AMBIENT CONCENTRATIONS OF PCBs IN THE SOUTHEAST FROM STORET DATA AND SELECTED EPA STUDIES

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AMBIENT CONCENTRATIONS OF PCBs IN THE SOUTHEAST FROM STORET DATA AND SELECTED EPA STUDIES

INTRODUCTION

PCBs and many other similar organic compounds are concentrated in biological tissues by biomagnification through the food chain and through absorption from the water. The magnitude of the environmental PCB hazard in the Southeast has only recently been brought into focus. Previously, environmental agencies had not been sufficiently monitoring critical portions of the environment for toxic, mutagenic, and carcinogenic compounds. Water and sediment samples had been routinely analyzed, but only a few fish flesh samples had been collected. This still remains a critical area which needs many more resources for effective monitoring programs.

The discovery of PCB concentrations in excess of the U. S. Food and Drug Administration (FDA) "action level" in edible portions of fish (5.0 mg/kg) caught in Lake Hartwell led to an intensive sampling program in this area beginning in the Spring of 1976. Subsequently, a similar survey was conducted in the Upper Coosa River Basin. A warning against consumption of fish from the Seneca River arm of Lake Hartwell has been issued jointly by the South Carolina Department of Health and Environmental Control (SC-DHEC) and the U. S. Environmental Protection Agency (EPA). As a result of actions initiated by the Georgia Department of Natural Resources (GA-EPD)(1), the following areas are currently closed to commercial fishing: the Coosa River from the Georgia-Alabama stateline to Rome, the Etowah River from its confluence with the Oostanaula to the US 441 bridge, and the Oostanaula River from its confluence with the Etowah to the GA 156 bridge.

STANDARDS

The first area of concern in developing and maintaining a PCB water quality criterion is the protection of humans from the ingestion of PCBs in

on Town Creek at Stations L-40 and L-41. The next highest sediment concentration (18.76 mg/kg) was on the 12 Mile Creek arm of Lake Hartwell (Station L-18). In general, sediment concentrations of PCBs decreases with distance from Town Creek and the 12 Mile Creek arm of the lake (downstream from Sangamo Electric Company).

Fish tissue samples collected in both the August 1976 and April 1977 studies show the same general trends as did the sediment samples. Mean tissue concentrations collected in the 12 Mile Creek arm of the lake were well above the FDA "action level" during both surveys (see Table 5). The samples taken in the Seneca River area (i.e., Lake Hartwell between the I-85 bridge and the US 123 bridge) had lower mean concentrations of PCBs than the samples from 12 Mile Creek arm, but the values were still in excess of the FDA "action level" for both catfish and stripped bass.* Except for concentrations found in striped bass, mean tissue analyses for the other areas sampled were less than the FDA "action level."

Striped bass are migratory feeders which move throughout the lake. The presence of PCBs in their tissue indicate overall contamination, while PCBs in the more territorial catfish and largemouth bass indicate more localized contamination. This is illustrated in Table 5 by the relatively consistent concentrations found in the striped bass from various areas of the lake and the elevated levels in catfish and largemouth bass from the 12 Mile Creek area.

Coosa River

Fish tissue samples for the Coosa River and Lake Weiss were collected by the GA-EPD, AWIC and EPA between May 7, 1976 and October 22, 1976. A summary

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* Striped bass as used in this report refers to striped bass (Morons Saxatilis), white bass (Morone Chrysops), and hybrid stripe bass (Morone Sp. (Hybrid).

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of the results from the samples is presented in Table. Table 6 gives results for water and sediment samples collected between August 18, 1976 and September 1, 1976. Station locations and areas where fish were collected are given in Figure III.

The maximum concentration detected in sediments (10.9 µg/kg) was in Dry Creek adjacent to the General Electric Company at Rome, GA. This level was reflected somewhat in the Oostanaula River below Dry Creek with a sediment concentration of 0.14 µg/kg as compared to non-detectable concentration upstream. This concentration is low, however, when compared to the sediment concentration downstream from the Rome STP (Station C-2) of 1.00 µg/kg.

Areas of sedimentation within Lake Weiss (C-5 and C-7) had the highest sediment concentrations (2.4 µg/kg and 1.5 µg/kg; and 3.9 µg/kg, respectively) except for Dry Creek. Water samples collected from the lake showed a decreasing trend from the headwaters (0.13 µg/l) to the dam (0.05 µg/l). The concentration at the Cedar Bluff water intake was 0.12 µg/l which is below the drinking water "level of concern." All water concentrations were in excess of the water quality criterion for the protection of fish and wildlife.

