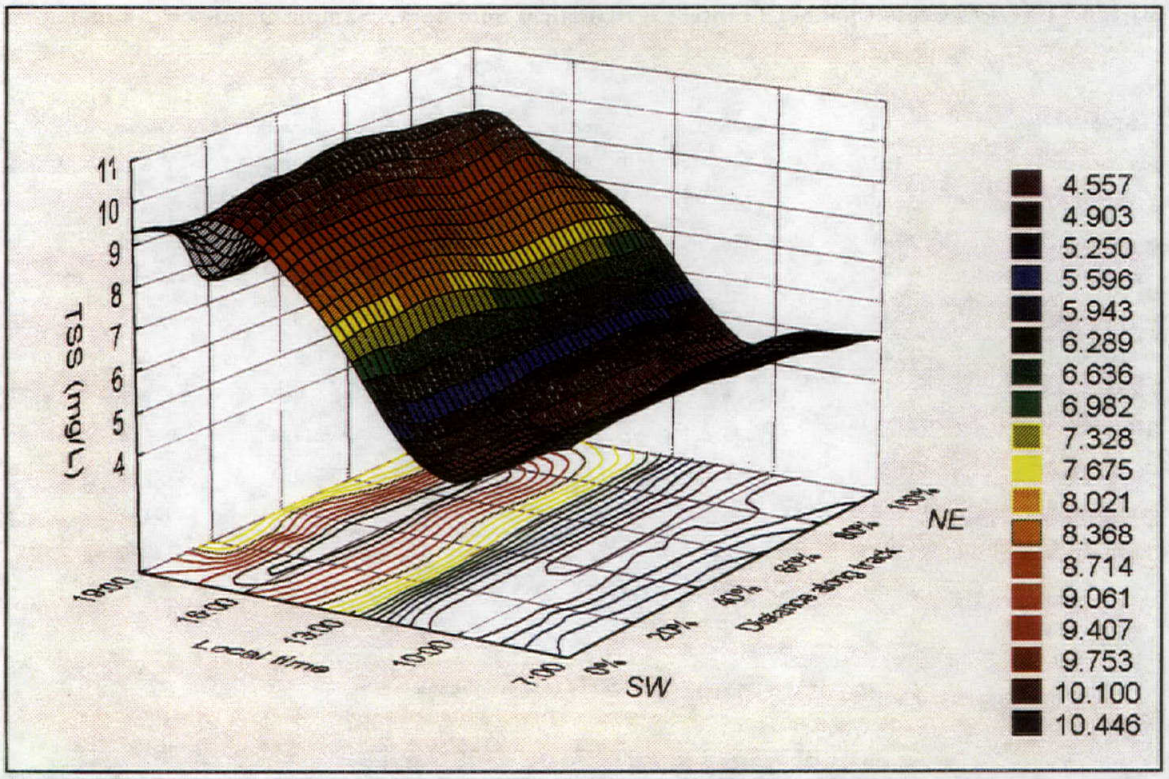


Figure 78. Cross-sectional time series of TSS on Day 192, Transect A.

TABLE 8. Day 192 Cross-Channel Transect B Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	853	1.146	0.150	0.828	1.939	1.112
Salinity	1330	29.446	0.739	25.944	30.692	4.747
Temperature	1333	16.234	2.095	12.926	25.126	12.200
pH	1333	7.933	0.026	7.888	8.004	0.116
Dissolved Oxygen	1328	6.062	0.374	5.453	6.894	1.442
Chlorophyll	1444	4.871	2.004	0.944	7.976	7.032
Oils Florescence	1132	18.246	6.979	8.997	34.954	25.957
Nephelometry	1308	1.475	0.202	1.048	1.994	0.946
Transmittance	1161	57.076	13.843	24.005	71.983	47.978
Bottom Depth	1429	-11.958	2.126	-16.000	-5.900	10.100
TSS Neph	1307	5.673	0.697	4.196	7.466	3.270
TSS Trans	1160	5.713	2.086	3.468	10.697	7.228

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.96653	-0.88030	0.72605	-0.56990	-0.54737	-0.28384	0.68961	-0.28391	-0.68964
	0.00000	1.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
tem	-0.96653	1.00000	0.91216	-0.77891	0.59668	0.54251	0.24135	-0.66352	0.24159	0.66336
	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ph	-0.88030	0.91216	1.00000	-0.74747	0.56011	0.53422	0.20021	-0.69124	0.20026	0.69129
	1.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
do2	0.72605	-0.77891	-0.74747	1.00000	-0.59269	-0.67483	-0.33260	0.81999	-0.33318	-0.81945
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
chl	-0.56990	0.59668	0.56011	-0.59269	1.00000	0.56192	0.07728	-0.52005	0.07760	0.51974
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00330	0.00000	0.00317	0.00000
oil	-0.54737	0.54251	0.53422	-0.67483	0.56192	1.00000	0.25250	-0.62907	0.25273	0.62891
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
nep	-0.28384	0.24135	0.20021	-0.33260	0.07728	0.25250	1.00000	-0.26657	0.99991	0.26682
	0.00000	0.00000	0.00000	0.00000	0.00330	0.00000	0.00000	0.00000	0.00000	0.00000
tra	0.68961	-0.66352	-0.69124	0.81999	-0.52005	-0.62907	-0.26657	1.00000	-0.26681	-0.99987
	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.28391	0.24159	0.20026	-0.33318	0.07760	0.25273	0.99991	-0.26681	1.00000	0.26684
	0.00000	0.00000	0.00000	0.00000	0.00317	0.00000	0.00000	0.00000	0.00000	0.00000
tsst	-0.68964	0.66336	0.69129	-0.81945	0.51974	0.62891	0.26682	-0.99987	0.26684	1.00000
	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000

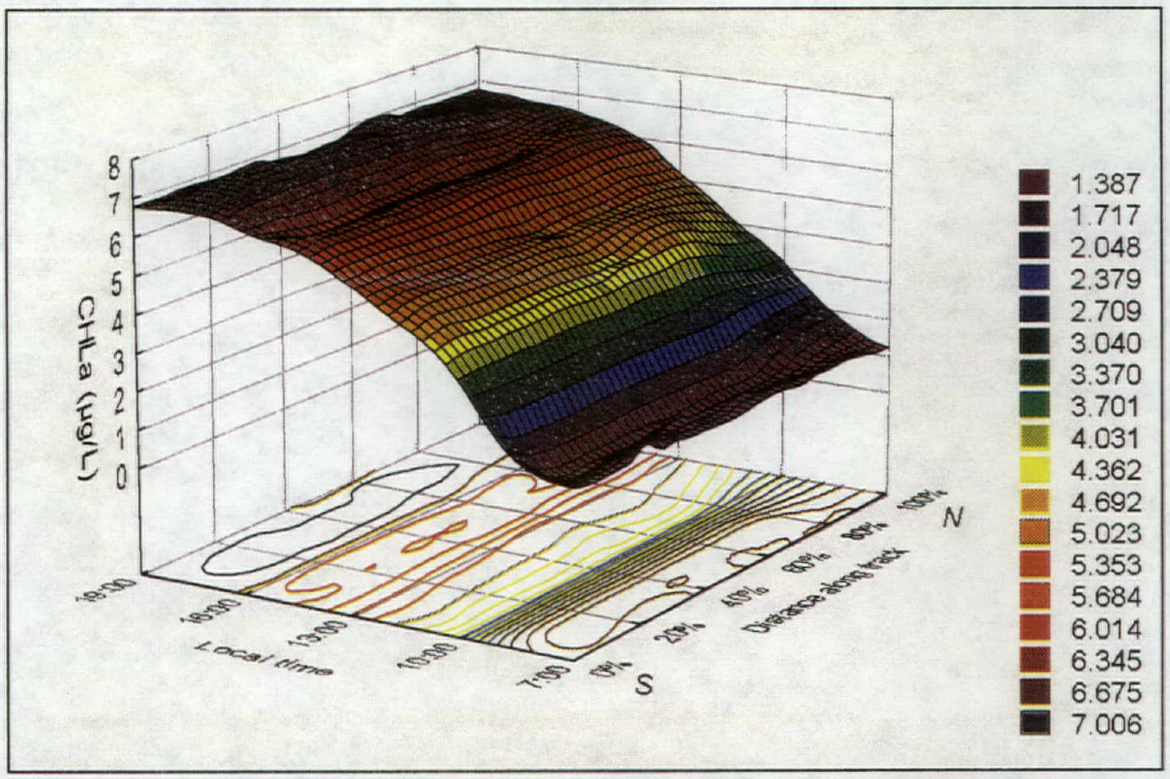


Figure 79. Cross-sectional time series of chlorophyll a *on Day 192, Transect B.*

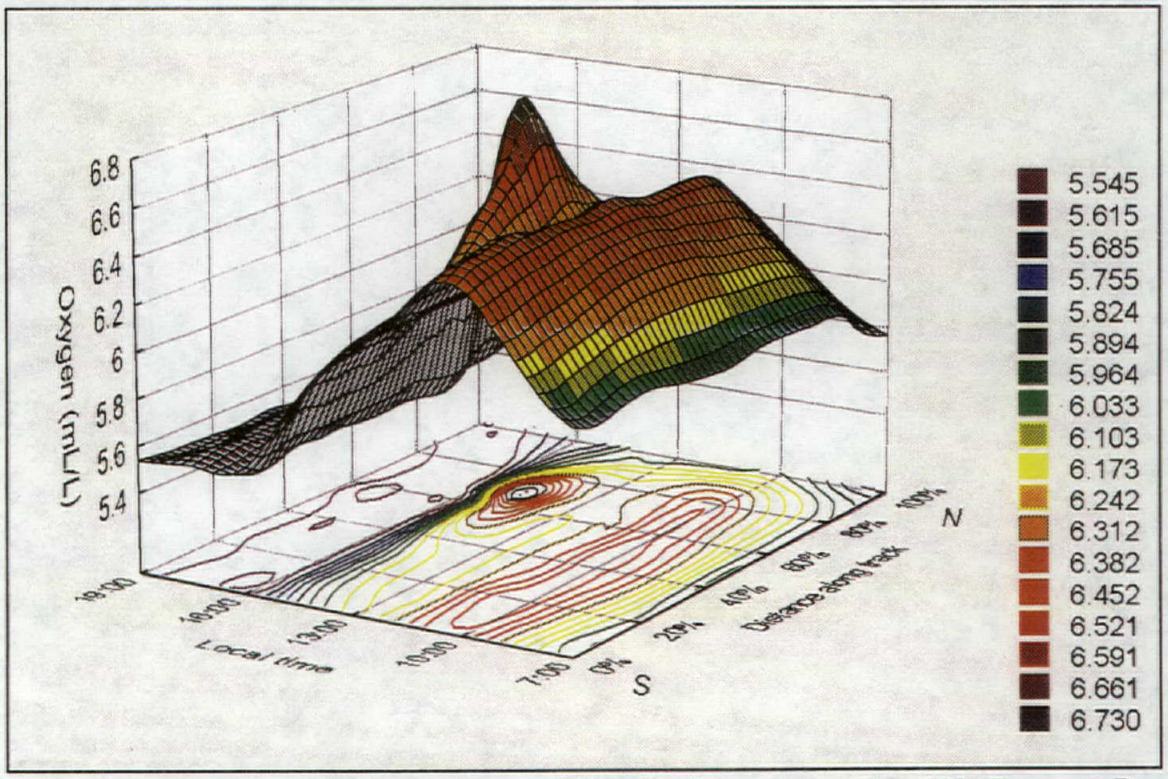


Figure 80. Cross-sectional time series of dissolved oxygen on Day 192, Transect B.

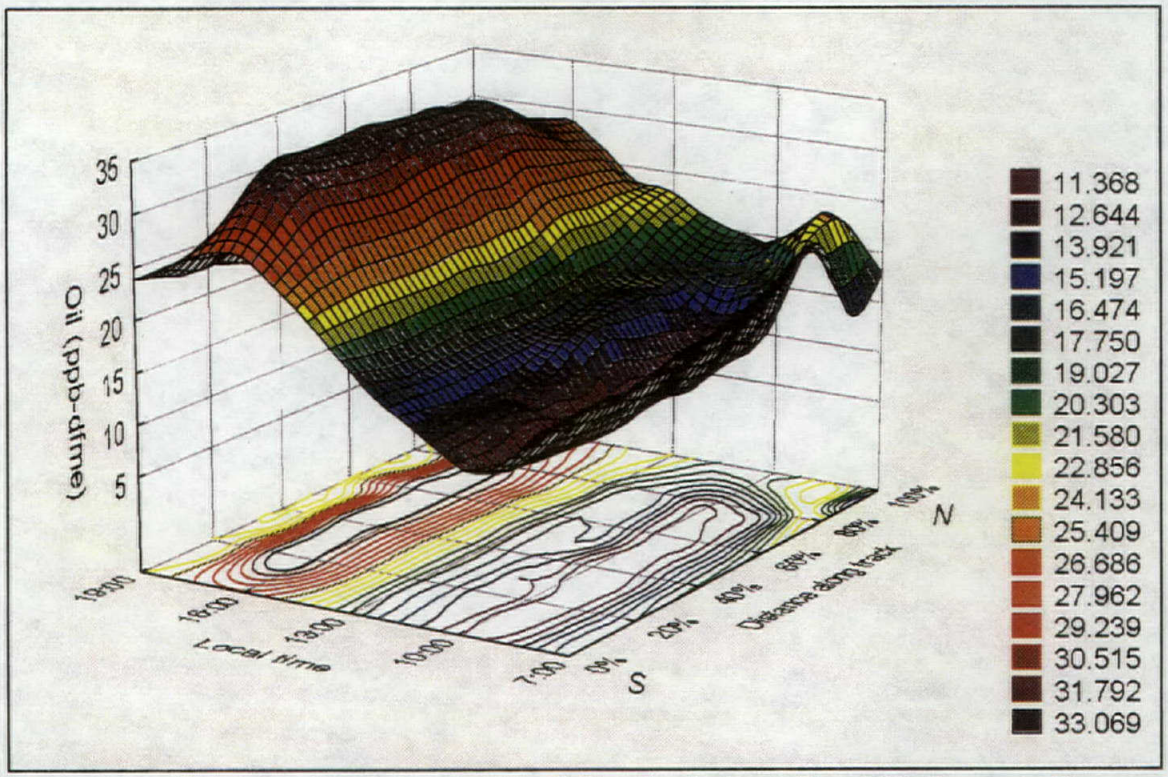


Figure 81. Cross-sectional time series of dissolved oil on Day 192, Transect B.

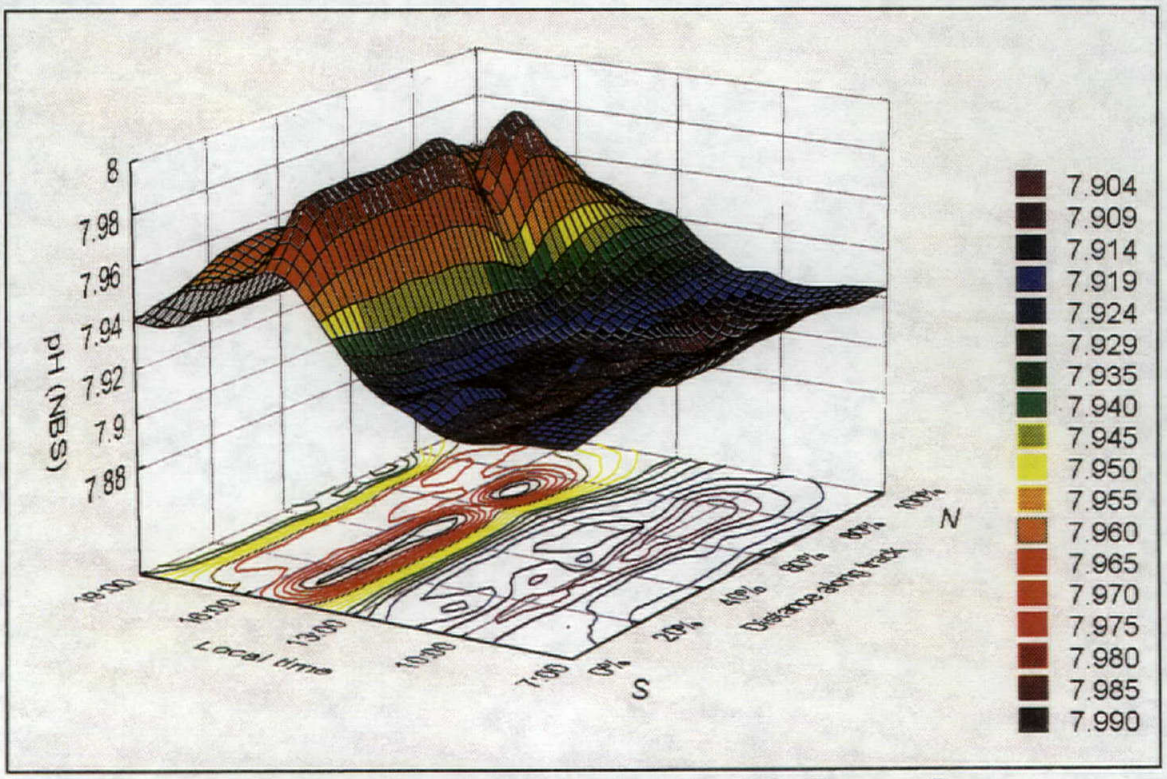


Figure 82. Cross-sectional time series of pH on Day 192, Transect B.

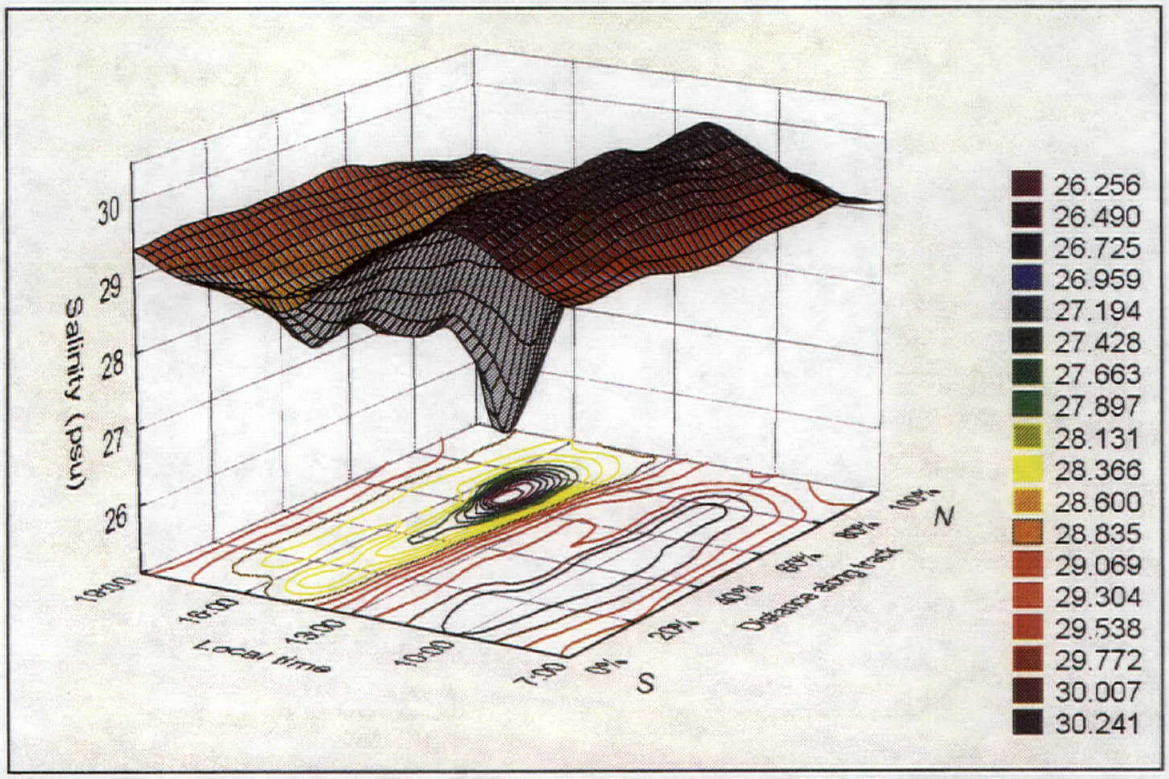


Figure 83. Cross-sectional time series of salinity on Day 192, Transect B.

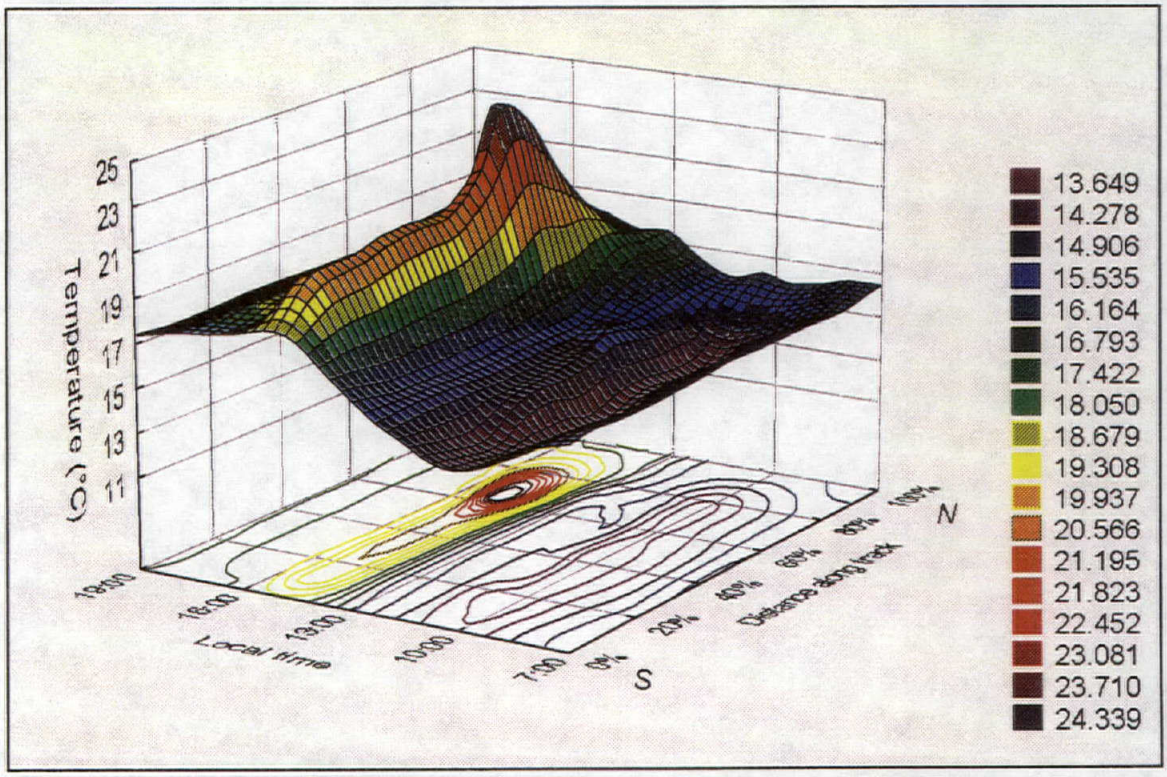


Figure 84. Cross-sectional time series of temperature on Day 192, Transect B.

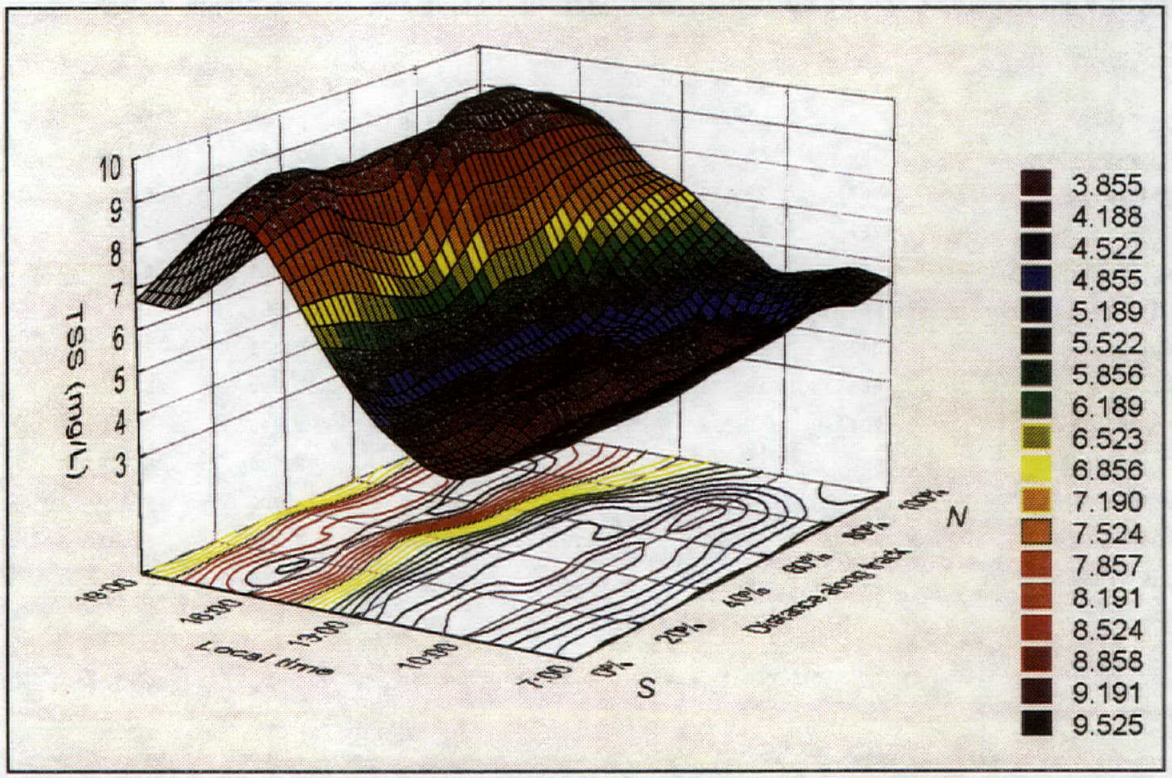


Figure 85. Cross-sectional time series of TSS on Day 192, Transect B.

TABLE 9. Day 192 Cross-Channel Transect C Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	586	1.118	0.151	0.842	1.939	1.097
Salinity	967	29.168	1.257	23.782	30.485	6.703
Temperature	967	16.526	1.762	13.383	20.761	7.378
pH	967	7.935	0.022	7.899	7.984	0.085
Dissolved Oxygen	967	5.977	0.343	5.476	6.553	1.077
Chlorophyll	1082	4.669	2.273	0.972	8.213	7.241
Oils Florescence	864	18.771	5.991	8.997	34.899	25.902
Nephelometry	904	1.553	0.217	1.104	1.996	0.892
Transmittance	957	53.542	13.428	23.856	72.604	48.748
Bottom Depth	1078	-8.802	2.313	-13.000	-3.700	9.300
TSS Neph	903	5.941	0.751	4.390	7.472	3.081
TSS Trans	956	6.246	2.024	3.375	10.719	7.344

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.81923	-0.50365	0.57537	-0.52393	-0.29085	-0.14966	0.72957	-0.13990	-0.72973
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
tem	-0.81923	1.00000	0.81659	-0.88237	0.70314	0.67082	0.10570	-0.94732	0.09942	0.94721
	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00050	1.00000	0.00106	1.00000
ph	-0.50365	0.81659	1.00000	-0.76803	0.68880	0.71085	0.07968	-0.84182	0.08160	0.84157
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00874	0.00000	0.00724	0.00000
do2	0.57537	-0.88237	-0.76803	1.00000	-0.64257	-0.68268	-0.06994	0.89453	-0.06257	-0.89396
	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.02141	1.00000	0.03961	1.00000
chl	-0.52393	0.70314	0.68880	-0.64257	1.00000	0.52371	0.22603	-0.66112	0.23205	0.66076
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
oil	-0.29085	0.67082	0.71085	-0.68268	0.52371	1.00000	-0.09233	-0.66056	-0.09498	0.66064
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00236	0.00000	0.00176	0.00000
nep	-0.14966	0.10570	0.07968	-0.06994	0.22603	-0.09233	1.00000	-0.12115	0.99891	0.12113
	0.00000	0.00050	0.00874	0.02141	0.00000	0.00236	0.00000	0.00006	1.00000	0.00006
tra	0.72957	-0.94732	-0.84182	0.89453	-0.66112	-0.66056	-0.12115	1.00000	-0.11470	-0.99988
	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00006	0.00000	0.00016	1.00000
tssn	-0.13990	0.09942	0.08160	-0.06257	0.23205	-0.09498	0.99891	-0.11470	1.00000	0.11472
	0.00000	0.00106	0.00724	0.03961	0.00000	0.00176	1.00000	0.00016	0.00000	0.00016
tsst	-0.72973	0.94721	0.84157	-0.89396	0.66076	0.66064	0.12113	-0.99988	0.11472	1.00000
	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00006	1.00000	0.00016	0.00000

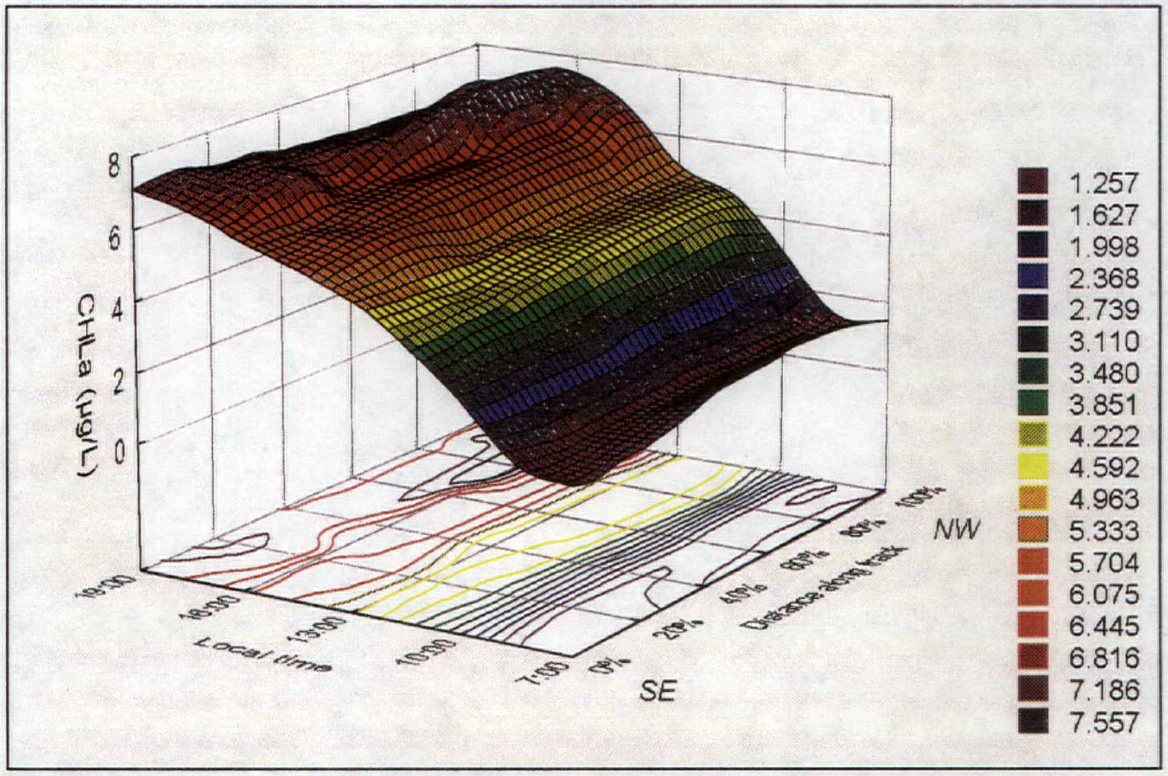


Figure 86. Cross-sectional time series of chlorophyll a *on Day 192, Transect C.*

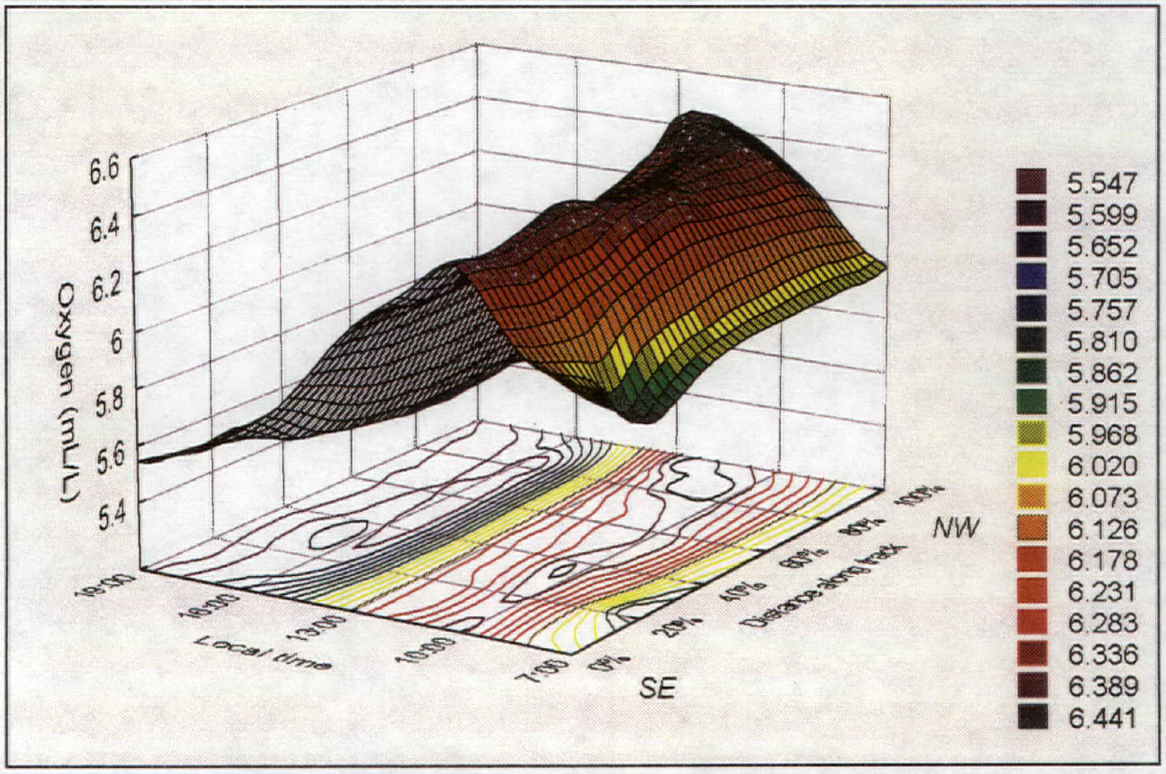


Figure 87. Cross-sectional time series of dissolved oxygen on Day 192, Transect C.

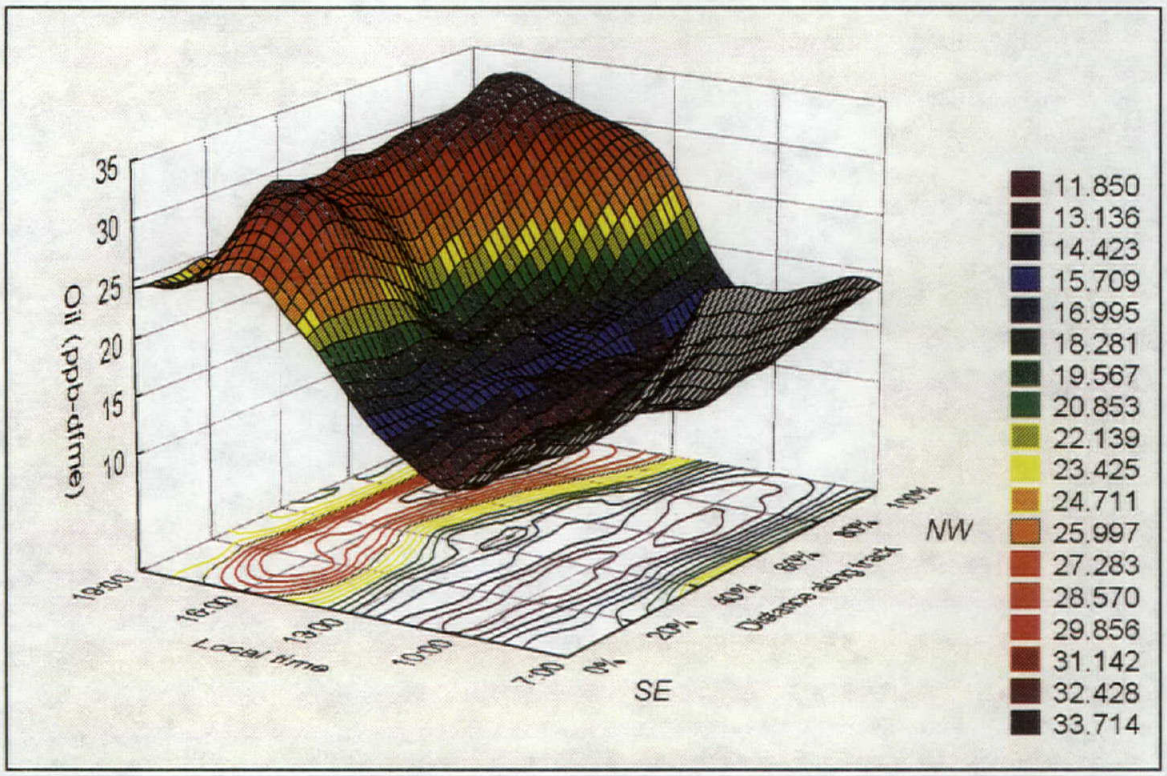


Figure 88. Cross-sectional time series of dissolved oil on Day 192, Transect C.

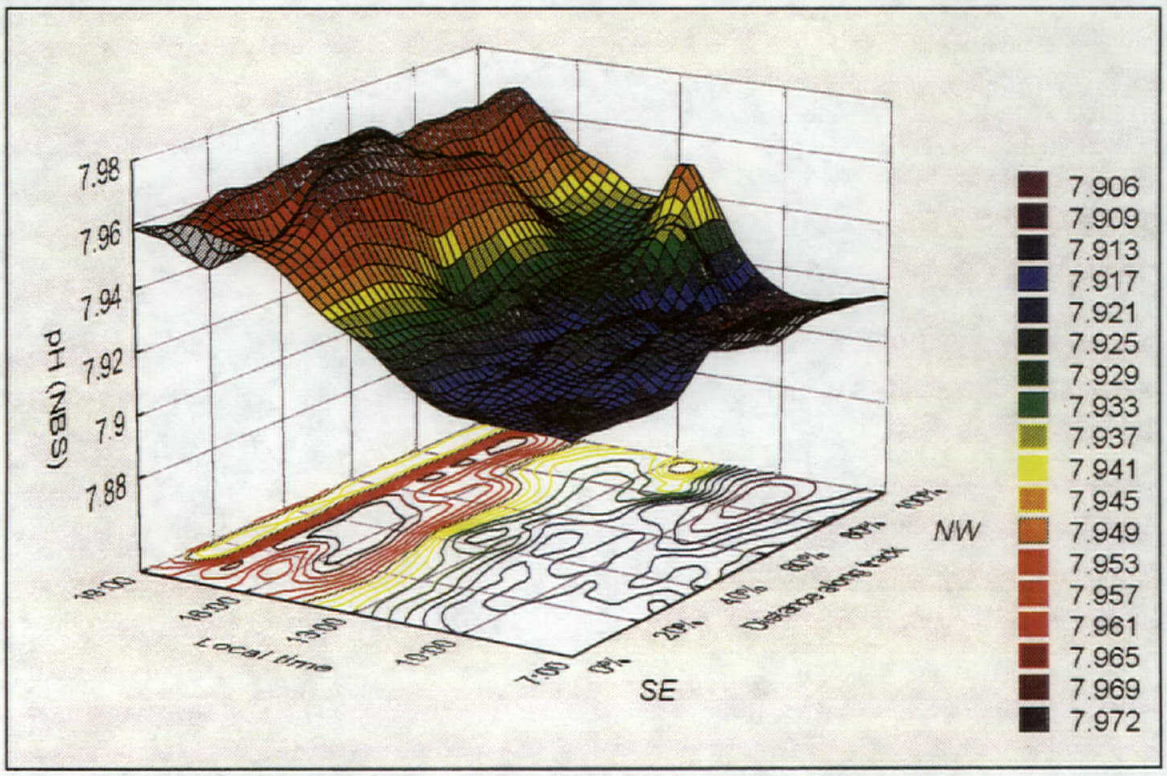


Figure 89. Cross-sectional time series of pH on Day 192, Transect C.

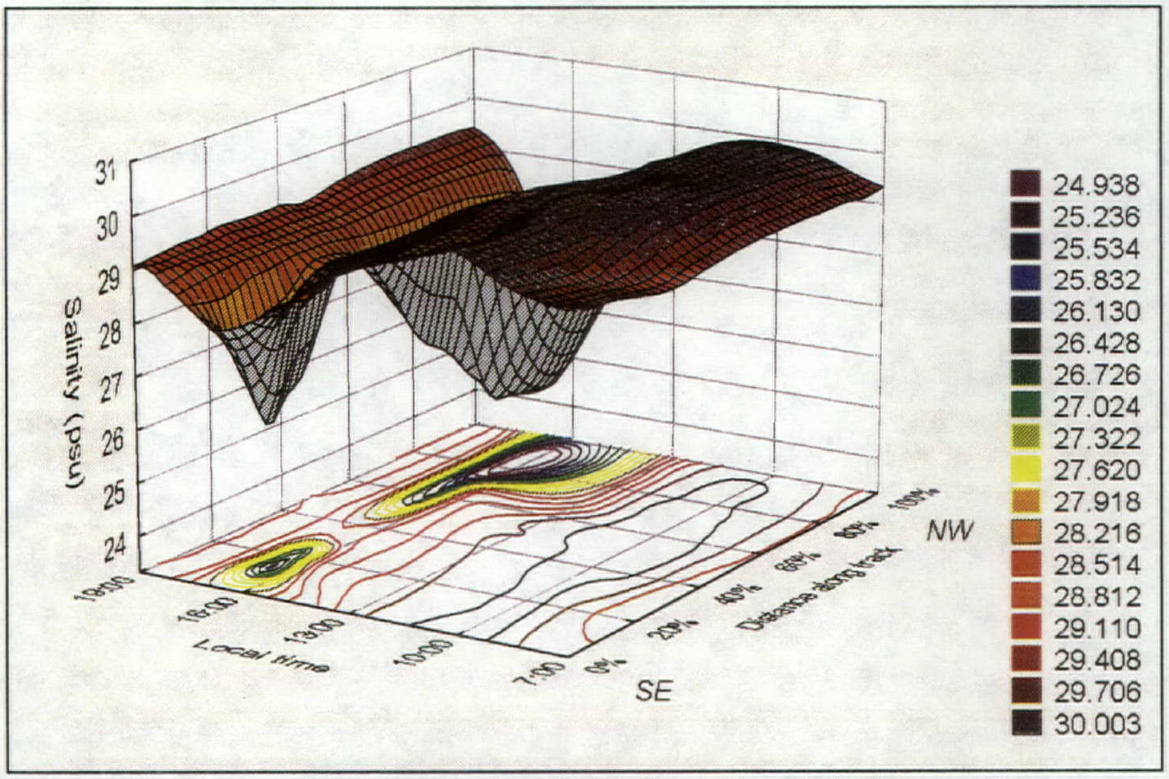


Figure 90. Cross-sectional time series of salinity on Day 192, Transect C.

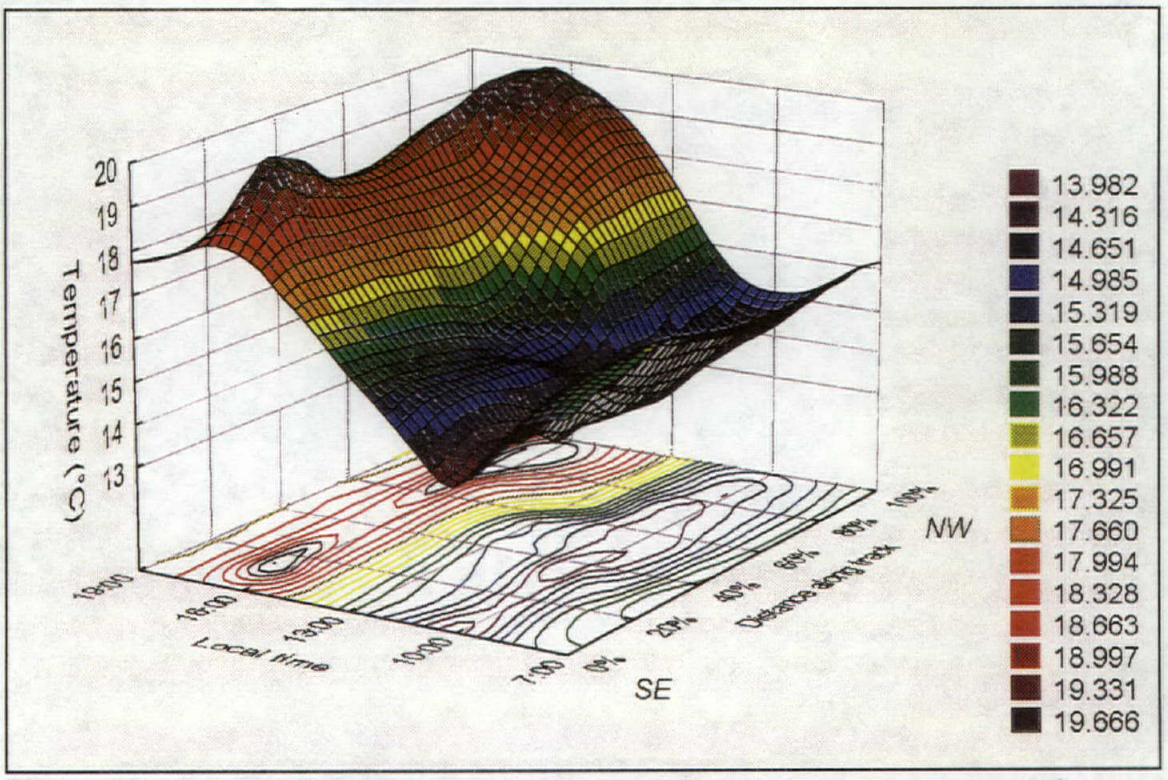


Figure 91. Cross-sectional time series of temperature on Day 192, Transect C.

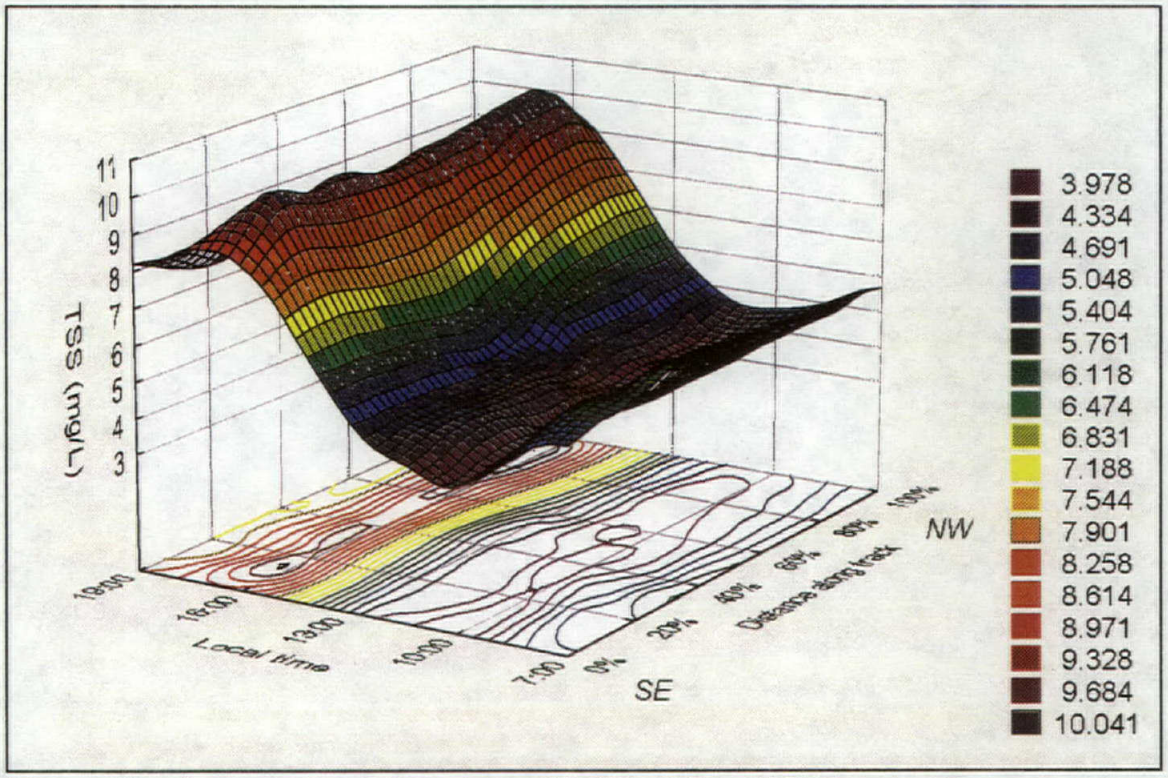


Figure 92. Cross-sectional time series of TSS on Day 192, Transect C.

