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UNIVERSITY of MARYLAND

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Chesapeake Bay

Water Quality Monitoring Program

ECOSYSTEM PROCESSES COMPONENT

A Program Supported by the
Office of Environmental Programs
Department of Health and Mental Hygiene
State of Maryland

January 7, 1985

[UMCEES]CBL Ref. No. 84-109*

MARYLAND OFFICE OF ENVIRONMENTAL PROGRAMS

MARYLAND CHESAPEAKE BAY WATER QUALITY MONITORING PROGRAM

ECOSYSTEM PROCESSES COMPONENT

DATA REPORT NO. 1

15 November 1984

(Covering the Monitoring Period 13 July - 30 August 1984)

PREPARED FOR:

Office of Environmental Programs
Department of Health and Mental Hygiene
State of Maryland

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EXECUTIVE SUMMARY

Program Objectives

The primary objectives of the Ecosystem Processes Component of the Biomonitoring Program are to:

1) characterize the present state of the bay (including spatial and seasonal variation) relative to sediment-water nutrient exchanges and oxygen consumption and the rate at which organic and inorganic particulate materials reach deep waters and the sediment surface.

2) determine the long-term trends that might develop in sediment water exchanges and vertical deposition rates in response to pollution control programs.

3) integrate the information collected in this program with other elements of the monitoring program to gain a better understanding of the processes affecting Chesapeake Bay water quality and its impact on living resources.

In the case of objective 1, measurements are made on a quarterly basis at 10 locations in the Bay, including three major tributary rivers (Patuxent, Choptank, and Potomac). Sedimentation rates are monitored at two mainstem Bay locations, one near the upstream point where anoxic conditions exist and one in the central anoxic region farther downstream. Measurements are made almost continuously during the spring and summer periods, with a lower frequency during the fall and winter. Activities in this program have been coordinated with other components of the Biomonitoring Program in terms of station locations, sampling frequency, methodologies, data storage and transmission and reporting schedules.

Justification

Recently, it has been shown that sediment-water processes and deposition of organic matter to the sediment surface are major features of estuarine nutrient cycles and play an important role in determining water quality and habitat conditions. For example, it has been found that during summer periods, when water quality conditions are typically poorest (i.e. anoxic conditions in deep water, algal blooms), sediment releases of nutrients (e.g. nitrogen, phosphorus) and consumption of oxygen are often highest as is the rate of organic matter deposition to the deep waters of the Bay. To a considerable extent, it is the magnitude of these processes which determine nutrient and oxygen water quality conditions in many zones of the Bay. Ultimately, these processes are driven by inputs of organic matter and nutrients from both natural and anthropogenic sources. If water quality management programs are instituted and loadings decrease, changes in the magnitude of the processes monitored in this program will serve as a guide in determining the effectiveness of strategies aimed at improving Bay water quality and habitat conditions.

Current Status

To date, all scheduled field monitoring operations for both components of this program have been completed. Samples collected between 13 July and 1 September 1984 have been analyzed, the results stored on our computer system and a copy of these data sent to the Office of Environmental Programs (OEP) in a form compatible with the system in use. A data dictionary has also been placed on file to ensure that future users of monitoring data can readily identify the sources and types of data contained in these files. A complete set of data covering the initial phase of the monitoring program, along with Level I data summaries, are contained in this report.

During the summer period dissolved oxygen concentrations beneath the pycnocline at the deeper stations were generally low ($\leq$0.4 mgl^{-1}) while dissolved nutrient concentrations were consistantly higher (e.g. $NH_4^+ \simeq$ 25uM; $PO_4^- \simeq$ 3uM) in deep waters. Particulate matter concentrations were higher ($\simeq$2X) in tributaries and the upper bay than in the mainstem bay. Additionally, at mid-bay stations, particulate matter concentrations were considerably reduced beneath the pycnocline, often by a factor of 3-4. Sediment oxygen demand ranged from 0.45-2.13$gO_2m^{-2}d^{-1}$ in August and were somewhat lower than previously measured rates, possibly due to the low ambient O_2 levels. Nitrate fluxes were small (23 to -94ug-$atm^{-2}h^{-1}$) and proportional to NO_3^- concentrations in overlying waters. Silicious acid fluxes were always directed from sediments to water and were higher at more saline stations, as previously reported. Fluxes of NH_4^+ and PO_4^- were erratic (not a normal pattern) and we are currently investigating the reasons for this. Vertical distribution of trapping rates were as expected; similar values occurred in the upper "mixed" layer and just beneath the pycnoclcine, while significantly higher rates (3-10X) occurred near the sediment surface due to wind/tide resuspension. Deposition rates of particulate carbon (from mid-level collecting cups) ranged from 1.1-2.1 $gCm^{-2}d^{-1}$ at the Tom. Pt. site (upper bay) and were lower (0.5-1.6 $gCm^{-2}d^{-1}$) at station R-64 in the mid-bay region. Deposition rates appear to represent 30-60% of the plankton primary production in central Chesapeake Bay.

INTRODUCTION

During the past decade much has been learned about the effects of nutrient inputs (e.g. nitrogen, phosphorus, silica), from both natural and anthropogenic sources, on such important estuarine processes as phytoplankton production and oxygen status (Nixon, 1981; D'Elia et al., 1983; Kemp et al., 1982). While our understanding is not complete, important pathways regulating these processes have also been identified and related to water quality conditions. For example, it has been shown that annual algal primary production and maximum algal biomass levels in many estuaries (including portions of Chesapeake Bay) are related to the magnitude of nutrient loading from all types of sources (Boynton et al., 1982a). It has been also been found that the high, and at times excessive, algal production is sustained through the summer and fall periods by the recycling of essential nutrients which had entered the estuary previous to periods exhibiting eutrophic characteristics. Similarly, sediment oxygen demand (SOD) has been found to be related to the amount of organic matter reaching the sediment surface and the magnitude of this demand is sufficiently high in many regions to be a major oxygen sink (Hargrave, 1969; Kemp and Boynton, 1980).

The delay between nutrient additions and the response of algal communities (and the onset of eutrophic conditions) suggests that there are mechanisms wherein nutrients are retained in estuaries, such as the Chesapeake, and can be mobilized for use at later dates. Research conducted in this and other regions has shown that estuarine sediments can act as both important storages and sources for nutrients as well as important sites of intense oxygen consumption (Kemp and Boynton, 1984). For example, during summer periods in the Choptank and Patuxent estuaries, 40-70% of the total oxygen utilization was associated with sediments and 25-70% of algal nitrogen demand was supplied from estuarine sediments (Boynton et al., 1982b). Processes of this magnitude have a pronounced effect on estuarine water quality and habitat conditions. In terms of storage, sediments in much of Chesapeake Bay, especially upper Bay and tributary rivers, contain large amounts of carbon, nitrogen, phosphorus and other compounds. Additionally, it appears that a large percentage of this material reaches the sediments during the warm periods of the year and that some portion is available to regenerative processes and hence for continued algal utilization. In a sense, nutrients and other materials deposited or buried in sediments, represent the potential "water quality memory" of the Bay.

Justification

It appears that processes associated with estuarine sediments have a considerable influence on water quality and habitat conditions in the Bay and it's tributary rivers. In a simplified fashion, nutrients and organic matter enter the Bay from a variety of sources, including sewage treatment plant effluents, fluvial inputs, local non-point drainage and direct rainfall on Bay waters. It appears that dissolved nutrients are rapidly removed from the water column via biological, chemical and physical mechanisms and much of this material then sinks to the bottom or is remineralized prior to reaching the bottom. These essential nutrients are then utilized by algal communities, a portion of which in turn sink to the bottom, contributing to the development of anoxic conditions and loss of habitat for important infaunal, shellfish and demersal fish communities. The regenerative capacities and the potentially large nutrient storages in bottom sediments ensure a large return flux of nutrients from sediments to the water column and sustain continued phytoplankton growth, deposition of organics to deep waters and anoxic conditions typically associated with eutrophying estuarine systems.

It is within the context of this model that we have undertaken a monitoring study of deposition, sediment oxygen demand and sediment nutrient regeneration. Our rationale is that if nutrient and organic matter loading to the Bay is decreased then the cycle of deposition to sediments, sediment oxygen demand, release of nutrients and continued high algal production will be strongly influenced. Since these benthic processes are important in influencing water quality conditions, changes in these processes will serve as important indications as to the effectiveness of nutrient control actions.

Finally, an important consideration in the design of monitoring studies is the spatial and temporal variability associated with measured variables. If an element varies substantially in a manner which cannot be accounted for, then quantification of trends or differences becomes difficult and expensive. However, the processes to be monitored in this program appear to be quite stable over small temporal (days-months) and spatial (1-10 km) scales (Smetacek et al., 1978; Smetacek, 1980; Wassmann, 1983; Kelly and Nixon, 1984; Boynton et al., 1984) and hence are appropriate for monitoring trends in Bay water quality in an efficient manner.

Objectives

The primary objectives of the Ecosystem Processes Component of the Biomonitoring Program are to:

1) characterize the present state of the bay (including spatial and seasonal variation) relative to sediment-water nutrient exchanges and oxygen consumption and the rate at which organic and inorganic particulate materials reach deep waters and the sediment surface.

2) determine the long-term trends that might develop in sediment water exchanges and vertical deposition rates in response to pollution control programs.

3) integrate the information collected in this program with other elements of the monitoring program to gain a better understanding of the processes affecting Chesapeake Bay water quality and its impact on living resources.

PROJECT DESCRIPTION

Sampling Locations

General

Sampling locations for both the sediment oxygen and nutrient exchange (SONE) study and the vertical flux study (VFX) are shown in Figures 1 and 2. Brief descriptions and exact locations of SONE and VFX stations are given in Tables 1 and 2. Four of the 10 stations sampled as part of the SONE study were located along the salinity gradient in the mainstem Bay between Point No Point (north of the mouth of the Potomac River) and Still Pond Neck (20 km south of the Susquehanna River mouth). Two additional stations were located in each of three tributary rivers (Patuxent, Choptank and Potomac), one in the turbidity maximum or transition zone and one in the lower mesohaline region. The two stations monitored as part of the VFX study were located in the mainstem of the Bay, one near the upstream point where anoxic conditions exist (during summer periods) and one in the central anoxic region (Fig. 2).

Justification

Locations of SONE stations (Fig. 1 and Table 1) were selected based on prior knowledge of the general patterns of sediment-water nutrient and oxygen exchanges in Chesapeake Bay. Several earlier studies (Boynton et al., 1980, 1984 and Boynton and Kemp, 1985) reported the following: 1) along the mainstem of the Bay fluxes were moderate in the upper Bay, reached a maxima in the mid-Bay and were lower in the higher salinity regions and, 2) fluxes in the transition zone of tributaries were much larger than those observed in the higher salinity downstream portions of tributaries. Hence, a series of stations were located along the mainstem from Still Pond Neck in the upper Bay to Point No Point near the mouth of the Potomac River. A pair of stations were established in three tributaries (Potomac, Patuxent, and Choptank), one being in the transition zone and one in the lower estuary. In all cases station

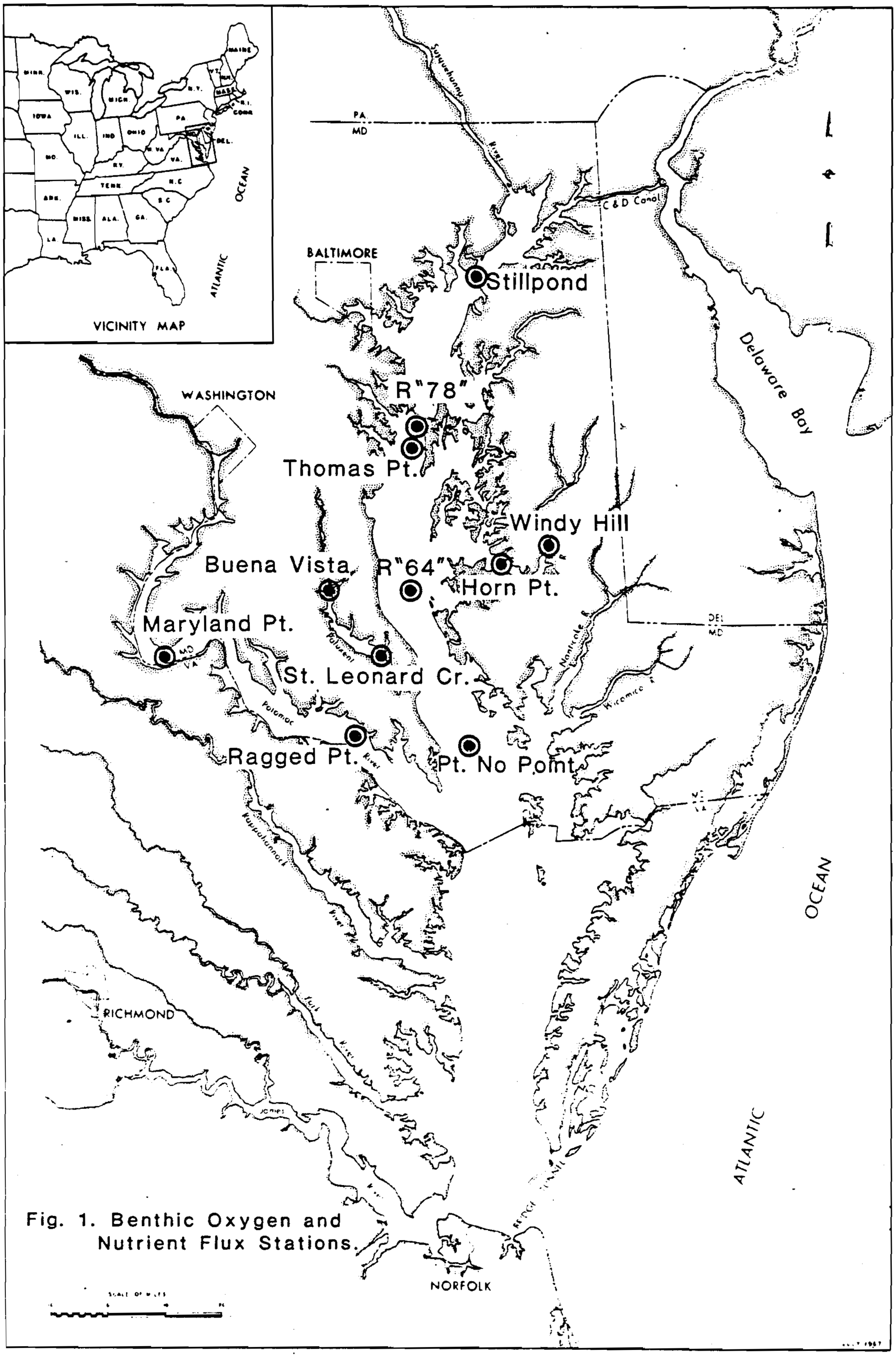

Fig. 1. Benthic Oxygen and Nutrient Flux Stations.

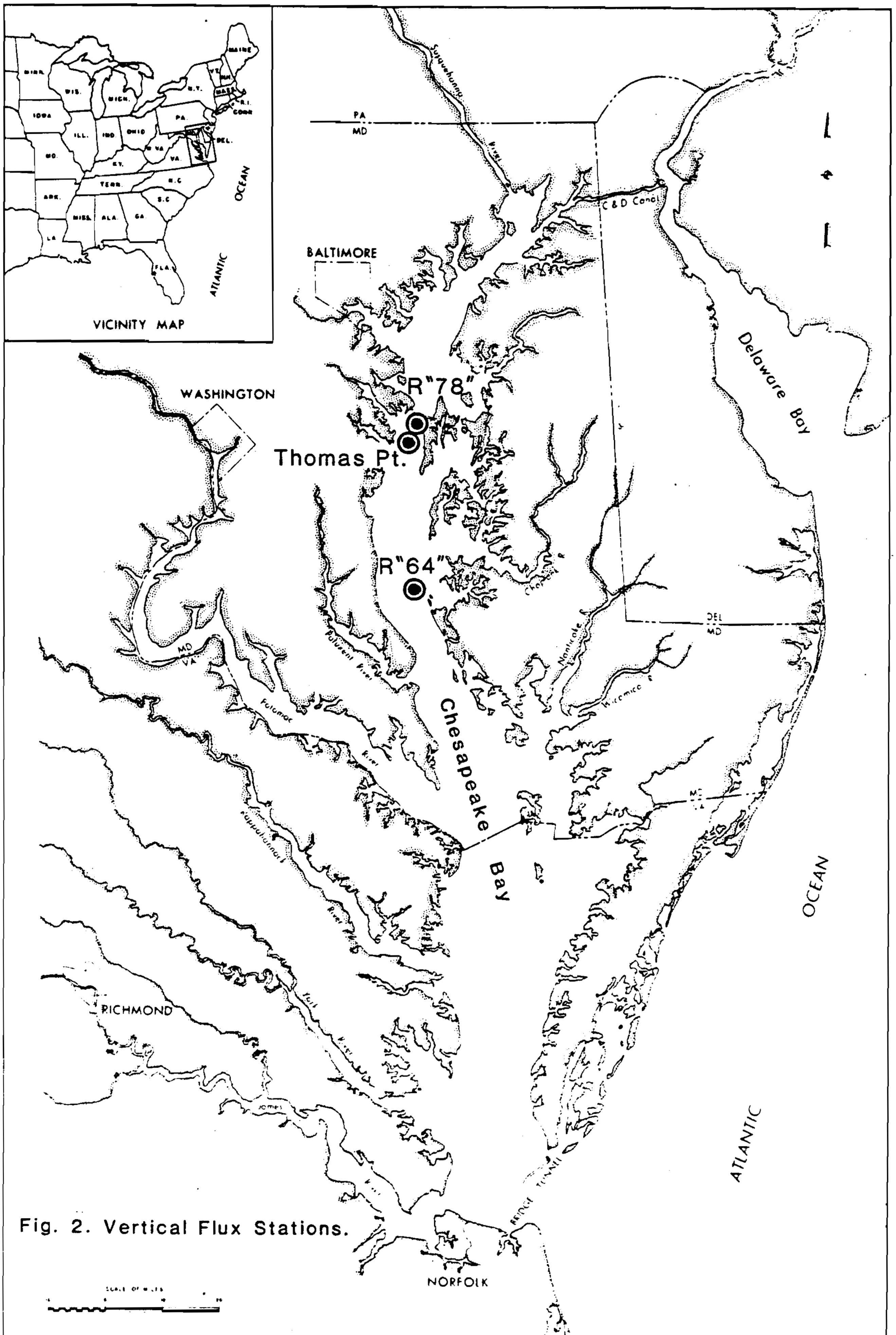

Fig. 2. Vertical Flux Stations.

Table 1. Locations and descriptions of stations sampled as part of the Ecosystem Processes Sediment oxygen and Nutrient Exchange Project (SONE).

Bay Segment	Station Name	Code Name	General Location	Latitude & Longitude	Total Depth, m	Salinity Characteristics
Patuxent River	Buena Vista	Bu. Vista	0.75 naut. mi N of Rt. 231 Bridge at Benedict, MD	38°30.96[1] 76°39.85	3-4	Oligohaline
	St. Leonard Creek	St. Leo	7.5 naut. mi of upstream of Patuxent River mouth	38°22.74 76°30.08	6-7	Mesohaline
Choptank River	Windy Hill	Wind. HL	10.0 naut. mi upstream of Rt. 50 bridge at Cambridge, MD	38°41.43 75°58.42	3-4	Oligohaline
	Horn Point	Horn. Pt	4.0 naut. mi downstream Rt. 50 Bridge at Cambridge, MD	38°37.07 76°07.80	7-8	Mesohaline
Potomac River	Maryland Point	Md. Pt	1250 yds. SE of buoy R-18	38°21.36 77°11.52	9-10	Oligohaline
	Ragged Point	Rag. Pt	1.5 naut. mi WNW of BW "51B"	38°09.77 76°35.58	13-14	Mesohaline
Chesapeake Mainstem	Still Pond	Stil. Pd	700 yds W of channel marker "41"	37°20.91 76°10.87	9-10	Oligohaline
	Buoy R-78	R-78	200 yds NNW of channel buoy "78"	38°57.28 (72) 76°23.58	15-16	Oligo-Meso haline
	Buoy R-64	R-64	300 yds NE of channel buoy R-64	38°33.60 76°25.64	15-16	Mesohaline
	Point No Point	Pt. No. Pt	3.2 naut. mi E of Pt. No Pt.	38°07.98 76°15.10	13-14	Mesohaline

[1]Seconds of latitude and longitude are expressed as hundreths of a second.

Table 2. Locations and descriptions of stations sampled as part of the Ecosystem Processes Vertical Flux Project (VFX).

Station Name	Code Name	General Location	Latitude & Longitude	Total Depth, m	Salinity Characteristics
Thomas Pt.[1]	Tom. Pt	1.3 naut. mi E of Thomas Point Light	38°54.07[2] 76°24.54	15-16	Oligo-Meso haline
Buoy R-78	R-78	200 yds NNW of channel buoy R-78	38°57.~~28~~72 76°23.58	15-16	Oligo-Meso haline
Buoy R-64	R-64	300 yds NE of channel buoy R-64	38°33.60 76°25.64	15-16	Mesohaline

[1]Thomas Pt. station occupied from 23/7/84 to 30/8/84 and then relocated to R-78 due to interference from commercial boat traffic.

[2]Seconds of latitude and longitude expressed as hundreths of a minute.

locations were selected having depths and sediment characteristics representative of the estuarine zone being monitored.

In a few instances (Patuxent stations and Choptank station at Horn Point) SONE stations are not located exactly at the same site as other Biomonitoring Program stations, although they are close ($\leq$ 10 km). The prime reason for this is that there is a considerable amount of benthic flux data already available from the SONE sites selected in the Patuxent and Choptank and these data can be used by the monitoring program. In all cases our stations and the OEP stations are in the same estuarine zone. Benthic fluxes have been found to be quite constant over small spatial scales (~10-20 km) given that measurements were taken in the same estuarine zone (similar salinity, sediments and depths) and hence this program retains a high degree of comparability with other program components (Boynton et al., 1982b).

The use of sediment trap methodology to determine the net vertical flux of particulate material is restricted to the deeper portions of the Bay. In shallower areas local resuspension of bottom sediments is sufficiently large to mask the downward flux of "new" material. Hence, sediment traps are not a useful tool in the upper reaches of the mainstem and in many tributary areas. For these reasons we chose to deploy two sets of traps in mainstem areas. One array (R "64", Fig. 2) was positioned near the center of the region experiencing seasonal anoxia to monitor the vertical flux of particulate organics reaching deeper waters. The station location is close to, but does not exactly coincide with, Biomonitoring stations in this area. Since sediment traps are fixed pieces of gear exposed to damage and/or loss by commercial boat traffic we chose a location not regularly used by such vessels, but still close to the OEP station.

The second station was located farther north (1.3 m E Thomas Point), but still in the region experiencing seasonal anoxia. It seemed probable that both the magnitude and composition of sedimenting material would be different here then at the down-Bay station because of the lower salinity and proximity to the turbid upper Bay. Preliminary results indicate a considerable difference in sedimentation rates of inorganic solids between sites. Again, the location of the Thomas Point station does not coincide exactly with the other water quality monitoring program stations in this region, although they are close. Our justification for this is based on the need to locate these sampling devices in areas not exposed to heavy commercial boat traffic. The Thomas Point station was later moved several kilometers farther north (bouy R-78) to minimize interference from commercial boat traffic.

Sampling Frequency

Field sample collection data for the 1984-1985 Ecosystem Processes Component are given in Table 3. All scheduled monitoring cruises through October 20, 1984 were completed and data associated with cruises conducted between July 23, 1984 and August 30, 1984 are contained in this report.

The strategy of sampling frequency of the SONE portion of this program component is based on the seasonal patterns of sediment water exchanges observed in previous studies conducted in the Chesapeake Bay region (Kemp and Boynton, 1980; Kemp and Boynton, 1981; Boynton et al., 1982b; Boynton and Kemp, 1985). These studies indicated that there were several distinct periods over an annual cycle including: 1) a period influenced by the presence of a large macrofaunal community (spring-early summer), 2) a period during which macrofaunal biomass was low but water temperature and water column metabolic activity high and anoxia prevalent in deeper waters (August), 3) a period in the fall when anoxia was not present and macrofaunal community abundance low but re-establishing and 4) an early spring period (April-May) when the spring phytoplankton bloom occurred, and water column nutrient concentrations were high (particularly nitrate). Previous studies had also indicated that short-

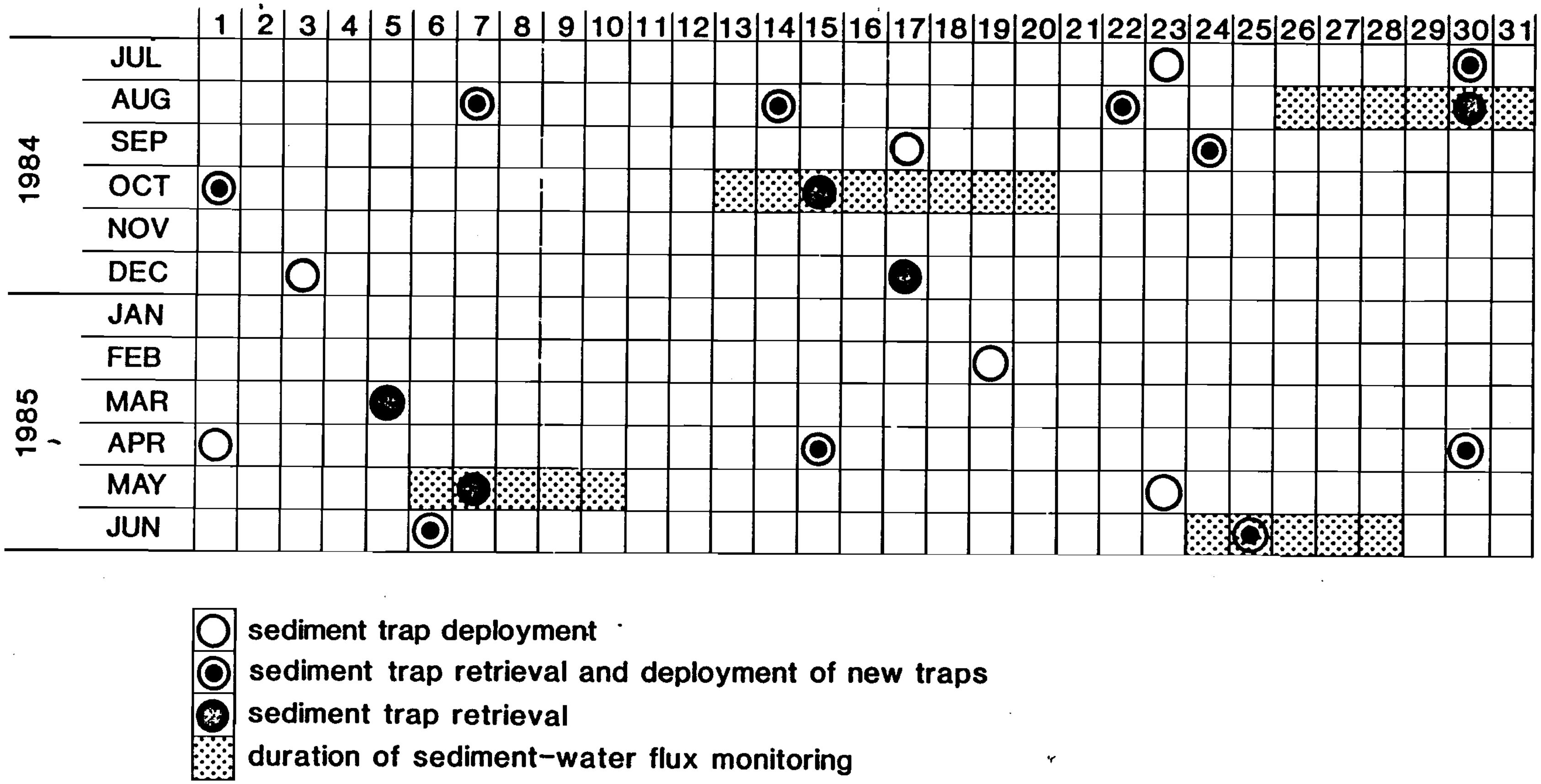

Table 3. Sampling frequency for the 1984-1985 Ecosystem Processes Component of the Biomonitoring Program.

term temporal (day-month) variation in these exchanges was small but that there were considerable differences in the magnitude and characteristics of fluxes among distinctively different estuarine zones (i.e. tidal fresh vs. mesohaline regions). In light of these results, the monitoring design adopted for the SONE study involves quarterly measurements, as described above, distributed in zones characteristic of mainstream Chesapeake Bay and tributary rivers.

