Contract AT(11-1)-3568

GENERAL SUMMARY OF PROGRESS

1973 - 1974

Plutonium and Americium Concentration along Fresh
Water Food Chains of the Great Lakes, U.S.A.

Principal Investigator: Vaughan T. Bowen

Woods Hole Oceanographic Institution

Woods Hole, Mass. 02543

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

leg

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

In this report are summarized the following:

- a) Collections in 1973-1974, in and about Lake Ontario, of water, sediments, and biological materials.
- b) The analytical data so far completed on samples collected in 1971, 1972, and 1973.
- c) Some of our ideas on the trends revealed by these data, and on their interpretation.

SAMPLING

In Table 1 we have summarized the 1973-74 sampling program, and in Figure 1 have shown the station locations for all water, plankton and sediment samples that we have so far collected; in Figure 2 are shown the locations of the samples of rooted algae and angiosperms collected during the past year.

The water, plankton and sediment sampling in 1973 was done on the research vessel T-501, operated by the Lake Ontario Environmental Laboratory, New York State University College at Oswego. We are grateful to Captain K. McCullough and his crew for their assistance, interest and cooperation, and to Dr. R. B. Moore, Director of the Laboratory, for his help in making our arrangements.

Samples of fish were, again, collected for us by the Cape Vincent Fisheries Station, New York State Department of Environmental Conservation. We are especially grateful to Mr. G. C. LeTendre for his enthusiasm in meeting our requirements.

Field work on shipboard was carried out by Mr. J. C. Burke and Dr. J. G. Farmer of our staff, and shore sampling was done by Mr. John W. Goodrich-Mahoney.

MASTER

Figure 1. Collection Locations for Water Samples, Plankton and Sediments -- 1971, 1972, 1973.

ANALYSES

A. Water Samples: In Table 2 are summarized the complete radiochemical data on the 1972 water samples, still uncompleted at the time of last year's report. In Table 3 are summarized, in the same pattern, the analyses so far completed on the 1973 samples. Not shown are four results of analysis of water for Am 241:

<u>1973 Station</u>	<u>Depth of Sample-m</u>	<u>dpm per 100 kg</u>	
		<u>Pu 239,240</u>	<u>Am 241</u>
1	0	0.12±0.03	0.01±0.01
3	20	0.10±0.02	0.02±0.01
3	80	0.33±0.06	<0.01
4	135	0.39±0.03	0.05±0.02

B. Sediment Samples: In Tables 4, 5, 6 and 7 are summarized the radiochemical data for the four 1971 sediment cores; these include some analyses that were not completed last year, and show all the Cs 137 values revised after reconsideration of our radiochemical blank, as we discussed in last year's report.

In Tables 8, 9, 10, 11 and 12 are summarized the data, still incomplete, for the five 1972 sediment cores.

And in Tables 13, 14, 15 and 16 are set out the data, also incomplete, for cores 73-1, 73-7, 73-13B, and 73-14, the only cores of the 1973 collection for which we have, yet, any data.

C. Biological Material: In Table 17 are summarized the available radiochemical data for the biological material collected in 1972 and 1973. A considerable amount of effort has been put, during the past year, to recounting Pu 239, 240 plates of "interesting" biological samples from the 1972 collection including the plankton; this has resulted in improved statistics on a large number of samples. For convenience in cross referencing, the 1972 sample data are arranged exactly as in last year's report.

None of the 1973 fish collection has yet been analyzed, and only a part of the shore-line plants. The data for these plants, and for the 1973 plankton, are to be found at the end of Table 17.

DISCUSSION

A. Quality of Data: We have continued the same sort of quality control analyses that we described at length last year, and have engaged in additional interlaboratory comparison analyses sponsored either by the International Atomic Energy Agency or by the U.S. National Bureau of Standards. The results of these activities appear to confirm that our data are of good quality.

B. Water Samples: Final data for the 1972 water samples are shown in Table 2 ; unfortunately two Pu samples were lost in separation. The data so far available for the 1973 samples are shown in Table 3; analysis of the rest of the samples is proceeding steadily. All the 1973 Sr 90 data have been held back because of some peculiarities in the Y 90 decay curves; we hope to resolve this confusion shortly.

As shown in Table 18 both Cs 137 and Pu 239 have shown a steady decline in mean concentration in Lake Ontario, but the rate of the decline is much less for Cs 137 than for Pu 239, and (probably) both much more than for Sr 90. In each of the three sampling years there has appeared to be a distinct break in the relation of concentration of Pu 239 to depth of sample. In 1972 and 1973, when good temperature data were available, the subjectively identified break in the concentration curve was much deeper than the measured thermocline depth, which ran from 8 to 15 m in 1972, and from 12 to 29 m in 1973. As shown in Table 18, no difference was seen in Sr 90 concentration above or below the break, while Cs 137 was higher above in 1971, lower above in 1972, and showed no difference in 1973. Pu 239, in each year, was quite consistently about twice as concentrated in the deeper water, although in 1973 the deep water mean was very strongly influenced by two very high-concentration samples. It does not appear to us that these data are consistent with Lerman's (1973) suggestion that diffusion out of the lake water into sediment interstitial water is a major removal pathway for either Cs 137 or Pu 239. Should this be so, we would expect to see, during the period of strong thermal stratification of the lake, a diminution of the concentrations of both nuclides in the deep water. The Pu 239 pattern could, we believe, be explained either by transport of Pu 239, across the thermocline, associated with sinking particles, or by release of Pu 239 from the sediments to the bottom water of the lake. In-

fluenced by the small number of very high bottom water Pu 239 concentrations in 1973, we incline to the hypothesis of sediment release of this nuclide, but need more data. An examination of all of our data shows no correlation of high bottom water Pu 239 (or Cs 137) with the concentration in the top layer of sediment cores at the same station. This, of course, need only indicate that horizontal rates of bottom water flow are fast compared to rates of return of either nuclide to the water column.

So far we have been unable to correlate the levels in the water of the fallout nuclides to any specific aspect of the lake's morphology. We hope that when all the 1973 data are in it will be possible to discern the influence of the Lake Erie input, via the Niagara River; this has been argued, both by ourselves in last year's Progress Report and by Lerman (1973) to be very important in the supply of fallout nuclides to Lake Ontario.

The four analyses of americium 241 in water samples, set out above on page 2, while too few for conclusive discussion, are already quite intriguing. In Atlantic Ocean water columns at about the latitude of Lake Ontario we have seen a tendency for Am 241 to Pu 239, 240 to approximate 0.16 in near-surface samples, and to increase systematically with depth, reaching about 0.38 at 2000 to 2500 m. Coupled with this change in ratio is a strong tendency for Am 241 and Pu 239, 240 to covary. In the lake samples, already, we see no evidence of this sort of behavior: complete lack of covariance, and no systematic relation of ratio with depth. These data do appear to confirm that the two nuclides move by different pathways in this fresh water environment, and we will return to this point in discussing the data for sediments and for organisms.

C. Sediment Cores: As noted in the section, Results, and in Tables 4 through 16, we now have a good deal of data from 13 sediment cores, taken in three different years, by two different coring devices, and sectioned either after freezing, or by immediate extrusion. Our statement last year that comparison of the core data "presents a very confusing picture" is holding up well as a masterly summary of the situation.

This is well illustrated in looking at the ranges of the Pu concentrations of the surface sediment layer:

In 1971, Pu 239, 240 from a low of 2 dpm per kg dry sediment to a high of 60.

In 1972, a low of <0.5 to a high of 450.

In 1973, a low of 6 to a high of 408.

Comparison of the integrated Pu 239, 240 and Cs 137 in the sediment columns also offers some possibility of fruit: the data, in mc/km²:

a) <u>In 1971</u>	<u>71-2</u>	<u>71-3</u>	<u>71-4</u>	<u>71-5</u>		
Pu 239,240	0.38	0.68	0.33	1.36		
Cs 137	19.9	34.5	15.8	47.7		
b) <u>In 1972</u>	<u>72-1</u>	<u>72-2</u>	<u>72-3</u>	<u>72-4</u>	<u>72-5</u>	
Pu 239,240	~0.00	0.32	0.19	0.58	0.61	
Cs 137	<0.5	~14.6	7.9	18.5	27.8	
c) <u>In 1973</u>	<u>73-1</u>	<u>73-7</u>	<u>73-1313</u>	<u>73-14</u>		
Pu 239,240	0.02	0.27	0.47	0.97		
Cs 137	1.45	~18	14.6	53.5		

These estimates can be compared with fallout delivery estimates: From Noshkin and Bowen (1973) the delivery of Pu 239, 240 should have been 2.1 mc/km² to the 40°-50° N. band, and of Cs 137 116 mc/km² up to the end of 1970; since 1970, annual increments of fallout have amounted to less than 2% in the northern hemisphere. If

we omit from consideration cores 72-1 and 73-1, from which, obviously, most fallout-containing sediment had been removed, the mean Pu 239, 240 inventory, in the 11 cores represented, is 0.56 mc/km^2 , and the mean Cs 137 is 24.8. In each case, to well within the uncertainty of the numbers, the inventory amounts to 25% of the estimated direct delivery to the lake surface. The mean ratio Cs 137 to Pu 239, 240 is 48.2 in the 13 cores, a value comparing favorably with the 55.5 estimated for fallout delivery, but that may well indicate somewhat more rapid passage of Cs 137 out of the lake -- or of Pu 239, 240 into the lake, either from the upper lakes or from run-off.

It appears to us clear that the result of "normal" sedimentation in Lake Ontario is exhibited in cores 71-4, 72-3, 72-4, 73-13, and 73-14: the great preponderance of Pu and of Cs 137 in the top 2 or 3 cm, with much smaller amounts distributed down to 6, 10, or even 12 cm. The other 8 of the 13 cores show more or less severe abnormalities, and of three different patterns:

- a) loss of the fallout-rich upper layer (as in cores 72-1 and 73-1),
- b) buried layers of fallout-rich sediment, either under a low fallout layer (as in core 71-3), or under relatively high fallout sediments (as in cores 71-2, 71-5, 72-2), or
- c) significant, but low and variable, concentrations of fallout nuclides extending very deep into cores, but below near-surface layers that look like "normal" sedimentation (as in cores 72-5 and 73-7).