Day 196- East Seavey Island

A Transect

TABLE 10 Statistical Summary
FIGURE 93 Chlorophyll *a*
FIGURE 94 Dissolved Oxygen
FIGURE 95 Oil
FIGURE 96 pH
FIGURE 97 Salinity
FIGURE 98 Temperature
FIGURE 99 Total Suspended Solids

B Transect

TABLE 11 Statistical Summary
FIGURE 100 Chlorophyll *a*
FIGURE 101 Dissolved Oxygen
FIGURE 102 Oil
FIGURE 103 pH
FIGURE 104 Salinity
FIGURE 105 Temperature
FIGURE 106 Total Suspended Solids

C Transect

TABLE 12 Statistical Summary
FIGURE 107 Chlorophyll *a*
FIGURE 108 Dissolved Oxygen
FIGURE 109 Oil
FIGURE 110 pH
FIGURE 111 Salinity
FIGURE 112 Temperature
FIGURE 113 Total Suspended Solids

D Transect

TABLE 13 Statistical Summary
FIGURE 114 Chlorophyll *a*
FIGURE 115 Dissolved Oxygen
FIGURE 116 Oil
FIGURE 117 pH
FIGURE 118 Salinity
FIGURE 119 Temperature
FIGURE 120 Total Suspended Solids

Day 196- East Seavey Island (cont)

E Transect

TABLE 14 Statistical Summary
FIGURE 121 Chlorophyll *a*
FIGURE 122 Dissolved Oxygen
FIGURE 123 Oil
FIGURE 124 pH
FIGURE 125 Salinity
FIGURE 126 Temperature
FIGURE 127 Total Suspended Solids

TABLE 10. Day 196 Cross-Channel Transect A Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	3920	1.222	0.154	0.798	1.999	1.201
Salinity	3918	30.557	0.296	29.795	31.198	1.403
Temperature	3920	14.315	0.746	12.185	16.165	3.980
pH	3920	8.035	0.015	7.996	8.070	0.074
Dissolved Oxygen	3920	6.799	0.207	6.036	7.328	1.292
Chlorophyll	3920	2.105	0.540	1.007	3.254	2.247
Oils Florescence	3786	1.165	3.392	-4.650	15.514	20.164
Nephelometry	3786	0.707	0.234	0.383	1.505	1.122
Transmittance	3920	70.888	4.587	59.256	80.758	21.502
Bottom Depth	3802	-14.143	4.942	-22.800	-3.900	18.900
TSS Neph	3785	3.019	0.808	1.899	5.778	3.879
TSS Trans	3919	3.633	0.691	2.146	5.386	3.240

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	0.01086	0.93319	0.83078	0.20960	-0.31563	-0.16554	0.63550	-0.12943	-0.24155
	0.00000	0.49652	1.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
tem	0.01086	1.00000	0.35816	-0.43895	-0.21899	0.72391	0.52779	-0.67215	0.47059	0.89164
	0.49652	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
ph	0.93319	0.35816	1.00000	0.61473	0.12179	-0.02638	0.03931	0.36873	0.05163	0.07501
	1.00000	0.00000	0.00000	1.00000	0.00000	0.09852	0.01382	0.00000	0.00122	0.00000
do2	0.83078	-0.43895	0.61473	1.00000	0.27452	-0.56252	-0.42975	0.86640	-0.37541	-0.63486
	1.00000	0.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
chl	0.20960	-0.21899	0.12179	0.27452	1.00000	-0.28347	-0.29599	0.19734	-0.26481	-0.16681
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
oil	-0.31563	0.72391	-0.02638	-0.56252	-0.28347	1.00000	0.37856	-0.65158	0.29821	0.68916
	0.00000	1.00000	0.09852	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
nep	-0.16554	0.52779	0.03931	-0.42975	-0.29599	0.37856	1.00000	-0.47797	0.99547	0.52989
	0.00000	0.00000	0.01382	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
tra	0.63550	-0.67215	0.36873	0.86640	0.19734	-0.65158	-0.47797	1.00000	-0.41799	-0.89871
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.12943	0.47059	0.05163	-0.37541	-0.26481	0.29821	0.99547	-0.41799	1.00000	0.47126
	0.00000	0.00000	0.00122	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
tsst	-0.24155	0.89164	0.07501	-0.63486	-0.16681	0.68916	0.52989	-0.89871	0.47126	1.00000
	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000

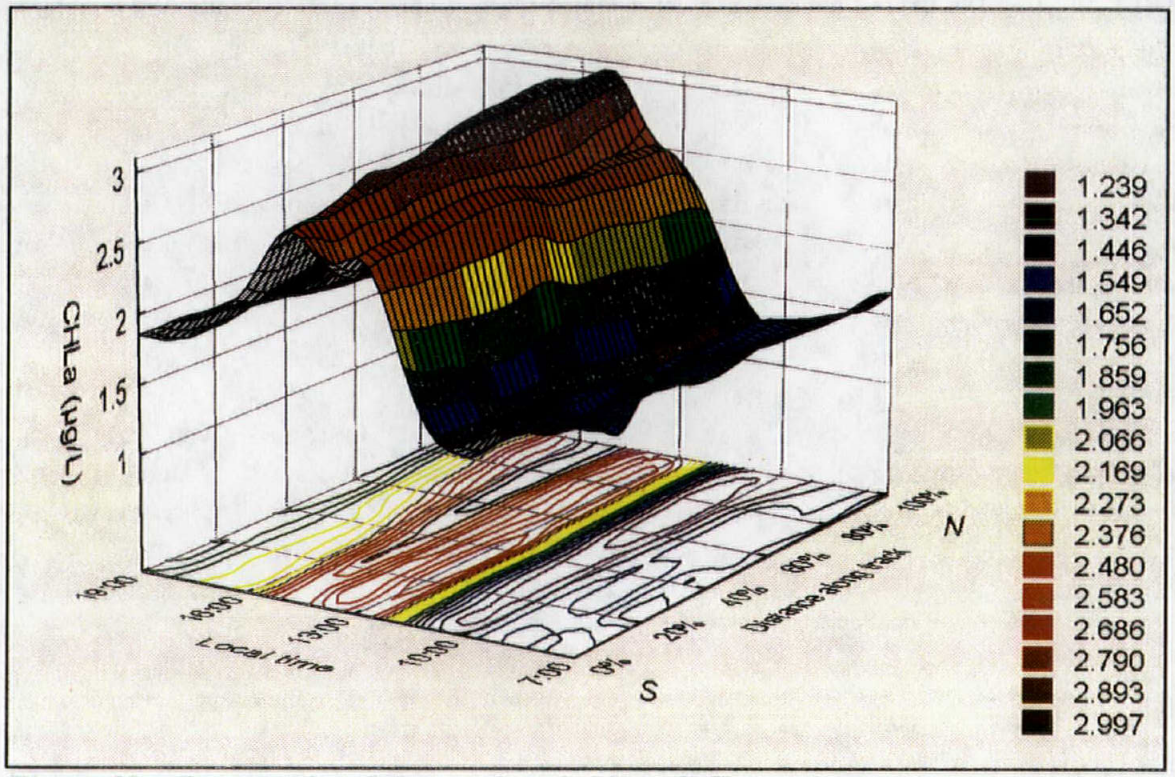


Figure 93. Cross-sectional time series of chlorophyll a on Day 196, Transect A.

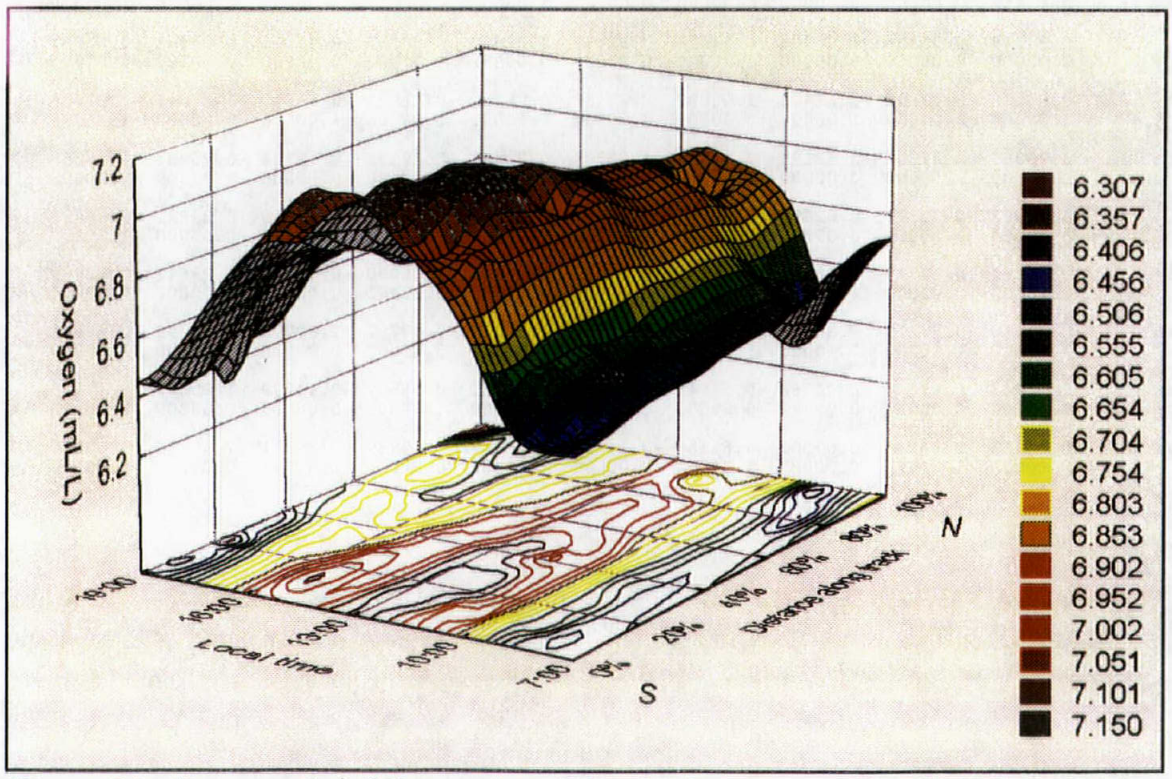


Figure 94. Cross-sectional time series of dissolved oxygen on Day 196, Transect A.

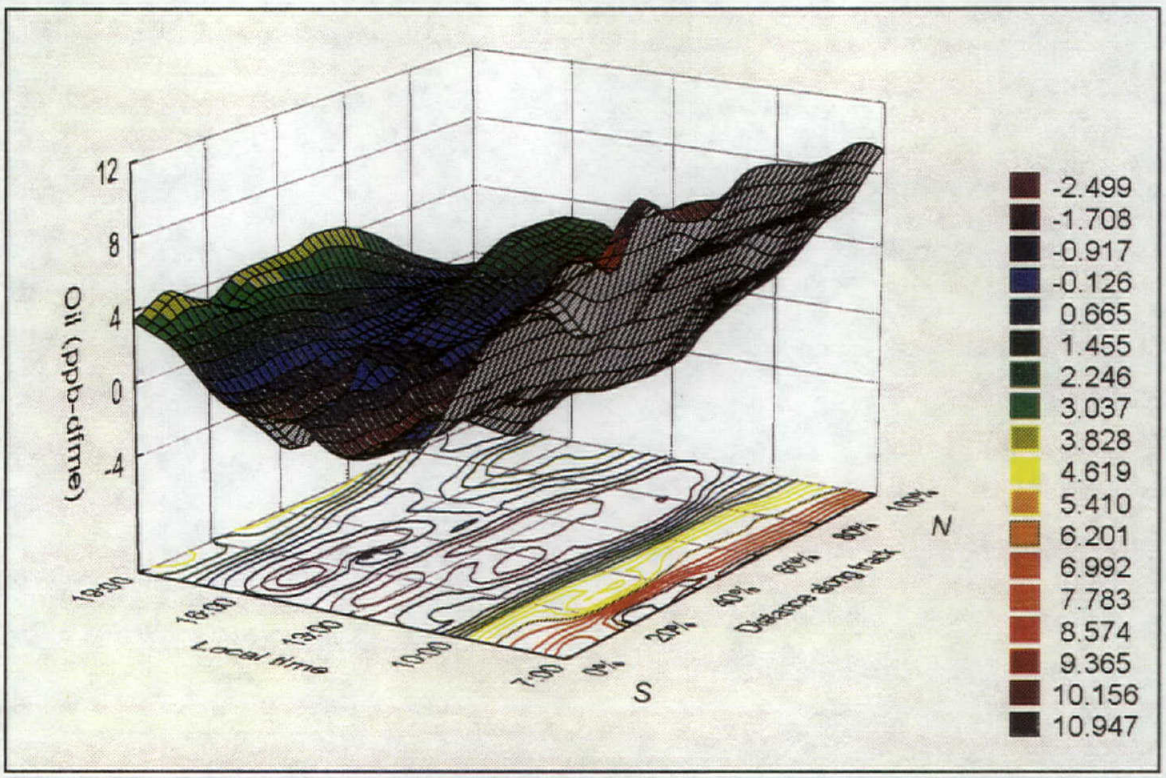


Figure 95. Cross-sectional time series of dissolved oil on Day 196, Transect A.

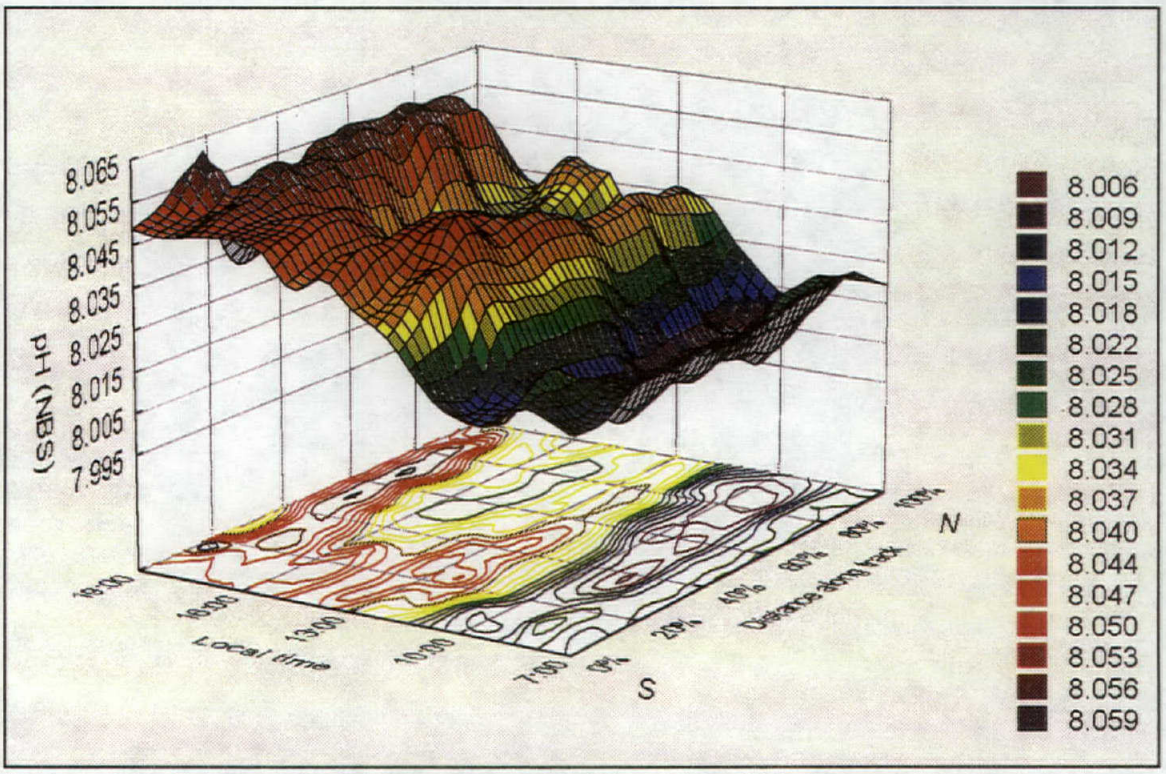


Figure 96. Cross-sectional time series of pH on Day 196, Transect A.

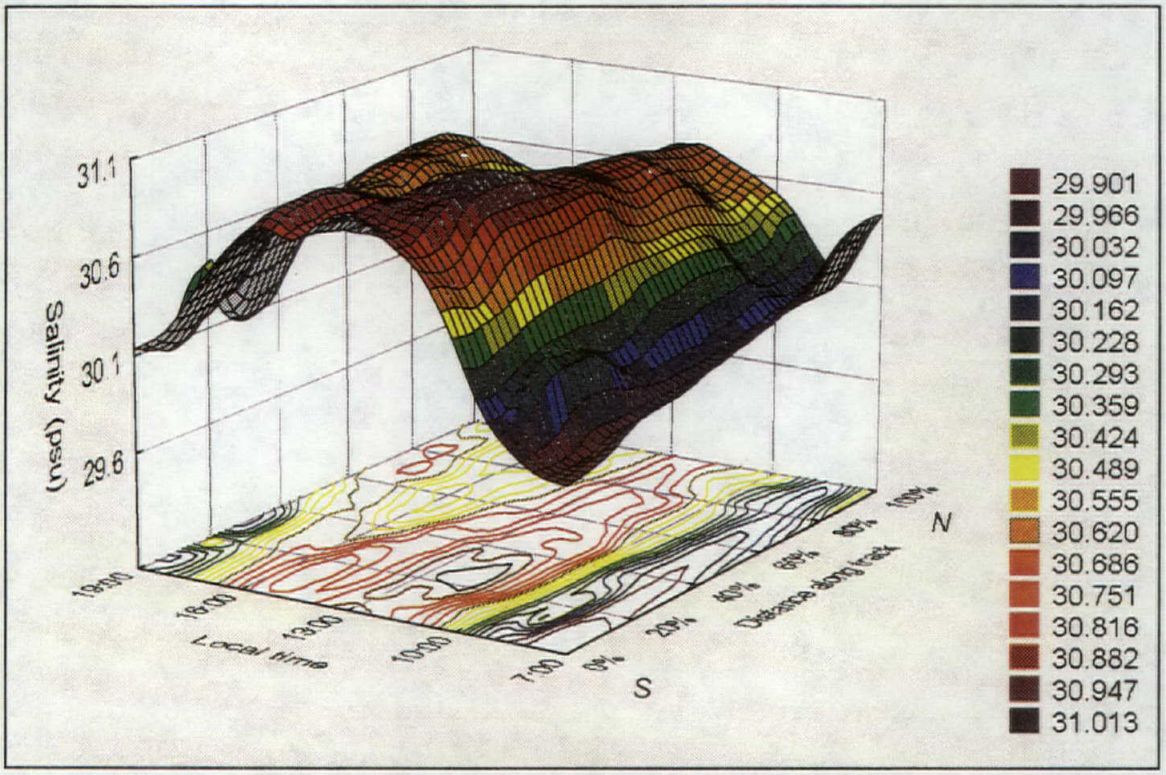


Figure 97. Cross-sectional time series of salinity on Day 196, Transect A.

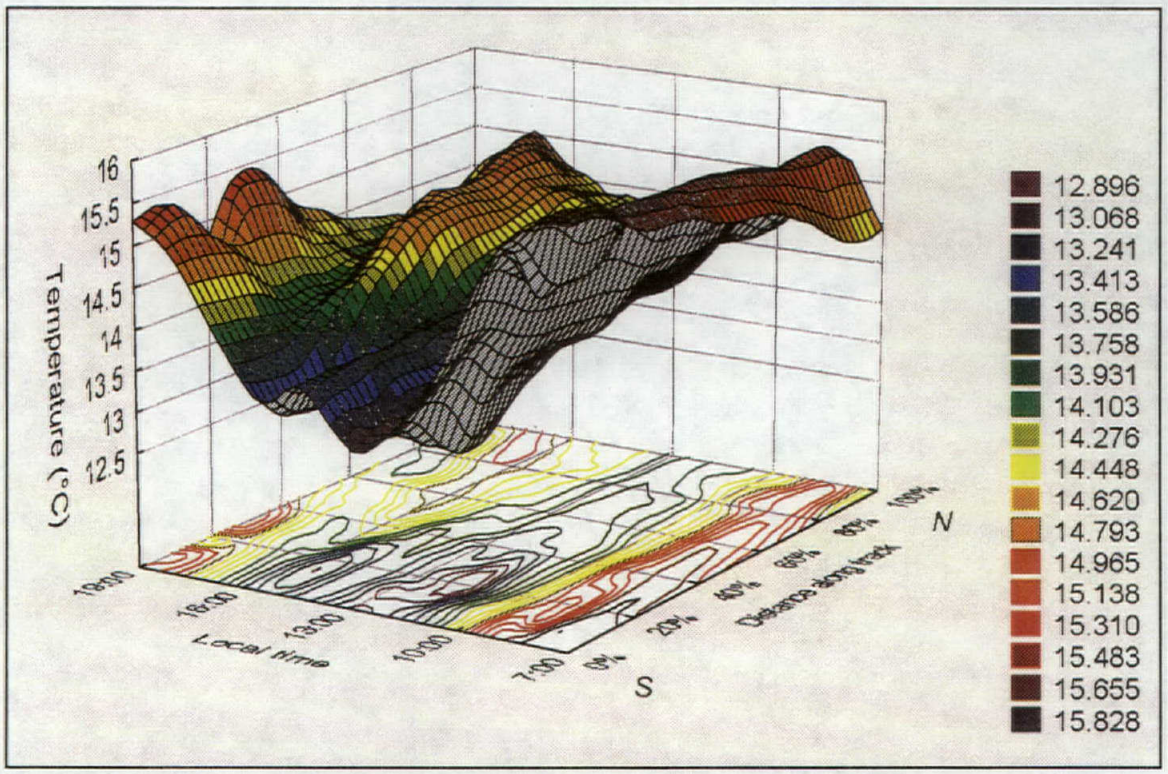


Figure 98. Cross-sectional time series of temperature on Day 196, Transect A.

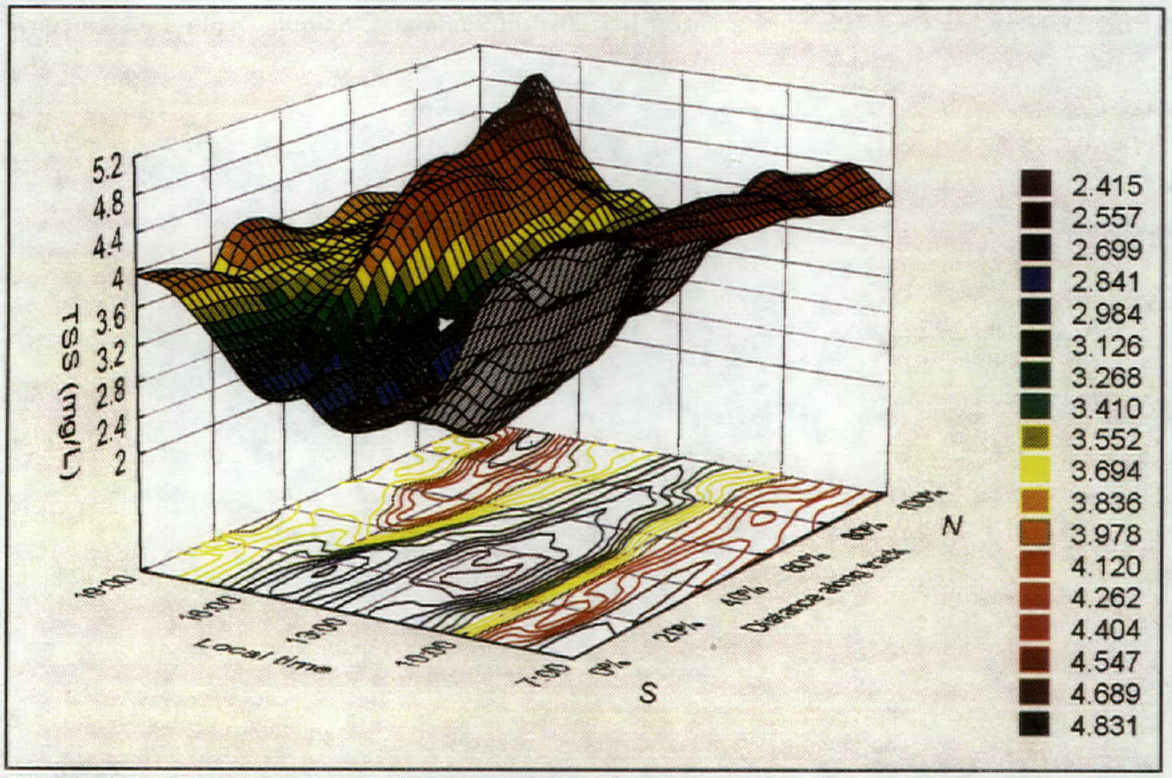


Figure 99. Cross-sectional time series of TSS on Day 196, Transect A.

TABLE 11. Day 196 Cross-Channel Transect B Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	1040	1.299	0.188	0.887	1.999	1.112
Salinity	1029	30.589	0.200	30.037	30.951	0.914
Temperature	1040	14.311	0.490	13.605	15.543	1.938
pH	1039	8.035	0.015	7.998	8.067	0.069
Dissolved Oxygen	1031	6.697	0.242	5.703	7.016	1.313
Chlorophyll	1040	2.077	0.596	1.156	3.153	1.997
Oils Florescence	1040	1.680	2.311	-2.478	8.663	11.140
Nephelometry	1013	0.795	0.181	0.501	1.243	0.742
Transmittance	1032	70.466	3.953	59.952	77.155	17.202
Bottom Depth	1038	-9.490	2.027	-13.300	-3.700	9.600
TSS Neph	1012	3.322	0.627	2.307	4.872	2.565
TSS Trans	1031	3.696	0.596	2.689	5.281	2.592

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.92555	0.49337	0.41795	0.23661	-0.49254	-0.61520	0.74096	-0.57757	-0.74086
	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
tem	-0.92555	1.00000	-0.38495	-0.50906	-0.14104	0.48373	0.52665	-0.88847	0.48378	0.88795
	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
ph	0.49337	-0.38495	1.00000	0.07491	0.75669	-0.28994	-0.19474	0.30768	-0.15988	-0.30770
	0.00000	0.00000	0.00000	0.01568	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
do2	0.41795	-0.50906	0.07491	1.00000	0.12929	-0.16551	-0.23691	0.43656	-0.21486	-0.43431
	0.00000	0.00000	0.01568	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000
chl	0.23661	-0.14104	0.75669	0.12929	1.00000	-0.11292	-0.13071	0.08156	-0.10614	-0.08183
	0.00000	0.00000	0.00000	0.00003	0.00000	0.00026	0.00002	0.00850	0.00061	0.00829
oil	-0.49254	0.48373	-0.28994	-0.16551	-0.11292	1.00000	0.43020	-0.43992	0.35579	0.44058
	0.00000	0.00000	0.00000	0.00000	0.00026	0.00000	0.00000	0.00000	0.00000	0.00000
nep	-0.61520	0.52665	-0.19474	-0.23691	-0.13071	0.43020	1.00000	-0.36008	0.99575	0.36027
	0.00000	0.00000	0.00000	0.00000	0.00002	0.00000	0.00000	0.00000	1.00000	0.00000
tra	0.74096	-0.88847	0.30768	0.43656	0.08156	-0.43992	-0.36008	1.00000	-0.31105	-0.99973
	0.00000	1.00000	0.00000	0.00000	0.00850	0.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.57757	0.48378	-0.15988	-0.21486	-0.10614	0.35579	0.99575	-0.31105	1.00000	0.31113
	0.00000	0.00000	0.00000	0.00000	0.00061	0.00000	1.00000	0.00000	0.00000	0.00000
tsst	-0.74086	0.88795	-0.30770	-0.43431	-0.08183	0.44058	0.36027	-0.99973	0.31113	1.00000
	0.00000	1.00000	0.00000	0.00000	0.00829	0.00000	0.00000	1.00000	0.00000	0.00000

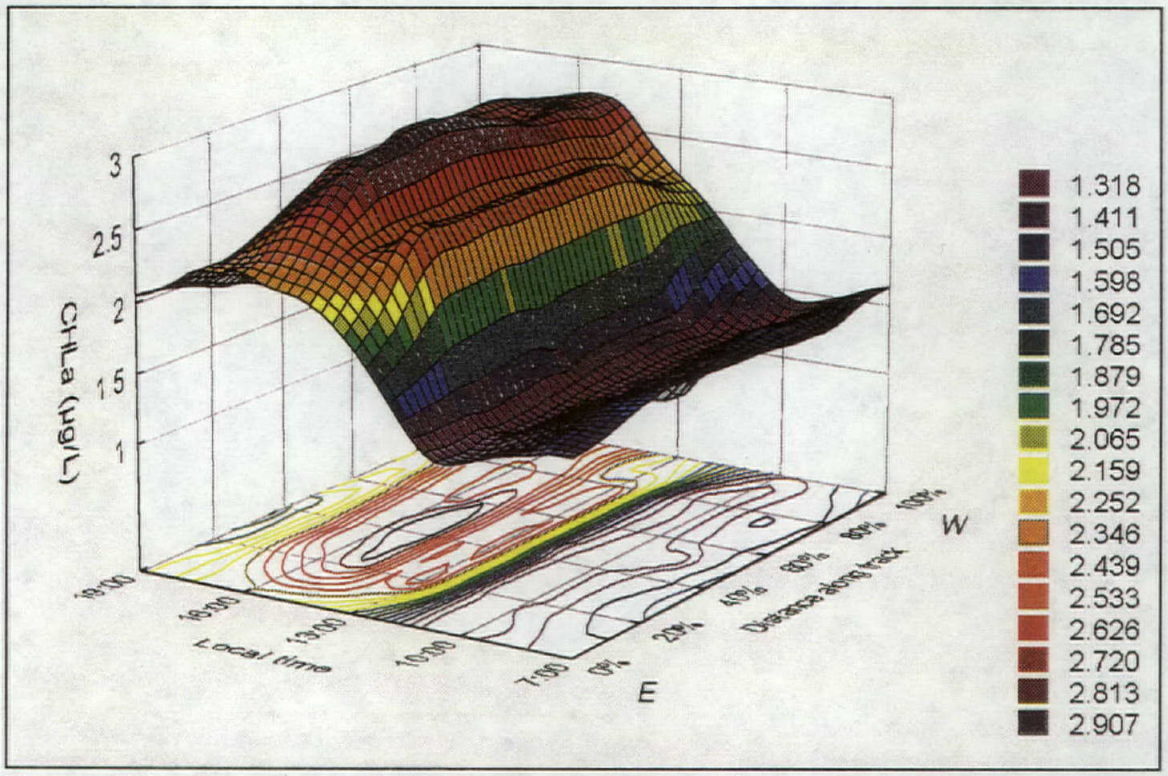


Figure 100. Cross-sectional time series of chlorophyll* a *on Day 196, Transect B.

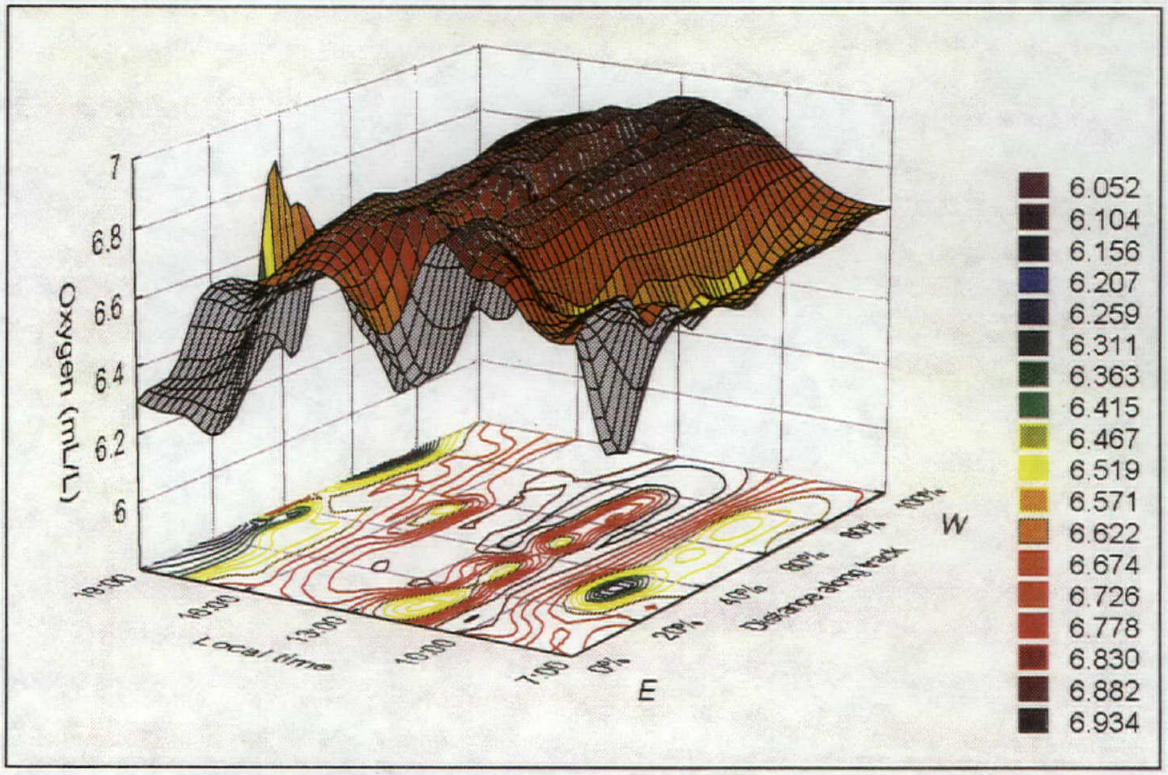


Figure 101. Cross-sectional time series of dissolved oxygen on Day 196, Transect B.

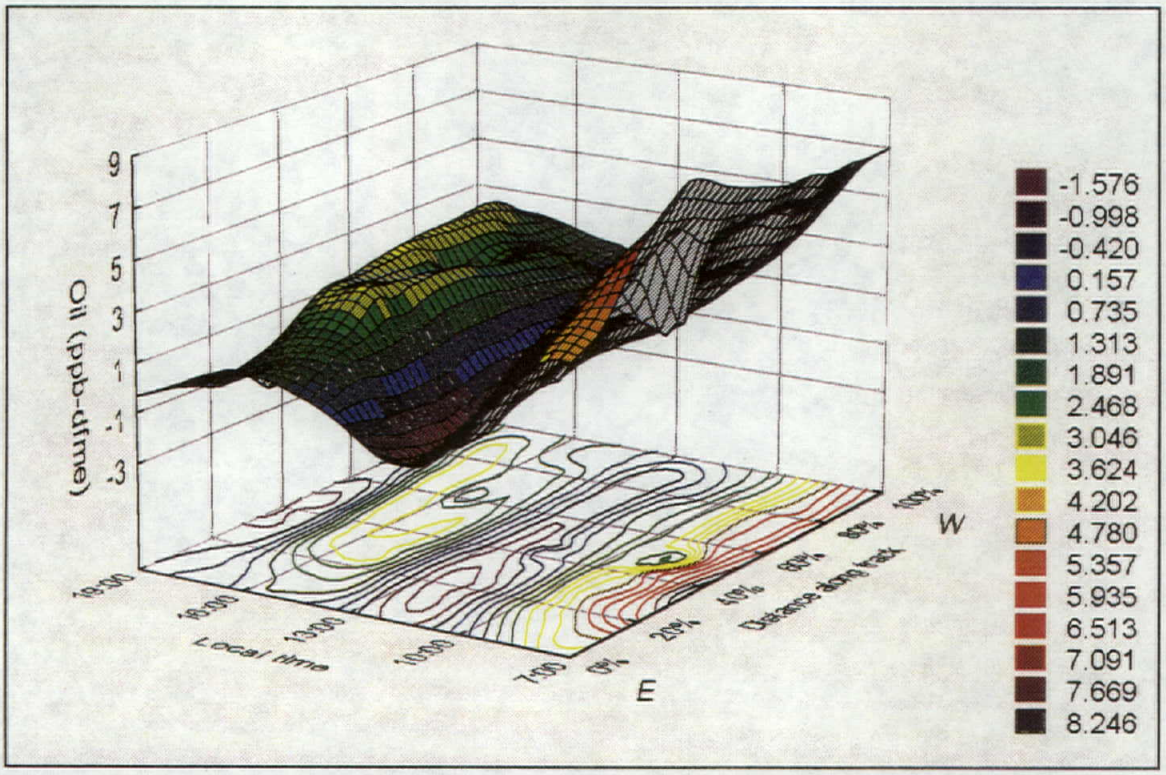


Figure 102. Cross-sectional time series of dissolved oil on Day 196, Transect B.

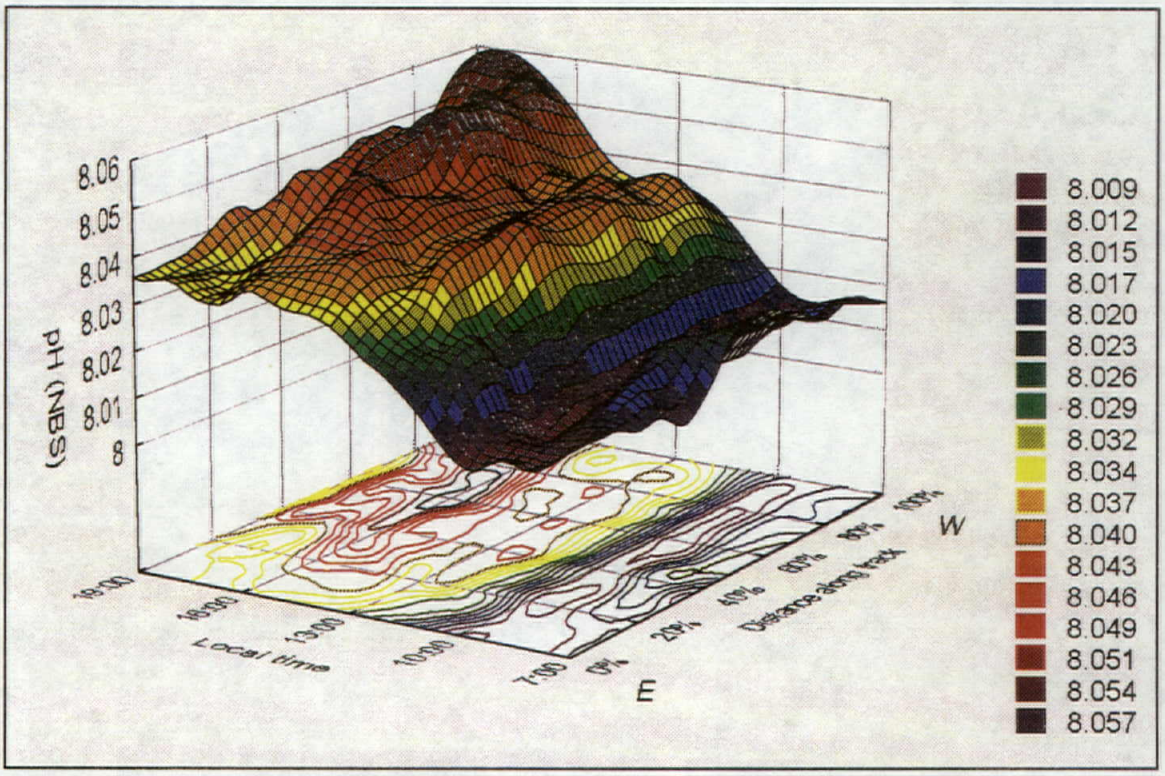


Figure 103. Cross-sectional time series of pH on Day 196, Transect B.

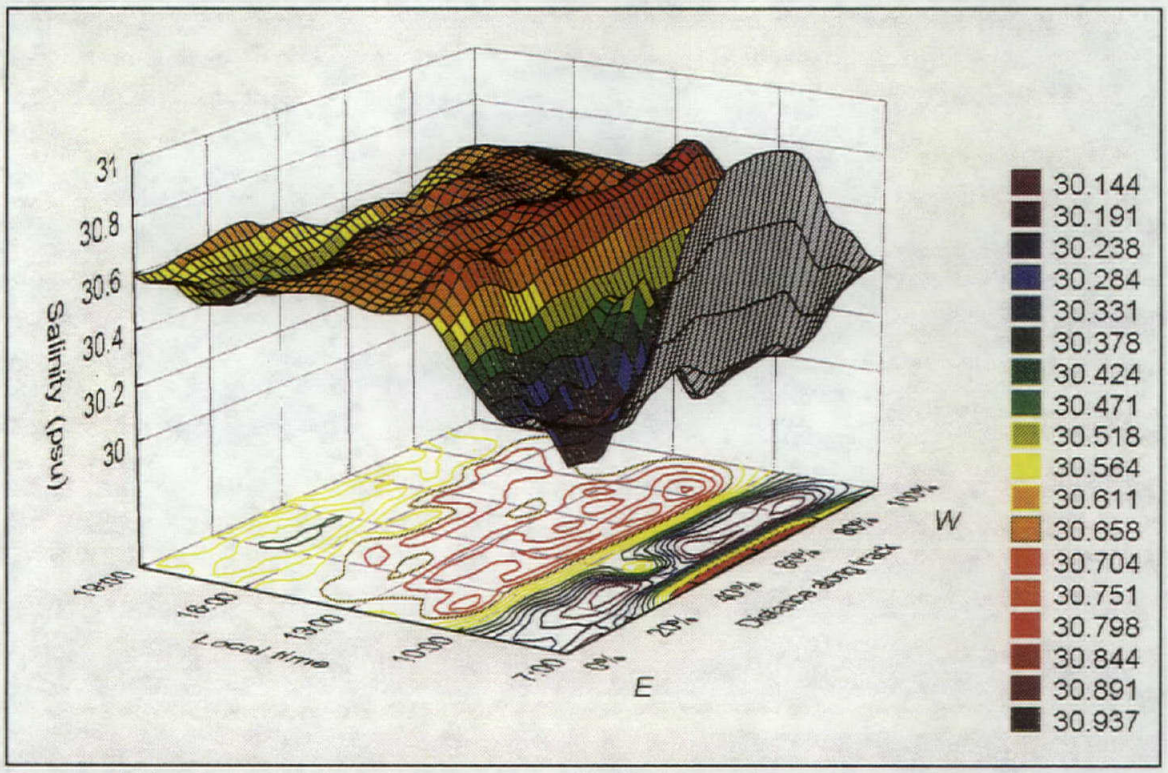


Figure 104. Cross-sectional time series of salinity on Day 196, Transect B.

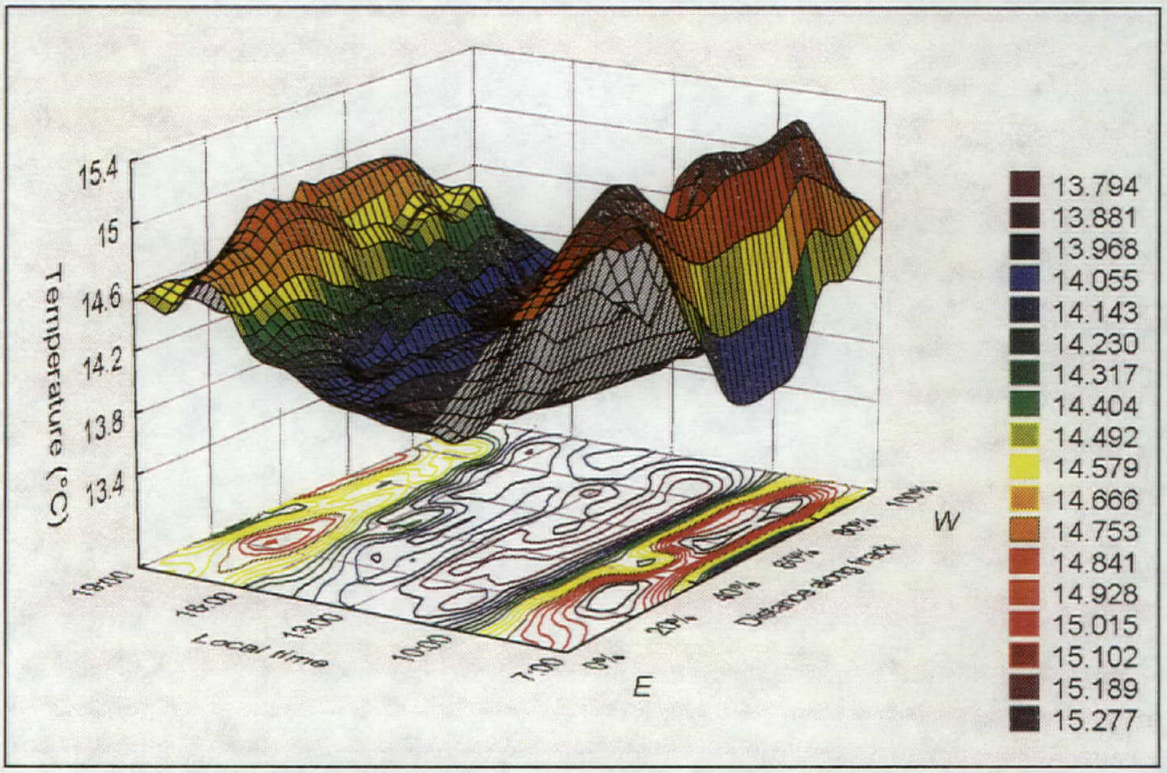


Figure 105. Cross-sectional time series of temperature on Day 196, Transect B.