In order to simplify the data presentation, fish species were separated into 6 groups according to similar feeding habits. A mean concentration for each group was then calculated for each area where samples were collected (Table 7). Gizzard Shad collected in Area 1 had the highest mean concentration (66 mg/kg) of all the fish collected (based on two fish). Catfish had high concentrations in all areas, but the lowest concentration was in Area 2 which had the highest sediment concentration of all the areas where fish were caught. Carp and buffalo, the other bottom feeders sampled, had a mean PCB concentration of 14 mg/kg in Area 2. This was slightly less than the catfish caught in the area but well above the FDA "action level."

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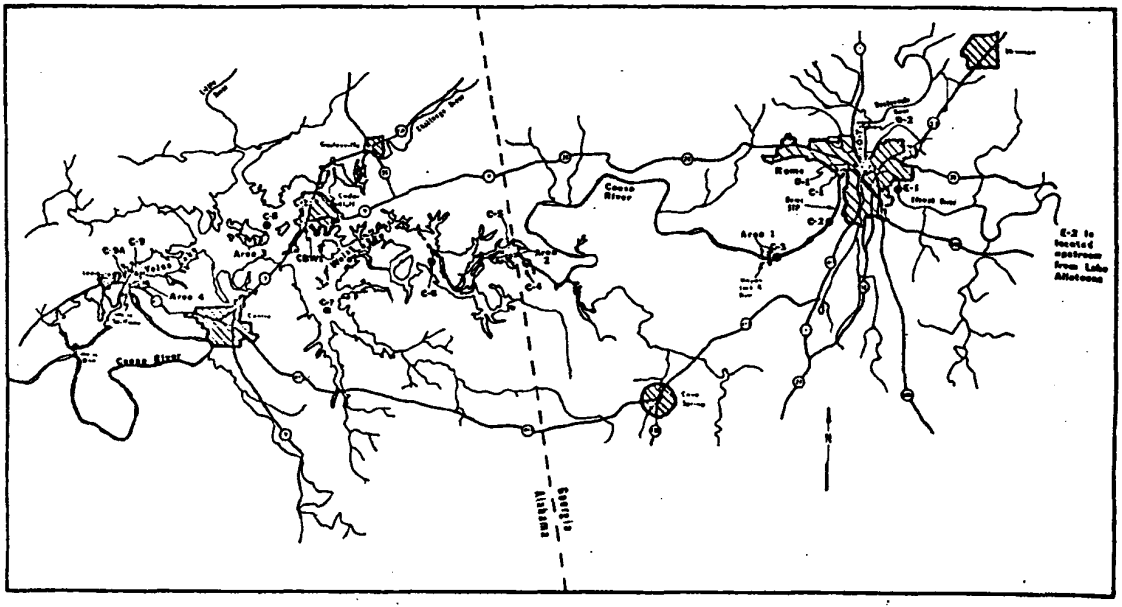

Figure III. Coosa River and Lake Weiss Sampling Locations

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Table 6
Total PCB Concentration In Water and
Sediments of the Coosa River and Lake Weiss

Station Number	Location	Date	Total PCB Water mg/l	Total PCB Sediment mg/kg/a
O-1	Oostananla River	9/1/76	--	0.14
O-2	Oostananla River	9/1/76	--	ND/b
O-T-1	Dry Creek	9/1/76	--	10.9
E-1	Etowah River	9/1/76	--	ND
E-2	Etowah River	9/1/76	--	ND
C-1	Coosa River	9/1/76	--	0.08
C-2	Coosa River	9/1/76	--	1.00
C-3	Coosa River	9/1/76	--	0.45
C-4	Coosa River	8/31/76	--	0.76
C-5	Lake Weiss	8/19/76	0.13	2.4
		8/31/76	--	1.5
C-6	Lake Weiss	8/31/76	--	0.70
CBWI	Lake Weiss	8/18/76	0.12	--
C-7	Lake Weiss	8/31/76	--	3.9
C-8	Lake Weiss	8/31/76	--	0.18
C-9	Lake Weiss	8/31/76	--	0.88
C-9a	Lake Weiss	8/18/76	0.05	--

/a - Calculated on dry weight basis.

/b - ND (None detected).

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Table 7
Mean Concentration of PCBs/a For Various Groups/b
Of Fish From The Coosa River and Lake Weiss

Fish Grouping	Area 1 Near Mayos L&D	Area 2 Near AL/GA Stateline	Area 3 Near Cedar Bluff Water Intake	Area 4 Near Spillway Dam
Catfish (Channel/ Blue/Flat-head)	46(4)/c	20(8)	46(13)	43(13)
Largemouth Bass	3.9(2)	8.3(14)	4.6(11)	8.2(14)
Crappie (Black/ White)	--	2.6(8)	2.8(8)	5.9(11)
Bream (Bluegill/ Sunfish)	7.8 (2)	5.2(5)	--	--
Carp/ Buffalo	--	14(4)	--	--
Gizzard Shad	66(2)	--	--	--

/a - All concentrations are for fish fillets and are reported in mg/kg of Aroclor 1254 a wet weight basis. Aroclor 1254 was the only PCB found in these sampes.