Each of these abnormal patterns is explainable by sediment translocation in reasonably simple patterns, and we are now persuaded that a large amount of very severe sediment erosion and redeposition must have characterized Lake Ontario in the last few years. We are, however, puzzled by the apparent lack of correspondence between bathymetry and evidence of sediment relocation, and by the evidence, in two places, that a core represents the history of only a small amount of lake bottom:

- 1) In the deepest part of the lake we now have 3 cores: 71-3, 71-5 and 73-13B. The first two show evidence of massive relocation of sediment, to depths of at least 40 cm. The third, however, two years later, shows essentially "normal" deposition, and has been analyzed down to 82 cm. It is very hard to see how the physical phenomenon responsible for the 1971 patterns in this basin could have left a near-by area completely undisturbed.
- 2) At the western end of the lake we have two adjacent cores, one 72-5 (at 104 m), the other 73-1 (at 80 m). The latter of these shows evidence of almost complete removal of the upper few centimeters of sediment, but the former shows no evidence of having been affected by such a translocation. We will make a strong effort in 1974 to reexamine this area, to pinpoint whether the scouring of 73-1 must have taken place after collection of core 72-5.

We hope that completion of the 1973 cores, and of the series planned for 1974 may illuminate some of these problems. At present we are puzzled that it can be possible anywhere in the lake to find long columns of such undisturbed sediments as have been used for pollen dating or, by Lamont, for Pb 210: if only 5 out of 13 cores have remained undisturbed over the fallout experiment period (20 years at most) the statistics look very bad for any location remaining undisturbed for hundreds of years.

A point that may be relevant to some of the sediment profiles is the question of upward diffusion of Pu 239 and Cs 137 in the sediment column. We have evidence that this is an important process in shallow, largely reducing, marine sediments, although the rate appears to be only 2-4 cm per year for upward translocation -- too slow to convert profiles like 71-5 to resemble 73-13B. The only positive evidence we can see that this may be happening, to some extent, in Lake Ontario, is in the regularly higher late-summer Pu 239 in deep water versus shallow water. The amount of Pu 239 represented by the indicated deep water excess appears too

large to have originated, since the lake was homogenized during spring overturn, anywhere except from the sediments. There is no such evidence for upward diffusion of Cs 137 from the sediments into the deep water.

Americium 241 data have now been obtained for several sections of each of 7 cores; these and the Am^{241} data for the near-shore plants discussed below are set out, as ratios of Am 241 to Pu 239, 240 in Table 19. The range of ratios seen in the sediments, from 0.15 to 0.42 matches very closely with the range (from 0.16 to 0.38) we have seen in two North Atlantic Ocean water columns. Unlike these water column data, where a definite positive relation is established giving higher ratios in deeper water samples, no very strong regularities appear in the sediment columns. We believe that the data are good enough so that significance can be attached to differences between the low ratios (0.15-0.19), the middle range (0.25-0.28), and the high range (0.32-0.42); it will take more analyses to give us information to confirm the significance of some of the subtler differences. In some cases (the two pairs of ratios on core 71-5, the 4-5 cm peak ratio of core 72-4, the top of core 72-5, for example) inspection of the curves of Pu 239 and Cs 137 concentrations versus depth in core suggests that the Cs 137 data, when calculated, will indicate that there has been upward movement of Pu 239 compared to either Cs 137 or Am 241 resulting in the higher ratios. Our prediction had been that Am 241, as the most lanthanide-like of the actinides, would be less mobile in sediments than we have found Pu 239 to be, at least in marine cores. These ratio data seem to be pointing, though still weakly, in the same direction.

D. Biological Materials: As discussed above, under Analyses, a lot of effort has been put into improving the counting statistics on the 1972 fish Pu 239, 240 data. The results, as set out in Table 17, are quite satisfactory. Samples of guts, or of guts and liver combined, are usually the richest in Pu of the dissected samples. The changing balance between these and those of liver alone reflects, we believe, the fact that the latter organ integrates Pu over a longer time span than does the gut, which is probably reflecting Pu in its contents rather than in the intestinal tissues themselves. Bones are the next most likely to exhibit high Pu levels, but here the concentrations range lower, and are more variable. Muscle and roe samples, the "eating parts" of the fish, show the lowest range of concentrations.

There are some ecological consistencies, in that bottom feeding fish tend to pick up more Pu than do those feeding more widely in the water column. And there are some puzzling ecological-taxonomic irregularities:

a) Of the higher predators, large-mouth bass, rock bass, white perch and coho salmon agree in depositing a good deal of Pu in their bones, while the northern pike, yellow perch and fresh water drum put about all their Pu in the liver -- and the chinook salmon seems to be able to avoid much uptake of Pu at all.

b) Of the bottom feeders only the redhorse sucker shows a high bone Pu, and combines with this, the second highest "meat" Pu of any fish we have yet analyzed. We know no basis in ecology or physiology why it should differ from the white sucker, carpsucker or carp, nor do we know why the gizzard shad which showed by far the highest Pu yet seen in its "guts and liver" sample, should have much less than average Pu in its bones, and the highest concentration in its "meat" of the fish so far analyzed.

The data hint, also, of some geographical regularities, but too few samples are involved to justify any discussion.

Our more recently collected fish samples are much larger size -- 5 kg or so -- and should yield good data from rather shorter counting times. We hope that the next year will, then, permit us to clarify some of these questions.

Plankton: As noted above, the 1972 plankton samples were recounted, for long periods, to yield better statistics. The range has been reduced to a quite reasonable $\pm 30\%$. Our confidence is enhanced, also, by the fact that the 1972 plankton dry-weight Pu data all fall within the range of the more extensive 1973 series; this is true for the Cs 137 values as well. We would not have expected that the latter data would reflect the small reduction in mean Cs 137 concentration in lake water (about -25% above 45 m from 1972 to 1973), but are surprised that the plutonium in plankton showed no change between these two years when the water concentration fell by almost 50% in the upper layers of the lake.

It is of interest to examine the degree to which net plankton concentrate plutonium, or cesium 137, in the lake. We have used the mean wet weight to dry weight ratio, 42.84, found for 10 plankton samples (#6 mesh) collected in 1973, to adjust the 1972 plankton data to wet weight basis; the range of ratios in the 1973 samples, from 19.0 to 77.0, indicates this operation to be only marginally satisfactory, but 6 of the 10 fell in the range 30 to 50, so the results may be taken as probably good.

This is quite a change from the ratio of 10, used last year in calculating the concentration factor for Pu in plankton, and has had a strong effect on the pattern.

In both years the surface water collected at the plankton tow sites showed significant variations: in 1972 from a low of 0.04 dpm Pu 239, 240 per 100 kg, to a high of 0.13, and in 1973 from a low of 0.01 to a high of 0.12. In neither year did either the high or the low plankton value coincide with the high or the low water value. In 1972, the wet weight Pu concentration ratios were all less than 100, ranging from a low of 15 to a high of 40; in 1973, by contrast, 6 out of 8 samples (for two of the 10 plankton samples analyzed, surface water samples have not yet been analyzed, and for two others it is necessary to extrapolate from nearby stations) showed ratios 100 or more, with a mean of 150 and a range from <8 to 300.

In the case of Cs 137 also, the wet weight ratios range below 100: only one sample showed a ratio higher than 100 in the two years; data from 12 samples are represented.

These results offer an interesting contrast to the marine situation where the available data indicate concentration factors of 10^2 - 10^3 for Pu 239, 240 (Noshkin, 1972) and of close to 10 for Cs 137 (Bowen, 1971). We are curious to know whether the difference in respect to Pu, is to be attributed just to the higher concentration of competing surfaces in the more turbid lake environment, or to some difference in the chemical states of the elements in fresh water; we incline to the former explanation, but feel it desirable to examine the question further. In the case of Cs 137, the difference can safely be assumed to be produced by the much lower concentrations of stable Cs and of K in the fresh water environment.

Shore-line Plants: At the end of Table 17 are shown the radiochemical analyses of a number of plant specimens collected from the shores of Lake Ontario, and the upper St. Lawrence River, at the sites shown on Figure 2. By no means all the samples in hand have yet been analyzed. As shown in the table, most samples consisted of Cladonia, either C. fracta (3 samples) or C. glamorata (4 samples), or an unidentifiable species (1 sample); two others consisted of Rhyoclonium, either R. crassipelictum alone, or R. hookeri mixed with C. glamorata; and two others consisted of higher plants, either eel grass or an unidentified water weed.

Interpreting these data is made difficult by the fact that we do not know how well the lake water data of Table 18 represent the concentrations of Pu 239 or Cs 137 to which the plants were actually exposed, and that we know even less well how to use the few Am 241 data shown on page 1. Our expectation, however, based on the belief that Pu, Am, and Cs are all more or less avidly removed from the water by contact with oxidizing sediments, is that the "open lake" values should represent upper limits to the concentrations in near shore or river waters. This makes interesting the fact that Pu 239, 240 concentration factors (per unit wet weight in plants versus mean lake water) range from 630 to 3200, the mean being 1410 for the 12 samples analyzed. The attached near shore plants thus appear to be at least an order of magnitude more active in drawing Pu from the lake than are the net plankton of the open waters: an observation we find quite surprising.

Am 241 was also concentrated in most of these samples compared to the mean of 4 "open lake" water values (0.02 ± 0.02 dpm per 100 kg), but always to a lesser extent than was Pu. Our data indicate, tentatively, a mean ratio Am 241:Pu 239, 240, in the open lake, of

0.33. By comparison, the same ratio in the near-shore plants ranged from a low of 0.05 to a high of 0.2. We do not present the mean of these ratios since there seem, here, to be systematic variations, possibly a taxonomic relationship: each of the three samples of C. fracta showed a ratio less than 0.1, whereas only two of the other 9 samples showed ratios this low (one C. glamorata, and the C. glamorata plus R. hookeri sample). The data are not yet numerous enough to allow us to distinguish, with confidence, between high or low concentrations characterizing species, and those that characterize locations.