The selection of sampling frequency for the VFX (organic deposition) portion of the Ecosystem Processes Component of the Biomonitoring Program was governed by different constraints, although compatible with SONE sampling frequencies. It appears that net depositional rates are largest during the warm seasons of the year (May-October) and considerably lower during winter periods (November-March). Resuspension of near-bottom sediments and organics in one tributary of the Bay (Patuxent) followed a similar pattern (Boynton et al., 1982b; Kemp and Boynton, 1984). However, there is some variability in warm season depositional rates, due probably to algal blooms (of short duration; days-week), variation in zooplankton grazing rates (week-month) and other, less well described features of the Bay. Given the importance of obtaining inter-annual estimates of organic matter deposition rates to deep waters of the Bay, sampling was designed to be almost continuous during the summer period (July-August), of shorter duration during the generally smaller bloom periods of the spring and fall and only occasional during the low productivity, low depositional period of the winter (December-March). Direct measurements of organic deposition to Bay sediments is monitored for 20 weeks of the year. The frequency of vertical deposition rate measurements is coordinated with SONE measurements (and other Biomonitoring Program Components) in that sediment-water exchange are monitored at the end of each intensive VFX development period and coincide with other monitoring measurements.

Field Methods

SONE Study

Water Column Profiles: At each of the 10 sediment oxygen and nutrient exchange (SONE) stations, vertical water column profiles of temperature, salinity and oxygen were obtained at 2 m intervals from the surface to the bottom immediately prior to obtaining intact sediment cores for incubation. Temperature and salinity measurements were made using a Beckman induction salinometer (Model RS5) while dissolved oxygen concentrations were measured using polargraphic oxygen system (YSI Model 57). Both instruments were calibrated daily. Near-surface (~1 m) and near-bottom (~+1 m) water samples were also collected using a high volume submersible pump system. Samples were filtered, where appropriate, using 0.45 u GFC filter pads (47 mm) and immediately frozen. Samples were analyzed for the normal suite of dissolved nutrients and particulate materials including: ammonium (NH_4^+), nitrate + nitrite ($NO_3^- + NO_2^-$), total dissolved nitrogen (TDN), dissolved inorganic phosphorous (DIP), total dissolved phosphorous (TDP), silicious acid ($Si(OH)_4$), particulate carbon (PC), particulate nitrogen (PN), particulate phosphorous (PP), chlorophyll a and seston.

Sediment Cores: Intact sediment cores were obtained at each SONE station using a Bouma box corer. This corer is capable of obtaining a core with areal dimensions of 8 x 17 cm and depths of about 30 cm. The main advantage of this corer is that it is capable of obtaining a sediment sample with minimal disturbance, particularly to the sediment surface. After deployment and retrieval of the box corer, the plexiglass liner containing the sediment sample was removed and visually inspected for disturbance to the sediment surface. If the core appeared satisfactory it was placed in a holding stand prior to further processing. A minimum of 4 cores were taken at each station.

Sediment-water Exchanges: Three of the intact cores were used to estimate net exchanges of oxygen and dissolved nutrients between sediments and overlying waters. Each core was equipped with a bottom plate made of plexiglass (1.2 cm thickness) having a unicellular foam gasket to ensure a water-tight seal. The plate was attached to the sediment core liner with several elastic cords. After bottoms were in place, water was either added or siphoned from the core to adjust the height of overlying water to about 5-10 cm. This height of water produced a sediment surface area:water volume ratio similar to that commonly used in other sediment-water exchange studies (Boynton et al., 1982b). A plate, made of plexiglass and foam, was then inserted in the top of the corer to form a seal between the water and atmosphere. The cover plate was equipped with ports for oxygen and nutrient sampling and for manifolds used in maintaining water circulation. The cores were then placed in a darkened water bath, and circulating pumps attached. After an equilibration period of about 10 minutes the oscillating pumps ($1.8 l min^{-1}$ at max flow) were turned on and maintained a well mixed water column but did not induce sediment resuspension. Oxygen concentrations were monitored continuously using a polagraphic oxygen probe (YSI Model 57) connected to chart recorders. Water samples (approximately 30 ml) were extracted from each core every 30-40 minutes over the 2-4 hour incubation periods. After each sampling, core covers were moved downward inside the core to form a tight seal. The cores were then inspected for air bubbles and any that had developed due to sampling were removed. Water samples were filtered (1.45u GFC filters), immediately frozen and later analyzed for NH_4^+, NO_3^- + NO_2^-, DIP and $Si(OH)_4$. At the end of each incubation the amount of water in each core was determined volumetrically. Nutrient and oxygen fluxes were estimated by calculating the mean rate of change in concentration over the incubation period and then converting the volumetric rate to a flux using the volume:area ratio of each core.

Sediment Profiles: At each SONE station a core was obtained and Eh measurements taken at 1 cm intervals over the first 5 cm of the sediment column (where possible) and at 2-5 cm intervals to depths of up to 25 cm. The Eh values reported here are not corrected to standard hydrogen electrodes. Once a year intact sediments will be sampled for both dissolved and particulate nutrient concentrations and percent water content. These sediment properties were sampled during the October, 1984 SONE monitoring cruise and will be presented in the next report. These data will be particularly useful in evaluating nutrient storages in sediments and can also be used in calculating gradient supported fluxes.

VXF Study

At each of the two vertical flux stations (VFX), vertical water column profiles of temperature, salinity and oxygen were obtained at 2 m intervals from the surface to the bottom to characterize general features of the water column. Temperature, salinity and oxygen were measured using the same techniques as described in the SONE study. Water samples were also collected at 5 discrete depths using a submersible pump system. Sampling depths at each station were determined by inspection of water column physical characteristics. Routinely, a sample was taken from near-bottom and near-surface waters, and the remaining three distributed such that one was just above, one just below and one at the pycnocline. Samples were filtered using 1.45u GFC filter pads (47 mm) and immediately frozen. Samples were analyzed for particulate materials including PC, PN, PP, chlorophyll-a and seston. These data provide instantaneous descriptions of the particulate matter field and are useful in evaluating results developed from sediment trap collections.

Sediment Sampling. During each VFX monitoring cruise (both deployments and retrivals) a surficial sediment sample was obtained at each VFX station using either a Van Veen grab or the Bouma box corer. Sub-samples (to a depth of 1 cm) were obtained using a modified syringe sampler which provided a sediment volume of about 3.1 cm^3. Sediment samples were placed in pre-labeled plastic tubes and immediately frozen. Sediment samples were later analyzed to determine particulate carbon, nitrogen and phosphorous concentration (% by weight of dry sediment), and chlorophyll-a content (ug m^{-2}). Subsamples were also examined to determine the composition of surficial sediments particulates (e.g. algal species, zooplankton fecal pellets, etc.)

VFX Sampling. The sampling device used to develop estimates of the vertical flux of particulate materials to the sediment surface was comprised of a lead or concrete anchor-weight (~200 kg) connected to a stainless steel wire (0.8 cm diameter) which was maintained in a vertical position through the water column by a sub-surface buoy (45 cm diameter; 40 kg positive buoyancy). The sub-surface buoy was tethered to a surface marker buoy by wire cable. At three locations on the vertical wire collecting devises (trap arrays) were attached. The arrays were attached at about 5, 9 and 14 m beneath the water surface to obtain estimates of vertical flux of particulates from the surface euphotic zone to the pycnocline, flux across the pycnocline to deep waters and flux of materials associated with near-bottom areas which includes local resuspension of bottom sediments as well as net deposition.

Each collecting trap array was constructed from steel angle-iron and pipe. Arrays were composed of 2, 48" horizontal pieces of 1" angle iron. The horizontal pieces were connected with 4 pieces of angle iron spaced 1' intervals. Each vertical piece was equipped with two stainless steel rings which held collecting cups in a vertical position. A 1/2" (I.D.) pipe (4' length) was welded at right angles to the mid-point of the horizontal pieces. A piece of 5/16" stainless steel wire was passed through the pipe and each end was provided with a Nico pressed thimble. A 24" x 30" plywood fin was bolted to the vertical pipe and served to keep the frame holding the collecting cups at a

90^{o} angle relative to tidal currents. Each frame was then shackled to pennants (5/16" stainless steel wire) which were of such lengths that collecting arrays could be positioned in euphotic waters (4-5 m), in the vicinity of the pycnocline (7-9 m) and about 1 m above the sediment surface. Collecting cups were made from 3" (I.D.) PVC (schedule 40 pipe). Cups were 30" in length and each was equipped with a removable plastic bottom.

The two sediment trap strings were initially deployed and retrieved at the end of a series of measurements using CEES research vessels. Normal sampling periods lasted 1-2 weeks. At the end of a sampling period, the collecting cups were retrieved either by SCUBA equipped divers or by hoisting the entire array to shipboard. In the latter case, cups were not capped prior to retrieval. However, earlier measurements indicated that losses from cups was negligable using this procedure. New cups were attached, fouling organisms removed from the frames and, in the case of shipboard retrieval, the array lowered back into the water.

The contents of each collecting cup was gently decanted into a graduated cylinder. The cup was then gently rinsed and the total volume of water noted. The entire sample was then mixed using a magnetic stirer and aliquots taken for determination of PC, PN, PP, chlorophyll and seston concentrations. Additionally, a 10 ml sample was taken, preserved in a modified Lugol's solution, and later examined to determine characteristics of collected particulate material (e.g. algal speciation, zooplankton fecal pellets, etc.).

Particulate material concentrations in sampling cups were converted to vertical flux to the depth at which collecting cup was suspended by consideration of the cross-sectional area of the collecting cup, deployment time and sample and subsample volumes.

To be specific, vertical flux to the depth of the collecting cup was calculated as:

$$F_x = (C_x \quad V_t) \quad (D_d) \quad [M]$$

where: F = flux of component x to the deplth of the collecting cup ($gm^{-2}\ d^{-1}$)

C_x = concentration of component x in the sub-sample taken from the collecting cup (gl^{-1})

D_d = duration of deployment (days)

M = conversion of collecting cup cross-sectional area ($45.6cm^2$) to a square meter basis (m=0.00456).

Estimates of depositional flux to the bottom were made by linear extrapolation of flux at the collecting depth to the bottom.

Chemical Analyses

Chemical methods used in the SONE and VFX portions of this monitoring program are summarized in Table 4. In brief, methods were as follows: NO_3^-, NH_4^+ and DIP were measured using the automated method of EPA (1979); total dissolved phosphate (TDP, filtered) and total phosphate (TP, unfiltered) analyses used the digestion and neutralization procedure of D'Elia et al. (1977) followed by DIP analysis (EPA 1979); silicious acid was determined using the Technicon Industrial System (1977) method; dissolved organic nitrogen analysis followed the method of D'Elia et al. (1977); sediment PP concentrations were obtained by acid digestion of muffled dry sediment (Aspila et al. 1976) while PC and PN samples were analyzed using a model 240B Perkin Elmer Elemental Analyzer; methods of Strickland and Parsons (1972) and Shoaf and Lium (1976) were followed for chlorophyll a analysis; total suspended solids determination used the gravimetric technique of EPA (1979).

Algal Identification

Identification of particulates was accomplished by microscopic examination (Nikon Inverted Microscope, Diaphot-TMD). Phytoplankton samples were allowed to settle for 3 or more days prior to concentration and subsequent analysis. Net plankton (<40 u on longest axis) and nannoplankton were counted using the

Table 4. Summary of nutrient analysis methods, giving percent recovery, standard replication and instrumentation used.

ANALYSIS SPECIFICATION

Nutrient	Recovery Percent	Standard Replication Day to Day %	Instrumentation	Reference
NO_2-N	100	±5	Technicon AutoAnalyzer II	EPA (1979)
NO_2+NO_3 as N	98	±5	AutoAnalyzer II	EPA (1979)
NH_3-N	98	±5	AutoAnalyzer II	EPA (1979)
DON[a]	98	±5	AutoAnalyzer II	D'Elia et al. (1977)
PO_4-P	98	±5	AutoAnalyzer II	EPA (1979)
DOP[b]	96	±5	AutoAnalyzer II	D'Elia et al. (1977)
Chlorophyll a active/total	90	±10[c]	Turner Fluorometer	Strickland & Parsons (1972) Shoaf & Lium (1976)
PC[d]	100	±5	Perkin-Elmer Elemental Analyzer	Hobson & Menzel (1969)
PN[d]	100	±5	Perkin-Elmer Elemental Analyzer	Hobson & Menzel (1969)
PP[d]	97-102	±5	AutoAnalyzer II	Aspila et al. (1976)
$Si(OH)_4$	98	±5	AutoAnalyzer II	Technicon Industrial Systems (1977)
Total Suspended Solids	100	±5	Sartorius Analytical Balance	EPA (1979)

[a] Dissolved organic nitrogen determined as total dissolved nitrogen (TDN) after filtration and reported as the difference of summed inorganic N and TDN.

[b] Dissolved organic phosphorus determined as total dissolved phosphorus (TDP) after filtration and reported as the difference of summed inorganic P and TDP.

[c] For chlorophyll a only.

[d] Determined on sediment sample or as particulate fraction concentrated on glass fiber filter.

Quality control on analytical techniques is provided via a program conducted by the USEPA Environmental Monitoring and Support Laboratory. We routinely obtain samples from EPA which we analyze and report results to EPA. Our results have all been within the acceptance limits.

random field technique (Lund et al., 1958; Venrick, 1978), which requires a minimum of 10 fields to be enumerated with 200 cells or more present. This random field technique was done at 200x magnification, with species identification confirmation at 400x as required. Following the identification of more than 200 cells via random field analysis, a 100X scan was made of the entire settling chamber to identify the large net forms and rare species present. Algae were identified to species where possible. Additionally, non-algal particles were also examined and identified (i.e. zooplankton fecal pellets, cysts, skeletal fragments) to further characterize the composition of depositing materials.

Data Processing, Transmission and Storage

Since this monitoring program is a field oriented study, the first step in data acquisition involves recording characteristics of field samples. Field data sheets are given in Appendix Table 1. Following field cruises, data sheets are reproduced to provide back-up copies and the results of chemical analyses added to field or laboratory data sheets. Data dictionaries were also developed describing each of the 8 data files associated with this program (Appendix Table 2). Data were then entered on a Victor 9000 computer and then transfered to magnetic tape at the University of Maryland's Computer Science Center. Subsequently these tapes were modified so as to be compatible with OEP requirements.

DESCRIPTION OF RESULTS

In the following sections, data collected in the Ecosystem Processes Component of the OEP Biomonitoring Program are presented and summarized. Included are data collected during the period 13 July 1984 - 1 September 1984. Specifically, this section of the report contains results of the SONE cruise conducted from 26-31 August 1984 and results of weekly sediment trap deployments from 23 July through 30 August 1984.

SONE Study

Water Column Profiles

Temperature, salinity and dissolved oxygen conditions were measured at 2 m intervals at all SONE stations during the August cruises (Figs. 3a and 3b and Appendix Table 3). Both salinity and temperature profiles exhibited expected patterns. Temperatures decreased slightly with depth and were slightly higher ($\simeq 1^{o}C$) in tributaries than in the mainstem. Salinities increased with depth at the deeper stations, as expected. Interestingly, the depth of the pycnocline along the mainstem increased from about 7 m at Point No Point to about 13 m at Thomas Point in the upper Bay. The most interesting patterns were associated with dissolved oxygen conditions. Briefly, DO concentrations mirrored vertical salinity conditions. At these stations where the water column was well mixed (i.e. the shallow tributary stations) oxygen showed little change with depth. However, at those stations having strong vertical water column stratification, oxygen concentrations decreased sharply beneath the surface mixed layer. For example, DO ranged from 7.8-7.0 mgl^{-1} in the surface mixed layer at R-64. However, beneath the pycnocline ($\simeq 10$ m) concentrations rapidly decreased to 0.40 mgl^{-1}. Overall, conditions reported here were similar to those observed by Kemp et al. (pers. comm.) and Tuttle et al. (pers. comm.) during the 1984 summer period.

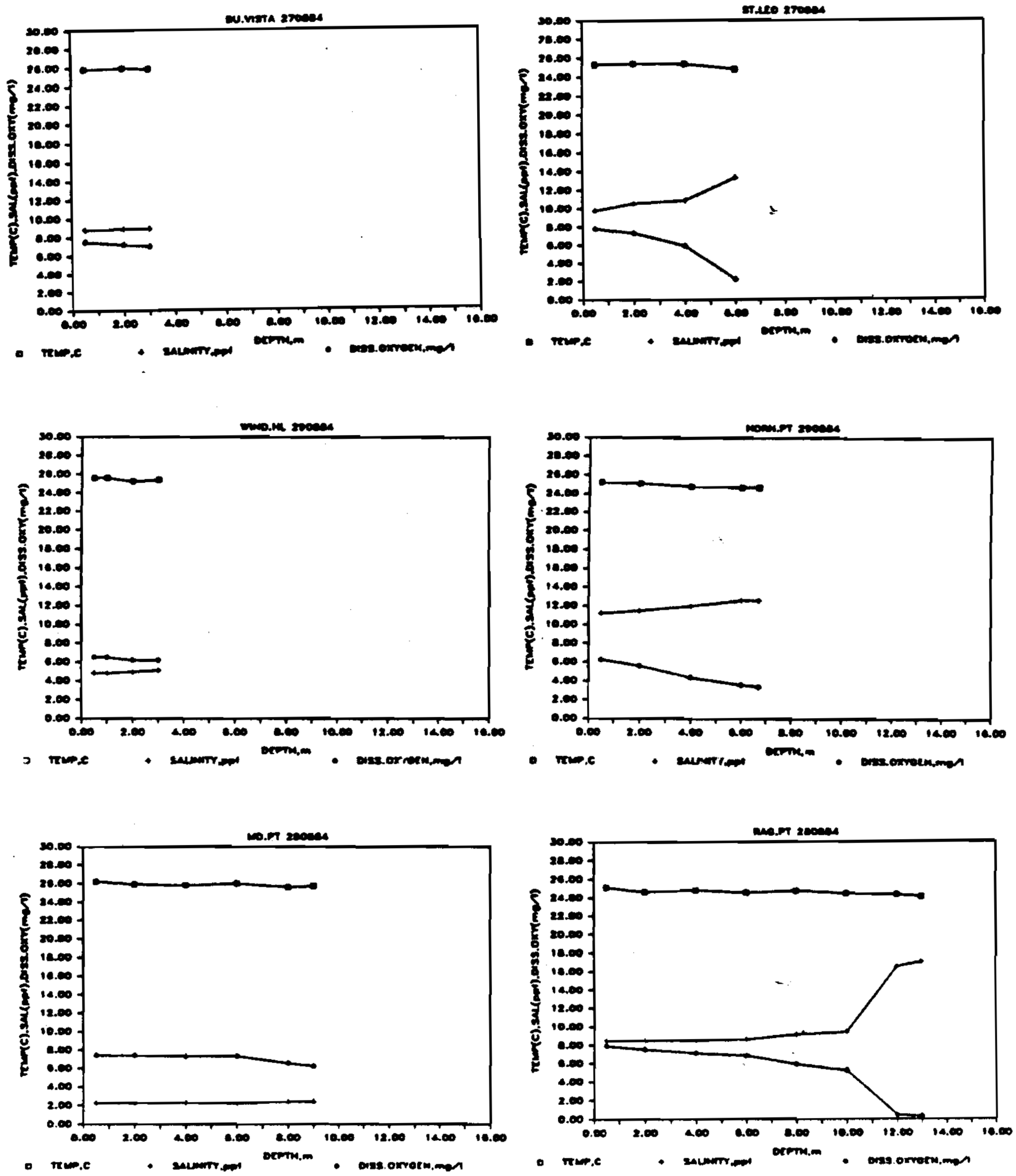

Fig. 3a. Vertical profiles of temperature, salinity, and dissolved oxygen at tributary SONE stations, August, 1984. Note that values at greatest depths are approximately 1 m from the bottom.

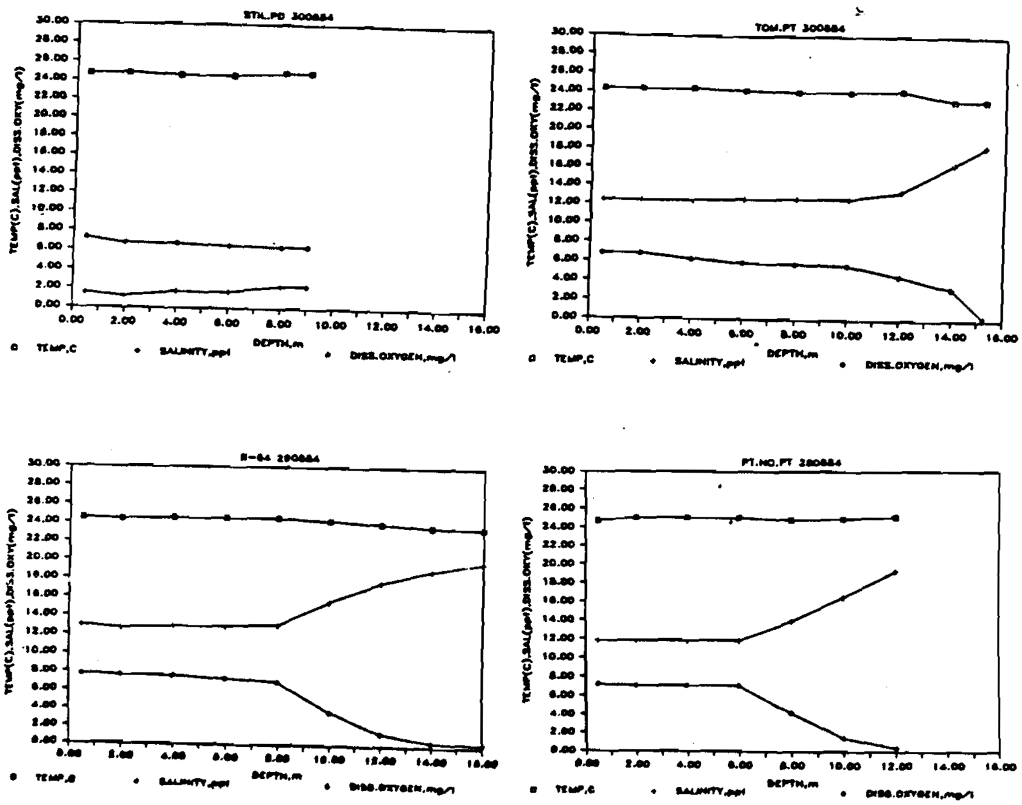

Fig. 3b. Vertical profiles of temperature, salinity, and dissolved oxygen at mainstream SONE stations, August, 1984. Note that values at greatest depths are approximately 1 m from the bottom.

Water Column Nutrient Conditions

At each SONE station surface and bottom water samples were taken and analyzed for the dissolved and particulate nutrient concentrations described earlier. Data are summarized in Table 5. At stations where the water column was stratified, there were larger differences in NH_4 concentration between surface and bottom waters. For example, surface and bottom concentrations were 3.0 and 25.2 uM, respectively, at R-64. Surface water concentrations increased in an up-Bay direction but showed little consistant change in or among tributaries. The elevated NH_4 concentrations in deep waters suggest the importance of deep-water/sediment regenerative processes. Nitrate concentrations, as expected, increased with decreased salinity in both mainstem and tributary areas. Dissolved inorganic phosphate (DIP) was consistently higher in bottom waters with concentrations typical of summer maxima (≃3 uM) previously observed. In most cases, DIP was higher in tributaries than in the mainstem. Concentrations of $Si(OH)_4$ were in excess of 32 uM at all stations and were highest in tributaries. Concentrations were comparable to those reported earlier.

Concentrations of particulates were generally higher in tributary areas than the mainstem. For example, PC ranged from 2.4-3.4 mgl^{-1} at the oligohaline tributary stations while at mainstem stations concentrations ranged from 0.9-1.2 mgl^{-1}. Additionally, the relative proportion of particulate material comprising the seston was quite constant. Ratios of PC:PN (weight:weight) ranged from 4.8-6.7 at all stations except Still Pond and Windy Hill where values were somewhat higher (7.1-8.6), possibly reflecting the presence of low PN particulates from terrestrial sources. The very high particulate values at Windy Hill were probably the result of tidally induced resuspension of sediments (and not the result of a sampling error).

TABLE 5. Dissolved and particulate material concentrations at SONE stations, August, 1984.

BIOMONITIORING PROGRAM: SEDIMENT OXYGEN AND NUTRIENT EXCHANGES(SONE)
H2ONUTS (Surface and bottom water dissolved and particulate nutrient concentrations at SONE stations)

					DISSOLVED NUTRIENTS						PARTICULATES				
STATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	NH4 (uM N)	NO3+NO2 (uM N)	TDN (uM N)	DIP (uM P)	TDP (uM P)	SI(OH)4 (uM Si)	PC (ug/l)	PN (ug/l)	PP (ug/l)	CHLORO (ug/l)	SESTON (mg/l)
ST.LEO	27-8-84	940	6.7	0.5	1.9	0.12	27.35	0.33	0.38	72.8	2126	439	79.8	14.85	21.6
				6	10.9	0.38	17.25	0.69	0.07	63.5	626	108	30.6	3.2	19.4
BU.VISTA	27-8-84	1335	3.6	0.5	0.7	0.16	25.8	2.89	2.89	93	2463	395	110	16.15	54
				3	0.6	0.15	26.6	3.06	3.63	91	2872	439	140	14.45	70
PT.NO.PT	28-8-84	900	13	0.5	0.7	0.06	21.6	0.15	0.14	46.8	1078	194	36.1	4.8	13.8
				12	20.5	0.13	38.9	1.1	0.57	47.6	1182	196	33.1	2.45	33.2
RAG.PT	28-8-84	1145	13.2	0.5	0.3	0.39	21.6	0.83	0.75	62.1	1341	210	40	7.8	10.1
				13	19.3	0.75	46.75	2.42	2.72	57.6	824	137	34.8	2.5	20.65
MD.PT	28-8-84	1720	9.8	0.5	0.6	36.3	62.35	1.7	1.85	32.8	3438	564	69.6	21.85	22
				9	1.8	35	59.7	2.28	1.92	38.8	2607	435	72.4	16.1	31.8
R-64	29-8-84	745	16	0.5	3	0.92	28.35	0.09	0.07	50	947	198	27.6	5.9	9.4
				16	25.2	0.18	44.9	1.29	0.89	48.2	1243	186	38.3	2.4	45.2
HORN.PT	29-8-84	1025	7.2	0.5	0.5	0.19	28.15	0.28	0.95	74.6	2108	409	70.1	20.25	21
				6.7	7.8	0.84	36.65	0.31	0.49	68.7	938	179	37.5	4.25	28.4
WIND.HIL	29-8-84	1255	3.6	0.5	0.4	0.15	29.3	1	1.67	37.5	3313	470	85.2	18.4	37.25
				3	0.5	0.2	27.6	1.23	1.76	39.6	13847	1601	375	23.4	272
STIL.PB	30-8-84	730	9.5	0.5	5.2	48.5	82.95	0.2	1.42	47.9	959	136	32.2	6.25	16
				9	5.9	47.5	70.95	0.3	0.44	42.6	1189	162	38.2	6.4	21.8
TOM.PT	30-8-84	1010	15.2	0.5	5.6	6.32	36.15	0.16	0.85	47.1	1287	247	50.2	10.15	17.2
				15.2	15.8	5.58	53.95	0.28	0.95	47.5	565	110	27.6	2.2	16.8

Sediment Profiles

The results of Eh measurements made at 1 cm intervals in the sediment column are given in Appendix Table 4. Other variables (PC, PN, PP, Si, Chloro and %H_2O) are sampled only once per year and were scheduled for the October 1984 SONE cruise. However, Eh measurements are useful for broad brush characterization of the electronic environment (oxidizing vs reducing) of sediments. Values more positive than -186 mV represent generally oxidizing conditions while those more negative indicate a reducing environment. At the deeper stations reducing conditions were evident throughout the sediment column including surface sediments. However, at the shallower stations, oxidizing conditions were apparent in the surface 1-2 cm. The values reported here are similar to those previously reported for some stations in the general vicinity of ours (Jenkins, 1982).