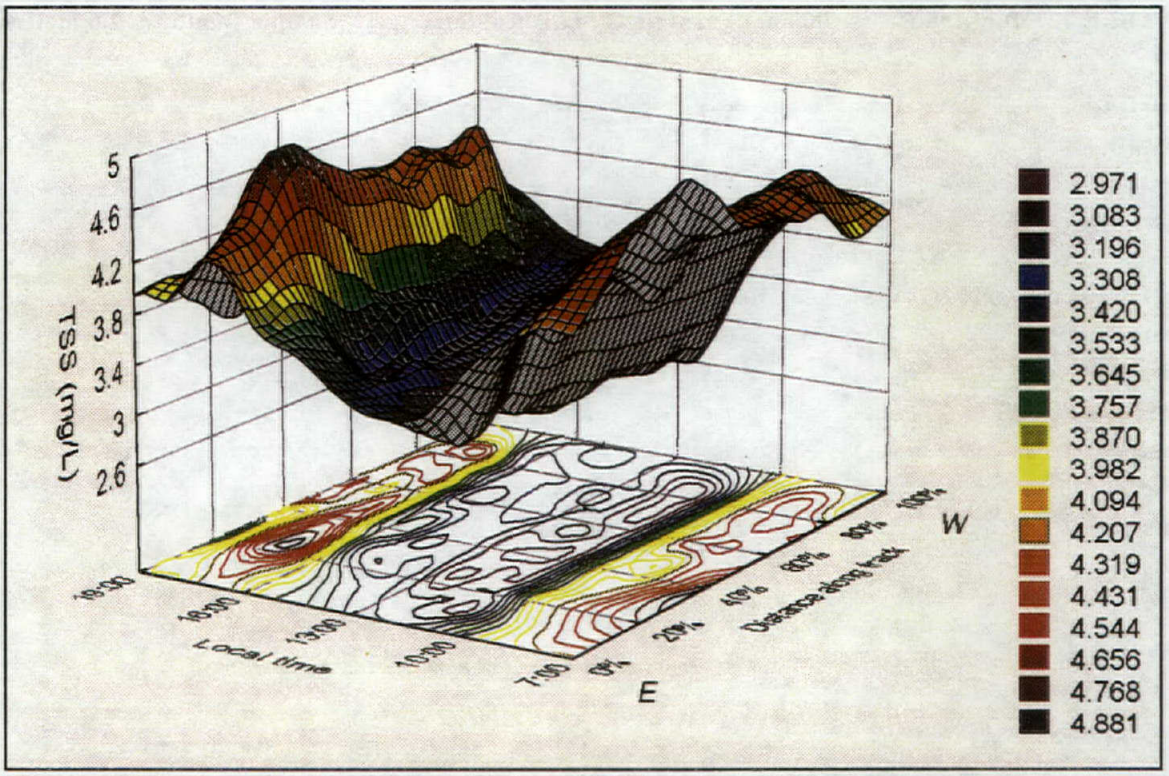


Figure 106. Cross-sectional time series of TSS on Day 196, Transect B.

TABLE 12. Day 196 Cross-Channel Transect C Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	854	1.299	0.200	0.946	1.999	1.052
Salinity	848	30.596	0.259	30.001	31.057	1.056
Temperature	854	14.261	0.592	13.445	15.664	2.219
pH	854	8.038	0.019	7.997	8.076	0.079
Dissolved Oxygen	854	6.710	0.298	5.552	7.073	1.521
Chlorophyll	854	2.008	0.556	1.099	2.992	1.892
Oils Florescence	854	1.555	2.288	-2.701	8.496	11.196
Nephelometry	824	0.798	0.198	0.511	1.217	0.706
Transmittance	853	71.385	3.981	63.008	78.124	15.115
Bottom Depth	808	-10.612	1.635	-13.200	-5.700	7.500
TSS Neph	823	3.334	0.684	2.342	4.783	2.441
TSS Trans	852	3.558	0.600	2.543	4.820	2.277

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.97270	0.70099	0.42447	0.40297	-0.78708	-0.44896	0.89921	-0.38610	-0.89918
	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
tem	-0.97270	1.00000	-0.64367	-0.53563	-0.34940	0.77604	0.45429	-0.92829	0.39255	0.92826
	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
ph	0.70099	-0.64367	1.00000	0.18506	0.75216	-0.49214	-0.17272	0.58503	-0.12957	-0.58507
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00015	0.00000
do2	0.42447	-0.53563	0.18506	1.00000	0.01212	-0.40620	-0.29231	0.53147	-0.26571	-0.53146
	0.00000	0.00000	0.00000	0.00000	0.72349	0.00000	0.00000	0.00000	0.00000	0.00000
chl	0.40297	-0.34940	0.75216	0.01212	1.00000	-0.21686	-0.10741	0.21635	-0.08343	-0.21644
	0.00000	0.00000	0.00000	0.72349	0.00000	0.00000	0.00167	0.00000	0.01474	0.00000
oil	-0.78708	0.77604	-0.49214	-0.40620	-0.21686	1.00000	0.35297	-0.76533	0.27448	0.76546
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
nep	-0.44896	0.45429	-0.17272	-0.29231	-0.10741	0.35297	1.00000	-0.49918	0.99567	0.49918
	0.00000	0.00000	0.00000	0.00000	0.00167	0.00000	0.00000	0.00000	1.00000	0.00000
tra	0.89921	-0.92829	0.58503	0.53147	0.21635	-0.76533	-0.49918	1.00000	-0.43521	-0.99998
	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.38610	0.39255	-0.12957	-0.26571	-0.08343	0.27448	0.99567	-0.43521	1.00000	0.43522
	0.00000	0.00000	0.00015	0.00000	0.01474	0.00000	1.00000	0.00000	0.00000	0.00000
tsst	-0.89918	0.92826	-0.58507	-0.53146	-0.21644	0.76546	0.49918	-0.99998	0.43522	1.00000
	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000

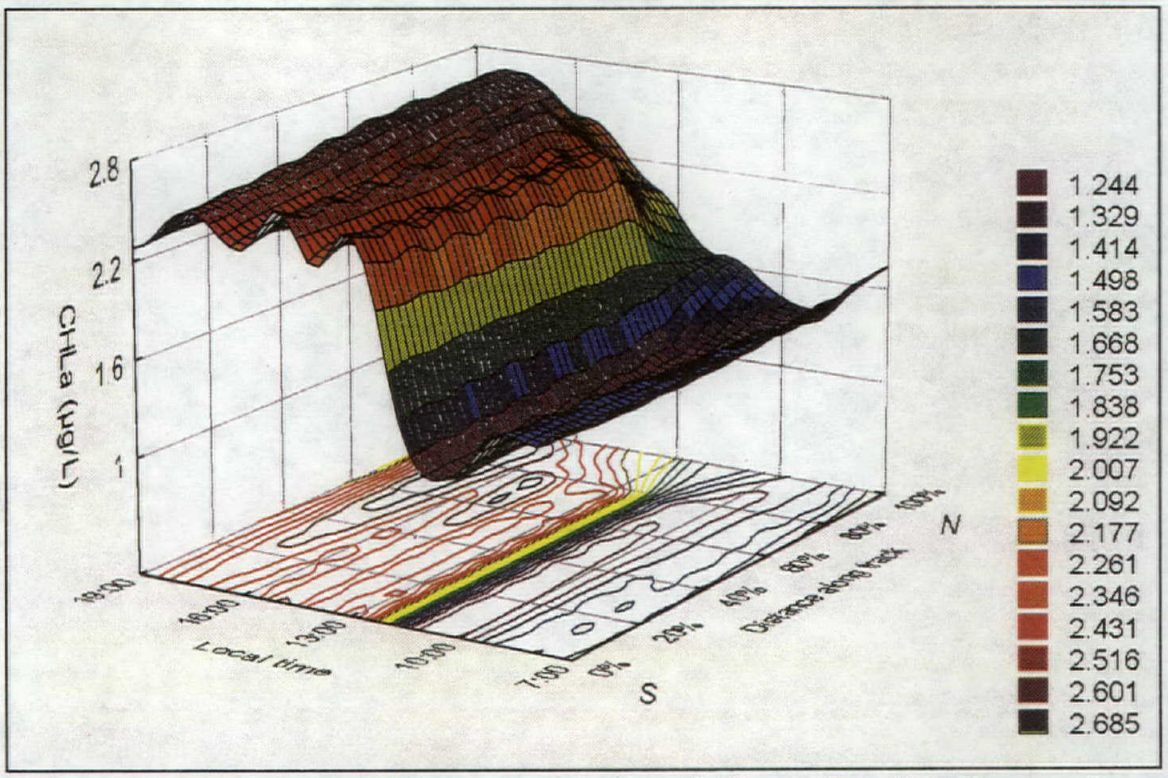


Figure 107. Cross-sectional time series of chlorophyll a on Day 196, Transect C.

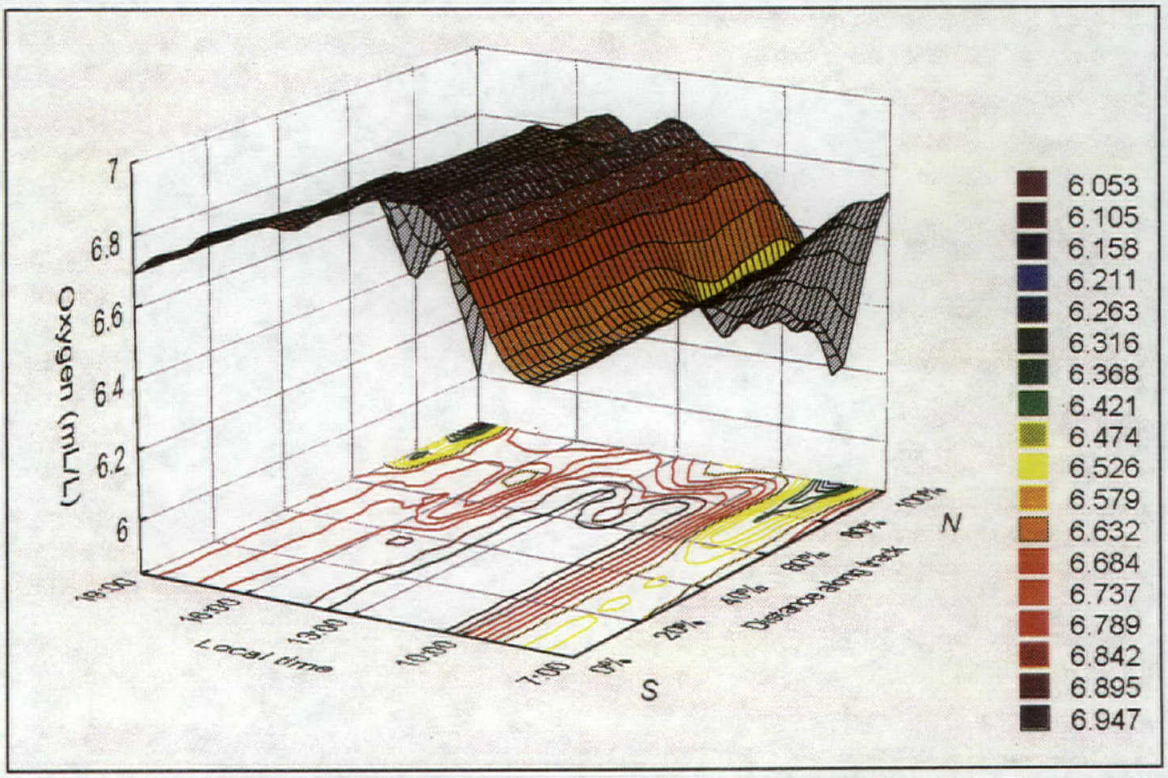


Figure 108. Cross-sectional time series of dissolved oxygen on Day 196, Transect C.

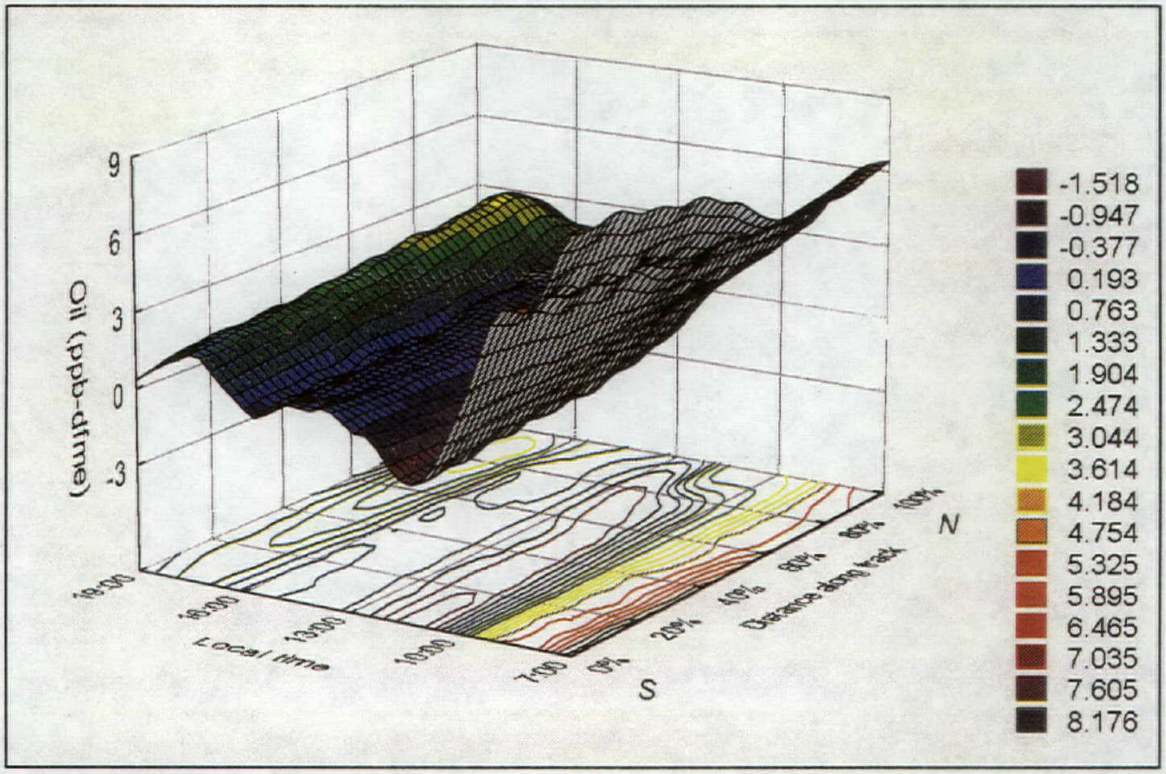


Figure 109. Cross-sectional time series of dissolved oil on Day 196, Transect C.

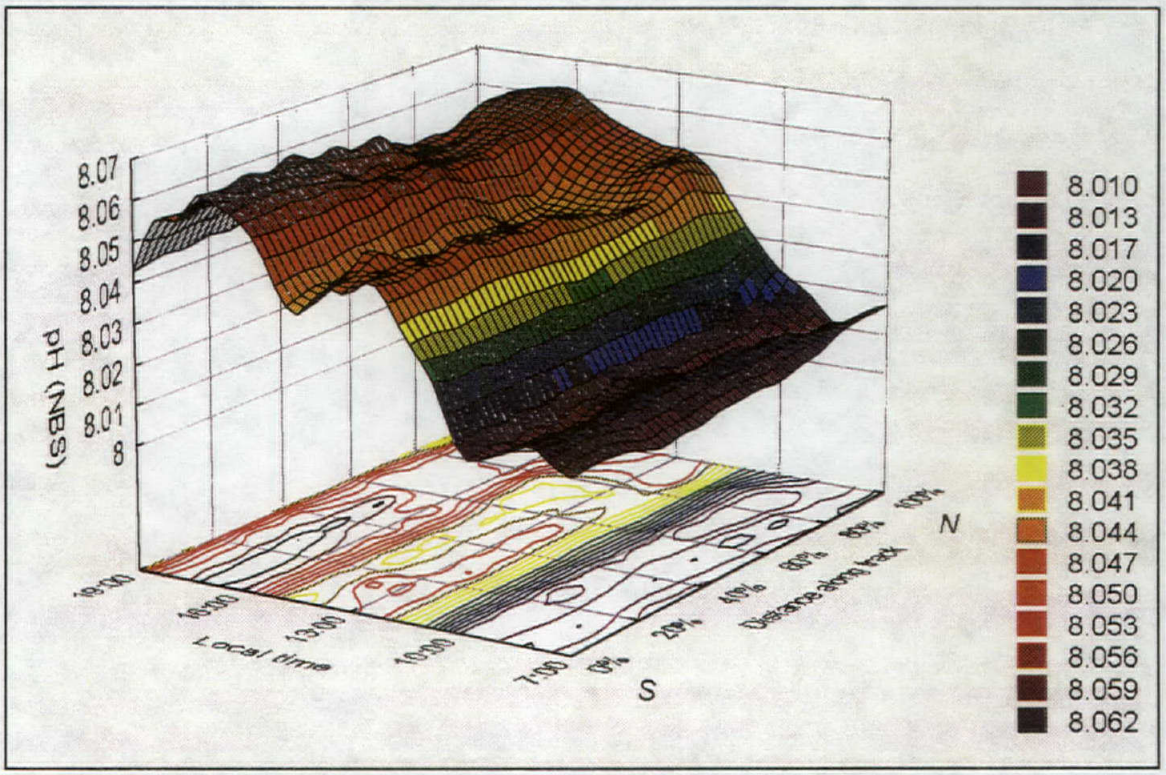


Figure 110. Cross-sectional time series of pH on Day 196, Transect C.

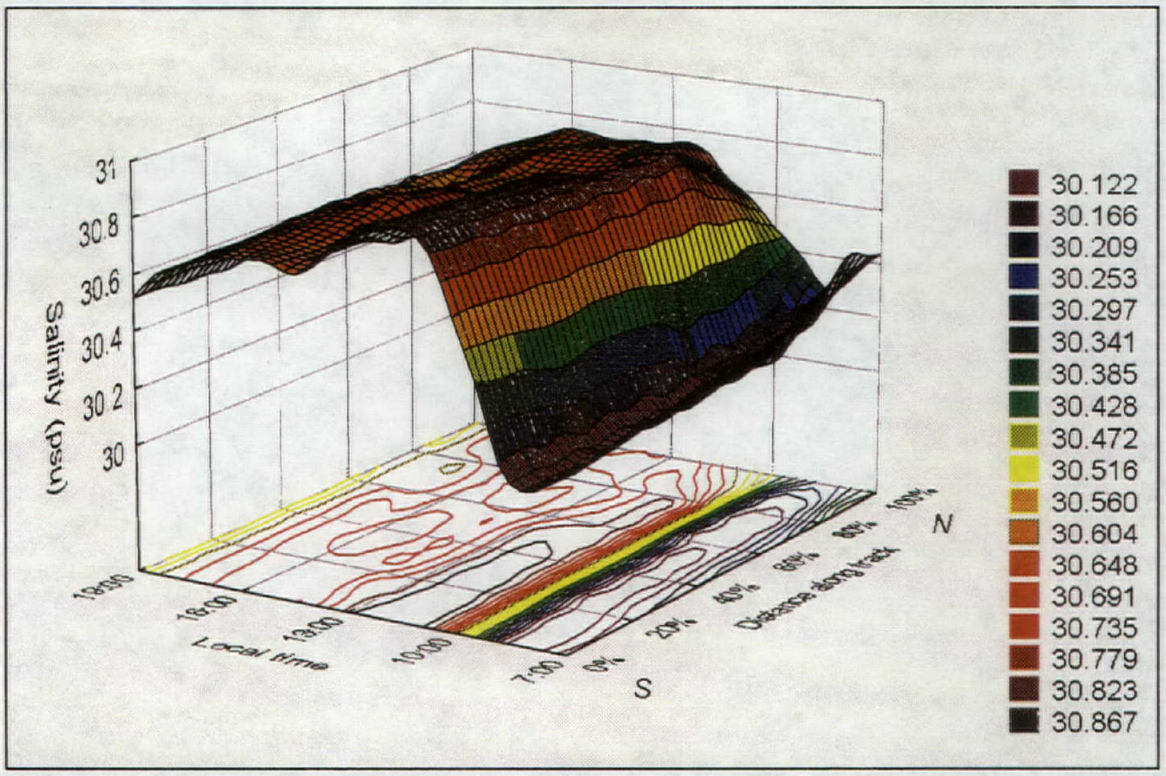


Figure 111. Cross-sectional time series of salinity on Day 196, Transect C.

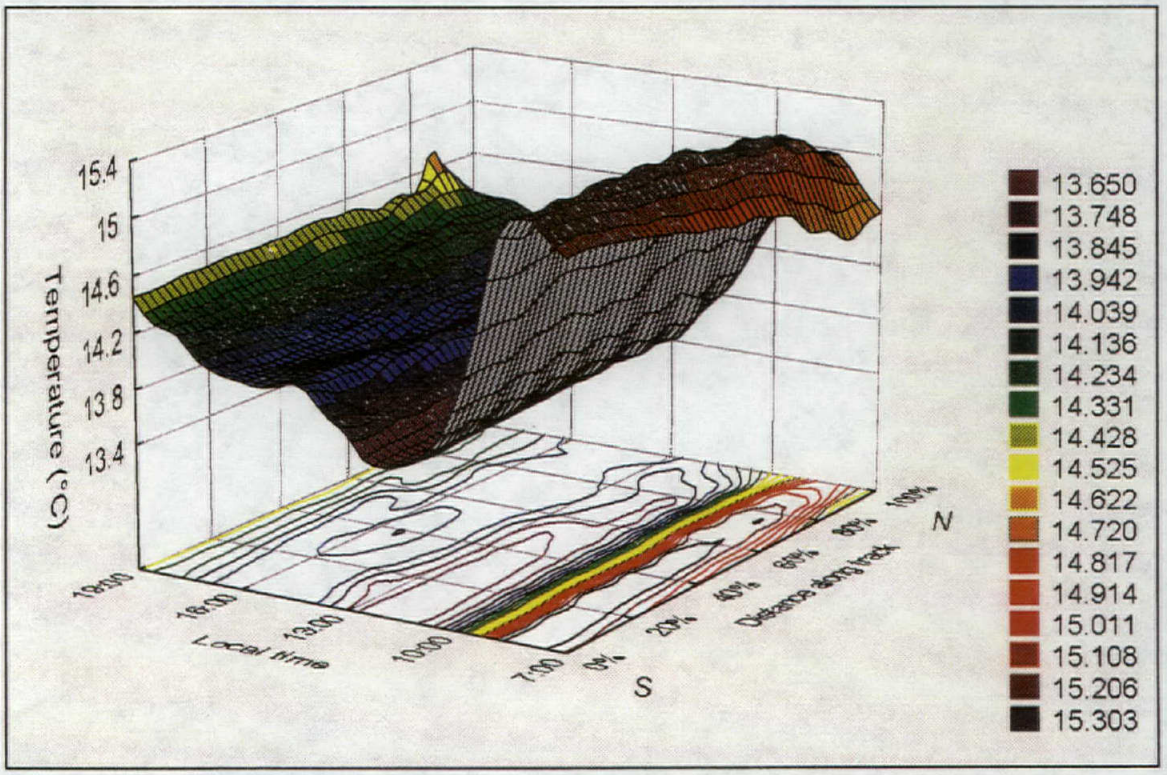


Figure 112. Cross-sectional time series of temperature on Day 196, Transect C.

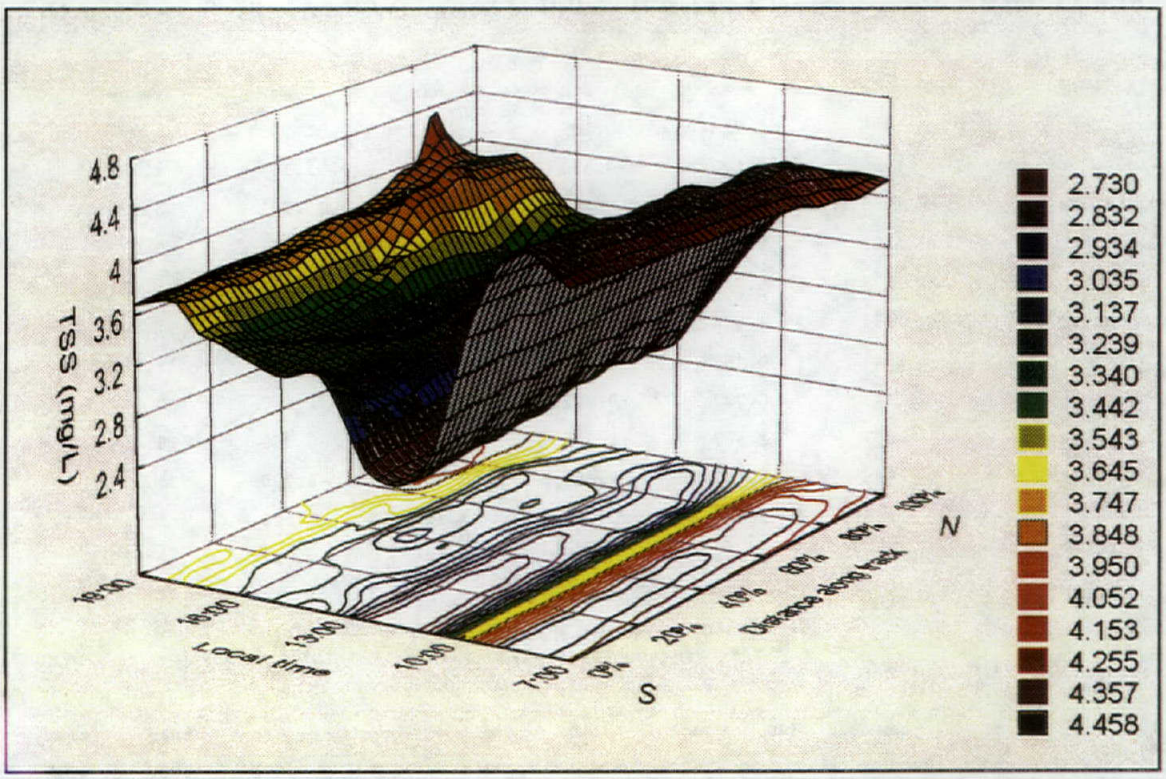


Figure 113. Cross-sectional time series of TSS on Day 196, Transect C.

TABLE 13 Day 196 Cross-Channel Transect D Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	1999	1.224	0.135	0.931	1.999	1.067
Salinity	1999	30.577	0.331	29.768	31.105	1.336
Temperature	1999	14.281	0.780	12.848	16.221	3.373
pH	1999	8.038	0.018	7.997	8.072	0.075
Dissolved Oxygen	1999	6.766	0.269	5.605	7.232	1.627
Chlorophyll	1994	1.974	0.535	0.998	2.846	1.848
Oils Florescence	1943	0.489	2.541	-3.536	8.050	11.586
Nephelometry	1943	0.727	0.212	0.444	1.317	0.873
Transmittance	1987	71.807	4.720	61.270	80.758	19.489
Bottom Depth	1966	-10.147	2.683	-17.800	-4.700	13.100
TSS Neph	1942	3.086	0.731	2.110	5.126	3.016
TSS Trans	1986	3.495	0.711	2.146	5.082	2.936

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.99070	0.67574	0.63507	0.30511	-0.77714	-0.55630	0.94091	-0.49026	-0.94025
	0.00000	0.91312	0.00000	0.00000	0.00000	0.56666	0.00000	0.78006	0.00000	0.77881
tem	-0.99070	1.00000	-0.65729	-0.65421	-0.30260	0.76601	0.55458	-0.94805	0.48858	0.94743
	0.91312	0.00000	0.00000	0.00000	0.00000	0.55552	0.00000	0.79390	0.00000	0.79266
ph	0.67574	-0.65729	1.00000	0.28371	0.72690	-0.55740	-0.39563	0.61771	-0.34503	-0.61780
	0.00000	0.00000	0.00000	0.00000	0.51808	0.00000	0.00000	0.00000	0.00000	0.00000
do2	0.63507	-0.65421	0.28371	1.00000	0.10221	-0.49163	-0.39776	0.63744	-0.35841	-0.63699
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
chl	0.30511	-0.30260	0.72690	0.10221	1.00000	-0.18102	-0.26800	0.23513	-0.24374	-0.23507
	0.00000	0.00000	0.51808	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
oil	-0.77714	0.76601	-0.55740	-0.49163	-0.18102	1.00000	0.81424	-0.79357	0.77008	0.79310
	0.56666	0.55552	0.00000	0.00000	0.00000	0.00000	0.60569	0.58356	0.55957	0.58307
nep	-0.55630	0.55458	-0.39563	-0.39776	-0.26800	0.81424	1.00000	-0.59362	0.99552	0.59344
	0.00000	0.00000	0.00000	0.00000	0.00000	0.60569	0.00000	0.00000	0.93974	0.00000
tra	0.94091	-0.94805	0.61771	0.63744	0.23513	-0.79357	-0.59362	1.00000	-0.52809	-0.99974
	0.78006	0.79390	0.00000	0.00000	0.00000	0.58356	0.00000	0.00000	0.00000	0.98556
tssn	-0.49026	0.48858	-0.34503	-0.35841	-0.24374	0.77008	0.99552	-0.52809	1.00000	0.52823
	0.00000	0.00000	0.00000	0.00000	0.00000	0.55957	0.93974	0.00000	0.00000	0.00000
tsst	-0.94025	0.94743	-0.61780	-0.63699	-0.23507	0.79310	0.59344	-0.99974	0.52823	1.00000
	0.77881	0.79266	0.00000	0.00000	0.00000	0.58307	0.00000	0.98556	0.00000	0.00000

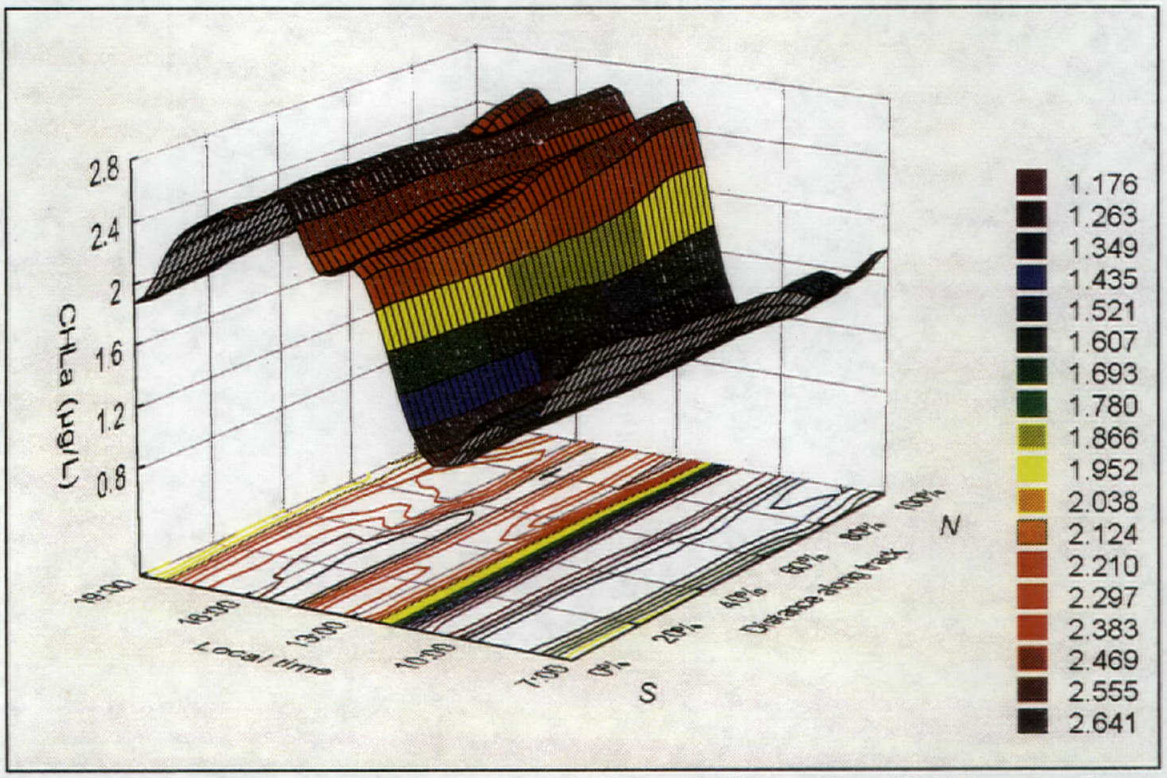


Figure 114. Cross-sectional time series of chlorophyll a on Day 196, Transect D.

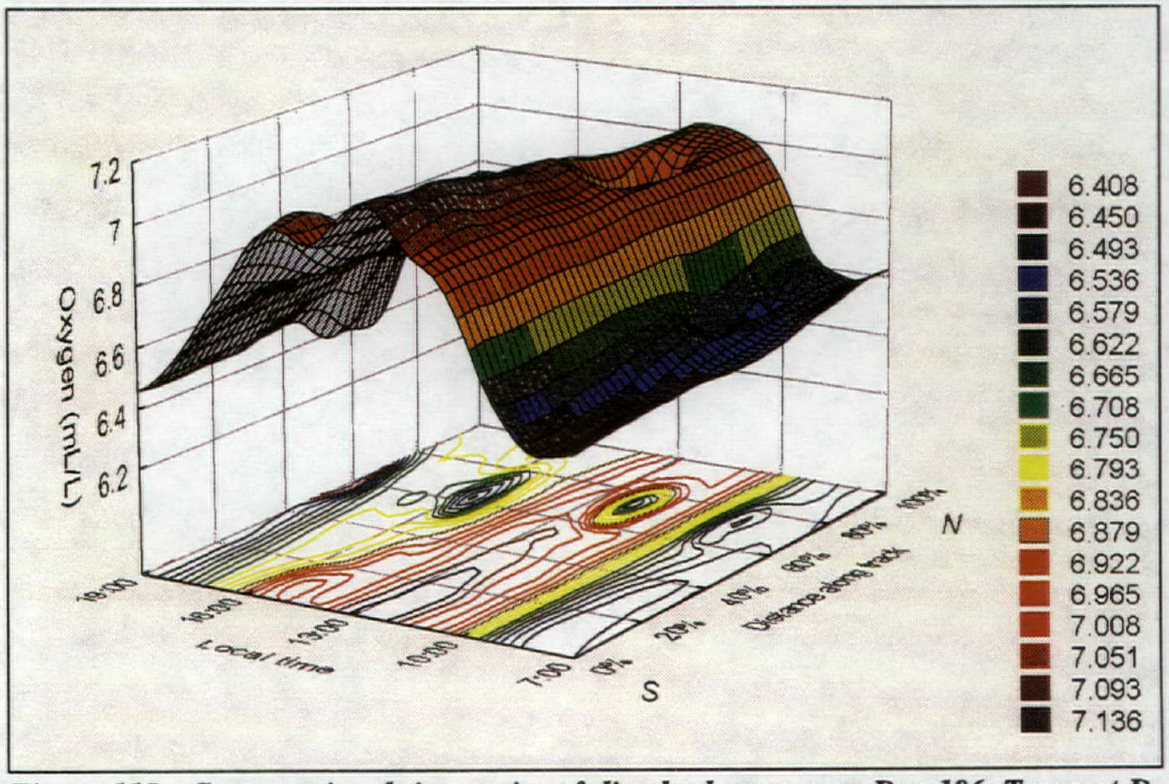


Figure 115. Cross-sectional time series of dissolved oxygen on Day 196, Transect D.

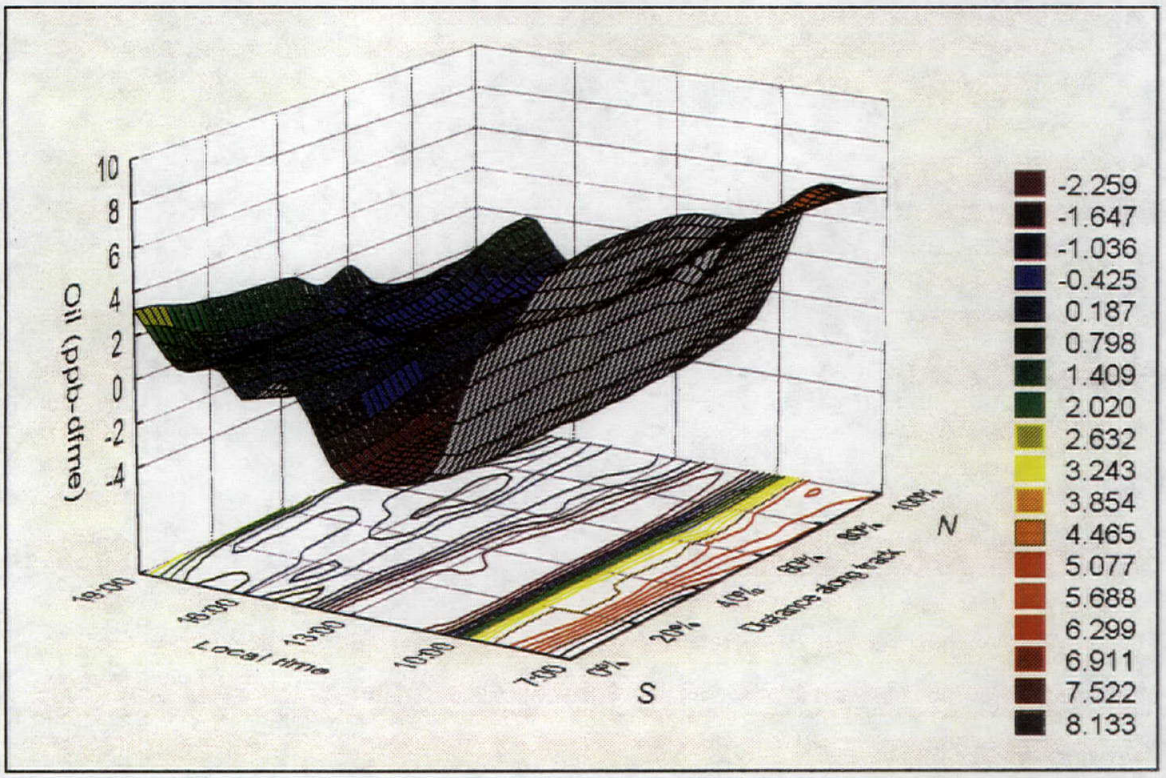


Figure 116. Cross-sectional time series of dissolved oil on Day 196, Transect D.

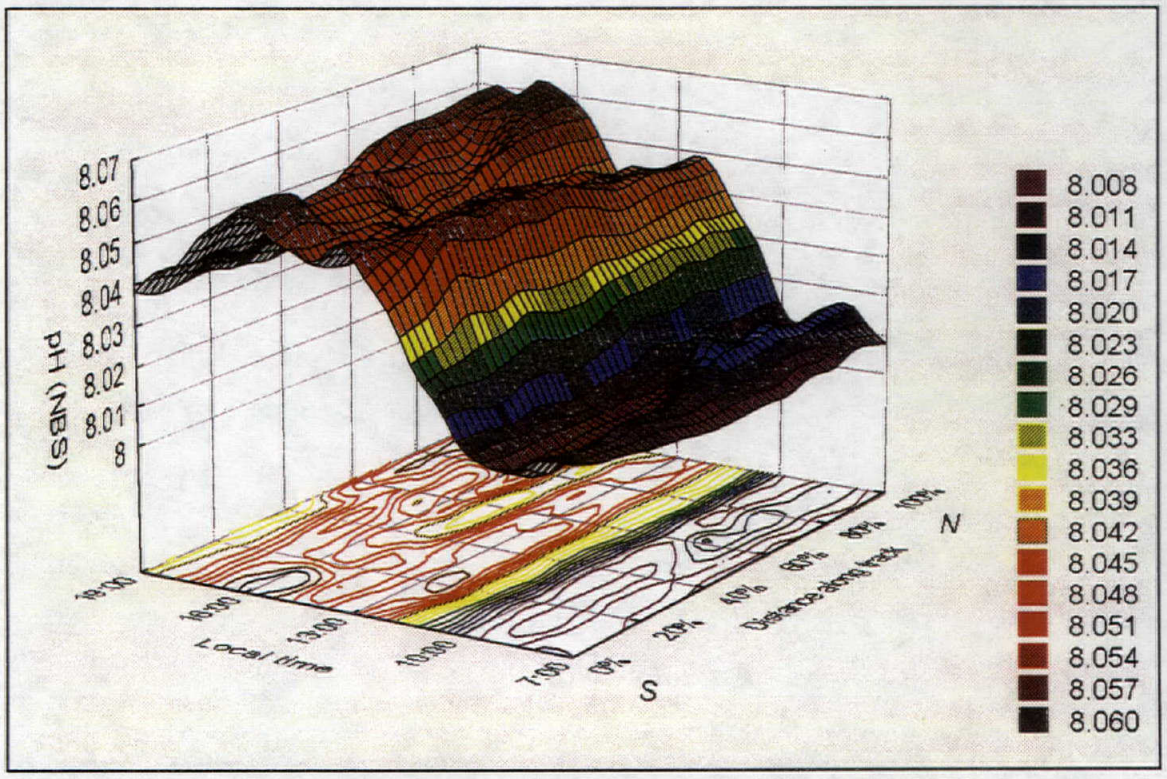


Figure 117. Cross-sectional time series of pH on Day 196, Transect D.

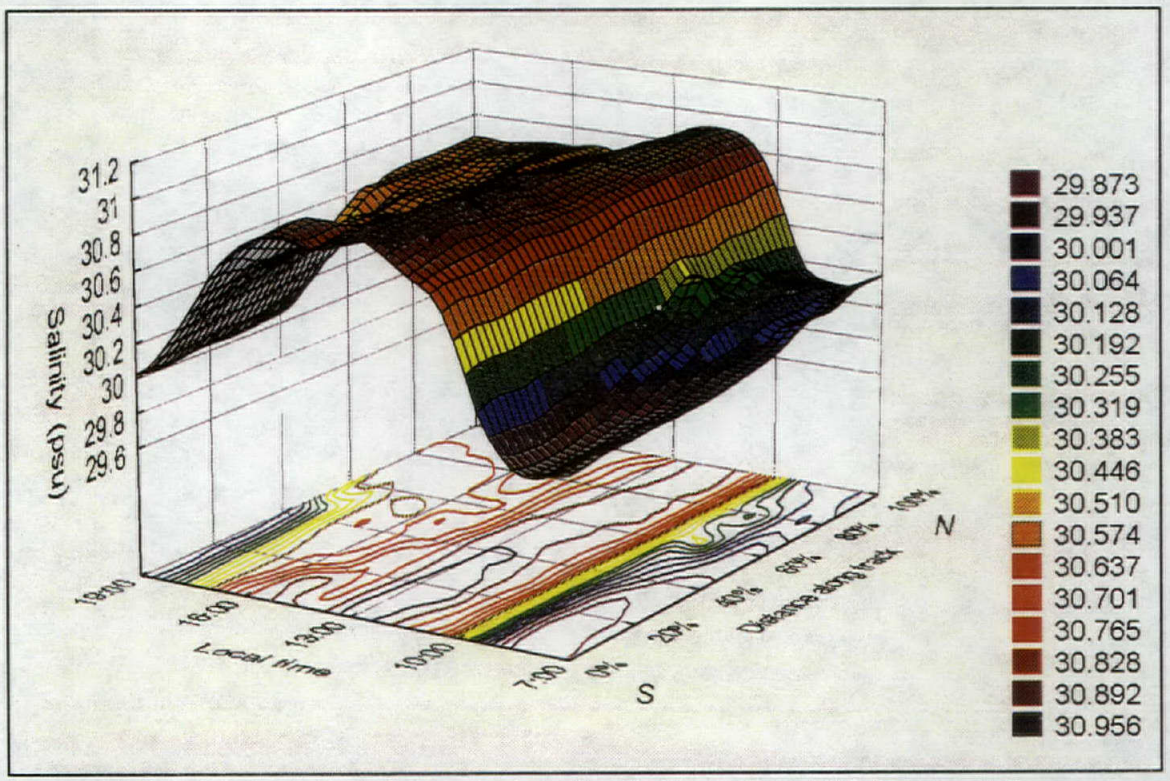


Figure 118. Cross-sectional time series of salinity on Day 196, Transect D.

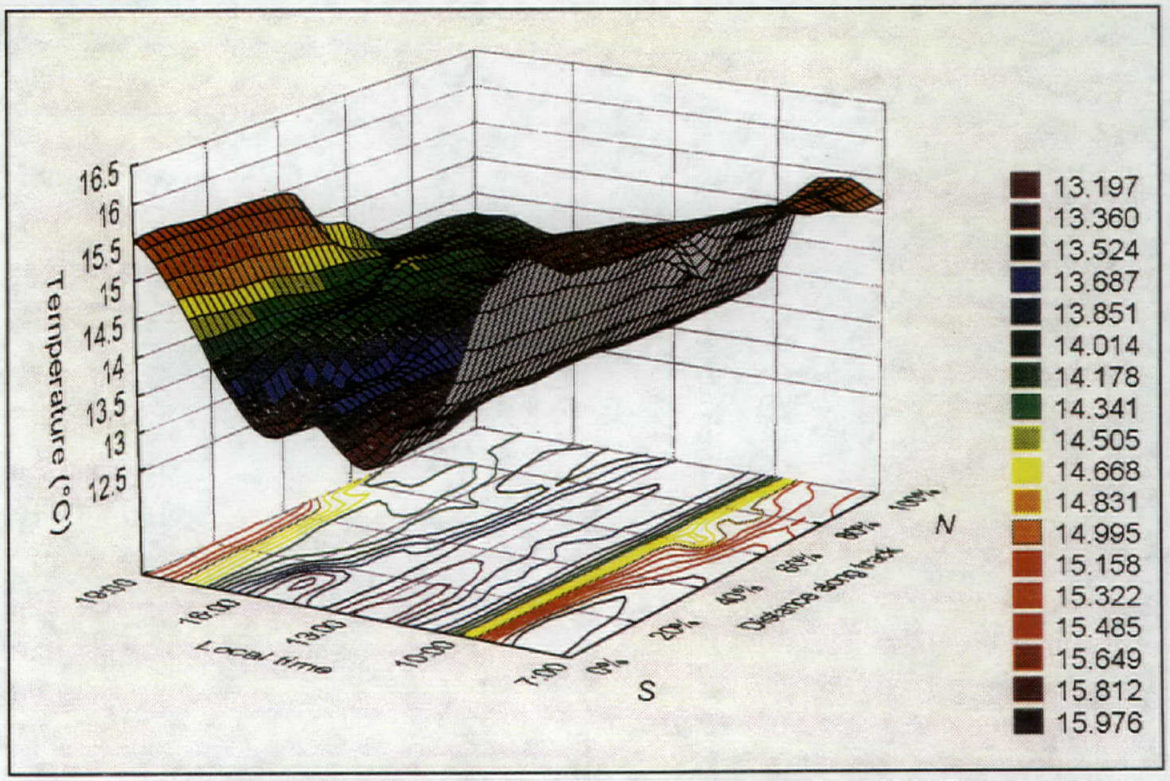


Figure 119. Cross-sectional time series of temperature on Day 196, Transect D.

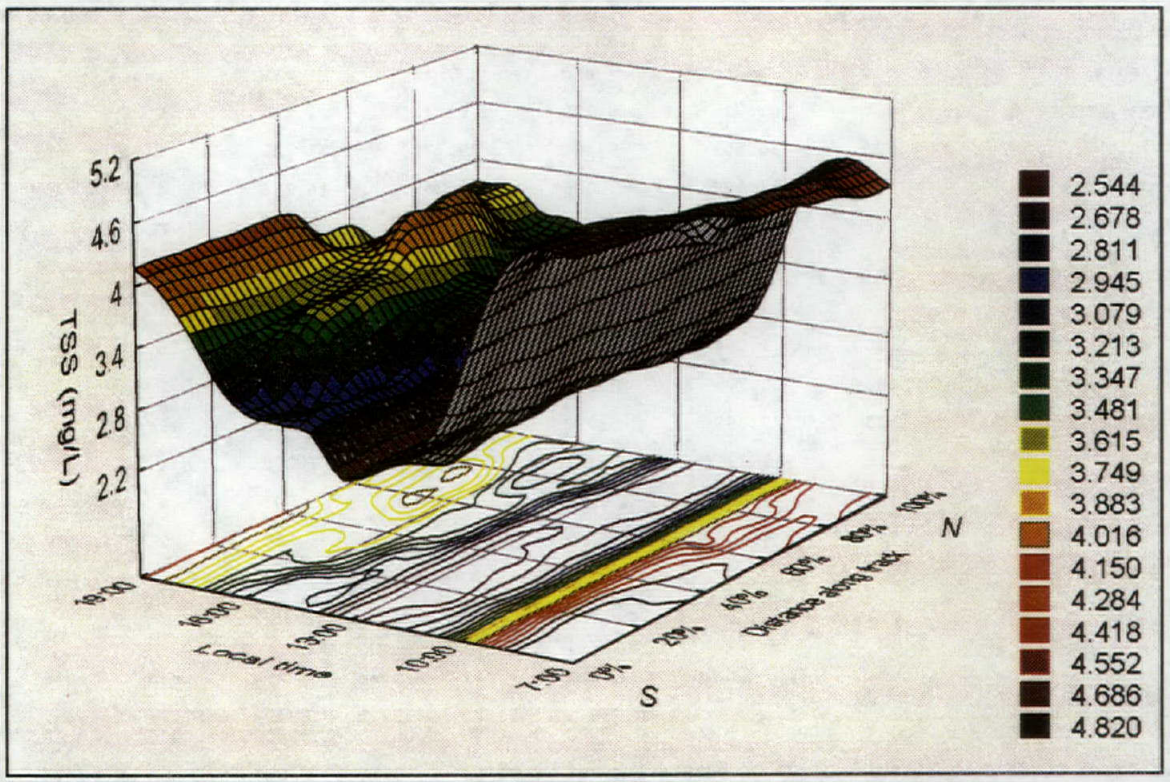


Figure 120. Cross-sectional time series of TSS on Day 196, Transect D.

