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LIPID BIOMARKER COMPOSITION OF PARTICULATE ORGANIC MATTER IN THE LOWER CHESAPEAKE BAY

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ABSTRACT

In this report we present results from a sampling program designed to characterize the abundance, sources, and composition of particulate organic matter (POM) in the lower Chesapeake Bay. To meet these objectives, we used measurements of bulk parameters (total suspended solids, chlorophyll a, particulate carbon and nitrogen concentrations) combined with information on the concentration of two classes of lipid biomarker compounds (fatty acids and sterols). In addition to providing baseline information on the sources and composition of POM important to the lower Bay, the study addressed spatial and temporal variations in organic matter quality. This was accomplished using an experimental design which incorporated seasonal samplings to investigate temporal variability. Spatial variability was examined by comparison of sites located at the mouths of two tributaries (York and Rappahannock Rivers) to two sites located in the Bay mainstem. A further goal of the research project was to improve our understanding of the role of biological and physical processes in controlling the distribution and quality of organic matter. This information can then be used to understand how POM composition changes spatially and temporally in this region of the CB and to provide important insights regarding the nutritional value of the POM to consumer organisms.

INTRODUCTION

The composition of suspended and sedimentary particulate organic matter (POM) influences a number of key environmental processes such as the supply of food to benthic and pelagic organisms, water chemistry and quality, and the transport and accumulation of contaminants. The abundance and quality of POM, however, can change substantially in response to variations in the biological and physical processes controlling its distribution. Given the dynamic nature of estuarine environments, gradients in the distribution and composition of POM can be pronounced. Physical processes, influencing the transport and delivery of particles, can vary over a range of timescales from as short as minutes to hours (e.g., in response to tidal resuspension or advection events) to time scales on the order of seasons to years. Similarly, key biological processes such as primary production and respiration, fluctuate over a range of temporal scales in response to the availability of light, nutrients, and temperature regime. These agents which force temporal, as well as spatial variations alter the abundance and composition of reactive organic matter, including that assimilated by heterotrophic organisms and incorporated into pelagic and benthic food webs.

The pool of organic matter in estuaries is typically large and is comprised of materials ranging in source, type and reactivity. These compositional variations influence the nutritional value of the POM, as well as the partitioning of other materials such as hydrophobic organic contaminants (Calvo et al., 1991; DeWitt et al., 1992; Brannon et al., 1993). Allochthonous organic matter, derived from outside the estuary, may have sources both from the surrounding watershed and from the tributaries draining into the estuary. Other allochthonous materials may be derived from surrounding wetland habitats and tidal flats, as well as marine-derived organic matter from the adjacent coastal ocean. In addition, industrial and municipal discharge may be important contributors of organic material in some estuaries. In addition to these sources of organic matter originating from outside the

estuary, there are a number of potential sources of autochthonous production. Organic matter produced within the estuary originates from a number of sources including phytoplankton, benthic algae and vascular plants. Although each of these sources may contribute substantially to the input of organic matter, the relative importance of these sources may vary spatially and temporally within an individual estuary (Jassby et al., 1993; Canuel and Cloern, 1996).

A useful approach for characterizing the origin, chemical nature and reactivity of POM involves the application of biological markers or "biomarkers". These biomarkers are "organic compounds whose chemical structure, or skeleton, is formed by living organisms and are sufficiently stable to be recognized" in materials such as suspended particles, recently deposited and ancient sediments, and petroleum (Hunt, 1979). Examples of biomarker compounds applicable to estuarine environments are provided in Table 1. Previous studies have used a number of biomarkers ranging in source specificity to evaluate the relative importance of different sources of organic matter associated with suspended and sedimentary particles in estuaries. These include the analysis of stable isotopes (Haines, 1977; Spiker and Schemel, 1979; Peterson et al., 1985; Cifuentes et al., 1988; Lucotte et al., 1991), lignin oxidation products (Reeves and Preston, 1989), and lipid biomarker compounds (Mayzaud et al., 1989; Lajat and Saliot, 1990; Lajat et al., 1990; Canuel et al., 1995; Canuel and Cloern, 1996).

In the present study, we used several indicators of organic matter source to examine the origins and infer the reactivity of particulate organic matter in suspended and surficial sediments collected from the lower Chesapeake Bay. Total organic carbon (TOC), total nitrogen (TN), and elemental ratios (C/N) were used to evaluate the relative proportions of marine and terrestrial carbon. Marine derived organic matter has C/N ratios of 6-7 whereas degraded marine organic matter and terrestrial organic matter have C/N ratios >10. In addition, the pigment, chlorophyll a, was used to identify the portion of the carbon derived from photosynthetic organisms.

To aid in further identifying sources of carbon, two classes of lipid biomarker compounds-- fatty acids and sterols were examined. This approach is based on observations that although lipids are important biochemicals in all organisms, specific lipid compounds are synthesized uniquely by certain groups of organisms (Brassell and Eglinton, 1986; Killops and Killops, 1993). Combining information derived from several independent indicators of the origins of organic matter has proven to be a reliable approach in addressing questions of organic matter source and reactivity (Hedges and Prahl, 1993; Canuel and Martens, 1993). This strategy allows for less ambiguous source identifications, as well as an improved ability to discriminate between organic matter sources with overlapping signatures.

MATERIALS AND METHODS

Description of the Study Site

Chesapeake Bay (CB), the largest estuary in the United States, has a surface area of 7740 km^2 (Wright and Phillips, 1988). In addition, the drainage basin is 165,760 km^2 in size. Within its boundaries is an extremely complex and variable ecosystem which includes a number of habitats (e.g., salt and freshwater marshes, seagrass beds, riverine systems). These environments encompass a range of salinities and support a variety of organisms. Owing to the diversity of this system and the high level of productivity of the Chesapeake Bay ecosystem, one might expect substantial degrees of temporal and spatial variability in the delivery of labile and refractory POM.

In addition to its importance in terms of size and productivity, the water and land resources of CB serve the citizens of five states (over 12 million people). Its resources have been stressed by increasing population growth, resulting in erosion of sediments from the surrounding watershed, input of human and industrial wastes, and coastal eutrophication resulting from large nutrient inputs derived from agricultural runoff and sewage treatment plants. Anthropogenic activities have contributed to declines in water

quality, diminished fish and shellfish stocks, and an increase in the frequency of hypoxic conditions. The health of CB is relevent not only to the economic interests of this region, but to the coastal ocean as the Bay acts as a conduit for toxic materials and terrigenous and estuarine-derived carbon.

Seasonal hypoxia and anoxia is perhaps the most important water quality issue influencing the health of the Chesapeake Bay ecosystem. Although oxygen depletion has increased in recent years (Officer et al., 1984), the sedimentary record indicates that anoxic conditions and eutrophication have been present since Europeans settled the region (Cooper and Brush, 1991 and 1993). Nutrient inputs from sewage and agricultural sources have resulted in rates of phytoplankton production (and biomass) in excess of the Bay's aerobic, oxygen assimilation capacity (Malone, 1992). Much of this organic matter is remineralized in the water column, where processing of organic matter is dominated by heterotrophic bacteria. High concentrations of organic matter, coupled with physical features of the Bay (e.g., circulation and water column stratification), control the distribution and concentration of dissolved oxygen (DO) throughout Chesapeake Bay. Regional variations in the magnitude of these processes result in spatial and temporal variability in the concentration of DO (Kuo and Neilson, 1987; Diaz et al., 1992).

To date, few studies have focused on identifying the specific sources of labile organic matter contributing to these high rates in organic matter respiration and associated depletions in dissolved oxygen (Jonas, 1992). Stable carbon isotope analysis suggests that the sources of the POM are spatially homogeneous and are consistent with a phytoplankton origin (Zieman and Macko, 1987). However, sources of organic matter of potential importance to this system may have overlapping isotopic signatures (e.g., the $\delta^{13}C_{oc}$ signature of phytoplankton from marine/estuarine systems is -19 to -22‰; however, a mixture of sea grass (-10‰) and terrestrial plants (-28‰) could also produce particulate organic matter with this isotopic signature). Furthermore, a decoupling between the

locations of highest phytoplankton biomass and biological oxygen demand (BOD) indicates that additional sources of organic matter may be important.

Sample Collection

Samples were collected on 8-9 May, 24 July, 18-19 September 1995, and 14-15 March, 1996 from four sites in the lower Chesapeake Bay (Table 2, Fig. 1). Three of these samplings were coordinated with VIMS sampling cruises collecting samples for the Chesapeake Bay Water Quality Monitoring Program (WQMP). Because funding for the VIMS component of the WQMP was discontined at the end of calendar year 1995, the final cruise (March, 1996) was coordinated with another research project.

After arriving at each site, physical features of the water column were recorded using a conductivity-temperature-depth (CTD) continuous profiling instrument with a dissolved oxygen electrode and *in vivo* fluorometer (Curling and Neilson, 1994). Physical measurements included water temperature, conductivity, depth, dissolved oxygen (DO), and *in vivo* fluorescence. Generally, the water column was sampled at one-meter intervals except at sites where depths exceeded 15 meters when measurements were made at two-meter intervals. Water samples (4-liters) were collected from 1m below the surface (hereafter, surface) and one meter above the bottom (deep) from a pump associated with the continuous profiling instrument package. This water was subsampled and filtered for the measurement of WQMP parameters. In addition, larger water samples (40-liters) were collected from 1-inch diameter polyurethane tubing attached to the CTD unit and pumped on-board the research vessel using a peristaltic pump. Polyurethane (PUR) and silicone tubing were used to avoid contamination (PUR tubing contains no plasticizers and very low levels of extractables). These larger samples were filtered and used for the organic geochemical analyses described below.

Surface sediments were collected using either a Van Veen grab sampler or a box core (Ocean Instruments, San Diego, CA). Water overlying the sediments was removed by

siphon and surface sediments (uppermost 1 cm) collected using a solvent-rinsed spatula. Sediment samples were collected into pre-combusted glass jars and place in an ice chest aboard the ship. All samples were stored in an ultracold (-80 °C) freezer upon return to the laboratory and until analyzed.

Bulk Parameters

Aliquots of the 4-liter water samples were filtered to quantify the concentration of suspended particulate matter (SPM), chlorophyll a (chl a), and particulate carbon and nitrogen (PC and PN). In addition, a separate set of samples were filtered, acidified to remove inorganic carbon and analysed to determine the concentration of particulate organic carbon (POC). Water samples used for measuring these bulk parameters were handled following standard WQMP analytical procedures (for details see *Laboratory Procedures Manual*, 1989).

Organic Geochemical Analyses

The large volume water samples (40-liters) were collected into stainless steel carboys. Two carboy volumes were collected and discarded to flush the tubing and rinse the carboys prior to sample collection. The carboys were sealed, pressurized with nitrogen (~8 psi) and the water displaced and forced through a stainless steel filter holder containing a pre-combusted (450 °C) glass fiber filter (142-mm diameter; Gelman A/E). Total filtration time was generally around 4 hours and carboys were shaken at regular intervals to resuspend particles which had fallen out of solution. After passing through the filter, water was collected into a carboy and the volume of water which had passed through the filter recorded. Following filtration, glass fiber filters were removed from the filter holders and placed in pre-combusted jars and a 2:1 solution (v:v) of methylene chloride:methanol (May, only) or chloroform:methanol (others) (2:1; v:v) was added (hereafter, we refer to chloroform only). Samples were placed in an ice chest aboard the research vessel and

tranferred to an ultracold freezer (-80 °C) upon return to the lab. Samples were stored at -80 °C until analyzed.

Before beginning the extraction procedure, individual filters were torn into 1-2 cm pieces using solvent-rinsed forceps. Sample jars were placed in an ice bath and extracted for 10 min using an ultrasonic probe (5 min pulsed mode; 5 min continuous). After allowing samples to sit (overnight for the initial extraction and 1-2 hours for subsequent extractions), the jars were centrifuged (1800 rpm for 20 min). The extracts were decanted following centrifugation. The chloroform:methanol was renewed and the ultrasonic extraction was repeated three times following the initial extraction. A small volume of 20% NaCl in H_2O (~ 70 ml) was added to the combined extracts such that the final proportions were chloroform:methanol:water (2:2:1.8 by volume). Samples were allowed to separate into two phases and the organic (lower) phase was collected. The filter was extracted a final time with chloroform which was then used to re-extract the aqueous phase. The combined organic phases were refrigerated overnight over anhydrous Na_2SO_4 to remove traces of water. The extract was concentrated using turbo-evaporation and stored under N_2 in a small volume of hexane.

A portion (30-50%) of the lipid extract was saponified using 1N KOH (Canuel and Martens, 1993 and references therein). The saponified extract was extracted under basic and acidic conditions yielding neutral (SAP-N) and acidic (SAP-A) fractions respectively. The acids (SAP-A) were methylated using 3% BF_3-CH_3OH and purified using column chromatography. Neutral lipids were separated into constituent classes on a silica gel column using solvents of increasing polarity. Sterols were eluted with 15% and 20% ethyl acetate in hexane. This fraction was concentrated to 1 ml using turbo-evaporation, dried under N_2 and converted to trimethylsilyl ethers using bis(trimethylsilyl)trifluoroacetamide (BSTFA). Fatty acids (as methyl esters) and sterols (as trimethylsilyl ethers) were analyzed by gas chromatography according to conditions given in Canuel and Martens (1993). Individual peaks were identified based on relative retention times of known

standards and peak areas were quantified relative to internal standards added prior to GC analysis (methyl heneicosanoate for fatty acids and 5α-cholestane for sterols). Identifications of components in selected samples were confirmed by gas chromatography-mass spectrometry.

Several aliquots (generally, three), each representing ~ 1% of the total lipid extract (TLE) were weighed on a microbalance in order to gravimetrically determine the weight of the TLE.

RESULTS AND DISCUSSION

Bulk Parameters: Suspended Particles

Concentrations of suspended particulate matter (SPM) ranged from 5-63 mg L^{-1} and 6-43 mg L^{-1} in the surface and deep portions of the water column, respectively (Table 3). Generally, SPM concentrations were higher in the surface waters collected from both of the river sites (Stns. 3.6 and 4.2) than in the mainstem sites (Stns. 5.4 and 6.3). A similar trend was not observed for particles collected 1m above the bottom.

The range of concentrations for the photosynthetic pigment, chlorophyll a, (chl a) was greatest in the deep samples (0-39.9 μg L^{-1}; Table 3). The lowest concentrations were measured in July, 95 and the highest in March, 96. In the surface waters, the highest chl a concentrations were measured at Stn 3.6 in July, though concentrations of chl a in the deep waters were at their lowest at this time.

Particulate organic carbon (POC) and particulate nitrogen (PN) concentrations varied spatially and temporally over the study period (Table 3). In the surface waters, POC concentrations ranged from 21-368 μM at the river mouth sites and 24-83 μM at sites located in the mainstem. Particulate nitrogen (PN) ranged from 5-39 μM in the surface waters. PN concentrations were higher at the river vs. mainstem sites except in May when the highest concentrations were measured at Stn 5.4. Overall, the highest concentrations of POC and PN in the surface waters were measured in July. Generally, the lowest POC and

PN concentrations were found at Stn 6.3. In the deep waters, the POC ranged from 47-175 μM and 22-213 μM at the river mouth and mainstem sites, respectively. PN ranged from 3-29 μM with a wider range of values observed at the mainstem vs. river mouth sites (Table 3). In contrast to the surface waters, POC and PN were most abundant during March, 96 in the deep waters. Elemental ratios (C/N) were computed from the POC and PN concentration data. The range in C/N ratios was similar for particles collected from both the surface and deep regions of the water column (5.1-9.8) with no obvious temporal or spatial trend.

Suspended particles had TLE concentrations ranging from 0.06 to 5.38 mg L^{-1} in the surface waters and from 0.04 to 0.87 mg L^{-1} in the deep waters (Table 4). The concentration of total extractable lipid (TLE) associated with suspended particles did not show substantial spatial variations. In the sediments, TLE ranged from 0.5 to 6.15 mg g^{-1} dry sediment (Table 5). At the more northerly sites (Stns 3.6 and 5.4) TLE was highest in July while at Stn 4.2, the highest TLE concentrations were measured in March. With the exception of the March 1996 samples, the lowest TLE concentrations were found at Stn 6.3.

Particulate organic carbon, chl a and TLE concentrations were correlated with SPM (r^2 = 0.76, 0.58, and 0.67, respectively). In addition, POC concentrations were strongly correlated with chl a and TLE (r^2 = 0.87 and 0.94, respectively). We also found a strong correlation between chl a and TLE (r^2 = 0.94).

Elemental Composition of Sediments

The abundance of total organic carbon (TOC) and nitrogen (TN) was also examined for the surface sediment samples (Table 5). At the river mouth sites, TOC ranged from 17.6 to 35.6 mg g^{-1} dry sediment and TN ranged from 2.76 to 4.95 mg g^{-1} dry sediment. Similar ranges were found at Stn 5.4 in the Mainstem although TOC and TN abundances were substantially lower at Stn 6.3 (5.7 to 10.2 and 0.9 to 1.6 mg g^{-1} dry sediment,

respectively). Carbon-Nitrogen ratios ranged from 4.3 to 11, with the greatest variation found at Stn 6.3. Possible explanations for the differences in the composition of sediments collected at Stn 6.3 relative to the other sites include the increased influence of macrofauna and differences in sediment type. We observed that sediments at Stn 6.3 were coarser and sandier than found at either of the other sites and that cores contained greater numbers of worms.

Fatty Acids

Fatty acid (FA) concentrations associated with particles collected from the surface waters ranged from 8.6-373.5 $\mu g\ L^{-1}$ at the riverine sites and 14.9-75.7 $\mu g\ L^{-1}$ at the Mainstem sites (Table 4). At the Mainstem sites, FA concentrations were higher during both of the Spring samplings (May 1995 and March 1996) relative to during the summer. No apparent temporal trend was found at either of the riverine sites. To account for changes in particle concentration and to allow for comparisons with the surface sediments, FA concentrations were normalized to SPM. At the riverine and mainstem sites, FA concentrations normalize to SPM ranged from 731-49,811 $\mu g\ g^{-1}$ SPM and 933-75,693 $\mu g\ g^{-1}$ SPM, respectively (Fig. 2). When expressed relative to the concentrations of suspended particles, an enrichment in FA was found at all sites during the Spring 1995 and 1996 samplings (Fig. 2).

Particles collected 1m above the bottom had a narrower range in FA concentrations than found in the surface waters. At the riverine sites, FA concentrations ranged from 20.9-185.9 $\mu g\ L^{-1}$ (Table 4). As was true in the surface waters, FA concentrations were lower at the Mainstem sites, ranging from 7.8-146.2 $\mu g\ L^{-1}$. When normalized to SPM, FA concentrations at the riverine and mainstem sites ranged from 483-26,557 and 383-146244 $\mu g\ g^{-1}$ SPM, respectively (Fig. 2). Again, enrichments in FA were found for samples collected during Spring, with the highest concentrations occurring in March, 1996.

On a mass basis, FA concentrations were lower in the surface sediment samples than for the suspended particles. This is primarily due to the fact that much of the particle mass in the sediments is inorganic minerals. Fatty acid concentrations ranged from 168.4-1911.3 and 24.8-344.2 $\mu g\ g^{-1}$ dry weight sediment for the riverine and mainstem sites, respectively (Fig. 2). No temporal trend was evident in the sedimentary FA concentrations except at Stn 4.2 which showed significant enrichment during the March, 1996 sampling (Fig. 2).

In addition to changes in FA concentration, we observed changes in the relative abundance of FA groups indicative of particle source and reactivity (Figs. 3-5). In the surface waters, fatty acid distributions were dominated by saturated and monounsaturated compounds which together comprised 68.9-87.7% and 70-0-85.8% of the Total FA ($\sum$FA) at the riverine and mainstem sites, respectively. These compounds are derived from a number of organisms thus providing little information about the sources of organic matter contributing to the particles. However, the polyunsaturated and branched FAs, are more useful in assessing the relative importance of organic matter derived from algal and bacterial sources, respectively (Johns et al., 1977; Gillan and Johns, 1986; Killops and Killops, 1993). In addition, the relative abundance of polyunsaturated fatty acids provides an index of organic matter lability. Preferential degradation of polyunsaturated fatty acids results in their rapid removal from surficial sediments (Johns et al., 1978).

