



NJ Department of Environmental Protection and Energy  
Division of Science and Research  
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## RESEARCH PROJECT SUMMARY

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### **Polychlorinated Biphenyls (PCBs), Chlordane, and DDTs in Selected Fish and Shellfish from New Jersey Waters, 1988 - 1991: Results from New Jersey's Toxics in Biota Monitoring Program**

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#### SUMMARY OVERVIEW

This summary presents the results of monitoring carried out between 1988 and 1991 under the direction of the New Jersey Department of Environmental Protection and Energy's (DEPE) Toxics in Biota Technical Committee. Data on levels of polychlorinated biphenyls (PCBs), chlordane, and DDT and its metabolites DDD and DDE (DDTs) in 217 single-fish samples and composite samples from ten species overall show consistency with previous DEPE monitoring data. The results indicate that fish sampled from the Northeast region (Hudson, Raritan, Hackensack and Passaic River drainages) remain the most severely contaminated. However, there is some indication that there is a decrease in contaminant levels, as there were fewer exceedances of FDA action levels than previously observed. All samples in exceedance of FDA action levels, with three exceptions, are covered by consumption advisories or bans issued by the state.

#### INTRODUCTION

This is a summary of the fifth technical report published by the DEPE on the levels of organic contaminants in fish and shellfish and summarizes data collected between 1988 & 1991.

In 1982 and 1983, the Office of Cancer and Toxic Substances Research (later the Office of Science and Research, and currently the Division of Science and Research, DSR), in conjunction with the Division of Fish, Game and Wildlife, released reports detailing five years (1975-1982) of fish tissue data for PCBs, chlordane, and DDT. The report showed freshwater species having lower levels of contamination than the estuarine and marine species tested. It also showed that the fish and shellfish collected from Hudson River -

Newark Bay - Raritan Bay complex, in the northeastern part of the state, were the most severely contaminated.

In 1985, another DSR report detailing the discovery of extensive soil, sediment and fish contamination with dioxin resulted in the establishment of a number of consumption advisories and fishing closures in the Newark Bay complex.

The results of the first two years of the Toxics in Biota Monitoring Program (1986-1987), presented in a 1990 DSR report<sup>1</sup>, were consistent with previous findings, showing the species samples from the Northeast region of the state as the most contaminated.

The continuation of the monitoring program reported here focused on levels of PCBs,

chlordane and DDTs in ten fish and shellfish species collected at 49 stations throughout NJ. Species studied included: brown bullhead, carp, largemouth bass, channel catfish, white perch, American eel, striped bass, bluefish, weakfish, and blue crab. (See Figure 1 for location of stations)

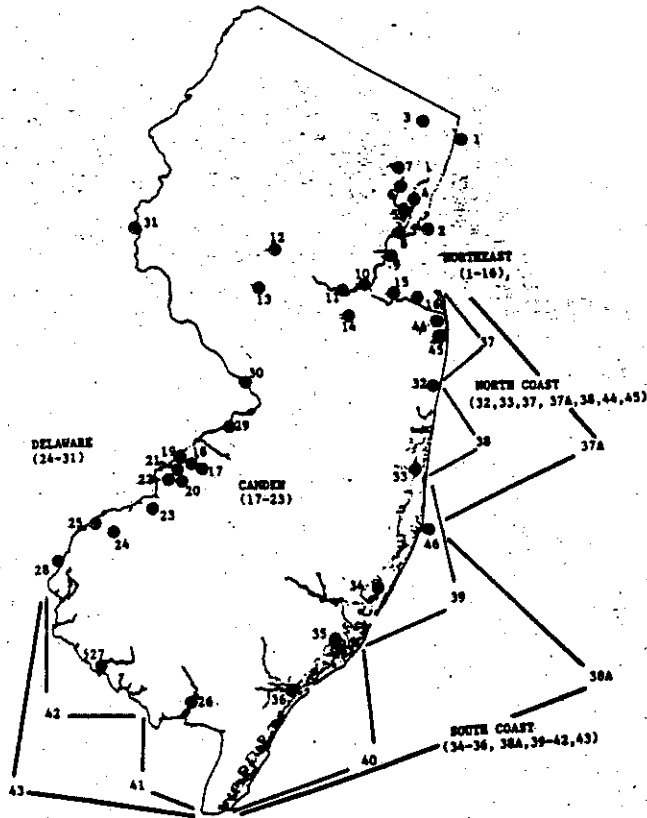


Figure 1. Sampling Sites and Regions

## OBJECTIVES

This monitoring project was conducted to determine: 1) the levels of PCBs, chlordane and DDTs found in the ten species sampled; and 2) if existing fishing consumption bans and/or advisories could be amended or eliminated or if new bans/advisories need to be established.