/b - Grouped according to feeding and migration habits.

/c - The number of parenthesis indicates the number of fish used to calculate the mean.

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Largemouth bass, crappie and bream (bluegill and sunfish) had much lower mean PCB concentrations than the bottom feeders or the shad. However, several of the mean concentrations exceeded the FDA "action limit." There is no significant trend within these groups.

PCBs appear to be distributed homogeneously throughout the Coosa River-Lake Weiss area sampled in this survey. Some heterogeneity is apparent in sediment concentrations of total PCBs with high concentrations correlating strongly with areas of sedimentation within the lake. There is no apparent correlation between high PCB concentrations in fish and in sediment. This finding coupled with the detectable PCB concentrations in the water and the high concentration of PCBs in gizzard shad, implies that the PCBs are entering the food chain directly from the water probably through the plankton and/or periphyton communities, and possibly directly through the gills.

AMBIENT CONCENTRATIONS

In an attempt to determine potential PCB problem areas in the southeast, PCB data were retrieved from the STORET water quality file. The STORET data in some instances have been supplemented with data provided by the states and the USGS through personal communications (5)(6). Data presented in Table 8 represent those stations with one or more observations of total PCB concentration equal to or greater than: 100 µg/kg in the sediments, or 0.1 µg/l in whole water samples.

The values presented in Table 8 are annual and gross means of one or more values and, therefore do not always meet the above criteria. However, in all cases, at least one observation met the stated criteria.

Ft. Lauderdale, Florida Area

There were a large number of stations in the Ft. Lauderdale area which exceeded the criteria and are included in Table 8. Of these stations, six had

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Table 8

PCB Concentration At Selected Station in the Southeast

Station No.	Location	Mean Concentration Sediment ppb/kg 1973	1974	1975	1976	Grand mean/a ppb/kg	Maximum Conc. Whl. Water Sampled ppb/l
Ft. Lauderdale Area							
263904080370300	North New R. C. ab. S-7	40	20	85	60	51	—
263134080374300	S-11 C. @ Levee 38E nr Andytown	1900	—	—	—	1900	0.0
02284700	N. New R. Canal @ 20 Mile Bend	48	243	0	39	320	143	0.0
02284800	South New R. C. @ S-9	5	7	15	0	0	8	0.0
263919080172300	Middle R. C. nr Lauderhill	0	67	—	44	0	55	0.1
264807080140700	Plantation C., NW 65th Ave., Fla.	602	12	560	—	0	327	0.0
02283200	Plantation Rd. C. @ S-33 nr Ft. Laud.	157	80	170	46	0	109	<0.1
264743080103100	N. Fork New R. @ Ft. Lauderdale	15	155	7	31	0	55	0.0
264911080094700	N. Fork New R., Broad. Blvd., Ft. Laud.	—	—	68	120	—	94	0.0
264834080085800	New R. SW 4th & 7th Ave., Ft. Laud.	50	10	20	160	60	51	<0.1
264514080110800	N. New R.C. @ SW 31st Ave., Ft. Laud.	20	14706	7	1300000	—	168158	<0.1
260333080084300	Davie Cutoff C., W. of FECRR Br.	100	0	—	—	—	50	0.0
260320080110600	Rainfall, 2202 N. 45th Ave., Hollywood, FL	—	—	—	—	—	—	<0.1
260008080145300	Davie Rd., C. @ Pembroke Pines, FL	10	33	79	110	0	50	0.0
02281500	Hillsborough C. nr Deerfield Beach	0	0	0	0	0	0	0.1
02287000	Pompano C. @ Pompano Beach	225	90	20	17	100	119	0.0
02283100	Cypress Ct. C. @ S-37A nr Pom.	50	20	2	0	38	29	<1.0
Miami Area							
255719080181300	1st St. Drain Ditch, Miami	20	—	—	—	—	357	0.0
254612080182000	Barrow Pit C. @ Ludlow Rd.	—	—	—	—	—	—	0.1
02290500(WPI/b)	Miami C. nr Hialeah Well Field	95	—	—	—	—	63	0.0
254813080160100	Drain B. NE Cor. Miami Int.	45	—	—	—	—	28	0.4
02290510	Miami C. @ NW 27th Ave.	—	320	—	—	—	320	—
Everglades Area							
02286700	Miami C. @ S-8 nr Lake Harbor	400	110	82	0	—	130	—
255130080540000	Cypress Sw. nr Jetport Barrow	0	0	387	—	—	105	0.0
254550080403000	Levee 67C. @ S-12E nr Homestead	20	0	8500	0	—	1706	0.0
02290820	Everglades F-30 nr Homestead	—	60	0	70	—	50	0.0
02290800	Taylor Slough nr Homestead	0	12	—	155	—	67	0.0
Atlanta Area							
03703000	South R. @ Bouldercrest Rd.	—	14	—	—	—	257	—
02301900	South R. @ Fishes Mill Rd.	—	—	—	—	—	600	—
02304070	South R. @ Klondike Rd.	—	760	—	—	—	780	—
02304520/c	South R. @ SR81 @ Knapp	—	704	—	—	—	536	—
02304870	South R. @ SR36 @ Jackson	—	—	—	—	—	409	—
02308040	South R. - 1 mile ab. Alcovy R.	—	—	—	—	—	57	—
02309560	Ocmulgee R. ab. Tussahaw Cr., Ja.	300	—	—	—	—	500	—
03010001(WPI)	Ocmulgee R. @ Moron WPI	—	—	327	6000/d	—	3164	—
13140001	Chattahoochee R. @ SR92	—	260	—	—	—	260	—
13150001	Chattahoochee R. @ SR36	—	180	—	—	—	180	—
13170001	Chattahoochee R. @ SR27	—	200	—	—	—	200	—
Rome Area/e							
14040001	Conasauga R. @ FAS1800 nr Resaca	—	410	—	—	—	410	—
14250001(WPI)	Oostanaula R. @ Rome WPI	—	—	165	—	—	165	—
14400001	Coosa R. @ Mayes	—	930	—	—	—	930	—
14430001	Coosa R. @ GA-AL Stateline	—	1800	253	11000	—	4351	—
Mississippi Area							
02473999	Bowie R. @ mouth @ Hattiesburg	—	—	—	—	—	170	—
02485500	Pelahatchie Cr. nr Fannin	—	—	—	125	1	63	<0.05

