2004 Monitoring Program for Chemical Contaminants in Fish from the State of New Jersey

Second Year of Routine Monitoring Program

FINAL REPORT

Report No. 06-04F

Richard J. Horwitz, Paul F. Overbeck, Jeff Ashley, David Velinsky and Linda Zadoudeh

Patrick Center for Environmental Research

Academy of Natural Sciences

NJ contract SR-04073
ANS: Project # 895

December 14, 2006

TABLE OF CONTENTS

Page

INTRODUCTION 1
Background 1
Study Design 2

SAMPLING PROCEDURES 2
Field 2
Laboratory 3
Chemical Analyses 4

RESULTS 7
Task I 7
Task II 8
Risk Assessment Based on Exceedances of FDA Action Levels 9
Shellfish Tissue Weights 12
Comparison Between the 2004 and 1998 Study Results 13

DISCUSSION 14

REFERENCES 17

FIGURES 19

TABLES 33

APPENDIX I. 77

INTRODUCTION

Background

In 1994, research on freshwater fish found mercury concentrations exceeding the risk-based health criteria established by the State. The NJDEP/Department of Health and Senior Services (DHSS) issued statewide, regional and lake-specific fish consumption advisories for two species, largemouth bass and chain pickerel. Additional data were developed and reported in ANSP (1999) and Ashley and Horwitz (2000). These data have been used to develop water quality assessments for specific waterways (see NJDEP 2004 for most current list). The state's 303d list of impaired sites (derived from the Clean Water Act) drives the development of Total Maximum Daily Limits (TMDL) and other contaminant control strategies. The results of this Routine Monitoring Program will be used to enhance waterbody assessments, to amend existing advisories or, if necessary, develop new advisories and to assist the NJDEP in evaluating trends in contaminant concentrations of these selected species. The monitoring program described here builds upon New Jersey Division of Science, Research and Technology (DSRT) fish contamination research that identified widespread mercury contamination in the fresh waters of the state, chlordane, PCB and dioxin contamination in site specific locations, and PCB contamination predominantly in several estuarine and marine fish species.

In July 2002, the Academy of Natural Sciences of Philadelphia (ANSP) began a Routine Monitoring Program for Toxics in Fish for the New Jersey Department of Environmental Protection (NJDEP). There has been a clear need for a continuous monitoring program for toxics in fish to regularly assess the status and trends of fish contamination and related consumption advisories in New Jersey waters, in order to provide current data on a variety of species and sites. Due to the large number of water bodies in the state, the sampling program is based on a rotating assessment of contamination of five regions of the state on a 5-year cycle:

1. Passaic River Region;
2. Marine/Estuarine Coastal Region.
3. Raritan River Region;
4. Atlantic Coastal Inland Waterways Region; and
5. Upper and Lower Delaware River Region.

Sampling in the Passaic Region was conducted in 2002-2003, and the results were reported in Horwitz, et al. (2004). This document reports findings of the second year of the cycle, which involved marine and estuarine fish sampled in 2004-2005.

The main objectives of this program are to provide current and more comprehensive data to the State of New Jersey on concentrations of toxic contaminants in finfish and shellfish. This program consists of two tasks. Task I of this study is the second year of the monitoring program. The objective of Task I is to provide data relevant to updating consumption advisories. Task I sampling targeted species of recreational and commercial importance in areas under current state advisory and/or in selected areas with little or no current information. Task II focuses on species in the Passaic and Raritan estuaries and adjacent oceanic waters to provide information relevant to Natural Resource Damage Claims.

A third part of the study (Task III) remains under development. The third task will analyze additional samples of organisms from the Delaware River drainage or from areas serving as reference sites for the Delaware River. If this study is conducted, the results will be reported in a separate document.

Study Design

Task I. Coastwide Routine Monitoring: Estuarine and Marine Species

Eight species of estuarine-marine fish (striped bass, bluefish, white perch, white catfish, American eel, American croaker, weakfish and porgy) were sampled. These species are either under consumption advisories on a statewide, regional and waterway specific basis for PCB and/or dioxin contamination or are regularly consumed within the state (Table 1).Individual fillets from all fish species sampled were analyzed for analytes under Task I, and that list is presented in Table 2. In addition to the chemical analytes listed, lipid content was also measured for each sample analyzed.

Task II. Tidal Passaic River and Downstream Receiving Waters (NRD)

Four species (white perch, striped bass, blue crab and American lobster) were collected and analyzed (Table 3). Fillets from all fish species were analyzed. Separate analyses of muscle and hepatopancreas tissue were done for all blue crab and lobster samples (thus, the total number of analyses of shellfish is twice the number of samples). Each crab and lobster sample was a composite of 3-5 individual crabs or lobsters in order to achieve sufficient material for analysis. The original project plan specified samples of Double-crested cormorant tissue from two locations. After initiation of the project, discussions with personnel of USFWS indicated that sufficient data on Double-crested cormorants were available. In place of these samples, additional analyses will be done. Specimens for these analyses have not been determined as of the date of preparation of this report. Lists of chemical analytes for Task II are presented in Table 3. In addition, lipid content was measured for each sample.

SAMPLING PROCEDURES

Field

Specimens were collected by standard fisheries methods and/or by legal angling methods, using an applicable State of New Jersey Freshwater or Marine Scientific Collecting Permit. Extra specimens and species of opportunity collected were retained frozen for possible future analyses.

Fish were collected by a variety of techniques as appropriate to the location, water levels and species needed. The primary techniques used were trapping (especially for eels and shellfish) and angling (especially for striped bass, bluefish, weakfish and white perch). Sample collection was supplemented by boat electrofishing (e.g., in freshwater portions of the Delaware Estuary), pound netting, gill netting and direct purchase from commercial fishermen in designated areas.. Specimens were collected both by staff of ANSP and by NJDEP personnel. All information on

specimens collected in the field was kept on numbered data sheets for each station. Field chain-of-custody forms were completed for each collection trip and were used to track transfers of specimens from other collection groups to ANSP fisheries personnel and within ANSP.

All specimens were placed on ice as soon after capture as practical. Specimens were held in stainless steel containers (pre-cleaned for each station) until processing. Within 24 h of capture (usually less), specimens selected for dioxin, PCB and pesticide analysis were wrapped in muffled aluminum foil sealed with freezer tape, labeled and placed in freezers. The specimens selected for mercury analysis were frozen in Ziploc-type (plastic) or kitchen bags. Specimens for both planar PCB and mercury analysis were wrapped in muffled aluminum foil. All specimens were labeled with both internal and external tags and held frozen until thawed for sample preparation. Samples were maintained with complete sample documentation (chain-of-custody forms, etc.) consistent with the QA/QC Plan.

In order to ensure uncontaminated samples, cleaning of the sampling gear, coolers, stainless pans and appropriate sample containers (muffled aluminum foil wrap) was done between sampling events. The procedures for cleaning sampling gear and wrapping specimens were consistent with ANSP standard operating procedures.

Laboratory

All samples were stored frozen (0°C) until processing in the ANSP laboratory. All transfers of samples were properly documented throughout transport and analysis (internal lab chain-of-custody). All laboratory equipment was properly calibrated as per each method completed. Careful cleaning of all laboratory equipment and instruments using the appropriate soaps, solvents, acids, and double deionized water (DDW) was done throughout the program.

Tissue preparation of fish followed common preparation methods for consumption. The selected fish specimens were filleted using clean methods for both trace metals and organic contaminants as outlined in EPA (1995; ANSP SOP-14-12r4). The samples were filleted with skin off using either titanium or stainless steel utensils on glass plates. All fish samples were individual fillets, typically the left side fillet, with the remains (right side, remaining carcass and head) retained for archival material. The archived sample material (including the extra sample homogenate not analyzed) will be retained by ANSP for a period of one year following project final report submission.

Tissue preparation of shellfish (blue crab and American lobster) included extractions of separate muscle and hepatopancreas tissue. Muscle tissue included claw tissue (both species), tail tissue (lobster) and backfin tissue (blue crab). Hepatopancreas material was extracted and preserved and analyzed separately. To avoid laboratory contamination and cross-tissue contamination, handling methods, holding methods, and tool use and cleaning were done analogously to that for fish tissue. Shellfish samples consisted of composite tissue from a number of specimens. Sample material destined for the same composite sample were handled using the same utensils and plates without cleanup between specimen samples.

All glassware and materials coming into contact with the fish specimens were pre-cleaned with the appropriate cleaning agent (e.g., micro soap, acids, deionized water, solvents, etc) pertaining to the specific parameter or group of parameters.

Chemical Analyses

Each tissue sample was minced and tissuemized and placed into separate pre-cleaned jars (e.g., ICHEM) for trace metals and organic analysis. Chemical analysis were performed by ANSP using modified U.S. EPA and NOAA Status and Trends approved methods (ANSP SOPs P-16-84r4, P-16-111, P-16-109r1, and P-16-108). Chemical contaminants and ancillary parameters for Task I are listed in Table 2 and in Table 4 for Task II.

As part of quality assurance and quality control (QA/QC), Standard Reference Material (SRM) were analyzed as part of the QA/QC procedure. The SRM was obtained from the National Institute of Standards and Technology (NIST) or equivalent agency (see NOAA, 1992) and consisted of DORM-1, EPA SRS903, SRM 1974 (or equivalent as available). Also, additional duplicate fish tissue samples were analyzed to help assess laboratory variations and provide critical information for the assessment of both geographical and temporal trends.

All glassware and materials coming into contact with the fish was pre-cleaned with the appropriate cleaning agent (e.g., micro soap, acids, deionized water, solvents, etc) pertaining to the specific parameter or group of parameters.

Mercury

Extractions and Analyses: Strong acid digestions were performed using 10 ml nitric acid on approximately 1g homogenized wet fish material in a CEM MDS 2100 microwave digestion system. Mercury quantitation was subsequently accomplished using a Perkin Elmer Fimms 400 Cold Vapor AA. Calibration blanks, intercalibration verification samples, and instrument duplicates were analyzed to insure instrument performance and accuracy.

Polychlorinated Biphenyls, Organochlorine Pesticides and Polybrominated Diphenyl Ethers

Extractions and Analyses:

Task I. All methods employed were similar to those used in previous monitoring studies for the State of New Jersey and the Delaware River Basin Commission. Homogenized fish samples were stored frozen until extraction. For extraction, samples were thawed and 2 g of the homogenate were sub-sampled using a stainless steel spatula. An additional 2-5 g sub-sample was taken for moisture analysis. Approximately 30 g of Na2SO4 (previously extracted with hexane using a Soxhlet extractor and dried) was added to the sub-sample to eliminate water. The dried sample was then placed in a glass thimble and extracted using a Soxhlet extractor with ca. 200 ml dichloromethane (DCM) for a minimum of 18 h. The extracts were then sub-sampled for gravimetric lipid determination. For this, a known volume of extract was transferred to a pre-weighed aluminum pan. The solvent was evaporated at 110 ⁄C for at least 24 h. The residue remaining (lipid) was weighed and percent lipid calculated. Lipids were removed from sample extracts by gel permeation chromatography (GPC) using DCM as the mobile phase. The

collected fraction containing analytes was concentrated by roto-evaporation and a N2 stream. Solid-liquid chromatography using florisil was performed as an additional clean-up step. Using this technique, PCBs (as well as heptachlor, nonachlors, and DDEs) were eluted from the chromatographic column containing florosil using petroleum ether (F1 fraction). The remaining organochlorine pesticides were eluted using 50:50 petroleum ether and dichloromethane (F2 fraction).

Congener-specific PCBs and organochlorine pesticides were analyzed using a Hewlett Packard 5890 gas chromatograph equipped with a 63Ni electron capture detector and a 5% phenylmethyl silicon capillary column. The identification and quantification of PCB congeners follows the '610 Method' (Swackhamer, 1987) in which the identities and concentrations of each congener in a mixed Aroclor standard (25:18:18 mixture of Aroclors 1232, 1248 and 1262) were determined by calibration with individual PCB congener standards. Congener identities in the sample extracts were based on their chromatographic retention times relative to the internal standards added. In cases where two or more congeners could not be chromatographically resolved, the combined concentrations were reported. In conjunction with the Geochemical and Environmental Research Group (GERG) at Texas A&M University (contact: Dr. Terry Wade), four of the dominant co-planar PCBs were measured on samples. All methods were similar to previous monitoring studies for the State of New Jersey and the Delaware River Basin Commission. Organochlorine pesticides (OCPs) were identified and quantified based on comparisons (retention times and peak areas) with a known calibration standard prepared from individual compounds. Quality assurance and control measures were included at a frequency of 10% of the total number of samples. These measures included: evaluation of surrogate recoveries, calculation of blank-based detection limits, use of NIST standard reference materials and involvement in NIST's annual inter-laboratory comparison to assess ANSP's accuracy and precision in quantifying PCBs and OCPs, duplicate analysis, and spike recoveries.

Task II. Collections of targeted species from each region included in the monitoring plan were analyzed for those chemical analytes identified in Table 4. Analytical methods were selected to be comparable to those used in other Natural Resource Damage Assessments. As a result, the list of non-coplanar PCB congeners for Task II (Table 3) differs somewhat from that for Task I (Table 2). The same coplanar PCBs were measured in both tasks.

Total mercury was analyzed using methods that were used in previous State of New Jersey projects and the laboratory was certified by the State of New Jersey (Office of Quality Assurance) in FY05. Samples for organic contaminant analysis were done by the Geochemical and Environmental Research Group (GERG) at Texas A&M University (contact: Dr. Terry Wade). This group is one of only a few labs certified by the US Fish and Wildlife Service for damage assessment studies and over the past 10 years has been a National Status and Trends laboratory for NOAA. Samples were analyzed for various compounds including PCBs, OC pesticides, dioxins and furans. Specific co-planar PCBs were extracted through carbon columns to separate the planar from the co-planar PCBs and analyzed via HRMS (GERG SOP-9302). All data submitted to and generated by ANSP were rigorously documented and underwent external quality assurance by the QA Officer and staff.

The samples prepared for dioxin analysis were sent to the Texas A&M University, Geochemical

and Environmental Research Group (GERG), for analysis.

Finally, a subset of extracts from the PCB analyses was used to quantify polybrominated diphenyl ethers (PBDEs), which are components of flame retardants. Twenty-six conformations of PBDEs (Tables 2 and 4) were analyzed in extracts using gas chromatography (GC) with a mass spectrometer operated in negative chemical ionization mode (GC/ECNI-MS) using a 0.25 mm x 30 m fused silica capillary column coated with a 5% phenyl methylpolysiloxane column (DB-5MS; 0.25 μm film thickness). One column injection was employed in the GC and the injection port was set to track the oven temperature. The oven temperature program was: 80°C for 2 min followed by a temperature ramp of 12°C/min to 140°C and followed by a temperature ramp of 5°C/min to a final temperature of 280°C which was held for an additional 20 min. The auxiliary temperature and transfer line were maintained at 280°C. For all brominated flame retardant analytes, ions 79 and 81 (bromide ions) were monitored as quantitative and qualitative ions. Analysis of PBDEs was performed by Dr. Heather Stapleton of the National Institute of Standards and Technology.

All data and information obtained during the course of this project were kept by the laboratory in either computerized or handwritten form (i.e., notebooks and field sheets) and are available for inspection on request. Field data sheets were used throughout this project. All data were kept on IBM type computers (both hard drives and backed up on fixed media, such as nightly backup from the ANSP server). The format was on an EXCEL type spreadsheet or ACCESS database. Reporting of the data was done at specific points during the study.

Detection Limits and Qualified Data

Detection limits were defined by the mean plus 3 standard deviations of measured concentrations in blanks. Measured sample concentrations were qualified as non-detect (ND) or below-detection-limit (BDL) based on these detection limits, and these qualifiers are contained in the final data package. For data summaries (e.g., mean concentrations among groups of samples) of Task I samples, the BDL and ND values were censored, i.e., both BDL and ND samples were treated as 0 concentration. For Task II samples, ND concentrations were treated as 0, and the measured concentrations of all other samples were used, even where BDL. While these measured BDL concentrations are not meaningful for interpretation of individual samples, use of the measured concentration reduces potential biases in forming group means. The same approach was used in calculating total concentrations of groups of compounds (e.g, total PCBs, total DDX, total chlordanes, total chlorobenzenes). Thus, for Task I samples, the totals of a class of compound are the sum of all quantified compounds within that class. For Task II samples, the totals are the sum of all measured concentrations of compounds within that class. Congeners which are BDL typically contribute relatively little to the sum of compounds within a class, so the difference in treatment of the BDL data has little effect on total concentrations in most cases. For PCB analyses of Task I samples, the total PCB concentration based on censored data (BDL and ND values treated as 0) were 93.46-99.99% (median 99.43%, mean 98.50%) of the uncensored data (based on all quantitated values, including BDL values) for all but three samples. These three samples were those with the lowest total PCBs, for which almost half of the congeners were BDL or ND. For these samples, the censored and uncensored PCB totals were

7.1 and 13.3 ng/g (sample F-1575), 13.7 and 20.3 ng/g (sample F-1604), and 15.3 and 21.8 ng/g (sample F-1585).

All samples analyzed for total PCBs, DDX, chlordanes, heptachlor epoxide, and chlorobenzenes (analyzed in task II samples only) under both Task I and Task II exhibited concentrations that were above the detection limit (Table 5). There were relatively high proportions of BDL or ND samples for planar PCBs (Task I samples), heptachlor, endrin, aldrin, and chlorpyrifos (Task II samples only).

RESULTS

Task I

Summaries of Task I results are presented in Tables 6-13. Patterns of average, minimum and maximum concentrations are directly relevant to risk assessment and can highlight potential differences among sites or species. These patterns also show occurrence of high values of several contaminants in the same individuals. For example, one eel from Delaware River and several bluefish from Raritan Bay showed high values for a number of the organic analytes. A detailed comparison of concentrations across species and sites would require analysis of variation within and among groups and relationships between concentrations and relationships with factors like fish size and lipid content. Such analyses are beyond the scope of the current study.

Total PCBs (Table 6) varied across sites and species, with the highest values (greater than 700 ng/g wet weight) in an individual American eel (Delaware River), a striped bass (Cape May), a weakfish (Raritan Bay) and five bluefish (four from Raritan Bay and one from the Atlantic Ocean). Lowest values were found in smaller fish (Atlantic croaker from Delaware Bay and a weakfish from Barnegat Bay) and some relatively small American eels (one from the Mullica River and one from the Navesink River), although relatively low concentrations were also seen in a variety of other fish (Table 6). The highest measured concentrations of planar PCBs (Table 7) were seen in bluefish from Raritan Bay and the ocean and in one striped bass caught at Cape May.

Measurements of PBDEs (Table 7) were made on selected groups of specimens. These data are important, since there are relatively few data on this contaminant. PBDEs were detected in all samples. The highest values were found in American eels from the Delaware River and bluefish from Raritan Bay.

The highest concentrations of DDX (sum of DDE, DDD and DDT) were seen in one American eel sample from the Delaware River (about 1400 ng/g) and one American eel sample from the Navesink River (about 500 ng/g). Other values were less than 250 ng/g (Table 8). In addition to the two eel specimens mentioned above, higher values were seen in bluefish from Raritan Bay, white catfish from the Delaware River,and eels from various sites. Total chlordanes (Table 8) showed similar patterns as DDX, although chlordane concentrations were generally lower. The highest chlordane concentrations were seen in the same two American eel specimens which showed high DDX concentrations, as well as bluefish from Raritan Bay. In addition, some

American eels also showed relatively high concentrations of DDX compared to the other fish in the Dataset.

Mercury concentrations (Table 9) were mostly below 0.4 µg/g. The highest concentrations were seen in larger bluefish and striped bass from various locations, and in one American eel collected in the Delaware River.

Concentrations of endrin (Table 10) were generally low, with a number of ND or BDL samples. The five highest concentrations (1.4-3.3 ng/g wet weight) were seen in the five American eel samples from Barnegat Bay near Toms River. The next highest concentrations were seen in a few bluefish, striped bass and weakfish from various sites, and a single American eel sample from the Delaware River. Concentrations of BHC (Table 10) were also generally low. A number of ND and BDL measurements of total BHC (Table 10) were also seen. The highest total BHC concentrations were noted in bluefish collected from Raritan Bay and Atlantic Ocean sites and a single American eel from Shrewsbury River. A number of ND and BDL measurements of total BHC were also identified in this data set.

Concentrations of aldrin (Table 11) were highest in an American eel from the Delaware River, several bluefish from Raritan Bay, and an American eel from the Navesink River. Concentrations of dieldrin, heptachlor and heptachlor epoxide (Tables 11-12) showed a similar pattern as that of aldrin, with highest concentrations in an American eel from the Delaware River and some bluefish from Raritan Bay. Concentrations of heptachlor and heptachlor epoxide were also relatively high in some American eel samples from several locations (Navesink and Shrewsbury Rivers and Barnegat Bay), white catfish from the Delaware River, and striped bass and bluefish from various sites. Heptachlor showed a lower range of concentrations among sites, while heptachlor epoxide was more variable. Heptachlor epoxide showed much higher values (greater than 16 ng/g) in three individuals (American eels from Navesink and Delaware Rivers) than in other samples (all less than 9 ng/g). Endosulfan (Table 13) also showed highest concentrations in American eels from coastal rivers (especially Navesink and Shrewsbury rivers) and bluefish from Raritan Bay. Lindane (Table 13) showed a number of ND and BDL samples; the highest measurements were found in one eel from Delaware River and bluefish from Raritan Bay and Delaware Bay.

Task II

Summaries of Task II results are presented in Tables 14-25. Task II samples were taken over a more limited range of sites than the Task I samples, and the Task II concentration data do not show as great among-station differences as the Task I samples.

The Task II data for shellfish (blue crab and American Lobster) generally revealed some of the highest chemical concentrations identified in this project. For almost all of the organic compounds, concentrations were much higher (often 10-100 times higher) in shellfish hepatopancreas tissue than in the corresponding muscle tissue. This pattern is consistent with the much higher lipid content of hepatopancreas than muscle tissue. Lipid-normalized concentrations (e.g., PCBs Table 14) in muscle are much nearer hepatopancreas concentrations than non-normalized data. However, dioxin hepatopancreas concentrations were relatively low

and more similar to muscle concentrations at several sites (Eastern and mid-lower Raritan Bay and Upper NY Bay), although hepatopancreas lipid percentages were much higher than muscle lipid percentages for these samples (Table 19). Mercury concentrations in shellfish muscle samples (which were generally low) were usually similar to or higher than the corresponding hepatopancreas concentrations. Mercury, which is not lipophilic, tends to bind to the sulfur compounds in muscle tissue and therefore preferentially accumulates in the muscle tissue.

PCB concentrations (Table 14) in shellfish hepatopancreas were generally high, particularly in crabs from several stations, such as Arthur Kill, Hackensack River, Shooters Island, Passaic River and western Raritan Bay. Concentrations of PCBs were high in fish tissue samples from the Hackensack River, as well. Concentrations of DDX (Table 16) were highest in the blue crab samples from Arthur Kill and Newark Bay at Shooters Island. There was less variation in total chlordane concentrations among sites, although samples from the Hackensack River, Passaic River and Shooters Island showed the highest concentrations. Tetrachlorobenzene (TCB) concentrations in shellfish were highest at the Hackensack River, but were also relatively high in the samples from the lower Passaic River and Newark Bay (Table 17). Dioxins and furans (Tables 18-20) were highest in blue crab samples from the Hackensack River, Passaic River and Newark Bay sites. Endrin (Table 22) was not detected in shellfish in a number of samples; endrin was found mainly in blue crab samples from the Arthur Kill, Newark Bay and the Passaic River at Kearny. Heptachlor (Table 24) was found in highest concentrations in blue crabs from Newark Bay Shooters Island, and the Arthur Kill, while the heptachlor epoxide concentrations were highest in blue crabs collected in the Passaic River at Kearny

In general, the Task II database generated though this project indicates that hepatopancreas and muscle tissue may be most useful for different purposes. The blue crab (and to some degree the American lobster) hepatopancreas tissue concentrations appear to be the most useful for among station comparisons of most organic contaminants, because of the range of concentrations and relatively high frequency of detection and quantifiability. In contrast, the muscle concentrations may be more useful for human health risk assessment since these are the primary tissues consumed, although some people do consume the hepatopancreas.

Risk Assessment Based on Exceedances of FDA Action Levels

The FDA nationally promulgates guidelines for the consumption of fish and fishery products by issuing action limits. The primary purpose of these limits is to represent the point at or above which the administration will take legal action to remove products from the market. While fish caught by recreational anglers do not fall under FDA purview, the FDA limits are often used as a benchmark for the minimum concentration above which ingestion is not recommended. The US EPA and individual states, including New Jersey, have promulgated other action limits. These are often based on risk assessments, may vary with target population and may recommend frequency of consumption rather than setting a single “do not eat” level. These US EPA and state action levels are often lower than those of FDA. US EPA (2004) defines screening values as “concentrations of target analytes in fish or shellfish tissue that are of potential public health concern and that are used as threshold values against which levels of contamination in similar tissue collected from the ambient environment can be compared.” For comparison, screening

values (SV) for recreational fishermen (SVrf) are used below (Table 5-4 in USEPA 2004). SV for different groups depend on the balance between different consumption rates and lower body weights of children. For noncarcinogens, relationships between SV for different groups are more complex, since reference doses (e.g., related to developmental or reproductive effects) differ among groups as well.

Mercury

The FDA action limit for total mercury in fish tissue is 1 µg/g on a wet weight basis (or 1 ppm) and no sample from Task I or Task II exceeded this limit. New Jersey has used risk assessment to assign consumption advisories for high and low risk groups in the population. For each risk group, categories may be "no restrictions," "1 meal per week," "1 meal per month," or "do not eat." For the high risk group, some restriction would apply to every Task I fish, with the majority of fish in the "1 meal per month" and three that would be at "do not eat" (one bluefish from the Atlantic Ocean and two from Raritan Bay). For the low risk groups (or general population), 13 fish species would be in the "1 meal per week category"(mainly bluefish from the Atlantic Ocean and Raritan Bay, and one striped bass and one American eel), and the rest would have no applicable restriction. For fish in Task II, one white perch from the Hackensack River would be in the "1 meal per week" group for high risk individuals. Since the advisories are based on meal quantities, advisories would differ for shellfish muscle and hepatopancreas.

PCBs

The US FDA "do not eat" limit is 2,000 ng/g for total PCBs. For this project, one American eel sample (from the Delaware River) exceeded this limit. The hepatopancreas concentration exceeded this for 22 blue crabs and 2 American lobster samples. These limits may not be relevant for hepatopancreas samples, since these would be consumed in different amounts than muscle tissue. Furthermore, many states and organizations recognize that this limit may be too high and use lower limits. Fifteen additional Task II sample (one American lobster hepatopancreas, three white perch and eleven blue crab hepatopancreas samples) exceeded one-half of the FDA action limit (1,000 ng/g). Three additional Task I samples (two bluefish from the Raritan Bay at Port Monmouth and a striped bass from Cape May) also exceeded 1,000 ng/g.

The NJDEP has developed a set of risk-based consumption advisories for total PCBs (Post, et al. 2001). Consumption advisories are based on different cancer risk levels (Appendix I), non-cancer risks, and distinct advisories are issued for different groups at risk. NJ currently uses a cancer risk of 10^{-4} (G. Buchanan, pers. comm.) defined for two risk groups, the general population and the high risk group (children, pregnant women and women of child-bearing age). The PCB consumption advisory for this last group (children, pregnant women and women of child-bearing age), however, is not based on cancer risks, but is based on developmental and reproductive As with mercury advisories, these range from "do not eat" to maximal recommended frequencies of consumption ("once per year," "once per 3 months," "once per month," or "one meal per week"). The study found a general correspondence between the advisories for cancer risk and risk for high risk groups (children, pregnant women and women of

child-bearing age) based on developmental and reproductive endpoints. However, intermediate frequency consumption advisories ("once per month" or "once per 3 months") are not recommended for the developmental and reproductive endpoints, to protect against single high dosages which might be allowed under these intermediate consumption frequencies.

Some form of consumption advisory would be appropriate for 108 of the 109 fish analyzed in the 2004 study. Based on the cancer risk of 10^{-4}, all but one fish exceeded the "one meal per week" criterion, 68% exceeded the "one meal per month" criterion, and 16% exceeded the "one meal per 3 months" criterion. Only 3 fish were greater than the "one meal per year" criterion, and no fish exceeded the "do not eat" criterion. Since species and sites varied in PCB concentration, and the study targeted sites and species with higher likelihood of chemical contamination, these proportions are not representative of the overall state fish populations. Specific consumption advisories for species and sites would require a more detailed analysis of exceedance frequencies by species and site. For the Task II fish, one specimen was in the "1 meal per week" group, and four fish were in the "1 meal per 3 months" group, based on 10^{-4} cancer risk.

Chlordane

The US FDA has set an action limit of 300 ng/g wet weight (or 0.3 ppm) for chlordane (cis and trans forms, equivalent to alpha and gamma forms) in fish. None of the Task I samples exceeded this limit (Table 8). Fifteen Task II samples (all blue crab hepatopancreas) exceeded this limit. The SVrf for total chlordanes is 114 ng/g wet weight (based on carcinogenic effects). Three Task I fish (two American eels from the Delaware River and one American eel from the Navesink River) exceeded this limit (Table 27). Among Task II samples, an additional 13 blue crab hepatopancreas samples exceeded this limit. However, as noted above, these limits may be less relevant to hepatopancreas samples than to muscle tissue.

