PARTICULATE ORGANIC MATTER IN THE SAN FRANCISCO BAY ESTUARY, CALIFORNIA: CHEMICAL INDICATORS OF ITS ORIGIN AND ASSIMILATION INTO THE BENTHIC FOOD WEB

By James E. Cloern, Elizabeth A. Canuel, and Sally M. Wienke

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Dallas L. Peck, Director

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For additional information
write to:

James E. Cloern
Water Resources Division
U.S. Geological Survey
345 Middlefield Road, MS-496
Menlo Park, California 94025

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CONVERSION FACTORS

Multiply	By	To Obtain
meter (m)	3.28	foot (ft)
nanometer (nm)	3.94×10^{-8}	inch
gram	2.2×10^{-3}	pound
kilogram	2.2	pound
milligram	2.2×10^{-6}	pound
liter	1.06	quart

Temperature is given in degrees Celsius (°C) and can be converted to degrees Fahrenheit (°F) using the following equation:

$$°F = 1.8\ (°C) + 32$$

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ABSTRACT

This report presents results from a sampling program designed to characterize the abundance, origin, composition, and nutritional quality of particulate organic matter (POM) in the San Francisco Bay estuary. Sampling was done throughout the estuarine system, from the Sacramento River to the estuary mouth in Central Bay, and into South San Francisco Bay. Sampling dates were chosen to represent a range of hydrologic and hydrographic conditions, including periods of low river flow, winter/spring floods, phytoplankton blooms, and episodes of enhanced resuspension. Analyses were done both on the suspended particulate matter (seston), and on tissues of the suspension-feeding clam Potamocorbula amurensis. Analyses were performed to determine: concentration of suspended particulate matter, chlorophyll a, and particulate carbon and nitrogen; isotopic ratios $\delta^{13}C$ and $\delta^{15}N$; and molecular composition of two classes of lipids -- sterols and PLFA (phospholipid, ester-linked fatty acids).

INTRODUCTION

This report presents analytical results from a special investigation in the San Francisco Bay estuary during the period January 1990 to October 1992. The objective was to provide new information about the nature of particulate organic matter (POM) in the San Francisco Bay estuary. It was made because of fundamental gaps in knowledge about the origins and composition of the organic matter that supports production by heterotrophs (consumer organisms) in this estuary.

Measurements were chosen to characterize the abundance and chemical nature of seston (suspended particulate matter), including two specific biochemical indicators of the origin of POM. The first set of indicators included measurements of the relative abundance of the two stable isotopes of carbon (^{13}C and ^{12}C) and nitrogen (^{15}N and ^{14}N). This approach is based on the observation that organic matter of different origins (for example, terrestrial vegetation as opposed to marine phytoplankton) has different isotopic ratios of elements such as carbon and nitrogen (for example, Rundel and others, 1988). The second set of indicators included measurements of the molecular composition of two important classes of lipid compounds -- sterols and fatty acids (in particular, phospholipid, ester-linked fatty acids, PLFA). This approach is based on observations that although lipids are important biochemicals in all organisms, specific lipid components (for example, sterols and PLFA) are synthesized only by specific groups of organisms. Analysis of sterol/PLFA composition of POM can give clues about the relative contributions of these organisms to the pool of organic matter from which heterotrophs derive their nutrition (for example, polyunsaturated fatty acids are indicative of "fresh" algae, brassicasterol of diatoms, sitosterol and campesterol are generally derived from vascular plants; Volkman and others, 1981; Volkman, 1986). Hence this study was designed to provide information about trophic dynamics, with emphasis on the lower trophic levels, in San Francisco Bay.

Biochemical characterizations were done on two kinds of samples from San

Francisco Bay. First, analyses were performed on samples of seston to give fundamental information about the concentration, bulk chemical composition, C and N isotopic ratios, and molecular composition of lipids of the suspended particulate matter. These results constitute one description of the abundance, nutritional quality, and potential origins of the POM that might be available as a food resource to suspension-feeding organisms. However, these seston characterizations do not necessarily provide information about those classes of organic compounds that can be assimilated into food webs that support production by filter-feeders such as crustacean zooplankton or bivalve molluscs. In a second, more direct approach to characterize the origin of assimilable organic matter, we made similar analyses on the tissues of the clam Potamocorbula amurensis. The rationale for this second study element is that some biochemical indicators, such as C or N isotopic composition and lipid molecular composition, are changed only slightly as organic matter is transferred from one trophic level to the next. For example, carbon isotopes change by about 1 per mil at each step of a food web; nitrogen isotopes change about 3 per mil at each trophic level (DeNiro and Epstein, 1978, 1981). Furthermore, because organisms such as bivalve molluscs cannot synthesize certain compounds essential for growth, these compounds must be obtained from their diet. Biochemical analyses of Potamocorbula amurensis tissues were therefore made as one indicator of the origin of organic matter ('food') that is assimilated directly by suspension-feeding animals. Potamocorbula amurensis was chosen because it is currently the most widely distributed suspension-feeding species within San Francisco Bay, and therefore can be used as an indicator of spatial variability in the nature and origin of assimilable POM within this estuary.

Parallel samples of seston and Potamocorbula amurensis were collected along the entire San Francisco Bay system, from the Sacramento River through the North Bay and then into South San Francisco Bay toward San Jose (Fig. 1 and table 1). Sampling periods were chosen to represent temporal variability associated with: (a) seasonal cycles in the distribution and composition of POM; (b) hydrologic events (for example, the February 1992 period of increased runoff from the Sacramento River); (c) biological events (for example, periods of very high phytoplankton biomass during

the April 1990 and April 1992 spring blooms in the South Bay); and (d) periods of wind-wave resuspension (April 1991) when seston concentrations were exceptionally high. Descriptions of the range of hydrologic/biological conditions included in the sampling program are given in table 2.

Acknowledgments

This special investigation was a collaborative study of the U.S. Geological Survey (Branch of Regional Research, Menlo Park, CA), University of California-Santa Cruz/NASA-Ames Research Center, and the University of Tennessee/Oak Ridge National Laboratory. Partial funding was provided by the San Francisco Estuary Project -- Gaps in Knowledge Program, and by the USGS Toxic Substances Hydrology Program. We thank our colleagues Andrea Alpine, Brian Cole, Jan Thompson, Francis Parchaso, Steve Hager, and Sam Luoma who assisted in the collection of samples and performed some of the analyses presented here.

METHODS

Samples were collected during this investigation as supplements to the USGS program of basic hydrographic measurement in San Francisco Bay. Complete results from this hydrographic program are summarized in annual data reports (for example, Wienke and others, 1992). Here we present measurements of salinity, made at those sampling locations where seston or Potamocorbula amurensis were collected. Salinity was measured with a Sea-Bird Electronics[1] SBE-9/11 instrument package that includes a 3-electrode conductivity sensor and thermistor (see Wienke and others,

[1]The use of brand names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

1992 for details and precision of salinity determination). Samples were collected at fixed sampling locations in the deep central channel of the San Francisco Bay system. The upstream boundary of the sampling domain was at Rio Vista on the Sacramento River (Fig. 1); the seaward boundary was station 17.5 in the Central Bay near Angels Island; and the landward boundary of South Bay sampling was at station 36 near Coyote Creek (Fig. 1 and table 1). Seston samples were collected along the North Bay-Central Bay transect, and along the South Bay transect. Potamocorbula amurensis was collected at a smaller set of North Bay sampling locations, between the upstream limit of its distribution (station 3, near Chipps Island) and station 12.5 in San Pablo Bay. Potamocorbula amurensis was collected from four locations in the South Bay, in a region bounded approximately by the San Mateo and Dumbarton Bridges. Positions of sampling locations are given in table 1.

Seston

Near-surface (1-m depth) or near-bottom (2-m above the seabed) water samples were collected with a 10-liter Niskin bottle. Samples were transferred to 4-L Nalgene bottles that were then subsampled for all seston determinations. Water samples were screened with Pecap netting (approximately 200 µm mesh size) to exclude coarse particulate matter and macrozooplankton. Aliquots from the 4-L bottles were then analyzed for the following:

1. Suspended particulate matter (SPM) concentration -- aliquots of 200-1,000 mL were filtered onto 47-mm Nuclepore filters (0.4 µm pore size) that had been preweighed. SPM concentration was then determined gravimetrically, after samples had been air-dried, and using a correction for the weight of salts retained in the filter matrix. Results of a more comprehensive investigation of SPM distribution are given by Hager (1993), who presents a detailed description of the method and precision of SPM determination.

2. Chlorophyll *a* (Chl *a*, a measure of phytoplankton biomass) -- seston from aliquots of 200-1,000 mL was collected onto 47-mm GF/AE filters which were frozen immediately. These filters were later ground and extracted in 90 percent acetone.

Absorbances of the acetone extract were measured with a Hewlett Packard 8452A diode array spectrophotometer, and used to calculate chlorophyll *a* and pheopigment concentrations using methods of Lorenzen (1967) and Riemann (1978).

3. Particulate carbon (PC) and particulate nitrogen (PN) -- aliquots of 10 to 100 mL were collected onto 13-mm GF/AE filters that had been precombusted. These were folded, placed in nickel capsules, and stored under vacuum until analyzed with an elemental analyzer (Hewlett Packard Model 240C). PC and PN concentrations were determined after correction for filter blanks, using acetanilide as a standard (Wienke and Cloern, 1987, give detailed procedures). These samples were not treated to remove inorganic carbon, so PC concentration may include contributions from carbonates as well as organic carbon.

4. Ratios of ^{13}C:^{12}C and ^{15}N:^{14}N-- aliquots of 200-1,000 mL were collected onto 47-mm GF/AE filters that had been precombusted. These samples were lyophilized in the laboratory and stored frozen until analyzed. Analysis for particulate organic carbon (POC), particulate organic nitrogen (PON), and isotopic ratios ^{13}C:^{12}C and ^{15}N:^{14}N were done in the laboratory of Dr. G.H. Rau (Institute of Marine Sciences, University of California-Santa Cruz, and NASA-Ames Research Center). Each filter was saturated with 0.5 N HCl to remove inorganic carbon and then analyzed for organic C, organic N, and isotopic abundances, using methods described by Rau and others (1990). By convention, the ratios ^{13}C:^{12}C and ^{15}N:^{14}N are reported as the relative per mil difference between the sample ratio and the ratio of a standard:

$$\delta X = [R_{sample}/R_{standard} - 1] \times 1000 ,$$

where *X* is ^{13}C or ^{15}N , R is ^{13}C:^{12}C or ^{15}N:^{14}N , and the standard is PDB carbonate or air N_2. The analytical precision for these determinations is usually about 0.2 per mil for both $\delta^{13}C$ and $\delta^{15}N$ (Rau and others, 1990). Results of these seston analyses are presented in table 3.

