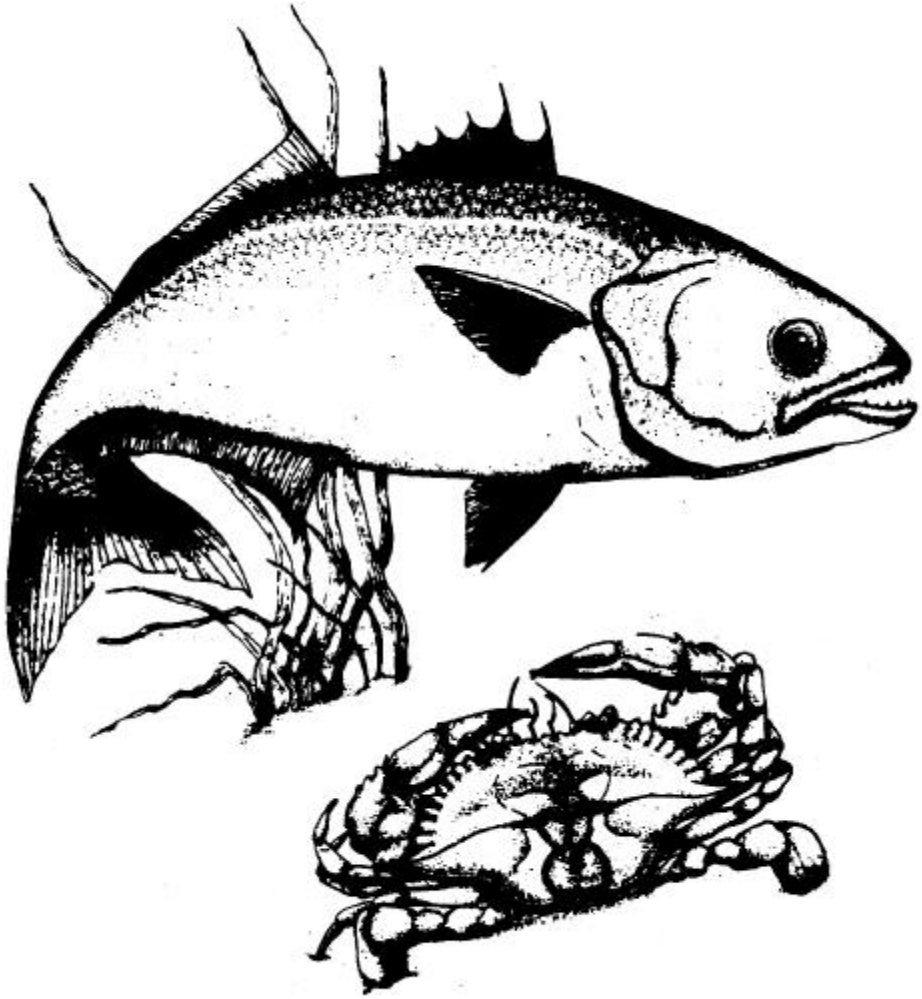
NEW JERSEY
DEPARTMENT OF ENVIROMENTAL PROTECTION

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



Division of Science and Research

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

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James Nickels of the New Jersey Marine Sciences Consortium coordinated all sample collection activities. The members of the Toxics in Biota Technical Committee, chaired by Dr. James Butler of DEP's Division of Science and Research, reviewed the draft of this report.

EXECUTIVE SUMMARY

This report presents the results of the first two years (1986 and 1987) of monitoring carried out under the direction of the New Jersey Department of Environmental Protection's (DEP) Toxics in Biota Technical Committee. It presents data on the levels of polychlorinated biphenyls (PCBs), chlordane, and DDT and its metabolites DDD and DDE ("DDTs") in ten species (brown bullhead, carp, largemouth bass, white catfish, white perch, American eel, striped bass, bluefish, weakfish, and blue crab) collected at forty stations throughout the state. A total of 225 composite samples, generally consisting of edible tissue from five animals, were analyzed.

Comparison of the results with action levels s et-by the U.S. Food and Drug Administration (FDA) shows them to be consistent with previous DEP findings that showed the Northeast region of the state to be the most severely contaminated. Elevated levels were also found in the Camden region, and in striped bass from the North Coast region.

Among the results for particular samples, exceedances of FDA action levels for PCBs and/or chlordane are noted for American eels, blue crabs, bluefish, brown bullhead, carp, striped bass, and white perch; there were no exceedances for DDTs. Exceedances for blue crabs were limited to samples consisting of hepatopancreas ("tomalley") tissue or a mixture of hepatopancreas and muscle; none occurred in samples consisting entirely of crab muscle tissue.

Results from both years were combined and stations were grouped into five regions to allow comparisons of levels across the state. The Northeast region had the greatest number of species with overall means exceeding FDA action levels: blue crab (hepatopancreas) (PCBs), carp (PCBs and chlordane), striped bass. (PCBs), and white perch (PCBs).., The North Coast region (PCBs in striped bass) and the Camden region (PCBs and chlordane in American eels) each had one species with at least one overall mean exceeding the relevant action level.

For all three contaminants, mean levels in large bluefish (.2:60 cm) were approximately twice those in small bluefish (<60 cm), and mean levels in blue crab hepatopancreas tissue were approximately an order of magnitude higher than those in blue crab muscle tissue.

This work was funded by appropriations from the New Jersey Legislature.

I. INTRODUCTION

This is the fourth technical report published by the New Jersey Department of Environmental Protection (DEP) on the levels of organic contaminants in fish and shellfish. It summarizes the first two years of data collected under the direction of DEP's Toxics in Biota Technical Committee, which was formed in 1983.

A. Previous DEP Reports

In 1982, the Office of Cancer and Toxic Substances Research (later the Office of Science and Research (OSR), and currently the Division of Science and Research), - in conjunction with the Division of Fish, Game and Wildlife, released a report detailing five years (1975-1980) of fish bioaccumulation data for PCBs (1) . The results of that effort showed that 75% of the finfish and 50% of the shellfish analyzed had detectable levels (>0.1 parts per million (ppm)) of PCBs in their f lash. A total of 11. 1% of the f infish and none of the shellfish had PCB levels greater than the current U.S. Food and Drug Administration (FDA) action level of 2.0 ppm.. (The action level was lowered from 5.0 ppm to 2.0 ppm in 1984.) Freshwater species had lower levels than the estuarine and marine species tested. The heavily urbanized and industrialized northeastern portion of the state, within the Hudson River - Newark Bay - Raritan Bay complex, was the most severely contaminated.

The second OSR report (2), released in 1983, presented the results of sampling conducted during 1981 and 1982, which concentrated on the above-described drainage area as well as the adjacent ocean waters. In addition to PCB data, the 1983 report contained limited data on chlordane levels in bluefish.

The data published in the 1982 report and the then - unpublished results of the 1981-82 work led to the establishment of consumption advisories and fishing bans for certain species in a number of areas of the state in late 1982. (See Appendix A for a discussion of the advisories and fishing closures currently in place.) Based on these findings, it was clear that the existing data base had to be expanded and a routine monitoring program put into place in order to track the levels of organic contaminants in fish and shellfish and to -protect New Jersey's fish-consuming public from unnecessary and excessive exposure to these contaminants.

The discovery of extensive soil contamination with dioxin (specifically, ;,3,7,8-tetrachlorodibenzo-p-dioxin, or 2,3,7,8,TCDD) at a site adjacent to the Passaic River in Newark prompted an intensive study of dioxin levels in sediments and biota in 1983 and 1984. This study focused on the waters of the Newark Bay complex, but also included sampling in other areas of the state. The results of this study, which were compiled in a 1985 OSR report (3), led to the establishment of a number of consumption advisories and fishing closures in the Newark Bay complex. (See Appendix A.)

B. The Ongoing- Toxics in Biota Sampling Program

In 1983 the Toxics in Biota Technical Committee, consisting of representatives of the Division of Science and Research, the Division of Fish,, Game and Wildlife, and the Division of Water Resources (and now the Division of Hazardous Site Mitigation and the Department of Health as well),, wad formed. The committee developed a program in 1985 to monitor the levels of PCBs and organochlorine pesticides in selected species collected from New Jersey waterways in which elevated levels of these toxic chemicals in fish and/or shellfish had been found or might be suspected.

The program called for the annual collection and analysis of 223 samples from a total of 42 sites. The New Jersey Marine Sciences Consortium, based at Sandy Hook, performed the collection and processing of the samples, and was successful in collecting approximately fifty per cent of the total planned number of samples in both 1986 and 1987, for a total (both years combined) of 225 samples. Chemical analyses were performed at the Department of Health's laboratory facilities. The Technical Committee reviews the results as they become available, and on the basis of its own results and other information makes recommendations concerning new' or amended consumption advisories needed to protect the public.

C. Species Collected

The 1986 and 1987 monitoring program considered ten aquatic species. They included three freshwater species (brown bullhead, Ictalurus nebulosus; carp, = rinus car2io; and largemouth bass, micropterus salmgides), two species that are found in both fresh water and estuarine waters of moderate salinity (white catfish, Ictalurus - catus; and white perch,, *'Morone americana), one catadromous species (American eel, Ancruilla rostrata), one anadromous species (striped bass, Morone saxatilia) , two marine species (bluefish,, Pomatomun saltatrix; and weakfish, Cynoscion regalis), and one estuarine species (blue crab, Callinectes sapidus). Table 1 shows the species collected at each site.

D. Contaminants Considered

The fish and shellfish samples collected in 1986 and 1987 were analyzed for PCBs and two organochlorine pesticides, chlordane and DDT. All are persistent in the environment, and share the properties of low solubility in water and a lipophilic nature, i.e.,, they tend to become dissolved in lipid (fatty) material. These properties result in their tendency to accumulate in the tissue of fish and other organisms, especially in those tissues and

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[1] **One sample was actually collected in February 1988, but was included with the samples from the 1987 sampling season. See Appendix B.**

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organisms with a high lipid content.

PCBs, first commercially produced in 1929, were commonly used in transformer oils and electrical products. In 1977 the U.S. Environmental Protection Agency (EPA) banned the production of PCBs, but many PCB-laden transformers, capacitors, and other electrical equipment remain in service. Spills, effluent discharges, incineration, and disposal in landfills have dispersed this persistent contaminant throughout the environment. PCBs are classified by EPA as a probable human carcinogen. Many chronic and acute health effects, as well as birth defects, have been associated with PCBs.

Chlordane was widely used for the control of termites, as an insecticide in homes, gardens, and lawns, and for the control of soil insects in corn fields until 1976, when EPA restricted its use to underground application for termite control. EPA completely banned the use of chlordane in 1988. Chlordane is a probable human carcinogen. Exposure to high levels of chlordane can also affect the central nervous system, lungs and skin.

DDT (dichlorodiphenyltrichloroethane) is an organochlorine pesticide used for agricultural purposes and to control disease vectors. It was banned for most uses in the United States in 1972 because of its detrimental' ecological impacts, particularly increases in the frequency of egg breakage and a decrease in the populations of certain birds, including the peregrine falcon, golden eagle, and osprey. DDT appears to affect estrogen levels in birds, altering egg calcification, egg laying, and nesting. Only at very high doses does DDT have acute toxic effects on humans; there is no evidence of mutagenicity or carcinogenicity based on laboratory experiments. Like many other chlorinated hydrocarbons, DDT is highly persistent. Dicofol, a pesticide still widely used on U.S. agricultural crops, contains DDT impurities, and DDT is still widely used in many developing countries for the control of insect-transmitted diseases. Alteration of DDT in the environment yields two main breakdown products, DDD and DDE.

II. METHODS

A. Sample Collection

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. Sampling locations are shown in Figure 1 and listed in Table 1. After collection, samples were sealed in plastic bags and stored in ice chests that had been cleaned with a laboratory detergent, such as Liqui-Nox, flushed with pesticide grade hexanes, and finally rinsed with distilled water. "Cold packs"- or ice sealed in plastic containers was used.

B. Sample Processing

Before actual 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 degrees F until processing.

1. Finfish

All sample processing was done on a stainless steel surface with metal instruments. Homogenization took place in a blender with stainless steel blades. The work surface, instruments, and blender *container, after* being cleaned with a laboratory detergent such as Liqui-Nox, were flushed with pesticide grade hexanes between each fish lot. In any given set of samples, species were processed in ascending order of lipid content.

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.

These standard fillets were either used as an individual sample from a single fish (11 of the 225 samples) or combined with other individuals of the same species and size to form a composite sample usually consisting of five fish, although some composites consisted of two, three, or four fish depending on collection success. (See Table 2 for a list of those samples consisting of fewer than five organisms.) Where possible, the portion taken from each fish consisted of 100 grams, yielding a five-fish composite sample of 500 grams. For individual fillets that exceeded 100 grams in weight, the portion was taken by cutting from the anterior portion of the fillet and proceeding posteriorly until 100 grams were obtained. For extremely large fish, three cross-sections of the fillet -- one from behind the pectoral fins, one from halfway between the first slice and the vent, and one from behind the vent -- were taken and combined to yield the 100-gram portion. The five-fish composite sample was then thoroughly homogenized, packaged in PCB-free aluminum foil, labeled, and stored frozen in polypropylene bags until requested for analysis.

2. Blue Crabs

All storage containers, packaging, work surfaces, and utensils were thoroughly scrubbed, rinsed with pesticide grade acetone or hexanes, and finally rinsed with distilled water. Immediate work surfaces and utensils were washed and rinsed with acetone or hexanes and distilled water after-each sample was processed.

Samples designated for processing were removed from the freezer and thawed. After the sample was weighed, measured, and examined with respect to shell condition and abnormalities, the thoracic body cavity was opened and the hepatopancreas completely removed with a small laboratory spoon. All edible meat was then removed, and the rest of the animal discarded. The tissue was homogenized and stored in contaminant-free aluminum foil at approximately -21 degrees F until analysis.

Blue crab samples were composite samples 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, with a single exception: one hepatopancreas/muscle sample consisted of tissues from four animals. (See Table 2.) 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.

C. Analyses

The homogenized tissue samples were extracted and quantified by gas chromatography at the New Jersey Department of Health laboratory. A Tracor Model 222 gas chromatograph equipped with two dissimilar chromatographic columns and electron capture detectors was used for the analyses. EPA methods (4,5,6,7) for PCB and pesticide analyses were used with slight modification in the initial tissue preparation and extraction sections. In the referenced methods, where PCBs re not specifically mentioned, they are co-eluted with the pesticides and are efficiently separated by specific column chromatography techniques (8).

Ten grams of tissue were soxhlet-extracted for six hours in a 3:1 hexane-acetone mixture. The extract was then isolated and cleaned up using gel permeation chromatography. The final extract was then concentrated, characterized by gas chromatography and quantified by comparison with standards for PCB Aroclors 1248, 1254, or 1260, the alpha and gamma isomers of chlordane, and p, p'DDT, p,p^1-DDE and p,p^1-DDD. The results for PCB Aroclors 1254 and 1260 indicate approximately equal amounts of the two Aroclors present in the samples. Since the profiles for the two Aroclors differ only slightly, either one may be used satisfactorily to quantify that PCB Aroclor.

Quality control followed EPA-recommended guidelines (8,9) and included spiking muscle tissue of one sample with appropriate standards, as well as analyzing replicates of one of the samples in a set. Recoveries for samples spiked with the analytes of interest ranged from 70 to 130 percent. These recoveries were calculated using the 95 percent confidence interval (± 2 standard deviations)

for the mean of the spiked component in the control sample.

Detection limits were 0.1 ppm for PCB- Aroclors 1248 and 1254/1260; 2.5 parts per billion (ppb) for alpha and gamma chlordane; 5 ppb for p,p^{l}-DDE; and 10 ppb for p,p^{l}-DDD and p,p^{l}-DDT. These figures were calculated by using the 1/2 standard peak height concentration divided by the highest quantity of sample extract that could be injected into the chromatographic column without permanently damaging the system.

III. RESULTS AND DISCUSSION

A. General

Results for each site-species-year combination (e.g., bluefish at Site 10 in 1987) are presented in Appendix B. Analytical results are presented as reported (i.e., two decimal places), For all parameters, results reported an "below detection limit" were assigned a value equal to the detection limit for the purpose of data analysis. PCB Aroclors 1248 and 1254/1260, DDT/DDD/DDE, and alpha and gamma isomers of chlordane were summed to yield values for PCBs, DDTs, and chlordane, respectively.

The small number of composite samples for a given species at any one site (generally one or two for, both years combined, except for blue crabs, bluefish, striped bass, and weakfish), renders station-by-station comparisons of limited usefulness and potentially misleading. For this reason, and because the contaminants considered are persistent and their levels would not be expected to change significantly over a two-year period, for purposes of graphic presentation and discussion the results for both the 1986 and 1987 sampling seasons have been combined to form one data set and the sites have been grouped into the following five regions:

Northeast:	Sites within the Hudson, Raritan, Hackensack and Passaic River drainages
North Coast:	All ocean sites and estuarine sites between Sandy Hook and Seaside Park
South Coast:	All ocean sites and estuarine sites between Seaside Park and Cape May, and- sites in Delaware Bay
Camden:	Sites within Stewart Lake, Cooper River, Pennsauken Creek and Newton Creek drainages
Delaware:	Sites on the main stem of the Delaware River, tributaries to the river (except those in the Camdenarea), and tributaries to Delaware Bay

In addition, all blue crab samples in each region, regardless of tissue type, have been grouped together, although separate results for samples of each tissue type are also presented in Tables 5-7.

Figure 1 and Table 3 indicate the region to which each site belongs. Because concentrations will vary among sites in a region, readers interested in values for a specific site, or in the reasons behind differences in regional means, should refer to Appendix B.

Table 4 lists all samples in which the level of at least one of the contaminants studied exceeded the FDA action 1?vel (2.0 ppm for PCBs, 300 ppb for chlordane, 5000 ppb for DDTs). More than half (26 of 46) are from the Northeast region, previously identified (1) as the most severely contaminated area of the state. These samples comprise 31% (26 of 85) of all samples taken from that region; all twenty-six showed exceedances for PCBs, while only one showed an exceedance for chlordane. Ten of thirty-three samples (30%) from the Camden region showed exceedances of FDA action levels (1 for PCBs only, 3 for chlordane only, and six for both contaminants). Table 4 also shows seven PCB exceedances (out of 37 total samples) in the North Coast region; all are for striped bass, of which a total of ten samples were collected from the North Coast region. Only a few samples from either the Delaware or South Coast region had PCB levels in excess of the FDA action level.

All samples listed in Table 4 were covered by one of the consumption advisories, bans, or other information described in Appendix A, with three exceptions for PCBs, as follows: (1) Striped bass at Station 39 (Seaside Park - Brigantine) in 1987, when the level in one sample was 2.82 ppm, and the mean level was 2.08 ppm (N = 2). However, the 1987 mean for the South Coast region, covering five composite samples for Stations 39 and 40 (Brigantine - Cape May), was 1.35 ppm. There is also a statewide prohibition on the sale of striped bass. (2) Brown bullhead at Station 14 (South River at Old Bridge) in 1987, when the level in the only sample collected was 2.04 ppm. However, the level in the brown bullhead sample collected at this station in 1986 was 0.32 ppm. (3) Single samples of carp collected in 1986 (2.66 ppm) and 1987

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[2] While the following discussion focuses on comparing regional means with FDA action levels, it should be noted that even when the regional mean is below the action level, the level in a given composite sample from that region (see Appendix B), and especially levels in individual organisms within those composites, may exceed the action level. In addition, the action levels are based on both health and economic factors, and are designed to protect the average fish consumer. DEP, along with agencies in many other states, considers all of these factors in determining what measures (e.g., consumption advisories) are needed to protect the public, especially those segments of the public that may be at greater risk, such as recreational anglers.

