

TRACE METALS IN CLAMS (*MACOMA BALTHICA*) AND SEDIMENTS AT
THE PALO ALTO MUDFLAT IN SOUTH SAN FRANCISCO BAY:
APRIL, 1990 - APRIL, 1991

By Samuel N. Luoma, Daniel J. Cain, Cynthia Brown and Ellen V. Axtmann

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CONVERSION FACTORS

<i>Multiply</i>	<i>By</i>	<i>To obtain</i>
Micrometer	2.54×10^{-6}	Inches
Millimeter	2.54×10^{-3}	Inches
Centimeter	2.54×10^{-2}	Inches
Kilometer	1.609	Miles
Microgram	2.83×10^{-5}	Ounce
Milligram	2.83×10^{-2}	Ounce
gram	28.3	Ounce
Millimeter	5.5×10^{-2}	pint

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ABSTRACT

This report presents trace element concentrations analyzed on samples of sediment and clams (*Macoma balthica*) collected from a mudflat one kilometer south of the discharge of the Palo Alto sewage treatment works. Samples were collected on nine occasions between May, 1990 and May 1991, at near monthly intervals. Concentrations of silver and copper from this mudflat are compared with values observed at other stations in San Francisco Bay in earlier studies. The concentrations of these metals found in 1990 to 1991 also are compared with concentrations observed in near monthly collections between 1977 and 1990.

INTRODUCTION

Sediments and benthic organisms are commonly employed to determine spatial distributions and temporal trends of trace metal contamination in estuarine waters. Sediments bind metals strongly, removing them from solution. The result is that sediments may progressively accumulate the metals released to an environment, and concentrations may be indicative of anthropogenic releases to an environment, integrated over time.

Metals in sediments are also indicative of the exposure of animals in contact with benthic and suspended particulate materials. However, it is not well known what proportion of sediment-bound metal is passed on to living organisms. In order to better estimate bioavailable metal exposures, the tissues of the organisms themselves may be analyzed for trace metals. Most species concentrate metals to levels higher than occur in solution, but different species concentrate metals to different degrees. Nevertheless, analysis of one species has been successfully employed to indicate trace element exposures to the food web of the organism. For example, Ag, Cu and Se contamination originally observed in clams (*Macoma balthica*) at a Palo Alto mudflat was later also found in diving ducks, snails and mussels from that area.

Purpose

The purpose of this study is to present trace metal concentrations observed in sediments and clams at a mudflat in south San Francisco Bay. The station, termed here the Palo Alto mudflat, is located one kilometer south of the intertidal discharge point of the Palo Alto publically-owned treatment works (POTW). The data reported here are from samples collected on nine dates between May 15, 1990 and April 8, 1991. These data and data collected from earlier studies will be used to approach three questions:

1. What are concentrations of Ag, Cd, Cr, Cu, Ni, Pb, V and Zn in clams that reside at the Palo Alto mudflat and in sediments from that site? Concentrations of Cd, Cr, Ni, Pb, and V from this environment have not been reported previously.
2. How do concentrations of Ag, Cu and Zn at Palo Alto in 1990-91 compare with concentrations observed at other mudflats in the Bay?
3. Have concentrations of Ag, Cu and Zn at Palo Alto changed with time? Specifically, were concentrations of these elements in 1990-91 different from concentrations observed at this locality since 1977?

Study Site

The data from this study were collected from site 3 (fig. 1) of the transect conducted by Thomson and others (1984) along the Palo Alto shoreline. Although the highest concentrations of copper and silver were observed in clams and sediments adjacent to the Palo Alto POTW discharge (site 5 in fig. 1) in that study, contamination also was observed at site 3. The influence of the POTW on metal concentrations at site 3 also was demonstrated by Cain and Luoma (1990). They showed a similarity in temporal trends at site 3 between metal discharge from the POTW and concentrations in clam tissues. Results from both studies thus indicated that environmental metal concentrations at site 3 were indicative of POTW metal discharges.

Several studies have compared the degree of contamination at site 3 with copper and silver contamination elsewhere in San Francisco Bay. Cain and Luoma (1990) showed the average copper and silver content in *M. balthica* of a standard length between 1977 and 1980 at eight sites in the Bay (Fig. 2). The Palo Alto mudflat was site 8 in that study. They also compared concentrations at the Palo Alto mudflat in 1986 with concentrations in 1977 to 1980 (fig. 2). In late June and early July 1989 a synoptic study was conducted comparing copper and silver concentrations among seven bay stations, including the Palo Alto mudflat and a stations directly adjacent to the POTW discharge at Palo Alto (table 1, fig. 3). This study also provided perspective on the degree of the Cu and Ag contamination at the 1990-91 study site relative to other localities.

Another important conclusion from Cain and Luoma (1990) and Luoma and others (1985) was that concentrations of metals fluctuated on nearly monthly time scales in the Palo Alto mudflat environment. Thus frequent sampling within a year (at near monthly intervals) was necessary to characterize contamination for that year. The data presented in this report follow those procedures.

SAMPLING PROCEDURES

All samples were collected at low tide from the exposed mudflat. Sediment samples were scraped from the surface oxidized layers (1 -2 cm) of mudflat. Thus, these samples represent recently deposited sediments, or sediments affected by recent chemical reactions. Sediments were immediately returned to the laboratory in Menlo Park after collection. There they were sieved through 100 micrometer polyethylene mesh with ocean water adjusted to ambient salinity in order to remove large grains that might bias interpretation of concentrations. Previous studies have shown little difference between sieved and unsieved sediments in the silt-clay type sediment that predominates at this station, however. The sediments that passed through the sieve were allowed to settle overnight. The water was then decanted, leaving a slurry of sediment of particle size less than 100 micrometers. Subsamples of wet sediment were collected from the slurry using a pipette while swirling. Replicate subsamples were further washed to remove salts then dried to obtain a representative dry weight. Subsamples from different collections ranged from 67 to 176 milligrams in weight. Replicates agreed within 10 percent of mean sample weight. Replicate subsamples were digested for "total" metal analysis by refluxing in 10 milliliters of concentrated nitric acid until the digest was clear. Samples were then evaporated to dryness and reconstituted in dilute (5 percent) hydrochloric acid for analysis. The hydrochloric acid matrix was specifically chosen because it mobilizes Ag into solution through creation of Ag-chloro complexes. Another set of replicate samples was subjected to a partial weak acid extraction, as a crude chemical estimate of bioavailable metal. These subsamples were extracted for 2 hours with 10 ml of five percent hydrochloric acid at room temperature (Luoma and Bryan, 1981). The extract was then pressure filtered through a 0.45 micrometer membrane filter.

The deposit feeding clam *Macoma balthica* was collected simultaneously with the sediment samples. At least 20 individuals were collected at each sampling, and the range of sizes (shell width) was as wide as could be found in 5 person-hours of searching. Animals were returned to the laboratory and held for 48 hours in ocean water diluted to the ambient salinity at the time of sampling. This was done to depurate undigested material from their digestive tracts. After depuration the individual clams were separated into size classes (determined by differences of one millimeter shell length). Each size class was composited for a single sample, and soft tissues were removed. Samples for each date thus were composed of replicate composites, with each composite consisting of animals of a similar shell. Animal samples were dried, weighed and refluxed in concentrated nitric acid until

the digest was clear. Digests were then dried and reconstituted in dilute (5 percent) hydrochloric acid for analysis.

All metal analyses were conducted by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAPES). Selected tissue samples were also analyzed by Atomic Absorption Spectroscopy to compare with the results of ICAPES analysis. Data from the two types of analyses were not significantly different. Analyses of NBS reference materials (bovine liver, oyster tissue) were also routinely conducted to assure adequate recovery and accurate analyses. Values were all within the acceptable range reported by NBS.

RESULTS OF ANALYSES

Appendix 1 shows all sediment analyses, and Appendix 2 shows all metal analyses of clam tissues conducted in 1990 to 1991. Analytical data and detection limits also are shown for each sample to aid in verification of peaks. Statistical data associated with size influences on tissue concentrations, and content calculations are reported with summary statistics in Appendix 2.

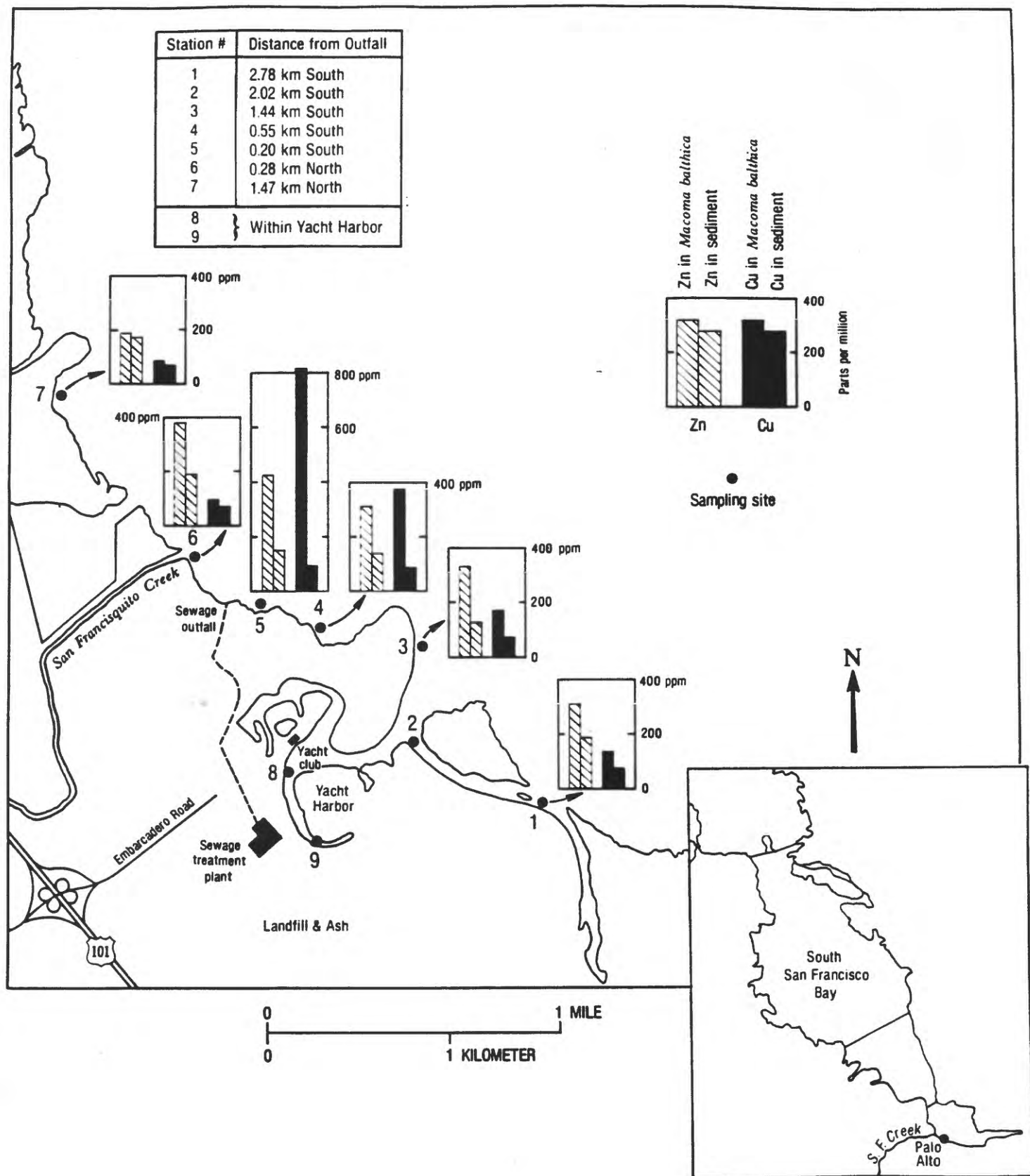
Figures 4 and 5 show monthly variability in mean silver and copper concentrations observed in clams from the study site between May 1990 and May 1991. These fluctuations are compared with fluctuations observed in the years 1981 to 1982 and 1977 to 1978. Tables 2 and 3 compare the 1990 with 1991 data to long-term temporal trends observed in the copper and silver concentrations of clams since 1977. These data are annual mean concentrations calculated from the 7 to 11 samples collected between May of one year and April of the next. Figures 6 and 7 illustrate the trends in these data. From these figures and tables the data collected in 1990-91 can be compared with earlier levels of contamination at this station.