5. Lipid analyses -- aliquots of 200-1,000 mL were collected onto precombusted 47-mm GF/AE filters; these were lyophilized and stored under vacuum. Analyses were

made by Dr. D.B. Ringelberg (Center for Environmental Biotechnology, University of Tennessee/Oak Ridge National Laboratory), using methodology described by Guckert and others (1991). Samples were extracted using a modified Bligh and Dyer procedure (White and others, 1979). A portion of this extract was dried and saponified using 5 percent KOH in methanol:water (80:20). The saponification was carried out at 60°C for two hours. After cooling, the organic phase was removed, dried, and converted to TMS ethers by the addition of BSTFA (bis(trimethylsilyl) trifluoroacetamide) prior to analysis by gas chromatography. The remaining extract was separated into neutral, glyco-, and polar lipids on a silicic acid column using a series of mobile phases of increasing polarity. The fatty acids associated with the polar lipid fraction were converted to methyl esters using a mild alkaline transesterification procedure (Guckert and others, 1991). Fatty acid methyl esters were run on both polar and non-polar columns. Lipid components were quantified using internal standards added just prior to analysis by gas chromatography. Identifications were verified by gas chromatography-mass spectrometry.

Fatty acids are designated as A:BωC, where A is the total number of carbon atoms, B is the number of double bonds, and C is the position of the double bond from the aliphatic (ω) end of the molecule. Geometry of this bond is indicated as 'c' for *cis* and 't' for *trans*; prefixes 'i' and 'a' refer to *iso* and *anteiso* methyl branches (see Guckert and others, 1991). Results of these seston lipid analyses are presented in table 4.

Potamocorbula amurensis

Benthic samples were collected with a van Veen grab and sieved with a 0.5-mm screen. A minimum of 20 individuals of Potamocorbula amurensis were taken per sample. Where possible, individuals were taken only from the size range 10-15 mm (shell length). The gut and digestive gland were removed by dissection, and the remaining soft tissue was saved for analysis. Each analysis of Potamocorbula amurensis composition was done on composites of five individuals. These composite tissue samples were either stored on GF/AE filters and lyophilized, or held in

4 percent formalin. The lyophilized samples were analyzed by Dr. G. H. Rau for C and N content and isotopic abundance, using procedures outlined above. Results are given in Table 5. The formalin-preserved samples were analyzed for PLFA and sterol composition by Dr. D.B. Ringelberg, using procedures outlined above for seston analysis. Results of these analyses are presented in table 6.

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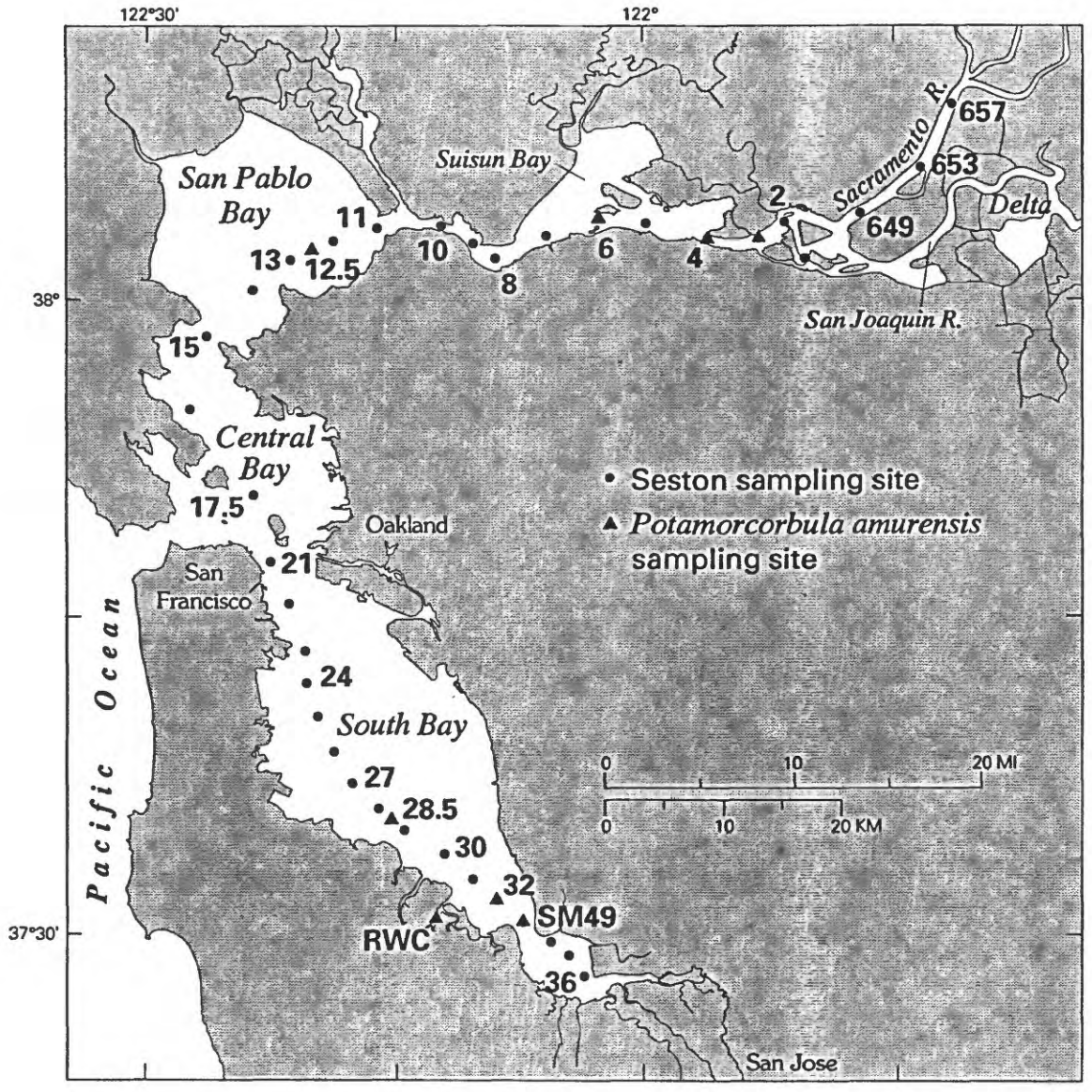

Figure 1. Map of San Francisco Bay estuary showing locations of sampling stations.

Table 1. San Francisco Bay stations and locations.

Station Number	Station Name	N. Latitude		W. Longitude	
657	Rio Vista	38°	8.9'	121°	41.3'
655	N. of Three Mile Slough	38°	7.3'	121°	42.1'
653	Mid-Decker Island	38°	6.3'	121°	43.2'
651	Sacramento River	38°	4.8'	121°	45.8'
649	Sacramento River #10	38°	3.7'	121°	48.0'
2	Chain Island	38°	3.8'	121°	51.3'
3	Pittsburg	38°	3.0'	121°	52.7'
4	Simmons Pt.	38°	2.9'	121°	56.1'
4.5		38°	3.3'	121°	56.6'
5	Middle Ground	38°	3.6'	121°	58.8'
6	Roe Island	38°	3.9'	122o	2.1'
7	Avon Pier	38°	2.9'	122o	5.8'
8	Martinez	38°	1.8'	122o	9.1'
8.5		38°	1.9'	122o	8.4'
9	Benicia	38°	3.0'	122o	10.4'
10	Crockett	38°	3.6'	122o	12.5'
11	Mare Island	38°	3.7'	122o	15.8'
12	San Pablo #14	38°	3.1'	122o	18.7'
12.5		38°	2.4'	122o	18.9'
13	N. of Pinole Pt.	38°	1.9'	122o	21.9'
14	Echo Buoy	38°	0.5'	122o	24.2'
15	Pt. San Pablo	37o	58.2'	122o	26.2'

Station Number	Station Name	N. Latitude		W. Longitude	
16	Red Rock	37o	54.9'	122o	26.8'
17.5	Central Bay	37o	50.8'	122o	25.2'
21	Bay Bridge	37o	48.0'	122o	22.2'
22	Potrero Pt.	37o	45.7'	122o	21.5'
23	Hunters Pt.	37o	43.6'	122o	20.2'
24	Candlestick Pt.	37o	42.0'	122o	20.3'
25	Oyster Pt.	37o	40.3'	122o	19.5'
26	San Bruno Shoal	37o	38.2'	122o	19.0'
27	San Francisco Airport	37o	37.1'	122o	17.5'
28	N. of San Mateo Bridge	37o	36.0'	122o	16.2'
28.5		37o	35.6'	122o	15.6'
29	S. of San Mateo Bridge	37o	34.9'	122o	14.8'
29.5	South Bay #12	37o	34.1'	122o	13.2'
RWC	Port of Redwood City	37o	30.7'	122o	12.7'
30	Redwood Creek	37o	33.3'	122o	11.5'
31	Coyote Hills	37o	31.8'	122o	9.4'
32	Ravenswood Pt.	37o	31.1'	122o	8.1'
33, SM49	Dumbarton Bridge	37o	30.5'	122o	7.3'
34	Newark Slough	37o	29.7'	122o	5.4'
35	Mowry Slough	37o	28.8'	122o	4.7'
36	Calaveras Pt.	37o	28.3'	122o	4.0'

Table 2. Summary of hydrographic/hydrologic conditions when seston samples were collected in North and South San Francisco Bay.

North Bay Profiles

Date	Hydrologic Condition	Seston Concentration	Chlorophyll a Concentration
17 January 1990	Winter - Low Flow	Low	Low
30 July 1990	Summer - Very Low Flow	Low	Low
6 December 1990	Winter - Very Low Flow	Low	Very Low
11 March 1991	Small Storm	Variable	Low-Intermediate
11 April 1991	Spring -Intermediate Flow	Variable	Low-Intermediate
19 February 1992	Winter Storm	Very High	Low

South Bay Profiles

18 January 1990	Winter - Low Flow	Low	Low
18 April 1990	Low Flow	Very Low	Very High -Large Spring Bloom
31 July 1990	Summer - Very Low Flow	Intermediate	Low
7 December 1990	Winter - Very Low Flow	Intermediate	Low
11 April 1991	Intermediate Flow Strong Winds	Very High	Intermediate
19 February 1992	Winter Storm	High	Low
14 April 1992	Low Flow	Very Low	High - Small Spring Bloom