In the surface waters, polyunsaturated fatty acids made-up 6.5-26.8% and 8.8-26.7% of the fatty acid distribution at the riverine and mainstem sites, respectively (Fig. 3). Comparable levels of variability were found associated with particles collected from the deep water in the Mainstem (7.7-29.5%). At the riverine sites, a narrower range in polyunsaturated fatty acid abundance was found with these compounds comprising 14.8-25.6% of the total fatty acid distribution (Fig. 4). Polyunsaturated fatty acid concentrations were 2-3 times higher during the Spring samplings (May, 1995 and March, 1996) than at other times of the year suggesting that a greater fraction of the particle-associated organic

matter was labile organic matter derived from phytoplankton sources. This is also supported by high concentrations of the photosynthetic pigment, chlorophyll a during the Spring samplings (Table 3).

Branched fatty acids, generally indicative of bacterial sources of organic matter, made-up a small fraction (generally, <10% total FAs) of the fatty acids associated with suspended particles. In contrast to the polyunsaturated acids, branched fatty acids were most abundant in the July and September water column samplings. Increases in the branched fatty acids suggest an enrichment in bacterial biomass associated with the suspended particles during these warmer months.

Similar patterns in the relative abundance of saturated, unsaturated and branched fatty acids were found in the surface sediments. Again, the fatty acid distributions were dominated by saturated and monounsaturated compounds (Fig. 5). Generally, polyunsaturated fatty acids were enriched during the Spring samplings while the branched fatty acids were enriched during summer. Branched fatty acids, however, were proportionally more abundant in the surficial sediments (15-22% of the Total FA) than associated with the suspended particles. Conversely, polyunsaturated fatty acids made-up a smaller fraction of the sedimentary organic matter than in the suspended particles. Together, these results suggest that organic matter associated with even the surface most sediments is more degraded than that associated with particles collected from the overlying water column.

Sterols

Particulate sterol concentrations at the riverine sites ranged from 2.7 to 89.04 $\mu g\ L^{-1}$ in the surface waters and from 2.3 to 9.59 $\mu g\ L^{-1}$ in the deep water (Table 4). At the mainstem sites, particulate sterol concentrations ranged from 1 to 8.19 and 0.9 to 17.4 $\mu g\ L^{-1}$ in the surface and deep waters, respectively. When normalized to SPM, sterol concentrations in the surface waters ranged from 220 to 1683 $\mu g\ g^{-1}$ SPM at the riverine

sites and 74 to 653 μg g^{-1} SPM at the Mainstem sites (Fig. 6). In the deep waters, sterol concentrations normalized to SPM ranged from 85 to 1370 μg g^{-1} SPM at the riverine sites and from 48 to 1358 μg g^{-1} SPM at the Mainstem sites. Generally, sterol concentrations associated with water column particulate matter were about four-fold lower than found for the fatty acids. As was observed for the fatty acids, the highest concentrations were measured during March, 1996.

Sterol concentrations in the surficial sediments ranged from 46.6 to 191.4 μg g^{-1} dry weight sediment and 7.9 to 92.9 μg g^{-1} dry weight sediment at the riverine and mainstem sites, respectively (Fig. 6). At all sites except 3.6, the highest concentrations were measured during the March, 1996 sampling. At site 3.6, sterol concentrations in the sediments were lowest.

The sterol distributions in both the water column and sediments included C_{27}, C_{28} and C_{29} compounds. Generally, marine plankton are dominated by C_{27} and C_{28} sterols while higher plants are dominated by C_{29} sterols (Huang and Meinschein, 1979; Volkman, 1986). Phytoplankton usually contain C_{28} sterols while zooplankton, of which crustaceans are the dominant class, often contain C_{27} sterols, particularly cholesterol (cholest-5-en-3ß-ol) (Killops and Killops, 1993). It is important to note that although these sterols are dominant in the organisms described above, they are not exclusive to those sources (i.e., some phytoplankton may contain low levels of C_{29} sterols, for example).

In the lower Chesapeake Bay, C_{27} and C_{28} sterols generally dominated the suspended particle samples (Figs. 7 and 8). During the spring samplings, C_{28} sterols made-up a greater percentage of the sterols while C_{27} sterols were generally more abundant during summer. These data suggest that the suspended organic matter was enriched in phytoplankton derived organic matter during the spring samplings and by zooplankton during the summer. This is further supported by increases in the concentration of sterols known to be derived from diatoms such as brassicasterol (24-methylcholesta-5,22-dien-3ß-ol). Generally, there was little temporal variation in the relative abundance of C_{29} sterols suggesting that fluctuations in the delivery of organic matter derived from vascular plants

suggesting that fluctuations in the delivery of organic matter derived from vascular plants was not important at these sites. In the sediments, we found no discernible temporal or spatial pattern in the relative abundance of C_{27}, C_{28} or C_{29} sterols (Fig 9).

CONCLUSIONS

Results from this study suggest that the analysis of lipid biomarker compounds provides a useful means of assessing sources of suspended and sedimentary particulate organic matter (POM). The information biomarker compounds can provide is not only complementary to that available using bulk parameters (chl a and POC), but additional insights about the sources and quality of POM is gained. This is due to the increased resolution lipid biomarkers provide relative to these other, more general measures of organic matter abundance.

In the surface waters, SPM and chl a concentrations were generally higher at the river mouth sites (Stns. 3.6 and 4.2) than at the Mainstem sites (Stns. 5.4 and 6.3) but a distinct pattern in temporal variability was not evident. In contrast, while a temporal trend was evident in the deep waters with an enrichment in chl a, POC and PN during March, there were no obvious spatial variations. Temporal variations were not evident in the surface sediments although there was a depletion in organic carbon and total nitrogen at Stn 6.3. Differences in the sediment type and the influence of macrofauna are possible explanations for these depletions.

Fatty acids (FAs) and sterols associated with SPM were elevated during Spring of both years. Biomarkers derived from phytoplankton were 2-3 times higher during these spring samplings suggesting that a greater fraction of the POM was labile. In comparision, biomarkers (FAs and sterols) suggest the increased abundance of heterotrophic organisms (bacteria and zooplankton) during summer months. The relative abundance of bacterial biomarkers (branched FAs) was higher in the surface sediments than in the SPM, indicating that a larger fraction of the POM was derived from bacterial biomass and

suggesting that sedimentary POM is degraded relative to that found in the overlying water column.

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Table 1. Examples of Biomarker Compounds.

Organism	Compound(s)	Refs.
Bacteria	methyl branched C_{13}, C_{15}, C_{17} fatty acids	1
	17:1ω8 (specific to sulfate-reducers)	
	18:1ω7 (cis-vaccenic acid)	
Phytoplankton	polyunsaturated fatty acids (e.g., 20:4ω6, 20:5ω3)	1
diatoms	24-methylcholest-5-en-3ß-ol (brassicasterol)	2
dinoflagellates	4-methyl sterols (e.g., 4α,23,24-trimethyl-5α-cholest-22-en-3ß-ol; dinosterol)	
Zooplankton	cholest-5-en-3ß-ol (cholesterol)	2
Sewage	5ß-cholestan-3ß-ol (coprostanol)	3
Vascular plants	even-numbered, long-chain fatty acids >*n*C_{20}	1
	24-ethylcholest-5-en-3ß-ol (ß-sitosterol)	2

References cited: (1) Killops and Killops, 1993, (2) Volkman, 1986, (3) Kanazawa and Teshima, 1978.

Table 2. Locations of Study Sites

Station	Latitude	Longitude	Water Depth (m)	Designation
3.6	37° 35.8'	76° 17.1'	10	River Mouth
4.2	37° 14.5'	76° 23.2'	15	River Mouth
5.4	37° 48.0'	76° 10.5'	33	Mainstem
6.3	37° 24.7'	76° 9.6'	12	Mainstem

Table 3. Concentration and Composition of Suspended Particles

		Surface Particles				Deep Particles			
Date	Site	SPM[1] (mg/l)	Chl a[1] (μg/L)	POC[2] (μM)	PN[1] (μM)	SPM[1] (mg/l)	Chl a[1] (μg/L)	POC[2] (μM)	PN[1] (μM)
May 95	3.6	5.0	2.23	49.83	6.57	7.7	4.61	67.17	8.00
	4.2	10.2	3.77	46.75	6.14	18.0	3.66	58.58	7.79
	5.4	5.8	4.93	71.67	7.79	33.8	2.00	105.58	12.64
	6.3	5.5	1.45	40.50	5.57	13.8	2.93	46.33	7.00
Jul 95	3.6	63.2	37.48	368.00	38.79	26.6	0.0	70.17	10.07
	4.2	38.8	4.28	81.33	10.14	43.4	1.30	59.67	7.93
	5.4	24.4	0.72	83.83	9.79	30.4	0.0	21.58	2.93
	6.3	25.4	2.77	77.67	9.07	40.0	0.0	43.92	4.50
Sept 95	3.6	9.4	5.64	77.33	12.43	11.4	0.66	46.67	7.57
	4.2	11.8	7.87	21.50	7.86	18.6	5.77	56.25	8.93
	5.4	8.8	4.55	37.50	7.57	43.2	5.34	86.92	11.71
	6.3	7.8	2.82	24.25	4.79	6.2	2.21	35.17	5.07
Mar 96	3.6	7.5	7.43	55.58	7.64	10.1	25.90	175.25	21.36
	4.2	16.4	7.84	77.00	11.07	7.0	18.90	107.58	13.86
	5.4	6.2	4.06	35.33	6.07	18.4	19.22	132.08	17.21
	6.3	8.0	5.98	53.33	7.50	12.8	39.94	213.0	28.57

[1] Unpublished data from VIMS component of the Chesapeake Bay Water Quality Monitoring Program.

[2] May samples are particulate carbon (PC) instead of particulate organic carbon (POC).

Table 4. Concentrations of Total Lipid (TLE), Fatty Acids and Sterols

Date	Site	Surface Particles			Deep Particles		
		TLE (mg/L)	ΣFatty Acids (µg/l)	ΣSterols (µg/L)	TLE (mg/L)	ΣFatty Acids (µg/l)	ΣSterols (µg/L)
May 95	3.6	0.11	52.05	2.70	0.17	73.34	3.07
	4.2	0.16	56.56	2.85	0.08	31.80	2.30
	5.4	0.14	75.69	2.85	0.06	35.43	1.62
	6.3	0.10	32.34	1.76	0.09	21.23	1.48
Jul 95	3.6	5.38	137.58	89.04	0.10	37.78	7.26
	4.2	0.39	94.08	9.57	0.09	21.00	3.69
	5.4	0.38	35.31	8.19	0.07	10.45	1.86
	6.3	0.07	23.71	1.87	0.13	15.31	3.62
Sept 95	3.6	0.18	65.81	2.70	0.10	48.09	3.05
	4.2	0.12	8.63	3.52	0.12	25.77	4.26
	5.4	0.13	52.57	3.08	0.07	7.87	2.59
	6.3	0.06	14.86	0.99	0.04	7.86	0.90
Mar 96	3.6	0.79	373.59	12.62	0.29	143.67	6.13
	4.2	0.26	101.38	6.40	0.48	185.90	9.59
	5.4	0.14	68.09	3.33	0.45	146.25	9.26
	6.3	0.22	73.69	5.23	0.87	77.04	17.38

Table 5. Composition of Surficial Sediments

Date	Site	TOC (mg g^{-1} sed)	TN (mg g^{-1} sed)	[C/N]a	TLE (mg g^{-1} sed)
May 95	3.6	25.29 (0.11)[1]	3.58 (0.08)	8.24	1.39
	4.2	17.64 (0.24)	2.76 (0.05)	7.47	1.85
	5.4	23.29 (0.66)	3.68 (0.09)	7.38	1.89
	6.3	5.67 (0.20)	0.86 (0.12)	7.69	0.52
Jul 95	3.6	23.35 (0.27)	3.17 (0.002)	8.59	4.28
	4.2	22.25 (0.13)	3.53 (0.05)	7.35	2.40
	5.4	23.93 (0.27)	3.50 (0.01)	7.98	2.96
	6.3	5.92 (0.07)	1.60 (0.03)	4.32	0.18
Sept 95	3.6	20.17 (0.20)	3.03 (0.05)	7.77	1.11
	4.2	18.45 (1.03)	3.02 (0.09)	7.13	1.88
	5.4	25.01 (0.12)	3.73 (0.07)	7.82	2.29
	6.3	4.26 (0.39)	0.61 (0.06)	8.15	0.16
Mar 96	3.6	17.36 (0.36)	2.24 (0.07)	9.04	0.79
	4.2	35.57 (0.13)	4.95 (0.41)	8.40	6.15
	5.4	24.00 (0.64)	3.70 (0.42)	7.57	2.59
	6.3	10.18 (0.79)	1.08 (0.07)	11.00	1.32

[1] Mean of two replicates (± s.d.).

[2] n.d. = Not determined

FIGURE CAPTIONS

Figure 1. Locations of sample stations in Chesapeake Bay.

Figure 2. Fatty acid concentrations in Chesapeake Bay surface and deep particulate samples (μg/g SPM) and surface sediments (μg/g sed) collected during May, July and September 1995 and March 1996.

Figure 3. Relative concentrations of fatty acid compound classes (saturated, monounsaturated, polyunsaturated and branched fatty acids) in surface (1 meter below surface) particulate samples collected during May, July and September 1995 and March 1996.

Figure 4. Relative concentrations of fatty acid compound classes in deep (1 meter above bottom) particulate samples collected during May, July and September 1995 and March 1996.

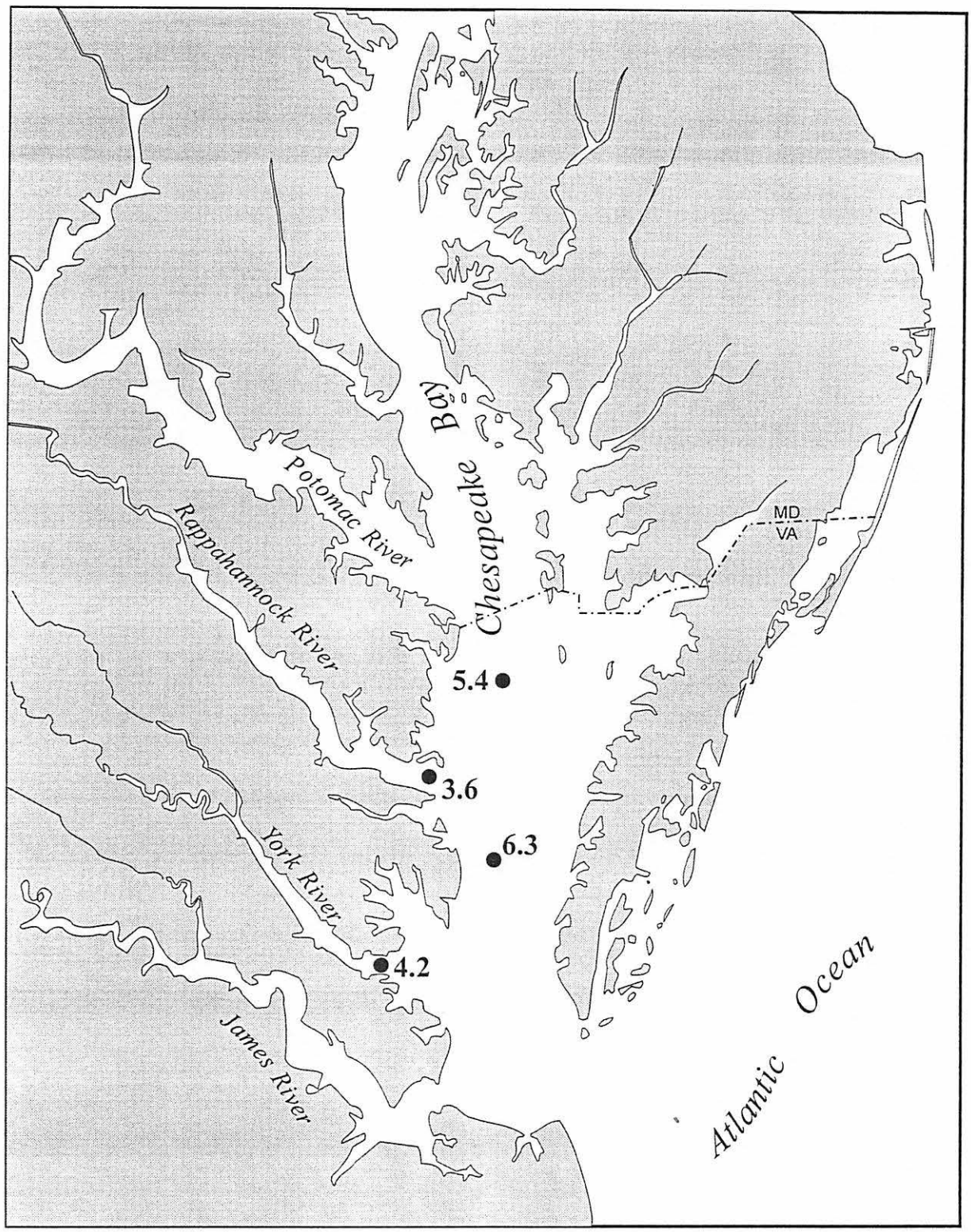
Figure 5. Relative concentrations of fatty acid compound classes in surface sediment samples collected during May, July and September 1995 and March 1996.

Figure 6. Sterol concentrations in Chesapeake Bay surface and deep particulate samples (μg/g SPM) and surface sediments (μg/g sed) collected during May, July and September 1995 and March 1996.

Figure 7. Relative concentrations of sterol compound classes (27, 28, and 29 carbon chain lengths) in surface (1 meter below surface) particulate samples collected during May, July and September 1995 and March 1996.

Figure 8. Relative concentrations of sterol compound classes in deep (1 meter above bottom) particulate samples collected during May, July and September 1995 and March 1996.

Figure 9. Relative concentrations of sterol compound classes in surface sediment samples collected during May, July and September 1995 and March 1996.