Sediment-Water Exchanges

Nutrient concentration changes over time in triplicate intact sediment cores for each SONE station are given in tabular form in Appendix Table 5 and in graphical form in Appendix Table 6. Example data collected at the oligohaline station (BU.VISTA) in the Patuxent River are shown in Figure 4. The concentration data given in the above tables and figures have not been parsed and hence extraneous values have not been deleted. However, prior to making sediment-water exchange calculations the data base was parsed using the following criteria: 1) occasionally observed values were deleted based on the assumption that some contamination occurred during the sampling-storage-analysis procedure, 2) data associated with cores that appeared (as indicated by enhanced seston levels) to have been disturbed during the handlinig-incubation period were also not used. A summary of oxygen and nutrient fluxes are given in Table 6 and a complete set of flux values are contained in Appendix Table 7.

ECOSYSTEM PROCESSES

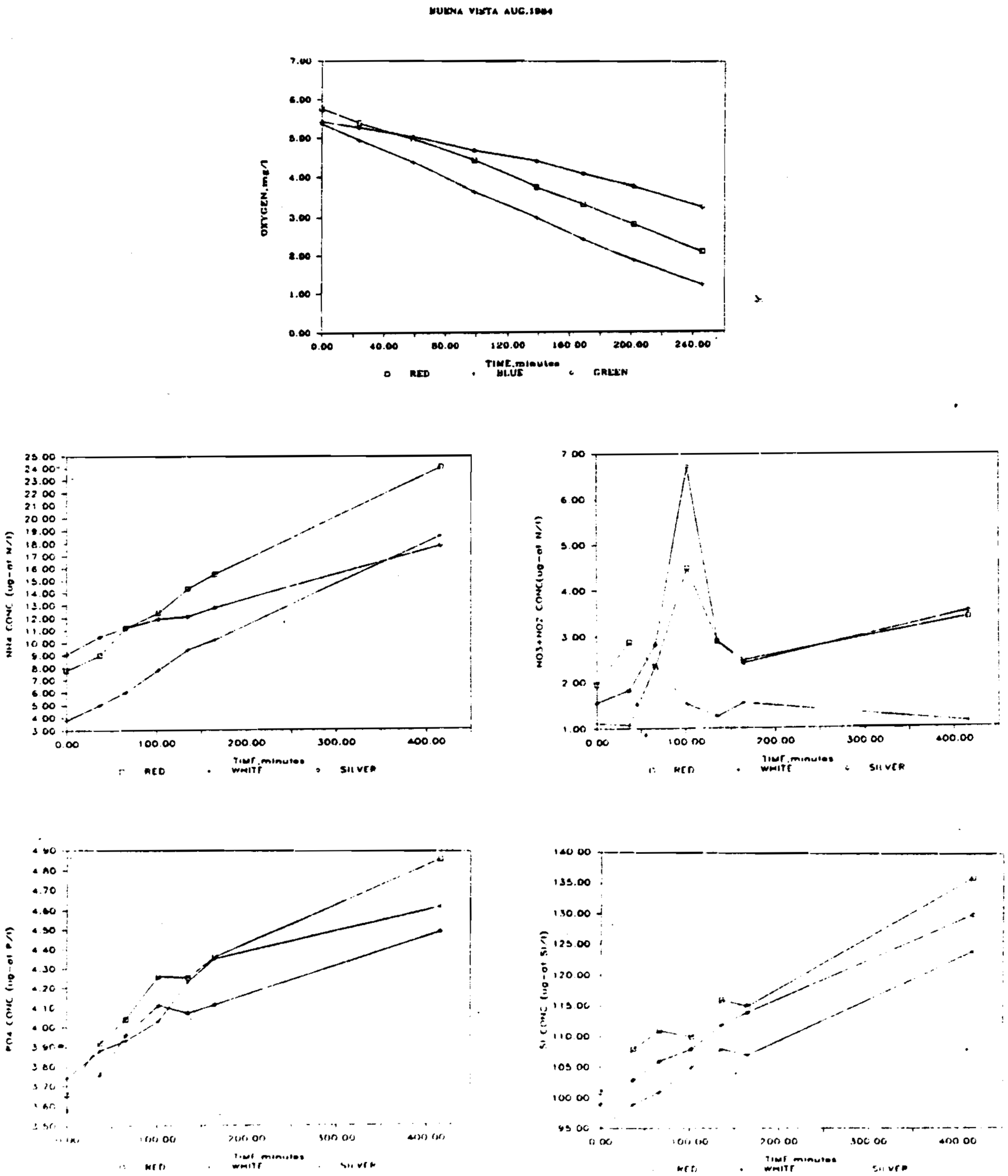

Fig. 4. Oxygen and nutrient concentrations vs. time data from replicated sediment cores collected at station BU. VISTA (Patuxent River) during the August 1984 SONE cruise.

Sediment oxygen demand ranged from 0.45 to 2.13 $gO_2m^{-2}d^{-1}$ among stations during the August 1984 monitoring cruise. In general values were somewhat lower than those previously recorded but this may be related to the low oxygen content of bottom waters encountered at several stations. Replication was reasonably good at most stations and can be expected to improve as we became more familiar with shipboard core acquisition and incubation systems. Nitrate fluxes were generally small (range 23.0 to -93.7 ug-at NO_3-$Nm^{-2}h^{-1}$) as observed in previous studies (i.e. Boynton and Kemp, 1985). Additionally, nitrate + nitrite fluxes were generally proportional to nitrate concentration in overlying waters. For example, at low nitrate concentrations, sediment-water exchanges were always small (either positive or negative) while at higher NO_3^- concentrations fluxes were directed into sediments and the magnitude of the flux was generally proportional to nitrate concentrations (see Tables 5 and 6).

Fluxes of silicious acid were always directed from sediments to the water column as previously seen (D'Elia et al., 1982). Additionally, fluxes were largest at more saline locations in all tributaries and higher in the more saline portion of the mainstem that at the oligohaline stations.

Fluxes of NH_4^+ and DIP were somewhat erratic and caused us some concern. Specifically, at some locations fluxes were directed into sediments rather than from sediments to the water column and this situation was unexpected, particularly for NH_4. It is possible that these fluxes are particularly sensitive to either small disturbances of the sediment surface or to oxygen conditions in overlying waters, the latter being of real concern. There was some considerable oxygen introduced into cores taken from anoxia waters (i.e. at Stations Pt.NoPt., R-64, Tom. Pt.) and this may have influenced the direction and magnitude of DIP and possibly NH_4 fluxes. We are reexamining these data and have made methodological adjustments. Specifically, we have adopted the strategy of maintaining cores in the incubation mode until DO

Table 6. A summary of sediment oxygen and nutrient changes ($\bar{X} \pm$ S.D.) observed during the August, 1984 SONE monitoring cruise. Negative sign indicates flux was directed into sediments.

	Oxygen	NH_4	NO_3	PO_4	S_i
Patuxent	$g\ O_2 m^{-2} d^{-1}$	$ug\text{-}at\ m^{-2} h^{-1}$			
Bu. Vista	−2.13 ± 0.64	135 ± 38	10.9 ± 7.9	9.6 ± 0.8	315 ± 19
St. Leo	−0.45 ± 0.21	141 ± 47	5.7 ± 14.8	11.6 ± 3.7	409 ± 68
Choptank					
Wind. HL	−0.55 ± 0.07	105 ± 75	23.0 ± 14.8	−6.5 ± 0.0	179 ± 74
Horn. PT	−0.55 ± 0.49	−268 ± 30	8.0 ± 3.7	−12.9 ± 1.5	316 ± 82
Potomac					
MD. PT	−0.63 ± 0.21	14	−65.3 ± 23.5	−27.7 ± 6.0	402 ± 125
RAG. PT	−1.05 ± 0.21	672 ± 70	8.2 ± 0.6	73.6 ± 19.7	557 ± 98
Mainstem Bay					
PT. NO. PT	−0.62 ± 0.25	−190 ± 96	3.9 ± 1.5	−10.9 ± 3.9	398 ± 23
R-64	−0.97 ± 0.03	−368 ± 112	−7.1 ± 2.5	−27.7 ± 14.9	657 ± 81
TOM. PT	−0.93 ± 0.09	−431 ± 22	−18.8 ± 14.4	−28.9 ± 8.8	239 ± 52
STIL. PD	−0.90 ± 0.05	−160 ± 96	−93.7 ± 2.3	−6.2 ± 2.9	268 ± 91

conditions are equivalent to those observed in ambient waters and then continuing the incubation/sampling routine for a period of time sufficient to obtain a flux under in-situ conditions. Overall, we are extremely pleased with the efficiency of the approach we have adopted for making sediment-water exchange measurements.

VFX Study

Sediment Traps

During the first sediment trap deployment (23-30 July 1984) we examined two methodological questions regarding the design of our sediment trap program. We compared the collection efficiency of cylindrical traps with aspect ratios (height:diameter of mouth) of 5 and 10. While at Thomas Point (TP) there was no consistent difference between the two designs, the longer traps (aspect ratio=10) collected 25-150% more material at "R64" than did the shorter traps, with greatest differences occuring for the "surface" (4 m) deployment (Table 7). Previous controlled experiments have suggested a rectangular hyperbolic relationship between trapping rate and aspect ratio (Bloesch and Burns, 1980; Blomquist and Hakanson, 1981), with collections at higher aspect ratios approaching 'true" deposition rates. We also investigated the necessity for capping traps prior to retrieval, and found no consistent significant loss of material when traps were brought to the water surface without capping, except possibly in some surface cups. Others have concluded similarly that traps with aspect ratios greater than 5 could be retrieved without capping (Bloesch and Burns, 1980), and there are substantial logistic advantages of being able to collect traps without the assistance of SCUBA divers, especially during the winter. On the basis of these experiments, we decided to use traps with an aspect of 10:1 (i.e. 7.6cm x 76.0cm) retrieved without capping in our routine sampling.

TABLE 7. Estimates of particulate matter flux to the sediment surface at two VFX stations (F-64; Tom. Pt.) for the period 30-7-84 to 30-8-34. For the first deployment period (23-7-84 to 30-7-34), the first two data enteries at each cup depth represent collections made with cup ratios of 10:1 while the latter two enteries represent collections made with cup ratios of 5:1. All subsequent collections reported here were*

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFXDEPO (deposition of particulates at the sediment surface,wgt/m2/d)

STATION	DATE DEPLOY	TIME DEPLOY	DATE RETRIEVE	TIME RETRIEVE	TOTAL TIME (days)	TOTAL DEPTH (m)	CUP DEPTH (m)	SESTON (g/m2/d)	PC (mg/m2/d)	PN (mg/m2/d)	PP (mg/m2/d)	CHLORO (mg/m2/d)
TOM.PT	23-7-84	1315	30-7-84	1455	7.06	15.50	4.20	60.52	3085.55	461.98	106.72	25.64
					7.06	15.50	4.20	68.14	3472.66	478.77	104.43	28.54
					7.06	15.50	4.20	40.52	1730.70	249.86	57.66	12.09
					7.06	15.50	4.20	46.28	2416.48	346.69	61.79	19.12
					7.06	15.50	9.20	38.94	1792.21	248.48	65.57	17.50
					7.06	15.50	9.20	44.46	1995.69	266.78	67.39	18.78
					7.06	15.50	9.20	42.27	1961.03	265.53	66.09	16.06
					7.06	15.50	9.20	47.65	1928.66	241.16	67.81	14.10
					7.06	15.50	14.30	381.50	19150.60	2564.01	398.62	89.57
					7.06	15.50	14.30	457.72	22547.74	3025.90	500.12	106.75
					7.06	15.50	14.30	408.49	20240.40	2770.84	446.73	103.21
TOM.PT	30-7-84	1510	7-8-84	1100	7.90	16.00	4.70	28.56	2945.60	278.98	43.87	9.09
					7.90	16.00	4.70	29.45	1680.17	242.89	53.88	11.40
					7.90	16.00	9.70	29.55	1630.33	230.92	49.58	5.06
					7.90	16.00	9.70	34.59	1489.72	199.26	51.03	14.37
					7.90	16.00	14.80	338.30	15361.77	2052.46	352.84	62.82
					7.90	16.00	14.80	308.74	15297.42	2048.49	346.55	66.76
TOM.PT	7-8-84	1100	14-8-84	1030	7.00	16.20	4.90	28.71	2279.27	351.71	63.90	7.14
					7.00	16.20	4.90	34.56	2359.80	342.96	70.83	8.67
					7.00	16.20	9.90	22.59	1236.98	174.86	34.41	5.30
					7.00	16.20	9.90	21.27	1185.67	155.34	34.13	5.14
					7.00	16.20	15.00	226.46	11220.87	1514.14	237.18	28.80
					7.00	16.20	15.00	207.48	10660.58	1434.46	228.91	25.80
TOM.PT	14-8-84	1045	22-8-84	1200	8.08	16.20	4.90	51.25	3346.21	509.96	110.26	14.00
					8.08	16.20	4.90	51.46	3389.64	475.84	103.31	11.79
					8.08	16.20	9.90	29.13	1133.06	162.20	57.20	5.19
					8.08	16.20	9.90	26.66	1124.59	158.03	32.07	4.85
					8.08	16.20	15.00	273.99	13855.66	1934.17	304.64	34.18
					8.08	16.20	15.00	293.42	13779.76	1927.78	282.20	33.46
TOM.PT	22-8-84	1200	30-8-84	1113	7.96	15.35	2.48	66.16	5874.85	1006.77	157.56	22.17
					7.96	15.35	2.48	64.80	5715.24	965.84	179.39	17.33
					7.96	15.35	7.77	39.41	2010.74	302.40	55.73	5.31
					7.96	15.35	7.70	43.94	2055.39	308.00	53.60	5.34
					7.96	15.35	13.52	352.21	18143.76	2380.48	393.37	30.64
					7.96	15.35	13.52	391.62	18323.67	2397.00	388.86	32.46

*made with cup ratios of 10:1 (see text for details). Cup depths at Station R-64 denoted with "∘" were capped prior to retrieval.

Table 7 (continued)

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFIDEPO (deposition of particulates at the sediment surface,wgt/m2/d)

STATION	DATE DEPLOY	TIME DEPLOY	DATE RETRIEVE	TIME RETRIEVE	TOTAL TIME (days)	TOTAL DEPTH (m)	CUP DEPTH (m)	SESTON (g/m2/d)	PC (mg/m2/d)	PN (mg/m2/d)	PP (mg/m2/d)	CHLORO (mg/m2/d)
R-64	23-7-84	1745	30-7-84	1010	6.70	16.00	3.80 •	11.55	1784.75	297.72	37.81	27.67
					6.70	16.00	3.80	11.30	1414.36	244.13	29.46	19.12
					6.70	16.00	3.80 •	4.93	610.87	100.33	15.82	7.51
					6.70	16.00	3.80	4.05	480.70	85.09	13.87	5.78
					6.70	16.00	7.80 •	8.14	798.23	126.21	17.05	7.75
					6.70	16.00	7.80	8.35	850.20	139.35	18.31	8.89
					6.70	16.00	7.80	5.03	482.68	73.16	13.38	4.04
					6.70	16.00	7.80 •	4.26	480.94	82.62	12.93	3.61
					6.70	16.00	13.70	149.59	7599.20	1109.60	128.92	36.91
					6.70	16.00	13.70 •	123.52	6755.18	967.60	112.51	32.51
					6.70	16.00	13.70	126.45	6686.92	947.24	49.73	30.24
					6.70	16.00	13.70	124.02	6886.67	977.29	117.83	31.29
R-64	30-7-84	1045	7-8-84	1250	8.08	16.10	3.90	14.31	1772.60	298.90	65.91	11.42
					8.08	16.10	3.90	15.60	2286.77	397.17	54.32	13.04
					8.08	16.10	7.90	4.12	549.73	90.92	14.52	4.60
					8.08	16.10	7.90	4.80	488.08	77.96	12.25	3.90
					8.08	16.10	13.80	49.45	2742.79	412.39	53.11	14.46
					8.08	16.10	13.80	49.95	2669.96	403.59	53.74	14.04
R-64	7-8-84	1230	14-8-84	1230	7.00	16.50	4.30	10.28	2038.16	330.28	51.57	7.53
					7.00	16.50	4.30	10.25	1917.63	311.63	43.93	7.06
					7.00	16.50	8.30	6.77	870.86	139.67	18.90	4.17
					7.00	16.50	8.30	6.91	930.38	147.18	19.13	4.49
					7.00	16.50	14.20	24.17	1769.43	264.08	34.22	6.44
					7.00	16.50	14.20	31.09	1888.67	279.14	36.63	6.73
R-64	14-8-84	1230	22-8-84	910	6.90	16.80	4.60	25.39	2724.27	475.28	72.40	10.01
					6.90	16.80	4.60	25.54	2762.14	481.95	73.82	10.08
					6.90	16.80	8.60	15.89	1074.10	170.37	25.58	4.69
					6.90	16.80	8.60	15.52	1056.97	166.39	22.60	3.97
					6.90	16.80	14.50	72.48	3858.48	576.12	70.54	11.50
					6.90	16.80	14.50	73.35	3375.73	533.06	64.07	10.25
R-64	22-8-84	910	30-8-84	1400	8.21	16.80	4.60	61.20	7043.53	1362.71	207.99	24.44
					8.21	16.80	4.60	39.11	5292.30	941.12	129.59	15.88
					8.21	16.80	8.60	19.90	1648.83	294.38	39.58	4.43
					8.21	16.80	8.60	19.04	1586.36	274.06	39.58	4.98
					8.21	16.80	14.50	224.24	9751.27	1460.13	185.38	21.64
					8.21	16.80	14.50	223.32	9656.26	1432.26	182.06	21.64

Vertical distribution of trapping rates (extrapolated to the sediment surface) generally followed the expected pattern: similar values occurred in the upper "mixed layer" and just beneath the pycnocline, while significantly higher (3-10 times) rates were observed for the traps well below the pycnocline (Tables 7 and 8). These higher rates in the bottom traps reflect the effects of capturing resuspended bottom material (Steele and Baird, 1972), and these values, thus, provide an index of tidal and wave-generated resuspension. The variance between duplicate traps was relatively small; ranges were generally ≤10% of the means for all variables measured in collected material (Table 7). Overall, the vertical distributions of particulate material in the water column paralleled those for substances retained in the traps (Tables 7, 8 and 9; Appendix Tables 8 and 9); however, there were a few noteworthy differences exemplified in the data for the deployment period 1-8 August 1984 (Table 8). An interesting and consistent pattern is the lower accumulation rates for traps in the pycnocline compared to those in the overlying mixed layer. We have no simple explanation for this observation (we considered such factors as grazing, light-related algal stratification, and trap artifacts), and we hope to conduct experiments in 1985 to further consider this question.

Various constituent ratios can serve as indices of the character of particulate material both in the water column and the traps. Particulate organic carbon content (as a percentage of total dry weight) offers a potential means of distinguishing resuspended bottom material from newly deposited biogenic substances (Gasith, 1975). At "R64" in early August, there was a clear distinction in %C between particulates in upper traps compared to bottom deployments (Table 8). Although the carbon content of water-column seston was only 8% on 8 August, it was 15% in the previous week and 14-19% in all other weeks (Table 7). This suggests that the material collected in the upper trap was dominated by "new" (as opposed to resuspended) particulates. It appears

Table 8. Example vertical distributions of sediment trap collection rates, water column concentrations and constituent rates for Thomas Point and "R64" stations, 1-8 August 1984.

Sediment Trap Collections

Station	(m) Trap Depth	Deposition ($gm^{-2}d^{-1}$) Dry Wt.	Chl a(10^3)	C:d.w. (%)	C:N (atom)	C:P (atom)	Chl:D.w. (%)
Thomas Pt.	5	31.6	7.9	7	7.8	11.5	0.024
	10	21.9	5.2	6	8.6	10.7	0.024
	15	217.0	27.3	5	8.7	14.0	0.013
"R64"	4	10.3	7.3	20	7.2	14.8	0.071
	8	6.8	4.3	13	7.3	16.7	0.063
	14	27.6	6.6	7	7.9	17.0	0.024

Water Column Constituents*

Station	Seston (mg/L)	Chl a (ug/L)	C:d.w. (%)	C:N (atom)	N:P (atom)	Chl:d.w. (%)
Thomas Pt.	11.4	24.4	14	6.6	16.9	0.210
	9.8	2.1	4	6.5	5.0	0.021
	9.3	2.1	4	6.7	5.3	0.023
"R64"	15.2	22.0	8	5.8	18.1	0.145
	10.2	5.7	7	5.6	13.6	0.056
	12.8	1.6	5	6.4	11.1	0.020

*Presented are water column constituents at depths above sediment trap height.

Table 9. Summary of deposition rates for July and August as estimated from sediment trap deployments in various estuaries and coastal environments.

System	References	Mo.	Sediment Accumulation: Dry Wt. ($gm^{-2}d^{-1}$)	C ($mgm^{-2}d^{-1}$)	N ($mgm^{-2}d^{-1}$)	P ($mgm^{-2}d^{-1}$)	Chl a ($mgm^{-2}d^{-1}$)	Ratios: C:Chl (mg/ng)	C:d.w. %	C:N (atom)	N:P (atom)
CHESAPEAKE BAY#											
Thomas Pt.	THIS STUDY	JUL	41.4	1890	257	66	18.1	104	5	8.6	8.6
		AUG	31.0	1490	211	46	6.4	233	5	8.2	10.2
"R64"	THIS STUDY	JUL	8.2	824	105	18	8.3	99	10	9.2	12.9
		AUG	11.6	1030	170	24	4.4	234	9	7.1	15.7
PATUXENT RIVER ESTUARY											
Jones Pt.	Boynton et al. (1982);	JUL	37.3	1740	236	79	-	-	5	8.6	6.6
		AUG	6.2	556	58	28	-	-	9	11.2	4.6
Buena Vista	Kemp and Boynton (1984)	JUL	690.0	24900	2530	1194	-	-	3	11.5	4.7
		AUG	15.3	593	49	32	-	-	4	14.1	3.4
St. Leonard's Cr.		JUL	18.8	1270	133	16	-	-	7	11.1	18.4
		AUG	1.3	144	33	7	-	-	11	5.1	10.4
YORK RIVER ESTUARY											
VIMS	Patten et al. (1966)	JUL	60.0	3000	-	-	-	-	5	-	-
		AUG	120.0	6000	-	-	-	-	5	-	-
BEDFORD BASIN* (Nova Scotia)	Hargrave & Taguchi (1978)	JUL	-	200	40	-	0.2	100	-	6	-
		AUG	-	320	45	-	0.2	160	-	9	-
KIEL BIGHT* (Baltic Sea)	Smetacek (1980)	JUL	1.0	200	25	-	2.0	100	20	9	-
		AUG	2.0	300	30	-	4.0	75	15	12	-
LOCH EWE* (North Sea)	Steele & Baird (1972)	JUL	1.0	100	-	-	0.3	33	10	-	-
		AUG	0.6	100	-	-	0.2	50	17	-	-

#These values are from the traps deployed in the pycnocline.

*Values reported in literature were estimated visually from graphical displays, and those should be considered approximations only.

that most of the suspended particulates in the surface waters were of phytoplanktonic origin, since C:N and N:P ratios were similar to the Redfield proportions (Tables 8 and 9). Ratios of C:N were 15-30% higher in trapped particulates as compared to water-column seston, indicating preferential release of dissolved nitrogen (compared to carbon) of material in the traps (Table 8). N:P ratios for trapped material increased slightly with depth, while N:P for seston decreased markedly in deeper waters (Table 8). These opposite trends probably reflect dominance of phosphate adsorption to sinking particles in the water, and phosphate release from particles deposited in traps surrounded by anoxic or hypoxic bottom waters (see Appendix Tables 10, 11a and 11b and review by Bloesch and Burns, 1980 and Blomquist and Hakanson, 1981). The percent of total dry weight associated with chlorophyll a decreased rapidly with depth in the water column (Tables 8 and 9). This decrease is seen similarly in the sediment trap collections, although the data in Table 8 are less pronounced for traps, since even the uppermost deployments are 4-5 m below the mean water surface.

The species composition of deposited algal cells was surprisingly diverse (Appendix Table 9). Both pennate and centric diatoms were important components of the total assemblages collected, with species such as Chaetocerus sp. and Skeletonema costatus typically abundant. The benthic pennate diatoms which were of occasional significance were probably part of the tychoplankton resuspended from shoals and transported to the deeper Bay. Various dinoflagellates (such as Prorocentrum minimum) and especially small green flagellated cells (such as Cryptomonas sp.) were often dominant in these collections. Other chlorophytes such as Chlorella sp. were sometimes important. Various blue-green bacteria, both chained colonies (such as Anacystis sp.) and unidentified spherical forms, were often numerically abundant in these samples. A substantial fraction of the cells accumulated in these traps were encysted, and many of those were dinoflagellates.

Deposition rates observed in this program for July and August of 1984 were similar to those reported previously for other estuarine sites and higher than rates measured with comparable sediment traps in coastal marine waters (Table 9). Rates of dry matter deposition at the Thomas Point site were 1-4 times higher than those at "R64", reflecting the higher rates of sedimentation toward the "turbidity-maximum" region (e.g. Boynton and Kemp, 1985). However, rates of carbon and chlorophyll a deposition were more similar at the two sites, and carbon represented about 5 and 10%, respectively, of the trapped materials at Thomas Point and "R64". These patterns along the salinity gradient are similar to those which we observed previously in the Patuxent River estuary (Boynton et al., 1982; Kemp and Boynton, 1984). It is interesting to note the remarkable similarity between July deposition at the Jones Point site in the Patuxent and at Thomas Point (Table 9).

Overall, the rates of carbon loss from the water-column were on the order of 1-2 $gCm^{-2}d^{-1}$, which represent about 30-60% of the plankton primary production in these regions of Chesapeake Bay (Boynton and Kemp, 1985). Ratios of carbon:chlorophyll a for these particulates were generally 75-225, typical of planktonic material. Thus, it appears that almost half of the carbon production by phytoplankton is not consumed in the upper mixed layer, and much of it may be deposited to the benthos. There were some indications of a temporal pattern of carbon (and chlorophyll a) deposition rates: relatively high values were observed in July, but those decreased to a minimum in early August, and increased again toward the end of August. However, if we use the pycnocline traps as a measure of actual loss from the euphotic zone, we would conclude that deposition of planktonic debris occurred continually throughout the summer season as a fraction of primary production. This is in contrast to the episodic or intermittent depositional events described elsewhere for spring plankton blooms (e.g. Smetacek, 1980).

We are encouraged by the results of this summer season sediment trapping program. Our findings here are consistent with those reported previously, but they provide a novel view of the plankton dynamics in Chesapeake Bay, and a quantitative (and qualitative) measure of the influence of plankton on the estuarine benthos. There are a number of methodological experiments which we would like to conduct in 1985 to test the interpretation of these results, and some minor changes in our approach may be warranted. We are especially enthusiastic about developing a description of particle deposition for a full annual cycle and further interpreting these results in light of the benthic nutrient regeneration studies discussed elsewhere in this report and other components of the OEP water quality monitoring program.

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APPENDIX TABLE 1.