TABLE 14. Day 196 Cross-Channel Transect E Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	1526	1.216	0.121	0.931	1.821	0.889
Salinity	1526	30.553	0.404	29.771	31.322	1.551
Temperature	1526	14.199	1.085	11.769	16.236	4.467
pH	1526	8.036	0.017	8.001	8.067	0.066
Dissolved Oxygen	1526	6.844	0.277	5.567	7.385	1.818
Chlorophyll	1526	1.952	0.485	1.087	2.867	1.779
Oils Florescence	1520	1.064	3.676	-4.260	12.395	16.655
Nephelometry	1488	0.705	0.266	0.383	1.715	1.332
Transmittance	1525	72.388	5.220	61.319	80.758	19.440
Bottom Depth	1515	-17.191	2.782	-21.900	-7.200	14.700
TSS Neph	1487	3.012	0.919	1.899	6.503	4.604
TSS Trans	1524	3.407	0.787	2.146	5.075	2.929

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.98972	0.57689	0.92997	0.46894	-0.91700	-0.72273	0.98499	-0.67171	-0.98452
	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tem	-0.98972	1.00000	-0.56772	-0.93759	-0.49793	0.91184	0.72217	-0.97821	0.67208	0.97779
	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
ph	0.57689	-0.56772	1.00000	0.39195	0.79010	-0.50753	-0.35586	0.58267	-0.32747	-0.58249
	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
do2	0.92997	-0.93759	0.39195	1.00000	0.39004	-0.84583	-0.69117	0.89599	-0.64573	-0.89463
	1.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
chl	0.46894	-0.49793	0.79010	0.39004	1.00000	-0.32097	-0.30825	0.44924	-0.29217	-0.44911
	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
oil	-0.91700	0.91184	-0.50753	-0.84583	-0.32097	1.00000	0.61672	-0.93436	0.55442	0.93452
	1.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
nep	-0.72273	0.72217	-0.35586	-0.69117	-0.30825	0.61672	1.00000	-0.71847	0.99653	0.71824
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
tra	0.98499	-0.97821	0.58267	0.89599	0.44924	-0.93436	-0.71847	1.00000	-0.66477	-0.99982
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.67171	0.67208	-0.32747	-0.64573	-0.29217	0.55442	0.99653	-0.66477	1.00000	0.66489
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
tsst	-0.98452	0.97779	-0.58249	-0.89463	-0.44911	0.93452	0.71824	-0.99982	0.66489	1.00000
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	0.00000

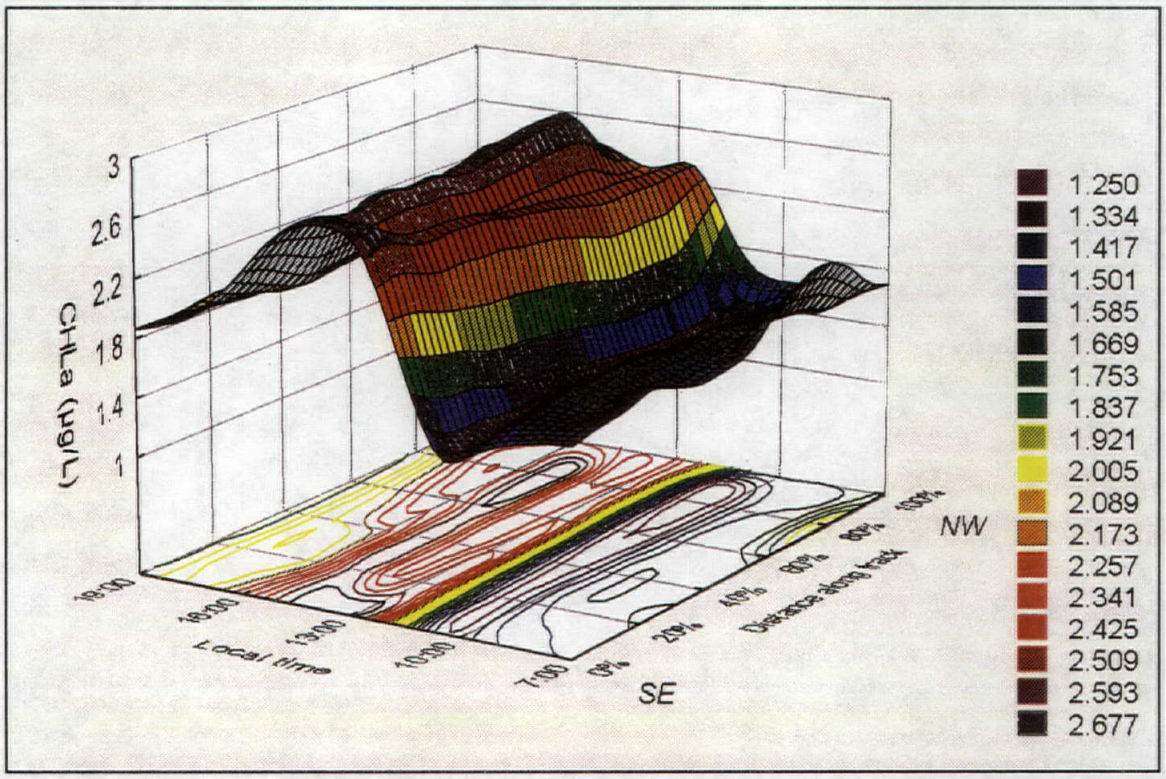


Figure 121. Cross-sectional time series of chlorophyll a on Day 196, Transect E.

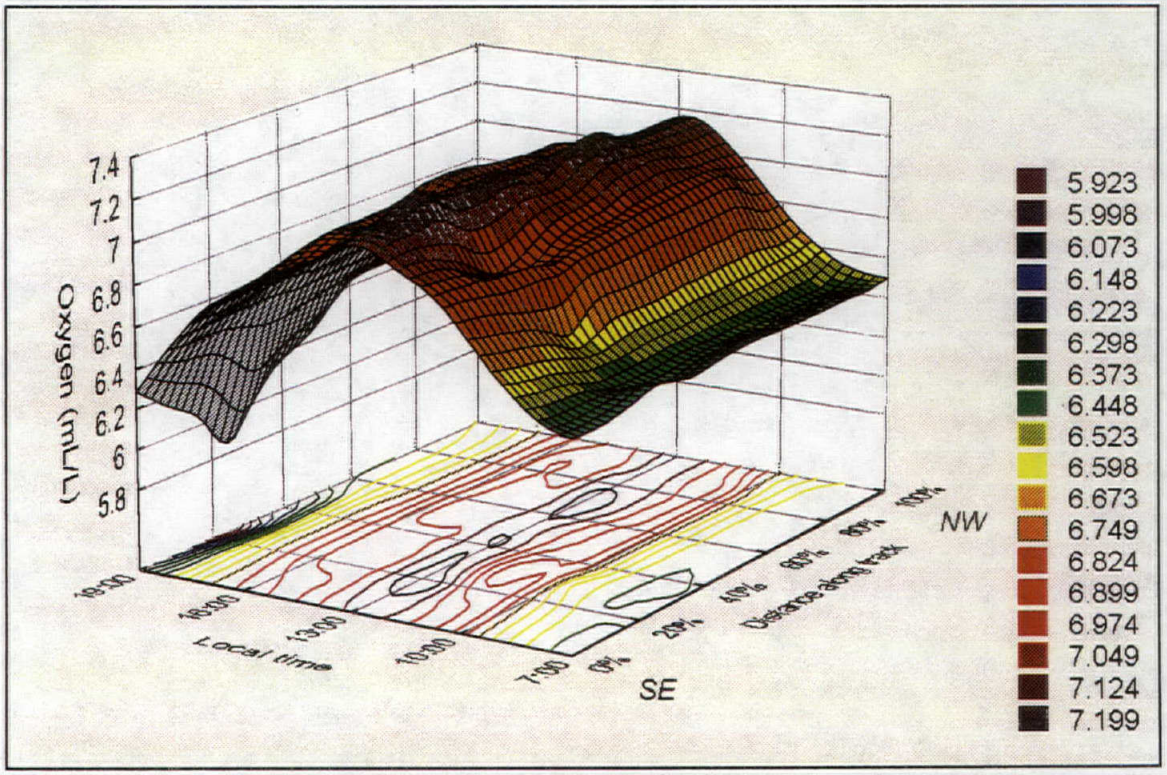


Figure 122. Cross-sectional time series of dissolved oxygen on Day 196, Transect E.

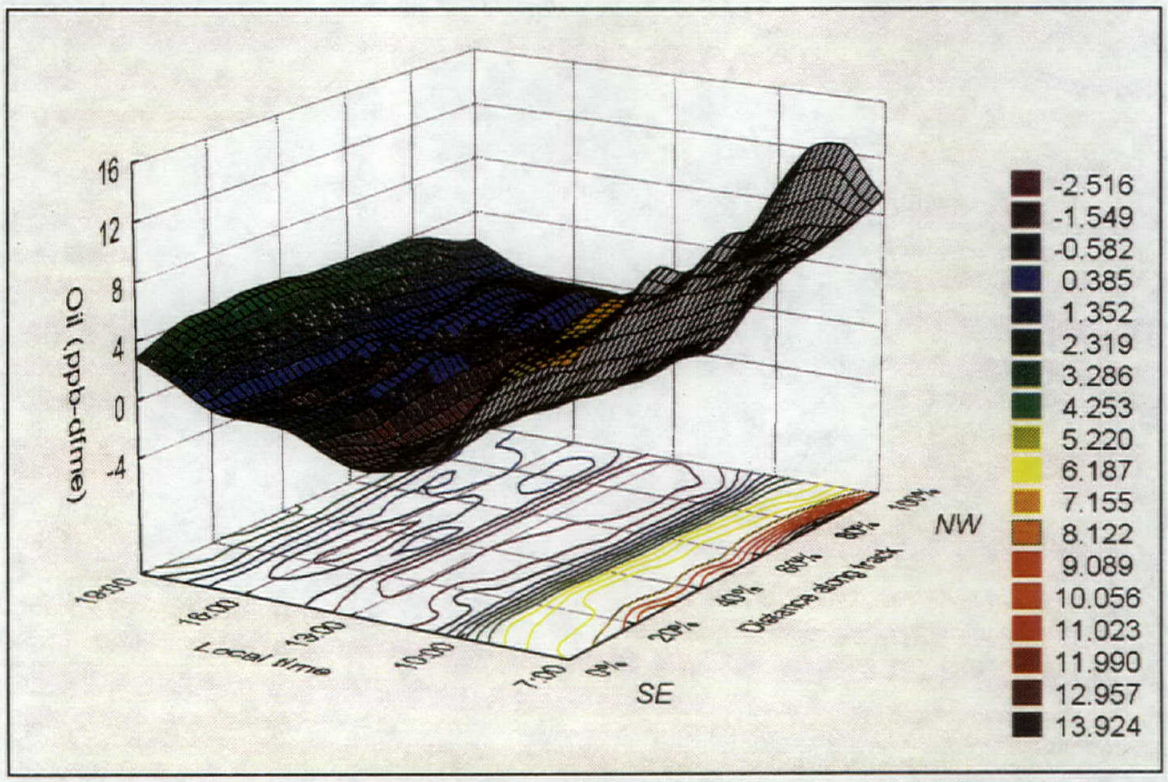


Figure 123. Cross-sectional time series of dissolved oil on Day 196, Transect E.

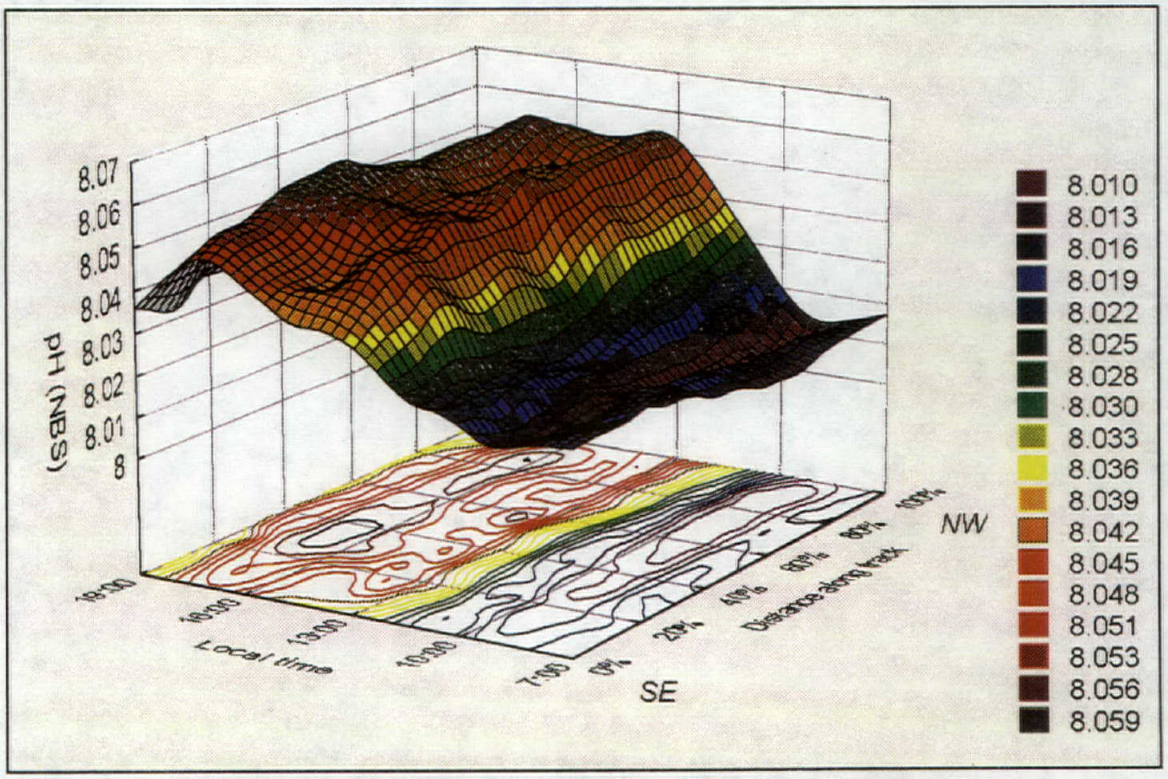


Figure 124. Cross-sectional time series of pH on Day 196, Transect E.

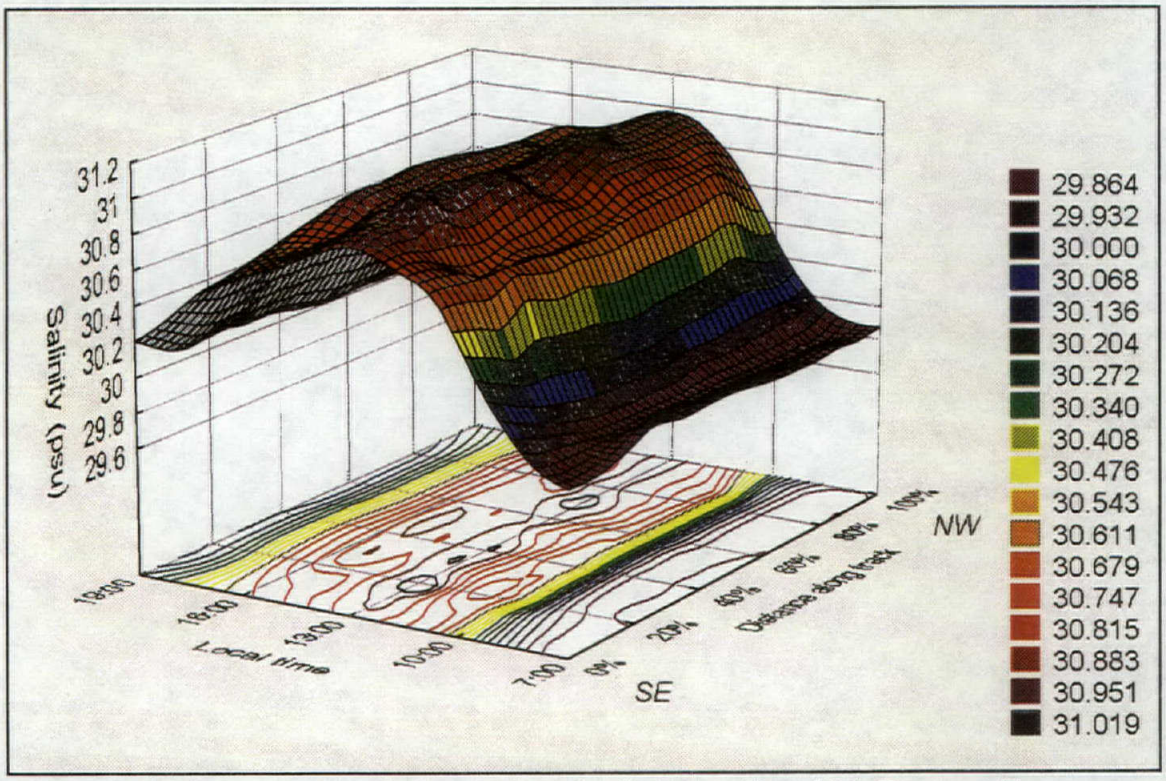


Figure 125. Cross-sectional time series of salinity on Day 196, Transect E.

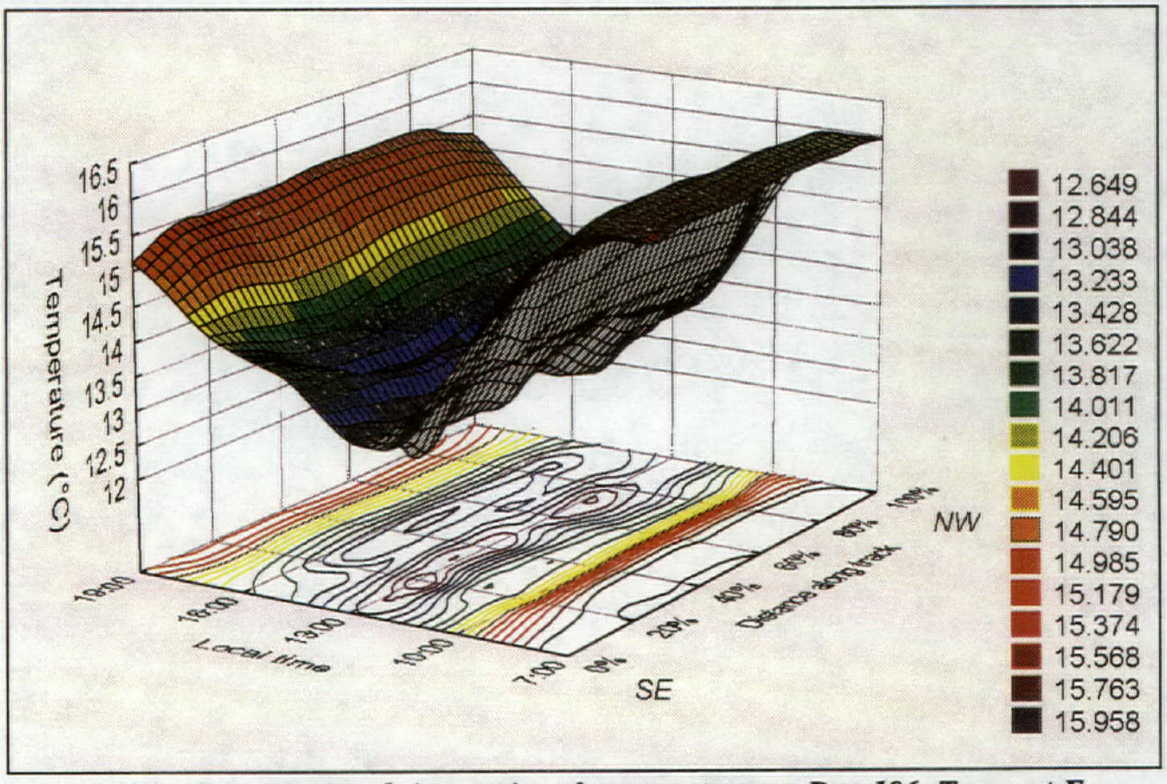


Figure 126. Cross-sectional time series of temperature on Day 196, Transect E.

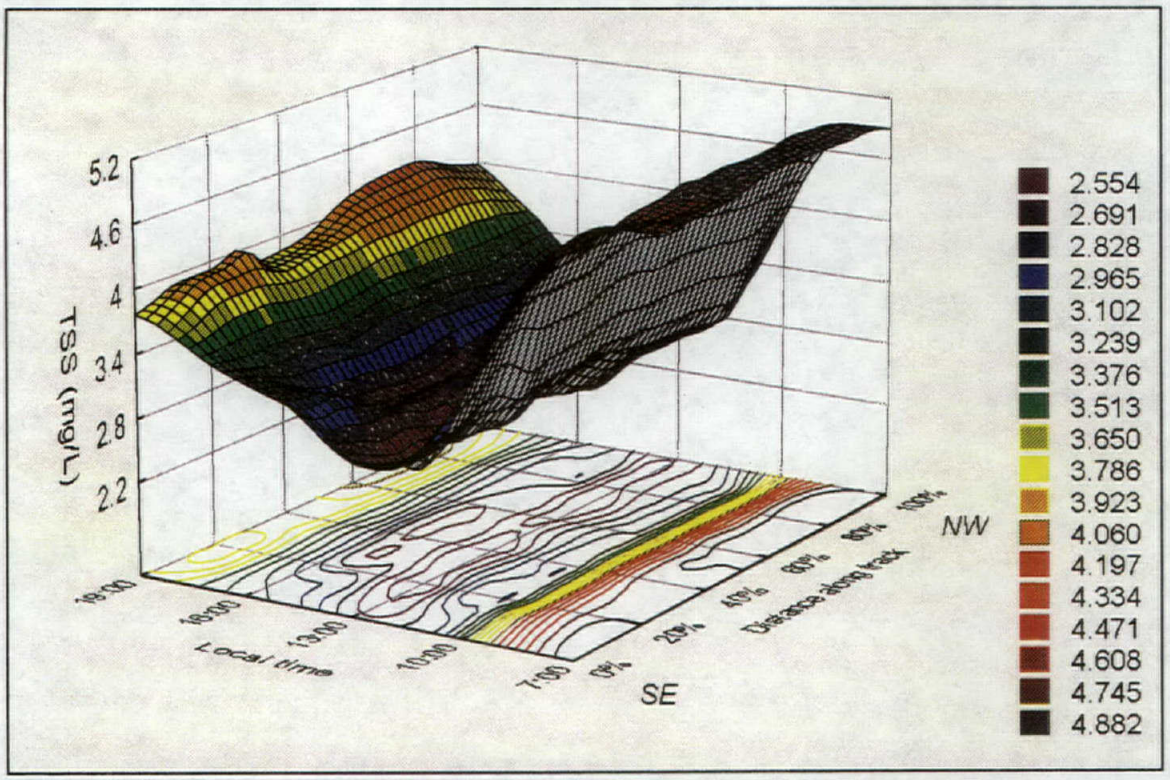


Figure 127. Cross-sectional time series of TSS on Day 196, Transect E.

Day 199- West Seavey Island

A Transect

TABLE 15 Statistical Summary
FIGURE 128 Chlorophyll *a*
FIGURE 129 Dissolved Oxygen
FIGURE 130 Oil
FIGURE 131 pH
FIGURE 132 Salinity
FIGURE 133 Temperature
FIGURE 134 Total Suspended Solids

B Transect

TABLE 16 Statistical Summary
FIGURE 135 Chlorophyll *a*
FIGURE 136 Dissolved Oxygen
FIGURE 137 Oil
FIGURE 138 pH
FIGURE 139 Salinity
FIGURE 140 Temperature
FIGURE 141 Total Suspended Solids

C Transect

TABLE 17 Statistical Summary
FIGURE 142 Chlorophyll *a*
FIGURE 143 Dissolved Oxygen
FIGURE 144 Oil
FIGURE 145 pH
FIGURE 146 Salinity
FIGURE 147 Temperature
FIGURE 148 Total Suspended Solids

TABLE 15. Day 199 Cross-Channel Transect A Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	2910	1.152	0.244	0.294	1.999	1.705
Salinity	2874	30.132	0.518	29.212	31.038	1.826
Temperature	2908	15.482	0.823	13.887	16.817	2.929
pH	2896	7.998	0.035	7.931	8.112	0.180
Dissolved Oxygen	2864	6.409	0.384	5.682	7.064	1.382
Chlorophyll	2902	1.709	0.878	0.733	9.449	8.716
Oils Florescence	2908	5.631	6.634	-3.759	43.700	47.459
Nephelometry	2869	1.030	0.318	0.521	3.701	3.180
Transmittance	2817	69.112	6.207	50.505	79.465	28.960
Bottom Depth	2868	-14.693	4.550	-22.300	-4.200	18.100
TSS Neph	2868	4.135	1.098	2.375	13.365	10.990
TSS Trans	2816	3.901	0.935	2.341	6.704	4.363

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.96089	0.64171	0.95699	0.80237	-0.87737	-0.79152	0.93976	-0.79153	-0.93968
	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
tem	-0.96089	1.00000	-0.64845	-0.92366	-0.76464	0.84262	0.79049	-0.95723	0.79050	0.95717
	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
ph	0.64171	-0.64845	1.00000	0.60509	0.49676	-0.43338	-0.45010	0.64813	-0.45015	-0.64766
	1.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
do2	0.95699	-0.92366	0.60509	1.00000	0.86901	-0.88193	-0.77809	0.88441	-0.77810	-0.88430
	1.00000	1.00000	0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
chl	0.80237	-0.76464	0.49676	0.86901	1.00000	-0.79060	-0.58132	0.72282	-0.58133	-0.72273
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
oil	-0.87737	0.84262	-0.43338	-0.88193	-0.79060	1.00000	0.71595	-0.81692	0.71596	0.81686
	1.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000
nep	-0.79152	0.79049	-0.45010	-0.77809	-0.58132	0.71595	1.00000	-0.75947	1.00000	0.75952
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tra	0.93976	-0.95723	0.64813	0.88441	0.72282	-0.81692	-0.75947	1.00000	-0.75947	-0.99995
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000
tssn	-0.79153	0.79050	-0.45015	-0.77810	-0.58133	0.71596	1.00000	-0.75947	1.00000	0.75952
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tsst	-0.93968	0.95717	-0.64766	-0.88430	-0.72273	0.81686	0.75952	-0.99995	0.75952	1.00000
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000

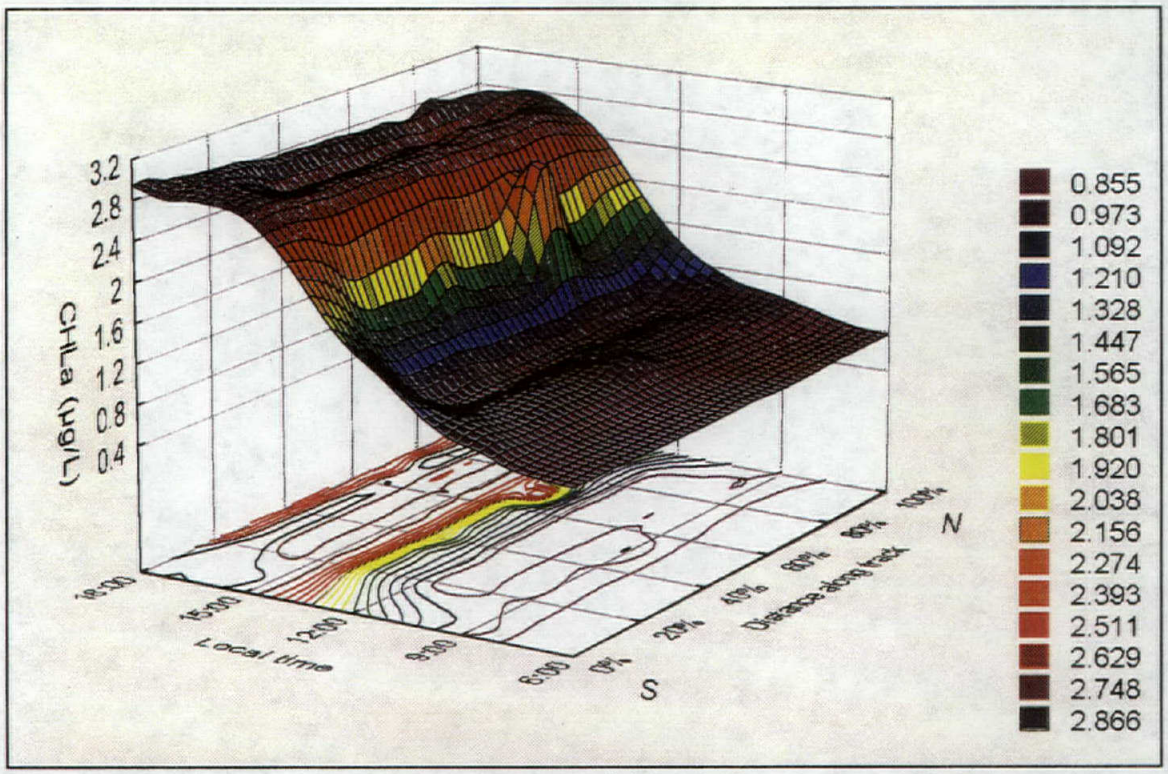


Figure 128. Cross-sectional time series of chlorophyll a on Day 199, Transect A.

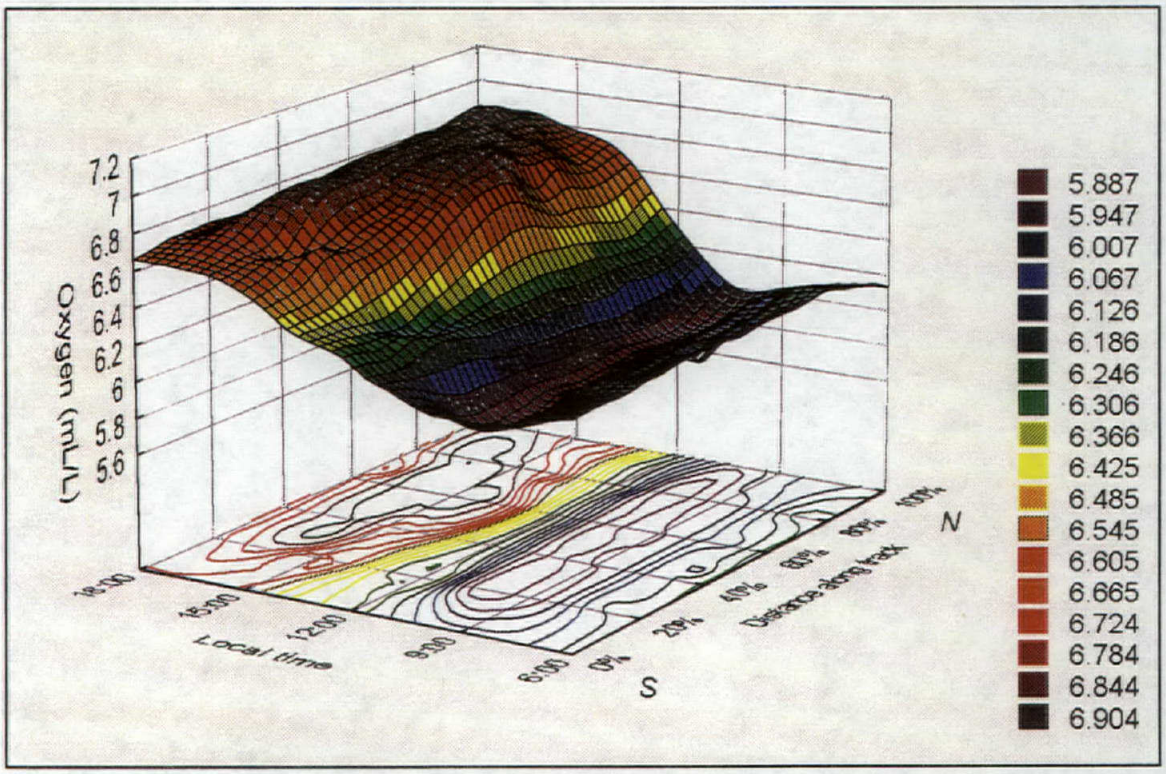


Figure 129. Cross-sectional time series of dissolved oxygen on Day 199, Transect A.

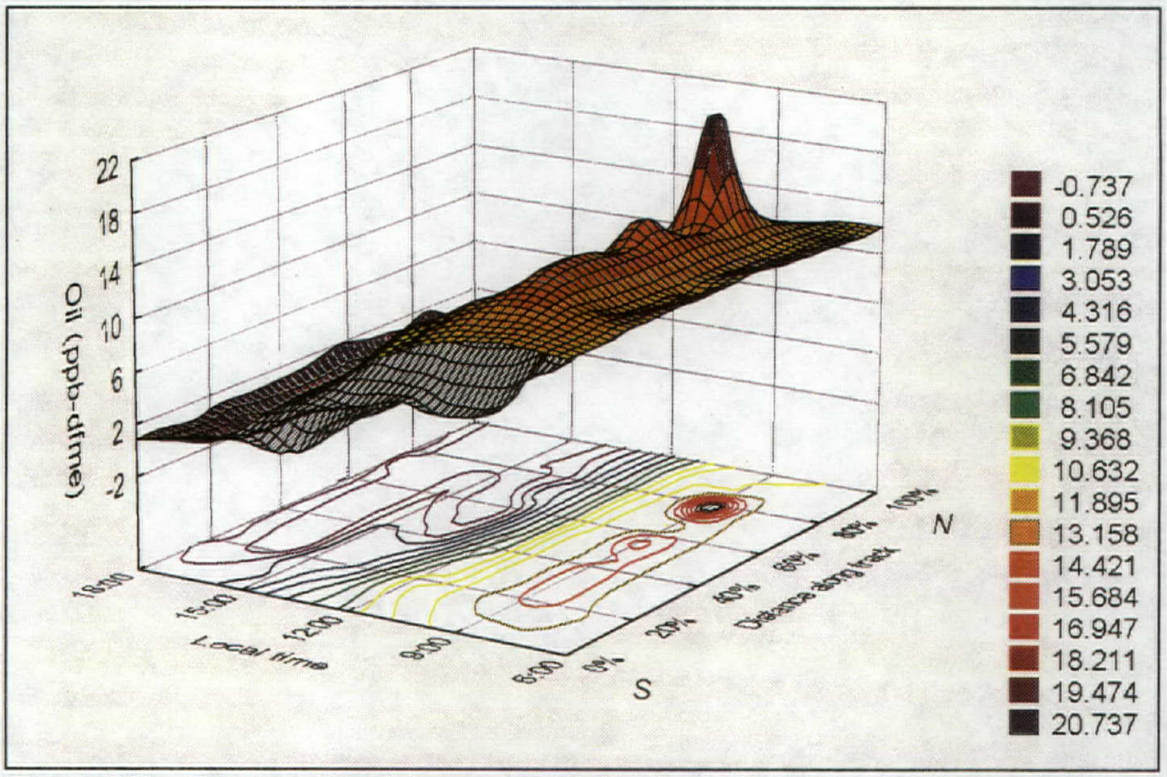


Figure 130. Cross-sectional time series of dissolved oil on Day 199, Transect A.

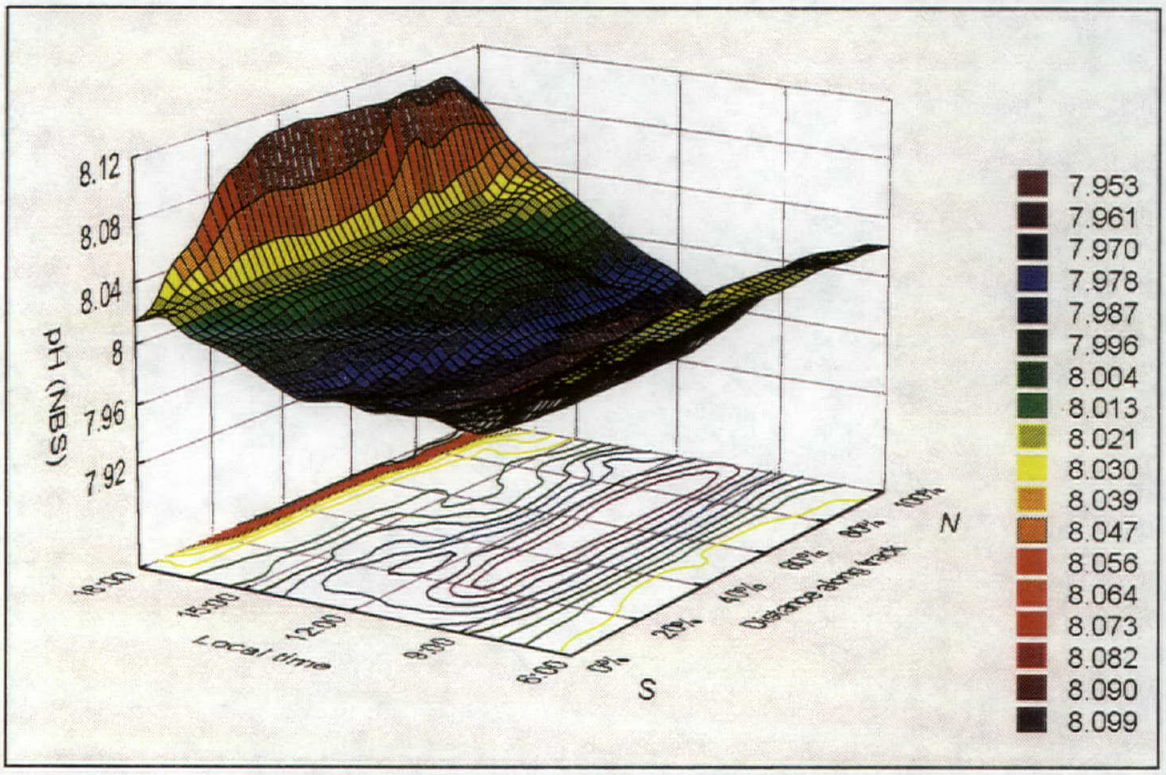


Figure 131. Cross-sectional time series of pH on Day 199, Transect A.

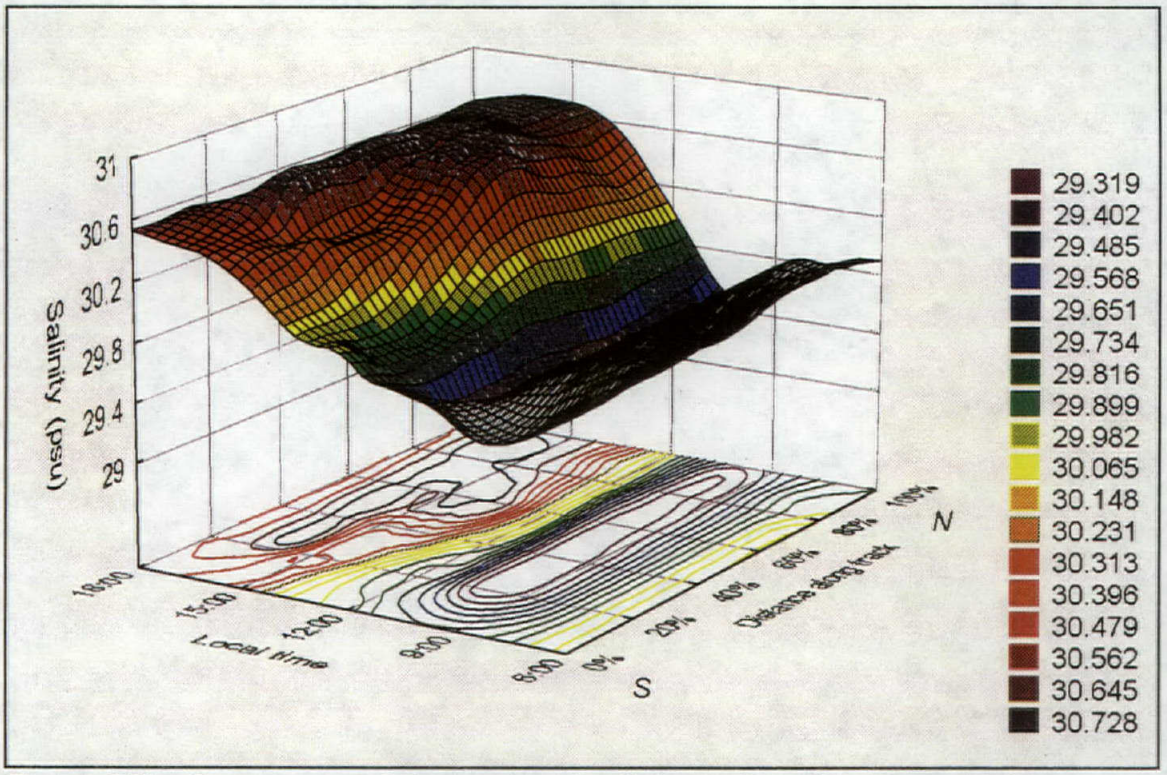


Figure 132. Cross-sectional time series of salinity on Day 199, Transect A.

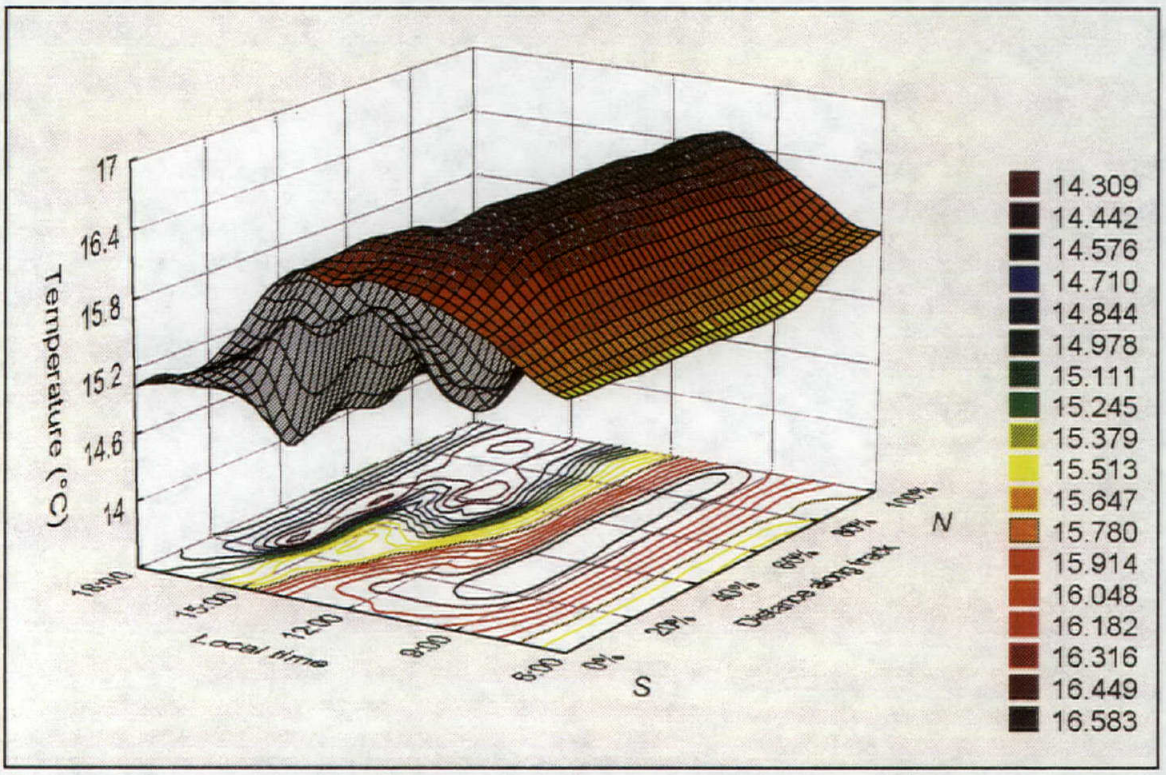


Figure 133. Cross-sectional time series of temperature on Day 199, Transect A.

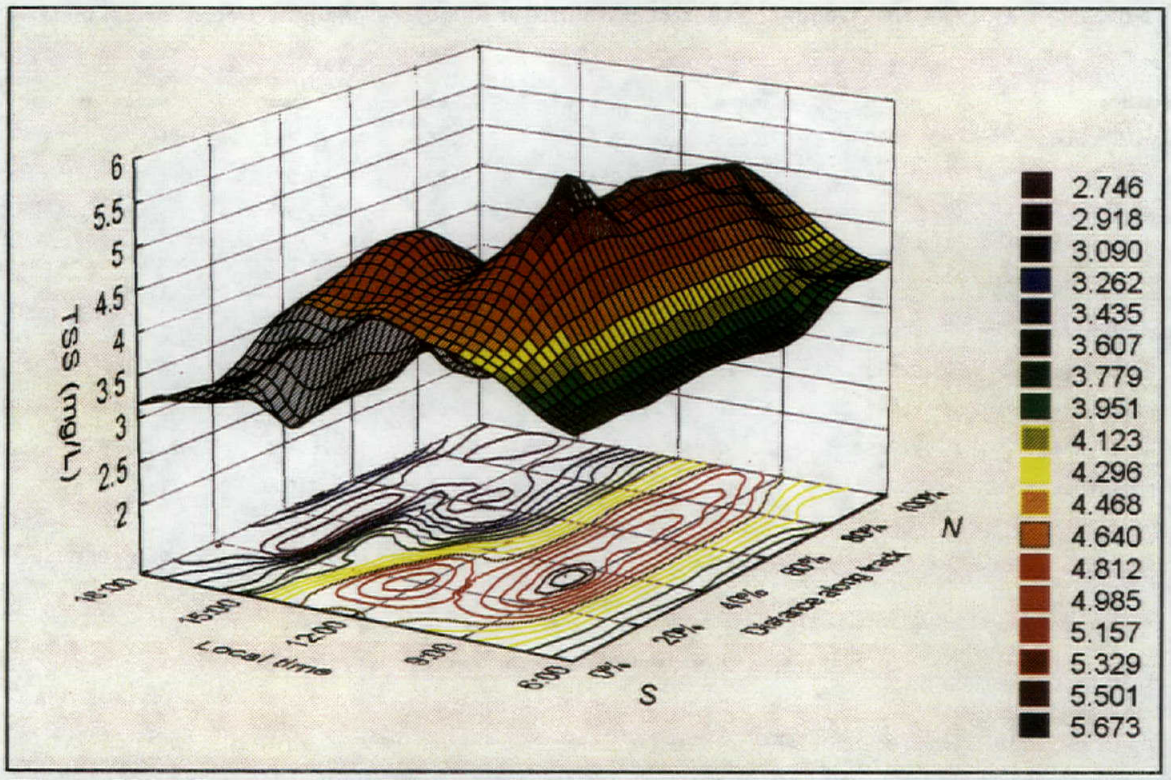


Figure 134. Cross-sectional time series of TSS on Day 199, Transect A.