Chesapeake Bay
Potomac River
Rappahannock River
York River
James River
Atlantic Ocean
MD
VA
5.4
3.6
6.3
4.2

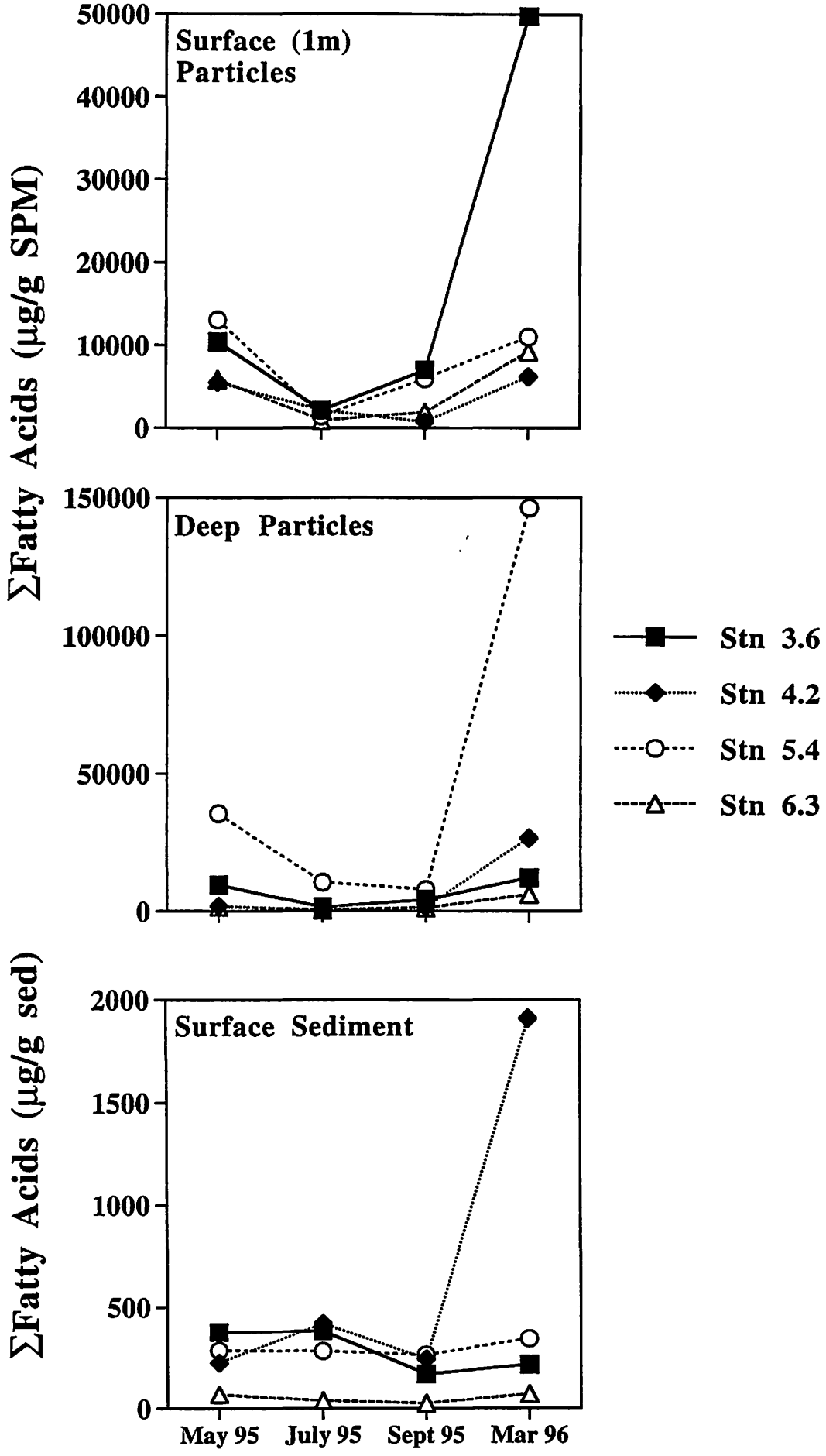

Surface (1m) Particles
Deep Particles
Surface Sediment
ΣFatty Acids (µg/g SPM)
ΣFatty Acids (µg/g sed)
50000
40000
30000
20000
10000
0
150000
100000
50000
0
2000
1500
1000
500
0
May 95
July 95
Sept 95
Mar 96
Stn 3.6
Stn 4.2
Stn 5.4
Stn 6.3

Fig. 2

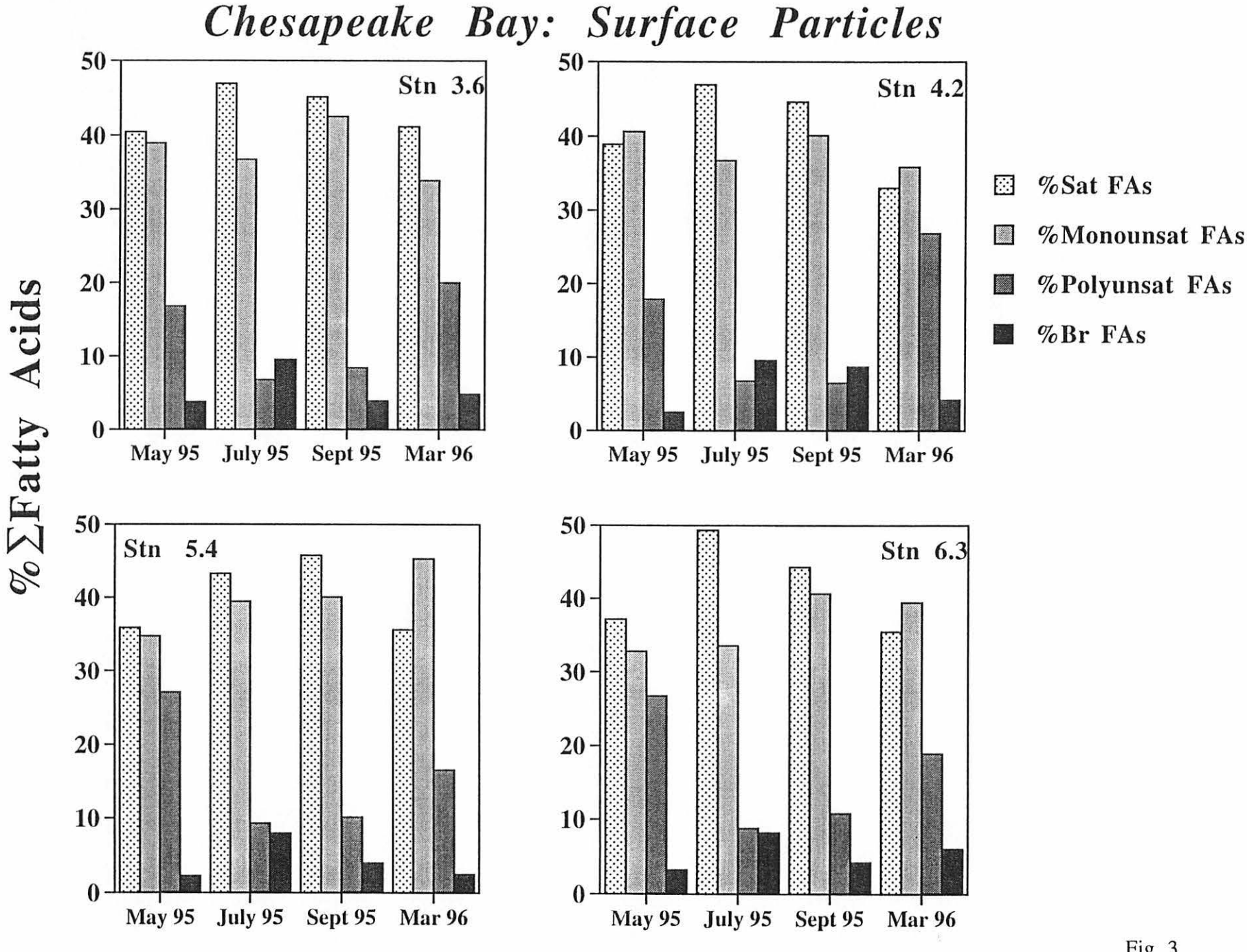

Chesapeake Bay: Surface Particles
% ∑Fatty Acids
Stn 3.6
Stn 4.2
Stn 5.4
Stn 6.3
0
10
20
30
40
50
May 95
July 95
Sept 95
Mar 96
%Sat FAs
%Monounsat FAs
%Polyunsat FAs
%Br FAs

Fig. 3

Chesapeake Bay: Deep Particles

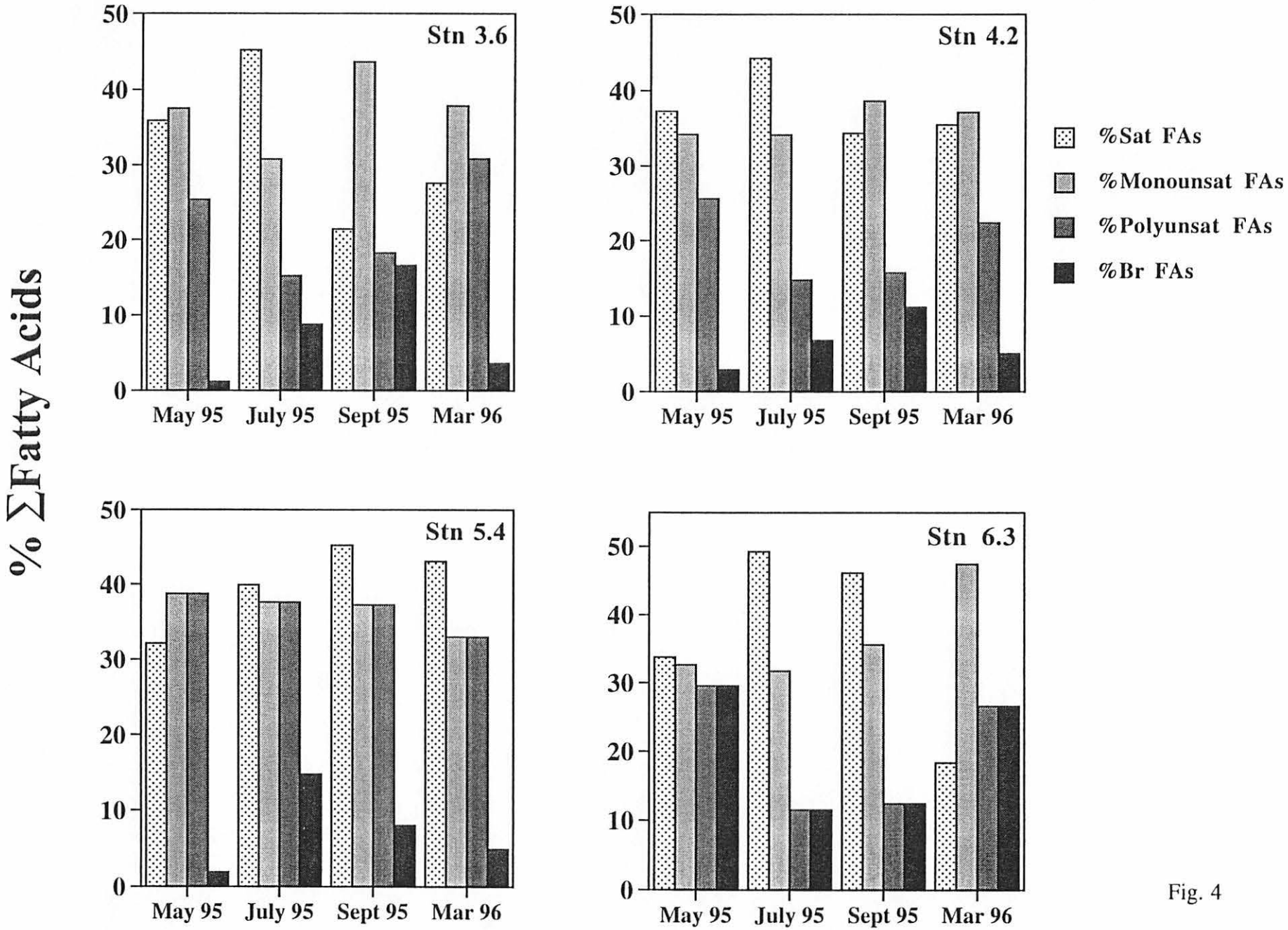


Fig. 4

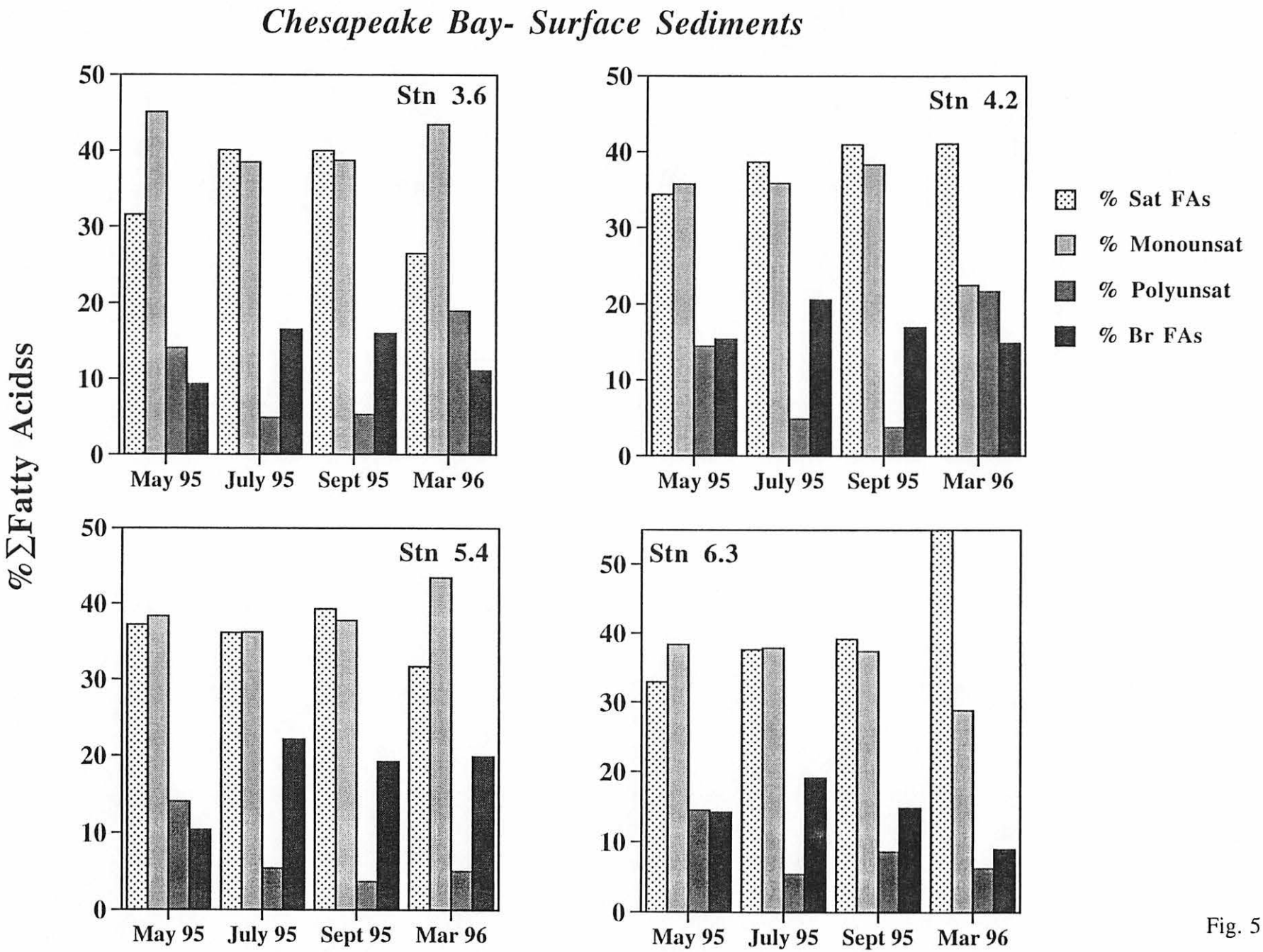

Chesapeake Bay- Surface Sediments
% ∑Fatty Acidss
Stn 3.6
Stn 4.2
Stn 5.4
Stn 6.3
0
10
20
30
40
50
May 95
July 95
Sept 95
Mar 96
% Sat FAs
% Monounsat
% Polyunsat
% Br FAs

Fig. 5

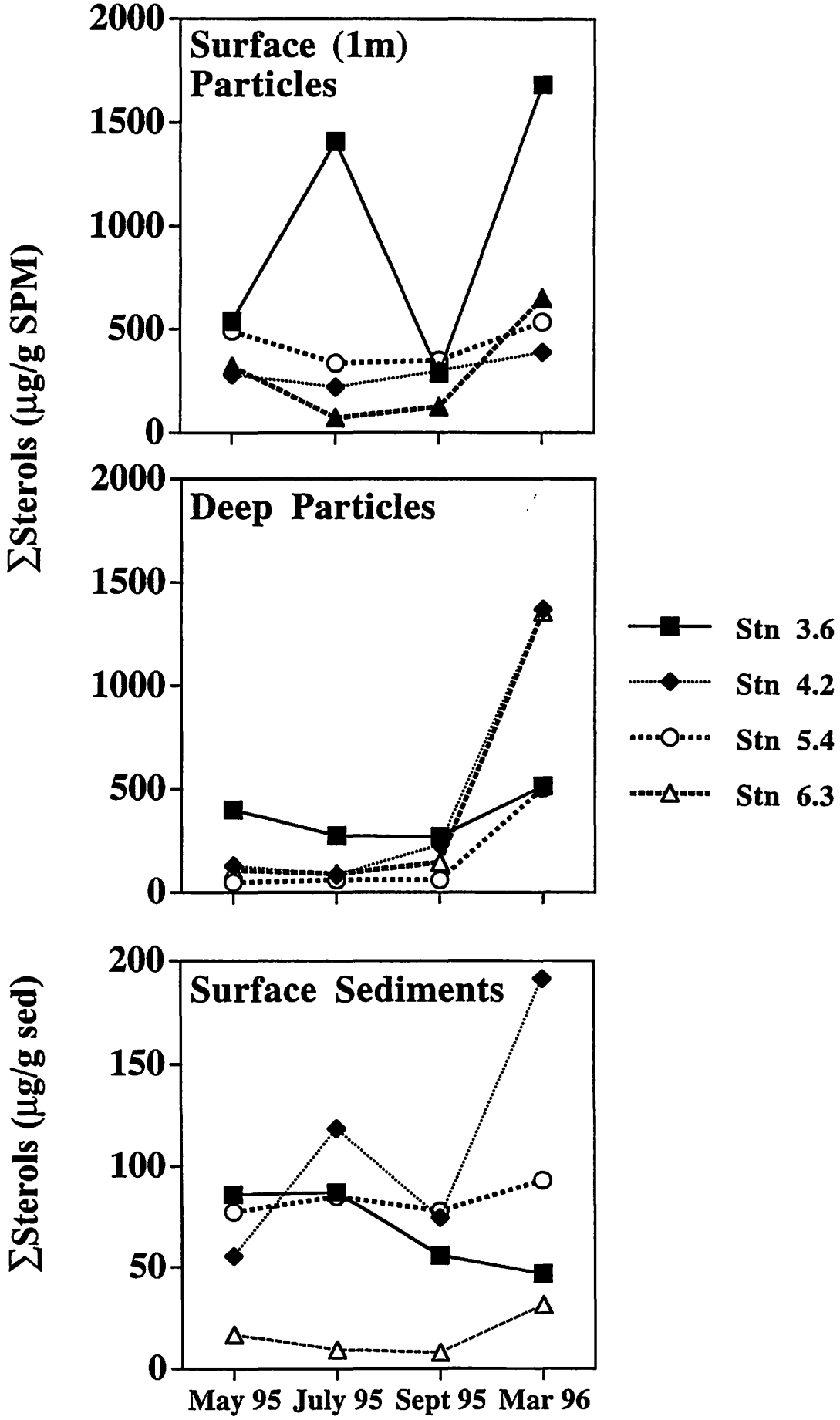

Surface (1m) Particles
Deep Particles
Surface Sediments
ΣSterols (µg/g SPM)
ΣSterols (µg/g sed)
2000
1500
1000
500
0
200
150
100
50
May 95
July 95
Sept 95
Mar 96
Stn 3.6
Stn 4.2
Stn 5.4
Stn 6.3

