Chapter III

RESULTS

The results of the water samples studied are shown in Table 1a and show the total concentration of lead and mercury in the water, both the soluble and particulate fractions, for the January collections. The amount of lead and mercury concentration, both the soluble and particulate fractions for the May collections are shown in Table 1b. The values for the overall concentration of lead and mercury at each station are also presented.

The total lead content in wet sediments for each assigned layer is shown in Table 2. The total mercury content in wet sediment for each assigned layer is shown in Table 3.

The total lead and mercury residues in the biological samples for the January collections are shown in Table 4 and for the May collections in Table 5.

The variation in total lead concentration for soluble and particulate fractions for the January collections are shown graphically in Figure 5, and the total concentration of mercury in the soluble and particulate fractions are shown graphically in Figure 6. The total concentration of lead and mercury in the soluble and particulate fractions May collections are shown graphically in Figure 7 and 8 respectively. Representations of the relationship between the total concentration of both lead and mercury in each assigned sediment layer of the sediment cores sampled from the 9 stations are shown in Figure 9-16 inclusive.

The biological samples of selected species are presented graphically in Figure 17a and 17b according to their content of the total lead and mercury residues in the muscle. Figure 18 represents a comparison between the values of the total lead and mercury residues in the species studied from the various stations in respect of the three trophic levels for the January and May collections.

Station	Dissolved		Particulate		Total	
	Lead	Mercury	Lead	Mercury	Lead	Mercury
I	2.60	0.013	13.00	0.001	15.60	0.041
II	3.50	0.134	13.75	0.009	17.25	0.143
III	2.00	0.699	16.19	0.005	18.19	0.704
IV+V	2.00	0.634	14.19	0.073	16.19	0.707
VI	4.70	0.088	14.58	0.029	19.28	0.117
VII	5.20	0.023	20.27	0.032	25.57	0.055
VIII	3.90	0.069	48.13	0.021	52.03	0.090
IX	2.00	0.069	12.33	0.034	14.33	0.103

Table 1a: Concentration of Dissolved, Particulate and Total Content of Lead and Mercury in the Water Samples on the ppb Basis for January. Collections

Station	Dissolved		Particulate		Total	
	Lead	Mercury	Lead	Mercury	Lead	Mercury
I	3.00	0.028	15.60	0.001	18.60	0.029
II	3.50	0.460	12.00	0.016	15.50	0.476
III	4.70	0.325	20.90	0.009	25.60	0.334
IV	3.60	0.420	16.88	0.026	20.48	0.446
V	4.70	0.560	19.25	0.071	23.95	0.631
VI	3.00	0.650	14.75	0.037	17.75	0.687
VII	3.00	0.046	18.85	0.050	21.85	0.096
VIII	2.60	0.070	59.45	0.031	62.05	0.101
IX	2.00	0.050	16.63	0.017	18.63	0.073

Table 1b: Concentration of Dissolved, Particulate and Total Content of Lead and Mercury in the Water Samples on the ppb Basis for May. Collections.

Depth (cm.) \ Station	I	II	III	IV + V	VI	VII	VIII	IX
1	0.556	1.742	2.413	0.532	0.565	0.303	0.326	0.159
3	0.854	0.887	2.241	0.520	0.328	0.386	0.614	0.224
5	0.234	0.723	1.894	0.014	3.343	0.354	0.631	0.262
7	0.140	1.135	3.500	0.556	0.967	0.314	1.489	0.169
9	0.396	0.366	2.420	0.024	0.274	0.569	1.402	0.269
12	0.418	0.307	1.352	0.376	0.119	0.480	0.941	0.075
15	0.642	0.400	0.600	0.472	0.197	0.621	0.836	0.243
18	0.155	0.594	1.899	0.634	0.182	0.446	-	0.128
22	-	0.617	1.880	0.444	0.189	0.435	-	0.157
26	-	0.670	0.600	0.350	0.198	0.447	-	0.160
30	-	0.660	1.348	0.236	0.395	-	-	0.156
34	-	-	1.348	0.622	0.238	-	-	0.164
38	-	-	0.817	0.398	-	-	-	0.091
42	-	-	2.417	0.736	-	-	-	-
46	-	-	1.897	0.360	-	-	-	-
50	-	-	1.349	0.247	-	-	-	-
54	-	-	1.349	-	-	-	-	-
58	-	-	-	-	-	-	-	-

Table 2: Total Lead Concentration in Wet Sediment on the ppm Basis.

Station / Depth (cm)	I	I	III	IV + V	VI	VII	VIII	IX
1	0.003	0.237	0.046	0.182	0.034	0.329	0.176	0.050
3	0.017	0.179	0.091	0.226	0.085	0.139	0.194	0.061
5	0.022	0.195	0.068	0.285	0.241	0.343	0.178	0.084
7	0.014	0.193	0.057	0.301	0.334	0.229	0.133	0.110
9	0.005	0.227	0.078	0.327	0.259	0.088	0.113	0.153
12	0.003	0.200	0.157	0.218	0.228	0.086	0.112	0.179
15	0.004	0.211	0.028	0.143	0.158	0.066	0.047	0.156
18	0.006	0.190	0.059	0.140	0.160	0.058	0.110	0.173
22	0.006	0.231	0.143	0.138	0.231	0.099	0.216	0.143
26	-	0.356	0.128	0.122	0.218	0.136	0.180	0.163
30	-	0.251	0.098	0.109	0.219	0.112	0.216	0.072
34	-	0.182	0.085	0.128	0.118	-	0.193	0.075
38	-	0.090	0.082	0.078	0.050	-	0.073	0.124
42	-	0.089	0.188	0.078	0.053	-	0.098	0.136
46	-	0.024	0.110	-	-	-	0.114	0.056
50	-	-	0.085	-	-	-	0.137	-
54	-	-	0.094	-	-	-	-	-
58	-	-	0.082	-	-	-	-	-

Table 3: Total Mercury Concentration in Wet Sediment on the ppm Basis

No.	Organism	Weight (gm)	Length (cm)	Station	Trophic Level	Lead (ppm)	Mercury (ppm)
1	Loligo sp.	218	24.3	I+II	4	1.034	0.032
2	Loligo sp.	186	22.7	I+II	4	1.874	0.029
3	Loligo sp.	86	14.3	I+II	4	0.205	0.019
4	Loligo sp.	65	12.5	I+II	4	0.846	0.015
5	Loligo sp.	5	7.5	I+II	4	-	-
6	Loligo sp.	3	6.7	I+II	4	0.010	-
7	Sepia sp.	288	16.8	I+II	4	0.436	0.085
8	Sepia sp.	129	11.8	I+II	4	0.224	0.011
9	Sepia sp.	37	7.2	I+II	4	0.224	0.012
10	Caranx mate	35	17.4	I+II	4	0.236	0.027
11	Caranx mate	33	16.5	I+II	4	0.206	0.031
12	Caranx malan	113	21.5	I+II	4	1.009	0.058
13	Caranx malan	80	20	I+II	4	0.784	0.037
14	Epinepherus tauvina	67	16	I+II	5	0.613	0.294
15	Epinepherus tauvina	55	15	I+II	5	0.410	0.269
16	Scatophagus argus (Blyth)	43	11.4	I+II	5	0.543	0.057
17	Scatophagus argus (Blyth)	34	10.5	I+II	5	0.881	0.043
18	Scatophagus argus (Blyth)	29	9.5	I+II	5	0.514	0.036
19	Pangasius pangasius (Hamilton)	115	24	IV+V	4	0.687	0.126
20	Pangasius pangasius (Hamilton)	97	23	IV+V	4	0.510	0.046
21	Scatophagus argus (Blyth)	75	12.7	IV+V	5	0.417	0.084
22	Larus brunnicephelus	425	-	IV+V	5	2.609	0.271
23	Larus brunnicephelus	368	-	IV+V	5	0.842	0.160
24	Larus brunnicephelus	359	-	IV+V	5	0.885	0.192
25	Larus brunnicephelus	357	-	IV+V	5	-	0.188
26	Larus brunnicephelus	355	-	IV+V	5	0.814	0.136
27	Larus brunnicephelus	352	-	IV+V	5	1.054	0.102
28	Larus brunnicephelus	338	-	IV+V	5	0.841	0.224
29	Larus brunnicephelus	333	-	IV+V	5	0.651	0.040
30	Puntius gonionotus (Bleeker)	487	30.5	IX	3	1.416	0.024
31	Puntius gonionotus (Bleeker)	460	30	IX	5	1.243	0.042
32	Pluntioplites proctozyron (Bleeker)	820	41.5	IX	4	0.693	0.014
33	Pluntioplites proctozyron (Bleeker)	650	37	IX	4	0.641	0.013
34	Pangasius nasatus (Hamilton)	2416	56	IX	4	0.841	0.118
35	Pangasius nasatus (Hamilton)	1616	53	IX	4	0.622	0.032
36	Dasybatus imbricatus	600	26	IX	5	0.605	0.165
37	Kryptoterus bleekeri	910	53	IX	5	0.610	0.205
38	Kryptoterus bleekeri	230	34	IX	5	0.211	0.039

Table 4: Total Concentration of Lead and Mercury Residues in Biological Samples for January Collections.