Field data sheets used in the Ecosystem Processes Component of the OEP Biomonitoring Program

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

SEDIMENT OXYGEN-NUTRIENT EXCHANGE

Core Measurements

Station: **Date:**

Core Number: ________ **Water Volume:** ________

Time:										
DO, mg/l:										
AA vial #:										

Core Number: ________ **Water Volume:** ________

Time:										
DO, mg/l:										
AA vial #:										

Core Number: ________ **Water Volume:** ________

Time:										
DO, mg/l:										
AA vial #:										

Blank: ________ **Water Volume:** ________

Time:										
DO, mg/l:										
AA vial #:										

Appendix Table 1 (continued)

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

SEDIMENT OXYGEN-NUTRIENT EXCHANGE

Core Eh Measurements

Station:					
Date:					
Time:					

Depth	Eh	Depth	Eh	Depth	Eh	Depth	Eh	Depth	Eh

Appendix Table 1 (continued)

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

WATER COLUMN PROFILES: Temperature, Salinity, Dissolved Oxygen

Date:_______ Station:_______ Time:_______ Depth:_______ Secchi:_______

Sample Depth m	Temperature °C	Salinity ppt	Dissolved Oxygen mgl^{-1}

Appendix Table 1 (continued)

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

SEDIMENT TRAP IDENTIFICATION

Station:

Deployment Date:	Retrieval Date:
Deployment Time:	Retrieval Time:
Total Depth:	Total Depth:

Anchor to top of bottom cups:

Bottom to mid cups:

Mid to surface cups:

Estimated sinking depth:

Surface Cup Numbers:

Mid Cup Numbers:

Bottom Cup Numbers:

Comments:	Comments:

Appendix Table 1 (continued)

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

WATER COLUMN PROFILES; PARTICULATES

Date:_______ Station:_______ Time of Sample:_______

Depth of Sample:	____	____	____	____	____	____
Chloro	____	____	____	____	____	____
Vol	____	____	____	____	____	____
PP	____	____	____	____	____	____
Vol	____	____	____	____	____	____
PC/PN	____	____	____	____	____	____
Vol	____	____	____	____	____	____

Surficial Sediment Sample #

Appendix Table 1 (continued)

Office of Environmental Programs
Biomonitoring Program
Ecosystem Processes Component

SEDIMENT TRAP CUPS

Date:________ **Station:**________ **Time of Sample:**________

Cup Number:												
Total Volume:												
Test Tube Vol:												
Chloro												
Vol												
PP												
Vol												
PC/PN												
Vol												

Appendix Table 1 (continued)

NUTRIENTS											
Date											
Station											
Time											
Depth											
AA VIAL CODE											
NO_3/NO_2											
NH_3											
DIP											
SiO_2											
GLASS CODE											
DON/DOP											
TP											
FILTER PADS											
PC/PN											
VOL											
CHLORO											
VOL											
SESTON											
VOL											
PP											
VOL											

APPENDIX TABLE 2

Data dictionaries associated with the Ecosystem Processes Component of the OEP Biomonitoring Program

DATA DICTIONARY

Name of data file described by this data dictionary file: H2OPROF
Names and descriptions of associated data dictionary files: SEDFLUX, SEDPROF, H2ONUTS
Project Title: Ecosystem Processes; Sediment Oxygen and Nutrient Exchanges (SONE)
Principal Investigator(s): W.R. Boynton and W.M. Kemp
> Program Manager: L. Lubbers (CBL)
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department Health & Mental Hygiene, Office of Environmental Programs; Biomonitoring Program
Project Cost: $172,000/yr
QA/QC Officer: --
Location of Study: Maryland portion mainstem Chesapeake Bay and Patuxent, Potomac and Choptan tributaries
Date Intervals: 84-7-13 to 85-6-30 (quarterly measurements: Aug., Oct., May and June-July)
Abstract: Temperature (°C), salinity (ppt) and dissolved oxygen (O_2) concentrations were measured throughout the water column (2m intervals) at 10 locations in the Md. portion of Chesapeake Bay and tributaries during four periods of the year (August, October, May and June-July) in association with sediment oxygen and nutrient exchange measurements.

Station Names and Descriptions:

Name	Description	File Name
St. Leonard Cr.	Patuxent River; adjacent to mouth of St. Leonard Cr. (RM=5)	ST.LEO
Buena Vista	Patuxent River; 0.5 naut. mi upstream of Rt. 231 bridge (RM=15)	BU.VISTA
Horn Pt.	Choptank River; Adjacent to Horn Pt. (RM=11)	HORN.PT
Windy Hill	Choptank River; Adjacent to Windy Hill (RM=25)	WIND.HIL
Ragged Pt.	Potomac River; Adjacent to Bouy 51-P (RM=13)	RAG.PT
Maryland Pt.	Potomac River; Adjacent to Bouy C-17 (RM=53)	MD.PT
Point No Pt.	Chesapeake Bay; Adjacent to Point No Pt.	PT.NO.PT.
R-64	Chesapeake Bay; Adjacent to channel Bouy R-64	R-64
R-78	Chesapeake Bay; Adjacent to channel Bouy R-78	R-78
Still Pond	Chesapeake Bay; Adjacent to channel Bouy 41	STIL.PD

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
ST.LEO	38°22.74	76°30.08	6.7 m
BU.VISTA	38°30.96	76°39.85	3.6 m
HORN.PT	38°37.07	76°07.80	7.2 m
WIND.HIL	38°41.43	75°58.42	3.6 m
RAG.PT	38°09.77	76°35.58	13.2 m
MD.PT	38°21.36	77°11.52	9.8 m
PT.NO.PT	38°07.98	76°15.10	13.0 m
R-64	38°33.60	76°25.64	16.0 m
R-78	38°57.28	76°23.58	15.2 m
STIL.PD	37°20.91	76°10.87	9.5 m

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: H2OPROF
> Parameter: total depth
Collection Method: fathometer
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: H2OPROF
> Parameter: sample depth
Collection Method: research vessel cable meter
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: H2OPROF
> Parameter: temp.
Collection Method: probe, Beckman induction salinometer
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: H2OPROF
> Parameter: salinity
Collection Method: probe, Beckman induction salinometer
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: H2OPROF
> Parameter: dissolved oxygen (uncorrected for salinity)
Collection Method: probe
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none

Appendix Table 2 (continued)

Lab Techniques with References: none
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION LOCATION: station name (see earlier documentation in this data dictionary file for full station name and location)
DATE: indicates day of measurement, dd,mm,yy
TIME: Time of day that sample was collected; reported as hr. min (24 hr clock)
TOTAL DEPTH: Total water column depth; in meters (m)
SAMPLE DEPTH: Depth beneath the water surface at which a sample was taken; in meters (m)
TEMP: Temperature (°C) of water at a specified depth
SALINITY: Salinity (parts per thousand, ppt) of water at a specified depth
DISS. OXY: Dissolved oxygen concentration (mg/l or parts per million) at a specified depth. Value reported is uncorrected for salinity effects on dissolved oxygen.
FORMULAS, CALCULATIONS AND CONVERSIONS: None in file named H2OPROF
REFERENCE SPECIES CODE USED: none
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: none
KEY WORDS: sediment-water exchanges; benthic fluxes
TECHNICAL REFERENCES IN THIS FILE: none
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

DATA DICTIONARY

Name of data file described by this data dictionary file: SEDPROF
Names and descriptions of associated data dictionary files: H2OPROF, SEDFLUX, H2ONUTS
Project Title: Ecosystem Processes; Sediment, oxygen and nutrient exchanges (SONES)
Principal Investigator(s): W.R. Boynton and W.M. Kemp
> Program Manager: L. Lubbers (CBL)
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: St. of Md., Dept. health & Mental Hygiene, Office of Environmental Programs; Biomonitoring Program
Project Cost: $172,000/yr
QA/QC Officer: --
Location of Study: Md. portion mainstem Chesapeake Bay and Patuxent, Potomac and Choptank tributaries
Date Intervals: 84-7-13 to 85-6-30 (quarterly measurements; Aug., Oct., May and June-July)
Abstract: Concentrations of particulate carbon, nitrogen, phosphorus, biogenic silica and chlorophyll as well as Eh, and $\%H_2O$ are measured in sediments at 10 locations in Md. portion of Chesapeake Bay and three tributaries. The above variables are measured at 1 cm intervals in sediment cores (to depth of 10 cm) at all stations once per year.

Station Names and Descriptions:

Name	Description	File Name
St. Leonard Cr.	Patuxent River; adjacent to mouth of St. Leonard Cr. (RM=5)	ST.LEO
Buena Vista	Patuxent River; 0.5 naut. mi upstream of Rt. 231 bridge (RM=15)	BU.VISTA
Horn Pt.	Choptank River; Adjacent to Horn Pt. (RM=11)	HORN.PT
Windy Hill	Choptank River; Adjacent to Windy Hill (RM=25)	WIND.HIL
Ragged Pt.	Potomac River; Adjacent to Bouy 51-B (RM=13)	RAG.PT
Maryland Pt.	Potomac River; Adjacent to Bouy C-17 (RM=53)	MD.PT
Point No Pt.	Chesapeake Bay; Adjacent to Point No Pt.	PT.NO.PT
R-64	Chesapeake Bay; Adjacent to channel Bouy R-64	R-64
R-78	Chesapeake Bay; Adjacent to channel Bouy R-78	R-78
Still Pond	Chesapeake Bay; Adjacent to channel Bouy 41	STIL.PD

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
ST.LEO	$38^o22.74$	$76^o30.08$	6.7 m
BU.VISTA	$38^o30.96$	$76^o39.85$	3.6 m
HORN.PT	$38^o37.07$	$76^o07.80$	7.2 m
WIND.HIL	$38^o41.43$	$75^o58.42$	3.6 m
RAG.PT	$38^o09.77$	$76^o35.58$	13.2 m
MD.PT	$38^o21.36$	$77^o11.52$	9.8 m
PT.NO.PT	$38^o07.98$	$76^o15.10$	13.0 m
R-64	$38^o33.60$	$76^o25.64$	16.0 m
R-78	$38^o57.28$	$76^o23.58$	15.2 m
STIL.PD	$37^o20.91$	$76^o10.87$	9.5 m

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: research vessel captain to program manager
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: total depth (meters)
Collection Method: fathometers
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
Data Entry Method: field sheets to key to disk
Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: program manager to field sheets
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: core depth (cm)
Collection Method: probe or volumetric core at predetermined depth
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheets to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: Eh
Collection Method: probe
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheets to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: % H_2O
Collection Method: volumetric sediment core sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: weight of known sediment volume before and after drying
> Data Entry Method: field sheets to lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: particulate carbon (PC)
Collection Method: sediment core
Sample Preservatives: freezing
Sample Storage Environment: -10°C

Appendix Table 2 (continued)

Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: particulate nitrogen (PN)
Collection Method: sediment core
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: particulate phosphorus (PP)
Collection Method: sediment core
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Aspila et al. (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: biogenic silica (Si)
Collection Method: sediment core
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Paasche (1973)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: shipboard scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDPROF
> Parameter: chlorophyll-a (chloro)
Collection Method: sediment core
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: Strickland and Parsons (1972) and Shoaf and Lium (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: Station name (see earlier documentation in this data file for full station name and location)
DATE: Indicates day of measurement (dd, mm, yy)
TIME: Indicates time of day that sample was collected (hr., min.: 24 hr clock)
TOTAL DEPTH: Indicates total water depth at a sampling station (meters, m)
CORE DEPTH: Indicates depth (cm) beneath the sediment surface at which a sample was taken
Eh: A measure of the chemical electronic environment (oxidizing or reducing) at a specified depth in the sediment column. Reported as millivolts (mV) not corrected to a hydrogen reference electrode.
% H_2O: The percent (by weight) of water in a cubic centimeter (cm^3) of sediments collected from a specified depth in the sediment column.
PC: The percent by dry weight (%) of particulate carbon (PC) collected from a specified depth in the sediment column.
PN: The percent by dry weight (%) of particulate nitrogen (PN) collected from a specified depth in the sediment column.
PP: The percent by dry weight (%) of particulate phosphorus (PP) collected from a specified depth in the sediment column.
Si: The percent by dry weight (%) of particulate biogenic silica (Si) collected from a specified depth in the sediment column.
Chloro: The concentration (ug/l) of chlorophyll obtained from a specified area at a specified depth within the sediment column.
FORMULAS, CALCULATIONS & CONVERSIONS: none in file named SEDPROF
REFERENCE SPECIES CODE USED: none
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: none
KEY WORDS: sediment-water exchanges; benthic fluxes
TECHNICAL REFERENCES IN THIS FILE:
Aspila, I., H. Agemian and A.S.Y. Chau. 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst 101:187-197.
Hobson, L.A. and D.W. Menzel. 1969. The distribution and chemical composition of organic particulate matter in the sea and sediments off the east coast of South America. Limnol. Oceanogr. 14:159-163.
Paasche, E. 1973. The influence of cell size on growth rate, silica content and some other properties of four marine diatom species. Norw. J. Bot. 20:197-204.
Shoaf, W.T. and B.W. Lium. 1976. Improved extraction of chlorophyll a and b from algae using Dimethyl Sulfoxide. Limnol. Oceanogr. 21:926-928.
Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167 (second edition). Fisheries Research Bd. Canada, Ottaawa, Canada.
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

DATA DICTIONARY

Name of data file described by this data dictionary file: SEDFLUX
Names and descriptions of associated data dictionary files: H2OPROF; SEDPROF; H2ONUTS
Project Title: Ecosystem Processes; Sediment Oxygen & Nutrient Exchanges (SONE)
Principal Investigator(s): W.R. Boynton & W.M. Kemp
> Program Manager: Lawrence Lubbers (CBL)
> Statistician:
> Programmer/Analyst:
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs: Biomonitoring Program
Project Cost: $172,000/yr
QA/QC Officer:
Location of Study: Md Portion Mainstem Chesapeake Bay and Patuxent, Potomac and Choptank tributaries
Date Intervals: 84-7-13 to 85-6-30 (QUARTERLY measurements: AUG, OCT, MAY, JUN-JUL)
Abstract: The net exchanges of oxygen (O_2) and several nutrient species [NH_4^+, NO_3^- + NO_2^-, $PO_4^=$ and $Si(OH)_4$] were measured at 10 locations in the MD portion of Chesapeake Bay during 4 periods of the year (August, October, May and June-July) using intact sediment cores.

Station Names and Descriptions:

Station	Description	File Name
St. Leonard Cr.	Patuxent River; Adjacent to mouth of St. Leonard Cr. (RM=6)	ST.LEO
Buena Vista	Patuxent River; 0.5 naut. mi upstream of Rt. 231 Bridge (RM=18)	BU.VISTA
Horn Pt.	Choptank River; Adjacent to Horn Point (RM=11)	HORN.PT
Windy Hill	Choptank River; Adjacent to Windy Hill (RM=25)	WIND.HIL
Ragged Pt.	Potomac River; Adjacent to Bouy 51-B (RM=13)	RAG.PT
Maryland Pt.	Potomac River; Adjacent to Bouy C-17 (RM=53)	MD.PT
Point No Pt.	Chesapeake Bay; Adjacent to Point No Pt.	PT.NO.PT
R-64	Chesapeake Bay; Adjacent to channel Bouy R-64	R-64
R-78	Chesapeake Bay; Adjacent to channel Bouy R-78	R-78
Still Pond	Chesapeake Bay; Adjacent to channel Bouy 41	STIL.PD

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
ST.LEO	$38^{o}22.74$	$76^{o}30.08$	6.7 m
BU.VISTA	$38^{o}30.96$	$76^{o}39.85$	3.6 m
HORN.PT	$38^{o}37.07$	$76^{o}07.80$	7.2 m
WIND.HIL	$38^{o}41.43$	$75^{o}58.42$	3.6 m
RAG.PT	$38^{o}09.77$	$76^{o}35.58$	13.2 m
MD.PT	$38^{o}21.36$	$77^{o}11.52$	9.8 m
PT.NO.PT	$38^{o}07.98$	$76^{o}15.10$	13.0 m
R-64	$38^{o}33.60$	$76^{o}25.64$	16.0 m
R-78	$38^{o}57.28$	$76^{o}23.58$	15.2 m
STIL.PD	$37^{o}20.91$	$76^{o}10.87$	9.5 m

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: Program Manager to Field Sheets
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: Core Volume
Collection Method: Volumetric measurement
Sample Preservatives: None
Sample Storage Environment: None
Time in Storage: None
Lab Techniques with References: --
> Data Entry Method: Field Sheet to Key to Disk
> Data Verification: Visual Comparison

Methodology Describing Chain of Custody for Lab Samples: Program Manager to Field Sheets
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: DO; Dissolved Oxygen (uncorrected)
Collection Method: Polagraphic Probe (YSI Model 57)
Sample Preservatives: None
Sample Storage Environment: None
Time in Storage: None
Lab Techniques with References: None
> Data Entry Method: Field Sheet to Key to Disk
> Data Verification: Visual Comparison

Methodology Describing Chain of Custody for Lab Samples: Shipboard Scientific Party to Program Manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: NH_4^+ concentration; ug-at N l^{-1}
Collection Method: syringe sample from sediment core
Sample Preservatives: filtered (0.45u) and frozen
Sample Storage Environment: freezer (-10°C)
Time in Storage: 0-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: Data Book to Key to Disk
> Data Verification: Visual comparison

Methodology Describing Chain of Custody for Lab Samples: Shipboard Scientific Party to Program Manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: NO_3^- + NO_2 concentration; ug at N l^{-1}
Collection Method: NO_3^- + NO_2 concentration; ug at N l^{-1}
Sample Preservatives: Syringe sample from sediment cores
Sample Storage Environment: freezer (-10°C)
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: data book to ky to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Shipboard Scientific Party to Program Manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: DIP (dissolved inorganic phosphorus) concentration; ug-at P l^{-1}
Collection Method: syringe sample from sediment cores
Sample Preservatives: filtered (0.45u) and frozen
Sample Storage Environment: freezer (-10°C)
Time in Storage: 4-35 days

Appendix Table 2 (continued)

Lab Techniques with References: EPA (1979)
> Data Entry Method: data book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Shipboard Scientific Party to Program Manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: SEDFLUX File
> Parameter: Silica concentration; ug-at Si l^{-1}
Collection Method: syringe sample from sediment cores
Sample Preservatives: filtered (0.45u) and frozen
Sample Storage Environment: freezer (-10°C)
Time in Storage: 0-35 days
Lab Techniques with References: Technicon Industrial Systems (1977)
> Data Entry Method: data book to key to disk
> Data Verification: visual comparison

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: station name (see earlier portion of this data file for station locations, descriptions, etc.)
DATE: indicates day of measurement (ddmmyy)
CORE NO.: indicates intact sediment core replicate number
CORE VOL: total volume of water overlying sediment core (ml)
CORE H_2O Height: height of water above sediment surface (cm)
TIME SUM: summation of time elapsed from beginning of incubation (min)
TIME OF SAMPLE: reported as hrs (24hr) and minutes (min) in separate columns.
DELTA T: reported as time between samples (oxygen or nutrient) in minutes
DO: refers to dissolved oxygen concentration in intact sediment core head water and is reported as mg/l or ppm or mg l^{-1}
NH_4: refers to ammonium-nitrogen concentration in intact sediment core head water and is reported as uM-N or ug-at NH_4-N l^{-1}
$NO_3 + NO_2$: refers to nitrate plus nitrite concentration in intact sediment core head water and is reported as uM-N or ug-at $NO_3 + NO_2$-N l^{-1}
DIP: refers to dissolved inorganic phsophorus (DIP) concentration in intact core head water and is reported as uM-P or ug-at PO_4^--P l^{-1}
$Si(OH)_4^-$: refers to silicous acid concentration in intact core head water and is reported as uMSi or ug-at Si l^{-1}
REFERENCE SPECIES CODE USED: none
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: none
KEY WORDS: sediment-water exchanges; benthic fluxes
TECHNICAL REFERENCES IN THIS FILE:
EPA (1979): Environmental Protection Agency. 1979. Methods for chemical analysis of water and wastes. USEPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.
Technicon Industrial Systems (1977): Technicon Industrial Systems. 1977. Silicates in water and seawater. Industrial Method No. 186-72W/B. Technicon Industrial Systems, Terrytown, NY.
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

Appendix Table 2 (continued)

DATA DICTIONARY

Name of data file described by this data dictionary file: H2ONUTS, describes surface and bottom water concentrations of dissolved and particulate nutrient concentrataions associated with sediment oxygen and nutrient exchanges (SONE) stations.
Names and descriptions of associated data dictionary files: SEDFLUX, SEDPROF, H2OPROF
Project Title: Ecosystem Processes; Sediment Oxygen and Nutrient Exchanges (SONES)
Principal Investigator(s): W.R. Boynton and W.M. Kemp
> Program Manager: L. Lubbers
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs; Biomonitoring Program
Project Cost: $172,000/yr
QA/QC Officer: --
Location of Study: Md. portion of Chesapeake Bay mainstem and Patuxent, Potomac and Choptank tributaries
Date Intervals: 84-7-13 to 85-6-30 (quarterly measurements; Aug, Oct., May and June-July)
Abstract: Measurements of surface and bottom water particulate and dissolved nutrient concentrations made quarterly at 10 locations in Md. portion of Chesapeake Bay and three tributaries.

Station Names and Descriptions:

Name	Description	File Name
St. Leonard Cr.	Patuxent River; adjacent to mouth of St. Leonard Cr. (RM=5)	ST.LEO
Buena Vista	Patuxent River; 0.5 naut. mi upstream of Rt. 231 bridge (RM=15)	BU.VISTA
Horn Pt.	Choptank River; Adjacent to Horn Pt. (RM=11)	HORN.PT
Windy Hill	Choptank River; Adjacent to Windy Hill (RM=25)	WIND.HIL
Ragged Pt.	Potomac River; Adjacent to Bouy 51-B (RM=13)	RAG.PT
Maryland Pt.	Potomac River; Adjacent to Bouy C-17 (RM=53)	MD.PT
Point No Pt.	Chesapeake Bay; Adjacent to Point No Pt.	PT.NO.PT.
R-64	Chesapeake Bay; Adjacent to channel Bouy R-64	R-64
R-78	Chesapeake Bay; Adjacent to channel Bouy R-78	R-78
Still Pond	Chesapeake Bay; Adjacent to channel Bouy 41	STIL.PD

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
St.LEO	38°22.74	76°30.08	6.7 m
BU.VISTA	38°30.96	76°39.85	3.6 m
HORN.PT	38°37.07	76°07.80	7.2 m
WIND.HIL	38°41.43	75°58.42	3.6 m
RAG.PT	38°09.77	76°35.58	13.2 m
MD.PT	38°21.36	77°11.52	9.8 m
PT.NO.PT	38°07.98	76°15.10	13.0 m
R-64	38°33.60	76°25.64	16.0 m
R-78	38°57.28	76°23.58	15.2 m
STIL.PD	37°20.91	76°10.87	9.5 m

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: total depth (meters)
Collection Method: Fathometer
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheets to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to mate to program manager
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: sample depth (meters)
Collection Method: research vessel cable meter
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: none
> Data Entry Method: field sheets to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Ammonium (NH_4^+) concentration
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 0-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Nitrate (NO_3^-) concentration
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Nitrite (NO_2^-) concentration
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C

Appendix Table 2 (continued)

Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: none
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Total Dissolved Nitrogen (TDN)
Collection Method: none
Sample Preservatives: none
Sample Storage Environment: none
Time in Storage: none
Lab Techniques with References: summation of other N-species
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Dissolved Inorganic Phosphorus (DIP)
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Total Dissolved Phosphorus (TDP)
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: D'Elia et al. (1977)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: silicious acid [$Si(OH)_4$]
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 0-35 days
Lab Techniques with References: Technicon Industrial Systems (1977)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: particulate carbon (PC)

Appendix Table 2 (continued)

Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: particulate nitrogen (PN)
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: particulate phosphorus (PP)
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Aspila et al. (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: Chlorophyll concentration (chloro)
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: Strickland and Parsons (1972) and Shoaf and Lium (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: H2ONUTS
> Parameter: seston
Collection Method: water sample (pumped)
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Appendix Table 2 (continued)

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: station name (see earlier documentation in this data file for full station name, location and description)
DATE: Indicates day of measurement (dd,mm,yy)
TIME: Indicates time sample was collected (hr., min; 24 hr clock)
TOTAL DEPTH: Total depth of water column at a specified station (meters; m)
SAMPLE DEPTH: Depth beneath the water surface at which a sample was taken (meters; m)
NH_4: Ammonium concentration at a specified depth (ug-at NH_4-N/l)
NO_3: Nitrate concentration at a specified depth (ug-at NO_3-N/l)
NO_2: Nitrite concentration at a specified depth (ug-at NO_2-N/l)
TDN: Total dissolved nitrogen concentration (TDN) at a specified depth (ug-at DON-N/l)
TDP: Total dissolved phosphorus (TDP) concentration at a specified depth (ug-at DIP-P/l)
DOP: Dissolved organic phosphorus (DOP) concentration at a specified depth (ug-at DOP-P/l^{-1})
$Si(OH)_4$: a Silicous acid concentration at a specified depth (ug-at Si/l^{-1}
PC: Particulate carbon (PC) concentration at a specified depth (mg C/l)
PN: Particulate nitrogen (PN) concentration at a specified depth (mg N/l)
PP: Particulate phosphorus (PP) concentration at a specified depth (mg P/l)
Chloro: Concentration of chlorophyll at a specified depth (ug/l)
Seston: Concentration of total particulates (seston) at a specified depth (mg/l)
FORMULAS, CALCULATIONS & CONVERSIONS: none in file named H2ONUTS
REFERENCE SPECIES CODE USED: none
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: none
KEY WORDS: sediment-water exchanges; benthic fluxes
TECHNICAL REFERENCES IN THIS FILE:

Aspila, I., H. Agemian and A.S.Y. Chau. 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst 101:187-197.

D'Elia, C.F., P.A. Steudler and N. Corwin. 1977. Determination of total nitrogen in aqueous samples using persulfate digestion. Limnol. Oceanogr. 22:760-764.

Environmental Protection Agency (EPA). 1979. Methods for Chemical Analysis of Water and Wastes. USEPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati.

Hobson, L.A. and D.W. Menzel. 1969. The distribution and chemical composition of organic particulate matter in the sea and sediments off the east coast of South America. Limnol. Oceanogr. 14:159-163.

Shoaf, W.T. and B.W. Lium. 1976. Improved extraction of chlorophyll a and b from algae using Dimethyl Sulfoxide. Limnol. Oceanogr. 21:926-928.

Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167 (second edition). Fisheries Research Bd. Canada, Ottaawa, Canada.

Technicon Industrial Systems. 1977. Silicates in water and seawater. Industrial Method No. 186-72W/B. Technicon Industrial Systems, Terrytown, New York.

INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

DATA DICTIONARY

Name of data file described by this data dictionary file: VFXSEDS
Names and descriptions of associated data dictionary files: VFXDEPO, VFXALGCUP, VFXPROF
Project Title: Ecosystem Processes; Vertical Flux Program
Principal Investigator(s): W.R. Boynton and W.M. Kemp
> Program Manager: L. Lubbers
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs
Project Cost: $172,000/yr
QA/QC Officer: --
Location of Study: Md. portion mainstem Chesapeake Bay
Date Intervals: 13-7-84 to 30-6-85 (weekly and biweekly measurements taken 16 times per year)
Abstract: Description of particulate organics, chlorophyll <u>a</u> and algal species present in the top 1cm of the sediment column at sediment trap locations.