## PROJECT DESIGN/METHODS

Samples were collected by gill netting, otter trawls, electrofishing, hook and line, fish traps, and crab pots. Some samples (i.e., weakfish, bluefish and striped bass) were obtained from commercial and recreational fishermen. All samples were sealed in plastic bags and stored in

ice chests. Before processing, all samples were identified to species level, weighed and measured (blue crabs were measured across the shell, point to point). Shell condition and physical abnormalities in blue crabs were also noted. Samples were stored frozen at approximately -21°F until processing.

The samples excised from edible finfish consisted of a scaled fillet with skin intact for all species except American eels, catfish and bullheads, for which samples consisted of a skinless fillet. The standard fillet was defined as the portion of the fish bounded anteriorly by the pectoral fin and posteriorly by the caudal fin, and from the mid-dorsal line to the mid-ventral line, including the rib cage and belly flap.

Blue crab tissue samples were composites consisting of the edible meat portions (thoracic, claw, leg and tail meat), the hepatopancreas, or a mixture of both tissues from five animals of approximately equal size. A given sample contained roughly equal portions from each of the animals in the composite. The separate hepatopancreas and muscle samples consisted of the two tissue types from the same set of five animals. Hepatopancreas/muscle mixtures for blue crabs consisted of all of the available tissue of both types, not equal masses of each tissue type.

The homogenized tissue samples were extracted and quantified by gas chromatography at the NJ Department of Health. Quality control followed EPA-recommended guidelines<sup>2</sup> and included spiking muscle tissue of one sample with appropriate standards, as well as analyzing replicates of one of the samples in a set.

## RESULTS AND DISCUSSION

The results were generally consistent with previous findings that showed the samples collected from the Northeast region to be the most severely contaminated. Mean values for PCBs in three species from the region, American eel, carp and blue crab (hepatopancreas), were elevated (i.e., exceeded the FDA action level). Elevated PCB levels were also found in the following individual samples: bluefish, blue crab (hepatopancreas/muscle mixture), and striped bass from the Northeast region; some striped bass from the North Coast and South Coast regions;

bluefish from the North Coast, South Coast and Atlantic regions; and one brown bullhead sample from the Camden region.

All exceedances of FDA action levels in individual samples are covered by a consumption advisory, ban or other information already issued by the state, with the exception of the following: carp samples from the Passaic River's Stations 7 and 7A; a brown bullhead sample from Station 25 on Raccoon Creek; and two striped bass samples from the Seaside Park to Brigantine area, Station 39.

There is some indication of decreasing contaminant levels, as reflected in the occurrence of fewer exceedances of FDA action levels. For example, in contrast with the 1986-1987 results, in the Camden region no regional means and no results for specific composite samples exceeded FDA action levels. However, small sample sizes for the 1988-1991 sampling made detailed comparisons difficult.

PCB levels in striped bass from the Northeast and North Coast regions appeared to have decreased since surveys in the 1970s and early 1980s. This decrease is consistent with results for striped bass from New York waters<sup>3</sup>.

Large bluefish (total length  $\geq 60$  cm) contained, on average, approximately two to three times the level of a given contaminant found in small bluefish. In blue crabs, levels in hepatopancreas samples were approximately six to eight times the levels in samples of muscle tissue.

Despite apparent decreases in contaminant levels in some species and regions, the results still point to widespread occurrence of contaminants above FDA action levels in the edible portions of those species and the waterways that were examined (see Table 1 for PCB results). The existing framework of sale and consumption advisories and prohibitions continues to serve as an important way of protecting the public from excessive exposure to contaminants found in fish and shellfish.

## CONCLUSIONS/RECOMMENDATIONS

\* Regular monitoring of the network of stations, established in 1986, needs to take place as detection of changes in contaminant levels can only be accomplished through regular sampling. Sound management decisions on this issue

depend on adequate and reliable data.

\* Special efforts should be made to collect data on contaminant levels in the following: bullhead, white perch and other benthic species along the lower Delaware River and its tributaries; a variety of species, including carp, from the Passaic River above the Dundee Dam; and striped bass from the North Coast and South Coast regions.

\* Future sampling of bluefish should explore the relationship between contaminant levels and fish size.

\* There is a need for better data on contaminant levels in fresh water species, as well. Such data could be collected as part of the Basinwide Ambient Systematic Sampling (BASS) Program planned by DSR's Water Monitoring Management program.

\* Follow established consumption advisories and prohibitions that apply to particular species and locations. (See Fish & Wildlife Digest, Vol. 6, No.4, May 1993).

