(Extra)

BIOLOGICAL CONSULTANTS

Water Pollution · Water Quality · Biological Surveys · Fishery Biology

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IV

September 25, 1974

Monsanto Industrial Chemicals Co.
Attention: Mr. Edward E. Stewart
W. G. Krummrich Plant
Sauget, Illinois 62201

Dear Mr. Stewart:

Enclosed is our analysis of the residue data you sent me recently. Please note that I have chosen to discuss the data from a number of vantage points in the form of Exercises. I will discuss each of these exercises individually and then make some general comments about the entire analysis of the various data.

Exercise I--Comparisons of P.C.B. levels as Aroclor 1254, between various years where pairs of values were available for the same species, controls and experimentals (those fishes taken at stations which received P.C.B.'s from the Anniston plant when it was operative, or shortly after shutdown):

December 1970 compared with June 1974--11 pairs of values for Aroclor 1254 showed increases for 1974 and none showed a decrease in 1974.

December 1971 compared with June 1974--9 pairs of values for Aroclor 1254 showed increases for 1974 and 3 pairs showed decreases for 1974.

September 1972 (first and only survey trip made for residue analysis after the Anniston mill effluent had been cleaned up subsequent to shutdown of manufacture of P.C.B's) compared with June 1974--11 pairs of values for Aroclor 1254 showed increases for 1974 and none showed a decrease in 1974.

This exercise clearly indicates that the residue levels determined for the specimens collected in June 1974 were, on the average, higher than we obtained in December, 1970, December, 1971, and September, 1972.

Exercise II--Residue data for control stations, Aroclor 1254 (wet weight and lipid fractions), comparing September, 1972 and June, 1974. Dash indicates that no residue was found:

Exercise II (continued)

Shoal Creek, 2.3 miles east of White Plains

	1972	1974
Lepomis megalotis	-	0.04 (1.79)
Lepomis macrochirus	-	0.35 (32.6)

Choccolocco Creek at Highway 9, 1 mi. south of White Plains, Fish Station 3

Notropis stilbius	0.02 (0.71)	0.94 (26.4)
Campostoma anomalum	-	0.67 (15.8)
Lepomis cyanellus	0.10 (0.85)	0.30 (18.6)

Cane Creek, Tributary to Coosa R., 8.6 mi. north of Lincoln

Dorosoma cepedianum	0.30 (16.25)	2.10 (62.0)
Lepomis macrochirus	0.04 (0.96)	6.98 (362.0)
Lepomis megalotis	0.04 (1.28)	3.23 (173.0)

Aker Creek, Tributary to Coosa R., 6.6 miles north of Lincoln

Notropis venustus	0.06 (2.36)	1.02 (32.0)

Exercise II clearly indicates that in every instance wherein the same species was compared with respect to residue levels in 1972 and 1974, the 1974 value was higher. Since all of these stations are clearly control stations in the sense that the residues could not have originated from the Anniston plant and have been carried to the fishes via the aquatic route, it seems to us that there are two equally possible explanations: 1) Better instrumentation and methodology for analysis of P.C.B. residues may account directly for the observed increases, or 2) increased contamination from P.C.B s in the atmosphere, or from the watershed (thinking particularly of the high levels in the controls from Cane Creek).

Exercise III--Comparison of residue levels in two species of sunfishes from the Coosa River and tributaries, Aroclor 1254, June, 1974:

Control station above mouth of Choccolocco Creek on the Coosa River, specifically Cane Creek, tributary to Coosa River, 8.6 miles north of Lincoln:

Lepomis macrochirus	6.98 (362)
Lepomis megalotis	3.23 (173)

Below mouth of Choccolocco Creek on Coosa River, specifically Coosa River at Stemley Bridge (Logan Martin Reservoir), Highway 34:

Lepomis macrochirus	21.7 (1010)
Lepomis megalotis	17.2 (550)

Below mouth of Choccolocco Creek on Coosa River, specifically Clear Creek, tributary to Coosa River (Logan Martin Reservoir), Highway 42:

Lepomis macrochirus	2.99 (130)
Lepomis megalotis	2.91 (89.8)

Exercise III shows clearly that the levels of Aroclor 1254 in both species of sunfishes at the Clear Creek location are less than the levels obtained for the controls at Cane Creek location. Keep in mind the fact that contamination by P.C.B's presumably traceable to the Anniston plant operations enters the Coosa River via the mouth of Choccolocco Creek, and that the Cane Creek site is considerably distant from the mouth in the upstream direction, whereas both Stemley Bridge site and the Clear Creek site are downstream from the mouth of Choccolocco Creek.

Exercise III clearly shows that L. macrochirus consistently had about twice the amount of residue found in L. megalotis at all three stations: 1) Cane Creek, 2) Stemley Bridge, and 3) Clear Creek. The fact that the two closely related sunfishes consistently indicated a significant difference in residue levels that is indicated quantitatively by the results obtained should be a source of satisfaction to the men who ran the samples and to Monsanto Company, since this exercise alone, other factors not taken into account, indicates that your method of analysis does indeed give replicate results and indeed consistent results. What I am saying then is that you should definitely have faith in the methods you are using in the laboratory to determine the residues. No alteration or adjustment in methodology is called for as shown by the results obtained in Exercise III.