DDXs

Because of its bioaccumulative nature and toxicity, the US FDA has set an action limit for DDXs (sum of DDTs, DDEs, and DDDs) at 5.0 ppm (5000 ng/g). None of the Task I or Task II samples exceeded this limit. The SVrf for total DDXs is 117 ng/g, based on carcinogenic effects. Thirteen Task I samples exceeded this limit (Table 27), including American eel and white catfish from the Delaware River, and bluefish from Raritan Bay.

Dieldrin, Aldrin, Heptachlor and Heptachlor Epoxide

The US FDA's action limit for aldrin and dieldrin in fish is 0.3 ppm (300 ng/g). None of the samples in this study exceeded this limit for dieldrin and aldrin (Tables 11 and 23). The SVrf for dieldrin is 2.5 ng/g based on carcinogenic effects. Three Task I samples exceeded this limit (Table 27), the same three specimens which exceeded the chlordane limit.

Heptachlor expoxide is an oxidation product of heptachlor formed by many organisms, including humans. Based on their toxicity, both heptachlor and heptachlor expoxide action limits in food

were set by the US FDA. For fish, the two compounds, either individually or in combination, should not exceed 0.3 ppm. For this study, concentrations for all collected species fell well below the action limit (Table 6). However, the SVrf for heptachlor epoxide based on carcinogenic effects is low (4.4 ng/g). Twelve fish exceeded this limit (Table 27), including American eels from the Delaware River (4 of 5 specimens), Shrewsbury River (2 specimens), Navesink River (1 specimen), Barnegat Bay near Toms River (1 specimen), two white catfish from the Delaware River and 6 bluefish from Raritan Bay. Ninety-seven of the 115 fish specimens analyzed (84%) exceeded the more stringent limit (0.54 ng/g) for subsistence fishermen.

Organochlorine Pesticides of Concern Having No Action Limits

There are no federal action limits or consumption guidelines for foods containing benzene hexachlorides (alpha, beta, and delta BHC). For all the fish and shellfish sampled in this project, the concentrations of BHCs were very low. Lindane, another compound having no FDA fish actions limits, is used as an insecticide and fumigant on a wide variety of crops and seeds and as a means to control insect-borne diseases. Lindane is primarily comprised of the gamma isomer of hexachlorocyclohexane (γ-HCH). The SVrf for lindane is 31 ng/g. All of the specimens analyzed were below this limit. Endrin has been used as a pesticide to control insects and rodents. It is no longer produced or sold for general use in the US. To date, there are no federal consumption guidelines for foods containing endrin. The SVrf for endrin is 1200 ng/g and SV for subsistence fishermen is 147 ng/g. All of the specimens analyzed were well below this limit. Lastly, in this country, there are no federal consumption guidelines for foods containing endosulfan. The SVrf for endosulfan (I and II combined) is 24000 ng/g and the SV for subsistence fishermen is 2949 ng/g. The concentrations of the two forms of endosulfan were well below these limits in all samples analyzed.

Shellfish Tissue Weights

Consumption advisories are generally based on defining acceptable or unacceptable rates of contaminant consumption for different endpoints and different groups of consumers. The rates of contaminant consumption are based on concentration of contaminants in food, typical serving sizes and frequency of consumption. For shellfish, consumers are likely to base consumption on number of crabs or lobsters, rather than on a serving weight. In preparation of the Task II samples, tissue weights (i.e., total amount of muscle or hepatopancreas removed) and total weight of each composite, and total length (point-point length of crabs, abdomen length of lobsters) of each specimen were measured. These data can be used to estimate weights per serving of shellfish. The average weight of muscle tissue in each composite was regressed on the average total length of specimens and average total weight in each composite (Figs. 10-11). Based on the regressions, an average muscle tissue weight of a crab of typical length (about 15 cm) is 37 g, and of a typical weight (180 g) is about 33 g. For lobster, the tissue weight of a lobster of typical length (about 9 cm) is about 380 g, and of a typical weight (550 g) is about 350 g. Similarly, hepatopancreas rates are approximately linearly related to total weight or muscle tissue weight. The average hepatopancreas weight of the blue crab samples was about 7 g per crab (averaging 4.0% of specimen weight and 4.4% of muscle tissue weight), with a range of

3.4-9.9 g. The average hepatopancreas weight of the lobster samples was about 23 g per lobster, with a range of 18.5-31.2 g (averaging 4.4% of specimen weight and 7.3% of muscle tissue weight).

These relationships are derived from sample preparation and may differ from food preparation in several ways. The samples were frozen and then thawed for preparation, and some weight loss may have occurred. Samples included claw tissue (both species), and backfin meat (crab) or tail meat (lobster). Consumption of meat from other legs would increase serving weights.

Comparison Between the 2004 and 1998 Study Results

Some of the same species (American eel, striped bass and bluefish) were sampled at the same or nearby sites in the 2004 Task I study and the 1998 study (fish caught in 1998-1999). Simple comparisons of results of the two studies are presented in this section. Detailed comparisons of data trends in these years would require analysis of relationships between contaminants and factors such as fish size, sex, lipid content, time of capture, etc.

For comparison, some stations are grouped together (station-group in Tables 28-31). For example, for the 2004 study, several Atlantic Ocean sites in the central part of the state were differentiated; for comparison with 1998, these are grouped together. For several comparisons (Tables 28-29), average contaminant concentrations varied greatly between the two studies, such as higher concentrations of PCBs and DDX in oceanic striped bass and bluefish in 1998 than in 2004. However, average lipid content varied for a number of these comparisons as well. Lipid-normalization (concentration divided by proportion of lipid) was done to provide consistent comparisons (Tables 30-31). These lipid-normalized data are also presented as ln-transformed data (Table 32), to reduce effects of single large values on the means. For a sample concentration of C, the transformation is:

$$LgCLipN = \ln ((100*C/[\% \text{ lipid}]) +1),$$

which provides a value of 0 for C = 0 (i.e., C non-detect or below detection limit). The untransformed C corresponding to a ln-transformed value is:

$$100*C/[\% \text{ lipid}] = e^{LgCLipN} - 1.$$

Lipid-normalized concentrations differ markedly between surveys for a number of comparisons (Tables 30-31), in some cases reversing the trend in the non-lipid normalized data. For American eel from the Delaware River near Philadelphia, lipid-normalized concentrations of most of the contaminants were much higher in 2004 than 1998, although total BHC was lower. In contrast, data for American eels from the Mullica and Shark Rivers indicate that lipid-normalized concentrations were higher in 1998 for most contaminants, except heptachlor epoxide.

The between-year differences varied among stations for striped bass. For fish from the three divisions of the Atlantic Ocean (Figs. 1-5, Tables 29-31), lipid-normalized concentrations in 1998 were mainly much higher than (e.g., DDX, BHC, dieldrin, and endosulfan) or higher than (e.g., PCBs, chlordanes, endrin, and lindane) 2004 concentrations. For striped bass from

Delaware Bay, lipid-normalized concentrations were higher in 2004 for some contaminants (e.g., PCBs, chlordane, DDX, heptachlor, heptachlor epoxide, and aldrin), but lower in 2004 for some contaminants (e.g., BHC and dieldrin).

For bluefish, trends in concentrations in fish from the Atlantic Ocean were not as consistent among coastal regions and contaminants (Figs. 6-9, Tables 29-31). In 2004, the largest bluefish from the Atlantic Ocean was 82.5 cm, while in 1998, 11 of the 25 Atlantic Ocean bluefish were greater than this. In addition, some smaller bluefish (less than 36-52 cm total length) were analyzed to characterize possible length and age-related changes and to provide information on risk associated with consumption of smaller fish. Contaminant concentrations in Delaware Bay were much lower in 2004, but this is also likely due to the smaller average size of the 2004 fish. For Raritan River bluefish, the 1998 fish averaged larger than 2004 fish, and tended to have higher lipid-normalized concentrations. The 1998 fish from upper Raritan Bay were smaller than those collected in 2004, but also tended to have higher concentrations.

DISCUSSION

This study includes (as Task I) the second portion of the 5-year rotating routine monitoring program. The study provides relevant data for assessment of potential consumption risks and trends in contaminants. The study included a number of groups of fish (American eel, large bluefish and striped bass) that typically bioaccumulate certain organic contaminants. This is because of high trophic position (e.g., bluefish and striped bass), lipid content (especially American eel), longevity (e.g., striped bass, bluefish and American eel) and/or association with sediment (American eel). The study also investigated patterns of bioaccumulation of other size or taxa which are likely to be consumed, such as Atlantic croaker, porgy, weakfish and small bluefish. These data are relevant to risk assessment, since they include sizes and species that are targeted by fishermen.

In general, few of the Task I samples exceeded high action levels (e.g., FDA action levels for mercury, PCBs, and DDX). However, a number of samples exceeded various risk-based thresholds. In many cases, the same specimens exceeded thresholds for several contaminants. Since striped bass and bluefish are migratory, levels of contamination of larger fish reflect source concentrations over an area beyond the site of capture. For example, striped bass caught in different parts of the Atlantic coast may reflect different mixtures of fish from various source populations (Chesapeake Bay, Delaware Bay, Hudson River, etc.), as well as seasonal or physiological changes (e.g., increase and decrease in lipid) in fish as they move south in the fall. Similarly, contaminant concentrations in bluefish may reflect changes during their north-south and inshore-offshore movements. Apparent differences in contaminant concentrations among years (e.g., between the 1998 and 2004 studies) are affected by annual differences in movement, growth and physiology, as well as by changes in input or cycling of contaminants. Differences in lipid content in striped bass and bluefish between the 1998 and 2004 studies were noted, with few samples in 2004 with as high lipid levels as seen in some of the 1998 fish. The cause of this difference is not known. Seasonal lipid cycles are likely, with increases in early spring, decreases related to spring migration and spawning, and subsequent increases and decreases reflecting summer and fall patterns of migration, feeding, and metabolism. Plots of lipid content versus

collection time shows both inter-annual and intra-annual differences for striped bass and bluefish (Figs. 12-13). For striped bass in the 1998 survey, many of the high lipid fish were caught in late March through early June. These samples of spring fish with high lipid concentrations included likely pre-spawning fish from Delaware Bay in late March-early April, as well as pre-spawning fish from the Atlantic Ocean (near Sandy Hook) caught in early June. A few fish with high lipid concentrations were also caught in the fall of both 1998 and 1999. These include fish from the Atlantic Ocean, lower Delaware River and Raritan Bay. In contrast, most striped bass in the 2004 survey were caught in late fall. The lipid content of these fish was less than the higher values noted for the fall of 1998 and 1999. In the 1998 survey, bluefish were caught in the spring of 1999, summer of 1998 and fall of both 1997 and 1998. The lowest lipid values were seen in fish from June to October, and the highest values were seen in November. This probably relates to loss of lipid associated with spawning in summer and the subsequent build-up of lipids. The lipid concentrations in bluefish collected in the late fall of 1997 were higher than the concentrations seen in late fall of 1999. In the 2004 survey, bluefish were caught in the summer and fall of 2004. Summer lipid values for this species were lower than fall lipid values. The late fall values in 2004 were generally similar to those in the fall of 1999, but lower than those in 1997.

Differences in amount or types of food could also affect lipid content in predatory species. For example, changes in condition of predatory fish species have been noted in Chesapeake Bay (Uphoff 2003). Decreases in condition were first noted around 1997 and have continued. These have been attributed to decreases in menhaden populations, leading to less food consumption and/or switching to foods with different nutritional value (e.g., crustaceans and bay anchovy). Correspondingly, an increased incidence of lesions has been attributed to several diseases, which may be more prevalent in poorly-nourished fish. These lesions have been seen mainly in Chesapeake Bay fish and not in migratory fish. The observed pattern of lipid change in this study is consistent with changes in prey quality and/or quantity, but the small sample size and the confounding effects of location and fish size make this observation speculative. More information on prey populations and feeding would be needed to determine the basis of the pattern. Stomach contents were noted on 13 striped bass from the Delaware River in the 1998 study. Six of these had fish and seven were empty. One bluefish from the Atlantic Ocean contained two anchovies and one sand lance. Stomach contents were noted on 13 striped bass from the Atlantic Ocean in the 2004 survey. Eight of these were empty, two had fish (probably a blenny and an anchovy, excluding likely bait eel in one fish), and two had crustaceans (one with crab and one with mantis shrimp). Three striped bass from the Barnegat Bay Inlet and one bluefish from the Atlantic Ocean in 2004 also had empty stomachs. Stomachs was examined primarily in specimens which appeared to contain food, so the proportion of empty stomachs is probably underestimated by these samples. No lesions were noted on fish analyzed in this study.

In comparing 1998 and 2004 samples, patterns of contaminant and lipid-normalized contaminant concentrations differed in some cases. For some of the comparisons, higher concentrations were noted in fish with relatively low lipids; lipid-normalizing these data increases the difference. If contaminants occur only in lipids, occur non-selectively in different lipids, and are accumulated and depurated along with lipids, then lipid-normalization would adjust for differences in lipid content. However, lipid and feeding dynamics may complicate interpretation of lipid-normalization if these conditions are not met. For example, if lipids are metabolized, but

contaminants are retained in other tissues (e.g., remaining lipid or blood), then tissue concentrations could increase even though total body burden remained constant. In this case, lipid-normalized concentrations could increase much more than non-normalized concentrations. Contaminant concentrations within the fish body are presumably dynamic, with apparent increases as lipid or other tissue is metabolized and subsequent decrease if contaminants are depurated. Partitioning of contaminants among different lipids will also affect lipid-normalized concentrations if there is differential loss of different lipids (e.g., through metabolism or egg-laying).

Because of these combined effects of contaminant availability, fish behavior (movement and feeding), and fish physiology, it is difficult to partition causes of among-year differences in contaminant concentrations. This is particularly true of contaminants which are no longer produced or produced in small quantities (i.e., PCBs and DDT). These contaminants have typically shown large decreases in concentrations in the years following decrease in new inputs. Subsequent decreases are smaller, as contaminants cycle through the environment through geochemical, physical and biological processes. Many of the factors affecting bioavailability and bioaccumulation will show among-year variability related to weather, changes in fish and prey populations, etc. It is hard to detect small decreases in contaminants from short periods, because of these fluctuations in other factors. However, decreases may be detected over longer periods of study, short-term fluctuations in these factors are averaged out and increasing data provides increased statistical power.

REFERENCES

Academy of Natural Sciences of Philadelphia (ANSP). 1994. Preliminary Assessment of Total Mercury Concentrations in fishes from rivers, lakes and reservoirs of New Jersey. Report 93-15F. Submitted to New Jersey Department of Environmental Protection and Energy, Division of Science and Research. Contract P-35272. 92 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1999. Phase II Assessment of total mercury concentrations in fishes from rivers, lakes and reservoirs of New Jersey. Report 99-7. Submitted to New Jersey Department of Environmental Protection and Energy, Division of Science and Research. 155 pp.

Appel, K.E. 2003. Risk assessment of non-dioxin-like PCBs- report on a WHO-consultation. Freestones Env. Bull. 12(3):268-275.

Ashley, J. And R. Horwitz. 2000. Assessment of PCBs, selected organic pesticides and mercury in fishes from New Jersey: 1998-1999 Monitoring Program, Academy of Natural Sciences Report No. 00-20F. 112 pp.

Clarkson, T.W. 2002. The three modern faces of mercury. Env. Health Perspectives. 110, Suppl 1. pp. 11-23.

Horwitz, RJ, B Ruppell, S Wisniewski, P Kiry, M Hermanson and C Gilmour. 1995. Mercury concentrations in freshwater fishes in New Jersey. *Wat., Air and Soil Poll.* 80:885-888.

Horwitz, R.J., J. Ashley, P. Overbeck and D. Velinsky. 2004. Final Report: Routine Monitoring Program for Toxics in Fish. Contract SR02-064. ANS Report No. 04-06. December 30, 2004. 175 pp.

New Jersey Department of Environmental Protection (NJ DEP). 2004. NJ Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)). Water Assessment Team. NJDEP. www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/2004report.html

Post, G., G. Buchanan, P. Cohn, J. Klotz, B. Ruppel and A. Stern. 2001. Options for development of Risk-based fish consumption advisories for PCBs. Report by New Jersey Risk Assessment Subcommittee of the Interagency Toxics in Biota Committee. October 10, 2001. 4 pp.

Ratcliffe, H.E., G.M. Swanson and L.J. Fischer. 1996. Human exposure to mercury: a critical assessment of the evidence of adverse health effects. J. Tox. Env. Health. 49:221-270.

Schoeny, R. 1996. Use of genetic toxicology data in U.S.EPA risk assessment: the mercury study report as an example. Env. Health Perspectives 104, Suppl 3. pp. 663-678.

Swackhamer, D.L. 1987. Quality Assurance Plan for Green Bay Mass Balance Study - PCBs and Dieldrin. U.S. Environmental Protection Agency, Great Lakes National Program Office.

United States Environmental Protection Agency (USEPA). 2004. Guidance for assessing chemical contaminant data for use in fish advisories. Volume 1. Fish sampling and analysis. Third Edition. www.epa.gov/waterscience/fishadvice/volume1/.

Uphoff, J.H., Jr. 2003. Predator-prey analysis of striped bass and Atlantic menhaden in upper Chesapeake Bay. Fisheries Management and Ecology 10:313-322.

Watanabe, C. and H. Satoh. 1996. Evolution of our understanding of methylmercury as a health threat. Env. Health Perspectives 104, Suppl 2. pp 367-379.

FIGURES

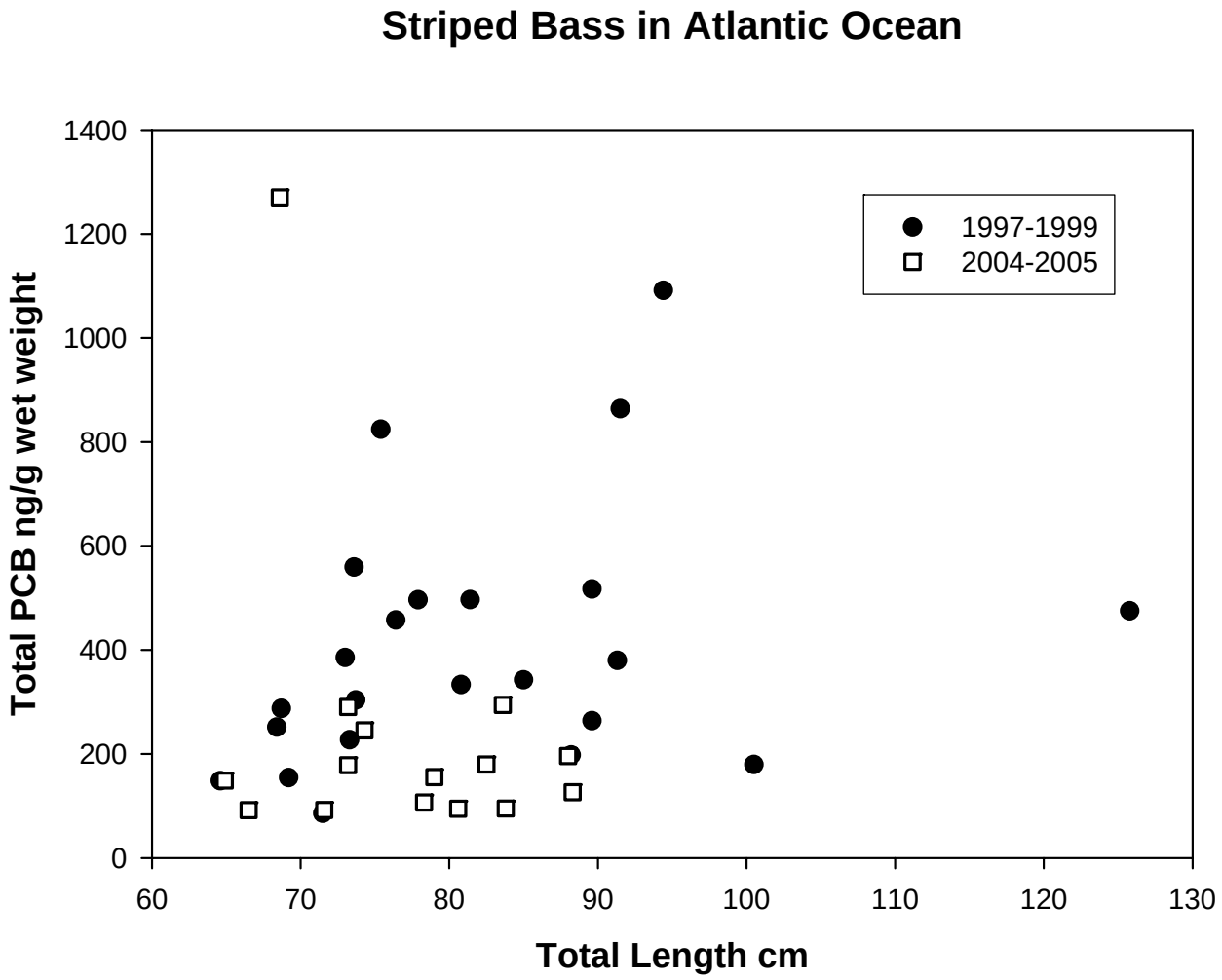

Figure 1. Comparison of total PCB concentrations as a function of total length in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

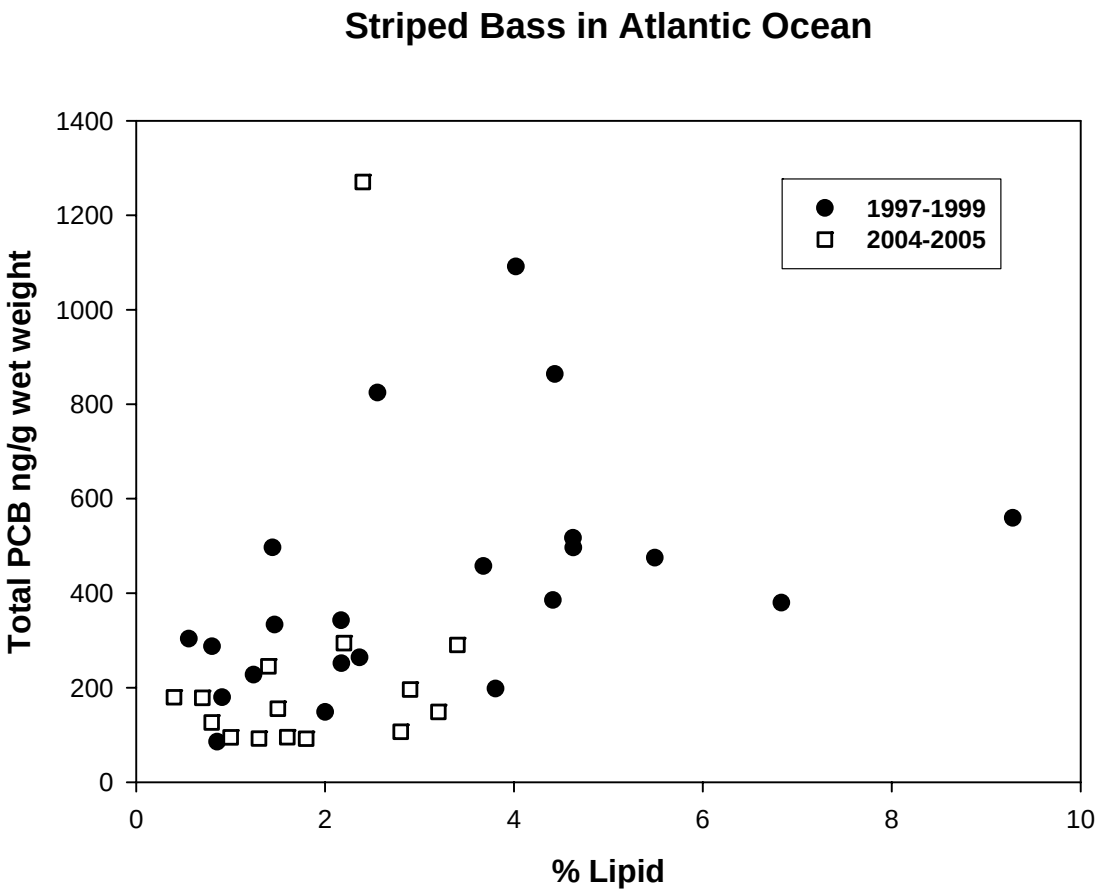

Figure 2. Comparison of total PCB concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

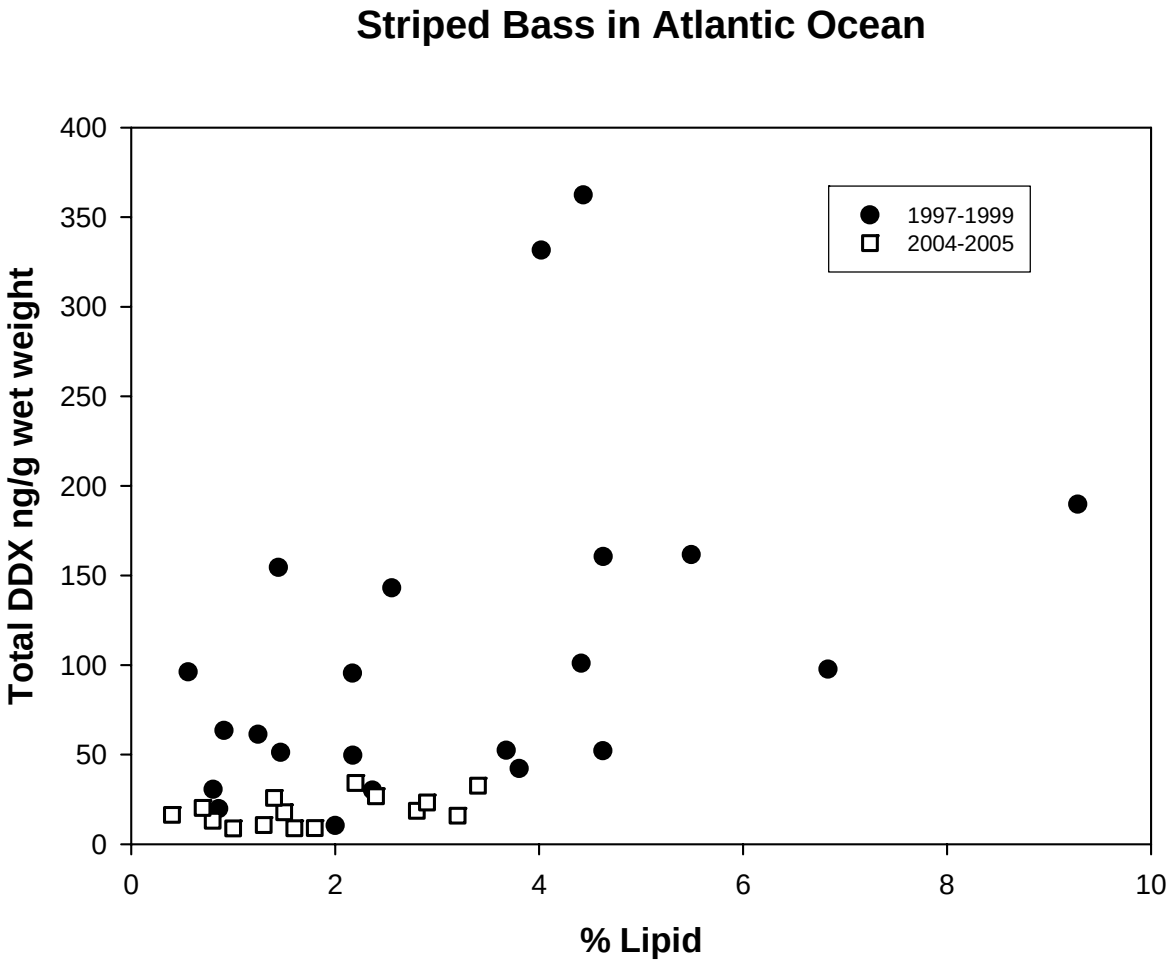

Figure 3. Comparison of total DDX concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

