Environmental Protection Agency

Program Office
536 South Clark Street
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EPA 905/3-84-003
April 1984

Contaminants in Fish From Great Lakes Harbors and Tributary Mouths 1980-81

by

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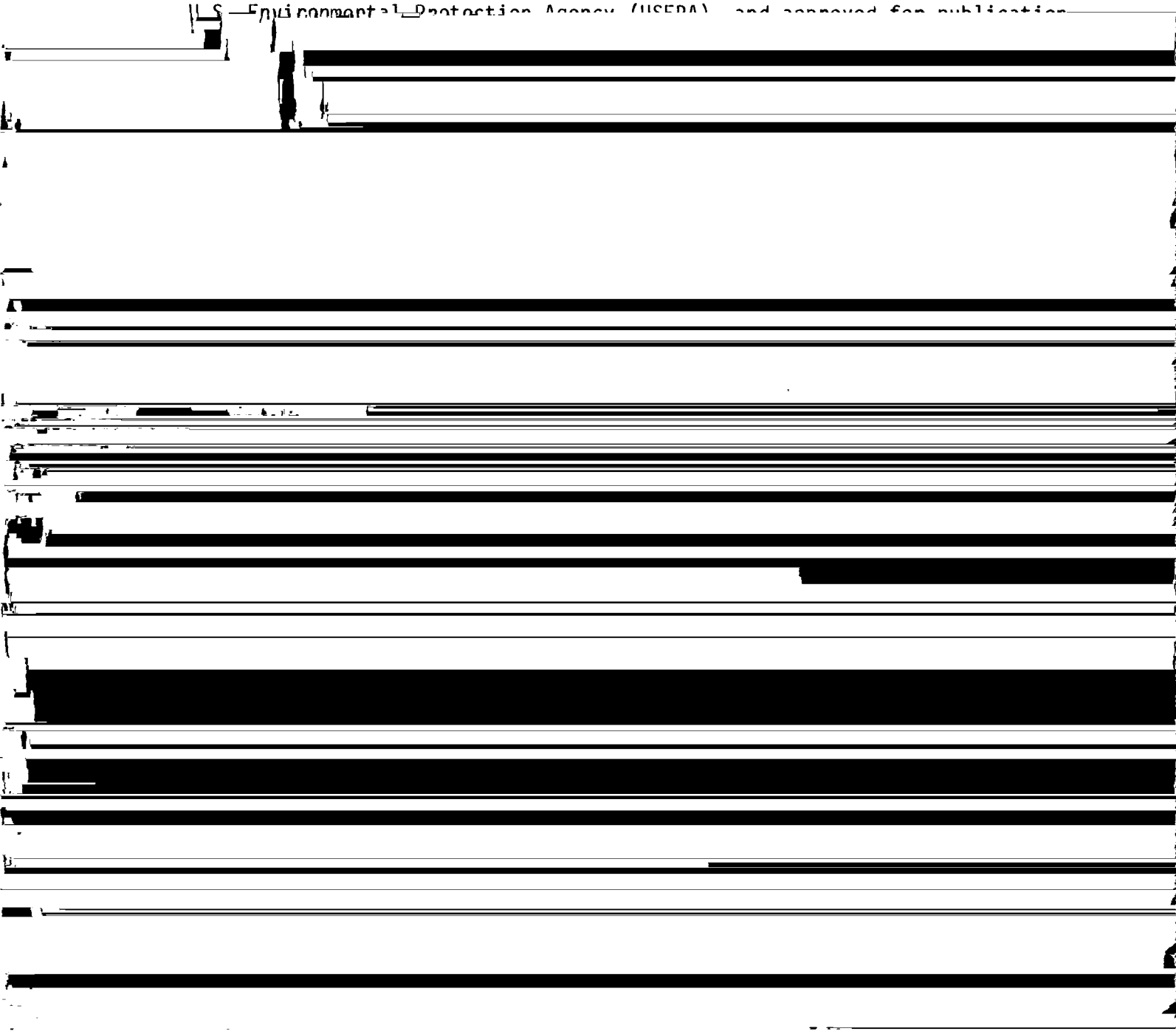
DISCLAIMER