Fig. 6

Chesapeake Bay- Surface (1m) Particles

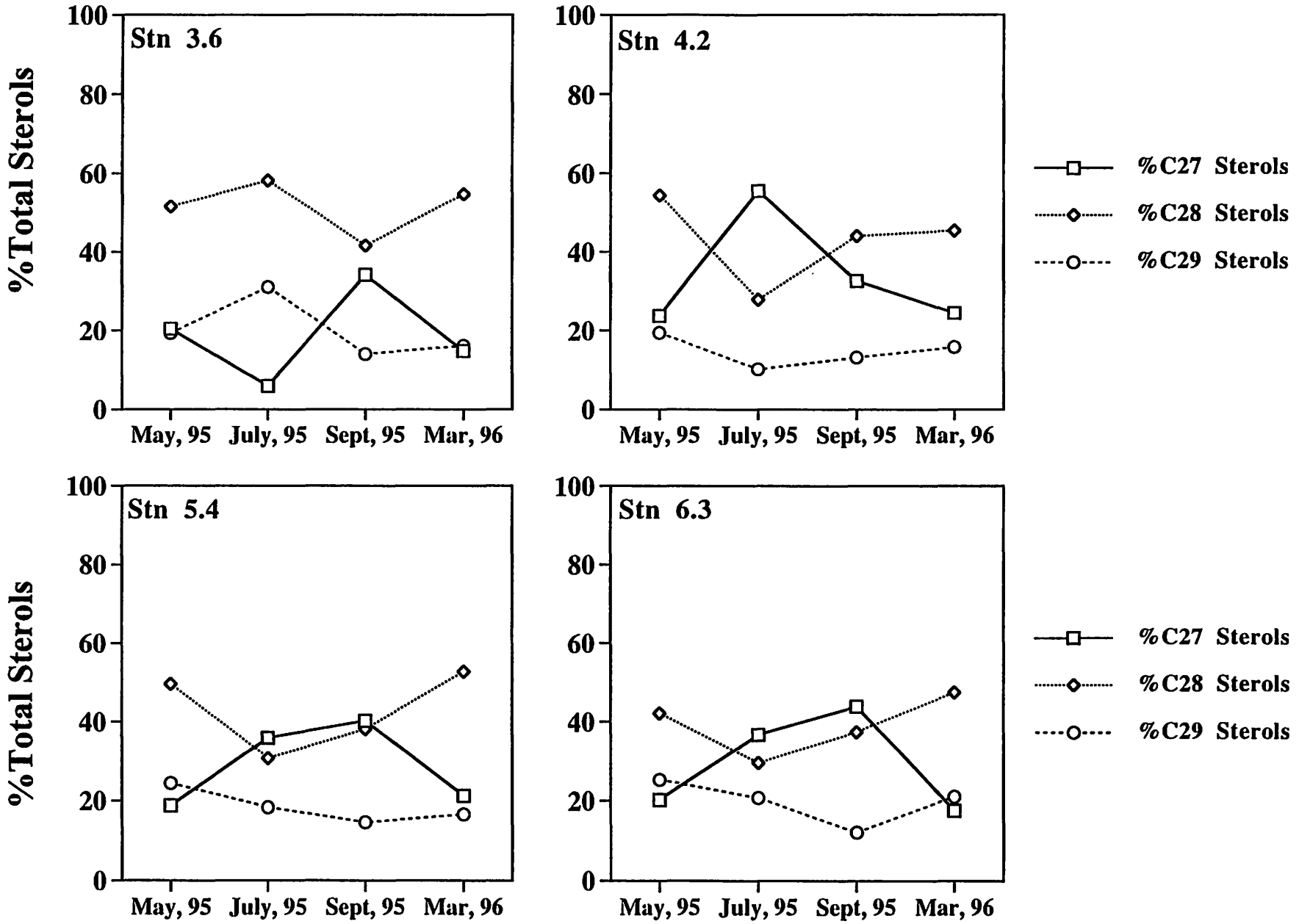


Fig. 7

Chesapeake Bay- Deep Particles

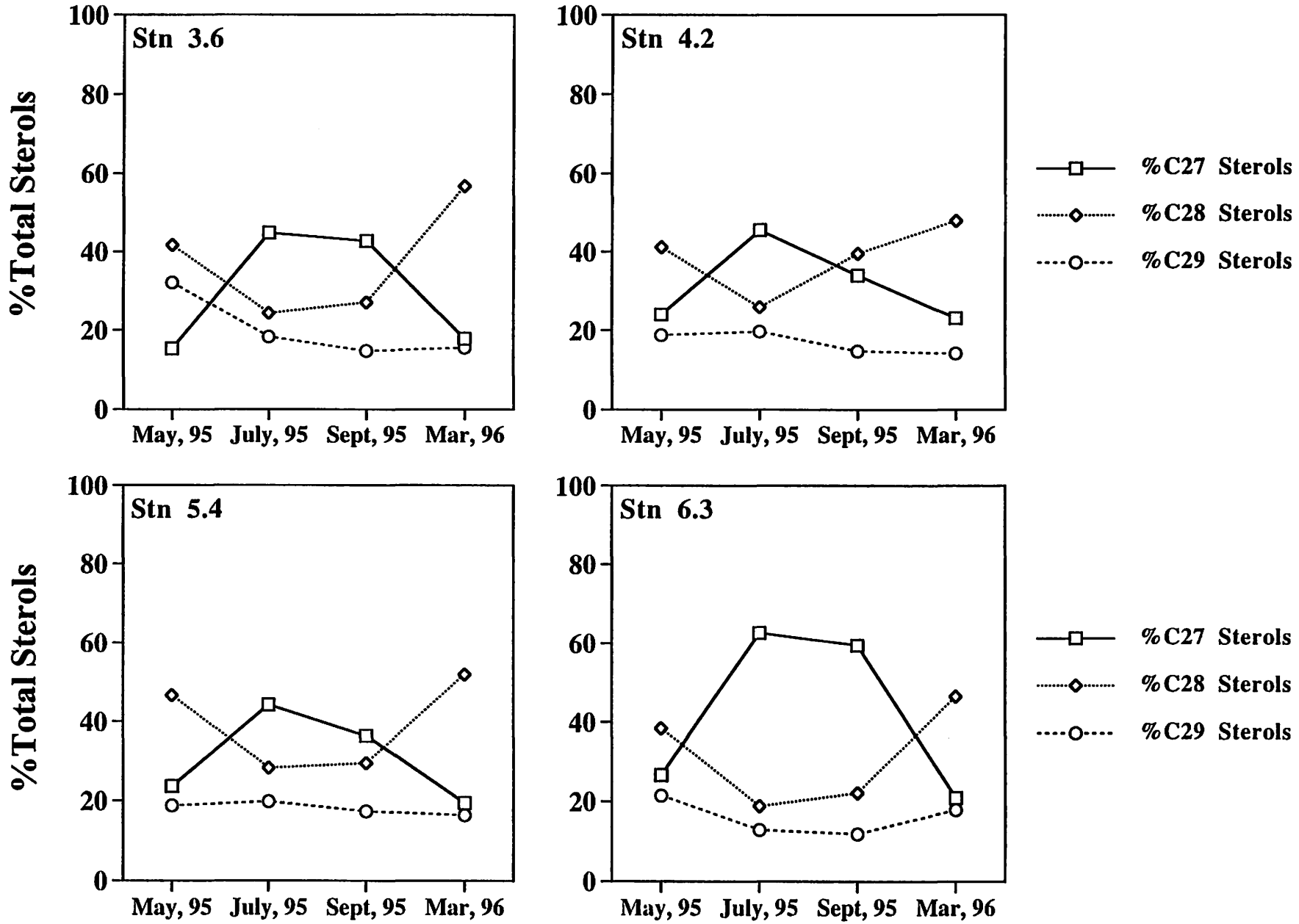


Fig. 8

Chesapeake Bay-Sediments

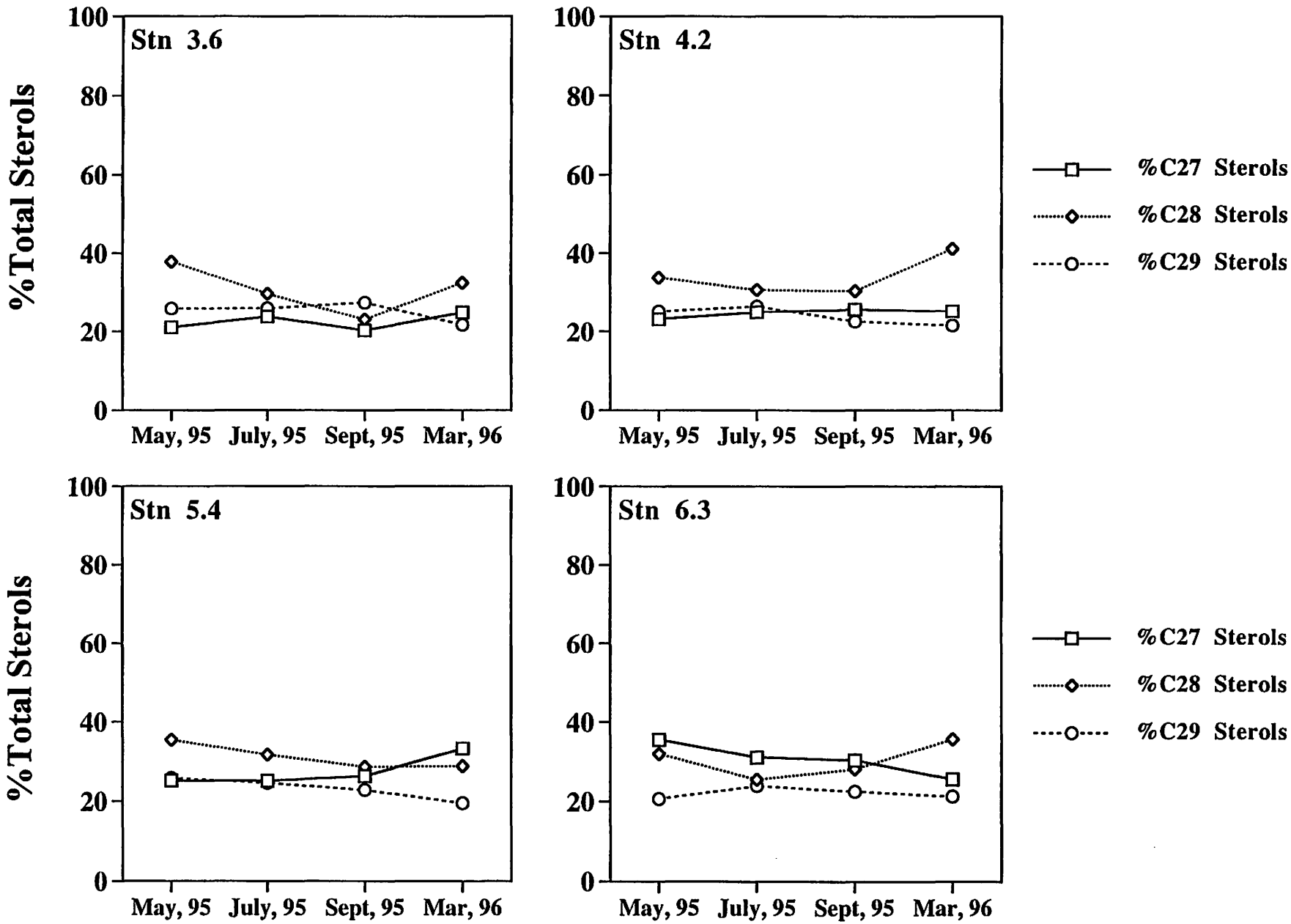


Fig. 9

APPENDICES

Appendix-1

Fatty Acid Concentrations (ng/L) - Suspended Particles

Water Samples	(ng/L)							
Site CB 3.6								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	53.75	0.00	3135.25	0.00	0.00	0.00	603.85
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	0.00	0.00	0.00	0.00	257.72	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	4566.03	6216.44	7297.56	36471.64	4188.91	2686.32	6408.95	11909.99
i15	757.64	156.09	733.68	0.00	546.87	1269.99	539.30	466.36
a15	418.48	71.71	438.88	0.00	0.00	578.49	260.18	0.00
15:1	0.00	105.66	0.00	0.00	0.00	0.00	0.00	0.00
15	414.99	78.74	459.88	1695.98	351.38	540.00	571.92	953.34
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	42.44	306.39	0.00	0.00	137.36	0.00	0.00
16:4	697.62	0.00	0.00	3547.26	578.77	0.00	511.13	1917.44
i16	578.94	747.60	1068.29	7003.85	334.09	553.31	5985.76	3429.23
16:1w9	397.81	276.01	353.00	0.00	593.79	0.00	0.00	0.00
16:1w7	5364.42	0.00	11214.00	52295.23	3746.21	3428.35	9857.93	35979.19
16:1w5	0.00	0.00	244.23	1058.56	0.00	274.93	267.87	661.15
16	14319.42	4091.05	19281.45	73688.09	19698.30	11397.28	606.86	21282.96
10Me16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i17	0.00	0.00	0.00	0.00	0.00	301.72	0.00	0.00
a17	0.00	0.00	0.00	0.00	0.00	343.60	304.06	431.07
17:1	0.00	0.00	0.00	0.00	0.00	200.86	0.00	0.00
17	406.82	319.79	412.37	0.00	338.96	568.67	485.05	346.26
18:n	0.00	0.00	0.00	0.00	0.00	0.00	171.27	0.00
18:2	0.00	0.00	150.31	0.00	0.00	0.00	118.77	0.00
18:1	0.00	4650.08	2947.45	0.00	0.00	1038.00	2289.25	0.00
18:4w3	0.00	0.00	0.00	31006.43	6735.00	0.00	0.00	0.07
18:2w6	0.00	251.06	1698.10	18699.36	3045.92	391.76	585.11	33505.10
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w9	11147.21	0.00	8968.36	61510.92	19213.80	3816.13	2297.78	13421.54
18:1w7	2152.04	1845.86	1862.98	6733.65	2866.12	1488.19	1851.81	2707.60
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	1069.10	2082.35	918.89	0.00	1116.20	165.09	302.12	0.00
18	1346.44	4017.56	2254.63	38891.09	1740.61	1894.96	1861.85	4576.52
i19	204.26	260.39	340.44	5481.87	0.00	0.00	0.00	881.82
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	95931.88	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	228.29	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	2668.14	0.00	152.80	0.00	2622.29	204.77	382.76	0.00
20:5w3	0.00	2891.69	1689.43	18174.03	0.00	1488.47	4032.13	7547.20
20:4	212.28	36.86	0.00	0.00	160.95	0.00	0.00	0.00
20:2	0.00	10780.50	186.00	808.08	0.00	0.00	150.23	406.76
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	144.55	181.51	0.00	1124.52	0.00	187.37	289.01	0.00
20:1w7	0.00	409.98	383.14	1198.98	0.00	300.27	859.14	495.28
20:1w5	0.00	216.96	675.22	2824.31	0.00	396.91	1722.53	1182.31
20	1309.98	8064.52	1305.38	1674.71	1499.60	3617.49	2302.86	954.55
21	33.28	6451.61	1250.00	9328.36	35.36	1811.59	1893.94	3731.34

Appendix-1

Fatty Acid Concentrations (ng/L) - Suspended Particles

22:6w6	0.00	431.93	0.00	0.00	210.22	137.25	172.29	0.00
22:6w3	108.51	346.57	979.15	0.00	4782.24	2718.13	2197.01	0.00
22:5	4875.86	126.03	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	198.81	0.00	161.36	857.57	181.78	202.77	292.41	238.09
22:4	0.00	247.07	208.48	1712.83	289.88	472.88	171.84	723.61
i22 (?)	0.00	124.96	0.00	5666.17	0.00	0.00	905.93	0.00
22:1w9	0.00	75.40	424.52	0.00	0.00	340.23	791.77	0.00
22:1w7	0.00	0.00	0.00	0.00	0.00	0.00	323.01	0.00
22	0.00	199.71	0.00	0.00	0.00	0.00	371.24	0.00
24:1	0.00	0.00	0.00	0.00	0.00	0.00	155.63	0.00
24	0.00	86.50	0.00	0.00	0.00	0.00	0.00	0.00
Total	*52049.37*	*137582.39*	*65810.99*	*373585.69*	*73342.29*	*37781.80*	*48093.92*	*143666.74*
Sat FAs	*21053.71*	*6435.43*	*29705.89*	*153882.04*	*26318.16*	*17087.22*	*10305.87*	*39672.92*
Mono Unsat	*20275.13*	*105775.69*	*27991.79*	*126746.18*	*27536.11*	*11636.34*	*21007.85*	*54447.07*
Polyunsat	*8761.21*	*15154.15*	*5532.02*	*74805.57*	*18607.06*	*5753.41*	*8784.97*	*44338.27*
Br FAs	*1959.32*	*1360.74*	*2581.29*	*18151.90*	*880.96*	*3304.83*	*7995.22*	*5208.48*

Appendix-1
Fatty Acid Concentrations (ng/L) - Suspended Particles

Water Samples	(ng/L)							
Site CB 4.2								
	Surface				Deep			
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	250.72	0.00	367.17	0.00	0.00	0.00	514.64
i13	0.00	185.38	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	1394.29	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	497.92	0.00	0.00	0.00	0.00	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	166.34	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	5113.82	10953.95	938.33	11254.70	1606.33	1773.74	2796.72	17715.73
i15	357.52	1804.07	182.68	538.39	273.39	509.03	361.52	541.12
a15	0.00	1043.23	145.57	0.00	168.20	300.11	249.68	0.00
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	423.03	1060.53	151.68	953.48	203.64	333.52	342.84	1136.98
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	226.10	0.00	0.00	0.00	0.00	0.00	0.00
16:4	790.73	0.00	0.00	2190.50	260.18	0.00	226.17	2741.88
i16	1066.25	3073.56	319.33	2902.65	329.41	616.60	2050.12	4315.36
16:1w9	0.00	364.72	0.00	0.00	196.65	0.00	0.00	0.00
16:1w7	11733.27	20154.69	1620.84	19803.29	2492.38	2748.68	5374.78	29140.81
16:1w5	0.00	426.94	0.00	454.09	0.00	154.22	139.37	639.38
16	14932.27	25001.88	2091.77	16727.35	7572.16	5879.44	4832.96	29194.10
10Me16	0.00	373.98	0.00	0.00	0.00	0.00	0.00	0.00
i17	0.00	361.03	0.00	0.00	0.00	0.00	0.00	0.00
a17	0.00	226.55	102.58	0.00	0.00	0.00	0.00	0.00
17:1	0.00	422.51	0.00	0.00	0.00	161.30	0.00	0.00
17	306.37	1017.39	188.51	0.00	480.65	264.08	177.83	0.00
18:n	0.00	96.11	0.00	0.00	0.00	0.00	0.00	0.00
18:2	0.00	215.82	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	1213.99	195.88	0.00	0.00	583.76	777.66	0.00
18:4w3	0.00	0.00	0.00	6635.48	2238.36	0.00	0.00	12934.09
18:2w6	1461.89	1419.72	0.00	2753.60	835.65	294.13	351.26	0.00
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9926.48
18:1w9	8543.74	4783.06	800.76	10823.86	5102.54	1668.96	1231.54	18621.94
18:1w7	1731.04	3014.17	525.90	3490.41	2334.67	952.88	1278.27	3996.03
18:1	0.00	137.56	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	708.83	156.79	0.00	0.00	625.60	0.00	0.00	0.00
18	1250.10	3629.62	483.08	4216.59	1989.24	1043.04	702.28	16893.61
i19	0.00	204.73	0.00	800.96	150.57	0.00	0.00	2522.08
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	146.19	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	154.88	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	4119.03	652.58	0.00	273.54	76.86	204.76	278.23	327.99
20:5w3	0.00	3107.08	520.76	9120.30	1550.50	1340.14	3113.73	12429.55
20:4	249.45	102.44	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	160.52	0.00	368.76	72.09	0.00	0.00	466.99
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	0.00	350.59	43.36	0.00	122.90	192.21	0.00	564.89

Appendix-1

Fatty Acid Concentrations (ng/L) - Suspended Particles

20:1w7	0.00	817.84	76.81	541.08	0.00	180.81	315.50	958.43
20:1w5	0.00	1157.87	130.32	1251.39	0.00	255.55	608.59	2126.58
20	1899.27	2899.91	1010.35	1058.86	1129.59	3034.51	1390.06	1435.40
21	33.28	1453.49	1077.59	3906.25	14.56	1644.74	1388.89	4901.96
22:6w6	0.00	234.08	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	0.00	0.00	0.00	5515.73	1990.45	1117.39	0.00	0.00
22:5	3508.49	159.86	0.00	0.00	0.00	0.00	0.00	11839.41
22:5w3	0.00	0.00	40.45	0.00	76.38	0.00	97.15	545.63
22:4	0.00	0.00	0.00	393.49	1052.36	153.38	0.00	342.34
i22 (?)	0.00	1209.94	0.00	0.00	0.00	0.00	231.00	1994.57
22:1w9	266.84	917.09	73.80	0.00	0.00	267.89	230.33	2374.52
22:1w7	0.00	343.77	0.00	0.00	0.00	0.00	0.00	614.84
22	0.00	520.35	0.00	0.00	0.00	0.00	0.00	483.12
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	171.62	0.00	0.00	0.00	0.00	0.00	0.00
Total	*56562.67*	*94084.07*	*8632.41*	*101376.81*	*31801.14*	*20995.61*	*25767.55*	*185903.12*
Sat FAs	*22025.59*	*44155.25*	*3853.37*	*33519.29*	*11852.01*	*9293.83*	*8852.62*	*65938.17*
Mono Unsat	*22983.72*	*34574.12*	*3467.66*	*36364.11*	*10874.74*	*7166.24*	*9956.05*	*68963.92*
Polyunsat	*10129.58*	*6374.32*	*561.21*	*27251.42*	*8152.82*	*3109.80*	*4066.55*	*41627.90*
Br FAs	*1423.77*	*8980.39*	*750.17*	*4241.99*	*921.57*	*1425.74*	*2892.32*	*9373.13*

Appendix-1
Fatty Acid Concentrations (ng/L) - Suspended Particles

Water Samples	(ng/L)							
Site CB 5.4								
	Surface				Deep			
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	942.71
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	382.40	0.00	0.00	0.00	86.51	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	6018.60	4507.28	4851.61	5496.03	1256.64	851.45	702.86	17105.52
i15	670.13	1157.12	426.47	0.00	235.99	476.63	226.67	0.00
a15	301.60	668.93	247.30	0.00	0.00	264.25	172.54	0.00
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	363.66	420.87	448.07	570.63	161.20	196.45	155.20	1238.71
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:4	780.04	0.00	277.85	750.96	178.54	0.00	0.00	2138.14
i16	401.87	615.54	1439.43	1713.29	247.64	357.74	229.85	5136.86
16:1w9	548.65	196.97	0.00	0.00	237.48	0.00	0.00	0.00
16:1w7	4820.14	6611.25	10489.41	15053.69	1953.95	1525.16	1350.30	37066.10
16:1w5	0.00	227.29	251.77	0.00	0.00	131.86	0.00	788.50
16	18532.00	9116.46	16254.19	12618.14	8434.06	2349.87	1962.45	30149.76
10Me16	0.00	0.00	0.00	0.00	0.00	111.43	0.00	0.00
i17	0.00	0.00	0.00	0.00	0.00	100.21	0.00	0.00
a17	0.00	0.00	0.00	0.00	186.40	140.73	0.00	0.00
17:1	0.00	0.00	0.00	0.00	0.00	197.76	0.00	0.00
17	504.81	282.06	321.88	868.17	354.62	183.50	182.68	0.00
18:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	1256.96	2033.13	2765.27	0.00	168.87	136.03	0.00
18:4w3	6482.70	0.00	0.00	1395.65	3790.04	0.00	0.00	9824.59
18:2w6	3433.99	468.51	1036.36	1709.31	1338.94	45.39	128.93	6083.69
18:1w11	0.00	0.00	0.00	0.00	0.00	107.84	0.00	0.00
18:1w9	16523.27	3356.15	5382.52	8105.03	8993.09	726.28	690.50	1838.81
18:1w7	2470.22	1605.77	1490.93	2965.19	1883.11	902.91	757.07	3728.13
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	1758.72	301.33	614.11	0.00	664.33	0.00	0.00	0.00
18	1754.05	939.00	2182.33	4706.26	1168.89	592.93	554.63	12909.39
i19	336.45	0.00	0.00	0.00	0.00	0.00	0.00	2048.48
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	2783.19	174.87	153.42	3797.95	0.00	400.68	0.00	0.00
20:5w3	0.00	1093.84	2039.87	0.00	1590.30	0.00	273.72	8879.99
20:4	242.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	0.00	131.94	0.00	0.00	0.00	0.00	427.64
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	191.11	0.00	0.00	532.16	0.00	0.00	0.00	0.00