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
17Jan90	1	657.0	0.1		1.3	102.9	6.09	-26.21	3.62	100.9	9.15
17Jan90	8	657.0	0.1	37.3	1.6	105.8	4.92				
17Jan90	1	4.5	1.8	20.6	0.9	85.9	4.52	-25.91	5.01	72.4	7.58
17Jan90	9	4.5	2.2	33.6	0.5	120.9	5.81				
17Jan90	1	6.0	4.3	31.5	0.3	79.3	3.45	-25.62	6.82	78.6	6.50
17Jan90	10	6.0	5.3	44.8	0.3	92.5	3.54				
17Jan90	1	8.5	10.5	44.0	0.8	97.1	6.07	-25.59	5.82	79.2	7.03
17Jan90	18	8.5	14.6	185.0	1.5	280.1	21.33				
17Jan90	1	10.8	15.6	62.0	0.6	127.0	8.52	-24.78	5.65	112.9	9.99
17Jan90	10	10.8	18.5	133.0	0.8	194.6	14.74				
17Jan90	1	13.0	20.1	17.1	0.4	49.7	3.50	-24.50	9.01	50.9	4.15
17Jan90	7	13.0		66.2	0.9	117.3	8.69				
17Jan90	1	15.0	21.0	14.2	0.7	37.5	2.62	-25.56	6.81	43.7	4.16
17Jan90	22	15.0	27.1	26.7	0.8	59.5	3.74				
17Jan90	1	15.6	25.8	23.4	0.9			-24.17	6.84	57.0	5.03
17Jan90	11	15.6	28.3	36.3	0.9	80.1	5.23				
17Jan90	1	17.5	29.0	7.6	1.0	34.8	3.26	-24.27	7.26	33.4	3.98
17Jan90	35	17.5	30.1	11.5	1.0	39.8	3.83				
18Jan90	1	21.0	29.5	1.3	2.3	42.8	3.15	-24.32	5.18	42.1	4.80
18Jan90	16	21.0	29.7	37.8	1.6	92.6	8.19				
18Jan90	1	24.0	29.8	4.2	1.8	31.7	2.51				
18Jan90	8	24.0	29.8	18.1	1.8	67.2	3.86				
18Jan90	1	27.0	29.7	13.6	1.7	44.9	3.94	-23.99	6.65	45.0	6.85
18Jan90	11	27.0	29.7	32.2	1.9	80.1	7.09				
18Jan90	1	30.0	29.1	9.2	2.8	40.4	3.81				
18Jan90	13	30.0	29.5	37.0	2.1	98.8	9.50				
18Jan90	1	32.0	28.5	11.5	2.1	41.8	3.80	-24.53	8.09	43.1	4.90
18Jan90	10	32.0	29.1	38.6	2.0	76.3	6.94				

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
18April90	1	21.0	30.3	2.0	5.1	27.5	3.40	-21.50	6.79	28.8	4.22
18April90	1	23.0	30.1	0.4	6.3	34.6	4.94	-20.21	8.54	39.2	6.21
18April90	1	23.0	30.1	0.4	6.3	34.6	4.94	-20.73	8.10	35.3	4.60
18April90	1	25.0	29.9	2.7	15.9	55.6	8.42	-19.03	9.44	60.8	12.58
18April90	1	27.0	29.5	0.1	13.7	51.0	6.99	-17.73	8.23	53.0	9.35
18April90	1	27.0	29.5	0.1	13.7	51.0	6.99	-17.99	6.71	50.1	9.58
18April90	1	29.0	29.1	1.1	24.7	96.8	13.63	-17.86	8.63	80.6	14.48
18April90	1	30.0	28.6	4.5	37.0	98.0	14.20	-17.90	9.41	92.9	15.93
18April90	1	30.0	28.6	4.5	37.0	98.0	14.20	-17.81	9.13	88.3	13.28
18April90	1	32.0	28.2	8.0	61.5	155.2	22.49	-17.45	9.67	116.3	19.33
30July90	1	657.0	0.1	15.2	2.3	40.2	3.35	-28.01	5.06	48.7	4.14
30July90	7	657.0	0.1	18.0	1.9	58.3	3.10				
30July90	1	653.0	0.2	23.7	2.6	66.9	4.71	-27.22	6.68	71.5	5.62
30July90	7	653.0	0.2	26.5	3.0	69.3	4.23				
30July90	1	2.0	3.2	27.5	2.4			-25.92	7.33	81.6	6.43
30July90	10	2.0	4.6	43.4	1.1	98.0	5.44				
30July90	1	4.0	5.9	33.9	1.3	72.5	5.33	-26.09	6.49	88.3	5.72
30July90	11	4.0	6.4	59.6	0.3	110.8	6.79				
30July90	1	6.0	10.2	44.9	1.6	95.8	8.41	-25.55	7.71		
30July90	9	6.0	11.3	37.5	0.9	77.1	5.93				
30July90	1	8.0	16.7	19.5	1.9	45.9	3.76	-25.94	8.04	50.2	4.72
30July90	1	8.0	16.7	19.5	1.9	45.9	3.76	-26.38	8.26	42.8	4.19
30July90	1	8.0	16.7	19.5	1.9	45.9	3.76	-26.12	8.04	40.2	3.62
30July90	13	8.0	20.6	31.2	0.0	68.3	4.35				
30July90	1	10.0	20.7	12.1	3.3	39.2	4.35	-25.87	3.42	22.5	2.72
30July90	16	10.0	23.4	23.5	0.4	50.0	4.13				
30July90	1	13.0	26.1	7.9	5.7	44.1	4.95	-24.88	8.29	45.7	5.51
30July90	1	15.0	28.2	8.3	3.5			-24.12	6.56	42.6	5.67

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
30July90	22	15.0	30.4	26.6	2.0	60.8	5.34				
30July90	1	17.5	30.7	7.0	5.1	43.2	6.08	-22.72	4.11	52.5	7.07
31July90	1	21.0	31.7	8.5	4.3	44.1	5.17	-23.04	4.56	52.9	6.14
31July90	1	21.0	31.7	8.5	4.3	44.1	5.17	-23.65	8.52	40.7	5.68
31July90	1	21.0	31.7	8.5	4.3	44.1	5.17	-23.43	8.51	43.5	5.67
31July90	13	21.0	32.1	9.8	2.5	41.3	3.66				
31July90	1	24.0	31.7	22.6	2.6	51.3	5.69	-23.55	6.14	69.3	6.31
31July90	10	24.0	31.7	26.2	2.4	59.2	6.29				
31July90	1	27.0	31.6	18.0	2.7	43.6	5.38	-24.13	10.21	57.0	5.88
31July90	13	27.0	31.6	16.9	2.3	56.3	5.21				
31July90	1	30.0	31.6	17.0	2.1	47.5	5.65	-24.21	10.42	55.3	5.64
31July90	12	30.0	31.6	21.2	1.9	53.6	5.25				
31July90	1	32.0		28.4	7.7	80.8	9.74				
6Dec90	1	657.0	0.3	23.0	1.1			-28.34	3.12	31.6	1.77
6Dec90	1	653.0	1.2	18.5	1.3	44.0	3.68	-28.83	3.56	28.2	1.94
6Dec90	1	649.0	3.0	13.9	1.4	38.5	3.78	-28.98	4.36	26.3	2.00
6Dec90	1	2.0	4.5	15.4	0.9	38.5	4.09	-27.98		26.5	1.74
6Dec90	1	2.0	4.5	15.4	0.9	38.5	4.09	-28.32	5.32	22.1	1.91
6Dec90	1	3.0	5.2	13.6	1.3	32.3	2.94	-28.38		25.9	1.93
6Dec90	1	3.0	5.2	13.6	1.3	32.3	2.94	-29.40	5.52	17.5	1.61
6Dec90	1	4.0	8.0	22.2	0.6	41.7	3.31	-27.79	4.30	28.7	1.93
6Dec90	1	5.0	8.4	21.9	0.6	37.6	4.33	-28.11		23.9	1.55
6Dec90	1	5.0	8.4	21.9	0.6	37.6	4.33	-28.39	4.41	27.4	2.12
6Dec90	1	6.0	12.0	30.3	0.9	57.0	5.63	-27.21	3.74	33.8	2.12
6Dec90	1	7.0	15.0	36.5	0.9	59.2	5.52	-26.94	3.08	37.4	2.20
6Dec90	1	7.0	15.0	36.5	0.9	59.2	5.52	-26.79	4.93	39.6	3.27
6Dec90	1	8.0	15.8	17.0	0.6	24.7	2.72	-28.09	4.61	17.8	1.33
6Dec90	1	9.0	18.1	27.3	0.9			-27.11	4.75	35.6	2.93

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
6Dec90	1	10.0	20.5	37.8	1.0	57.2	5.83	-27.03	4.72	33.9	2.53
6Dec90	1	11.0	22.3	44.7	0.3	70.2	7.14	-26.15		51.6	3.98
6Dec90	1	11.0	22.3	44.7	0.3	70.2	7.14	-26.95	3.57	48.2	2.93
6Dec90	1	13.0	26.4	27.2	1.0	43.6	4.60	-26.51	4.48	22.4	2.01
6Dec90	1	15.0	27.8	16.0	1.4	35.8	4.98	-26.42	4.87	23.9	1.98
6Dec90	1	17.5	31.2	14.5	1.2	39.5	4.23	-24.24	5.54	23.7	2.59
7Dec90	1	21.0	31.2	8.5	1.5	19.0	2.25	-24.61	4.55		1.43
7Dec90	1	23.0	31.0	12.6	1.7	27.4	3.45	-24.46	4.65	17.7	2.00
7Dec90	1	25.0	31.2	20.1	2.0	31.1	3.45	-25.79	5.09	28.1	2.48
7Dec90	1	27.0	31.7	27.8	1.9	40.4	4.54	-27.04	7.12		2.67
7Dec90	1	29.0	31.8	12.4	2.0	32.0	4.29	-25.48	7.44	23.0	2.26
7Dec90	1	30.0	31.8	18.2	1.5	32.0	4.16	-25.95	6.68	22.2	2.08
6Feb91	1	657.0	0.1	11.2	1.1	31.6	2.43				
6Feb91	1	653.0	0.2	14.4	1.5	38.4	2.82				
6Feb91	1	2.0	3.1	14.7	1.1	52.7	3.21				
6Feb91	1	4.0	6.0	22.7	1.4	52.7	4.63				
6Feb91	1	6.0	10.2	36.3	1.1	89.8	6.26				
6Feb91	1	8.0	13.4	45.0	1.6	95.8	7.09				
6Feb91	1	10.0	17.7	49.7	1.4	97.9	8.87				
6Feb91	1	13.0	25.4	76.8	1.8	107.8	9.59				
6Feb91	1	15.0	25.2	38.7	1.6	73.2	7.14				
6Feb91	1	17.5	29.8	25.4	1.9	57.3	4.60				
6Feb91	1	21.0	30.3	27.2	1.6	53.4	5.03				
6Feb91	1	24.0	30.2	27.6	1.8	50.5	5.45				
6Feb91	1	27.0	30.2	10.7	2.4	41.6	5.07				
6Feb91	1	29.0	30.0	13.9	2.1	39.1	4.56				
6Feb91	1	30.0	29.9	10.6	2.1	39.5	4.74	-25.99		44.2	6.80
6Feb91	1	32.0	29.6	27.7	2.0	59.8	6.48				