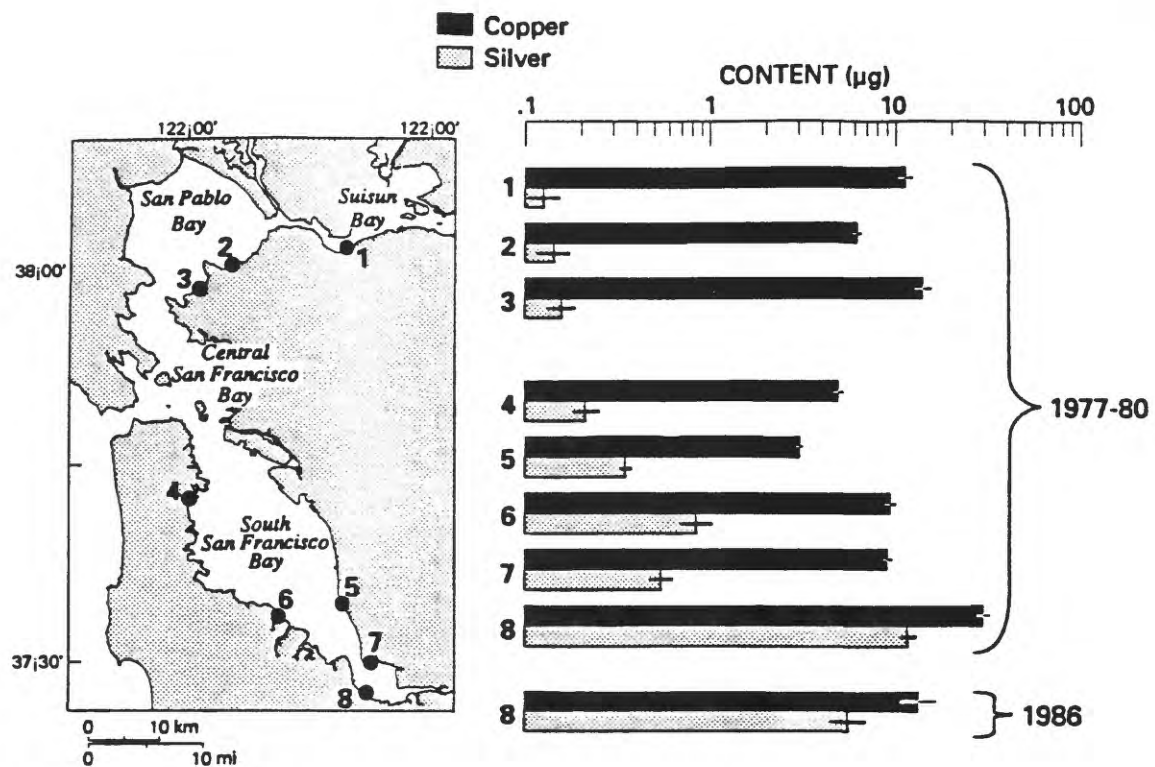
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LIST OF FIGURES

- Figure 1. Transect stations along the Palo Alto shoreline where sediments and clams (*Macoma balthica*) were collected by Thomson and others (1984). Vertical bars show concentrations of copper and zinc in micrograms per gram dry weight (parts per million), as indicated. Site 3 is the Palo Alto mudflat considered in the present report.
- Figure 2. Comparison of copper and silver content in micrograms (ug) per 20 mm *Macoma balthica* between seven stations in San Francisco Bay. Values are mean content from near monthly collections in 1977 to 1980, and mean content in 1986 for station 8 (the Palo Alto mudflat). Vertical bars are standard deviation. Figure from Cain and Luoma, 1990.
- Figure 3. Comparison of silver in clams (in micrograms per gram dry weight of soft tissue) between five stations in San Francisco Bay. One sample from each station was collected in June or July, 1989. PA is Palo Alto Mudflat (Station 3 in fig. 1); PA.Out is adjacent to the POTW discharge at Palo Alto (station 5 in fig. 1); SBE1 is from the eastern shore of South Bay near the Dumbarton Bridge (Station 7 in Figure 2); SBE2 is from the eastern shore of South Bay near the San Mateo Bridge (Station 5 in Figure 2); NBSP is from San Pablo Bay (Station 2 in Figure 2).
- Figure 4. Silver concentrations in clams (in micrograms per gram dry weight of soft tissues) as observed at near-monthly intervals between May and May in 1977 to 1978, 1981 to 1982 and 1990 to 1991. Numbers on x-axis indicate months of the year.
- Figure 5. Silver concentrations in clams (in micrograms per gram dry weight of soft tissues) as observed at near-monthly intervals between May and May in 1981 to 1982 and 1990 to 1991. Numbers on x-axis indicate months of the year.
- Figure 6. Annual mean concentrations of copper in clams (in micrograms per gram dry weight soft tissue) from May to May of each year from 1977-78 to 1990-91. Each annual mean is derived from seven to eleven collections at near-monthly intervals in each year.
- Figure 7. Annual mean concentrations of silver in clams (in micrograms per gram dry weight soft tissue) from May to May of each year from 1977-78 to 1990-91. Each annual mean is derived from seven to eleven collections at near-monthly intervals in each year.





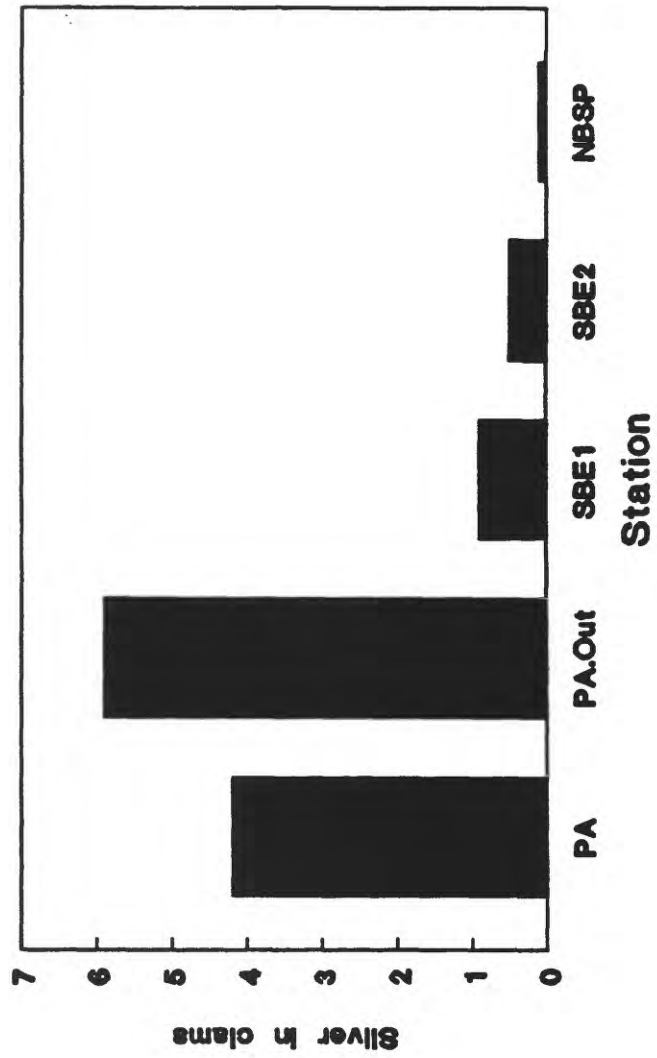
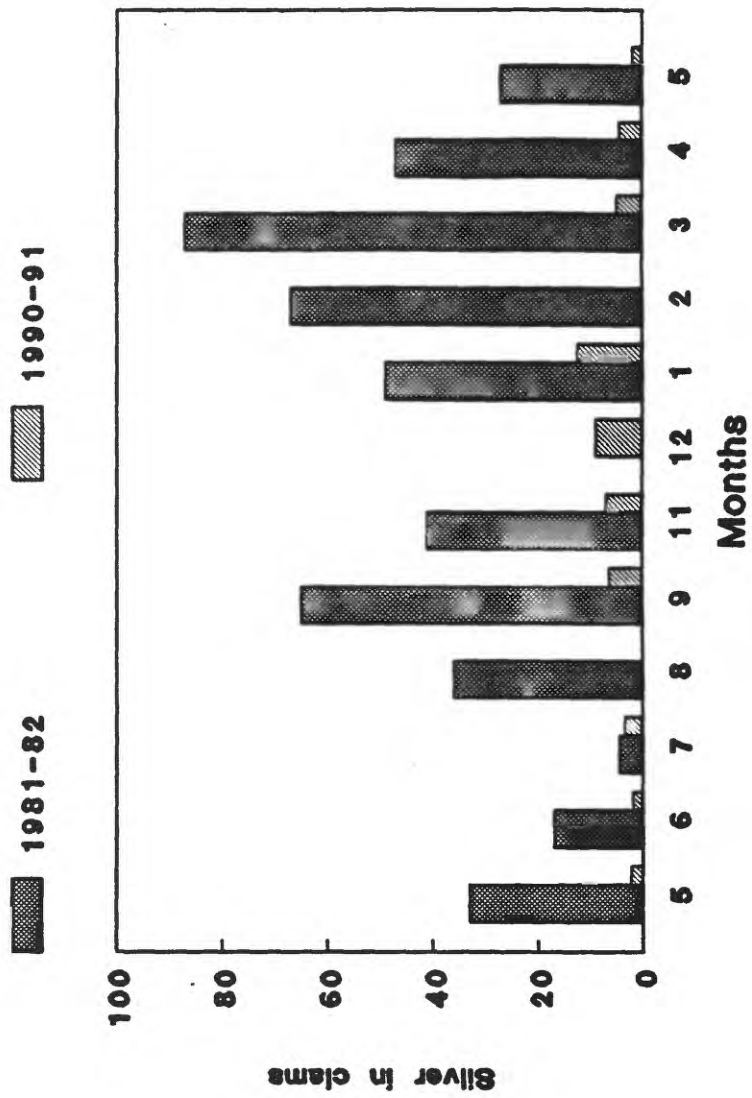