Station Names and Descriptions:

Name	Description	File Name
Thomas Point (occupied 23/7/84 - 30/8/84)	1.3 naut. mi E of Thomas Pt. Light	Tom.Pt.
R-78 (occupied 27/9/84 and replaces Thomas Pt.)	200 yds NNW of Bouy R78	R-78
R-64	300 yds NE of Bouy R64	R-64

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
Tom.Pt.	38°54.07	76°24.54	15.2 m
R-78	38°57.28	76°23.58	15.2 m
R-64	38°33.60	76°25.64	16.0 m

Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXSEDS
> Parameter: PC (particulate carbon)
Collection Method: bottom core
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXSEDS
> Parameter: PN (particulate nitrogen)
Collection Method: bottom core
Sample Preservatives: freezing
Sample Storage Environment: $-10^{o}C$
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXSEDS
> Parameter: PP (particulate phosphorus)
Collection Method: bottom core
Sample Preservatives: freezing
Sample Storage Environment: $-10^{o}C$
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXSEDS
> Parameter: Chloro (chlorophyll a)
Collection Method: bottom core
Sample Preservatives: freezing
Sample Storage Environment: $-10^{o}C$
Time in Storage: 4-35 days
Lab Techniques with References: Strickland and Parsons (1972) and Shoaf and Lium (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison
VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: Station name (see earlier documentation in this file for location)
DATE: Day of measurement (dd,mm,yy)
PC: Particulate carbon (expressed as % dry wgt of sediment sample)
PN: Particulate nitrogen (expressed as % dry wgt of sediment sample)
PP: Particulate phosphorus (expressed as % dry wgt of sediment sample)
CHLORO: Chlorophyll a content of surface 1cm of sediments (ug/m^2)
ALGAL VOLUME: Total volume of sample taken for algal identification (cm^3)
DILUTION VOLUME: Volume of water (l) in which algal sample diluted
VOLUME EXAMINED: Volume of algal sample examined (ml)
NUMBER PARTICLES: The total number of particles (algal and others) that were identified and counted in an algal sample.
STDING STOCK: The total number of particles (algal and others) identified in the surface 1cm of the sediment column and expressed as number per m^2.
FORMULAS, CALCULATIONS AND CONVERSIONS:
Chloro (ug/m^2) = wgt of chlorophyll (ug) ÷ sample area (cm^2) * 10,000 (cm^2/m^2)
Standing Stock ($\#/m^2$) = count (#) ÷ sample volume (cm^3) * 10,000 (cm^2/m^2)
* dilution volume (ml) ÷ volume examined (ml)
# REFERENCE SPECIES CODE USED: PPSP
# SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: scientific names to be used

Appendix Table 2 (continued)

KEY WORDS: vertical flux, organic deposition, sedimentation
TECHNICAL REFERENCES IN THIS FILE:
Hobson, L.A. and D.W. Menzel. 1969. The distribution and chemical composition of organic particulate matter in the sea and sediments off the east coast of South America. Limnol. Oceanogr. 14:159-163.
Shoaf, W.T. and B.W. Lium. 1976. Improved extraction of chlorophyll a and b from algae using Dimethyl Sulfoxide. Limnol. Oceanogr. 21:926-928.
Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167 (second edition). Fisheries Research Bd. Canada, Ottaawa, Canada.
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

Appendix Table 2 (continued)

DATA DICTIONARY

Name of data file described by this data dictionary file: VFXALGCUP
Names and descriptions of associated data dictionary files: VFXDEPO, VFXSEDS, VFXPROF
Project Title: Ecosystem Processes; Vertical Flux Program
Principal Investigator(s): W.R. Boynton and W.M. Kemp
> Program Manager: L. Lubbers
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs
Project Cost: $172,000/yr
QA/QC Officer: --
Location of Study: Md. portion of mainstem Chesapeake Bay
Date Intervals: 13-7-84 to 30-6-84 (weekly and biweekly measurements taken 16 times/year)
Abstract: Vertical arrays of sediment traps were used to obtain measurements of the quantity and speciation of algae (and other particles) sinking to the sediment surface.
Station Names and Descriptions:

Name	Description	File Name
Thomas Point (occupied 23/7/84 to 30/8/84)	1.3 naut. mi E of Thomas Pt. Light	TOM.PT
R-78 (occupied 27/9/84 and replaces Thomas Pt.	200 yds NNW of Bouy R78	R-78
R-64	300 yds NE of Bouy R64	R-64

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
TOM.PT	38°54.07	76°24.54	15.2 m
R-78	38°57.28	76°23.58	15.2 m
R-64	38°33.60	76°25.64	16.0 m

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: VFXALGCUP
> Parameter: total depth
Collection Method: fathometer
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheets to key to disk
> Data Verification: visual comparison
VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: station name (see earlier documentation in this file for full name and location)
DATE DEPLOY: Day of sediment trap deployment

Appendix Table 2 (continued)

DATE RETRIEVE: Day concluding sediment trap deployment
DEPLOY TIME: Total time (days) sediment traps were deployed
TOTAL DEPTH: Total depth of water column at a specified station (meters; m)
CUP LOCATION: Qualitative location of sediment trap cup; surface, middle, bottom
SAMPLING DEPTH: Depth beneath the water surface at which a sediment trap cup array was suspended (meters; m)
DILUTION VOLUME: Total volume of water contained in sediment trap cup (plus rinsing water). Reported in liters (l).
ALGAL VOLUME: Total volume of water used as a sub-sample for algal identification (ml)
VOLUME EXAMINED: Volume of water examined for algal identification (ml).
PPSP CODE: PPSP species code
MATERIAL ID'ed: Particulate material (algal and others) identified
NUMBER PARTICLES: The number of particles identified (number)
FLUX: The number of particles estimated as reaching the sediment surface (number/m^2/d).
FORMULAS, CALCULATIONS AND CONVERSIONS:
FLUX (#/m^2/day): number identified(#) $* \dfrac{\text{Dilution Volume (ml)}}{\text{Volume Examined (ml)}} \div$

Deploy Time (d) * 219.3 $* \dfrac{\text{Total Depth (m)}}{\text{Sampling Depth (m)}}$

REFERENCE SPECIES CODE USED: PPSP
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: scientific names to be used
KEY WORDS: vertical flux, organic deposition, sedimentation
TECHNICAL REFERENCES IN THIS FILE: none
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

Appendix Table 2 (continued)

DATA DICTIONARY

Name of data file described by this data dictionary file: VFXPROF
Names and descriptions of associated data dictionary files: VFXDEPO, VFXALGCUP, VFXSEDS
Project Title: Ecosystem Processes; Vertical Flux Program
Principal Investigator(s): W.R. Boynton, W.M. Kemp
> Program Manager: L. Lubbers
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs; Biomonitoring Program
Project Cost: $172,000
QA/QC Officer: --
Location of Study: Md. portion mainstem Chesapeake Bay
Date Intervals: 13-7-84 to 30-6-85 (weekly and bi-weekly measurements taken 16 times per year)
Abstract: Describes temperature, salinity and oxygen concentrations and particulate matter concentrations at various depths at two sediment trap locations in Chesapeake Bay (Md. portion).

Station Names and Descriptions:

Name	Description	File Name
Thomas Point (occupied 23/7/84-30/8/84)	1.3 naut. mi E of Thomas Pt. Light	TOM.PT.
R-78 (occupied 27/9/84 and replaces Thomas Pt.	200 yds NNW of Bouy R78	R-78
R-64	300 yds NE of Bouy R64	R-64

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
TOM.PT	38°54.07	76°24.54	15.2 m
R-78	38°57.28	76°23.58	15.2 m
R-64	38°33.60	76°25.64	16.0 m

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: total depth (meters; m)
Collection Method: fathometer
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Appendix Table 2 (continued)

Methodology Describing Chain of Custody for Lab Samples: Research vessel captain to program manager
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: sample depth
Collection Method: research vessel cable meter
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: TEMP (temperature °C)
Collection Method: probe
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: salinity (ppt)
Collection Method: probe
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: scientific party on research vessel to program manager
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: dissolved oxygen (uncorrected for salinity)
Collection Method: probe
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: field sheet to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: PC (particulate carbon; mg/l)
Collection Method: pumped sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days

Appendix Table 2 (continued)

Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: PN (particulate nitrogen; mg/l)
Collection Method: pumped sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: PP (particulate phosphorus; mg/l)
Collection Method: pumped sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Aspila et al. (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXPROF
Parameter: Chloro (chlorophyll-a; ug/l)
Collection Method: pumped sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: Strickland and Parsons (1972) and Shoaf and Lium (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

Methodology Describing Chain of Custody for Lab Samples: field party to program manager to Analytical Services (CBL)
Monitoring QA/QC Plan for Project: VFXPROF
> Parameter: Seston (mg/l)
Collection Method: pumped sample
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: Station name (see earlier documentation in this data file for full name and location)

Appendix Table 2 (continued)

DATE: Indicates day of measurement (dd,mm,yy)
TIME: Indicates time of measurement (hr min; 24 hr clock)
TOTAL DEPTH: Total depth of water column at a specified station (meters; m)
SAMPLE DEPTH: Depth beneath water surface at which a sample was taken (meters; m)
TEMP: Temperature (°C) at a specified depth
SALINITY: Salinity (ppt) at a specified depth
DISSOLVED OXYGEN: Dissolved oxygen concentration (mg/l) at a specified depth (uncorrected for salinity)
PC: Particulate carbon concentration (mg/l) at a specified depth
PN: Particulate nitrogen concentration (mg/l) at a specified depth
PP: Particulate phosphorus concentration (mg/l) at a specified depth
CHLORO: Chlorolphyll-a concentration (ug/l) at a specified depth
SESTON: Total suspended solids concentration (mg/l) at a specified depth
FORMULAS, CALCULATIONS AND CONVERSIONS: none in this file VFXPROF
REFERENCE SPECIES CODE USED: none
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAME: none
KEY WORDS: vertical flux; organic deposition; sedimentation
TECHNICAL REFERENCES IN THIS FILE:

Aspila, I., H. Agemian and A.S.Y. Chau. 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst 101:187-197.

Environmental Protection Agency (EPA). 1979. Methods for Chemical Analysis of Water and Wastes. USEPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati.

Hobson, L.A. and D.W. Menzel. 1969. The distribution and chemical composition of organic particulate matter in the sea and sediments off the east coast of South America. Limnol. Oceanogr. 14:159-163.

Shoaf, W.T. and B.W. Lium. 1976. Improved extraction of chlorophyll a and b from algae using Dimethyl Sulfoxide. Limnol. Oceanogr. 21:926-928.

Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167 (second edition). Fisheries Research Bd. Canada, Ottaawa, Canada.

INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

Appendix Table 2 (continued)

DATA DICTIONARY

Name of data file described by this data dictionary file: VFXDEPO
Names and descriptions of associated data dictionary files: VFXSEDS, VFXALGCUP, VFXPROF
Project Title: Ecosystem Processes; Vertical Flux Program
Principal Investigator(s): W.R. Boynton & W.M. Kemp
> Program Manager: L. Lubbers
> Statistician: --
> Programmer/Analyst: --
> Data Coordinator: Tom Page (CBL)
Funding Agency: State of Maryland, Department of Health & Mental Hygiene, Office of Environmental Programs
Project Cost: $172,000
QA/QC Officer: --
Location of Study: Md. portion mainstem Chesapeake Bay
Date Intervals: 13-7-84 to 30-6-85 (weekly and biweekly measurements taken 16 times per year).
Abstract: Description of particulate organic and inorganic deposition rates at two mainstem Chesapeake Bay locations.

Station Names and Descriptions:

Name	Description	File Name
Thomas Point (occupied 23/7/84 - 30/8/84)	1.3 naut. mi E of Thomas Pt. Light	TOM.PT.
R-78 (occupied 27/9/84 and replaces Thomas Pt.)	200 yds NNW of Bouy R78	R-78
R-64	300 yds NE of Bouy R64	R-64

Station Names, Latitudes, Longitudes, and Total Depths:

Station	Latitude	Longitude	Total Depth
TOM.PT.	$38^{o}54.07$	$76^{o}24.54$	15.2 m
R-78	$38^{o}57.28$	$76^{o}23.58$	15.2 m
R-64	$38^{o}33.60$	$76^{o}25.64$	16.0 m

Methodology Describing Chain of Custody for Lab Samples: RV Captain to Program Manager
Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: Total Depth
Collection Method: Fathometer
Sample Preservatives: --
Sample Storage Environment: --
Time in Storage: --
Lab Techniques with References: --
> Data Entry Method: Field book to key to disk
> Data Verification: Visual comparison

Appendix Table 2 (continued)

\# Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
\# Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: Seston
Collection Method: sediment trap
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: EPA (1979)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

\# Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
\# Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: PC (particulate carbon)
Collection Method: sediment trap
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

\# Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
\# Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: PN (particulate nitrogen)
Collection Method: sediment trap
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Hobson and Menzel (1969)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

\# Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
\# Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: PP (particulate phosphorus)
Collection Method: sediment trap
Sample Preservatives: freezing
Sample Storage Environment: -10°C
Time in Storage: 4-60 days
Lab Techniques with References: Aspila et al. (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

\# Methodology Describing Chain of Custody for Lab Samples: Scientific field party to program manager to Analytical Services (CBL)
\# Monitoring QA/QC Plan for Project: VFXDEPO
> Parameter: Chloro (Chlorophyll a)
Collection Method: sediment trap
Sample Preservatives: freezing

Appendix Table 2 (continued)

Sample Storage Environment: -10°C
Time in Storage: 4-35 days
Lab Techniques with References: Strickland and Parsons (1972) and Shoaf and Lium (1976)
> Data Entry Method: lab book to key to disk
> Data Verification: visual comparison

VARIABLE NAMES AND DESCRIPTIONS (EXCLUDING SPECIES COUNTS):
STATION: station name (see earlier documentation in this data file for location)
DATE DEPLOY: The date (ddmmyy) sediment trap was deployed
TIME DEPLOY: The time (24 hr clock) sediment trap was deployed
DATE RETRIEVAL: The date (ddmmyy) sediment trap was retrieved
TIME RETRIEVAL: The time (24 hr clock) sediment trap was retrieved
TOTAL TIME: The total time (in days) sediment traps were deployed
TOTAL DEPTH: Average total depth of water column at a station
CUP DEPTH: Depth from the surface to the top of a sediment trap collecting cup.
SESTON: The calculated flux of total particulates to the sediment surface ($mg/m^2/day$)
PC: The calculated flux of particulate carbon (PC) to the sediment surface ($mg/m^2/day$)
PN: The calculated flux of particulate nitrogen (PN) to the sediment surface ($mg/m^2/day$)
PP: The calculated flux of particulate phosphorus (PP) to the sediment surface ($mg/m^2/day$)
Chloro: The calculated flux of chlorophyll a to the sediment surface ($ug/m^2/day$)
FORMULAS, CALCULATIONS & CONVERSIONS:

PC FLUX ($mg/m^2/day$) = seston concentration in sediment trap cup subsample (mg/l) * total volume of water in sediment trap (l)
* 219.3 (cm^2/m^2) ÷ total deployment time, days
* total depth of water column, m ÷ depth of collecting cup, m

PN FLUX ($mg/m^2/day$) = as above except using PN concentration
PP Flux ($mg/m^2/day$) = as in PC flux except using PP concentration
Chloro Flux ($ug/m^2/day$) = as in PC flux except using chloro concentration
Seston Flux ($mg/m^2/day$) = as in PC flux except using seston concentraion
REFERENCES SPECIES CODE USED: None
SPECIES IN HOUSE CODE, REF. CODE & SCIENTIFIC NAMES: None
KEY WORDS: vertical flux, organic deposition, sedimentation
TECHNICAL REFERENCES IN THIS FILE:

Aspila, I., H. Agemian and A.S.Y. Chau. 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst 101:187-197.
Environmental Protection Agency (EPA). 1979. Methods for Chemical Analysis of

Water and Wastes. USEPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati.
Hobson, L.A. and D.W. Menzel. 1969. The distribution and chemical composition of organic particulate matter in the sea and sediments off the east coast of South America. Limnol. Oceanogr. 14:159-163.
Shoaf, W.T. and B.W. Lium. 1976. Improved extraction of chlorophyll a and b from algae using Dimethyl Sulfoxide. Limnol. Oceanogr. 21:926-928.
Strickland, J.D.H. and T.R. Parsons. 1972. A Practical Handbook of Seawater Analysis. Bull. 167 (second edition). Fisheries Research Bd. Canada, Ottaawa, Canada.
INITIALS OF SCIENTISTS IN DATA SET: WRB, WMK, LL, KVW, CWK, JEB

APPENDIX TABLE 3

Vertical water column profiles of temperature, salinity, and dissolved oxygen at SONE Stations, August, 1094.

Done for Sone Oct

BIOMONITORING PROGRAM: SEDIMENT OXYGEN AND NUTRIENT EXCHANGE COMPONENT(SONE)
H2OPROF(Vertical profiles of temp.,salinity and oxygen conc. at SONE stations)

STATION LOCATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	TEMP (oC)	SALINITY (ppt)	DISS.OXY (mg/l)
ST.LEO	27-AUG-84	940	6.7	0.5	25.3	9.8	7.80
				2	25.40	10.50	7.30
				4	25.30	10.80	5.90
				6	24.70	13.30	2.20
BU.VISTA	27-AUG-84	1335	3.6	0.5	25.80	8.80	7.50
				2	25.90	8.90	7.20
				3	25.80	8.90	7.00
HORN.PT	29-AUG-84	1025	7.2	0.5	25.20	11.20	6.25
				2	25.10	11.50	5.60
				4	24.80	12.00	4.40
				6	24.70	12.60	3.60
				6.7	24.70	12.60	3.40
WIND.HL	29-AUG-84	1255	3.6	0.5	25.60	4.80	6.50
				1	25.60	4.80	6.50
				2	25.20	4.90	6.20
				3	25.40	5.10	6.20
RAG.PT	28-AUG-84	1145	13.2	0.5	25.10	8.50	7.90
				2	24.60	8.50	7.50
				4	24.80	8.50	7.10
				6	24.50	8.60	6.80
				8	24.70	9.10	5.90
				10	24.40	9.40	5.20
				12	24.30	16.50	0.40
				13	24.10	17.00	0.30

Appendix Table 4 (continued)

BIOMONITORING PROGRAM: ECOSYSTEM PROCESSES COMPONENT(SONE STUDY)
SEDPROF (Vertical sediment profiles of Eh,%H2O and various particulates)

SEDIMENT PROFILES

STATION	DATE	TIME	TOTAL DEPTH (M)	CORE DEPTH (CM)	Eh	%H2O (%)	CORE ANALYSIS,% PC	PN	PP	SI	CHLORO (uG/l)
RAG.PT	28-8-84	1248	13.2	0	-386						
				1	-395						
				2	-402						
				3	-413						
				4	-412						
				5	-450						
				6	-472						
				7	-465						
				8	-453						
				9	-425						
				10	-412						
HD.PT	28-8-84	1715	9.8	0	-65						
				1	-177						
				2	-365						
				3	-438						
				4	-452						
				5	-502						
				6	-483						
				7	-472						
				8	-503						
				9	-462						
				10							
R 64	29-8-84	840	16	0	-355						
				1	-400						
				2	-410						
				3	-423						
				4	[illegible]						
				5	-426						
				6	-432						
				7	-430						
				8	-438						
				9	-430						
				10	-436						
				11	-442						

On Field sheet

3 pages for Cruise

On Orange Page in Lab Note book

Not done as of 3/13/85

Appendix Table 4 (continued)

BIOMONITORING PROGRAM: ECOSYSTEM PROCESSES COMPONENT(SONE STUDY)
SEDPROF (Vertical sediment profiles of Eh,%H20 and various particulates)

SEDIMENT PROFILES

STATION	DATE	TIME	TOTAL DEPTH (M)	CORE DEPTH (CM)	Eh	%H20 (%)	PC	CORE ANALYSIS,% PN	PP	SI	CHLORO (uG/l)
HORN.PT	29-8-84	1120	7.2	0	-249						
				1	-256						
				2	-278						
				3	-290						
				4	-291						
				5	-282						
				6	-295						
				7	-322						
				8	-345						
				9	-347						
				10	-362						
				11	-381						
				12	-361						
WIND.HIL	29-8-84	1343	3.6	0	-63						
				1							
				2	-257						
				3	-277						
				4	-284						
				5	-292						
				6	-290						
				7	-291						
				8	-304						
				9	-297						
				10	-324						
				11	-340						
				12	-359						

Appendix Table 4 (continued)

BIOMONITORING PROGRAM: ECOSYSTEM PROCESSES COMPONENT(SONE STUDY)
SEDPROF (Vertical sediment profiles of Eh,%H2O and various particulates)

SEDIMENT PROFILES

STATION	DATE	TIME	TOTAL DEPTH (M)	CORE DEPTH (CM)	Eh	%H2O (%)	CORE ANALYSIS,% PC	PN	PP	SI	CHLORO (uG/l)
STIL.PD	30 8 84	800	9.5	0	-38						
				1	-230						
				2	-257						
				3	-263						
				4	-285						
				5	-291						
				6	-293						
				7	-304						
				8	-284						
				9	-307						
				10	-320						
				11	-354						
				12	-357						
				13	-369						
				14	-404						
TON.P1	30 8 84	1100	15.2	0	-238						
				1	-283						
				2	-284						
				3	-302						
				4	-313						
				5	-313						
				6	-324						
				7	-401						
				8	-353						
				9	450						
				10	-502						
				11	-522						
				12	-440						
				13	310						
				14	-335						

APPENDIX TABLE 5

Sedflux

Nutrient and oxygen concentration vs. time data from intact sediment cores for the August, 1984 SONE cruise. Data in this table have not been parsed and hence there is not a direct correspondence between these data and calculated sediment-water fluxes.

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

Sedflux

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H20 HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
BU.VISTA	31-AUG-84	RED	1560.00	11.14	0.00	9.00	26.00		5.77				
			1560.00	11.14	24.00	9.00	50.00	24.00	5.40				
			1560.00	11.14	59.00	10.00	25.00	35.00	4.99				
			1560.00	11.14	99.00	11.00	5.00	40.00	4.45				
			1560.00	11.14	139.00	11.00	45.00	40.00	3.77				
			1560.00	11.14	169.00	12.00	15.00	30.00	3.34				
			1560.00	11.14	202.00	12.00	48.00	33.00	2.83				
			1540.00	11.14	246.00	13.00	32.00	44.00	2.11				
BU.VISTA	31-AUG-84	BLUE	1470.00	10.50	0.00	9.00	27.00		5.37				
			1470.00	10.50	23.00	9.00	50.00	23.00	4.96				
			1470.00	10.50	58.00	10.00	25.00	35.00	4.39				
			1470.00	10.50	98.00	11.00	5.00	40.00	3.67				
			1470.00	10.50	138.00	11.00	45.00	40.00	3.00				
			1470.00	10.50	168.00	12.00	15.00	30.00	2.44				
			1470.00	10.50	201.00	12.00	48.00	33.00	1.89				
			1470.00	10.50	245.00	13.00	32.00	44.00	1.23				
BU.VISTA	31-AUG-84	GREEN	1610.00	11.50	0.00	9.00	27.00		5.44				
			1610.00	11.50	23.00	9.00	50.00	23.00	5.28				
			1610.00	11.50	58.00	10.00	25.00	35.00	5.05				
			1610.00	11.50	98.00	11.00	5.00	40.00	4.70				
			1610.00	11.50	138.00	11.00	45.00	40.00	4.43				
			1610.00	11.50	168.00	12.00	15.00	30.00	4.11				
			1610.00	11.50	201.00	12.00	48.00	33.00	3.79				
			1610.00	11.50	245.00	13.00	32.00	44.00	3.26				

4 Cores per station
Blank in #4
Ignore Notes "air bubbles" ie

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
ST.LEO	31-AUG-84	1.00	1080.00	7.71	0.00	10.00	30.00		4.66				
			1080.00	7.71	30.00	11.00	0.00	30.00	4.50				
			1080.00	7.71	80.00	11.00	50.00	50.00	4.30				
			1080.00	7.71	110.00	12.00	20.00	30.00	4.10				
			1080.00	7.71	140.00	12.00	50.00	30.00	3.94				
			1080.00	7.71	185.00	13.00	35.00	45.00	3.62				
ST.LEO	31-AUG-84	2.00	880.00	6.29	0.00	10.00	30.00		4.78				
			880.00	6.29	30.00	11.00	0.00	30.00	4.73				
			880.00	6.29	80.00	11.00	50.00	50.00	4.59				
			880.00	6.29	110.00	12.00	20.00	30.00	4.48				
			880.00	6.29	140.00	12.00	50.00	30.00	4.40				
			880.00	6.29	185.00	13.00	35.00	45.00	4.40				
			880.00	6.29	255.00	14.00	45.00	70.00	3.97				
ST.LEO	31-AUG-84	3.00	895.00	6.39	0.00	10.00	30.00		4.33				
			895.00	6.39	30.00	11.00	0.00	30.00	3.93				
			895.00	6.39	80.00	11.00	50.00	50.00	3.23				
			895.00	6.39	110.00	12.00	20.00	30.00	2.82				
			895.00	6.39	140.00	12.00	50.00	30.00	2.26				
			895.00	6.39	185.00	13.00	35.00	45.00	1.52				

