1994 annual fish and shellfish report

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FINAL

1994 ANNUAL FISH AND SHELLFISH REPORT

by

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EXECUTIVE SUMMARY

The Massachusetts Water Resources Authority (MWRA) is implementing Phase I of a long-term monitoring plan for the effluent outfall to be located in Massachusetts Bay. The goal of Phase I monitoring is to provide baseline data that may be used to assess potential environmental impacts of the effluent discharge into Massachusetts Bay and to evaluate compliance with the discharge permit. The overall objective of the fish and shellfish monitoring is to define the baseline health of winter flounder and lobster in terms of the presence of disease, and organic and metal contaminant concentrations in tissues of flounder and lobster.

To achieve the objectives of the fish and shellfish monitoring tasks, winter flounder (*Pleuronectes americanus*) were collected from five sites in Boston Harbor and the Bays: Deer Island Flats, Broad Sound, Nantasket Beach, the Future Outfall Site, and a reference site in Eastern Cape Cod Bay. The Deer Island, Future Outfall, and Eastern Cape Cod Bay sites are core sites for the monitoring study, while Broad Sound and Nantasket Beach are ancillary sites providing information on fish in the general area of the existing Deer Island outfall. Lobster (*Homarus americanus*) were collected only at the Deer Island, Future Outfall, and Eastern Cape Cod Bay sites. Analyses of contaminants in edible muscle and livers of winter flounder from the three core sites, and in the hepatopancreas and tail muscle of lobster were conducted. Histopathological observations of the livers of winter flounder from all five sites were carried out, and some comparisons of the 1994 results with those of 1993, the first year of the monitoring plan, were made. Possible relationships between observed lesions and contaminant body burdens were investigated.

Significantly, the lesion that has been monitored most intensively since 1987 because of its known relationship to contaminant concentrations, hydropic vacuolation, remained at about the same levels in 1994 as reported in 1993. Centrotubular hydropic vacuolation, the least severe of the three categories of hydropic vacuolation, occurred in about half of the flounder from Deer Island and Broad Sound. The lowest prevalence (<10%) of centrotubular hydropic vacuolation was at the Eastern Cape Cod Bay reference site.

The lesion called "balloon hepatocytes" remained at about the same levels recorded in 1993 at Broad Sound and Nantasket Beach, but increased at Deer Island, the Future Outfall, and Eastern Cape Cod Bay. The nature and etiology of the lesion remains undetermined. However, the possibility of a viral etiology is suggested.

There were several other histologically diagnosable liver lesions described, which may or may not be related to the balloon hepatocyte condition. Principal among them were relatively high prevalences of hepatic and pancreatic necrosis, pancreatic duct proliferation, eosinophilic and basophilic cell facing and hepatocellular regeneration. Theses lesions, with the balloon hepatocytes, indicate that the overall baseline health of the winter flounder populations in Boston Harbor and Massachusetts Bay is less than desirable.

Fish collected in 1994 were slightly younger on average than the fish collected in 1993, although the differences were not statistically significant. The oldest fish, averaging slightly over 4 years of age, were collected on the Deer Island Flats, although there was no statistical difference in mean age between them and fish collected at the other sites. The youngest fish, about 3.8 years of age, were collected at the Future Outfall Site.

The Deer Island Flats produced the largest fish, which averaged almost 37 cm in length. The smallest fish, about 33 mm long, came from the Future Outfall Site, but they were not significantly smaller than those from Nantasket Beach and Eastern Cape Cod Bay.

There was an increase in the severity of fin erosion at all sites in 1994 compared to 1993. The index calculated for the Future Outfall Site, 0.48, was four times what it was in 1993 and twice the highest 1993 index (0.24 at Nantasket Beach).

The prevalence of macrophage aggregates was high at all sites. This lesion can result from natural causes as well as from contaminants, and is not necessarily a useful biomarker. Biliary proliferation, which is a significant biomarker, decreased considerably in 1994 at Broad Sound, Nantasket Beach, and the Future Outfall Site, although it did not return to the low levels observed in 1992. The reasons for the 1993 elevations and the 1994 decline are not clear at this time.

Neoplasia was generally absent except in two instances, one in the liver cells of a 5-year-old probable female from Eastern Cape Cod Bay, and the other in the bile duct of a 6-year-old female from Nantasket Beach.

Contaminant concentrations were measured in 15 flounder muscle samples, 15 flounder liver samples, 8 lobster muscle samples, and 8 lobster hepatopancreas samples. Each sample was a composite comprised of tissue from five individual flounder or lobster. All samples were analyzed for PCB, chlorinated pesticides, and mercury concentrations. The liver and hepatopancreas samples were also analyzed for PAH and a suite of metals. Results of the analyses were compared with those of the 1993 analyses. Some comparisons were made to data from previous years and with FDA action levels where appropriate.

Chlorinated hydrocarbons in muscle tissue of flounder from Deer Island increased somewhat from 1993 to 1994. Mercury generally decreased in muscles of fish from all sites except the Future Outfall Site, where it increased slightly. There was a general decrease in mercury, however, from 1987 through 1994, with a large decrease between 1988 and 1989.

All chlorinated hydrocarbon concentrations in winter flounder liver tissue were elevated compared to 1992 and 1993 concentrations, although the increases were slight. PAH concentrations were down from 1992 levels by a factor of 10. Mercury concentrations were reduced from 1992 levels at all locations except the Future Outfall Site.

Between 1993 and 1994, PCB, DDT, and chlordane concentrations increased by at least a factor of two in lobster tail meat from the Future Outfall Site. DDT, PCB, and chlordane concentrations changed less than 15% at Deer Island and Eastern Cape Cod Bay during this same time period. Mercury concentrations in samples collected in 1994 and 1993 changed little relative to the concentrations in lobsters collected in 1985. At Deer Island, PCB concentrations in tail meat were higher in 1994 than in 1985, but the total PCB concentration decreased slightly between 1993 and 1994. Dieldrin concentrations in lobster tail meat increased at Deer Island between 1992 and 1993, and again in 1994.

Concentrations of all chlorinated hydrocarbons and PAH were highest in lobster hepatopancreas tissue from the Deer Island site. The mean mercury concentrations were highest in tissue from the Future Outfall Site. In hepatopancreas tissue from the Future Outfall Site, concentrations of mercury, PCB, and DDT increased between 1993 and 1994. Concentrations of PCB, chlordane, dieldrin, and PAH in hepatopancreas from the Eastern Cape Cod Bay site all decreased more than 50% between 1993 and 1994. PCB concentrations in lobster meat and hepatopancreas from Deer Island were dramatically lower in 1992 through 1994 than previously detected in 1987.

PCB and mercury concentrations from all tissues were compared to FDA Action Levels for those contaminants. No exceedences were detected. For PCBs in lobster hepatopancreas, concentrations were more than four times less than the FDA action limit. PCB in flounder muscle and mercury in flounder and lobster tissue were all at least one tenth of the FDA action limits.

Except for previously described relationships between contamination and the incidence of hydropic vacuolation in liver cells, no conclusions relative to the relationship between contaminant levels and histopathology of the livers of the winter flounder can be made.