TABLE 1

LAKE ONTARIO SAMPLES COLLECTED DURING 1973 AND EARLY 1974

A. From RV T-501 of STATE COLLEGE at OSWEGO:

STATION 73-1: Position 43°21'N; 79°29'W.

Date 8-21-73; Time 1015; Water Depth 80 m.

60 L. Water Samples @ Surface, 20m, 40m, 78m.

Plankton Tow 1/2 m, #6 Mesh for 15 min.

21-cm Diameter Gravity Core @ 80m: 62 cm.

STATION-73-2: Position 43°45'N; 79°W.

Date 8-22-73; Time 0830; Water Depth 70m; Thermocline 13m.

60 L. Water Samples @ Surface, 20m, 40m, 70m.

Plankton Tow 1/2 m, #6 Mesh for 10 min.

STATION-73-3: Position 43°39'N; 79°W.

Date 8-22-73; Time 1030; Water Depth 120m; Thermocline 13m.

60 L. Water Samples @ Surface, 20m, 40m, 80m, 120m.

21-cm Diameter Gravity Core @ 120 m: 72 cm.

STATION-73-4: Position 43°31'N; 79°W.

Date 8-22-73; Time 1200; Water Depth 135m; Thermocline 12m.

60 L. Water Samples @ Surface, 20m, 40m, 80m, 135m.

Plankton Tow 1/2 m, #6 Mesh for 10 min.

21-cm Diameter Gravity Core @ 135 m: 66 cm.

STATION-73-5: Position 43°23'N; 79°W.

Date 8-22-73; Time 1410; Water Depth 95m; Thermocline 20m.

60 L. Water Samples @ Surface, 20m, 40m, 90m.

21-cm Diameter Gravity Core @ 95m: 77 cm.

STATION-73-6: Position 43°20'N; 79°W.

Date 8-22-73; Time 1525; Water Depth 50m; Thermocline 29m.

60 L. Water Samples @ Surface, 20m, 48m.

Plankton Tow 1/2 m, #6 Mesh for 10 min.

21-cm Diameter Gravity Core @ 50m: 54 cm.

STATION-73-7: Position 43°24'N; 78°W.

Date 8-23-73; Time 1240; Water Depth 50m; Thermocline -- None.

60 L. Water Samples @ Surface, 20m, 50m.

Plankton Tow 1/2 m, #6 Mesh for 10 min.

21-cm Diameter Gravity Core @ 50m: 13 cm.

STATION-73-8: Position 43°26'N; 78°W.

Date 8-23-73; Time 1345; Water Depth 104 m; Thermocline 16m.

60 L. Water Samples @ Surface, 20m, 40m, 80m, 100m.

21-cm Diameter Gravity Core @ 104m: 58 cm. (8-24-73; 1600)

STATION-73-9: Position 43°48'N; 78°W.

Date 8-24-73; Time 1045; Water Depth 85m; Thermocline 15 m.

60 L. Water Samples @ Surface, 20m, 40m, 80m.

Plankton Tow 1/2 m, #6 Mesh for 10 min.

STATION-73-10: Position 43°43'N; 78°W.

Date 8-24-73; Time 1230; Water Depth 132m; Thermocline 12m.

60 L. Water Samples @ Surface, 20m, 40m, 80m, 128m.

21-cm Diameter Gravity Core @ 132m: 17 cm.

STATION-73-11: Position 43°28'N; 78°W.

Date 8-24-73; Time 1500; Water Depth 130m; Thermocline 17m.

60 L. Water Samples @ Surface, 20m, 40m, 80m, 125m.

Plankton Tow 1/2m, #6 Mesh for 10 min.

21-cm Diameter Gravity Core @ 130m: 91 cm.

TABLE 1 -- Contd. (2)

STATION-73-12: Position 43°23'N; 76°58'W
 Date 8-25-73; Time 0835; Water Depth 95m; Thermocline 14m.
 60 L. Water Samples @ Surface, 20m, 40m, 90m.
 Plankton Tow 1/2 m, #6 Mesh for 10 min.
 21-cm Diameter Gravity Core @ 95m: 23 cm.

STATION-73-13: Position 43°31'N; 76°58'W.
 Date 8-25-73; Time 1010; Water Depth 245m; Thermocline 15m.
 60 L. Water Samples @ Surface, 20m, 40m, 80m, 245m.
 Plankton Tow 1/2 m, #6 Mesh for 10 min.
 21-cm Diameter Gravity Core @ 245m: A - top 10 cm..
 B - 82 cm.

STATION-73-14: Position 43°42'N; 77°W.
 Date 8-25-73; Time 1230; Water Depth 105m; Thermocline 15m.
 60 L. Water Samples @ Surface, 20m, 40m, 95m.
 Plankton Tow 1/2 m, #6 Mesh for 10 min.
 21-cm Diameter Gravity Core @ 105m: 52 cm.

B. Lake Ontario and St. Lawrence River Biological Samples Collected July/Aug. 1973

STATION 73-A: Morristown: 44°36.7'N; 75°36.7'W.
 Eel grass (angiosperm), algae (*C. fracta*), algae (*Rhyoclonium hyroglyphicum* and *spirogya*)

STATION 73-B: Wilson Pt.: 44°05.3'N; 76°21.7'W.
 Algae (*Cladophora glamorata*), algae (*C. fracta*)

STATION 73-C: Grass Pt. State Park: 44°17.0'N; 76°00.0'W.
 Green plant (non-grasses), algae (*Rhyoclonium hookeri* and *spirogya* species)
 algae (*Rhyoclonium crassipelictum*)

STATION 73-D: Cape Vincent: 44°07.7'N; 76°20.0'W.
 Algae (*C. glamorata*), algae (*cladophora* species), clams, green plant (angiosperm),
 angiosperm.

STATION 73-E: Long Pt. State Park (Chaumont Bay side): 44°00.0'N; 76°13.5'W.
 Algae (*C. glamorata*)

STATION 73-F: Long Pt. State Park (Lake Ontario side): 44°00.5'N; 76°17.0'W.
 Algae (*C. glamorata*).

STATION 73-G: Stoney Pt.: 43°50.5'N; 76°17.0'W
 Algae (*C. glamorata*) (2)

STATION 73-H: Sandy Pond: 43°38.0'N; 76°12.0'W
 Algae (*C. glamorata*) (2)

STATION 73-I: Nine Mile Pt.: 43°31.5'N; 76°22.5'W
 Algae (*C. fracta*), algae (*Rhyoclonium* species and *C. glamorata*)

STATION 73-J: Burt's Pt., Oswego: 43°27.2'N; 76°33.1'W
 Algae unidentifiable, algae (*C. glamorata*)

STATION 73-K: Fairhaven Beach State Park: 43°20.8'N; 76°41.5'W
 Algae (*C. glamorata*) (2)

STATION 73-L: Sodus Pt. Coast Guard Station: 43°16.4'N; 76°59.0'E
 Algae (*C. glamorata*), algae (*Rhyoclonium hookeri* and *C. glamorata*)

STATION 73-M: Hughes Marina, Putneyville: 43°17.5'N; 77°08.5'W
 Algae (*C. glamorata*)

TABLE 1 -- Contd. (3)

C. Fish Collected by Cape Vincent Fisheries Station, 1973:

<u>Species</u>	<u>Weight, kg</u>	<u>Date</u>	<u>Location</u>
Gizzard Shad	2.5	Sept.-Oct., '73	Eastern Lake Ontario
Smallmouth Bass	7	"	"
Alewife	5.5	"	"
Spot Tail	3	"	"
Unionid Clams	6	"	"

D. Fish Collected by Cape Vincent Fisheries Station, Spring 1974:

<u>Species</u>	<u>Date Captured</u>	<u>Location</u>	<u>Water Depth</u>
Gizzard Shad	5/15/74	Eastern Lake Ontario	Shallow
White Sucker	5/15/74	"	"
Redhorse Sucker	5/15/74	"	"
Carp	5/15/74	"	"
Brown Bullhead	5/15/74	"	"
Rock Bass	5/15/74	"	"
White Perch	5/15/74	"	"
Northern Pike	5/29/74	"	"

TABLE 2

RADIOCHEMICAL ANALYSES OF 1972 LAKE ONTARIO WATER SAMPLES
RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER 100KG

STATION	72-1	72-2	72-3	72-4	72-5
POSITION	43°40'12"N; 76°43'48"W	43°45'00"N; 77°42'00"W	43°38'24"N; 78°30'00"W	43°24'00"N; 79°00'36"W	43°21'30"N; 79°28'48"W
DATE - 72	9-11	9-12	9-12	9-13	9-13
WATER DEPTH - m	140	90	140	90	104
SAMPLE DEPTHS (m)					
Pu239	0.08 ± 0.02	0.13 ± 0.03	0.04 ± 0.02	0.07 ± 0.03	0.07 ± 0.04
0 Cs137	8.4 ± 0.6	8.0 ± 0.6	7.3 ± 0.7	9.5 ± 0.7	7.9 ± 0.6
Sr90	249 ± 2	257 ± 16	272 ± 2	271 ± 8	266 ± 12
12-Pu239			0.04 ± 0.01	0.09 ± 0.02	0.06 ± 0.03
15 Cs137			7.8 ± 0.8	9.5 ± 0.8	9.7 ± 0.5
Sr90			273 ± 7	274 ± 3	259 ± 2
Pu239	0.04 ± 0.02	lost			
20 Cs137	8.4 ± 0.6	9.8 ± 0.6			
Sr90	250 ± 3	262 ± 11			
Pu239	lost	0.10 ± 0.03			
40 Cs137	7.5 ± 0.6	9.1 ± 0.5			
Sr90	278 ± 1	274 ± 12			
Pu239				0.15 ± 0.03	0.04 ± 0.02
50 Cs137				10.0 ± 0.7	10.0 ± 0.5
Sr90				279 ± 3	290 ± 11
Pu239		0.14 ± 0.01	0.04 ± 0.01	0.22 ± 0.05	
80 Cs137		10.4 ± 0.6	9.1 ± 0.7	9.9 ± 0.8	
Sr90		273 ± 13	258 ± 9	277 ± 2	
Pu239					0.12 ± 0.03
95 Cs137					11.1 ± 0.5
Sr90					286 ± 10
Pu239	0.14 ± 0.01		0.10 ± 0.03		
120-Cs137	6.7 ± 0.7		9.2 ± 0.7		
130 Sr90	267 ± 1		277 ± 3		