/a - Mean for all data for period of record for station.

/b - WPI indicates that the station is located at a Water Treatment Plant Intake.

/c - Also GA-EPD station no. 06113001 at same location.

/d - "Subsequent investigations did not verify this number," according to October 13, 1976 letter from Larry Neal.

/e - This area is currently under surveillance by GA-EPD, AWIC, and US-EPA.

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concentrations in sediments for this area were high compared to other areas included in the "Ambient Concentrations" section of this report (10 of 11 >100 µg/kg and 6 of 11 >300 µg/kg). The most critical location in this area is station 05010001 on the Ocmulgee River at the Macon Water Treatment Plant intake. Since the 6000 µg/kg concentration was detected in August, 1975, the Georgia Environmental Protection Division (EPD) has investigated the intake and area upstream as far as Lake Jackson and "no high PCB contaminations were found" (5).

Rome, Georgia Area

This area has the highest gross mean concentrations in sediments of any area included in this study. The area is currently under a commercial fishing ban and is being investigated by the US-EPA, AWIC, and GA-EPD (See "Contaminated Areas - Coosa River" this report). Station 14250001 is located at the Rome Water Treatment Plant intake.

Mississippi Area

Only two stations in the State of Mississippi met the criteria for inclusion in Table 8. Of these stations, the gross mean concentrations in sediments at one was based on only one samples collected prior to 1972 and the other has only two observations in sediments the most recent of which was 1 µg/kg. This area, therefore, would carry the lowest priority for concern of the areas included in this study.

RECOMMENDATIONS

1. Surveillance should continue along the Coosa, Oostanaula, Conasauga and Etowah Rivers in the Rome, GA area until the PCB problem is abated.
2. Surveillance should also continue in Lake Hartwell, especially in the Twelve Mile Creek and Seneca River arms, until the PCB problem is abated. Striped bass should be monitored throughout all areas of the lake.

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3. Periodic surveillance, including fish tissue and sediment analyses, should be continued along the Chattahoochee and Ocmulgee Rivers (including South and Yellow Rivers below Atlanta, GA). Particular attention should continue to be given to the stretch of the Ocmulgee adjacent to the Macon Water Treatment Plant intake.

4. Periodic surveillance, including fish tissue and sediment analyses, should be conducted in Ft. Lauderdale, Miami, and Everglades Water Conservation areas of South Florida. A thorough investigation should be conducted in the vicinity of station 260514080110800 (N. New River Canal at SW 31st Ave., Ft. Lauderdale) to determine the source and extent of PCB contamination in this reach.

5. Periodic sampling for PCB and other persistent organic compounds in sediments and fish tissues should be carried out as part of on-going ambient monitoring programs in order to detect build-ups of these compounds before hazardous concentrations are reached.

MONS 052324

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