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H20 HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
BU.VISTA	27-AUG-84	RED		6.70	0.00	15.00	38.00			7.80	1.95	3.66	101.00
				6.70	37.00	16.00	15.00	37.00		9.00	2.87	3.92	108.00
				6.70	66.00	16.00	44.00	29.00		11.20	2.33	4.04	111.00
				6.70	102.00	17.00	20.00	36.00		12.40	4.50	4.26	110.00
				6.70	135.00	17.00	53.00	33.00		14.30	2.89	4.25	116.00
				6.70	165.00	18.00	23.00	30.00		15.50	2.47	4.36	115.00
				6.70	416.00	22.00	34.00	251.00		24.10	3.40	4.86	136.00
BU.VISTA	27-AUG-84	WHITE		7.30	0.00	15.00	38.00			3.80	1.11	3.74	95.00
				7.30	37.00	16.00	15.00	37.00		5.00	1.07	3.88	99.00
				7.30	67.00	16.00	45.00	30.00		6.00	2.37	3.93	101.00
				7.30	103.00	17.00	21.00	36.00		7.80	1.52	4.03	105.00
				7.30	137.00	17.00	55.00	34.00		9.40	1.25	4.23	108.00
				7.30	167.00	18.00	25.00	30.00		10.20	1.54	4.35	107.00
				7.30	414.00	22.00	32.00	247.00		18.60	1.11	4.62	124.00
BU.VISTA	27-AUG-84	SILVER		7.50	0.00	15.00	38.00			9.10	1.55	3.58	99.00
				7.50	37.00	16.00	15.00	37.00		10.50	1.82	3.76	103.00
				7.50	68.00	16.00	46.00	31.00		11.20	2.82	3.96	106.00
				7.50	105.00	17.00	23.00	37.00		11.90	6.72	4.11	108.00
				7.50	139.00	17.00	57.00	34.00		12.10	2.88	4.07	112.00
				7.50	169.00	18.00	27.00	30.00		12.80	2.40	4.11	114.00
				7.50	410.00	22.00	28.00	241.00		17.80	3.53	4.49	130.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
ST.LEO	27-AUG-84	BLACK		5.10	0.00	15.00	30.00			36.20	2.01	3.74	109.00
				5.10	30.00	16.00	0.00	30.00		37.50	1.97	3.86	108.00
				5.10	60.00	16.00	30.00	30.00		39.90	2.33	4.21	113.00
				5.10	96.00	17.00	6.00	36.00		44.20	2.40	3.92	118.00
				5.10	129.00	17.00	39.00	33.00		43.80	3.48	4.27	121.00
				5.10	162.00	18.00	12.00	33.00		44.70	2.30	4.18	125.00
				5.10	416.00	22.00	26.00	254.00		53.10	2.58	3.50	
ST.LEO	27-AUG-84	BLUE		10.00	0.00	15.00	25.00			19.50	1.31	1.81	80.00
				10.00	30.00	15.00	55.00	30.00		20.10	0.95	1.81	82.00
				10.00	60.00	16.00	25.00	30.00		22.00	1.18	1.93	86.00
				10.00	100.00	17.00	5.00	40.00		22.10	0.93	1.94	86.00
				10.00	134.00	17.00	39.00	34.00		23.20	1.32	1.98	91.00
				10.00	167.00	18.00	12.00	33.00		24.10	1.64	2.32	93.00
				10.00	416.00	22.00	21.00	249.00		29.40	1.60	2.02	112.00
ST.LEO	27-AUG-84	GREEN		7.70	0.00	15.00	25.00	0.00		25.50	1.99	2.73	98.00
				7.70	30.00	15.00	55.00	30.00		25.00	1.70	3.06	101.00
				7.70	60.00	16.00	25.00	30.00		25.90	2.87	3.36	104.00
				7.70	100.00	17.00	5.00	40.00		26.30	1.52	3.26	111.00
				7.70	134.00	17.00	39.00	34.00		28.10	1.57	3.29	111.00
				7.70	167.00	18.00	12.00	33.00		28.40	1.75	3.25	115.00
				7.70	415.00	22.00	20.00	248.00		33.20	2.09	2.67	127.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H20 HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
WIND.HL	29-AUG-84	1.00	1255.00	8.96	0.00	14.00	35.00		5.74	7.90	0.78	1.59	42.90
			1255.00	8.96	47.00	15.00	22.00	47.00	6.09	9.70	>1.39	1.53	55.60
			1255.00	8.96	117.00	16.00	32.00	70.00	6.04	12.60	1.35	1.46	53.50
			1255.00	8.96	195.00	17.00	50.00	78.00	5.90	13.30	2.76	1.44	54.20
			1255.00	8.96	255.00	18.00	50.00	60.00	5.55	13.00	3.10	1.39	55.90
			1255.00	8.96	315.00	19.00	50.00	60.00	4.87	12.60	2.53	1.14	62.70
WIND.HL	29-AUG-84	2.00	0.00	0.00	0.00	14.00	35.00		5.76	10.00	0.82	1.67	44.80
			1074.00	7.67	50.00	15.00	25.00	50.00	5.96	14.00	1.73	1.83	49.20
			1074.00	7.67	119.00	16.00	34.00	69.00	5.61	17.80	1.50	1.85	53.20
			1074.00	7.67	195.00	17.00	50.00	76.00	5.34	19.00	1.40	1.68	60.40
			1074.00	7.67	255.00	18.00	50.00	60.00	5.02	21.70	2.16	1.56	58.70
			1074.00	7.67	323.00	19.00	58.00	68.00	4.45	23.80	2.33	1.50	63.30
WIND.HL	29 AUG 84	3.00	655.00	4.68	0.00	14.00	35.00		5.84	49.60	2.78	2.93	72.40
			655.00	4.68	50.00	15.00	25.00	50.00	5.87	45.40	3.22	2.68	74.20
			655.00	4.68	123.00	16.00	38.00	73.00	5.33	54.20	2.79	2.40	85.50
			655.00	4.68	195.00	17.06	50.00	72.00	4.91	54.60	5.25	2.35	95.60
			655.00	4.68	255.00	18.00	50.00	60.00	4.44	60.70	3.16	2.35	106.00
			655.00	4.68	295.00	19.00	30.00	40.00	3.57	60.50	3.12	1.90	110.00
			655.00	4.68	315.00	19.00	50.00	20.00	3.50	59.30	3.48	1.80	113.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H20 HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
HORN.PT	29-AUG-84	SILVER	1150.00	8.21	0.00	12.00	0.00		3.95	9.70	0.80	0.89	74.60
			1150.00	8.21	56.00	12.00	56.00	56.00	3.45	12.10	0.84	0.60	84.80
			1150.00	8.21	116.00	13.00	56.00	60.00	3.15	2.40	0.94	0.45	82.50
			1150.00	8.21	176.00	14.00	56.00	60.00	2.51	1.50	0.99	0.46	85.80
			1150.00	8.21	245.00	16.00	5.00	69.00	2.23	2.50	0.68	0.43	86.70
			1150.00	8.21	305.00	17.00	5.00	60.00		2.10	0.62	0.37	88.10
HORN.PT	29-AUG-84	WHITE	960.00	6.86	0.00	12.00	0.00		4.15	16.60	1.42	1.62	81.90
			960.00	6.86	56.00	12.00	56.00	56.00	2.30	12.70	1.17	1.11	94.50
			960.00	6.86	116.00	13.00	56.00	60.00	0.66	2.30	1.62	0.83	104.00
			960.00	6.86	178.00	14.00	58.00	62.00	0.66	0.40	0.47	0.70	111.00
			960.00	6.86	245.00	16.00	5.00	67.00	0.58	0.70	0.51	0.97	117.00
			960.00	6.86	310.00	17.00	10.00	65.00		0.40	1.09	1.64	120.00
HORN.PT	29-AUG-84	RED	940.00	6.71	0.00	12.00	0.00		5.05	13.90	0.67	1.08	81.00
			940.00	6.71	56.00	12.00	56.00	56.00	3.70	5.30	0.86	0.77	81.00
			940.00	6.71	116.00	13.00	56.00	60.00	2.25	5.00	1.17	0.40	91.00
			940.00	6.71	180.00	15.00	0.00	64.00	1.18	0.40	1.16	0.44	98.00
			940.00	6.71	245.00	16.00	5.00	65.00	1.53	0.40	0.86	0.47	100.00
			940.00	6.71	314.00	17.00	14.00	69.00		0.50	0.52	0.38	102.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
MD.PT	28-AUG-84	GREEN	960.00	6.86	0.00	18.00	56.00		6.25	12.80	35.80	2.89	44.30
			960.00	6.86	64.00	20.00	0.00	64.00	5.40	14.80	35.50	2.52	52.60
			960.00	6.86	120.00	20.00	56.00	56.00	5.20	12.80	35.10	1.79	79.60
			960.00	6.86	178.00	21.00	54.00	58.00	4.55	14.10	33.60	1.62	67.30
MD.PT	28-AUG-84	BLUE	820.00	5.86	0.00	19.00	0.00		5.10	34.00	36.10	2.48	51.40
			820.00	5.86	60.00	20.00	0.00	60.00	4.35	34.00	28.50	1.86	55.50
			820.00	5.86	116.00	20.00	56.00	56.00	4.00	33.40	31.70	1.42	61.70
			820.00	5.86	174.00	21.00	54.00	58.00	3.60	32.50	25.20	0.96	64.90
MD.PT	28-AUG-84	BLACK	1100.00	7.86	0.00	19.00	0.00		4.95	9.50	36.00	1.28	49.40
			1100.00	7.86	60.00	20.00	0.00	60.00	4.35	12.60	35.10	0.87	56.20
			1100.00	7.86	116.00	20.00	56.00	56.00	3.95	11.30	33.60	0.73	60.50
			1100.00	7.86	174.00	21.00	54.00	58.00	3.65	9.40	32.00	0.48	64.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
RAG.PT	28-AUG-84	RED	850.00	6.07	0.00	13.00	17.00		2.91	97.20	>1.70	11.20	81.40
			850.00	6.07	62.00	14.00	19.00	62.00	2.85	128.00	1.42	11.30	94.30
			850.00	6.07	120.00	15.00	17.00	58.00	2.74	144.00	0.96	11.00	108.00
			850.00	6.07	176.00	16.00	13.00	56.00	2.56	155.00	0.95	11.80	118.00
			850.00	6.07	250.00	17.00	27.00	74.00	2.02	173.00	1.22	14.30	126.00
			850.00	6.07	296.00	18.00	13.00	46.00	1.41	165.00	0.69	13.70	139.00
			850.00	6.07	331.00	18.00	48.00	35.00	1.41	164.00	1.55	14.10	139.00
			850.00	6.07	369.00	19.00	26.00	38.00	0.54	157.00	1.10	13.10	142.00
RAG.PT	28-AUG-84	WHITE	950.00	6.79	0.00	13.00	17.00		3.56	34.40	1.42	5.10	70.00
			950.00	6.79	65.00	14.00	22.00	65.00	3.48	52.20	1.12	6.90	81.00
			950.00	6.79	125.00	15.00	22.00	60.00	2.82	62.80	0.62	7.40	98.00
			950.00	6.79	179.00	16.00	16.00	54.00	2.30	65.70	0.80	8.50	94.00
			950.00	6.79	252.00	17.00	29.00	73.00	1.54	65.20	0.67	9.30	104.00
			950.00	6.79	300.00	18.00	17.00	48.00	1.15	56.80	0.69	9.60	108.00
			950.00	6.79	371.00	19.00	28.00	71.00		35.60	0.52	7.80	118.00
RAG.PT	28-AUG-84	SILVER	860.00	6.14	0.00	13.00	18.00		3.63	30.00	0.92	4.10	72.00
			860.00	6.14	67.00	14.00	25.00	67.00	2.84	49.70	0.91	6.70	86.00
			860.00	6.14	126.00	15.00	24.00	59.00	1.79	64.00	0.93	9.20	99.00
			860.00	6.14	185.00	16.00	23.00	59.00	1.11	69.40	0.69	10.60	108.00
			860.00	6.14	254.00	17.00	32.00	69.00	0.19	73.50	0.38	11.80	119.00
			860.00	6.14	301.00	18.00	19.00	47.00	0.12	74.00	0.70	12.50	128.00
			860.00	6.14	372.00	19.00	30.00	71.00	0.05	70.10	1.08	13.00	135.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
PT.NO.PT	28-AUG-84	GREEN	900.00	6.43	0.00	11.00	25.00		4.60	19.80	0.71	1.13	64.30
			900.00	6.43	79.00	12.00	44.00	79.00	4.60	20.00	1.25	0.79	69.20
			900.00	6.43	138.00	13.00	43.00	59.00	4.80	18.50	1.00	0.59	81.20
			900.00	6.43	197.00	14.00	42.00	59.00	4.50	18.00	0.76	0.51	87.00
			900.00	6.43	259.00	15.00	44.00	62.00	4.35	13.20	0.99	0.40	89.70
			900.00	6.43	319.00	16.00	44.00	60.00	4.40	10.10	1.19	0.39	94.40
PT.NO.PT	28-AUG-84	BLUE	980.00	7.00	0.00	11.00	25.00		4.15	16.40	0.67	1.02	62.80
			980.00	7.00	79.00	12.00	44.00	79.00	4.00	15.50	0.94	0.75	69.00
			980.00	7.00	138.00	13.00	43.00	59.00	4.00	14.20	0.97	0.63	75.00
			980.00	7.00	197.00	14.00	42.00	59.00	3.75	11.40	0.86	0.34	80.60
			980.00	7.00	259.00	15.00	44.00	62.00	3.45	7.90	0.74	0.30	85.40
			980.00	7.00	319.00	16.00	44.00	60.00	3.50	5.50	1.36	0.47	92.60
PT.NO.PT	28-AUG-84	BLACK	1130.00	8.07	0.00	11.00	25.00		3.60	23.10	0.84	1.34	66.40
			1130.00	8.07	79.00	12.00	44.00	79.00	3.50	20.80	1.36	0.86	73.50
			1130.00	8.07	138.00	13.00	43.00	59.00	3.75	16.60	0.98	0.50	79.70
			1130.00	8.07	197.00	14.00	42.00	59.00	3.25	12.40	1.18	0.35	84.90
			1130.00	8.07	259.00	15.00	44.00	62.00	3.30	7.40	1.35	0.30	89.50
			1130.00	8.07	319.00	16.00	44.00	60.00	3.25	4.40	1.11	0.31	94.50

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
R-64	29-AUG-84	GREEN	900.00	6.43	0.00	9.00	25.00		4.34	37.50	1.09	1.74	59.80
			900.00	6.43	49.00	10.00	14.00	49.00	2.82	36.40	2.04	1.85	71.60
			900.00	6.43	122.00	11.00	27.00	73.00	0.37	29.10	1.21	1.17	98.00
			900.00	6.43	170.00	12.00	15.00	48.00	0.07	27.40	0.46	1.40	100.00
			900.00	6.43	230.00	13.00	15.00	60.00	0.03	27.50	0.28	1.84	114.00
			900.00	6.43	290.00	14.00	15.00	60.00	0.02	22.10	0.21	1.74	123.00
R-64	29-AUG-84	BLUE	1000.00	7.14	0.00	9.00	25.00		3.15	38.00	0.93	2.84	67.00
			1000.00	7.14	49.00	10.00	14.00	49.00	2.94	43.00	1.02	2.80	76.00
			1000.00	7.14	125.00	11.00	30.00	76.00	2.03	40.00	0.69	2.07	89.00
			1000.00	7.14	172.00	12.00	17.00	47.00	1.28	31.60	0.93	1.44	96.00
			1000.00	7.14	233.00	13.00	18.00	61.00	0.10	15.90	0.38	0.72	106.00
			1000.00	7.14	294.00	14.00	19.00	61.00	0.16	12.40	0.40	0.51	117.00
R-64	29-AUG-84	BLACK	945.00	6.75	0.00	9.00	25.00		3.84	28.90	0.76	2.16	67.00
			945.00	6.75	49.00	10.00	14.00	49.00	3.14	33.20	0.73	2.15	76.00
			945.00	6.75	127.00	11.00	32.00	78.00	2.37	32.30	0.68	1.77	86.00
			945.00	6.75	174.00	12.00	19.00	47.00	1.88	28.00	0.60	1.58	93.00
			945.00	6.75	236.00	13.00	21.00	62.00	1.11	18.10	0.48	1.18	103.00
			945.00	6.75	297.00	14.00	22.00	61.00	0.57	9.10	0.38	1.01	111.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H2O HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
TOM.PT	30-AUG-84	RED	1055.00	7.54	0.00	11.00	17.00		3.61	26.60	4.65	2.22	61.90
			1055.00	7.54	63.00	12.00	20.00	63.00	3.84	28.70	4.74	1.53	61.90
			1055.00	7.54	123.00	13.00	20.00	60.00	3.41	24.90	4.41	0.96	64.00
			1055.00	7.54	183.00	14.00	20.00	60.00	2.36	15.30	4.38	0.39	69.30
			1055.00	7.54	273.00	15.00	50.00	90.00	1.13	3.20	4.21	0.41	73.00
TOM.PT	30-AUG-84	WHITE	1000.00	7.14	0.00	11.00	17.00		3.38	20.40	3.71	1.85	61.60
			1000.00	7.14	63.00	12.00	20.00	63.00	2.64	10.60	3.92	0.67	61.10
			1000.00	7.14	123.00	13.00	20.00	60.00	1.54	0.40	2.65	0.32	63.50
			1000.00	7.14	183.00	14.00	20.00	60.00	0.60	0.40	0.17	0.29	70.00
			1000.00	7.14	278.00	15.00	55.00	95.00	0.22	0.40	0.83	0.30	74.80
TOM.PT	30-AUG-84	SILVER	990.00	7.07	0.00	11.00	17.00		3.51	28.80	4.83	2.67	61.40
			990.00	7.07	66.00	12.00	23.00	66.00	2.95	24.10	4.42	1.51	66.90
			990.00	7.07	123.00	13.00	20.00	57.00	2.43	18.80	4.29	0.86	67.90
			990.00	7.07	188.00	14.00	25.00	65.00	1.67	7.90	8.44	1.00	74.10
			990.00	7.07	283.00	16.00	0.00	95.00	0.96	0.70	1.13	0.50	80.00

Appendix Table 5 (continued)

LONG-TERM BIOMONITORING PROGRAM SEDIMENT-WATER EXCHANGE COMPONENT

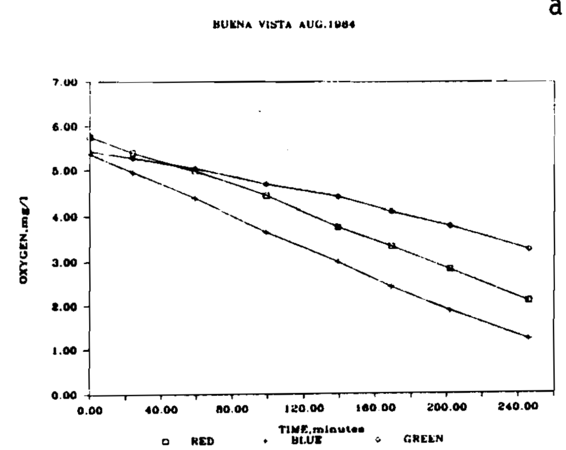
STATION	DATE	CORE NO.	CORE VOL (ML)	CORE H20 HEIGHT (CM)	TIME (SUM)	TIME OF SAMPLE HR	MIN	DELTA T (min)	DO (MG/l)	NH4 (uM-N)	NO3+NO2 (uM-N)	DIP (uM-P)	SI(OH)4 (uM-SI)
STIL.PB	30-AUG-84	GREEN	1115.00	7.96	0.00	8.00	45.00		5.20	21.10	47.00	0.75	52.20
			1115.00	7.96	40.00	9.00	25.00	40.00	4.65	22.50	46.40	0.61	55.10
			1115.00	7.96	100.00	10.00	25.00	60.00	3.90	19.90	43.60	0.32	60.60
			1115.00	7.96	160.00	11.00	25.00	60.00	3.10	18.30	42.90	0.24	60.50
			1115.00	7.96	235.00	12.00	40.00	75.00	3.32	18.30	41.60	0.19	63.70
			1115.00	7.96	295.00	13.00	40.00	60.00	2.95	15.60	41.40	0.13	69.10
STIL.PB	30-AUG-84	BLUE	910.00	6.50	0.00	8.00	45.00		5.40	21.50	46.30	0.55	53.20
			910.00	6.50	40.00	9.00	25.00	40.00	4.35	21.00	45.50	0.27	58.00
			910.00	6.50	100.00	10.00	25.00	60.00	3.90	18.90	43.00	0.21	62.70
			910.00	6.50	160.00	11.00	25.00	60.00	1.80	15.60	39.40	0.12	69.70
			910.00	6.50	235.00	12.00	40.00	75.00	1.40	14.40	35.10	0.09	75.90
			910.00	6.50	295.00	13.00	40.00	60.00	1.25	13.40	32.00	0.11	81.30
STIL.PB	30-AUG-84	BLACK	920.00	6.57	0.00	8.00	45.00		5.95	25.80	47.50	0.46	52.20
			920.00	6.57	40.00	9.00	25.00	40.00	5.10	24.50	47.60	0.25	55.70
			920.00	6.57	100.00	10.00	25.00	60.00	4.00	19.60	46.70	0.15	61.00
			920.00	6.57	160.00	11.00	25.00	60.00	2.65	14.50	45.20	0.11	62.20
			920.00	6.57	235.00	12.00	40.00	75.00	1.88	10.10	43.20	0.10	63.80
			920.00	6.57	295.00	13.00	40.00	60.00	1.70	6.10	40.60	0.10	68.50

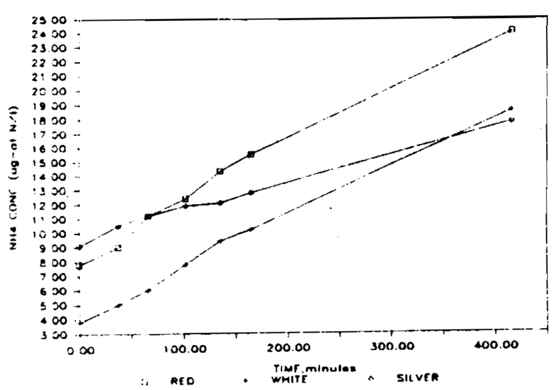
APPENDIX TABLE 6

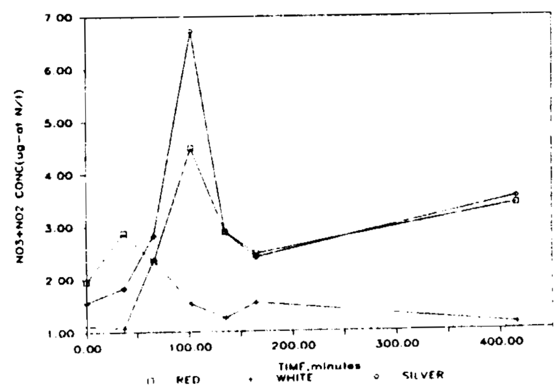
Nutrient and oxygen concentration vs. fine data from intact sediment cores for the August, 1984 SONE cruise. Data in figures have not been parsed and hence there is not a direct correspondence between these data

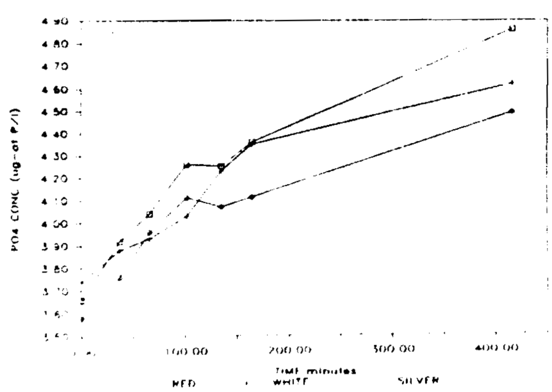
ECOSYSTEM PROCESSES

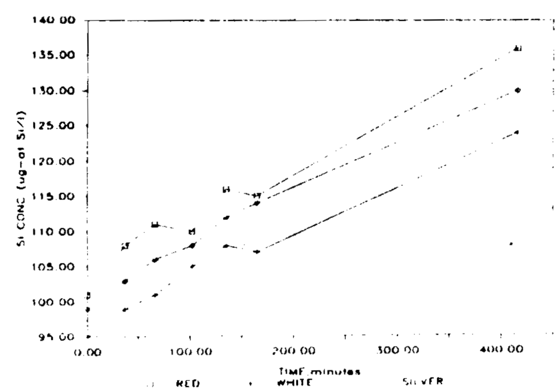
and calculated flux rates.



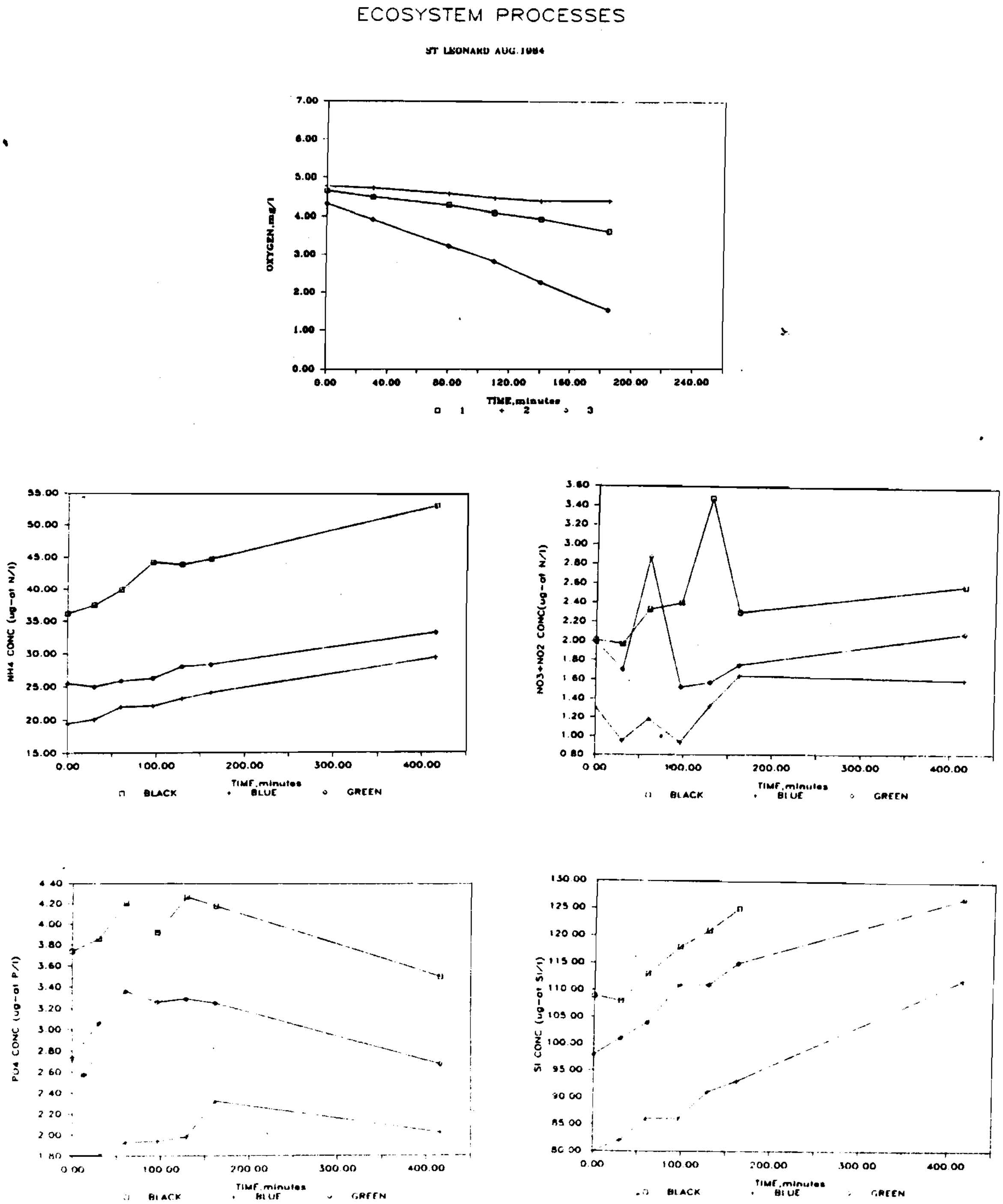








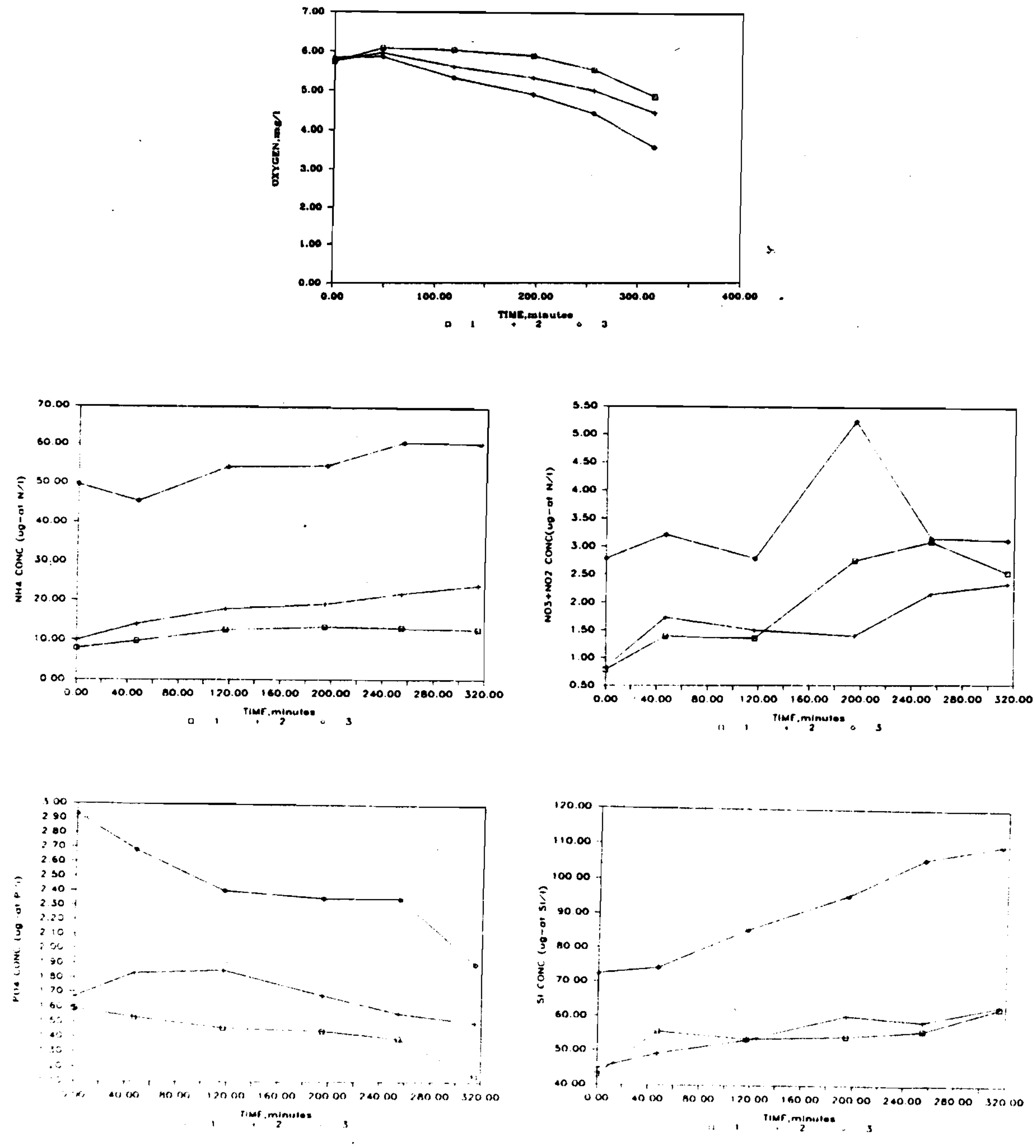
Appendix Table 6 (continued)



Appendix Table 6 (continued)