No.	Organism	Weight (gm)	Length (cm)	Station	Trophic Level	Lead (ppm)	Mercury (ppm)
1	Caranx malan	50	17.2	I	4	0.625	0.026
2	Caranx malan	45	16.6	I	4	0.761	0.029
3	Caranx malan	44	16.4	I	4	0.713	0.021
4	Megalospis cordyla	40	16.5	I	5	1.163	0.032
5	Scmberomerus commersoni	234	33.6	II	5	0.687	0.033
6	Scmberomerus commersoni	216	32.8	II	5	0.651	0.020
7	Loligo sp.	35	14.5	III	4	0.983	0.012
8	Loligo sp.	25	12.5	III	4	0.969	0.009
9	Sepia sp.	165	14.9	III	4	0.475	0.016
10	Polynemus sp.	42	18.7	III	5	1.213	0.033
11	Polynemus sp.	28	15.9	III	5	0.707	0.026
12	Polynemus sp.	23	16.2	III	5	0.774	0.015
13	Tilapia mossambica (Peter)	188	21.3	IV+V	3	1.148	0.019
14	Macrobrachium rosenbergii (De Man)	100	21.1	IV+V	4	0.891	0.137
15	Macrobrachium rosenbergii (De Man)	77	20.6	IV+V	4	0.834	0.098
16	Macrobrachium rosenbergii (De Man)	50	18.5	IV+V	4	0.402	0.146
17	Macrobrachium rosenbergii (De Man)	24	14.8	IV+V	4	0.425	0.074
18	Lates calcarifer (Bloch)	370	29.2	IV+V	5	0.324	0.041
19	Puntius gonionotus (Bleeker)	160	23.7	VI	3	0.906	0.033
20	Puntius gonionotus (Bleeker)	38	13.3	VI	3	0.876	0.020
21	Mugil dussumieri	36	15.5	VII	3	1.269	0.018
22	Dasybatus sp.	50	19.5	VII	5	0.238	0.013
23	Plerogasius culturatus	282	32	VII	5	0.412	0.024
24	Kryptoterus bleekeri	134	31	VII	5	3.458	0.034
25	Kryptoterus bleekeri	54	23.7	VII	5	0.903	0.021
26	Mystus nemurus (Cuv & Val)	550	39	VII	5	0.963	0.189
27	Mystus nemurus (Cuv & Val)	30	17	VII	5	0.667	0.085
28	Mystus nemurus (Cuv & Val)	29	16.9	VII	5	1.450	0.029
29	Mystus nemurus (Cuv & Val)	16	13.6	VII	5	0.271	0.018
30	Puntius gonionotus (Bleeker)	56	16.7	IX	3	0.255	0.015
31	Cyclocheilichthys armatus	196	26	IX	4	0.747	0.012
32	Pluntioplites proctozysron	45	13.7	IX	4	0.242	0.009
33	Cyclocheilichthys enophus	45	16.6	IX	4	0.747	0.037
34	Cyclocheilichthys enophus	42	16.2	IX	4	0.806	0.033
35	Cyclocheilichthys enophus	40	16	IX	4	0.710	0.031
36	Ambassis wolfii (Bleeker)	142	17.5	IX	4	0.561	0.036
37	Ambassis wolfii (Bleeker)	100	19.7	IX	4	0.476	0.052
38	Ophicephalus striatus (Bloch)	220	31.2	IX	5	0.275	0.029
39	Mastocenbelus armatus ar.(Gunther)	242	49	IX	5	0.279	0.037
40	Mastocenbelus circumcetus	176	39	IX	5	0.341	0.028
41	Natopterus natopterus (Pallas)	236	30	IX	5	1.071	0.051
42	Natopterus natopterus (Pallas)	37	17	IX	5	0.367	0.036
43	Natopterus natopterus (Pallas)	26	15.6	IX	5	0.269	0.026
44	Natopterus natopterus (Pallas)	26	15.6	IX	5	0.200	0.026

Table 5: Total Concentration of Lead and Mercury Residues in Biological Samples for May Collections.

