

**Analysis of Polychlorinated Biphenyl (PCB) Residues in
Fish Collected July 27, 2000 from Little Bayou Creek**

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INTRODUCTION

Fish were collected from Little Bayou Creek on July 27, 2000. Fillet samples were analyzed for Aroclors 1248, 1254, and 1260 for stations LB2, LB3, and LB4. A total of 8 fish were analyzed for station LB2, 9 for LB3, and 1 for LB4.

METHODS

Fish collection

Fish were collected by use of back-pack shocker or by seining. Collections were conducted by UK and Division of Waste Management personnel. Fish that did not meet our requirements were returned to the stream. Collected fish were wrapped in aluminum foil, tagged, bagged, and placed on ice (4 °C) for transport to the laboratory. Fish species were identified and stored in the freezer (-15 °C) until extraction.

Tissue extraction and clean-up

Fish were measured for length and whole body weight, scales were removed, and fillets were taken with solvent-cleaned surgical instruments. The fillets were then weighed and macerated as described below. Otoliths (sagittae) were removed from each specimen for age determinations (Boxrucker 1986).

PCBs in fish tissues were extracted and analyzed using standard U.S. EPA methods (Watts, 1980; U.S. EPA, 1997; Erickson, 1997). The muscle fillet samples were ground with 10g anhydrous sodium sulfate and the powder extracted with petroleum ether in a Soxhlet apparatus for 5-h. The extracts were concentrated to near dryness in a Roto-evaporator (Buchi Model RE121).

Reconstituted samples (5.0 mL in iso-octane) were then cleaned of interferences as described below and then analyzed by gas chromatography. A 1.0 mL sub-sample was taken for lipid determinations prior to clean-up. Lipid and pesticide clean-up were performed according to procedures given by Erickson (1997) and U.S. EPA (1997, SW-846 Method 3620B). Elemental sulfur was then removed by shaking 2-propanol (2 mL) and tetrabutylammonium sulfite (2 mL), adding ultra-pure water (8 mL) and reshaking. The organic extract was removed and mixed with 2.0-mL concentrated sulfuric acid (Jensen *et al.*, 1977; U.S. EPA, 1997, SW-846 Method 3660B, sulfur cleanup). A 4 μ L sub-sample was then analyzed by gas chromatography.

Analysis by Gas Chromatography

Samples were analyzed for Aroclors 1248, 1254, and 1260 according to SW-846 Method 8082 (polychlorinated biphenyls by gas chromatography; U.S. EPA, 1997). Analysis was performed using a Hewlett-Packard (HP) Model 5890A gas chromatograph equipped with an electron capture detector and an HP Model 7673A Automatic Sampler. Samples were analyzed using a 60m X 0.53mm ID SPB-5 (0.5 μ m film) fused silica megabore column (Supelco, Inc.) with ultra-high purity helium and nitrogen as carrier and makeup gases, respectively. The temperature program was set at 160 °C (6 min); 10 °C/min-235 °C (0 min); 0.9 °C/min-260 °C (10 min); Injector temperature, 280 °C; Detector temperature, 300 °C. PCB peak heights were quantified using an HP Model 3396A integrator and multiple-peak linear regression analysis was performed with Lotus-123®

software. Aroclor levels were calculated from heights of 6 to 9 peaks for Aroclors 1248 and 1260 and 4-6 peaks for Aroclor 1254. Five external standards were used for calibration curves and for every tenth sample, either a solvent blank or a standard was analyzed. The Lotus program regresses data from PCB standards to the sample being analyzed. Each peak selected for each Aroclor class was statistically analyzed (e.g., standard deviation; standard error; relative deviation).

Quality Assurance

Permanent bench records were kept of all assays and annotated as required under Good Laboratory Practices (*Federal Register*, 40 CFR, Part 160, August 17, 1989). All printouts and graphic recordings were filed and are open for inspection. These bench records will be archived within two years after the close of the project but retrievable upon request. Chain of Custody was maintained for the samples collected.