(3.11 ppm) in the Passaic River at Elmwood Park, just upstream of an area covered by an existing ban. These results warrant further investigation.

Table 5 and Figures 2 through 5 show the mean level of PCBs in each species by region. As expected, the Northeast region had the greatest number of species with mean PCB levels greater than or equal to the FDA action level of 2.0 ppm. They were the blue crab (hepatopancreas) (5.38 ppm, N=5), carp (3.20 ppm,, N=4) , striped bass (2.14 ppm, N-16), and white perch (2.06 ppm, N=6). This is generally consistent with the results of DEP's 1982 survey of PCBs in finfish from the Northeast region (2), which showed mean PCB levels in all four species sampled (American eel, striped bass, white perch, and white catfish) to be over 2 ppm. The only exception is American eel, which contained an average of 1.71 ppm of PCBs (N-10) in 1986-87. (White catfish were not collected from the Northeast region in the present study.) For blue crabs, the hepatopancreas was the only tissue type with a mean PCB level in' the Northeast region in 1986-87 greater than 2 ppm. Muscle tissue (0.33 ppm, N=5) and mixtures of hepatopancreas and muscle (1.84 ppm, N-18) had lower mean PCB levels. The overall mean for all blue crab tissue types for the Northeast region also exceeded 2 ppm (2.20 ppm, n=28).

In the North Coast region, only striped bass had a mean PCB level greater than or equal to 2 ppm (mean-2.33 ppm, N-10).

In the Camden region, only American eels had a mean PCB level greater than or equal to 2 ppm (2.32 ppm, N-7). Mean PCB levels for both the Delaware River and the South Coast regions were all below 2 ppm.

Chlordane levels by region are presented in Table 6 and Figures 6 through 9. American eels in the Camden region showed elevated (greater than or equal to the FDA action level of 300 ppb) levels of chlordane, with a mean of 629.98 ppb (N-7). The only other region with elevated levels was the Northeast, for carp (334.08 ppb, N-4).

As shown in Table 7 and Figures 10 through 13, none of the five regions had any species in which the mean DDT level exceeded the FDA action level of 5000 ppb.

B. Bluefish -- Variation in Contaminant Levels by Size

The results of previous DEP studies (2,10), as well as an Atlantic Coast-wide survey carried out by the several federal agencies (11), indicated that PCB levels in bluefish vary according to the size of the fish. The federal study, for instance, found that only bluefish with fork lengths greater than 50 centimeters (approximately 20 inches, equivalent to a total length of approximately 22 inches) contained PCBs at levels over 2 ppm.

Bluefish samples from the present study were divided into two categories according to the mean total length of the individuals in the composite: large (mean total length Z60 cm I or approximately 24 inches.) and small (mean total length <60 cm). Table 8 and Figure 14 show mean PCB levels in these bluefish, grouped over all sites and over both years. The large bluefish have a significantly (t=3.95, df=621 p<0.005) higher burden of this contaminant (mean-1.23 ppm, N-22) than the smaller bluefish (mean=0.67 ppm, N=42). Similarly, large bluefish caught within the Northeast and North Coast regions in 1982 contained higher mean PCB levels (3.03 ppm, N-14) than "medium-sized" (40-60 cm; mean-0.54 ppm, N=13) and small (<40 cm; mean-0.70 ppm, N-8) bluefish collected in the same regions (2). The present study also found significant differences between large and small bluefish in the mean levels of DDTs (mean-137.86 ppb vs. 80.56 ppb, t=3.63, dfm62, p<0.005) and chlordane (mean=51.18 ppb vs. 25.09 ppb, t-4.52, df=62, p<0.005) (Table 8; Figure 14).

C. Blue Crabs -- Variation in contaminant Levels by Tissue

As noted above, analyses were performed on three separate types of tissues from blue crabs: muscle, hepatopancreas, and a hepatopancreas/muscle mixture. The hepatopancreas (Figure 15) (12) is the main site of lipid storage, enzyme secretion and nutrient absorption. As a lipid-rich-tissue, it is also a likely site of concentration of lipophilic contaminants such as those considered in the present study. Previous DEP research in the Newark Bay complex (3) found that 2,3,7,8-TCDD, also a highly lipophilic compound, accumulated to detectable levels in the hepatopancreas but not in the muscle tissue, even when the concentration in the hepatopancreas exceeded 1000 parts per trillion.

This pattern is repeated 'for PCBs, chlordane, and DDTs, although detectable levels of all three classes of compounds are found in the muscle tissue (Table 9; Figure 16). Mean levels in the hepatopancreas (N=5) are approximately one order of magnitude greater than those in the muscle tissue (N=5) (mean-5.38 ppm vs. 0.33 ppm for PCBs, 106.44 ppb vs. 9.04 ppb for chlordane, and

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[3] Although ovary attempt was made to keep large and small bluefish separated when composites were assembled, limited availability of fish of a given size sometimes necessitated the inclusion of "small" bluefish in composites designated "large" according to the mean total length of the individual fish in them, or the inclusion of "large" fish in "small" composites. However, there was only a slight overlap between the two populations. Only 14% (15 of 107) of the individual fish in the "large" composites were actually <60 cm. long, and only 12% (24 of 207) of the individual fish in the "small" composites were ≥60 cm long. Overall mean lengths were 51.5 cm for the "small" composites and 70.2 cm for the "large" composites.

492.52 ppb vs. 54.70 ppb for DDTS). All three differences are statistically significant (Mann-Whitney test for $n_1=n_2=5$: U=O, p=0.0040 for PCBs and chlordane; U=3, P=0.0278 for DDTs).

The mean concentration of PCBs in the hepatopancreas samples far exceeded the FDA action level of 2.0 ppm, while the mean level in the muscle samples was well below the action level. As expected, the combined muscle/hepatopancreas samples had contaminant concentrations between those found in either individual tissue type. Because unequal masses of the two tissue types were combined (see Section II.B above), the contaminant levels in the combined tissue samples are not exactly halfway between the concentrations found in each individual tissue type.

IV. CONCLUSIONS

0 The results are consistent with previous DEP findings that showed the Northeast region of the state to be the -most severely contaminated. Regional means for four species from the region -- carp, white perch, striped bass, and blue crab (hepatopancreas) -- were elevated (i.e, exceeded FDA action levels). Elevated levels were also found in individual samples of bluefish, American eel, brown bullhead, and blue crab (hepatopancreas/muscle mixture) from this region. Of the three contaminants considered, the major contaminant in the Northeast was PCBs.

0 Elevated levels were also found in the Camden region. There, the contamination problem involves both chlordane and PCBs. Regional means for American eels were elevated, as were levels in individual samples of carp and brown bullhead.

0 Levels of PCBs in striped bass from the North Coast region were also elevated.

0 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 three exceptions. In two instances (a striped bass sample 'from the Seaside Park Brigantine area, and a brown bullhead sample from the South River at Old Bridge), other results for the same species from the same region or the same site brought the overall mean below the FDA action level. Exceedances also occurred in carp from the Passaic River at Elmwood Park, just upstream of an area covered by an existing ban.

0 Large bluefish (total length $\geq$60 cm) contained, on average, approximately twice the level of a given contaminant found in small bluefish.

0 **In blue crabs, the contaminants considered were found at much higher levels (approximately ten times higher on average) in hepatopancreas samples than in samples of muscle tissue.**

0 **The results confirm the importance and value of existing measures (consumption advisories and bans, fishing prohibitions, and sales bans) designed to protect the public from excessive exposure to contaminants found in fish and shellfish.**

V. RECOMMENDATIONS

0 **Regular monitoring of contaminant levels in New Jersey's fish and shellfish should continue. Sound decisions concerning the issue of seafood contamination depend on adequate and reliable data.**

0 **The State's framework of protective measures (consumption advisories and bans, fishing prohibitions, and, sales bans) for seafood consumers should be continually re-evaluated in light of new information as it becomes available, either through the State's own monitoring programs or from other sources.**

0 **Besides following the consumption advisories that apply to particular species from specific areas, consumers can reduce their potential intake of contaminants by taking other simple steps:**

- 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, in this study and elsewhere," to be the case for bluefish. Selecting smaller fish can thus reduce exposure.

- For finfish, especially fatty species such as bluefish, removing the fatty tissues before cooking can also reduce exposure. These include the belly flaps, dark moat along the lateral line, and the skin.

- Using cooking techniques that allow fats to drip away from the fish (such, as grilling, broiling, or baking an a rack) and avoiding coatings that hold in fats and oils is another way to reduce exposure.

- 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.

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TABLE 1
Sampling Sites and Species Collected
1986-1987

Site Number	Location	Species Collected'
1	Hudson River at Alpine	1,10
2	Upper New York Bay at Robbins Reef	1,2,7,10
3	Hackensack River at Rivervale	1,5,6,10
4	Hackensack River at Laurel Hill	1,2
5	Passaic River at confluence with Newark Bay	1,2,7
6	Passaic River at Monroe Street Bridge	5
7	Passaic River at Elmwood Park	5
8	Newark Bay at Central Railroad of New Jersey bridge	1,2,3,7
9	Arthur Kill at Rahway River	--
10	Raritan River at Route 35 bridge	2,3
11	Raritan River at Kin Buc landfill	2,7,10
12	North Branch Raritan River at North Branch	1
13	South Branch Raritan River at Neshanic	1
14	South River at 01d Bridge	4
15	Raritan Bay at Union Beach	3,7,8
16	Raritan Bay at Earle Ammunition Pier	3,7,8
17	Upper Strawbridge Lake at Moorestown	1,4,5
18	Lower Strawbridge Lake at Moorestown	1,4,5,6
19	Pennsauken Creek at Forked Landing Road	4,5
20	Cooper River at Evans Pond	1,5,6
21	CooperRiver at Cooper River Lake	1,4,5
22	Newton Lake at Newton Creek	4,5,6
23	Stewart Lake at Woodbury Creek	5,6
24	Raccoon Creek at Swedesboro	1,4,5
25	Raccoon Creek at Delaware River	1,4
26	Maurice River at Mauricetown	2,9
27	Cohansey River at Greenwich	--
28	Delaware River at Deepwater	1
29	Delaware River at Burlington Island	1,5
30	Delaware River at Trenton (above tidal influence).	1,5
31	Delaware River at Easton	1
32	SharkRiver at Route 35 bridge	3
33	Toms River at Ocean Gate	3
34	Barnegat Bay at Little Egg Harbor	3,8
35	Absecon Bay at Absecon	1,3
36	GreatEgg Harbor at Route 9 bridge	3
37	Sandy Hook Asbury Park	3,7,8
38	Asbury Park Seaside Park	3,7
39	Seaside Park Brigantine	3,7,8
40	Brigantine - Cape May	3,7
41	Cape May--Fortescue	3,8
42	Fortescue-Salem	8

TABLE 1
(Continued)

[1] **Numbers correspond to species as follows:**

1 = American eel

2 - Blue crab

3 = Bluefish

4 = Brown bullhead

5 = Carp

6 = Largemouth bass

7 = Striped bass

8 = weakfish

9 = White catfish

10 = White perch

TABLE 2

Samples Consisting of Fewer Than Five Fish or Crabs

Site	Region	Species	Year	Number in Sample
1	Northeast	American eel	1986	1
2	Northeast	Striped bass	1986	3
3	Northeast	Carp	1986	1
3	Northeast	Largemouth bass	1986	1
5	Northeast	American eel	1986	1
5	Northeast	Striped bass	1987	2
8	Northeast	Striped bass	1987	1
11	Northeast	Striped bass	1986	2
18	Camden	Brown bullhead	1986	3
18	Camden	Largemouth bass	1986	4
19	Camden	Brown bullhead	1987	1
20	Camden	American eel	1986	1
23	Camden	Largemouth bass	1986	3
24	Delaware	American eel	1986	1
24	Delaware	Brown bullhead	1986	1
25	Delaware	American eel	1986	2
25	Delaware	Brown bullhead	1987	2
26	Delaware	Blue crab (H/N)	1986	4
34	South Coast	Weakfish	1987	1
35	South Coast	American eel	1986	4
37	North Coast	Striped bass	1986	1
37	North Coast	Bluefish	1986	2
38	North Coast	Striped bass	1986	2
39	South Coast	Bluefish	1986	4
40	South Coast	Bluefish	1986	3
41	South Coast	Weakfish	1986	2

TABLE 3

Regions and Corresponding Sampling Sites

Region	Sites[1]
Northeast	1-16
North Coast	32, 33, 37,38
Camden	17-23
Delaware	24-31
South Coast	34-36, 39-42

See Table 1 for list of site numbers and locations.

TABLE 4
Results in Excess of FDA Action Levels [1]

Species	Site	Region[2]	Year	PCBs[3] (ppm)	Chlordane (ppb)
American eel	4	NE	1986	4.81	--
American eel	8	NE	1986	2.41	--
American eel	8	NE	1987	3.49	--
American eel	17	C	1986	3.29	2158.84
American eel	18	C	1987	3.23	667.77
American eel	20	C	1986	3.35	686.24
American eel	20	C	1987	--	399.80
American eel	21	C	1987	3.04	--
American eel	29	D	1986	2.45	--
Blue crab (H/N)	2	NE	1986	3.86	--
Blue crab (H/M)	2	NE	1987	2.39	--
Blue crab (H/M)	4	NE	1986	2.24	--
Blue crab (H/N)	5	NE	1987	3.34	--
Blue crab (H/M)	8	NE	1986	2.13	--
Blue crab (H/M)	11	NE	1987	2.07	--
Blue crab (H)	2	NE	1987	2.76	--
Blue crab (H)	5	NE	1987	6.29	--
Blue crab (H)	8	NE	1987	8.27	--
Blue crab (H)	10	NE	1987	4.18	--
Blue crab (H)	11	NE	1987	5.40	--
Bluefish	8	NE	1987	3.80	--
Bluefish	39	SC	1987	2.03	--
Brown bullhead	14	NE	1987	2.04	--
Brown bullhead	17	C	1987	--	301.67
Carp	6	NE	19",	5.83	584.16
Carp	7	NE	1986	2.66	--
Carp	7	NE	1987	3.11	--
Carp	17	C	1986	2.30	426.91
Carp	17	C	1987	--	595.94
Carp	21	C	1987	2.36	359.96
Carp	22	C	1987'	2.84	359.11
striped bass	2	NE	1986	2.00	--
striped bass	5	NE	1987	4.06	--
Striped bass	-8	NE	1986	6.65	--
Striped bass	8	NE	1987	3.35	--
Striped bass	11	NE	1987	2.47	--
Striped bass	16	NE	1986	2.79	--
Striped bass	37	NC	1986	2.65	--
Striped bass	37	NC	1986	2.98	--
Striped bass	37	NC	1987	2.54	--
Striped bass	37	NC	1987	3.91	--
Striped bass	37	NC	1987	2.05	--
Striped bass	38	NC	1987	3.72	--
Striped bass	38	NC	1987	2.31	--
Striped bass	39	SC	1987	2.82	--
White perch	11	NE	1987	7.12	--

TABLE 4
(Continued)

[1] **Results for discrete composite samples, not station means. Other composite samples may have been analyzed for the same Species/site/year combination. See Appendix B. Action levels are 2.0 ppm for PCBs, 300 ppb for chlordane, and 5000 ppb for DDTs.**

[2] **NE= Northeast, NC= North Coast, SC= South Coast, D= Delaware, C =Camden; see Table 3.**

[3] **All concentrations are on a wet weight basis.**

TABLE 5

PCBs by Region

(ppm, wet weight)[1]

Species	Camden	Delaware	North Coast	Northeast	South Coast
American eel	2.32	0.99	--	1.71 (10)	1.11 (1)
Blue crab					
All samples	--	0.20 (1)	--	2.20 (28)	--
Hepatopancreas	--	--	--	5.38 (5)	--
Muscle	--	--	--	0.33 (5)	--
Hepatopancreas/ Muscle Mixture	--	0.20 (1)	--	1.84 (18)	--
Bluefish	--	--	0.93 (24)	0.82 (11)	0.83 (29)
Brown bullhead	0.60 (8)	0.22 (2)	--	1.18 (2)	-
Carp	1.47 (13)	0.96 (3)	--	3.20 (4)	--
Largemouth bass	0.56 (5)	--	--	0.20 (1)	--
Striped bass	--	--	2.33 (10)	2.14 (16)	1.35 (5)
Weakfish	--	--	0.25 (3)	0.55 (7)	0.46 (19)
White catfish	--	0.20 (1)	--	--	--
White perch	--	--	--	2.06 (6)	--

[1] Mean values; number in parentheses = number of data points
FDA Action Level - 2.0 ppm

TABLE 6

Chlordane by Region

(ppb, wet weight)'

Species	Camden	Delaware	North Coast	Northeast	South Coast
American eel	629.98 (7)	61.95 (9)	--	72.57 (10)	39.28 (1)
Blue crab					
All Samples	--	5.00 (1)	--	40.48 (28)	--
Hepatopancreas	--	--	--	106.44 (5)	--
Muscle	--	--	--	9.04 (5)	--
Hepatopancreas/ Muscle Mixture	--	5.00 (1)	--	30.89 (18)	--
Bluefish	--	--	36.92 (24)	30.46 (11)	33.05 (29)
Brown bullhead	124.31 (8)	5.83 (2)	--	72.89 (2)	--
Carp	260.50 (13)	51.43 (3)	--	334.08 (4)	--
Largemouth bass	21.16 (5)	--	--	12.93 (1)	--
Striped bass	--	--	60.79 (10)	50.39 (16)	63.89 (5)
Weakfish	--	--	6.94 (3)	18.78 (7)	14.30 (19)
White catfish	--	5.00 (1)	--	--	--
White perch	--	--	--	63.99 (6)	--

[1] Mean values; number in parentheses number of data points
FDA Action Level = 300 ppb

TABLE 7

DDTs by Region

(ppb, wet weight)1

Species	Camden	Delaware	North Coast	Northeast	South Coast
American eel	1299.69	411.97	--	260.66 (10)	114.62 (1)
Blue crab All Samples	--	28.13 (1)	--	217.28 (28)	--
Hepatopancreas	--	--	--	492.52 (5)	--
Muscle	--	--	--	54.70 (5)	--
Hepatopancreas/ Muscle Mixture	--	28.13 (1)	--	185.99 (18)	--
Bluefish	--	--	104.35 (24)	101.86 (11)	96.25 (29)
Brown bullhead	177.09 (8)	44.12 (2)	--	192.79 (2)	--
Carp	540.29 (13)	240.18 (3)	--	424.71 (4)	--
Largemouth bass	74.48 (5)	--	--	29.69 (1)	--
Striped bass	--	--	193.94 (10)	189.39 (16)	192.80 (5)
Weakfish	--	--	34.88 (3)	64.16 (7)	61.08 (19)
White catfish.		29.38 (1)			
White perch				192.70 (6)	

Mean values; number in parentheses number of data points
FDA Action Level - 5000 ppb