TABLE 3

RADIOCHEMICAL ANALYSES OF 1973 LAKE ONTARIO WATER SAMPLES
RADIONUCLIDES IN DISINTEGRATIONS PER MINUE PER 100 KG

STATION	73-1	73-2	73-3	73-4	73-6	73-8	73-10	73-11	73-12
POSITION	43°21'N; 79°29'W	43°45'N; 79°W	43°39'N; 79°W	43°31'N; 79°W	43°20'N; 79°W	43°26'N; 78°W	43°43'N; 78°W	43°28'N; 78°W	43°23'N; 76°58'W
DATE - 73	8-21	8-21	8-22	8-22	8-22	8-23	8-24	8-24	8-25
WATER DEPTH - m	80	70	120	135	50	104	132	130	95
SAMPLE DEPTHS (m)									
0	Pu-239 Cs-137 Sr-90	0.12±0.03 6.5 ±0.8	0.02±0.01 13.5 ±0.9	0.02±0.01 7.8 ±0.6	0.02±0.01 5.4 ±1.2	0.03±0.01 8.1 ±0.5	0.02±0.01 7.0 ±1.9	0.01±0.01 8.6 ±0.6	0.01±0.01 9.7 ±0.5
20	Pu-239 Cs-137 Sr-90	0.03±0.01 4.2 ±0.6	0.10±0.02 10.5± 1.5	0.03±0.01 5.5 ±0.9	0.05±0.01 9.7 ±0.6	0.03±0.01 5.9 ±0.7	0.10±0.03	0.02±0.01 6.0 ±0.6	0.01±0.01 6.9 ±0.7
40	Pu-239 Cs-137 Sr-90	0.03±0.01 5.5 ±0.6	0.07±0.01 10.1 ±0.6	0.03±0.01 6.1 ±0.8	0.07±0.01 5.9 ±0.6	0.02±0.01	0.03±0.01	0.07±0.03 5.6 ±0.6	0.05±0.02 7.5 ±0.5
70	Pu-239 Cs-137 Sr-90		0.10±0.01 8.0 ±0.8						
78-80	Pu-239 Cs-137 Sr-90	0.03±0.01 6.5 ±0.8	0.01±0.01 6.9 ±0.6	0.11±0.04		0.05±0.01 6.0 ±0.5	0.04±0.01	0.06±0.02	
90	Pu-239 Cs-137 Sr-90								0.03±0.02 6.9 ±0.6
100	Pu-239 Cs-137 Sr-90					0.04±0.01 8.1 ±0.7			
120-135	Pu-239 Cs-137 Sr-90		0.33±0.06 8.7 ±0.8	0.39±0.03 13.1 ±0.8			0.02±0.02	0.06±0.02 6.2 ±0.8	

Sr-90 analyses all are still unfinished.

TABLE 4

RADIOCHEMICAL ANALYSES OF 1971 LAKE ONTARIO SEDIMENT CORE -- STATION 71-2

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date : 8/17/71.
 Location : 43°17'N, 77°28'W
 Water Depth : 36 m
 Core Cross-sectional Area: 28.3 cm²

Depth in Sediment (cm)	Wet/dry Weight	Dry Weight Section (kg)	Pu ²³⁹	Cs ¹³⁷	Sr ⁹⁰	Pu ²³⁸ /Pu ²³⁹
0- 1	1.36	0.036	43.0±3.0	2219±17	---	0.09±0.02
1- 2	1.33	0.045	3.0±1.0	158±11	88± 3	b.d.
2- 3	1.29	0.050	1.3±0.6	103± 9	---	b.d.
3- 4	1.34	0.046	1.2±0.4	72± 9	---	b.d.
4- 5	1.36	0.041	0.7±0.5	35±12	---	b.d.
5- 6	1.36	0.043	<0.5	21±11	4±10	b.d.
6- 7	1.33	0.042	<0.5	4± 8	---	b.d.
7- 8	1.39	0.045	<0.5	10± 8	71±29	b.d.
8- 9	1.41	0.039	<0.7	6±13	---	b.d.
9-10	1.44	0.042	1.3±0.9	26±28	---	b.d.
10-11	1.46	0.041	0.6±0.4	-5±14	---	b.d.
11-12	1.49	0.038	<0.5	2±15	---	---
12-13	1.52	0.054	<0.5	-2± 7	---	---
13-14	2.06	0.057	7.5±1.3	448± 7	---	0.09±0.05

b.d. = below detection limits.

TABLE 5

RADIOCHEMICAL ANALYSES OF 1971 LAKE ONTARIO SEDIMENT CORE -- STATION 71-3

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date : 8/17/71
 Location : 43°28'N, 76°57'W
 Water Depth : 173 m
 Core Cross-sectional Area: 260 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	<u>Pu</u> ²³⁹	* <u>Cs</u> ¹³⁷	<u>Sr</u> ⁹⁰	<u>Pu</u> ²³⁸ / <u>Pu</u> ²³⁹
0- 1	5.95	0.058	3.0±1.0	170± 90	73± 1	1.4 ±0.6
1- 2	4.78	0.068	0.9	150± 80	38± 1	b.d.
2- 3	3.62	0.045	1.0	140	30± 1	1.3
3- 4	3.88	0.050	0.5	300	17± 1	b.d.
4- 5	4.37	0.057	0.8±0.6	90	---	b.d.
5- 6	3.96	0.081	0.4±0.3	110	51± 2	---
6- 7	3.91	0.078	0.2±0.2	100	---	---
7- 8	3.80	0.087	1.0	110	58±12	b.d.
8- 9	3.45	0.098	1.1±0.6	210± 80	---	---
9-10	3.24	0.109	1.4±0.4	150± 80	69± 2	0.03
10-11	3.10	0.105	4.5±1.5	130±100	---	---
11-12	3.07	0.128	5.9±1.2	300± 50	52± 1	0.05±0.03
12-13	2.98	0.130	9.3±1.7	610± 110	---	0.02
13-14	2.88	0.120	8.8±1.4	370± 90	14± 2	0.03
14-15	2.72	0.140	8.8±1.9	560±130	---	0.06
15-16	2.91	0.135	16.4±2.4	680±210	28± 1	0.03±0.02
16-17	2.94	0.146	37.4±2.9	2020±610	---	0.03±0.01
17-18	2.88	0.139	17.0±1.9	870±180	16± 1	0.04±0.02
18-20	2.88	0.243	45.0±2.7	---	---	0.04
20-22	2.61	0.297	12.3±1.9	---	2± 2	0.05
22-24	2.60	0.279	3.6±1.5	93± 6	---	0.03±0.02
24-26	2.50	0.272	3.6±1.5	---	7± 2	0.03±0.03
26-28	2.55	0.302	0.7±0.2	50± 5	---	b.d.
28-30	2.46	0.315	1.5±0.6	83± 5	17± 1	b.d.
30-35	2.29	0.830	0.7±0.3	36± 5	---	b.d.
35-40	2.55	1.137	6.0±2.0	300± 6	13± 1	b.d.

* Cs-137 values from 0-18 cm obtained in d.p.m./Kg by multiplying corresponding values in d.p.m./g in 1971-72 Progress Report by 1000.

TABLE 6

RADIOCHEMICAL ANALYSES OF 1971 LAKE ONTARIO SEDIMENT CORE -- STATION 71-4
RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date : 8/17/71
 Location : 43°27'N, 76°35'W
 Water Depth : 76 m
 Core Cross-Sectional Area: 28.3 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Pu ²³⁹	Cs ¹³⁷	Pu ²³⁸ /Pu ²³⁹
0-1	1.54	0.024	59.6 ± 7.8	3002 ± 14	0.05 ± 0.03
1-2	1.32	0.034	1.1 ± 1.1	111 ± 12	
2-3	1.34	0.032	5.4 ± 3.1	31 ± 15	
3-4	1.42	0.036	1.4 ± 0.8	-4 ± 14	
4-5	1.45	0.031	2.0 ± 1.1	-15 ± 13	
5-6	1.44	0.036	<0.8	77 ± 18	
6-7	1.46	0.026	1.7 ± 1.2	78 ± 18	
7-8	1.50	0.030	1.4 ± 0.8	59 ± 15	
8-9	1.42	0.031	0.8 ± 0.8	56 ± 19	
9-10	1.39	0.033	1.0 ± 0.7	85 ± 12	
10-11	1.40	0.030	<0.3	-4 ± 12	
11-12	1.44	0.032	1.0 ± 0.6	26 ± 14	
12-13	1.50	0.026	<0.4	9 ± 14	
13-14	1.54	0.028	1.0 ± 0.6	27 ± 14	
14-15	1.52	0.021	0.4 ± 0.4	7 ± 14	
15-16	1.52	0.031	<0.2	50 ± 15	
16-17	1.50	0.026	<0.5	9 ± 15	
17-18	1.46	0.028	<0.2	-7 ± 16	
18-19	1.48	0.025	0.5 ± 0.3	0 ± 17	
19-20	1.54	0.026	1.0 ± 0.7	122 ± 5	
20-21	1.52	0.029	<0.5	98 ± 19	
21-22	1.47	0.030	<0.3	16 ± 19	
22-23	1.43	0.030	<0.2	-4 ± 16	
23-24	1.42	0.033	<0.2	6 ± 14	
24-25	1.41	0.027	<0.6	-4 ± 17	
25-26	1.47	0.030	<1.3	-7 ± 20	
26-27	1.42	0.026	<1.0	-1 ± 19	
27-28	1.45	0.034	<0.7	3 ± 16	
28-29	1.46	0.026	<0.6	3 ± 20	
29-30	1.44	0.034	<0.7	-7 ± 19	
30-31	1.39	0.031	0.8 ± 0.5	5 ± 20	
31-32	1.43	0.023	<0.7	-2 ± 26	

CONTINUED NEXT PAGE.