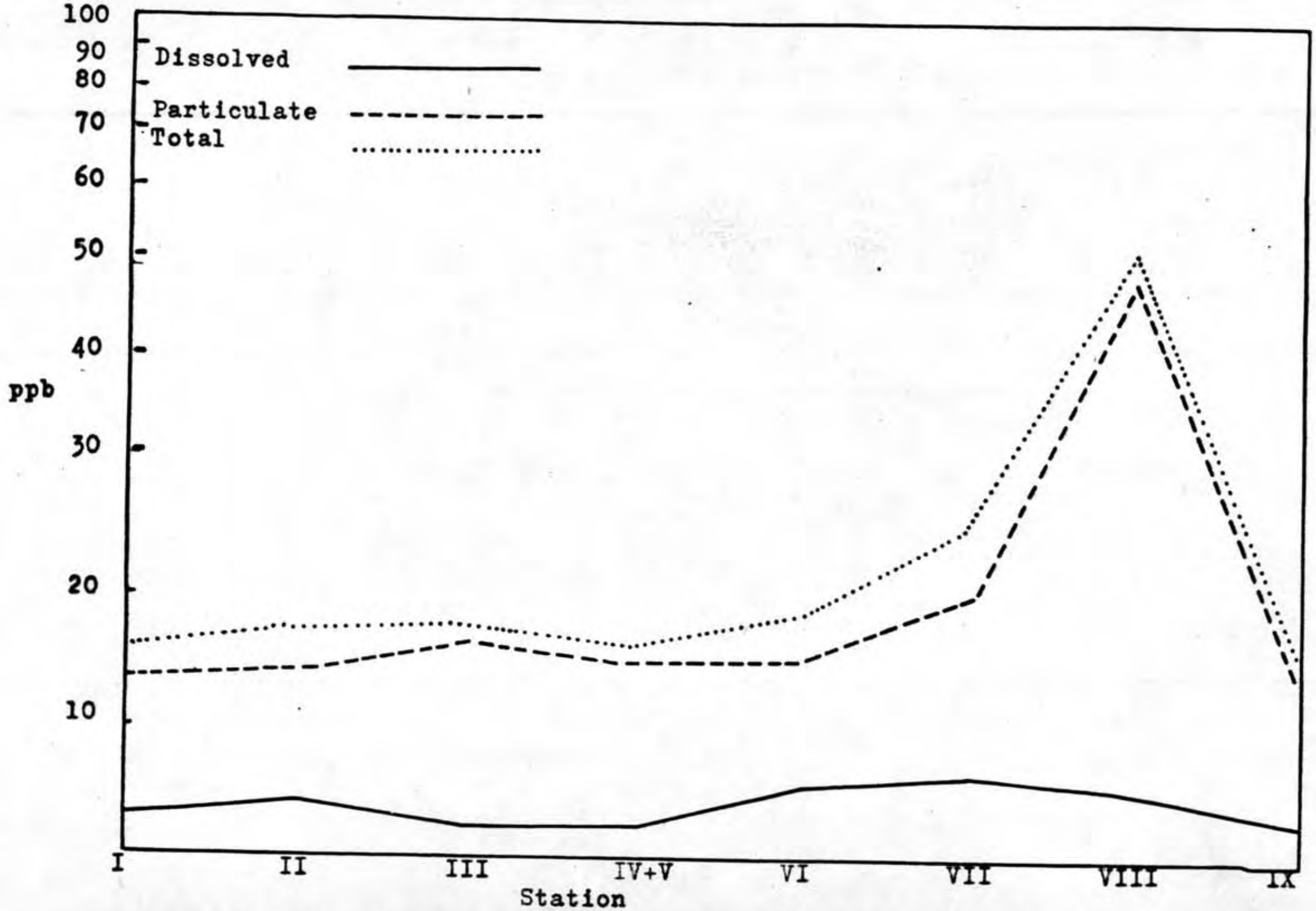


__Figure__ 5: Distribution of Dissolved, Particulate and Total Lead in the Water Samples from the January Collections.

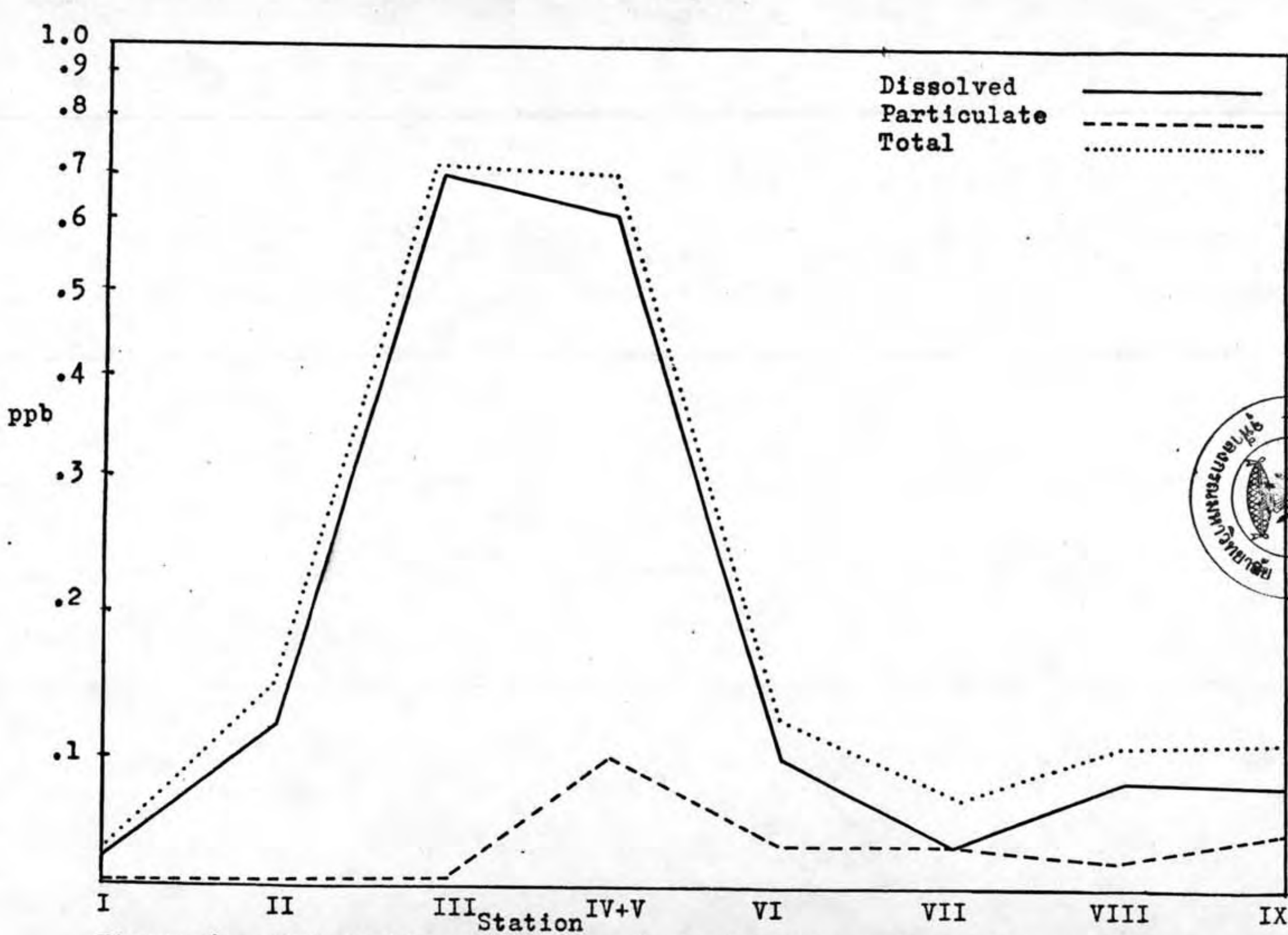
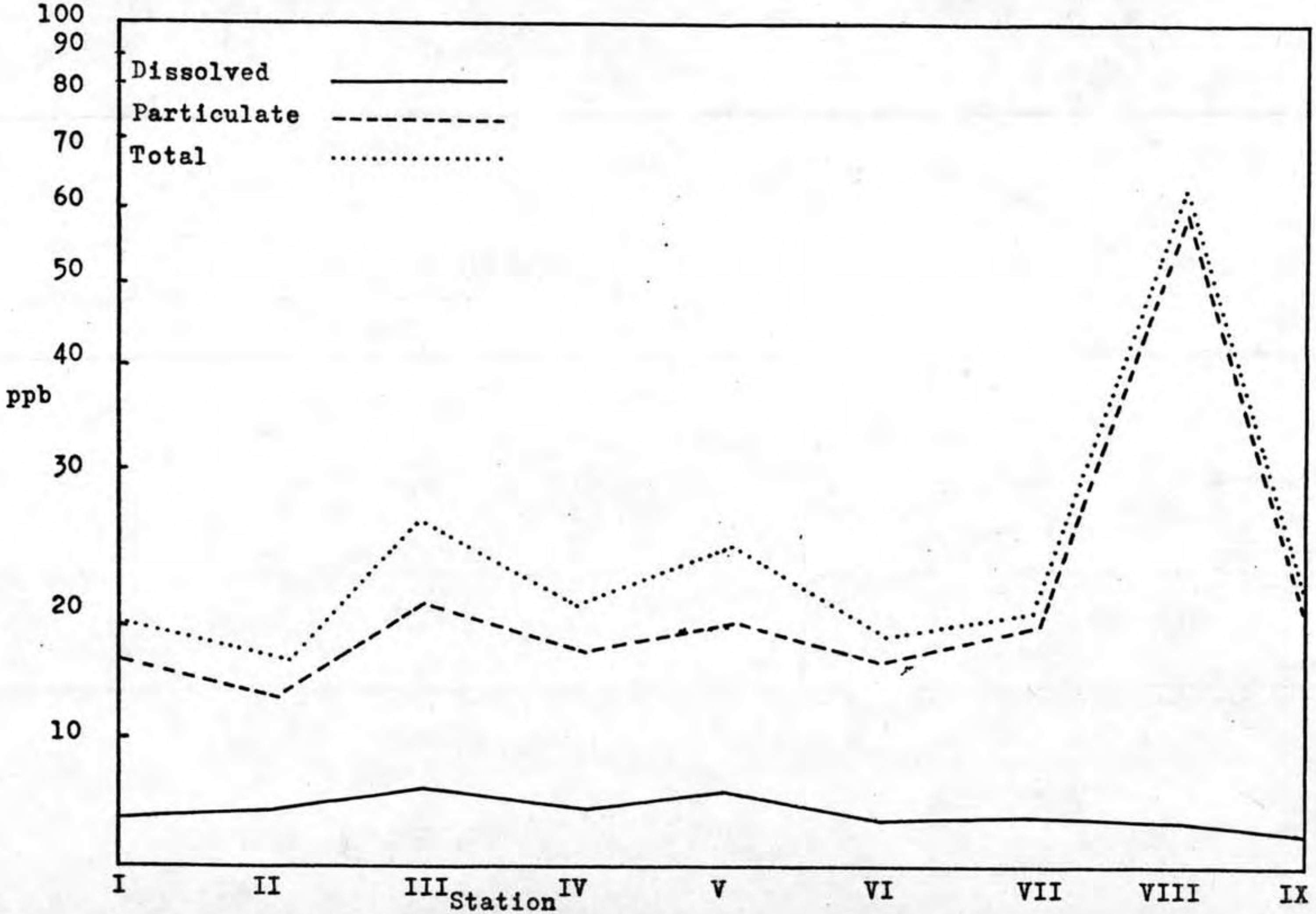


Figure 6: Distribution of Dissolved, Particulate and Total Mercury in the Water Samples from the January Collections.



<u>Figure</u> 7: Distribution of Dissolved, Particulate and Total Lead in the Water Samples from May Collections.