TABLE 8

Contaminant Levels by Size -- Bluefish

All Sites -- 1986-1987

	Small (<60 cm)	Large (>60 cm)
Mean Length	51.5	70.2
PCBs (ppm, wet weight)	0.67 ± 0.59	1.23 ± 0.51
Chlordane (ppb, wet weight)	25.09 + 21.97	51.18 + 21.88
DDTs (ppb, wet weight)	80.56 ± 68.11	137.86
N (composites)	42-	22
N (individuals)	207	107

55

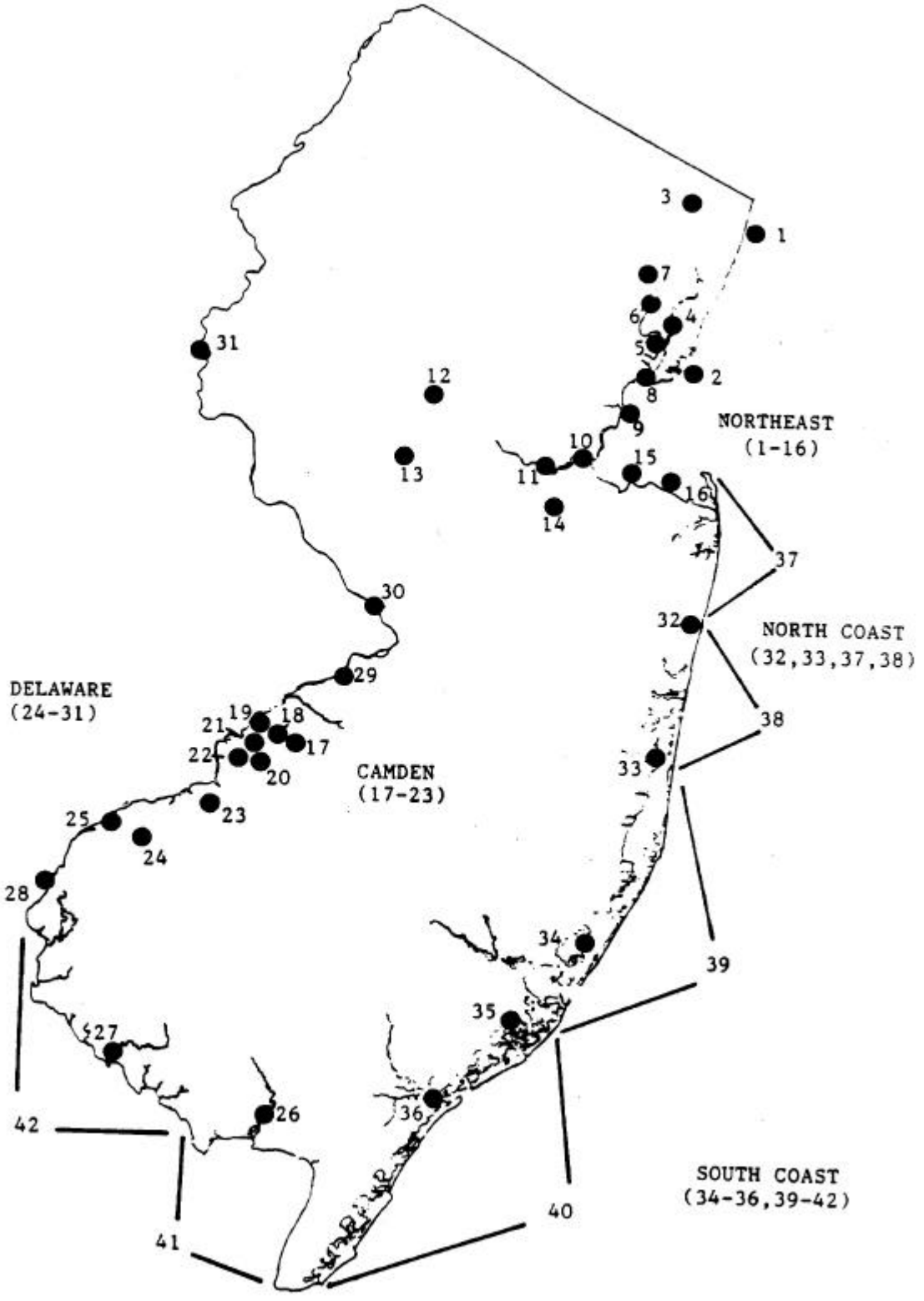
TABLE 9

Contaminant Levels by Tissue Type -- Blue Crabs

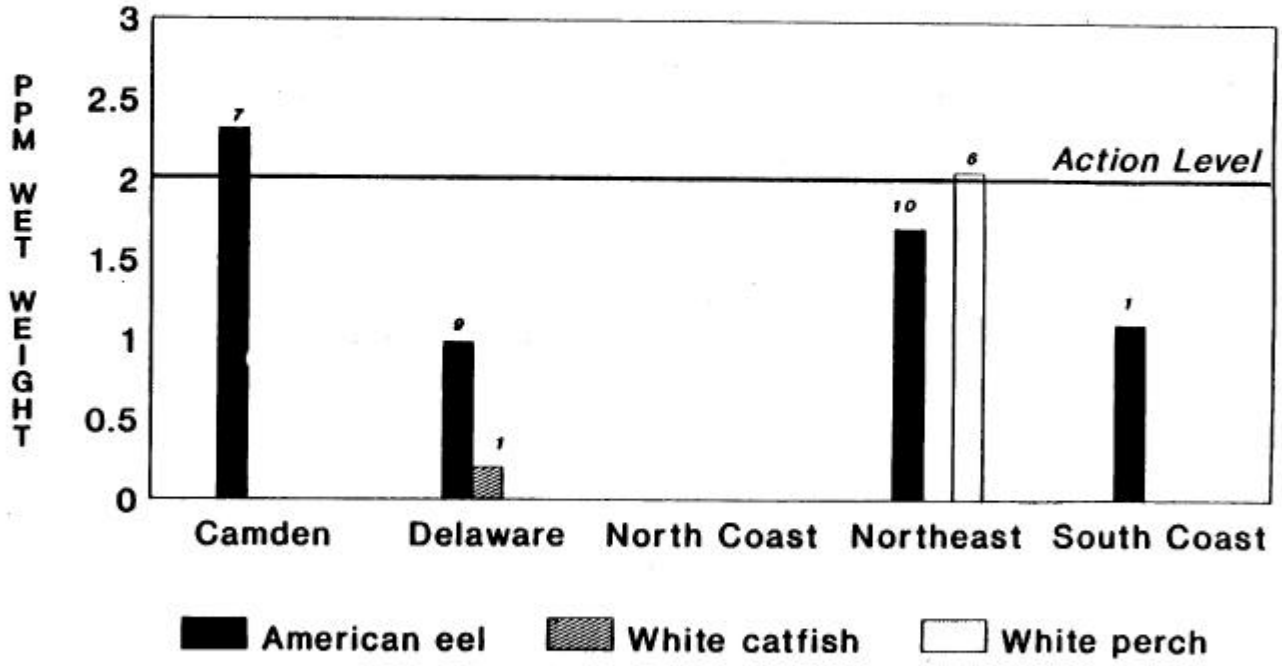
All Sites--1986-1987

Mixture	Muscle	Hepatopancreas	Hepatopancreas Muscle
PCBs (ppm, wet weight)	0.33 ± 0.07	5.38 ± 2.09	1.75 + 0.85
Chlordane, (ppb, wet weight)	9.04 ± 2.85	106.44 ± 71.65	29.53 + 17.4
DDTs (ppb, wet weight)	54.70 ± 12.96	492.52 ± 359.12	177.68 + 88.
N	5	5	19

FIGURE 1
SITES AND REGIONS



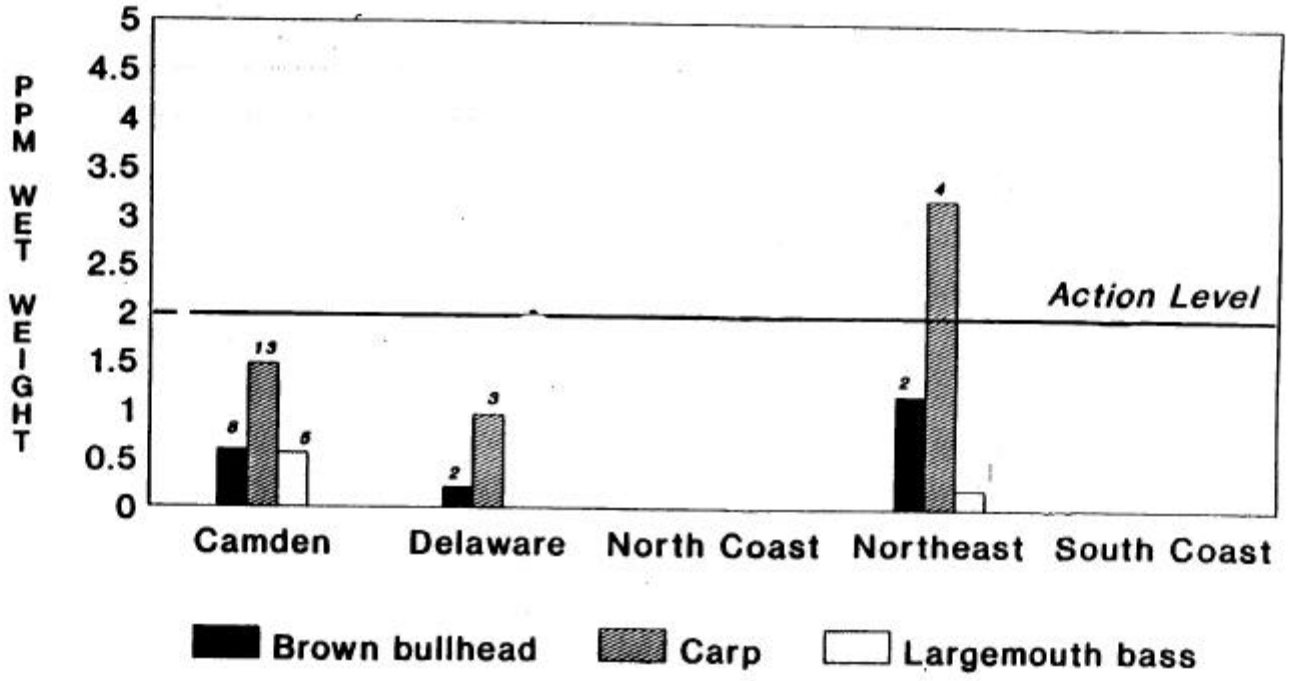
PCBs BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 2

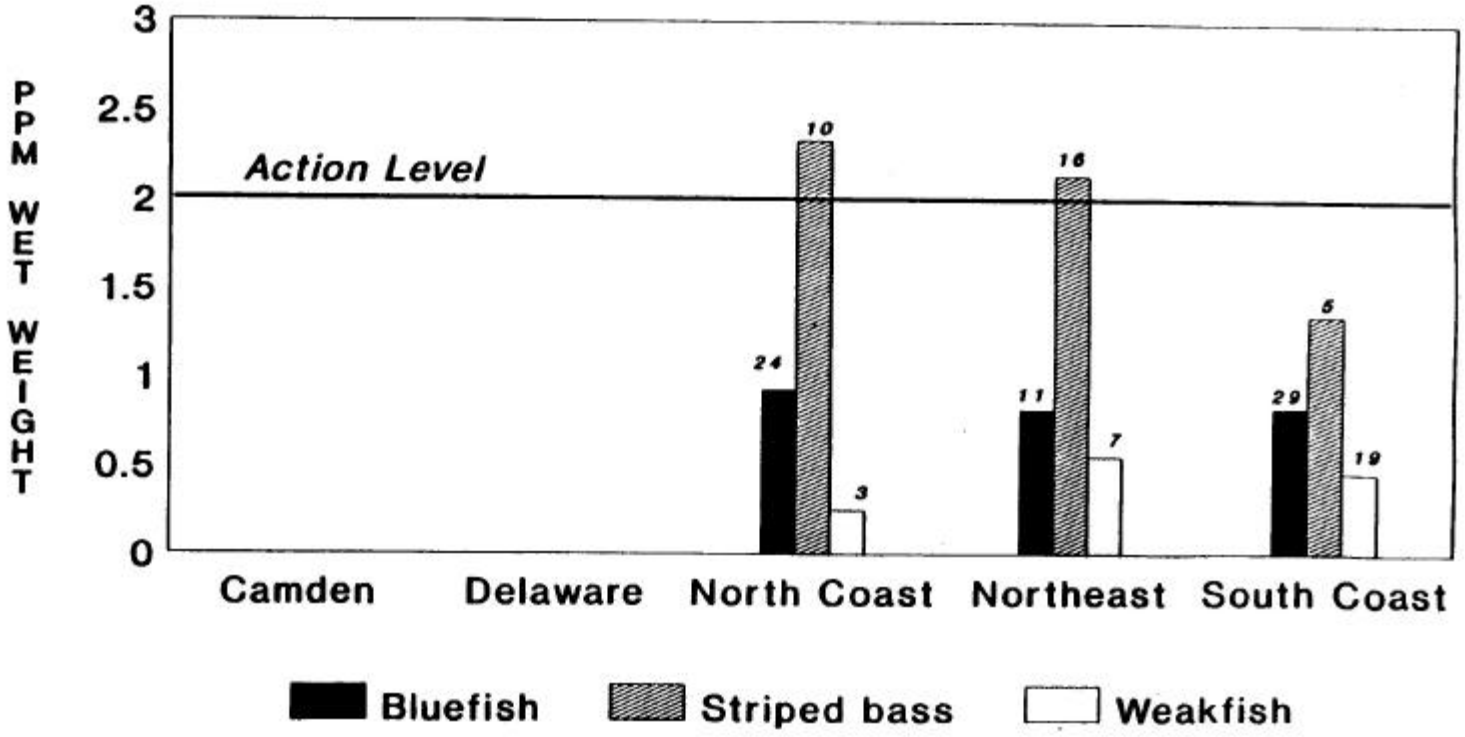
PCBs BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 3

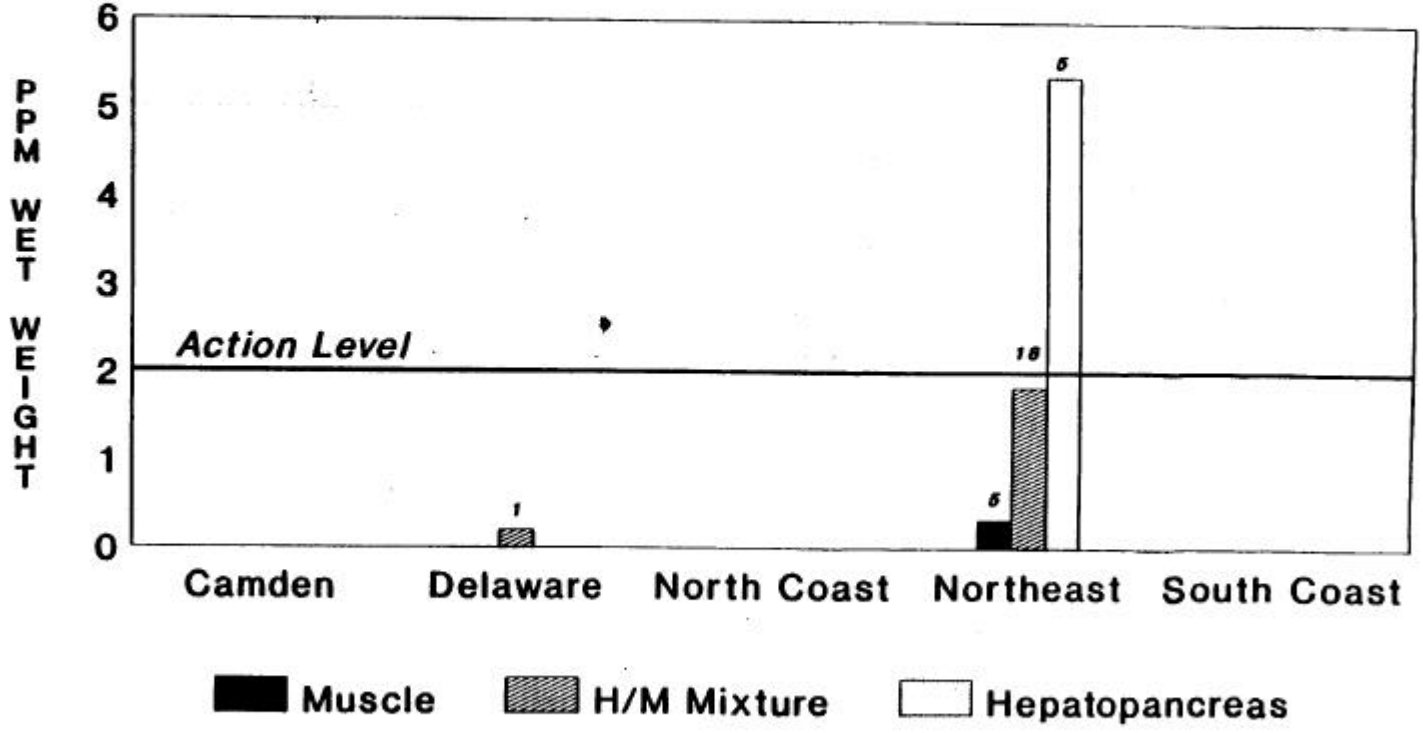
PCBs BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 4