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
12Feb91	1	29.0	29.8	13.8	2.2	44.9	4.66				
12Feb91	12	29.0	30.0	49.2	2.0	110.3	10.82				
12Feb91	1	29.5	29.6	10.6	2.4	49.4	6.27				
12Feb91	1	30.0	29.6	13.4	4.9	64.3	7.17				
12Feb91	1	31.0	29.3	6.2	2.3	42.7	5.34				
12Feb91	1	32.0	28.9	15.5	3.4	56.4	6.60				
12Feb91	1	33.0	29.0	16.2	2.9	78.6	7.73				
12Feb91	1	34.0	29.0	39.5	2.5	84.6	8.92				
5March91	1	21.0	29.5	53.3	3.8	111.7	10.44				
5March91	1	24.0	29.8	59.7	2.9	133.6	12.05				
5March91	1	27.0	29.4	31.2	2.7	74.4	5.31				
5March91	1	29.0	28.8	31.3	3.3	84.6	9.05				
5March91	11	29.0	29.1	97.2	5.3	189.7	16.14				
5March91	1	29.5	28.8	25.6	3.0	65.9	5.90				
5March91	1	30.0	28.0	36.4	3.6	84.6	8.89				
5March91	12	30.0	28.8	94.9	3.3	217.6	23.09				
5March91	1	31.0	26.8	31.5	3.8	79.5	8.85				
5March91	1	32.0	25.7	30.9	3.7	71.8	8.26				
5March91	1	33.0	25.1	32.5	3.9	82.3	7.68				
5March91	8	33.0	26.5	76.5	4.1	154.7	15.61				
11March91	1	657.0	0.1	90.5	2.7	133.7	12.91	-26.99	2.56	161.8	11.62
11March91	1	653.0	0.1	109.2	2.5	232.2	20.70	-26.67	2.81	205.0	14.23
11March91	1	2.0	0.5	66.6	1.7	128.9	14.72	-26.96	3.76	145.7	10.18
11March91	1	4.0	2.1	88.1	1.6	181.5	15.60	-26.89	4.08	205.7	16.00
11March91	1	6.5	6.7	40.6	1.3	78.3	6.78	-27.35	4.45	51.3	3.33
11March91	1	8.0	12.3	21.9	3.1	48.0	3.99	-26.27	5.51	34.2	3.02
11March91	1	10.0	16.9	28.1	3.7	63.7	7.30	-27.16	6.53	40.6	3.47
11March91	1	12.0	18.7	12.7	7.9	49.2	7.21	-26.63	7.33	59.2	7.57

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
11March91	1	13.0	21.5	8.6	4.7	42.1	4.72	-24.83	7.37	46.5	4.89
11March91	1	15.0	24.3	6.4	4.2	34.1	4.49	-26.20	6.69	36.8	4.00
11March91	1	17.5	29.2	4.4	1.2	16.4	1.60	-26.16	4.93	22.1	1.94
11March91	37	17.5	31.2	8.6	1.6	22.8	2.95	-23.16		21.5	3.93
19March91	1	21.0	28.7	73.4	3.4	124.8	12.21				
19March91	1	24.0	29.0	76.2	3.5	136.5	10.32				
19March91	1	27.0	28.6	43.3	5.1	81.2	8.94				
19March91	1	29.0	28.2	77.3	4.7	140.5	17.41				
19March91	12	29.0	28.6	307.3	4.6	450.9	42.40				
19March91	1	29.5	28.0	61.7	5.1	121.4	12.21				
19March91	1	30.0	28.0	74.5	5.0	144.5	14.77	-24.94	6.60	85.6	7.41
19March91	11	30.0	28.0	329.0	5.7	557.6	48.66				
19March91	1	31.0	27.1	50.3	5.3	117.9	11.31				
19March91	1	32.0	26.9	51.8	6.0	121.5	8.71				
19March91	1	33.0	26.3	48.7	6.6	109.9	13.86				
19March91	9	33.0	27.3	327.0	6.9	508.2	50.88				
1April91	1	29.0	27.5	92.8	5.5	163.6	15.61				
1April91	12	29.0	27.6	156.8	5.0	251.1	24.94				
1April91	1	29.5	27.3	54.2	5.9	104.1	11.91				
1April91	1	30.0	26.5	55.0	5.8	103.6	10.63	-24.88	7.47	127.4	11.85
1April91	10	30.0	27.3	249.4	6.6	395.9	41.29				
1April91	1	31.0	25.7	59.5	7.3	118.2	11.70				
1April91	1	32.0	25.1	48.6	9.3	111.8	13.76				
1April91	1	33.0	23.9	78.1	8.2	148.2	17.55				
1April91	7	33.0	25.1	219.5	7.7	365.4	34.06				
5April91	12	29.0	27.2	83.6	7.2	153.4	21.66				
5April91	1	29.5	26.4	59.4	8.5	128.2	14.23				
5April91	11	29.5	26.9			152.6	20.64				

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
5April91	1	30.0	26.1	55.4	7.7			-24.52	9.18	134.2	11.62
5April91	11	30.0	26.9	111.4	8.3	152.6	20.64				
5April91	1	32.0	25.3	58.1	9.2	124.4	16.39				
5April91	1	33.0	24.2	36.8	10.1	117.8	17.87				
8April91	1	36.0	24.9	54.1	6.7	130.0	15.90				
8April91	6	36.0	24.9	80.8	7.7	185.2	20.07				
11April91	1	657.0	0.1	34.8	1.8	66.0	5.00	-27.92	4.31	75.5	6.23
11April91	1	649.0	0.1	50.6	1.7	112.0	8.80	-27.56	3.38	130.1	8.20
11April91	1	3.0	0.2	80.9	2.1	157.0	11.80	-27.17	5.02	172.1	10.98
11April91	1	6.0	2.9	143.8	1.6	277.0	21.80	-26.59	4.88	291.2	19.07
11April91	1	8.0	8.4	37.8	4.6	91.0	9.50	-27.66	6.14	107.7	8.92
11April91	1	11.0	15.3	37.3	7.1	89.0	9.30	-26.18	7.68	97.9	10.50
11April91	1	13.0	23.3	27.6	6.1	76.0	8.20	-25.85	7.39	83.9	8.19
11April91	1	15.0	23.6	38.5	9.0	96.0	9.50	-25.33	7.89	99.8	9.02
11April91	1	17.5	30.2	9.9	3.8	36.0	4.40	-23.50	7.59	37.6	4.42
11April91	33	17.5	32.1	14.5	3.4	46.0	5.10	-23.27	7.44	48.9	5.69
11April91	1	29.0	26.6	203.6	11.1	287.0	30.50	-24.08	8.48	328.0	34.50
11April91	12	29.0	26.7	241.9	12.2	420.0	35.00				
11April91	1	29.5	26.6	207.5	12.8	360.0	36.30				
11April91	1	30.0	26.6	308.9	13.9	488.0	48.80	-24.66	8.71	501.2	38.49
11April91	12	30.0	26.5	408.0	14.5	611.0	58.70				
11April91	1	31.0	26.5	289.2	14.7	489.0	46.60				
11April91	1	33.0	25.3	212.2	8.5	368.0	36.80	-24.54	8.60	382.3	31.80
11April91	10	33.0	26.1	491.3	13.7	727.0	67.60				
15April91	1	29.0	26.4	208.7	9.2	400.9	36.43				
15April91	11	29.0	26.5	471.3	9.1	759.0	74.50				
15April91	1	29.5	26.4	141.5	7.9	235.0	23.80				
15April91	1	30.0	26.5		8.8	259.0	26.20	-24.12	8.96	168.8	18.51

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
15April91	11	30.0	26.5	655.3	11.0	1035.0	97.30				
15April91	1	31.0	26.4	108.8	7.2	204.0	23.00				
15April91	1	32.0	26.1	124.5	9.1	211.0	25.50				
15April91	1	33.0	26.0	141.3	8.3	252.0	26.88				
15April91	9	33.0	26.1	329.7	8.5	525.0	47.30				
25April91	11	29.0	26.8	125.8	7.6	225.5	19.57				
25April91	1	29.5	26.6	53.6	5.5	110.8	13.64				
25April91	1	30.0	26.6	49.4	6.5	98.8	13.02	-24.81	8.75	118.7	11.17
25April91	10	30.0	26.6	165.2	9.1	269.3	29.02				
25April91	1	31.0	26.4	29.5	8.3	71.0	9.21				
25April91	1	32.0	26.1	49.1	7.2	103.8	19.17				
25April91	1	33.0	25.8	47.9	7.9	100.5	14.52				
25April91	9	33.0	25.9	220.1	9.5	329.9	38.87				
19Feb92	1	657.0	0.1	110.2	1.5			-26.30		110.8	8.80
19Feb92	1	653.0	0.1	114.1	1.6			-26.40	2.51	197.0	12.70
19Feb92	1	2.0	0.3	113.3	3.0			-26.50	3.40	268.0	17.20
19Feb92	1	4.0	0.5	108.9	1.3			-26.40	3.23	327.0	21.20
19Feb92	1	6.0	1.9	65.1	1.1			-26.20	3.86	231.0	14.90
19Feb92	1	8.0	5.8	43.1	0.9			-26.10	5.17	124.1	8.20
19Feb92	1	11.0	9.9	26.9	1.1			-25.60	5.03	93.8	7.80
19Feb92	1	13.0	18.4	18.5	3.1			-25.60	5.19	63.6	8.90
19Feb92	1	15.0	21.2	22.0	2.0			-25.00	4.58	44.8	4.20
19Feb92	1	17.5	30.0	27.4	1.5			-23.70	4.96	71.3	6.20
19Feb92	1	21.0	27.6	34.8	1.9			-24.20	4.87	41.4	3.30
19Feb92	1	24.0	28.2	56.1	2.3			-24.30	6.08	110.5	9.50
19Feb92	1	26.0	28.8	39.5	2.4			-24.10	5.60	75.8	6.70
19Feb92	1	28.0	28.1	35.6	2.3			-23.70	5.35	65.1	5.40
19Feb92	1	29.0	27.7	56.6	1.9			-24.30	5.90	111.2	10.70

Table 3. Composition of Seston from San Francisco Bay

Date	Depth	Station	Salinity	SPM	Chl a	PC	PN	del 13C	del 15N	POC	PON
	m		psu	mg/L	ug/L	uM	uM	per mil	per mil	uM	uM
19Feb92	1	30.0	25.4	64.0	1.9			-24.10	5.85	76.2	6.30
14April92	1	24.0	27.8	2.8	7.5			-20.80	6.92	42.5	6.50
14April92	1	27.0	26.5	4.3	16.1			-19.30	7.15	84.9	13.40
14April92	14	27.0	26.7	4.1	14.6			-19.70	8.27	70.9	11.60
14April92	1	29.0	25.4	6.9	25.9			-19.00	8.56	117.4	18.00
14April92	1	30.0	25.6	6.3	17.8			-19.90	8.29	81.9	12.10
14April92	1	31.0	25.1	6.4	14.5			-20.20	7.94	73.3	11.50
14April92	1	33.0	24.6	9.8	11.0			-20.30	8.92	68.4	11.50
14April92	14	33.0	24.8	9.7	11.4			-22.10	8.24	145.8	17.90
14April92	1	36.0	23.1	38.4	6.6			-23.60	8.75	112.8	14.30
14April92	9	36.0	23.4	116.6	6.4			-23.80	8.31	237.6	26.00