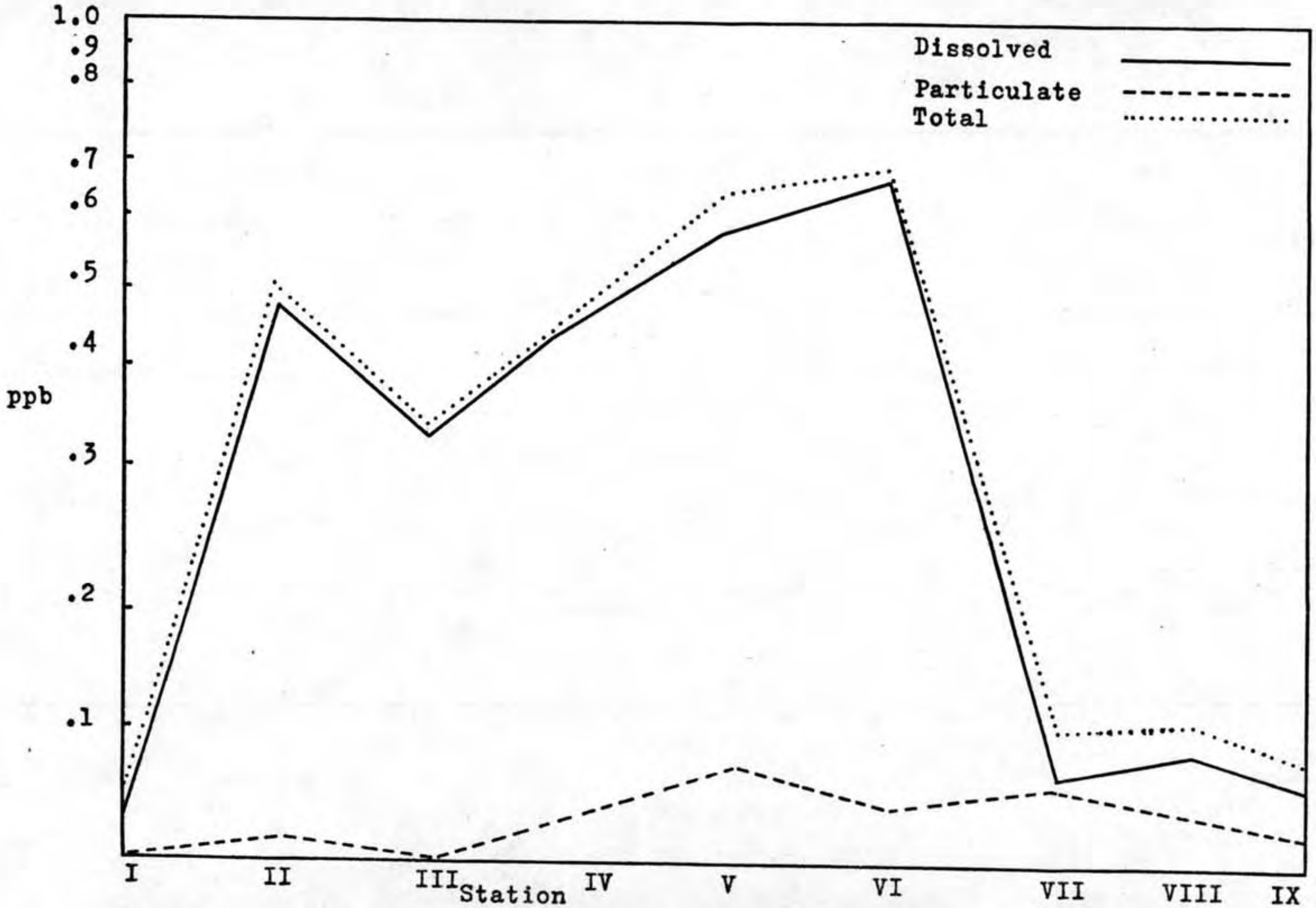
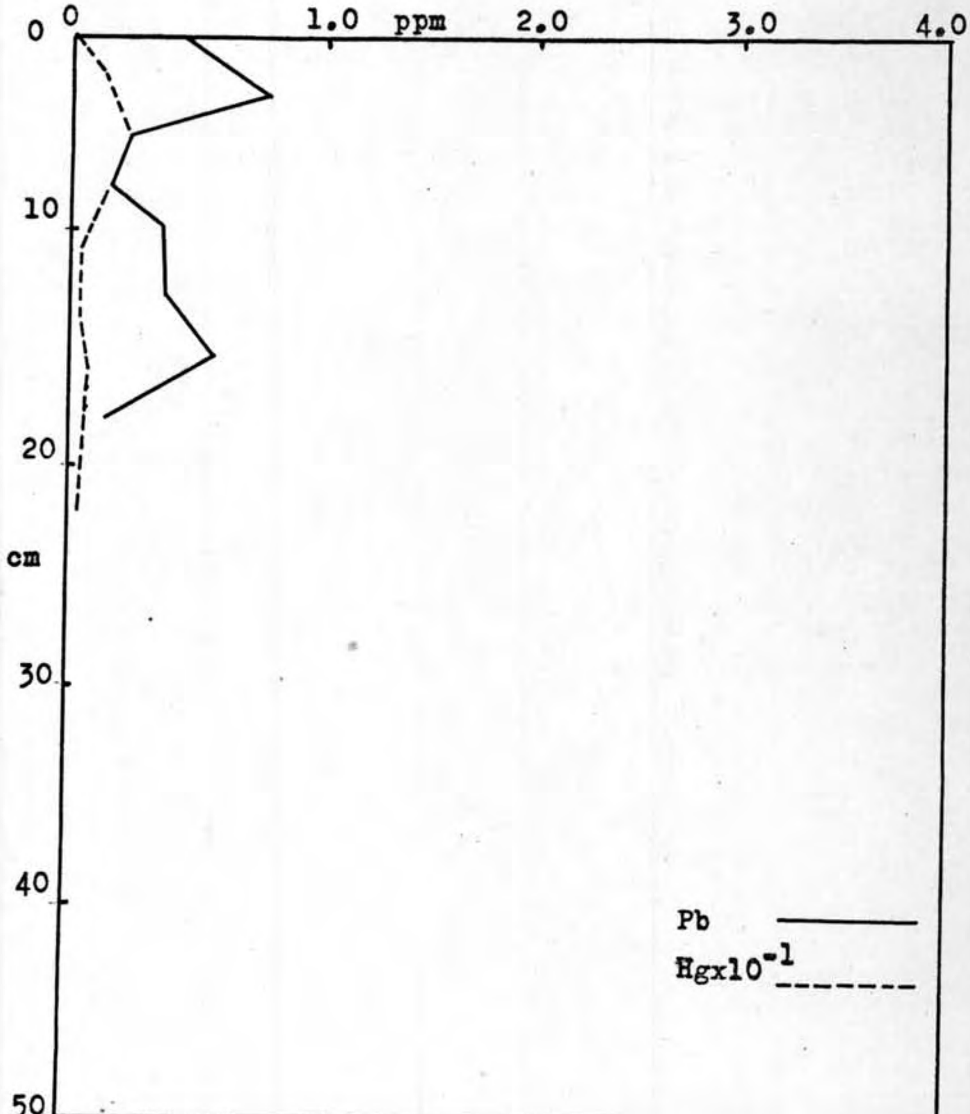
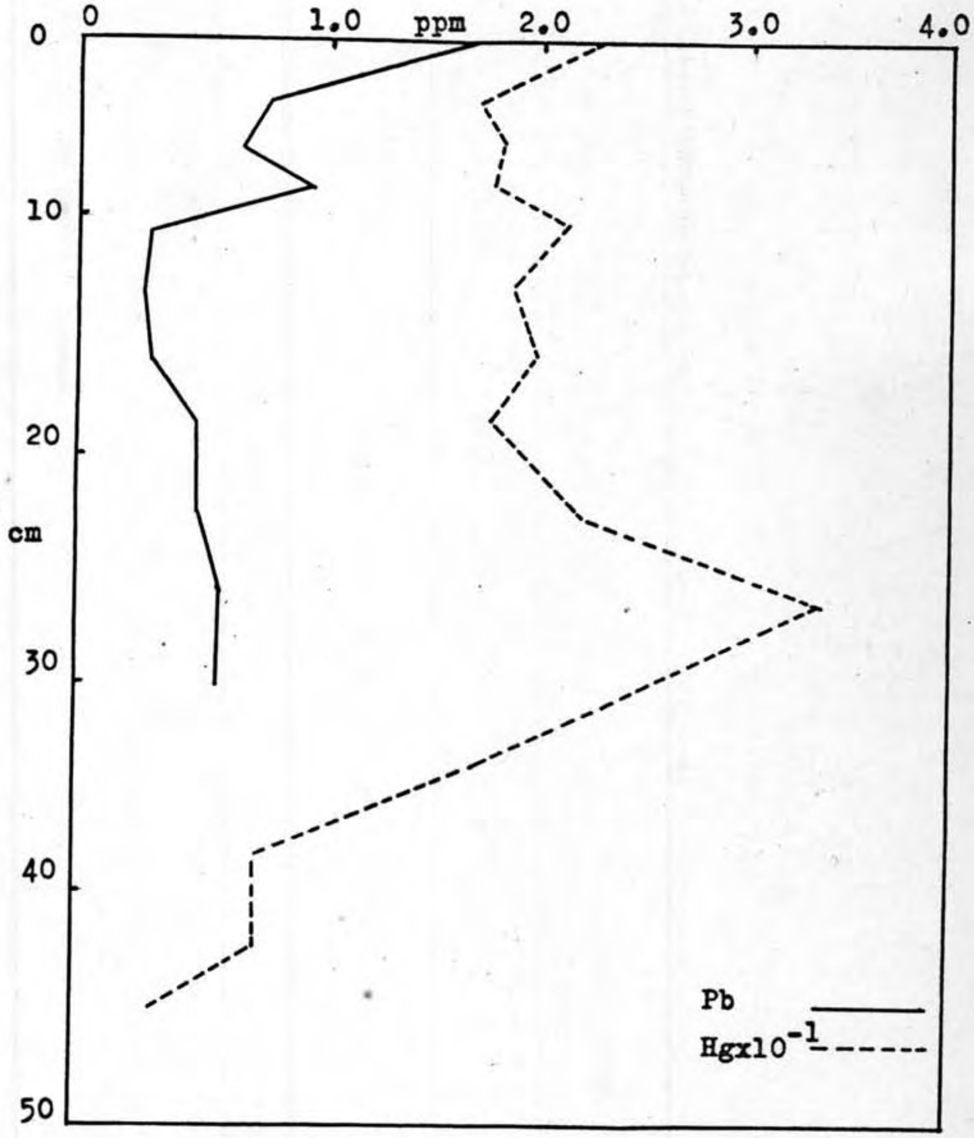


Figure 8: Distribution of Dissolved, Particulate and Total Mercury in the Water Samples from May Collections.



<u>Figure</u> 9: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station I.



<u>Figure</u> 10: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station II.

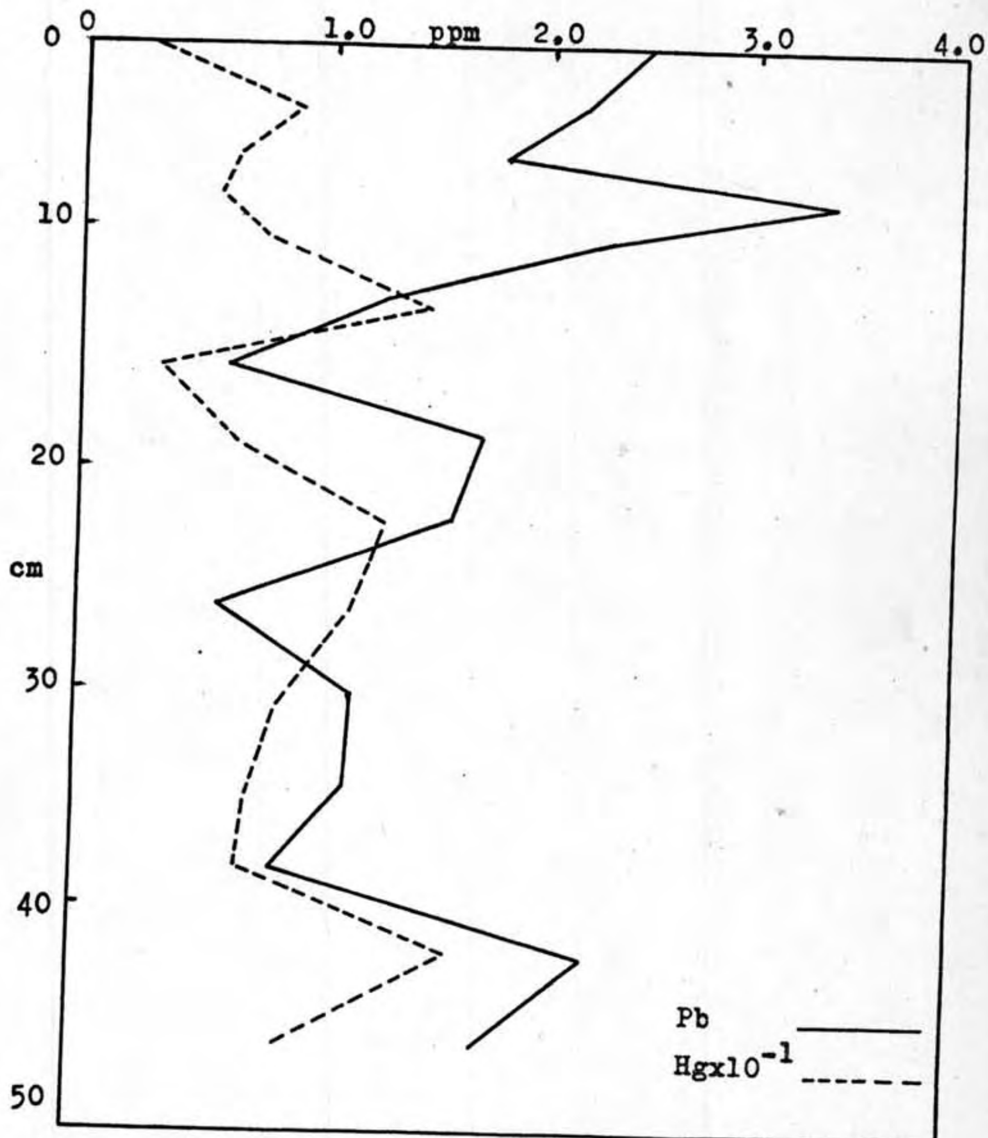


Figure 11: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station III.