Appendix-1
Fatty Acid Concentrations (ng/L) - Suspended Particles

20:1w7	0.00	0.00	276.20	0.00	0.00	70.79	0.00	688.47
20:1w5	0.00	159.87	521.94	873.07	0.00	102.12	0.00	1690.59
20	1290.38	1148.35	1380.26	1731.58	1727.22	2109.03	1349.06	1302.86
21	35.36	2140.41	2155.17	9803.92	16.64	1404.49	1388.89	6578.95
22:6w6	264.88	127.24	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	0.00	1427.04	1385.45	2265.77	1824.56	199.68	143.26	0.00
22:5	6267.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	243.30	0.00	0.00	0.00	0.00	0.00	0.00	440.42
22:4	0.00	0.00	315.97	1354.30	929.65	162.24	205.05	0.00
i22 (?)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:1w9	0.00	213.15	0.00	552.90	0.00	0.00	0.00	1846.14
22:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	649.53
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	621.75
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	*75693.05*	*35309.94*	*52572.16*	*68093.78*	*35429.44*	*10453.27*	*7871.74*	*146243.94*
Sat FAs	*27173.11*	*15265.69*	*24058.08*	*24259.23*	*11375.42*	*4174.20*	*3557.82*	*62967.85*
Mono Unsat	*26312.10*	*13928.76*	*21060.01*	*30847.31*	*13731.95*	*3933.59*	*2933.90*	*48296.26*
Polyunsat	*20497.78*	*3291.50*	*5340.87*	*11273.95*	*9652.04*	*807.99*	*750.96*	*27794.48*
Br FAs	*1710.05*	*2824.00*	*2113.20*	*1713.29*	*670.03*	*1537.49*	*629.06*	*7185.34*

Appendix-1
Fatty Acid Concentrations (ng/L) - Suspended Particles

Water Samples	(ng/L)							
Site CB 6.3								
	Surface				Deep			
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	175.19	0.00	0.00	0.00	424.50
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	213.27	0.00	0.00	0.00	0.00	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	3074.50	3286.74	1459.32	7714.59	1242.62	913.60	857.40	1394.62
i15	469.09	782.17	135.95	361.23	272.88	328.38	128.18	295.23
a15	227.78	414.22	85.78	0.00	187.53	234.13	0.00	305.96
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	217.43	306.39	140.31	631.50	162.75	219.74	141.97	793.78
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	90.21	0.00	0.00	0.00	0.00	0.00	0.00
16:4	313.04	0.00	92.36	1233.33	205.49	0.00	0.00	1184.86
i16	253.55	374.78	414.69	2328.63	246.08	280.77	331.31	3698.58
16:1w9	216.04	0.00	68.99	0.00	0.00	0.00	0.00	0.00
16:1w7	3107.56	4484.14	2318.31	18240.30	1876.30	1408.65	1348.72	2301.66
16:1w5	0.00	182.23	75.58	426.15	0.00	100.65	0.00	551.63
16	7367.32	6920.58	4072.11	12355.57	4644.50	4707.85	1996.85	2088.00
10Me16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	224.43
i17	0.00	0.00	0.00	0.00	0.00	105.52	0.00	0.00
a17	0.00	165.11	0.00	0.00	150.12	178.98	0.00	0.00
17:1	0.00	0.00	0.00	0.00	0.00	208.89	0.00	0.00
17	280.81	323.43	106.19	178.58	465.37	318.43	110.42	230.55
18:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	391.02
18:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	0.00	706.95	0.00	0.00	269.46	210.97	0.00
18:4w3	2173.13	373.95	0.00	4148.23	1506.51	0.00	0.00	6740.11
18:2w6	1171.42	357.05	305.52	2542.15	674.42	114.14	124.83	4966.84
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w9	5332.39	1831.12	1581.76	5530.05	3496.70	1411.00	612.94	0.00
18:1w7	1304.39	1164.07	599.58	1767.86	1089.40	999.69	406.49	10496.33
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20606.72
18:1w5	538.12	0.00	217.26	0.00	467.18	0.00	0.00	0.00
18	1086.25	858.40	796.36	4776.88	652.41	1405.32	518.04	9199.14
i19	109.82	0.00	0.00	1024.86	0.00	0.00	0.00	1376.20
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:5	64.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	1213.89	0.00	46.51	0.00	0.00	0.00	0.00	0.00
20:5w3	0.00	398.08	649.79	5469.40	1076.94	621.26	451.57	6256.67
20:4	109.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	0.00	57.28	302.59	0.00	0.00	0.00	230.65
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	117.67	0.00	113.07	0.00	0.00	136.60	84.39	0.00

Appendix-1
Fatty Acid Concentrations (ng/L) - Suspended Particles

20:1w7	0.00	0.00	135.72	559.12	0.00	149.23	0.00	307.73
20:1w5	0.00	144.60	224.88	1154.75	0.00	0.00	135.84	985.66
20	1070.12	1411.51	586.14	1196.66	1435.94	2918.04	898.12	496.01
21	14.56	1524.39	752.11	2049.18	16.64	1785.71	886.52	1488.10
22:6w6	76.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	2826.10	381.19	395.00	0.00	1503.32	833.37	331.21	0.00
22:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	135.87	0.00	0.00	260.86	0.00	0.00	0.00	262.74
22:4	549.36	494.76	58.84	0.00	1306.90	194.23	69.64	456.02
i22 (?)	0.00	0.00	0.00	763.64	0.00	0.00	0.00	0.00
22:1w9	0.00	164.89	0.00	1061.31	0.00	168.12	0.00	1054.18
22:1w7	0.00	0.00	0.00	348.13	0.00	0.00	0.00	212.25
22	0.00	0.00	0.00	333.34	0.00	0.00	0.00	0.00
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	*32335.74*	*23711.40*	*14858.10*	*73688.24*	*21227.41*	*15308.01*	*7860.79*	77036.04
Sat FAs	*12026.31*	*11695.55*	*6574.29*	*26165.65*	*7167.65*	*7564.94*	*3624.69*	14130.58
Mono Unsat	*10616.17*	*7971.04*	*6042.10*	*29087.67*	*6929.58*	*4852.29*	*2799.35*	36516.15
Polyunsat	*8633.02*	*2095.25*	*1605.30*	*13956.56*	*6273.58*	*1763.00*	*977.25*	20488.91
Br FAs	*1060.24*	*1949.55*	*636.42*	*4478.36*	*856.60*	*1127.78*	*459.49*	5900.40

Appendix-2
Fatty Acid Concentrations (ng/mg SPM)

Water Samples	ng/mg SPM							
Site CB 3.6								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.85	0.00	418.03	0.00	0.00	0.00	50.74
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	0.00	0.00	0.00	0.00	9.69	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	913.21	98.36	776.34	4862.89	544.01	100.99	562.19	1000.84
i15	151.53	2.47	78.05	0.00	71.02	47.74	47.31	39.19
a15	83.70	1.13	46.69	0.00	0.00	21.75	22.82	0.00
15:1	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00
15	83.00	1.25	48.92	226.13	45.63	20.30	50.17	80.11
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	0.67	32.59	0.00	0.00	5.16	0.00	0.00
16:4	139.52	0.00	0.00	472.97	75.16	0.00	44.84	161.13
i16	115.79	11.83	113.65	933.85	43.39	20.80	525.07	288.17
16:1w9	79.56	4.37	37.55	0.00	77.12	0.00	0.00	0.00
16:1w7	1072.88	0.00	1192.98	6972.70	486.52	128.89	864.73	3023.46
16:1w5	0.00	0.00	25.98	141.14	0.00	10.34	23.50	55.56
16	2863.88	64.73	2051.22	9825.08	2558.22	428.47	53.23	1788.48
10Me16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i17	0.00	0.00	0.00	0.00	0.00	11.34	0.00	0.00
a17	0.00	0.00	0.00	0.00	0.00	12.92	26.67	36.22
17:1	0.00	0.00	0.00	0.00	0.00	7.55	0.00	0.00
17	81.36	5.06	43.87	0.00	44.02	21.38	42.55	29.10
18:n	0.00	0.00	0.00	0.00	0.00	0.00	15.02	0.00
18:2	0.00	0.00	15.99	0.00	0.00	0.00	10.42	0.00
18:1	0.00	73.58	313.56	0.00	0.00	39.02	200.81	0.00
18:4w3	0.00	0.00	0.00	4134.19	874.68	0.00	0.00	0.01
18:2w6	0.00	3.97	180.65	2493.25	395.57	14.73	51.33	2815.55
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w9	2229.44	0.00	954.08	8201.46	2495.30	143.46	201.56	1127.86
18:1w7	430.41	29.21	198.19	897.82	372.22	55.95	162.44	227.53
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	213.82	32.95	97.75	0.00	144.96	6.21	26.50	0.00
18	269.29	63.57	239.85	5185.48	226.05	71.24	163.32	384.58
i19	40.85	4.12	36.22	730.92	0.00	0.00	0.00	74.10
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	1517.91	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	3.61	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	533.63	0.00	16.26	0.00	340.56	7.70	33.58	0.00
20:5w3	0.00	45.75	179.73	2423.20	0.00	55.96	353.70	634.22
20:4	42.46	0.58	0.00	0.00	20.90	0.00	0.00	0.00
20:2	0.00	170.58	19.79	107.74	0.00	0.00	13.18	34.18
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	28.91	2.87	0.00	149.94	0.00	7.04	25.35	0.00

Appendix-2
Fatty Acid Concentrations (ng/mg SPM)

20:1w7	0.00	6.49	40.76	159.86	0.00	11.29	75.36	41.62
20:1w5	0.00	3.43	71.83	376.58	0.00	14.92	151.10	99.35
20	262.00	127.60	138.87	223.29	194.75	136.00	202.01	80.21
21	6.66	102.08	132.98	1243.78	4.59	68.11	166.14	313.56
22:6w6	0.00	6.83	0.00	0.00	27.30	5.16	15.11	0.00
22:6w3	21.70	5.48	104.16	0.00	621.07	102.19	192.72	0.00
22:5	975.17	1.99	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	39.76	0.00	17.17	114.34	23.61	7.62	25.65	20.01
22:4	0.00	3.91	22.18	228.38	37.65	17.78	15.07	60.81
i22 (?)	0.00	1.98	0.00	755.49	0.00	0.00	79.47	0.00
22:1w9	0.00	1.19	45.16	0.00	0.00	12.79	69.45	0.00
22:1w7	0.00	0.00	0.00	0.00	0.00	0.00	28.33	0.00
22	0.00	3.16	0.00	0.00	0.00	0.00	32.57	0.00
24:1	0.00	0.00	0.00	0.00	0.00	0.00	13.65	0.00
24	0.00	1.37	0.00	0.00	0.00	0.00	0.00	0.00
Total	*10409.87*	*2176.94*	*7001.17*	*49811.43*	*9524.97*	*1420.37*	*4218.76*	*12072.84*
Sat FAs	*4210.74*	*101.83*	*3160.20*	*20517.61*	*3417.94*	*642.38*	*904.02*	*3333.86*
Mono Unsat	*4055.03*	*1673.67*	*2977.85*	*16899.49*	*3576.12*	*437.46*	*1842.79*	*4575.38*
Polyunsat	*1752.24*	*239.78*	*588.51*	*9974.08*	*2416.50*	*216.29*	*770.61*	*3725.91*
Br FAs	*391.86*	*21.53*	*274.60*	*2420.25*	*114.41*	*124.24*	*701.34*	*437.69*

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

Water Samples	ng/mg SPM							
Site CB 4.2								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	5.78	0.00	22.39	0.00	0.00	0.00	73.52
i13	0.00	4.27	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	32.13	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	11.47	0.00	0.00	0.00	0.00	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	3.83	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	501.36	252.40	79.52	686.26	89.24	40.87	150.36	2530.82
i15	35.05	41.57	15.48	32.83	15.19	11.73	19.44	77.30
a15	0.00	24.04	12.34	0.00	9.34	6.91	13.42	0.00
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	41.47	24.44	12.85	58.14	11.31	7.68	18.43	162.43
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	5.21	0.00	0.00	0.00	0.00	0.00	0.00
16:4	77.52	0.00	0.00	133.57	14.45	0.00	12.16	391.70
i16	104.53	70.82	27.06	176.99	18.30	14.21	110.22	616.48
16:1w9	0.00	8.40	0.00	0.00	10.93	0.00	0.00	0.00
16:1w7	1150.32	464.39	137.36	1207.52	138.47	63.33	288.97	4162.97
16:1w5	0.00	9.84	0.00	27.69	0.00	3.55	7.49	91.34
16	1463.95	576.08	177.27	1019.96	420.68	135.47	259.84	4170.59
10Me16	0.00	8.62	0.00	0.00	0.00	0.00	0.00	0.00
i17	0.00	8.32	0.00	0.00	0.00	0.00	0.00	0.00
a17	0.00	5.22	8.69	0.00	0.00	0.00	0.00	0.00
17:1	0.00	9.74	0.00	0.00	0.00	3.72	0.00	0.00
17	30.04	23.44	15.98	0.00	26.70	6.08	9.56	0.00
18:n	0.00	2.21	0.00	0.00	0.00	0.00	0.00	0.00
18:2	0.00	4.97	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	27.97	16.60	0.00	0.00	13.45	41.81	0.00
18:4w3	0.00	0.00	0.00	404.60	124.35	0.00	0.00	1847.73
18:2w6	143.32	32.71	0.00	167.90	46.42	6.78	18.89	0.00
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1418.07
18:1w9	837.62	110.21	67.86	659.99	283.47	38.46	66.21	2660.28
18:1w7	169.71	69.45	44.57	212.83	129.70	21.96	68.72	570.86
18:1	0.00	3.17	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	69.49	3.61	0.00	0.00	34.76	0.00	0.00	0.00
18	122.56	83.63	40.94	257.11	110.51	24.03	37.76	2413.37
i19	0.00	4.72	0.00	48.84	8.37	0.00	0.00	360.30
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	3.37	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	3.57	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	403.83	15.04	0.00	16.68	4.27	4.72	14.96	46.86
20:5w3	0.00	71.59	44.13	556.12	86.14	30.88	167.40	1775.65
20:4	24.46	2.36	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	3.70	0.00	22.49	4.00	0.00	0.00	66.71
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	0.00	8.08	3.67	0.00	6.83	4.43	0.00	80.70

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

20:1w7	0.00	18.84	6.51	32.99	0.00	4.17	16.96	136.92
20:1w5	0.00	26.68	11.04	76.30	0.00	5.89	32.72	303.80
20	186.20	66.82	85.62	64.56	62.76	69.92	74.73	205.06
21	3.26	33.49	91.32	238.19	0.81	37.90	74.67	700.28
22:6w6	0.00	5.39	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	0.00	0.00	0.00	336.33	110.58	25.75	0.00	0.00
22:5	343.97	3.68	0.00	0.00	0.00	0.00	0.00	1691.34
22:5w3	0.00	0.00	3.43	0.00	4.24	0.00	5.22	77.95
22:4	0.00	0.00	0.00	23.99	58.46	3.53	0.00	48.91
i22 (?)	0.00	27.88	0.00	0.00	0.00	0.00	12.42	284.94
22:1w9	26.16	21.13	6.25	0.00	0.00	6.17	12.38	339.22
22:1w7	0.00	7.92	0.00	0.00	0.00	0.00	0.00	87.83
22	0.00	11.99	0.00	0.00	0.00	0.00	0.00	69.02
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	3.95	0.00	0.00	0.00	0.00	0.00	0.00
Total	*5545.36*	*2167.84*	*731.56*	*6181.51*	*1766.73*	*483.77*	*1385.35*	*26557.59*
Sat FAs	*2159.37*	*1017.40*	*326.56*	*2043.86*	*658.44*	*214.14*	*475.95*	*9419.74*
Mono Unsat	*2253.31*	*796.64*	*293.87*	*2217.32*	*604.15*	*165.12*	*535.27*	*9851.99*
Polyunsat	*993.10*	*146.87*	*47.56*	*1661.67*	*452.93*	*71.65*	*218.63*	*5946.84*
Br FAs	*139.59*	*206.92*	*63.57*	*258.66*	*51.20*	*32.85*	*155.50*	*1339.02*

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

Water Samples	(ng/L)							
Site CB 5.4								
	Surface				Deep			
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	942.71
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	382.40	0.00	0.00	0.00	86.51	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	6018.60	4507.28	4851.61	5496.03	1256.64	851.45	702.86	17105.52
i15	670.13	1157.12	426.47	0.00	235.99	476.63	226.67	0.00
a15	301.60	668.93	247.30	0.00	0.00	264.25	172.54	0.00
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	363.66	420.87	448.07	570.63	161.20	196.45	155.20	1238.71
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:4	780.04	0.00	277.85	750.96	178.54	0.00	0.00	2138.14
i16	401.87	615.54	1439.43	1713.29	247.64	357.74	229.85	5136.86
16:1w9	548.65	196.97	0.00	0.00	237.48	0.00	0.00	0.00
16:1w7	4820.14	6611.25	10489.41	15053.69	1953.95	1525.16	1350.30	37066.10
16:1w5	0.00	227.29	251.77	0.00	0.00	131.86	0.00	788.50
16	18532.00	9116.46	16254.19	12618.14	8434.06	2349.87	1962.45	30149.76
10Me16	0.00	0.00	0.00	0.00	0.00	111.43	0.00	0.00
i17	0.00	0.00	0.00	0.00	0.00	100.21	0.00	0.00
a17	0.00	0.00	0.00	0.00	186.40	140.73	0.00	0.00
17:1	0.00	0.00	0.00	0.00	0.00	197.76	0.00	0.00
17	504.81	282.06	321.88	868.17	354.62	183.50	182.68	0.00
18:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	1256.96	2033.13	2765.27	0.00	168.87	136.03	0.00
18:4w3	6482.70	0.00	0.00	1395.65	3790.04	0.00	0.00	9824.59
18:2w6	3433.99	468.51	1036.36	1709.31	1338.94	45.39	128.93	6083.69
18:1w11	0.00	0.00	0.00	0.00	0.00	107.84	0.00	0.00
18:1w9	16523.27	3356.15	5382.52	8105.03	8993.09	726.28	690.50	1838.81
18:1w7	2470.22	1605.77	1490.93	2965.19	1883.11	902.91	757.07	3728.13
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w5	1758.72	301.33	614.11	0.00	664.33	0.00	0.00	0.00
18	1754.05	939.00	2182.33	4706.26	1168.89	592.93	554.63	12909.39
i19	336.45	0.00	0.00	0.00	0.00	0.00	0.00	2048.48
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	2783.19	174.87	153.42	3797.95	0.00	400.68	0.00	0.00
20:5w3	0.00	1093.84	2039.87	0.00	1590.30	0.00	273.72	8879.99
20:4	242.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	0.00	131.94	0.00	0.00	0.00	0.00	427.64
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	191.11	0.00	0.00	532.16	0.00	0.00	0.00	0.00