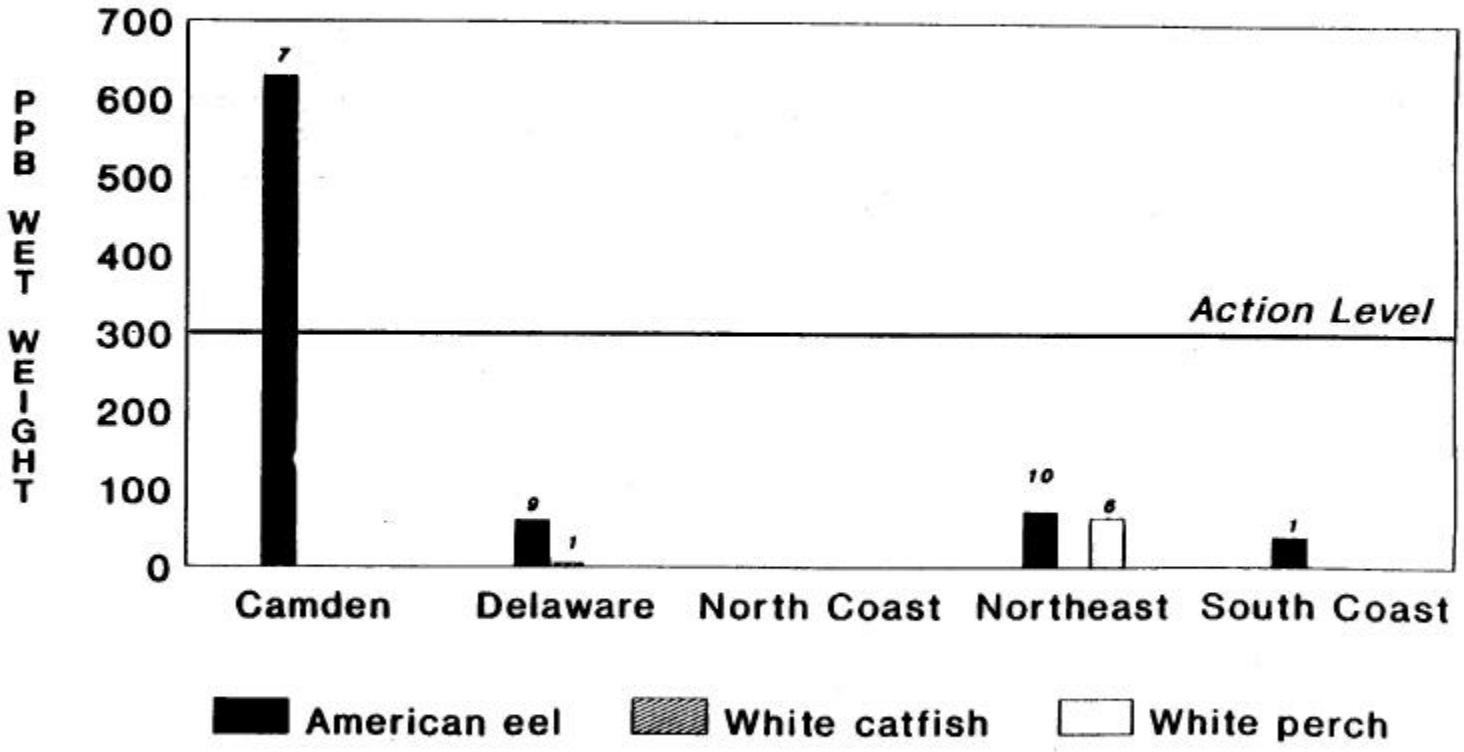
PCBs BY REGION
Blue Crabs -- 1986-1987



Mean Values; # on Bar = # of Data Points

Figure 5

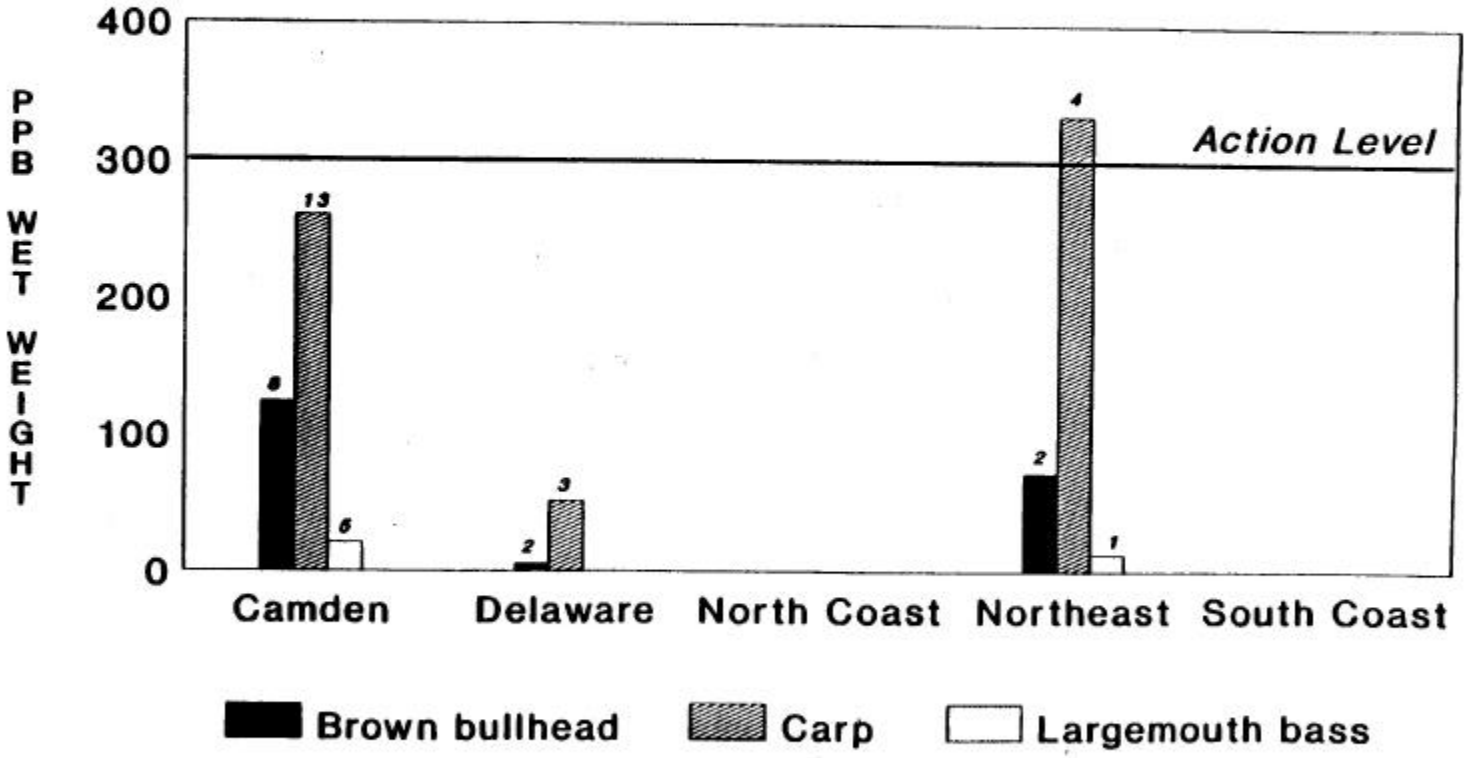
CHLORDANE BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 6

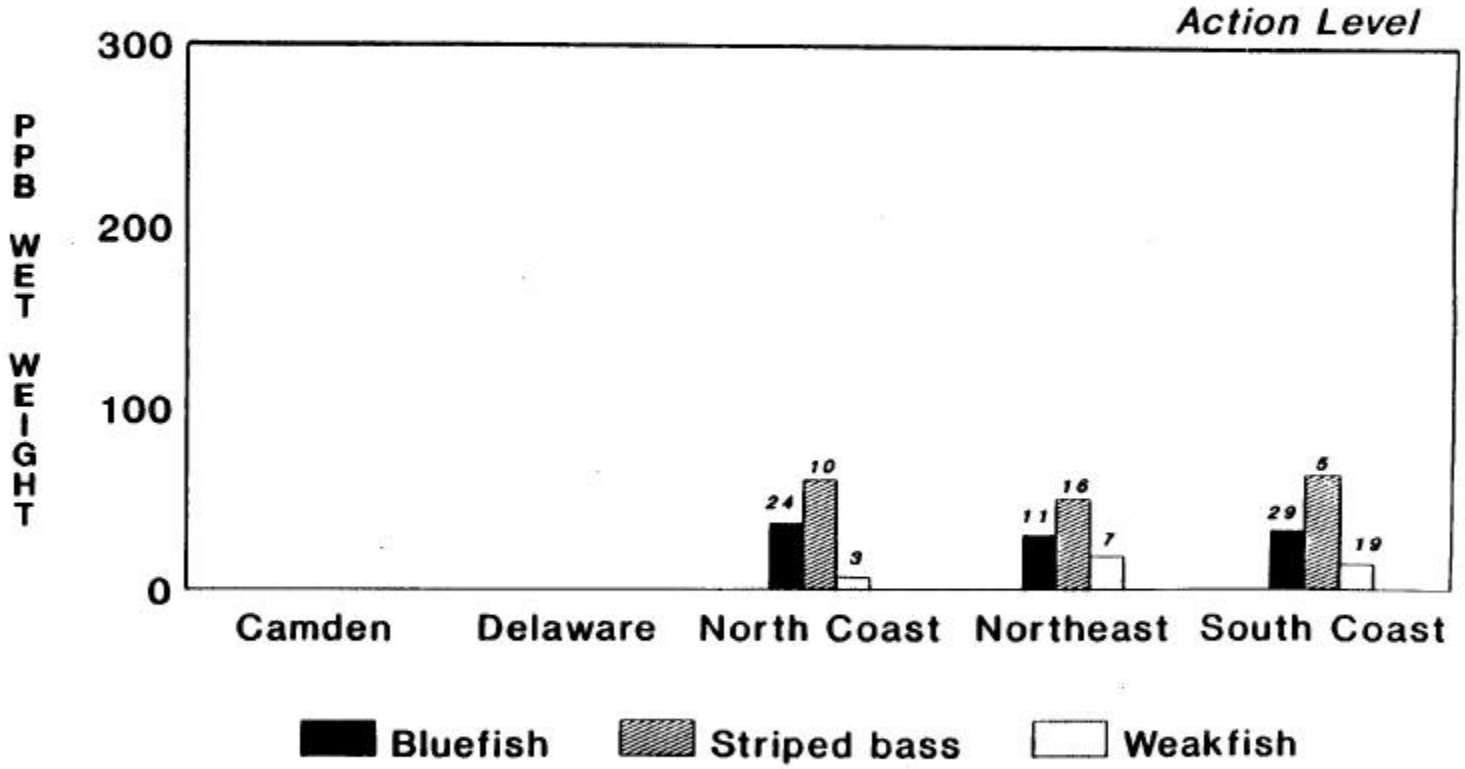
CHLORDANE BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 7

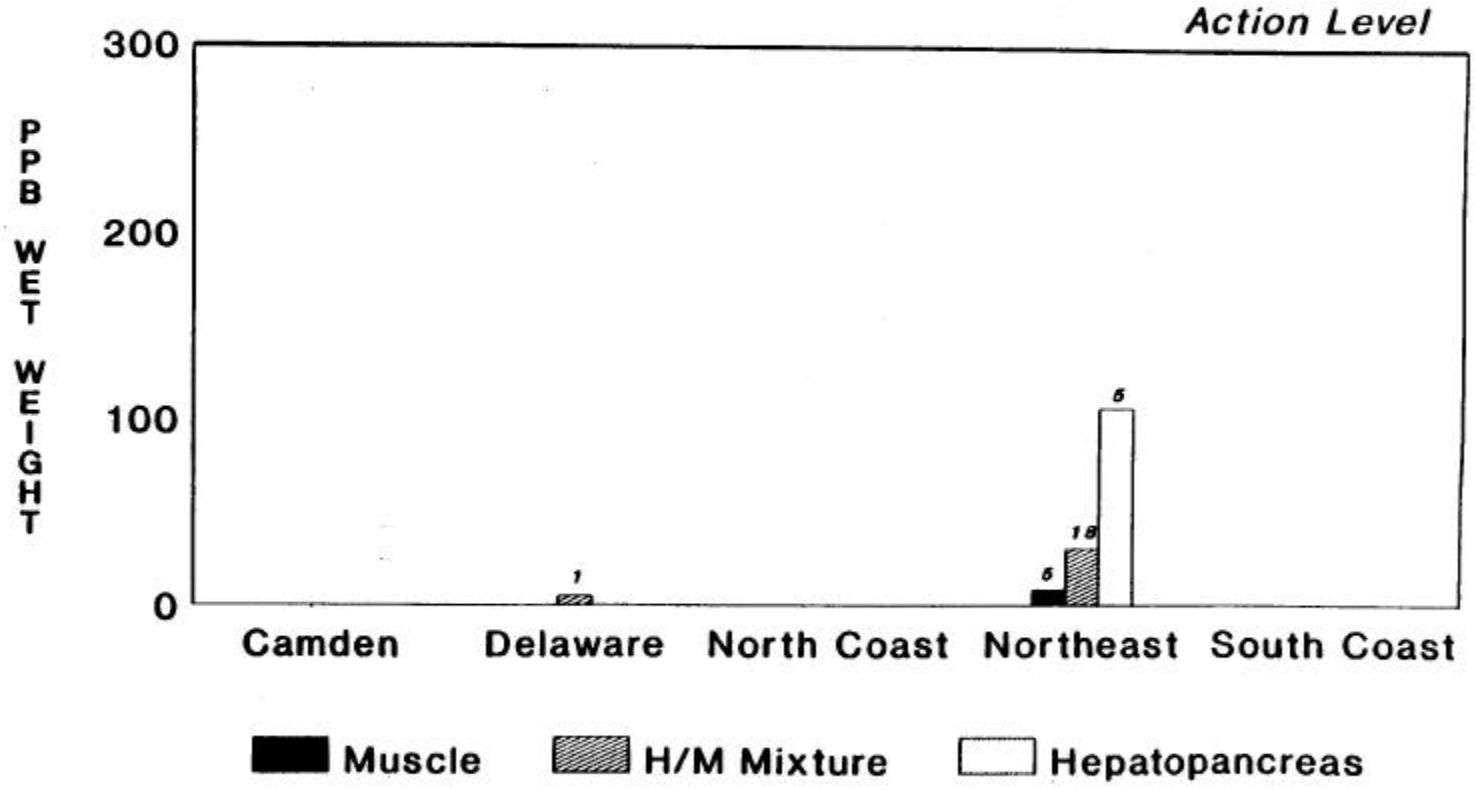
CHLORDANE BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 8

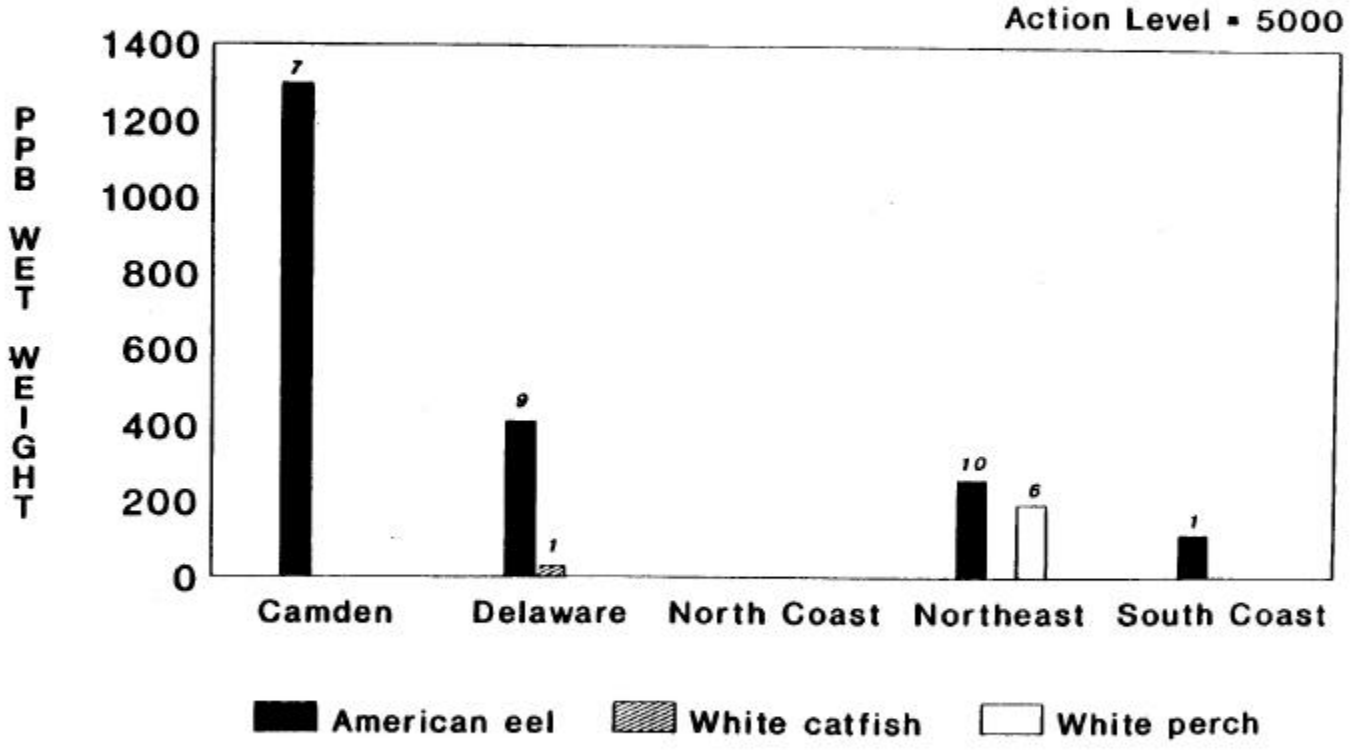
CHLORDANE BY REGION
Blue Crabs -- 1986-1987



Mean Values; # on Bar = # of Data Points

Figure 9

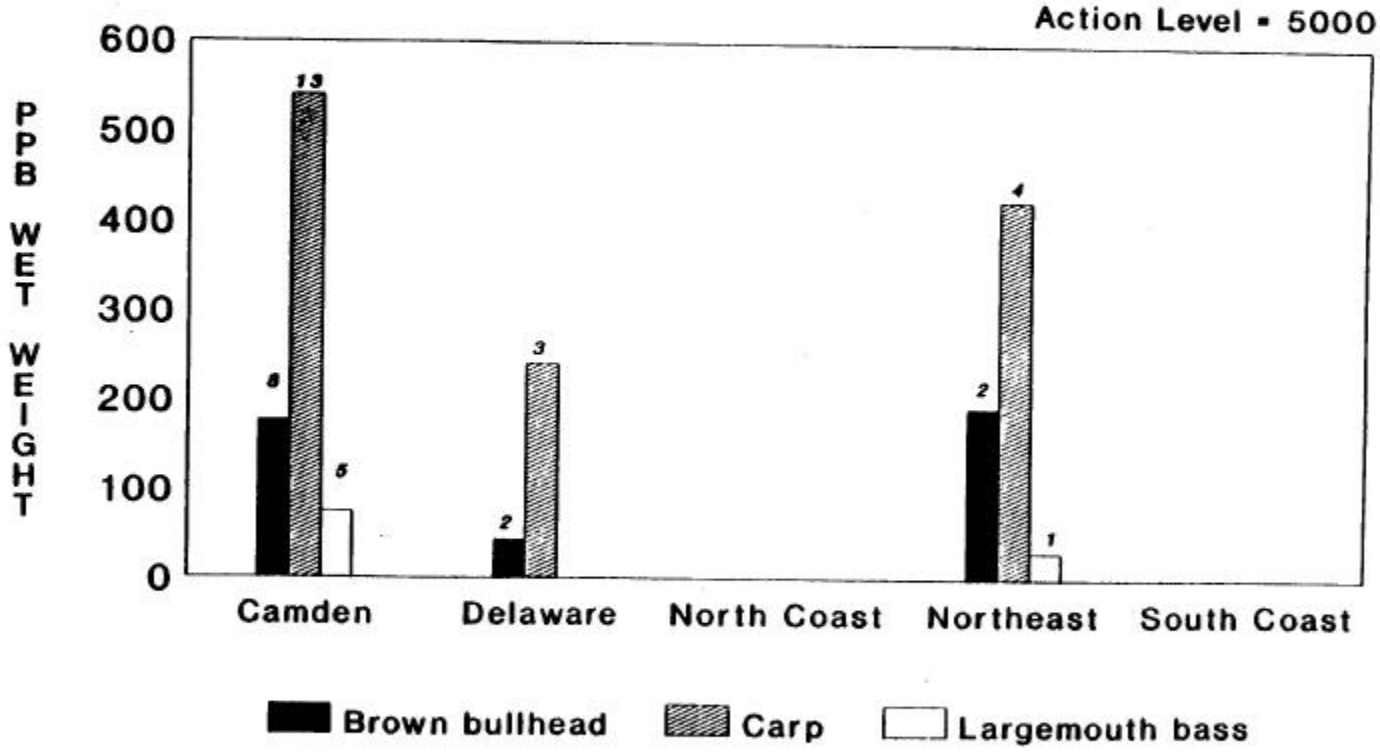
DDTs BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 10