ECOSYSTEM PROCESSES

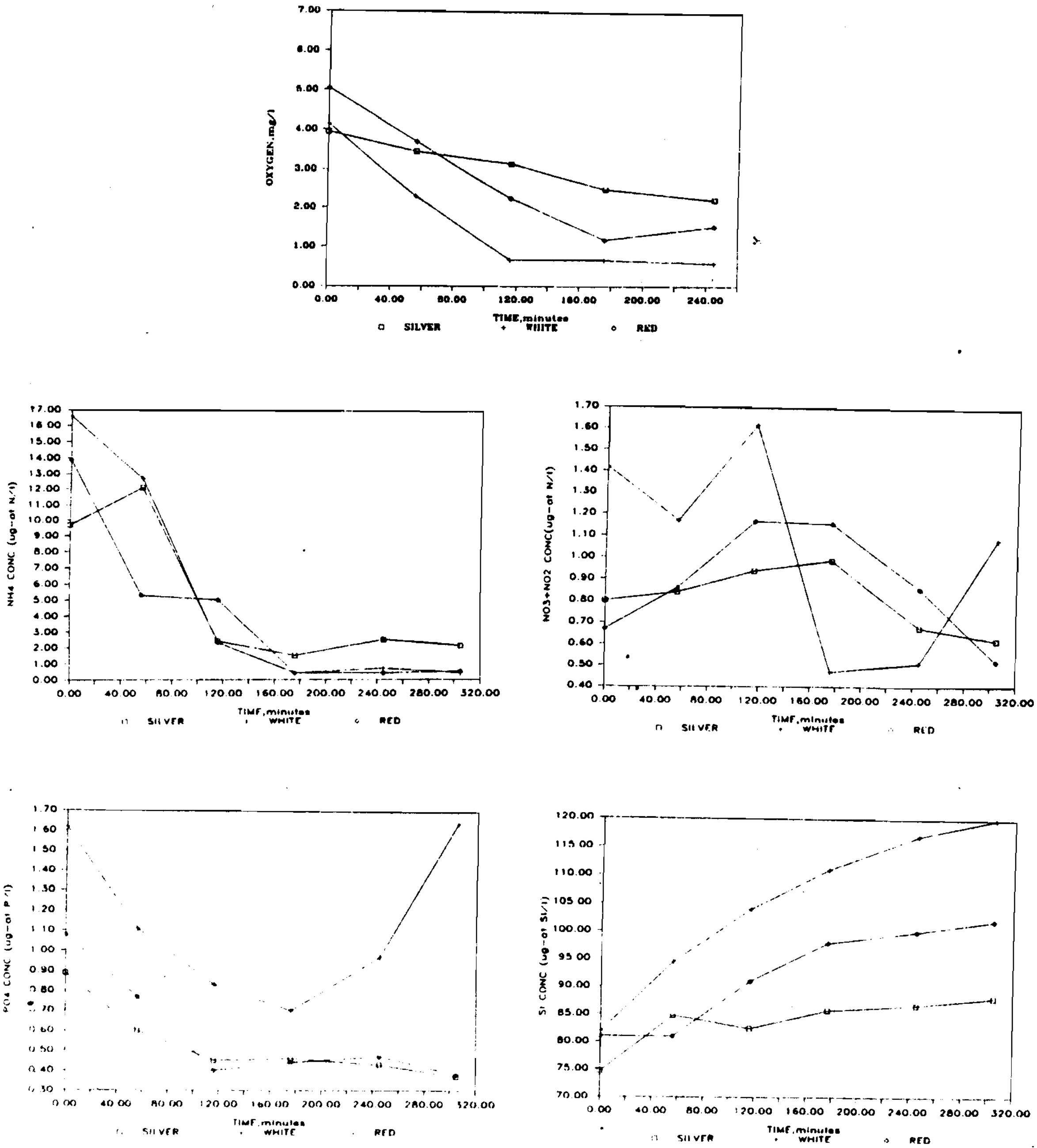
WINDY HILL AUG.1984



Appendix Table 6 (continued)

ECOSYSTEM PROCESSES

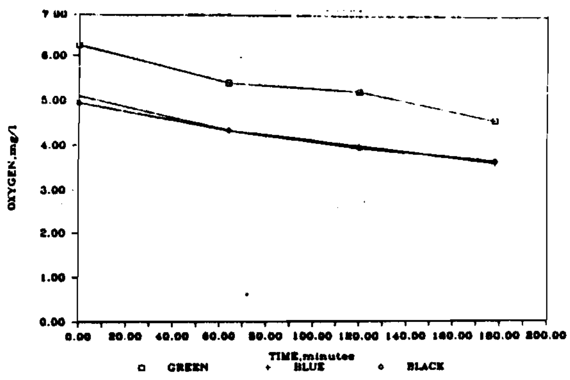
HORN PT AUG.1984

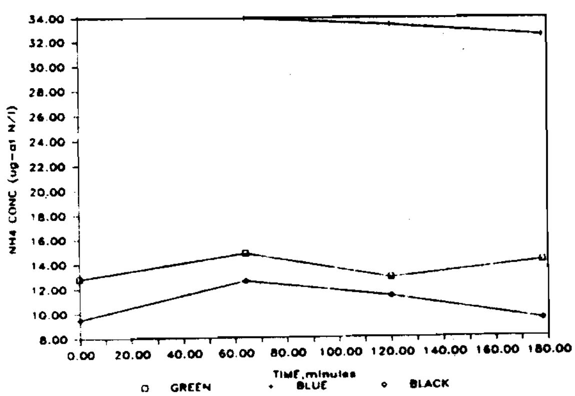


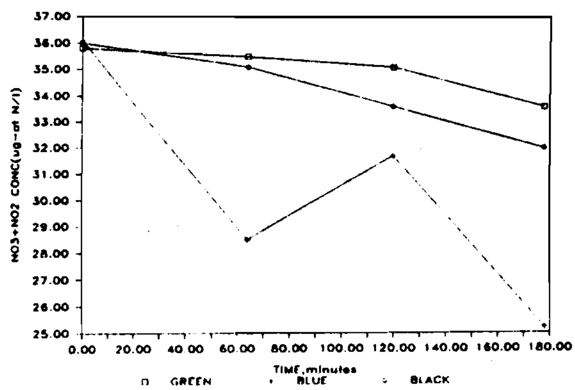
Appendix Table 6 (continued)

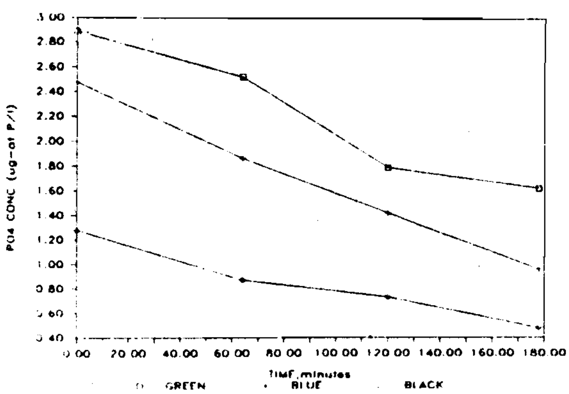
ECOSYSTEM PROCESSES

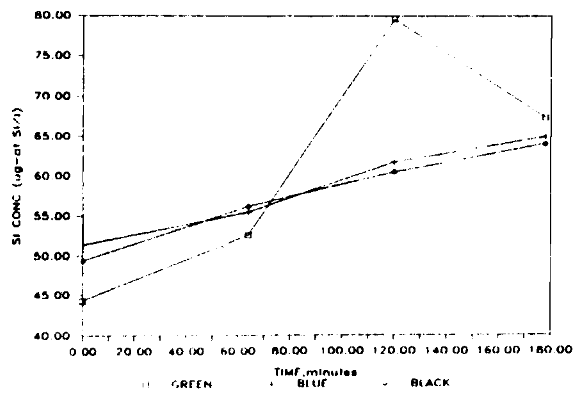
MD.PT.AUG.1984





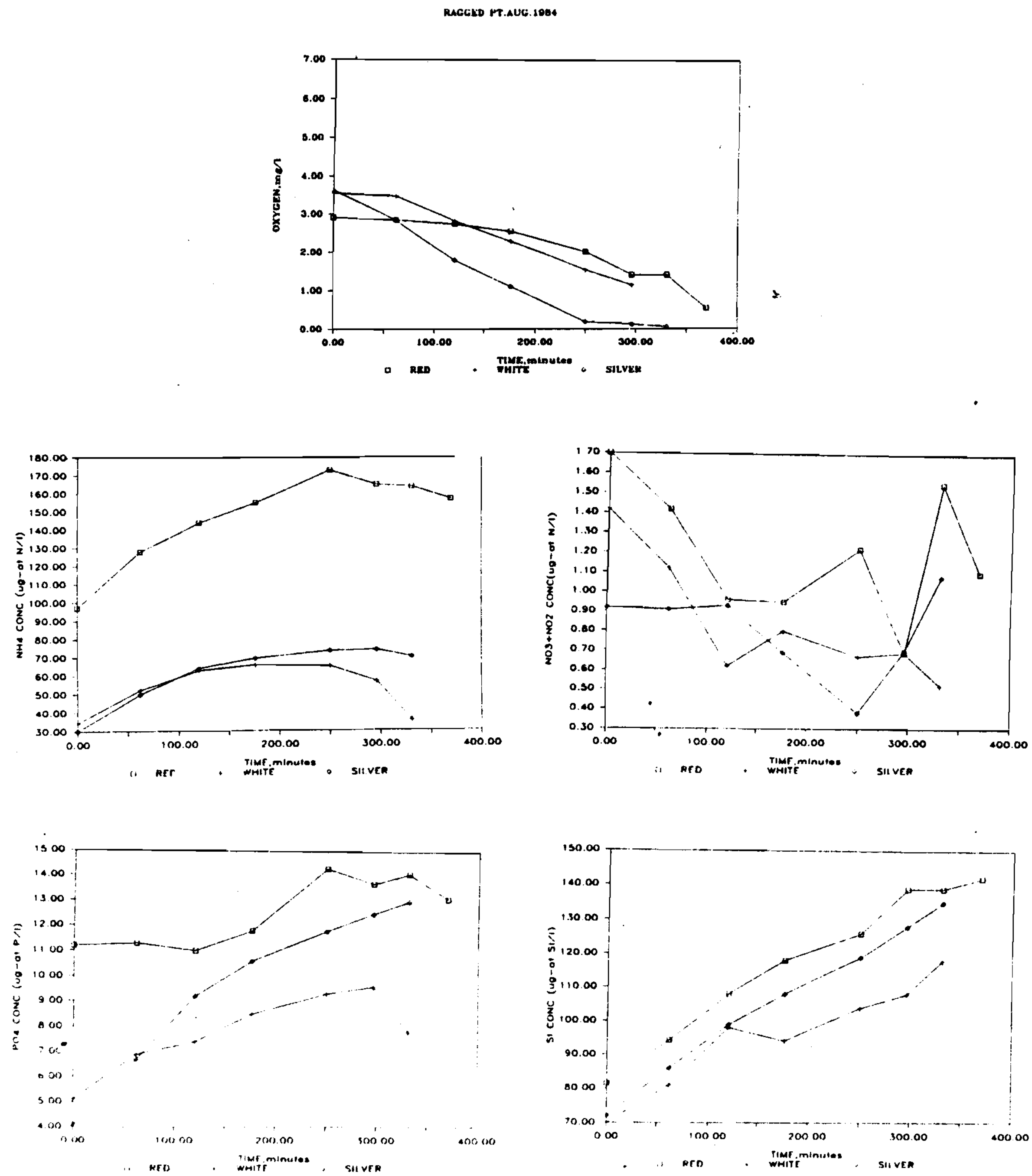






Appendix Table 6 (continued)

ECOSYSTEM PROCESSES



Appendix Table 6 (continued)

ECOSYSTEM PROCESSES

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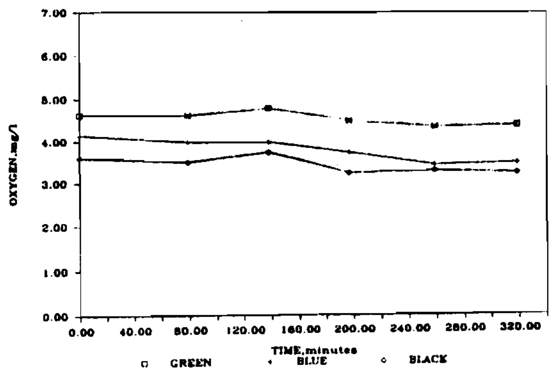
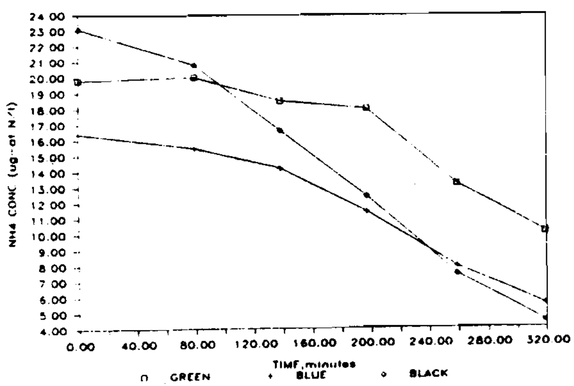
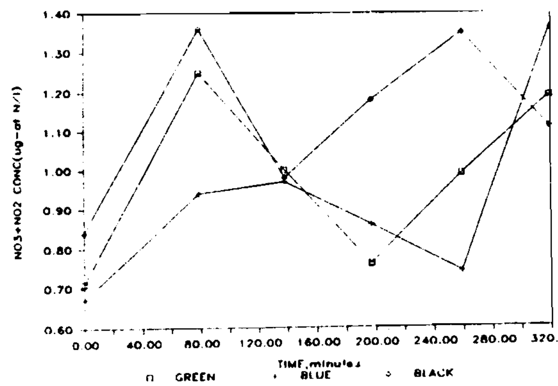
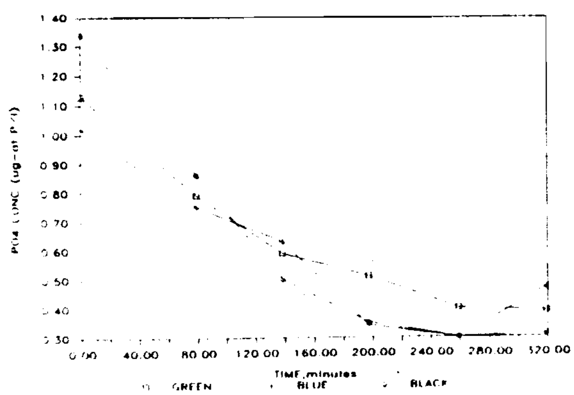
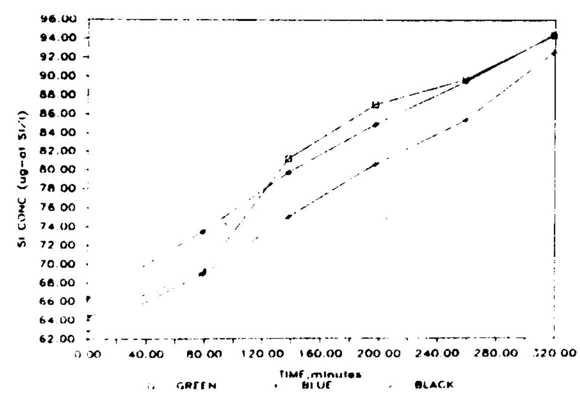






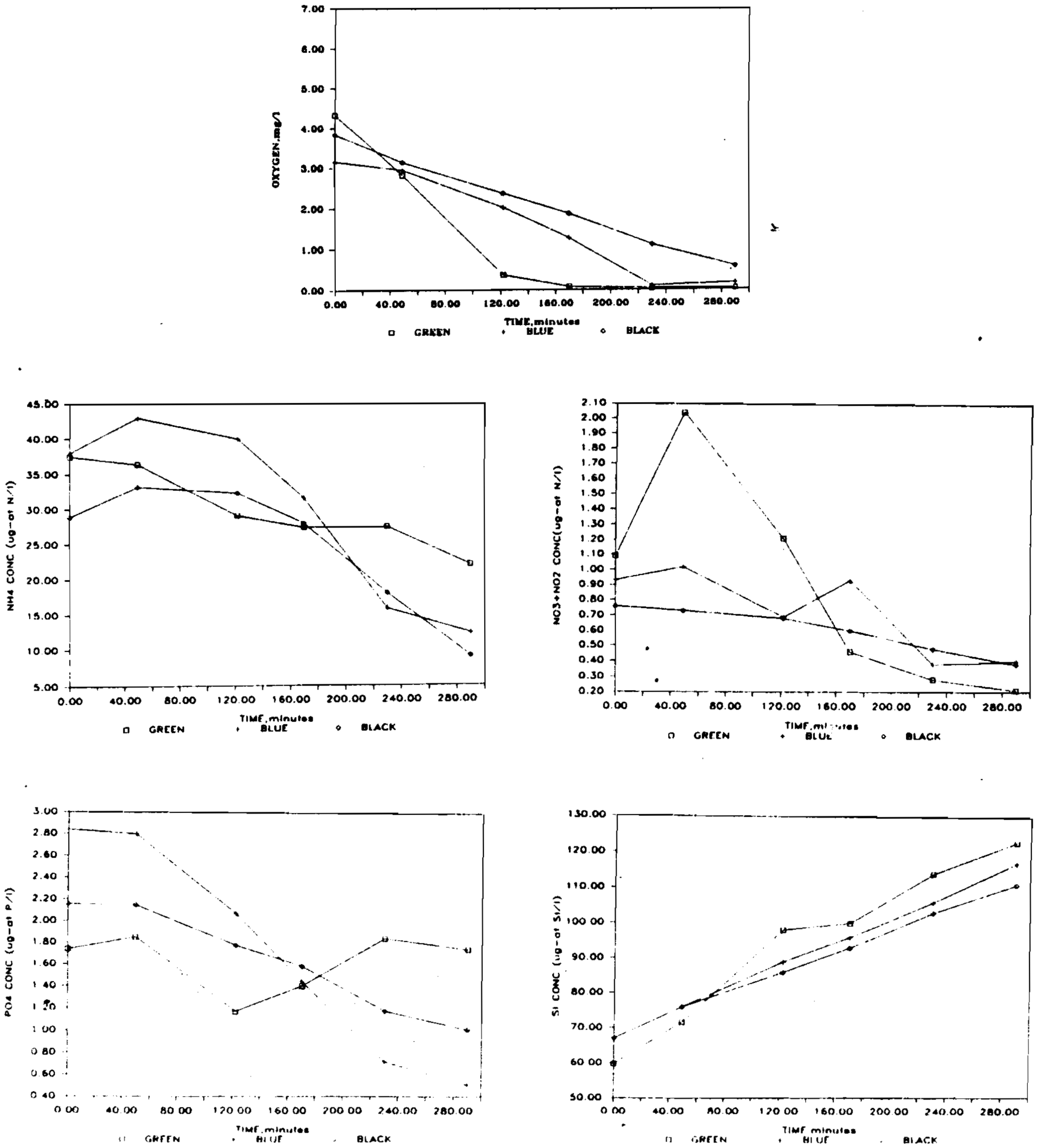




Appendix Table 6 (continued)

ECOSYSTEM PROCESSES

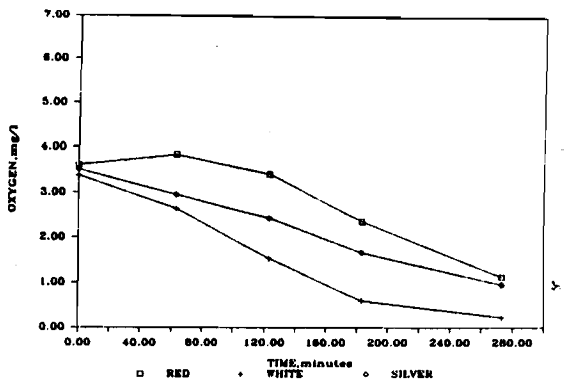
R-64 29-AUG-84

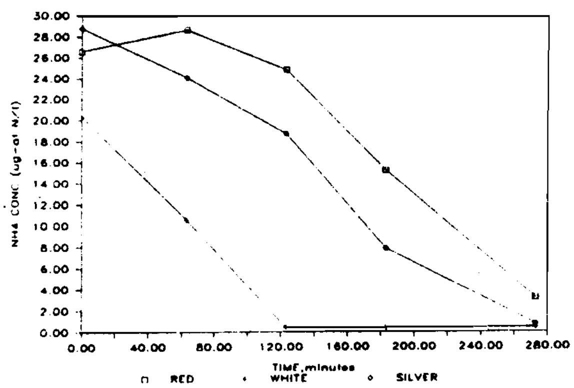


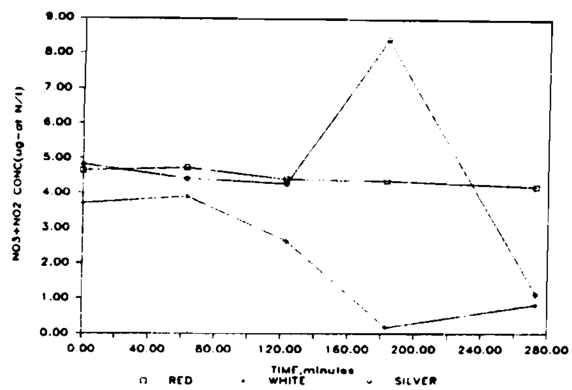
Appendix Table 6 (continued)

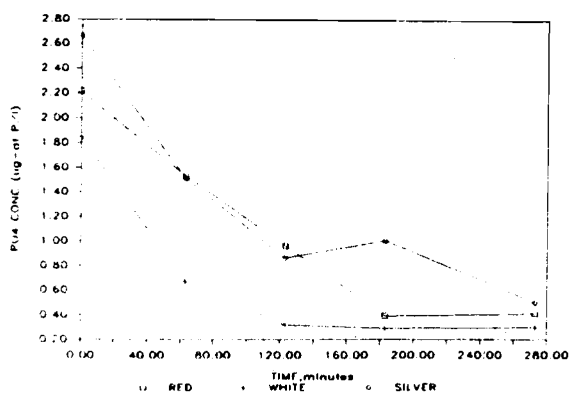
ECOSYSTEM PROCESSES

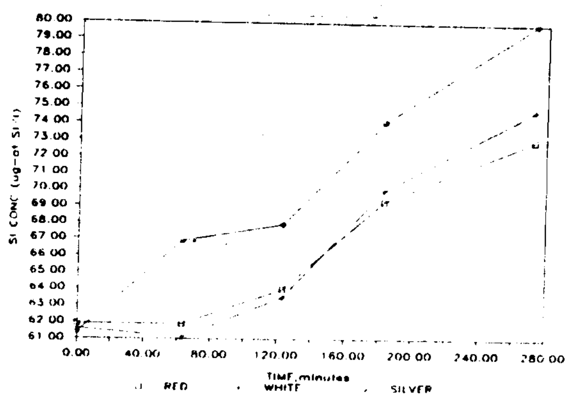
THOMAS PT AUG 1984







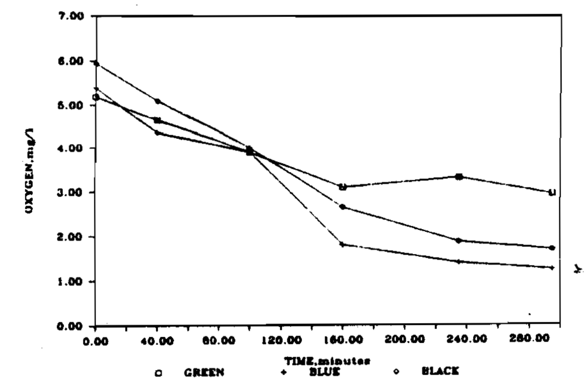


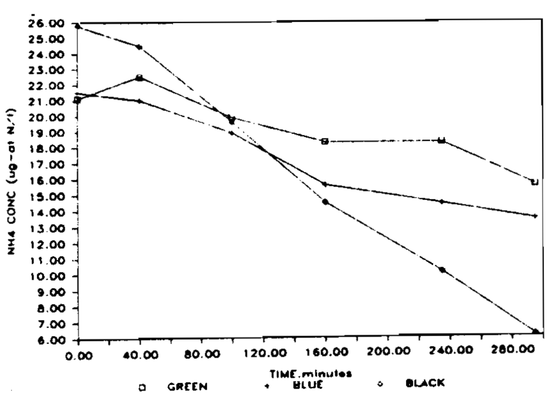


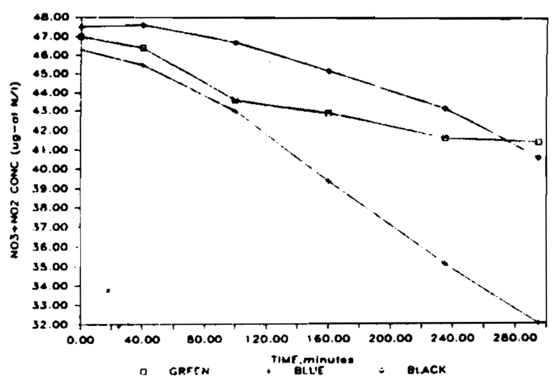
Appendix Table 6 (continued)

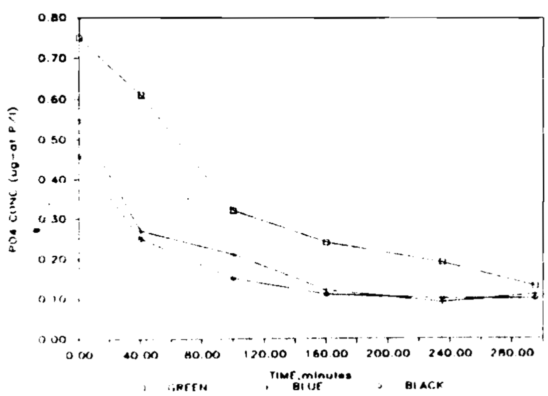
ECOSYSTEM PROCESSES

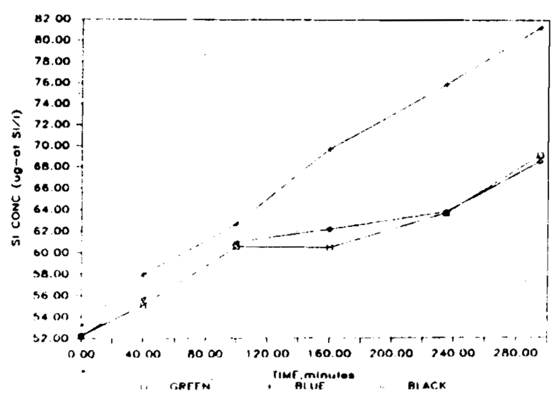
STILL POND AUG 1984











APPENDIX TABLE 7

Summary ($\overline{X} \pm$ S.D.) of sediment-water fluxes observed during the August, 1934 SONE cruics. Note that ND indicates that either no flux measurement was taken or that data were not interpretable (i.e., core was disturbed, sample contaminated)

BIOMONITORING PROGRAM: SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) COMPONENT
SONEFLX (Summary of sediment water exchanges expressed in units of mass/m2/time.

				g02/m2/d			ug-atN/m2/h			ug-atN/m2/h			ug-atP/m2/h			ug-atSi/m2/h		
			CORE DEPTH	O2 FLX			NH4 FLX			NO3 FLX			PO4 FLX			SI FLX		
STATION	DATE	NO	(m)	m	r2	flux	m	r2	flux	m	r2	flux	m	r2	flux	m	r2	flux
BU.VISTA	270884	1	0.067	ND	ND	0.0	0.0392	0.99	157.6	0.0027	0.62	10.9	0.0026	0.92	10.5	0.0784	0.97	315.2
		2	0.073	ND	ND	0.0	0.0361	0.99	158.1	0.0007	0.04	3.1	0.0021	0.90	9.2	0.0676	0.98	296.1
		3	0.075	ND	ND	0.0	0.0202	0.99	90.9	0.0042	0.71	18.9	0.0020	0.86	9.0	0.0741	0.99	333.5
		T	0.072	ND	ND	0.0	0.0319	0.75	137.8	0.0021	0.13	9.1	0.0022	0.83	9.5	0.0733	0.86	316.7
ST.LEO	270884	1	0.051	ND	ND	0.0	0.0574	0.90	175.6	0.0052	0.34	15.9	0.0027	0.57	8.3	0.1089	0.96	333.2
		2	0.100	ND	ND	0.0	0.0271	0.95	162.6	0.0021	0.26	12.6	0.0026	0.76	15.6	0.0771	0.96	462.6
		3	0.070	ND	ND	0.0	0.0206	0.87	86.5	-0.0027	0.12	-11.3	0.0026	0.50	10.9	0.1029	0.97	432.2
		T	0.074	ND	ND	0.0	0.0318	0.05	141.2	0.0013	0.01	5.8	0.0024	0.02	10.7	0.0929	0.16	412.5
HORN.PT	290884	1	0.082	-0.0078	0.98	-0.9	-0.0588	0.72	-289.3	0.0011	0.98	5.4	-0.0024	0.81	-11.8	0.0526	0.62	258.8
		2	0.069	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		3	0.061	-0.0022	0.99	-0.2	-0.0675	0.86	-247.1	0.0029	0.88	10.6	-0.0038	0.84	-13.9	0.1024	0.91	374.8
		T	0.071	-0.0149	0.81	-1.5	-0.0632	0.79	-269.2	0.0021	0.71	8.9	-0.0031	0.78	-13.2	0.0783	0.62	333.6
WIND.HIL	290884	1	0.090	-0.0042	0.81	-0.5	0.0096	0.50	51.8	0.0062	0.66	33.5	-0.0012	0.77	-6.5	0.0235	0.47	126.9
		2	0.077	-0.0053	0.97	-0.6	0.0344	0.98	158.9	0.0027	0.49	12.5	-0.0014	0.92	-6.5	0.0500	0.90	231.0
		3	0.047	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		T	0.079	-0.0047	0.76	-0.5	0.0226	0.25	107.1	0.0044	0.48	20.9	-0.0013	0.38	-6.2	0.0370	0.68	175.4
RAG.PT	280884	1	0.067	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		2	0.068	-0.0087	0.97	-0.9	0.1770	0.93	722.2	0.0021	0.72	8.6	0.0146	0.96	59.6	0.1196	0.93	488.0
		3	0.061	-0.0137	0.99	-1.2	0.1702	0.90	622.9	0.0021	0.75	7.7	0.0239	0.93	87.5	0.1711	0.99	626.2
		T	0.068	-0.0100	0.79	-1.0	0.1694	0.91	691.2	0.0019	0.62	7.8	0.0211	0.85	86.1	0.1457	0.87	594.5
MD.PT	280884	1	0.069	-0.0040	0.96	-0.4	0.0035	0.07	14.4	-0.0118	0.85	-48.6	-0.0077	0.95	-31.7	0.1292	0.99	531.8
		2	0.059	-0.0084	0.97	-0.7	ND	ND	0.0	-0.0233	0.98	-81.9	-0.0087	0.99	-30.6	0.0807	0.98	283.7
		3	0.079	-0.0074	0.98	-0.8	-0.0026	0.02	-12.3	ND	ND	0.0	-0.0044	0.96	-20.8	0.0833	0.98	392.8
		T	0.069	-0.0081	0.49	-0.8	0.0011	.00	4.6	-0.0173	0.76	-71.6	-0.0068	0.36	-28.2	0.0982	0.92	406.5