This report has been reviewed by the Great Lakes National Program Office, U.S. Environmental Protection Agency (USEPA), and approved for publication



and policies of the USEPA, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

FOREWORD

The Great Lakes National Program Office (GLNPO) of the U.S. Environmental Protection Agency was established in Region V, Chicago to focus attention on the significant and complex natural resource represented by the Great Lakes.

GLNPO implements a multi-media environmental management program drawing on a wide range of expertise represented by universities, private firms, State, Federal and Canadian governmental agencies and the International

ABSTRACT

Composite fish samples collected from Great Lakes Harbors and Tributaries between 1980 and 1981 were analyzed by gas chromatography-electron capture detector and gas chromatographic-mass spectrometry for a wide range of pesticides and priority pollutants. Severe PCB [redacted] Diseased fish with moderate to severe PCB contamination in samples from the Milwaukee, Kinnickinic

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TABLES

Acknowledgements

I thank the many people in the Fisheries and Natural Resources Departments of the States of Wisconsin and Ohio for collecting the samples and providing valuable site information. I also thank Dr. James Clark, (USEPA, Environmental Research Laboratory, Gulf Breeze, Florida), Mr. David Rockwell (USEPA, Great Lakes National Program Office) for reviewing and commenting on the report. I also wish to thank Mary Martin and Carroll Whatley for typing the manuscript.

INTRODUCTION

The Great Lakes Fish Monitoring Program (GLFMP) is a cooperative program between the U.S. Environmental Protection Agency, Great Lakes National Program Office (GLNPO), U.S. Fish and Wildlife Service (USFWS), U.S. Food and Drug Administration (USFDA) and the eight Great Lakes states. It is

METHODS

State personnel collected indigenous fish from harbor and tributary mouth sites in the Great Lakes basin using gillnets, trap nets, electro-shock and other conventional methods. Individual fish were weighed, measured for length and wrapped in solvent rinsed aluminum foil in the field. Fish were then frozen and shipped to the US Environmental Protection Agency's (USEPA) Central Regional Laboratory (CRL) in Chicago for compositing and analysis.

Table 1 gives the mean size, weight and collection date of the composite samples. After composite groupings were formed, each fish was chopped into 2 to 3 inch cubes with a meat cleaver or butcher saw and ground twice in a solvent washed Hobart meat grinder. The ground fish was then thoroughly

TABLE 1
SAMPLE COLLECTION DATA

[redacted]

The GC/MS portion of the extract was screened by a Varian 2700 gas chromato-

[redacted]

adjustments required for GC/MS analysis as well as what, if any, additional

[redacted]

cleanup was required (EPA 1979a). This was then analyzed by a Hewlett-Packard 5985 automated gas chromatograph/mass spectrometer using the following operating conditions (EPA 1979b):

Column: 30m x 0.2mm SE-54 fused silica capillary
Carrier Gas: Helium at 25 cm/sec.
Mass Range: 45-450 AMU
Electron voltage: 70 EV
Temperature Program: T_1 = 50°C for 1 min.
T_2 = 300° for 20 min.