Fig. 5



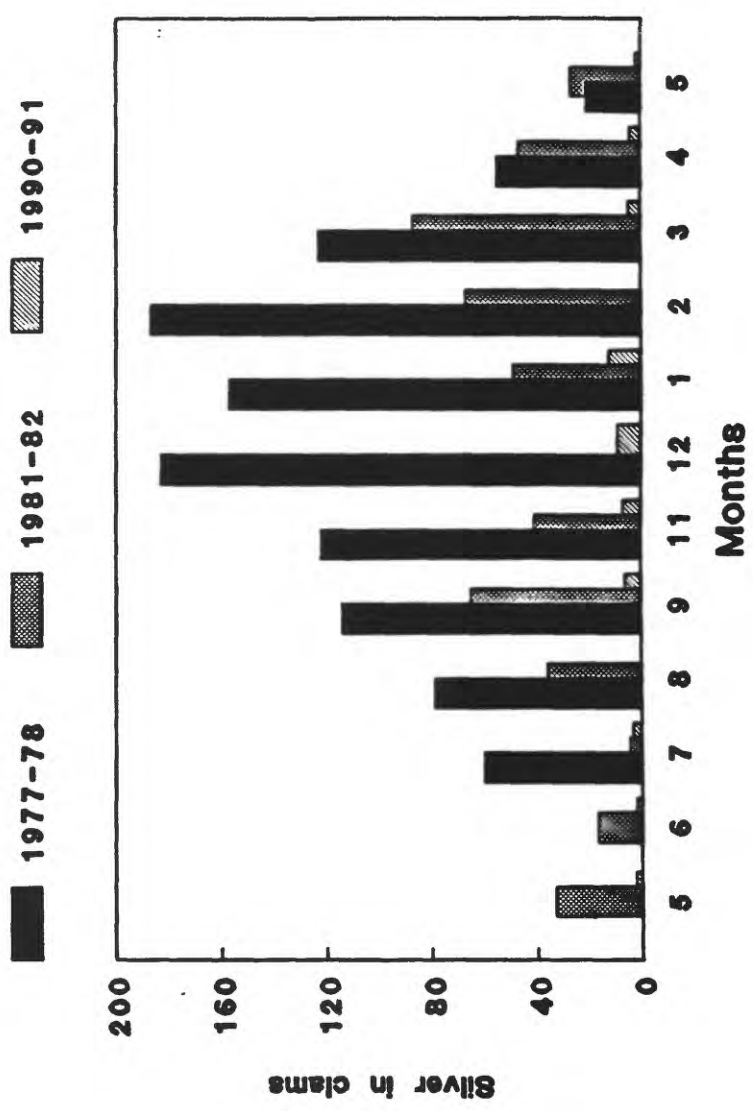
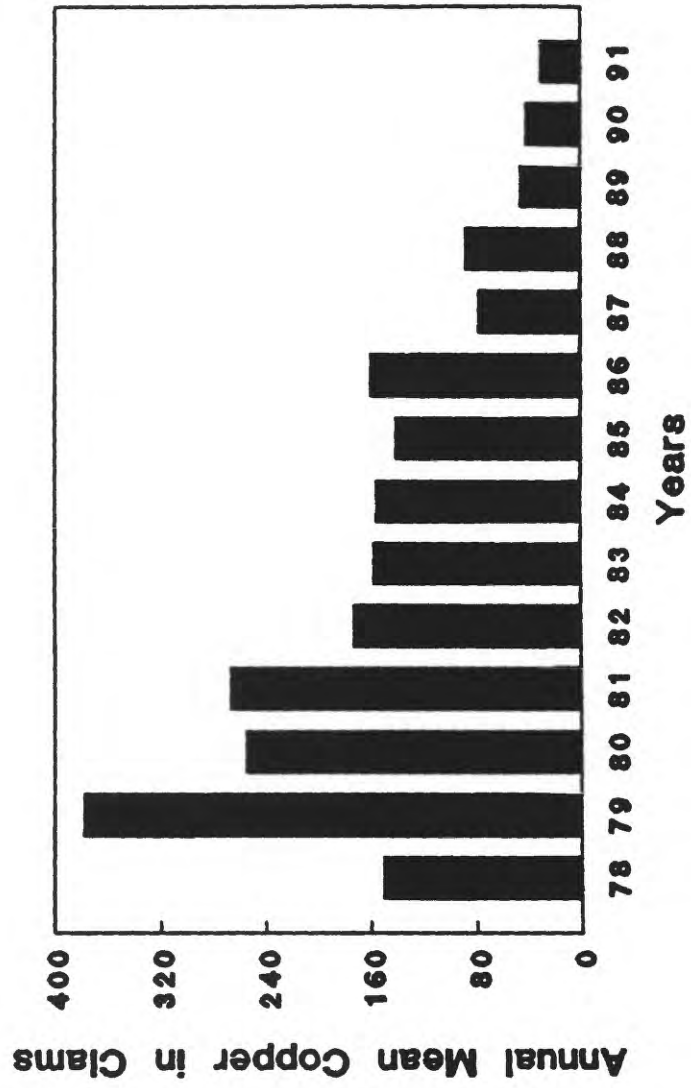


Fig. 6



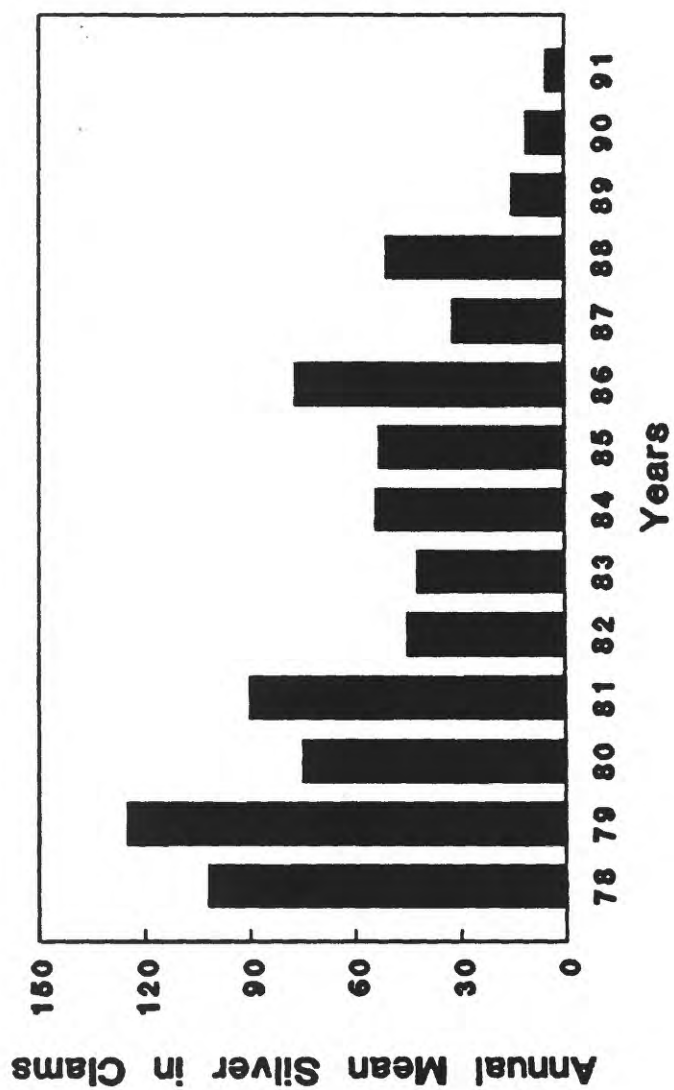


TABLE 1: Comparison of Cu and Ag in clams at seven Bay stations.

[Samples collected in June and July, 1989. All values in micrograms per gram dry tissue weight. Stations from Figure 1. PA outfall is adjacent to Palo Alto discharge, one kilometer north of Palo Alto mudflat monitoring station.]

Station	Copper		Silver	
	mean	standard deviation	mean	standard deviation
PA Mudflat	23	2	4.2	1.4
PA Outfall	39	9	5.9	1.9
East shore Dumbarton Bridge	31	2	0.9	0.1
East shore San Mateo Bridge	21	6	0.5	0.2
China Camp North San Pablo Bay	66	7	1.7	0.3
West Pinole Point South San Pablo Bay	34	2	1.3	0.2
East Pinole Point South San Pablo Bay	18	2	0.23	0.1

Table 2. Annual mean copper concentrations in clams and sediments: 1977 to 1991.

[Values are annual means from 7 to 12 collections per year and standard deviations. Units are microgram per gram dry weight of soft tissue for clams (*Macoma balthica*) and microgram per gram dry weight for sediment.]

Year (May to April)	Copper in sediment (micrograms per gram)		Copper in clams (micrograms per gram)
	HCl	Total	
1977 to 1978	38±16	56±20	151 ± 24
1978 to 1979	51±20	70±19	378 ± 104
1979 to 1980	50± 8	84±25	255 ± 124
1980 to 1981	46± 9	63±11	267 ± 107
1981 to 1982	43± 8	71±11	173 ± 63
1982 to 1983	31± 7	64±11	158 ± 62
1983 to 1984	29± 7	58± 8	156 ± 62
1984 to 1985	32±11	52± 8	141 ± 81
1985 to 1986	26± 4	51±12	160 ± 81
1986 to 1987	22± 4	48± 9	78 ± 28
1987 to 1988	23± 7	48±10	88 ± 48
1988 to 1989	27± 5	54± 6	46 ± 22
1989 to 1990	24± 3	47±12	42 ± 19
1990 to 1991	23± 4	53± 7	31 ± 13

Table 3. Annual mean silver concentrations in clams and sediments from Palo Alto mudflat: 1977 to 1991.

[Values are annual means from 7 to 12 collections per year and standard deviations. Units are microgram per gram dry weight of soft tissue for clams (*Macoma balthica*) and microgram per gram dry weight for sediment. Silver in sediment is from the hydrochloric acid extract. Mean for 1990 to 1991 silver in sediment was calculated from values where silver was above the instrumental level of detection.]

Year (May to April)	Silver in sediment (micrograms per gram)	Silver in clams (micrograms per gram)
1977 to 1978	1.44 \pm 0.92	102 \pm 47
1978 to 1979	1.44 \pm 0.51	125 \pm 49
1979 to 1980	1.58 \pm 0.30	75 \pm 51
1980 to 1981	1.27 \pm 0.21	90 \pm 41
1981 to 1982	1.29 \pm 0.36	45 \pm 24
1982 to 1983	0.82 \pm 0.14	42 \pm 26
1983 to 1984	0.73 \pm 0.22	54 \pm 26
1984 to 1985	0.75 \pm 0.13	53 \pm 24
1985 to 1986	0.71 \pm 0.24	77 \pm 44
1986 to 1987	0.62 \pm 0.21	32 \pm 18
1987 to 1988		51 \pm 36
1988 to 1989		15 \pm 9
1989 to 1990		10.5 \pm 6
1990 to 1991	0.38 \pm 0.12	5.3 \pm 3.3

APPENDIX 1. Metal concentrations in sediments collected at the Palo Alto mudflat. Each monthly collection is reported on a separate page. Concentrations observed in the reconstituted samples or extracts (in micrograms per milliliter or ug/ml) are reported at the top of each page, along with the sediment weight and dilution factor. The latter are employed to determine concentrations in sediments (reported as microgram per gram dry sediment or ug/g). Replicate subsamples were analyzed from each collection. Mean and standard deviation for the replicate samples are reported for the total and hydrochloric acid extracts.

