UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES
CENTER FOR ESTUARINE AND MENHADEN RESEARCH
PESTICIDE FIELD STATION
GULF BREEZE, FLORIDA 32561

Information for FWPCA Enforcement Conference

The Bureau of Commercial Fisheries is vitally concerned about pollution of Escambia Bay and contiguous waters and is conducting research on the effects of pollution on commercial fishery organisms from the bay at the BCF Center for Estuarine and Menhaden Research Pesticide Field Station, Gulf Breeze, Florida. These research activities are concerned primarily with pesticides and PCB (polychlorinated biphenyls) that occur in the biota. PCB's are considered industrial pollutants and, unfortunately, are relatively persistent in an aquatic ecosystem. Aroclor® 1254, one of a series of chlorinated biphenyl compounds manufactured by the Monsanto Company, is a light yellow viscous oil with a chlorine content of 54%. It is stable, insoluble in water and highly soluble in lipid. Structurally it resembles chlorinated hydrocarbon insecticides such as DDT.

Investigators at this station analyzed fish and other estuarine organisms, water, and sediments that were collected after local "fish-kills" that occurred during the past year. In addition, other samples were collected from Escambia Bay at periodic intervals and samples of oysters from East Bay have been analyzed at 30-day intervals for the past 2 years. All samples were analyzed for the following pesticides: Heptachlor, BHC, Aldrin, DDT, Dieldrin, Endrin, Methoxychlor, Mirex, Toxaphene, Malathion, and Parathion. Also, analyses for PCB were made. Details of our analytical procedures are available from the station.

In general, we detected only traces (<0.010 ppm wet weight body tissues) of DDT and its metabolites in some of the animals involved in the fish-kills and the levels of these pesticides in shellfish from Escambia and East Bays have not exceeded 1 ppm.

We first detected residues of PCB, later identified as Aroclor 1254, in animal tissue in April 1969 at a newly established pesticide monitoring station in Escambia Bay. Subsequent sampling in this area showed residues of the chemical in water, sediment, fish, blue crabs,

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and shrimp (Table I). We traced one source of Aroclor 1254 to the outfall of Monsanto Chemical Company, approximately seven miles above the mouth of Escambia River, after analyzing 30 water samples from Escambia River and Bay (above and below the outfall). The Aroclor reportedly entered the plant's effluent through accidental leakage of a heat-exchange fluid. High concentrations (290 ppb) of Aroclor in water during the sampling period occurred at the outfall in August and decreased abruptly when leakage from the plant was corrected. Samples taken from the outfall on September 1969 contained only 0.80 ppb. Less than 0.10 ppb of Aroclor was detected in water where Highway 90 crosses Escambia Bay and none of the chemical was detected in the water south of the highway. However, animals now being collected as far south as Santa Rosa Sound contain residues of this chemical.

We are evaluating the effects of pesticides and Aroclor 1254 on estuarine organisms under controlled conditions in the laboratory. Results of preliminary experiments and the levels of residues of these chemicals in the tissues of animals associated with the fish-kills indicate that neither pesticides nor Aroclor 1254 alone caused the mortalities. Since some data are already available on DDT, we are now determining lethal levels of Aroclor 1254 to test organisms and then exposing others to sublethal concentrations for long periods of time.

We have determined that continuous exposure to 5 ppb Aroclor 1254 in the water for 20 days killed 72 percent of a test population of commercial shrimp. A composite sample of the dead shrimp contained 16 ppm Aroclor 1254. Juvenile blue crabs are not as sensitive to the chemical as only one of 20 crabs died during a 20-day exposure to 5.0 ppb. Fish appear to be even less susceptible than crabs.

TABLE I

Residues of Aroclor 1254 in samples from Escambia Bay and River

Sample*	Number of Animals or Organs in Sample	Date Collected (D-M-Y)	Location	Residues of Aroclor 1254 ppm
Fish				
Flounder liver	1	5-6-69	Mulatto Bayou	76.
Flounder muscle	1	"	"	4.5
Flounder gills	1	"	"	19.
Croaker	3	"	"	12.
Menhaden	5	"	"	11.
Pinfish	5	"	"	10.
Menhaden	5	1-7-69	"	12.
Speckled trout gills	1	14-8-69	Pensacola Bay	7.5
Speckled trout liver	1	"	"	21.
Speckled trout	3	31-8-69	Northern Escambia Bay	20.
Flounder liver	1	"	"	184.
Menhaden	6	10-10-69	Mulatto Bayou	5.7
Crustaceans				
Shrimp	10	1-7-69	Mulatto Bayou	1.5
Shrimp	5	31-8-69	Northern Escambia Bay	2.5
Blue crab	6	13-8-69	"	7.0
Blue crab	5	31-8-69	"	6.3
Blue crab	6	9-9-69	Mulatto Bayou	1.0
Sediment				
"		1-7-69	Mulatto Bayou	N.D.**
"		8-7-69	Highway 90	1.7
"		15-8-69	Garcon Point	N.D.
"		"	Mulatto Bayou	N.D.
"		"	Northern Escambia Bay	.14
"		"	Highway 90	1.4
"		"	Outfall 6 miles north of N. Hwy 90	486.

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TABLE I (continued)

* Shrimp were collected alive; crab and fish were dead or moribund. Scientific names: trout (Cynoscion nebulosus), croaker (Micropogon undulatus), menhaden (Brevoortia patronus), pinfish (Lagodon rhomboides), flounder (Paralichthys sp.), shrimp (Penaeus setiferus) and (Penaeus aztecus), and blue crab (Callinectes sapidus).

**N.D. : < .03 ppm for sediment.

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