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	4/18/90	4/18/90	4/18/90	7/30/90	7/30/90	7/30/90	7/30/90
STATION	21	29	32	13	8	4	657
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
PLFA (picomoles):							
13:0	0	0	0	0	0	0	0
i14:0	0	67	66	0	5	0	0
14:0	79	459	1007	5	18	0	6
i15:0	0	41	66	0	11	0	0
a15:0	0	0	0	0	9	0	0
15:0	0	37	64	0	8	0	0
16:4w3	0	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0	0
i16:0	0	0	0	0	9	0	0
16:1w9c	0	0	0	0	0	0	0
16:1w7c	72	459	815	15	79	22	4
16:1w7t	0	0	0	0	0	0	0
16:1w5c	0	0	0	0	0	0	0
16:1w13t	0	140	309	0	0	0	0
16:0	253	1050	1799	33	152	34	7
a17:1w8c	0	0	0	6	3	3	4
i17:0	0	0	0	6	10	0	10
a17:0/17:1w8c	0	0	0	0	0	0	0
17:1w8c	0	0	0	0	0	0	0
cy17:0	0	0	0	4	11	9	0
17:0	0	26	31	9	13	7	0
18:3w6	0	27	73	0	3	0	0
18:4w3	70	79	123	0	0	0	0
18:1	0	0	0	0	0	0	0
18:2w6	0	119	363	0	0	0	0
18:3w3	0	74	287	0	0	0	0
18:1w9c	34	112	113	9	41	26	6
18:1w7c	34	182	225	30	80	72	4
18:1w7t	0	0	0	4	10	6	9
18:1w5c	119	718	1294	0	0	0	0
18:0	73	136	207	21	51	29	7
br19:1	0	0	0	0	0	0	0
10Me18:0	0	0	0	21	14	11	27
i19:0	0	0	0	0	0	0	0
19:1w12c	0	0	0	0	0	0	0
a19:0	0	0	0	0	0	0	0
cy19:0	0	0	0	0	0	0	0
20:4w6	0	0	0	14	11	39	6
20:5w3	29	57	233	0	0	0	0
20:2	0	0	0	0	0	0	0
20:2	0	0	0	0	0	0	0
20:3w6	0	0	0	17	21	16	9
20:4w3	0	0	0	0	0	0	0
20:2w6	0	0	0	0	0	0	0

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	4/18/90	4/18/90	4/18/90	7/30/90	7/30/90	7/30/90	7/30/90
STATION	21	29	32	13	8	4	657
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
PLFA (picomoles):							
20:2w3	0	0	51	0	0	4	0
20:1w11c/13c	0	0	36	6	0	4	0
20:1w9c	0	0	0	0	6	9	0
20:1w7c	0	0	0	0	0	0	0
20:0	0	0	0	0	0	0	0
22:5w6	0	0	0	0	0	0	0
22:6w3	43	0	156	0	19	34	3
22:4w6	0	0	0	0	0	0	0
22:5w3	0	0	0	0	0	0	0
22:2	0	0	0	0	0	0	0
22:1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL (picomoles/mL)	0.9	5.0	10.5	0.4	1.2	0.9	0.3
Sample Volume (mL)	930	750	700	690	615	500	600

DATE	4/18/90	4/18/90	4/18/90	7/30/90	7/30/90	7/30/90	7/30/90
STATION	21	29	32	13	8	4	657
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
STEROLS (picomoles):							
24-norcholesterol	433	503	813	nd	nd	nd	nd
24-norcholestanol	0	0	0	nd	nd	nd	nd
cis-22-dehydrocholesterol	393	539	619	nd	nd	nd	nd
trans-22-dehydrocholesterol	0	0	0	nd	nd	nd	nd
Cholesterol	1925	4852	2158	nd	nd	nd	nd
Cholestanol	0	539	0	nd	nd	nd	nd
Desmosterol	0	0	0	nd	nd	nd	nd
Brassicasterol	759	566	906	nd	nd	nd	nd
24-methylenecholesterol	796	2035	4366	nd	nd	nd	nd
Campesterol	170	230	483	nd	nd	nd	nd
Stigmasterol	0	0	203	nd	nd	nd	nd
Sitosterol	0	543	753	nd	nd	nd	nd
isofucosterol	0	0	0	nd	nd	nd	nd
TOTAL (picomoles/mL)	4.8	13.1	14.7	nd	nd	nd	nd
Sample Volume (mL)	930	750	700	690	615	500	600

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	2/12/91	2/12/91	3/5/91	3/11/91	3/11/91	3/11/91	3/11/91
STATION	30	30	30	17.5	17.5	13	12
DEPTH (m)	surface	bottom	surface	surface	bottom	surface	surface
PLFA (picomoles):							
13:0	0	0	0	0	0	0	0
i14:0	22	142	40	22	35	32	43
14:0	126	573	428	184	364	360	547
i15:0	23	196	90	32	61	40	103
a15:0	20	188	86	29	56	46	106
15:0	19	98	82	27	56	41	80
16:4w3	0	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0	0
i16:0	23	93	61	18	27	50	74
16:1w9c	35	185	86	35	74	52	100
16:1w7c	515	2283	1402	345	875	592	1586
16:1w7t	10	71	31	17	22	12	26
16:1w5c	19	86	64	15	39	23	79
16:1w13t	0	0	0	0	0	0	0
16:0	1019	2073	1444	786	1102	1933	4567
a17:1w8c	0	0	0	0	0	0	0
i17:0	10	50	28	7	16	13	38
a17:0/17:1w8c	24	79	65	17	34	26	100
17:1w8c	0	0	0	0	0	0	0
cy17:0	33	129	61	38	19	17	49
17:0	27	54	58	20	33	48	80
18:3w6	136	172	71	27	72	476	343
18:4w3	468	359	251	161	279	2177	2043
18:1	0	0	0	0	0	0	0
18:2w6	102	115	98	50	63	394	470
18:3w3	290	167	84	97	88	1684	1644
18:1w9c	166	269	185	84	143	251	542
18:1w7c	547	1027	651	239	422	854	1870
18:1w7t	90	113	15	48	36	207	172
18:1w5c	0	0	0	0	0	0	0
18:0	137	224	199	95	149	164	352
br19:1	28	50	17	8	18	29	64
10Me18:0	8	16	9	0	0	16	46
i19:0	0	0	0	0	0	0	0
19:1w12c	0	0	0	0	0	0	0
a19:0	0	0	0	0	0	0	0
cy19:0	42	46	12	20	14	16	44
20:4w6	0	0	0	0	0	0	0
20:5w3	113	196	384	50	176	498	368
20:2	0	0	0	0	0	0	0
20:2	0	0	0	0	0	0	0
20:3w6	0	0	0	0	0	0	0
20:4w3	0	0	0	0	0	0	0
20:2w6	0	0	0	0	0	0	0

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	2/12/91	2/12/91	3/5/91	3/11/91	3/11/91	3/11/91	3/11/91
STATION	30	30	30	17.5	17.5	13	12
DEPTH (m)	surface	bottom	surface	surface	bottom	surface	surface
PLFA (picomoles):							
20:2w3	0	0	0	0	0	0	0
20:1w11c/13c	0	0	0	0	0	0	0
20:1w9c	0	0	0	0	0	0	0
20:1w7c	0	0	0	0	0	0	0
20:0	0	0	0	0	0	0	0
22:5w6	0	0	0	0	0	0	0
22:6w3	0	0	0	0	0	0	0
22:4w6	0	0	0	0	0	0	0
22:5w3	0	0	0	0	0	0	0
22:2	0	0	0	0	0	0	0
22:1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL (picomoles/mL)	5.6	17.8	12.0	2.5	3.0	12.1	19.9
Sample Volume (mL)	720	510	500	1000	1406	834	780

DATE	2/12/91	2/12/91	3/5/91	3/11/91	3/11/91	3/11/91	3/11/91
STATION	30	30	30	17.5	17.5	13	12
DEPTH (m)	surface	bottom	surface	surface	bottom	surface	surface
STEROLS (picomoles):							
24-norcholesterol	43	117	261	39	212	261	315
24-norcholestanol	0	0	0	0	0	0	0
cis-22-dehydrocholesterol	0	0	0	0	0	0	0
trans-22-dehydrocholesterol	59	115	147	118	226	193	29
Cholesterol	161	506	781	250	588	442	293
Cholestanol	0	0	0	0	0	0	0
Desmosterol	19	26	90	37	51	43	97
Brassicasterol	208	38	281	186	373	1238	1719
24-methylenecholesterol	390	98	97	63	288	134	118
Campesterol	32	147	167	55	157	94	57
Stigmasterol	0	0	0	0	0	0	0
Sitosterol	72	256	219	155	241	82	163
isofucosterol	83	121	90	68	143	45	159
TOTAL (picomoles/mL)	1.5	2.8	4.3	1.0	1.6	3.0	3.8
Sample Volume (mL)	720	510	500	1000	1406	834	780

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/19/91
STATION	8	6.5	4	2	653	657	30
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
PLFA (picomoles):							
13:0	0	0	0	0	0	0	0
i14:0	14	77	150	119	131	70	0
14:0	69	238	329	202	158	119	57
i15:0	34	152	346	217	208	103	24
a15:0	38	167	325	201	190	102	22
15:0	28	70	106	63	48	31	25
16:4w3	0	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0	0
i16:0	45	75	156	93	89	43	0
16:1w9c	53	130	275	210	219	135	35
16:1w7c	889	1627	2263	1409	1077	547	459
16:1w7t	16	41	76	47	48	33	0
16:1w5c	39	88	296	231	210	114	23
16:1w13t	0	0	0	0	0	0	0
16:0	1426	1307	1963	1105	877	473	659
a17:1w8c	0	0	0	0	0	0	0
i17:0	30	35	78	54	48	25	0
a17:0/17:1w8c	67	90	171	100	88	41	28
17:1w8c	0	0	0	0	0	0	0
cy17:0	43	46	90	58	64	31	20
17:0	61	48	86	51	39	26	21
18:3w6	262	33	40	33	41	23	27
18:4w3	974	214	134	98	63	29	66
18:1	0	0	0	0	0	0	0
18:2w6	170	97	212	142	150	75	25
18:3w3	631	135	190	128	115	68	22
18:1w9c	285	260	561	335	307	152	88
18:1w7c	1043	895	1355	745	728	375	288
18:1w7t	16	42	51	51	28	47	0
18:1w5c	0	0	0	0	0	0	0
18:0	184	199	442	220	189	134	85
br19:1	28	44	77	44	37	24	0
10Me18:0	37	41	58	33	39	16	0
i19:0	0	0	0	0	0	0	0
19:1w12c	0	0	0	0	0	0	0
a19:0	0	0	0	0	0	0	0
cy19:0	15	40	104	61	72	36	0
20:4w6	0	0	0	0	0	0	0
20:5w3	387	90	117	65	70	35	89
20:2	0	0	0	0	0	0	0
20:2	0	0	0	0	0	0	0
20:3w6	0	0	0	0	0	0	0
20:4w3	0	0	0	0	0	0	0
20:2w6	0	0	0	0	0	0	0