Palo Alto 5/15/90

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.0675	10.50	HCl	0.000	0.000	0.057	0.156	54.91	5.377	0.070	0.207	0.106	0.409
			0.000	0.000	0.053	0.149	50.51	4.939	0.064	0.198	0.095	0.386
	11.00	Total	0.012	0.004	1.469	0.681	568.80	14.61	1.324	0.449	1.260	1.952
			0.010	0.006	1.549	0.716	598.40	15.33	1.390	0.451	1.342	2.046
		HCl	0.000	0.000	8.85	24.19	8541.6	836.4	10.92	32.14	16.41	63.68
			0.000	0.000	8.28	23.15	7857.1	768.3	9.91	30.75	14.81	60.01
		Total	0.937	0.326	119.70	55.46	46346.7	1190.4	107.88	36.58	102.67	159.05
			0.847	0.505	126.21	58.32	48758.5	1249.1	113.26	36.72	109.35	166.71
		HCl	0.000	0.000	8.56	23.67	8199.3	802.4	10.41	31.45	15.61	61.85
		STD	0.000	0.000	0.41	0.74	484.0	48.2	0.71	0.98	1.13	2.60
		Total	0.892	0.416	122.96	56.89	47552.6	1219.8	110.57	36.65	106.01	162.88
		STD	0.063	0.127	4.61	2.03	1705.4	41.5	3.80	0.10	4.72	5.42

Palo Alto 6-12-90

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.1057	10.50	HCl	0.003	0.000	0.068	0.180	68.78	4.148	0.097	0.265	0.124	0.552
			0.003	0.000	0.075	0.198	76.03	4.583	0.101	0.265	0.136	0.616
	11.00	Total	0.007	0.006	2.520	0.996	815.00	14.84	1.875	0.559	2.165	2.810
			0.008	0.007	2.602	1.019	831.70	15.14	1.917	0.571	2.278	2.890
		HCl	0.338	0.000	6.73	17.91	6832.5	412.1	9.63	26.31	12.28	54.83
			0.308	0.000	7.49	19.70	7552.6	455.3	10.00	26.36	13.54	61.21
		Total	0.380	0.297	131.13	51.84	42407.8	772.2	97.56	29.11	112.65	146.22
			0.395	0.385	135.39	53.02	43276.7	787.8	99.75	29.70	118.53	150.38
		HCl	0.323	0.000	7.11	18.80	7192.5	433.7	9.81	26.34	12.91	58.02
		STD	0.021	0.000	0.54	1.26	509.3	30.6	0.27	0.04	0.89	4.51
		Total	0.388	0.341	133.26	52.43	42842.2	780.0	98.66	29.40	115.59	148.30
		STD	0.011	0.063	3.02	0.84	614.5	11.0	1.55	0.42	4.16	2.94

Palo Alto 7-24-90 *Water was not decanted prior to drying. Sed wt high.

Sed Wt(g)*	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.1514	10.50	HCl	0.004	0.004	0.098	0.274	9.60E+01	9.010	0.133	0.354	0.177	0.705
			0.003	0.004	0.099	0.274	9.62E+01	8.974	0.137	0.362	0.177	0.756
	11.00	Total	0.000	0.013	3.581	1.277	1.22E+03	28.38	2.729	0.700	2.924	4.124
			0.000	0.008	3.475	1.242	1.23E+03	28.65	2.769	0.701	2.775	4.031
		HCl	0.257	0.277	6.80	19.00	6656.5	624.9	9.21	24.56	12.29	48.87
			0.201	0.277	6.88	19.02	6671.7	622.4	9.52	25.08	12.27	52.44
		Total	0.000	0.287	130.09	46.39	44356.0	1031.0	99.14	25.43	106.22	149.82
			0.000	ERR	126.24	45.12	44719.3	1040.8	100.59	25.47	100.81	146.44
		HCl	0.229	0.277	6.84	19.01	6664.1	623.6	9.36	24.82	12.28	50.65
			0.039	0.000	0.05	0.01	10.8	1.8	0.22	0.37	0.01	2.53
		Total	0.000	ERR	128.16	45.75	44537.6	1035.9	99.86	25.45	103.52	148.13
			0.000	ERR	2.72	0.90	256.9	6.9	1.03	0.03	3.83	2.39

Palo Alto 9-19-90

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.176	10.50	HCl	0.006	0.000	0.104	0.377	117.90	13.54	0.155	0.497	0.218	0.891
			0.006	0.000	0.098	0.346	110.60	12.43	0.148	0.452	0.202	0.833
11.00		Total	0.000	0.000	3.741	1.408	1346.00	33.21	3.041	1.096	3.061	4.553
		HCl	0.382	0.000	6.22	22.48	7033.8	807.8	9.27	29.66	13.02	53.13
			0.382	0.000	5.85	20.64	6598.3	741.6	8.84	26.99	12.08	49.68
		Total	0.000	0.000	116.91	44.00	42062.5	1037.8	95.03	34.25	95.66	142.28
		HCl	Mean	0.382	0.000	6.04	21.56	6816.1	9.06	28.33	12.55	51.41
			Stdv	0.000	0.000	0.26	1.30	308.0	0.30	1.89	0.67	2.44
		Total	Mean	0.000	0.000	116.91	44.00	42062.5	95.03	34.25	95.66	142.28
			Stdv	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR

Palo Alto 10-31-90

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.1397	10.50	HCl	0.008	0.000	0.076	0.249	75.05	12.15	0.098	0.296	0.131	0.583
			0.008	0.000	0.088	0.278	85.62	13.66	0.112	0.337	0.148	0.659
	11.00	Total	0.000	0.006	3.225	1.078	1192.00	41.25	2.743	0.783	2.180	3.953
			0.000	0.005	2.844	1.085	1045.00	36.13	2.415	0.734	2.151	3.522
		HCl	0.609	0.000	5.73	18.72	5640.8	913.2	7.37	22.23	9.87	43.81
			0.616	0.000	6.61	20.92	6435.3	1026.7	8.40	25.31	11.09	49.52
		Total	0.000	0.224	126.97	42.44	46929.1	1624.0	107.99	30.83	85.83	155.63
			0.000	0.201	111.97	42.72	41141.7	1422.4	95.08	28.90	84.69	138.66
		HCl	0.613	0.000	6.17	19.82	6038.1	970.0	7.89	23.77	10.48	46.67
		STD	0.005	0.000	0.63	1.56	561.8	80.3	0.73	2.18	0.86	4.04
		Total	0.000	0.213	119.47	42.58	44035.4	1523.2	101.54	29.86	85.26	147.15
		STD	0.000	0.017	10.61	0.19	4092.3	142.5	9.13	1.36	0.81	12.00

Palo Alto 12-17-90

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.0955	10.50	HCl	0.004	0.000	0.064	0.206	61.67	7.986	0.084	0.238	0.126	0.420
			0.004	0.000	0.066	0.220	65.90	8.547	0.085	0.266	0.132	0.461
	11.00	Total	0.000	0.000	2.306	0.924	758.30	22.260	1.805	0.576	2.110	2.669
			0.000	0.000	2.166	0.875	718.60	20.910	1.696	0.531	2.019	2.441
		HCl	0.418	0.000	7.08	22.63	6780.5	878.04	9.25	26.19	13.80	46.22
			0.407	0.000	7.23	24.19	7245.5	939.72	9.30	29.28	14.54	50.69
		Total	0.000	0.000	132.81	53.19	43671.7	1281.99	103.95	33.17	121.52	153.71
			0.000	0.000	124.74	50.39	41385.3	1204.24	97.68	30.59	116.28	140.58
		HCl	0.412	0.000	7.16	23.41	7013.0	908.88	9.27	27.73	14.17	48.45
		STD	0.008	0.000	0.11	1.10	328.9	43.61	0.04	2.18	0.52	3.16
		Total	0.000	0.000	128.77	51.79	42528.5	1243.12	100.81	31.88	118.90	147.15
		STD	0.000	0.000	5.70	1.98	1616.7	54.98	4.44	1.82	3.71	9.28

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.0889	10.50	HCl	0.003	0.000	0.054	0.218	58.38	8.801	0.079	0.265	0.129	0.464
			0.003	0.000	0.060	0.238	64.03	9.633	0.080	0.300	0.140	0.506
	11.00	Total	0.000	0.006	2.314	0.951	743.00	23.82	1.777	0.583	2.138	2.625
			0.000	0.005	2.359	0.972	750.80	24.13	1.802	0.552	2.189	2.690
		HCl	0.366	0.000	6.4016	25.724	6895.3	1039.5	9.283	31.346	15.248	54.744
			0.366	0.000	7.0276	28.157	7562.6	1137.8	9.4016	35.386	16.559	59.717
		Total	0.000	0.340	143.16	58.848	45967.4	1473.7	109.94	36.069	132.27	162.40
			0.000	0.303	145.94	60.135	46449.9	1492.9	111.48	34.120	135.43	166.42
		HCl	0.366	0.000	6.71	26.94	7228.9	1088.6	9.34	33.37	15.90	57.23
		STD	0.000	0.000	0.44	1.72	471.9	69.5	0.08	2.86	0.93	3.52
		Total	0.000	0.322	144.55	59.49	46208.7	1483.3	110.71	35.09	133.85	164.41
		STD	0.000	0.026	1.97	0.91	341.2	13.6	1.09	1.38	2.23	2.84

Palo Alto 3-5-91

Sed Wt (g)	Dilution(ml)	Extractant	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.0728	10.50	HCl	0.000	0.000	0.047	0.217	52.39	8.57	0.075	0.282	0.118	0.495
			0.000	0.000	0.046	0.212	51.32	8.43	0.075	0.275	0.117	0.484
	11.00	Total	0.000	0.009	1.688	0.851	609.30	19.70	1.499	0.513	1.493	2.294
			0.000	0.006	1.837	0.853	645.80	20.78	1.599	0.566	1.607	2.460
		HCl	0.000	0.000	6.81	31.23	7556.3	1236.6	10.77	40.63	17.02	71.37
			0.000	0.000	6.59	30.59	7401.9	1215.4	10.86	39.68	16.86	69.85
		Total	0.000	0.695	127.53	64.32	46032.3	1488.3	113.25	38.75	112.80	173.31
			0.000	0.416	138.78	64.47	48789.8	1569.9	120.80	42.78	121.41	185.85
		HCl	0.000	0.000	6.70	30.91	7479.1	1226.0	10.82	40.15	16.94	70.61
			0.000	0.000	0.15	0.45	109.1	15.0	0.06	0.67	0.11	1.07
		Total	0.000	0.555	133.16	64.39	47411.1	1529.1	117.03	40.77	117.10	179.58
			0.000	0.198	7.96	0.11	1949.9	57.7	5.34	2.85	6.09	8.87

Palo Alto 4-8-91

Sed Wt (g)	Dilution(ml)	Extractions	Ag	Cd	Cr	Cu	Fe	Mn	Ni	Pb	V	Zn
0.088	10.50	HCl	0.000	0.000	0.055	0.226	59.67	10.070	0.122	0.297	0.134	0.512
			0.000	0.000	0.051	0.214	57.02	9.619	0.074	0.288	0.125	0.484
11.00		Total	0.000	0.000	1.732	0.892	649.60	23.28	1.529	0.583	1.484	2.383
			0.000	0.000	1.854	0.890	686.90	24.74	1.637	0.653	1.587	2.511
		HCl	0.000	0.000	6.60	26.95	7119.7	1201.5	14.54	35.44	15.93	61.08
			0.000	0.000	6.07	25.58	6803.5	1147.7	8.88	34.32	14.88	57.70
		Total	0.000	0.000	108.25	55.73	40600.0	1455.0	95.56	36.41	92.75	148.94
			0.000	0.000	115.88	55.62	42931.3	1546.3	102.31	40.81	99.19	156.94
		HCl	0.000	0.000	6.34	26.27	6961.6	1174.6	11.71	34.88	15.40	59.39
			0.000	0.000	0.37	0.97	223.6	38.1	4.01	0.79	0.74	2.39
		Total	0.000	0.000	112.06	55.67	41765.6	1500.6	98.94	38.61	95.97	152.94
			0.000	0.000	5.39	0.08	1648.4	64.5	4.77	3.11	4.55	5.66

APPENDIX 2. Metal concentrations in the clam *Macoma balthica* collected at the Palo Alto Mudflat. Each monthly collection is reported on two pages. The first page contains summary statistics:

Mean concentrations in microgram per gram dry tissue weight (ug/g).