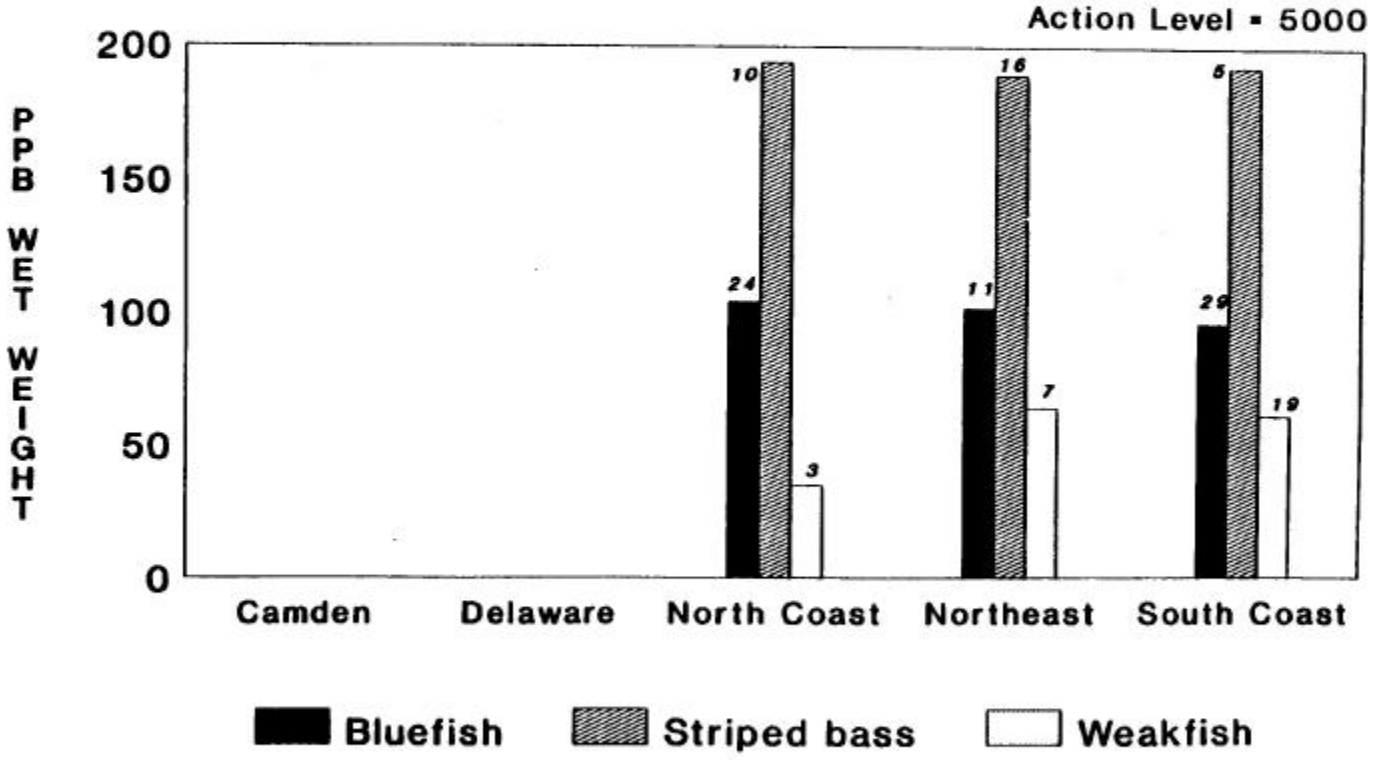
DDTs BY REGION
1986-1987



Mean Values; # on Bar = # of Data Points

Figure 11

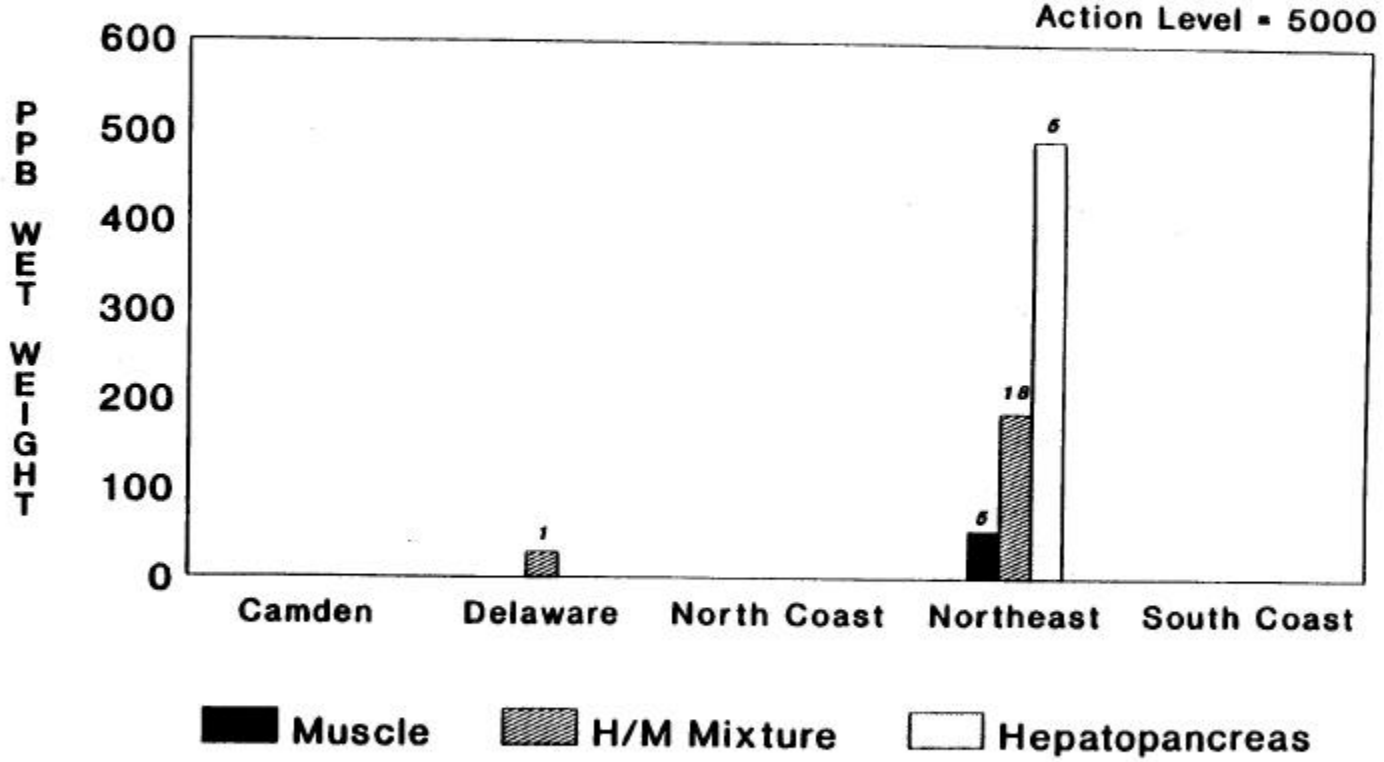
DDTs BY REGION
1986-87



Mean Values; # on Bar = # of Data Points

Figure 12

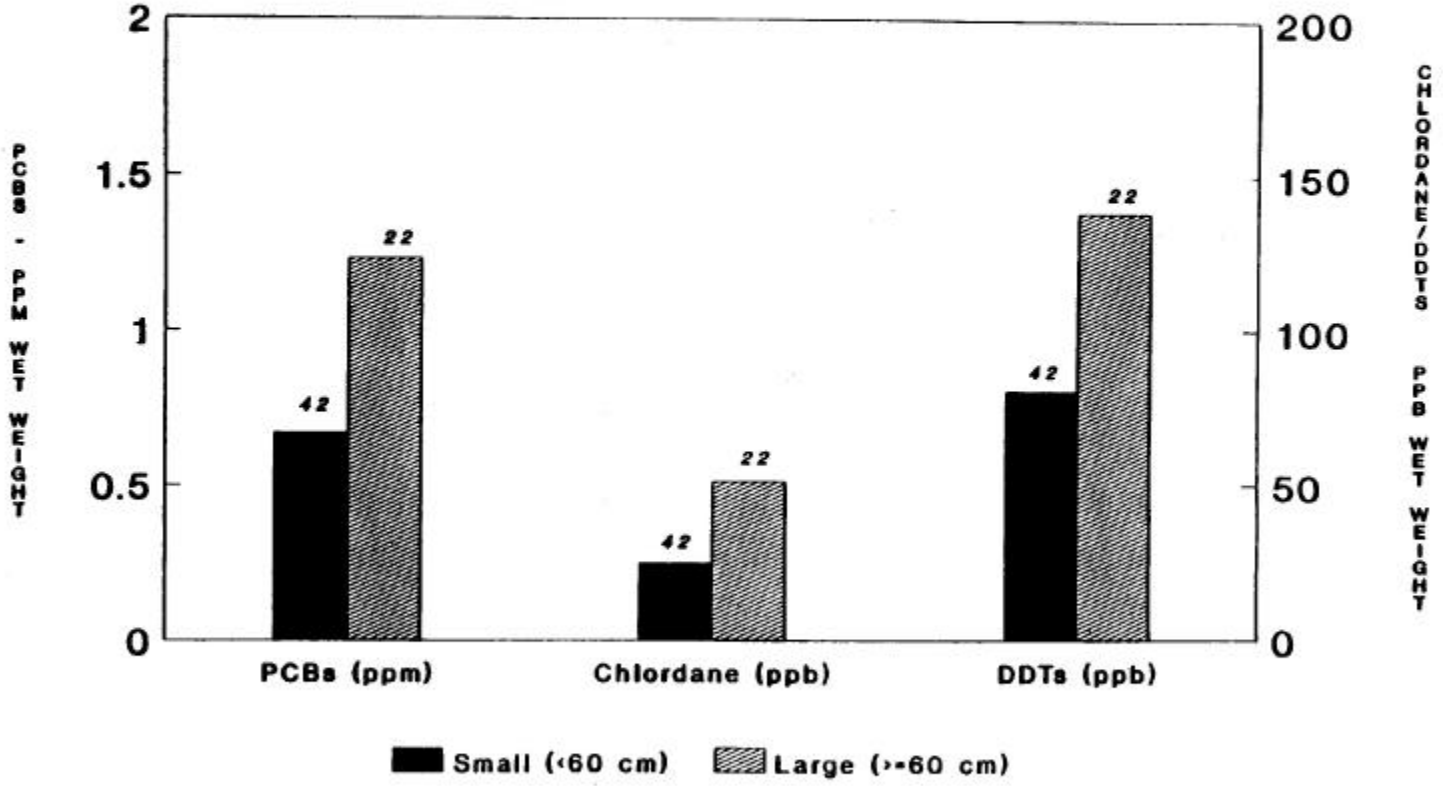
DDTs BY REGION
Blue Crabs -- 1986-1987



Mean Values; # on Bar = # of Data Point

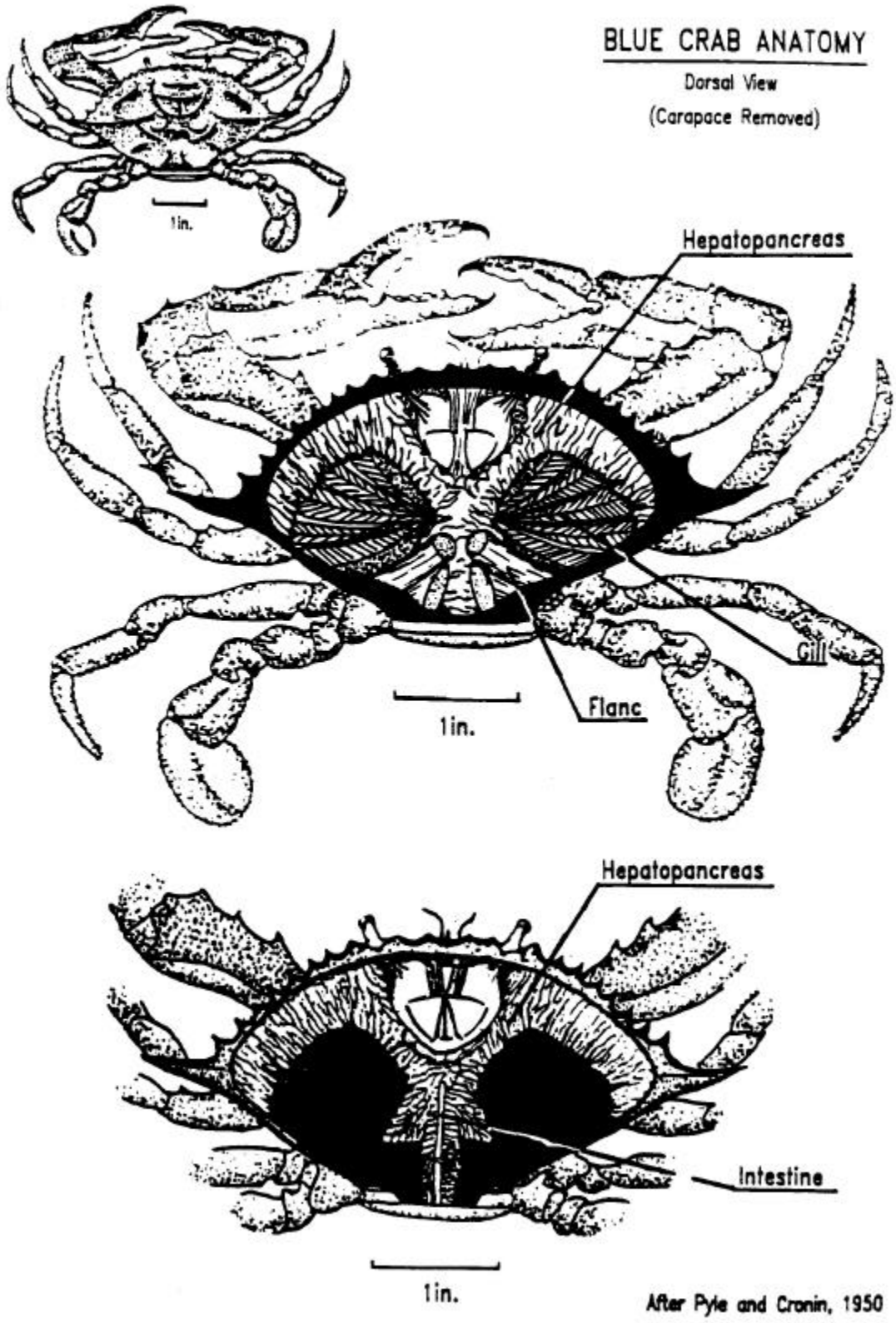
Figure 13

Contaminants in Bluefish by Size
All Stations -- 1986-1987



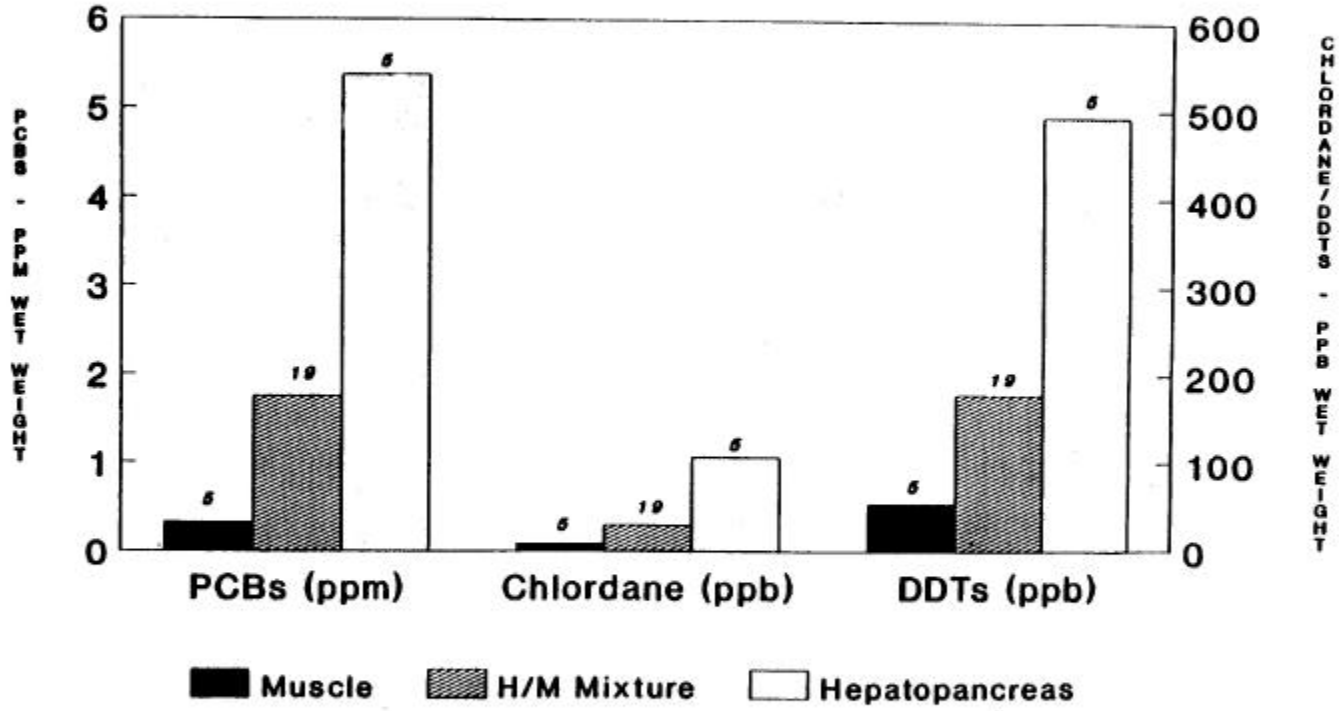
Mean Values; # on Bar = # of Data Points
Note Different Scales on Y-Axis
Figure 14

Figure 15



After Pyle and Cronin, 1950

Contaminants in Blue Crab Tissues
All Stations -- 1986-1987



Mean Values; # on Bar = # of Data Points
Note Different Scale on Y-Axis
Figure 16

APPENDIX A

New Jersey Fisheries Prohibitions and Consumption Advisories

A. Summary

Based on the results of monitoring and research undertaken since the mid-19708, the State of New Jersey has taken a number of steps, in the form of consumption advisories, closures, and sales bans, to limit the exposure of the fish-eating public to toxic contaminants. The advisories, closures, and prohibitions currently in place are summarized below.

1. Statewide Prohibitions

All sales of striped bass.

2. Statewide Advisories

Limited consumption of American eels.

Limited consumption of large bluefish.

3. Regional Prohibitions

a. Tidal Passaic River

Sale or consumption of all fish, shellfish, and crustaceans.

b. Newark Bay Complex

Sale or consumption of striped bass and blue crabs.

Sale of American eels.

c. Hudson River

Sale of American eels.

d. Camden Area

Sale or consumption of all fish, shellfish, and

crustaceans.

e. Delaware River (I-276 Bridge to Birch Creek)

Sale of channel catfish.