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

20:1w7	0.00	0.00	276.20	0.00	0.00	70.79	0.00	688.47
20:1w5	0.00	159.87	521.94	873.07	0.00	102.12	0.00	1690.59
20	1290.38	1148.35	1380.26	1731.58	1727.22	2109.03	1349.06	1302.86
21	35.36	2140.41	2155.17	9803.92	16.64	1404.49	1388.89	6578.95
22:6w6	264.88	127.24	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	0.00	1427.04	1385.45	2265.77	1824.56	199.68	143.26	0.00
22:5	6267.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	243.30	0.00	0.00	0.00	0.00	0.00	0.00	440.42
22:4	0.00	0.00	315.97	1354.30	929.65	162.24	205.05	0.00
i22 (?)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:1w9	0.00	213.15	0.00	552.90	0.00	0.00	0.00	1846.14
22:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	649.53
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	621.75
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	*75693.05*	*35309.94*	*52572.16*	*68093.78*	*35429.44*	*10453.27*	*7871.74*	*146243.94*
Sat FAs	*27173.11*	*15265.69*	*24058.08*	*24259.23*	*11375.42*	*4174.20*	*3557.82*	*62967.85*
Mono Unsat	*26312.10*	*13928.76*	*21060.01*	*30847.31*	*13731.95*	*3933.59*	*2933.90*	*48296.26*
Polyunsat	*20497.78*	*3291.50*	*5340.87*	*11273.95*	*9652.04*	*807.99*	*750.96*	*27794.48*
Br FAs	*1710.05*	*2824.00*	*2113.20*	*1713.29*	*670.03*	*1537.49*	*629.06*	*7185.34*

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

Water Samples	ng/mg SPM							
Site CB 6.3								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	21.90	0.00	0.00	0.00	33.16
i13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
i14	0.00	8.40	0.00	0.00	0.00	0.00	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	559.00	129.40	187.09	964.32	90.05	22.84	138.29	108.95
i15	85.29	30.79	17.43	45.15	19.77	8.21	20.67	23.06
a15	41.41	16.31	11.00	0.00	13.59	5.85	0.00	23.90
15:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	39.53	12.06	17.99	78.94	11.79	5.49	22.90	62.01
16:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16:n	0.00	3.55	0.00	0.00	0.00	0.00	0.00	0.00
16:4	56.92	0.00	11.84	154.17	14.89	0.00	0.00	92.57
i16	46.10	14.76	53.16	291.08	17.83	7.02	53.44	288.95
16:1w9	39.28	0.00	8.84	0.00	0.00	0.00	0.00	0.00
16:1w7	565.01	176.54	297.22	2280.04	135.96	35.22	217.54	179.82
16:1w5	0.00	7.17	9.69	53.27	0.00	2.52	0.00	43.10
16	1339.51	272.46	522.07	1544.45	336.56	117.70	322.07	163.12
10Me16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.53
i17	0.00	0.00	0.00	0.00	0.00	2.64	0.00	0.00
a17	0.00	6.50	0.00	0.00	10.88	4.47	0.00	0.00
17:1	0.00	0.00	0.00	0.00	0.00	5.22	0.00	0.00
17	51.06	12.73	13.61	22.32	33.72	7.96	17.81	18.01
18:n	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.55
18:2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1	0.00	0.00	90.63	0.00	0.00	6.74	34.03	0.00
18:4w3	395.11	14.72	0.00	518.53	109.17	0.00	0.00	526.57
18:2w6	212.99	14.06	39.17	317.77	48.87	2.85	20.13	388.03
18:1w11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18:1w9	969.53	72.09	202.79	691.26	253.38	35.27	98.86	0.00
18:1w7	237.16	45.83	76.87	220.98	78.94	24.99	65.56	820.03
18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1609.90
18:1w5	97.84	0.00	27.85	0.00	33.85	0.00	0.00	0.00
18	197.50	33.80	102.10	597.11	47.28	35.13	83.55	718.68
i19	19.97	0.00	0.00	128.11	0.00	0.00	0.00	107.52
a19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:5	11.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:4	220.71	0.00	5.96	0.00	0.00	0.00	0.00	0.00
20:5w3	0.00	15.67	83.31	683.67	78.04	15.53	72.83	488.80
20:4	19.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:2	0.00	0.00	7.34	37.82	0.00	0.00	0.00	18.02
20:2 ?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20:1w9	21.39	0.00	14.50	0.00	0.00	3.42	13.61	0.00

Appendix-2
Fatty Acid Concentrations (ng/mg SPM) - Suspended Particles

20:1w7	0.00	0.00	17.40	69.89	0.00	3.73	0.00	24.04
20:1w5	0.00	5.69	28.83	144.34	0.00	0.00	21.91	77.00
20	194.57	55.57	75.15	149.58	104.05	72.95	144.86	38.75
21	2.65	60.02	96.42	256.15	1.21	44.64	142.99	116.26
22:6w6	13.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:6w3	513.84	15.01	50.64	0.00	108.94	20.83	53.42	0.00
22:5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22:5w3	24.70	0.00	0.00	32.61	0.00	0.00	0.00	20.53
22:4	99.88	19.48	7.54	0.00	94.70	4.86	11.23	35.63
i22 (?)	0.00	0.00	0.00	95.46	0.00	0.00	0.00	0.00
22:1w9	0.00	6.49	0.00	132.66	0.00	4.20	0.00	82.36
22:1w7	0.00	0.00	0.00	43.52	0.00	0.00	0.00	16.58
22	0.00	0.00	0.00	41.67	0.00	0.00	0.00	0.00
24:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	*5879.23*	*933.52*	*1904.89*	*9211.03*	*1538.22*	*382.70*	*1267.87*	*6018.4*
Sat FAs	*2186.60*	*460.45*	*842.86*	*3270.71*	*519.39*	*189.12*	*584.63*	*1104.0*
Mono Unsat	*1930.21*	*313.82*	*774.63*	*3635.96*	*502.14*	*121.31*	*451.51*	*2852.8*
Polyunsat	*1569.64*	*82.49*	*205.81*	*1744.57*	*454.61*	*44.08*	*157.62*	*1600.7*
Br FAs	*192.77*	*76.75*	*81.59*	*559.80*	*62.07*	*28.19*	*74.11*	*461.0*

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediments

Sediments	(ng/g)			
Site CB 3.6				
	Sediments			
Component	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00
12	2316.24	0.00	1563.29	0.00
i13	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00
i14	2230.52	0.00	1702.55	1078.21
14:1w9	702.11	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00
14	31914.36	27528.91	10684.00	13349.99
i15	6763.97	16717.16	5533.79	3206.63
a15	8106.68	19624.49	7933.17	3792.95
15:1	927.42	0.00	0.00	0.00
15	6526.64	14520.75	3734.60	2822.02
16:2	659.30	0.00	0.00	0.00
16:n	0.00	0.00	0.00	0.00
16:4	2810.54	0.00	0.00	1559.16
i16	9226.32	9180.11	3458.48	6758.38
16:1w9	0.00	0.00	0.00	0.00
16:1w7	112636.77	70602.85	27952.88	51539.33
16:1w5	3019.65	4583.75	1606.59	1695.62
16	66198.88	87868.97	37720.42	30347.54
10Me16	3017.06	7962.44	4300.56	2158.02
i17	2039.27	0.00	1812.22	1424.72
a17	3719.57	9452.79	2096.61	1798.02
17:1	1837.95	4003.93	1706.95	1035.93
17	2595.41	6813.02	2935.37	1565.97
18:n	0.00	0.00	0.00	0.00
18:2	0.00	0.00	0.00	672.03
18:1	0.00	0.00	1398.98	3405.39
18:4w3	4741.00	0.00	0.00	0.00
18:2w6	0.00	5583.64	1740.41	2404.21
18:1w11	7289.28	0.00	0.00	0.00
18:1w9	16005.33	25503.25	10639.19	9169.58
18:1w7	23735.71	42356.23	19872.50	17320.07
18:1	0.00	0.00	0.00	0.00
18:1w5	0.00	0.00	0.00	0.00
18	6523.70	16416.36	7505.65	4921.31
i19	0.00	0.00	0.00	0.00
a19	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00
20:5	25179.98	0.00	0.00	3476.96
20:4	5845.66	0.00	1852.32	0.00

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediment

20:5w3	505.34	9134.47	2981.43	13791.23
20:4	1057.94	0.00	0.00	0.00
20:2	0.00	0.00	0.00	1073.52
20:2 ?	0.00	0.00	0.00	0.00
20:1w9	1202.09	0.00	1024.33	1664.31
20:1w7	1451.63	0.00	1050.49	2568.34
20:1w5	650.17	0.00	0.00	2167.96
20	6267.65	3980.42	2932.59	8020.20
21	12.48	46296.30	12886.60	10245.90
22:6w6	722.98	0.00	0.00	2325.09
22:6w3	7950.18	4124.46	1340.55	8318.57
22:5	0.00	0.00	0.00	3056.73
22:5w3	1831.34	0.00	0.00	3004.13
22:4	1451.90	0.00	1079.90	1209.06
i22 (?)	0.00	0.00	0.00	3764.16
22:1w9	0.00	0.00	0.00	2221.52
22:1w7	0.00	0.00	0.00	0.00
22	1158.17	0.00	1475.28	1588.30
24:1	0.00	0.00	0.00	976.10
24	1522.44	0.00	1759.68	2552.49
Total	*376073.51*	*381977.58*	*168462.19*	*215783.57*
Sat FAs	*118755.83*	*153148.01*	*67378.27*	*57147.64*
Mono Unsat	*169458.12*	*147050.01*	*65251.92*	*93764.15*
Polyunsat	*52756.17*	*18842.57*	*8994.61*	*40890.69*
Br FAs	*35103.39*	*62936.99*	*26837.39*	*23981.10*

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediments

Sediments	(ng/g)			
Site CB 4.2				
	Sediments			
Component	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00
12	2635.32	2782.35	0.00	4114.58
i13	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00
13	543.15	0.00	0.00	0.00
i14	2104.95	4955.82	0.00	7328.18
14:1w9	0.00	0.00	0.00	0.00
14:1w7	491.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00
14	16811.09	27624.81	17678.82	266754.28
i15	6272.61	17519.87	9993.21	18172.63
a15	8723.92	19257.88	12552.00	20118.14
15:1	978.84	2467.74	0.00	6288.52
15	5491.59	21728.50	7916.53	37448.57
16:2	512.74	0.00	0.00	0.00
16:n	0.00	0.00	0.00	53648.20
16:4	2035.57	0.00	0.00	0.00
i16	7075.58	10531.11	8204.00	198629.03
16:1w9	1728.50	2391.85	0.00	0.00
16:1w7	51486.70	68232.11	46511.99	0.00
16:1w5	2866.43	4459.95	2795.20	109003.77
16	40960.63	83902.75	52549.13	406642.82
10Me16	3701.68	6949.47	5172.19	6908.68
i17	1753.03	4951.22	0.00	6956.57
a17	4820.48	21856.72	5207.82	24980.35
17:1	2218.69	4492.57	2483.61	7001.76
17	2922.03	8157.25	4472.41	10335.90
18:n	0.00	0.00	0.00	4257.21
18:2	0.00	0.00	0.00	10865.37
18:1	0.00	3972.72	0.00	67107.36
18:4w3	0.00	0.00	0.00	0.00
18:2w6	0.00	3920.04	2087.87	34115.46
18:1w11	3843.96	0.00	0.00	0.00
18:1w9	12346.24	21250.41	13946.98	68848.77
18:1w7	1022.93	33404.94	27459.91	72823.61
18:1	0.00	0.00	0.00	0.00
18:1w5	0.00	0.00	0.00	0.00
18	5543.03	14843.96	12537.36	50505.69
i19	0.00	0.00	0.00	0.00
a19	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00
20:5	4442.10	0.00	0.00	0.00
20:4	0.00	5292.17	2484.18	0.00

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediments

20:5w3	13182.79	7863.14	4620.85	287443.50
20:4	423.73	0.00	0.00	5287.10
20:2	694.94	0.00	0.00	10272.25
20:2 ?	0.00	0.00	0.00	0.00
20:1w9	1085.14	2624.35	0.00	0.00
20:1w7	743.70	2098.41	0.00	24612.33
20:1w5	575.92	1805.58	0.00	54274.03
20	7403.23	4575.10	3619.62	29334.22
21	12.48	23854.96	22977.94	45289.86
22:6w6	818.15	0.00	0.00	0.00
22:6w3	6599.67	0.00	0.00	0.00
22:5	0.00	0.00	0.00	0.00
22:5w3	940.76	0.00	0.00	7975.12
22:4	2719.72	3470.17	0.00	0.00
i22 (?)	0.00	0.00	0.00	0.00
22:1w9	444.44	0.00	0.00	11606.77
22:1w7	0.00	0.00	0.00	4070.27
22	1003.59	2898.17	2039.39	3932.18
24:1	444.66	3039.80	0.00	3811.31
24	1288.85	0.00	2394.25	5235.90
Total	224298.88	418745.85	243107.70	1911376.21
Sat FAs	77199.27	161937.78	99587.90	784969.93
Mono Unsat	80277.16	150240.45	93197.69	429448.49
Polyunsat	32370.18	20545.52	9192.90	413864.22
Br FAs	34452.26	86022.10	41129.22	283093.58

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediments

Sediments	(ng/g)			
Site CB 5.4				
	Sediments			
Component	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00
12	3402.16	0.00	0.00	2489.89
i13	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00
i14	1978.02	3658.70	3901.24	3624.51
14:1w9	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00
14	22229.01	18671.23	17167.04	23631.61
i15	6011.64	11282.49	12050.23	10617.65
a15	8316.76	15674.13	15144.03	13873.11
15:1	0.00	0.00	0.00	0.00
15	5326.27	8037.35	5991.06	6446.29
16:2	0.00	0.00	0.00	0.00
16:n	0.00	0.00	0.00	0.00
16:4	2028.14	0.00	0.00	0.00
i16	6012.79	6590.43	7597.21	10449.98
16:1w9	0.00	0.00	0.00	0.00
16:1w7	62705.40	47199.82	43373.71	79807.47
16:1w5	2615.96	4375.31	3806.43	4999.36
16	56786.94	54451.94	54588.75	56726.45
10Me16	3384.87	4340.47	4990.09	5387.12
i17	1867.53	3215.50	3366.80	3353.38
a17	2170.13	6661.82	3553.70	3618.51
17:1	1805.35	2987.60	2695.74	2882.76
17	4946.47	5082.78	4651.98	3870.16
18:n	0.00	0.00	0.00	0.00
18:2	0.00	0.00	0.00	0.00
18:1	0.00	3274.44	2540.79	4513.86
18:4w3	4026.75	0.00	0.00	0.00
18:2w6	3166.14	4671.23	2549.12	3623.54
18:1w11	0.00	0.00	0.00	0.00
18:1w9	19885.35	18724.16	17301.26	17620.22
18:1w7	21340.37	25698.84	27789.23	28814.10
18:1	0.00	0.00	0.00	3047.51
18:1w5	0.00	0.00	0.00	0.00
18	13716.49	10819.97	16180.63	11469.44
i19	0.00	11048.10	0.00	17474.52
a19	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00
20:5	3085.14	0.00	2319.12	3372.17
20:4	11917.14	2793.09	0.00	0.00

Appendix-3
Fatty Acid Concentrations (ng/g) - Surface Sediments

20:5w3	0.00	0.00	0.00	10286.94
20:4	0.00	0.00	0.00	0.00
20:2	0.00	0.00	0.00	0.00
20:2 ?	0.00	0.00	0.00	0.00
20:1w9	0.00	0.00	1986.04	2500.79
20:1w7	0.00	0.00	0.00	2786.24
20:1w5	0.00	0.00	0.00	2478.13
20	14385.46	3516.07	4234.74	10264.33
21	14.56	28280.54	23496.24	19113.15
22:6w6	0.00	0.00	0.00	0.00
22:6w3	6503.40	3697.03	2243.98	0.00
22:5	0.00	0.00	0.00	0.00
22:5w3	0.00	0.00	0.00	0.00
22:4	9359.18	4121.80	2604.55	0.00
i22 (?)	0.00	0.00	0.00	0.00
22:1w9	0.00	0.00	0.00	0.00
22:1w7	1290.64	0.00	0.00	0.00
22	0.00	2223.43	2171.05	2532.90
24:1	0.00	0.00	0.00	0.00
24	0.00	2856.00	2827.48	1996.39
Total	285878.04	282157.65	263391.27	344294.99
Sat FAs	106407.34	102142.70	103577.99	109163.12
Mono Unsat	109643.07	102260.18	99493.21	149450.44
Polyunsat	40085.89	15283.15	9716.78	17282.65
Br FAs	29741.73	62471.63	50603.30	68398.78

Appendix-3

Fatty Acid Concentrations (ng/g) - Surface Sediments

Sediments	(ng/g)			
Site CB 6.3				
	Sediments			
Component	May-95	Jul-95	Sep-95	Mar-96
i12	0.00	0.00	0.00	0.00
12	0.00	212.92	0.00	0.00
i13	0.00	0.00	0.00	0.00
a13	0.00	0.00	0.00	0.00
13:1	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00
i14	486.13	485.73	0.00	0.00
14:1w9	0.00	0.00	0.00	0.00
14:1w7	0.00	0.00	0.00	0.00
14:1w5	0.00	0.00	0.00	0.00
14	4578.45	2238.10	1757.27	7868.67
i15	1687.00	1738.42	830.40	850.05
a15	1948.90	2152.71	1163.80	835.21
15:1	0.00	0.00	0.00	0.00
15	2179.41	1731.83	679.93	1335.08
16:2	0.00	0.00	0.00	0.00
16:n	0.00	0.00	0.00	0.00
16:4	628.95	0.00	0.00	0.00
i16	1487.68	1002.69	800.43	2711.23
16:1w9	0.00	0.00	0.00	0.00
16:1w7	15253.73	6225.27	5329.57	0.28
16:1w5	704.02	533.14	0.00	757.13
16	12808.38	7555.93	5507.31	18326.03
10Me16	934.92	0.00	470.75	0.00
i17	611.01	548.63	0.00	492.32
a17	2648.48	1228.90	418.73	616.76
17:1	487.28	398.93	0.00	0.00
17	919.78	755.29	511.73	1207.31
18:n	0.00	0.00	0.00	320.47
18:2	0.00	0.00	0.00	0.00
18:1	0.00	461.10	0.00	852.37
18:4w3	1176.66	0.00	0.00	0.00
18:2w6	887.11	397.14	274.83	1059.74
18:1w11	0.00	0.00	0.00	0.00
18:1w9	3922.17	2560.23	1752.38	7245.69
18:1w7	4614.89	3030.08	2203.02	9240.97
18:1	0.00	217.40	0.00	0.00
18:1w5	0.00	0.00	0.00	0.00
18	2168.12	1600.85	1261.43	10269.26
i19	0.00	0.00	0.00	823.46
a19	0.00	0.00	0.00	0.00
19:1	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00
20:5	795.57	0.00	322.66	0.00
20:4	4592.39	433.54	0.00	0.00

Appendix-3
Fatty Acid Concentrations (ng/g) - Surface Sediments

20:5w3	0.00	1063.53	822.16	0.00
20:4	253.95	0.00	0.00	0.00
20:2	0.00	0.00	0.00	278.59
20:2 ?	0.00	0.00	0.00	0.00
20:1w9	714.45	406.27	0.00	0.00
20:1w7	400.68	166.33	0.00	687.96
20:1w5	0.00	0.00	0.00	1186.19
20	3639.27	519.93	461.89	3790.52
21	14.56	2059.31	3156.57	8741.26
22:6w6	0.00	0.00	0.00	0.00
22:6w3	0.00	0.00	320.89	346.56
22:5	359.82	0.00	0.00	0.00
22:5w3	0.00	0.00	0.00	319.71
22:4	1287.05	131.56	399.31	2094.00
i22 (?)	0.00	0.00	0.00	0.00
22:1w9	0.00	184.13	0.00	398.30
22:1w7	306.53	0.00	0.00	0.00
22	0.00	0.00	0.00	431.62
24:1	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00
Total	*68843.50*	*37460.67*	*24826.61*	*70554.97*
Sat FAs	*22654.13*	*14094.93*	*9717.67*	*39437.97*
Mono Unsat	*26403.74*	*14182.88*	*9284.97*	*20368.89*
Polyunsat	*9981.50*	*2025.78*	*2139.84*	*4419.08*
Br FAs	*9804.12*	*7157.08*	*3684.12*	*6329.03*