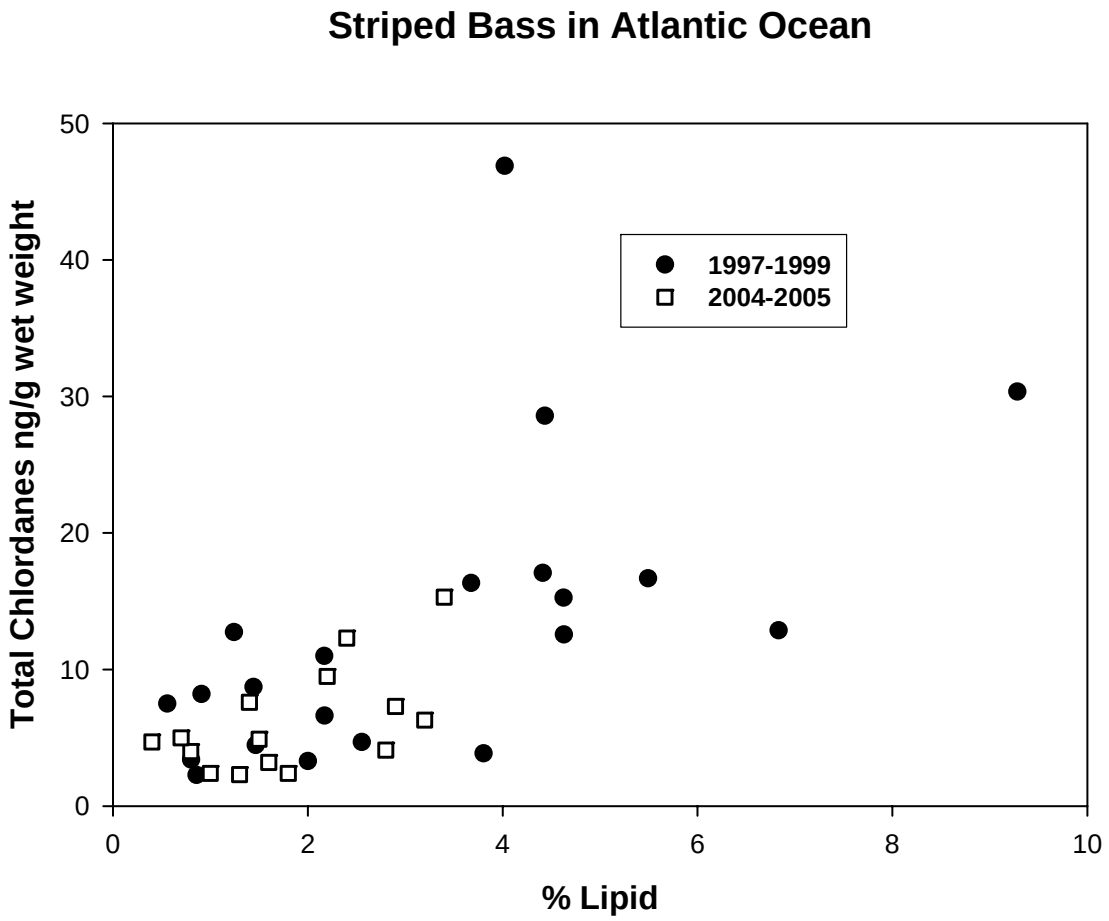

Figure 4. Comparison of total chlordane concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

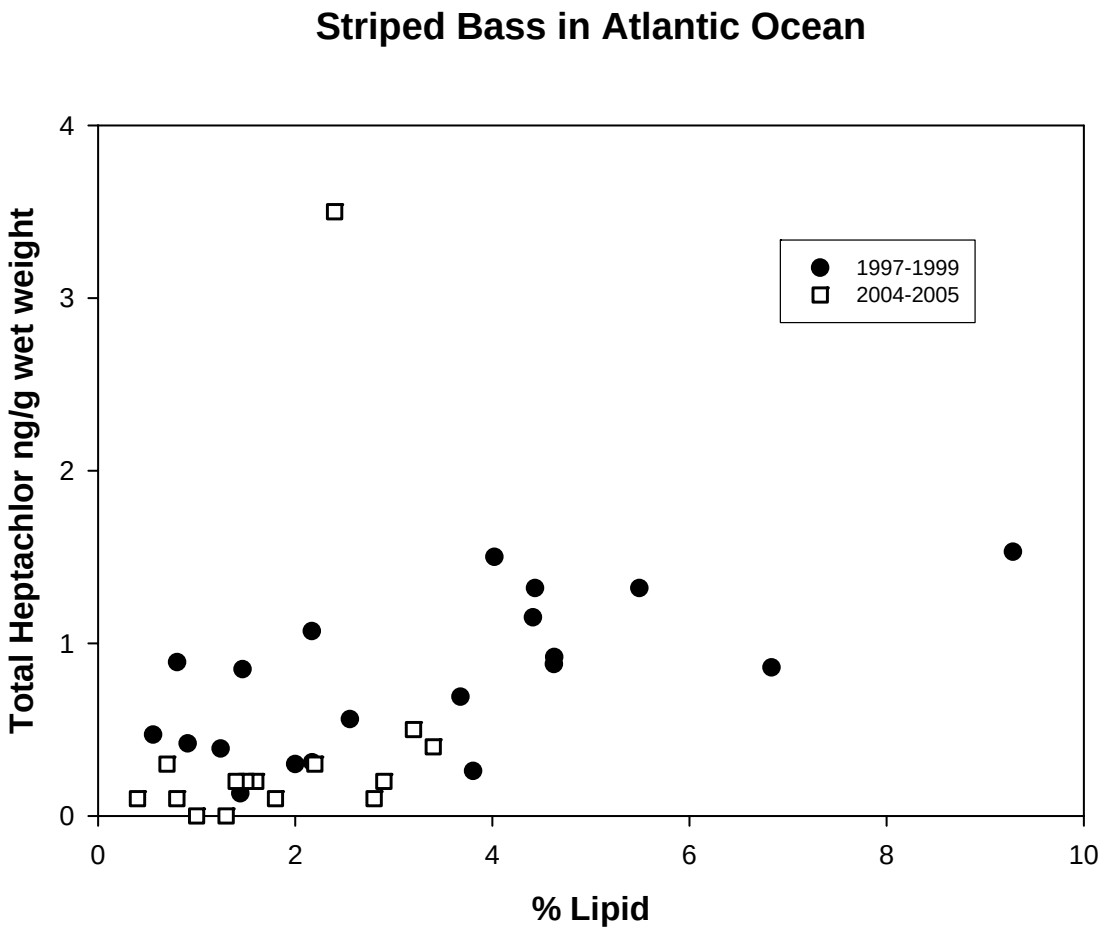

Figure 5. Comparison of total heptachlor concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

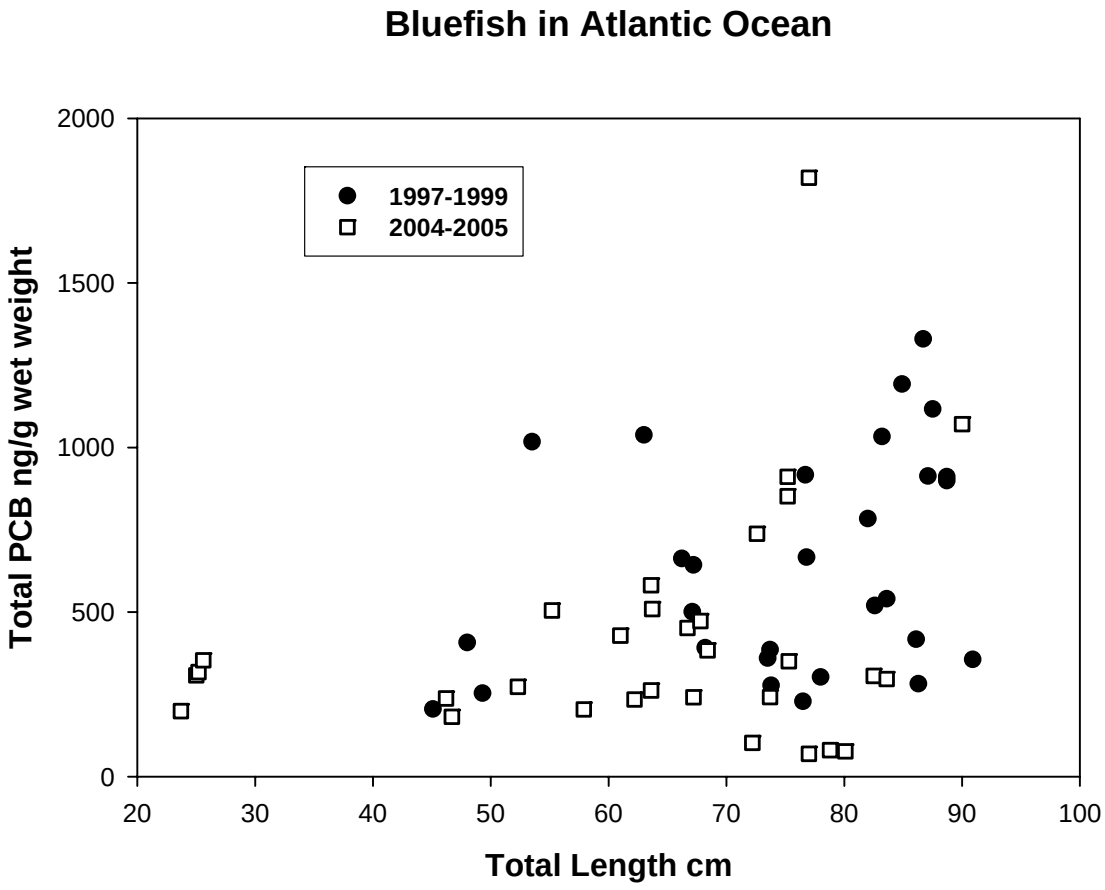

Figure 6. Comparison of total PCB concentrations as a function of total length in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

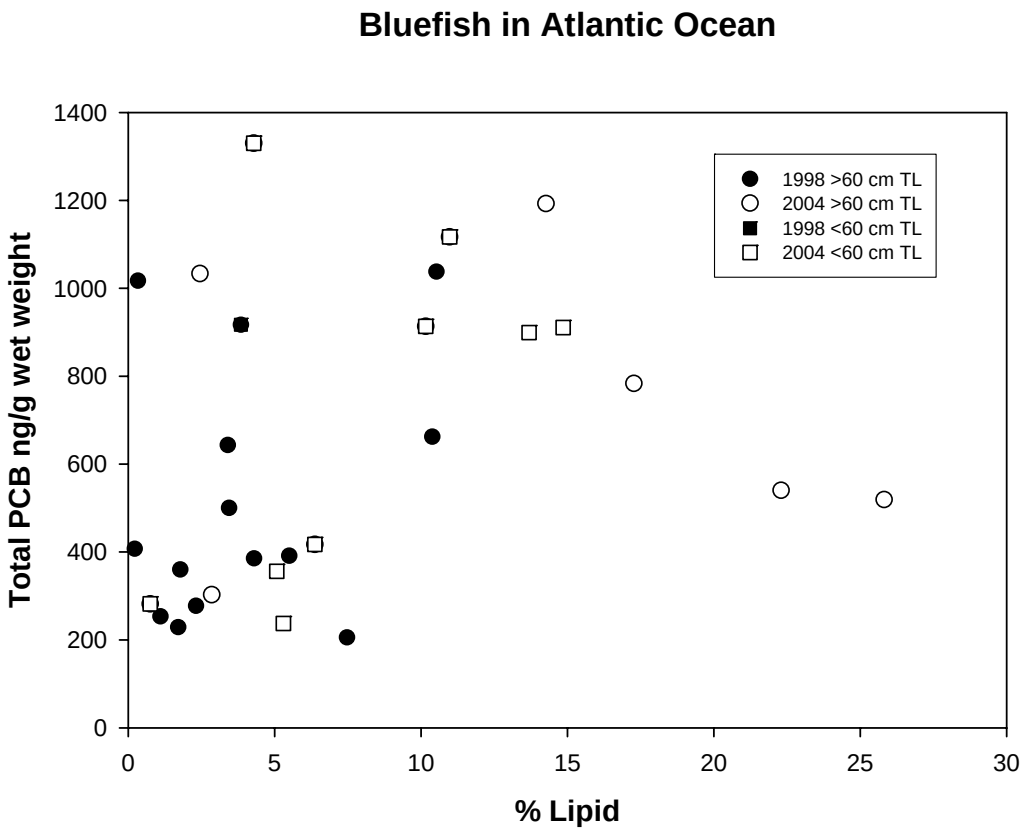

Figure 7. Comparison of total PCB concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

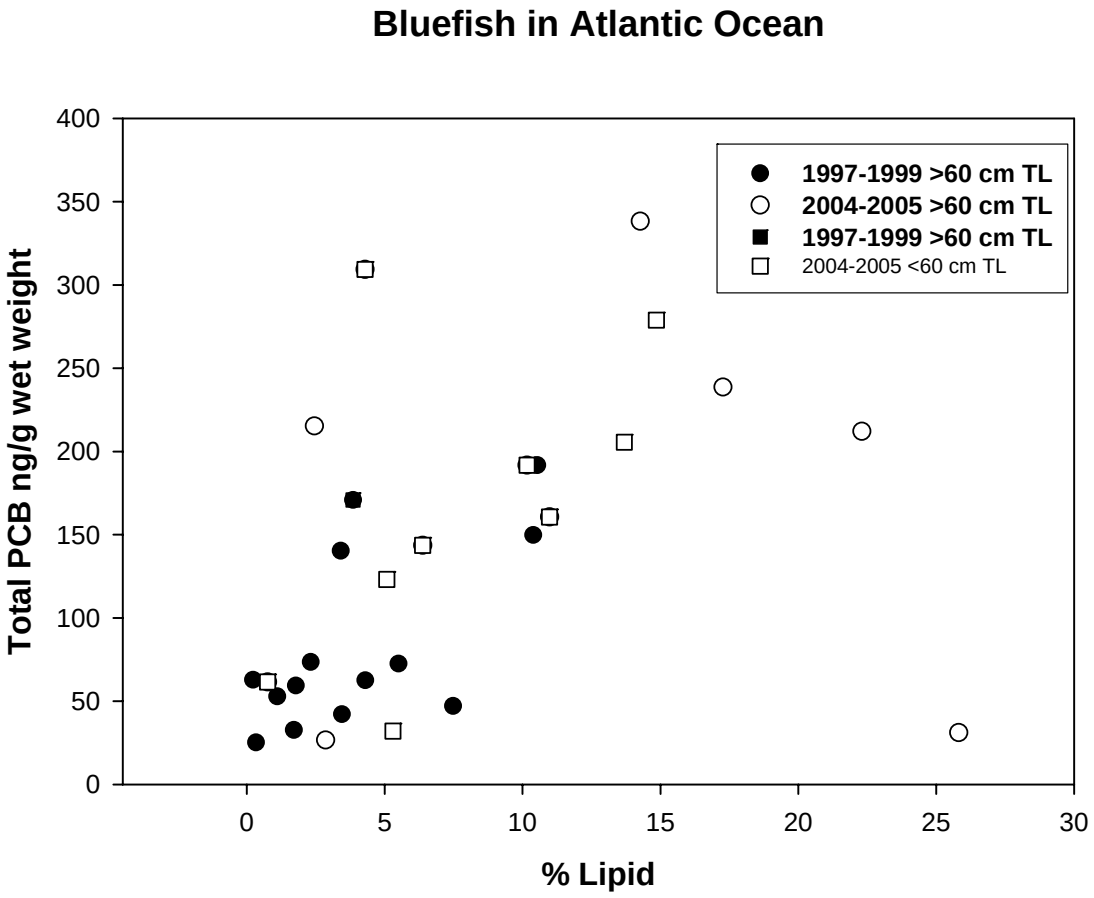

Figure 8. Comparison of total DDX concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

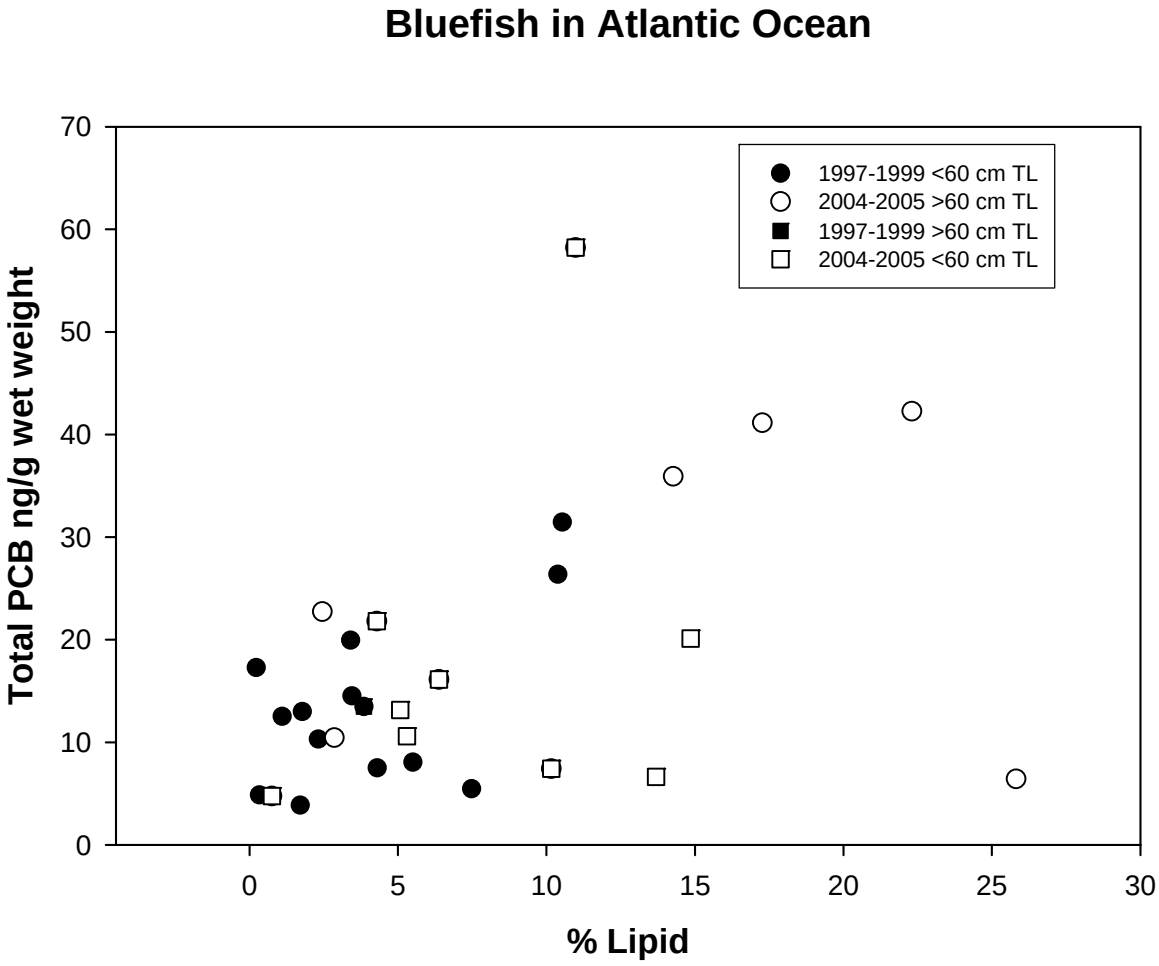

Figure 9. Comparison of total chlordane concentrations as a function of lipid content in fish from the Atlantic Ocean from the 1998 New Jersey toxics program and the 2004 routine monitoring program.

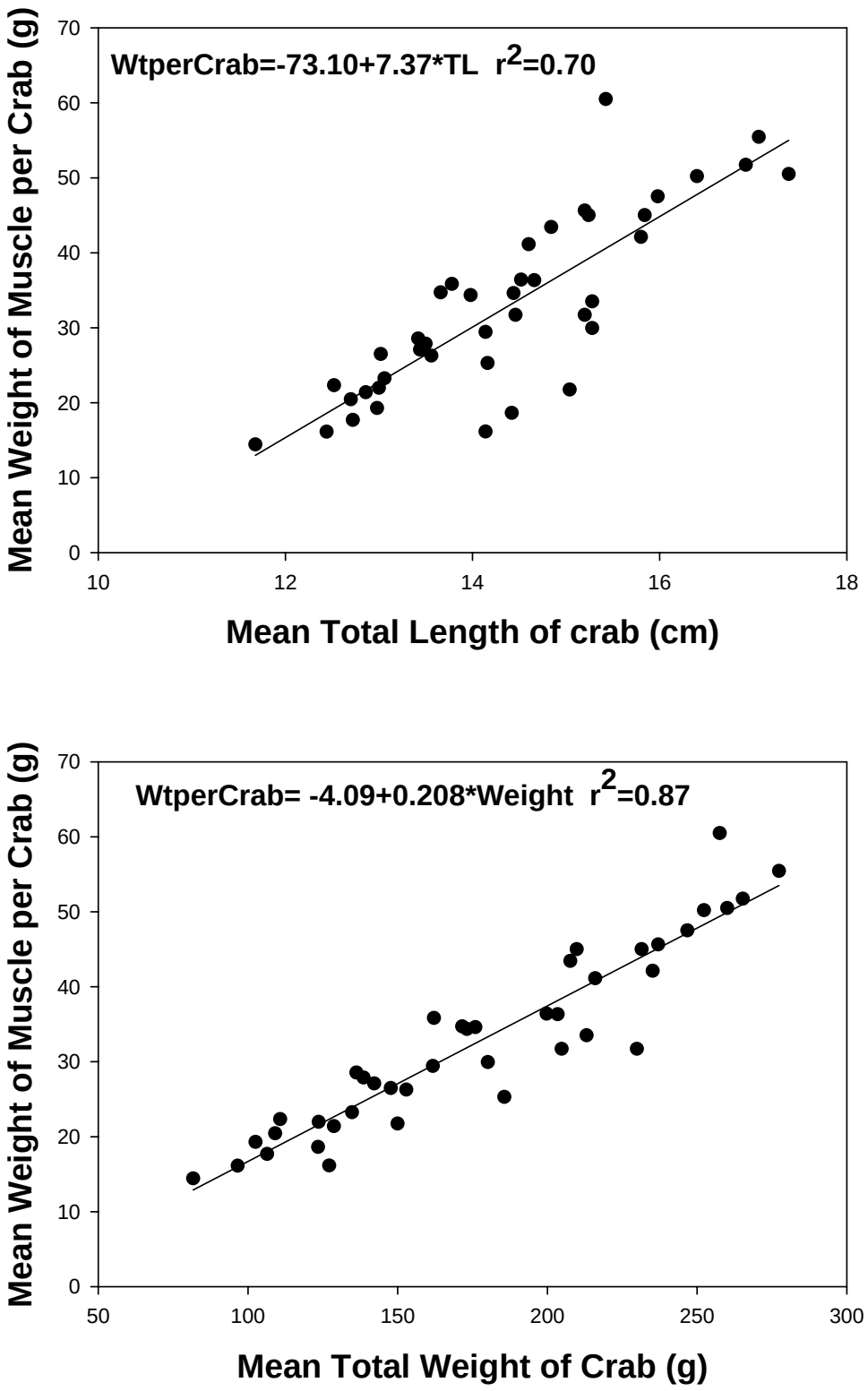

Figure 10. Relationship between weight of muscle tissue and crab length (top) and crab weight (bottom) among all Task II samples in the 2004 Routine Monitoring Program.

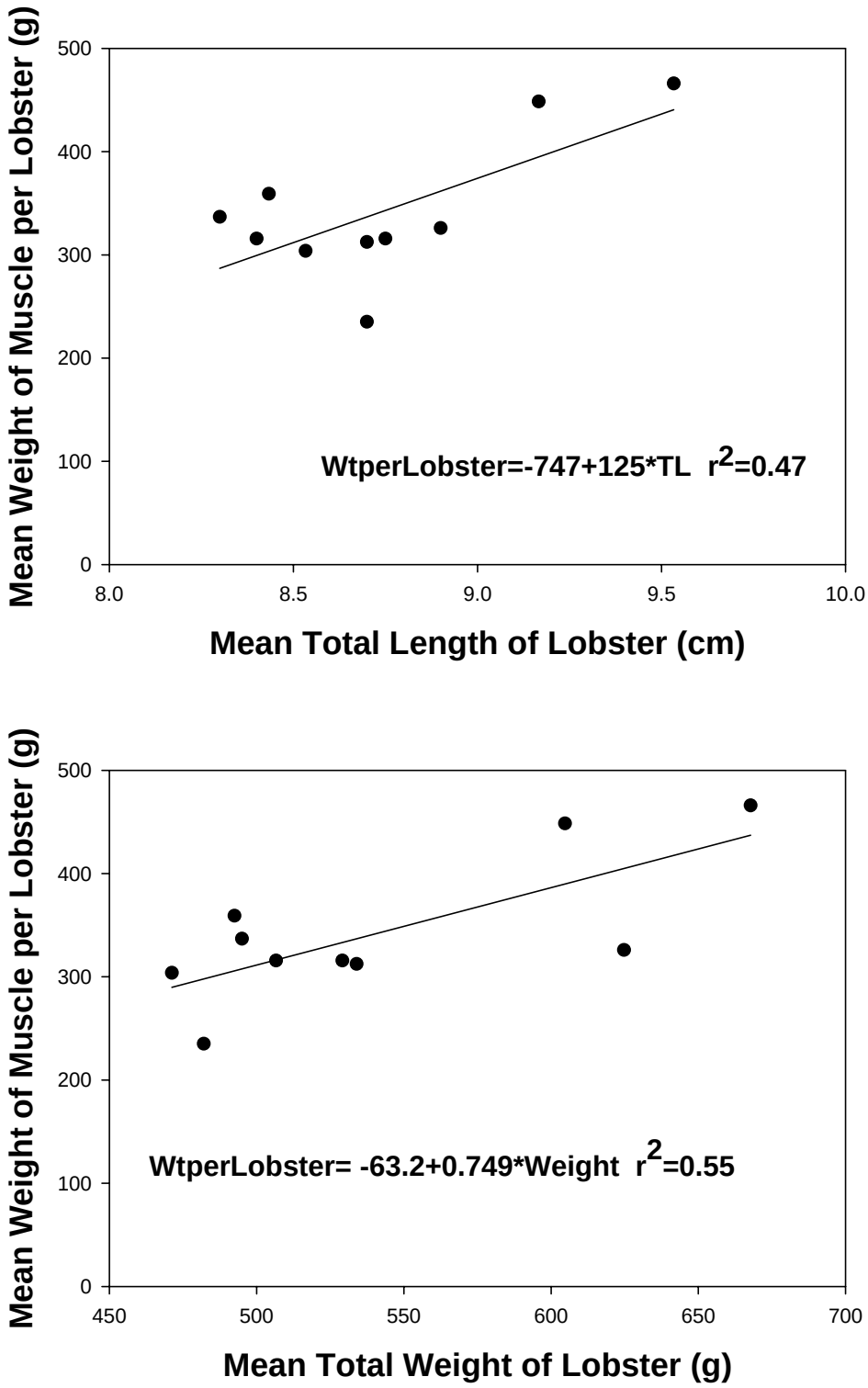

Figure 11. Relationship between weight of muscle tissue and lobster length (top) and lobster weight (bottom) among all Task II samples in the 2004 Routine Monitoring Program.

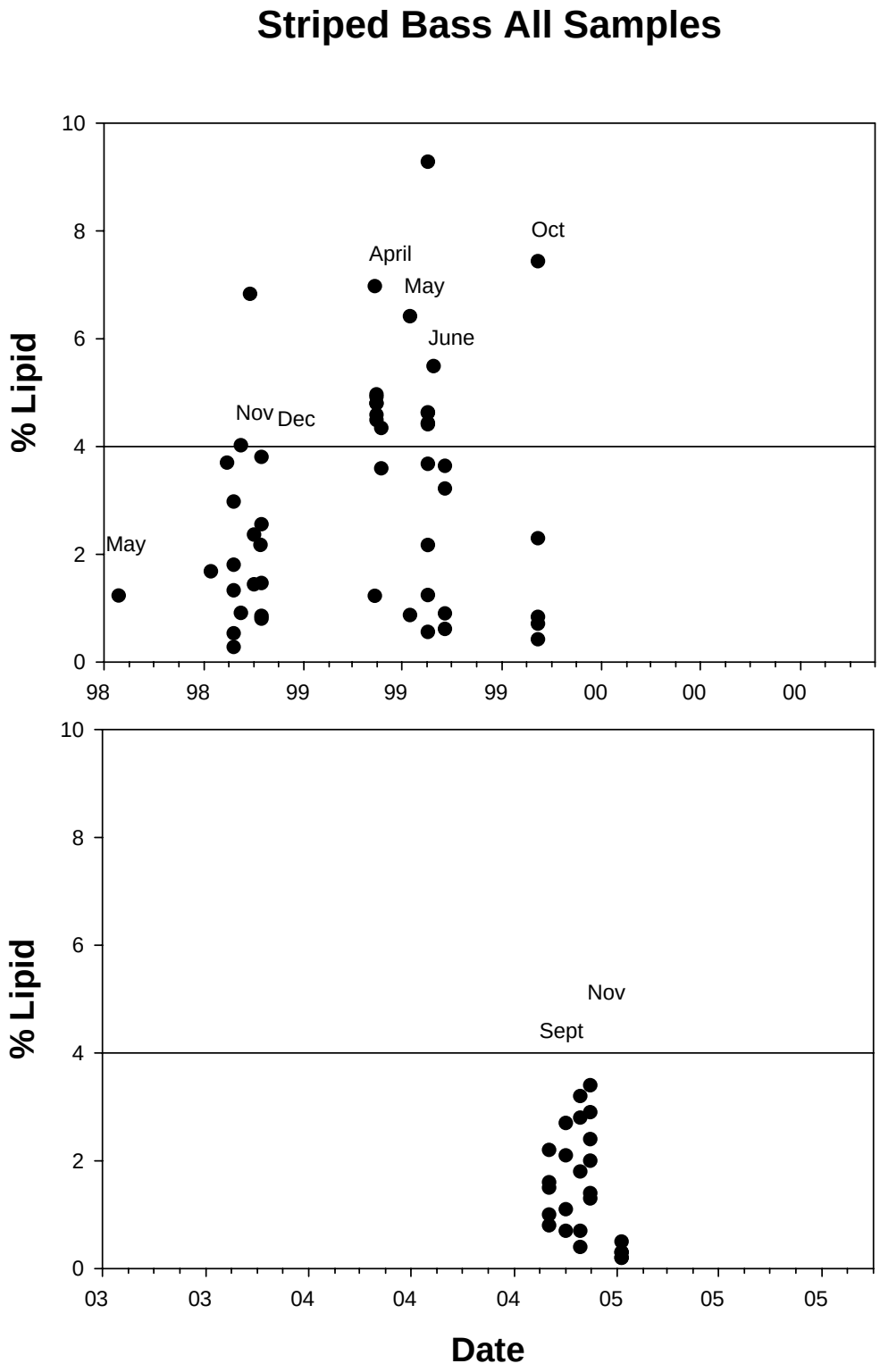

Figure 12. Relationship between sampling date and % lipid for all striped bass taken in the 1998 survey and 2004 Routine Monitoring Program. Samples include fish from the Atlantic Ocean, Delaware River, Delaware Bay, Raccoon Creek and Raritan Bay.