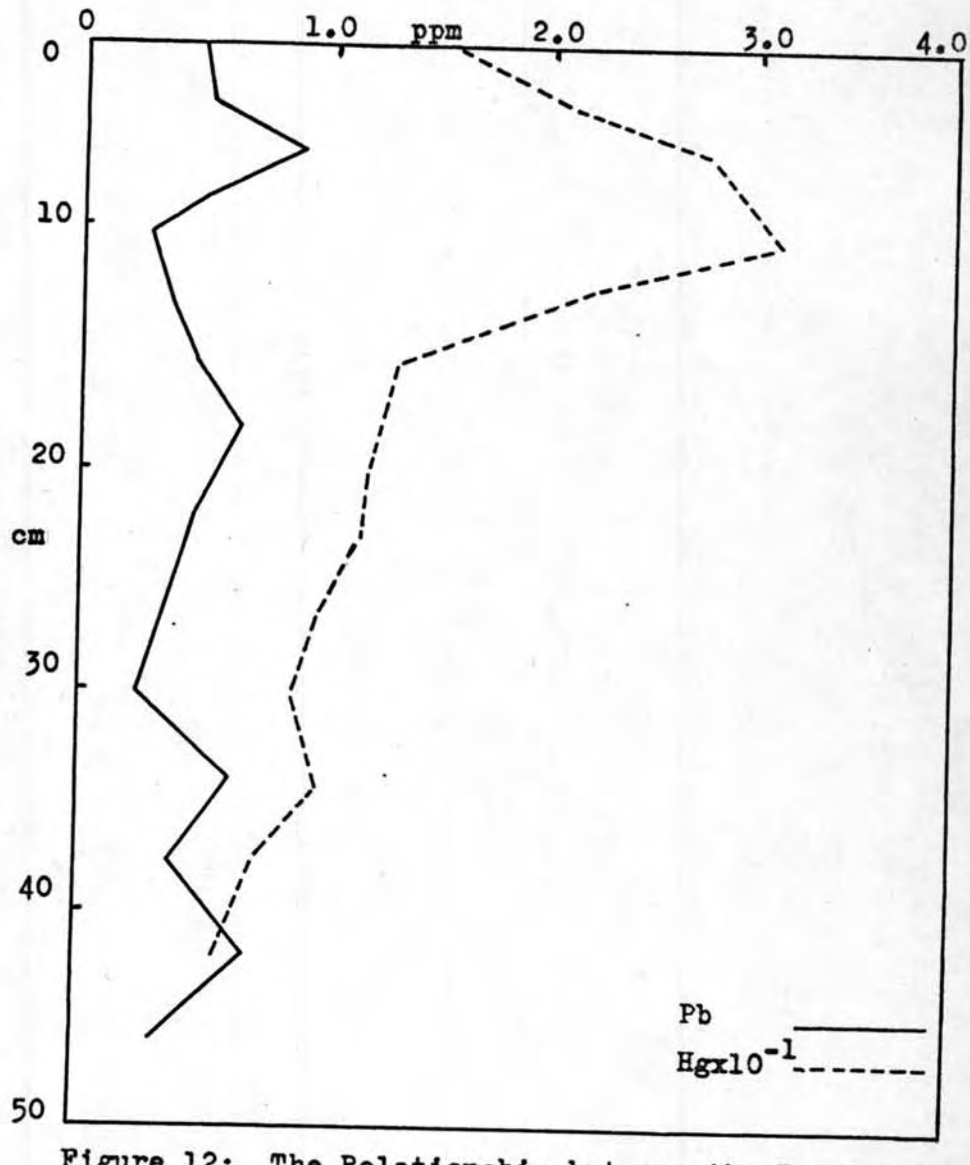


Figure 12: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station IV+V.

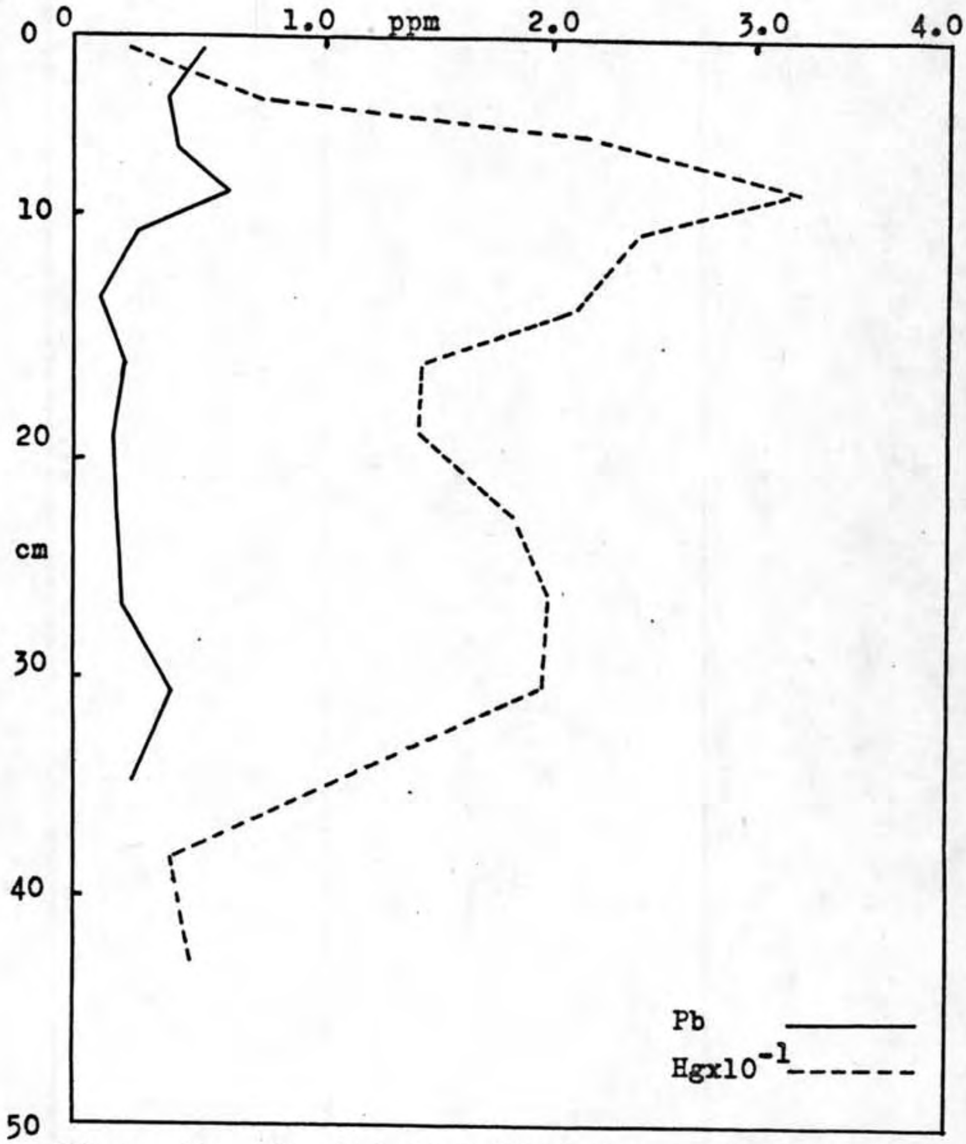


Figure 13: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station VI.