Appendix-4
Sterol Identifications

Component	RRT	Compound Name
S-1	0.37	unknown
S-2	0.40	24-norcholesta-5,22-dien-3ß-ol
S-3	0.44	24-nor-5α(H)-cholest-22-en-3ß-ol
S-4	0.82	unknown
S-5	0.87	cholest-5,22-dien-3ß-ol
S-6	0.90	5α(H)-cholest-22-en-3ß-ol
S-7	1.00	cholest-5-en-3ß-ol
S-8	1.03	5α(H)-cholestan-3ß-ol
S-9	1.14	24-methylcholesta-5,22-dien-3ß-ol
S-10	1.18	24-methyl-5α(H)-cholest-22-en-3ß-ol
S-11	1.29	unknown
S-12	1.32	24-methylcholest-5,24(28)-dien-3ß-ol
S-13	1.34	24-methylcholest-5-en-3ß-ol
S-14	1.37	24-methyl-5α(H)-cholestan-3ß-ol
S-15	1.41	23,24-dimethylcholesta-5,22-dien-3ß-ol
S-16	1.44	24-ethylcholest-5,22-dien-3ß-ol
S-17a	1.45	23,24-dimethyl-5α(H)-cholest-22-en-3ß-ol
S-17	1.47	24-ethyl-5α(H)-cholest-22-en-3ß-ol
S-18a	1.48	4-methyl-C29-Δ22-stanol
S-18	1.51	unknown
S-19	1.59	unknown
S-20	1.63	24-ethylcholest-5-en-3ß-ol
S-21	1.65	24-ethyl-5α(H)-cholestan-3ß-ol
S-22	1.68	24-ethylcholesta-5,24(28)-dien-3ß-ol
S-23	1.73	4α,23,24-trimethyl-5α(H)-cholest-22-en-3ß-ol
S-24	1.81	unknown
S-25	1.87	5α(H)-C29 stenol (possibly Δ7 or Δ8)
S-26	1.94	4α,23,24-trimethyl-5α(H)-cholestan-3ß-ol
S-27	2.06	unknown
S-28	2.21	hopan-3ß-ol
S-29	2.34	unknown
S-30	3.15	extended hopanol

Appendix-5
Sterol Concentrations (ng/L)-Suspended Particles

Water Samples (ng/ L)								
Site CB 3.6								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-2	92.23	0.00	176.01	595.31	106.16	567.80	254.17	373.49
S-3	0.00	0.00	0.00	0.00	0.00	28.13	0.00	0.00
S-4	38.19	0.00	18.09	0.00	29.78	66.02	24.79	42.95
S-5	138.84	939.30	323.12	422.88	146.99	742.17	390.76	256.83
S-6	0.00	410.61	0.00	0.00	0.00	40.17	32.64	0.00
S-7	379.82	3029.29	564.58	1445.81	302.56	2290.82	841.80	788.29
S-8	32.35	892.95	35.92	0.00	22.00	173.78	67.21	43.60
S-9	661.68	19121.85	659.15	3068.16	850.12	750.37	391.86	1454.15
S-10	36.80	17435.55	35.57	0.00	29.15	120.25	40.85	0.00
S-11	100.67	427.91	42.65	677.63	0.00	62.97	0.00	97.23
S-12	592.73	1651.64	275.90	2963.69	400.59	341.72	215.10	1830.92
S-13	0.00	0.00	110.22	191.37	0.00	334.63	179.44	90.38
S-14	0.00	13158.25	0.00	0.00	0.00	157.63	0.00	0.00
S-15	33.41	327.58	37.43	291.53	22.82	132.22	55.13	93.40
S-16	0.00	0.00	0.00	0.00	0.00	274.18	0.00	0.00
S-17a	71.54	14151.75	53.55	152.41	131.00	0.00	75.08	115.63
S-17	0.00	0.00	0.00	0.00	0.00	32.38	0.00	0.00
S-18a	26.20	1024.32	12.22	0.00	20.46	0.00	0.00	0.00
S-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	212.49	0.00	430.79	0.00	50.61	0.00	85.70
S-20	187.60	0.00	125.63	595.28	484.00	531.12	198.76	342.74
S-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-22	228.70	12977.88	162.72	562.86	349.56	306.13	120.01	313.92
S-23	77.08	2688.29	31.75	665.80	100.49	169.96	71.22	113.91
S-24	0.00	0.00	0.00	0.00	19.74	0.00	0.00	45.61
S-25	0.00	0.00	16.74	425.15	36.48	25.44	0.00	36.81
S-26	0.00	588.04	20.15	130.46	20.27	36.62	49.42	0.00
S-27	0.00		0.00	0.00	0.00	0.00	20.42	0.00
S-28	0.00	0.00	0.00	0.00	0.00	21.06	0.00	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	21.87	0.00
Σ Sterols	*2697.81*	*89037.71*	*2701.40*	*12619.12*	*3072.15*	*7256.19*	*3050.53*	*6125.55*
Σ C27 Sterols	*551.01*	*5272.15*	*923.62*	*1868.69*	*471.54*	*3246.94*	*1332.42*	*1088.71*
Σ C28 Sterols	*1391.87*	*51795.20*	*1123.48*	*6900.84*	*1279.86*	*1767.57*	*827.25*	*3472.67*
Σ C29 Sterols	*521.24*	*27669.70*	*379.33*	*2032.86*	*987.38*	*1326.64*	*448.98*	*951.40*
Others	*233.69*	*4300.65*	*274.97*	*1816.72*	*333.37*	*915.03*	*441.88*	*612.77*
% C27 Sterols	*20.42*	*5.92*	*34.19*	*14.81*	*15.35*	*44.75*	*43.68*	*17.77*
% C28 Sterols	*51.59*	*58.17*	*41.59*	*54.69*	*41.66*	*24.36*	*27.12*	*56.69*
% C29 Sterols	*19.32*	*31.08*	*14.04*	*16.11*	*32.14*	*18.28*	*14.72*	*15.53*
% Others	*8.66*	*4.83*	*10.18*	*14.40*	*10.85*	*12.61*	*14.49*	*10.00*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-5
Sterol Concentrations (ng/L)-Suspended Particles

Water Samples (ng/ L)								
Site CB 4.2								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	21.85	0.00	0.00	0.00	0.00	0.00	0.00
S-2	0.00	0.00	99.43	669.91	143.53	116.73	131.30	600.05
S-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-4	0.00	0.00	0.00	0.00	25.70	27.65	19.14	0.00
S-5	162.09	85.29	254.27	354.39	182.97	333.48	289.48	386.25
S-6	0.00	0.00	28.78	0.00	35.85	26.24	37.09	0.00
S-7	515.29	5230.04	806.96	1161.59	288.62	1202.57	1020.19	1748.40
S-8	0.00	299.09	58.82	48.05	45.67	115.06	100.33	79.98
S-9	655.66	729.63	260.91	765.00	489.13	320.27	437.89	1706.73
S-10	0.00	92.07	40.79	451.77	31.21	94.48	52.44	0.00
S-11	0.00	127.23	35.74	101.68	22.69	25.82	27.95	291.48
S-12	895.17	628.72	968.79	1587.64	402.99	234.13	849.28	2586.77
S-13	0.00	792.73	224.69	0.00	0.00	223.96	287.84	0.00
S-14	0.00	47.78	18.24	0.00	0.00	55.96	27.13	0.00
S-15	37.49	130.36	52.57	90.25	51.96	70.84	86.38	179.92
S-16	0.00	179.38	0.00	98.41	0.00	0.00	0.00	102.90
S-17a	71.04	0.00	64.19	0.00	65.17	187.94	101.86	0.00
S-17	0.00	37.24	0.00	0.00	0.00	0.00	0.00	0.00
S-18a	0.00	0.00	19.72	0.00	27.11	17.27	24.49	49.20
S-18	0.00	24.10	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	56.83	25.90	70.97	0.00	30.87	0.00	118.36
S-20	195.97	535.23	136.16	408.07	147.73	286.39	221.96	441.24
S-21	0.00	0.00	0.00	0.00	0.00	0.00	45.33	0.00
S-22	249.83	361.86	185.00	343.50	166.80	150.47	170.75	511.46
S-23	68.43	128.18	82.31	164.00	96.56	121.16	143.70	569.64
S-24	0.00	43.60	33.16	33.57	21.20	0.00	20.40	61.00
S-25	0.00	0.00	80.64	49.93	15.64	24.14	73.06	61.84
S-26	0.00	0.00	32.04	0.00	38.67	25.33	73.23	94.85
S-27	0.00	0.00	10.53	0.00	0.00	0.00	0.00	0.00
S-28	0.00	20.79	0.00	0.00	0.00	0.00	0.00	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	17.99	0.00
Σ Sterols	*2850.95*	*9572.00*	*3519.63*	*6398.72*	*2299.19*	*3690.78*	*4259.22*	*9590.07*
Σ C27 Sterols	*677.38*	*5315.33*	*1148.83*	*1564.03*	*553.11*	*1677.36*	*1447.09*	*2214.63*
Σ C28 Sterols	*1550.83*	*2669.48*	*1549.16*	*2906.08*	*946.02*	*954.63*	*1682.53*	*4584.98*
Σ C29 Sterols	*554.32*	*973.68*	*463.82*	*1011.21*	*431.66*	*726.52*	*626.28*	*1353.88*
Others	*68.43*	*613.52*	*357.82*	*917.41*	*368.41*	*332.27*	*503.31*	*1436.57*
% C27 Sterols	*23.76*	*55.53*	*32.64*	*24.44*	*24.06*	*45.45*	*33.98*	*23.09*
% C28 Sterols	*54.40*	*27.89*	*44.01*	*45.42*	*41.15*	*25.87*	*39.50*	*47.81*
% C29 Sterols	*19.44*	*10.17*	*13.18*	*15.80*	*18.77*	*19.68*	*14.70*	*14.12*
% Others	*2.40*	*6.41*	*10.17*	*14.34*	*16.02*	*9.00*	*11.82*	*14.98*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-5
Sterol Concentrations (ng/L)-Suspended Particles

Water Samples (ng/ L)								
Site CB 5.4								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-2	82.29	1044.60	164.02	320.55	109.53	93.64	129.33	421.59
S-3	0.00	0.00	0.00	0.00	0.00	0.00	24.88	0.00
S-4	36.52	0.00	0.00	0.00	0.00	0.00	18.22	0.00
S-5	139.29	1119.63	381.85	197.63	127.70	207.46	247.19	351.92
S-6	0.00	0.00	0.00	0.00	0.00	0.00	38.65	0.00
S-7	366.82	1729.37	796.96	506.49	229.34	557.49	562.69	1361.56
S-8	27.34	89.37	57.59	0.00	25.51	55.69	95.93	88.10
S-9	865.83	1592.42	603.60	942.25	459.59	236.87	283.10	1814.99
S-10	30.64	0.00	33.23	0.00	0.00	29.26	55.12	0.00
S-11	0.00	0.00	0.00	0.00	0.00	19.46	16.53	304.88
S-12	514.03	583.07	332.89	811.46	296.16	137.18	203.95	2690.11
S-13	0.00	336.10	201.54	0.00	0.00	101.27	182.22	0.00
S-14	0.00	0.00	0.00	0.00	0.00	0.00	22.80	0.00
S-15	34.55	148.22	43.16	0.00	41.23	30.35	66.56	195.27
S-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	108.52
S-17a	86.80	467.61	56.77	117.36	41.25	67.60	85.87	0.00
S-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-18a	34.05	0.00	0.00	0.00	0.00	0.00	23.84	0.00
S-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	74.75	0.00	0.00	0.00	0.00	24.68	185.81
S-20	236.05	528.91	165.73	260.61	108.36	185.43	166.47	560.11
S-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-22	335.20	279.80	182.06	172.49	113.41	84.16	106.44	467.84
S-23	56.19	193.14	30.64	0.00	48.96	50.03	86.51	485.41
S-24	0.00	0.00	0.00	0.00	0.00	0.00	13.55	73.77
S-25	0.00	0.00	26.30	0.00	0.00	0.00	29.49	75.49
S-26	0.00	0.00	0.00	0.00	19.39	0.00	41.30	78.70
S-27	0.00	0.00	0.00	0.00	0.00	0.00	15.21	0.00
S-28	0.00	0.00	0.00	0.00	0.00	0.00	22.54	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	28.91	0.00
Σ Sterols	*2845.60*	*8186.99*	*3076.33*	*3328.85*	*1620.44*	*1855.90*	*2591.99*	*9264.07*
Σ C27 Sterols	*533.45*	*2938.37*	*1236.40*	*704.12*	*382.55*	*820.64*	*944.46*	*1801.58*
Σ C28 Sterols	*1410.50*	*2511.60*	*1171.25*	*1753.71*	*755.76*	*524.05*	*763.72*	*4809.98*
Σ C29 Sterols	*692.61*	*1499.29*	*447.72*	*550.46*	*304.25*	*367.55*	*450.02*	*1517.54*
Others	*209.05*	*1237.73*	*220.96*	*320.55*	*177.87*	*143.67*	*433.78*	*1134.97*
% C27 Sterols	*18.75*	*35.89*	*40.19*	*21.15*	*23.61*	*44.22*	*36.44*	*19.45*
% C28 Sterols	*49.57*	*30.68*	*38.07*	*52.68*	*46.64*	*28.24*	*29.46*	*51.92*
% C29 Sterols	*24.34*	*18.31*	*14.55*	*16.54*	*18.78*	*19.80*	*17.36*	*16.38*
% Others	*7.35*	*15.12*	*7.18*	*9.63*	*10.98*	*7.74*	*16.74*	*12.25*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-5
Sterol Concentrations (ng/L)-Suspended Particles

Water Samples (ng/ L)								
Site CB 6.3								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	689.40
S-2	82.49	214.39	54.63	315.17	112.49	152.69	59.96	60.10
S-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-4	21.05	0.00	0.00	42.55	23.36	0.00	0.00	86.02
S-5	102.00	231.43	143.43	249.36	120.40	380.81	136.53	521.89
S-6	0.00	0.00	0.00	0.00	0.00	32.27	0.00	49.09
S-7	238.20	417.56	264.73	625.74	242.95	1716.56	375.93	2913.85
S-8	15.81	37.55	24.91	43.51	31.29	133.92	24.37	143.18
S-9	459.19	294.40	202.57	996.69	344.40	309.77	64.58	2920.22
S-10	26.76	0.00	11.22	30.30	23.91	36.56	0.00	111.46
S-11	21.51	0.00	0.00	112.63	0.00	27.46	0.00	512.60
S-12	233.74	173.23	92.63	1339.67	201.59	142.93	69.53	0.00
S-13	0.00	84.65	62.83	0.00	0.00	161.94	65.40	4528.59
S-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-15	22.58	0.00	16.54	81.03	21.71	41.84	23.52	348.50
S-16	0.00	0.00	0.00	109.36	0.00	0.00	15.32	233.31
S-17a	48.46	97.56	17.03	0.00	40.58	81.43	0.00	0.00
S-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	154.37
S-18a	24.49	0.00	0.00	23.34	0.00	0.00	0.00	0.00
S-18	14.00	0.00	0.00	0.00	0.00	0.00	0.00	170.77
S-19	0.00	0.00	0.00	55.61	0.00	24.99	0.00	177.89
S-20	149.31	133.59	46.10	474.82	115.05	227.24	45.80	904.41
S-21	0.00	0.00	8.15	0.00	0.00	0.00	0.00	0.00
S-22	210.34	156.08	31.54	380.86	140.78	87.95	22.25	1122.41
S-23	63.14	30.80	10.89	222.25	48.08	56.89	0.00	1280.45
S-24	14.06	0.00	0.00	39.56	0.00	0.00	0.00	159.94
S-25	0.00	0.00	0.00	52.70	0.00	0.00	0.00	74.38
S-26	11.72	0.00	0.00	32.61	17.53	0.00	0.00	197.45
S-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.26
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Σ Sterols	*1758.87*	*1871.25*	*987.21*	*5227.77*	*1484.10*	*3615.25*	*903.19*	*17384.55*
Σ C27 Sterols	*356.01*	*686.54*	*433.08*	*918.61*	*394.64*	*2263.57*	*536.83*	*3628.01*
Σ C28 Sterols	*741.21*	*552.29*	*369.25*	*2479.29*	*569.89*	*678.66*	*199.52*	*8072.88*
Σ C29 Sterols	*444.69*	*387.23*	*119.36*	*1101.70*	*318.11*	*463.45*	*106.88*	*3111.66*
Others	*216.96*	*245.20*	*65.52*	*728.17*	*201.46*	*209.57*	*59.96*	*2572.00*
% C27 Sterols	*20.24*	*36.69*	*43.87*	*17.57*	*26.59*	*62.61*	*59.44*	*20.87*
% C28 Sterols	*42.14*	*29.51*	*37.40*	*47.43*	*38.40*	*18.77*	*22.09*	*46.44*
% C29 Sterols	*25.28*	*20.69*	*12.09*	*21.07*	*21.43*	*12.82*	*11.83*	*17.90*
% Others	*12.34*	*13.10*	*6.64*	*13.93*	*13.57*	*5.80*	*6.64*	*14.79*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-6
Sterol Concentrations (ng/mg SPM)-Suspended Particles

Water Samples (ng/ mg SPM)								
Site CB 3.6								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-2	18.45	0.00	18.72	79.37	13.79	21.35	22.30	31.39
S-3	0.00	0.00	0.00	0.00	0.00	1.06	0.00	0.00
S-4	7.64	0.00	1.92	0.00	3.87	2.48	2.17	3.61
S-5	27.77	14.86	34.37	56.38	19.09	27.90	34.28	21.58
S-6	0.00	6.50	0.00	0.00	0.00	1.51	2.86	0.00
S-7	75.96	47.93	60.06	192.77	39.29	86.12	73.84	66.24
S-8	6.47	14.13	3.82	0.00	2.86	6.53	5.90	3.66
S-9	132.34	302.56	70.12	409.09	110.40	28.21	34.37	122.20
S-10	7.36	275.88	3.78	0.00	3.79	4.52	3.58	0.00
S-11	20.13	6.77	4.54	90.35	0.00	2.37	0.00	8.17
S-12	118.55	26.13	29.35	395.16	52.02	12.85	18.87	153.86
S-13	0.00	0.00	11.73	25.52	0.00	12.58	15.74	7.60
S-14	0.00	208.20	0.00	0.00	0.00	5.93	0.00	0.00
S-15	6.68	5.18	3.98	38.87	2.96	4.97	4.84	7.85
S-16	0.00	0.00	0.00	0.00	0.00	10.31	0.00	0.00
S-17a	14.31	223.92	5.70	20.32	17.01	0.00	6.59	9.72
S-17	0.00	0.00	0.00	0.00	0.00	1.22	0.00	0.00
S-18a	5.24	16.21	1.30	0.00	2.66	0.00	0.00	0.00
S-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	3.36	0.00	57.44	0.00	1.90	0.00	7.20
S-20	37.52	0.00	13.36	79.37	62.86	19.97	17.43	28.80
S-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-22	45.74	205.35	17.31	75.05	45.40	11.51	10.53	26.38
S-23	15.42	42.54	3.38	88.77	13.05	6.39	6.25	9.57
S-24	0.00	0.00	0.00	0.00	2.56	0.00	0.00	3.83
S-25	0.00	0.00	1.78	56.69	4.74	0.96	0.00	3.09
S-26	0.00	9.30	2.14	17.39	2.63	1.38	4.33	0.00
S-27	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00
S-28	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	1.92	0.00
Σ Sterols	*539.56*	*1408.82*	*287.38*	*1682.55*	*398.98*	*272.79*	*267.59*	*514.75*
Σ C27 Sterols	*110.20*	*83.42*	*98.26*	*249.16*	*61.24*	*122.07*	*116.88*	*91.49*
Σ C28 Sterols	*278.37*	*819.54*	*119.52*	*920.11*	*166.22*	*66.45*	*72.57*	*291.82*
Σ C29 Sterols	*104.25*	*437.81*	*40.35*	*271.05*	*128.23*	*49.87*	*39.38*	*79.95*
Others	*46.74*	*68.05*	*29.25*	*242.23*	*43.29*	*34.40*	*38.76*	*51.49*
% C27 Sterols	*20.42*	*5.92*	*34.19*	*14.81*	*15.35*	*44.75*	*43.68*	*17.77*
% C28 Sterols	*51.59*	*58.17*	*41.59*	*54.69*	*41.66*	*24.36*	*27.12*	*56.69*
% C29 Sterols	*19.32*	*31.08*	*14.04*	*16.11*	*32.14*	*18.28*	*14.72*	*15.53*
% Others	*8.66*	*4.83*	*10.18*	*14.40*	*10.85*	*12.61*	*14.49*	*10.00*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-6
Sterol Concentrations (ng/mg SPM)-Suspended Particles