TABLE 6 (Continued)

<u>Depth in Sediment (cm)</u>	<u>Wet/Dry Weight</u>	<u>Dry Weight Section (Kg)</u>	<u>Pu²³⁹</u>	<u>Cs¹³⁷</u>
32-33	1.41	0.027	<0.9	7 ± 20
33-34	1.33	0.036	<0.4	2 ± 16
34-35	1.25	0.036	<0.4	7 ± 17
35-36	1.26	0.035	<0.5	-5 ± 19
36-37	1.26	0.035	<0.4	5 ± 15
37-40	1.09	0.135	0.4 ± 0.4	1 ± 17

TABLE 7

RADIOCHEMICAL ANALYSES OF 1971 LAKE ONTARIO SEDIMENT CORE -- STATION 71-5

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 8/18/71

Location: 43°30'N; 76°57'W

Water depth: 215 m

Core cross-sectional area: 260 cm²

Depth in Sediment (cm)	Wet/dry Weight	Dry Weight Section (kg)	Pu ²³⁹	Cs ¹³⁷	Sr ⁹⁰	Pu ²³⁸ /Pu ²³⁹
0-1	6.18	0.141	27.6 ± 1.4	1033 ± 8	53 ± 2	0.03 ± 0.01
1-3	7.11	0.157	40.9 ± 3.7	945 ± 7	127 ± 1	0.03 ± 0.01
3-4	5.20	0.094	48.2 ± 2.2	1402 ± 10	----	0.06 ± 0.01
4-5	4.53	0.090	49.8 ± 5.6	2377 ± 43	126 ± 1	<0.03
5-6	3.31	0.126	37.8 ± 2.3	994 ± 9	----	0.05 ± 0.01
6-7	3.58	0.091	28.2 ± 2.3	490 ± 30	37 ± 5	<0.06
7-8	3.57	0.164	20.4 ± 1.9	640 ± 20	----	<0.03
8-9	3.83	0.109	9.0 ± 1.2	268 ± 10	36 ± 2	<0.05
9-10	3.90	0.126	4.6 ± 0.6	139 ± 5	----	<0.02
10-11	3.84	0.127	5.1 ± 1.0	148 ± 12	43 ± 1	<0.04
11-12	3.50	0.121	9.8 ± 1.1	275 ± 6	----	<0.05
12-13	3.45	0.144	10.6 ± 1.2	339 ± 8	24 ± 4	<0.04
13-14	3.36	0.101	12.4 ± 1.2	545 ± 7	----	<0.02
14-15	3.76	0.124	26.8 ± 2.3	1114 ± 7	30 ± 15	0.04 ± 0.02
15-16	3.67	0.129	14.9 ± 3.2	820 ± 10	----	
18-20	3.43	0.226	36.6 ± 4.0	1350 ± 19	----	
20-22	4.58	0.170	16.2 ± 1.3	517 ± 5	----	0.03 ± 0.01
22-24	4.61	0.159	21.5 ± 1.6	764 ± 5	----	0.03 ± 0.01
24-26	4.32	0.196	23.0 ± 1.6	704 ± 6	----	0.07 ± 0.02
26-28	4.30	0.185	15.1 ± 1.7	560 ± 4	----	0.06 ± 0.03
28-30	4.48	0.155	22.2 ± 2.8	693 ± 4	----	0.02 ± 0.02
30-35	3.15	0.580	11.0 ± 1.6	509 ± 4	----	
35-40	2.84	0.670	8.2 ± 1.1	364 ± 5	----	0.06 ± 0.03

TABLE 8

RADIOCHEMICAL ANALYSES OF 1972 LAKE ONTARIO SEDIMENT CORE - STATION 72-1

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

CORE COLLECTION DATE: 9/11/72
 LOCATION: 43°40'12"N; 76°43'48"W
 WATER DEPTH: 140 m
 CORE CROSS-SECTIONAL AREA: 285 cm²

Depth in Sediment(cm)	Wet/dry Weight	Dry Weight Section(kg)	Pu ²³⁹	Cs ¹³⁷
0-1	11.63	0.008	<0.5	65 ± 35
1-2	4.24	0.042	<0.5	52 ± 18
2-3	3.38	0.114	<0.5	6 ± 7
3-4	2.95	0.078	<0.5	12 ± 9
4-5	2.91	0.159	<0.5	2 ± 6
5-6	2.81	0.135	<0.5	-3 ± 6
6-7	2.77	0.165	<0.5	0 ± 5
7-8	2.81	0.227	<0.5	2 ± 6
8-9	2.71	0.136	<0.2	4 ± 6
9-10	2.69	0.118	<0.2	2 ± 5
10-11	3.00	0.148	0.2 ± 0.2	20 ± 4
11-12	2.83	0.109	0.7 ± 0.3	2 ± 4
12-13	2.90	0.143	0.3 ± 0.2	-1 ± 5
13-14	2.68	0.104	0.1 ± 0.1	-4 ± 4
14-16	2.82	0.241	<0.1	0 ± 4
16-18	3.05	0.259	0.5 ± 0.3	0 ± 7
18-19	2.73	0.169	0.2 ± 0.2	1 ± 6
19-20	2.87	0.149	0.2 ± 0.2	2 ± 9
20-21	2.84	0.145	<0.1	11 ± 5
21-22	2.83	0.128	0.4 ± 0.2	7 ± 6
22-23	2.77	0.129	<0.2	7 ± 5
23-24	2.77	0.141	<0.3	8 ± 12
24-25	2.94	0.126	0.2 ± 0.2	14 ± 5
25-26	3.22	0.130	0.2 ± 0.2	4 ± 6
26-27	2.95	0.143	0.2 ± 0.2	9 ± 5
27-28	2.85	0.141	<0.3	9 ± 7
28-29	2.78	0.147	0.1 ± 0.1	7 ± 7
29-30	2.81	0.149	<0.2	5 ± 9
30-31	2.88	0.161	0.1 ± 0.1	60 ± 7
31-32	2.88	0.166	0.2 ± 0.2	20 ± 12
32-33	2.82	0.149	0.4 ± 0.2	21 ± 6
33-34	2.83	0.141	<0.2	9 ± 7
34-35	2.81	0.162	0.5 ± 0.4	29 ± 8
37-38	2.77	0.143	<0.2	6 ± 6

Continued on next page

TABLE 8 (Continued)

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section(Kg)	<u>Sr-90</u>	<u>Cs-137</u>	<u>Pu-239</u>	<u>Am-241</u>	<u>Pu²³⁸/Pu²³⁹</u>
40 - 41	2.76	0.136					
41 - 42	2.76	0.118					
42 - 43	2.80	0.153					
43 - 44	2.80	0.122					
44 - 45	2.82	0.139	16± 5	0± 6	<0.1		
45 - 46	2.75	0.134					
46 - 47	2.85	0.141					
47 - 48	2.77	0.122					
48 - 49	2.82	0.119					
49 - 50	2.84	0.121		4± 4	<0.1		
50 - 51	2.75	0.130					
51 - 52	2.87	0.135					
52 - 53	2.84	0.139					
53 - 54	2.84	0.143					
54 - 55	2.85	0.125		6± 8	<0.1		
55 - 56	2.88	0.133					
56 - 57	2.81	0.118					
57 - 58	2.89	0.141					
58 - 59	2.70	0.131					
59 - 60	2.78	0.128		-1± 4	0.5±0.3		
60 - 61	2.82	0.139					
61 - 62	2.74	0.108					
62 - 63	2.79	0.142					
63 - 64	2.72	0.141					
64 - 65	2.78	0.111	15±44	-2± 8	<0.1		
65 - 66	2.80	0.164					
66 - 67	2.69	0.149					
67 - 68	2.67	0.165					
68 - 69	2.60	0.163					
69 - 70	2.57	0.176		0± 3	0.3±0.3		
70 - 71	2.44	0.195					
71 - 79	2.61	0.975		-3± 9	<0.1		
79 - 83	2.46	0.622	-14± 5	2± 4	0.2±0.2		

TABLE 9

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 72-2

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 9/12/72
 Location: 43°45'N, 77°42'W
 Water Depth: 90m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 1	3.30	0.132	51± 5	937±10	18.1±2.4	3.2±0.3	0.035±0.020
1 - 2	1.80	0.253	105± 4	1154±10	26.5±3.4	5.1±0.4	0.027±0.016
2 - 3	1.48	0.437	72± 5	629± 8	14.6±2.2	2.9±0.3	
3 - 4	1.35	0.436	115±10	188± 7	3.1±2.2		
4 - 6	1.31	0.671		81± 5	2.4±0.5		
6 - 8	1.29	0.699		96± 7	2.0±0.5		
8 - 9	1.25	0.412		39± 4	0.7±0.2		
9 -10	1.23	0.318		28± 5	0.6±0.2		
10 -11	1.23	0.267		11± 8	0.1±0.1		
11 -12	1.22	0.189		4±10	0.1±0.1		
12 -13	1.25	0.254		0± 5	<0.1		
13 -14	1.25	0.208		1± 5	0.2±0.1		
14 -15	1.25	0.257		5± 6	<0.1		
15 -17	1.30	0.506		2± 8	0.1±0.1		