Comparison of the ability to detect change in chemical concentrations in the composited tissue were found to be generally better relative to analysis of individual animals. This was achieved at significantly lower cost than would be achieved by analysis of individual animals.

CONTENTS

LIST OF FIGURES

CONTENTS (List of Figures Continued)

LIST OF TABLES

CONTENTS (List of Tables Continued)

1.0 INTRODUCTION

In 1992, the Massachusetts Water Resources Authority (MWRA) began to implement Phase I of a long-term monitoring plan (MWRA, 1991) for the MWRA effluent outfall that will be located in Massachusetts Bay. The goal of Phase I monitoring is to provide baseline data that may be used to assess potential environmental impacts of effluent discharge into Massachusetts Bay and to evaluate compliance with the discharge permit. The overall objective of the fish and shellfish monitoring is to define the baseline health of winter flounder and lobster in terms of the presence of disease (external and internal), and organic and inorganic (metal) contaminant concentrations in the liver (winter flounder), hepatopancreas (lobster), and edible tissue (winter flounder and lobster). With a sound baseline characterization of the health of winter flounder and lobster in Boston Harbor and the Bays, it should be possible to observe potential changes resulting from the relocation of the outfall discharge.

To achieve the objectives of the fish and shellfish monitoring tasks, winter flounder (*Pleuronectes americanus*) were collected from five sites in Boston Harbor and the Bays: Deer Island Flats, Broad Sound, Nantasket Beach, the Future Outfall Site, and a reference site in Eastern Cape Cod Bay. The Deer Island, Future Outfall, and Eastern Cape Cod Bay sites are core sites for the monitoring study, while Broad Sound and Nantasket Beach are ancillary sites providing information on fish in the general area of the existing Deer Island outfall. Lobsters (*Homarus americanus*) were collected only at the Deer Island, Future Outfall, and Eastern Cape Cod Bay sites. Edible muscle and livers of winter flounder from all sites, and the hepatopancreas and tail muscle of lobster from the core sites were analyzed for contaminants. Histopathological observations of the livers of the winter flounder from all sites were carried out and, where possible, comparisons of the results with those of previous years were made. Possible relationships between observed lesions and contaminant body burdens were also investigated.

The surprisingly high incidence of toxic chemical-associated liver lesions in winter flounder from Deer Island Flats was noted by Murchelano and Wolke in 1984 (Murchelano and Wolke, 1985). These observations created considerable concern, and helped to crystallize concern over pollution in the harbor. Annual monitoring of the lesions in winter flounder from the Harbor has been ongoing since 1987 (Moore, 1991; Moore *et al.,* 1992; Moore and Stegeman, 1993; Hillman *et al.,* 1994). Four additional locations in Massachusetts and Cape Cod Bays were added in 1991 (Moore *et al.,* 1992). These studies are needed to further build an internally consistent baseline data set on winter flounder liver pathology for the Deer Island and Future Outfall sites, in addition to other sites in the region. This is necessary because of the existing Deer Island outfall's apparent biological effects, such as the hepatocellular hydropic vacuolation and other toxicopathic lesions, and the need to understand and document the change in biological impact on this ecosystem of recent and projected changes in sewage management by MWRA. These changes include cessation of sludge dumping in December 1991, planned initiation of primary and potentially secondary treatment, and the relocation of the outfall to the future site now scheduled to occur in 1997.

The rationale and necessary background information on the biology and toxicology of winter flounder have been reported previously (Moore *et al.*, 1992; Moore and Stegeman, 1993; Hillman *et al.,* 1994). In these previous studies, hydropic vacuolation in the liver of winter flounder was detectable at all stations sampled, but was substantially more prevalent at the contaminated near-urban sites. In contrast, liver neoplasia was a rare lesion and absent from all but the most contaminated sites. Moore (1991) has shown a close association between hydropic vacuolation and liver neoplasms in winter flounder, and Johnson *et al.* (1992) have demonstrated that hydropic vacuolation was closely correlated with a suite of chemical contaminants, particularly chlorinated hydrocarbons. Hydropic vacuolation can be regarded as a harbinger of neoplastic risk, given adequate duration and level of exposure to carcinogens. Because, at the latitude of the study area, winter flounder apparently do not migrate much as indicated by the study of Howe and Coates (1975) and the stable isotope study reported last year (Hillman *et al.*, 1994), observation of the prevalence of hydropic vacuolation, given age-specific analysis and between-year consistency in histopathological interpretation, is an appropriate long-term monitoring parameter for the effects of benthic chemical contaminants on winter flounder in the Boston Harbor area. Thus, hydropic vacuolation is one of the principal lesions emphasized in this report.

In addition to reporting the prevalence and lesion index of hydropic vacuolation, the 1993 annual fish and shellfish report also quantified in detail several other lesions, including macrophage aggregates, biliary proliferation, neoplasia, and a previously unreported lesion that we called "balloon hepatocytes," the exact nature of which is not fully known at this time. For this report, we have put the same general level of emphasis on those lesions, and have included a less-quantitative approach to the prevalence of a number of other lesions. This report also examines the relationship of certain contaminant levels in the edible tissues of flounder and lobster to current Food and Drug Administration (FDA) Action Levels for those contaminants.