Exercise IV--Levels of Aroclor 1254 in Percina nigrofasciata, a bottom-feeding fish, June, 1974:

Control Stations		Stations Below Anniston Plant	
Shoal Creek	0.06 (1.74)	Choccolocco Cr., High. 95	48.3 (1580)
Aker Creek	0.55 (52.9)	Choccolocco Cr., High. 93	22.7 (1620)
		*** Cheaha Creek, High. 93	56.8 (5340)

***Note: This station is so close to Choccolocco Creek that we believe Percina nigrofasciata must have moved to Choccolocco Creek, picked up Aroclor 1254 residues, and then returned to Cheaha Creek. Such movements are not uncommon in fishes.

Exercise IV is typical of the type of results we have obtained in past residue level surveys for Monsanto. The influence of the Anniston plant is indeed shown clearly since all of the levels for the stations below the plant are much greater than found at the two control sites.

Exercise V--Comparison of residue levels, Aroclor 1254, for bluegill, Lepomis macrochirus, at both control and experimental stations (showing P.C.B. contamination), June, 1974.

	Controls		Experimentals	
	Shoal Creek	0.35 (32.6)	Choccolocco Cr., High. 95	26.2 (2450)
***	Chesha Creek	0.27 (15.7)	Choccolocco Cr., High. 93	43.5 (897)
	Cane Creek	6.98 (362)	Coosa River, Stemley Br.	21.7 (1010)
			Clear Creek, High. 42	2.99 (180)

***Bluegill, on the basis of our research studies, would not be expected to move from Chesha Creek to Choccolocco Creek and back, hence we included them with the controls.

Exercise V is again typical of the type of results we have obtained in past residue level surveys for Monsanto. The influence of the Anniston Plant is again shown clearly since the levels for the stations below the plant are greater than those found at the control sites, except for the levels at Clear Creek. A decrease here, in comparison with the Stemley Bridge location, has been observed many times in the past in other residue level studies.

Exercise VI--Comparison of residue levels, Aroclor 1254, for longear sunfish, L. megalotis, at both control and experimental stations, June, 1974:

	Controls		Experimentals	
	Shoal Creek	0.04 (1.79)	Choccolocco Cr., High. 77	43.6 (1050)
***	Chesha	2.94 (78.7)	Coosa R., Stemley Bridge	17.2 (550)
	Cane Creek	3.23 (173)	Clear Creek, High. 42	2.91 (89.8)

***Same footnote as for bluegill, Exercise V.

Note again that the explanation for Exercise V for the bluegill, is equally applicable here for the longear sunfish, L. megalotis.

Exercise VII--Correlation of Aroclor 1254 levels in sediments with fish residue levels by species: Sediments-March 1974 & Fishes June 1974

	Choccolocco Cr. Highway 95 556 ppb in the sediments	Choccolocco Cr. Highway 93 13,350 ppb in the sediments	Coosa River Stemley Bridge High. 34 125 ppb in the sediments
Lepomis macrochirus	26.2 (2430)	43.5 (897)	21.7 (1010)
Notropis venustus	80.5 (1320)	39.7 (731)	
Lepomis cyanellus	53.7 (2020)		13.6 (1250)

With respect to Exercise VII, I fully realize that this is not truly a valid comparison since so many variables are operating here. The sediment analyses were based on sediments taken during March 1974 and the fishes were collected for residue analysis during June, 1974. It is nevertheless interesting to note that the two lowest residue levels were found at the Choccolocco Creek, Highway 93 site where the highest levels were found in the sediments in March 1974. One would have to have more complete data in this connection before truly valid comparisons could be made. This material is included only for general interest, and merely to show what we could do if additional data were available.

With respect to the entire survey, we would not want to say at this point that the general increases in residue levels noted between successive years, as compared to 1974 data, should be explained on the basis of differing methodologies and improved equipment when comparing the respective laboratories at St. Louis and Anniston. Keep in mind that the precipitous drop we observed in September, 1972, was supported by only one set of data for that month and that there was no follow-up work done until June, 1974. In short, we must have additional data for 1975 and successive years before we can approach an understanding as to just what is going on in the environment with respect to P.C.B. uptake. We are dealing here with persistent chemicals that will be in the environment many, many years before they are degraded by organisms, and consequently we should expect gauging of their ultimate effects to take many years.

Our recommendation is that nothing be done until at least June, 1975. At that time we would recommend repeating the procedure exactly as done in June, 1974 with one exception--an additional station should be added upstream from Cane Creek on the Coosa River, and an additional station should be added downstream from Clear Creek, Logan Martin Reservoir. Perhaps these stations would enable us to explain the high levels found in the controls at the upper sites on the Coosa River.

MONS 094997

Thank you for your consideration. Enclosed is a report for the ichthyological survey. Our billing for Phases 2, 3 and 4 was sent to Accounts Payable.

Very truly yours,

Gerald E. Cumming, Ph.D.
Biological Consultant

Enclosures