TABLE 10
RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 72-3
RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 9/12/72
Location: 43°38'24"N, 78°30'W
Water Depth: 140 m
Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0-1	3.95	0.081	286±6	2521±11	67.4±5.7	19.3±0.8	0.052±0.012
1-2	3.46	0.099	236±5	680± 7	19.9±1.6	4.5±0.4	0.043±0.014
2-3	3.28	0.121	149±5	878± 8	20.0±2.4	5.5±0.4	0.009±0.009
3-4	2.83	0.150	69±3	178± 9	5.5±0.7		0.031±0.022
4-5	2.68	0.138		67± 7	1.5±0.3		
5-6	2.68	0.136		30± 5	1.1±0.2		
6-7	2.71	0.112		8± 5	0.6±0.2		
7-8	2.66	0.116		5± 6	0.1±0.1		
8-9	2.54	0.115		5± 9	<0.1		
9-10	2.38	0.097			<0.1		
10-11	1.86	0.191		28±11	<0.1		
11-21	2.04	0.746		4± 9	<0.1		
21-22	2.14	0.124			<0.1		
22-23	2.14	0.112		10± 6	0.1±0.1		
23-25	2.16	0.186		8± 6	<0.1		
25-27	2.18	0.221		-3± 6	<0.1		
27-29	2.19	0.231		16±10	<0.1		
29-31	2.20	0.230		21± 7	0.2±0.2		
31-33	2.16	0.267		21±17	1.3±0.3		
33-35	2.17	0.285		0± 9	<0.1		
35-37	2.11	0.278		2± 5	0.9±0.2		
-39	2.09	0.291		14±13	0.1±0.1		
39-41	2.13	0.301		18± 5	<0.2		
41-43	2.14	0.348		11±12	<0.1		
43-45	2.13	0.373		15± 7	0.1±0.1		
45-47	2.17	0.340		23± 5	0.3±0.2		
47-49	2.21	0.393		1± 4	<0.1		
49-51	2.24	0.378		17± 5	0.3±0.1		
51-53	2.22	0.402		8± 9	<0.3		
53-57	2.85	0.314		49± 7	0.7±0.3		

TABLE 11

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 72-4

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 9/13/72
 Location: 43°24'00"N, 79°00'36"W
 Water Depth: 90 m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 2	9.02	0.046	504±28	13548±31	459.5±18.5	74.0±3.7	0.033±0.007
2 - 3	4.84	0.037	323±36	6614±27	193.5±20.3	31.1±2.3	0.077±0.030
3 - 4	4.10	0.041	237± 8	3497±19	108.6± 8.1	16.4±2.2	0.028±0.013
4 - 5	3.42	0.067	177± 2	1201±10	40.0± 3.7	12.8±1.0	0.026±0.015
5 - 6	3.18	0.076	140± 7	294± 7	2.6± 0.5		
6 - 7	3.08	0.116		103±22	1.8± 0.4		
7 - 8	2.81	0.105		34± 7	0.3± 0.2		
8 - 9	2.70	0.097		14±10	0.6± 0.2		
9 - 10	2.63	0.142	158± 4	69±10	2.1± 0.5		
10 - 11	2.61	0.141		15± 5	0.1± 0.1		
11 - 12	2.57	0.128		78± 6	0.5± 0.2		
12 - 13	2.51	0.125		39± 4	<0.1		
13 - 14	2.50	0.141		43± 6	<0.1		
14 - 15	2.51	0.137		48± 5	0.1		
15 - 16	2.57	0.145		6± 7	<0.1		
16 - 17	2.58	0.146		6± 9	<0.1		
17 - 18	2.71	0.135		8± 9	0.2± 0.1		
18 - 19	2.68	0.139		5±12	<0.1		
19 - 20	2.57	0.133		6± 5	<0.2		
20 - 21	2.62	0.125		5± 5	0.3± 0.2		
21 - 22	2.70	0.126		8± 5			
22 - 23	2.71	0.122		4± 5	0.5± 0.2		
23 - 24	2.63	0.127					
24 - 25	2.74	0.125	-2± 3	9± 9	<0.1		
25 - 26	2.85	0.126		9±11	<0.1		
26 - 27	2.83	0.122		2± 5	0.1± 0.1		
27 - 28	2.96	0.135		9± 5	<0.1		
28 - 29	3.04	0.130		7± 5	<0.1		
29 - 30	3.04	0.134		14± 6	0.2± 0.2		
30 - 31	2.88	0.114					
31 - 32	2.93	0.121					
32 - 33	3.05	0.130					
33 - 34	2.92	0.128					
34 - 35	2.84	0.116		11± 6	<0.1		
35 - 36	2.93	0.132					
36 - 37	2.81	0.117					
37 - 38	2.86	0.153					
38 - 39	2.88	0.138					
39 - 40	2.76	0.139		0± 7	<0.2		

TABLE 12

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 72-5

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

ore Collection Date: 9/13/72
 Location: 43°21'36"N, 79°28'48"W
 Water Depth: 104m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 1	8.93	0.030	404±10	10593±41	294.8±6.2	84.0±15.0	0.026±0.003
1 - 2	4.58	0.040	330±19	7554±22	166.2±7.2		0.025±0.007
					194.2±9.3	48.2± 4.7	0.023±0.007
2 - 3	3.87	0.077	230± 7	3277±12	45.9±2.7		0.030±0.010
					54.9±2.1	12.4± 0.7	0.036±0.007
3 - 4	3.16	0.104	161± 9	712± 6	10.3±1.3	1.7± 0.5	0.033±0.024
					10.5±0.9	2.3± 0.3	0.034±0.015
4 - 5	2.84	0.106	121± 4	126±10	3.7±0.8	0.7± 0.2	
5 - 6	2.58	0.097		30± 4	0.4±0.3	0.4± 0.1	
6 - 7	2.46	0.129		62± 7	1.6±0.6	0.8± 0.2	
7 - 8	2.72	0.138		34± 5	1.2±0.4	0.8± 0.2	
8 - 9	2.50	0.140		16± 9	0.3±0.2		
9 - 10	2.73	0.128		32± 7	0.2±0.2		
10 - 11	2.78	0.136		74± 6	1.0±0.4		
11 - 12	2.69	0.160	53±5	111±40	0.2±0.2		
12 - 13	2.81	0.140		99± 9	1.8±0.5		
13 - 14	2.76	0.157		155± 7	0.5±0.3		
14 - 15	2.77	0.137		43± 7	1.2±0.4		
15 - 16	2.80	0.128		48± 7	1.6±0.6		
16 - 17	2.76	0.142		93± 6	1.7±0.5		
17 - 18	2.90	0.169		104± 5	1.0±0.4		
18 - 19	2.84	0.140		228± 9	4.7±0.7		
19 - 20	2.70	0.142		42± 6	0.8±0.4		
20 - 21	2.86	0.138		71± 9	2.4±0.6		
21 - 22	2.91	0.158	16±5	133±12	2.5±0.7		
22 - 23	2.88	0.130		79± 5	3.1±0.5		
23 - 24	2.88	0.164		94± 5	1.3±0.5		
24 - 25	2.87	0.141		241± 7	4.1±0.6		
25 - 26	2.89	0.162		187±16	4.0±0.6		
26 - 27	2.76	0.126	15±2	193± 6	4.7±0.8		
27 - 28	2.88	0.180		219± 8	3.5±0.6		
28 - 29	2.78	0.140		64± 6	1.3±0.4		
29 - 30	2.84	0.161		136± 4	1.3±0.5		
30 - 31	2.94	0.152		176±14	4.3±0.8		
31 - 32	2.87	0.143	3±2	312±14	7.0±0.7		
32 - 33	2.83	0.142		80± 4	1.8±0.4		
33 - 34	2.77	0.158		101± 6	1.4±0.4		
34 - 35	2.76	0.133		106± 5	0.7±0.3		
35 - 36	2.78	0.130		134±16	1.6±0.4		
36 - 37	2.86	0.151		164±33	2.6±0.5		

TABLE 12 (continued)

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	$\text{Pu}^{238}/\text{Pu}^{239}$
37 - 38	2.78	0.148		68±15	1.3±0.4		
38 - 39	2.73	0.156		82± 4	1.1±0.3		
39 - 40	2.79	0.145		137± 6	2.6±0.4		
40 - 41	2.71	0.148		132± 5	1.5±0.4		
41 - 42	2.71	0.153	2±2	125± 4	2.3±0.4		
42 - 43	2.71	0.141		59± 6	2.2±0.4		
43 - 44	2.74	0.143		152± 5	0.6±0.2		
44 - 45	2.69	0.161		76±12	1.2±0.3		
45 - 46	2.66	0.143		27±11	1.0±0.4		
46 - 47	2.62	0.151		67± 9	0.7±0.3		
47 - 48	2.61	0.177		94±10	0.9±0.3		
48 - 49	2.58	0.142		127±13	0.4±0.2		
49 - 50	2.54	0.167		100± 8	2.6±0.4		
50 - 51	2.42	0.184		63± 4	1.8±0.4		
51 - 61	1.48	2.240	2±2	43± 7	2.4±0.7		

TABLE 13

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 73-1

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 8/21/73
 Location: 43°21'N, 79°29'W
 Water Depth: 80 m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 2	3.33	0.054		286± 7	6.3±1.5		
2 - 3	3.31	0.056		213±10	3.8±0.5		
3 - 4	3.27	0.061		219±11	2.3±0.6		
4 - 5	3.16	0.057		228± 9	3.2±0.4		
5 - 6	3.14	0.075		73± 7	1.7±0.2		
6 - 7	3.10	0.078		28± 7	0.2±0.1		
7 - 8	3.01	0.077		27± 6	0.7±0.2		
8 - 9	2.88	0.085		17± 5	0.2±0.1		
9 - 10	2.67	0.091		7± 5	0.2±0.1		
10 - 12	2.43	0.245		-2± 4	<0.1		
12 - 14	2.44	0.283		-1± 5	0.1±0.1		
14 - 16	2.42	0.314		3± 3	<0.1		
16 - 18	2.42	0.393		3± 4	<0.1		
18 - 20	2.48	0.298		25± 7	0.4±0.1		
20 - 22	2.54	0.333		0± 3	0.1±0.1		
22 - 24	2.47	0.358		2± 5	<0.1		
24 - 26	2.45	0.316		7± 3	0.2±0.1		
26 - 28	2.39	0.328		1± 4	0.4±0.1		
28 - 30	2.41	0.345		3± 4			
30 - 32	2.39	0.344		14±11	<0.1		
32 - 34	2.32	0.247		0± 9	0.1±0.1		
34 - 36	2.40	0.284		5± 6	0.1±0.1		
36 - 38	2.40	0.253		3± 5	0.1±0.1		
38 - 40	2.48	0.296		0± 8	0.1±0.1		
40 - 42	2.44	0.236		2± 5	<0.1		
42 - 44	2.46	0.252		3± 5	0.1±0.1		
44 - 46	2.45	0.302		9± 3	0.1±0.1		
46 - 48	2.37	0.297		2±25	<0.1		
48 - 50	2.37	0.320		1± 3	0.1±0.1		
50 - 52	2.36	0.318		-3± 7	<0.1		
52 - 54	2.38	0.343		10±11	<0.1		
54 - 56	2.36	0.333		-4± 5	<0.1		
56 - 58	2.48	0.306		-3± 6	<0.1		
58 - 60	2.25	0.301		16± 4	0.4±0.2		
60 - 62	2.13	0.466		35± 3	0.4±0.2		