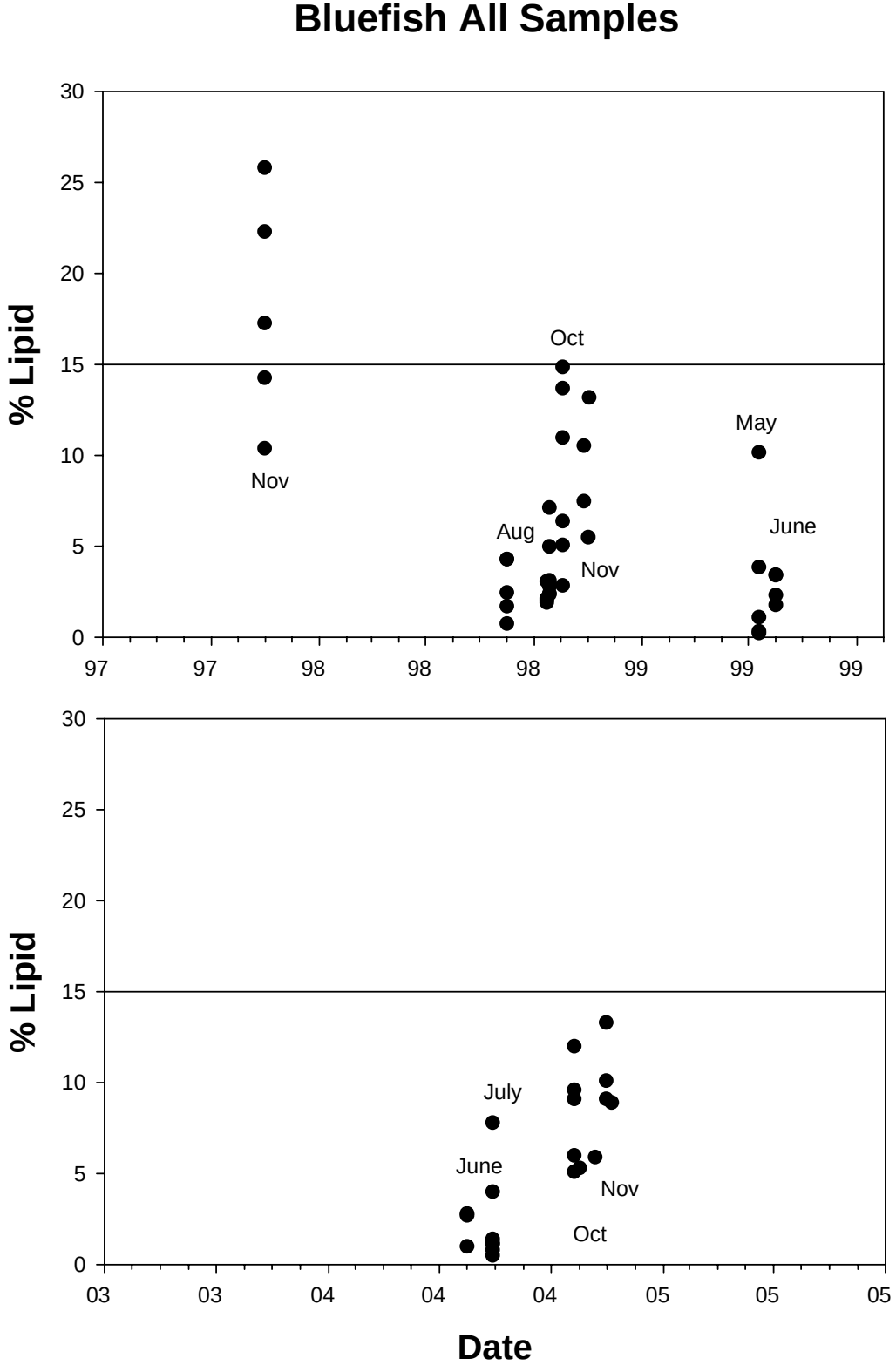

Figure 13. Relationship between sampling date and % lipid for all bluefish taken in the 1998 survey and 2004 Routine Monitoring Program. Samples include fish from the Atlantic Ocean, Delaware Bay, Raritan River and Raritan Bay.

TABLES

Table 1. Summary of data on total species collected for Task I samples from the NJ 2004 Routine Monitoring Program.

Station	Station Name	American eel	Atlantic croaker	Bluefish	Porgy (scup)	Striped bass	Weakfish	White catfish	White perch	TOTAL
AOB	Atlantic Ocean at Belmar			5						5
AOM	Atlantic Ocean Island Beach			3		1				4
AON	Atlantic Ocean Sandy Hook			2		5				7
AOS	Atlantic Ocean Sea Isle City to Cape May			5		10				15
BBTR	Barnegat Bay near Toms River	5		1		4	1			11
DBL	Delaware Bay						1			1
DBM	Delaware Bay Middle		5	3		5	9			22
DRP	Delaware River near Camden	5						5		10
MLR	Mullica River	5								5
NR	Navesink River	5								5
RBPM	Raritan Bay @ Port Monmouth (old Union Beach)			5	5		5			15
RR	Raritan @ Rt 35			3						3
RR	Raritan River @Rt 35 Victory Bridge								3	3
SBR	Shrewsbury River	4								4
SHB	Sandy Hook			3						3
SKR	Shark River	2								2
TOTAL		26	5	30	5	25	16	5	3	115

Table 2. Analyte list for Task I.

Organochlorinated Pesticides	**Polychlorinated biphenyls[1]**					
BHC (alpha, beta, delta) and Lindane	1	31,28	74	134,144	185	208,195
Heptachlor	3	33,21,53	70,76	107	174	205
Heptachlor epoxide	4,10	22	66,95	149	177	206
Chlordanes (gamma and alpha)	6	45	91	118	201,171	207
Nonachlors (cis and trans)	7	46	56,60	131	172,197	209
Dieldrin	8,5	52	101	146	180	16,32
DDDs (o,p and p,p)	11	49	99	132,153,105	193	
DDEs (o,p and p,p)	19	48,47	83	141	191	
DDTs (o,p and p,p)	12,13	44	97	137,176	199	
Aldrin	18	37,42	81,87	163,138	170,190	
Endosulfan I and II	17	41,71	85	158	201	
Endrin	24,27	40	136	129,178	189	
Oxychlordane	29	100	77,110	187,182	203,196	
Total Mercury (T Hg)	25	63	82	183	194	
Total lipid (proportion)	26	64	151	128	198	
Coplanar PCBs	**PBDEs (NIST)**					
77	17	49	99	153	183	206
81	25	66	100	154	190	
126	28,33	71	116	155	191	
169	30	75	119	156	203	
	47	85	138	181	205	

[1] PCB congeners appearing as pairs or triplets will coelute and were reported as sum.

Table 3. Summary of data on total species collected for Task II samples from the NJ 2004 Routine Monitoring Program. Tissue types are shellfish muscle (M), hepatopancreas (H) and fish fillet (F).

Common Name	Blue crab		American lobster		White perch	Striped bass	TOTAL
Tissue	H	M	H	M	F	F	
Arthur Kill @ Fresh Kill Landfill	3	3					6
Eastern Raritan Bay @ Keansburg	3	3					6
Hackensack River @ Laurel Hill	3	3			4		10
Lower Passaic River @ Newark Bay	5	5					10
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	3	5	5		2	18
Newark Bay @ Shooters Island	3	3					6
Newark Bay @ Turnpike Bridge	3	3					6
off shore NY Bight @ Mud Hole			4	4			8
Raritan River @Rt 35 Victory Bridge	3	3					6
Upper NY Bay @ Caven Point	3	3					6
Upper Tidal Passaic River @ Kearny	5	5					10
Western Raritan Bay	3	3					6
TOTAL	37	37	9	9	4	2	98

36 PATRICK CENTER FOR E

Table 4. Analyte List for Task II.

Trace Metals: Hg (ANSP)

OC Pesticides(GERG)	*Individual PCB congeners (GERG)*				*PBDE congeners (NIST)*
Alpha HCH	PCB1	PCB41/64	PCB118	PCB180	PBDE 17
Beta HCH	PCB7/9	PCB40	PCB114	PCB193	PBDE 25
Gamma HCH	PCB8/5	PCB67	PCB146	PCB191	PBDE 28,33
Delta HCH	PCB30	PCB63	PCB153/132	PCB200	PBDE 30
Heptachlor	PCB18/17	PCB74/61	PCB105	PCB169	PBDE 47
Heptachlor Epoxide	PCB15	PCB70	PCB141/179	PCB170/190	PBDE 49
Oxychlordane	PCB24/27	PCB66	PCB130	PCB199	PBDE 66
Alpha Chlordane	PCB16/32	PCB95/80	PCB176/137	PCB203/196	PBDE 71
Gamma Chlordane	PCB29	PCB55/91	PCB138 /160	PCB189	PBDE 75
Cis-Nonachlor	PCB26	PCB56/60	PCB158	PCB195/208	PBDE 85
Trans-Nonachlor	PCB25	PCB92	PCB129	PCB207	PBDE 99
Aldrin	PCB31	PCB84	PCB126	PCB194	PBDE 100
Dieldrin	PCB28	PCB101/90	PCB178	PCB205	PBDE 116
Endrin	PCB33/20	PCB99	PCB166	PCB206	PBDE 119
Pentachloroanisole	PCB53	PCB119	PCB175	PCB209	PBDE 138
Chlorpyrifos	PCB22/51	PCB83	PCB187		PBDE 153
Mirex	PCB45	PCB97	PCB183	*Coplanar PCBs*	PBDE 154
Endosulfan II	PCB46	PCB81	PCB128	PCB81	PBDE 155
Methoxychlor	PCB39	PCB87/115	PCB167	PCB77	PBDE 156
2,4' DDE	PCB69	PCB85	PCB185	PCB126	PBDE 181
4,4' DDE	PCB52	PCB136	PCB174	PCB169	PBDE 183
2,4' DDD	PCB49	PCB110/77	PCB177		PBDE 190
4,4' DDD	PCB47/75	PCB82	PCB171/202		PBDE 191
2,4' DDT	PCB48	PCB151	PCB156		PBDE 203
4,4' DDT	PCB44	PCB135	PCB201/157/173		PBDE 205
	PCB42/59/37	PCB107	PCB172		PBDE 206
	PCB72	PCB149/123	PCB197		

Furans and Dioxins (GERG)

2,3,7,8-TCDF	2,3,7,8-TCDD	1,2,3,4,7,8,9, -HpCDF
1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDD	OCDF
2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDD	
1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	
1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	
2,3,4,6,7,8-HxCDF	1,2,3,4,6,7,8-HpCDD	
1,2,3,7,8,9-HxCDF	OCDD	
1,2,3,4,6,7,8-HpCDF		

Table 5. Summary of numbers of samples with non-detect concentrations (ND), below detection limit concentrations (BDL) and above detection limits (>MDL) for Task I and Task II samples from the NJ 2004 Routine Monitoring Program.

	Task I			Task II			
	>MDL	**BDL**	**ND**	**>MDL**	**BDL**	**ND**	**B**
Hg	115	0	0	98	0	0	
Total PCBs	115	0	0	98	0	0	
Planar PCBs	55	60	0				
DDX	115	0	0	98	0	0	
Heptachlor	102	10	3	67	4	27	
Heptachlor epoxide	115	0	0	97	0	1	
Total chlordanes	115	0	0	98	0	0	
Cis and Trans nonachlor	114	1	0	96	2	0	
Endrin	71	28	16	27	2	69	
Dieldrin	107	8	0	98	0	0	
Aldrin	88	26	1	72	5	21	
Total BHC	111	4	1				
Total endosulfan	104	9	2				
Endosulfan II	99	11	5	31	6	61	
Lindane	83	28	4				
Tetrachlorobenzene				98	0	0	
Pentachlorobenzene				88	10	1	
Hexachlorobenzene				96	2	0	
Total Chlorobenzene				98	0	0	
HCH				98	0	0	
Pentachloroanisole				67			31
Chlorpyrifos				44	2	52	
Mirex				92	1	5	

Table 6. Summary of concentrations of Lipid %, Total PCBs (ng/g) and Total PCBs/Proportion Lipid (ng/g) in Task I samples from the NJ 2004 Routine Monitoring Program.

			No. of	% Lipid			Total PCBs ng/g			Total PCBs/Prop Lipid		
Common Name	**Station**	**Station Name**	**Samples**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	5	1.6	0.6	3.6	312	62	581	18980	10367	25893
American eel	BBTR	Barnegat Bay near Toms River	5	7.1	2.9	13.9	72	57	96	1430	503	2166
American eel	DRP	Delaware River near Camden	5	0.9	0.1	1.8	1537	235	2991	204509	114300	324700
American eel	MLR	Mullica River	5	11.6	0.3	16.9	151	15	245	2067	817	5100
American eel	NR	Navesink River	5	7.6	1.3	18.4	163	77	302	3920	1204	6862
American eel	SBR	Shrewsbury River	4	4.9	1.9	9.6	132	49	215	3218	2242	5495
American eel	SKR	Shark River	2	8.9	4.9	12.8	216	154	278	2658	2173	3143
weakfish	BBTR	Barnegat Bay near Toms River	1	1.3	1.3	1.3	46	46	46	3527	3527	3527
weakfish	DBL	Delaware Bay	1	0.8	0.8	0.8	7	7	7	888	888	888
weakfish	DBM	Delaware Bay Middle	9	5.6	2.5	10.1	116	56	213	2275	1377	4626
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	7.1	5.0	11.4	333	92	717	4273	1452	7535
Atlantic croaker	DBM	Delaware Bay Middle	5	2.2	0.7	3.2	41	14	52	2337	1400	5180
white perch	RR	Raritan River @Rt 35 Victory Bridge	3	1.8	1.5	2.3	146	91	192	7856	6060	9153
striped bass	AOM	Atlantic Ocean Island Beach	1	2.0	2.0	2.0	149	149	149	7425	7425	7425
striped bass	AON	Atlantic Ocean Sandy Hook	5	1.4	0.8	2.2	153	95	294	11000	5950	15813
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	10	2.0	0.4	3.4	280	92	1270	17686	3814	52929
striped bass	BBTR	Barnegat Bay near Toms River	4	1.7	0.7	2.7	174	85	266	11356	7682	17157
striped bass	DBM	Delaware Bay Middle	5	0.3	0.2	0.5	209	159	313	73714	52900	94850
bluefish	AOB	Atlantic Ocean at Belmar	5	1.6	0.5	4.0	142	69	241	10689	6020	17243
bluefish	AOM	Atlantic Ocean Island Beach	3	2.2	1.0	2.8	321	273	383	18130	10119	30580
bluefish	AON	Atlantic Ocean Sandy Hook	2	4.5	1.1	7.8	477	102	852	10114	9309	10919
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	2	7.4	5.9	8.9	266	182	350	3508	3080	3937
bluefish	BBTR	Barnegat Bay near Toms River	1	5.3	5.3	5.3	238	238	238	4483	4483	4483
bluefish	DBM	Delaware Bay middle	3	4.8	1.5	6.5	289	112	488	6397	4120	7631
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	8.4	5.1	12.0	967	296	1820	11284	5810	17848
bluefish	RR	Raritan @ Rt 35	3	6.2	5.5	7.0	462	313	578	7315	5691	8261
bluefish	SHB	Sandy Hook	3	4.9	4.0	6.2	377	248	587	8325	4779	14683
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	5.8	2.8	9.3	171	64	323	3022	1171	5875

Table 7. Summary of concentrations of planar PCBs ng/g and PBDEs ng/g in Task I samples from the NJ 2004 Routine Monitoring Program.

			No. of	Planar PCBs ng/g			# of PBDE	PBDEs ng/g		
Common Name	**Station**	**Station Name**	**Samples**	**Mean**	**Min**	**Max**	**Samples**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	5	0.24	0.00	0.50				
American eel	BBTR	Barnegat Bay near Toms River	5	0.10	0.10	0.10				
American eel	DRP	Delaware River near Camden	5	0.12	0.10	0.20	5	131.5	12.2	290.7
American eel	MLR	Mullica River	5	0.14	0.00	0.20				
American eel	NR	Navesink River	5	0.10	0.10	0.10				
American eel	SBR	Shrewsbury River	4	0.08	0.00	0.10				
American eel	SKR	Shark River	2	0.25	0.10	0.40				
weakfish	BBTR	Barnegat Bay near Toms River	1	0.10	0.10	0.10				
weakfish	DBL	Delaware Bay	1	0.00	0.00	0.00	0			
weakfish	DBM	Delaware Bay Middle	9	0.11	0.10	0.20				
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	0.28	0.10	0.40				
Atlantic croaker	DBM	Delaware Bay Middle	5	0.06	0.00	0.10				
white perch	RR	Raritan River @Rt 35 Victory Bridge	3	0.30	0.20	0.40				
striped bass	AOM	Atlantic Ocean Island Beach	1	0.50	0.50	0.50				
striped bass	AON	Atlantic Ocean Sandy Hook	5	0.20	0.10	0.40	5	12.8	5.5	37.4
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	10	0.39	0.10	1.70				
striped bass	BBTR	Barnegat Bay near Toms River	4	0.23	0.10	0.40				
striped bass	DBM	Delaware Bay Middle	5	0.12	0.10	0.20	5	13.0	6.2	21.2
bluefish	AOB	Atlantic Ocean at Belmar	5	0.14	0.10	0.30	4	6.5	3.1	15.8
bluefish	AOM	Atlantic Ocean Island Beach	3	0.43	0.20	0.70	2	17.8	13.4	22.1
bluefish	AON	Atlantic Ocean Sandy Hook	2	0.60	0.10	1.10				
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	5	0.54	0.20	0.80	3	25.9	20.1	29.7
bluefish	BBTR	Barnegat Bay near Toms River	1	0.70	0.70	0.70	1	13.9	13.9	13.9
bluefish	DBM	Delaware Bay middle	3	0.30	0.10	0.50				
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	1.46	0.60	2.80	5	85.1	56.3	137.8
bluefish	RR	Raritan @ Rt 35	3	0.67	0.50	0.80				
bluefish	SHB	Sandy Hook	3	0.47	0.40	0.50				
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	0.26	0.00	0.50				

Table 8. Summary of data on total DDX (ng/g) and total chlordanes (ng/g) for Task I samples from the NJ 2004 Routine Monitoring Program.

			No. of	Total DDX ng/g			Total Chlordanes ng/g		
Common Name	**Station**	**Station Name**	**Samples**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	5	98.1	17.6	191.6	16.0	4.1	32.5
American eel	BBTR	Barnegat Bay near Toms River	5	20.3	12.5	34.8	16.1	7.4	33.4
American eel	DRP	Delaware River near Camden	5	530.8	67.8	1362.5	90.5	11.0	173.5
American eel	MLR	Mullica River	5	41.3	16.0	53.3	10.6	1.0	16.2
American eel	NR	Navesink River	5	126.4	12.7	476.7	57.5	11.2	158.1
American eel	SBR	Shrewsbury River	4	37.0	12.5	65.0	25.8	13.0	44.8
American eel	SKR	Shark River	2	27.2	17.4	36.9	16.0	11.0	21.0
weakfish	BBTR	Barnegat Bay near Toms River	1	8.7	8.7	8.7	2.1	2.1	2.1
weakfish	DBL	Delaware Bay	1	5.4	5.4	5.4	0.4	0.4	0.4
weakfish	DBM	Delaware Bay Middle	9	21.8	13.5	32.5	4.7	1.9	6.5
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	39.1	15.7	81.3	11.0	4.7	21.2
Atlantic croaker	DBM	Delaware Bay Middle	5	8.0	2.6	9.8	1.9	0.5	2.7
white perch	RR	Raritan River @Rt 35 Victory Bridge	3	56.2	29.5	77.4	14.4	9.4	18.6
striped bass	AOM	Atlantic Ocean Island Beach	1	10.4	10.4	10.4	3.3	3.3	3.3
striped bass	AON	Atlantic Ocean Sandy Hook	5	16.6	8.8	34.2	4.8	2.4	9.5
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	10	19.9	9.0	32.7	6.7	2.3	15.3
striped bass	BBTR	Barnegat Bay near Toms River	4	19.0	9.9	32.6	5.3	2.4	9.0
striped bass	DBM	Delaware Bay Middle	5	36.0	22.3	67.9	10.0	6.5	20.1
bluefish	AOB	Atlantic Ocean at Belmar	5	18.7	11.8	27.9	4.9	2.6	8.8
bluefish	AOM	Atlantic Ocean Island Beach	3	41.6	36.7	48.0	11.1	10.1	12.5
bluefish	AON	Atlantic Ocean Sandy Hook	2	53.2	11.1	95.2	19.5	3.7	35.3
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	5	51.0	24.0	82.9	14.4	8.7	21.6
bluefish	BBTR	Barnegat Bay near Toms River	1	32.1	32.1	32.1	10.6	10.6	10.6
bluefish	DBM	Delaware Bay middle	3	54.5	15.1	92.3	15.2	5.6	26.4
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	137.2	42.7	210.3	37.9	12.9	67.1
bluefish	RR	Raritan @ Rt 35	3	123.5	64.1	173.9	30.0	19.8	38.0
bluefish	SHB	Sandy Hook	3	67.8	40.5	102.4	18.1	12.8	25.9
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	19.6	5.0	44.6	6.1	2.2	12.8

Table 9. Summary of concentrations of total mercury in Task I samples from the NJ 2004 Routine Monitoring Program.

			No. of	Total Hg µg/g		
Common Name	**Station**	**Station Name**	**Samples**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	5	0.13	0.10	0.20
American eel	BBTR	Barnegat Bay near Toms River	5	0.24	0.10	0.30
American eel	DRP	Delaware River near Camden	5	0.24	0.10	0.50
American eel	MLR	Mullica River	5	0.24	0.20	0.30
American eel	NR	Navesink River	5	0.18	0.10	0.30
American eel	SBR	Shrewsbury River	4	0.10	0.10	0.10
American eel	SKR	Shark River	2	0.20	0.20	0.20
weakfish	BBTR	Barnegat Bay near Toms River	1	0.30	0.30	0.30
weakfish	DBL	Delaware Bay	1	0.20	0.20	0.20
weakfish	DBM	Delaware Bay Middle	9	0.14	0.10	0.20
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	0.16	0.10	0.20
Atlantic croaker	DBM	Delaware Bay Middle	5	0.14	0.10	0.20
white perch	RR	Raritan River @Rt 35 Victory Bridge	3	0.10	0.10	0.10
striped bass	AOM	Atlantic Ocean Island Beach	1	0.30	0.30	0.30
striped bass	AON	Atlantic Ocean Sandy Hook	5	0.28	0.20	0.40
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	10	0.23	0.20	0.30
striped bass	BBTR	Barnegat Bay near Toms River	4	0.23	0.20	0.30
striped bass	DBM	Delaware Bay Middle	5	0.26	0.20	0.30
bluefish	AOB	Atlantic Ocean at Belmar	5	0.48	0.20	0.70
bluefish	AOM	Atlantic Ocean Island Beach	3	0.43	0.30	0.70
bluefish	AON	Atlantic Ocean Sandy Hook	2	0.35	0.30	0.40
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	5	0.30	0.20	0.50
bluefish	BBTR	Barnegat Bay near Toms River	1	0.30	0.30	0.30
bluefish	DBM	Delaware Bay middle	3	0.17	0.10	0.20
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	0.52	0.30	0.80
bluefish	RR	Raritan @ Rt 35	3	0.13	0.10	0.20
bluefish	SHB	Sandy Hook	3	0.20	0.20	0.20
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	5	0.14	0.10	0.20

Table 10. Summary of concentrations of endrin (ng/g) and total BHC (ng/g) in Task I samples from the NJ 2004 Routine Monitoring Program.

			Endrin ng/g			Total BHC ng/g		
Common Name	**Station**	**Station Name**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	0.2	0.0	0.3	0.1	0.0	0.2
American eel	BBTR	Barnegat Bay near Toms River	1.9	1.4	3.3	0.3	0.1	0.6
American eel	DRP	Delaware River near Camden	1.0	0.0	2.6	0.2	0.0	0.4
American eel	MLR	Mullica River	0.2	0.0	0.4	0.1	0.0	0.2
American eel	NR	Navesink River	0.1	0.0	0.3	0.3	0.1	0.6
American eel	SBR	Shrewsbury River	0.0	0.0	0.0	0.2	0.0	0.7
American eel	SKR	Shark River	0.0	0.0	0.0	0.2	0.1	0.3
weakfish	BBTR	Barnegat Bay near Toms River	0.2	0.2	0.2	0.1	0.1	0.1
weakfish	DBL	Delaware Bay	0.1	0.1	0.1	0.0	0.0	0.0
weakfish	DBM	Delaware Bay Middle	0.3	0.0	0.5	0.3	0.1	0.6
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.2	0.1	0.3	0.2	0.2	0.3
Atlantic croaker	DBM	Delaware Bay Middle	0.1	0.0	0.2	0.1	0.1	0.2
white perch	RR	Raritan River @Rt 35 Victory Bridge	0.1	0.0	0.2	0.0	0.0	0.1
striped bass	AOM	Atlantic Ocean Island Beach	0.0	0.0	0.0	0.1	0.1	0.1
striped bass	AON	Atlantic Ocean Sandy Hook	0.1	0.0	0.3	0.0	0.0	0.2
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	0.2	0.0	0.8	0.1	0.0	0.2
striped bass	BBTR	Barnegat Bay near Toms River	0.2	0.0	0.4	0.1	0.0	0.1
striped bass	DBM	Delaware Bay Middle	0.1	0.0	0.3	0.1	0.0	0.2
bluefish	AOB	Atlantic Ocean at Belmar	0.2	0.0	0.6	0.0	0.0	0.2
bluefish	AOM	Atlantic Ocean Island Beach	0.4	0.2	0.8	0.4	0.0	0.9
bluefish	AON	Atlantic Ocean Sandy Hook	0.2	0.2	0.2	0.2	0.0	0.3
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	0.7	0.3	1.6	0.5	0.2	0.9
bluefish	BBTR	Barnegat Bay near Toms River	0.0	0.0	0.0	0.4	0.4	0.4
bluefish	DBM	Delaware Bay middle	0.0	0.0	0.1	0.3	0.1	0.4
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.1	0.0	0.3	0.4	0.0	1.3
bluefish	RR	Raritan @ Rt 35	0.4	0.3	0.4	0.5	0.3	0.7
bluefish	SHB	Sandy Hook	0.2	0.0	0.4	0.4	0.3	0.6
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.2	0.1	0.2	0.3	0.2	0.5

Table 11. Summary of concentrations of aldrin (ng/g) and dieldrin (ng/g) in Task I samples from the NJ 2004 Routine Monitoring Program.

			Aldrin ng/g			Dieldrin ng/g		
Common Name	**Station**	**Station Name**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	0.2	0.0	0.4	0.5	0.0	1.3
American eel	BBTR	Barnegat Bay near Toms River	0.2	0.0	0.4	0.1	0.0	0.3
American eel	DRP	Delaware River near Camden	1.9	0.3	3.5	6.4	0.2	12.6
American eel	MLR	Mullica River	0.1	0.0	0.1	0.1	0.1	0.2
American eel	NR	Navesink River	0.4	0.1	1.2	0.9	0.0	3.2
American eel	SBR	Shrewsbury River	0.1	0.1	0.2	0.2	0.0	0.6
American eel	SKR	Shark River	0.1	0.0	0.1	0.2	0.0	0.3
weakfish	BBTR	Barnegat Bay near Toms River	0.0	0.0	0.0	0.0	0.0	0.0
weakfish	DBL	Delaware Bay	0.0	0.0	0.0	0.0	0.0	0.0
weakfish	DBM	Delaware Bay Middle	0.1	0.0	0.1	0.0	0.0	0.1
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.1	0.1	0.1	0.1	0.0	0.1
Atlantic croaker	DBM	Delaware Bay Middle	0.1	0.0	0.1	0.0	0.0	0.0
white perch	RR	Raritan River @Rt 35 Victory Bridge	0.1	0.0	0.1	0.0	0.0	0.1
striped bass	AOM	Atlantic Ocean Island Beach	0.0	0.0	0.0	0.0	0.0	0.0
striped bass	AON	Atlantic Ocean Sandy Hook	0.1	0.0	0.1	0.1	0.0	0.3
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	0.0	0.0	0.1	0.1	0.0	0.2
striped bass	BBTR	Barnegat Bay near Toms River	0.1	0.0	0.1	0.0	0.0	0.1
striped bass	DBM	Delaware Bay Middle	0.3	0.1	0.6	0.0	0.0	0.1
bluefish	AOB	Atlantic Ocean at Belmar	0.0	0.0	0.1	0.0	0.0	0.1
bluefish	AOM	Atlantic Ocean Island Beach	0.2	0.1	0.2	0.2	0.1	0.3
bluefish	AON	Atlantic Ocean Sandy Hook	0.1	0.0	0.2	0.2	0.0	0.3
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	0.3	0.1	0.6	0.1	0.1	0.2
bluefish	BBTR	Barnegat Bay near Toms River	0.5	0.5	0.5	0.1	0.1	0.1
bluefish	DBM	Delaware Bay middle	0.2	0.1	0.2	0.2	0.0	0.3
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	1.1	0.5	1.6	0.4	0.1	0.7
bluefish	RR	Raritan @ Rt 35	0.4	0.3	0.5	0.4	0.0	0.6
bluefish	SHB	Sandy Hook	0.4	0.4	0.4	0.3	0.1	0.6
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.0	0.0	0.1	0.1	0.0	0.3

Table 12. Summary of concentrations of heptachlor epoxide (ng/g) and heptachlor (ng/g) in Task I samples from the NJ 2004 Routine Monitoring Program.