TABLE 2

Bis (2-Chloroethyl) Ether	2-Chlorophenol	*Triflan(Trifluralin)
1,3-Dichlorobenzene	*2,4-Dimethylphenol	*2,4,D-Isopropyl Ester
1,4-Dichlorobenzene	2-Nitrophenol	Alpha BHC (A-BHC)

20% diethyl ether in benzene (pesticides). All fractions were concentrated to the appropriate volumes and analyzed on a Perkin-Elmer (PE-3920B) dual column gas chromatograph with electron capture detectors using the following operating conditions (EPA 1979b):

Channel 1:

Column: 3% SP-2100 Supelcoport
Length, Diameter: 2.4m, 3.175mm (ID)
Injection Column: 5 ul Injection Temperature: 270°C

RESULTS

GC/EC

GC/EC analysis identified 10 pesticides and industrial compounds in the

22 composite samples analyzed (Table 3). These include compounds currently

in use in the Great Lakes basin and those whose use has been banned, such

DCD and DDT, as severely restricted such as chlordane and heptachlor

Table 3
Gas Chromatographic Results for Harbor and Tributary

	Black River	Ashtabula River				Sheboygan River			Milwaukee River	
Sample #	1S82	1S88	1S90	1S95	1S97	1S02	1S01	0S99	2S09	2S10
Aroclor 1248	0.42	4.17	8.81	2.01	0.88	21.30	51.37	31.3	3.27	7.36
Aroclor 1254	0.57	2.39	1.85	0.79	0.62	15.79	42.37	29.25	2.16	5.32
Aroclor 1260	0.29	<0.05	<0.05	<0.05	0.22	1.51	4.70	2.55	1.20	2.86
Total PCB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3 cont'd
Gas Chromatographic Results for Harbor and Tributary
Mouth Fish (mg/kg)

[redacted]

Rivers. The ratio of DDE to the parent compounds varied from sample to sample, however, DDE was predominant in all but sample #1S11 (Wolf River).

One interesting result was the high proportion of O,P-DDT and O,P-DDE to the corresponding P,P isomers. The predominance of the O,P-isomer has also

GC/MS Scans

In addition to quantitative confirmation of PCB, DDT

some others of the above pesticides and industrial compounds. GC/MS

Table 4

Results of GC/MS Scans of Harbor and Tributary Mouth Fish (mg/kg)

Table 4 cont'd

Results of GC/MS Scans of Harbor and Tributary Mouth Fish (mg/kg)

Menominee River		Kinnickinnic River	Wolf River		Fox River above DePere			Fox River below DePere		Chequamegon Bay	
2S04	1S00	1S08	1S11	1S09	1S14	2S14	1S13	1S07	1S06	1S15	1S16

Table 4 cont'd

Results of GC/MS Scans of Harbor and Tributary Mouth Fish (mg/kg)

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

TABLE 4 cont'd

Results of GC/MS Scans of Harbor and Tributary Mouth Fish (mg/kg)

	Black River	Ashtabula River				Sheboygan River			Milwaukee River	
Sample #	1S82	1S88	1S90	1S95	1S97	1S02	1S01	0S99	2S09	2S10
Monocyclic Aromatics										
Butylhexyl benzene										

Discussion

These data illustrate the environmental persistance and continued existence of sources to the Great Lakes of industrial contaminants and pesticides whose use has been banned or restricted. These include PCB, chlordane

basin is also demonstrated. Dacthal was above detection limits in samples

[redacted]

Sheboygan River fish appear to have declined since 1978 the fishery

[redacted]

analysis of Black River samples was conducted by Baumann et al. (1983). They quantified 18 PAHs in brown bullheads and 24 PAHs in sediments. They also found that PAH concentrations were correlated with a high incidence

studies in both the compounds identified and concentrations reported, these are to be expected as a result of the more intensive analytical methodologies employed in the Vieth et al. (1981) and Baumann et al. (1982) studies, as well differences in habits of the species analyzed.

compositing schemes used in the different studies, this data is in general

fluoranthene at 22 mg/kg in Black River sediments. However brown bullheads,

bottom dwelling species ranged from 0.558 mg/kg to 1.938 mg/kg. In the Fox

River sediments all PAH concentrations were below 2.1 mg/kg (GLNPO 1981). This illustrates the need to utilize mechanisms other than fish tissue to monitor the potential exposure to PAH of both animal and human populations.

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TECHNICAL REPORT DATA
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