Water Samples (ng/ mg SPM)								
Site CB 4.2								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
S-2	0.00	0.00	8.43	40.85	7.97	2.69	7.06	85.72
S-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-4	0.00	0.00	0.00	0.00	1.43	0.64	1.03	0.00
S-5	15.89	1.97	21.55	21.61	10.16	7.68	15.56	55.18
S-6	0.00	0.00	2.44	0.00	1.99	0.60	1.99	0.00
S-7	50.52	120.51	68.39	70.83	16.03	27.71	54.85	249.77
S-8	0.00	6.89	4.98	2.93	2.54	2.65	5.39	11.43
S-9	64.28	16.81	22.11	46.65	27.17	7.38	23.54	243.82
S-10	0.00	2.12	3.46	27.55	1.73	2.18	2.82	0.00
S-11	0.00	2.93	3.03	6.20	1.26	0.59	1.50	41.64
S-12	87.76	14.49	82.10	96.81	22.39	5.39	45.66	369.54
S-13	0.00	18.27	19.04	0.00	0.00	5.16	15.48	0.00
S-14	0.00	1.10	1.55	0.00	0.00	1.29	1.46	0.00
S-15	3.68	3.00	4.45	5.50	2.89	1.63	4.64	25.70
S-16	0.00	4.13	0.00	6.00	0.00	0.00	0.00	14.70
S-17a	6.96	0.00	5.44	0.00	3.62	4.33	5.48	0.00
S-17	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00
S-18a	0.00	0.00	1.67	0.00	1.51	0.40	1.32	7.03
S-18	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	1.31	2.19	4.33	0.00	0.71	0.00	16.91
S-20	19.21	12.33	11.54	24.88	8.21	6.60	11.93	63.03
S-21	0.00	0.00	0.00	0.00	0.00	0.00	2.44	0.00
S-22	24.49	8.34	15.68	20.95	9.27	3.47	9.18	73.07
S-23	6.71	2.95	6.98	10.00	5.36	2.79	7.73	81.38
S-24	0.00	1.00	2.81	2.05	1.18	0.00	1.10	8.71
S-25	0.00	0.00	6.83	3.04	0.87	0.56	3.93	8.83
S-26	0.00	0.00	2.72	0.00	2.15	0.58	3.94	13.55
S-27	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00
S-28	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.00
Σ Sterols	*279.50*	*220.55*	*298.27*	*390.17*	*127.73*	*85.04*	*228.99*	*1370.01*
Σ C27 Sterols	*66.41*	*122.47*	*97.36*	*95.37*	*30.73*	*38.65*	*77.80*	*316.38*
Σ C28 Sterols	*152.04*	*61.51*	*131.28*	*177.20*	*52.56*	*22.00*	*90.46*	*655.00*
Σ C29 Sterols	*54.35*	*22.43*	*39.31*	*61.66*	*23.98*	*16.74*	*33.67*	*193.41*
Others	*6.71*	*14.14*	*30.32*	*55.94*	*20.47*	*7.66*	*27.06*	*205.22*
% C27 Sterols	*23.76*	*55.53*	*32.64*	*24.44*	*24.06*	*45.45*	*33.98*	*23.09*
% C28 Sterols	*54.40*	*27.89*	*44.01*	*45.42*	*41.15*	*25.87*	*39.50*	*47.81*
% C29 Sterols	*19.44*	*10.17*	*13.18*	*15.80*	*18.77*	*19.68*	*14.70*	*14.12*
% Others	*2.40*	*6.41*	*10.17*	*14.34*	*16.02*	*9.00*	*11.82*	*14.98*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-6
Sterol Concentrations (ng/mg SPM)-Suspended Particles

Water Samples (ng/ mg SPM)								
Site CB 5.4								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-2	14.19	42.81	18.64	51.70	3.24	3.08	2.99	22.91
S-3	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00
S-4	6.30	0.00	0.00	0.00	0.00	0.00	0.42	0.00
S-5	24.01	45.89	43.39	31.88	3.78	6.82	5.72	19.13
S-6	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00
S-7	63.24	70.88	90.56	81.69	6.79	18.34	13.03	74.00
S-8	4.71	3.66	6.54	0.00	0.75	1.83	2.22	4.79
S-9	149.28	65.26	68.59	151.98	13.60	7.79	6.55	98.64
S-10	5.28	0.00	3.78	0.00	0.00	0.96	1.28	0.00
S-11	0.00	0.00	0.00	0.00	0.00	0.64	0.38	16.57
S-12	88.63	23.90	37.83	130.88	8.76	4.51	4.72	146.20
S-13	0.00	13.77	22.90	0.00	0.00	3.33	4.22	0.00
S-14	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00
S-15	5.96	6.07	4.90	0.00	1.22	1.00	1.54	10.61
S-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.90
S-17a	14.97	19.16	6.45	18.93	1.22	2.22	1.99	0.00
S-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-18a	5.87	0.00	0.00	0.00	0.00	0.00	0.55	0.00
S-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-19	0.00	3.06	0.00	0.00	0.00	0.00	0.57	10.10
S-20	40.70	21.68	18.83	42.03	3.21	6.10	3.85	30.44
S-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-22	57.79	11.47	20.69	27.82	3.36	2.77	2.46	25.43
S-23	9.69	7.92	3.48	0.00	1.45	1.65	2.00	26.38
S-24	0.00	0.00	0.00	0.00	0.00	0.00	0.31	4.01
S-25	0.00	0.00	2.99	0.00	0.00	0.00	0.68	4.10
S-26	0.00	0.00	0.00	0.00	0.57	0.00	0.96	4.28
S-27	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00
S-28	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00
Σ Sterols	*490.62*	*335.53*	*349.58*	*536.91*	*47.94*	*61.05*	*60.00*	*503.48*
Σ C27 Sterols	*91.97*	*120.42*	*140.50*	*113.57*	*11.32*	*26.99*	*21.86*	*97.91*
Σ C28 Sterols	*243.19*	*102.93*	*133.10*	*282.86*	*22.36*	*17.24*	*17.68*	*261.41*
Σ C29 Sterols	*119.42*	*61.45*	*50.88*	*88.78*	*9.00*	*12.09*	*10.42*	*82.48*
Others	*36.04*	*50.73*	*25.11*	*51.70*	*5.26*	*4.73*	*10.04*	*61.68*
% C27 Sterols	*18.75*	*35.89*	*40.19*	*21.15*	*23.61*	*44.22*	*36.44*	*19.45*
% C28 Sterols	*49.57*	*30.68*	*38.07*	*52.68*	*46.64*	*28.24*	*29.46*	*51.92*
% C29 Sterols	*24.34*	*18.31*	*14.55*	*16.54*	*18.78*	*19.80*	*17.36*	*16.38*
% Others	*7.35*	*15.12*	*7.18*	*9.63*	*10.98*	*7.74*	*16.74*	*12.25*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-6
Sterol Concentrations (ng/mg SPM)-Suspended Particles

Water Samples (ng/ mg SPM)								
Site CB 6.3								
		Surface				Deep		
Component	May-95	Jul-95	Sep-95	Mar-96	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.86
S-2	15.00	8.44	7.00	39.40	8.15	3.82	9.67	4.70
S-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-4	3.83	0.00	0.00	5.32	1.69	0.00	0.00	6.72
S-5	18.55	9.11	18.39	31.17	8.72	9.52	22.02	40.77
S-6	0.00	0.00	0.00	0.00	0.00	0.81	0.00	3.84
S-7	43.31	16.44	33.94	78.22	17.61	42.91	60.63	227.64
S-8	2.87	1.48	3.19	5.44	2.27	3.35	3.93	11.19
S-9	83.49	11.59	25.97	124.59	24.96	7.74	10.42	228.14
S-10	4.87	0.00	1.44	3.79	1.73	0.91	0.00	8.71
S-11	3.91	0.00	0.00	14.08	0.00	0.69	0.00	40.05
S-12	42.50	6.82	11.88	167.46	14.61	3.57	11.22	0.00
S-13	0.00	3.33	8.06	0.00	0.00	4.05	10.55	353.80
S-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-15	4.11	0.00	2.12	10.13	1.57	1.05	3.79	27.23
S-16	0.00	0.00	0.00	13.67	0.00	0.00	2.47	18.23
S-17a	8.81	3.84	2.18	0.00	2.94	2.04	0.00	0.00
S-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.06
S-18a	4.45	0.00	0.00	2.92	0.00	0.00	0.00	0.00
S-18	2.54	0.00	0.00	0.00	0.00	0.00	0.00	13.34
S-19	0.00	0.00	0.00	6.95	0.00	0.62	0.00	13.90
S-20	27.15	5.26	5.91	59.35	8.34	5.68	7.39	70.66
S-21	0.00	0.00	1.04	0.00	0.00	0.00	0.00	0.00
S-22	38.24	6.14	4.04	47.61	10.20	2.20	3.59	87.69
S-23	11.48	1.21	1.40	27.78	3.48	1.42	0.00	100.03
S-24	2.56	0.00	0.00	4.95	0.00	0.00	0.00	12.50
S-25	0.00	0.00	0.00	6.59	0.00	0.00	0.00	5.81
S-26	2.13	0.00	0.00	4.08	1.27	0.00	0.00	15.43
S-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.90
S-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
∑ Sterols	*319.79*	*73.67*	*126.57*	*653.47*	*107.54*	*90.38*	*145.68*	*1358.17*
∑ C27 Sterols	*64.73*	*27.03*	*55.52*	*114.83*	*28.60*	*56.59*	*86.59*	*283.44*
∑ C28 Sterols	*134.77*	*21.74*	*47.34*	*309.91*	*41.30*	*16.97*	*32.18*	*630.69*
∑ C29 Sterols	*80.85*	*15.25*	*15.30*	*137.71*	*23.05*	*11.59*	*17.24*	*243.10*
Others	*39.45*	*9.65*	*8.40*	*91.02*	*14.60*	*5.24*	*9.67*	*200.94*
% C27 Sterols	*20.24*	*36.69*	*43.87*	*17.57*	*26.59*	*62.61*	*59.44*	*20.87*
% C28 Sterols	*42.14*	*29.51*	*37.40*	*47.43*	*38.40*	*18.77*	*22.09*	*46.44*
% C29 Sterols	*25.28*	*20.69*	*12.09*	*21.07*	*21.43*	*12.82*	*11.83*	*17.90*
% Others	*12.34*	*13.10*	*6.64*	*13.93*	*13.57*	*5.80*	*6.64*	*14.79*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-7
Sterol Concentrations (ng/g)-Surface Sediments

Sediment (ng/g dry weight)				
Site CB 3.6				
		Sediment		
Component	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	1103.68	1093.58	0.00
S-2	2547.92	1832.24	1402.45	1444.98
S-3	883.86	1214.28	637.07	380.59
S-4	893.89	695.12	370.89	573.26
S-5	3404.09	4000.95	2654.85	2422.98
S-6	1040.88	1681.40	794.30	450.07
S-7	10146.68	9611.84	5322.83	7498.61
S-8	3454.73	5371.50	2503.42	1238.50
S-9	8740.71	9100.25	4316.63	6843.26
S-10	2160.31	3651.22	1902.07	1169.40
S-11	588.27	912.71	547.63	511.97
S-12	15207.96	4686.54	2390.73	3791.66
S-13	5126.19	6156.53	2965.32	2416.07
S-14	697.37	1239.75	699.44	424.12
S-15	1351.14	1871.58	1674.44	858.62
S-16	3589.71	4705.56	3207.18	2116.84
S-17a				
S-17	1046.82	1452.90	970.92	557.81
S-18a				
S-18	494.97	0.00	306.23	250.68
S-19	0.00	0.00	453.03	593.00
S-20	10409.95	9916.15	5883.49	3649.60
S-21	0.00	3288.98	1302.67	0.00
S-22	5341.45	1282.78	1449.20	2090.11
S-23	3913.40	5987.61	5226.28	2337.78
S-24	829.19	826.04	763.39	1030.27
S-25	523.01	495.00	444.02	629.13
S-26	1223.10	1772.72	3212.88	1041.52
S-27	664.37	665.39	747.99	489.96
S-28	0.00	820.89	294.25	514.12
S-29	557.97	0.00	581.18	401.68
S-30	1070.16	2485.84	1482.83	894.91
∑ Sterols	*85908.08*	*86829.45*	*55601.17*	*46621.52*
∑ C27 Sterols	*18046.38*	*20665.68*	*11275.39*	*11610.16*
∑ C28 Sterols	*32520.82*	*25747.00*	*12821.82*	*15156.49*
∑ C29 Sterols	*22234.04*	*22517.96*	*15247.15*	*10116.66*
∑Hopanols	*1070.16*	*3306.73*	*1777.08*	*1409.02*
Others	*12036.70*	*14592.08*	*14479.72*	*8329.18*
% C27 Sterols	*21.01*	*23.80*	*20.28*	*24.90*
% C28 Sterols	*37.86*	*29.65*	*23.06*	*32.51*
% C29 Sterols	*25.88*	*25.93*	*27.42*	*21.70*
%Hopanols	*1.25*	*3.81*	*3.20*	*3.02*
% Others	*14.01*	*16.81*	*26.04*	*17.87*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-7
Sterol Concentrations (ng/g)-Surface Sediments

Sediment (ng/g dry weight)				
Site CB 4.2				
		Sediment		
Component	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	1195.88	0.00	0.00
S-2	1377.35	2427.21	1329.13	6756.58
S-3	660.27	1577.44	829.66	1665.78
S-4	405.85	966.57	446.00	1483.37
S-5	1972.82	6178.40	3713.85	8910.72
S-6	812.72	2154.43	1362.91	1425.66
S-7	6857.67	14711.98	9658.89	34769.39
S-8	3171.25	6428.78	4318.33	3083.94
S-9	4829.11	12039.46	5795.15	8996.46
S-10	1657.53	4280.25	2628.83	1979.71
S-11	460.40	1533.73	745.20	1357.46
S-12	7372.76	7497.28	5237.63	51828.17
S-13	4437.01	9227.24	6896.43	13785.21
S-14	0.00	1626.62	1280.54	628.65
S-15	1324.14	3589.07	2528.11	2823.58
S-16	2481.36	5896.77	3329.46	4326.20
S-17a				
S-17	743.95	1568.12	1006.36	1331.99
S-18a				
S-18	484.09	613.78	644.37	736.57
S-19	0.00	0.00	0.00	707.88
S-20	5741.14	13073.30	5693.17	21003.21
S-21	0.00	3670.28	2273.15	0.00
S-22	3169.81	2880.62	1287.05	10257.34
S-23	3403.49	7275.43	5676.53	8473.28
S-24	560.99	1285.88	824.89	1771.20
S-25	378.61	1180.70	427.67	1220.46
S-26	1770.57	2537.34	3747.14	1610.43
S-27	389.84	877.55	698.89	0.00
S-28	0.00	234.24	690.70	480.67
S-29	315.06	445.82	237.55	0.00
S-30	656.76	1269.43	1004.16	0.00
∑ Sterols	*55434.55*	*118243.60*	*74311.75*	*191413.90*
∑ C27 Sterols	*12814.45*	*29473.58*	*19053.99*	*48189.70*
∑ C28 Sterols	*18756.82*	*36204.58*	*22583.76*	*78575.67*
∑ C29 Sterols	*13944.49*	*31291.94*	*16761.67*	*41186.76*
∑Hopanols	*656.76*	*1503.68*	*1694.87*	*480.67*
Others	*9262.02*	*19769.82*	*14217.47*	*22981.10*
% C27 Sterols	*23.12*	*24.93*	*25.64*	*25.18*
% C28 Sterols	*33.84*	*30.62*	*30.39*	*41.05*
% C29 Sterols	*25.15*	*26.46*	*22.56*	*21.52*
%Hopanols	*1.18*	*1.27*	*2.28*	*0.25*
% Others	*16.71*	*16.72*	*19.13*	*12.01*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-7
Sterol Concentrations (ng/g)-Surface Sediments

Sediment (ng/g dry weight)				
Site CB 5.4				
		Sediment		
Component	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	1128.55	0.00	0.00
S-2	0.00	2054.81	1830.27	2612.90
S-3	0.00	1474.94	1281.57	1179.67
S-4	1236.92	561.60	743.14	868.95
S-5	3455.69	3508.83	4173.32	4951.67
S-6	2199.15	1878.16	1767.71	1708.00
S-7	8270.37	10596.87	9470.73	19695.88
S-8	5478.57	5296.96	4982.93	4516.70
S-9	7133.56	7330.38	6268.56	8951.55
S-10	3352.44	3549.03	3105.06	2989.82
S-11	1414.02	1409.47	1012.18	1186.33
S-12	7323.75	6777.80	4778.97	5866.14
S-13	8134.93	6560.02	5870.59	6537.72
S-14	0.00	1219.60	1141.97	1215.83
S-15	1646.97	2031.72	2220.42	2136.80
S-16	3523.36	4118.92	3424.39	3426.58
S-17a				
S-17	1185.79	1262.84	1257.87	1203.31
S-18a				
S-18	836.27	505.97	801.80	457.41
S-19	0.00	1531.30	565.31	1322.26
S-20	8859.65	6954.97	5815.39	5879.03
S-21	0.00	2280.09	2338.39	2200.58
S-22	3885.41	2116.99	1244.61	1464.18
S-23	4697.48	3409.10	5216.20	5071.83
S-24	0.00	1079.31	1138.76	1040.28
S-25	750.74	1241.07	642.30	768.83
S-26	999.03	1219.69	2223.26	1968.84
S-27	631.04	755.54	779.20	691.51
S-28	256.89	960.73	1085.68	772.97
S-29	560.78	292.18	942.83	807.05
S-30	1372.98	1704.20	1456.02	1441.42
∑ Sterols	*77205.77*	*84811.64*	*77579.46*	*92934.05*
∑ C27 Sterols	*19403.78*	*21280.81*	*20394.70*	*30872.25*
∑ C28 Sterols	*27358.69*	*26846.31*	*22177.33*	*26747.39*
∑ C29 Sterols	*19937.44*	*20802.79*	*17668.19*	*18090.15*
∑Hopanols	*1629.87*	*2664.93*	*2541.69*	*2214.39*
Others	*8875.99*	*13216.80*	*14797.55*	*15009.87*
% C27 Sterols	*25.13*	*25.09*	*26.29*	*33.22*
% C28 Sterols	*35.44*	*31.65*	*28.59*	*28.78*
% C29 Sterols	*25.82*	*24.53*	*22.77*	*19.47*
%Hopanols	*2.11*	*3.14*	*3.28*	*2.38*
% Others	*11.50*	*15.58*	*19.07*	*16.15*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*

Appendix-7
Sterol Concentrations (ng/g)-Surface Sediments

Sediment (ng/g dry weight)				
Site CB 6.3				
		Sediment		
Component	May-95	Jul-95	Sep-95	Mar-96
S-1	0.00	0.00	0.00	0.00
S-2	584.16	298.56	199.47	1506.55
S-3	201.42	124.30	119.17	324.09
S-4	192.64	95.32	58.50	373.37
S-5	964.42	555.36	523.62	1723.98
S-6	225.04	139.58	135.77	272.28
S-7	4070.86	1748.19	1336.13	5356.38
S-8	701.35	440.79	427.04	688.70
S-9	1785.29	898.56	640.29	1828.59
S-10	405.20	289.84	258.78	464.62
S-11	0.00	107.46	95.72	199.74
S-12	2264.87	456.35	534.82	6595.43
S-13	900.08	512.33	601.54	2015.59
S-14	0.00	99.16	110.54	139.33
S-15	271.91	265.29	246.63	538.62
S-16	630.96	433.01	342.58	712.50
S-17a				
S-17	171.98	126.66	110.49	268.04
S-18a				
S-18	135.13	94.99	84.19	188.39
S-19	0.00	126.70	0.00	0.00
S-20	1471.98	815.04	665.74	3454.57
S-21	0.00	354.95	218.34	0.00
S-22	780.48	0.00	125.63	1535.92
S-23	661.43	531.01	602.95	1556.39
S-24	0.00	98.57	111.82	366.81
S-25	0.00	99.52	36.65	296.88
S-26	180.99	186.89	0.00	373.57
S-27	0.00	75.91	86.12	155.36
S-28	0.00	97.84	103.21	199.21
S-29	0.00	82.36	35.17	160.92
S-30	193.46	134.59	163.45	199.91
∑Sterols	*16793.64*	*9289.13*	*7974.38*	*31495.71*
∑ C27 Sterols	*5961.68*	*2883.93*	*2422.57*	*8041.33*
∑ C28 Sterols	*5355.44*	*2363.70*	*2241.68*	*11243.29*
∑ C29 Sterols	*3462.43*	*2216.64*	*1793.62*	*6698.05*
∑Hopanols	*193.46*	*232.43*	*266.66*	*399.11*
Others	*1820.63*	*1592.44*	*1249.85*	*5113.93*
% C27 Sterols	*35.50*	*31.05*	*30.38*	*25.53*
% C28 Sterols	*31.89*	*25.45*	*28.11*	*35.70*
% C29 Sterols	*20.62*	*23.86*	*22.49*	*21.27*
%Hopanols	*1.15*	*2.50*	*3.34*	*1.27*
% Others	*10.84*	*17.14*	*15.67*	*16.24*
Sum %	*100.00*	*100.00*	*100.00*	*100.00*