2.0 METHODS

2.1 Stations and Sampling

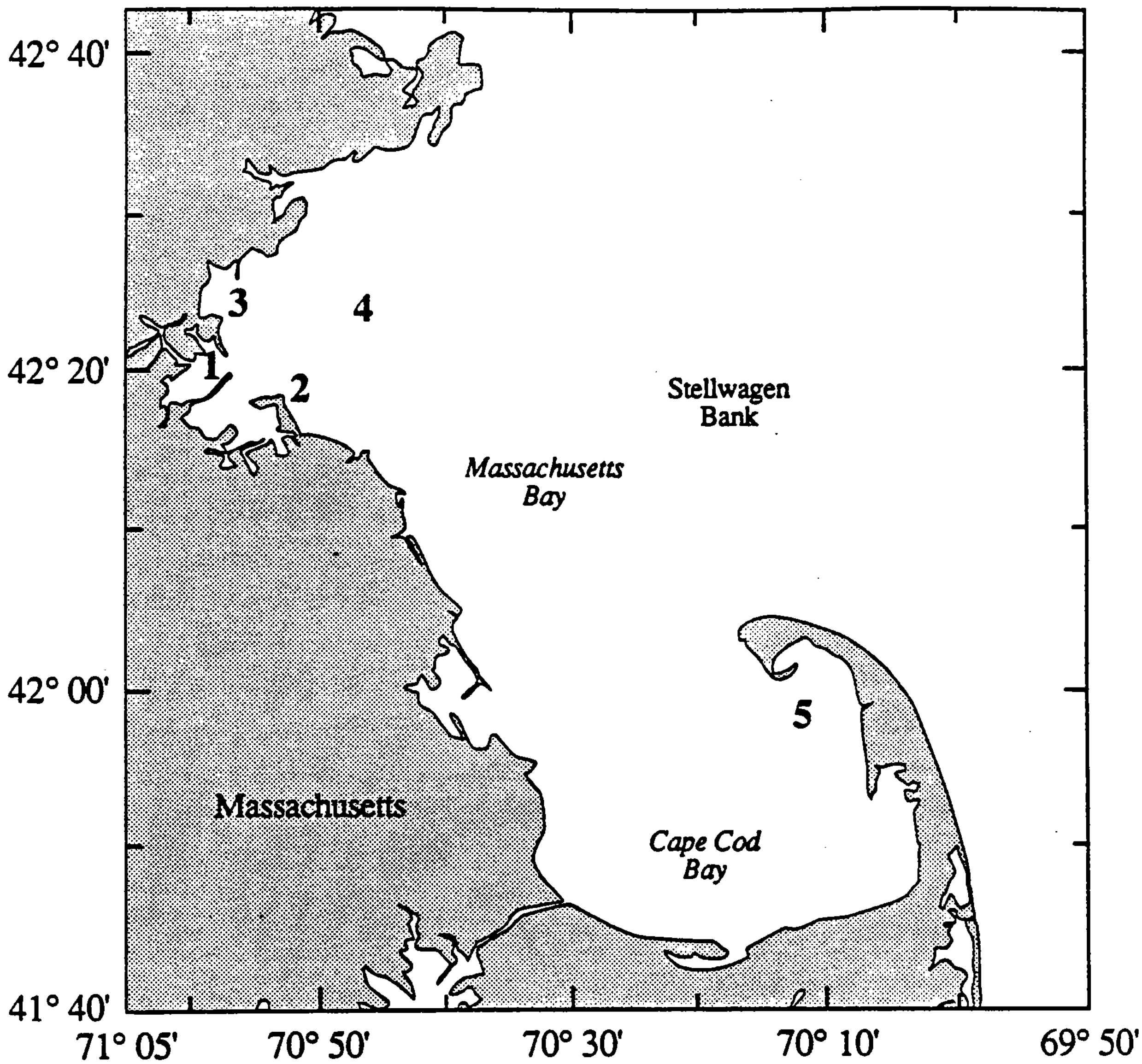
The sampling sites for the flounder and lobster collections are shown in Figure 1. In 1994, five sites were sampled for flounder: Deer Island Flats (Boston Harbor), off Nantasket Beach, Broad Sound, the Future Outfall Site, and Eastern Cape Cod Bay. Table 1 provides the trawl data (stations, positions, etc.) for the flounder collections. Lobsters were collected in commercial traps in the Deer Island Flats, Future Outfall Site, and Eastern Cape Cod Bay areas.

2.2 Fish Collections

Sampling for winter flounder was conducted from April 25 through April 29, 1994. At each of the five designated sampling sites, otter-trawl tows were conducted to collect 50 sexually mature (4- to 5-year-old) winter flounder. The F/V *Odessa*, owned and operated by William Crossen, served as the platform for the collections. Fishing gear comprised a Western Atlantic trawl, with a 4-seam chain sweep, 53-foot head rope, 83-foot rope, 10-fathom legs, 10-fathom ground cables, 400-pound Bison steel doors, and 25-fathom of main wire for shallow stations, with more for the deep stations. Trawling speed was approximately 2 knots. Fish were placed in a livebox prior to measurement and dissection for pathology and chemistry. All specimens 30 cm in length and larger were retained. Fish longer than 60 cm were to be analyzed separately. No fish longer than 60 cm was collected. Fish used for chemical analysis were returned alive to the Battelle Ocean Sciences laboratory in Duxbury, Massachusetts, in the labeled coolers and were immediately processed for analysis.

2.3 Lobster Collections

Lobsters were to be purchased from commercial lobstermen who had traps set as close as possible to the Deer Island, Future Outfall, and Eastern Cape Cod Bay sites. During the other



Key:
1 — Deer Island Flats
2 — Off Nantasket Beach
3 — Broad Sound
4 — The site of the future effluent outfall
5 — Eastern Cape Cod Bay

Figure 1. Sampling Stations for Winter Flounder and Lobster Collected During the 1994 Fish and Shellfish Field Season.

Table 1. Summary of Trawl Data for Winter Flounder Collections made in April 1994.

Station	Trawl Date	Start Time (EST)	Latitude	Longitude	End Time (EST)	Latitude	Longitude	Bottom Time (Minutes)
FI1	4/25/94	09:02	42°21.00'N	70°58.36'W	09:35	42°20.65'N	70°58.06'W	33
FI1	4/25/94	09:52	42°20.76'N	70°58.16'W	10:23	42°20.76'N	70°58.47'W	31
FI1	4/25/94	10:42	42°20.88'N	70°58.46'W	11:47	42°20.73'N	70°57.90'W	65
FI3	4/25/94	13:24	42°24.41'N	70°57.72'W	13:52	42°24.53'N	70°57.79'W	28
FI3	4/25/94	14:37	42°26.76'N	70°53.55'W	15:36	42°26.64'N	70°53.20'W	59
FI3	4/25/94	15:56	42°26.88'N	70°53.25'W	16:27	42°26.87'N	70°53.47'W	31
FI1	4/26/94	08:43	42°20.85'N	70°58.31'W	09:08	42°20.91'N	70°58.22'W	25
FI1	4/26/94	09:21	42°20.84'N	70°57.99'W	10:23	42°20.92'N	70°58.55'W	62
FI1	4/26/94	10:39	42°20.82'N	70°58.01'W	11:39	42°21.38'N	70°58.65'W	60
FI1	4/26/94	12:04	42°20.78'N	70°58.33'W	13:03	42°20.93'N	70°58.30'W	59
FI4	4/26/94	14:25	42°23.33'N	70°49.77'W	14:51	42°23.41'N	70°49.56'W	26
FI4	4/27/94	09:25	42°23.10'N	70°49.56'W	09:42	42°23.62'N	70°49.77'W	17
FI4	4/27/94	10:06	42°23.52'N	70°49.82'W	10:58	42°23.58'N	70°49.69'W	42
FI4	4/27/94	11:45	42°23.43'N	70°49.95'W	12:56	42°23.48'N	70°49.47'W	62
FI4	4/27/94	13:32	42°23.57'N	70°49.98'W	14:36	42°23.43'N	70°49.94'W	64
FI5	4/28/94	09:18	41°57.60'N	70°07.27'W	10:16	41°55.11'N	70°08.22'W	58
FI5	4/28/94	10:31	41°55.29'N	70°08.04'W	11:31	41°57.19'N	70°07.55'W	60
FI2	4/29/94	08:53	42°17.35'N	70°51.59'W	09:39	42°17.37'N	70°51.39'W	46
FI2	4/29/94	09:53	42°17.36'N	70°51.53'W	10:13	42°17.57'N	70°51.47'W	20

trawling for winter flounder at the Future Outfall Site on April 27, 10 commercially harvestable lobsters (carapace length >3.25 inches) were collected in the trawls. These lobsters were considered the sample from that site. On July 13, a Battelle staff member accompanied a commercial lobsterman to the Deer Island area and purchased 15 lobsters that had been removed from the traps at that site. Similarly, a Battelle staff member accompanied a commercial lobsterman to the Eastern Cape Cod Bay site on July 20 and purchased 15 lobsters taken directly from the traps. In each case, the location of the collection was documented by the Battelle staff member. The Deer Island lobsters were collected approximately 1.5 nmi northwest from the flounder site center. The Eastern Cape Cod Bay lobster collection site was approximately 6.5 nmi southwest from the trawl site. All lobsters were grossly inspected for lesions or other aberrations, and returned alive to the laboratory in Duxbury where they were frozen until processed for chemical analysis.