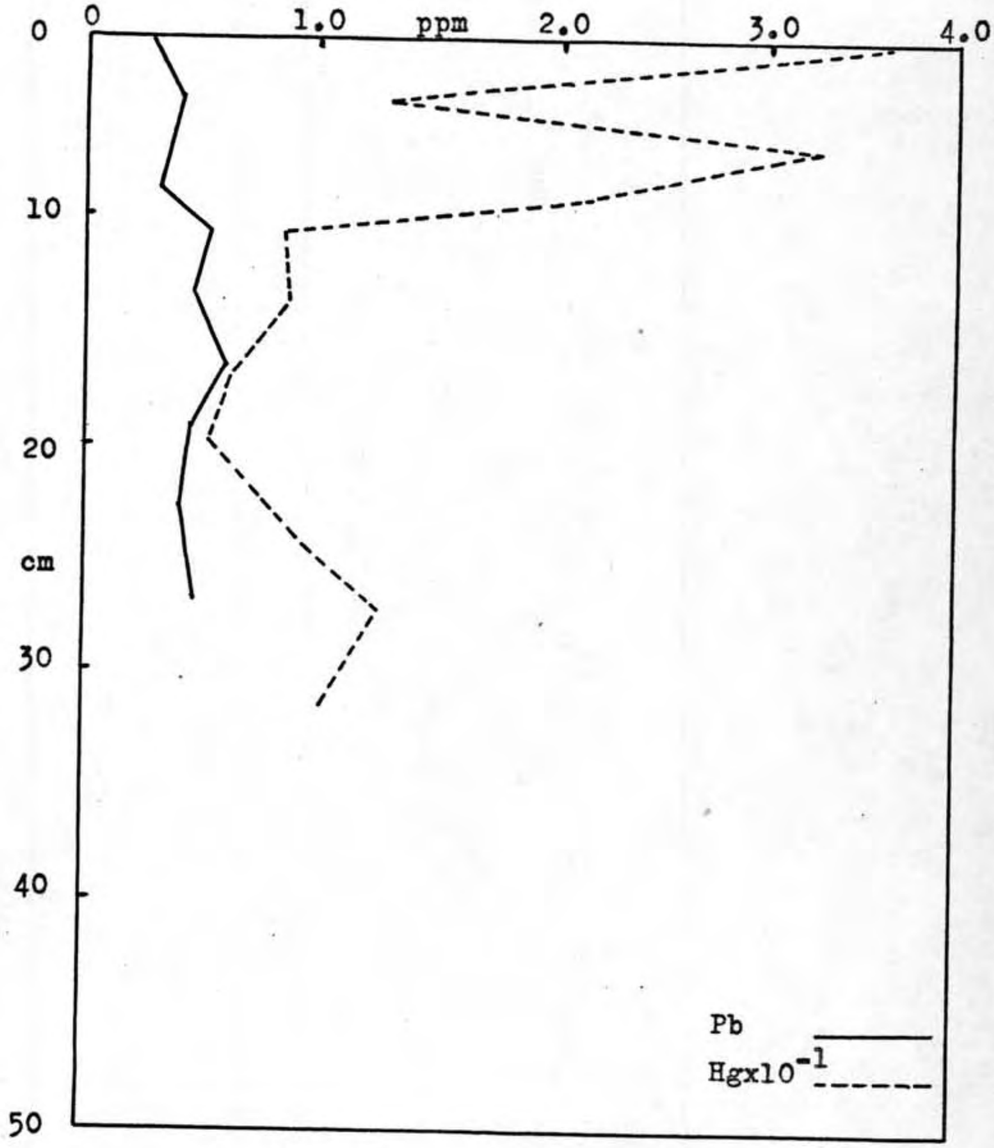


Figure 14: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station VII.

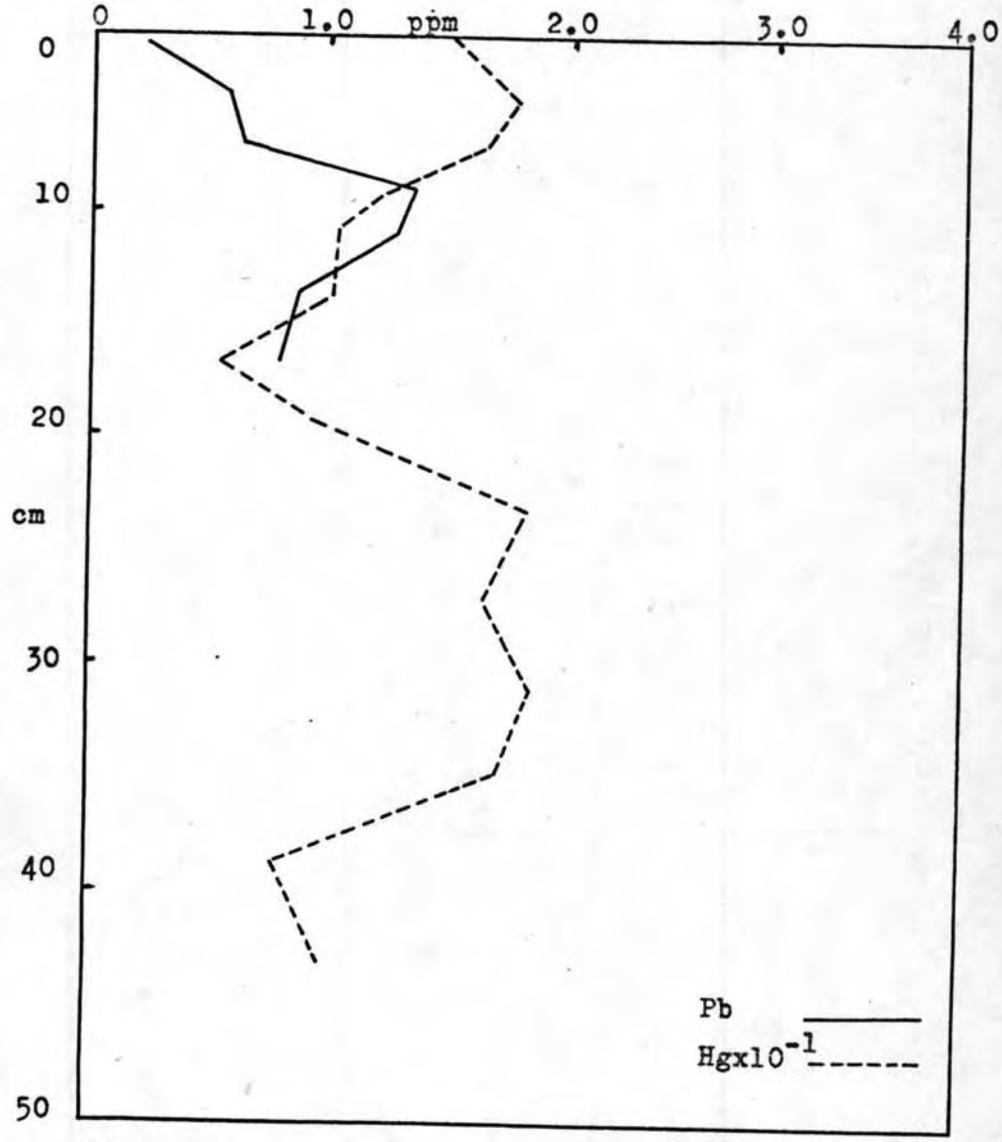
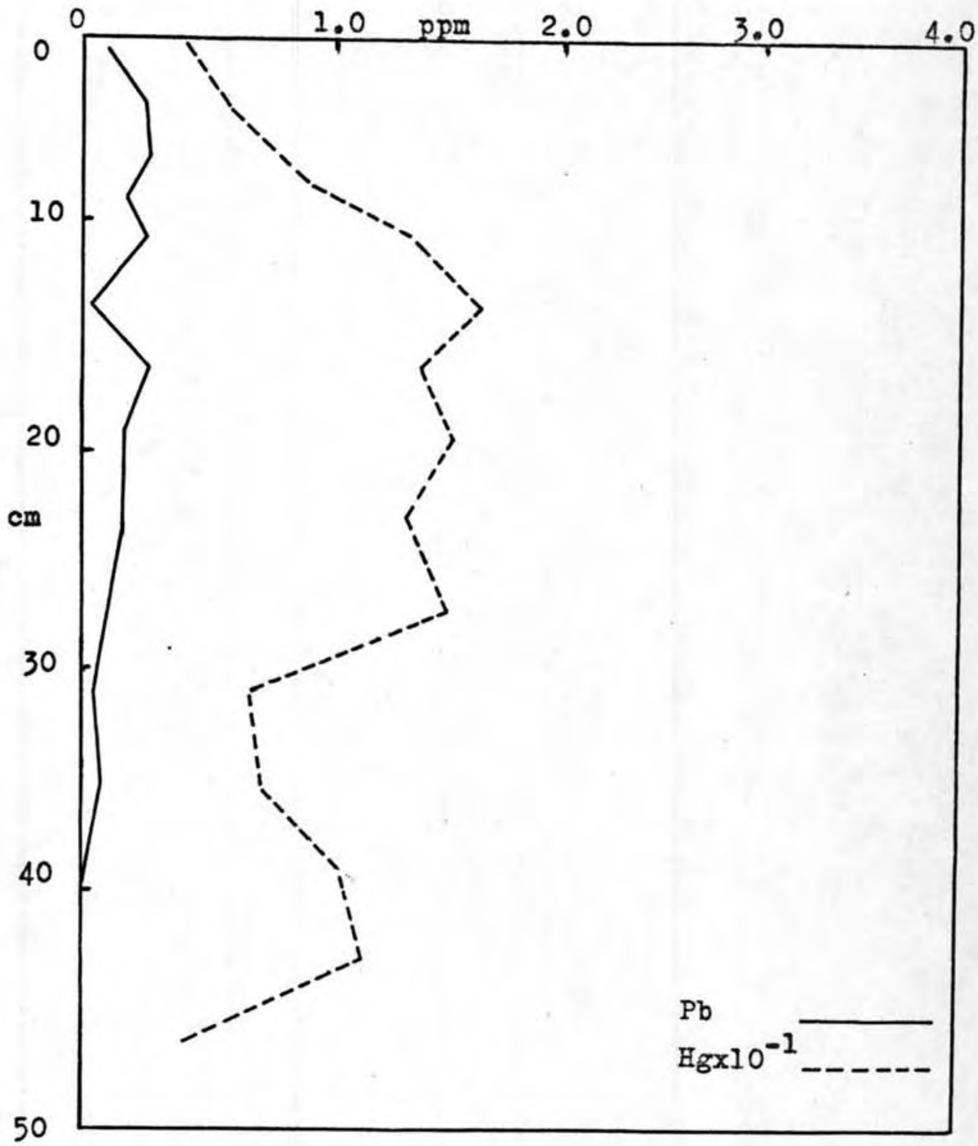


Figure 15: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station VIII.