			Heptachlor Epoxide ng/g			Heptachlor ng/g		
Common Name	**Station**	**Station Name**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	2.1	0.6	4.3	0.4	0.1	0.8
American eel	BBTR	Barnegat Bay near Toms River	3.3	1.2	8.1	0.6	0.3	1.1
American eel	DRP	Delaware River near Camden	13.1	1.2	22.7	4.0	0.4	6.3
American eel	MLR	Mullica River	2.6	0.1	4.3	0.3	0.0	0.4
American eel	NR	Navesink River	15.1	2.1	51.4	2.8	0.3	10.0
American eel	SBR	Shrewsbury River	4.6	2.5	8.0	0.9	0.3	1.5
American eel	SKR	Shark River	2.3	1.1	3.5	0.5	0.4	0.6
weakfish	BBTR	Barnegat Bay near Toms River	0.2	0.2	0.2	0.0	0.0	0.0
weakfish	DBL	Delaware Bay	0.1	0.1	0.1	0.0	0.0	0.0
weakfish	DBM	Delaware Bay Middle	1.2	0.5	1.9	0.1	0.0	0.3
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	1.3	0.6	2.5	0.4	0.1	1.0
weakfish	DBL	Delaware Bay	0.1	0.1	0.1	0.0	0.0	0.0
Atlantic croaker	DBM	Delaware Bay Middle	0.6	0.1	1.0	0.0	0.0	0.1
white perch	RR	Raritan River @Rt 35 Victory Bridge	2.6	1.8	3.2	0.5	0.4	0.6
striped bass	AOM	Atlantic Ocean Island Beach	0.2	0.2	0.2	0.3	0.3	0.3
striped bass	AON	Atlantic Ocean Sandy Hook	0.4	0.2	0.8	0.2	0.0	0.3
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	0.5	0.0	1.6	0.5	0.0	3.5
striped bass	BBTR	Barnegat Bay near Toms River	0.5	0.2	0.8	0.2	0.1	0.2
striped bass	DBM	Delaware Bay Middle	1.3	0.4	3.1	0.9	0.5	1.8
bluefish	AOB	Atlantic Ocean at Belmar	0.4	0.1	0.8	0.1	0.0	0.4
bluefish	AOM	Atlantic Ocean Island Beach	1.3	0.8	2.0	0.2	0.1	0.3
bluefish	AON	Atlantic Ocean Sandy Hook	1.7	0.2	3.2	0.3	0.0	0.5
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	1.7	0.8	3.1	0.4	0.2	0.6
bluefish	BBTR	Barnegat Bay near Toms River	1.5	1.5	1.5	0.4	0.4	0.4
bluefish	DBM	Delaware Bay middle	2.0	0.8	3.2	1.0	0.2	2.0
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	4.8	2.1	8.4	3.4	0.6	9.5
bluefish	RR	Raritan @ Rt 35	6.1	3.7	8.7	1.0	0.8	1.2
bluefish	SHB	Sandy Hook	2.8	2.1	3.2	0.8	0.5	1.3
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.8	0.3	1.5	0.2	0.1	0.4

Table 13. Summary of concentrations of endosulfan (ng/g) and lindane (ng/g) in Task I samples from the NJ 2004 Routine Monitoring Program.

			Endosulfan ng/g			Lindane ng/g		
Common Name	**Station**	**Station Name**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
white catfish	DRP	Delaware River near Camden	0.5	0.0	1.4	0.2	0.0	0.4
American eel	BBTR	Barnegat Bay near Toms River	0.8	0.1	2.0	0.0	0.1	0.1
American eel	DRP	Delaware River near Camden	4.0	0.6	9.2	0.7	0.0	1.2
American eel	MLR	Mullica River	0.7	0.0	1.3	0.1	0.0	0.2
American eel	NR	Navesink River	2.9	0.8	6.3	0.1	0.1	0.6
American eel	SBR	Shrewsbury River	1.7	0.0	3.5	0.1	0.0	0.1
American eel	SKR	Shark River	1.2	0.7	1.7	0.2	0.1	0.2
weakfish	BBTR	Barnegat Bay near Toms River	0.0	0.0	0.0	0.0	0.1	0.0
weakfish	DBM	Delaware Bay Middle	0.1	0.0	0.3	0.1	0.1	0.2
weakfish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.2	0.1	0.4	0.2	0.2	0.3
weakfish	DBL	Delaware Bay	0.0	0.0	0.0	0.0	0.0	0.0
Atlantic croaker	DBM	Delaware Bay Middle	0.0	0.0	0.1	0.1	0.1	0.1
white perch	RR	Raritan River @Rt 35 Victory Bridge	0.1	0.0	0.1	0.1	0.0	0.1
striped bass	AOM	Atlantic Ocean Island Beach	0.1	0.1	0.1	0.1	0.1	0.1
striped bass	AON	Atlantic Ocean Sandy Hook	0.1	0.0	0.1	0.0	0.0	0.1
striped bass	AOS	Atlantic Ocean Sea Isle City to Cape May	0.1	0.0	0.3	0.0	0.0	0.2
striped bass	BBTR	Barnegat Bay near Toms River	0.1	0.0	0.2	0.1	0.0	0.1
striped bass	DBM	Delaware Bay Middle	0.1	0.0	0.2	0.1	0.0	0.3
bluefish	AOB	Atlantic Ocean at Belmar	0.1	0.1	0.1	0.1	0.0	0.1
bluefish	AOM	Atlantic Ocean Island Beach	0.4	0.2	0.7	0.1	0.0	0.2
bluefish	AON	Atlantic Ocean Sandy Hook	0.7	0.0	1.3	0.2	0.0	0.3
bluefish	AOS	Atlantic Ocean Sea Isle City to Cape May	0.3	0.1	0.7	0.3	0.2	0.4
bluefish	BBTR	Barnegat Bay near Toms River	0.0	0.0	0.0	0.1	0.4	0.1
bluefish	DBM	Delaware Bay middle	0.3	0.1	0.6	0.4	0.1	1.0
bluefish	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	1.3	0.3	2.4	0.7	0.0	1.0
bluefish	RR	Raritan @ Rt 35	0.2	0.1	0.3	0.5	0.3	0.7
bluefish	SHB	Sandy Hook	0.4	0.3	0.5	0.2	0.3	0.3
Porgy/Scup	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	0.2	0.0	0.5	0.2	0.2	0.3

Table 14. Summary of concentrations of percent lipid, total PCBs ng/g and total PCBs/proportion lipid (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of	% Lipid			Total PCBs ng/g			Total PCBs/Prop Lipid		
	Samples	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Blue crab Hepatopancreas										
Arthur Kill @ Fresh Kill Landfill	3	26.1	25.5	26.5	3463.9	2647.6	4377.8	13255	10395	16652
Eastern Raritan Bay @ Keansburg	3	33.2	20.5	54.9	859.8	642.3	1220.4	3149	1306	5014
Hackensack River @ Laurel Hill	3	20.2	14.8	23.3	5222.6	2573.6	7864.8	26836	11352	35358
Lower Passaic River @ Newark Bay	5	23.4	19.7	26.0	3597.4	1668.1	7020.0	14949	6408	27605
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	26.0	19.4	31.3	850.6	714.8	1087.4	3351	2395	3977
Newark Bay @ Shooters Island	3	34.4	24.7	50.4	4718.5	4337.8	5186.5	15204	9196	21024
Newark Bay @ Turnpike Bridge	3	21.2	13.7	26.5	2594.4	822.3	3809.1	14092	3102	22972
Raritan River @Rt 35 Victory Bridge	3	28.9	21.9	32.4	1628.8	1017.8	1989.3	5531	4652	6146
Upper NY Bay @ Caven Point	3	19.0	4.2	31.5	2873.8	1540.4	3932.5	31803	7249	75688
Upper Tidal Passaic River @ Kearny	5	23.8	17.5	32.1	3189.6	1539.5	5975.8	13304	8812	24252
Western Raritan Bay	3	25.4	19.8	32.5	2705.7	1828.1	3740.4	10924	7849	15690
Blue crab Muscle										
Arthur Kill @ Fresh Kill Landfill		0.3	0.2	0.3	17.7	13.7	21.4	7012	5265	8560
Eastern Raritan Bay @ Keansburg	3	0.6	0.4	0.9	13.1	10.4	18.2	2191	2068	2364
Hackensack River @ Laurel Hill	3	0.4	0.3	0.5	47.0	21.5	81.1	12114	4135	18022
Lower Passaic River @ Newark Bay	5	1.1	0.7	1.7	70.3	48.7	97.3	7009	2848	10027
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.6	0.4	0.7	16.5	12.7	22.8	3053	1896	3757
Newark Bay @ Shooters Island	3	0.5	0.1	1.2	21.0	3.2	52.0	4933	4333	5333
Newark Bay @ Turnpike Bridge	3	0.7	0.5	1.2	47.0	28.3	69.3	6577	5442	8365
Raritan River @Rt 35 Victory Bridge	3	0.9	0.6	1.2	18.8	12.6	25.3	2187	1969	2500
Upper NY Bay @ Caven Point	3	0.6	0.2	1.1	27.6	17.4	42.2	5668	4019	7565
Upper Tidal Passaic River @ Kearny	5	1.1	0.5	1.4	42.1	22.1	72.3	3945	2167	5074
Western Raritan Bay	3	1.1	0.4	1.9	31.2	18.9	42.6	3593	2278	4974
American Lobster Hepatopancreas										
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	39.7	35.2	45.9	1739.7	318.9	4058.0	4126	905	8847
off shore NY Bight @ Mud Hole	4	41.8	34.5	49.7	586.0	207.8	1267.1	1476	602	3477
American Lobster Muscle										
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.3	0.9	2.0	9.8	3.3	19.9	762	280	1592
off shore NY Bight @ Mud Hole	4	1.5	1.1	1.9	6.7	3.7	10.3	490	200	972
White perch fillet										
Hackensack River @ Laurel Hill	3	8.3	6.9	9.6	1448.9	1298.9	1719.9	17475	15622	18907
Striped bass fillet										
Hackensack River @ Laurel Hill	1	4.2	4.2	4.2	1465.4	1465.4	1465.4	34725	34725	34725
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	1.6	1.6	1.6	157.4	133.3	181.5	9786	8437	11135

Table 15. Summary of concentrations of %lipid, planar PCBs, and lipid normalized planar PCBs (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of	% Lipid			Planar PCBs ng/g			Lipid Normalized Planar PCBs ng/g		
	Samples	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Blue crab Hepatopancreas										
Arthur Kill @ Fresh Kill Landfill	3	26.08	25.47	26.47	18.40	14.50	20.60	70.4	56.9	78.4
Eastern Raritan Bay @ Keansburg	3	33.25	20.54	54.86	2.67	1.90	3.30	9.3	5.1	13.6
Hackensack River @ Laurel Hill	3	20.24	14.79	23.27	23.83	16.50	36.30	118.4	72.8	156.0
Lower Passaic River @ Newark Bay	5	23.40	19.71	26.03	14.04	8.90	22.00	59.2	43.8	86.5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	26.02	19.42	31.3	3.10	2.50	3.70	12.0	11.3	12.9
Newark Bay @ Shooters Island	3	34.40	24.67	50.36	31.03	29.00	34.00	97.3	67.5	117.6
Newark Bay @ Turnpike Bridge	3	21.25	13.72	26.51	12.23	7.50	16.80	63.4	28.3	90.4
Raritan River @Rt 35 Victory Bridge	3	28.89	21.88	32.42	6.37	5.40	8.20	22.3	17.0	25.3
Upper NY Bay @ Caven Point	3	18.98	4.16	31.53	11.90	7.50	14.40	137.6	35.3	331.7
Upper Tidal Passaic River @ Kearny	5	23.77	17.47	32.12	11.80	8.50	15.80	49.4	42.0	64.1
Western Raritan Bay	3	25.37	19.8	32.47	8.10	7.20	9.40	33.5	22.2	39.4
Blue crab Muscle										
Arthur Kill @ Fresh Kill Landfill	3	0.26	0.19	0.34	0.00	0.00	0.00	0.0	0.0	0.0
Eastern Raritan Bay @ Keansburg	3	0.61	0.44	0.88	0.00	0.00	0.00	0.0	0.0	0.0
Hackensack River @ Laurel Hill	3	0.41	0.27	0.52	0.07	0.00	0.20	14.8	0.0	44.4
Lower Passaic River @ Newark Bay	5	1.13	0.73	1.71	0.32	0.20	0.50	30.4	17.5	46.3
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.56	0.37	0.67	0.03	0.00	0.10	5.1	0.0	15.4
Newark Bay @ Shooters Island	3	0.47	0.06	1.2	0.03	0.00	0.10	2.8	0.0	8.3
Newark Bay @ Turnpike Bridge	3	0.74	0.52	1.17	0.10	0.00	0.20	12.1	0.0	19.2
Raritan River @Rt 35 Victory Bridge	3	0.86	0.64	1.21	0.07	0.00	0.10	9.7	0.0	15.6
Upper NY Bay @ Caven Point	3	0.57	0.23	1.05	0.07	0.00	0.10	10.9	0.0	23.3
Upper Tidal Passaic River @ Kearny	5	1.07	0.54	1.44	0.08	0.00	0.20	6.5	0.0	17.7
Western Raritan Bay	3	1.05	0.38	1.87	0.10	0.10	0.10	14.2	5.3	26.3
American Lobster Hepatopancreas										
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	39.73	35.24	45.87	4.72	0.50	11.20	11.2	1.4	24.4
off shore NY Bight @ Mud Hole	4	41.77	34.5	49.69	1.75	0.30	4.60	4.5	0.9	12.6
American Lobster Muscle										
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.33	0.87	2.04	0.00	0.00	0.00	0.0	0.0	0.0
off shore NY Bight @ Mud Hole	4	1.54	1.06	1.85	0.03	0.00	0.10	1.4	0.0	5.4
White Perch fillet										
Hackensack River @ Laurel Hill	3	8.33	6.87	9.61	2.30	1.60	2.70	27.4	23.3	31.8
Striped bass fillet										
Hackensack River @ Laurel Hill	1	4.22	4.22	4.22	2.90	2.90	2.90	68.7	68.7	68.7
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	1.61	1.58	1.63	0.05	0.00	0.10	3.1	0.0	6.1

Table 16. Summary of concentrations of total DDX (ng/g) and total chlordanes (ng/g) in Task II samples from the NJ 2004 Routing Monitoring Program.

Location	No. of	Total DDX ng/g			Total chlordanes ng/g		
	Samples	Mean	Min	Max	Mean	Min	Max
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	1537.8	1152.0	1786.9	292.2	240.3	323.3
Eastern Raritan Bay @ Keansburg	3	177.7	117.7	266.8	78.9	58.6	107.1
Hackensack River @ Laurel Hill	3	713.6	453.0	856.7	406.4	181.5	551.8
Lower Passaic River @ Newark Bay	5	595.5	263.3	1182.2	389.5	174.5	802.3
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	150.0	122.4	187.8	103.9	72.4	159.2
Newark Bay @ Shooters Island	3	1602.8	1087.3	1991.1	323.7	261.8	384.8
Newark Bay @ Turnpike Bridge	3	444.2	174.7	619.9	200.2	82.7	315.0
Raritan River @Rt 35 Victory Bridge	3	391.1	270.4	458.0	137.9	94.2	164.5
Upper NY Bay @ Caven Point	3	314.3	207.6	426.1	106.4	60.4	145.6
Upper Tidal Passaic River @ Kearny	5	421.2	223.5	788.1	533.7	391.2	826.1
Western Raritan Bay	3	732.1	311.1	1182.7	281.5	192.8	359.2
Blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	3	12.8	7.8	16.6	1.1	0.9	1.2
Eastern Raritan Bay @ Keansburg	3	3.3	2.9	4.1	1.0	0.7	1.5
Hackensack River @ Laurel Hill	3	7.9	4.1	14.9	3.6	1.5	7.1
Lower Passaic River @ Newark Bay	5	18.1	14.5	22.9	6.9	4.5	9.9
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	5.8	3.6	8.6	1.0	0.6	1.3
Newark Bay @ Shooters Island	3	10.8	1.5	28.2	1.6	0.2	4.1
Newark Bay @ Turnpike Bridge	3	10.9	7.2	13.3	3.4	1.7	6.0
Raritan River @Rt 35 Victory Bridge	3	6.0	4.5	8.3	1.6	1.0	2.3
Upper NY Bay @ Caven Point	3	3.0	1.6	5.3	1.1	0.7	1.9
Upper Tidal Passaic River @ Kearny	5	11.9	8.5	14.1	7.4	4.4	10.7
Western Raritan Bay	3	15.0	8.7	20.6	2.6	1.5	3.8
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	180.9	45.0	391.2	32.2	12.1	72.3
off shore NY Bight @ Mud Hole	4	74.2	41.9	133.6	15.6	7.4	26.7
American Lobster Muscle							
Raritan Bay @ Raritan beach/Chapel Hill Mid-lower	5	0.7	0.3	1.4	0.2	0.1	0.4
off shore NY Bight @ Mud Hole	4	0.6	0.5	0.9	0.1	0.1	0.1
White perch fillet							
Hackensack River @ Laurel Hill	3	89.4	71.6	113.5	58.1	33.2	81.1
Striped bass fillet							
Hackensack River @ Laurel Hill	1	125.9	125.9	125.9	96.0	96.0	96.0
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	21.0	12.4	29.6	4.5	3.9	5.0

Table 17. Summary of concentrations of total mercury (ug/g) and total tetrachlorobenze (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of	Total Hg ug/g wet wt			Total Tetrachlorobenze ng/g		
	Samples	Mean	Min	Max	Mean	Min	Max
	MDL					0.13	
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	0.10	0.10	0.10	21.7	17.6	28.4
Eastern Raritan Bay @ Keansburg	3	0.10	0.10	0.10	2.7	0.8	5.4
Hackensack River @ Laurel Hill	3	0.13	0.10	0.20	205.7	148.1	298.6
Lower Passaic River @ Newark Bay	5	0.10	0.10	0.10	60.3	26.6	111.9
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.07	0.00	0.10	1.6	1.1	2.3
Newark Bay @ Shooters Island	3	0.10	0.10	0.10	53.7	36.4	74.8
Newark Bay @ Turnpike Bridge	3	0.10	0.10	0.10	56.3	18.7	88.4
Raritan River @Rt 35 Victory Bridge	3	0.10	0.10	0.10	7.1	4.7	9.3
Upper NY Bay @ Caven Point	3	0.10	0.10	0.10	3.5	0.8	8.4
Upper Tidal Passaic River @ Kearny	5	0.10	0.10	0.10	11.0	4.5	15.1
Western Raritan Bay	3	0.10	0.10	0.10	5.0	3.1	7.4
Blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	3	0.20	0.20	0.20	0.5	0.4	0.6
Eastern Raritan Bay @ Keansburg	3	0.10	0.10	0.10	0.1	0.1	0.2
Hackensack River @ Laurel Hill	3	0.33	0.30	0.40	6.6	5.4	8.4
Lower Passaic River @ Newark Bay	5	0.18	0.10	0.20	4.5	2.5	6.0
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.10	0.10	0.10	0.3	0.1	0.4
Newark Bay @ Shooters Island	3	0.20	0.20	0.20	1.3	0.3	2.9
Newark Bay @ Turnpike Bridge	3	0.27	0.20	0.30	3.7	3.1	4.6
Raritan River @Rt 35 Victory Bridge	3	0.10	0.10	0.10	0.4	0.2	0.7
Upper NY Bay @ Caven Point	3	0.20	0.20	0.20	0.3	0.2	0.4
Upper Tidal Passaic River @ Kearny	5	0.16	0.10	0.20	0.4	0.3	0.5
Western Raritan Bay	3	0.10	0.10	0.10	0.9	0.6	1.1
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.12	0.10	0.20	2.9	1.8	4.2
off shore NY Bight @ Mud Hole	4	0.10	0.10	0.10	5.3	1.3	12.7
American Lobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.20	0.10	0.30	0.2	0.0	0.3
off shore NY Bight @ Mud Hole	4	0.10	0.10	0.10	0.2	0.1	0.3
White perch fillet							
Hackensack River @ Laurel Hill	3	0.27	0.10	0.40	38.2	26.8	53.9
Striped bass fillet							
Hackensack River @ Laurel Hill	1	0.20	0.20	0.20	24.5	24.5	24.5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	0.25	0.20	0.30	0.1	0.1	0.1

Table 18. Summary of concentrations of dioxins (pg/g) and furans (pg/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	% Lipid	Dioxins ng/g			Furans ng/g		
	Mean	Mean	Min	Max	Mean	Min	Max
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	26.1	76.2	65.2	82.8	96.5	84.9	117.4
Eastern Raritan Bay @ Keansburg	33.2	5.8	0.0	15.0	29.9	15.5	44.5
Hackensack River @ Laurel Hill	20.2	251.6	205.0	316.5	284.5	140.6	475.9
Lower Passaic River @ Newark Bay	23.4	311.9	235.5	398.8	89.7	22.3	184.8
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	26.0	13.2	4.8	21.0	24.9	19.0	27.9
Newark Bay @ Shooters Island	34.4	227.0	112.3	421.8	184.4	161.7	208.8
Newark Bay @ Turnpike Bridge	21.2	260.6	88.7	369.7	164.3	43.0	286.5
Raritan River @Rt 35 Victory Bridge	28.9	82.7	15.6	178.9	34.8	0.8	60.8
Upper NY Bay @ Caven Point	19.0	13.1	8.0	22.1	56.0	35.3	68.8
Upper Tidal Passaic River @ Kearny	23.8	257.7	164.2	390.0	61.7	32.2	80.1
Western Raritan Bay	25.4	22.7	0.0	46.9	56.1	0.0	119.9
Blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	0.3	15.1	8.9	24.0	1.4	0.0	2.6
Eastern Raritan Bay @ Keansburg	0.6	7.3	4.3	9.4	5.9	5.4	6.8
Hackensack River @ Laurel Hill	0.4	7.3	5.8	8.9	4.5	1.8	7.1
Lower Passaic River @ Newark Bay	1.1	27.1	0.0	74.2	3.7	0.0	9.3
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	0.6	2.8	1.2	4.2	0.7	0.0	2.0
Newark Bay @ Shooters Island	0.5	10.5	2.3	14.9	1.0	0.0	2.5
Newark Bay @ Turnpike Bridge	0.7	12.8	7.4	18.7	3.2	2.1	4.4
Raritan River @Rt 35 Victory Bridge	0.9	15.5	11.3	19.1	11.5	8.9	13.5
Upper NY Bay @ Caven Point	0.6	7.0	4.3	11.6	1.1	1.0	1.4
Upper Tidal Passaic River @ Kearny	1.1	11.0	0.0	29.3	1.3	0.0	2.2
Western Raritan Bay	1.1	30.1	19.0	37.2	29.7	16.7	51.4
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	39.7	57.0	3.9	112.3	79.7	22.9	173.1
off shore NY Bight @ Mud Hole	41.8	25.7	4.3	71.0	22.4	7.5	52.1
American Lobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	1.3	5.6	1.1	11.7	1.0	0.1	2.6
off shore NY Bight @ Mud Hole	1.5	1.4	0.0	2.4	1.0	0.1	1.8
White perch fillet							
Hackensack River @ Laurel Hill	8.3	29.8	23.2	36.9	18.6	3.0	32.0
Striped bass fillet							
Hackensack River @ Laurel Hill	4.2	35.3	35.3	35.3	6.6	6.6	6.6
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	1.6	1.8	0.0	3.5	1.4	0.3	2.4

Table 19. Summary of means of individual dioxins (all as pg/g) for Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of Samples	% Lipid Mean	2378-TCDD Mean	12378-PeCDD Mean	123478-HxCDD Mean	123678-HxCDD Mean	123789-HxCDD Mean	1234678-HpCDD Mean	OCDD Mean
Blue crab Hepatopancreas									
Arthur Kill @ Fresh Kill Landfill	3	26.1	48.6	5.6	0.4	3.4	1.5	3.3	13.4
Eastern Raritan Bay @ Keansburg	3	33.2	0.0	0.0	0.0	0.0	0.8	0.0	5.0
Hackensack River @ Laurel Hill	3	20.2	188.1	2.2	0.3	0.0	0.0	3.5	57.4
Lower Passaic River @ Newark Bay	5	23.4	288.0	1.1	0.4	0.3	0.0	10.5	11.5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	26.0	0.0	1.6	0.0	0.0	0.0	0.9	10.7
Newark Bay @ Shooters Island	3	34.4	140.2	4.1	0.0	3.7	0.6	7.4	71.0
Newark Bay @ Turnpike Bridge	3	21.2	237.0	4.1	0.2	1.5	0.0	2.9	14.9
Raritan River @Rt 35 Victory Bridge	3	28.9	4.6	0.6	0.0	0.7	0.0	0.9	75.9
Upper NY Bay @ Caven Point	3	19.0	2.4	0.0	0.0	0.0	0.1	0.4	10.2
Upper Tidal Passaic River @ Kearny	5	23.8	220.5	1.7	0.0	5.3	0.5	6.4	23.2
Western Raritan Bay	3	25.4	4.8	2.1	0.0	0.6	0.0	1.4	13.9
Blue crab Muscle									
Arthur Kill @ Fresh Kill Landfill	3	0.3	0.8	1.3	0.0	0.0	0.0	0.3	12.6
Eastern Raritan Bay @ Keansburg	3	0.6	0.7	0.5	0.2	0.0	0.0	0.0	5.9
Hackensack River @ Laurel Hill	3	0.4	3.2	0.0	0.0	0.0	0.0	0.0	4.1
Lower Passaic River @ Newark Bay	5	1.1	9.0	0.0	0.0	0.1	0.1	2.1	15.7
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.6	0.0	0.0	0.0	0.0	0.2	0.1	2.5
Newark Bay @ Shooters Island	3	0.5	0.6	0.0	0.0	0.0	0.0	0.0	9.9
Newark Bay @ Turnpike Bridge	3	0.7	5.8	0.4	0.0	0.0	0.0	0.1	6.5
Raritan River @Rt 35 Victory Bridge	3	0.9	0.0	1.1	0.3	0.4	0.8	1.2	11.6
Upper NY Bay @ Caven Point	3	0.6	0.6	0.0	0.0	0.0	0.0	0.1	6.3
Upper Tidal Passaic River @ Kearny	5	1.1	3.4	0.0	0.0	0.0	0.0	0.5	7.1
Western Raritan Bay	3	1.1	0.0	2.4	3.2	2.5	2.7	6.0	13.3
American Lobster Hepatopancreas									
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	39.7	13.8	7.1	0.3	13.9	2.0	9.3	10.6
off shore NY Bight @ Mud Hole	4	41.8	5.3	2.4	0.0	4.7	1.4	4.5	7.4
American Lobster Muscle									
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.3	0.0	0.0	0.1	0.0	0.0	0.2	5.4
off shore NY Bight @ Mud Hole	4	1.5	0.0	0.1	0.1	0.1	0.0	0.0	1.1
White perch fillet									
Hackensack River @ Laurel Hill	3	8.3	17.6	1.9	0.0	0.9	1.2	1.2	7.1
Striped bass fillet									
Hackensack River @ Laurel Hill	1	4.2	16.9	0.0	0.0	0.0	0.0	0.0	18.4
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.8