2.4 Fish Dissection

Each fish was assigned a sample identification number (pathology accession number) that was unique to the site and date of collection. Each fish was examined grossly for external lesions and the general external conditions were noted. All specimens were weighed on a Chatillon fish scale, and the standard and fork length were determined. A sample of scales for age analysis was taken from the dorsum of the caudal peduncle of each specimen kept. The scales were placed in scale envelopes, labeled with the appropriate sample information, and subsequently delivered to Jay Burnett, National Marine Fisheries Service, Woods Hole, Massachusetts, for age determination.

Fifteen fish from each station were selected for chemical analysis. With the aid of a random number generator, five individuals were chosen for each of three composites of liver and fillet. The liver and fillet composites were composed of the same set of five fish.

All fish were killed by cervical section. An oval incision was made in the ventral body wall overlying the liver and anterior ventral gonad. The gonads were examined and their color and sex recorded. Gonads were either white and triangular in males, pink and elongated caudally in females, or small and blue-gray in immature fish. Livers were removed by severance of the peritoneal attachments, and examined grossly for color and abnormalities. The liver of each fish used only for histopathology was completely submerged in a 10% neutral-buffered formalin solution in a 140-mL plastic container. The formalized livers were then processed for histological sectioning as described below.

Tissue processing was conducted in a Class-100 clean room. Livers were dissected using a precleaned [*i.e.*, rinsed sequentially with 10% HCl, Milli-Q (18 megohm) water, acetone, DCM, and hexane] scalpel. Sections of the liver, approximately 4-6 mm thick, were cut transversely from three equidistant areas (A, B, and C) of the liver and placed in cassettes numbered to correspond with the sampling information. These sections were processed for histopathology. The remaining liver tissue was used for subsequent chemical analyses. Edible muscle tissue was also removed from each fish. A precleaned titanium knife was used to remove the fillets (muscle) from the flounder and the skin from the fillets.

The liver tissue and the muscle tissue of each individual fish was homogenized, ensuring that any liquid from the fish muscle was included with the homogenate. The liver and fillet from the same set of five fish made up each liver and fillet composite (*i.e.*, matched composites). The homogenization equipment was cleaned between use on each tissue.

Equal amounts of liver from each of the five fish were used in the composites. Wet weights were recorded. The combined tissues were re-homogenized prior to distribution to the analytical laboratories for analysis. Aliquots were removed for dry weight determination. The remaining tissue from each fish was archived as a separate sample, with full chain-of-custody being retained for each sample.

Equal amounts (within $\pm 5\%$) of muscle tissue from each fish were composited, and the wet weight was recorded. The combined tissue was re-homogenized prior to distribution to the analytical laboratories for analysis. Aliquots were removed for dry weight determination.

2.5 Lobster Dissection

An identifying number was assigned to each lobster collected from a single station. With the aid of a random number generator, five individuals for each of three composites were randomly chosen from the Deer Island and Eastern Cape Cod Bay collections, and five individuals for each of two composites were randomly chosen from the Future Outfall Site collection. The same individuals were used for the hepatopancreas and meat composites. The lobsters were thawed, and ventral incisions were made in the carapace and tail. The hepatopancreas and tail muscle were removed for analysis.

For each lobster, hepatopancreas and muscle tissue was separately homogenized. The homogenization equipment was cleaned between each tissue homogenization. The hepatopancreas and muscle meat from the same set of five lobsters comprised each hepatopancreas and muscle composite (*i.e.,* matched composites).

For the hepatopancreas, equal (within ±5%) amounts of the homogenate from each five-lobster group were combined, the weights were recorded, and an aliquot was removed for dry weight analysis. The combined tissue was re-homogenized prior to distribution to the analytical laboratories for analysis.

Muscle tissue was treated in a manner similar to the methods for the hepatopancreas. Equal (within ±5%) amounts from each of the five lobsters in a lobster group were composited. The wet weight was recorded and an aliquot was removed for dry weight measurement. The combined tissue was re-homogenized prior to its distribution to the analytical laboratories for analysis. Each tissue (muscle tissue and hepatopancreas) from each animal was archived as a separate sample, with full chain-of-custody retained for each sample.

2.6 Histological Processing

Livers were removed from the fixative and rinsed overnight in running tap water. Sections, approximately 4-6 mm thick, were cut transversely from three equidistant areas (A, B, and C) of the liver and placed in cassettes numbered to correspond with the sampling information. The tissues were embedded in paraffin, and two 5-μm-thick sections (1 and 2), from each of the three transversely cut portions, were cut and stained with hematoxylin and eosin by standard methods (see Hillman *et al.*, 1994).

2.7 Histological Analysis

After an initial examination of the material, the prevalence and severity of the following lesions, which have been described and illustrated in detail elsewhere (Moore, 1991; Hillman *et al.*, 1994), were recorded:

1. Hydropic vacuolation, seen in three forms:

   a. Centrotubular vacuolation — isolated groups of 1-2 vacuolated cells in the center of the hepatic tubule.

   b. Tubular vacuolation — linear arrays of vacuolated cells, filling the hepatic tubule, often extending into biliary duct structures.

   c. Focal vacuolation — foci of thirty to several hundred contiguous vacuolated cells.

2. Macrophage aggregation — circular golden-brown cellular masses, often associated with fibrotic tracts, bile ducts, and blood vessels.

3. Biliary duct proliferation — branching ducts, often ensheathed by fibrosis.

4. Neoplasms — focal, often grossly visible areas of cells fulfilling established criteria for neoplasia in this species (Moore, 1991).

5. Balloon hepatocytes — an idiopathic lesion in which the hepatocytes become swollen by a large vacuole that displaces the nucleus. The vacuole often contains a small round body with basophilic components. The presence of these cells in the liver is often accompanied by a variety of pathological conditions including necrotic foci, loss of distinction of hepatocellular boundaries, cytomegaly, foci of basophilic hepatocytes, and foci of cellular alteration. The lesion is possibly a manifestation of apoptosis (M. Myers, J. Fournie, personal communication).

The severity of each lesion was scored as follows: histological slides were examined under bright-field illumination at 25 x, 100 x, and 200 x using a Zeiss Photomicroscope (REH) or a Zeiss Axioskop (MJM). For each slide, each lesion was scored by examining the whole section at 25 x, and at least five views at 100 x and 200 x. Each lesion was scored from 0 to 4, where 0 = absent, 1 = minor, 2 = moderate, 3 = severe, and 4 = extreme. Lesion indices were calculated as the mean scores for a particular lesion at a given site.

To allow comparison of 1994 data with those from previous years, the prevalence of each lesion was also calculated from each site. These data were derived from the histopathological indices by assigning each fish with a lesion score of 1 or more as having the lesion present. This approach was used previously (Moore and Stegeman, 1993; Hillman, *et al.*, 1994).