TABLE 16. Day 199 Cross-Channel Transect B Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	2990	1.055	0.140	0.753	1.999	1.245
Salinity	2990	30.108	0.477	29.226	30.971	1.745
Temperature	2990	15.544	0.755	13.872	16.814	2.942
pH	2990	7.989	0.029	7.917	8.062	0.144
Dissolved Oxygen	2966	6.386	0.372	5.801	7.051	1.250
Chlorophyll	2960	1.634	0.891	0.673	3.162	2.488
Oils Florescence	2989	5.925	5.518	-2.868	15.347	18.215
Nephelometry	2957	1.010	0.251	0.555	1.620	1.066
Transmittance	2985	68.837	5.436	47.472	78.745	31.273
Bottom Depth	2964	-10.042	1.432	-15.500	-4.500	11.000
TSS Neph	2956	4.065	0.867	2.493	6.175	3.682
TSS Trans	2984	3.943	0.819	2.450	7.161	4.712

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.96854	0.63969	0.96772	0.81924	-0.90397	-0.91707	0.96087	-0.91705	-0.96065
	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
tem	-0.96854	1.00000	-0.67703	-0.94996	-0.78658	0.85507	0.89885	-0.96020	0.89883	0.96000
	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
ph	0.63969	-0.67703	1.00000	0.57124	0.31827	-0.31411	-0.61086	0.61932	-0.61085	-0.61929
	1.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
do2	0.96772	-0.94996	0.57124	1.00000	0.89445	-0.92755	-0.90324	0.93203	-0.90321	-0.93176
	1.00000	1.00000	0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
chl	0.81924	-0.78658	0.31827	0.89445	1.00000	-0.89431	-0.78549	0.77007	-0.78547	-0.76992
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000
oil	-0.90397	0.85507	-0.31411	-0.92755	-0.89431	1.00000	0.82298	-0.87017	0.82295	0.86994
	1.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000
nep	-0.91707	0.89885	-0.61086	-0.90324	-0.78549	0.82298	1.00000	-0.91320	1.00000	0.91335
	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tra	0.96087	-0.96020	0.61932	0.93203	0.77007	-0.87017	-0.91320	1.00000	-0.91317	-0.99981
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000
tssn	-0.91705	0.89883	-0.61085	-0.90321	-0.78547	0.82295	1.00000	-0.91317	1.00000	0.91335
	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tsst	-0.96065	0.96000	-0.61929	-0.93176	-0.76992	0.86994	0.91335	-0.99981	0.91335	1.00000
	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000

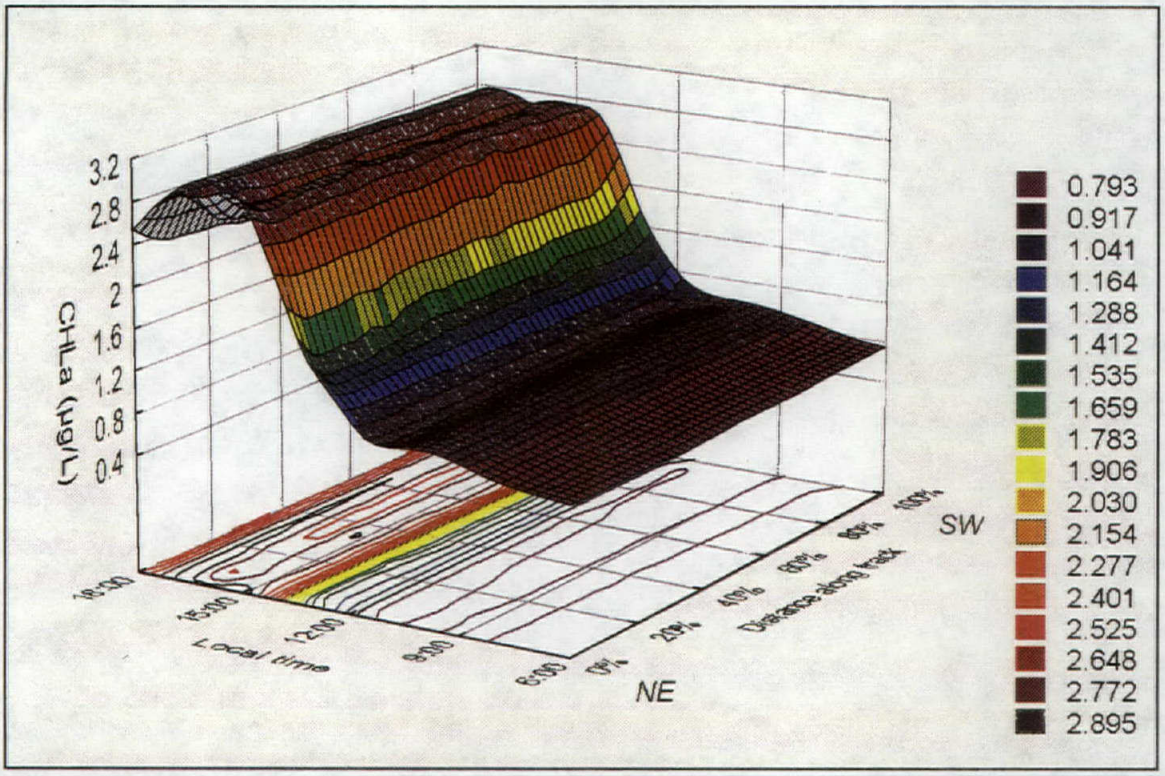


Figure 135. Cross-sectional time series of chlorophyll a on Day 199, Transect B.

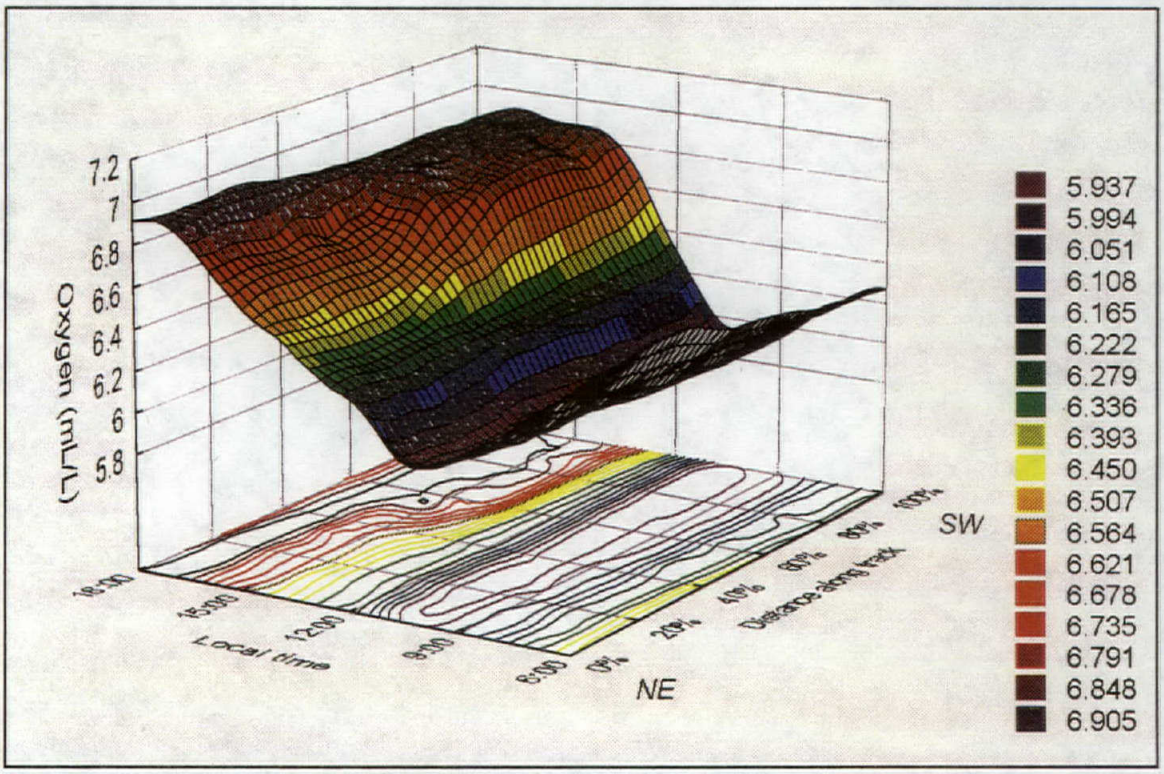


Figure 136. Cross-sectional time series of dissolved oxygen on Day 199, Transect B.

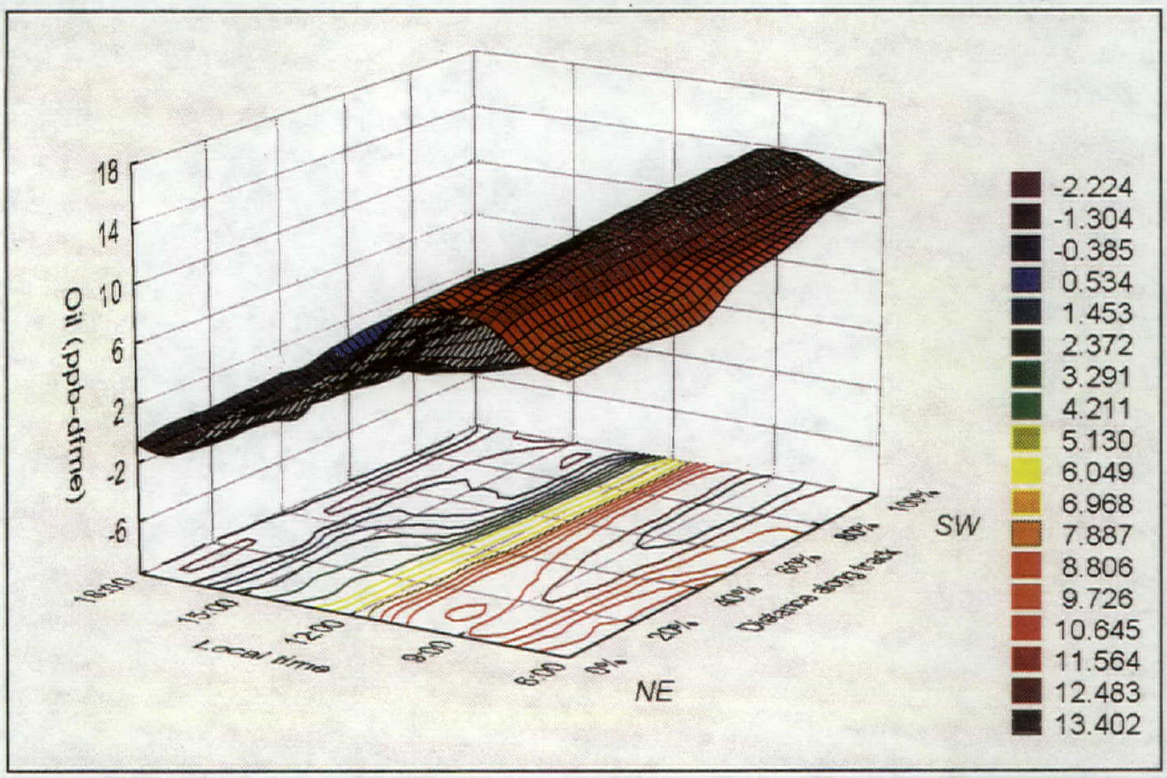


Figure 137. Cross-sectional time series of dissolved oil on Day 199, Transect B.

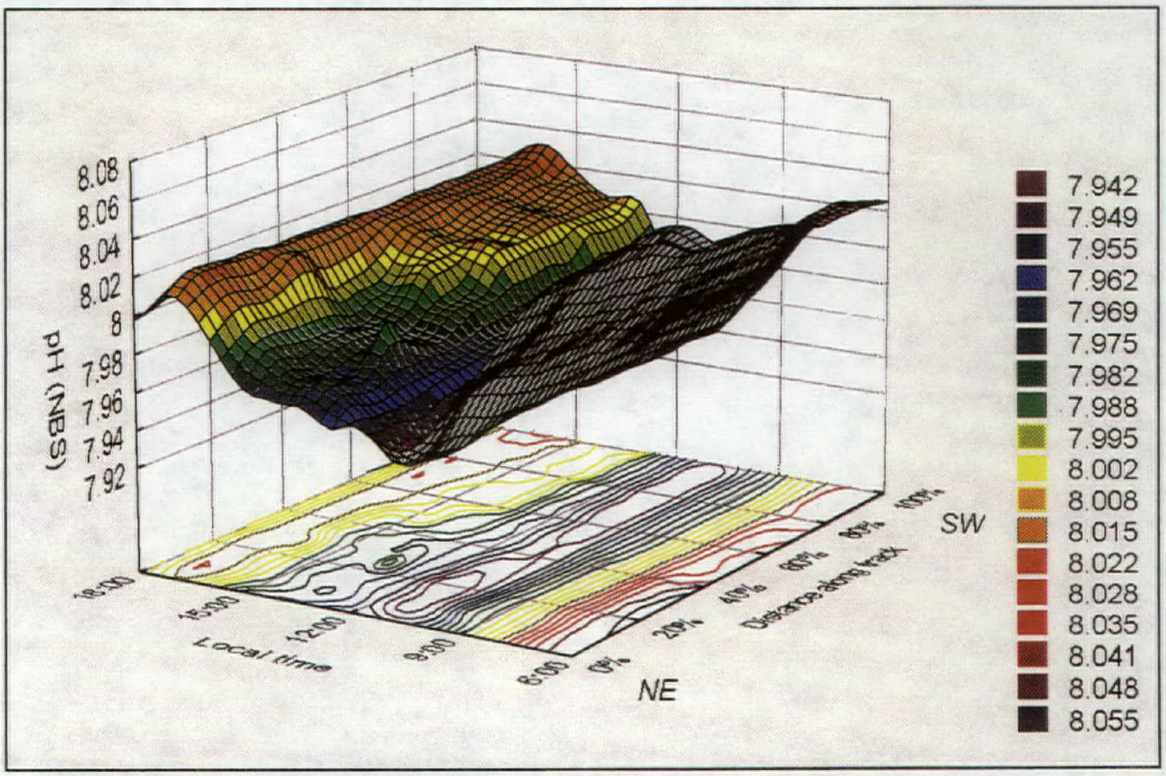


Figure 138. Cross-sectional time series of pH on Day 199, Transect B.

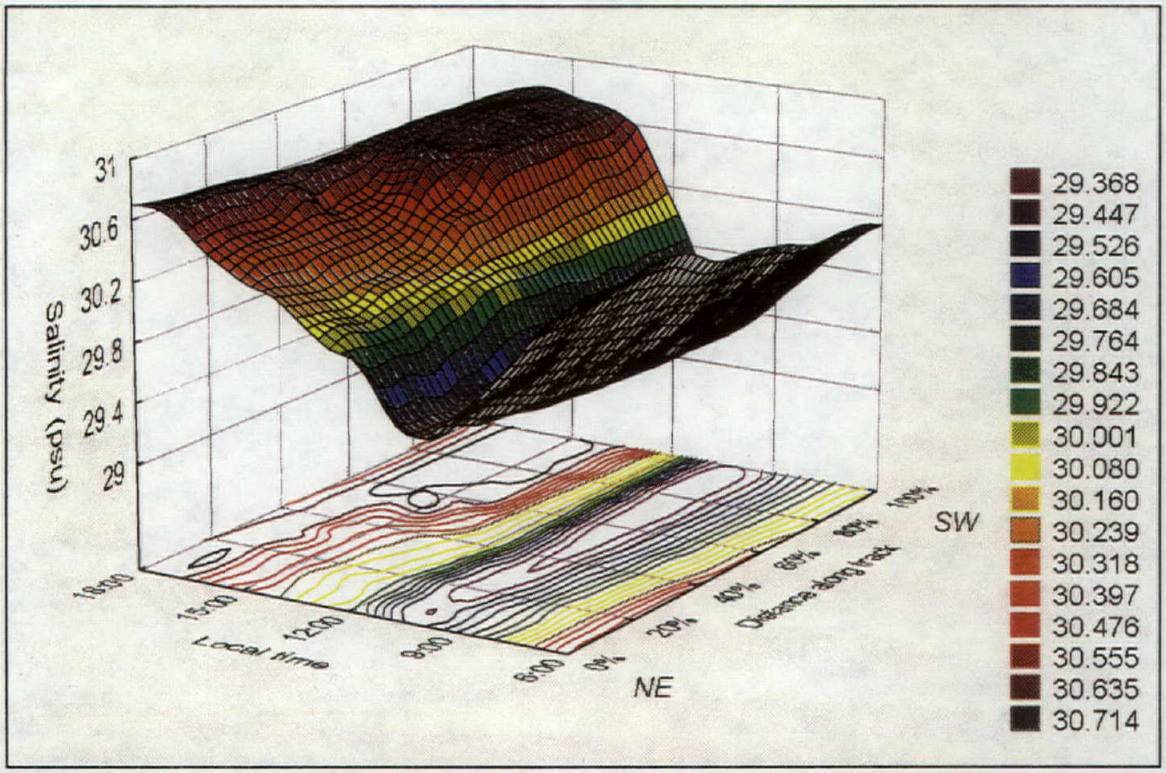


Figure 139. Cross-sectional time series of salinity on Day 199, Transect B.

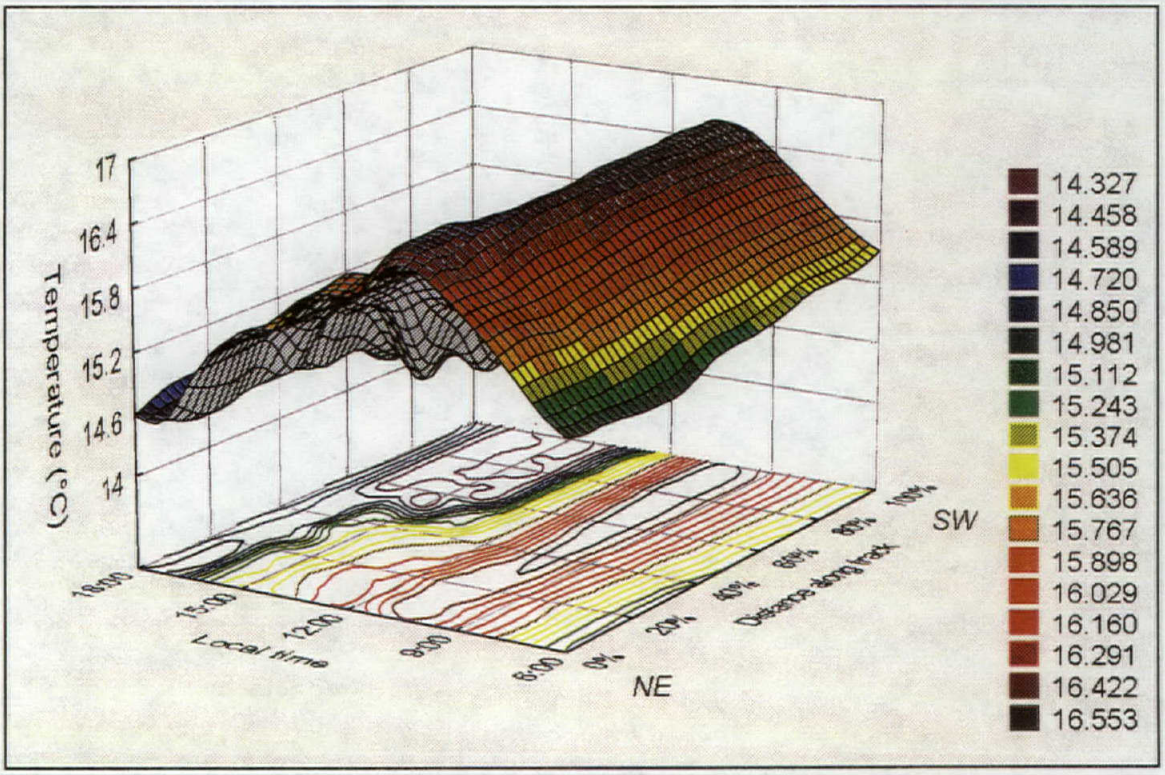


Figure 140. Cross-sectional time series of temperature on Day 199, Transect B.

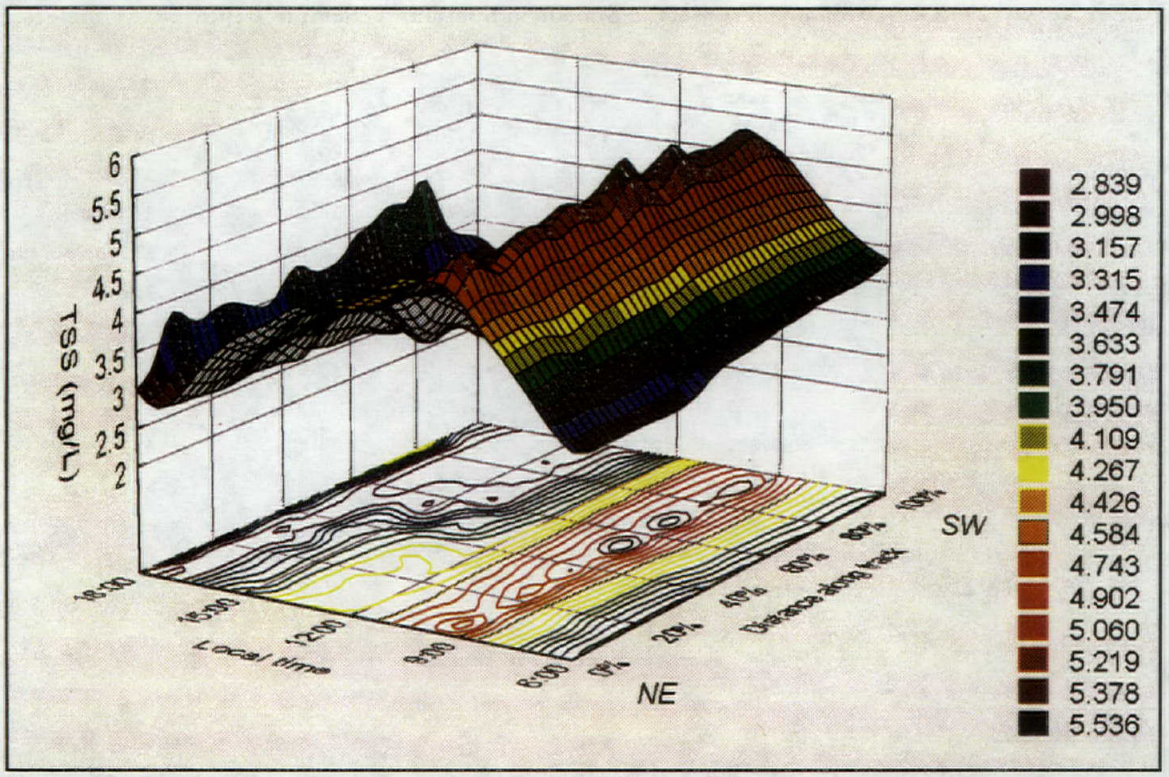


Figure 141. Cross-sectional time series of TSS on Day 199, Transect B.

TABLE 17. Day 199 Cross-Channel Transect C Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	1990	1.166	0.249	0.753	1.999	1.245
Salinity	1984	30.228	0.310	29.424	30.767	1.343
Temperature	1989	15.528	0.451	14.423	16.700	2.277
pH	1988	8.000	0.025	7.937	8.071	0.135
Dissolved Oxygen	1975	6.426	0.287	5.921	7.029	1.108
Chlorophyll	1960	1.520	0.873	0.643	3.075	2.432
Oils Florescence	1955	4.645	4.022	-2.255	12.562	14.817
Nephelometry	1947	0.967	0.201	0.574	1.811	1.237
Transmittance	1931	69.871	3.588	56.546	77.179	20.633
Bottom Depth	1964	-7.512	1.569	-11.400	-3.800	7.600
TSS Neph	1946	3.919	0.693	2.558	6.833	4.274
TSS Trans	1930	3.787	0.540	2.686	5.794	3.109

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.92650	0.47529	0.94424	0.74287	-0.83172	-0.81161	0.90322	-0.81138	-0.90267
	0.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
tem	-0.92650	1.00000	-0.60623	-0.87941	-0.64368	0.67937	0.74762	-0.87111	0.74730	0.87000
	1.00000	0.00000	0.00000	1.00000	0.00000	0.00000	1.00000	1.00000	1.00000	1.00000
ph	0.47529	-0.60623	1.00000	0.31787	0.08779	-0.03192	-0.52739	0.54106	-0.52739	-0.54163
	0.00000	0.00000	0.00000	0.00000	0.00009	0.15461	0.00000	0.00000	0.00000	0.00000
do2	0.94424	-0.87941	0.31787	1.00000	0.85973	-0.88075	-0.76222	0.85104	-0.76197	-0.85030
	1.00000	1.00000	0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
chl	0.74287	-0.64368	0.08779	0.85973	1.00000	-0.82962	-0.62456	0.65281	-0.62442	-0.65336
	1.00000	0.00000	0.00009	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
oil	-0.83172	0.67937	-0.03192	-0.88075	-0.82962	1.00000	0.62767	-0.72558	0.62769	0.72620
	1.00000	0.00000	0.15461	1.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000
nep	-0.81161	0.74762	-0.52739	-0.76222	-0.62456	0.62767	1.00000	-0.80967	0.99997	0.81036
	1.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
tra	0.90322	-0.87111	0.54106	0.85104	0.65281	-0.72558	-0.80967	1.00000	-0.80940	-0.99915
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	1.00000
tssn	-0.81138	0.74730	-0.52739	-0.76197	-0.62442	0.62769	0.99997	-0.80940	1.00000	0.81009
	1.00000	1.00000	0.00000	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
tsst	-0.90267	0.87000	-0.54163	-0.85030	-0.65336	0.72620	0.81036	-0.99915	0.81009	1.00000
	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	0.00000

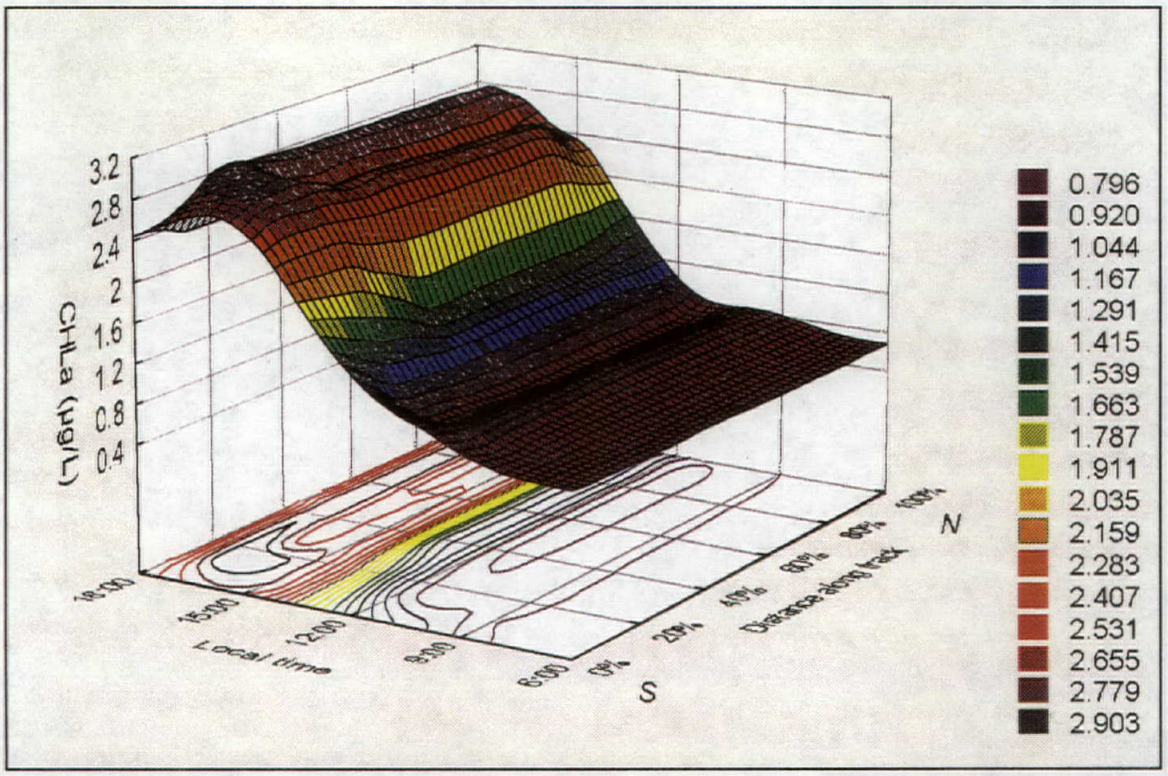


Figure 142. Cross-sectional time series of chlorophyll a on Day 199, Transect C.

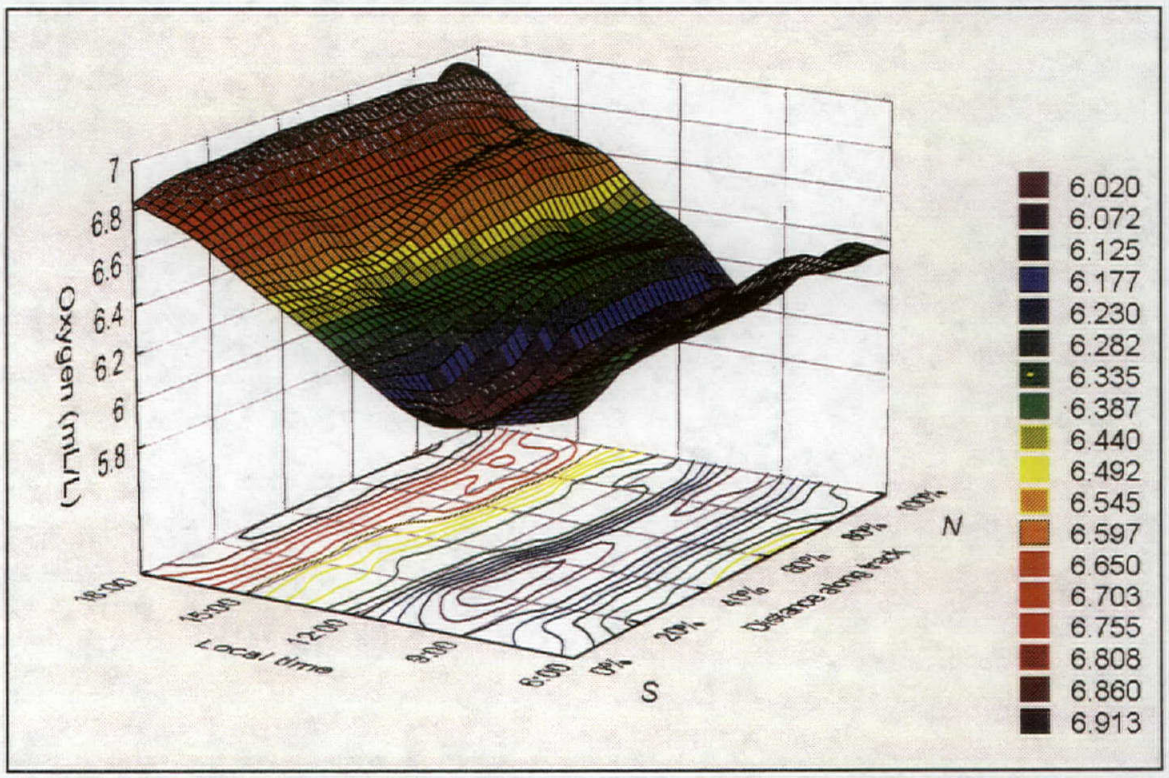


Figure 143. Cross-sectional time series of dissolved oxygen on Day 199, Transect C.

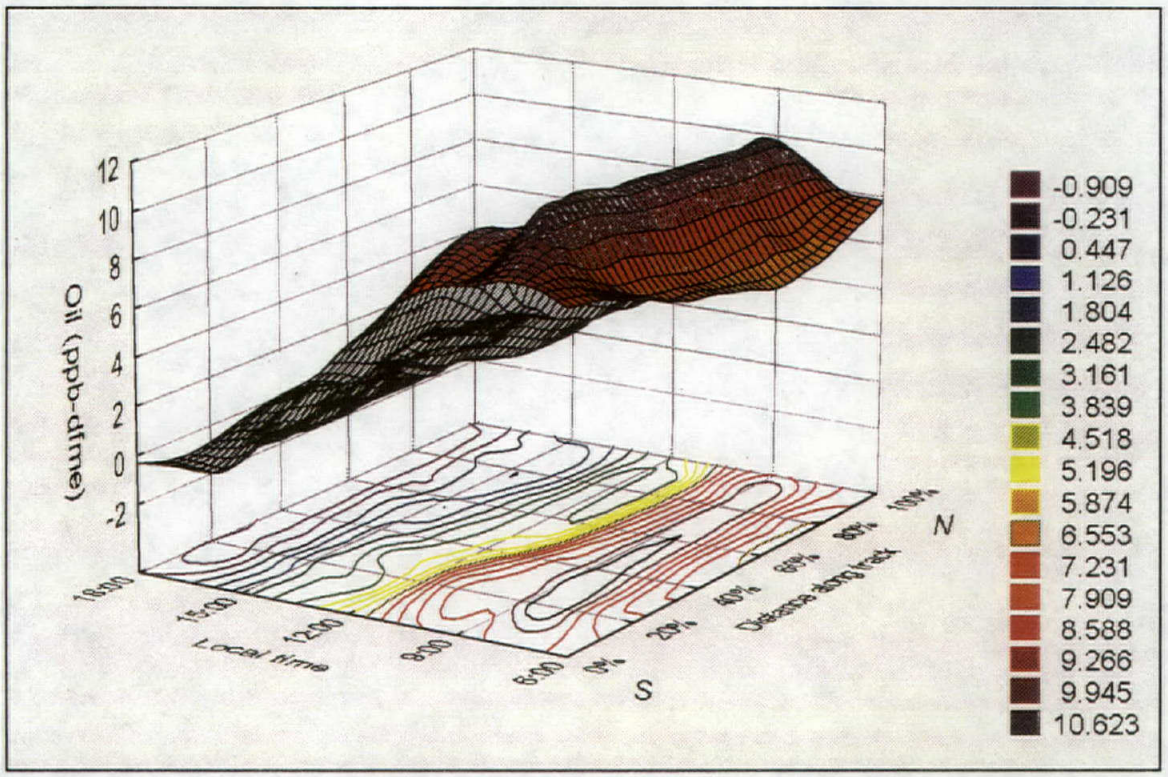


Figure 144. Cross-sectional time series of dissolved oil on Day 199, Transect C.

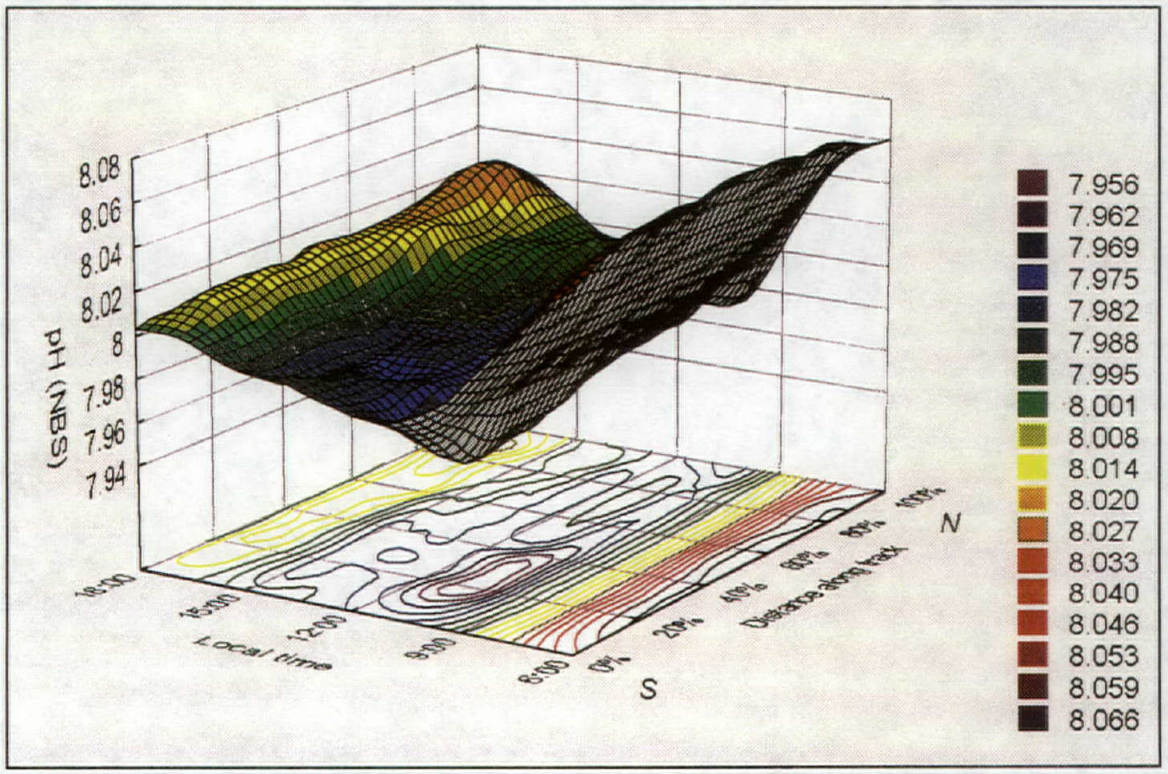


Figure 145. Cross-sectional time series of pH on Day 199, Transect C.

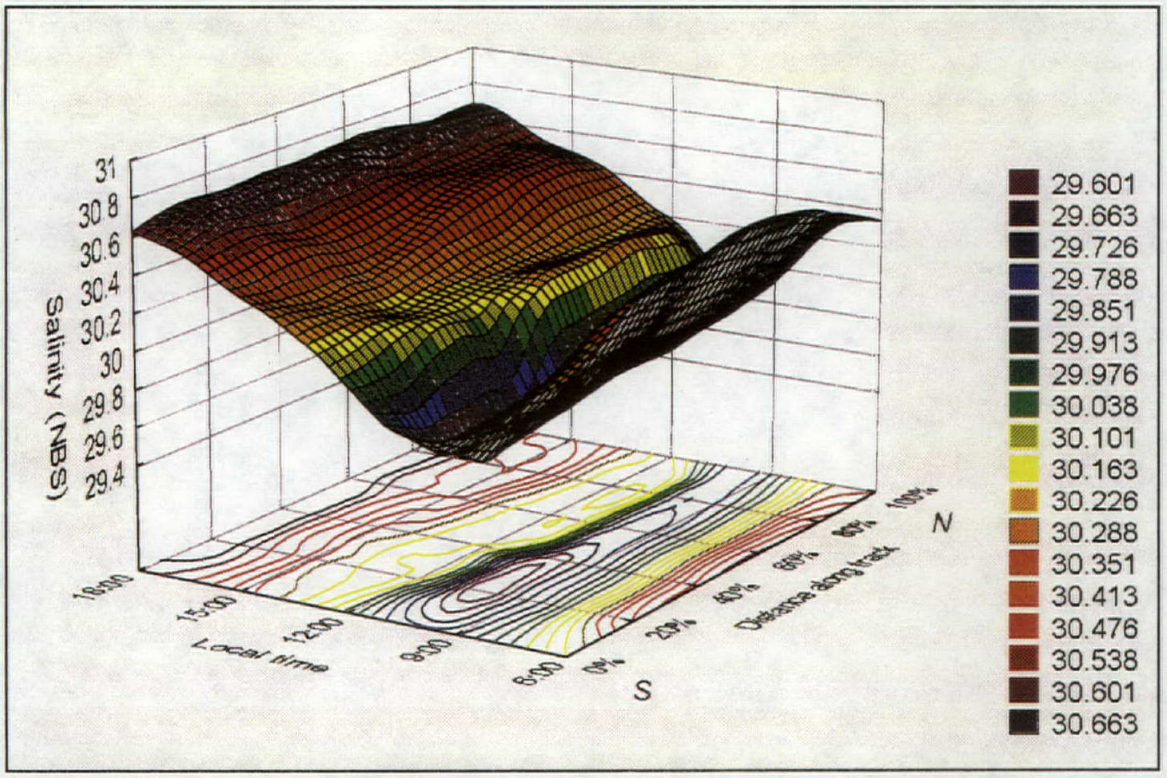


Figure 146. Cross-sectional time series of salinity a on Day 199, Transect C.

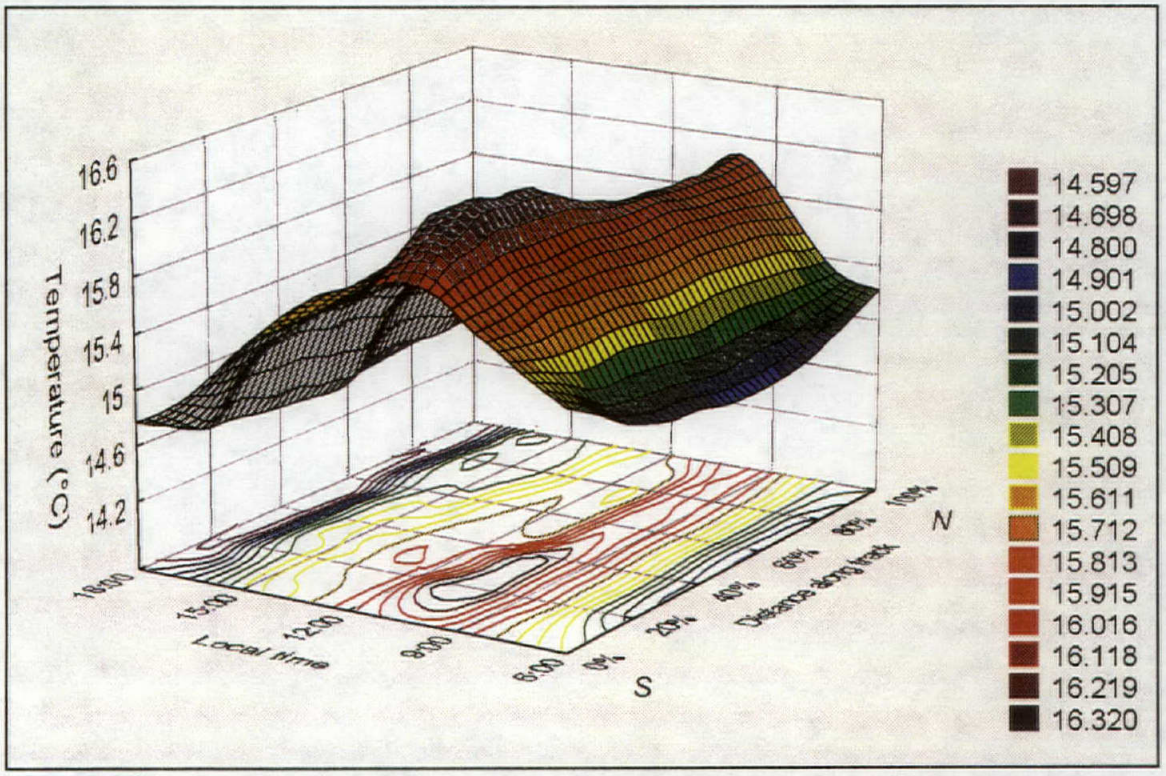


Figure 147. Cross-sectional time series of temperature on Day 199, Transect C.

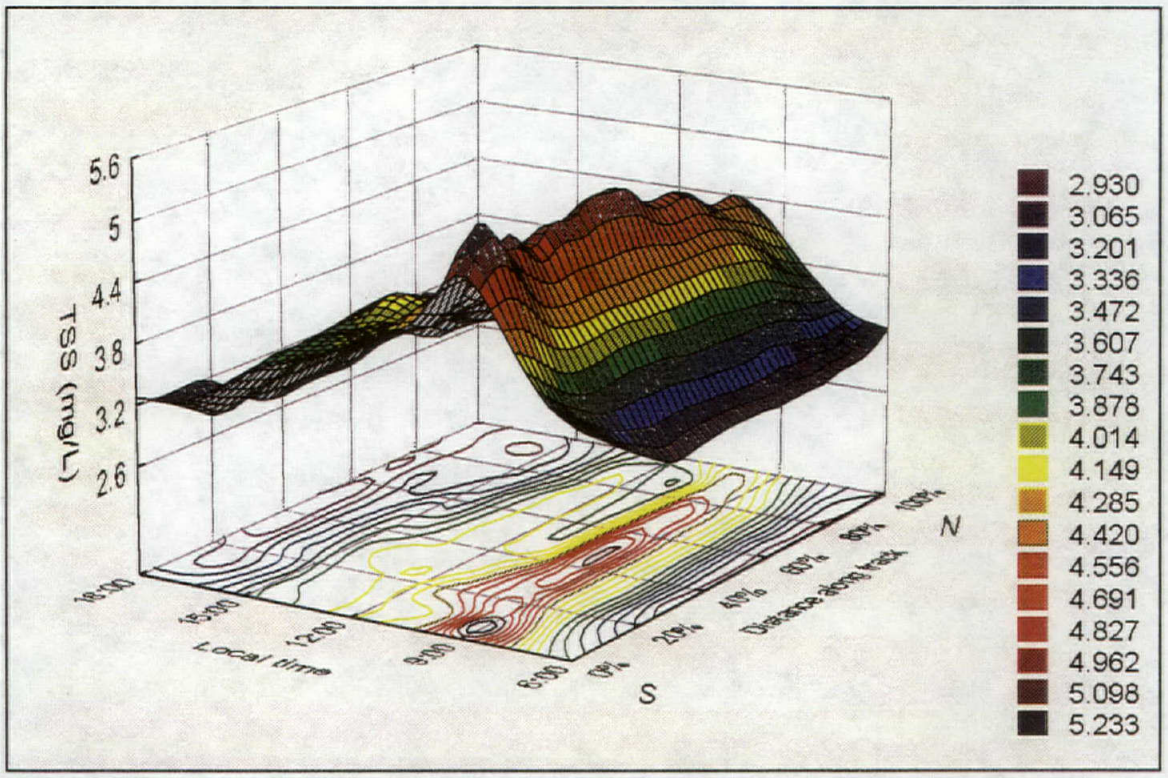


Figure 148. Cross-sectional time series of TSS on Day 199, Transect C.

FIXED STATION SURVEYS

FIGURE 149 Location map of fixed station surveys performed Day 191, 193, 195, and 200.

Day 191- Fort Foster

TABLE 18 Statistical Summary
FIGURE 150 Time Series Plot
FIGURE 151 Vertical Profile 1, 1008 hrs.

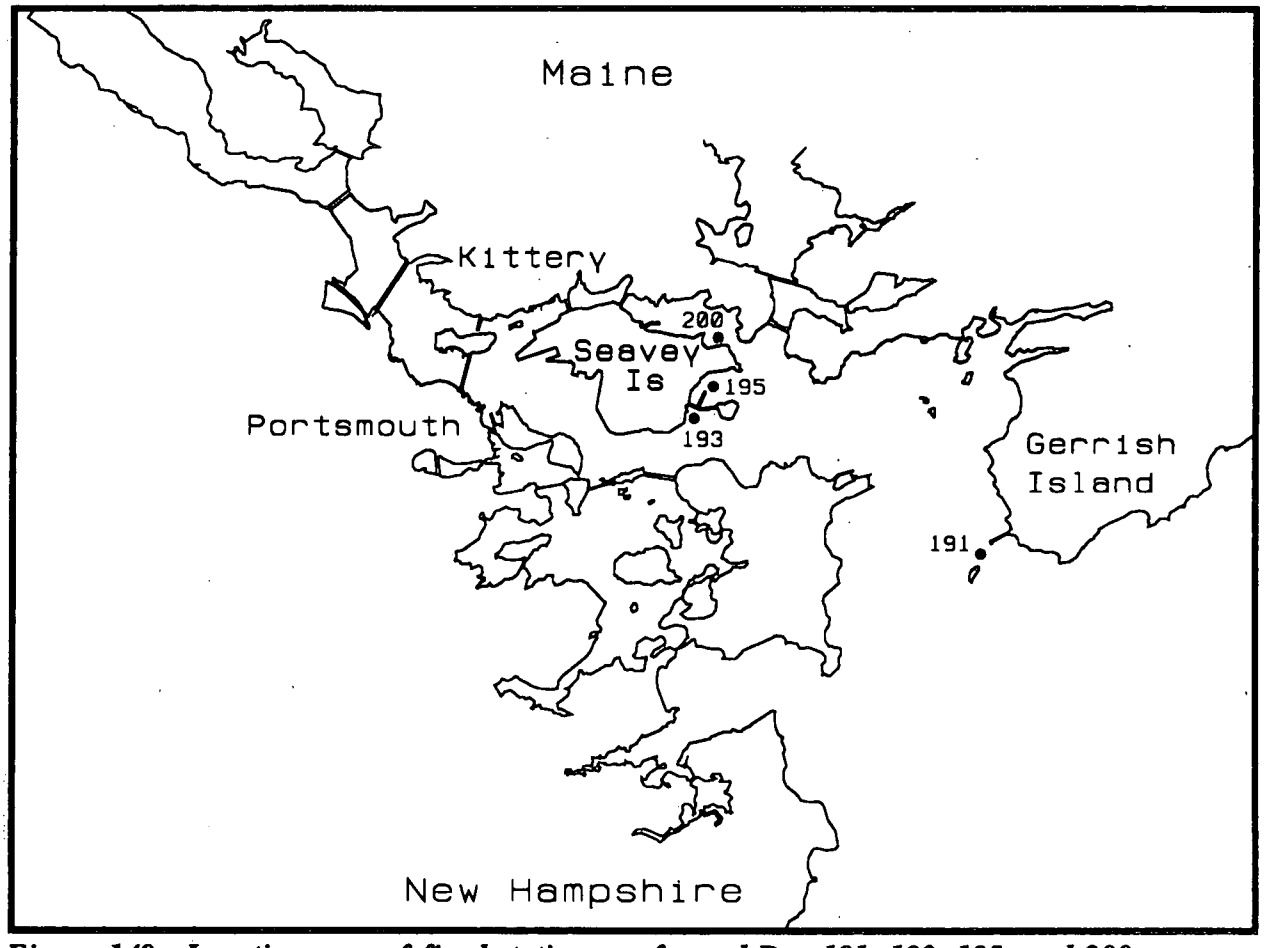


Figure 149. Location map of fixed stations performed Day 191, 193, 195, and 200.