\* In general, consumers can reduce their potential intake of contaminants by taking the following steps: 1) since contaminants accumulate in fish over a long period of time, smaller fish often contain lower levels of contaminants than larger fish of the same kind. This has been found to be the case for bluefish. Selecting smaller fish can thus reduce exposure; 2) for finfish, especially fatty species such as bluefish, removing the fatty tissues before cooking can also reduce exposure. These include the belly flaps, dark meat along the lateral line and the skin; 3) using cooking techniques that allow fats to drip away from the fish (such as grilling, broiling, or baking on a rack) and avoiding coatings that hold in fats and oils is another way to reduce exposure; and 4) intake of contaminants that may be found in crabs and lobsters can be minimized by discarding the internal organs ("tomalley," "green gland," or "mustard") before cooking or, if the animals are cooked whole, by not using these organs in any sauces or juices.

## FUNDING SOURCE

This work was funded by appropriations from the New Jersey Legislature. A DSR technical report describing the results, in detail, is available by calling (609) 292-9692. Further information regarding other research efforts by the division may be obtained by calling (609) 984-6071. DSR Reference No. 93005.

## ACKNOWLEDGEMENTS

Paul Hauge was a Research Scientist and Manager of the Bureau of Environmental Assessment with DSR at the time this research was conducted. He is currently a student at Harvard Law School. Bruce Ruppel is currently a Principal Environmental Specialist with DSR. Alena Baldwin-Brown is the Technology Transfer Program Coordinator for DSR.

## REFERENCES

- <sup>1</sup> Hauge, P., J. Bukowski, P. Morton, M. Boriek, J. McClai and G. Casey. 1990. Polychlorinated Biphenyls (PCBs), Chlordane and DDTs in Selected Fish and Shellfish from New Jersey Waters, 1986-1987: Results from New Jersey's Toxics in Biota Monitoring Program. Trenton: New Jersey Department of Environmental Protection, Division of Science and Research.
- <sup>2</sup> American Public Health Association, American Water Works Association, and Water Pollution Control Federation. 1975. Standard Methods for the Examination of Water and Wastewater, 14th edition, pp. 17-32. Washington, D.C.: American Public Health Association. and U.S. Environmental Protection Agency. 1976. Manual of Analytical Quality Control for Pesticides in Human and Environmental Media. EPA 600/1-76-017. Research Triangle Park, N.C.: Health Effects Research Laboratory.
- <sup>3</sup> Sloan, R., B. Young, K. McKown and V. Vecchio. 1991. PCBs in Striped Bass from New York Marine Waters. Technical Report 91-1 (BEP). Albany: New York State Department of Environmental Conservation, Division of Fish and Wildlife/Division of Marine Resources.

Table 1.

Results at or in Excess of FDA Action Level for PCBs<sup>1</sup>

Species	Site	Region	Year	PCBs (ppm wet wt.)
Striped bass	2	Northeast	1988	2.68
Blue crab (H)	2	Northeast	1988	1.90
Blue crab (H)	2	Northeast	1989	2.95
American eel	4	Northeast	1988	1.74
Blue crab (H)	4	Northeast	1988	2.47
Striped bass	5	Northeast	1988	2.48
Blue crab (H/M)	5	Northeast	1988	2.05
Blue crab (H)	5	Northeast	1988	1.69
American eel	6	Northeast	1988	2.46
Carp	6	Northeast	1988	2.99
Carp	7	Northeast	1988	1.30
Carp	7A	Northeast	1989	1.64
Striped bass	8	Northeast	1988	2.00
American eel	8	Northeast	1988	2.53
Blue crab (H)	8	Northeast	1988	1.51
American eel	9	Northeast	1988	1.05
Bluefish	10	Northeast	1988	1.81
Striped bass	10	Northeast	1988	2.73
Blue crab (H)	10	Northeast	1988	2.99
Blue crab (H/M)	11	Northeast	1988	2.07
Blue crab (H)	11	Northeast	1988	1.52
Bluefish	15	Northeast	1988	2.02
Striped bass	16	Northeast	1988	2.49
Brown bullhead	25	Camden	1988	2.60
Bluefish	37	North Coast	1988	2.77
Striped bass	37	North Coast	1988	2.15
Striped bass	37	North Coast	1988	2.27
Striped bass	37A	North Coast	1989	2.67
Striped bass	37A	North Coast	1989	2.08
Striped bass	37A	North Coast	1989	2.59
Striped bass	38	North Coast	1989	3.33
Striped bass	38A	South Coast	1989	2.52
Bluefish	39	South Coast	1988	2.17
Striped bass	39	South Coast	1988	2.43
Bluefish	46	South Coast	1988	1.05
Bluefish	46	Atlantic	1989	2.25
Bluefish	46	Atlantic	1989	2.15

<sup>1</sup> Results for discrete samples, not station means. Other samples may have been analyzed for the same species/site/year combination. Action level is 2.0 ppm for PCBs.