Appendix Table 7 (continued)

BIOMONITORING PROGRAM: SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) COMPONENT
SONEFLX (Summary of sediment water exchanges expressed in units of mass/m2/time.

				gO2/m2/d			ug-atN/m2/h			ug-atN/m2/h			ug-atP/m2/h			ug-atSi/m2/h		
			CORE DEPTH	O2 FLX			NH4 FLX			NO3 FLX			PO4 FLX			SI FLX		
STATION	DATE	NO	(m)	m	r2	flux	m	r2	flux	m	r2	flux	m	r2	flux	m	r2	flux
PT.NO.PT	280884	1	0.064	-0.0009	0.43	-0.1	-0.0312	0.82	-119.8	0.0007	0.13	2.7	-0.0023	0.90	-8.8	0.0992	0.96	380.9
		2	0.070	-0.0023	0.90	-0.2	-0.0362	0.94	-152.0	0.0013	0.37	5.5	-0.0020	0.76	-8.4	0.0927	0.99	389.3
		3	0.080	-0.0013	0.52	-0.1	-0.0625	0.98	-300.0	0.0007	0.18	3.4	-0.0032	0.84	-15.4	0.0884	0.99	424.3
		T	0.072	-0.0015	0.10	-0.2	-0.0433	0.75	-187.1	0.0009	0.19	3.9	-0.0025	0.79	-10.8	0.0934	0.95	403.5
R-64	290884	1	0.064	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		2	0.071	-0.0117	0.95	-1.2	-0.1050	0.80	-447.3	-0.0021	0.70	-8.9	-0.0090	0.97	-38.3	0.1678	0.99	714.8
		3	0.068	-0.0109	0.99	-1.1	-0.0707	0.71	-288.5	-0.0013	0.95	-5.3	-0.0042	0.97	-17.1	0.1469	0.99	599.4
		T	0.068	-0.0113	0.92	-1.1	-0.0878	0.70	-358.2	-0.0017	0.66	-6.9	-0.0066	0.86	-26.9	0.1571	0.99	641.0
TOM.PT	300884	1	0.075	-0.0099	0.86	-1.1	-0.0924	0.85	-415.8	-0.0019	0.84	-8.6	-0.0069	0.88	-31.1	0.0450	0.92	202.5
		2	0.071	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		3	0.071	-0.0092	0.99	-0.9	-0.1049	0.98	-446.9	-0.0068	0.08	-29.0	-0.0069	0.80	-29.4	0.0648	0.98	276.0
		T	0.073	-0.0010	0.85	-0.1	-0.0992	0.89	-434.5	-0.0044	0.07	-19.3	-0.0069	0.81	-30.2	0.0055	0.83	24.1
STIL.PD	300884	1	0.079	-0.0074	0.85	-0.8	-0.0199	0.86	-94.3	-0.0201	0.92	-95.3	-0.0020	0.87	-9.5	0.0516	0.95	244.6
		2	0.065	-0.0148	0.91	-1.4	-0.0299	0.96	-116.6	-0.1273	0.67	-496.5	-0.0013	0.69	-5.1	0.0947	0.99	369.3
		3	0.065	-0.0151	0.95	-1.4	-0.0694	0.99	-270.7	-0.0236	0.94	-92.0	-0.0010	0.67	-3.9	0.0497	0.94	193.8
		T	0.069	-0.0124	0.80	-1.2	-0.0397	0.72	-164.4	-0.0570	0.32	-236.0	-0.0014	0.60	-5.8	0.0653	0.75	270.3
BU.VISTA	310884	1	0.111	-0.0148	0.99	-2.4	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		2	0.105	-0.0171	0.99	-2.6	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		3	0.115	-0.0087	0.99	-1.4	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		T	0.110	-0.0135	0.80	-2.1	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
ST.LEO	310884	1	0.077	-0.0055	0.99	-0.6	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		2	0.062	-0.0030	0.94	-0.3	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		3	0.064	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
		T	0.069	0.5900	0.59	58.6	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0

Appendix Table 8. Vertical profiles of temperature, salinity, dissolved oxygen and particulate concentrations at VFX stations R-64 and Tom. Pt. for the time periods indicated.

BIOMONITORING; VERTICAL FLUX PROGRAM
VFXPROF (Vertical water column profiles of temp.,salinity,oxygen and particulates)

STATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	TEMP (C)	SALINITY (ppt)	DISSOLVED OXYGEN (mg/l)	PC (ug/l)	PN (ug/l)	PP (ug/l)	CHLORO (ug/l)	SESTON (mg/l)
R-64	23-JULY-84	1600	16.00	1.00	26.90	8.40	9.70	1829.00	276.00	25.20	22.90	13.20
				3.00	26.10	8.30	8.80					
				4.00				1124.00	190.00	19.80	15.30	11.50
				5.00	26.00	8.40	8.10					
				7.00	25.80	8.40	7.80					
				8.00				582.00	108.00	13.80	8.20	6.70
				9.00	25.80	8.50	7.30					
				10.00				641.00	118.00	16.10	7.40	16.60
				11.00	24.50	9.80	0.90					
				13.00	24.00	10.80	0.80					
				15.00	23.30	12.60	0.30	286.00	51.00	12.80	1.70	10.10
R-64	30-JULY-84	0900	16.00	1.00	24.20	7.00	7.75					
				2.00				1028.00	205.00	27.00	20.90	6.90
				3.00	24.40	7.00	7.75					
				5.00	24.20	7.00	7.70					
				6.00				975.00	202.00	25.30	19.10	6.60
				7.00	24.50	7.00	7.60					
				9.00	24.70	11.70	3.75	514.00	99.00	19.80	4.90	6.40
				11.00	23.90	16.30	0.25					
				12.00				262.00	44.00	9.40	1.90	5.40
				13.00	23.90	17.00	0.20					
				15.00	23.90	18.40	0.20	238.00	40.00	7.40	2.10	6.00
R-64	07-AUG-84	1220	55.00	1.00	26.00	7.00	9.30					
				3.00	26.00	7.00	8.90	1191.00	240.00	29.30	22.00	15.20
				5.00	25.50	7.90	7.40					
				6.00				679.00	141.00	23.00	5.70	10.20
				7.00	25.00	8.50	3.50					
				9.00	24.50	12.10	0.70	572.00	119.00	24.90	3.80	12.80
				11.00	24.00	13.10	0.60					
				12.00				382.00	70.00	14.00	1.60	7.90
				13.00	23.20	17.30	0.45					
				15.00	22.50	19.00	0.25	293.00	54.00	12.50	3.60	8.60
				16.00	22.50	19.10	0.25					
R-64	14-AUG-84	1203	55.00	1.00	28.00	8.10	7.35					
				2.00				1214.00	220.00	25.00	10.40	7.00
				3.00	27.50	8.00	7.50					
				5.00	27.50	8.30	5.10	1009.00	201.00	25.00	7.70	7.80
				7.00	26.30	9.40	1.90					
				8.00				464.00	81.00	22.90	1.76	8.00
				9.00	25.10	12.90	0.45					
				11.00	23.90	18.00	0.55	268.00	49.00	9.80	1.47	6.30
				13.00	23.10	18.50	0.45					
				15.00	23.00	18.90	0.45	253.00	45.00	11.10	0.86	6.20

Appendix Table 8. Continued

BIOMONITORING; VERTICAL FLUX PROGRAM
VFXPROF (Vertical water column profiles of temp.,salinity,oxygen and particulates)

STATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	TEMP (C)	SALINITY (ppt)	DISSOLVED OXYGEN (mg/l)	PC (ug/l)	PN (ug/l)	PP (ug/l)	CHLORO (ug/l)	SESTON (mg/l)
R-64	22-AUG-84	0900	55.00	1.00	25.00	8.60	6.60					
				2.00				1011.00	217.00	24.60	8.00	7.00
				3.00	25.00	8.60	6.60					
				5.00	25.00	9.50	4.90					
				6.00				880.00	187.00	24.90	6.32	7.60
				7.00	25.00	13.00	2.55					
				9.00	25.00	15.00	0.20	635.00	124.00	24.00	4.37	7.40
				11.00	24.00	19.20	0.20					
				12.00				248.00	45.00	11.50	0.85	8.60
				13.00	24.00	21.00	0.20					
				15.00	24.00	21.00	0.20	213.00	50.00	12.50	1.09	8.00
R-64	30-AUG-84	1325	14.20	0.00	25.60	12.90	8.30					
				1.00				1503.00	254.00	37.50	7.50	8.00
				2.00	24.80	13.00	7.90					
				4.00	24.80	13.00	7.30					
				6.00	24.50	13.10	6.60	832.00	161.00	25.10	4.70	8.50
				8.00	24.30	13.10	6.00					
				9.00				519.00	102.00	20.30	2.04	13.80
				10.00	24.10	15.10	3.10					
				12.00	23.70	16.40	0.70					
				13.00				556.00	103.00	33.00	1.63	17.40
				14.00	23.60	17.20	0.40					
				16.00	23.60	18.70	0.30	417.00	79.00	25.50	1.33	18.00

Appendix Table 8. Continued

BIOMONITORING; VERTICAL FLUX PROGRAM
VFXPROF (Vertical water column profiles of temp.,salinity,oxygen and particulates)

STATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	TEMP (C)	SALINITY (ppt)	DISSOLVED OXYGEN (mg/l)	PC (ug/l)	PN (ug/l)	PP (ug/l)	CHLORO (ug/l)	SESTON (mg/l)
TOM.PT	23-JULY-84	1120	15.80	1.00	28.30	4.80	7.70	1072.00	199.00	27.60	22.90	10.80
				3.00	26.20	4.90	8.10					
				5.00	25.90	5.00	6.60	674.00	120.00	23.40	11.90	8.90
				7.00	25.50	5.40	6.20					
				9.00	24.20	8.80	3.80	418.00	73.00	16.80	4.50	8.30
				11.00	23.80	9.70	1.20	300.00	50.00	16.30	1.50	8.00
				13.00	22.70	11.50	0.40					
				15.00	22.50	12.70	0.20	329.00	54.00	17.10	2.10	13.10
TOM.PT	30-JULY-84	1325	15.30	1.00	24.40	5.60	7.80					
				2.00				878.00	166.00	30.40	22.40	8.80
				3.00	24.20	5.80	7.15					
				5.00	24.40	7.70	4.10	498.00	108.00	20.40	10.70	6.60
				7.00	24.20	9.30	1.80					
				8.00				301.00	50.00	21.70	2.20	7.30
				9.00	23.40	12.20	0.20					
				11.00	22.90	14.40	0.20	220.00	43.00	9.10	9.10	5.80
				13.00								
				14.00	22.90	14.40	0.35	722.00	117.00	19.70	5.40	17.60
				15.00	22.70	14.70	0.30					
TOM.PT	07-AUG-84	1020	16.20	1.00	26.50	5.70	8.90					
				2.00				1556.00	277.00	36.30	24.40	11.40
				3.00	26.00	6.30	7.80					
				5.00	25.00	7.70	5.30					
				6.00				816.00	150.00	31.70	11.20	7.80
				7.00	24.00	12.50	0.40					
				9.00	23.20	14.60	0.25	358.00	64.00	28.10	2.10	9.80
				11.00	23.00	17.00	0.25	338.00	59.00	24.50	2.10	9.30
				13.00	23.00	17.00	0.25					
				15.00	23.00	17.00	0.20	426.00	72.00	26.70	2.70	6.50
TOM.PT	14-AUG-84	1007	16.80	1.00	27.00	7.50	7.80					
				2.00				2073.00	402.00	60.30	21.30	11.20
				3.00	27.00	7.50	7.40					
				5.00	27.10	7.70	7.20	903.00	183.00	31.70	8.60	4.90
				7.00	25.90	10.00	1.80					
				8.00				537.00	92.00	31.00	0.95	10.60
				9.00	24.80	13.50	0.75					
				11.00	24.20	14.80	0.50	439.00	71.00	37.00	2.97	[illegible]
				13.00	23.80	16.50	0.55					
				15.00	23.10	17.10	0.60	342.00	58.00	21.70	2.07	11.30

Appendix Table 8. Continued

BIOMONITORING; VERTICAL FLUX PROGRAM
VFXPROF (Vertical water column profiles of temp.,salinity,oxygen and particulates)

STATION	DATE	TIME	TOTAL DEPTH (m)	SAMPLE DEPTH (m)	TEMP (C)	SALINITY (ppt)	DISSOLVED OXYGEN (mg/l)	PC (ug/l)	PN (ug/l)	PP (ug/l)	CHLORO (ug/l)	SESTON (mg/l)
TOM.PT	22-AUG-84	1146	16.80	1.00	25.00	8.60	7.10					
				2.00				1284.00	250.00	29.60	9.80	15.20
				3.00	24.50	8.60	6.60	1174.00	238.00	30.10	9.10	15.40
				5.00	24.00	12.50	3.75					
				6.00				317.00	57.00	16.30	0.96	9.80
				7.00	24.00	15.50	0.75					
				9.00	23.00	19.40	0.30	449.00	68.00	23.70	1.31	17.20
				11.00	23.00	19.40	0.25					
				13.00	23.00	19.40	0.25					
				15.00	23.00	19.40	0.25	529.00	80.00	31.10	1.17	21.10
TOM.PT	30-AUG-84	1010	15.20	0.00	24.30	12.40	6.80					
				2.00	24.30	12.40	6.80					
				4.00	24.40	12.50	6.30	1002.00	187.00	42.30	6.20	17.60
				6.00	24.20	12.60	5.70					
				8.00	24.10	12.70	5.80					
				10.00	24.10	12.70	5.70					
				11.00				700.00	128.00	25.70	4.17	11.20
				12.00	24.20	13.50	4.60					
				14.00	23.20	16.50	3.30	711.00	113.00	26.80	2.10	10.40
				15.25	23.20	18.40	0.30					

Appendix Table 9. Composition of particulate materials retained in VFX collecting cups at St.Leo (pilot study station) and R-64. The designations S, M and B indicate surface, mid and bottom depth collecting cups, respectively. The designation (S) and (L) indicate collecting cups with short or long aspect ratios (cup height:diameter of opening), respectively.

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFXALGCUP (the flux of algae and other particles to the sediment surface)

STATION	DATE DEPLOY	DATE RETRIEVE	DEPLOY TIME (days)	TOTAL DEPTH (m)	CUP LOCATION	SAMPLING DEPTH (m)	VOLUME EXAMINED (ml)	PPSP CODE	MATERIAL ID'ed	NUMBER PARTICLES (#)
ST.LEO		130784			S(S)				NITZSCHIA SP	361692
									CYLINDROTHECA CLOSTERIUM	904231
									GYMNO SP	361692
									BLUE-GREEN SPHERES >10u	2351000
									CYSTS	1085077
									CHAETOCEROS SP	17722919
									UNID FLAGELLATES	10127382
									UNID DINOFLAGELLATES	2351000
									UNID CENTRICS	904231
									UNID PENNATES	180846
									CALYCOMONAS OVALIS	542538
									DIPLONEIS SP	4200
									MELOSIRA NUMMULOIDES	16800
									PLEUROSIGMA SP	109200
									SKELETONEMA COSTATUS	403200
									COSCINODISCUS SP	16800
									UNID PENNATES >100u	8400
ST.LEO	050784	130784			M(L)				COSCINODISCUS SP	47840
									CYCLOTELLA SP	191360
									PLEUROSIGMA SPP	95680
									THALASSIONEMA NITZSCHIOIDES	47840
									CHLORELLA SPP	1746160
									UNID CENTRICS	980720
									UNID PENNATES	526240
									CYSTS	430560
									DINOFLAGELLATE CYSTS	526240
									PRORO MINIMUM	167440
									UNID FLAGELLATES <10u	1985360
									CRYPTOMONAS SPP	71760
									MELOSIRA NUMMALIOIDES (?)	4000
									NITZSCHIA SP	2000
									SKELETONEMA COSTATUM	79000
									FECAL PELLETS COMMON	
									LARGE CYSTS >25u	5000

Appendix Table 9. Continued

DATE DATE

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFXALGCUP (the flux of algae and other particles to the sediment surface)

STATION	DATE DEPLOY	DATE RETRIEVE	DEPLOY TIME (days)	TOTAL DEPTH (m)	CUP LOCATION	SAMPLING DEPTH (m)	VOLUME EXAMINED (ml)	PPSP CODE	MATERIAL ID'ed	NUMBER PARTICLES (#)
ST.LEO	130784	230784			B(L)				CRYPTOMONAS	688938
									UNID BLUE-GREEN SPHERES	9920701
									GYMNO ENCYSTED	137788
									CYSTS	1102300
									UNID BLUE-GREEN SPHERES <3u	78676673
									UNID DINOFLAGELLATES	413363
									FLAGELLATES	2342388
									CENTRICS <20u	6200438
									PENNATES <20u	1791238
									COSCINODISCUS SP	22400
									PLEUROSIGMA	22400
									SKELETONEMA COSTATUM	70400
									CYCLOTELLA SP	25600
									UNID GREEN FILAMENTS	3200
									PARALIA SULCATA	1600
									UNID PENNATES >20u	9600
ST.LEO	130784	230784							GYMNO SP <15 u	2284800
									UNID CENTRICS <20u (CYCLOTELLA	1747200
									FLAGELLATES <10u	1646400
									BLUE-GREEN COLONIES-ANACYSTIS	2520000
									PLEUROSIGMA	320
									COSCINODISCUS MARGINATUS	320
									NAVICULA SP	320
									GYMNO STELLATUM	960
									UNID PENNATES	320

Appendix Table 9. Continued

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFXALGCUP (the flux of algae and other particles to the sediment surface)

STATION	DATE DEPLOY	DATE RETRIEVE	DEPLOY TIME (days)	TOTAL DEPTH (m)	CUP LOCATION	SAMPLING DEPTH (m)	VOLUME EXAMINED (ml)	PPSP CODE	MATERIAL ID'ed	NUMBER PARTICLES (#)
R-64		300784			B(L)				UNID CENTRIC >20u	413362
									PENNATES >20u	9369551
									CENTRICS <20u	3169113
									CYCLOTELLA SP	5029244
									AMPHORA SP	137788
									GYMNO SP (?)	551150
									UNID DINOFLAGELLATE	137788
									FLAGELLATES <5u (CHILOMONAS ?)	68894
									CRYPTOMONAS	4064732
									NAVICULA SP	137788
									PROROCENTRUM MINIMUM	206681
									GYMNODINIUM STELLATUIM CYSTS	137788
									THALASSIONEMA NITZSCHIOIDES	482256
									B-6 TRICHOME	206681
									RHIZO SP	68894
									CYSTS	551150
									RHIZO CALCAR AVIS	16000
									PARALIA SULATA	9600
									BIDCHILPHIA SPP	3200
									BROKEN B-6 (POROPYROSIPHON NOT	3200
									GYMN STELLATUM	9600
									PLEUROSIGMA.SP	9600
R-64		300784			S(L)				CRYPTOMONAS SP	336469
									UNID FLAGELLATES <10u	4306801
									ANACYSTIS SP (?)	5787263
									DGYMNODINIUM SP	269175
									CENTRICS <20u	2052460
									HETEROCAPSA TRIGUERA	33647
									CALYCOMONAS OVALIS	100941
									CYCLOTELLA SP	67294
									PROROCENTRUM MINIMUM	6400
									SCRIPSIELLA TRICHOEDEA	800
									SKELETONEMA COSTATUM	3200
									GYMNODINIUM STELLATUM	10400
									CENTRICS>20u	4800
									PENNATES >20u	49600
									EUGLENA SP	36800

Appendix Table 9. Continued

BIOMONITORING PROGRAM; VERTICAL FLUX PROGRAM
VFXALGCUP (the flux of algae and other particles to the sediment surface)

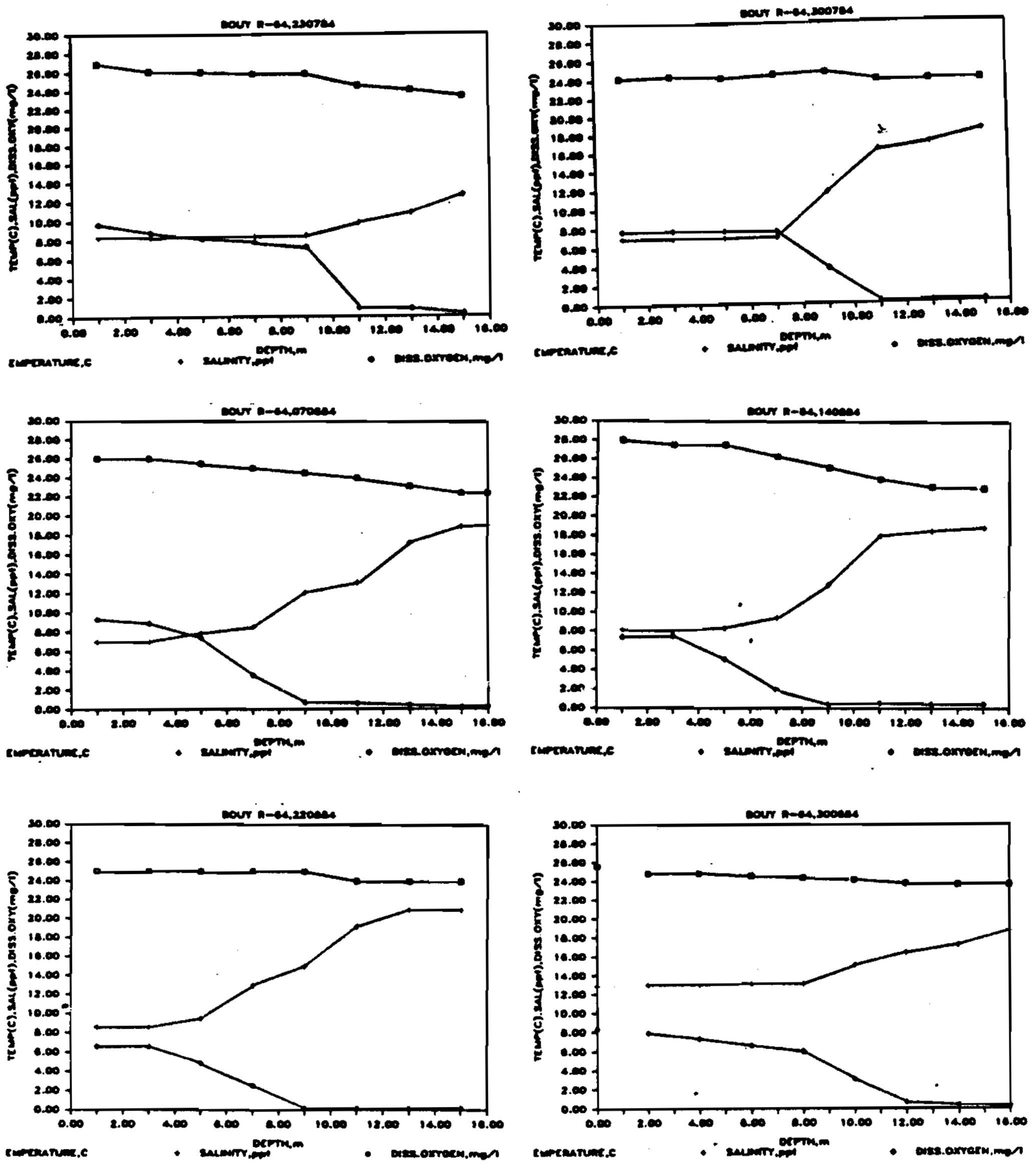
STATION	DATE DEPLOY	DATE RETRIEVE	DEPLOY TIME (days)	TOTAL DEPTH (m)	CUP LOCATION	SAMPLING DEPTH (m)	VOLUME EXAMINED (ml)	PPSP CODE	MATERIAL ID'ed	NUMBER PARTICLES (#)
ST.LEO		130784			M(L)				SKELETONEMA COSTATUM	383900
									PLEUROSIGMA SPP	23100
									AMPHORA SP	3300
									SCRIPSIELLA TRICHOEDEA	1100
									CALONEIS SP	1100
									THALASSIONEMA NITZSCHIOIDES	3300
									PROROCENTRUM MINIMUM	1100
									MELOSIRA SP	1100
									CYCLOTELLA SP	1100
									GYROSIGMA BALTICUM	1100
									GYMNODINIUM SP	2200
									CYLINDROTHECA CLOSTERIUM	1100
									UNID PENNATE DIATOMS	41800
									UNID CENTR4IC	59400
									UNID CYSTS	22000
									UNID DINOFLAGELLATES	7700
ST.LEO	130784	230784			M(S)				EUGLENA SP	3200
									PROROCENTRUM MINIMUM	9600
									SKELETONEMA CLSTATUM	612800
									UNID CSENTRICS	288000
									UNID PENNATES	160000
									PLEUROSIGMA	9600
									THALASSIOSIRA	1600
									CALYCOMONAS OVALIS	344468
									UNID CENTRICS <20u	206681
									UNID DINOFLAGELLATES	12800
									GYMNODINIUM STELLATUM	3200

Appendix Table 10. Description of particulate carbon (PC), nitrogen (PN), phosphorus (PP) and chlorophyll a (chloro) concentrations in surficial sediments (upper 1 cm) at VFX stations.

BIOMONITORING; VERTICAL FLUX PROGRAM
VFXSEDS (description of particles in the surface 1 cm of the sediment column)

STATION	DATE	PC (%)	PN (%)	PP (%)	CHLORO (mg/m2)
TOM.PT	230784	3.39	0.43	0.090	19.6
TOM.PT	300784	3.67	0.47	0.083	17.0
TOM.PT	070884	3.53	0.44	0.078	19.2
TOM.PT	140884	3.43	0.40	0.073	17.7
TOM.PT	220884	3.83	0.49	0.089	18.5
TOM.PT	300884	3.28	0.41	0.077	13.2
R-64	230784	3.11	0.43	0.059	19.6
R-64	300784	2.74	0.34	0.048	12.4
R-64	070884	3.00	0.37	0.054	19.2
R-64	140884	3.62	0.50	0.060	13.4
R-64	220884	3.78	0.51	0.064	16.0
R-64	300884	2.71	0.40	0.050	12.8

Appendix Table 11a. Vertical profiles of temperature, salinity and dissolved oxygen at VFX station R-64 for periods indicated.



Appendix Table 11b. Vertical profiles of temperature, salinity and dissolved oxygen at VFX station Tom.Pt. for periods indicated.