Table 20. Summary of means of individual furans (all as pg/g) for Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of Samples	% Lipid	2378-TCDF pg/g	12378-PeCDF pg/g	23478-PeCDF pg/g	123478-HxCDF pg/g	123678-HxCDF pg/g	234678-HxCDF pg/g	123789-HxCDF pg/g	1234678-HpCDF pg/g	OCDF pg/g
		Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Blue crab Hepatopancreas											
Arthur Kill @ Fresh Kill Landfill	3	26.1	67.6	7.1	8.2	6.5	1.4	0.0	0.0	5.7	0.0
Eastern Raritan Bay @ Keansburg	3	33.2	28.5	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Hackensack River @ Laurel Hill	3	20.2	137.1	2.4	31.2	81.9	5.5	0.0	0.0	26.1	0.0
Lower Passaic River @ Newark Bay	5	23.4	35.3	1.5	4.6	25.5	3.4	0.9	0.0	9.6	8.8
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	26.0	23.5	1.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Newark Bay @ Shooters Island	3	34.4	121.4	9.7	19.2	19.1	3.9	1.3	0.0	6.7	3.0
Newark Bay @ Turnpike Bridge	3	21.2	88.3	7.2	20.6	29.7	3.8	2.2	0.0	12.5	0.0
Raritan River @Rt 35 Victory Bridge	3	28.9	32.8	0.6	0.0	0.0	0.0	0.0	0.0	1.4	0.0
Upper NY Bay @ Caven Point	3	19.0	52.6	2.0	0.0	0.6	0.5	0.3	0.0	0.0	0.0
Upper Tidal Passaic River @ Kearny	5	23.8	26.5	2.9	6.6	10.7	2.4	1.5	0.0	11.0	0.0
Western Raritan Bay	3	25.4	47.4	3.5	3.7	1.1	0.0	0.0	0.0	0.4	0.0
Blue crab Muscle											
Arthur Kill @ Fresh Kill Landfill	3	0.3	0.3	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.6
Eastern Raritan Bay @ Keansburg	3	0.6	0.9	1.4	0.4	0.5	0.4	0.5	0.0	0.8	0.9
Hackensack River @ Laurel Hill	3	0.4	0.8	0.8	0.4	1.8	0.0	0.0	0.0	0.6	0.1
Lower Passaic River @ Newark Bay	5	1.1	1.8	0.6	0.4	0.3	0.0	0.0	0.0	0.6	0.0
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.6	0.0	0.0	0.2	0.1	0.0	0.2	0.0	0.0	0.0
Newark Bay @ Shooters Island	3	0.5	0.7	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Newark Bay @ Turnpike Bridge	3	0.7	0.5	0.7	0.2	0.7	0.7	0.1	0.0	0.1	0.1
Raritan River @Rt 35 Victory Bridge	3	0.9	0.6	1.6	0.2	0.8	1.1	1.0	0.4	1.6	3.3
Upper NY Bay @ Caven Point	3	0.6	0.4	0.2	0.2	0.3	0.0	0.0	0.0	0.1	0.0
Upper Tidal Passaic River @ Kearny	5	1.1	0.4	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.4
Western Raritan Bay	3	1.1	2.7	2.8	3.4	1.0	3.5	5.3	0.9	5.1	1.6
American Lobster Hepatopancreas											
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	39.7	51.1	6.3	15.5	2.7	0.8	3.0	0.0	0.3	0.0
off shore NY Bight @ Mud Hole	4	41.8	15.8	1.8	3.7	0.4	0.0	0.4	0.0	0.2	0.0
American Lobster Muscle											
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.3	0.2	0.2	0.2	0.3	0.0	0.1	0.0	0.0	0.0
off shore NY Bight @ Mud Hole	4	1.5	0.1	0.0	0.2	0.3	0.1	0.1	0.0	0.1	0.1
White perch fillet											
Hackensack River @ Laurel Hill	3	8.3	4.3	0.8	2.3	1.2	0.6	1.2	1.4	1.2	5.5
Striped bass fillet											
Hackensack River @ Laurel Hill	1	4.2	0.0	0.8	2.0	0.0	0.8	0.0	0.0	0.6	2.4
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	1.6	0.8	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.0

54 PATRICK CENTER FOR ENVIRONMENTAL RESEARCH

Table 21. Summary of concentrations of HCH (ng/g) and Mirex (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of Samples	HCH ng/g			Mirex ng/g		
		Mean	Min	Max	Mean	Min	Max
	MDL:		0.05			0.01	
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	1.6	1.3	2.0	1.5	1.4	1.7
Eastern Raritan Bay @ Keansburg	3	0.7	0.6	0.8	0.6	0.5	0.8
Hackensack River @ Laurel Hill	3	1.7	1.3	2.0	2.8	1.7	3.9
Lower Passaic River @ Newark Bay	5	1.1	0.7	1.7	2.8	1.2	5.9
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.9	0.8	1.1	0.8	0.6	1.0
Newark Bay @ Shooters Island	3	2.3	2.1	2.5	3.6	3.0	4.6
Newark Bay @ Turnpike Bridge	3	1.4	0.6	2.1	1.9	0.6	2.6
Raritan River @Rt 35 Victory Bridge	3	1.0	0.8	1.2	1.6	0.8	2.0
Upper NY Bay @ Caven Point	3	0.9	0.7	1.1	2.7	1.6	3.8
Upper Tidal Passaic River @ Kearny	5	1.4	1.0	2.2	4.3	3.6	5.3
Western Raritan Bay	3	1.3	1.0	1.5	2.5	2.0	3.1
Blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	3	0.1	0.1	0.1	0.0	0.0	0.0
Eastern Raritan Bay @ Keansburg	3	0.1	0.1	0.1	0.0	0.0	0.0
Hackensack River @ Laurel Hill	3	0.1	0.1	0.1	0.0	0.0	0.1
Lower Passaic River @ Newark Bay	5	0.1	0.1	0.2	0.1	0.0	0.2
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.1	0.1	0.1	0.0	0.0	0.0
Newark Bay @ Shooters Island	3	0.1	0.1	0.1	0.0	0.0	0.1
Newark Bay @ Turnpike Bridge	3	0.1	0.1	0.1	0.1	0.1	0.1
Raritan River @Rt 35 Victory Bridge	3	0.1	0.1	0.1	0.0	0.0	0.0
Upper NY Bay @ Caven Point	3	0.1	0.1	0.1	0.1	0.1	0.1
Upper Tidal Passaic River @ Kearny	5	0.1	0.1	0.1	0.1	0.1	0.1
Western Raritan Bay	3	0.0	0.0	0.1	0.0	0.0	0.1
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	2.0	1.0	2.9	3.5	1.3	6.9
off shore NY Bight @ Mud Hole	4	2.9	2.4	3.5	1.4	0.3	3.3
American Lobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.1	0.1	0.1	0.0	0.0	0.1
off shore NY Bight @ Mud Hole	4	0.1	0.0	0.1	0.0	0.0	0.0
White perch fillet							
Hackensack River @ Laurel Hill	3	0.3	0.1	0.4	0.1	0.0	0.1
Striped bass fillet							
Hackensack River @ Laurel Hill	1	0.4	0.4	0.4	0.2	0.2	0.2
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	0.1	0.1	0.1	0.2	0.1	0.2

Table 22. Summary of concentrations of endrin (ng/g) and chlorpyrifos (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of Samples	Endrin ng/g			Chlorpyrifos ng/g		
		Mean	Min	Max	Mean	Min	Max
	MDL:		0.04			0.06	
blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	4.8	4.0	6.3	ND		
Eastern Raritan Bay @ Keansburg	3	ND			1.2	0.9	1.7
Hackensack River @ Laurel Hill	3	ND			3.7	2.4	5.0
Lower Passaic River @ Newark Bay	5	ND			4.9	2.5	9.3
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	ND			0.9	0.2	2.1
Newark Bay @ Shooters Island	3	7.4	6.6	8.0	4.3	ND	9.9
Newark Bay @ Turnpike Bridge	3	4.7	3.0	7.0	1.4	ND	2.2
Raritan River @Rt 35 Victory Bridge	3	ND			2.3	2.1	2.5
Upper NY Bay @ Caven Point	3	1.5	ND	2.6	2.6	1.1	4.3
Upper Tidal Passaic River @ Kearny	5	9.0	5.3	14.1	4.8	4.0	5.3
Western Raritan Bay	3	ND			3.3	2.4	4.3
blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	3	ND			ND		
Eastern Raritan Bay @ Keansburg	3	ND			ND		
Hackensack River @ Laurel Hill	3	ND			ND		
Lower Passaic River @ Newark Bay	5	0.0	ND	0.1	ND		
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	ND			ND		
Newark Bay @ Shooters Island	3	ND			ND		
Newark Bay @ Turnpike Bridge	3	ND			ND		
Raritan River @Rt 35 Victory Bridge	3	ND			ND		
Upper NY Bay @ Caven Point	3	ND			0.0	ND	0.1
Upper Tidal Passaic River @ Kearny	5	0.0	ND	0.1	0.0	ND	0.1
Western Raritan Bay	3	ND			ND		
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.0	ND	2.3	0.1	ND	0.3
off shore NY Bight @ Mud Hole	4	0.4	ND	1.0	0.2	ND	0.4
American Lobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	ND			ND		
off shore NY Bight @ Mud Hole	4	ND			ND		
Striped bass fillet							
Hackensack River @ Laurel Hill	1	ND			2.5	2.5	2.5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	ND			ND		
White perch fillet							
Hackensack River @ Laurel Hill	3	ND			1.6	1.5	1.7

Table 23. Summary of concentrations of aldrin (ng/g) and dieldrin (ng/g) in Task II samples from the NJ 2004 Routine Monitoring Program.

Location	No. of Samples	Aldrin ng/g			Dieldrin ng/g		
		Mean	Min	Max	Mean	Min	Max
	MDL:		0.02			0.05	
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	2.1	1.8	2.7	59.8	37.2	82.6
Eastern Raritan Bay @ Keansburg	3	0.5	0.4	0.7	21.0	17.4	27.4
Hackensack River @ Laurel Hill	3	1.3	0.9	2.0	51.8	33.0	88.1
Lower Passaic River @ Newark Bay	5	1.3	0.1	4.2	49.7	27.7	102.0
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.3	0.2	0.4	19.4	14.2	24.0
Newark Bay @ Shooters Island	3	1.8	1.4	2.3	57.6	48.1	68.5
Newark Bay @ Turnpike Bridge	3	0.2	0.1	0.4	36.9	12.8	61.3
Raritan River @Rt 35 Victory Bridge	3	1.6	1.0	2.2	29.2	17.8	35.8
Upper NY Bay @ Caven Point	3	0.6	0.4	0.7	25.3	14.1	35.7
Upper Tidal Passaic River @ Kearny	5	0.9	0.6	1.3	58.8	44.5	78.8
Western Raritan Bay	3	2.2	1.4	3.0	54.1	40.7	62.2
Blue crab Muscle	3	0.0	0.0	0.0	0.4	0.3	0.4
Arthur Kill @ Fresh Kill Landfill							
Eastern Raritan Bay @ Keansburg	3	0.0	0.0	0.0	0.3	0.2	0.5
Hackensack River @ Laurel Hill	3	0.1	0.0	0.1	0.8	0.5	1.1
Lower Passaic River @ Newark Bay	5	0.1	0.0	0.1	1.6	1.0	2.4
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.0	0.0	0.0	0.3	0.2	0.3
Newark Bay @ Shooters Island	3	0.0	0.0	0.0	0.5	0.1	1.1
Newark Bay @ Turnpike Bridge	3	0.0	0.0	0.1	0.7	0.4	0.9
Raritan River @Rt 35 Victory Bridge	3	0.1	0.0	0.1	0.5	0.2	0.8
Upper NY Bay @ Caven Point	3	0.0	0.0	0.0	0.3	0.1	0.6
Upper Tidal Passaic River @ Kearny	5	0.1	0.0	0.1	1.4	0.7	1.7
Western Raritan Bay	3	0.1	0.0	0.2	0.7	0.4	0.9
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.1	0.0	0.2	14.0	6.6	23.7
off shore NY Bight @ Mud Hole	4	0.2	0.0	0.2	9.1	4.5	12.7
American Lobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.0	0.0	0.0	0.3	0.2	0.4
off shore NY Bight @ Mud Hole	4	0.0	0.0	0.0	0.3	0.2	0.3
White perch fillet	3	0.2	0.1	0.3	16.2	13.0	20.1
Hackensack River @ Laurel Hill							
Striped bass fillet	1	0.1	0.1	0.1	20.4	20.4	20.4
Hackensack River @ Laurel Hill							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	0.0	0.0	0.0	0.7	0.5	0.8

Table 24. Summary of concentrations of heptachlor (ng/g) and heptachlor epoxide (ng/g) in task II samples from the NJ 2004 Routine Monitoring Program.

Location	Number of Samples	Heptachlor ng/g			Heptachlor Epoxide ng/g		
		Mean	Min	Max	Mean	Min	Max
	MDL:		0.01			0.02	
Blue crab Hepatopancreas							
Arthur Kill @ Fresh Kill Landfill	3	3.7	2.3	4.8	26.3	18.8	30.7
Eastern Raritan Bay @ Keansburg	3	0.6	0.4	0.9	8.8	5.8	12.5
Hackensack River @ Laurel Hill	3	1.9	1.0	3.1	31.3	14.1	40.1
Lower Passaic River @ Newark Bay	5	1.1	0.0	2.1	30.8	11.5	67.6
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.5	0.4	0.6	10.1	6.9	14.5
Newark Bay @ Shooters Island	3	5.6	4.3	6.5	27.8	24.8	32.9
Newark Bay @ Turnpike Bridge	3	2.7	0.9	4.2	17.5	7.0	28.9
Raritan River @Rt 35 Victory Bridge	3	2.0	1.8	2.2	11.8	7.9	13.8
Upper NY Bay @ Caven Point	3	2.6	1.4	3.2	6.3	3.0	9.2
Upper Tidal Passaic River @ Kearny	5	2.1	0.0	4.1	59.1	40.8	87.0
Western Raritan Bay	3	2.5	1.6	3.2	25.0	20.0	29.3
Blue crab Muscle							
Arthur Kill @ Fresh Kill Landfill	3	0.0	0.0	0.0	0.1	0.1	0.1
Eastern Raritan Bay @ Keansburg	3	0.0	0.0	0.0	0.1	0.0	0.1
Hackensack River @ Laurel Hill	3	0.0	0.0	0.1	0.2	0.1	0.4
Lower Passaic River @ Newark Bay	5	0.1	0.0	0.1	0.4	0.2	0.5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.0	0.0	0.0	0.1	0.0	0.1
Newark Bay @ Shooters Island	3	0.0	0.0	0.1	0.1	0.0	0.3
Newark Bay @ Turnpike Bridge	3	0.0	0.0	0.1	0.1	0.1	0.2
Raritan River @Rt 35 Victory Bridge	3	0.0	0.0	0.0	0.1	0.1	0.1
Upper NY Bay @ Caven Point	3	0.0	0.0	0.1	0.1	0.0	0.1
Upper Tidal Passaic River @ Kearny	5	0.0	0.0	0.0	0.7	0.4	1.0
Western Raritan Bay	3	0.0	0.0	0.0	0.1	0.1	0.2
American Lobster Hepatopancreas							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.3	0.6	2.3	1.4	1.1	1.7
off shore NY Bight @ Mud Hole	4	0.9	0.5	1.3	1.2	0.9	1.7
AmericanLobster Muscle							
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.0	0.0	0.0	0.0	0.0	0.0
off shore NY Bight @ Mud Hole	4	0.0	0.0	0.0	0.0	0.0	0.0
White perch fillet							
Hackensack River @ Laurel Hill	3	0.6	0.5	0.6	4.0	3.5	5.1
Striped bass fillet							
Hackensack River @ Laurel Hill	1	0.3	0.3	0.3	6.9	6.9	6.9
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	0.0	0.0	0.0	0.1	0.0	0.1

Table 25. Summary of concentrations of endosulfan II (ng/g) and pentachloroanisole (ng/g) in task II samples from the NJ 2004 Routine Monitoring Program. B indicates the number of specimens with qualifier for pentachloroanisole, based on apparent contamination of blanks.

Location	No. of Samples	Endosulfan II ng/g			Pentachloroanisole ng/g			
		Mean	Min	Max	Mean	Min	Max	# B
	MDL:		0.02			0.01		
Blue crab Hepatopancreas								
Arthur Kill @ Fresh Kill Landfill	3	2.3	1.6	2.7	1.7	1.1	2.5	0
Eastern Raritan Bay @ Keansburg	3	0.0	0.0	0.0	0.3	0.2	0.3	3
Hackensack River @ Laurel Hill	3	0.0	0.0	0.0	1.8	1.2	2.8	0
Lower Passaic River @ Newark Bay	5	0.0	0.0	0.0	1.3	0.5	2.7	2
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.0	0.0	0.0	0.4	0.3	0.4	3
Newark Bay @ Shooters Island	3	2.2	1.6	3.1	2.3	1.9	2.7	0
Newark Bay @ Turnpike Bridge	3	0.3	0.0	0.6	0.9	0.3	1.4	0
Raritan River @Rt 35 Victory Bridge	3	0.0	0.0	0.0	0.9	0.7	1.1	1
Upper NY Bay @ Caven Point	3	0.5	0.2	0.8	0.6	0.4	0.9	0
Upper Tidal Passaic River @ Kearny	5	1.6	0.8	2.3	1.2	0.6	2.2	0
Western Raritan Bay	3	0.0	0.0	0.0	0.6	0.3	0.9	2
Blue crab muscle								
Arthur Kill @ Fresh Kill Landfill	3	0.0	0.0	0.0	0.0	0.0	0.0	0
Eastern Raritan Bay @ Keansburg	3	0.0	0.0	0.0	0.0	0.0	0.0	3
Hackensack River @ Laurel Hill	3	0.0	0.0	0.0	0.0	0.0	0.1	0
Lower Passaic River @ Newark Bay	5	0.0	0.0	0.0	0.1	0.0	0.1	5
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	3	0.0	0.0	0.0	0.1	0.0	0.1	3
Newark Bay @ Shooters Island	3	0.0	0.0	0.0	0.0	0.0	0.0	0
Newark Bay @ Turnpike Bridge	3	0.0	0.0	0.0	0.0	0.0	0.0	0
Raritan River @Rt 35 Victory Bridge	3	0.0	0.0	0.0	0.1	0.0	0.1	3
Upper NY Bay @ Caven Point	3	0.0	0.0	0.0	0.0	0.0	0.0	0
Upper Tidal Passaic River @ Kearny	5	0.0	0.0	0.0	0.0	0.0	0.0	0
Western Raritan Bay	3	0.0	0.0	0.0	0.1	0.1	0.1	3
American lobster hepatopancreas								
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	1.4	0.2	4.1	1.3	1.1	1.6	0
off shore NY Bight @ Mud Hole	4	0.3	0.1	0.4	1.4	0.8	2.0	0
American Lobster muscle								
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	5	0.0	0.0	0.0	0.0	0.0	0.0	0
off shore NY Bight @ Mud Hole	4	0.0	0.0	0.0	0.0	0.0	0.1	3
White perch fillet								
Hackensack River @ Laurel Hill	3	1.2	0.8	1.4	1.3	1.2	1.5	0
Striped bass fillet								
Hackensack River @ Laurel Hill	1	1.6	1.6	1.6	1.7	1.7	1.7	0
Mid-lower Raritan Bay @ Raritan beach/Chapel Hill	2	0.1	0.1	0.1	0.1	0.0	0.1	0

Table 26. Individual fish exceeding stated USEPA criteria for subsistence fisherman. Data are based on sums with component compounds below detection limit treated as 0. Task I samples from the NJ 2004 Routine Monitoring Program. The criteria which are exceeded are shown in bold face and underlined text.

Fish	Serial Number	Station	Station Name	Common Name	LTL cm	Lipid Percent	Total DDXs ng/g	Total Chlordanes ng/g	Dieldrin ng/g	Heptachlor Epoxide ng/g	Lindane ng/g
Anal #				**Criteria:**			**14.4**	**14**	**0.307**	**0.54**	**30.7**
F-1520	NJT04-DBMGN2	DBM	Delaware Bay Middle	striped bass	86.7	0.2	**22.3**	6.5	0.0	**0.6**	0.0
F-1521	NJT04-DBMGN2	DBM	Delaware Bay Middle	striped bass	79.8	0.5	**67.9**	**20.1**	0.1	**3.1**	0.3
F-1522	NJT04-DBMGN2	DBM	Delaware Bay Middle	striped bass	79.1	0.3	**43.1**	9.2	0.1	**1.3**	0.1
F-1523	NJT04-DBMGN2	DBM	Delaware Bay Middle	striped bass	78.0	0.2	**22.7**	7.0	0.0	0.4	0.1
F-1524	NJT04-DBMGN2	DBM	Delaware Bay Middle	striped bass	72.0	0.3	**24.0**	7.1	0.0	**0.9**	0.1
F-1525	NJT04-BBTREP5	BBTR	Barnegat Bay near Toms River	American eel	54.8	11.4	**18.9**	**20.7**	0.1	**3.9**	0.1
F-1526	NJT04-BBTREP8	BBTR	Barnegat Bay near Toms River	American eel	45.2	3.8	**16.4**	9.4	BDL	**1.9**	BDL
F-1528	NJT04-BBTREP7	BBTR	Barnegat Bay near Toms River	American eel	51.1	3.7	**18.9**	9.7	0.1	**1.2**	BDL
F-1529	NJT04-SKREP14	SKR	Shark River	American eel	52.3	4.9	**17.4**	11.0	0.0	**1.1**	0.1
F-1530	NJT04-BBTREP1	BBTR	Barnegat Bay near Toms River	American eel	63.3	13.9	**34.8**	**33.4**	0.3	**8.1**	0.1
F-1531	NJT04-SKREP10	SKR	Shark River	American eel	81.9	12.8	**36.9**	**21.0**	0.3	**3.5**	0.2
F-1532	NJT04-SBREP1	SBR	Shrewsbury River	American eel	58.7	6.2	**41.3**	**31.1**	0.1	**4.9**	BDL
F-1534	NJT04-AONA2	AON	Atlantic Ocean Sandy Hook	striped bass	79.0	1.5	**17.8**	4.9	0.1	0.4	0.1
F-1536	NJT04-AONA2	AON	Atlantic Ocean Sandy Hook	striped bass	83.6	2.2	**34.2**	9.5	0.3	**0.8**	BDL
F-1538	NJT04-AOSA1	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	64.9	3.2	**15.9**	6.3	0.0	**0.6**	BDL
F-1541	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	68.6	2.4	**26.7**	12.3	0.0	0.3	BDL
F-1542	NJT04-AOSA1	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	78.3	2.8	**18.6**	4.1	0.1	0.4	0.1
F-1543	NJT04-AOSA3	AOS	Atlantic Ocean Sea Isle City to Cape May	bluefish	75.3	8.9	**55.2**	**15.2**	0.1	**1.3**	0.2
F-1544	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	73.2	3.4	**32.7**	**15.3**	0.1	**1.6**	BDL
F-1545	NJT04-AOSA1	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	73.2	0.7	**20.2**	5.0	0.2	0.2	0.2
F-1546	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	74.3	1.4	**25.8**	7.6	0.1	0.5	BDL
F-1547	NJT04-AOSA1	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	82.5	0.4	**16.4**	4.7	0.1	0.0	BDL
F-1548	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	striped bass	88.0	2.9	**23.3**	7.3	0.1	**0.7**	BDL
F-1552	NJT04-BBTRA2	BBTR	Barnegat Bay near Toms River	striped bass	68.8	2.1	**23.3**	7.0	0.0	**0.6**	BDL
F-1553	NJT04-SBREP5	SBR	Shrewsbury River	American eel	62.5	9.6	**65.0**	**44.8**	**0.6**	**8.0**	0.1
F-1554	NJT04-SBREP5	SBR	Shrewsbury River	American eel	55.0	1.9	**29.1**	**14.4**	0.0	**2.5**	BDL
F-1556	NJT04-BBTRA2	BBTR	Barnegat Bay near Toms River	striped bass	85.1	2.7	**32.6**	9.0	0.1	**0.8**	0.1
F-1557	NJT04-NREP1	NR	Navesink River	American eel	48.4	1.6	**15.4**	**14.0**	0.0	**2.3**	BDL
F-1559	NJT04-NREP1	NR	Navesink River	American eel	55.4	2.7	**35.4**	25.9	0.3	**3.7**	BDL
F-1560	NJT04-NREP1	NR	Navesink River	American eel	63.4	14.2	**91.6**	**78.4**	**1.0**	**16.1**	0.1
F-1561	NJT04-NREP1	NR	Navesink River	American eel	71.3	18.4	**476.7**	**158.1**	**3.2**	**51.4**	0.6

Table 26 (continued). Individual fish exceeding stated USEPA criteria for subsistence fisherman. Data are based on sums with component compounds below detection limit treated as 0. Task I samples from the NJ 2004 Routine Monitoring Program.

Fish	Serial Number	Station	Station Name	Common Name	LTL cm	Lipid Percent	Total DDXs ng/g	Total Chlordanes ng/g	Dieldrin ng/g	Heptachlor Epoxide ng/g	Lindane ng/g
Anal #				**Criteria:**			**14.4**	**14**	**0.307**	**0.54**	**30.7**
F-1562	NJT04-DBMGN1	DBM	Delaware Bay Middle	weakfish	37.7	4.6	**25.7**	6.4	BDL	**0.7**	0.1
F-1563	NJT04-DBMGN1	DBM	Delaware Bay Middle	weakfish	36.1	6.9	**30.0**	6.1	0.0	**1.8**	BDL
F-1564	NJT04-DBMGN1	DBM	Delaware Bay Middle	weakfish	36.4	6.3	**32.5**	6.5	0.1	**1.4**	0.1
F-1565	NJT04-DBMGN1	DBM	Delaware Bay Middle	weakfish	40.2	10.1	**23.7**	5.8	0.0	**1.5**	0.2
F-1566	NJT04-DBMA3	DBM	Delaware Bay Middle	weakfish	39.2	2.5	**15.7**	3.2	0.1	**0.7**	0.1
F-1568	NJT04-AOBA1	AOB	Atlantic Ocean at Belmar	bluefish	67.2	4.0	**25.7**	8.8	0.1	**0.8**	0.1
F-1569	NJT04-AOBA1	AOB	Atlantic Ocean at Belmar	bluefish	73.7	1.4	**27.9**	7.6	0.0	0.5	BDL
F-1570	NJT04-AOBA1	AOB	Atlantic Ocean at Belmar	bluefish	78.8	1.2	**15.4**	2.6	0.0	0.2	0.1
F-1574	NJT04-DBMA3	DBM	Delaware Bay Middle	weakfish	34.2	4.4	**20.0**	3.9	0.1	**1.3**	0.1
F-1576	NJT04-DBMA3	DBM	Delaware Bay Middle	weakfish	46.6	6.5	**20.8**	5.5	0.1	**1.9**	0.2
F-1577	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	bluefish	61.0	10.1	**82.9**	**21.6**	0.1	**3.1**	0.3
F-1578	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	bluefish	62.2	13.3	**39.4**	11.2	0.2	**1.7**	0.4
F-1579	NJT04-AOSA2	AOS	Atlantic Ocean Sea Isle City to Cape May	bluefish	63.7	9.1	**53.5**	**15.4**	0.2	**1.6**	0.4
F-1580	NJT04-DRPEP2	DRP	Delaware River near Camden	American eel	50.0	1.1	**127.0**	**103.2**	**2.1**	**17.8**	0.9
F-1581	NJT04-DRPEP2	DRP	Delaware River near Camden	American eel	52.6	0.2	**242.9**	**32.0**	**1.1**	**3.9**	0.1
F-1582	NJT04-DRPEP3	DRP	Delaware River near Camden	American eel	60.2	1.4	**853.6**	**132.8**	**3.9**	**19.9**	1.0
F-1583	NJT04-DRPBS1	DRP	Delaware River near Camden	American eel	53.7	0.1	**67.8**	11.0	0.2	**1.2**	0.1
F-1584	NJT04-DRPBS5	DRP	Delaware River near Camden	American eel	60.6	1.8	**1362.5**	**173.5**	**12.6**	**22.7**	1.2
F-1585	NJT04-MLREP9	MLR	Mullica River	American eel	49.2	0.3	**16.0**	1.0	0.1	0.1	BDL
F-1586	NJT04-MLREP14	MLR	Mullica River	American eel	68.5	16.9	**44.3**	13.6	0.1	**3.7**	0.1
F-1587	NJT04-MLREP14	MLR	Mullica River	American eel	63.2	16.4	**53.3**	**16.2**	0.2	**4.3**	0.2
F-1588	NJT04-MLREP11	MLR	Mullica River	American eel	62.4	10.2	**48.4**	13.7	0.1	**2.4**	0.1
F-1589	NJT04-MLRCRT6	MLR	Mullica River	American eel	72.6	14.2	**44.4**	8.4	0.1	**2.5**	0.1
F-1590	NJT04-RRA1	RR	Raritan River @Rt 35 Victory Bridge	white perch	16.0	2.3	**61.8**	**18.6**	0.1	**3.2**	0.1
F-1591	NJT04-RRA1	RR	Raritan River @Rt 35 Victory Bridge	white perch	14.5	1.7	**77.4**	**15.1**	0.0	**2.9**	0.1
F-1592	NJT04-RRA1	RR	Raritan River @Rt 35 Victory Bridge	white perch	13.8	1.5	**29.5**	9.4	0.0	**1.8**	0.1
F-1593	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	Porgy/Scup	29.1	5.8	**24.9**	7.6	0.1	**1.3**	0.2
F-1595	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	Porgy/Scup	29.9	5.5	**44.6**	12.8	0.3	**1.5**	0.1
F-1599	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	28.2	0.6	**17.6**	4.1	0.0	**0.6**	0.1
F-1600	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	35.3	0.7	**37.3**	7.0	0.1	**1.0**	0.1

Table 26 (continued). Individual fish exceeding stated USEPA criteria for subsistence fisherman. Data are based on sums with component compounds below detection limit treated as 0. Task I samples from the NJ 2004 Routine Monitoring Program.