2.8 Chemical Analysis

Fish and lobster tissue collected in 1994 from Deer Island Flats, Broad Sound, Nantasket Beach, the Future Outfall Site, and Eastern Cape Cod Bay were analyzed for chemical contaminants. Liver samples were analyzed for organic contaminants listed in Table 2 and for mercury. Muscle tissue was analyzed for the organic contaminants except PAH. The lobster hepatopancreas samples were also analyzed for seven additional metals: silver, cadmium, chromium, copper, nickel, lead, and zinc. Tissues for analysis were divided between the organics and metals laboratories, although the division was not equal because the organic analyses require more tissue material.

2.8.1 Organics Analyses

Tissue samples were serially extracted for PAH, chlorinated pesticides, and PCB following methods developed by Battelle in support of the NOAA Status & Trends Mussel Watch Project (Peven and Uhler, 1993). Briefly, an aliquot of homogenized tissue was serially extracted with dichloromethane (DCM) and sodium sulfate using a Tekmar tissuemizer. An aliquot of the original sample was removed for dry weight determination. (Sample dry weights are presented in the appendix.). The sample was weighed in a Teflon extraction jar and spiked with the appropriate surrogate internal standards. Sodium sulfate and solvent were added, and the sample was macerated for 2 min and centrifuged. The solvent extract was decanted into an Erlenmeyer

Table 2. Analytes Included in Tissue Chemistry Analyses.

Trace Metals[a]
- Ag Silver
- Cd Cadmium
- Cr Chromium
- Cu Copper
- Hg Mercury[b]
- Ni Nickel
- Pb Lead
- Zn Zinc

Polychlorinated biphenyls (PCBs)[c]
- 2,4,-Cl_2(8)
- 2,2',5-Cl_3(18)
- 2,4,4'-Cl_3(28)
- 2,2',3,5'-Cl_4(44)
- 2,2',5,5'-Cl_4(52)
- 2,3',4,4'-Cl_4(66)
- 3,3',4,4'-Cl_4(77)
- 2,2'4,5,5'-Cl_5(101)
- 2,3,3',4,4'-Cl_5(105)
- 2,3',4,4'5-Cl_5(118)
- 3,3',4,4',5-Cl_5(126)
- 2,2',3,3',4,4'-Cl_6(128)
- 2,2',3,4,4',5-Cl_6(138)
- 2,2'4,4',5,5'-Cl_6(153)
- 2,2'3,3,4,4',5-Cl_7(170)
- 2,2',3,4,4',5,5'-Cl_7(180)
- 2,2',3,4,5,5',6-Cl_7(187)
- 2,2',3,3',4,4',5,6-Cl_8(195)
- 2,2',3,3'4,4',5,5',6-Cl_9(206)
- Decachlorobiphenyl-Cl_{10}(209)

Polynuclear Aromatic Hydrocarbons (PAHs)[a]
- naphthalene
- C_1-naphthalenes
- C_2-naphthalenes
- C_3-naphthalenes
- C_4-naphthalenes
- biphenyl
- acenaphthylene
- acenaphthene
- dibenzofuran
- fluorene
- C_1-fluorenes
- C_2-fluorenes
- C_3-fluorenes

Polynuclear Aromatic Hydrocarbons (PAHs) (continued)
- anthracene
- phenanthrene
- C_1-Phenanthrenes/anthracene
- C_2-Phenanthrenes/anthracene
- C_3-Phenanthrenes/anthracene
- C_4-Phenanthrenes/anthracene
- dibenzothiophene
- C_1-dibenzothiophenes
- C_2-dibenzothiophenes
- C_3-dibenzothiophenes
- fluoranthene
- pyrene
- C_1-fluoranthenes/pyrene
- benzo[*a*]anthracene
- chrysene
- C_1-chrysene
- C_2-chrysene
- C_3-chrysene
- C_4-chrysene
- benzo[*b*]fluoranthene
- benzo[*k*]fluoranthene
- benzo[*e*]pyrene
- benzo[*a*]pyrene
- perylene
- indeno[1,2,3-*c,d*]pyrene
- dibenzo[*a,h*]anthracene
- benzo[*g,h,i*]perylene

Pesticides[c]
- hexachlorobenzene
- lindane
- heptachlor
- aldrin
- endrin
- heptachlorepoxide
- alpha-chlordane
- trans-Nonachlor
- dieldrin
- mirex
- 2,4'-DDD
- 4,4'-DDD
- 2,4'-DDE
- 4,4'-DDE
- 2,4'-DDT
- 4,4'-DDT

Additional Parameters[c]
- Lipids
- % dry wt.

[a] Flounder liver; lobster hepatopancreas
[b] Flounder and lobster edible tissue
[c] Flounder edible tissue and liver; lobster edible tissue and hepatopancreas

flask. After each extraction (total of two homogenizations and a third shake by hand), the centrifuge solvent was combined in the flask. A 10-mL aliquot of the combined extracts was removed for lipid weight determination (Peven, 1993), and sodium sulfate was added to the extract in the flask. After approximately 30 min, the contents of the Erlenmeyer flask were processed through an alumina column. The eluate from the alumina column was concentrated to 900 μL using a Kuderna-Danish apparatus and nitrogen evaporation techniques. The concentrated extract was further cleaned using a high-performance liquid chromatographic (HPLC) gel-permeation technique. This procedure removed common contaminants, including lipids, that interfere with instrumental analysis. The post-HPLC extract was concentrated to approximately 500 μL under nitrogen gas and the recovery internal standards were added to quantify extraction efficiency. The tissue final extract was split for analysis, one-half remaining in DCM for PAH analysis, and the other half solvent-exchanged with isooctane for PCB and pesticide analysis.

Sample extracts were analyzed for PAH compounds in the selected-ion-monitoring (SIM) mode by gas chromatography/mass spectrometry (GC/MS). Pesticides and PCB congeners were analyzed and quantified using gas chromatography/electron capture detection (GC/ECD).

2.8.2 Metal Analyses

Metals analyzed in the tissues are shown in Table 2. The tissue samples were homogenized with an OMNI Tissue Homogenizer fitted with a titanium cutting probe. After homogenization, samples were freeze-dried and digested with hot acids for dissolution. Mercury was analyzed by cold vapor atomic absorption spectrophotometry (CVAAS) and, silver, cadmium, chromium, copper, nickel, lead, and zinc were analyzed by inductively coupled plasma-mass spectrometry (ICP-MS).

A 0.5-g subsample of the dry tissue was heated by microwave in a Teflon digestion vessel containing 6 mL HNO_3 and 0.5 mL $HClO_4$. The digestion solution was then diluted to $\approx$30 mL and transferred to pre-cleaned polyethylene storage containers for final analysis. Silver, cadmium, chromium, nickel, copper, lead, and zinc concentrations were measured using ICP-MS instrumentation. Mercury was measured in the digestion solution by cold-vapor atomic absorption spectrophotometry (CVAAS) using an LDC mercury monitor.