TABLE 18. Day 191 Fixed Station Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	3261	1.615	0.400	0.101	1.999	1.897
Salinity	3210	30.891	0.081	30.731	31.044	0.313
Temperature	3345	13.118	0.391	12.165	14.515	2.350
pH	3155	8.041	0.022	8.006	8.090	0.084
Dissolved Oxygen	3311	6.592	0.317	4.758	7.425	2.667
Transmittance	2468	76.011	5.196	60.201	82.299	22.099
TSS Trans	2467	2.861	0.783	1.914	5.243	3.329
Bottom Depth	3338	-3.430	0.608	-5.000	-2.200	2.800

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	tsst	tra
sal	1.00000	0.13919	-0.17172	-0.30903	-0.76761	0.76828
	0.00000	0.00000	0.00000	0.00000	0.55711	0.55777
tem	0.13919	1.00000	-0.45995	-0.77588	-0.20478	0.20428
	0.00000	0.00000	0.00000	0.56539	0.00000	0.00000
ph	-0.17172	-0.45995	1.00000	0.49880	0.14708	-0.14713
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
do2	-0.30903	-0.77588	0.49880	1.00000	0.29970	-0.29968
	0.00000	0.56539	0.00000	0.00000	0.00000	0.00000
tsst	-0.76761	-0.20478	0.14708	0.29970	1.00000	-0.99947
	0.55711	0.00000	0.00000	0.00000	0.00000	0.97918
tra	0.76828	0.20428	-0.14713	-0.29968	-0.99947	1.00000
	0.55777	0.00000	0.00000	0.00000	0.97918	0.00000

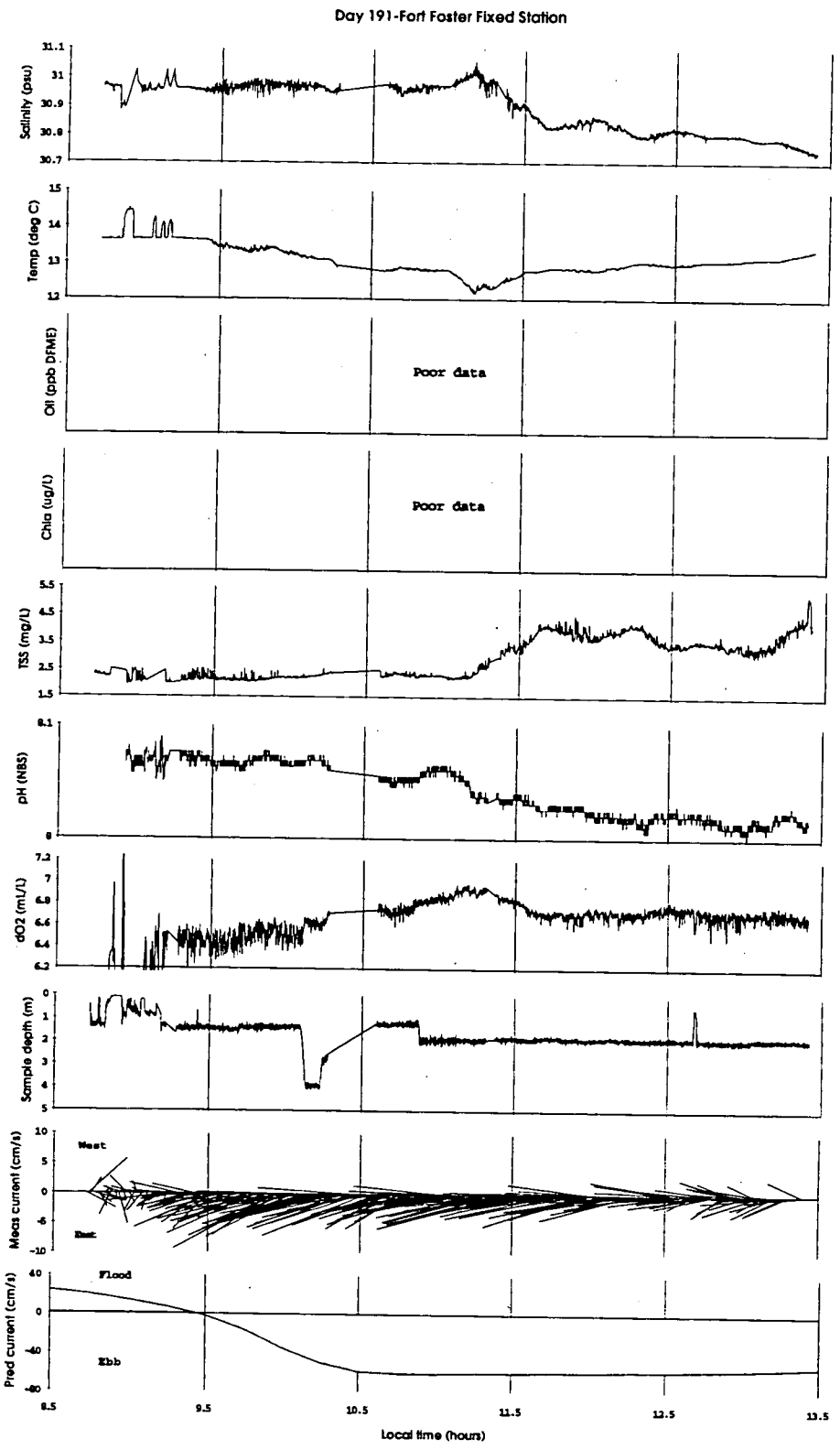


Figure 150. Day 191 time series plot.

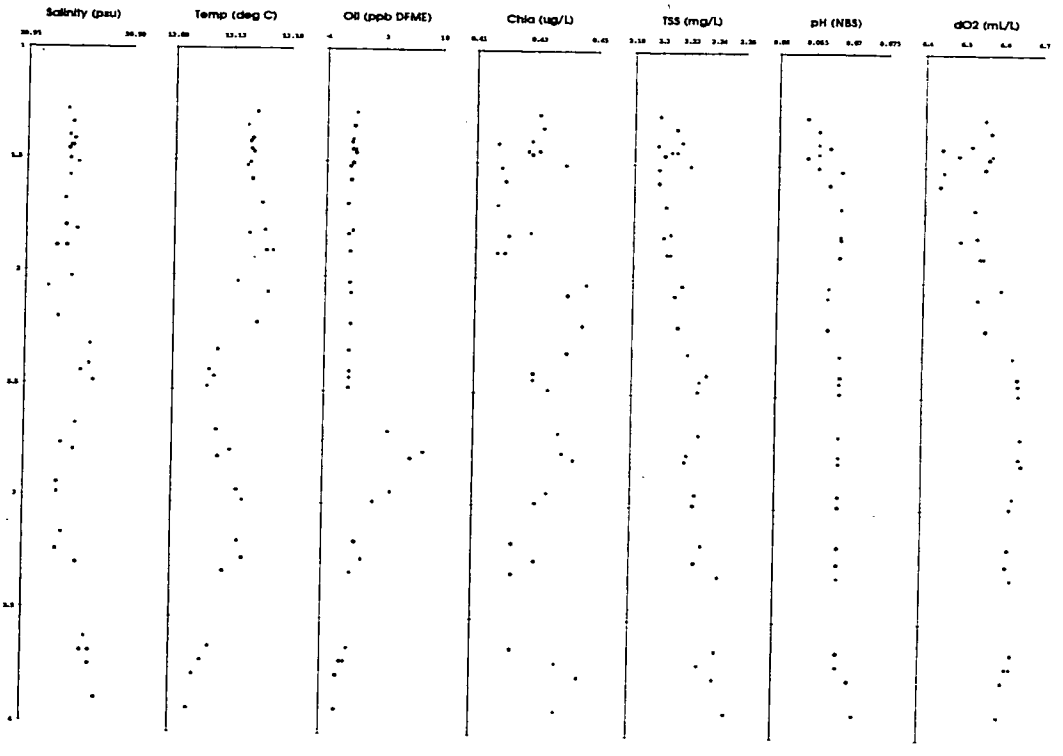


Figure 151. Vertical profile 1, Day 191, 1008 hrs.

FIXED STATION SURVEYS

Day 193- Police Dock

TABLE 19 Statistical Summary
FIGURE 152 Time Series Plot
FIGURE 153 Vertical Profile 1, 0854 hrs
FIGURE 154 Vertical Profile 2, 0943 hrs
FIGURE 155 Vertical Profile 3, 1031 hrs
FIGURE 156 Vertical Profile 4, 1132 hrs
FIGURE 157 Vertical Profile 5, 1232 hrs
FIGURE 158 Vertical Profile 6, 1332 hrs
FIGURE 159 Vertical Profile 7, 1404 hrs

TABLE 19. Day 193 Fixed Station Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	499	1.008	0.396	0.457	1.999	1.542
Salinity	495	31.022	0.066	30.836	31.120	0.284
Temperature	499	11.879	0.185	11.605	12.521	0.917
pH	499	7.961	0.014	7.942	7.990	0.048
Dissolved Oxygen	497	6.241	1.121	3.713	7.087	3.374
Chlorophyll	479	1.116	0.414	0.547	1.773	1.226
Oils Florescence	490	69.499	13.485	57.959	158.113	100.154
Nephelometry	482	1.088	0.213	0.514	1.599	1.085
Transmittance	449	77.483	2.368	68.479	79.989	11.509
Bottom Depth	499	-4.622	0.561	-5.300	-3.300	2.000
TSS Neph	481	4.338	0.737	2.352	6.100	3.748
TSS Trans	448	2.639	0.357	2.262	3.996	1.734

*** * * * * * Pearson Correlation Matrix * * * * * ***

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.77740	0.49276	0.35794	0.43483	0.17475	-0.58289	0.51776	-0.58570	-0.51422
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00009	0.00000	0.00000	0.00000	0.00000
tem	-0.77740	1.00000	-0.00104	-0.04265	0.10001	0.08561	0.12140	-0.40508	0.12508	0.40060
	0.00000	0.00000	0.98147	0.34175	0.02548	0.05600	0.00662	0.00000	0.00514	0.00000
ph	0.49276	-0.00104	1.00000	0.52633	0.89059	0.33885	-0.75902	0.37100	-0.75856	-0.37147
	0.00000	0.98147	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
do2	0.35794	-0.04265	0.52633	1.00000	0.60837	0.04819	-0.61189	0.61297	-0.61153	-0.61390
	0.00000	0.34175	0.00000	0.00000	0.00000	0.28260	0.00000	0.00000	0.00000	0.00000
chl	0.43483	0.10001	0.89059	0.60837	1.00000	0.38002	-0.83632	0.35361	-0.83504	-0.35378
	0.00000	0.02548	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
oil	0.17475	0.08561	0.33885	0.04819	0.38002	1.00000	-0.18354	-0.03494	-0.18315	0.03496
	0.00009	0.05600	0.00000	0.28260	0.00000	0.00000	0.00004	0.43610	0.00004	0.43589
nep	-0.58289	0.12140	-0.75902	-0.61189	-0.83632	-0.18354	1.00000	-0.44517	0.99962	0.44538
	0.00000	0.00662	0.00000	0.00000	0.00000	0.00004	0.00000	0.00000	0.98238	0.00000
tra	0.51776	-0.40508	0.37100	0.61297	0.35361	-0.03494	-0.44517	1.00000	-0.44616	-0.99953
	0.00000	0.00000	0.00000	0.00000	0.00000	0.43610	0.00000	0.00000	0.00000	0.98056
tssn	-0.58570	0.12508	-0.75856	-0.61153	-0.83504	-0.18315	0.99962	-0.44616	1.00000	0.44637
	0.00000	0.00514	0.00000	0.00000	0.00000	0.00004	0.98238	0.00000	0.00000	0.00000
tsst	-0.51422	0.40060	-0.37147	-0.61390	-0.35378	0.03496	0.44538	-0.99953	0.44637	1.00000
	0.00000	0.00000	0.00000	0.00000	0.00000	0.43589	0.00000	0.98056	0.00000	0.00000

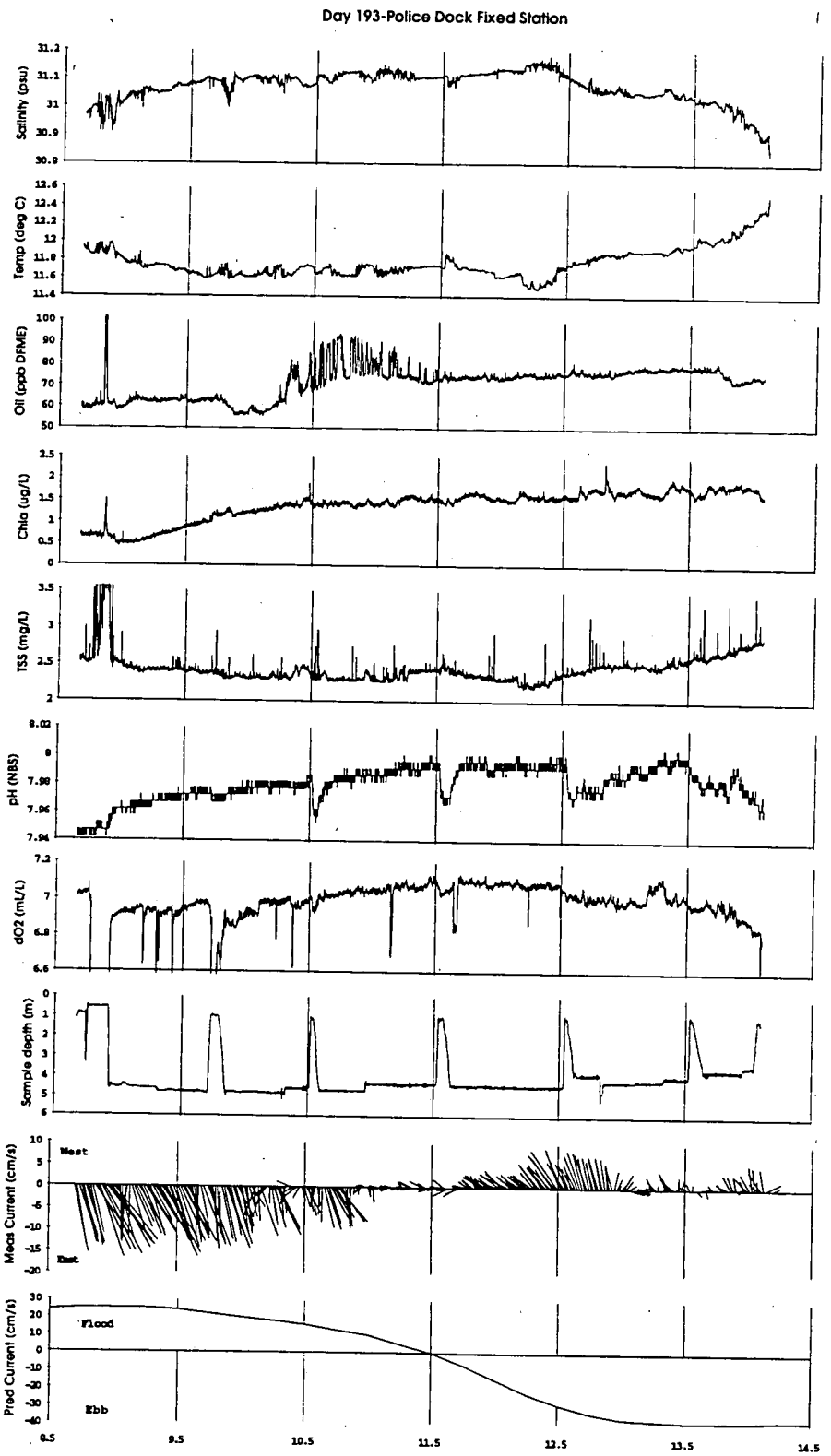


Figure 152. Day 193 time series plot.

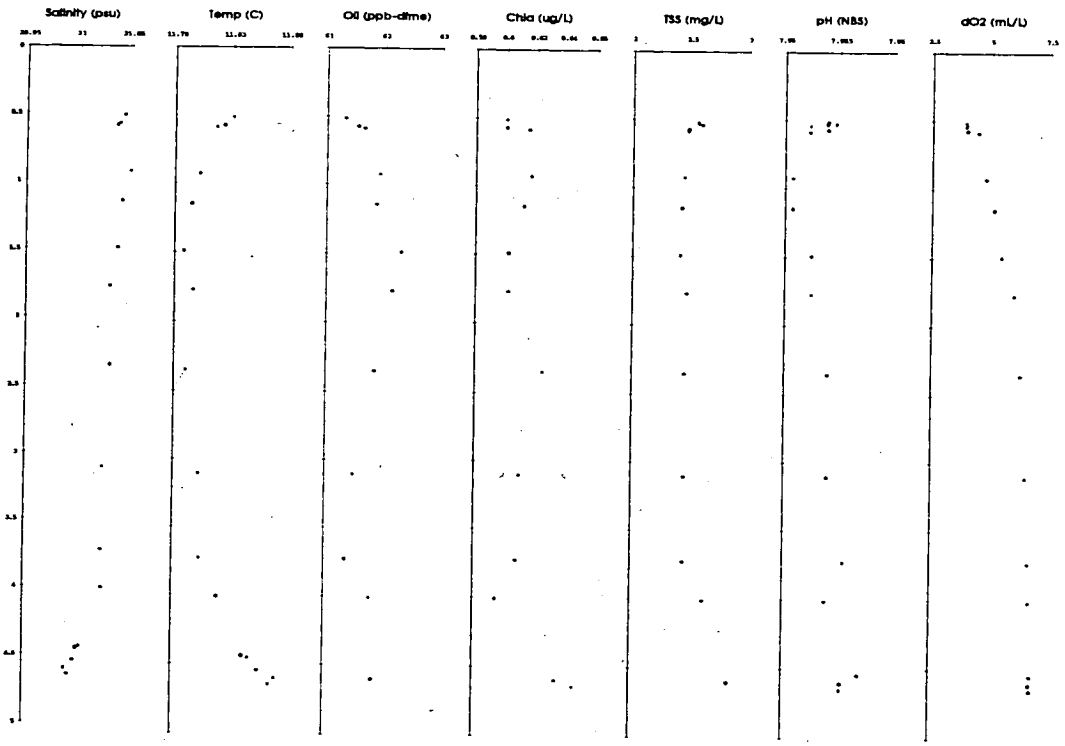


Figure 153. Vertical Profile 1, Day 193, 0854 hrs.

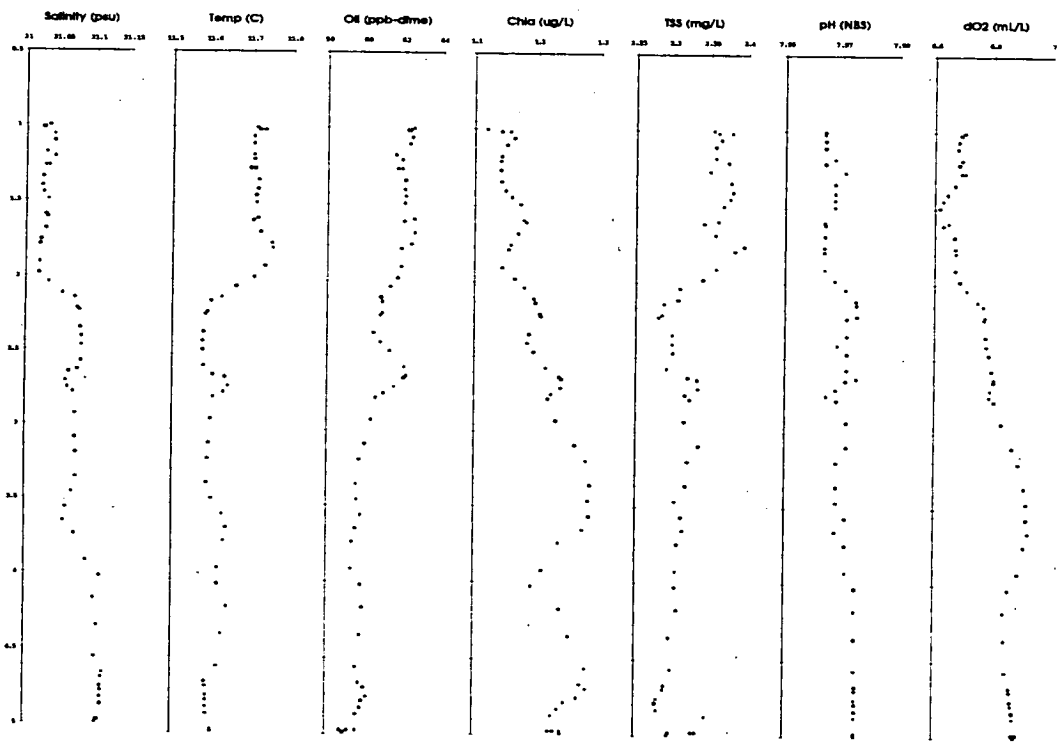


Figure 154. Vertical Profile 2, Day 193, 0943 hrs.

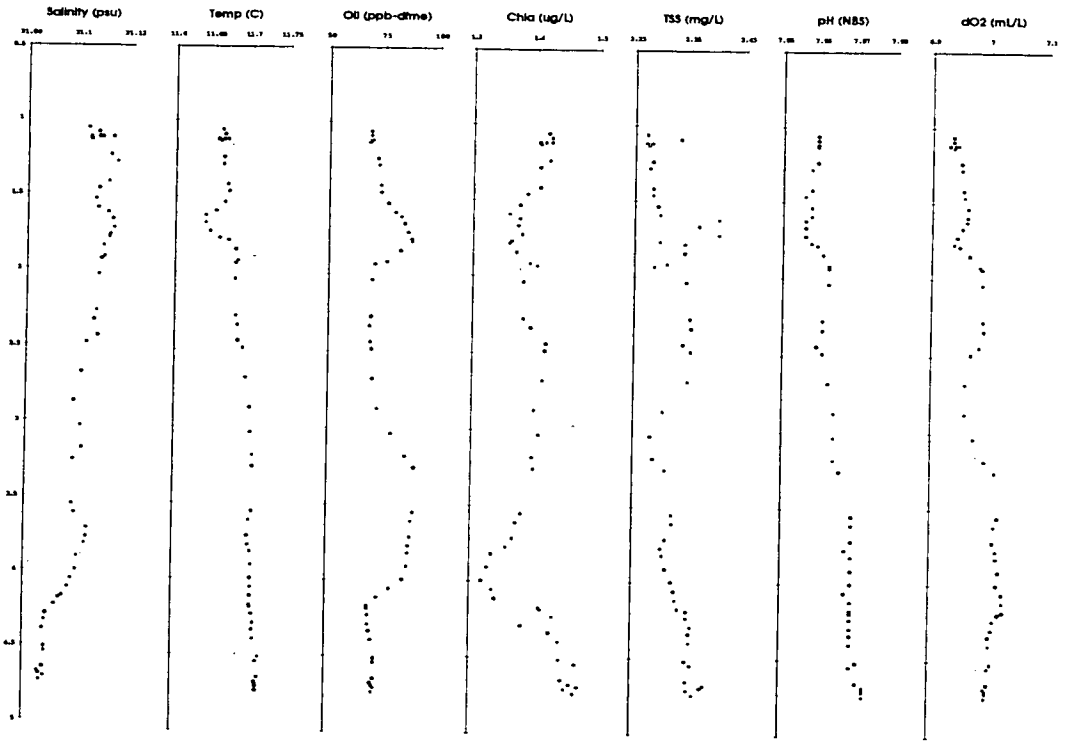


Figure 155. Vertical Profile 3, Day 193, 1031 hrs.

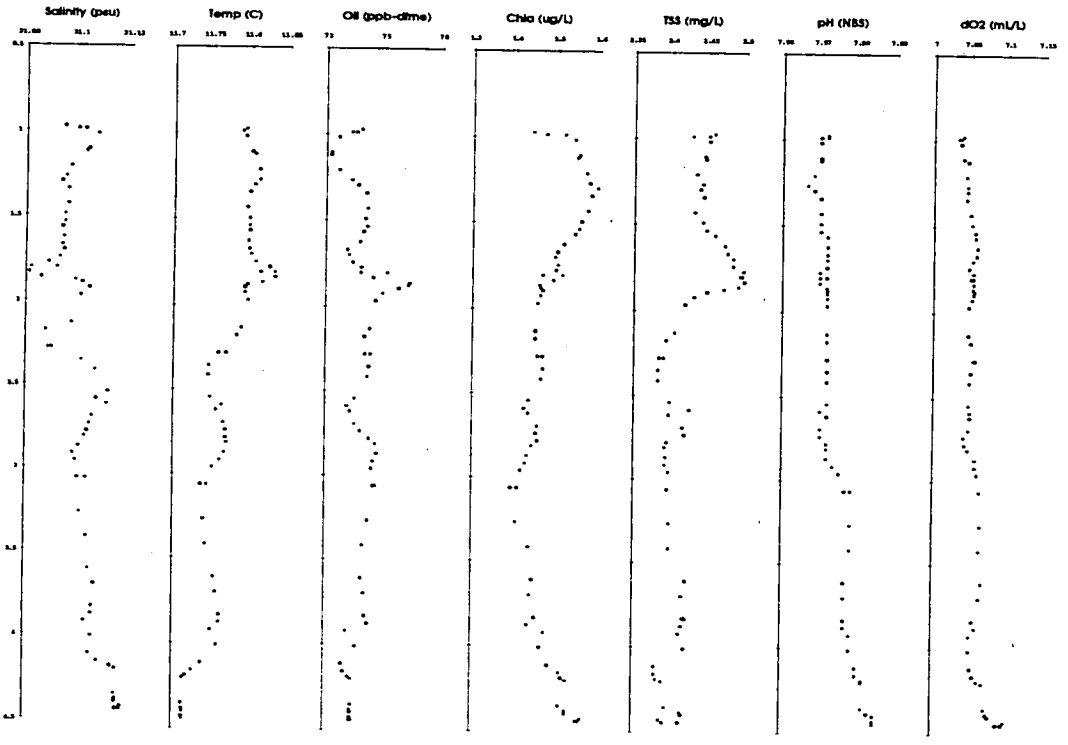


Figure 156. Vertical Profile 4, Day 193, 1132 hrs.

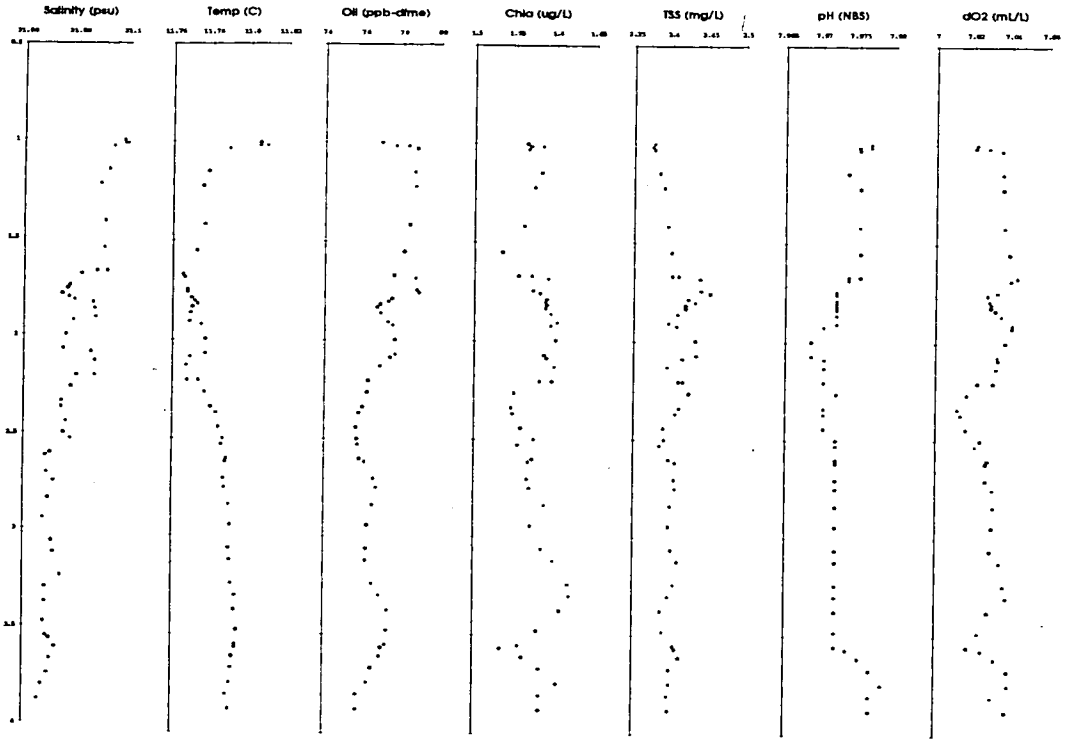


Figure 157. Vertical Profile 5, Day 193, 1232 hrs.

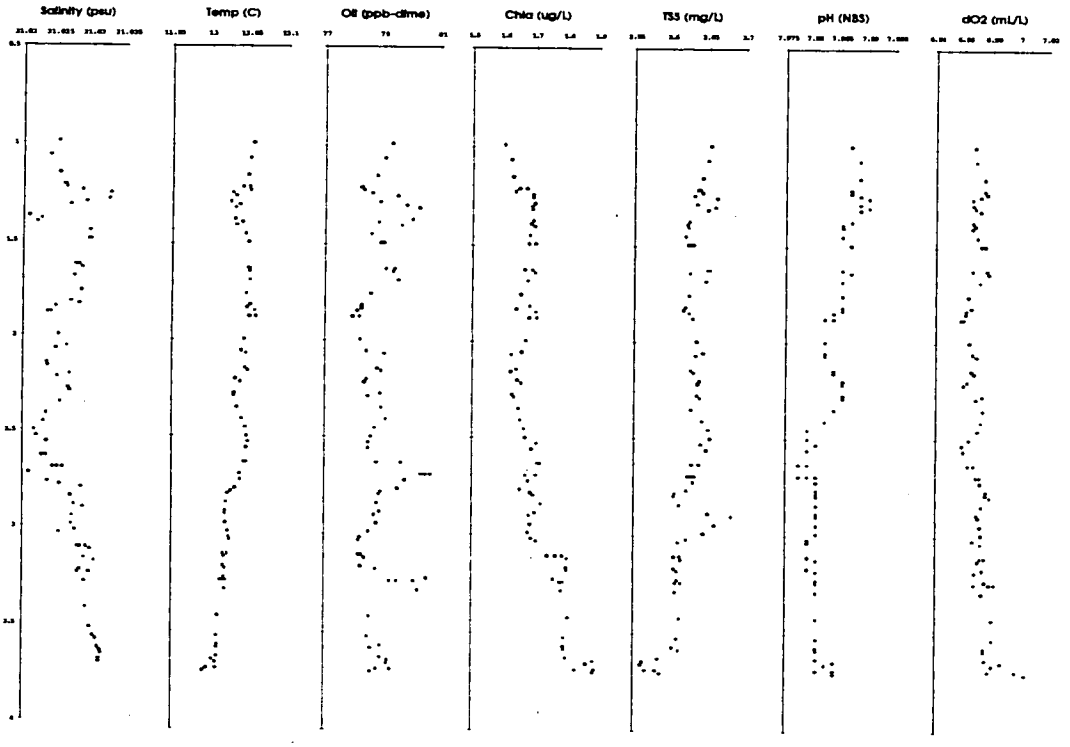


Figure 158. Vertical Profile 6, Day 193, 1332 hrs.

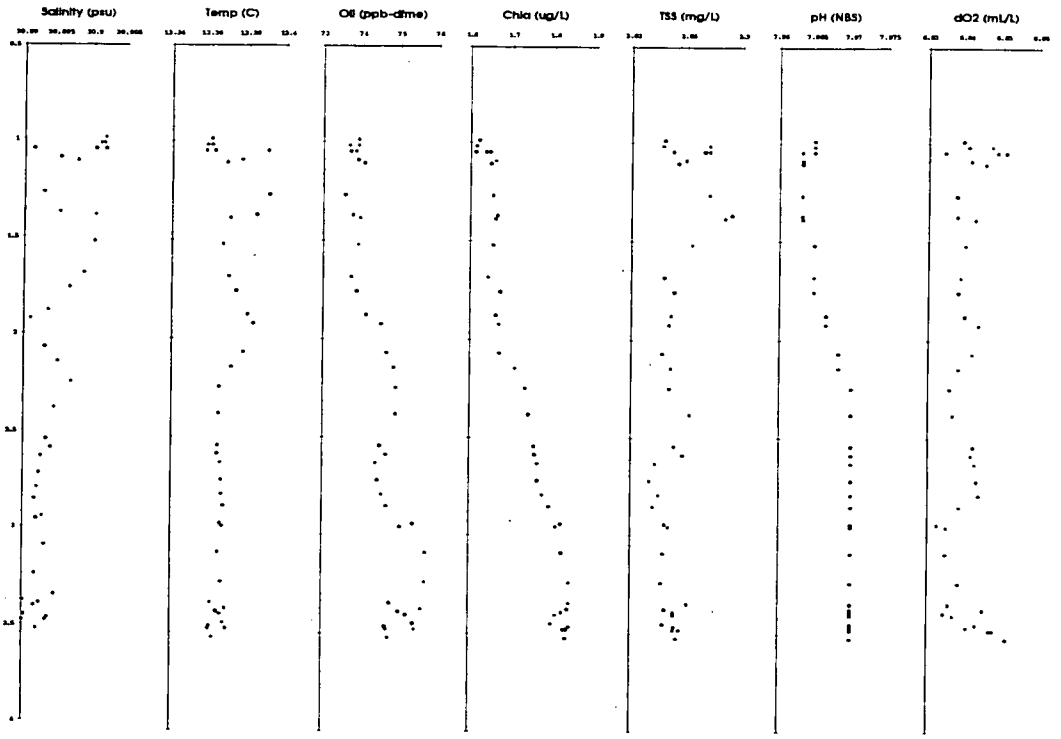


Figure 159. Vertical Profile 7, Day 193, 1404 hrs.

FIXED STATION SURVEYS

Day 195- Clark Cove

TABLE 20 Statistical Summary
FIGURE 160 Time Series Plot
FIGURE 161 Vertical Profile 1, 0916 hrs.
FIGURE 162 Vertical Profile 2, 1032 hrs.
FIGURE 163 Vertical Profile 3, 1133 hrs.
FIGURE 164 Vertical Profile 4, 1233 hrs.
FIGURE 165 Vertical Profile 5, 1332 hrs.

TABLE 20. Day 195 Fixed Station Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	607	1.170	0.271	0.101	1.999	1.897
Salinity	602	30.450	0.187	30.186	31.012	0.826
Temperature	613	14.724	0.411	12.955	16.055	3.101
pH	544	7.959	0.029	7.903	8.028	0.124
Dissolved Oxygen	549	6.202	0.265	5.686	6.872	1.186
Chlorophyll	536	0.800	0.325	0.566	1.539	0.973
Oils Florescence	370	11.563	6.079	3.761	27.992	24.231
Nephelometry	576	0.812	0.103	0.553	1.198	0.645
Transmittance	588	63.924	7.379	44.265	75.414	31.149
Bottom Depth	221	-8.419	0.206	-9.200	-8.000	1.200
TSS Neph	576	3.380	0.355	2.488	4.717	2.229
TSS Trans	588	4.683	1.112	2.951	7.644	4.693

* * * * * * **Pearson Correlation Matrix** * * * * * *

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000 0.00000	-0.19013 0.00000	0.18674 0.00000	0.20510 0.00000	0.21633 0.00000	0.17955 0.00001	-0.07912 0.05023	0.03166 0.43395	-0.07912 0.05023	-0.03166 0.43395
tem	-0.19013 0.00000	1.00000 0.00000	-0.40327 0.00000	-0.48232 0.00000	-0.83297 0.00000	-0.83063 0.00000	0.61645 0.00000	-0.36059 0.00000	0.61645 0.00000	0.36059 0.00000
ph	0.18674 0.00000	-0.40327 0.00000	1.00000 0.00000	0.94559 0.00000	0.62488 0.00000	0.34670 0.00000	0.06531 0.10620	-0.30171 0.00000	0.06531 0.10620	0.30171 0.00000
do2	0.20510 0.00000	-0.48232 0.00000	0.94559 0.00000	1.00000 0.00000	0.67351 0.00000	0.41302 0.00000	0.00387 0.92373	-0.20879 0.00000	0.00387 0.92373	0.20879 0.00000
chl	0.21633 0.00000	-0.83297 0.00000	0.62488 0.00000	0.67351 0.00000	1.00000 0.00000	0.80037 0.00000	-0.51708 0.00000	0.29015 0.00000	-0.51708 0.00000	-0.29015 0.00000
oil	0.17955 0.00001	-0.83063 0.00000	0.34670 0.00000	0.41302 0.00000	0.80037 0.00000	1.00000 0.00000	-0.60780 0.00000	0.39395 0.00000	-0.60780 0.00000	-0.39395 0.00000
nep	-0.07912 0.05023	0.61645 0.00000	0.06531 0.10620	0.00387 0.92373	-0.51708 0.00000	-0.60780 0.00000	1.00000 0.00000	-0.56223 0.00000	1.00000 0.00000	0.56223 0.00000
tra	0.03166 0.43395	-0.36059 0.00000	-0.30171 0.00000	-0.20879 0.00000	0.29015 0.00000	0.39395 0.00000	-0.56223 0.00000	1.00000 0.00000	-0.56223 0.00000	-1.00000 1.00000
tssn	-0.07912 0.05023	0.61645 0.00000	0.06531 0.10620	0.00387 0.92373	-0.51708 0.00000	-0.60780 0.00000	1.00000 0.00000	-0.56223 0.00000	1.00000 0.00000	0.56223 0.00000
tsst	-0.03166 0.43395	0.36059 0.00000	0.30171 0.00000	0.20879 0.00000	-0.29015 0.00000	-0.39395 0.00000	0.56223 0.00000	-1.00000 1.00000	0.56223 0.00000	1.00000 0.00000

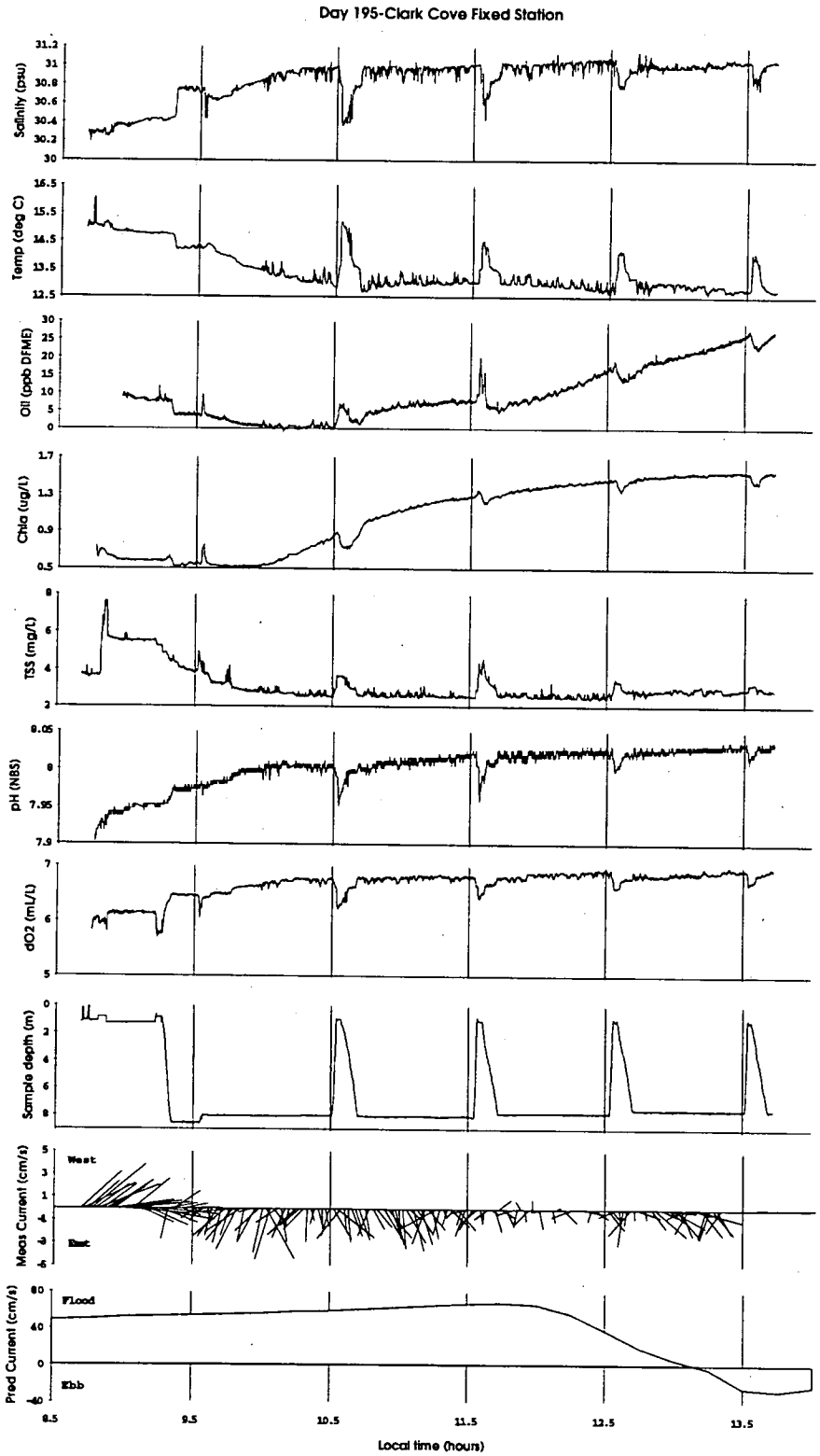


Figure 160. Day 195 time series plot.

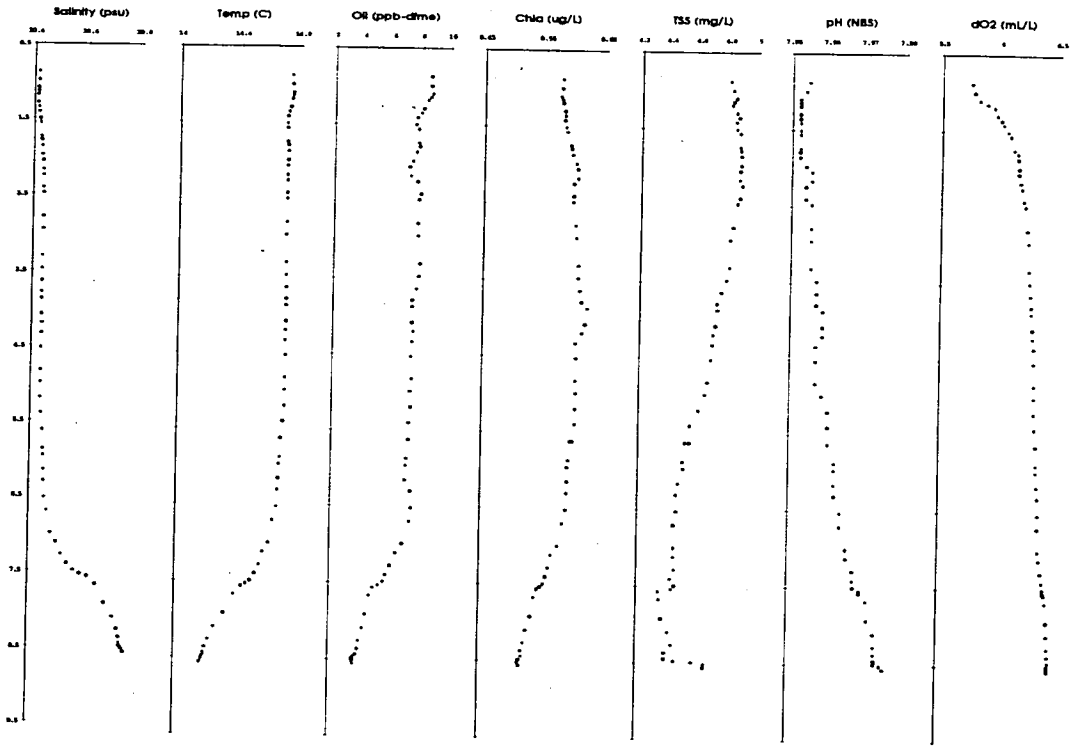


Figure 161. Vertical Profile 1, Day 195, 0916 hrs.

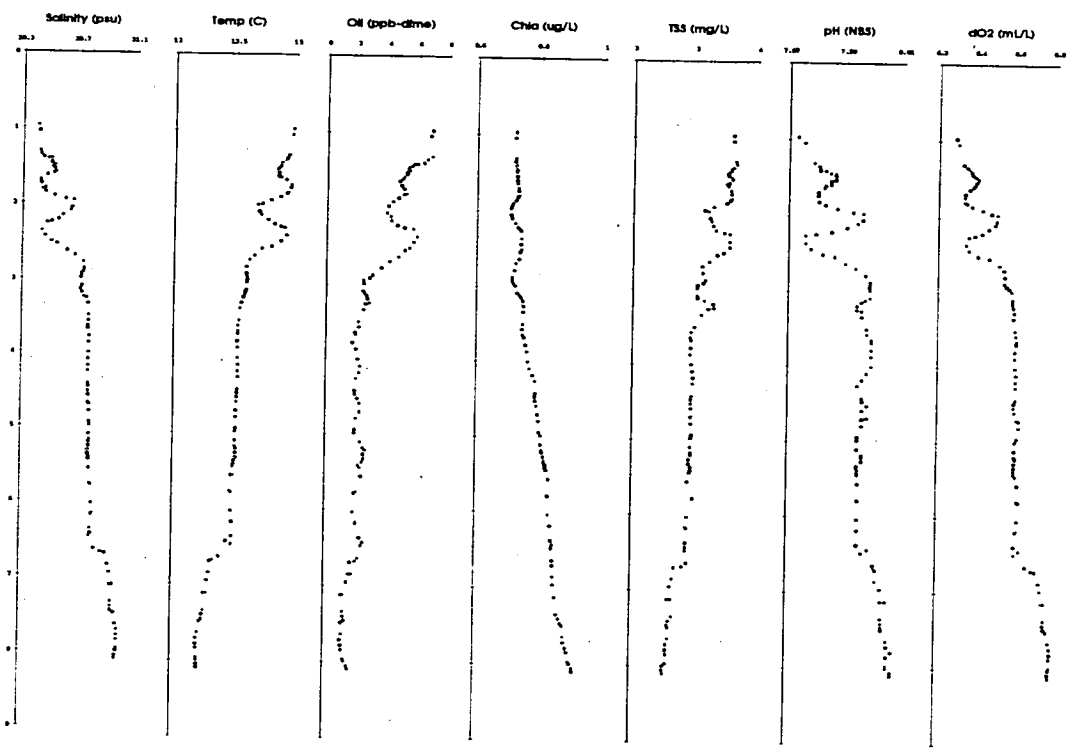


Figure 162. Vertical Profile 2, Day 195, 1032 hrs.