4. Regional Advisories

a. Hudson River

Very limited consumption of striped bass.

b. Northeast Region

Limited consumption of white perch and white catfish.

c. Northeast Region and Offshore Waters in Northern Coastal

Limited consumption of striped bass.

d. Delaware River (I-276 Bridge to Birch Creek)

No consumption of channel catfish.

B. Definitions

The following definitions apply to both the summary above and the background information that follows.

1. Regions

a. Tidal Passaic River means the Passaic River upstream to the Dundee Dam.

b. Newark Bay Complex means Newark Bay, the Passaic River upstream to the Dundee Dam, the Hackensack River upstream to the Oradell-Dam, Arthur Kill, Kill Van Kull, and all tributaries.

c. Hudson River means the New Jersey portion of the river up to the New York-New Jersey border (approximately four miles above Alpine, N.J.), and Upper New York Bay.

d. Camden Area means Strawbridge Lake, Pennsauken Creek (North and South Branches), Cooper River and its, drainage, Cooper River lake, Stewart Lake, and Newton Lake.

e. Northeast Region means the region encompassing the New Jersey portion of Sandy Hook and Raritan Bays; the tidal portion of the Raritan River upstream to the Route 1 Bridge in New Brunswick; Arthur Kill and Kill Van Kull; Newark Bay; the Passaic River upstream to the Dundee Dam; the Hackensack River upstream to the Oradell Dam; the New Jersey portion of the Hudson River upstream to the New York-New Jersey border; and Upper New York Bay.

2. Advisories

a. Limited -Consumption means that any person should not consume more than one meal per week of such fish, and that persons of high risk such as pregnant women, nursing mothers, women of child-bearing age, and young children should not eat any of such fish from the designated waters.

b. Very Limited Consumption means the same as limited consumption, except that any person should not eat more than one meal per month of such fish.

C. Background and References for Prohibitions and Advisories

1. N.J.A.C. 7:25-16A

These measures were based on findings of PCB contamination in several species. They were adopted as an emergency rule in late 1982, and readopted as a permanent rule with minor changes to 7:2518a.6 on early 1983.

a. Definitions (7:25-18A.3)

The regulations defines, among other terms, "limited consumption" and "Northeast Region".

b. Closures (7:25-18A.4)

i. Prohibition on sale of striped bass and of American eels from Hudson River, Upper New York Bay, Newark Bay, Lower Passaic River, Lower Hackensack River, Arthur Kill, and Kill Van Kull.

ii. No person may expose for sale, offer for sale, or sell striped bass anywhere in the state.

c. Advisories (7:25-18A.5)

Limited consumption of:

i. Striped bass from Northeast Region, including offshore waters in northern coastal area

ii. American eels from entire state, especially Northeast Region

iii. Bluefish from Northeast Region, including offshore waters in northern coastal area

iv. White perch from Northeast Region

v. White catfish from Northeast Region

This subsection also describes suggested preparation and cooking methods.

The bluefish advisory was amended by public notice on April 13, 1989 to (1) cover the entire coast, and (2) apply only to large bluefish (over 24 inches or 6 pounds).

2. Administrative Orders EO-40-1, EO-40-17, and EO-40-19

The discovery of widespread dioxin contamination in the Newark Bay Complex led to the issuance of three separate administrative orders by DEP Commissioner Robert E. Hughey in 1983 and 1984.

a. Administrative Order EO-40-1 (June 2, 1983) established a presumptive advisory against A= consumption of any fish or shellfish taken from Newark Bay, the Passaic River upstream to the Dundee Dam, the Hackensack River upstream to the Oradell Dam, the Arthur Kill, and the Kill Van Kull. This order was superseded by Administrative Order EO-40-17.

b. Administrative Order EO-40-17 (October 19, 1983) continued the presumptive advisory against any consumption of any fish and shellfish from Newark Bay, the Hackensack River upstream to the Oradell Dam, the Arthur Kill, and Kill Van Kull, and prohibited the sale or consumption of any fish and shellfish taken from the Passaic River from its mouth upstream to the Dundee Dam.

c. Administrative Order EO-40-19 (August 6, 1984) continued the prohibition against sale or consumption of any fish and shellfish taken from the Passaic River from its mouth upstream to the Oradell Dam, and additionally- prohibited the sale or consumption of striped bass and blue crabs taken from Newark Bay, the tidal Hackensack River, the Arthur Kill, and Kill Van Kull.

3. Channel Catfish

An advisory against any consumption of channel catfish from the Delaware River between the Interstate 276 Highway Bridge and Birch Creek (opposite the Pennsylvania-Delaware border) was signed on March 20, 1989. It is based on findings of elevated levels of PCBs and/or chlordane. On November 19, 1990, the Department of Health promulgated regulations that ban the sale of channel catfish taken from the same stretch of the river (N.J.A.C. 8:21-2-42).

4. Other Advisories

a. By means of a fact sheet on "Dioxin in Fish - Health Advisories" dated October 20, 1983 and issued in conjunction with Administrative Order EO-40-17, DEP issued an advisory to limit consumption of striped bass from the New Jersey portion of the Hudson River to no more than one meal per month. This is described

in public information as an advisory for "very limited consumption." (See Section B.2 above.) As for "limit consumption advisories, pregnant women, nursing mothers, women of child-bearing age, and young children) are advised not to eat A= striped bass from this area.

b. The discovery of widespread chlordane contamination in 1978 led to a ban on the sale or consumption of all fish, shellfish, and crustaceans from the Camden area (now including Strawbridge Lake, Pennsauken Creek (North and South Branches), Cooper River and its drainage, Cooper River Lake, Stewart Lake, and Newton Lake. The fishing ban was initially announced via a news release and has been continued and expanded several times. The contamination was initially discovered in the wake of a f ire at a garden supply center in Mt. Laurel Township (Burlington County), in which a pesticide warehouse was destroyed and it was suspected that pesticides had washed into the adjacent North Branch of Pennsauken Creek and downstream into Strawbridge Lake in Moorestown. Fish kills were observed in both areas, and several investigators at the fire scene experienced transient adverse health effects. Although the fire spurred the initial investigation into the contamination problem, there are also other likely sources of the chlordane in these water bodies (e.g., runoff) (13).

c. In addition to instructions on how to prepare and cook finfish (e.g., bluefish) so as to minimize potential ingestion of PCBs and other organic contaminants (as spelled out in N.J.A.C. 7:25-18A.5), the notice on consumption advisories, fishing prohibitions, etc. provided to anglers in the Division of Fish, Game and Wildlife's <u>New Jersey Fish and Wildlife Digest</u> states that consumers of blue crabs should not eat the hepatopancreas and should instead remove it before cooking so as not to contaminate the meat during cooking. It further notes that if the crab is cooked whole, the cooking water should be discarded and neither the cooking water nor the hepatopancreas (commonly called the tomalley or mustard) should be used in any juices or sauces.

APPENDIX B

MONITORING RESULTS BY SITE/SPECIES/YEAR

Notes:

1. Abbreviations appearing in the "species" column with blue crab results indicate the type of tissue analyzed, as follows:

H = hepatopancreas

M = muscle

H/M = hepatopancreas/muscle mixture

See Section II.B.2 for details.

2. Analytical results are presented as reported (i.e., two decimal places).

3. As indicated in Section III.A of the text, results reported as "below detection limit" were assigned a value equal to the detection limit for the purpose of data analysis. Detection limits were as follows: 0.1 ppm for PCB Aro6lbrs 1248 and 1254/1260; 2.5 ppb for the alpha and gamma isomers of chlordane; 5 ppb for p,p^{l}-DDE; and 10 ppb for p,p^{l}-DDD and p,pl-DDT.

4. Samples marked with an asterisk (*) consisted of fewer than five individuals. See Table 2.

5. Brown bullhead from Station 25 in 1987 was actually collected in February 1988, but included with samples from the 1987 sampling season.

PCBs
(PPM, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBS
1	American eel*	47	203	5.65	0.63	1.14	1.77
	white perch	20	130	2.99	0.81	0.88	1.69
2	American eel	53	342	11.64	0.59	0.91	1.50
	blue crab (HIM)	18	291	3.39	0.69	0.98	1.67
	blue crab (HIM)	16	242	3.20	1.02	2.84	3.86
	striped bass	44	911	2.57	0.43	1.57	2.00
	striped bass*	35	420	1.00	0.94	0.64	1.58
	white perch	22	172	2.10	0.83	0.60	1.43
3	American eel	53	328	5.80	0.27	0.41	0.68
	carp*	51	2050	5.25	0.90	0.31	1.21
	largemouth bass*	18	79	0.20	<0.10	<0.10	<0.20
	white perch	13	31	2.57	0.20	<0.10	<0.30
4	American eel	41	160	1.07	1.77	3.04	4.81
	blue crab (HIM)		208	2.49	0.28	0.31	0.59
	blue crab-(H/M)	17	234	2.70	1.07	1.17	2.24
	blue crab (HIM)	17	203	6.05	0.66	0.74	1.40
5	American eel*	49	233	2.55	0.28	0.37	0.65
	blue crab (HIM)	16	179	1.185	0.58	0.60	1.18
	blue crab (HIM)	18	232	10.36	0.93	0.86	1.79
	striped bass	53	1560	1.86	0.50	0.66	1.16
6	carp	43	1294	5.30	3.13	2.70	5.83
7	carp	42	1235	4.80	1.29	1.37	2.66
8	American eel	28	80	9.05	1.09	1.32	2.41
	blue crab (HIM)	17	248	3.22	0.98	1.15	2.13
	striped bass	55	1705	4.43	0.33	0.49	0.82
	striped bass	49	1238	5.35	3.55	3.10	6.65
10	blue crab (HIM)	14	142	5.57	0.74	0.74	1.48
11	blue crab (HIM)	15	141	1.49	0.51	0.70	1.21
	striped bass	44	911	2.49	0.45	0.58	1.03
	striped bass	73	4972	4.71	0.98	1.00	1.98
	striped bass*	46	945	2.20	0.38	0.34	0.72
	white perch	19	120	4.72	0.89	0.54	1.43
	American eel	43	169	3.64	<0.10	0.17	<0.27

(PPM, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBS
14	brown bullhead	30	399	1.22	0.15	0.17	0.32
15	bluefish	45	853	1.43	<0.10	0.26	<0.36
	bluefish	51	1216	4.22	0.15	0.36	0.51
	striped bass	71	4531	5.28	0.97	0.92	1.89
	weakfish	57	1515	3.44	0.18	0.34	0.52
	weakfish	43	703	4.71	0.25	0.36	0.61
16	bluefish	45	823	1.07	<0.10	0.18	<0.28
	bluefish	58	1774	5.58	0.35	0.60	0.95
	striped bass	80	7126	5.57	1.30	1.49	2.79
	weakfish	56	1461	3.71	0.26	0.41	0.67
	weakfish	47	975	2.93	0.16	0.26	0.42
17	American eel	32	68	18.29	2.00	1.29	3.29
	brown bullhead	28	283	0.99	0.23	<0.10	<0.33
	carp	58	3115	9.65	1.30	1.00	2.30
18	American eel	32	79	7.20	0.86	0.21	1.07
	brown bullhead*	28	290	0.75	<0.10	<0.10	<0.20
	carp	46	1343	0.43	<0.10	0.67	<0.77
	largemouth bass*	28	189	0.40	<0.10	<0.10	<0.20
19	carp	54	2476	8.15	0.90	1.06	1.96
20	American eel*	30	55	16.55	3.00	0.35	3.35
	carp	47	1567	4.60	0.37	0.39	0.76
21	brown bullhead	23	129	0.64	0.12	0.20	0.32
	carp	49	1562	3.50	0.77	0.60	1.37
22	carp	56	2503	5.45	0.40	0.74	1.14
	largemouth bass	36	754	0.28	<0.10	<0.10	<0.20
23	carp	57	3034	6.60	0.58	0.96	1.54
	largemouth bass*	31	409	5.00	<0.10	<0.10	<0.20
24	American eel*	32	62	5.10	0.28	0.62	0.90
	brown bullhead*	30	292	0.70	0.14	<0.10	<0.24
	carp	45	1493	8.54	0.77	0.23	1.00
25	American eel*	27	43	5.75	0.56	0.75	1.31

1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBs
26	blue crab (H/M)*	13	105	0.95	<0.10	<0.10	<0.20
	white catfish	26	198	0.79	<0.10	<0.10	<0.20
28	American eel	46	163	9.00	0.16	0.51	0.67
29	American eel	44	190	9.99	0.51	1.94	2.45
30	American eel	68	599	13.35	0.25	1.14	1.39
31	American eel	52	284	14.50	0.15	0.37	0.52
35	American eel*	50	253	9.45	0.33	0.78	1.11
	bluefish	48	866	1.85	<0.10	0.31	<0.41
36	bluefish	50	1111	3.80	0.45	0.78	1.23
37	bluefish	71	3399	9.57	0.56	1.01	1.57
	bluefish	81	4348	5.29	0.29	0.70	0.99
	bluefish	86	5448	12.50	0.55	1.37	1.92
	bluefish*	48	1063	5.20	0.29	0.55	0.84
	striped bass	58	2699	1.Rx	1.17	1.48	2.65
	striped bass	42	827	2.51	0.47	0.53	1.00
	striped bass*	62	2330	5.45	1.55	1.43	2.98
38	bluefish	52	1248	2.43	0.11	0.30	0.41
	bluefish	55	1670	2.43	0.11	0.27	0.38
	bluefish	49	1132	3.14	0.15	0.40	0.55
	bluefish	47	1018	7.95	0.18	0.84	1.02
	bluefish	47	1032	11.00	0.39	1.20	1.59
	bluefish	48	1045	5.10	0.23	0.38	0.61
	striped bass*	86	6581	8.95	0.53	0.93	1.46
39	bluefish*	78	4150	2.57	0.31	0.63	0.94
	bluefish	45	844	2.72	<0.10	0.26	<0.36
	bluefish	45	878	2.56	<0.10	0.20	<0.30
	bluefish	44	822	2.64	0.15	0.29	0.44
	bluefish	44	856	2.36	<0.10	0.22	<0.32
	weakfish	78	3730	4.21	0.39	1.03	1.42
	weakfish	76	3760	0.50	<0.10	0.14	<0.24
	weakfish	78	3760	1.00	0.27	0.58	0.85

PCBs
(PPM, WET WEIGHT)

1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBS
40	bluefish	78	4170	6.22	0.29	1.43	1.72
	bluefish	72	3320	3.93	0.65	1.27	1.92
	bluefish*	78	3967	2.49	0.43	1.07	1.50
	bluefish	54	1440	3.50	0.14	0.25	0.39
	bluefish	53	1291	3.20	0.11	0.37	0.48
	bluefish	44	765	2.30	0.13	0.30	0.43
	bluefish	58	1528	2.40	0.10	0.18	0.28
41	bluefish	48	948	3.43	0.16	0.32	0.48
	bluefish	43	732	0.64	<0.10	0.10	<0.20
	bluefish	48	993	1.00	<0.10	0.13	<0.23
	bluefish	49	1100	1.57	<0.10	0.15	<0.25
	weakfish	53	1379	3.35	<0.10	0.17	<0.27
	weakfish	48	912	2.86	<0.10	0.11	<0.21
	weakfish	45	797	1.55	<0.10	<0.10	<0.20
	weakfish*	46	889	3.29	<0.10	0.11	<0.21
	weakfish	40	613	2.65	<0.10	0.17	<0.27
	weakfish	38	586	3.43	<0.10	0.36	<0.46
	weakfish	40	662	1.50	<0.10	0.10	<0.20

1987

2	blue crab (H/M)	18	303	2.54	0.76	1.63	2.39
	blue crab (H)	15	229	5.86	1.49	1.27	2.76
	blue crab (M)	15	229	0.66	0.20	0.20	0.40
	striped bass	56	1895	3.82	<0.10	<0.10	<0.20
	striped bass	40	643	0.65	0.88	1.00	1.88
3	white perch	15	32	0.97	0.25	0.13	0.38
4	blue crab (H/X)	17	203	1.83	0.72	0.75	1.47
5	blue crab (H/M)	is	354	2.25	1.11	2.23	3.34
	blue crab (H/M)	18	268	2.32	0.88	0.99	1.87
	blue crab (H)	16	245	6.97	2.58	3.71	6.29
	blue crab (M)	16	245	0.83	0.21	0.18	0.39
	striped bass*	50	1305	3.23	1.70	2.36	4.06
7	carp	41	1117	4.62	1.68	1.43	3.11

PCBS
(PPM, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBS
8	American eel	41	186	12.47	1.60	1.89	3.49
	blue crab (H/M)	16	262	0.81	0.53	0.54	1.07
	blue crab (H/M)	19	354	3.63	0.86	1.03	1.89
	blue crab (H)	19	387	11.41	3.86	4.41	8.27
	blue crab (M)	19	387	0.49	0.15	0.21	0.36
	bluefish	58	1816	5.86	1.88	1.92	3.80
	striped bass*	48	1110	7.26	1.69	1.66	3.35
10	blue crab (H/M)	19	296	2.17	0.72	0.69	1.41
	blue crab (H)	18	383	5.02	3.47	0.71	4.18
	blue crab (M)	18	383	0.11	<0.10	0.14	<0.24
	bluefish	54	1284	1.09	<0.10	<0.10	<0.20
11	blue crab (H/M)	16	191	5.02	0.91	1.16	2.07
	blue crab (H)	16	232	12.99	3.00	2.40	5.40
	blue crab (M)	16	232	1.02	0.18	0.10	0.28
	striped bass	40	751	1.91	0.98	1.49	2.47
	white perch	21	151	4.30	2.93	4.19	7.12
12	American eel	40	113	3.09	0.19	0.24	0.43
13	American eel	38	132	9106	0.30	0.83	1.13
14	brown bullhead	33	577	6.30	0.98	1.06	2.04
15	bluefish	64	2015	1.82	0.11	0.88	0.99
	bluefish	54	1416	5.36	0.41	0.62	1.03
	weakfish	39	573	1.88	0.28	0.29	0.57
	weakfish	47	1086	2.73	0.2'1	0.36	0.57
16	bluefish	61	1924	6.72	<0.10	<0.10	<0.20
	bluefish	45	819	1.48	0.13	0.26	0.39
	bluefish	58	1710	1.25	0.12	0.20	0.32
	striped bass	62	2316	1.45	0.80	0.80	1.60
	weakfish	38	529	2.46	0.18	0.29	0.47
17	American eel	28	40	3.83	0.28	0.23	0.51
	brown bullhead	31	474	3.16	0.56	0.26	0.82
	carp	45	1775	18.61	0.65	0.47	1.12
18	American eel	31	92	9.70	2.06	1.17	3.23
	brown bullhead	30	350	2.63	0.80	0.43	1.23
	carp	50	1950	4.51	0.64	0.30	0.94