Fish	Serial Number	Station	Station Name	Common Name	LTL cm	Lipid Percent	Total DDXs ng/g	Total Chlordanes ng/g	Dieldrin ng/g	Heptachlor Epoxide ng/g	Lindane ng/g
Anal #				**Criteria:**			**14.4**	**14**	**0.307**	**0.54**	**30.7**
F-1601	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	38.1	1.6	**139.9**	**16.1**	**0.9**	**2.0**	0.1
F-1602	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	40.1	3.6	**191.6**	**32.5**	**1.3**	**4.3**	0.4
F-1603	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	43.2	1.5	**104.1**	**20.2**	0.3	**2.4**	0.1
F-1609	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	72.6	9.1	**121.6**	**31.8**	**0.5**	**4.8**	0.8
F-1610	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	75.2	9.6	**170.4**	**43.3**	**0.6**	**5.8**	1.0
F-1611	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	77.0	12.0	**210.3**	**67.1**	**0.7**	**8.4**	0.8
F-1612	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	83.6	5.1	**42.7**	12.9	0.1	**2.1**	0.4
F-1613	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	90.0	6.0	**141.0**	**34.6**	0.3	**2.8**	0.5
F-1614	NJT04-AOSA1	AOS	Atlantic Ocean Sea Isle City to Cape May	bluefish	46.7	5.9	**24.0**	8.7	0.1	**0.8**	0.2
F-1615	NJT04-RBPMA1	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	weakfish	34.8	5.4	**18.5**	5.5	0.0	**0.7**	0.2
F-1616	NJT04-RBPMA1	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	weakfish	45.6	5.0	**21.8**	7.5	0.0	**0.7**	0.1
F-1617	NJT04-RBPMA1	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	weakfish	42.5	11.4	**81.3**	**21.2**	0.1	**2.5**	0.3
F-1618	NJT04-RBPMA1	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	weakfish	43.4	7.2	**58.0**	**16.2**	0.1	**1.8**	0.2
F-1619	NJT04-RBPMA1	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	weakfish	54.5	6.3	**15.7**	4.7	0.1	**0.6**	0.1
F-1620	NJT04-AOMA1	AOM	Atlantic Ocean Island Beach	bluefish	52.3	2.7	**40.1**	12.5	0.1	**2.0**	0.2
F-1621	NJT04-AOMA1	AOM	Atlantic Ocean Island Beach	bluefish	68.4	2.8	**36.7**	10.7	0.1	**0.8**	BDL
F-1622	NJT04-AOMA1	AOM	Atlantic Ocean Island Beach	bluefish	82.5	1.0	**48.0**	10.1	0.3	**1.0**	BDL
F-1623	NJT04-BBTRA2	BBTR	Barnegat Bay near Toms River	bluefish	46.2	5.3	**32.1**	10.6	0.1	**1.5**	0.1
F-1625	NJT04-AONA1	AON	Atlantic Ocean Sandy Hook	bluefish	75.2	7.8	**95.2**	**35.3**	0.3	**3.2**	0.3
F-1626		RR	Raritan @ Rt 35	bluefish	40.6	6.2	**132.6**	**32.2**	**0.5**	**5.9**	0.5
F-1627		RR	Raritan @ Rt 35	bluefish	40.3	5.5	**64.1**	**19.8**	0.0	**3.7**	0.3
F-1628		RR	Raritan @ Rt 35	bluefish	36.7	7.0	**173.9**	**38.0**	**0.6**	**8.7**	0.7
F-1629		SHB	Sandy Hook	bluefish	40.7	4.0	**102.4**	**25.9**	**0.6**	**3.1**	0.2
F-1630		SHB	Sandy Hook	bluefish	37.5	6.2	**60.4**	**15.7**	0.2	**3.2**	0.3

Table 26 (continued). Individual fish exceeding stated USEPA criteria for subsistence fisherman. Data are based on sums with component compounds below detection limit treated as 0. Task I samples from the NJ 2004 Routine Monitoring Program.

Fish	Serial Number	Station	Station Name	Common Name	LTL cm	Lipid Percent	Total DDXs ng/g	Total Chlordanes ng/g	Dieldrin ng/g	Heptachlor Epoxide ng/g	Lindane ng/g
Anal #				**Criteria:**			**14.4**	**14**	**0.307**	**0.54**	**30.7**
F-1631		SHB	Sandy Hook	bluefish	36.0	4.5	**40.5**	12.8	0.1	**2.1**	0.2
F-1632		DBM	Delaware Bay middle	bluefish	26.5	1.5	**15.1**	5.6	0.0	**0.8**	0.1
F-1633		DBM	Delaware Bay middle	bluefish	37.3	6.5	**56.1**	13.6	0.2	**2.0**	1.0
F-1634		DBM	Delaware Bay middle	bluefish	41.3	6.4	**92.3**	**26.4**	0.3	**3.2**	0.1

Table 27. Individual fish exceeding stated USEPA criteria for recreational fisherman. Data are based on sums with component compounds below detection limit treated as 0. Task I samples from the NJ 2004 Routine Monitoring Program. Bold numbers indicate compounds

Fish Anal #	Serial Number	Station	Station Name	Common Name Criteria:	LTL cm	Lipid Percent	Total DDXs ng/g 117	Total Chlordanes ng/g 114	Dieldrin ng/g 2.50	Heptachlor Epoxide ng/g 4.39	Lindane ng/g 30.7
F-1530	NJT04-BBTREP1	BBTR	Barnegat Bay near Toms River	American eel	63.3	13.9	34.8	33.4	0.3	**8.1**	0.1
F-1532	NJT04-SBREP1	SBR	Shrewsbury River	American eel	58.7	6.2	41.3	31.1	0.1	**4.9**	BDL
F-1553	NJT04-SBREP5	SBR	Shrewsbury River	American eel	62.5	9.6	65.0	44.8	0.6	**8.0**	0.1
F-1560	NJT04-NREP1	NR	Navesink River	American eel	63.4	14.2	91.6	78.4	1.0	**16.1**	0.1
F-1561	NJT04-NREP1	NR	Navesink River	American eel	71.3	18.4	**476.7**	**158.1**	**3.2**	**51.4**	0.6
F-1580	NJT04-DRPEP2	DRP	Delaware River near Camden	American eel	50.0	1.1	**127.0**	103.2	2.1	**17.8**	0.9
F-1581	NJT04-DRPEP2	DRP	Delaware River near Camden	American eel	52.6	0.2	**242.9**	32.0	1.1	3.9	0.1
F-1582	NJT04-DRPEP3	DRP	Delaware River near Camden	American eel	60.2	1.4	**853.6**	**132.8**	**3.9**	**19.9**	1.0
F-1584	NJT04-DRPBS5	DRP	Delaware River near Camden	American eel	60.6	1.8	**1362.5**	**173.5**	**12.6**	**22.7**	1.2
F-1601	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	38.1	1.6	**139.9**	16.1	0.9	2.0	0.1
F-1602	NJT04-DRPCRT1	DRP	Delaware River near Camden	white catfish	40.1	3.6	**191.6**	32.5	1.3	4.3	0.4
F-1609	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	72.6	9.1	**121.6**	31.8	0.5	**4.8**	0.8
F-1610	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	75.2	9.6	**170.4**	43.3	0.6	**5.8**	1.0
F-1611	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	77.0	12.0	**210.3**	67.1	0.7	**8.4**	0.8
F-1613	NJT04-RBPMA2	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	bluefish	90.0	6.0	**141.0**	34.6	0.3	2.8	0.5
F-1626		RR	Raritan @ Rt 35	bluefish	40.6	6.2	**132.6**	32.2	0.5	**5.9**	0.5
F-1628		RR	Raritan @ Rt 35	bluefish	36.7	7.0	**173.9**	38.0	0.6	**8.7**	0.7

Table 28. Average concentations of selected contaminants in the 1998 toxic monitoring study and the 2004 routine monitoring study. Samples BDL are treated as 0 concentration.

	StatGroup	Station	Station Name	Survey	Avg. LTL cm	Avg. %Lipid	Avg. Total PCBs ng/g	Avg. Total DDX ng/g	Avg. Total Chlordanes ng/g	Avg. Endosulfan ng/g	Avg. Endrin ng/g
American eel											
	CHR	CHR	Cohansey River	1998	56.5	8.2	81.3	75.2	6.1	0.8	0.1
	DRD	DRD	Delaware River, Deepwater to National Park	1998	56.2	8.5	1651.8	1052.8	71.0	11.5	0.5
	DRPc	DRP	Delaware River near Camden	2004	55.4	0.9	1536.7	530.8	90.5	4.0	1.0
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	55.6	6.6	646.8	544.4	34.1	4.9	0.4
	DRTA	DRTA	Delaware River, Above Trenton	1998	59.3	14.5	313.1	307.6	19.3	3.7	0.6
	MLR	MLR	Mullica River	1998	45.5	4.1	128.5	62.8	3.6	0.8	0.0
	MLR	MLR	Mullica River	2004	63.2	11.6	151.2	41.3	10.6	0.7	0.2
	MRR	MRR	Maurice River	1998	46.3	6.3	142.0	67.9	8.0	1.0	0.0
	NRc	NR	Navesink River	2004	56.9	7.6	162.7	126.4	57.5	2.9	0.1
	NRc	NVR	Navesink River	1998	41.0	4.0	218.3	119.9	16.4	5.3	0.2
	NTRc	BBTR	Barnegat Bay near Toms River	2004	52.9	7.1	72.0	20.3	16.1	0.8	1.9
	NTRc	TR	Toms River	1998	55.3	11.1	150.1	152.4	86.3	7.3	0.2
	PNR	PNR	Pennsauken River at Forked landing	1998	42.9	2.6	365.7	402.2	29.4	4.5	0.0
	PRE	PRE	Passaic River at Elmwood Park	1998	50.4	4.9	539.9	279.9	110.1	17.0	0.5
	RC	RC	Raccoon Creek	1998	51.7	3.1	996.1	509.4	26.3	4.5	0.2
	RRLc	RBM	Raritan Bay at Rt. 1	1998	42.6	11.1	1468.8	681.5	142.3	13.3	1.0
	SBR	SBR	Shrewsbury River	1998	54.2	7.3	241.2	132.8	19.6	4.7	0.4
	SBR	SBR	Shrewsbury River	2004	55.4	4.9	131.7	37.0	25.8	1.7	0.0
	SKR	SKR	Shark River	1998	57.3	9.2	458.7	212.7	57.1	15.1	0.4
	SKR	SKR	Shark River	2004	67.1	8.9	216.1	27.2	16.0	1.2	0.0
Striped bass											
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	74.6	1.9	305.1	51.1	3.9	0.6	0.7
	AOCc	AOM	Atlantic Ocean Island Beach	2004	64.6	2.0	148.5	10.4	3.3	0.1	0.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	83.1	1.4	153.3	16.6	4.8	0.1	0.1
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	79.3	3.9	461.5	130.2	16.8	2.3	0.8
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	74.1	2.0	280.0	19.9	6.7	0.1	0.2
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	97.2	3.5	481.2	139.8	18.7	1.8	0.3
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	80.8	4.5	634.8	183.5	15.0	2.0	0.6
	DBLc	DBM	Delaware Bay Middle	2004	79.1	0.3	208.7	36.0	10.0	0.1	0.1
	DRD	DRD	Delaware River, Deepwater to National Park	1998	64.1	2.0	621.0	339.6	24.3	4.4	0.0
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	59.8	2.5	375.0	220.0	65.1	6.5	0.4
	DRTA	DRTA	Delaware River, Above Trenton	1998	67.3	2.1	705.9	333.0	23.2	5.7	0.2

Table 28 (continued). Average concentations of selected contaminants in the 1998 toxic monitoring study and the 2004 routine monitoring study. Samples BDL are treated as 0 concentration.

	StatGroup	Station	Station Name	Survey	Avg. LTL cm	Avg. %Lipid	Avg. Total PCBs ng/g	Avg. Total DDX ng/g	Avg. Total Chlordanes ng/g	Avg. Endosulfan ng/g	Avg. Endrin ng/g
	NTRc	BBTR	Barnegat Bay near Toms River	2004	75.5	1.7	174.0	19.0	5.3	0.1	0.2
	RBUc	RBU	Raritan Bay upper	1998	69.0	2.3	430.4	105.8	27.4	2.8	0.2
	RC	RC	Raccoon Creek	1998	67.0	1.7	864.3	597.6	44.0	4.7	0.0
Bluefish											
	AOCc	AOB	Atlantic Ocean at Belmar	2004	75.4	1.6	141.8	18.7	4.9	0.1	0.2
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	76.3	15.3	644.6	156.3	26.9	1.9	1.5
	AOCc	AOM	Atlantic Ocean Island Beach	2004	67.7	2.2	320.8	41.6	11.1	0.4	0.4
	AONc	AON	Atlantic Ocean Sandy Hook	2004	73.7	4.5	477.1	53.2	19.5	0.7	0.2
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	76.4	2.7	560.1	110.8	13.2	1.5	0.4
	AONc	SHB	Sandy Hook	2004	38.1	4.9	377.2	67.8	18.1	0.4	0.2
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	61.8	9.5	340.8	51.0	14.4	0.3	0.7
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	78.5	9.0	655.8	147.2	20.2	1.9	0.7
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	62.9	3.1	701.7	100.7	11.1	1.0	0.1
	DBLc	DBM	Delaware Bay middle	2004	35.0	4.8	289.3	54.5	15.2	0.3	0.0
	NTRc	BBTR	Barnegat Bay near Toms River	2004	46.2	5.3	237.6	32.1	10.6	0.0	0.0
	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	79.7	8.4	967.1	137.2	37.9	1.3	0.1
	RBUc	RBU	Raritan Bay upper	1998	24.9	2.3	294.5	115.3	24.5	1.5	0.8
	RRLc	RR	Raritan @ Rt 35	2004	39.2	6.2	462.3	123.5	30.0	0.2	0.4
	RRLc	RRL	Raritan River lower	1998	62.5	3.8	412.7	76.8	10.5	1.4	0.3

Table 29. Average concentations of selected OCPs in the 1998 toxic monitoring study and the 2004 routine monitoring study. Samples BDL are treated as 0 concentration.

	StatGroup	Station	Station Name	Survey	Aldrin ng/g	Dieldrin ng/g	Total BHC ng/g	Heptachlor ng/g	Heptachlor epoxide ng/g	Lindane ng/g	Endrin ng/g
American eel											
	CHR	CHR	Cohansey River	1998	0.0	9.5	1.9	1.8	0.0	0.4	0.1
	DRD	DRD	Delaware River, Deepwater to National Park	1998	0.0	77.6	14.4	6.3	1.3	1.8	0.5
	DRPc	DRP	Delaware River near Camden	2004	2.3	4.0	0.2	4.0	13.1	0.7	0.4
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	0.5	22.0	9.9	2.8	0.2	1.0	0.4
	DRTA	DRTA	Delaware River, Above Trenton	1998	0.0	12.1	6.0	2.3	0.2	0.8	0.6
	MLR	MLR	Mullica River	1998	0.0	2.9	0.8	0.8	0.0	0.0	0.0
	MLR	MLR	Mullica River	2004	0.1	0.1	0.1	0.3	2.6	0.1	0.2
	MRR	MRR	Maurice River	1998	0.0	5.7	0.8	0.9	0.0	0.3	0.0
	NRc	NR	Navesink River	2004	0.4	0.9	0.3	2.8	15.1	0.1	0.1
	NRc	NVR	Navesink River	1998	0.0	8.9	14.7	3.1	0.2	0.2	0.2
	NTRc	BBTR	Barnegat Bay near Toms River	2004	0.2	0.1	0.3	0.6	3.3	0.0	1.9
	NTRc	TR	Toms River	1998	0.0	29.9	16.2	8.3	0.5	0.2	0.2
	PNR	PNR	Pennsauken River at Forked landing	1998	0.0	23.9	6.1	4.0	0.2	0.4	0.0
	PRE	PRE	Passaic River at Elmwood Park	1998	4.6	35.1	27.7	10.1	1.3	1.2	0.5
	RC	RC	Raccoon Creek	1998	0.3	19.3	3.3	2.2	0.3	1.0	0.2
	RRLc	RBM	Raritan Bay at Rt. 1	1998	1.7	56.4	9.9	11.3	1.6	1.1	1.0
	SBR	SBR	Shrewsbury River	1998	0.0	7.4	9.5	2.5	0.3	1.3	0.4
	SBR	SBR	Shrewsbury River	2004	0.1	0.2	0.2	0.9	4.6	0.1	0.0
	SKR	SKR	Shark River	1998	0.0	14.3	22.9	9.0	0.5	0.5	0.4
	SKR	SKR	Shark River	2004	0.1	0.2	0.2	0.5	2.3	0.2	0.0
Striped bass											
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	0.0	1.3	0.7	0.5	0.4	0.2	0.7
	AOCc	AOM	Atlantic Ocean Island Beach	2004	0.0	0.0	0.1	0.3	0.2	0.1	0.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	0.1	0.1	0.0	0.2	0.4	0.0	0.1
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	0.5	7.7	11.3	0.9	0.8	0.3	0.8
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	0.0	0.1	0.1	0.5	0.5	0.0	0.2
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	0.0	5.1	6.7	0.8	0.6	0.1	0.3
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	0.2	5.5	5.4	0.9	1.0	0.4	0.6
	DBLc	DBM	Delaware Bay Middle	2004	0.3	0.0	0.1	0.9	1.3	0.1	0.1
	DRD	DRD	Delaware River, Deepwater to National Park	1998	0.0	9.4	7.5	1.2	2.1	0.5	0.0
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	0.0	72.5	7.3	9.0	1.2	0.2	0.4
	DRTA	DRTA	Delaware River, Above Trenton	1998	0.0	7.5	6.8	0.9	1.1	0.0	0.2
	NTRc	BBTR	Barnegat Bay near Toms River	2004	0.1	0.0	0.1	0.2	0.5	0.1	0.2

Table 29 (continued). Average concentations of selected OCPs in the 1998 toxic monitoring study and the 2004 routine monitoring study. Samples BDL are treated as 0 concentration.

	StatGroup	Station	Station Name	Survey	Aldrin ng/g	Dieldrin ng/g	Total BHC ng/g	Heptachlor ng/g	Heptachlor epoxide ng/g	Lindane ng/g	Endrin ng/g
	RBUc	RBU	Raritan Bay upper	1998	0.0	11.0	3.1	2.6	1.1	0.1	0.2
	RC	RC	Raccoon Creek	1998	0.0	12.9	0.0	0.9	2.6	0.6	0.0
Bluefish											
	AOCc	AOB	Atlantic Ocean at Belmar	2004	0.0	0.0	0.0	0.1	0.4	0.1	0.2
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	0.5	11.4	8.2	0.9	0.6	0.5	1.5
	AOCc	AOM	Atlantic Ocean Island Beach	2004	0.2	0.2	0.4	0.2	1.3	0.1	0.4
	AONc	AON	Atlantic Ocean Sandy Hook	2004	0.1	0.2	0.2	0.3	1.7	0.2	0.2
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	0.5	6.3	3.4	0.5	0.4	0.2	0.4
	AONc	SHB	Sandy Hook	2004	0.4	0.3	0.4	0.8	2.8	0.2	0.2
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	0.3	0.1	0.5	0.4	1.7	0.3	0.4
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	0.3	12.1	3.3	0.9	0.6	0.3	0.7
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	0.0	2.6	1.2	0.5	0.5	0.1	0.1
	DBLc	DBM	Delaware Bay middle	2004	0.2	0.2	0.3	1.0	2.0	0.4	0.0
	NTRc	BBTR	Barnegat Bay near Toms River	2004	0.5	0.1	0.4	0.4	1.5	0.1	0.0
	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	1.1	0.4	0.4	3.4	4.8	0.7	0.1
	RBUc	RBU	Raritan Bay upper	1998	0.5	5.0	2.5	0.8	0.7	0.3	0.8
	RRLc	RR	Raritan @ Rt 35	2004	0.4	0.4	0.5	1.0	6.1	0.5	0.4
	RRLc	RRL	Raritan River lower	1998	0.5	3.8	2.7	0.4	0.5	0.4	0.3

Table 30. Comparison of average lipid-normalized concentrations of contaminants in the 1998 monitoring study (fish caught in 1998-1999) and the 2004 routine monitoring study. Bold face indicates cases where concentrations at the same station-group differed by a factor of more than 5 between the two surveys.

Species	Stat Group	Station	Station Name	Year	No. Samples	LTL cm	% Lipid	TPCB LipN ng/g	TDDX LipN ng/g	Tchlordane LipN ng/g	HeptEpoxide LipN ng/g	Hept LipN n/g	BHC LipN ng/g
						Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
ANROS	CHR	CHR	Cohansey River	1998	5	56.5	8.2	1935	1618	110	0.0	23.1	**15.7**
ANROS	DRD	DRD	Delaware River, Deepwater to National Park	1998	12	56.2	8.5	27223	15898	1042	30.5	88.2	**221.3**
ANROS	DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	55.6	6.6	**17762**	**14062**	**693**	**3.7**	**52.7**	**124.0**
ANROS	DRPc	DRP	Delaware River near Camden	2004	5	55.4	0.9	**204509**	**67492**	**11101**	**1490.1**	**515.0**	**22.4**
ANROS	DRTA	DRTA	Delaware River, Above Trenton	1998	12	59.3	14.5	2652	2521	130	1.7	15.4	38.6
ANROS	MLR	MLR	Mullica River	1998	12	45.5	4.1	**31319**	**9106**	408	**0.2**	**190.8**	**816.0**
ANROS	MLR	MLR	Mullica River	2004	10	63.2	11.6	**2067**	**1342**	141	**24.5**	**2.0**	**1.0**
ANROS	MRR	MRR	Maurice River	1998	5	46.3	6.3	2172	936	116	0.1	14.5	6.2
ANROS	NRc	NVR	Navesink River	1998	3	41.0	4.0	5617	3369	396	**7.0**	86.5	**404.0**
ANROS	NRc	NR	Navesink River	2004	5	56.9	7.6	3920	1297	821	**167.0**	29.1	**6.3**
ANROS	NTRc	TR	Toms River	1998	5	55.3	11.1	1656	1831	848	**4.3**	**80.2**	**182.1**
ANROS	NTRc	BBTR	Barnegat Bay near Toms River	2004	15	52.9	7.1	1430	358	237	**43.3**	**9.5**	**6.0**
ANROS	PNR	PNR	Pennsauken River at Forked landing	1998	1	42.9	2.6	14032	15433	1127	8.1	151.9	232.1
ANROS	PRE	PRE	Passaic River at Elmwood Park	1998	4	50.4	4.9	15177	7651	2597	34.2	229.0	644.4
ANROS	RC	RC	Raccoon Creek	1998	16	51.7	3.1	104362	35040	1039	32.9	68.0	160.0
ANROS	RRLc	RBM	Raritan Bay at Rt. 1	1998	4	42.6	11.1	14384	4878	1134	**19.3**	93.0	**205.8**
ANROS	SBR	SBR	Shrewsbury River	1998	14	54.2	7.3	4916	2075	318	4.4	33.5	**139.1**
ANROS	SBR	SBR	Shrewsbury River	2004	8	55.4	4.9	3218	883	603	111.6	19.3	**2.2**
ANROS	SKR	SKR	Shark River	1998	12	57.3	9.2	6887	**2594**	826	23.0	**105.7**	**387.2**
ANROS	SKR	SKR	Shark River	2004	4	67.1	8.9	2658	**322**	194	24.9	**6.4**	**2.2**
MOSAX	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	14	74.6	1.9	19605	**3104**	264	30.7	35.3	**37.0**
MOSAX	AOCc	AOM	Atlantic Ocean Island Beach	2004	2	64.6	2.0	7425	**520**	165	10.0	15.0	**5.0**
MOSAX	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	79.3	3.9	17460	5013	587	31.6	32.8	**250.0**
MOSAX	AONc	AON	Atlantic Ocean Sandy Hook	2004	20	83.1	1.4	11000	1163	340	27.9	10.4	**1.8**
MOSAX	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	97.2	3.5	17788	5264	633	19.4	25.8	**192.8**
MOSAX	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	74.1	2.0	17686	1419	430	21.9	27.1	**8.5**
MOSAX	DBLc	DBM	Delaware Bay Middle	2004	10	79.1	0.3	73714	11689	**3241**	**370.7**	**302.0**	**28.0**
MOSAX	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	22	80.8	4.5	16524	4599	**360**	**26.0**	**20.2**	**129.1**
MOSAX	DRD	DRD	Delaware River, Deepwater to National Park	1998	14	64.1	2.0	60073	35514	2258	209.5	97.5	810.5
MOSAX	DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	59.8	2.5	14634	6306	1859	45.2	259.0	218.8
MOSAX	DRTA	DRTA	Delaware River, Above Trenton	1998	8	67.3	2.1	51515	15036	1367	86.8	57.7	344.7

Table 30 (continued). Comparison of average lipid-normalized concentrations of contaminants in the 1998 monitoring study (fish caught in 1998-1999) and the 2004 routine monitoring study. Bold face indicates cases where concentrations at the same station-group differed by a factor of more than 5 between the two surveys.

Species	Stat Group	Station	Station Name	Year	No. Samples	LTL cm	% Lipid	TPCB LipN ng/g	TDDX LipN ng/g	Tchlordane LipN ng/g	HeptEpoxide LipN ng/g	Hept LipN n/g	BHC LipN ng/g
						Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
MOSAX	NTRc	BBTR	Barnegat Bay near Toms River	2004	12	75.5	1.7	11356	1167	314	26.2	10.1	4.4
MOSAX	RBUc	RBU	Raritan Bay upper	1998	10	69.0	2.3	33187	7690	1435	105.7	89.4	262.1
MOSAX	RC	RC	Raccoon Creek	1998	2	67.0	1.7	51412	35548	2614	151.7	55.9	0.0
POSAL	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	76.3	**15.3**	4851	1142	190	**4.0**	6.7	56.6
POSAL	AOCc	AOM	Atlantic Ocean Island Beach	2004	6	67.7	**2.2**	18130	2532	618	**67.5**	9.4	13.2
POSAL	AOCc	AOB	Atlantic Ocean at Belmar	2004	5	75.4	**1.6**	10689	1583	369	**23.5**	12.7	1.0
POSAL	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	76.4	2.7	22077	4379	517	14.2	17.8	**140.0**
POSAL	AONc	SHB	Sandy Hook	2004	3	38.1	4.9	8325	1478	395	58.6	17.2	**7.9**
POSAL	AONc	AON	Atlantic Ocean Sandy Hook	2004	8	73.7	4.5	10114	1115	394	29.6	3.2	**1.9**
POSAL	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	78.5	9.0	7456	1613	246	7.2	11.0	**55.4**
POSAL	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	61.8	9.5	3723	546	157	17.8	4.1	**4.8**
POSAL	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	62.9	3.1	**108466**	**9309**	**2137**	80.5	36.0	**450.4**
POSAL	DBLc	DBM	Delaware Bay middle	2004	6	35.0	4.8	**6397**	**1104**	**332**	44.7	18.5	**6.4**
POSAL	NTRc	BBTR	Barnegat Bay near Toms River	2004	3	46.2	5.3	4483	606	200	28.3	7.5	7.5
POSAL	RBUc	RBU	Raritan Bay upper	1998	8	24.9	2.3	13099	4967	1067	30.2	33.7	**113.8**
POSAL	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	79.7	8.4	11284	1610	438	54.2	36.4	**4.5**
POSAL	RRLc	RRL	Raritan River lower	1998	6	62.5	3.8	11765	1956	286	18.0	12.4	**76.3**
POSAL	RRLc	RR	Raritan @ Rt 35	2004	3	39.2	6.2	7315	1929	474	95.6	15.9	**8.4**

Table 31. Comparison of average lipid-normalized concentrations of contaminants in the 1998 monitoring study (fish caught in 1998-1999) and the 2004 routine monitoring study. Bold face indicates cases where concentrations at the same station-group differed by a factor of more than 5 between the two surveys.