STD is the standard deviation of the mean.

SEM is the standard error of the mean.

CV percent is the coefficient of variation.

$r_{wt \times []}$ is the correlation coefficient for the concentration versus weight correlation for each element.

X 100mg is the concentration interpolated from the above regression for a 100 mg animal.

$r_{l \times []}$ is the correlation coefficient for the concentration versus shell length regression.

X 20 mm and X 25 mm are concentrations interpolated from the regression for 20mm and 25 mm animals.

Content (a measure of metal bioaccumulation that is independent of mass) is also shown for 20 and 25 mm animals, as is the weight determined for animals of 15 mm and 20 mm shell length.

The second page for each month shows each analysis of each composite sample, the number of animals composited in each, concentration as calculated from sample dry weight and the dilution factor and the metal content for each sample.

Macoma balthica 5-15-90

	Ag	Cu	Zn
Mean(ug/g)	2.3251	17.3701	137.888
STD	0.6079	2.0392	25.4983
SEM	0.203	0.680	8.499
CV%	26.144	11.740	18.492
r wt x []	0.371	0.600	0.598
X 100mg	2.317	17.327	137.354
r l x []	0.272	0.629	0.541
X 20mm	2.377	17.771	142.191
X 25mm	2.543	19.058	156.021

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cu	Zn
20mm	0.2477	1.9170	15.1612
25mm	0.5358	4.2670	33.9651

Estimated weight for 15mm clam

0.041 gm
41.285 mg

Estimated weight for 20mm clam

0.108 gm
107.848 mg

Macoma balthica 5-15-90

Sample #	Average Length (mm)	Total Dry Wt (gm)	Average Dry Wt (gm)	Recon Amt (ml)	Concentration (ug/ml) - Blank Corrected from ICP-AES							
					Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	25.1	0.2195	0.2195	5	0.0900			0.8100				5.4000
MB2-3	24.2	0.5865	0.1955	10	0.2200			1.1600				11.3000
MB3-3	22.0	0.5028	0.1676	10	0.1200			0.8900				8.5000
MB4-4	19.9	0.4464	0.1116	5	0.2000			1.6900				12.2000
MB5-5	18.6	0.4098	0.0820	5	0.1300			1.2100				10.3000
MB6-3	17.0	0.1828	0.0609	5	0.0800			0.7300				4.4000
MB7-3	15.3	0.1295	0.0432	5	0.0600			0.4200				3.2000
MB8-4	14.2	0.1347	0.0337	5	0.0500			0.4100				3.3000
MB9-2	9.7	0.0196	0.0098	5	0.0100			0.0600				0.5000
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
Sample #												
Concentration (ug/g) ==>					MB1-1	2.0501		18.4510				123.007
					MB2-3	3.7511		19.7783				192.668
					MB3-3	2.3866		17.7009				169.053
					MB4-4	2.2401		18.9292				136.649
					MB5-5	1.5861		14.7633				125.671
					MB6-3	2.1882		19.9672				120.350
					MB7-3	2.3166		16.2162				123.552
					MB8-4	1.8560		15.2190				122.494
					MB9-2	2.5510		15.3061				127.551
Sample #												
Content (ug) ==>					MB1-1	0.4500		4.0500				27.0000
					MB2-3	0.7333		3.8667				37.6667
					MB3-3	0.4000		2.9667				28.3333
					MB4-4	0.2500		2.1125				15.2500
					MB5-5	0.1301		1.2106				10.3050
					MB6-3	0.1333		1.2160				7.3293
					MB7-3	0.1001		0.7005				5.3375
					MB8-4	0.0625		0.5129				4.1281
					MB9-2	0.0250		0.1500				1.2500

Macoma balthica 6-12-90

	Ag	Cu	Zn
Mean(ug/g)	1.9293	19.7845	135.777
STD	0.3835	5.7523	29.7783
SEM	0.128	1.917	9.926
CV%	19.876	29.075	21.932
r wt x []	0.597	0.018	0.548
X 100mg	1.976	19.763	132.416
r l x []	0.390	0.362	0.612
X 20mm	1.989	18.951	128.481
X 25mm	2.140	16.843	110.035

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cu	Zn
20mm	0.1807	1.6669	11.5743
25mm	0.4433	3.5602	24.6367

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.031 gm
30.783 mg

0.093 gm
92.854 mg

Macoma balthica 6-12-90

Sample #	Average Length (mm)	Total Dry Wt (gm)	Average Dry Wt (gm)	Recon Amt (ml)	Concentration (ug/ml) - Blank Corrected from ICP-AES							
					Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	24.9	0.2296	0.2296	5	0.1200			1.2900				4.4000
MB2-2	22.3	0.2805	0.1403	5	0.1200			0.8600				7.8000
MB3-4	21.3	0.4876	0.1219	10	0.0900			0.7500				6.4000
MB4-4	20.4	0.3965	0.0991	5	0.1700			1.3600				13.0000
MB5-5	19.5	0.3790	0.0758	5	0.1000			1.0200				8.6000
MB6-5	17.4	0.2827	0.0563	5	0.0900			0.9300				5.8000
MB7-4	13.7	0.0837	0.0209	5	0.0300			0.3500				2.4000
MB8-3	12.6	0.0457	0.0152	5	0.0200			0.2000				1.3000
MB9-4	10.1	0.0289	0.0072	5	0.0100			0.1700				1.1000
Detection Lim					.003	.004	.005	.002	.01	.025	.001	.005
Sample #												
Concentration (ug/g) ==>					MB1-1	2.6132		28.0923				95.819
					MB2-2	2.1390		15.3298				139.037
					MB3-4	1.8458		15.3815				131.255
					MB4-4	2.1438		17.1501				163.934
					MB5-5	1.3193		13.4565				113.456
					MB6-5	1.5918		16.4485				102.582
					MB7-4	1.7921		20.9080				143.369
					MB8-3	2.1882		21.8818				142.232
					MB9-4	1.7301		29.4118				190.311
Sample #												
Content (ug) ==>					MB1-1	0.6000		6.4500				22.0000
					MB2-2	0.3001		2.1508				19.5070
					MB3-4	0.2250		1.8750				16.0000
					MB4-4	0.2124		1.6996				16.2459
					MB5-5	0.1000		1.0200				8.6000
					MB6-5	0.0899		0.9293				5.7959
					MB7-4	0.0375		0.4370				2.9964
					MB8-3	0.0333		0.3326				2.1619
					MB9-4	0.0125		0.2118				1.3702

Macoma balthica 7-24-90

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	3.2575	0.2640	0.8019	26.7352	5.5368	1.1115	1.2977	144.271
STD	1.4837	*	0.5475	9.4579	2.1876	*	0.7257	49.7590
SEM	0.447		0.165	2.852	0.660		0.219	15.003
CV%	45.546		68.277	35.376	39.511		55.918	34.490
r wt x []	0.549	n.d.	0.641	0.502	0.557	n.d.	0.653	0.464
X 100mg	3.068	n.d.	0.720	25.630	5.253	n.d.	1.187	138.889
r l x []	0.732	n.d.	0.814	0.718	0.779	n.d.	0.851	0.736
X 20mm	2.914	n.d.	0.661	24.586	4.997	n.d.	1.102	132.672
X 25mm	2.030	n.d.	0.298	19.062	3.611	n.d.	0.600	102.863

*Cd and Pb means are calculated by only one value each.

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.1958	n.d.	0.0356	1.6977	0.3420	n.d.	0.0695	9.0879
25mm	0.3638	n.d.	0.0550	3.2891	0.6413	n.d.	0.1175	17.3742

Estimated weight for 15mm clam

0.026 gm
26.290 mg

Estimated weight for 20mm clam

0.075 gm
74.986 mg

Macoma balthica 7-24-90

Sample # - n	Average Length (mm)	Total Dry Wt (gm)	Average Dry Wt (gm)	Recon Amt (ml)	Concentration (ug/ml) - Blank Corrected from ICP-AES							
					Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-2	27.9	0.4735	0.2368	10	0.1134	0.0125	0.0339	1.1773	0.2502	0.0526	0.0473	4.4930
MB2-1	25.0	0.2186	0.2186	10	0.0438	0.0052	0.0040	0.4527	0.0788	0.0125	0.0135	3.9174
MB3-2	23.6	0.2705	0.1358	10	0.0624	0.0073	0.0052	0.5228	0.0990	0.0282	0.0164	2.0817
MB4-2	21.2	0.1861	0.0931	10	0.0702	0.0052	0.0088	0.4096	0.0733	0.0376	0.0165	2.2968
MB5-4	20.2	0.3074	0.0769	10	0.0721	0.0052	0.0133	0.5885	0.1187	0.0244	0.0203	2.9797
MB6-4	18.2	0.1976	0.0494	10	0.0447	0.0052	0.0119	0.4426	0.0988	0.0240	0.0188	2.1682
MB7-3	16.1	0.0927	0.0309	10	0.0183	0.0021	0.0038	0.1270	0.0375	0.0114	0.0108	1.2225
MB8-7	14.4	0.1319	0.0188	10	0.0365	0.0052	0.0181	0.4615	0.0853	0.0247	0.0219	2.0247
MB9-5	12.6	0.0721	0.0144	10	0.0317	0.0042	0.0095	0.2668	0.0464	0.0157	0.0134	1.3356
MB10-9	10.3	0.0627	0.0070	10	0.0397	0.0052	0.0088	0.2388	0.0512	0.0056	0.0122	1.3426
MB11-8	9.1	0.0375	0.0047	10	0.0198	0.0031	0.0065	0.1570	0.0392	0.0120	0.0110	0.8291
Detection Limit					0.003	0.005	0.004	0.002	0.010	0.026	0.002	0.004
Sample #												
Concentration (ug/g) ==>					MB1-2	2.3949	0.2640	0.7155	24.8634	5.2838	1.1115	94.888
					MB2-1	2.0055		0.1848	20.7100	3.6061		179.202
					MB3-2	2.3083		0.1919	19.3264	3.6603		76.959
					MB4-2	3.7743		0.4707	22.0097	3.9387		123.420
					MB5-4	2.3439		0.4330	19.1435	3.8621		96.932
					MB6-4	2.2627		0.6043	22.3993	4.9985		109.726
					MB7-3	1.9784		0.4110	13.6990	4.0442		131.873
					MB8-7	2.7635		1.3707	34.9871	6.4685		153.501
					MB9-5	4.3939		1.3107	37.0014	6.4327		185.248
					MB10-9	6.3381		1.3971	38.0893	8.1643		214.123
					MB11-8	5.2693		1.7307	41.8587	10.4453		221.104
Sample #												
Content (ug) ==>					MB1-2	0.5671	0.0625	0.1694	5.8876	1.2512	0.2632	22.4695
					MB2-1	0.4384	0.0000	0.0404	4.5272	0.7883	0.0000	39.1736
					MB3-2	0.3135	0.0000	0.0261	2.6245	0.4971	0.0000	10.4510
					MB4-2	0.3514	0.0000	0.0438	2.0491	0.3667	0.0000	11.4904
					MB5-4	0.1802	0.0000	0.0333	1.4721	0.2970	0.0000	7.4541
					MB6-4	0.1118	0.0000	0.0299	1.1065	0.2469	0.0000	5.4205
					MB7-3	0.0611	0.0000	0.0127	0.4233	0.1250	0.0000	4.0749
					MB8-7	0.0520	0.0000	0.0258	0.6578	0.1216	0.0000	2.8858
					MB9-5	0.0633	0.0000	0.0189	0.5328	0.0926	0.0000	2.6676
					MB10-9	0.0444	0.0000	0.0098	0.2666	0.0571	0.0000	1.4989
					MB11-8	0.0248	0.0000	0.0081	0.1967	0.0491	0.0000	1.0392