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/19/91
STATION	8	6.5	4	2	653	657	30
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
PLFA (picomoles):							
20:2w3	0	0	0	0	0	0	0
20:1w11c/13c	0	0	0	0	0	0	0
20:1w9c	0	0	0	0	0	0	0
20:1w7c	0	0	0	0	0	0	0
20:0	0	0	0	0	0	0	0
22:5w6	0	0	0	0	0	0	0
22:6w3	0	0	0	0	0	0	0
22:4w6	0	0	0	0	0	0	0
22:5w3	0	0	0	0	0	0	0
22:2	0	0	0	0	0	0	0
22:1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL (picomoles/mL)	10.3	11.4	20.6	15.1	18.1	10.0	5.2
Sample Volume (mL)	671	552	487	406	295	290	400

DATE	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/11/91	3/19/91
STATION	8	6.5	4	2	653	657	30
DEPTH (m)	surface	surface	surface	surface	surface	surface	surface
STEROLS (picomoles):							
24-norcholesterol	92	90	66	54	61	0	165
24-norcholestanol	0	0	0	0	0	0	0
cis-22-dehydrocholesterol	0	0	0	0	0	0	0
trans-22-dehydrocholesterol	93	91	213	172	159	54	105
Cholesterol	523	543	729	609	596	260	1400
Cholestanol	0	0	0	0	0	0	0
Desmosterol	8	33	0	6	14	22	62
Brassicasterol	496	235	325	228	203	34	326
24-methylenecholesterol	39	99	84	54	42	0	105
Campesterol	59	257	363	171	244	44	228
Stigmasterol	0	0	0	0	0	0	0
Sitosterol	128	296	857	567	641	183	267
isofucosterol	95	118	270	99	107	44	58
TOTAL (picomoles/mL)	2.3	3.2	6.0	4.8	7.0	2.2	6.8
Sample Volume (mL)	671	552	487	406	295	290	400

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	3/19/91	4/1/91	4/1/91	4/11/91	4/11/91	4/25/91	4/25/91
STATION	30	30	30	30	30	30	30
DEPTH (m)	bottom	surface	bottom	surface	bottom	surface	bottom
PLFA (picomoles):							
13:0	0	0	0	0	0	0	0
i14:0	51	33	0	0	353	21	44
14:0	295	430	13	42	2092	399	524
i15:0	112	96	0	21	663	145	346
a15:0	112	104	0	24	695	115	317
15:0	48	94	0	22	345	107	213
16:4w3	0	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0	0
i16:0	53	20	0	28	298	70	202
16:1w9c	91	114	0	55	686	175	428
16:1w7c	974	1536	45	652	6193	2100	4940
16:1w7t	31	23	0	12	127	34	86
16:1w5c	53	56	0	34	342	76	243
16:1w13t	0	0	0	0	0	0	0
16:0	1049	1909	83	792	5844	2292	5118
a17:1w8c	0	0	0	0	0	0	0
i17:0	27	33	6	22	145	31	117
a17:0/17:1w8c	56	62	8	46	290	76	285
17:1w8c	0	0	0	0	0	0	0
cy17:0	36	40	5	26	132	95	220
17:0	44	60	11	32	149	51	154
18:3w6	35	79	31	78	218	143	347
18:4w3	107	192	38	144	586	259	810
18:1	0	0	0	0	0	0	0
18:2w6	61	61	15	37	162	86	320
18:3w3	43	86	12	33	134	101	288
18:1w9c	151	229	54	144	685	227	719
18:1w7c	446	723	172	431	1981	695	2443
18:1w7t	11	0	0	6	0	8	44
18:1w5c	0	0	0	0	0	0	0
18:0	220	223	68	96	442	179	438
br19:1	17	0	5	20	81	38	113
10Me18:0	0	0	0	6	0	11	39
i19:0	0	0	0	0	0	0	0
19:1w12c	0	0	0	0	0	0	0
a19:0	0	0	0	0	0	0	0
cy19:0	6	0	4	18	39	19	90
20:4w6	0	0	0	0	0	0	0
20:5w3	177	266	141	321	1061	268	1069
20:2	0	0	0	0	0	0	0
20:2	0	0	0	0	0	0	0
20:3w6	0	0	0	0	0	0	0
20:4w3	0	0	0	0	0	0	0
20:2w6	0	0	0	0	0	0	0

Table 4. Lipid Analyses of Seston from San Francisco Bay

DATE	3/19/91	4/1/91	4/1/91	4/11/91	4/11/91	4/25/91	4/25/91
STATION	30	30	30	30	30	30	30
DEPTH (m)	bottom	surface	bottom	surface	bottom	surface	bottom
PLFA (picomoles):							
20:2w3	0	0	0	0	0	0	0
20:1w11c/13c	0	0	0	0	0	0	0
20:1w9c	0	0	0	0	0	0	0
20:1w7c	0	0	0	0	0	0	0
20:0	0	0	0	0	0	0	0
22:5w6	0	0	0	0	0	0	0
22:6w3	0	0	0	0	0	0	0
22:4w6	0	0	0	0	0	0	0
22:5w3	0	0	0	0	0	0	0
22:2	0	0	0	0	0	0	0
22:1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL (picomoles/mL)	14.4	18.5	3.6	15.3	115.8	15.6	64.4
Sample Volume (mL)	300	350	200	205	205	500	310

DATE	3/19/91	4/1/91	4/1/91	4/11/91	4/11/91	4/25/91	4/25/91
STATION	30	30	30	30	30	30	30
DEPTH (m)	bottom	surface	bottom	surface	bottom	surface	bottom
STEROLS (picomoles):							
24-norcholesterol	95	104	87	133	134	277	380
24-norcholestanol	0	0	0	0	0	0	0
cis-22-dehydrocholesterol	0	0	0	0	0	0	0
trans-22-dehydrocholesterol	68	49	99	199	221	119	172
Cholesterol	909	1635	433	602	658	553	808
Cholestanol	0	0	0	0	0	0	0
Desmosterol	11	21	57	41	70	93	75
Brassicasterol	193	190	285	383	428	332	473
24-methylenecholesterol	98	153	114	251	260	399	239
Campesterol	150	147	209	351	410	276	305
Stigmasterol	0	0	0	0	0	0	0
Sitosterol	108	107	189	258	323	188	352
isofucosterol	114	52	67	97	137	104	156
TOTAL (picomoles/mL)	5.8	7.0	7.7	11.3	12.9	4.7	9.5
Sample Volume (mL)	300	350	200	205	205	500	310

Table 5. Isotopic Composition of C and N in Potamocorbula amurensis from San Francisco Bay

Date	Station	Replicate	Sample	N Yield	del 15 N	C Yield	del 13 C
		number	Wt. (g)	micromole	per mil	micromole	per mil
27April90	32	1	5.7	40.60	13.45	195	-16.98
27April90	32	2	5.6	28.56	14.04	159	-18.45
27April90	32	3	2.2	10.34	12.78	69	-17.68
27April90	RWC	1	5.7	44.20	12.81	186	-19.87
27April90	RWC		3.8	25.84	12.99	155	-19.25
27April90	RWC		2.6	18.57	12.20	101	-19.53
27April90	RWC		2.9	20.35	13.02	122	-19.45
10July90	RWC	1	4.6	28.50	13.32	144	-19.35
10July90	RWC	2	2.3	13.60	13.40	62	-18.76
10July90	32	1	3.9	30.30	15.99	138	-21.09
10July90	32	2	3.5	23.00	15.12	109	-20.69
10July90	28.5	1	2.9	4.91	12.09	102	-18.17
10July90	28.5	2	3.5	14.04	12.93	88	-20.08
30July90	3	1	5.4	51.50	11.05	242	-25.20
30July90	3	2	4.6	23.12	11.65	146	-26.68
30July90	4	1	6.1	47.40	11.81	208	-25.28
30July90	4	2	2.8	15.85	12.14	105	-26.74
31July90	6	1	4	28.00	11.58	133	-24.44
31July90	6	2	2.1	12.68	11.37	81	-25.76
31July90	6	3	1.8	9.97	10.95	65	-25.79
31July90	8	1	3.7	25.30	11.61	116	-22.09
31July90	8	2	2.8	15.85	12.02	96	-23.24
31July90	8	3	2.2			63	-23.01
31July90	12.5	1	3.5	23.50	10.46		-20.50
31July90	12.5	2	5.5	35.79	10.59	189	-21.27
6-7Dec90	3	1	2.6	10.86	12.24	72	-27.66
6-7Dec90	4	1	3.2	12.68	12.41	85	-27.79
6-7Dec90	6	1	1.9	9.50	12.29	58	-26.23
6-7Dec90	8	1	2.6	7.70	10.91	54	-23.82
6-7Dec90	12.5	1	4.7	21.75	10.52	142	-21.49
6-7Dec90	28.5	1	3.2	13.59	16.52	107	-21.87
12Feb91	SM49	1	2.8	20.84	13.74	118	-23.75
12Feb91	SM49	2	4.7	26.25	14.18	176	-24.48
5March91	SM49	1	1.8	9.97	13.83	68	-23.20
19March91	SM49	1	5.7	37.53	14.71	210	-22.46
1April91	SM49	1	2.9	17.22	14.42	118	-23.01
5April91	SM49	1	2.3	14.48	14.15	92	-22.91
8April91	SM49	1	3.1	17.65	15.07	109	-22.68
11April91	SM49	1	2.1	9.51	13.81	62	-22.90
12April91	3	1	3.1	11.32	9.68	76	-27.56
12April91	4	1	2.9	14.94	11.34	91	-27.15
12April91	6	1	3.1	21.76	11.03	121	-25.76
12April91	8	1	2.5	13.59	11.58	84	-24.32
12April91	12.5	1	3.5	19.94	11.32	114	-22.70
15April91	SM49	1	2	8.62	14.07	64	-23.31
25April91	SM49	1	2.3	11.32	15.42	83	-23.16