RESULTS

The species of fish used in this study included 7 longear sunfish (*Lepomis megalotis*) (LS); 3 green sunfish (*Lepomis cyanellus*) (GS); 1 bluegill (*Lepomis macrochirus*) (BG); 5 brown bullheads (*Ictalurus nebulosus*) (BBCAT); 1 pirate perch (*Aphredoderus sayanus*) (PP); and 1 creek chub (*Semotilus atromaculatus*) (CC). This gave a total of 18 specimens that were analyzed (Table 1).

PCBs were detected in 6 of 8 fish collected at station LB2 (Table 1). Five specimens contained Aroclor 1254, whereas all 6 fish were contaminated with Aroclor 1260. There was no detection of Aroclor 1248. This is in contrast with earlier studies (Birge *et al.*, 1998). Only 2 of 8 specimens from LB3 contained PCBs. In each case, Aroclor 1254 and Aroclor 1260 were detected. However, the total concentrations were 0.48 and 0.35 µg/g (ppm), and these values are of concern under the Great Lakes PCB Protocol (GLPCBP) for human health risk assessment. The range of detected concentrations of PCBs in fish from LB2 was 0.18 to 1.57 µg/g (ppm), and the average concentration for the six fish was 0.46 ± 0.55 µg/g. One specimen exceeded the FDA action limit (FDA, 1987), but most specimens would be of concern under the GLPCBP, depending on the specific option used for assessment. In summary, PCB contamination in Little Bayou Creek remains to be a health risk, and these results should be forwarded to State personnel involved with PCB stream advisories and risk assessment at PGDP.

Table 1. PCB Concentrations in Fish from Little Bayou Creek (Station LB2) Collected July 27, 2000.

Station	Date	Type	Length (mm)	Age (Years)	Whole Body Wt. (g)	Fillet Wt. (g)	mg fat /g tissue	Aroclor Conc. ($\mu\text{g/g}$)			
								1248	1254	1260	Total
LB2	072700	LS1	110	1+	27.236	4.394	2.53	<0.046	0.174	0.114	0.288
LB2	072700	LS2	100	1+	18.500	2.518	3.65	<0.079	0.223	0.168	0.391
LB2	072700	LS3	83	1+	11.426	1.845	5.93	<0.108	<0.108	0.117	0.117
LB2	072700	LS4	80	1	9.655	1.360	4.74	<0.147	<0.147	<0.147	<0.147
LB2	072700	GS1	81	2	6.705	0.784	4.08	<0.255	0.764	0.801	1.565
LB2	072700	BBCAT1	170	2	65.18	7.797	2.68	<0.026	0.116	0.083	0.199
LB2	072700	BBCAT2	140	1+	38.908	4.531	3.79	<0.044	0.096	0.085	0.181
LB2	072700	BBCAT3	113	1	17.480	1.620	4.54	<0.123	<0.123	<0.123	<0.123

Table 1, continued. PCB Concentrations in Fish from Little Bayou Creek (Stations LB3, LB4) Collected July 27, 2000.

Station	Date	Type	Length (mm)	Age (Years)	Whole Body Wt. (g)	Fillet Wt. (g)	mg fat /g tissue	Aroclor Conc. (µg/g)			
								1248	1254	1260	Total
LB3	072700	LS1	116	1	31.488	4.397	2.51	<0.045	0.273	0.204	0.477
LB3	072700	LS2	96	1	18.765	3.108	4.15	<0.064	<0.064	<0.064	<0.064
LB3	072700	LS3	753	1	8.016	1.145	5.55	<0.175	<0.175	<0.175	<0.175
LB3	072700	GS1	117	2+	26.899	3.531	3.06	<0.057	<0.057	<0.057	<0.057
LB3	072700	BG1	97	1	14.394	2.112	2.41	<0.095	<0.095	<0.095	<0.095
LB3	072700	PP1	82	1+	9.490	1.539	9.88	<0.130	<0.130	<0.130	<0.130
LB3	072700	CC1	108	1	14.085	1.723	12.71	<0.116	<0.116	<0.116	<0.116
LB3	072700	BBCAT1	162	1+	51.216	5.611	2.49	<0.036	0.167	0.181	0.348
LB3	072700	BBCAT2	136	1	34.965	4.006	3.46	<0.050	<0.050	<0.050	<0.050
LB4	072700	GS1	94	2+	15.536	2.188	3.50	<0.091	<0.091	<0.091	<0.091

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