TABLE 14

RADIOCHEMICAL ANALYSES OF 1973 LAKE ONTARIO SEDIMENT CORE -- STATION 73-7

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 8/22/73
 Location: 43°23'N, 79°W
 Water Depth 50 m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (Kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0-1	1.52	0.176		2304±18	37.2±1.5		
1-2	1.43	0.158		1502± 8	16.3±0.9		
2-3	1.38	0.297		597± 6	8.3±0.6		0.060±0.016
3-4	1.37	0.242			6.2±0.8		
4-5	1.36	0.275		168± 4	1.4±0.3		
5-6	1.33	0.171		133± 5	1.9±0.4		
6-7	1.35	0.219		71± 4	1.6±0.3		
7-8	1.35	0.271		78± 3	1.2±0.3		
8-9	1.34	0.194		120± 4	2.1±0.4		
9-10	1.36	0.284		118± 5	1.5±0.3		
10-11	1.34	0.288		55± 4	0.5±0.2		
11-12	1.38	0.283		109± 4	1.4±0.4		
12-13	1.36	0.365		119± 4	2.7±0.6		

TABLE 15

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 73-13B

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date: 8/25/73
 Location: 43°31'N, 76°58'W
 Water Depth: 245 m
 Core Cross-Sectional Area: 285 cm²

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 1	5.23	0.038		9796±31	307.3±12.7	100.5±4.6	0.032±0.003
1 - 2	4.64	0.053		2061±14	59.6± 5.5	16.1±1.5	0.009±0.006
2 - 3	4.83	0.075		1672±10	60.9± 4.8	20.1±0.9	0.027±0.005
3 - 4	4.75	0.057		1054±14	25.3± 5.1	10.5±1.4	0.040±0.018
4 - 5	4.55	0.078		959± 9	33.8± 1.9	11.6±0.9	0.040±0.014
5 - 6	4.61	0.070		769± 9	24.0± 1.5	7.5±0.6	0.028±0.009
6 - 7	4.50	0.062		380± 9	13.1± 1.4		
7 - 8	4.42	0.064		238± 9	6.5± 0.8		
8 - 9	4.49	0.065		612± 9	17.6± 1.6		
9 - 10	4.26	0.064		245± 9	8.4± 0.8		
10 - 12	3.94	0.117		96± 5	4.6± 0.6		
12 - 14	4.10	0.111		35± 5	1.2± 0.3		
14 - 16	4.04	0.123		8± 5	0.4± 0.1		
16 - 18	3.96	0.134		4± 5	0.3± 0.2		
18 - 20	3.52	0.141		0± 4	0.1± 0.1		
20 - 22	3.83	0.154		18± 4	0.2± 0.1		
22 - 24	3.96	0.122		4± 5	<0.1		
24 - 26	3.90	0.141		4± 4	0.3± 0.1		
26 - 28	3.84	0.149		7± 5	<0.3		
28 - 30	3.72	0.144		3± 5	0.2± 0.1		
30 - 32	3.53	0.147		4± 3	0.9± 0.2		
32 - 34	3.52	0.171		3± 5	0.1± 0.1		
34 - 36	3.66	0.146		0± 4	0.2± 0.1		
36 - 38	3.56	0.169		2± 4	<0.1		
38 - 40	3.54	0.169		-1± 4	<0.1		
40 - 42	3.29	0.186		-2± 5	0.4± 0.2		
42 - 44	3.33	0.181		-1± 3	<0.1		
44 - 46	3.40	0.176		2± 3	<0.1		
46 - 48	3.35	0.181		3± 4	<0.1		
48 - 50	3.32	0.182		4± 5	0.5± 0.1		
50 - 54	3.26	0.343		-2± 4	0.1±0.1		
54 - 58	3.02	0.380		-4± 4	<0.1		
58 - 62	2.92	0.425		3± 3	<0.1		
62 - 66	3.04	0.389		1± 4	0.4±0.2		
66 - 70	3.15			-1± 4	0.2±0.1		
70 - 74	3.11	0.363		-1± 4	0.2±0.1		
74 - 78	3.08	0.389		0± 7	0.4±0.2		
78 - 82	2.65	0.410		16± 4	0.9±0.3		

TABLE 16

RADIOCHEMICAL ANALYSES OF LAKE ONTARIO SEDIMENT CORE -- STATION 73-14

RADIONUCLIDES IN DISINTEGRATIONS PER MINUTE PER KG DRY SEDIMENT

Core Collection Date:

Location:

Water Depth:

Core Cross-Sectional Area:

Depth in Sediment (cm)	Wet/Dry Weight	Dry Weight Section (kg)	Sr-90	Cs-137	Pu-239	Am-241	Pu ²³⁸ /Pu ²³⁹
0 - 1	4.42	0.069		22388±37	408.0±20.9	96.1±3.8	0.038±0.004
1 - 2	4.13	0.060		11449±26	203.7±10.4	62.1±4.6	0.047±0.007
2 - 3	3.78	0.080		4312±11	78.7± 5.9	24.0±1.1	0.033±0.005
3 - 4	3.67	0.087		2606±10	46.2± 3.1	11.6±1.2	0.026±0.008
4 - 5	3.67	0.067		2910±13	66.2± 4.4	11.8±1.3	0.037±0.009
5 - 6	3.57	0.083			21.8± 1.6	4.6±0.7	0.040±0.012
6 - 7	3.61	0.075			18.2± 1.5		
7 - 8	3.62	0.072		457± 7	10.7± 1.6		
8 - 9	3.53	0.070		638± 9	11.7± 1.8		
9 - 10	3.35	0.073		171± 8	4.3± 0.5		
10 - 12	3.22	0.180		247± 5	6.6± 0.7		
12 - 14	3.22	0.148		5± 4	0.5± 0.2		
14 - 16	3.31	0.159		5± 5	<0.1		
16 - 18	3.25	0.179		-1± 4	<0.1		
18 - 20	3.26	0.175		2± 4	<0.1		
20 - 22	3.14	0.176		2± 4	<0.1		
22 - 24	3.11	0.171		3± 4	<0.1		
24 - 26	3.12	0.178		4± 4	0.1± 0.1		
26 - 28	3.16	0.180		2± 4	<0.2		
28 - 30	3.05	0.201		0± 6	<0.1		
30 - 32	3.04	0.198		3± 4	<0.2		
32 - 34	3.07	0.193		3± 6	<0.1		
34 - 36	3.02	0.205		-1± 4	<0.1		
36 - 38	3.03	0.199		2± 5	<0.1		
38 - 40	2.98	0.188		26± 5	0.1± 0.1		
40 - 42	3.00	0.186		-1± 3	<0.1		
42 - 44	2.90	0.199		0± 5	<0.1		
44 - 46	2.99	0.188		-1± 3	0.2± 0.1		
46 - 48	2.94	0.195		1± 4	<0.1		
48 - 50	2.78	0.202		22± 3	0.3± 0.1		
50 - 52	2.65	0.218		30± 4	0.3± 0.1		

TABLE 17

RADIOCHEMICAL DATA ON BIOLOGICAL MATERIAL

(Collection information in Table 1, or in Table 1 of 1971-72 Progress Report)

<u>Sample</u>	<u>Identification</u>	<u>Wet Wgt</u> <u>(kg)</u>	<u>Dry Wgt</u> <u>(kg)</u>	<u>- dpm per kg wet -</u> <u>Pu-239</u>	<u>Cs-137</u>
<u>A</u>					
Plankton	72-1	---	0.0120	0.03±0.01*	5.1±1*
	72-2	---	0.0154	0.02±0.01*	3.5±0.4*
	72-3	---	0.0116	0.02±0.01*	1.2±0.6*
	72-4	---	0.0127	0.02±0.01*	1.7±0.5*
	72-5	---	0.0112	0.03±0.01*	1.3±0.6*
	73-1	0.537	0.020	0.04±0.02	5 ±1
	73-2	0.327	0.008	0.02±0.01	3 ±1
	73-4	0.368	0.010	0.06±0.01	2 ±1
	73-6	0.347	0.011	0.07±0.02	5 ±1
	73-7	0.497	0.026	0.03±0.01	35 ±3
	73-9	0.389	0.009	0.02±0.01	2 ±1
	73-11	0.281	0.007	<0.004	2 ±1
	73-12	0.154	0.002	0.02±0.01	-1 ±1
	73-13	0.333	0.005	0.02±0.01	
73-14	0.491	0.011	0.01±0.005		

*Converted from Dry weight basis by using mean Dry:Wet ratio of 1973 Plankton:42.8

<u>B</u>					
Fish					
Alewives	Port Credit	1.079	0.284	<0.02	149 ± 1
"	Mexico Bay (composite)	2.554	0.627	0.03±0.02	67 ± 1
"	"	0.605	0.125	0.13±0.03	614 ± 2
"	Olcott	1.850	0.516	0.06±0.06	141 ± 1
"	Prince Edward Point	1.363	0.328	0.04±0.02	110 ± 1
Smelt	Mexico Bay	1.323	0.309	0.28±0.28	298 ± 1
"	Prince Edward Point	1.353	0.298		179 ± 1
"	Olcott	1.091	0.240	0.02±0.02	86 ± 1
"	Rochester	1.261	0.277	Lost	Lost
Limy Sculpin	Mexico Bay	0.981	0.245	0.20±0.14	2 ± 1
"	Olcott	0.447	0.102	0.06±0.03	226 ± 1

TABLE 17 (Continued - 2)