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/27/90	4/27/90	4/27/90	4/27/90	7/10/90	7/10/90
STATION	32	32	RWC	RWC	28.5	RWC
REPLICATE	1	2	1	2	1	1
PLFA (picomoles):						
13:0	0	0	0	0	0	0
i14:0	0	0	0	0	0	0
14:0	12728	13958	26471	21447	1629	5596
i15:0	0	0	858	855	0	828
a15:0	0	0	0	0	0	0
15:0	5853	5342	15427	13110	1660	6791
16:4w3	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0
i16:0	0	0	0	0	0	0
16:1w9c	0	0	0	0	0	0
16:1w7c	50357	50337	88799	84316	7885	18107
16:1w7t	0	0	0	0	0	0
16:1w5c	0	0	0	0	0	0
16:1w13t	1407	1357	1932	2442	0	398
16:0	228036	211244	476343	477767	34702	143841
a17:1w8c	1218	888	8493	12475	3085	15789
i17:0	3950	3320	14247	14828	2523	11840
a17:0/17:1w8c	0	0	0	0	0	0
17:1w8c	0	0	0	0	0	0
cy17:0	0	0	0	0	0	0
17:0	8586	7091	24058	25801	5009	19585
18:3w6	11133	12588	19121	26052	985	2458
18:4w3	2984	3042	14055	20997	3877	6288
18:1	0	0	0	0	0	0
18:2w6	5029	3810	7563	5025	425	1567
18:3w3	2026	1943	2184	4078	399	2115
18:1w9c	24091	20353	46335	51889	7786	35656
18:1w7c	30934	28145	63582	66130	4572	18049
18:1w7t	0	0	0	0	0	0
18:1w5c	0	0	1785	1863	0	575
18:0	25933	24449	54779	64311	13479	53861
br19:1	0	0	0	0	0	0
10Me18:0	0	0	0	0	0	0
i19:0	0	0	0	0	0	0
19:1w12c	2525	1636	4901	5731	2116	4620
a19:0	0	0	0	0	0	0
cy19:0	0	0	0	0	0	0
20:4w6	20086	16458	48965	59645	5863	22025
20:5w3	206819	180946	428106	474455	7828	30339
20:2	0	0	0	0	0	0
20:2	0	0	0	0	0	0
20:3w6	8712	3024	19073	31812	3365	13971
20:4w3	9412	0	21910	38506	5199	15556
20:2w6	0	0	0	0	0	0

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/27/90	4/27/90	4/27/90	4/27/90	7/10/90	7/10/90
STATION	32	32	RWC	RWC	28.5	RWC
REPLICATE	1	2	1	2	1	1
PLFA (picomoles):						
20:2w3	17293	12711	26681	29228	5172	14254
20:1w11c/13c	27698	25816	110307	101165	36887	119690
20:1w9c	22728	21197	0	49738	0	0
20:1w7c	24283	20858	41609	50656	6884	27071
20:0	0	0	0	0	0	0
22:5w6	6657	5530	22142	28288	1617	5723
22:6w3	127702	113721	323226	383742	11910	40345
22:4w6	7536	6067	27722	38794	1961	10388
22:5w3	31973	29437	87170	110500	2557	15089
22:2	0	0	0	0	0	0
22:1	0	0	0	0	0	0
	0	0	0	0	0	0
TOTAL (picomoles/mg)	20167	19192	15362	19455	2847	7279
mg tissue	46	43	132	118	63	91

DATE	4/27/90	4/27/90	4/27/90	4/27/90	7/10/90	7/10/90
STATION	32	32	RWC	RWC	28.5	RWC
REPLICATE	1	2	1	2	1	1
STEROLS (picomoles):						
24-norcholesterol	13796	16124	38701	48768	35618	67206
24-norcholestanol	2351	2577	3057	3696	1662	3640
cis-22-dehydrocholesterol	9960	10669	32474	42990	26787	65355
trans-22-dehydrocholesterol	0	1512	3803	2401	2008	3646
Cholesterol	29371	34176	131968	184375	92144	321871
Cholestanol	3473	4655	8352	10147	9937	19620
Desmosterol	16210	17409	48412	73054	14149	18278
Brassicasterol	12737	13157	51698	72171	55175	119134
24-methylenecholesterol	33114	37106	86597	128521	48781	103720
Campesterol	9634	10147	30669	44775	27456	68844
Stigmasterol	1682	1858	6047	10373	7939	21602
Sitosterol	4163	10113	23467	22351	19544	38698
isofucosterol	3177	3630	10733	13836	5524	14672
	0	0	0	0	0	0
TOTAL (picomoles/mg)	3036	3794	3606	5572	5504	9520
mg tissue	46	43	132	118	63	91

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	7/10/90	7/31/90	7/31/90	7/30/90	7/30/90	7/31/90
STATION	32	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
13:0	0	0	0	0	0	0
i14:0	0	0	0	0	0	871
14:0	3132	9404	4035	2677	10613	28134
i15:0	0	865	868	532	2731	5425
a15:0	0	0	0	0	0	0
15:0	2424	10147	6113	5114	18716	41979
16:4w3	0	0	0	0	0	0
16:3w4	0	0	0	0	0	0
i16:0	0	0	0	0	0	0
16:1w9c	0	0	0	0	0	0
16:1w7c	14971	28772	12445	9358	31180	100337
16:1w7t	0	0	0	0	0	0
16:1w5c	0	0	0	0	0	0
16:1w13t	684	572	0	0	659	1477
16:0	69808	189205	94820	76760	249814	413577
a17:1w8c	3722	27289	22001	23652	56744	84919
i17:0	2894	9655	7701	6319	19321	36037
a17:0/17:1w8c	0	0	0	0	0	0
17:1w8c	0	0	0	0	0	0
cy17:0	0	0	0	0	0	0
17:0	7912	21094	14167	12601	33744	47765
18:3w6	2591	12565	4633	3624	10400	16531
18:4w3	9625	10921	8723	11579	12477	17546
18:1	0	0	0	0	0	0
18:2w6	2329	3186	1799	2199	5913	11752
18:3w3	2478	4883	2101	1381	5586	12736
18:1w9c	13927	39442	30502	29409	69312	99056
18:1w7c	10320	18694	11873	8746	24337	49943
18:1w7t	0	0	0	0	0	0
18:1w5c	0	864	611	485	902	1257
18:0	19162	47660	30071	25091	59123	71081
br19:1	0	0	0	0	0	0
10Me18:0	0	0	0	0	0	0
i19:0	0	0	0	0	0	0
19:1w12c	2811	8065	5750	4899	12635	22241
a19:0	0	0	0	0	0	0
cy19:0	0	0	0	0	0	0
20:4w6	8948	64809	48297	49878	173645	226924
20:5w3	20196	114868	52159	41140	182502	248238
20:2	0	0	0	0	0	0
20:2	0	0	0	0	0	0
20:3w6	6432	17396	11257	10380	21865	33325
20:4w3	8630	18600	13306	10938	24141	44923
20:2w6	0	0	0	0	0	0

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	7/10/90	7/31/90	7/31/90	7/30/90	7/30/90	7/31/90
STATION	32	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
20:2w3	12159	27899	15650	13572	35763	56604
20:1w11c/13c	61197	128670	104431	108245	227962	292937
20:1w9c	0	0	0	0	0	0
20:1w7c	11040	27776	18906	16454	48523	71704
20:0	0	0	0	0	0	0
22:5w6	2640	28054	19299	19644	79581	88161
22:6w3	19685	217363	113791	81307	278341	304776
22:4w6	3079	20739	17297	18979	68687	86033
22:5w3	5451	31000	16557	14236	51364	70659
22:2	0	0	0	0	0	0
22:1	0	0	0	0	0	0
	0	0	0	0	0	0
TOTAL (picomoles/mg)	6984	14256	13783	7521	9316	8951
mg tissue	47	80	50	81	195	289

DATE	7/10/90	7/31/90	7/31/90	7/30/90	7/30/90	7/31/90
STATION	32	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
STEROLS (picomoles):						
24-norcholesterol	39457	106187	66154	51059	98954	113400
24-norcholestanol	2244	2188	1295	1425	2611	2767
cis-22-dehydrocholesterol	35351	67799	62761	71169	187502	110233
trans-22-dehydrocholesterol	2964	1475	0	0	5028	1518
Cholesterol	179367	235881	202224	206893	533513	402294
Cholestanol	10773	6427	3300	4499	8551	9441
Desmosterol	9257	43010	20673	15758	49524	53633
Brassicasterol	65298	165325	115638	124492	375774	124685
24-methylenecholesterol	58648	105817	49247	38488	101665	87083
Campesterol	37992	49411	37586	39843	124905	112248
Stigmasterol	10719	22394	11755	12607	50899	36071
Sitosterol	22904	36224	19917	19830	66034	63197
isofucosterol	8595	17066	11262	14662	25435	22541
	0	0	0	0	0	0
TOTAL (picomoles/mg)	10289	10740	12036	7416	8361	3942
mg tissue	47	80	50	81	195	289

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	2/12/91	3/5/91	3/19/91	4/1/91	4/5/91	4/8/91
STATION	SM49	SM49	SM49	SM49	SM49	SM49
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
13:0	0	0	454	0	272	393
i14:0	0	0	0	0	0	0
14:0	40063	9306	10786	9486	10376	7647
i15:0	3575	620	695	601	509	346
a15:0	646	347	263	0	0	0
15:0	28450	6623	6805	5205	5236	3325
16:4w3	1947	932	1103	498	775	604
16:3w4	1185	392	0	0	445	252
i16:0	8433	2249	1962	1448	1446	756
16:1w9c	3662	483	447	543	544	554
16:1w7c	100672	21852	19948	23168	25179	18804
16:1w7t	0	0	0	0	0	0
16:1w5c	7276	2052	2526	3194	3657	1509
16:1w13t	2766	1573	1040	1326	1330	882
16:0	611398	200543	175368	201598	183145	125359
a17:1w8c	54047	14935	12656	13611	15759	14239
i17:0	32305	10266	9729	10016	8705	7330
a17:0/17:1w8c	11709	3359	3445	2425	2842	1831
17:1w8c	0	0	0	0	0	0
cy17:0	0	0	0	0	0	0
17:0	40747	17947	15882	16152	14536	13442
18:3w6	2371	0	0	0	0	0
18:4w3	12538	3005	2214	3369	4230	2918
18:1	6062	4693	2349	1190	5288	4398
18:2w6	4568	1520	773	931	1234	727
18:3w3	10033	3072	2352	2787	2972	2162
18:1w9c	58952	23011	20345	17982	20108	14629
18:1w7c	38820	14329	11461	14529	14351	12584
18:1w7t	954	291	259	0	280	398
18:1w5c	954	256	266	414	370	272
18:0	58538	32850	31749	28295	33563	31469
br19:1	0	0	0	0	0	0
10Me18:0	896	413	373	0	344	202
i19:0	1012	564	539	543	601	504
19:1w12c	5734	2287	2430	1979	2518	2467
a19:0	3874	1779	1689	1494	1547	1465
cy19:0	0	0	0	0	0	0
20:4w6	29982	9846	9491	8930	10151	8669
20:5w3	77350	31757	24351	36902	34294	33734
20:2	4212	1264	1334	1022	1628	1418
20:2	1735	497	401	556	622	419
20:3w6	27380	11183	10999	9815	12562	11397
20:4w3	16827	6371	6082	5438	7580	7207
20:2w6	2506	1320	1299	1151	1769	1945