<u>Figure</u> 16: The Relationship between the Total Lead and Mercury Concentration in Sediment Core with Depth at Station IX.

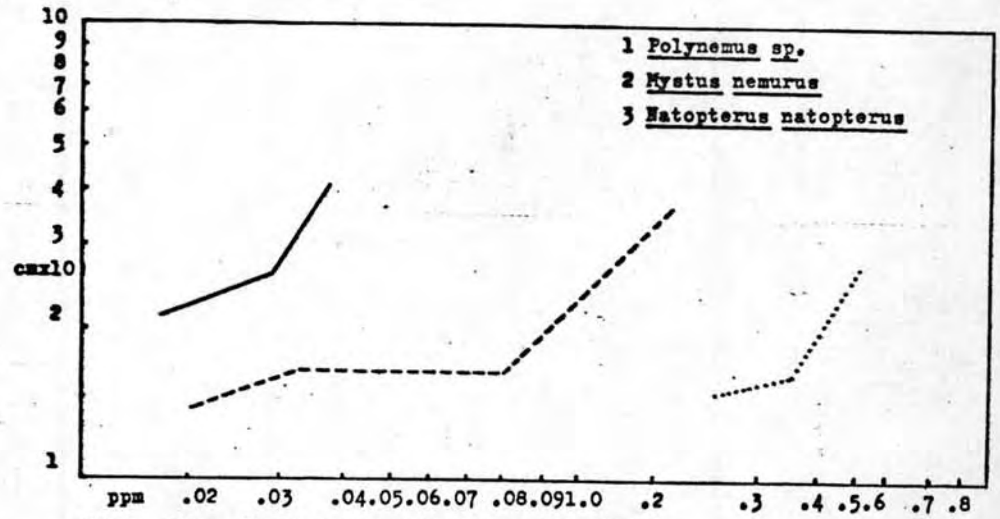


Figure 17a: The Relationship between the Total Mercury Residues in the Muscle of Selected Biota with Length.

1 ————
2 - - - - -
3 ....

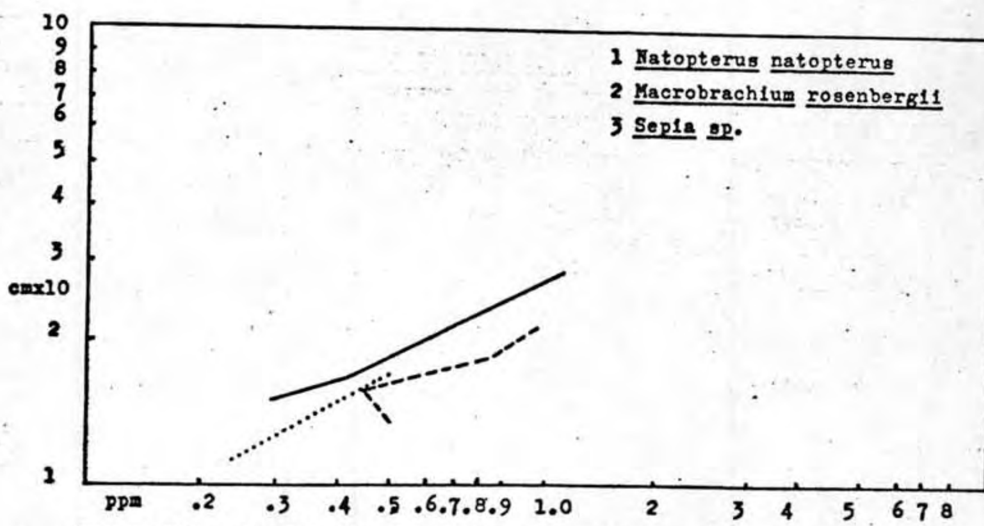


Figure 17b: The Relationship between the Total Lead Residues in the Muscle of Selected Biota with Length.

1 ————
2 - - - - -
3 ....

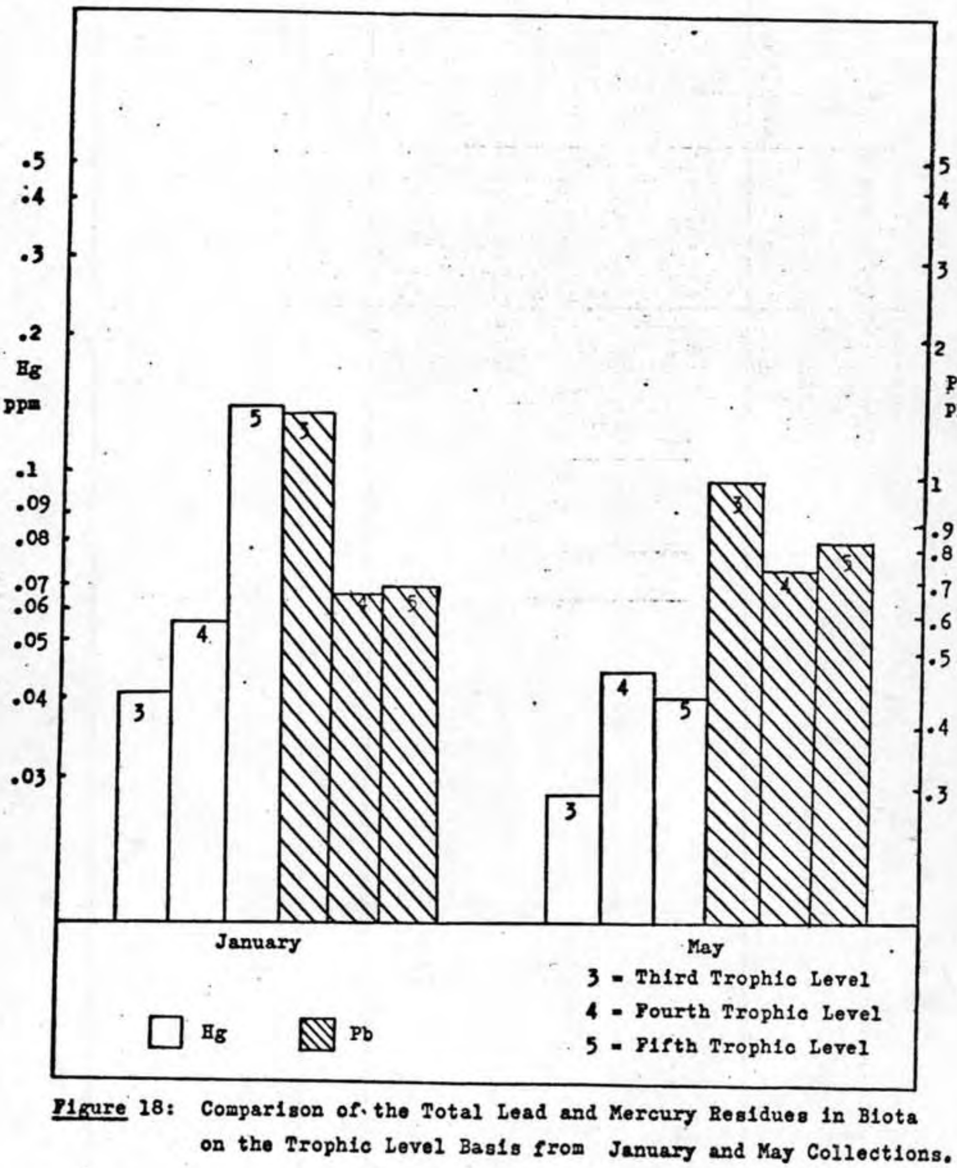


Figure 18: Comparison of the Total Lead and Mercury Residues in Biota on the Trophic Level Basis from January and May Collections.