2.9 Data Reduction and Analysis

Data reduction and analysis was carried out as described in the Combined Work/Quality Assurance Project Plan (CW/QAPP) for Fish and Shellfish Monitoring: 1993-1994, dated May 6, 1993 (Hillman *et al.*, 1993). Histopathological indices and prevalence of lesions were compared between classes of fish defined by differences in station, age, sex, and length. Because many lesions were found together, they were not statistically independent. Centrotubular vacuolation has been considered the most sensitive histological indicator of exposure to chemical contaminants (*e.g.*, Moore and Stegeman, 1993), and was thus tested by analysis of variance (ANOVA) for significant differences between groups of fish.

3.0 RESULTS AND DISCUSSION

3.1 Winter Flounder Histology

The sex, age, length, weight, gross pathological observations, and the results of microscopic examination of the livers of each fish are presented in Appendix A. Those data are summarized below, and some comparisons are made with data from previous years. Because of a difference in analytical techniques between those used in years prior to 1993 and those used for the Phase I monitoring program, data from years prior to 1993 are not strictly comparable. Those differences are discussed in Hillman *et al.* (1994). Data from years prior to 1993 are summarized in Moore and Stegeman (1993).

3.1.1 Age/Length Parameters

The mean ages of the winter flounder collected in the April 1994 samples are shown in Table 3 and are compared with the 1993 results. Fish with the oldest average age, just over 4 years, were collected at Deer Island. Fish with the youngest average age, about 3.8 years, were collected at the Future Outfall Site. In general, fish collected in 1994 averaged younger than the fish collected in 1993, although based on the broad overlap of standard deviations it would appear that there were no significant differences between years or sites.

The mean lengths of fish collected in 1994 are shown in Table 4 and are compared with those of fish collected in 1993. The largest fish, averaging almost 37 cm, were collected on the Deer Island Flats. The smallest fish, about 33 cm in length, were collected at the Future Outfall Site. They were not significantly smaller, however, than those collected from Nantasket Beach or Eastern Cape Cod Bay.

Table 3. Mean Age of Winter Flounder Collected at Boston Harbor and Massachusetts and Cape Cod Bay Sites during April 1993 and 1994.

Station	Station ID Number	1993	1994
Deer Island	1	4.68	4.42
Broad Sound	3	5.26±1.34	3.86±1.06
Nantasket Beach	2	4.96±1.00	4.00±0.88
Future Outfall Site	4	4.32±0.89	3.82±1.00
Eastern Cape Cod Bay	5	4.32±0.84	3.94±0.87

Table 4. Mean Length (cm) of Winter Flounder Collected at Boston Harbor and Massachusetts and Cape Cod Bay Sites during April 1993 and 1994.

Station	Station ID Number	1993	1994
Deer Island	1	34.1±3.2	36.6±4.1
Broad Sound	3	36.4±4.5	35.0±3.9
Nantasket Beach	2	35.6±3.6	34.1±2.9
Future Outfall Site	4	33.7±3.1	33.0±3.9
Eastern Cape Cod Bay	5	34.1±2.8	33.6±5.5

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2   3   5   1   4        1   3   5   2   4
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Stations connected by bars are not significantly different (Student-Neuman-Kuels Ranking Test)

3.1.2 Fin Erosion Indices

The mean fin erosion index for each of the five winter flounder populations is shown in Table 5, along with a comparison of 1994 fin erosion indices with those of 1993. Fin erosion indices increased from 1993 to 1994 at all sites. The index at the Future Outfall Site, 0.48, was four times the index in 1993, and twice the highest 1993 index (0.24 at Nantasket Beach). However, the large standard deviations negate any statistical significance between the 1993 and 1994 collections.

3.1.3 Lesion Prevalence and Severity

The prevalences of the principal histopathological lesions observed in sections of winter flounder liver tissues from fish collected at the five sampling sites in April 1994 are shown in Table 6, and compared with prevalences of the same lesions as observed in the 1993 samples.

While prevalence is based on the presence or absence of a particular lesion in at least one of the six sections studied for each fish, the assessment of severity of a given lesion is subjective. The severity of each lesion in a given section is assigned a score ranging from 0, when the lesion is absent, to 4, the most severe manifestation of the lesion. The incidences shown in Table 7 represent the mean severity score for all fish at a given site, based on an assessment of severity in six slides from each of 50 fish, or a mean of 300 scores. Because of the subjective nature of the incidence rating, year-to-year differences in severity might not be as important as year-to-year differences in prevalence. In fact, because of the large standard deviations, there were no statistically significant differences in year-to-year severity ratings.

Hydropic vacuolation has received the most emphasis in previous reports because of its known relationship to contaminants (*e.g.*, Moore, 1991; Johnson *et al.*, 1992; Myers *et al.*, 1993). In general, the prevalence of hydropic vacuolation was about the same in 1994 as in 1993. Flounder from Deer Island and Broad Sound continued to show higher prevalences of hydropic vacuolation than fish from the other three sites. Centrotubular hydropic vacuolation, the least severe of the three categories of hydropic vacuolation, occurred in about 50% of the fish from

Table 5. Fin Erosion Index for Winter Flounder Collected at Boston Harbor and Massachusetts and Cape Cod Bay Sites during April 1993 and 1994.

Station	Station ID Number	1993	1994
Deer Island	1	0.03	0.24±0.59
Broad Sound	3	0.04±0.20	0.44±0.61
Nantasket Beach	2	0.24±0.48	0.26±0.44
Future Outfall Site	4	0.12±0.33	0.48±0.68
Eastern Cape Cod Bay	5	0.14±0.40	0.24±0.43

1993					1994				
2	5	4	3	1	4	3	2	5	1
————	————	————			————	————	————	————	————
	————	————	————	————					

Stations connected by bars are not significantly different (Student-Neuman-Kuels Ranking Test)

Table 6. **Histopathological Lesion Prevalences (%) for Winter Flounder Collected from Boston Harbor and Massachusetts and Cape Cod Bay Sites in April 1993 and 1994. Numbers in parentheses represent sample size.**

Lesion	Deer Island		Broad Sound		Nantasket Beach		Future Outfall Site		Eastern Cape Cod Bay	
	1993 (29)	1994 (50)	1993 (50)	1994 (50)	1993 (50)	1994 (50)	1993 (50)	1994 (50)	1993 (50)	1994 (50)
Centrotubular Hydropic Vacuolation	55	54	50	42	28	20	30	24	4	6
Tubular Hydropic Vacuolation	28	34	36	18	14	10	22	12	2	2
Focal Hydropic Vacuolation	7	6	2.00	8	0	6	0	4	0	0
Neoplasia	0	0	2	0	0	2	0	0	0	2
Macrophage Aggregates	90	92	86	90	98	90	94	94	7	94
Biliary Proliferation	83	78	84	40	68	26	72	10	52	72
Balloon Hepatocytes	59	84	62	66	50	52	52	76	23	98

Table 7. Histopathological Lesion Indices for Winter Flounder Livers Collected from Boston Harbor and Massachusetts and Cape Cod Bays in April 1993 and 1994. Each histological condition was scored on a scale of 0 to 4 for severity, with 0=absent to 4=severe. Individual indices for each fish were averaged for each station.