<u>Sample</u>	<u>Identification</u>	<u>Wet Wgt (kg)</u>	<u>Dry Wgt (kg)</u>	<u>- dpm per kg wet - Pu-239</u>	<u>Cs-137</u>
Unionid Clams	Cape Vincent	0.447	0.102	0.06±0.03	226 ± 1
Soft Parts		0.803	0.092	0.80±0.17	30 ± 1
Shells		1.658	1.548	1.48±0.49	8 ± 1
Carp sucker	East End				
Bones		0.3089	0.111	0.05±0.04	202 ± 1
Liver		0.0223	0.005	0.41±0.16	38 ± 10
Guts		0.080	0.025	0.84±0.20	118 ± 3
Bluegill	East End	0.504	0.2194	0.04±0.03	326 ± 1
Smallmouth Bass	" "				
Backbone		0.087	0.034		536 ± 4
Gills		0.085	0.023		383 ± 4
Liver		0.028	0.007		530 ± 8
Guts		0.105	0.024		545 ± 4
Roe		0.162	0.059	<0.06	240 ± 2
Pumpkin Seed	East End	0.768	0.211	0.05±0.03	264 ± 1
White Bass	" "	0.133	0.037	0.04	418 ± 2
Largemouth Bass	East End				
Meat		0.585	0.140	0.06±0.03	468 ± 1
Bones		0.080	0.024	0.12±0.06	499 ± 4
Liver		0.010	0.008	0.11±0.11	500 ± 300
Guts		0.044	0.008	0.19±0.10	395 ± 15
Black Crappie	East End	0.465	0.163	0.23±0.23	41 ± 9
American Eel	East End				
Whole, fronthalf		0.968	0.361	<0.03	257 ± 1
Liver		0.018	0.005	<0.07	832 ± 18
Guts		0.105	0.041	0.30±0.11	280 ± 3
Cord		0.145	0.072	<0.06	505 ± 3
White Perch	East End				
Bones		0.074	0.031	0.10±0.07	Lost
Gills		0.52	0.014	0.05±0.05	343 ± 5
Liver		0.026	0.006	0.23±0.09	1224 ± 8
Guts		0.068	0.023	<0.05	307 ± 3
Roe		0.110	0.032	0 ± 2.0	479 ± 3
Lognose Gar	East End	0.942	0.352	0.09±0.09	271 ± 1
Brown Bullhead	" "				
Meat		0.681	0.143	0.03	23 ± 1

TABLE 17 (Continued - 3)

<u>Sample</u>	<u>Identification</u>	<u>Wet Wgt (kg)</u>	<u>Dry Wgt (kg)</u>	<u>- dpm per kg wet -</u>	
				<u>Pu-239</u>	<u>Cs-137</u>
Wn Bullhead	East End				
Bones		0.228	0.057	0.02±0.02	457 ± 2
Liver		0.033	0.006	0.21±0.12	277 ± 7
Guts		0.118	0.022	0.32±0.11	310 ± 4
Rock Bass	East End				
Meat		0.902	0.257	0.03±0.03	690 ± 1
Bones		0.200	0.054	0.16±0.07	351 ± 2
Guts and Liver		0.141	0.038	0.42±0.09	605 ± 3
Roe		0.106	0.037	0.02±0.01	610 ± 5
Yellow Perch	Extreme East				
Meat		1.168	0.301	0.02±0.01	111 ± 2
Bones		0.279	0.068	0.02±0.02	816 ± 2
Liver		0.019	0.005	0.25±0.14	395 ± 20
Guts		0.178	0.052	0.06±0.04	274 ± 4
Carp	Extreme East				
Meat		0.986	0.321	<0.01	217 ± 1
Bones		0.342	0.080	0.02±0.02	243 ± 1
Guts & Liver		0.243	0.080	0.26±0.09	164 ± 2
Roe		0.513	0.163		109 ± 2
Fresh-Water Drum	Extreme East				
Meat		1.216	0.386	0.02±0.01	321 ± 1
Bones		0.214	0.074	0.04±0.02	336 ± 11
Liver		0.033	0.008	0.28±0.14	285 ± 95
Guts		0.144	0.053	0.09±0.05	317 ± 2
Gizzard Shad	Extreme East				
Meat		1.307	0.132	0.12±0.04	189 ± 1
Bones		0.284	0.070	0.02±0.02	70 ± 3
Guts & Liver		0.157	0.085	5.6 ± 0.4	240 ± 3
Northern Pike	Extreme East				
Meat		2.050	0.475	<0.01	156 ± 1
Bones		0.229	0.084	0.04±0.03	297 ± 2
Liver		0.045	0.014	2.3±0.6	336 ± 6
Guts		0.150	0.050	<0.02	230 ± 4
Roe		0.091	0.017	0.04±0.04	897 ± 6
Whitehorse Sucker	Extreme East				
Meat		1.309	0.336	0.10±0.04	120 ± 1
Bones		0.164	0.051	0.23±0.10	132 ± 2

TABLE 17 (Continued - 4)

Sample	Identification	Wet Wgt (kg)	Dry Wgt (kg)	- dpm per kg wet -		
				Pu-239	Cs-137	
<u>B</u>						
Redhorse Sucker	Extreme East					
Guts & Liver		0.196	0.079	0.03±0.03	1110 ± 12	
Roe		0.200	0.060	0.04±0.03	275 ± 2	
White Sucker	Extreme East					
Meat		1.339	0.280	<0.02	45 ± 1	
Bones		0.211	0.055	<0.04	331 ± 2	
Guts & Liver		0.289	0.069	0.43±0.08	606 ± 2	
Coho Salmon	Extreme East					
Meat		1.4469	0.3203	0.01±0.01	292 ± 1	
Bones		0.2026	0.0553	0.12±0.06	273 ± 2	
Liver		0.0329	0.0097	0.13±0.09	769 ± 8	
Guts		0.038	0.008	<0.05	317 ± 7	
Roe		0.443	0.184	<0.02	22 ± 1	
Chinook Salmon	Not Recorded					
Meat		1.197	0.349	<0.01	368 ± 1	
Bones		0.201	0.081	0.03±0.03	338 ± 2	
Liver		0.044	0.011	0.03±0.03	259 ± 5	
Guts		0.460	0.096	<0.02	333 ± 1	
Sample	Identification	Wet Weight (kg)	Dry Weight (kg)	Pu-239	Am-241	Cs-137
<u>C</u>						
Attached Plants						
C. fracta	A	0.322	0.032	1.71±0.19	0.14±0.03	103±1
	B	0.405	0.038	0.63±0.10	0.03±0.01	84±1
	I	0.572	0.052	0.62±0.07	0.04±0.01	2583±3*
C. glamorata	E	0.275	0.017	1.11±0.16	0.22±0.03	83±1
	G	0.930	0.065	0.38±0.06	0.04±0.02	70±1
	K	0.613	0.050	0.46±0.04	0.02±0.01	44±1
	L	0.474	0.065	0.75±0.09	0.09±0.02	54±1
C. species	D	0.588	0.036	0.63±0.08	0.10±0.03	103±1
Rhyoclonium hookeri & C. glamorata	L	0.607	0.058	0.68±0.08	0.06±0.01	43±1
Rhyoclonium crass- ipelictum	C	0.893	0.103	1.91±0.10	0.32±0.03	114±1
Eel grass Angiosperm	A	0.564	0.043	0.82±0.10	0.16±0.02	100±1
Green plant Angiosperm	D	0.845	0.045	0.45±0.07	0.06±0.01	99±1

TABLE 18

FALLOUT NUCLIDES IN LAKE ONTARIO WATER

	<u>1971</u> <u>August</u>	<u>1972</u> <u>September</u>	<u>1973</u> <u>August</u>
<u>Mean For Lake</u>			
Sr ⁹⁰	282±10 (12)	270±10 (20)	
Cs ¹³⁷	10.5±2 (12)	9.0±0.8 (20)	7.5±1 (30)
Pu ²³⁹	0.16±0.06 (12)	0.09±0.06 (18)	0.06±0.03 (38)
<u>Mean above</u>	<u>30m</u>	<u>45m</u>	<u>45m</u>
Sr ⁹⁰	282±10 (5)	265±12 (12)	
Cs ¹³⁷	14.1±2 (5)	8.6±1 (12)	7.4±1 (21)
Pu ²³⁹	0.12±0.04 (5)	0.07±0.02 (10)	0.04±0.02 (25)
<u>Mean below</u>	<u>30m</u>	<u>45m</u>	<u>45m</u>
Sr ⁹⁰	282±10 (7)	276±10 (8)	
Cs ¹³⁷	7.9±1 (7)	9.6±0.6 (8)	7.8±1 (9)
Pu ²³⁹	0.20±0.05 (7)	0.12±3 (8)	0.10±0.09 (13)

TABLE 19

LAKE ONTARIO AMERICIUM-241/PLUTONIUM-239 RATIOS

SECTION	SEDIMENT CORES						
	71-5	72-2	72-3	72-4	72-5	72-13B	73-14
0 - 1		0.27±0.04	0.30±0.03	0.16±0.01	0.28±0.05	0.33±0.02	0.24±0.02
1 - 2		0.22±0.03	0.30±0.03		0.25±0.03	0.27±0.04	0.30±0.03
2 - 3		0.25±0.04	0.32±0.04	0.16±0.01	0.23±0.02	0.34±0.03	0.31±0.03
3 - 4	0.25±0.03			0.15±0.02	0.22±0.03	0.42±0.10	0.27±0.03
4 - 5	0.36±0.04			0.32±0.04	0.19±0.07	0.34±0.03	0.16±0.04
5 - 6						0.31±0.03	0.21±0.04
6 - 7						0.31±0.05	0.23±0.03
7 - 8						0.42±0.07	
8 - 9						0.34±0.05	0.29±0.07
9 - 10						0.25±0.05	0.16±0.05
18 - 20	0.26±0.06						
28 - 30	0.21±0.03						

BIOLOGICAL SAMPLES

Near-Shore Plants

STATION	73-A	73-B	73-C	73-D	73-E	73-G	73I	73-K	73-L
SAMPLE									
C. fracta	0.08±0.02	0.05±0.02					0.06±0.02		
C.glamorata					0.20±0.04	0.11±0.06		0.04±0.02	0.12±0.03
C.species				0.16±0.05					
Rhyclonium hookeri & C. glamorata									0.09±0.02
Rhyclonium crass- ipelictum			0.17±0.02						
Angiosperm				0.13±0.03					