Macoma balthica 9-19-90

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	6.3215	B.D.	1.5725	24.9977	6.3299	B.D.	1.7140	200.489
STD	2.017		0.338	8.559	1.490		0.505	54.961
SEM	0.713		0.138	3.026	0.527		0.179	19.432
CV%	31.909		21.465	34.239	23.533		29.477	27.414
r wt x []	0.951	n.d.	0.872	0.732	0.875	n.d.	0.606	0.760
X 100mg	0.541	n.d.	0.488	6.129	2.402	n.d.	0.792	74.673
r l x []	0.870	n.d.	0.797	0.633	0.830	n.d.	0.456	0.849
X 20mm	4.289	n.d.	1.199	18.717	4.898	n.d.	1.447	146.405
X 25mm	2.166	n.d.	0.815	12.157	3.402	n.d.	1.169	89.921

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.2464	n.d.	0.0718	1.0708	0.2824	n.d.	0.0789	8.7239
25mm	0.3951	n.d.	0.1254	1.8345	0.4904	n.d.	0.1422	14.8858

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.023 gm
22.920 mg

0.058 gm
58.051 mg

Macoma balthica 9-19-90

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES								
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn	
MB1-2	20.8	0.1315	0.0658	10	0.0418	0.0052	0.0027	0.2580	0.0687	0.0127	0.0092	2.0585	
MB2-2	20.1	0.1162	0.0581	10	0.0409	-0.0010	0.0136	0.1580	0.0389	0.0158	0.0195	2.0407	
MB3-3	17.4	0.1278	0.0426	10	0.0690	0.0052	0.0164	0.2166	0.0728	0.0180	0.0220	1.8398	
MB4-3	16.4	0.0889	0.0296	10	0.0651	0.0052	0.0124	0.2179	0.0608	0.0096	0.0162	1.3730	
MB5-4	14.3	0.0678	0.0170	10	0.0549	0.0063	0.0138	0.2654	0.0500	0.0041	0.0171	1.2222	
MB6-7	11.8	0.0713	0.0102	10	0.0566	0.0042	0.0131	0.2442	0.0555	0.0010	0.0141	1.8231	
MB7-7	10.9	0.0623	0.0089	10	0.0485	0.0042	0.0107	0.1664	0.0433	-0.0015	0.0108	1.7744	
MB8-6	10.0	0.0369	0.0062	10	0.0270	0.0010	0.0031	0.0930	0.0274	0.0012	0.0058	0.9320	
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005	
				Sample #									
				Concentration (ug/g) ==>	MB1-2	3.1802		19.6213	5.2266		0.6981	156.539	
					MB2-2	3.5215	1.1721	13.5955	3.3503		1.6738	175.621	
					MB3-3	5.4006	1.2864	16.9476	5.6980		1.7238	143.959	
					MB4-3	7.3183	1.3993	24.5152	6.8391		1.8211	154.447	
					MB5-4	8.1018	2.0310	39.1490	7.3732		2.5221	180.268	
					MB6-7	7.9355	1.8317	34.2511	7.7854		1.9734	255.687	
					MB7-7	7.7865	1.7143	26.7095	6.9438		1.7303	284.814	
					MB8-6	7.3279		25.1924	7.4228		1.5691	252.580	
				Sample #									
				Content (ug) ==>	MB1-2	0.2093	0.0000	0.0000	1.2911	0.3439	0.0000	0.0459	10.3003
					MB2-2	0.2046	0.0000	0.0681	0.7899	0.1947	0.0000	0.0973	10.2036
					MB3-3	0.2301	0.0000	0.0548	0.7220	0.2427	0.0000	0.0734	6.1327
					MB4-3	0.2166	0.0000	0.0414	0.7256	0.2024	0.0000	0.0539	4.5716
					MB5-4	0.1377	0.0000	0.0345	0.6655	0.1253	0.0000	0.0429	3.0646
					MB6-7	0.0809	0.0000	0.0187	0.3494	0.0794	0.0000	0.0201	2.6080
					MB7-7	0.0693	0.0000	0.0153	0.2377	0.0618	0.0000	0.0154	2.5348
					MB8-6	0.0454	0.0000	0.0000	0.1562	0.0460	0.0000	0.0097	1.5660

Macoma balthica 10-31-90

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	6.9623	0.4647	2.1867	45.4253	5.6839	2.7290	2.1415	174.711
STD	3.7817	0.1590	2.0418	13.5007	1.0628	0.9227	1.5636	70.6178
SEM	1.261	0.053	0.681	4.500	0.354	0.308	0.521	23.539
CV%	54.317	34.219	93.373	29.721	18.698	33.811	73.013	40.420
r wt x []	0.598	0.654	0.408	0.788	0.195	0.208	0.384	0.905
X 100mg	4.570	0.355	3.067	34.175	5.904	2.527	2.777	107.120
r l x []	0.580	0.671	0.360	0.805	0.063	0.239	0.349	0.971
X 20mm	5.957	0.416	2.524	40.448	5.714	2.628	2.392	143.301
X 25mm	4.056	0.323	3.161	31.039	5.772	2.437	2.865	83.913

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.2802	0.0218	0.1132	2.1318	0.3148	0.1373	0.1171	7.1476
25mm	0.4811	0.0406	0.2876	3.9229	0.6787	0.2764	0.2870	11.7742

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.021 gm
20.853 mg

0.056 gm
56.252 mg

Macoma balthica 10-31-90

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	25.4	0.1422	0.1422	5	0.0963	0.0111	0.0589	0.7203	0.1606	0.0476	0.0536	2.8257
BM2-1	23.8	0.0814	0.0814	5	0.1538	0.0050	0.0228	0.6934	0.0846	0.0363	0.0257	1.3379
MB3-2	21.9	0.1829	0.0915	5	0.1098	0.0091	0.2735	1.5237	0.2974	0.1624	0.2275	3.7153
MB4-3	20.3	0.1684	0.0561	5	0.1177	0.0121	0.0331	1.2200	0.1361	0.0541	0.0435	4.8296
MB5-3	17.7	0.1203	0.0401	5	0.1089	0.0141	0.0604	0.7535	0.1335	0.0799	0.0569	4.1692
MB6-8	13.4	0.1018	0.0127	5	0.1415	0.0111	0.0277	1.2200	0.1101	0.0522	0.0312	4.6367
MB7-7	12.3	0.0708	0.0101	5	0.1912	0.0101	0.0147	0.8990	0.0816	0.0329	0.0194	3.5982
MB8-9	11.4	0.0720	0.0080	5	0.1630	0.0091	0.0219	0.7012	0.0814	0.0514	0.0234	3.6832
MB9-9	10.0	0.0505	0.0056	5	0.0710	0.0040	0.0134	0.6020	0.0582	0.0287	0.0142	2.3734
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
		Concentration (ug/g) ==>		MB1-1	3.3854	0.3903	2.0707	25.3284	5.6470	1.6730	1.8847	99.356
				BM2-1	9.4466	0.3096	1.3980	42.5921	5.1984	2.2273	1.5786	82.179
				MB3-2	3.0003	0.2482	7.4759	41.6539	8.1312	4.4385	6.2195	101.567
				MB4-3	3.4958	0.3596	0.9822	36.2227	4.0407	1.6054	1.2919	143.396
				MB5-3	4.5241	0.5873	2.5083	31.3171	5.5466	3.3196	2.3645	173.283
				MB6-8	6.9519	0.5452	1.3595	59.9204	5.4067	2.5643	1.5319	227.738
				MB7-7	13.5042	0.7126	1.0388	63.4901	5.7634	2.3249	1.3729	254.109
				MB8-9	11.3194	0.6306	1.5222	48.6951	5.6549	3.5708	1.6264	255.779
				MB9-9	7.0327	0.3990	1.3248	59.6079	5.7663	2.8376	1.4030	234.992
				Sample #								
		Content (ug) ==>		MB1-1	0.4814	0.0555	0.2945	3.6017	0.8030	0.2379	0.2680	14.1285
				BM2-1	0.7690	0.0252	0.1138	3.4670	0.4232	0.1813	0.1285	6.6894
				MB3-2	0.2745	0.0227	0.6840	3.8113	0.7440	0.4061	0.5691	9.2934
				MB4-3	0.1961	0.0202	0.0551	2.0321	0.2267	0.0901	0.0725	8.0445
				MB5-3	0.1814	0.0236	0.1006	1.2558	0.2224	0.1331	0.0948	6.9487
				MB6-8	0.0883	0.0069	0.0173	0.7610	0.0687	0.0326	0.0195	2.8923
				MB7-7	0.1364	0.0072	0.0105	0.6413	0.0582	0.0235	0.0139	2.5665
				MB8-9	0.0906	0.0050	0.0122	0.3896	0.0452	0.0286	0.0130	2.0462
				MB9-9	0.0394	0.0022	0.0074	0.3338	0.0323	0.0159	0.0079	1.3160

Macoma balthica 12-17-90

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	8.9910	0.5067	3.7991	40.1524	7.0964	3.5111	2.7052	193.046
STD	3.7991	0.0512	0.8694	9.6400	1.2144	0.5736	0.6107	62.4056
SEM	1.266	0.030	0.290	3.213	0.405	0.191	0.204	20.802
CV%	42.254	10.109	22.885	24.008	17.113	16.337	22.576	32.327
r wt x []	0.700	n.d.	0.658	0.573	0.638	0.687	0.509	0.889
X 100mg	5.883	n.d.	3.130	33.693	6.191	3.050	2.342	128.231
r l x []	0.853	n.d.	0.722	0.773	0.739	0.705	0.444	0.918
X 20mm	7.573	n.d.	3.525	36.890	6.704	3.334	2.587	167.981
X 25mm	4.738	n.d.	2.976	30.366	5.919	2.980	2.349	117.850