Lesion	Deer Island		Broad Sound		Nantasket Beach		Future Outfall Site		Eastern Cape Cod Bay	
	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
Centrotubular Hydropic Vacuolation	0.85±1.09	1.41±1.42	0.87±1.15	1.04±1.32	0.44±0.91	0.55±1.17	0.61±1.07	0.48±1.07	0.08±0.46	0.12±0.49
Tubular Hydropic Vacuolation	0.46±0.93	0.50±0.92	0.43±0.87	0.32±0.85	0.22±0.61	0.20±0.66	0.36±0.84	0.14±0.52	0.01±0.08	0.03±0.24
Focal Hydropic Vacuolation	0.02±0.13	0.05±0.28	0.01±0.08	0.06±0.29	0.00	0.07±0.36	0.00	0.03±0.20	0.00	0.00
Macrophage Aggregates	0.95±0.95	1.75±1.02	1.13±0.92	1.43±1.06	1.00±0.94	1.45±0.99	0.81±0.83	1.31±0.97	0.54±0.71	1.48±1.01
Biliary Proliferation	0.69±0.69	0.88±0.95	0.76±0.69	0.36±0.63	0.55±0.61	0.32±0.71	0.44±0.57	0.90±0.37	0.32±0.54	0.78±0.76
Neoplasia	0.00	0.00	0.00	0.00	0.00	0.02±0.16	0.00	0.00	0.00	0.00
Balloon Hepatocytes	0.90±1.27	2.39±1.45	0.81±1.06	1.42±1.33	0.60±0.91	0.71±0.96	0.62±0.99	1.57±1.14	0.64±0.97	2.63±1.03

Deer Island and Broad Sound. At the Eastern Cape Cod Bay site, the prevalence of centrotubular hydropic vacuolation was $<10\%$, the lowest of any site.

In 1994, the prevalence of macrophage aggregates continued to be high at the same sites as in 1993. In addition, at the Eastern Cape Cod Bay reference site, lesion prevalence in 1994 increased markedly from 7% in 1993 to 94% in 1994. Incidences of macrophage aggregates are known to result from a variety of causes, including infectious diseases, starvation, aging, and chemical exposure (Blazer *et al.,* 1987). A high prevalence, therefore, is not necessarily a useful biomarker and future emphasis on this particular lesion could probably be reduced with no decrease in technical content of the program.

Prevalence of biliary proliferation, which is a significant biomarker, dropped considerably in 1994 at Broad Sound, Nantasket Beach, and the Future Outfall Site, although not as low as the levels reported for 1992 (Moore and Stegeman, 1993). In 1993, biliary proliferation rose sharply over what was observed in 1992 (Hillman *et al.,* 1994). The reasons for the elevation and decline in this particular lesion are not clear at this time. However, in 1994, we observed a great deal of pancreatic duct proliferation, a lesion not mentioned in previous reports. In 1994, however, there appeared to be considerably more pancreatic tissue in the liver sections, and much of the pancreatic duct tissue was observed directly with the pancreatic acinar and endocrine tissue. Thus, it was easier to determine that the proliferating ductile tissue was pancreatic rather than biliary. It is possible that some of what was considered biliary duct proliferation in 1993 was actually pancreatic duct proliferation. The pancreatic lesions observed in 1994 will be described subsequently.

Incidence of neoplasia remained at low levels in 1994. Only two incidences were observed, a cholangiolar carcinoma in a 6-year-old female from Nantasket Beach and a hepatocellular carcinoma in a 5-year-old probable female from the Eastern Cape Cod Bay site. This was the first incidence of a neoplasm from the Eastern Cape Cod Bay site in four years of monitoring.

The lesion that we called "balloon hepatocytes" in 1993 (Hillman *et al.,* 1994) remained in 1994 at generally the same prevalences recorded at Deer Island, Broad Sound, and Nantasket Beach in 1993. However, it increased at the Future Outfall Site and especially at the Eastern

Cape Cod Bay site, where it was observed at nearly 100% prevalence in 1994. While the lesion has been discussed primarily in connection with the liver cells, we have also observed it in pancreatic acinar cells.

This particular lesion was first discussed in connection with the Phase I monitoring study in the 1993 Annual Fish and Shellfish Report (Hillman *et al.*, 1994). At that time, it was described as being a possible manifestation of apoptosis, although that was not a definitive diagnosis. We subsequently described the lesion in a paper given in December 1994 at the Flatfish Biology Workshop, sponsored by the NOAA National Marine Fisheries Service. The primary reason for the presentation was to inquire as to whether the lesion had been previously described and to determine its nature. At that meeting, the lesion was discussed in detail with Robert Murchelano and Sharon MacLean, NOAA fisheries pathologists. Ms. MacLean indicated that she had seen it once before in a flounder, but was unable to determine its nature or etiology. We concluded, however, that the large vacuole was probably not a lipid vacuole. Thus the nature and etiology of the lesion remains undetermined, as does its effect on the metabolism of the fishes in which it is found.

Other Histologically Diagnosable Liver Lesions

A number of these lesions were observed frequently in 1993 and 1994, but discussions of them were not included in the 1993 annual report because of the emphasis, for consistency, on the principal lesions reported prior to 1993 (Moore *et al.*, 1992; Moore and Stegeman, 1993). Several of these lesions were quite prominent in the tissue, however, and the prevalences of the more important ones deserve mention in relation to the baseline health of the winter flounder in Boston Harbor and Massachusetts Bay. The prevalences of necrotic foci, pancreatic necrosis, pancreatic duct proliferation, eosinophilic cell foci, basophilic cell foci, and hepatocellular regeneration are shown in Table 8.

Areas of necrosis, from scattered small foci to extensive areas of dead cells and cellular debris were present in most fish. Much of the necrosis was in connection with biliary and pancreatic duct proliferation, but there were many instances of necrosis spread generally throughout

Table 8. Prevalences (%) of Other Histologically Diagnosable Hepatic Lesions in Winter Flounder Collected in Boston Harbor and Massachusetts Bays in April 1994.

	Deer Island	Broad Sound	Nantasket Beach	Future Outfall Site	Eastern Cape Cod Bay
Necrotic Foci	100	92	88	86	96
Pancreatic Necrosis	28	28	14	10	32
Pancreatic Duct Proliferation	8	8	32	8	26
Eosinophilic Cell Foci	0	0	2	2	0
Basophilic Cell Foci	10	16	14	14	22
Hepatocellular Regeneration	0	6	48	40	56

the livers. Much of the hepatocellular regeneration was observed in conjunction with the necrotic areas.

Basophilic cell foci, like the necrotic foci, ranged from small basophilic nodules, which are putatively neoplastic (*e.g.,* Myers *et al.,* 1993) to large areas of tendril-like projections of basophilic cells throughout the liver.

Fish collected from the Eastern Cape Cod Bay site had the highest total number of lesions, except for the principal lesions discussed previously. Particularly important are the relatively high prevalences of proliferative conditions and the basophilic cell foci.