PCBs
(PPM, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) PCBS
19	brown bullhead*	30	310	2.22	0.20	0.34	0.54
20	American eel	26	32	8.19	1.36	0.42	1.78
	carp	65	3501	1.17	0.52	0.33	0.85
	largemouth bass	33	450	0.16	1.01	0.98	1.99
21	American eel	27	40	12.11	2.06	0.98	3.04
	brown bullhead	23	177	1.05	0.34	0.31	0.65
	carp	49	1606	5.98	1.50	0.86	2.36
22	brown bullhead	26	247	1.64	0.46	0.27	0.73
	carp	52	1976	10.32	1.58	1.26	2.84
23	carp	64	3532	2.45	0.56	0.57	1.13
	largemouth bass	32	553	0.19	<0.10	<0.10	<0.20
25	brown bullhead*	19	88	1.02	<0.10	<0.10	<0.20
29	American eel	26	32	3.28	0.12	0.30	0.42
	carp	55	2515	3.42	0.21	0.63	0.84
30	American eel	30	47	3.69	0.23	0.39	0.62
	carp	41	1210	2.36	0.23	0.80	1.03
31	American eel	36	103	6.97	0.15	0.47	0.62
32	bluefish	66	2624	11.57	0.40	1.03	1.43
33	bluefish	64	2400	1.70	0.25	0.54	0.79
34	bluefish-	51	1132	1.53	0.21	0.69	0.90
	weakfish*	48	910	1.67	0.12	0.26	0.38
37	bluefish	62	1876	1.19	0.22	0.44	0.66
	bluefish	67	2679	6.49	0.39	0.74	1.13
	bluefish	63	2241	9.77	0.44	0.83	1.27
	bluefish	65	2469	12.55	0.43	0.94	1.37
	bluefish	58	1641	1.63	0.18	0.43	0.61
	striped bass	67	2985	2.94	1.15	1.39	2.54
	striped bass	69	3037	2.69	1.43	2.48	3.91
	striped bass	68	3087	2.15	0.85	1.20	2.05
	weakfish	32	308	2.88	<0.10	<0.10	<0.20
	weakfish	33	359	2.61	<0.10	0.18	<0.28
	weakfish	34	334	3.18	<0.10	0.18	<0.28

PCBs
(PPM, WET WEIGHT)

1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	AROCLORS 1248	AROCLORS 1254/60	(SUM) *PCBS*
38	bluefish	62	2042	3.25	0.23	0.27	0.50
	bluefish	62	1828	1.62	0.11	0.39	0.50
	bluefish	70	2838	9.56	0.28	0.80	1.08
	bluefish	57	1566	3.36	0.20	0.55	0.75
	bluefish	57	1405	1.28	<0.10	0.22	<0.32
	bluefish	60	1720	2.57	0.31	0.53	0.84
	bluefish	59	1749	18.01	0.32	0.78	1.10
	striped bass	56	2027	2.86	0.56	<0.10	<0.66
	striped bass	57	2104	3.12	1.70	2.02	3.72
	striped bass	64	3134	4.91	1.00	1.31	2.31
39	bluefish	78	4068	12.25	0.54	1.05	1.59
	bluefish	76	4567	26.44	0.32	0.91	1.23
	bluefish	71	3915	3.73	0.59	1.19	1.78
	bluefish	77	4644	14.35	1.08	0.95	2.03
	bluefish	50	1056	1.25	0.12	0.37	0.49
	bluefish	56	1500	3.36	0.17	0.52	0.69
	bluefish	59	1718	3.18	0.20	0.50	0.70
	striped bass	63	2752	5.65	0.82	2.00	2.82
	striped bass	63	2666	2.46	0.64	0.70	1.34
40	bluefish	59	1419	2.79	0.14	0.99	1.13
	bluefish	55	1459	0.53	0.47	0.38	0.85
	striped bass	60	2274	5.83	0.24	0.47	0.71
	striped bass	62	2522	4.32	0.18	0.46	0.64
	striped bass	62	2827	3.08	0.39	0.86	1.25
41	bluefish	55	1319	1.03	0.16	0.51	0.67
	weakfish	69	3648	4.11	0.35	0.65	1.00
	weakfish	73	3574	5.20	0.27	0.81	1.08
	weakfish	76	4050	5.20	0.42	0.47	0.89
	weakfish	32	308	5.08	<0.10	0.12	<0.22
	weakfish	32	279	3.75	<0.10	0.12	<0.22
42	weakfish	31	275	3.35	<0.10	<0.10	<0.20
	weakfish	32	296	4.78	<0.10	<0.10	<0.20
	weakfish	30	249	3.27	<0.10	<0.10	<0.20

CHLORDANE
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
1	American eel*	47	203	5.65	33.06	8.87	41.93
	white perch	20	130	2.99	19.56	11.85	31.41
2	American eel	53	342	11.64	56.82	20.83	77.65
	blue crab (H/M)	is	291	3.39	28.63	8.06	36.69
	blue crab (H/M)	16	242	3.20	26.21	12.10	38.31
	striped bass	44	911	2.57	47.62	10.12	57.74
	striped bass*	35	420	1.00	9.94	8.56	18.50
	white perch	22	172	2.10	29.76	15.87	45.63
3	American eel	53	328	5.80	106.93	40.72	147.65
	carp*	51	2050	5.25	164.68	63.49	228.17
	largemouth bass*	18	79	0.20	9.80	3.13	12.93
	white perch	13	31	2.57	40.11	10.60	50.71
4	American eel	41	160	1.07	116.19	34.14	150.33
	blue crab (H/M)	16	208	2.49	5.78	<2.50	<8.28
	blue crab (H/M)	17	234	2.70	30.24	14.11	44.35
	blue crab (H/M)	17	203	6.05	6.25	<2.50	<8.75
5	American eel*	49	233	2.55	26.21	10.08	36.29
	blue crab (H/M)	16	14	1.85	15.96	3.27	19.23
	blue crab (H/M)	18	232	10.36	23.24	4.59	27.83
	striped bass	53	1560	1.86	16.65	6.12	22.77
6	carp	43	1294	5.30	364.46	219.70	584.16
7	carp	42	1235	4.80	169.21	126.74	295.95
8	American eel	28	80	9.05	83.04	21.45	104.49
	blue crab (H/M)	17	248	3.22	29.09	5.95	35.04
	striped bass	55	1705	4.43	14.65	4.84	19.49
	striped bass	49	1238	5.35	73.15	86.81	159.96
10	blue crab (H/M)	14	142	5.57	28.74	5.91	34.65
11	blue crab (H/M)	15	141	3.49	25.45	2.67	28-12
	striped bass	44	911	2.49	19.43	14.29	33.72
	striped bass	73	4972	4.71	39.79	14.72	54.51
	striped bass*	46	945	2.20	19.84	13.49	33.33
	white perch	19	120	4.72	45.61	14.72	60.33
12	American eel	43	169	3.64	12.72	2.93	15.65
			53				

(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
14	brown bullhead	30	399	1.22	12.72	5.60	18.32
15	bluefish	45	853	1.43	8.62	4.27	12.89
	bluefish	51	1216	4.22	15.02	6.27	21.29
	striped bass	71	4531	5.28	31.75	12.53	44.28
	weakfish	57	1515	3.44	9.92	3.14	13.06
	weakfish	43	703	4.71	12.76	6.27	19.03
16	bluefish	45	823	1.07	7.08	3.88	10.96
	bluefish	58	1774	5.58	18.99	8.46	27.45
	striped bass	80	7126	5.57	55.66	20.06	75.72
	weakfish	56	1461	3.71	13.84	4.80	18.64
	weakfish	47	975	2.93	8.48	2.86	11.34
17	American eel	32	68	18.29	1651.79	507.05	2158.84
	brown bullhead	28	283	0.99	22.58	18.30	40.88
	carp	58	3115	9.65	255.68	171.23	426.91
18	American eel	32	79	7.20	151.99	41.10	193.09
	brown bullhead*	28	290	0.75	11.25	6.71	17.96
	carp	46	1343	0.43	26.20	7.84	34.04
	largemouth bass*	28	389	0.40	19.84	9.92	29.76
19	carp	54	2476	8.15	30.48	24.31	54.79
20	American eel*	30	55	16.55	496.58	189.66	686.24
	carp	47	1567	4.60	169.64	117.53	287.17
21	brown bullhead	23	129	0.64	30.08	15.04	45.12
	carp	49	1562	3.50	100.93	64.05	164.98
22	carp	56.	2503	5.45	166.08	106.34	272.42
	largemouth bass	36	754	0.28	10.29	<2.50	<12.79
23	carp	57	3034	6.60	196.43	24.25	220.68
	largemouth bass*	31	409	5.00	8.38	2.95	11.33
24	American eel*	32	62	5.10	32.53	10.78	43.31
	brown bullhead*	30	292	0.70	3.42	3.23	6.65
	carp	45	1493	8.54	13.21	10.45	23.66
25	American eel*	27	43	5.75	68.49	15.09	83.58

CHLORDANE
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	ISOMERS ALPHA	GAMMA	(SUM) CHLORDANE
26	blue crab (H/M)*	13	105	0.95	<2.50	<2.50	<5.00
	white catfish	26	198	0.79	<2.50	<2.50	<5.00
28	American eel	46	163	9.00	43.73	13.04	56.77
29	American eel	44	190	9.99	109.33	25.76	139-09
30	American eel	68	599	13.35	49.20	11.16	60.36
31	American eel	52	284	14.50	13.07	5.31	18.38
35	American eel*	50	253	9.45	30.81	8.47	39.28
	bluefish	48	866	1.85	10.63	3.77	14.40
36	bluefish	50	1111	3.80	32.57	14.83	47.40
37	bluefish	71	3399	9.57	37.52	13.69	51.21
	bluefish	81	4348	5.29	28.03	7.34	35.37
	bluefish	86	5448	12.50	54.25	17.12	71.37
	bluefish*	48	1063	5.20	19.69	7.54	27.23
	striped bass	58	2699	1.71	28.32	10.64	38.96
	striped bass	42	827	2.51	25.04	9.57	34.61
	striped bass*	62	2330	5.45	49.66	15.09	64.75
38	bluefish	52	1248	2.43	11.82	3.11	14.93
	bluefish	55	1670	2.43	8.33	2.81	11.14
	bluefish	49	1132	3.14	17.24	8.53	25.77
	bluefish	47	1018	7.95	22.89	11.65	34.54
	bluefish	47	1032	11-00	36.97	16.95	53.92
	bluefish	48	1045	5.10	21.13	10.59	31.72
	striped bass*	86	6581	8.95	41.10	15-09	56.19
39	bluefish*	78	4150	2.57	18.99	3.91	22.90
	bluefish	45	844	2.72	9.92	3.30	13.22
	bluefish	45	878	2.56	7.79	2.97	10.76
	bluefish	44	822	2.64	14.46	8.93	23.39
	bluefish	44	856	2.36	5.12	<2.50	<7.62
	weakfish	78	3730	4.21	37.09	8.81	45.90
	weakfish	76	3760	0.50	5.49	<2.50	<7.99
	weakfish	78	3760	1.00	23.63	5.53	29.16

CHLORDANE
(PPB, WET WEIGHT)

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
			1986				
40	bluefish	78	4170	6.22	58.18	14.29	72.47
	bluefish	72	3320	3.93	62.50	16.98	79.48
	bluefish*	78	3967	2.49	55.96	18.23	74.19
	bluefish	54	1440	3.50	12.50	5.59	18.09
	bluefish	53	1291	3.20	13.57	6.34	19.91
	bluefish	44	765	2.30	9.46	3.92	13.38
	bluefish	58	1528	2.40	7.68	3.03	10.71
41	bluefish	48	948	3.43	10.39	4.40	14.79
	bluefish	43	732	0.64	2.88	<2.50	<5.38
	bluefish	48	993	1.00	3.94	<2.50	<6.44
	bluefish	49	1100	1.57	4.99	<2.50	<7.49
	weakfish	53	1379	3.35	3.87	<2.50	<6.37
	weakfish	48	912	2.86	6.10	<2.50	<8.60
	weakfish	45	797	1.55	3.13	2.61	5.74
	weakfish*	46	889	3.29	<2.50	<2.50	<5.00
	weakfish	40	613	2.65	4.12	<2.50	<6.62
	weakfish	38	586	3.43	4.67	<2.50	<7.17
	weakfish	40	662	1.50	<2.50	<2.50	<5.00
			1987				
2	blue crab (H/M)	18	303	2.54	25.39	18.38	43.77
	blue crab (H)	15	229	5.86	32.17	5.51	37.68
	blue crab (M)	15	229	0.66	7.42	5.51	12.93
	striped bass	56	1895	3.82	<2.50	<2.50	<5.00
	striped bass	40	643	0.65	22.91	16.92	39.83
3	white perch	15	32	0.97	51.84	20.83	72.67
4	blue crab (H/M)	17	203	1.83	9.57	6.11	15.68
5	blue crab (H/M)	18	354	2.25	71.43	11.03	82.46
	blue crab (H/M)	18	268	2.32	15.20	8.15	23.35
	blue crab (H)	16	245	6.97	84.56	27.57	112.13
	blue crab (M)	16	245	0.83	6.25	4.04	10.29
	striped bass*	50	1305	3.23	34.65	12.15	46.80
7	carp	41	1117	4.62	141.07	86.96	228.03

CHLORDANE (PPB, WET 1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
8	American eel	41	186	12.47	35.15	19.09	54.24
	blue crab (H/M)	16	262	0.81	13.79	11.03	24.82
	blue crab (H/M)	19	354	3.63	20.27	6.11	26.38
	blue crab (H)	19	387	11.41	125.00	55.15	180.15
	blue crab (M)	19	387	0.49	4.04	<2.50	<6.54
	bluefish	58	1816	5.86	101.79	34.93	136.72
	striped bass*	48	1110	7.26	87.87	20.83	108.70
10	blue crab (H/M)	19	296	2.17	15.63	3.31	18.94
	blue crab (H)	18	383	5.02	16.54	12.87	29.41
	blue crab (M)	is	383	0.11	<2.50	3.49	<5.99
	bluefish	54	1284	1.09	<2.50	<2.50	<5.00
11	blue crab (H/M)	16	191	5.02	30.35	9.06	39.41
	blue crab (H)	16	232	12.99	130.21	42.61	172.82
	blue crab (M)	16	232	1.02	6.94	<2.50	<9.44
	striped bass	40	751	1.91	35.71	19.93	55.64
	white perch	21	151	4.30	93.75	29.41	123.16
12	American eel	40	113	3.09	26.07	5.14	31.21
13	American eel	38	132	9.06	53.57	12.68	66.25
14	brown bullhead	33	577	6.30	80.36	47.10	127.46
15	bluefish	64	2015	1.82	32.50	22.12	54.62
	bluefish	54	1416	5.36	19.71	11.55	31.26
	weakfish	39	573	1.88	21.43	17.71	39.14
	weakfish	47	1086	2.73	12.38	3.13	15.51
16	bluefish	61	1924	6.72	<2.50	<2.50	<5.00
	bluefish	45	819	1.48	8.11	3.94	12.05
	bluefish	58	1710	1.25	12.50	5.32	17.82
	striped bass	62	2316	1.45	18.02	12.23	30.25
	weakfish	38	529	2.46	10.42	4.29	14.71
17	American eel	28	40	3.83	106.44	12.15	118.59
	brown bullhead	31	474	3.16	176.67	125.00	301.67
	carp	45	1775	18.61	356.65	239.29	595.94
18	American eel	31	92	9.70	486.61	181.16	667.77
	brown bullhead	30	350	2.63	78.59	49.82	128.41
	carp	50	1950	4.51	133.93	88.77	222.70

CHLORDANE
(PPB, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
19	brown bullhead*	30	310	2.22	82.91	50.35	133.26
20	American eel	26	32	8.19	267.86	131.94	399.80
	carp	65	3501	1.17	100.96	78.13	179.09
	largemouth bass	33	450	0.16	22.84	15.63	38.47
21	American eel	27	40	12.11	53.57	131.94	185.51
	brown bullhead	23	177	1.05	73.14	41.67	114.81
	carp	49	1606	5.98	199.11	160.85	359.96
22	brown bullhead	26	247	1.64	141.54	70.83	212.37
	carp	52	1976	10.32	221.43	137.68	359.11
23	carp	64	3532	2.45	120.19	88.54	208.73
	largemouth bass	32	553	0.19	10.34	3.13	13.47
25	brown bullhead*	19	88	1.02	<2.50	<2.50	<5.00
29	American eel	26	32	3.28	38.90	4.34	43.24
	carp	55	2515	3.42	42.07	22.14	64.21
30	American eel	30	47	3.69	36.06	9.11	45.17
	carp	41	1210	2.36	46.88	19.53	66.41
31	American eel	36	103	6.97	48.08	19.53	67.61
32	bluefish	66	2624	11.57	43.75	22.14	65.89
33	bluefish	64	2400	1.70	23.92	7.72	31.64
34	bluefish	51	1132	1.53	41.43	12.50	53.93
	weakfish*	48	910	1.67	9.69	<2.50	<12.19
37	bluefish	62	1876	1.19	8.37	5.74	14.11
	bluefish	67	2679	6.49	33.33	18.23	51.56
	bluefish	63	2241	9.77	22.92	17.71	40.63
	bluefish	65	2469	12.55	44.08	18.75	62.83
	bluefish	58	1641	1.63	10.66	7.72	18.38
	striped bass	67	2985	2.94	34.04	14.67	48.71
	striped bass	69	3037	2.69	50.22	29.34	79.56
	striped bass	68	3087	2.15	37.38	14.69	52.07
	weakfish	32	308	2.88	<2.50	<2.50	<5.00
	weakfish	33	359	2.61	5.97	2.53	8.50
	weakfish	34	334	3.18	4.83	<2.50	<7.33

CHLORDANE
(PPB, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	ISOMERS ALPHA	ISOMERS GAMMA	(SUM) CHLORDANE
38	bluefish	62	2042	3.25	24.17	14.42	38.59
	bluefish	62	1828	1.62	13.33	9.74	23.07
	bluefish	70	2838	9.56	40.13	17.36	57.49
	bluefish	57	1566	3.36	22.22	10.98	33.20
	bluefish	57	1405	1.28	8.83	4.80	13.63
	bluefish	60	1720	2.57	21.02	12.00	33.02
	bluefish	59	1749	18.01	28.95	15.97	44.92
	striped bass	56	2027	2.86	20.59	10.00	30.59
	striped bass	57	2104	3.12	44.74	50.00	94.74
	striped bass	64	3134	4.91	63.73	43.96	107.6.9
39	bluefish	78	4068	12.25	48.61	11.30	59.91
	bluefish	76	4567	26.44	46.53	15.29	61.82
	bluefish	71	3915	3.73	61.11	19.95	81.06
	bluefish	77	4644	14.35	50.69	19.95	70.64
	bluefish	50	1056	1.25	13.33	5.71	19.04
	bluefish	56	1500	3.36	21.18	10.82	32.00
	bluefish	59	1718	3.18	20.00	4.62	24.62
	striped bass	63	2752	5.65	94.44	42.55	136.99
	striped bass	63	2666	2.46	25.00	14.63	39.63
40	bluefish	59	1419	2.79	33.33	13.46	46.79
	bluefish	55	1459	0.53	12.17	4.23	16.40
	striped bass	60	2274	5.83	27.57	12.50	40.07
	striped bass	62	2522	4.32	8.81	7.14	15.95
	striped bass	62	2827	3.08	46.54	40.28	86.82
41	bluefish	55	1319	1.03	15.69	14.44	30.13
	weakfish	69	3648	4.11	31.25	10.41	41.66
	weakfish	73	3574	5.20	34.57	10.63	45.20
	weakfish	76	4050	5.20	6.11	8.90	15.01
	weakfish	32	308	5.08	4.34	<2.50	<6.84
	weakfish	32	279	3.75	5.10	<2.50	<7.60
42	weakfish	31	275	3.35	2.60	<2.50	<5.10
	weakfish	32	296	4.78	2.98	<2.50	<5.48
	weakfish	30	249	3.27	<2.50	<2.50	<5.00