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.3437	n.d.	0.1712	1.7829	0.3306	0.1650	0.1265	7.8451
25mm	0.5580	n.d.	0.3173	3.2508	0.6291	0.3168	0.2451	13.2306

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.020 gm
19.768 mg

0.051 gm
50.892 mg

Macoma balthica 12-17-90

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	26.0	0.1353	0.1353	5	0.1794	0.0123	0.0889	1.1194	0.1908	0.0833	0.0637	3.0468
MB2-2	24.1	0.2034	0.1017	5	0.2176	0.0076	0.0918	1.1381	0.1837	0.0951	0.0663	4.6109
MB3-2	21.8	0.1345	0.0673	5	0.1431	0.0057	0.1050	0.6841	0.1788	0.1033	0.0808	3.5851
MB4-3	19.9	0.1269	0.0423	5	0.1393	0.0038	0.1010	0.8921	0.1732	0.0910	0.0847	5.5615
MB5-3	16.7	0.0771	0.0257	5	0.0969	0.0047	0.0437	0.5840	0.1032	0.0542	0.0312	2.5279
MB6-8	14.6	0.1294	0.0162	5	0.3415	0.0057	0.1068	1.1406	0.2004	0.0864	0.0828	6.1656
MB7-6	12.7	0.0764	0.0127	5	0.1987	0.0085	0.0648	0.7098	0.1146	0.0541	0.0414	3.5411
MB8-11	11.4	0.0878	0.0080	5	0.2326	0.0028	0.0895	0.8334	0.1566	0.0711	0.0600	4.6700
MB9-12	10.3	0.0744	0.0062	5	0.1845	0.0076	0.0665	0.8272	0.1188	0.0641	0.0399	3.8569
				Detection Limit	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
		Concentration (ug/g) ==>		MB1-1	6.6308	0.4545	3.2860	41.3688	7.0503	3.0798	2.3522	112.593
				MB2-2	5.3491		2.2566	27.9759	4.5147	2.3385	1.6286	113.345
				MB3-2	5.3182		3.9041	25.4323	6.6461	3.8398	3.0022	133.276
				MB4-3	5.4894		3.9795	35.1481	6.8223	3.5871	3.3353	219.128
				MB5-3	6.2821		2.8353	37.8716	6.6907	3.5162	2.0220	163.939
				MB6-8	13.1971		4.1252	44.0726	7.7415	3.3385	3.1998	238.240
				MB7-6	13.0039	0.5569	4.2415	46.4535	7.5013	3.5419	2.7081	231.744
				MB8-11	13.2483		5.0968	47.4590	8.9203	4.0484	3.4146	265.948
				MB9-12	12.3999	0.5087	4.4671	55.5894	7.9805	4.3098	2.6841	259.200
				Sample #								
		Content (ug) ==>		MB1-1	0.8972	0.0615	0.4446	5.5972	0.9539	0.4167	0.3183	15.2339
				MB2-2	0.5440	0.0000	0.2295	2.8452	0.4592	0.2378	0.1656	11.5272
				MB3-2	0.3579	0.0000	0.2627	1.7116	0.4473	0.2584	0.2021	8.9695
				MB4-3	0.2322	0.0000	0.1683	1.4868	0.2886	0.1517	0.1411	9.2691
				MB5-3	0.1615	0.0000	0.0729	0.9733	0.1720	0.0904	0.0520	4.2132
				MB6-8	0.2138	0.0000	0.0668	0.7140	0.1254	0.0541	0.0518	3.8595
				MB7-6	0.1651	0.0071	0.0539	0.5900	0.0953	0.0450	0.0344	2.9432
				MB8-11	0.1060	0.0000	0.0408	0.3797	0.0714	0.0324	0.0273	2.1276
				MB9-12	0.0769	0.0032	0.0277	0.3447	0.0495	0.0267	0.0166	1.6070

Macoma balthica 1-28-91

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	12.3976	0.2807	3.2658	58.0583	7.6213	3.4032	2.6493	268.840
STD	5.8741	0.0594	0.8162	21.3704	1.3060	0.5052	0.7572	73.9805
SEM	2.077	0.042	0.289	7.556	0.462	0.253	0.268	26.156
CV%	47.381	21.162	24.991	36.809	17.136	14.846	28.582	27.518
r wt x []	0.037	n.d.	0.044	0.387	0.042	0.924	0.386	0.326
X 100mg	12.618	n.d.	3.303	49.650	7.566	3.230	2.947	244.297
r l x []	0.250	n.d.	0.031	0.515	0.137	0.950	0.428	0.473
X 20mm	11.720	n.d.	3.278	52.982	7.539	3.539	2.799	252.724
X 25mm	10.631	n.d.	3.297	44.826	7.406	3.162	3.039	226.836

*only two values for Cd

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.4258	n.d.	0.1461	2.1692	0.3358	0.1482	0.1259	10.6515
25mm	0.7413	n.d.	0.2980	3.8458	0.6669	0.2884	0.2755	19.5501

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.018 gm
18.350 mg

0.045 gm
45.310 mg

Macoma balthica 1-28-91

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amnt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	30.0	0.1720	0.1720	5	0.6021	0.0111	0.1089	1.7412	0.2763	0.0976	0.1053	8.9648
MB2-2	23.1	0.1479	0.0740	5	0.1358	0.0071	0.1130	0.9642	0.1904	0.0922	0.1002	4.2041
MB4-2	19.0	0.0689	0.0345	5	0.0663	0.0020	0.0483	0.5425	0.0990	0.0523	0.0428	3.4730
MB5-3	15.1	0.0487	0.0162	5	0.1035	0.0050	0.0250	0.8435	0.0745	0.0376	0.0219	2.2238
MB6-3	13.3	0.0371	0.0124	5	0.0801	0.0000	0.0226	0.3627	0.0728	0.0241	0.0164	2.6423
MB7-3	12.5	0.0375	0.0125	5	0.0993	-0.0030	0.0208	0.3326	0.0464	0.0194	0.0127	2.8264
MB8-4	11.6	0.0314	0.0079	5	0.1054	0.0050	0.0148	0.5142	0.0413	0.0077	0.0112	1.5403
MB9-5	10.5	0.0305	0.0061	5	0.1271	0.0010	0.0299	0.4891	0.0556	0.0320	0.0225	1.7654
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
		Concentration (ug/g) ==>		MB1-1	17.5032	0.3227	3.1663	50.6157	8.0328	2.8372	3.0613	260.605
				MB2-2	4.5906	0.2387	3.8195	32.5974	6.4361	3.1180	3.3857	142.125
				MB4-2	4.8084		3.5029	39.3672	7.1814	3.7983	3.1081	252.033
				MB5-3	10.6211		2.5667	86.6016	7.6437	3.8593	2.2526	228.315
				MB6-3	10.7978		3.0391	48.8854	9.8059		2.2143	356.106
				MB7-3	13.2333		2.7707	44.3400	6.1827		1.6907	376.859
				MB8-4	16.7882		2.3583	81.8758	6.5732		1.7898	245.263
				MB9-5	20.8377		4.9033	80.1836	9.1148		3.6918	289.411
				Sample #								
		Content (ug) ==>		MB1-1	3.0106	0.0555	0.5446	8.7059	1.3817	0.4880	0.5266	44.8240
				MB2-2	0.3397	0.0177	0.2826	2.4122	0.4763	0.2307	0.2505	10.5173
				MB4-2	0.1659	0.0000	0.1209	1.3582	0.2478	0.1310	0.1072	8.6951
				MB5-3	0.1721	0.0000	0.0416	1.4029	0.1238	0.0625	0.0365	3.6987
				MB6-3	0.1339	0.0000	0.0377	0.6062	0.1216	0.0000	0.0275	4.4157
				MB7-3	0.1654	0.0000	0.0346	0.5543	0.0773	0.0000	0.0211	4.7107
				MB8-4	0.1326	0.0000	0.0186	0.6468	0.0519	0.0000	0.0141	1.9376
				MB9-5	0.1271	0.0000	0.0299	0.4891	0.0556	0.0000	0.0225	1.7654

Macoma balthica 3-5-91

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	4.7812	0.2645	1.1810	25.2928	4.0201	1.3242	1.1834	200.505
STD	1.0217	0.0552	0.4563	3.2606	0.5973	0.1572	0.1742	34.7647
SEM	0.341	0.032	0.152	1.087	0.199	0.070	0.058	11.588
CV%	21.369	20.878	38.633	12.891	14.859	11.869	14.722	17.339
r wt x []	0.581	0.544	0.974	0.359	0.618	0.073	0.821	0.679
X 100mg	3.974	-0.117	0.576	26.887	3.518	1.292	0.989	168.376
r l x []	0.551	0.671	0.945	0.360	0.594	0.101	0.768	0.577
X 20mm	4.351	0.020	0.852	26.190	3.749	1.302	1.081	185.183
X 25mm	3.820	-0.174	0.445	27.300	3.414	1.279	0.955	166.241

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.2914	0.0108	0.0492	1.7779	0.2493	0.0873	0.0725	12.3057
25mm	0.4913	0.0144	0.0647	3.3398	0.4240	0.1557	0.1219	20.8283

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.031 gm
31.476 mg

0.069 gm
68.558 mg

Macoma balthica 3-5-91

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	24.7	0.1115	0.1115	5	0.0870	0.0086	0.0106	0.6506	0.0952	0.0236	0.0219	3.9497
MB2-1	22.4	0.1035	0.1035	5	0.0746	0.0024	0.0089	0.4888	0.0549	0.0338	0.0176	2.5297
MB3-3	21.1	0.2258	0.0753	5	0.2199	0.0086	0.0409	1.3370	0.1657	0.0601	0.0536	9.8123
MB4-9	14.6	0.2899	0.0322	5	0.2441	0.0149	0.0858	1.3126	0.2369	0.0795	0.0722	12.4583
MB5-10	13.8	0.2569	0.0257	5	0.2576	0.0110	0.0772	1.0642	0.2143	0.0546	0.0699	11.3411
MB6-10	12.7	0.2061	0.0206	5	0.1905	0.0133	0.0613	1.0088	0.1627	0.0566	0.0555	8.8546
MB7-12	12.2	0.2005	0.0167	5	0.2199	0.0063	0.0535	0.8947	0.1655	0.0595	0.0446	9.6438
MB8-9	11.6	0.1370	0.0152	5	0.1926	0.0078	0.0424	0.7380	0.1262	0.0242	0.0341	5.7651
MB9-10	10.5	0.1189	0.0119	5	0.1023	0.0086	0.0349	0.6699	0.1107	0.0408	0.0316	4.4380
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
		Concentration (ug/g) ==>		MB1-1	3.9022		0.4753	29.1749	4.2709		0.9821	177.115
				MB2-1	3.6024		0.4290	23.6135	2.6498		0.8498	122.209
				MB3-3	4.8682		0.9057	29.6050	3.6685	1.3299	1.1858	217.279
				MB4-9	4.2102	0.2568	1.4800	22.6380	4.0861	1.3715	1.2444	214.873
				MB5-10	5.0138	0.2135	1.5033	20.7120	4.1715	1.0625	1.3605	220.729
				MB6-10	4.6220	0.3231	1.4859	24.4740	3.9459	1.3724	1.3462	214.812
				MB7-12	5.4828		1.3349	22.3120	4.1274	1.4845	1.1115	240.495
				MB8-9	7.0288		1.5464	26.9350	4.6073		1.2442	210.404
				MB9-10	4.2998		1.4685	28.1707	4.6535		1.3267	186.625
				Sample #								
		Content (ug) ==>		MB1-1	0.4351	0.0000	0.0530	3.2530	0.4762	0.0000	0.1095	19.7483
				MB2-1	0.3729	0.0000	0.0444	2.4440	0.2743	0.0000	0.0880	12.6486
				MB3-3	0.3666	0.0000	0.0682	2.2293	0.2762	0.1001	0.0893	16.3611
				MB4-9	0.1356	0.0083	0.0477	0.7289	0.1316	0.0442	0.0401	6.9189
				MB5-10	0.1289	0.0055	0.0386	0.5323	0.1072	0.0273	0.0350	5.6727
				MB6-10	0.0952	0.0067	0.0306	0.5042	0.0813	0.0283	0.0277	4.4251
				MB7-12	0.0916	0.0000	0.0223	0.3726	0.0689	0.0248	0.0186	4.0163
				MB8-9	0.1068	0.0000	0.0235	0.4094	0.0700	0.0000	0.0189	3.1981
				MB9-10	0.0512	0.0000	0.0175	0.3352	0.0554	0.0000	0.0158	2.2208