Species	Stat Group	Station	Station Name	Year	No. Samples	LTL cm	% Lipid	Aldrin LipN ng/g	Dieldrin LipN ng/g	Endosulfan LipN ng/g	Endrin LipN ng/g	Lindane LipN ng/g
						Mean	Mean	Mean	Mean	Mean	Mean	Mean
ANROS	CHR	CHR	Cohansey River	1998	5	56.5	8.2	0.0	**123.3**	**18.5**	0.9	**4.5**
ANROS	DRD	DRD	Delaware River, Deepwater to National Park	1998	12	56.2	8.5	0.0	**964.4**	**159.5**	4.5	**25.7**
ANROS	DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	55.6	6.6	**4.6**	414.7	**97.1**	**9.1**	**13.7**
ANROS	DRPc	DRP	Delaware River near Camden	2004	5	55.4	0.9	**306.0**	383.9	**586.3**	**94.0**	**74.0**
ANROS	DRTA	DRTA	Delaware River, Above Trenton	1998	12	59.3	14.5	0.0	82.5	24.2	3.8	4.8
ANROS	MLR	MLR	Mullica River	1998	12	45.5	4.1	0.0	**216.1**	**54.1**	0.0	0.0
ANROS	MLR	MLR	Mullica River	2004	10	63.2	11.6	0.6	**7.4**	**5.3**	1.0	0.7
ANROS	MRR	MRR	Maurice River	1998	5	46.3	6.3	0.0	88.1	14.9	0.0	3.9
ANROS	NRc	NVR	Navesink River	1998	3	41.0	4.0	0.0	**242.8**	149.3	**4.0**	3.7
ANROS	NRc	NR	Navesink River	2004	5	56.9	7.6	5.3	**7.1**	51.8	**0.3**	0.8
ANROS	NTRc	TR	Toms River	1998	5	55.3	11.1	0.0	**292.3**	**85.5**	**2.4**	**1.6**
ANROS	NTRc	BBTR	Barnegat Bay near Toms River	2004	15	52.9	7.1	2.1	**1.1**	**15.2**	**34.1**	**0.3**
ANROS	PNR	PNR	Pennsauken River at Forked landing	1998	1	42.9	2.6	0.0	917.0	171.5	0.0	13.4
ANROS	PRE	PRE	Passaic River at Elmwood Park	1998	4	50.4	4.9	186.4	698.7	397.4	6.1	31.7
ANROS	RC	RC	Raccoon Creek	1998	16	51.7	3.1	33.3	943.3	170.8	4.4	27.1
ANROS	RRLc	RBM	Raritan Bay at Rt. 1	1998	4	42.6	11.1	13.2	**455.8**	116.0	**11.9**	**12.0**
ANROS	SBR	SBR	Shrewsbury River	1998	14	54.2	7.3	0.0	**98.5**	66.1	**12.4**	**29.3**
ANROS	SBR	SBR	Shrewsbury River	2004	8	55.4	4.9	3.6	**2.0**	31.1	0.0	**1.6**
ANROS	SKR	SKR	Shark River	1998	12	57.3	9.2	0.0	**182.2**	**185.0**	3.1	3.9
ANROS	SKR	SKR	Shark River	2004	4	67.1	8.9	0.4	**1.2**	**13.8**	0.0	1.8
MOSAX	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	14	74.6	1.9	**0.0**	**68.4**	**36.1**	**40.3**	13.8
MOSAX	AOCc	AOM	Atlantic Ocean Island Beach	2004	2	64.6	2.0	0.0	**0.0**	**5.0**	**0.0**	5.0
MOSAX	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	79.3	3.9	**36.8**	**400.2**	**63.4**	32.9	5.6
MOSAX	AONc	AON	Atlantic Ocean Sandy Hook	2004	20	83.1	1.4	**6.0**	**5.3**	**6.0**	7.8	1.3
MOSAX	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	97.2	3.5	0.0	**158.7**	**58.7**	14.8	9.2
MOSAX	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	74.1	2.0	2.4	**8.4**	**7.7**	8.8	3.8
MOSAX	DBLc	DBM	Delaware Bay Middle	2004	10	79.1	0.3	**84.0**	**10.7**	24.7	12.0	35.3
MOSAX	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	22	80.8	4.5	**4.8**	**125.6**	40.8	6.3	7.1
MOSAX	DRD	DRD	Delaware River, Deepwater to National Park	1998	14	64.1	2.0	0.0	814.7	341.5	0.0	38.3
MOSAX	DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	59.8	2.5	0.0	2019.4	190.4	11.6	6.2

71 PATRICK CENTER FOR ENVIRONMENTAL RESEARCH

Table 31 (continued). Comparison of average lipid-normalized concentrations of contaminants in the 1998 monitoring study (fish caught in 1998-1999) and the 2004 routine monitoring study. Bold face, underline numbers indicate cases where concentrations at the same station-group differed by a factor of more than 5 between the two surveys.

Species	Stat Group	Station	Station Name	Year	No. Samples	LTL cm	% Lipid	Aldrin LipN ng/g	Dieldrin LipN ng/g	Endosulfan LipN ng/g	Endrin LipN ng/g	Lindane LipN ng/g
						Mean	Mean	Mean	Mean	Mean	Mean	Mean
MOSAX	DRTA	DRTA	Delaware River, Above Trenton	1998	8	67.3	2.1	0.0	433.3	281.7	12.3	0.0
MOSAX	NTRc	BBTR	Barnegat Bay near Toms River	2004	12	75.5	1.7	4.5	0.9	7.2	11.8	3.2
MOSAX	RBUc	RBU	Raritan Bay upper	1998	10	69.0	2.3	0.0	328.2	103.5	9.7	2.0
MOSAX	RC	RC	Raccoon Creek	1998	2	67.0	1.7	0.0	769.7	277.2	0.0	36.3
POSAL	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	76.3	**15.3**	3.5	**84.9**	12.7	10.2	3.1
POSAL	AOCc	AOM	Atlantic Ocean Island Beach	2004	6	67.7	**2.2**	10.3	**12.4**	30.7	32.7	2.5
POSAL	AOCc	AOB	Atlantic Ocean at Belmar	2004	5	75.4	**1.6**	1.4	**0.5**	9.5	18.3	4.7
POSAL	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	76.4	2.7	26.3	**301.4**	63.2	18.4	7.2
POSAL	AONc	SHB	Sandy Hook	2004	3	38.1	4.9	8.4	**6.8**	8.2	3.6	4.8
POSAL	AONc	AON	Atlantic Ocean Sandy Hook	2004	8	73.7	4.5	1.3	**1.9**	**8.3**	10.4	1.9
POSAL	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	78.5	9.0	2.9	**121.7**	**22.2**	6.1	2.5
POSAL	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	61.8	9.5	2.9	**1.5**	**3.2**	**6.4**	3.2
POSAL	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	62.9	3.1	0.0	**212.9**	**105.9**	**29.2**	2.3
POSAL	DBLc	DBM	Delaware Bay middle	2004	6	35.0	4.8	4.3	**2.6**	**6.9**	**0.5**	7.9
POSAL	NTRc	BBTR	Barnegat Bay near Toms River	2004	3	46.2	5.3	9.4	1.9	0.0	0.0	1.9
POSAL	RBUc	RBU	Raritan Bay upper	1998	8	24.9	2.3	15.2	**215.0**	63.4	**29.5**	12.1
POSAL	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	79.7	8.4	12.8	**4.9**	16.2	**0.5**	8.4
POSAL	RRLc	RRL	Raritan River lower	1998	6	62.5	3.8	22.8	**119.9**	**36.7**	11.2	11.3
POSAL	RRLc	RR	Raritan @ Rt 35	2004	3	39.2	6.2	6.3	**5.5**	**3.8**	6.0	7.8

72 PATRICK CENTER FOR ENVIRONMENTAL RESEARCH

Table 32. Average and standard deviation of ln(lipid-normalized concentrations) of contaminants in the 1998 New Jersey toxics program and the 2004 Routine Monitoring Program.

Stat-Group	Station	Station Name	Survey	No. Samples	LTL Mean	% Lipid Mean	LgTPCBLipN ng/g Mean	LgTPCBLipN ng/g StDev	LgDDXLipN ng/g Mean	LgDDXLipN ng/g StDev
American eel										
CHR	CHR	Cohansey River	1998	5	56.5	8.2	7.2	0.9	7.1	0.8
DRD	DRD	Delaware River, Deepwater to National Park	1998	12	56.2	8.5	10.0	0.8	9.4	0.8
DRPc	DRP	Delaware River near Camden	2004	5	55.4	0.9	12.2	0.4	10.9	0.9
DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	55.6	6.6	9.2	1.3	8.8	1.4
DRTA	DRTA	Delaware River, Above Trenton	1998	12	59.3	14.5	7.6	0.9	7.4	1.1
MLR	MLR	Mullica River	1998	12	45.5	4.1	9.1	1.8	8.1	1.6
MLR	MLR	Mullica River	2004	10	63.2	11.6	7.4	0.6	6.4	1.2
MRR	MRR	Maurice River	1998	5	46.3	6.3	7.7	0.3	6.8	0.3
NRc	NR	Navesink River	2004	5	56.9	7.6	8.1	0.7	7.1	0.5
NRc	NVR	Navesink River	1998	3	41.0	4.0	8.6	0.2	8.1	0.4
NTRc	BBTR	Barnegat Bay near Toms River	2004	15	52.9	7.1	7.1	0.6	5.8	0.4
NTRc	TR	Toms River	1998	5	55.3	11.1	7.3	0.4	7.3	0.7
PNR	PNR	Pennsauken River at Forked landing	1998	1	42.9	2.6	9.5		9.6	
PRE	PRE	Passaic River at Elmwood Park	1998	4	50.4	4.9	9.5	0.6	8.8	0.6
RC	RC	Raccoon Creek	1998	16	51.7	3.1	10.7	1.3	10.1	1.0
RRLc	RBM	Raritan Bay at Rt. 1	1998	4	42.6	11.1	9.6	0.2	8.3	0.6
SBR	SBR	Shrewsbury River	1998	14	54.2	7.3	8.3	0.7	7.5	0.6
SBR	SBR	Shrewsbury River	2004	8	55.4	4.9	8.0	0.4	6.7	0.4
SKR	SKR	Shark River	1998	12	57.3	9.2	7.3	3.5	7.7	0.6
SKR	SKR	Shark River	2004	4	67.1	8.9	7.9	0.2	5.8	0.1
Striped bass										
AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	12	75.5	1.9	9.7	0.7	7.9	0.5
AOCc	AOM	Atlantic Ocean Island Beach	2004	2	64.6	2.0	8.9	0.0	6.3	0.0
AONc	AON	Atlantic Ocean Sandy Hook	2004	20	83.1	1.4	9.3	0.3	7.0	0.4
AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	79.3	3.9	9.6	0.6	8.2	0.8
AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	74.1	2.0	9.3	0.9	7.0	0.7
AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	97.2	3.5	9.6	0.7	8.3	0.9
DBLc	DBL	Delaware Bay, Salem to Cape May	1998	20	80.8	4.5	9.4	0.8	7.6	1.7
DBLc	DBM	Delaware Bay Middle	2004	10	79.1	0.3	11.2	0.2	9.3	0.2
DRD	DRD	Delaware River, Deepwater to National Park	1998	14	64.1	2.0	10.7	0.8	9.9	1.2
DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	59.8	2.5	9.6	0.1	8.2	1.4
DRTA	DRTA	Delaware River, Above Trenton	1998	8	67.3	2.1	10.3	1.3	8.9	1.6
NTRc	BBTR	Barnegat Bay near Toms River	2004	12	75.5	1.7	9.3	0.3	7.1	0.2
RBUc	RBU	Raritan Bay upper	1998	10	69.0	2.3	10.2	0.7	8.8	0.6
RC	RC	Raccoon Creek	1998	2	67.0	1.7	10.8	0.0	10.5	0.0
Bluefish										
AOCc	AOB	Atlantic Ocean at Belmar	2004	5	75.4	1.6	9.2	0.5	7.3	0.5
AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	76.3	15.3	8.4	0.5	6.8	0.9
AOCc	AOM	Atlantic Ocean Island Beach	2004	6	67.7	2.2	9.7	0.5	7.7	0.6
AONc	AON	Atlantic Ocean Sandy Hook	2004	8	73.7	4.5	9.2	0.1	7.0	0.1
AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	76.4	2.7	9.9	0.5	8.2	0.7
AONc	SHB	Sandy Hook	2004	3	38.1	4.9	8.9	0.6	7.2	0.6
AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	61.8	9.5	8.2	0.4	6.2	0.4
AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	78.5	9.0	8.8	0.4	7.3	0.4
DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	62.9	3.1	10.8	1.4	8.7	0.9
DBLc	DBM	Delaware Bay middle	2004	6	35.0	4.8	8.7	0.3	7.0	0.2
NTRc	BBTR	Barnegat Bay near Toms River	2004	3	46.2	5.3	8.4	0.0	6.4	0.0
RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	79.7	8.4	9.2	0.5	7.3	0.4
RBUc	RBU	Raritan Bay upper	1998	8	24.9	2.3	9.5	0.2	8.5	0.2
RRLc	RR	Raritan @ Rt 35	2004	3	39.2	6.2	8.9	0.2	7.5	0.4
RRLc	RRL	Raritan River lower	1998	6	62.5	3.8	9.3	0.4	7.5	0.5

Table 32 (continued). Average and standard deviation of ln(lipid-normalized concentrations) of contaminants in the 1998 New Jersey toxics program and the 2004 Routine Monitoring Program.

	Stat Group	Station	Station Name	Survey	Num.	Ln(lipnorm) Chlordane		Ln(lipnorm) Hept. Epox.		Ln(lipnorm) Hept.	
						Mean	StDev	Mean	StDev	Mean	StDev
American eel											
	CHR	CHR	Cohansey River	1998	5	4.5	0.6	0.0	0.0	3.1	0.3
	DRD	DRD	Delaware River, Deepwater to National Park	1998	12	6.8	0.7	3.0	1.0	4.4	0.4
	DRPc	DRP	Delaware River near Camden	2004	5	9.3	0.2	7.3	0.2	6.2	0.4
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	6.4	0.6	1.2	0.9	3.8	0.5
	DRTA	DRTA	Delaware River, Above Trenton	1998	12	4.2	1.4	0.8	0.6	2.6	0.7
	MLR	MLR	Mullica River	1998	12	4.4	2.4	0.1	0.3	4.1	1.7
	MLR	MLR	Mullica River	2004	10	4.8	0.6	3.2	0.2	1.0	0.6
	MRR	MRR	Maurice River	1998	5	4.7	0.3	0.1	0.2	2.7	0.3
	NRc	NR	Navesink River	2004	5	6.7	0.2	5.1	0.3	3.3	0.4
	NRc	NVR	Navesink River	1998	3	6.0	0.1	2.0	0.6	4.4	0.4
	NTRc	BBTR	Barnegat Bay near Toms River	2004	15	5.5	0.1	3.8	0.2	2.3	0.2
	NTRc	TR	Toms River	1998	5	6.5	0.8	1.6	0.3	4.3	0.5
	PNR	PNR	Pennsauken River at Forked landing	1998	1	7.0		2.2		5.0	
	PRE	PRE	Passaic River at Elmwood Park	1998	4	7.8	0.5	3.4	0.6	5.4	0.4
	RC	RC	Raccoon Creek	1998	16	6.8	0.5	2.6	1.6	4.2	0.4
	RRLc	RBM	Raritan Bay at Rt. 1	1998	4	7.0	0.4	2.9	0.5	4.4	0.6
	SBR	SBR	Shrewsbury River	1998	14	5.6	0.6	1.3	1.0	3.5	0.4
	SBR	SBR	Shrewsbury River	2004	8	6.4	0.2	4.7	0.3	3.0	0.2
	SKR	SKR	Shark River	1998	12	6.5	0.8	1.8	1.6	4.2	1.0
	SKR	SKR	Shark River	2004	4	5.3	0.2	3.2	0.1	2.0	0.3
Striped bass											
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	12	5.5	0.5	3.1	1.1	2.8	1.6
	AOCc	AOM	Atlantic Ocean Island Beach	2004	2	5.1	0.0	2.4	0.0	2.8	0.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	20	5.8	0.4	3.3	0.3	2.1	1.1
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	6.2	0.5	3.2	0.8	3.4	0.5
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	5.8	0.7	2.8	1.0	2.6	1.3
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	6.2	0.7	2.3	1.4	3.1	0.6
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	20	5.0	1.9	2.9	1.0	2.8	1.0
	DBLc	DBM	Delaware Bay Middle	2004	10	8.1	0.2	5.8	0.4	5.7	0.3
	DRD	DRD	Delaware River, Deepwater to National Park	1998	14	7.3	1.1	4.8	1.2	4.4	0.7
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	6.9	1.4	3.8	0.2	5.0	1.3
	DRTA	DRTA	Delaware River, Above Trenton	1998	8	6.9	1.0	4.2	0.8	4.0	0.5
	NTRc	BBTR	Barnegat Bay near Toms River	2004	12	5.7	0.2	3.3	0.2	2.4	0.2
	RBUc	RBU	Raritan Bay upper	1998	10	7.2	0.4	4.4	1.0	4.5	0.3
	RC	RC	Raccoon Creek	1998	2	7.9	0.0	5.0	0.0	4.0	0.0
Bluefish											
	AOCc	AOB	Atlantic Ocean at Belmar	2004	5	5.8	0.5	3.2	0.3	2.1	1.4
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	5.1	0.8	1.5	0.6	1.9	0.7
	AOCc	AOM	Atlantic Ocean Island Beach	2004	6	6.3	0.5	4.1	0.6	2.3	0.2
	AONc	AON	Atlantic Ocean Sandy Hook	2004	8	6.0	0.2	3.3	0.4	1.0	1.1
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	6.1	0.5	2.1	1.3	2.6	1.0
	AONc	SHB	Sandy Hook	2004	3	5.9	0.5	4.1	0.3	2.7	0.7
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	5.0	0.3	2.9	0.3	1.6	0.3
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	5.3	0.8	1.8	0.9	2.4	0.3
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	6.7	1.6	2.9	2.1	3.4	0.7
	DBLc	DBM	Delaware Bay middle	2004	6	5.8	0.3	3.8	0.3	2.9	0.5
	NTRc	BBTR	Barnegat Bay near Toms River	2004	3	5.3	0.0	3.4	0.0	2.1	0.0
	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	6.0	0.3	4.0	0.2	3.4	0.7
	RBUc	RBU	Raritan Bay upper	1998	8	7.0	0.2	3.4	0.3	3.5	0.2
	RRLc	RR	Raritan @ Rt 35	2004	3	6.1	0.2	4.5	0.3	2.8	0.1
	RRLc	RRL	Raritan River lower	1998	6	5.6	0.4	2.6	0.8	2.5	0.4

Table 32 (continued). Average and standard deviation of ln(lipid-normalized concentrations) of contaminants in the 1998 New Jersey toxics program and the 2004 Routine Monitoring Program.

	Stat Group	Station	Station Name	Survey	No. Samples	Ln(lipnorm) T BHC		Ln(lipnorm) Aldrin		Ln(lipnorm) Deildrin	
						Mean	StDev	Mean	StDev	Mean	StDev
American eel											
	CHR	CHR	Cohansey River	1998	5	2.3	1.4	0.0	0.0	4.8	0.3
	DRD	DRD	Delaware River, Deepwater to National Park	1998	12	5.0	1.0	0.0	0.0	6.8	0.4
	DRPc	DRP	Delaware River near Camden	2004	5	2.6	1.5	5.7	0.4	5.8	0.6
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	3.8	2.2	0.6	1.3	5.8	0.6
	DRTA	DRTA	Delaware River, Above Trenton	1998	12	2.3	2.1	0.0	0.0	4.1	0.9
	MLR	MLR	Mullica River	1998	12	2.3	3.2	0.0	0.0	4.8	1.0
	MLR	MLR	Mullica River	2004	10	0.6	0.3	0.4	0.2	1.2	1.2
	MRR	MRR	Maurice River	1998	5	1.1	1.5	0.0	0.0	4.4	0.3
	NRc	NR	Navesink River	2004	5	1.8	0.6	1.8	0.4	1.5	1.4
	NRc	NVR	Navesink River	1998	3	6.0	0.4	0.0	0.0	5.5	0.3
	NTRc	BBTR	Barnegat Bay near Toms River	2004	15	1.6	0.8	1.0	0.6	0.6	0.6
	NTRc	TR	Toms River	1998	5	5.1	0.6	0.0	0.0	5.6	0.5
	PNR	PNR	Pennsauken River at Forked landing	1998	1	5.5		0.0		6.8	
	PRE	PRE	Passaic River at Elmwood Park	1998	4	6.0	1.3	4.8	1.2	6.5	0.4
	RC	RC	Raccoon Creek	1998	16	3.8	2.4	0.7	1.9	6.6	0.7
	RRLc	RBM	Raritan Bay at Rt. 1	1998	4	4.7	1.1	2.2	1.5	6.0	0.7
	SBR	SBR	Shrewsbury River	1998	14	4.6	0.9	0.0	0.0	4.5	0.3
	SBR	SBR	Shrewsbury River	2004	8	0.8	0.9	1.4	0.4	0.7	0.9
	SKR	SKR	Shark River	1998	12	5.8	0.7	0.0	0.0	5.1	0.5
	SKR	SKR	Shark River	2004	4	1.2	0.1	0.3	0.3	0.6	0.7
Striped bass											
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	12	2.3	1.9	0.0	0.0	3.7	1.7
	AOCc	AOM	Atlantic Ocean Island Beach	2004	2	1.8	0.0	0.0	0.0	0.0	0.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	20	0.5	0.9	1.7	0.9	1.3	1.2
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	5.3	0.7	0.6	1.9	5.2	1.0
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	2.0	0.8	0.6	1.0	1.7	1.1
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	5.0	0.9	0.0	0.0	4.8	0.7
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	20	3.6	1.9	0.4	1.2	4.4	1.1
	DBLc	DBM	Delaware Bay Middle	2004	10	2.3	2.0	4.4	0.4	1.3	1.7
	DRD	DRD	Delaware River, Deepwater to National Park	1998	14	5.2	2.9	0.0	0.0	6.4	0.9
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	5.0	1.0	0.0	0.0	6.7	1.8
	DRTA	DRTA	Delaware River, Above Trenton	1998	8	5.2	1.4	0.0	0.0	5.8	0.9
	NTRc	BBTR	Barnegat Bay near Toms River	2004	12	1.4	0.9	1.1	1.2	0.4	0.7
	RBUc	RBU	Raritan Bay upper	1998	10	5.1	0.9	0.0	0.0	5.7	0.4
	RC	RC	Raccoon Creek	1998	2	0.0	0.0	0.0	0.0	6.6	0.0
Bluefish											
	AOCc	AOB	Atlantic Ocean at Belmar	2004	5	0.4	0.8	0.4	0.9	0.3	0.6
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	3.9	0.6	0.4	1.2	3.9	1.2
	AOCc	AOM	Atlantic Ocean Island Beach	2004	6	1.9	1.6	2.2	0.7	2.2	1.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	8	0.8	0.8	0.6	0.7	0.8	0.8
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	4.0	1.9	0.6	1.7	4.7	1.2
	AONc	SHB	Sandy Hook	2004	3	2.2	0.2	2.2	0.2	1.8	0.9
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	1.7	0.2	1.3	0.5	0.9	0.2
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	3.2	1.4	0.4	1.1	4.3	0.8
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	3.7	2.9	0.0	0.0	4.9	0.9
	DBLc	DBM	Delaware Bay middle	2004	6	2.0	0.0	1.6	0.3	1.0	0.8
	NTRc	BBTR	Barnegat Bay near Toms River	2004	3	2.1	0.0	2.3	0.0	1.1	0.0
	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	1.3	1.0	2.6	0.2	1.7	0.4
	RBUc	RBU	Raritan Bay upper	1998	8	3.8	1.4	1.0	1.9	5.3	0.3
	RRLc	RR	Raritan @ Rt 35	2004	3	2.2	0.3	2.0	0.1	1.5	1.3
	RRLc	RRL	Raritan River lower	1998	6	3.4	1.9	0.8	2.0	4.5	0.8

Table 32 (continued). Average and standard deviation of ln(lipid-normalized concentrations) of contaminants in the 1998 New Jersey toxics program and the 2004 Routine Monitoring Program.

	Stat Group	Station	Station Name	Survey	No. Samples	Ln(lipnorm) Endosulfan		Ln(lipnorm) Endrin		Ln(lipnorm) Lindane	
						Mean	StDev	Mean	StDev	Mean	StDev
American eel											
	CHR	CHR	Cohansey River	1998	5	2.7	0.8	0.3	0.7	1.5	0.9
	DRD	DRD	Delaware River, Deepwater to National Park	1998	12	5.0	0.3	1.4	1.0	3.2	0.5
	DRPc	DRP	Delaware River near Camden	2004	5	6.0	1.4	3.7	2.2	4.3	0.3
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	10	4.5	0.5	1.5	1.4	2.3	1.2
	DRTA	DRTA	Delaware River, Above Trenton	1998	12	2.9	0.8	1.0	1.1	1.3	0.9
	MLR	MLR	Mullica River	1998	12	3.0	1.7	0.0	0.0	0.0	0.0
	MLR	MLR	Mullica River	2004	10	1.5	0.9	0.6	0.5	0.5	0.3
	MRR	MRR	Maurice River	1998	5	2.7	0.4	0.0	0.0	1.2	1.1
	NRc	NR	Navesink River	2004	5	3.9	0.4	0.2	0.4	0.4	0.6
	NRc	NVR	Navesink River	1998	3	4.9	0.5	0.9	1.5	1.3	1.1
	NTRc	BBTR	Barnegat Bay near Toms River	2004	15	2.5	1.0	3.5	0.5	0.2	0.3
	NTRc	TR	Toms River	1998	5	4.3	0.7	0.5	1.1	0.8	0.7
	PNR	PNR	Pennsauken River at Forked landing	1998	1	5.2		0.0		2.7	
	PRE	PRE	Passaic River at Elmwood Park	1998	4	5.9	0.6	1.3	1.5	3.4	0.5
	RC	RC	Raccoon Creek	1998	16	5.0	0.6	0.9	1.2	2.7	1.6
	RRLc	RBM	Raritan Bay at Rt. 1	1998	4	4.6	0.6	2.4	0.7	2.5	0.4
	SBR	SBR	Shrewsbury River	1998	14	4.1	0.4	1.2	1.7	1.6	1.7
	SBR	SBR	Shrewsbury River	2004	8	2.8	1.7	0.0	0.0	0.6	0.8
	SKR	SKR	Shark River	1998	12	4.8	1.0	0.8	1.0	1.3	1.0
	SKR	SKR	Shark River	2004	4	2.7	0.0	0.0	0.0	1.0	0.1
Striped bass											
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	12	2.9	1.6	2.5	2.0	1.6	1.7
	AOCc	AOM	Atlantic Ocean Island Beach	2004	2	1.8	0.0	0.0	0.0	1.8	0.0
	AONc	AON	Atlantic Ocean Sandy Hook	2004	20	1.7	0.9	1.1	1.5	0.4	0.8
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	4.1	0.4	2.5	1.6	1.5	1.1
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	40	1.6	1.2	1.4	1.5	0.7	1.1
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	24	3.9	0.7	2.1	1.3	1.1	1.5
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	20	3.2	1.4	1.5	1.2	1.8	1.0
	DBLc	DBM	Delaware Bay Middle	2004	10	2.2	1.9	0.8	1.7	3.0	1.6
	DRD	DRD	Delaware River, Deepwater to National Park	1998	14	5.5	1.0	0.0	0.0	3.2	1.4
	DRPc	DRTB	Delaware River, Trenton to National Park	1998	4	4.8	1.1	1.6	1.8	1.3	1.5
	DRTA	DRTA	Delaware River, Above Trenton	1998	8	5.3	1.0	1.6	1.7	0.0	0.0
	NTRc	BBTR	Barnegat Bay near Toms River	2004	12	1.6	1.2	2.1	1.3	1.0	1.0
	RBUc	RBU	Raritan Bay upper	1998	10	4.6	0.3	1.5	1.5	0.5	1.0
	RC	RC	Raccoon Creek	1998	2	5.6	0.0	0.0	0.0	3.6	0.0
Bluefish											
	AOCc	AOB	Atlantic Ocean at Belmar	2004	5	2.2	0.7	2.0	1.9	1.2	1.2
	AOCc	AOC	Atlantic Ocean, Asbury Park to Atlantic City	1998	16	2.5	0.5	1.8	1.3	1.2	0.8
	AOCc	AOM	Atlantic Ocean Island Beach	2004	6	3.0	1.0	3.0	1.1	0.7	1.1
	AONc	AON	Atlantic Ocean Sandy Hook	2004	8	1.4	1.5	2.1	0.9	0.8	0.8
	AONc	AON	Atlantic Ocean, North of Asbury Park	1998	36	3.8	0.8	1.9	1.6	1.2	1.4
	AONc	SHB	Sandy Hook	2004	3	2.2	0.1	1.2	1.1	1.8	0.1
	AOS	AOS	Atlantic Ocean Sea Isle City to Cape May	2004	20	1.3	0.6	1.9	0.4	1.4	0.2
	AOS	AOS	Atlantic Ocean, Atlantic City to Cape May	1998	32	3.1	0.4	1.1	1.3	1.0	0.8
	DBLc	DBL	Delaware Bay, Salem to Cape May	1998	10	4.2	1.0	1.0	2.1	0.7	1.0
	DBLc	DBM	Delaware Bay middle	2004	6	2.0	0.3	0.3	0.5	1.9	0.8
	NTRc	BBTR	Barnegat Bay near Toms River	2004	3	0.0	0.0	0.0	0.0	1.1	0.0
	RBUc	RBPM	Raritan Bay @ Port Monmouth (old Union Beach)	2004	5	2.6	0.7	0.3	0.6	2.2	0.1
	RBUc	RBU	Raritan Bay upper	1998	8	4.2	0.2	2.7	1.7	2.1	1.3
	RRLc	RR	Raritan @ Rt 35	2004	3	1.5	0.5	1.9	0.2	2.2	0.3
	RRLc	RRL	Raritan River lower	1998	6	3.6	0.3	1.5	1.7	2.1	1.2

APPENDIX I. Risk-based consumption advisories for PCBs (ppb = ng/g wet weight) in fish developed by the NJ Risk Assessment sub-committee of the Interagency toxics in biota committee. Numbers in boldface are protective of high-risk group for developmental/reproductive endpoints. Numbers not in boldface are not applicable to the high-risk group.

Consumption Frequency	**Advisory for Cancer Risk Level**	
Risk Level:	1×10^{-5}	1×10^{-4}
Unlimited (based on daily)	**<1.5**	**<15**
One meal per week	**1.5 - 11**	**15-110**
One meal per month	**11-47**	**110-470**
One meal per 3 months	47-140	470-1400
One meal per year	140-560	1400-5600
Do not eat (based on greater than yearly)	>560	>5600