DDT AND METABOLITES
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	DDT	DDD	DDE	(SUM) DDTs
1	American eel*	47	203	5.65	<10.00	62.50	77.90	<150.40
	white perch	20	130	2.99	<10.00	30.04	46.90	<86.94
2	American eel	53	342	11.64	11.79	76.53	84.82	173.14
	blue crab (H/M)	18	291	3.39	<10.00	70.60	93.02	<173.62
	blue crab (H/M)	16	242	3.20	12.25	75.23	107.56	195.04
	striped bass	44	911	2.57	16.85	45.35	85.57	147.77
	striped bass*	35	420	1.00	<10.00	17.36	34.31	<61.67
	white perch	22	172	2.10	12.50	56.82	59.52	128.84
3	American eel	53	328	5.80	13.30	61.85	132.27	207.42
	carp*	51	2050	5.25	<10.00	73.86	217.26	<301.12
	largemouth bass*	18	79	0.20	<10.00	<10.00	9.69	<29.69
	white perch	13	31	2.57	<10.00	13.74	31.25	<54.99
4	American eel	41	160	1.07	34.34	243.14	296.26	573.74
	blue crab (H/M)	16	208	2.49	<10.00	<10.00	32.34	<52.34
	blue crab (H/M)	17	234	2.70	18.38	127.31	165.70	311.39
	blue crab (H/M)	17	203	6.05	<10.00	28.94	45.35	<84.29
5	American eel*	49	233	2.55	18.38	115.74	116.28	250.40
	blue crab (H/M)	16	179	1.85	<10.00	24.80	47.24	<82.04
	blue crab (H/M)	18	232	10.36	10.73	75.73	107.55	194.01
	striped bass	53	1560	1.86	<10.00	56.73	60.33	<127.06
6	carp	43	1294	5.30	13.30	390.63	401.16	805.09
7	carp	42	1235	4.80	16.74	140.63	207.45	364.82
8	American eel	28	80	9.05	12.25	91.77	146.28	250.30
	blue crab (H/M)	17	248	3.22	61.06	120.46	137.65	319.17
	striped bass	55	1705	4.43	<10.00	28.83	45.47	<84.30
	striped bass	49	1238	5.35	30.44	208.33	292.55	531.32
10	blue crab (H/K)	14	142	5.57	<10.00	95.66	96.39	<202.05
11	blue crab (H/M)	15	141	3.49	<10.00	62.33	78.39	<150.72
	striped bass	44	911	2.49	<10.00	66.96	49.00	<125.96
	striped bass	73	4972	4.71	16.23	55.80	96.43	168.46
	striped bass*	46	945	2.20	<10.00	59.09	60.71	<129.80
	white perch	19	120	4.72	12.18	63.24	44.64	120.06
12	American eel	43	169	3.64	<10.00	<10.00	23.52	<43.52

DDT AND METABOLITES
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	DDT	DDD	DDE	(SUM) DDTs
14	brown bullhead	30	399	1.22	<10.00	55.59	20.91	<86.5
15	bluefish	45	853	1.43	<10.00	<10.00	25.29	<45.2
	bluefish	51	1216	4.22	<10-00	28.89	45.14	<84.0
	striped bass	71	4531	5.28	12.76	82.64	77.38	172.7
	weakfish	57	1515	3.44	<10.00	12.05	27.23	<49.2
	weakfish	43	703	-4.71	<10.00	23.75	40.18	<73.9
16	bluefish	45	823	1.07	<10.00	<10.00	17.86	<37.8
	bluefish	58	1774	5.58	11.69	34.19	48.12	94.0
	striped bass	80	7126	5.57	19.00	142.48	143.33	304.8
	weakfish	56	1461	3.71	<10.00	21.92	45.81	<77.7
	weakfish	47	975	2.93	<10.00	12.99	28.73	<51.7
17	American eel	32	68	18.29	911.07	1704.55	2212.73	4828.3
	brown bullhead	28	283	0.99	<10.00	17.86	23.05	<50.9
	carp	58	3115	9.65	10.41	615.08	784.31	1409.8
18	American eel	32	79	7.20	72.93	228.17	360.29	661.3
	brown bullhead*	28	290	0.75	<10.00	17.36	23.14	<50.5
	carp	46	1343	0.43	<10.00	66.96	107.14	<184.1
	largemouth bass*	28	389	*0140	12.50	39.77	92.2.7	144.5
19	carp	54	2476	8.15	11.16	229.17	308.51	548.8
20	American eel*	30	55	16.55	93.09	306.60	307.69	707.3
	carp	47	1567	4.60	<10.00	133.93	154.25	<298.1
21	brown bullhead	23	129	0.64	<1G.00	25.01	43.69	<78.7
	carp	49	1562	3.50	<10.00	161.64	186.17	<357.8
22	carp	56	2503	5.45	<10.00	133.93	215.43	<359.3
	largemouth bass	36	754	0.28	<10.00	<10.00	14.44	<34.4
23	carp	57	3034	6.60	<10.00	391.87	276.59	<678.4
	largemouth bass*	31	409	5.00	<10.00	10.42	13.30	<33.7
24	American eel*	32	62	5.10	19.95	194.58	346.15	560.6
	brown bullhead*	30	292	0.70	<10.00	19.46	28.21	<57.6
	carp	45	1493	8.54	<10.00	77.38	80.32	<167.7
25	American eel*	27	43	5.75	19.95	224.06	435.89	679.9

DDT AND METABOLITES
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	% LIPIDS	DDT	DDD	DDE	(SUM) DDTs
26	Blue crab (H/M)	13	105	0.95	<10.00	<10.00	8.13	<28.13
	White catfish	26	198	0.79	<10.00	<10.00	9.38	<29.38
28	American eel	46	163	9.00	47.83	51.23	136.55	235.61
29	American eel	44	190	9.99	55.80	402.52	640.76	1099.08
30	American eel	68	599	13.35	63.78	32.20	325.63	421.61
31	American eel	52	284	14.50	61.74	39.39	95.82	196.95
35	American eel*	50	253	9.45	12.02	31.77	70.83	114.62
	Bluefish	48	866	1.85	<10.00	<10.00	40.10	<60.10
36	Bluefish	50	1111	3.80	<10.00	31.78	72.22	<114.00
37	Bluefish	71	3399	9.57	13.89	66.07	95.54	175.50
	Bluefish	81	4348	5.29	15.87	30.36	81.25	127.48
	Bluefish	86	5448	12.50	27.78	73.21	123.21	224.20
	Bluefish*	48	1063	5.20	<10.00	38.33	84.94	<133.27
	Striped bass	58	2699	1.71	18.99	52.54	82.75	154.28
	Striped bass	42	827	2.51	<10.00	56.90	67.61	<134.41
	Striped bass*	62	2330	5.45	13.30	176.89	176.28	366.47
38	Bluefish	52	1248	2.43	<10.00	16.62	30.65	<57.27
	Bluefish	55	1670	2.43	<10.00	<10.00	27.02	<47.02
	Bluefish	49	1132	3.14	<10.00	18.60	42.66	<71.26
	Bluefish	47	1018	7.95	<10.00	18.54	55.56	<84.10
	Bluefish	47	1032	11.00	12.02	34.43	95.83	142.28
	Bluefish	48	1045	5.10	36.06	15.88	43.05	94.99
	Striped bass*	86	6581	8.95	16.62	58.96	91.35	166.93
39	Bluefish*	78	4150	2.57	<10.00	23.21	63.39	<96.60
	Bluefish	45	844	2.72	10.04	11.16	23.44	44.64
	Bluefish	45	878	2.56	<10.00	<10.00	18.53	<38.53
	Bluefish	44	822	2.64	77.00	20.98	29.69	127.67
	Bluefish	44	856	2.36	<10.00	<10.00	21.72	<41.72
	Weakfish	78	3730	4.21	13.02	34.34	88.43	135.79
	Weakfish	76	3760	0.50	<10.00	<10.00	17.86	<37.86
	Weakfish	78	3760	1.00	<10.00	26.79	57.69	<94.48

DDT AND METABOLITES
(PPB, WET WEIGHT)
1986

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	DDT	DDD	DDE	(SUM) DDTs
40	Bluefish	78	4170	6.22	33.22	44.64	136.10	213.96
	Bluefish	72	3320	3.93	37.20	54.95	144.23	236.38
	Bluefish*	78	3967	2.49	22.32	53.71	93.75	169.78
	Bluefish	54	1440	3.50	<10.00	14.38	29.52	<53.90
	Bluefish	53	1291	3.20	<10.00	16.87	47.87	<74.74
	Bluefish	44	765	2.30	<10.00	<10.00	27.39	<47.39
	Bluefish	58	1528	2.40	<10.00	<10.00	20.35	<40.35
41	Bluefish	48	948	3.43	<10.00	23.21	57.14	<90.35
	Bluefish	43	732	0.64	<10.00	<10.00	15.45	<35.45
	Bluefish	48	993	1.00	<10.00	<10.00	15.95	<35.95
	Bluefish	49	1100	1.57	<10.00	<10.00	22.20	<42.20
	Weakfish	53	1379	3.35	<10.00	12.95	24.33	<47.28
	Weakfish	48	912	2.86	<10.00	15.18	40.18	<65.36
	Weakfish	45	797	1.55	<10.00	<10.00	21.57	<41.57
	Weakfish*	46	889	3.29	<10.00	21.99	36.63	<68.62
	Weakfish	40	613	2.65	<10.00	<10.00	21.80	<41.80
	Weakfish	38	586	3.43	<10.00	<10.00	25.24	<45.24
	Weakfish	40	662	1.50	<10.00	<10.00	14.59	<34.59
					1987			
2	Blue crab (H/M)	18	303	2.54	<10.00	51.27	87.74	<149.01
	Blue crab (H)	15	229	5.86	11.49	83.17	121.25	215.91
	Blue crab (M)	15	229	0.66	<10.00	21.48	29.33	<60.81
	Striped bass	56	1895	3.82	<10.00	<10.00	<5.00	<25.00
	Striped bass	40	643	0.65	<10.00	29.56	78.63	<118.19
3	White perch	15	32	0.97	<10.00	31.25	28.41	<69.66
4	Blue crab (H/M)	17	203	1.83	<10.00	36.06	87.50	<133.56
5	Blue crab (H/M)	18	354	2.25	<10.00	139.16	227.50	<376.66
	Blue crab (H/M)	18	268	2.32	<10.00	52.88	115.91	<178.79
	Blue crab (H)	16	245	6.97	27.57	201.61	285.00	514.18
	Blue crab (M)	16	245	0.83	<10.00	19.66	32.75	<62.41
	Striped bass*	50	1305	3.23	<10.00	15.12	104.16	<129.28
7	Carp	41	1117	4.62	10.08	107.42	110.29	227.79

DDT AND METABOLITES
(PPB, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGHT (cm)	MEAN WEIGHT (g)	% LIPIDS	DDT	DDD	DDE	(SUM) DDTs
8	American eel	41	186	12.47	20.16	433.46	309.89	763.51
	Blue crab (H/M)	16	262	0.81	<10.00	57.96	93.75	<161.71
	Blue crab (H/M)	19	354	3.63	<10.00	67.31	107.95	<185.26
	Blue crab (H)	19	387	11.41	45.96	352.82	490.00	888.78
	Blue crab (M)	19	387	0.49	<10.00	18.15	23.00	<51.15
	Bluefish	58	1816	5.86	31.25	209.96	217.50	458.71
	striped bass*	48	1110	7.26	10.08	312.50	283.85	606.43
10	blue crab (H/M)	19	296	2.17	<10.00	85.69	117.50	<213.19
	blue crab (H)	18	383	5.02	<10.00	21.17	22.00	<53.17
	blue crab (M)	18	383	0.11	<10.00	11.09	12.50	<33.59
	bluefish	54	1284	1.09	<10.00	<10.00	<5.00	<25.00
11	blue crab (H/M)	16	191	5.02	<10.00	65.92	109.07	<184.99
	blue crab (H)	16	232	12.99	26.04	334.82	429.69	790.55
	blue crab (M)	16	232	1.02	<10.00	24.80	30.73	<65.53
	striped bass	40	751	1.91	20.16	58.59	100.49	179.24
	white perch	21	151	4.30	45.96	277.22	372.50	695.68
12	American eel	40	113	3.09	12.50	<10.00	32.50	<55.00
13	American eel	38	132	9.06	27.72	21.97	89.46	139.15
14	brown bullhead	33	577	6.30	25.20	161.13	112.75	299.08
15	bluefish	64	2015	1.82	10.42	47.88	93.09	151.39
	bluefish	54	1416	5.36	<10.00	28.85	62.50	<101.35
	weakfish	39	573	1.88	<10.00	23 44	54.52	<87.96
	weakfish	47	1086	2.73	<10.00	<10.00	32.29	<52.29
16	bluefish	61	1924	6.72	<10.00	<10.00	6.82	<26.82
	bluefish	45	819	1.48	<10.00	<10.00	23.18	<43.18
	bluefish	58	1710	1.25	<10.00	12.68	30.17	<52.85
	striped bass	62	2316	1.45	<10.00	45.67	62.50	<118.17
	weakfish	38	529	2.46	<10.00	13.89	32.29	<56.18
17	American eel	28	40	3.83	10.08	35.28	182.29	227.65
	brown bullhead	31	474	3.16	19.53	156.25	164.22	340.00
	carp	45	1775	18.61	19.53	322.25	401.96	743.74
18	American eel	31	92	9.70	277.19	598.14	1084.56	1959.89
	brown bullhead	30	350	2.63	30.14	144.04	192.40	366.58
	carp	50	1950	4.51	<10.00	259.79	294.12	<563.91

DDT AND METABOLITES
(PPB, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGTH (cm)	MEAN WEIGHT (g)	LIPIDS	DDT	DDD	DDE	(SUM) DDTs
19	brown bullhead*	30	310	2.22	<10.00	52.88	108.17	<171.05
20	American eel	26	32	8.19	10.96	134.62	161.06	306.64
	Carp	65	3501	1.17	<10.00	197.61	142.85	<350.46
	Largemouth bass	33	450	0.16	<10.00	32.17	80.36	<122.53
21	American eel	27	40	12.11	21.93	144.23	240.38	406.54
	brown bullhead	23	177	1.05	14.39	43.51	97.66	155.56
	Carp	49	1606	5.98	<10.00	229.49	216.25	<455.74
22	brown bullhead	26	247	1.64	11.36	61.38	130.68	203.42
	Carp	52	1976	10.32	<10.00	209.96	289.22	<509.18
23	Carp	64	3532	2.45	<10.00	335.48	218.75	<564.23
	Largemouth bass	32	553	0.19	<10.00	13.79	13.39	<37.18
25	brown bullhead*	19	88	1.02	<10.00	<10.00	10.56	<30.56
29	American eel	26	32	3.28	<10.00	31.25	122.60	<163.85
	Carp	55	2515	3.42	26.04	59.74	158.48	244.26
30	American eel	30	47	3.69	30.38	32.17	102.68	165.23
	Carp	41	1210	2.36	<10.00	59.74	238.84	<308.58
31	American eel	36	103	6.97	43.40	45.96	95.49	184.85
32	Bluefish	66	2624	11.57	16.89	42.23	94.75	153.87
33	Bluefish	64	2400	1.70	<10.00	26.37	62.00	<98.37
34	Bluefish	51	1132	1.53	12.50	46.88	90.00	149.38
	weakfish*	48	910	1.67	<10.00	<10.00	28.61	<48.61
37	bluefish	62	1876	1.19	<10.00	<10.00	31.84	<51.84
	bluefish	67	2679	6.49	12.67	29.56	96.77	139.00
	bluefish	63	2241	9.77	11.82	30.41	57.26	99.49
	bluefish	65	2469	12.55	16.23	35.42	83.33	134.98
	bluefish	58	1641	1.63	<10.00	14.20	41.02	<65.22
	striped bass	67	2985	2.94	13.79	43.35	99.05	156.19
	striped bass	69	3037	2.69	22.98	71.02	150.94	244.94
	striped bass	68	3087	2.15	16.08	66.29	108.49	190.86
	weakfish	32	308	2.88	<10.00	<10.00	<5.00	<25.00
	weakfish	33	359	2.61	<10.00	<10.00	18.36	<38.36
	weakfish	34	334	3.18	<10.00	<10.00	21.28	<41.28

DDT AND METABOLITES
(PPB, WET WEIGHT)
1987

SITE	SPECIES	MEAN LENGHT (cm)	MEAN WEIGHT (g)	% LIPIDS	DDT	DDD	DDE	(SUM) DDTs
38	bluefish	62	2042	3.25	<10.00	22.68	53.19	<85.87
	bluefish	62	1828	1.62	<10.00	10.04	35.11	<55.15
	bluefish	70	2838	9.56	20.29	27.08	80.36	127.73
	bluefish	57	1566	3.36	<10.00	22.82	57.59	<90.41
	bluefish	57	1405	1.28	<10.00	<10.00	23.40	<43.40
	bluefish	60	1720	2.57	<10.00	30.70	65.43	<106.13
	bluefish	59	1749	18.01	10.15	25.00	60.52	95.67
	striped bass	56	2027	2.86	<10.00	24.67	45.21	<79.88
	striped bass	57	2104	3.12	20.29	75.01	132.94	228.24
	striped bass	64	3134	4.91	21.11	77.05	119.05	217.21
39	bluefish	78	4068	12.25	23.87	45.29	85.13	154.29
	bluefish	76	4567	26.44	23.87	40.76	90.52	155.15
	bluefish	71	3915	3.73	30.38	45.29	98.06	173.73
	bluefish	77	4644	14.35	13.02	72.46	95.91	181.39
	bluefish	50	1056	1.25	<10.00	10.74	35.26	<56.00
	bluefish	56	1500	3.36	<10.00	20.83	51.56	<82.39
	bluefish	59	1718	3.18	<10.00	11.09	23.39	<44.48
	striped bass	63	2752	5.65	39.06	153.99	267.24	460.29
	striped bass	63	2666	2.46	<10.00	36.23	65.73	<111.96
40	bluefish	59	1419	2.79	15.63	22.68	83.78	122.09
	bluefish	55	1459	0.53	<10.00	<10.00	34.31	<54.31
	striped bass	60	2274	5.83	<10.00	30.69	76.70	<117.39
	striped bass	62	2522	4.32	<10.00	27.34	56.12	<93.46
	striped bass	62	2827	3.08	12.34	47.47	121.09	180.90
41	bluefish	55	1319	1.03	<10.00	<10.00	34.38	<54.38
	weakfish	69	3648	4.11	<10.00	33.62	109.38	<153.00
	weakfish	73	3574	5.20	10.28	15.82	87.89	113.99
	weakfish	76	4050	5.20	<10.00	<10.00	<5.00	<25.00
	weakfish	32	308	5.08	<10.00	<10.00	26.20	<46.20
	weakfish	32	279	3.75	<10.00	<10.00	20.67	<40.67
42	weakfish	31	275	3.35	<10.00	<10.00	20.54	<40.54
	weakfish	32	296	4.78	<10.00	<10.00	23.64	<43.64
	weakfish	30	249	3.27	<10.00	<10.00	16.36	<36.36