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	2/12/91	3/5/91	3/19/91	4/1/91	4/5/91	4/8/91
STATION	SM49	SM49	SM49	SM49	SM49	SM49
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
20:2w3	14687	6781	5109	6647	6508	5502
20:1w11c/13c	47397	7786	5783	20646	13860	9106
20:1w9c	29038	4494	3349	11697	7262	4111
20:1w7c	12905	4665	5198	5283	6858	5602
20:0	376	466	202	0	393	264
22:5w6	6910	2238	2548	2716	2486	3006
22:6w3	46183	15281	15204	19993	19070	21364
22:4w6	8818	3499	3875	4403	3903	4058
22:5w3	7710	3765	3768	5735	5484	6079
22:2	2535	1005	1068	1164	1078	1037
22:1	8548	3250	4180	4229	4394	4260
	0	0	0	0	0	0
TOTAL (picomoles/mg)	3944	2608	1989	3024	3148	2151
mg tissue	386	194	227	170	162	190

DATE	2/12/91	3/5/91	3/19/91	4/1/91	4/5/91	4/8/91
STATION	SM49	SM49	SM49	SM49	SM49	SM49
REPLICATE	1	1	1	1	1	1
STEROLS (picomoles):						
24-norcholesterol	117966	37546	42299	28997	27644	30542
24-norcholestanol	0	0	0	1585	1614	1842
cis-22-dehydrocholesterol	8674	3949	4373	3181	2882	2982
trans-22-dehydrocholesterol	0	29063	32955	24094	21778	25236
Cholesterol	195630	79702	91248	70669	62521	76925
Cholestanol	5019	3585	3767	4627	4615	5695
Desmosterol	39223	19403	11098	18539	16988	16709
Brassicasterol	172714	69919	76449	59114	52852	58417
24-methylenecholesterol	0	57016	65876	53455	52722	67055
Campesterol	57536	24995	30160	22944	21754	28814
Stigmasterol	21321	9034	9494	7878	7210	6580
Sitosterol	33429	16595	18314	16608	12769	14111
isofucosterol	30104	10548	7242	8456	7846	6465
	0	0	0	0	0	0
TOTAL (picomoles/mg)	1765	1863	1729	1883	1807	1799
mg tissue	386	194	227	170	162	190

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/11/91	4/12/91	4/12/91	4/12/91	4/12/91	4/12/91
STATION	SM49	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
13:0	250	0	447	0	298	816
i14:0	0	0	0	0	0	0
14:0	6213	15320	6327	19123	12834	17304
i15:0	371	1129	651	2627	2349	3729
a15:0	144	0	0	1156	1034	1447
15:0	3354	8527	4032	18992	15017	21114
16:4w3	747	1297	461	955	697	578
16:3w4	208	0	0	578	535	1079
i16:0	979	3083	1522	3714	3607	6050
16:1w9c	503	877	327	1849	2157	3046
16:1w7c	15009	24653	8499	32422	25492	31508
16:1w7t	0	0	0	0	0	0
16:1w5c	3106	2245	1047	6064	5492	7286
16:1w13t	592	1516	357	794	263	406
16:0	109757	274580	97813	310694	206003	276919
a17:1w8c	9868	12030	11554	35303	35175	35753
i17:0	6135	16874	7044	19909	15766	20417
a17:0/17:1w8c	1639	4083	2733	10224	8608	13436
17:1w8c	0	0	0	1734	2034	3419
cy17:0	0	0	0	0	0	0
17:0	10227	22035	9186	29802	21477	26108
18:3w6	250	0	0	732	1004	2201
18:4w3	1509	1954	628	7659	5571	8112
18:1	3464	4735	1647	2273	1924	1380
18:2w6	732	2167	1385	6842	4352	10757
18:3w3	1804	3619	1689	6996	6272	9201
18:1w9c	12237	28865	15449	42569	32900	55960
18:1w7c	7977	16648	6651	18414	13469	18989
18:1w7t	0	710	343	1240	631	793
18:1w5c	221	632	0	747	482	764
18:0	20885	33684	13452	37769	23498	31236
br19:1	0	0	0	0	0	0
10Me18:0	189	348	343	1325	1372	2144
i19:0	340	561	335	1233	934	1070
19:1w12c	1511	3167	1578	3899	3279	4536
a19:0	991	1832	930	3105	2569	3089
cy19:0	0	0	0	0	0	0
20:4w6	4704	3812	1879	29756	29560	50956
20:5w3	19631	11604	3331	66346	46343	81762
20:2	792	1677	659	1379	1547	4364
20:2	265	0	0	871	842	1905
20:3w6	6714	13049	4900	16688	10712	18244
20:4w3	3984	5902	2622	7797	7478	9721
20:2w6	1142	1355	477	1433	973	2067

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/11/91	4/12/91	4/12/91	4/12/91	4/12/91	4/12/91
STATION	SM49	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
PLFA (picomoles):						
20:2w3	3712	9901	3834	12574	7990	12362
20:1w11c/13c	4748	32316	3479	36220	30581	30926
20:1w9c	2539	17571	2407	25495	17015	24914
20:1w7c	3687	5315	2320	5979	4506	4970
20:0	170	477	184	794	381	1007
22:5w6	1429	1180	357	10124	9336	15924
22:6w3	7903	6876	1784	58202	37607	52484
22:4w6	2184	1600	424	7643	6535	8781
22:5w3	2713	1606	313	7589	5628	7472
22:2	656	1129	304	2003	1977	2798
22:1	3035	6592	2837	7435	7004	7420
	0	0	0	0	0	0
TOTAL (picomoles/mg)	2063	2450	1197	3852	4419	5521
mg tissue	144	252	195	246	159	178

DATE	4/11/91	4/12/91	4/12/91	4/12/91	4/12/91	4/12/91
STATION	SM49	12.5	8	6	4	3
REPLICATE	1	1	1	1	1	1
STEROLS (picomoles):						
24-norcholesterol	21089	75531	48948	38836	28981	40497
24-norcholestanol	1150	3117	1314	0	0	0
cis-22-dehydrocholesterol	2121	10031	5200	4824	1854	2192
trans-22-dehydrocholesterol	17244	47360	38356	56145	43878	73669
Cholesterol	51473	100825	96400	130145	80320	138719
Cholestanol	3425	5496	2577	2137	1676	2961
Desmosterol	10399	21424	27547	25334	15295	33805
Brassicasterol	38853	92885	74428	92470	63228	95085
24-methylenecholesterol	40325	71584	40476	45568	23448	32602
Campesterol	19119	26312	19205	21797	17524	32388
Stigmasterol	5385	10088	7250	10960	7294	12963
Sitosterol	11246	23031	15226	17751	13297	28291
isofucosterol	4707	10467	8930	10809	6569	11205
	0	0	0	0	0	0
TOTAL (picomoles/mg)	1576	1978	1979	1855	1908	2830
mg tissue	144	252	195	246	159	178

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/25/91	5/8/91	5/8/91	10/16/91
STATION	SM49	SM49	SM49	SM49
REPLICATE	1	1	2	1
PLFA (picomoles):				
13:0	0	0	442	0
i14:0	0	0	0	0
14:0	4130	8780	13931	30302
i15:0	242	398	525	1015
a15:0	0	0	0	0
15:0	2988	4419	4956	14544
16:4w3	570	489	410	1228
16:3w4	200	415	296	0
i16:0	831	1261	1192	2217
16:1w9c	0	427	483	1090
16:1w7c	12292	19251	20969	79357
16:1w7t	0	0	0	0
16:1w5c	2474	1610	833	2706
16:1w13t	570	579	1529	1240
16:0	110006	125618	153491	473437
a17:1w8c	9310	10936	2775	22385
i17:0	5355	6361	6088	9934
a17:0/17:1w8c	1398	1897	1456	3633
17:1w8c	0	0	0	0
cy17:0	0	0	0	0
17:0	9280	10291	12125	29701
18:3w6	0	0	0	852
18:4w3	2058	1602	1987	4209
18:1	2695	2682	2677	6539
18:2w6	634	571	741	4071
18:3w3	1638	1741	1723	3057
18:1w9c	10977	14861	10570	40887
18:1w7c	7858	9552	10558	25580
18:1w7t	0	0	0	0
18:1w5c	0	0	0	0
18:0	18425	20660	25700	63661
br19:1	0	0	0	0
10Me18:0	0	0	0	0
i19:0	216	398	331	0
19:1w12c	1126	2037	1853	1791
a19:0	724	1051	868	839
cy19:0	0	0	0	0
20:4w6	4522	4653	3748	39860
20:5w3	25024	15695	19936	151148
20:2	684	887	823	2343
20:2	0	0	264	2130
20:3w6	6138	7815	6167	12602
20:4w3	3454	5306	3955	11274
20:2w6	876	1273	1491	2856

Table 6. Lipid Analyses of Potamocorbula amurensis from San Francisco Bay

DATE	4/25/91	5/8/91	5/8/91	10/16/91
STATION	SM49	SM49	SM49	SM49
REPLICATE	1	1	2	1
PLFA (picomoles):				
20:2w3	3166	4304	5026	17249
20:1w11c/13c	13456	20011	20410	66480
20:1w9c	4817	9236	7658	17525
20:1w7c	2586	4431	4972	14807
20:0	0	218	372	626
22:5w6	1270	1478	1322	5349
22:6w3	12353	9199	13673	69398
22:4w6	2346	2620	1787	10272
22:5w3	3763	3339	4152	20268
22:2	450	903	718	1766
22:1	2224	3601	2712	5299
	0	0	0	0
TOTAL (picomoles/mg)	3768	2689	3764	3692
mg tissue	79	129	101	348

DATE	4/25/91	5/8/91	5/8/91	10/16/91
STATION	SM49	SM49	SM49	SM49
REPLICATE	1	1	2	1
STEROLS (picomoles):				
24-norcholesterol	23270	20552	44102	37558
24-norcholestanol	1313	1160	2590	0
cis-22-dehydrocholesterol	1986	2170	1950	0
trans-22-dehydrocholesterol	14587	16101	16640	177828
Cholesterol	42380	49350	48254	143434
Cholestanol	3195	3268	4969	4644
Desmosterol	9089	10285	11623	13916
Brassicasterol	30011	35328	32824	51280
24-methylenecholesterol	36113	40693	56377	73320
Campesterol	15051	17127	21185	51399
Stigmasterol	3315	4434	5151	9203
Sitosterol	7754	8951	11041	8825
isofucosterol	3451	4422	4693	5415
	0	0	0	0
TOTAL (picomoles/mg)	2433	1658	2583	1658
mg tissue	79	129	101	348