Macoma balthica 4-8-91

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	4.3358	0.2125	1.7092	29.7036	4.5082	1.6417	1.9946	217.106
STD	1.5147	0.0333	0.7971	6.4935	0.7858	0.4187	1.1824	30.3478
SEM	0.505	0.011	0.266	2.165	0.262	0.140	0.394	10.116
CV%	34.935	15.658	46.636	21.861	17.431	25.506	59.279	13.978
r wt x []	0.334	0.233	0.092	0.616	0.147	0.111	0.270	0.119
X 100mg	4.399	0.212	1.700	30.200	4.494	1.636	1.955	216.658
r l x []	0.314	0.189	0.077	0.584	0.131	0.065	0.239	0.040
X 20mm	4.268	0.213	1.718	29.165	4.523	1.646	2.035	217.277
X 25mm	4.679	0.208	1.665	32.439	4.434	1.622	1.791	216.238

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.2921	0.0148	0.1098	2.0490	0.3131	0.1125	0.1262	15.1305
25mm	0.5769	0.0272	0.2020	4.1888	0.5823	0.2124	0.2264	28.3757

Estimated weight for 15mm clam

Estimated weight for 20mm clam

0.031 gm
30.960 mg

0.070 gm
70.319 mg

Macoma balthica 4-8-91

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amnt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-2	27.2	0.3215	0.1608	5	0.5185	0.0165	0.1594	2.5862	0.3360	0.1299	0.1443	15.7968
MB2-2	26.6	0.3187	0.1594	5	0.2299	0.0133	0.1341	2.6453	0.3078	0.1059	0.1280	11.3445
MB3-2	25.6	0.2929	0.1465	5	0.1993	0.0094	0.0538	1.4108	0.2196	0.0700	0.0703	12.5732
MB4-3	24.5	0.3843	0.1281	5	0.3750	0.0141	0.0657	2.1397	0.2806	0.1059	0.0875	16.7735
MB5-3	22.2	0.2487	0.0829	5	0.1915	0.0118	0.0766	1.4076	0.2210	0.0820	0.0857	13.0986
MB6-2	20.1	0.1660	0.0830	5	0.0949	0.0063	0.0469	0.8669	0.1334	0.0509	0.0553	5.6305
MB7-5	15.5	0.1715	0.0343	5	0.1461	0.0086	0.1136	0.9399	0.2104	0.0874	0.1714	7.7164
MB8-8	13.4	0.1818	0.0227	5	0.1368	0.0071	0.0574	0.9941	0.1573	0.0556	0.0602	7.3920
MB9-9	12.3	0.1512	0.0168	5	0.1314	0.0071	0.0358	0.7420	0.1270	0.0383	0.0399	7.1437
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
		Concentration (ug/g) ==>		MB1-2	8.0635	0.2560	2.4784	40.2212	5.2249	2.0199	2.2442	245.673
				MB2-2	3.6064	0.2090	2.1034	41.5008	4.8293	1.6618	2.0088	177.981
				MB3-2	3.4017	0.1605	0.9175	24.0826	3.7482	1.1943	1.2002	214.633
				MB4-3	4.8793	0.1836	0.8552	27.8391	3.6512	1.3773	1.1380	218.234
				MB5-3	3.8494	0.2364	1.5392	28.3000	4.4433	1.6484	1.7230	263.342
				MB6-2	2.8569	0.1889	1.4127	26.1111	4.0181	1.5319	1.6660	169.592
				MB7-5	4.2580	0.2513	3.3125	27.4009	6.1327	2.5487	4.9956	224.969
				MB8-8	3.7616	0.1939	1.5792	27.3394	4.3248	1.5278	1.6559	203.299
				MB9-9	4.3456	0.2331	1.1845	24.5370	4.2011	1.2655	1.3201	236.234
				Sample #								
		Content (ug) ==>		MB1-2	1.2966	0.0412	0.3985	6.4676	0.8402	0.3248	0.3609	39.5042
				MB2-2	0.5749	0.0333	0.3353	6.6152	0.7698	0.2649	0.3202	28.3701
				MB3-2	0.4983	0.0235	0.1344	3.5281	0.5491	0.1750	0.1758	31.4437
				MB4-3	0.6250	0.0235	0.1096	3.5662	0.4677	0.1764	0.1458	27.9558
				MB5-3	0.3191	0.0196	0.1276	2.3461	0.3684	0.1367	0.1428	21.8311
				MB6-2	0.2371	0.0157	0.1173	2.1672	0.3335	0.1272	0.1383	14.0762
				MB7-5	0.1461	0.0086	0.1136	0.9398	0.2104	0.0874	0.1714	7.7164
				MB8-8	0.0854	0.0044	0.0358	0.6206	0.0982	0.0347	0.0376	4.6149
				MB9-9	0.0730	0.0039	0.0199	0.4122	0.0706	0.0213	0.0222	3.9687

Macoma balthica 5-15-91

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
Mean(ug/g)	1.8843	0.1808	1.1349	18.3003	3.4671	1.2820	1.1084	167.502
STD	0.5585	0.0556	0.3231	1.5012	0.3557	0.2138	0.1956	35.4135
SEM	0.186	0.019	0.108	0.500	0.119	0.071	0.065	11.805
CV%	29.638	30.774	28.468	8.203	10.258	16.679	17.648	21.142
r wt x []	0.190	0.295	0.812	0.411	0.103	0.385	0.742	0.401
X 100mg	1.877	0.180	1.153	18.257	3.470	1.288	1.119	168.498
r l x []	0.082	0.437	0.658	0.361	0.076	0.233	0.586	0.475
X 20mm	1.872	0.174	1.192	18.154	3.460	1.296	1.139	172.053
X 25mm	1.820	0.147	1.432	17.544	3.429	1.352	1.269	191.014

Estimated content (ug) for 20mm and 25mm clam

	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
20mm	0.1676	0.0156	0.1090	1.6967	0.3227	0.1202	0.1060	16.0118
25mm	0.3465	0.0296	0.2685	3.5603	0.6871	0.2666	0.2478	37.7627

Estimated weight for 15mm clam

0.035 gm
34.861 mg

Estimated weight for 20mm clam

0.094 gm
93.984 mg

Sample #-n	Average	Total	Average	Recon	Concentration (ug/ml) - Blank Corrected from ICP-AES							
	Length (mm)	Dry Wt (gm)	Dry Wt (gm)	Amt (ml)	Ag	Cd	Cr	Cu	Ni	Pb	V	Zn
MB1-1	27.2	0.2870	0.2870	5	0.0646	0.0086	0.1122	0.9396	0.2156	0.0893	0.0880	9.4012
MB2-1	23.9	0.1725	0.1725	5	0.0943	0.0071	0.0379	0.6549	0.1148	0.0468	0.0401	8.7519
MB3-2	21.4	0.2224	0.1112	5	0.0949	0.0055	0.0436	0.8115	0.1523	0.0515	0.0466	7.5009
MB4-7	17.4	0.3998	0.0571	5	0.1267	0.0110	0.0743	1.3628	0.2366	0.0816	0.0715	13.1087
MB5-8	17.3	0.4492	0.0562	5	0.1296	0.0157	0.0753	1.5379	0.2693	0.0865	0.0767	11.9375
MB6-7	16.8	0.3820	0.0546	5	0.1152	0.0149	0.0885	1.3750	0.2665	0.0912	0.0878	10.9306
MB7-6	16.3	0.2635	0.0439	5	0.1101	0.0078	0.0574	1.1085	0.1916	0.0719	0.0555	7.7662
MB8-5	15.4	0.1916	0.0383	5	0.1025	0.0071	0.0415	0.7687	0.1348	0.0598	0.0425	6.9287
MB9-5	13.5	0.1263	0.0253	5	0.0422	0.0078	0.0274	0.4510	0.1035	0.0345	0.0297	3.8737
				Detection Lim	.003	.004	.005	.002	.01	.025	.001	.005
				Sample #								
	Concentration (ug/g) ==>			MB1-1	1.1254	0.1502	1.9542	16.3686	3.7561	1.5554	1.5322	163.783
				MB2-1	2.7322	0.2043	1.0988	18.9812	3.3272	1.3565	1.1632	253.679
				MB3-2	2.1331	0.1232	0.9804	18.2451	3.4245	1.1578	1.0477	168.634
				MB4-7	1.5840	0.1372	0.9286	17.0434	2.9589	1.0209	0.8947	163.941
				MB5-8	1.4430	0.1745	0.8382	17.1185	2.9980	0.9624	0.8534	132.875
				MB6-7	1.5072	0.1949	1.1586	17.9974	3.4880	1.1932	1.1492	143.071
				MB7-6	2.0896	0.1488	1.0899	21.0334	3.6355	1.3638	1.0524	147.367
				MB8-5	2.6738	0.1840	1.0817	20.0595	3.5185	1.5611	1.1091	180.812
				MB9-5	1.6702	0.3104	1.0835	17.8559	4.0974	1.3674	1.1742	153.353
				Sample #								
	Content (ug) ==>			MB1-1	0.3230	0.0431	0.5609	4.6978	1.0780	0.4464	0.4398	47.0058
				MB2-1	0.4713	0.0353	0.1896	3.2743	0.5740	0.2340	0.2007	43.7597
				MB3-2	0.2372	0.0137	0.1090	2.0289	0.3808	0.1288	0.1165	18.7522
				MB4-7	0.0904	0.0078	0.0530	0.9732	0.1690	0.0583	0.0511	9.3610
				MB5-8	0.0811	0.0098	0.0471	0.9621	0.1685	0.0541	0.0480	7.4676
				MB6-7	0.0823	0.0106	0.0633	0.9827	0.1904	0.0651	0.0627	7.8117
				MB7-6	0.0917	0.0065	0.0478	0.9234	0.1596	0.0599	0.0462	6.4694
				MB8-5	0.1024	0.0070	0.0414	0.7683	0.1348	0.0598	0.0425	6.9251
				MB9-5	0.0423	0.0079	0.0274	0.4518	0.1037	0.0346	0.0297	3.8798