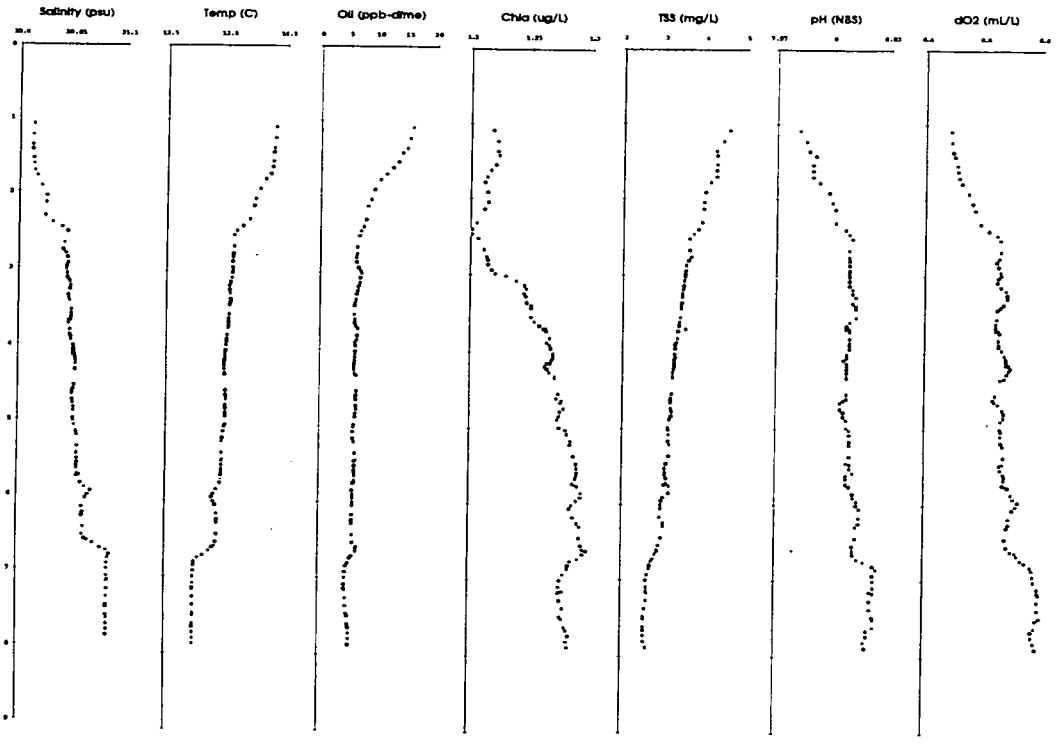


Figure 163. Vertical Profile 3, Day 195, 1132 hrs.

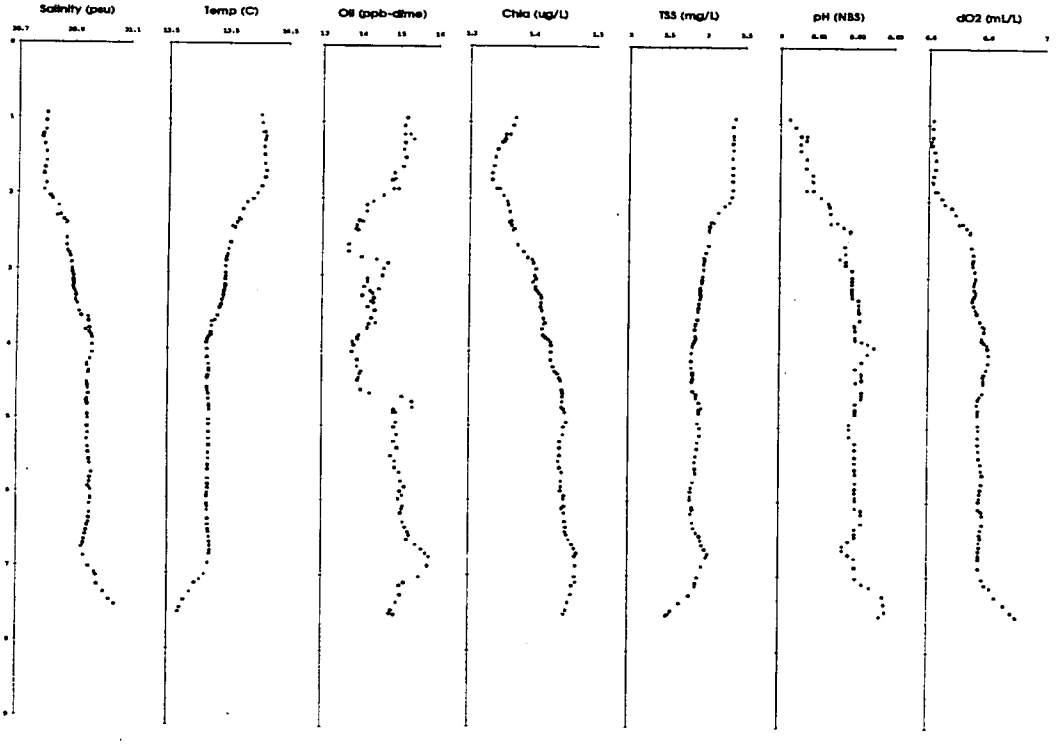


Figure 164. Vertical Profile 4, Day 195, 1233 hrs.

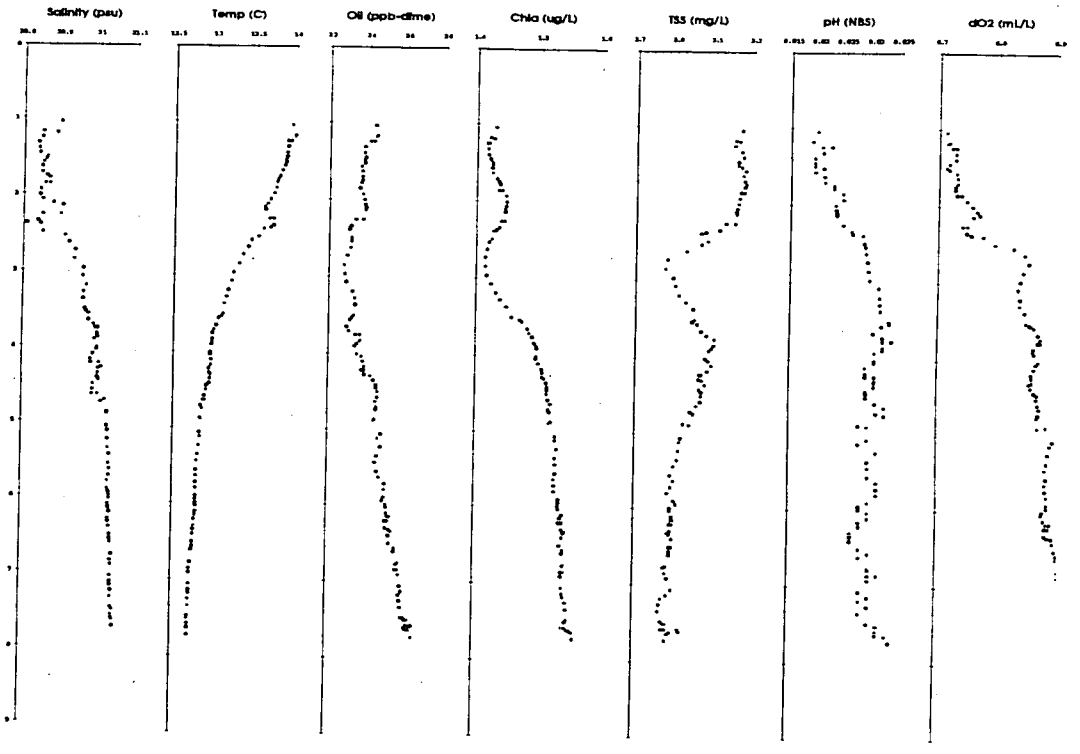


Figure 165. Vertical Profile 5, Day 195, 1332 hrs.

FIXED STATION SURVEYS

Day 200- Jamaica Island

TABLE 21 Statistical Summary
FIGURE 166 Time Series Plot
FIGURE 167 Vertical Profile 1, 1130 hrs.
FIGURE 168 Vertical Profile 2, 1230 hrs.
FIGURE 169 Vertical Profile 3, 1330 hrs.
FIGURE 170 Vertical Profile 4, 1430 hrs.
FIGURE 171 Vertical Profile 5, 1530 hrs.
FIGURE 172 Vertical Profile 6, 1630 hrs.
FIGURE 173 Vertical Profile 7, 1730 hrs.

TABLE 21. Day 200 Fixed Station Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	5148	1.103	0.142	0.235	1.984	1.749
Salinity	4996	30.509	0.249	30.022	30.863	0.841
Temperature	5034	14.998	0.693	13.837	16.065	2.229
pH	4949	7.976	0.021	7.891	8.014	0.123
Dissolved Oxygen	4899	5.884	0.222	5.043	6.479	1.436
Chlorophyll	5140	1.140	0.384	0.463	1.605	1.142
Oils Florescence	5082	33.738	15.575	7.103	67.095	59.991
Nephelometry	4837	1.005	0.175	0.731	1.445	0.714
Transmittance	5008	69.864	2.158	47.771	73.227	25.456
Bottom Depth	5112	-7.467	0.542	-9.000	-5.100	3.900
TSS Neph	4837	4.048	0.605	3.102	5.568	2.466
TSS Trans	5008	3.788	0.325	3.281	7.116	3.835

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	chl	oil	nep	tra	tssn	tsst
sal	1.00000	-0.96180	0.90748	0.43860	0.91343	0.93769	-0.88181	0.70974	-0.88181	-0.70974
	0.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
tem	-0.96180	1.00000	-0.81426	-0.40038	-0.85272	-0.86968	0.84604	-0.79168	0.84604	0.79168
	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
ph	0.90748	-0.81426	1.00000	0.53500	0.93041	0.88959	-0.71577	0.57233	-0.71577	-0.57233
	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
do2	0.43860	-0.40038	0.53500	1.00000	0.46047	0.36482	-0.18312	0.30179	-0.18312	-0.30179
	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
chl	0.91343	-0.85272	0.93041	0.46047	1.00000	0.94957	-0.73568	0.59446	-0.73568	-0.59446
	1.00000	1.00000	1.00000	0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000
oil	0.93769	-0.86968	0.88959	0.36482	0.94957	1.00000	-0.84436	0.57857	-0.84436	-0.57857
	1.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000
nep	-0.88181	0.84604	-0.71577	-0.18312	-0.73568	-0.84436	1.00000	-0.65122	1.00000	0.65122
	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tra	0.70974	-0.79168	0.57233	0.30179	0.59446	0.57857	-0.65122	1.00000	-0.65122	-1.00000
	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000
tssn	-0.88181	0.84604	-0.71577	-0.18312	-0.73568	-0.84436	1.00000	-0.65122	1.00000	0.65122
	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	0.00000	1.00000	0.00000	1.00000
tsst	-0.70974	0.79168	-0.57233	-0.30179	-0.59446	-0.57857	0.65122	-1.00000	0.65122	1.00000
	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000

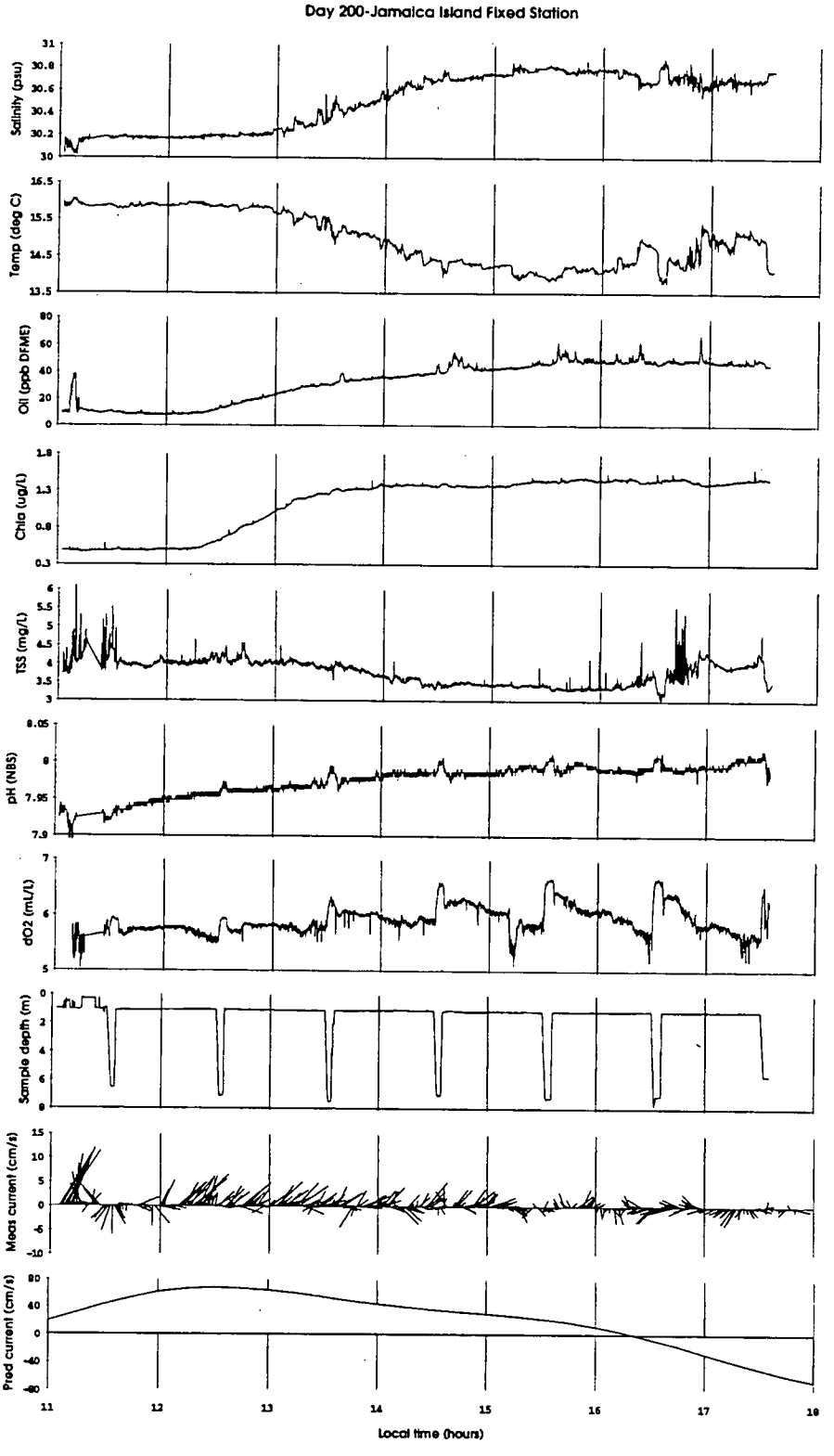


Figure 166. Day 200 time series plot.

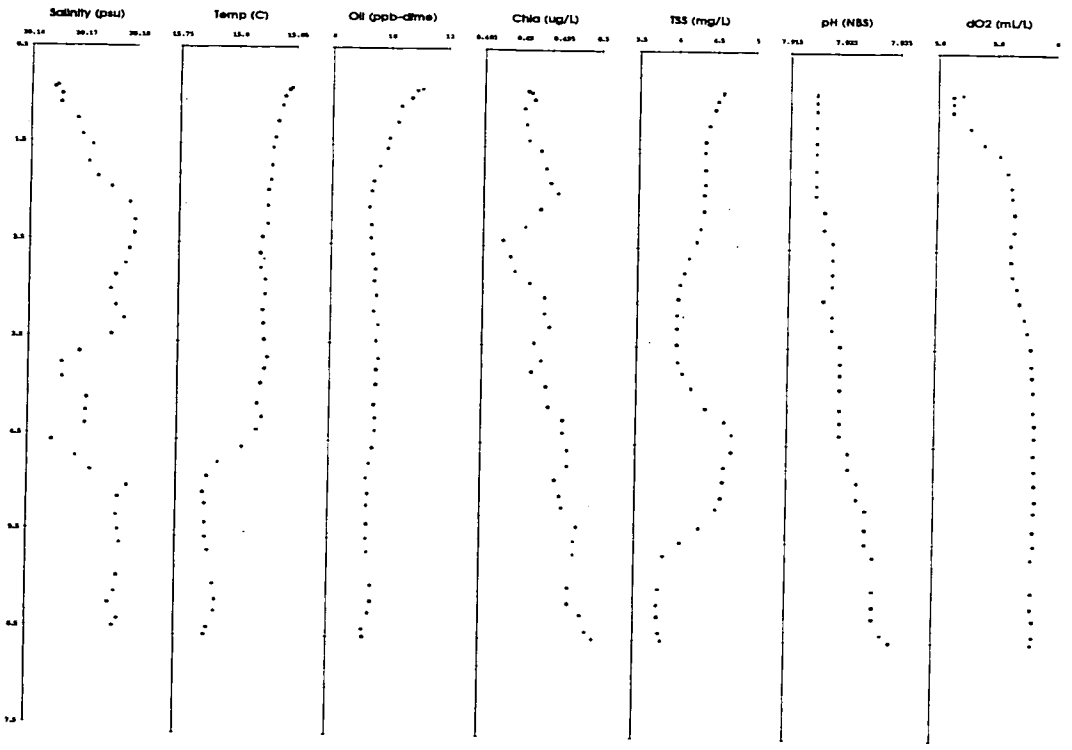


Figure 167. Vertical Profile 1, Day 200, 1130 hrs.

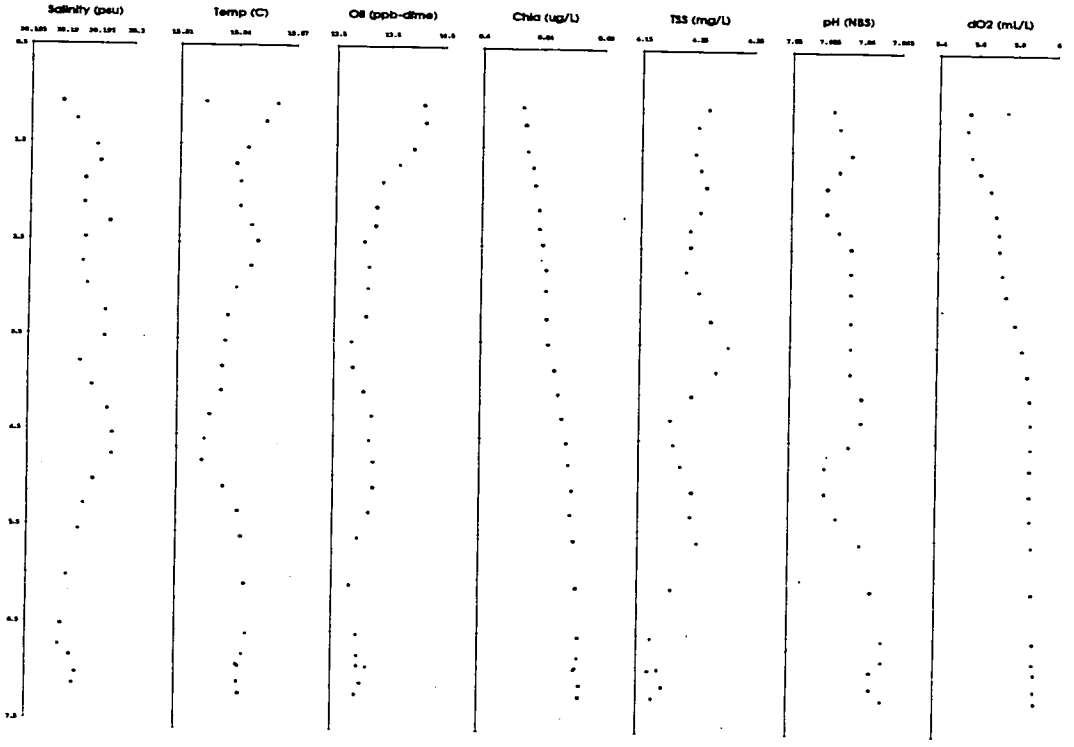


Figure 168. Vertical Profile 2, Day 200, 1230 hrs.

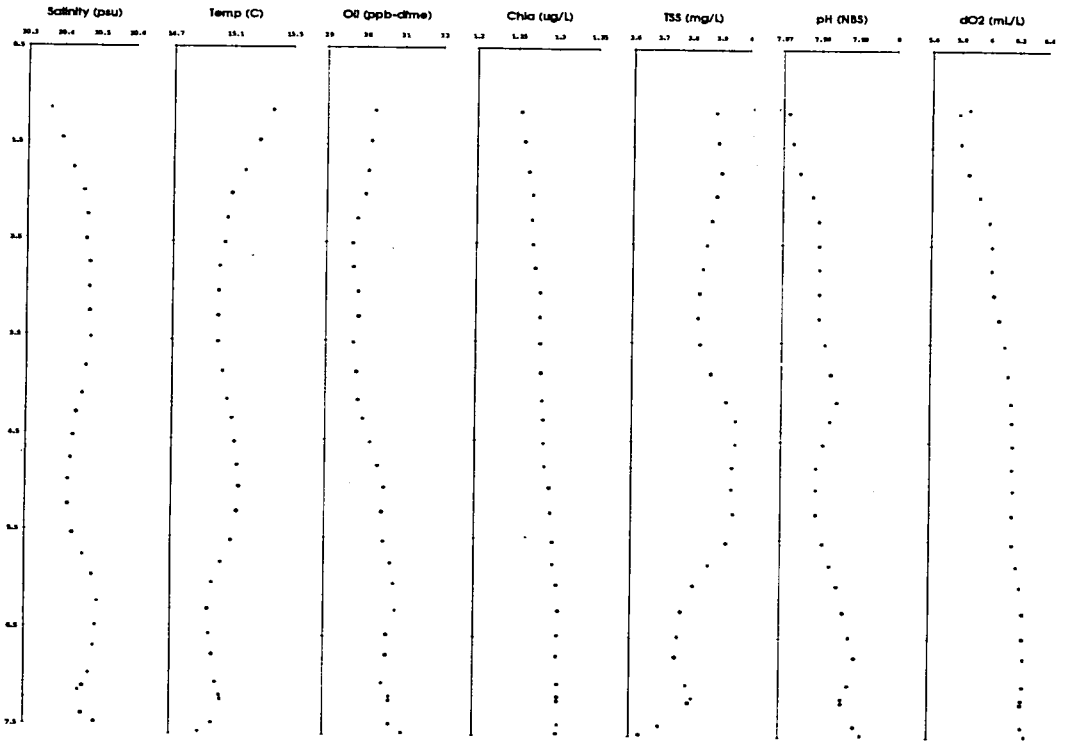


Figure 169. Vertical Profile 3, Day 200, 1330 hrs.

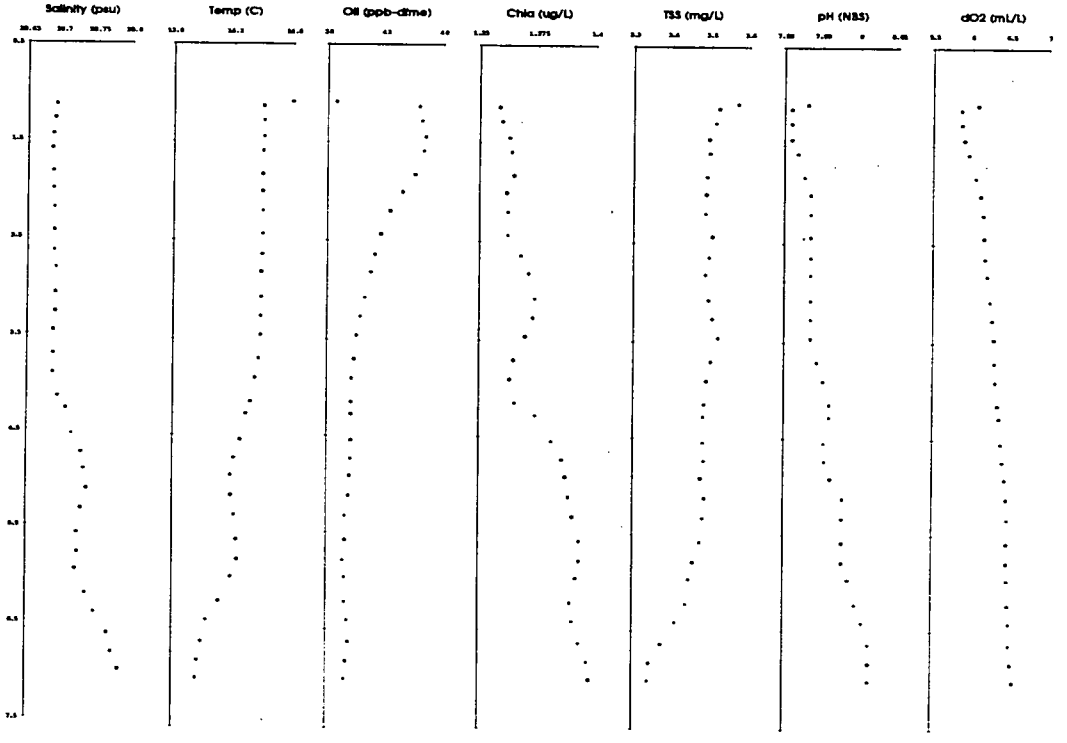


Figure 170. Vertical Profile 4, Day 200, 1430 hrs.

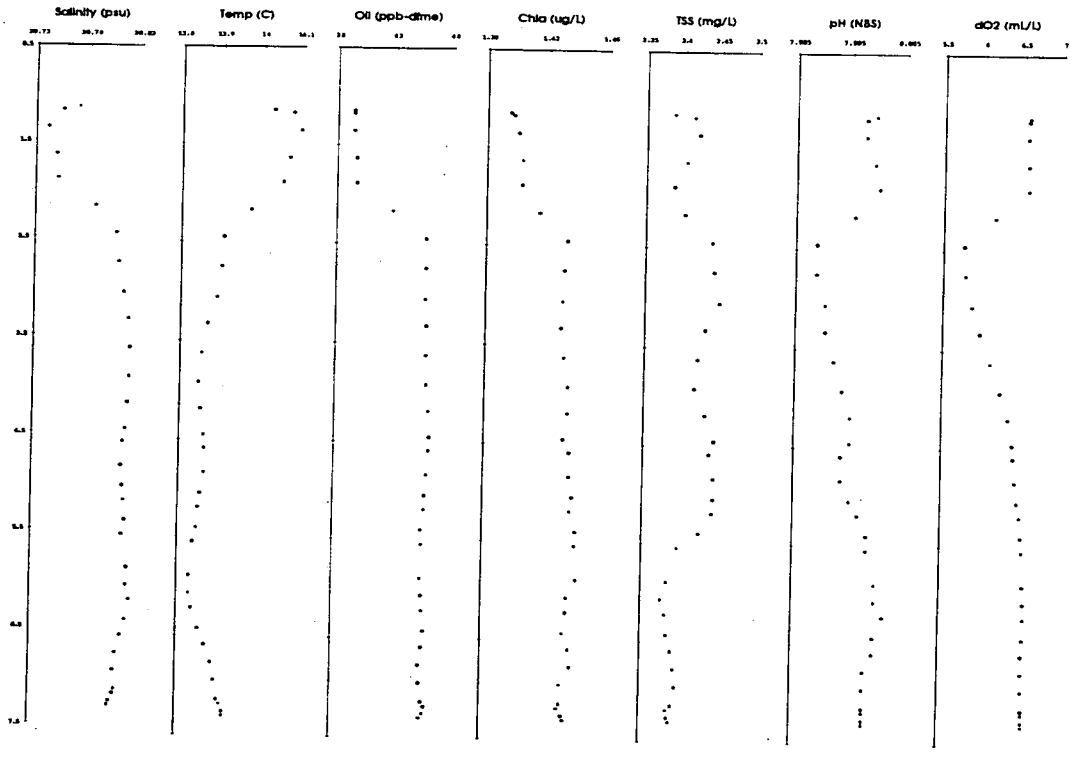


Figure 171. Vertical Profile 5, Day 200, 1530 hrs.

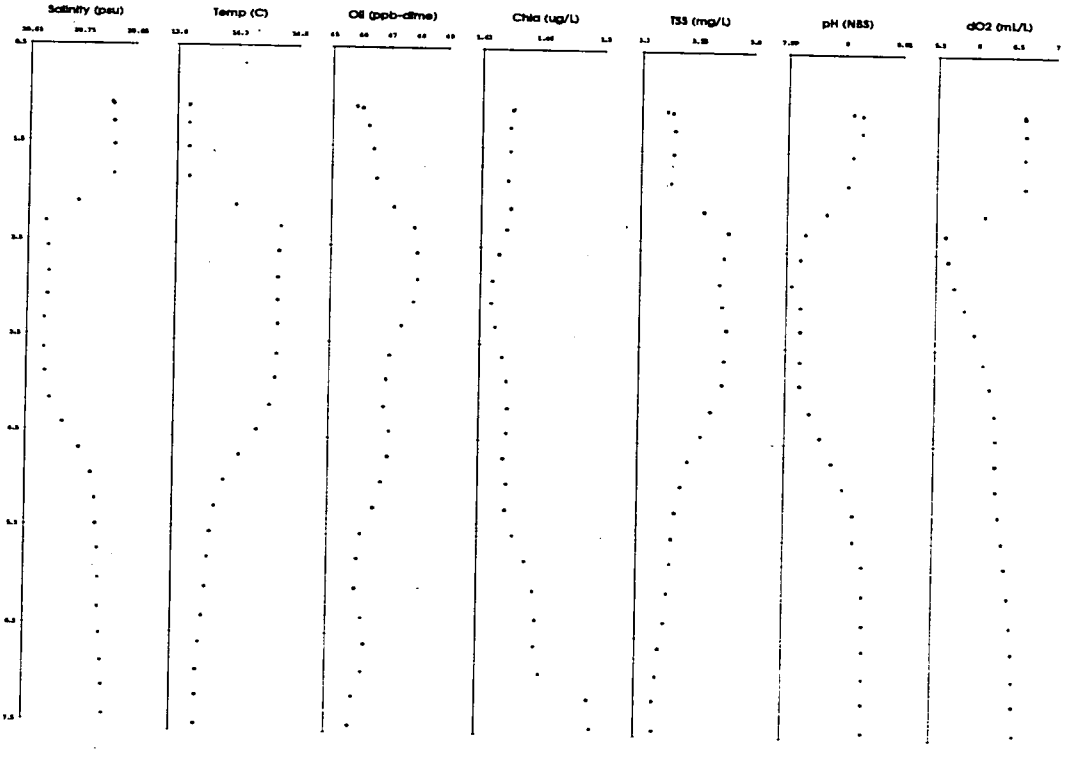


Figure 172. Vertical Profile 6, Day 200, 1630 hrs.

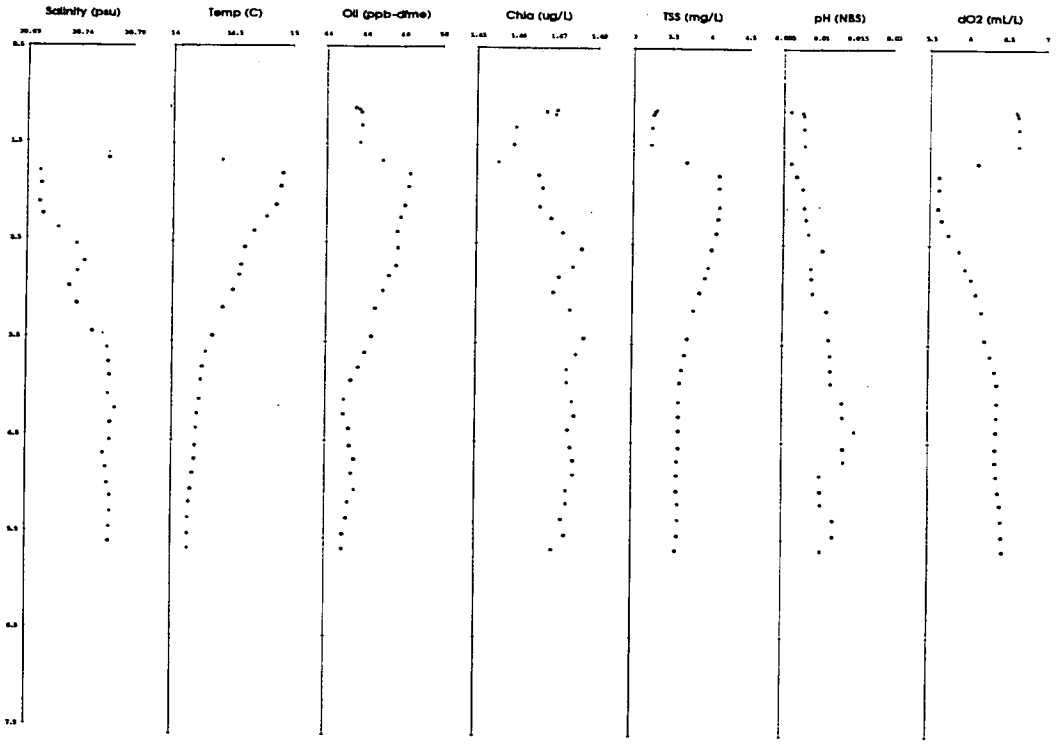


Figure 173. Vertical Profile 7, Day 200, 1730 hrs.

DYE RELEASE SURVEYS

Day 203- Flood Tide Release

TABLE 22 Statistical Summary
FIGURE 174 Areal Dispersion Plot Estimated from Aerial Photography
FIGURE 175 Dye Concentration Plot
FIGURE 176 Dye Patch 1 Concentration Profile
FIGURE 177 Dye Patch 2 Concentration Profile
FIGURE 178 Dye Patch 3 Concentration Profile
FIGURE 179 Dye Patch 4 Concentration Profile
FIGURE 180 Dye Patch 5 Concentration Profile
FIGURE 181 Dye Patch 6 Concentration Profile
FIGURE 182 Dye Patch 7 Concentration Profile
FIGURE 183 Dye Patch 8 Concentration Profile
FIGURE 184 Dye Patch 9 Concentration Profile

TABLE 22. Day 203 Dye Study Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	3011	1.307	0.136	0.917	1.999	1.082
Salinity	3011	29.404	0.515	28.495	31.355	2.861
Temperature	3011	17.652	1.185	12.247	19.366	7.119
pH	3011	7.925	0.026	7.884	8.013	0.129
Dissolved Oxygen	3011	5.882	0.345	5.579	7.234	1.655
Rhodamine	3004	4.565	30.892	0.458	929.514	929.056
Oils Flourescence	2987	15.826	2.913	8.718	23.647	14.928
Nephelometry	2980	1.523	3.389	0.535	85.280	84.745
Transmittance	2809	67.308	3.716	59.132	78.696	19.564
Bottom Depth	2812	-16.508	3.941	-25.300	-3.000	22.300
TSS Neph	2979	5.841	11.714	2.426	295.256	292.830
TSS Trans	2809	4.173	0.560	2.457	5.405	2.947

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	rho	oil	nep	tra	tssn	tsst
sal	1.00000	-0.98512	0.67502	0.96099	-0.04654	-0.43299	-0.08465	0.84070	-0.08433	-0.84070
	0.00000	0.89004	0.47173	0.82160	0.01064	0.00000	0.00000	0.63571	0.00000	0.63571
tem	-0.98512	1.00000	-0.66877	-0.97662	0.04670	0.35200	0.08459	-0.83473	0.08422	0.83473
	0.89004	0.00000	0.46636	0.86207	0.01038	0.00000	0.00000	0.62875	0.00000	0.62875
ph	0.67502	-0.66877	1.00000	0.62399	0.12151	-0.18784	0.04584	0.78443	0.04608	-0.78443
	0.47173	0.46636	0.00000	0.42898	0.00000	0.00000	0.01188	0.57409	0.01145	0.57409
do2	0.96099	-0.97662	0.62399	1.00000	-0.07250	-0.24542	-0.10316	0.77262	-0.10282	-0.77262
	0.82160	0.86207	0.42898	0.00000	0.00007	0.00000	0.00000	0.56211	0.00000	0.56211
rho	-0.04654	0.04670	0.12151	-0.07250	1.00000	0.08585	0.29914	0.07130	0.29913	-0.07130
	0.01064	0.01038	0.00000	0.00007	0.00000	0.00000	0.00000	0.00009	0.00000	0.00009
oil	-0.43299	0.35200	-0.18784	-0.24542	0.08585	1.00000	0.05825	-0.36260	0.05825	0.36260
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00138	0.00000	0.00139	0.00000
nep	-0.08465	0.08459	0.04584	-0.10316	0.29914	0.05825	1.00000	0.00169	0.99999	-0.00169
	0.00000	0.00000	0.01188	0.00000	0.00000	0.00138	0.00000	0.92601	0.00000	0.92601
tra	0.84070	-0.83473	0.78443	0.77262	0.07130	-0.36260	0.00169	1.00000	0.00196	-1.00000
	0.63571	0.62875	0.57409	0.56211	0.00009	0.00000	0.92601	0.00000	0.91457	1.00000
tssn	-0.08433	0.08422	0.04608	-0.10282	0.29913	0.05825	0.99999	0.00196	1.00000	-0.00196
	0.00000	0.00000	0.01145	0.00000	0.00000	0.00139	0.00000	0.91457	0.00000	0.91457
tsst	-0.84070	0.83473	-0.78443	-0.77262	-0.07130	0.36260	-0.00169	-1.00000	-0.00196	1.00000
	0.63571	0.62875	0.57409	0.56211	0.00009	0.00000	0.92601	1.00000	0.91457	0.00000

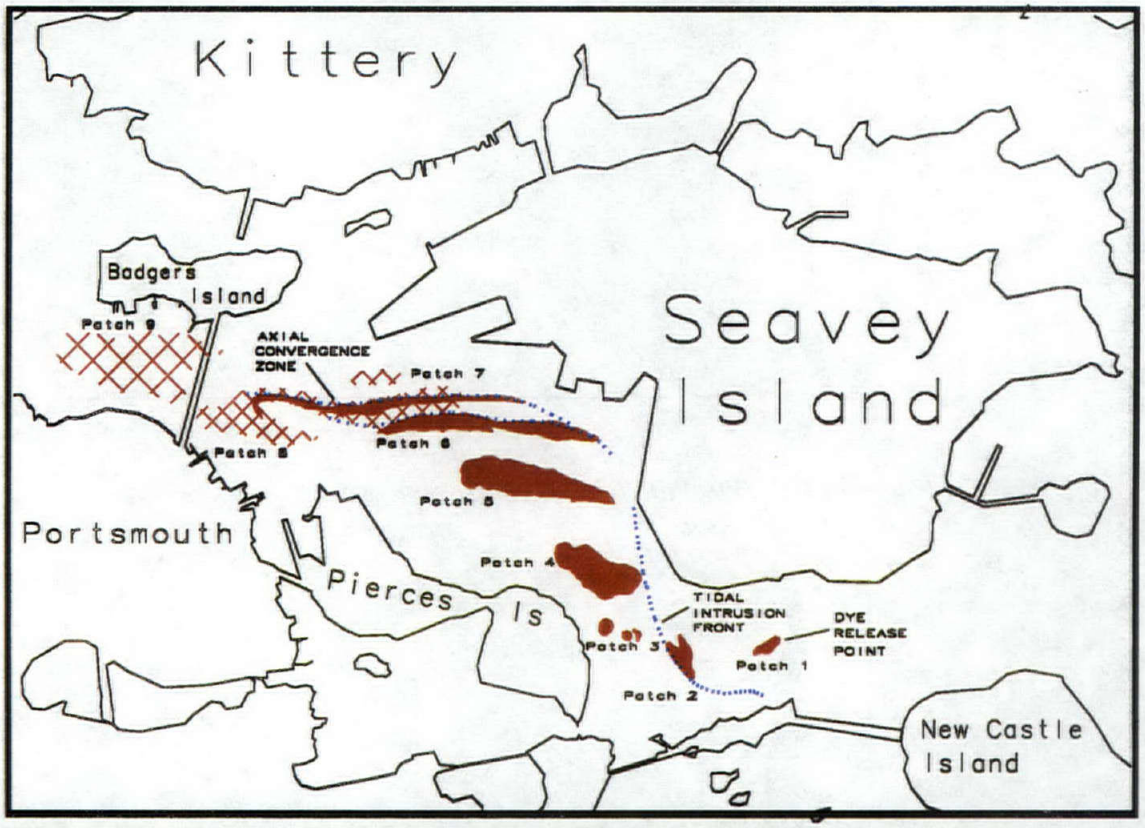


Figure 174. Dye patch locations estimated from aerial photography.

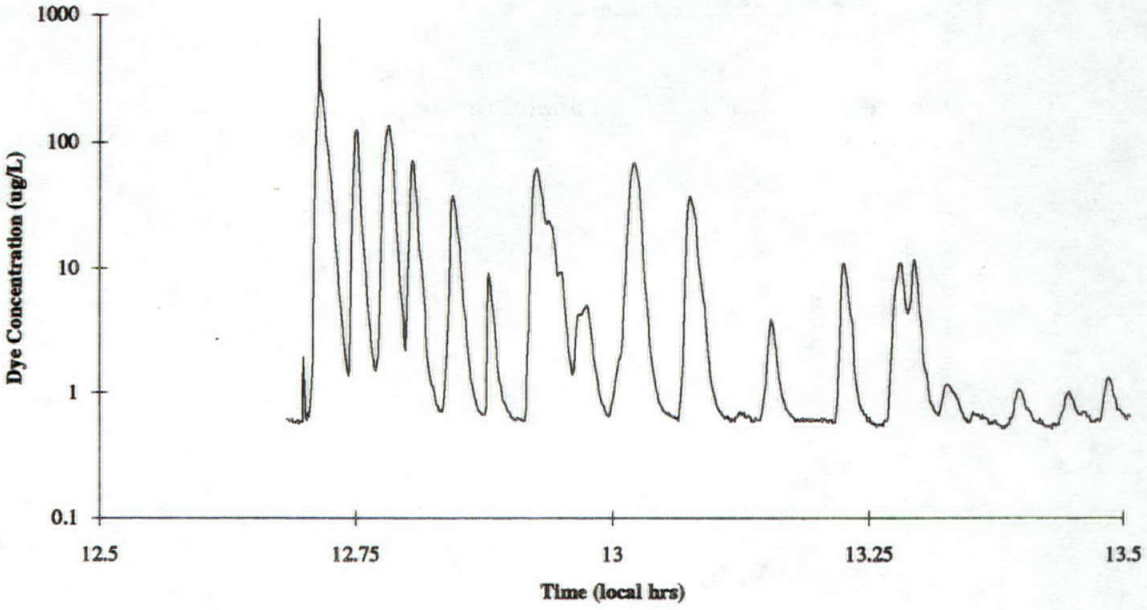


Figure 175. Rhodamine WT concentration as a function of time.

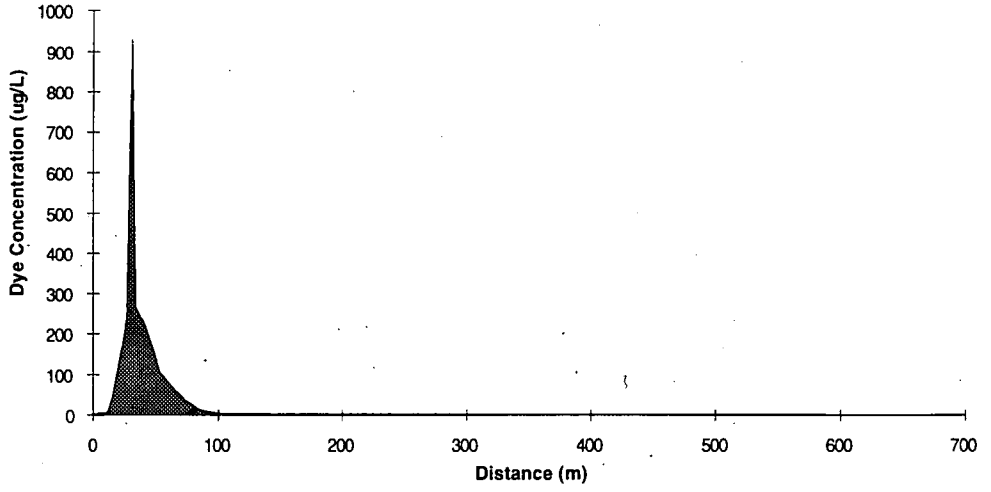


Figure 176. Dye Patch 1 concentration profile.

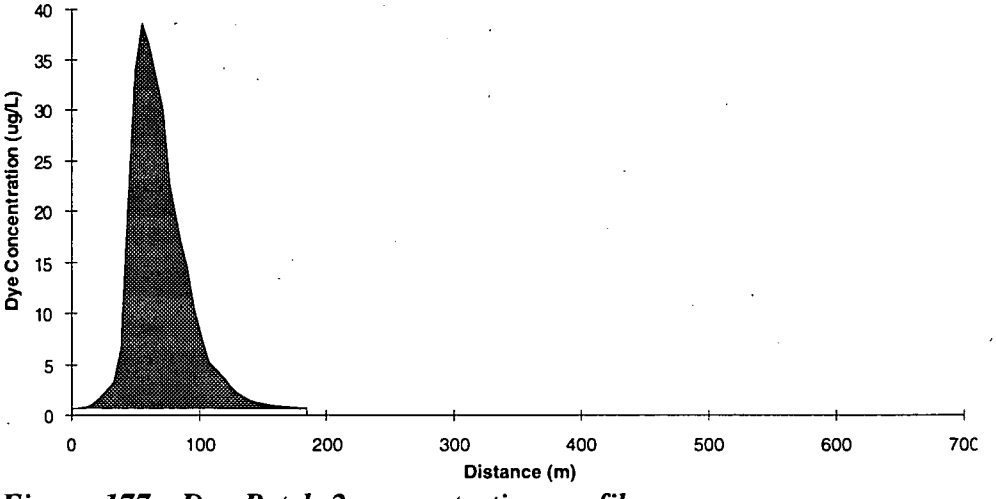


Figure 177. Dye Patch 2 concentration profile.

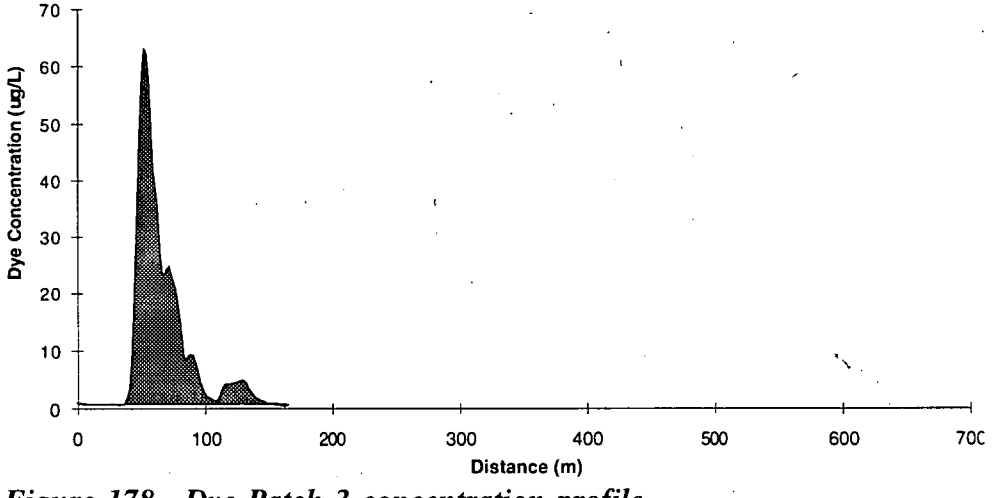


Figure 178. Dye Patch 3 concentration profile.