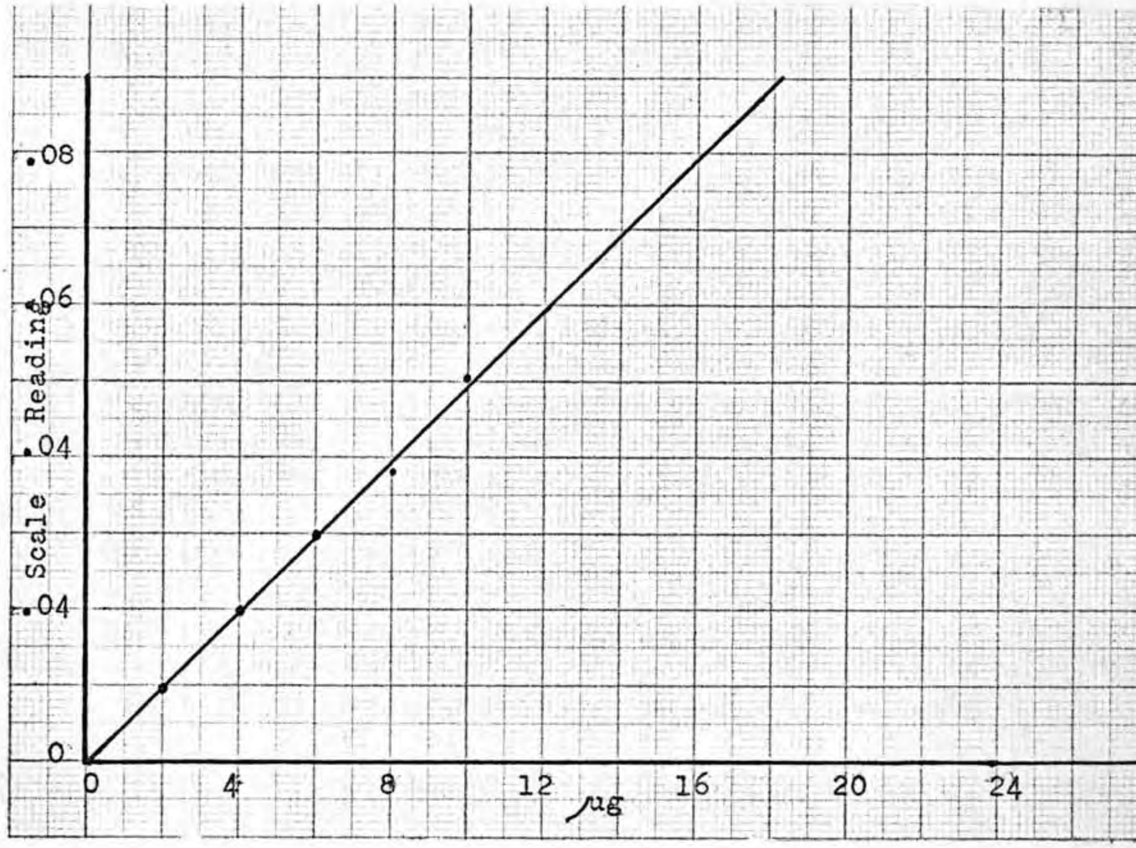


Figure 19a: Calibration Curve for Lead

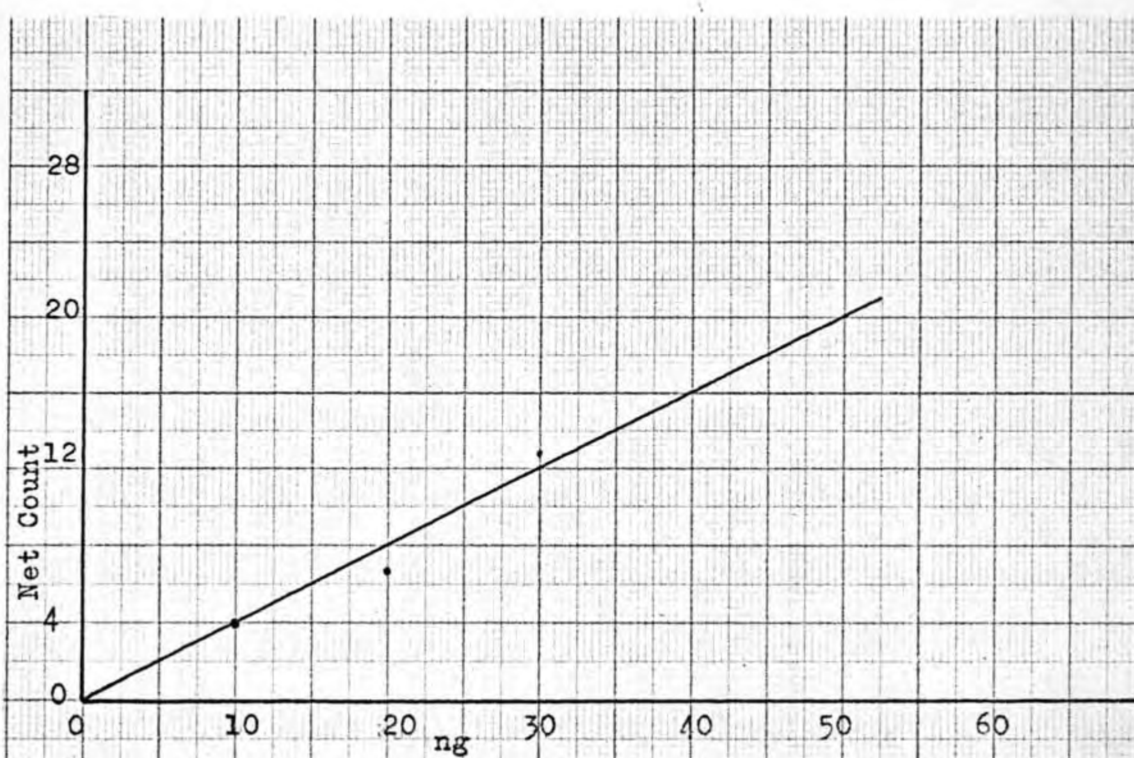
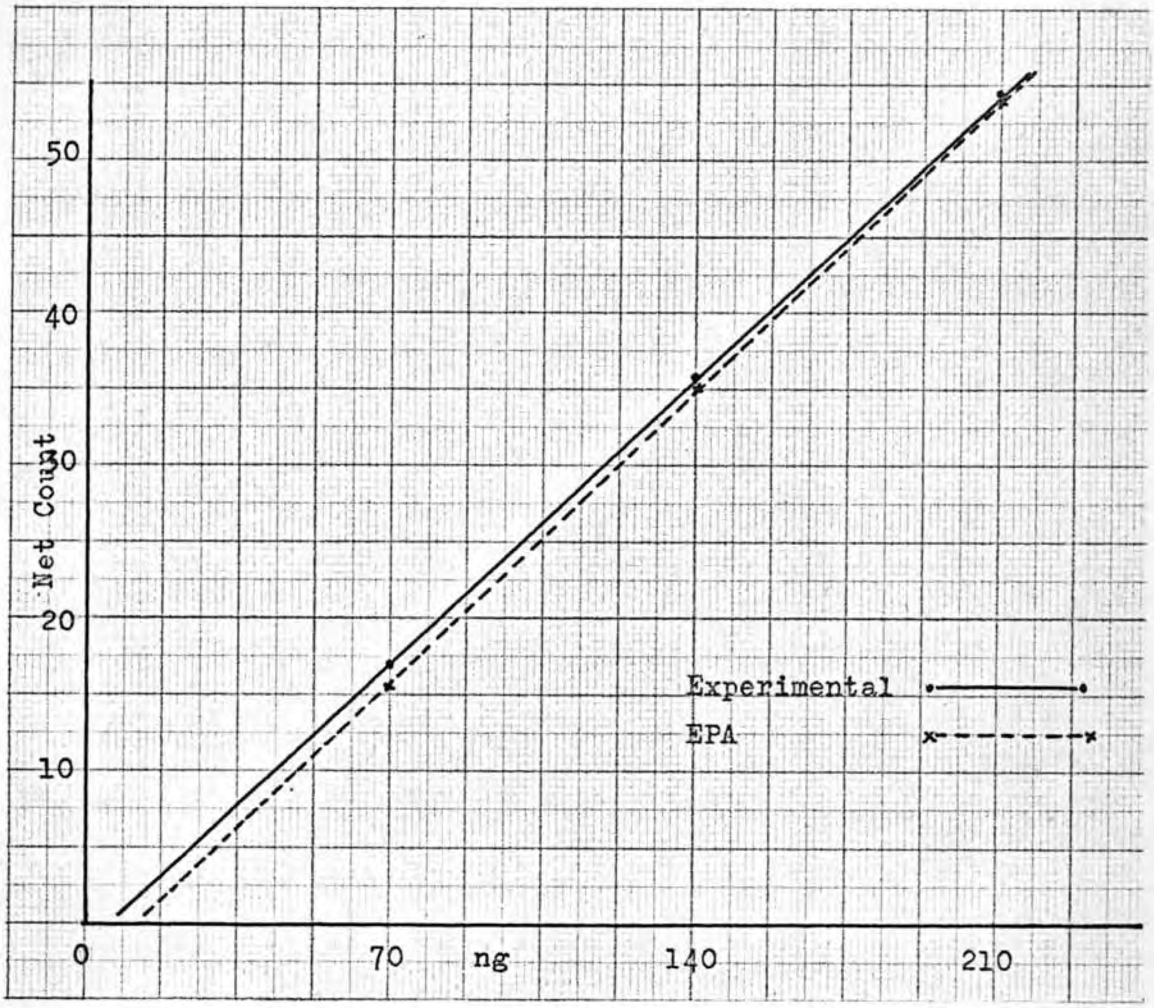


Figure 19b: Calibration Curve for Mercury



<u>Figure</u> 20: Accuracy Curves for Experimental and EPA Standards for Mercury

	Experimental	EPA
70 ng	17.0*	15.5*
140 ng	36.0	35.5
210 ng	54.5	54.0

EPA: Environmental Protection Agency

* : Net Count

Figure 19a and 19b show the calibration curves for lead and mercury respectively. The graphical representation of the accuracy test for the determination of the total mercury is illustrated in Figure 20 showing the comparison for the experimental and the EPA standards.

The four samples of the same specimen were determined for the lead content giving the following results:

Sample No.	Scale reading
1	5.3
2	6.0
3	5.6
4	5.0

So for these four determinations the precision values is $\bar{X} \pm 0.079$ at 95 % confidence interval.

The recovery percentage of the method for the determination of lead was also made with the following results:

Sample No.	recovery percentage
1 (2 μg)	85
2 (3 μg)	93.3
3 (4 μg)	116.7

The resulting recovery percentage was $\bar{X}\pm16.01$ at 95 % confidence interval.

The accuracy test for lead was not made due to the unvailability of the recommended lead standard.

The four samples of the same specimen were analysed for the total mercury content with the following results:

Sample No.	Net count
1	14
2	17
3	18
4	16

From these results, the precision value of $\bar{X}\pm0.08$ at 95 % confidence interval was observed.

The recovery percentage for the determination of mercury was also made with the following results:

Sample No.	Recovery percentage
1 (20 ng)	112.5
2 (30 ng)	90
3 (40 ng)	107.5

So the resulting mercury percentage was $\bar{X}\pm0.13$ at 95 % confidence interval.