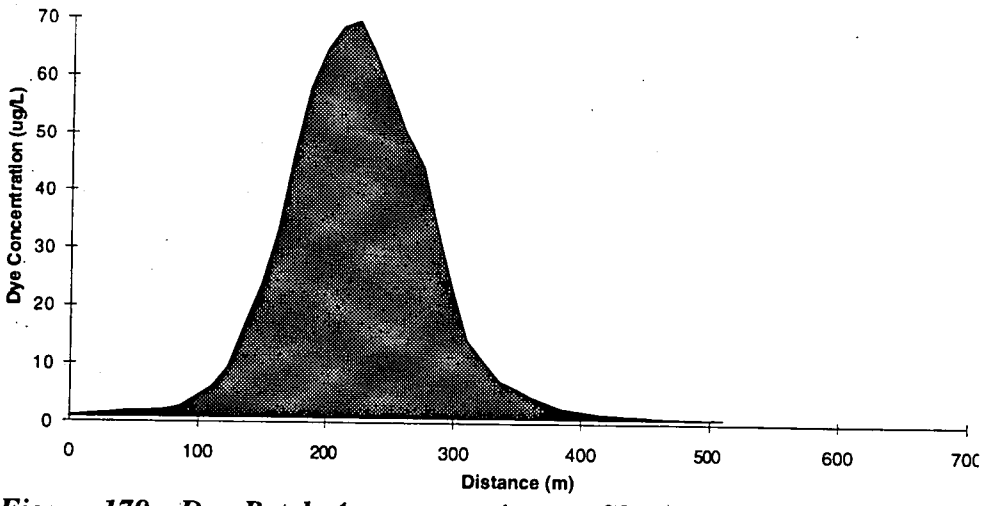


Figure 179. Dye Patch 4 concentration profile.

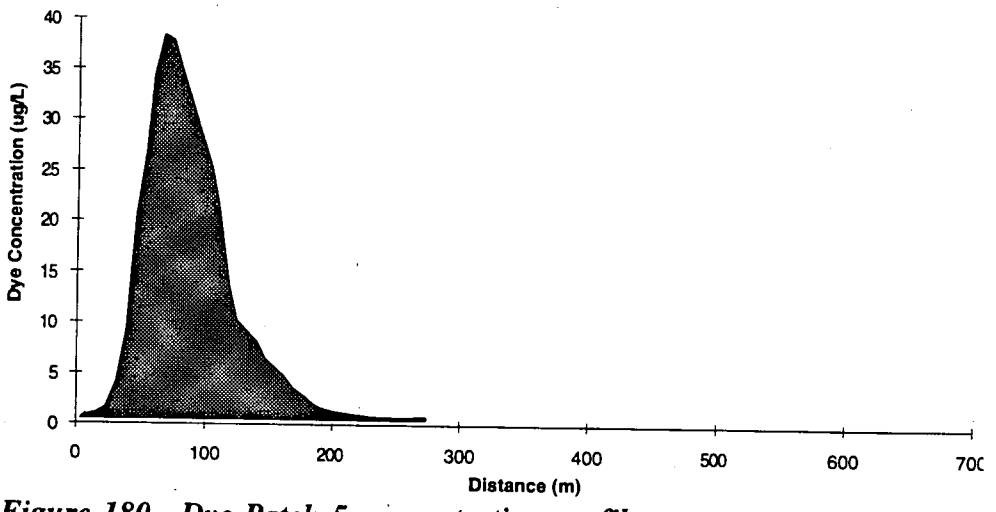


Figure 180. Dye Patch 5 concentration profile.

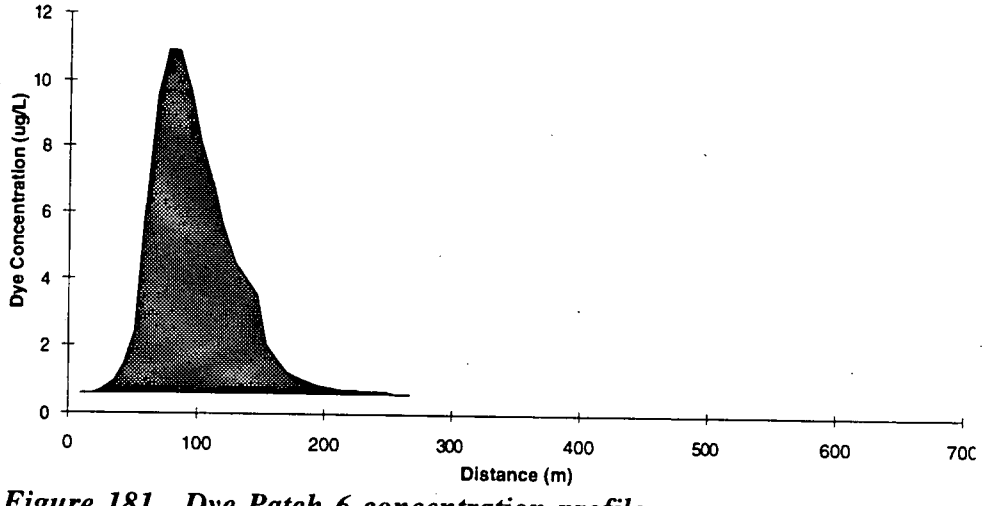


Figure 181. Dye Patch 6 concentration profile.

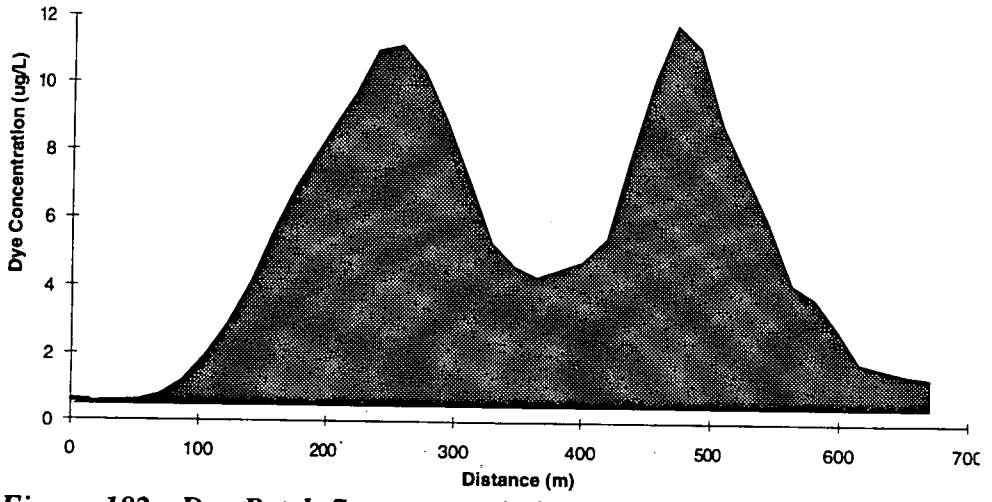


Figure 182. Dye Patch 7 concentration profile.

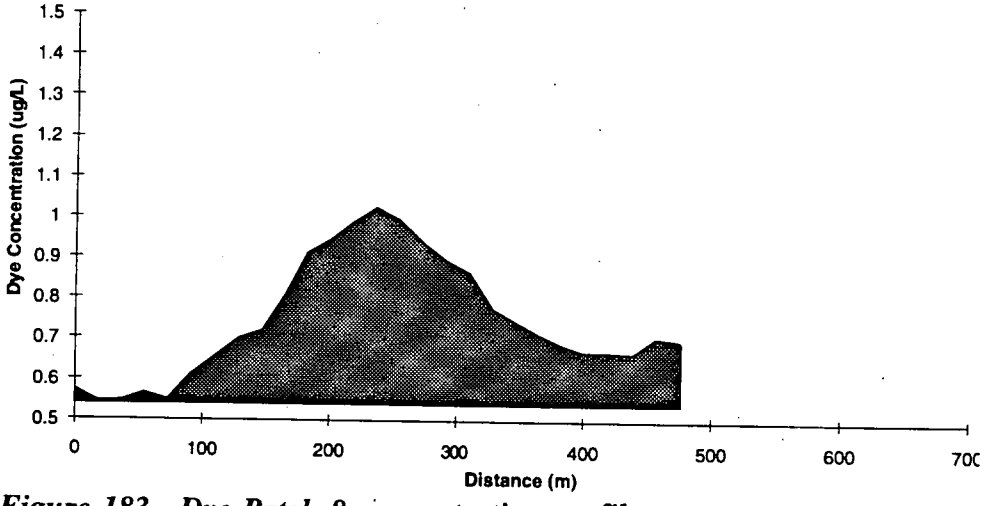


Figure 183. Dye Patch 8 concentration profile.

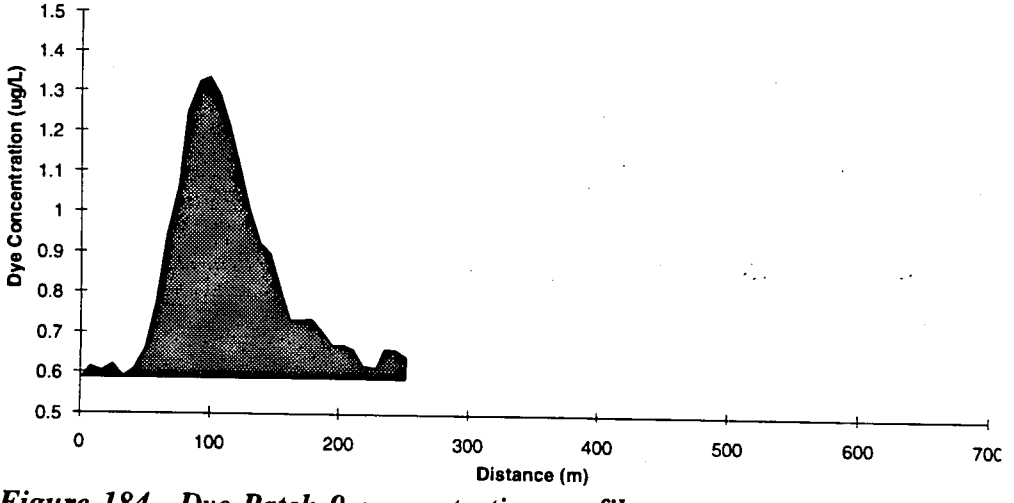


Figure 184. Dye Patch 9 concentration profile.

DYE RELEASE SURVEYS

Day 204- Ebb Tide Release

TABLE 23 Statistical Summary
FIGURE 185 Dye Concentration Plot

Day 204- Clark Cove Release

TABLE 24 Statistical Summary
FIGURE 186 Dye Concentration Plot

TABLE 23. Day 204 Ebb Tide Dye Study Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range	
Sample Depth	2048	1.345	0.156	0.999	1.983	0.983	
Salinity	2044	30.658	0.241	29.889	31.128	1.239	
Temperature	2048	13.689	0.751	12.331	15.815	3.484	
pH	2048	8.097	0.029	8.027	8.187	0.160	
Dissolved Oxygen	2048	6.162	0.182	5.560	6.412	0.852	
Rhodamine	2016	22.942	598.939	0.439	26582.550	26582.111	
Oils Flourescence	2021	0.236	2.543	-3.536	11.671	15.207	
Nephelometry	2044	1.172	2.660	0.577	71.380	70.803	
Transmittance	1958	75.108	1.674	68.181	78.891	10.710	
Bottom Depth	1992	-17.029	3.999	-24.700	-4.800	19.900	
TSS Neph	2044	4.625	9.190	2.570	247.225	244.655	
TSS Trans	1958	2.998	0.252	2.428	4.041	1.614	

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	rho	oil	nep	tra	tssn	tsst
sal	1.00000	-0.97913	0.71449	0.96255	0.01267	-0.83648	0.00039	0.74272	0.00039	-0.74272
	0.00000	1.00000	1.00000	1.00000	0.56675	1.00000	0.98576	1.00000	0.98576	1.00000
tem	-0.97913	1.00000	-0.70903	-0.96689	0.00521	0.84344	0.00561	-0.75367	0.00561	0.75367
	1.00000	0.00000	1.00000	1.00000	0.81377	1.00000	0.79978	1.00000	0.79978	1.00000
ph	0.71449	-0.70903	1.00000	0.62336	0.05622	-0.52668	0.17532	0.71863	0.17532	-0.71863
	1.00000	1.00000	0.00000	0.00000	0.01094	0.00000	0.00000	1.00000	0.00000	1.00000
do2	0.96255	-0.96689	0.62336	1.00000	-0.02031	-0.85551	-0.02233	0.69761	-0.02233	-0.69761
	1.00000	1.00000	0.00000	0.00000	0.35834	1.00000	0.31257	0.00000	0.31257	0.00000
rho	0.01267	0.00521	0.05622	-0.02031	1.00000	0.03668	0.09319	0.00999	0.09319	-0.00999
	0.56675	0.81377	0.01094	0.35834	0.00000	0.09706	0.00002	0.65148	0.00002	0.65148
oil	-0.83648	0.84344	-0.52668	-0.85551	0.03668	1.00000	0.13017	-0.70110	0.13017	0.70110
	1.00000	1.00000	0.00000	1.00000	0.09706	0.00000	0.00000	0.00000	0.00000	0.00000
nep	0.00039	0.00561	0.17532	-0.02233	0.09319	0.13017	1.00000	-0.00176	1.00000	0.00176
	0.98576	0.79978	0.00000	0.31257	0.00002	0.00000	0.00000	0.93650	0.00000	0.93650
tra	0.74272	-0.75367	0.71863	0.69761	0.00999	-0.70110	-0.00176	1.00000	-0.00176	-1.00000
	1.00000	1.00000	1.00000	0.00000	0.65148	0.00000	0.93650	0.00000	0.93650	1.00000
tssn	0.00039	0.00561	0.17532	-0.02233	0.09319	0.13017	1.00000	-0.00176	1.00000	0.00176
	0.98576	0.79978	0.00000	0.31257	0.00002	0.00000	0.00000	0.93650	0.00000	0.93650
tsst	-0.74272	0.75367	-0.71863	-0.69761	-0.00999	0.70110	0.00176	-1.00000	0.00176	1.00000
	1.00000	1.00000	1.00000	0.00000	0.65148	0.00000	0.93650	1.00000	0.93650	0.00000

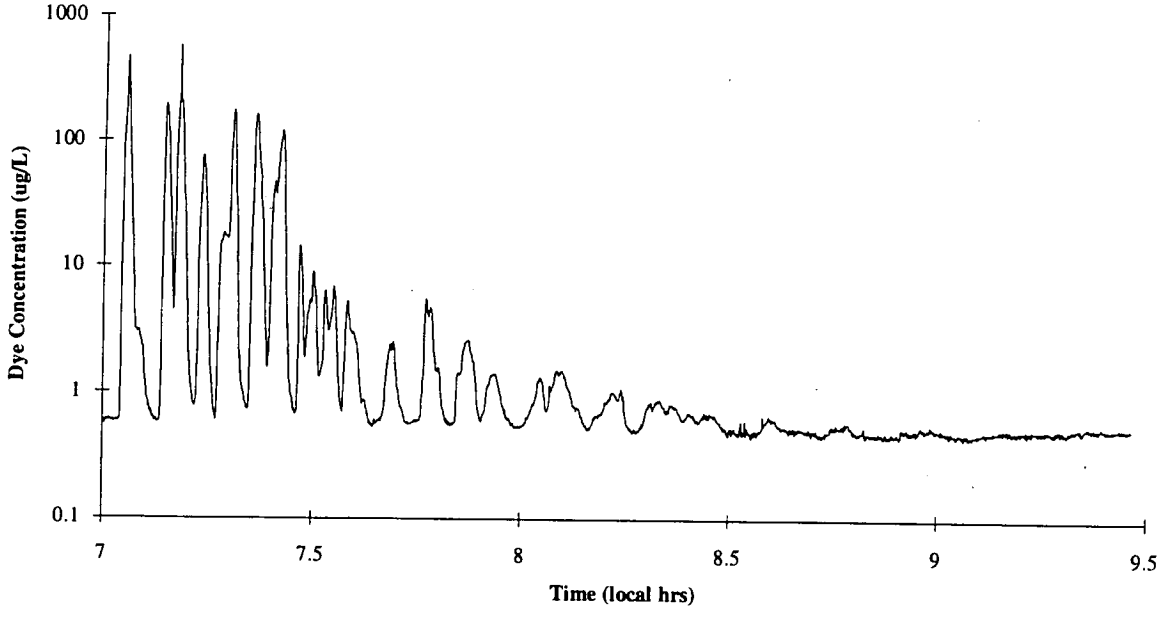


Figure 185. Rhodamine WT concentration as a function of time.

TABLE 24. Day 204 Clark Cove Dye Study Statistical Summary. Sample Depth <= 2.0 meters.

variable	n	mean	std	min	max	range
Sample Depth	3607	1.321	0.205	0.835	1.997	1.162
Salinity	3606	29.702	0.566	27.992	30.984	2.992
Temperature	3607	16.534	0.988	14.240	19.634	5.394
pH	3607	8.020	0.041	7.929	8.151	0.222
Dissolved Oxygen	3606	5.639	0.278	5.070	6.480	1.410
Rhodamine	3599	3.295	26.118	0.480	820.783	820.303
Oils Flourescence	3597	10.470	3.929	4.931	25.986	21.056
Nephelometry	3601	0.949	0.773	0.379	18.270	17.891
Transmittance	3565	69.230	3.747	56.362	78.424	22.062
Bottom Depth	3512	-11.424	4.561	-25.700	-2.900	22.800
TSS Neph	3601	3.854	2.672	1.885	63.707	61.822
TSS Trans	3565	3.883	0.565	2.498	5.822	3.324

* * * * * * Pearson Correlation Matrix * * * * * *

	sal	tem	ph	do2	rho	oil	nep	tra	tssn	tsst
sal	1.00000	-0.97161	0.96262	0.93048	0.00876	-0.67860	-0.17745	0.90515	-0.17745	-0.90515
	0.00000	0.84794	0.82538	0.76122	0.59878	0.47483	0.00000	0.72048	0.00000	0.72048
tem	-0.97161	1.00000	-0.91020	-0.85547	-0.01856	0.75614	0.14373	-0.86410	0.14373	0.86410
	0.84794	0.00000	0.72814	0.65346	0.26513	0.54583	0.00000	0.66423	0.00000	0.66423
ph	0.96262	-0.91020	1.00000	0.96764	-0.00210	-0.51654	-0.19961	0.86865	-0.19961	-0.86865
	0.82538	0.72814	0.00000	0.83761	0.89976	0.00000	0.00000	0.67002	0.00000	0.67002
do2	0.93048	-0.85547	0.96764	1.00000	-0.02124	-0.43332	-0.23352	0.82932	-0.23352	-0.82932
	0.76122	0.65346	0.83761	0.00000	0.20212	0.00000	0.00000	0.62255	0.00000	0.62255
rho	0.00876	-0.01856	-0.00210	-0.02124	1.00000	0.05984	0.86500	0.03260	0.86500	-0.03260
	0.59878	0.26513	0.89976	0.20212	0.00000	0.00032	0.66537	0.05029	0.66537	0.05029
oil	-0.67860	0.75614	-0.51654	-0.43332	0.05984	1.00000	0.12229	-0.55984	0.12229	0.55984
	0.47483	0.54583	0.00000	0.00000	0.00032	0.00000	0.00000	0.00000	0.00000	0.00000
nep	-0.17745	0.14373	-0.19961	-0.23352	0.86500	0.12229	1.00000	-0.14521	1.00000	0.14521
	0.00000	0.00000	0.00000	0.00000	0.66537	0.00000	0.00000	0.00000	0.00000	0.00000
tra	0.90515	-0.86410	0.86865	0.82932	0.03260	-0.55984	-0.14521	1.00000	-0.14521	-1.00000
	0.72048	0.66423	0.67002	0.62255	0.05029	0.00000	0.00000	0.00000	0.00000	1.00000
tssn	-0.17745	0.14373	-0.19961	-0.23352	0.86500	0.12229	1.00000	-0.14521	1.00000	0.14521
	0.00000	0.00000	0.00000	0.00000	0.66537	0.00000	0.00000	0.00000	0.00000	0.00000
tsst	-0.90515	0.86410	-0.86865	-0.82932	-0.03260	0.55984	0.14521	-1.00000	0.14521	1.00000
	0.72048	0.66423	0.67002	0.62255	0.05029	0.00000	0.00000	1.00000	0.00000	0.00000

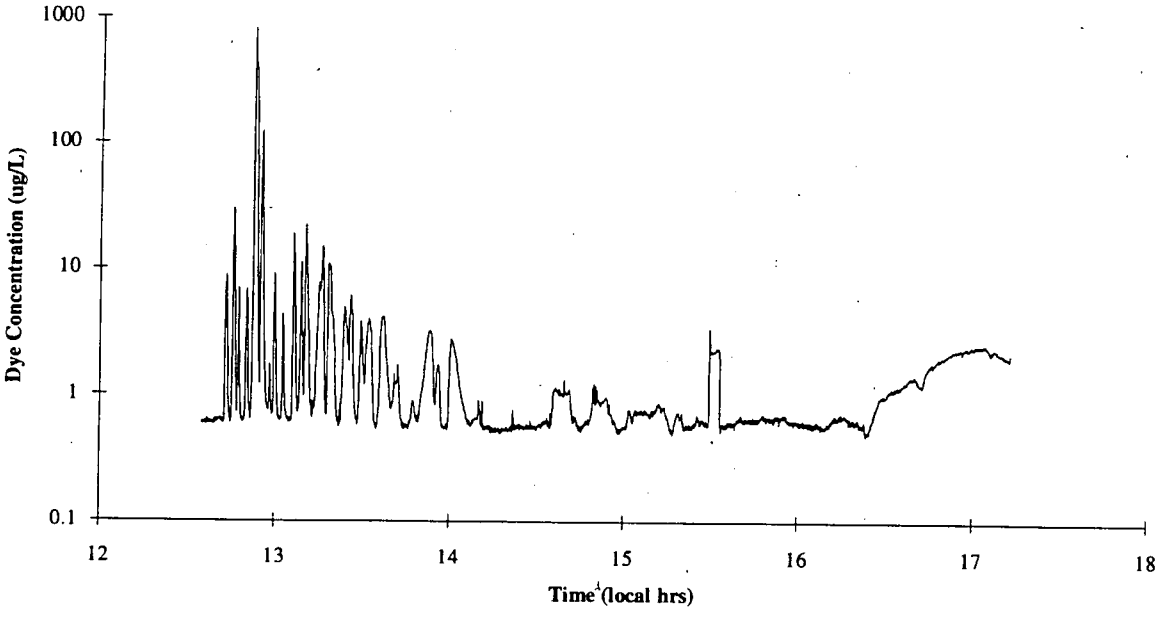


Figure 186. Rhodamine WT concentration as a function of time.

DATA FILES

GENERAL FILE DESCRIPTION

The data diskettes accompanying this report contain the complete set of hydrographic and seawater fluorescence data collected in July 1992. These data have been edited, corrected, and calibrated. Files are categorized by day, transect (if applicable), and parameter type. The parameters measured are shown below. Please note that DFM, CHL, NEP, and TSSN data collected on Days 190 and 191 were sufficiently poor to be thrown out. So that there would not be a future misunderstanding whether or not the files were lost, files were indeed generated for these data, but they include only a statement that the data were poor. It should also be remembered that rhodamine data were collected in lieu of chlorophyll *a* data on Days 202-204.

FILE NAMES

Data files are uniquely named using the following convention:

N JD CODE.DAT

where,

N-	a non-unique alphanumeric character, generally "P" for Portsmouth but also may be "A, B, C, D, E" -describing different transects or dye studies performed on the same day.
JD-	Julian Day
CODE-	measured parameter Code as shown in TABLE 1.

Two Examples:

P197OIL.DAT-	Portsmouth, Julian Day 197 (15 July 1992), Oil Fluorescence data
A199TRA.DAT-	Transect A, Julian Day 199 (17 July 1992), Transmission data

FILE FORMATS

The general format for each file is the same, containing at least five data fields (columns) separated by commas. However, files containing data collected along cross-channel transects have an additional data field containing a value describing the distance across a transect (in percent) at which the data were collected. The data fields for each file are shown below in Table 25. The original consecutive record number which was retained during all file manipulations can be used as a guide to determine which records were eliminated in the

editing process (ie., where the record number is not continuous) and can also be used as a key for merging data files (as can the time) if desired.

TABLE 25. Parameters measured as a function of time and location. Included are the corresponding codes used in naming the data files and the units of measure for each parameter.

Parameter	**Filename Code**	**Units of Measure**
Bottom Depth	BOT	meters
Chlorophyll *a* fluorescence	CHL	micrograms/Liter
Dissolved Oxygen	DO2	milliliters/Liter
Nephelometry	NEP	volts
Oil Fluorescence	OIL	parts per billion-Diesel Fuel Marine Equivalents
pH	PH	pH (NBS)
Rhodamine WT	RHO	micrograms/Liter
Salinity	SAL	practical salinity units (psu)
Sample Depth	SAM	meters
Temperature	TEM	degrees Centigrade
Transmission	TRA	percent
Total Suspended Solids Calibrated by Nephelometry	TSSN	milligrams/Liter
Total Suspended Solids Calibrated by Transmission	TSST	milligrams/Liter

TABLE 26. Data file format for diskettes accompanying this report. The units of measure for each parameter are listed in TABLE 25.

Column	Parameter	Parameter Description
1	Time	the time of day (EDT) in hours for each measurement
2	X Location	measured in (negative) minutes of longitude (at 70o West)
3	Y Location	measured in minutes of latitude (at 43o North)
4	Record Number	original consecutive measurement number from start of file
5	Parameter	chemical or physical parameter measured
6	% Distance	percent distance across a transect (if applicable)

FILE LISTING

Day 190, Cross-Channel Transects at Mouth

P190BOT.DAT
P190CHL.DAT-poor data
P190DO2.DAT
P190NEP.DAT-poor data
P190OIL.DAT-poor data
P190PH.DAT
P190SAL.DAT
P190SAM.DAT
P190TEM.DAT
P190TRA.DAT
P190TSSN.DAT-poor data
P190TSST.DAT

Day 191, Fixed-Station at Fort Foster

P191BOT.DAT
P191CHL.DAT-poor data
P191DO2.DAT
P191NEP.DAT-poor data
P191OIL.DAT-poor data
P191PH.DAT

Day 191, Fixed-Station at Fort Foster (cont)

P191SAL.DAT
P191SAM.DAT
P191TEM.DAT
P191TRA.DAT
P191TSSN.DAT-poor data
P191TSST.DAT

Day 192, Cross-Channel Transects at Dover Point (Transects A, B, C)

A192BOT.DAT	B192BOT.DAT	C192BOT.DAT
A192CHL.DAT	B192CHL.DAT	C192CHL.DAT
A192DO2.DAT	B192DO2.DAT	C192DO2.DAT
A192NEP.DAT	B192NEP.DAT	C192NEP.DAT
A192OIL.DAT	B192OIL.DAT	C192OIL.DAT
A192PH.DAT	B192PH.DAT	C192PH.DAT
A192SAL.DAT	B192SAL.DAT	C192SAL.DAT
A192SAM.DAT	B192SAM.DAT	C192SAM.DAT
A192TEM.DAT	B192TEM.DAT	C192TEM.DAT
A192TRA.DAT	B192TRA.DAT	C192TRA.DAT
A192TSSN.DAT	B192TSSN.DAT	C192TSSN.DAT
A192TSST.DAT	B192TSST.DAT	C192TSST.DAT

Day 193, Fixed-Station at Police Dock

P193BOT.DAT
P193CHL.DAT
P193DO2.DAT
P193NEP.DAT
P193OIL.DAT
P193PH.DAT
P193SAL.DAT
P193SAM.DAT
P193TEM.DAT
P193TRA.DAT
P193TSSN.DAT
P193TSST.DAT

Day 195, Fixed-Station at Clark Cove

P195BOT.DAT
P195CHL.DAT
P195DO2.DAT
P195NEP.DAT
P195OIL.DAT
P195PH.DAT
P195SAL.DAT
P195SAM.DAT
P195TEM.DAT
P195TRA.DAT
P195TSSN.DAT
P195TSST.DAT

Day 196, Cross-Channel Transects at East Seavey Island (Transects A, B, C, D, E)

A196BOT.DAT	B196BOT.DAT	C196BOT.DAT	D196BOT.DAT	E196BOT.DAT
A196CHL.DAT	B196CHL.DAT	C196CHL.DAT	D196CHL.DAT	E196CHL.DAT
A196DO2.DAT	B196DO2.DAT	C196DO2.DAT	D196DO2.DAT	E196DO2.DAT
A196NEP.DAT	B196NEP.DAT	C196NEP.DAT	D196NEP.DAT	E196NEP.DAT
A196OIL.DAT	B196OIL.DAT	C196OIL.DAT	D196OIL.DAT	E196OIL.DAT
A196PH.DAT	B196PH.DAT	C196PH.DAT	D196PH.DAT	E196PH.DAT
A196SAL.DAT	B196SAL.DAT	C196SAL.DAT	D196SAL.DAT	E196SAL.DAT
A196SAM.DAT	B196SAM.DAT	C196SAM.DAT	D196SAM.DAT	E196SAM.DAT
A196TEM.DAT	B196TEM.DAT	C196TEM.DAT	D196TEM.DAT	E196TEM.DAT
A196TRA.DAT	B196TRA.DAT	C196TRA.DAT	D196TRA.DAT	E196TRA.DAT
A196TSSN.DAT	B196TSSN.DAT	C196TSSN.DAT	D196TSSN.DAT	E196TSSN.DAT
A196TSST.DAT	B196TSST.DAT	C196TSST.DAT	D196TSST.DAT	E196TSST.DAT

Day 197, Flood-Tide Longitudinal Transect

P197BOT.DAT
P197CHL.DAT
P197DO2.DAT
P197NEP.DAT
P197OIL.DAT
P197PH.DAT
P197SAL.DAT
P197SAM.DAT
P197TEM.DAT

Day 197, Flood-Tide Longitudinal Transect (cont)

P197TRA.DAT
P197TSSN.DAT
P197TSST.DAT

Day 198, Ebb-Tide Longitudinal Transect

P198BOT.DAT
P198CHL.DAT
P198DO2.DAT
P198NEP.DAT
P198OIL.DAT
P198PH.DAT
P198SAL.DAT
P198SAM.DAT
P198TEM.DAT
P198TRA.DAT
P198TSSN.DAT
P198TSST.DAT

Day 199, Cross-Channel Transects at West Seavey Island (Transects A, B, C)

A199BOT.DAT	B199BOT.DAT	C199BOT.DAT
A199CHL.DAT	B199CHL.DAT	C199CHL.DAT
A199DO2.DAT	B199DO2.DAT	C199DO2.DAT
A199NEP.DAT	B199NEP.DAT	C199NEP.DAT
A199OIL.DAT	B199OIL.DAT	C199OIL.DAT
A199PH.DAT	B199PH.DAT	C199PH.DAT
A199SAL.DAT	B199SAL.DAT	C199SAL.DAT
A199SAM.DAT	B199SAM.DAT	C199SAM.DAT
A199TEM.DAT	B199TEM.DAT	C199TEM.DAT
A199TRA.DAT	B199TRA.DAT	C199TRA.DAT
A199TSSN.DAT	B199TSSN.DAT	C199TSSN.DAT
A199TSST.DAT	B199TSST.DAT	C199TSST.DAT

Day 200, Fixed-Station at Jamaica Island

P200BOT.DAT
P200CHL.DAT
P200DO2.DAT
P200NEP.DAT
P200OIL.DAT
P200PH.DAT
P200SAL.DAT
P200SAM.DAT
P200TEM.DAT
P200TRA.DAT
P200TSSN.DAT
P200TSST.DAT

Day 202, Mapping Survey at Seavey Island (Surveys A, B, C, D)

A202BOT.DAT	B202BOT.DAT	C202BOT.DAT	D202BOT.DAT
A202DO2.DAT	B202DO2.DAT	C202DO2.DAT	D202DO2.DAT
A202NEP.DAT	B202NEP.DAT	C202NEP.DAT	D202NEP.DAT

Day 202, Mapping Survey at Seavey Island (Surveys A, B, C, D)

A202OIL.DAT	B202OIL.DAT	C202OIL.DAT	D202OIL.DAT
A202PH.DAT	B202PH.DAT	C202PH.DAT	D202PH.DAT
A202RHO.DAT	B202RHO.DAT	C202RHO.DAT	D202RHO.DAT
A202SAL.DAT	B202SAL.DAT	C202SAL.DAT	D202SAL.DAT
A202SAM.DAT	B202SAM.DAT	C202SAM.DAT	D202SAM.DAT
A202TEM.DAT	B202TEM.DAT	C202TEM.DAT	D202TEM.DAT
A202TRA.DAT	B202TRA.DAT	C202TRA.DAT	D202TRA.DAT
A202TSSN.DAT	B202TSSN.DAT	C202TSSN.DAT	D202TSSN.DAT
A202TSST.DAT	B202TSST.DAT	C202TSST.DAT	D202TSST.DAT

Day 203, Flood-Tide Dye Study

P203BOT.DAT
P203DO2.DAT
P203NEP.DAT
P203OIL.DAT
P203PH.DAT
P203RHO.DAT
P203SAL.DAT
P203SAM.DAT
P203TEM.DAT
P203TRA.DAT
P203TSSN.DAT
P203TSST.DAT

Day 204, Ebb-Tide (E) and Clark Cove (C) Dye Studies

E204BOT.DAT	C204BOT.DAT
E204DO2.DAT	C204DO2.DAT
E204NEP.DAT	C204NEP.DAT
E204OIL.DAT	C204OIL.DAT
E204PH.DAT	C204PH.DAT
E204RHO.DAT	C204RHO.DAT
E204SAL.DAT	C204SAL.DAT
E204SAM.DAT	C204SAM.DAT
E204TEM.DAT	C204TEM.DAT
E204TRA.DAT	C204TRA.DAT
E204TSSN.DAT	C204TSSN.DAT
E204TSST.DAT	C204TSST.DAT

APPENDIX A

SURVEY CHRONOLOGY REPORT

PORTSMOUTH NAVAL SHIPYARD ENVIRONMENTAL SURVEY SUMMARY REPORT

Introduction

The following report summarizes data and work performed during a field survey conducted at Naval Shipyard, Kittery, Maine 6-24 July 1992 by the Marine Environment Branch, Code 522, NCCOSC. The objective of the survey was to provide supporting physical and chemical oceanographic data for Phase II of the "NCCOSC/ERLN Case Study of Estuarine Ecological Risk Assessment at Naval Shipyard Portsmouth, Kittery, Maine." Water velocity, hydrographic, and chemical measurements were made during the survey using the MESC, with its associated chemical sensor and navigation systems, and a hull mounted RD Instruments Acoustic Doppler Current Profiler (ADCP).

Personnel

Marine Environment Branch:

D. Bart Chadwick	Co-Principal Investigator, NCCOSC	06-22 July
Ken Richter	Co-Principal Investigator, NCCOSC	06-17 July
Frank Shipp	Technical Support, NCCOSC	17-24 July
Brad Davidson	Technical Support, CSC	01-25 July
Charles Katz	Technical Support, CSC	06-24 July
Andy Patterson	Technical Support, CSC	06-24 July

Other Principals involved:

Bob Johnston	Phase II Project Manager, NCCOSC-University of Rhode Island
Jim Tayon	Environmental Coordinator, Naval Shipyard Portsmouth
Fred Short	Principal Investigator, University of New Hampshire, Jackson Estuarine Laboratory
Larry Ward	Principal Investigator, University of New Hampshire, Jackson Estuarine Laboratory
Barborous Cielokol	Co-Principal Investigator, University of New Hampshire
Rob Swift	Co-Principal Investigator, University of New Hampshire
Rich Langan	Laboratory Manager, University of New Hampshire, Jackson Estuarine Laboratory
Wayne Munns	Researcher, SAIC representing ERLN

Measurements Made as a function of GPS Position:

Key	Measurement	
CTD:	Conductivity/Salinity	Transmissivity
	Temperature	Dissolved Oxygen
	Depth	pH
	Water Depth	
ADCP:	Current Velocity	
	Acoustic Backscatter	

FLOW:	UV Fluorescence Chlorophyll a Fluorescence Nephelometry
RHOD:	**Rhod**amine WT Fluorescence
DISCS:	Discrete samples for **S**uspended Matter (size, and C/N chemistry)
DISCC:	Discrete samples for **C**hlorophyll a and Nutrients
DISCD:	Discrete samples for **D**issolved Organic Carbon
DISCP:	Discrete samples for **P**AH/PHC
DISCR:	Discrete samples taken by zodiac for **R**hodamine WT analysis

Chronology of Events

24 June — The research vessel RV ECOS and its associated Marine Environmental Survey Capability (MESC) equipment are shipped via truck (Associated Boat Transport, Seattle) to New Hampshire.

02 July — The vessel and equipment arrive in New Hampshire. The boat is launched into the Piscataqua River at Great Bay Marine (Newington, NH) and taken to its berth at the Kittery Landing Marina. The Kittery Landing Marina serves as the base of operations for the duration of the field work.

03-06 July — Vessel and equipment are readied for survey operations.

07 July — Vessel and equipment setup is completed. All participants meet for planning session.

08 July — Cross-channel transects at the mouth of Piscataqua River. Forty-three transects are run between Odiornes Point (43^0 02.6'N, 70^0 42.6'W) and Gerrish Island (43^0 03.8'N, 70^0 41.5'W, between Whaleback Reef and White Island). The first transect begins at Odiornes Point.
RTAPS filenames: P190.* **ADCP** filenames: TRANS1\PORT002R.000 - PORT047R.000.
Approximate data start/stop times: 0730-1930.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

09 July — Fixed station at Fort Foster (43^0 03.86'N, 70^0 41.72'W). Near-surface water taken throughout except for one vertical profile. Planning meeting with other principles in afternoon. DFM Calibration.
RTAPS Filenames: P191.* **ADCP** filenames: EEL\EEL001R.000 - EEL001R.003.
Approximate data start/stop times: 0830-1330.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

10 July — Cross-channel transects at Dover Point. The transect circuit is broken down into 3 legs. Leg 1 transects the upper Piscataqua River (43^0 07.5'N, 70^0 49.8'W - 43^0 07.6'N, 70^0 49.6'W), Leg 2 transects the main body of the river (43^0 07.3'N, 70^0 48.8'W - 43^0 07.1'N, 70^0 48.8'W), and Leg 3 transects the entrance into Little Bay (parallel to the Route 4/16 Bridge, 43^0 07.1'N, 70^0 49.4'W -43^0 07.2'N, 70^0 49.6'W). The circuit begins on Leg 3 moving northwest, then Leg 2

running south, then Leg 1 moving east. A total of 21 circuits (plus an extra Leg 3) are completed. The towed system snags a submerged mooring and breaks electrical wires in tow cable @1325 hrs. The system is rerigged for hull mounted flowthrough system and is fully on line @ 1530 hrs.
RTAPS filenames: P192.* **ADCP** filenames: TRANS2\PORT001R.000 - PORT135R.000.
Approximate data start/stop times: 0700-1900.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

11 July Fixed Station at Seavey Island Police Dock (43^0 04.58'N, 70^0 43.73'W). Water sampling taken at near-bottom except for six vertical profiles taken hourly. Garden Hose and standard Seabird CTD electrical cable are used for sampling while tow cable is repaired.
RTAPS filenames: P193.* **ADCP** filenames: POLICE\PORT019R.000 - PORT023R.000.
Approximate data start/stop times: 0830-1400.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

12 July No field operations.

13 July Fixed Station at Clarks Cove (43^0 04.74'N, 70^0 43.49'W). Water sampling taken at near-bottom except for seven vertical profiles taken hourly. Garden Hose and standard Seabird CTD electrical cable are used for sampling while tow cable is repaired.
RTAPS filenames: P195.* **ADCP** filenames: CLARK\PORT001R.000 - PORT020R.000.
Approximate data start/stop times: 0830-1500.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

14 July Cross-channel transects at East Seavey Island. The transect circuit is broken down into 5 legs. Leg 1 runs across the main channel from near Salamander Point (43^0 04.4'N, 70^0 43.1'W,) to Kittery Point (43^0 04.9'N, 70^0 43.1'W). Leg 2 crosses Spruce Creek (43^0 04.9'N, 70^0 43.1'W - 43^0 04.9'N, 70^0 43.2'W). Leg 3 crosses the Back Channel north of Seavey Island (43^0 04.9'N, 70^0 43.2'W - 43^0 04.8'N, 70^0 43.3'W). Leg 4 crosses Clarks Cove (43^0 04.8'N, 70^0 43.3'W - 43^0 04.6'N, 70^0 43.4'W). Leg 5 re-crosses the main channel (43^0 04.6'N, 70^0 43.4'W - 43^0 04.4'N, 70^0 43.1'W). A total of 33 transects are run in a counterclockwise direction. Standard tow cable is again being used.
RTAPS filenames: P196.* **ADCP** filenames: EASTSVY\PORT001R.000 - PORT179R.000.
Approximate data start/stop times: 0700-1930.
Measured: CTD, ADCP, FLOW, DISCS, DISCC.

15 July Axial transect from the river mouth (Buoy 2KR) up into Great Bay during a flood tide. UNH Stations 1-4, and 6-15 are sampled in vertical profile along the way.
RTAPS filenames: P197.* **ADCP** filenames: HIGHLONG\PORT001R.000 - PORT007R.001.
Approximate data start/stop times: 1200-1700.
Measured: CTD, ADCP, FLOW, DISCS, DISCC, DISCD.

16 July Axial transect from the river mouth (Buoy 2KR) into Great Bay during an ebb tide. UNH Stations 1-9, and 11-15 are sampled in vertical profile. Generator overheat shuts down systems on two occasions near end of survey day. Planning meeting with other principles in the afternoon. DFM calibration.
RTAPS filenames: P198.* **ADCP** filenames: LOWLONG\PORT001R.000 - PORT010R.000.
Approximate data start/stop times: 0730-1200.
Measured: CTD, ADCP, FLOW, DISCS, DISCC, DISCD.

17 July

Cross-channel transect at West Seavey Island. The transect circuit is broken down into 3 legs running in a clockwise direction. Leg 1 traverses the main channel parallel to the Memorial Bridge (43^0 04.7'N, 70^0 45.1'W - 43^0 04.8'N, 70^0 45.1'W). Leg 2 crosses the Back Channel just north of Seavey Island Pier No. 2 (43^0 04.8'N, 70^0 44.1'W - 43^0 04.9'N, 70^0 44.7'W). Leg 3 continues crossing the Back Channel (43^0 04.9'N, 70^0 44.7'W - 43^0 05.0'N, 70^0 44.7'W). The first circuit begins on Leg 2. A total of 36 circuits are run.
RTAPS filenames: P199.* **ADCP** filenames: WESTSVY\PORT001R.000 - PORT213R.000.
Approximate data start/stop times: 0600-1800.
Measured: CTD, ADCP, FLOW, DISCC.

18 July

Fixed Station at Jamaica Island (43^0 04.95'N, 70^0 43.55'W), approximately the site of UNH Station 19. Water Sampling taken at near surface except for seven vertical profiles taken hourly. DFM Calibration. Change chlorophyll a fluorometer to a rhodamine fluorometer after survey. Rhodamine WT calibration.
RTAPS filenames: P200.* **ADCP** filenames: JAM\PORT215R.000 - PORT215R.005.
Approximate data start/stop times: 0830-1500.
Measured: CTD, ADCP, FLOW.

19 July

No field operations.

20 July

General Mapping Survey. A series of three mostly axial transects are run at four tide states in the vicinity of Seavey Island. Two of the transects run along the shorelines, ducking into coves and crossing creeks as possible. The third transect runs down mid-channel. The transects run roughly from Badgers Island to Fort Point/Pepperrell Cove. The circuit starts on the south side of the estuary at the Memorial Bridge, moves east to Fort Point, crosses to Pepperrell Cove, continues west along the north shore and returns down mid-channel from the Memorial Bridge to Fort Point. The transects are run during ebb, low slack, flood, high slack. Tow cable electrical signals fail at end of day.
RTAPS filenames: P202.* **ADCP** filenames: CHUCK\NEWA001R.000 - NEWA006R.000.
Approximate data start/stop times: 0830-1830.
Measured: CTD, ADCP, FLOW (no chlorophyll a), RHOD.

21 July

Flood Tide Dye Mapping. Approximately 6.5 gallons (23.68 L) of 20% Rhodamine WT are injected into the mid-channel at Buoy 9 south of Seavey Island. The dye is injected at a depth of 4 feet after the ADCP data indicate that flood tide has started throughout the entire water column. The majority of the material is injected within a couple of minutes although rinsing of containers continues for another 5-6 minutes. A handmade drogue is placed in the dye patch to help determine the advective component of the flow. The ECOS transits in and out of the patch, following the rhodamine fluorescent signal as far north as Dover Point. A UNH vessel is placed up-channel of the injection point to observe the dye patch as it passes. An aircraft flies over the estuary to take visible spectrum still photographs. The CTD is electrically connected using the standard Seabird cable attached to the standard tow cable. Rhodamine WT Calibration while dockside awaiting start of operations.
RTAPS filenames: P203.* **ADCP** filenames: CHUCK\NEWA009R.000 - NEWA010R.002.
Approximate data start/stop times: 1100-1600.
Measured: CTD, ADCP, FLOW (no chlorophyll a), RHOD.

22 July

Ebb Tide (1), and Point Source (2) Dye Mapping, and Discrete Water Sampling (3).
(1) Five gallons (18.93 L) of 20% Rhodamine WT are injected into the mid-channel at Buoy 11 south of Seavey Island. The dye is injected at a depth of 4 feet after the ADCP data indicate that ebb tide has started throughout the entire water column. The majority of the

material is injected within a couple of minutes although rinsing of containers continues for another 4-6 minutes. A handmade drogue is placed in the dye patch to help determine the advective component of the flow. The ECOS transits in and out of the patch, following the rhodamine fluorescent signal as far east as the Demarcation Line (river mouth). A UNH vessel is placed down-channel of the injection point to observe the dye patch as it passes.
Approximate data start/stop times: 0530-0930.

(2) A second dye release is done in the afternoon during flood tide. Approximately 1.5 gallons (5.67 L) of 20% Rhodamine WT are injected just west of Clarks Island at a depth of 4 feet. The majority of the material is injected within a couple of minutes although rinsing of containers continues for another 4-6 minutes. A handmade drogue is placed in the dye patch to help determine the advective component of the flow. The ECOS transits in and out of the patch, following the rhodamine fluorescent signal into the Back Channel on both sides of Seavey Island as water depths allow. The zodiac is deployed to take discrete samples for rhodamine analysis in the Back Channel and along the shoreline of Clarks Island where water depths/obstacles exclude sampling by ECOS. A total of 16 discrete samples are collected for Rhodamine analysis in this manner.
Approximate data start/stop times: 1215-1715.

(3) Discrete samples are collected at five sites for analysis of PHC/PAH by Battelle Ocean Sciences. Each sample is placed into two (a&b), 1 L bottles containing 5 mL HCl (conc). Sample 1a&b - Clarks Cove, Sample 2a&b - West Seavey Island, Sample 3a&b - Dover Point, Sample 4a&b - Power Plant, Sample 5a&b - Kittery Sewage Outfall. Full MESC and ADCP systems on-line for these sample collections.
Approximate data start/stop times: 1530-1715.

At start of this day, a new lamp is placed into the rhodamine fluorometer because of erratic behavior of the old lamp. Rhodamine WT calibration is run between dye releases. Discrete samples taken for rhodamine analysis are run in a recirculating flowthrough system (same as for calibrations).
RTAPS filenames: P204.* **ADCP** filenames: CHUCK\NEWA011R.000 - NEWA041R.004.
Measured: CTD, ADCP, FLOW (no chlorophyll a), RHOD, DISCP, DISCR.

23 July Pack equipment and vessel for shipment.

24 July Haul-out vessel at Great Bay Marine and load onto truck (Associated Boat Transport) for shipment to San Diego. Discrete PHC/PAH samples are hand delivered to Battelle Ocean Sciences, Duxbury, MA.

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