If an assessment of the overall baseline health of the winter flounder populations sampled for this study were based solely on the histopathology of the liver, the assessment would indicate less than healthy fish populations throughout the study area. There is no indication that toxic contaminants are the cause of much of the pathology, particularly the balloon hepatocytes, the hepatic and pancreatic necrosis, and the biliary and pancreatic duct proliferation. It is not unreasonable, therefore, to consider a viral etiology for some of the pathology observed, particularly at sites away from the Deer Island outfall. For example, an infectious pancreatic necrosis virus, which produces similar kinds of pathology observed in the winter flounder collected for this study, has been isolated from a wide variety of fish families, including flounder (Plumb, 1993). Further studies, especially electron microscopy, would be required to determine the etiology of the various lesions, and whether there might be a relationship between the balloon hepatocytes, necrosis and duct proliferation, and a virus.

3.2 Chemistry Tissue Analyses

Contaminant concentrations were measured in 15 flounder muscle samples, 15 flounder liver samples, 8 lobster samples, and 8 lobster hepatopancreas samples. Each sample was a composite comprised of tissue from five individual flounder or lobster. All samples were extracted and analyzed for PCB, chlorinated pesticides, and mercury concentrations. The liver and hepatopancreas samples were also analyzed for PAH and the entire list of target metals.

Summary data for 1994 samples, as well as data available from 1992 and 1993 tissue analyses, are plotted in Figures 2, 4, 6, and 8. [Note: No samples from Nantasket Beach or Broad Sound were analyzed in 1993.] These figures are arranged such that each page contains summary concentration data for an individual tissue type. Additionally, in each figure the standard deviations for analyses in 1994 data are presented as lines above the concentration bars. These lines show the variability in concentration between the multiple samples of the same matrix analyzed in 1994. For example, the plots in Figure 2 display concentrations of mercury, total PCB (sum of target congeners), total DDT (2,4'-DDE+4,4'-DDE+2,4'-DDD+4,4'-DDD+2,4'-DDT+4,4'-DDT), total chlordane (heptachlor+heptachlorepoxide+*cis*-chlordane+*trans*-nonachlor), and dieldrin, by site and year, in flounder muscle. These target analytes and analyte groups were chosen as representative contaminants for this discussion — the complete record of analytical results is presented in the Appendix.

3.2.1 Winter Flounder Edible Tissue Analyses

The results of flounder tissue analyses are plotted in Figure 2. The 1994 data are the mean values from the analyses of three composite samples. Each composite was comprised of tissues (liver or muscle) from five randomly chosen individuals. The 1993 data are the mean of 9 or 10 individually analyzed flounder. The data from 1992 are results of the analysis of single composite samples, each comprised of seven individuals.

No obvious trends are noted in any summary plots. Between 1993 and 1994, chlorinated hydrocarbon concentrations apparently increased in Deer Island flounder muscle. Mercury concentrations generally decreased between 1993 and 1994 in flounder muscle, except for tissue from the Future Outfall Site, in which there was a slight increase ($<10\%$). Mercury concentrations in Deer Island flounder tissue analyzed in the late 1980s (from Schwartz *et al.*, 1993) and in 1994 are plotted in Figure 3 (please note that these data are in units of μg/g wet weight). While there are no significant differences, these data suggest a decrease in concentration between 1987 and 1994, with the most dramatic decrease occurring between 1988 and 1989.

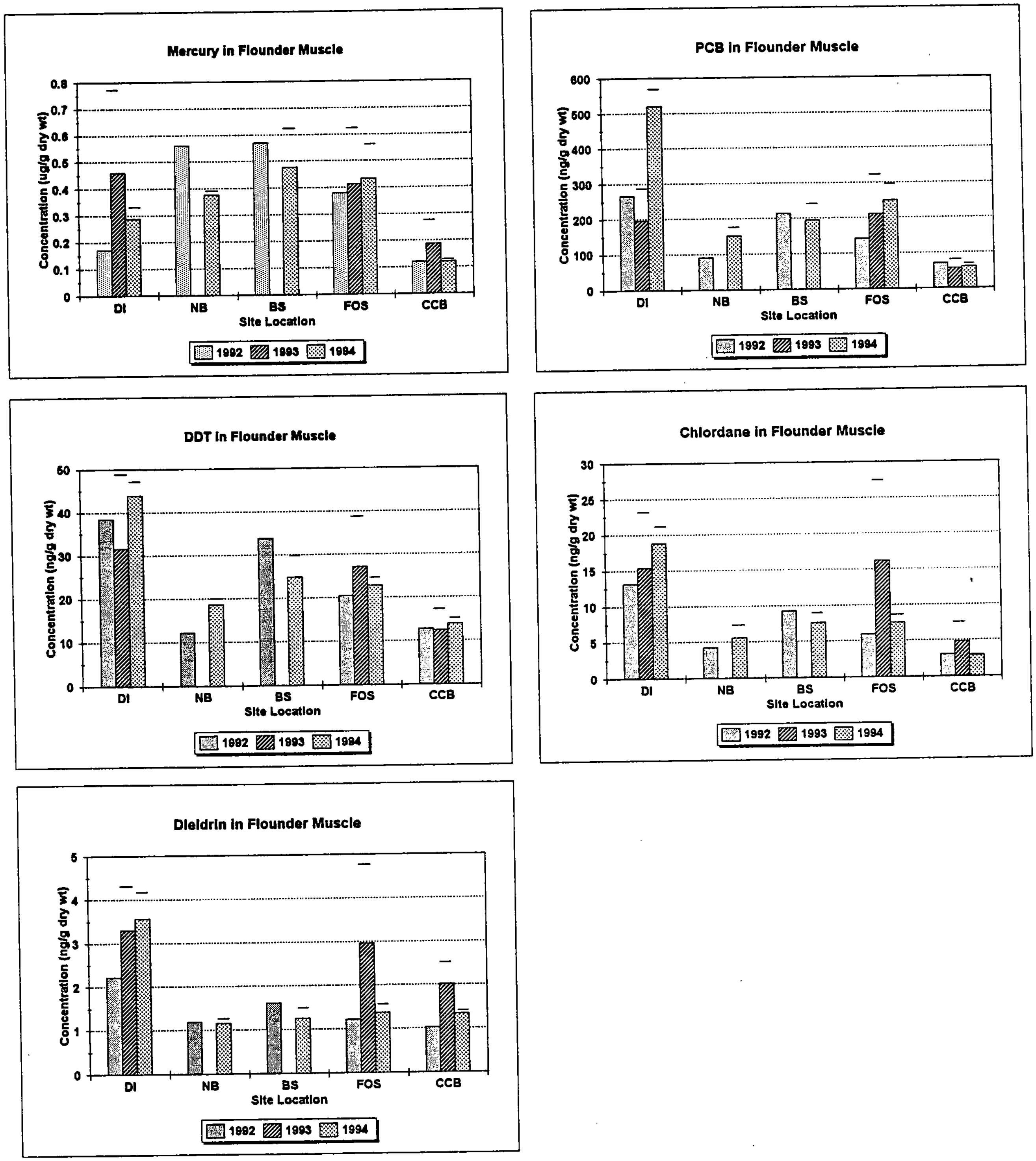


Figure 2. Comparison of Target Analyte Concentrations in Flounder Muscle, 1992 to 1994.

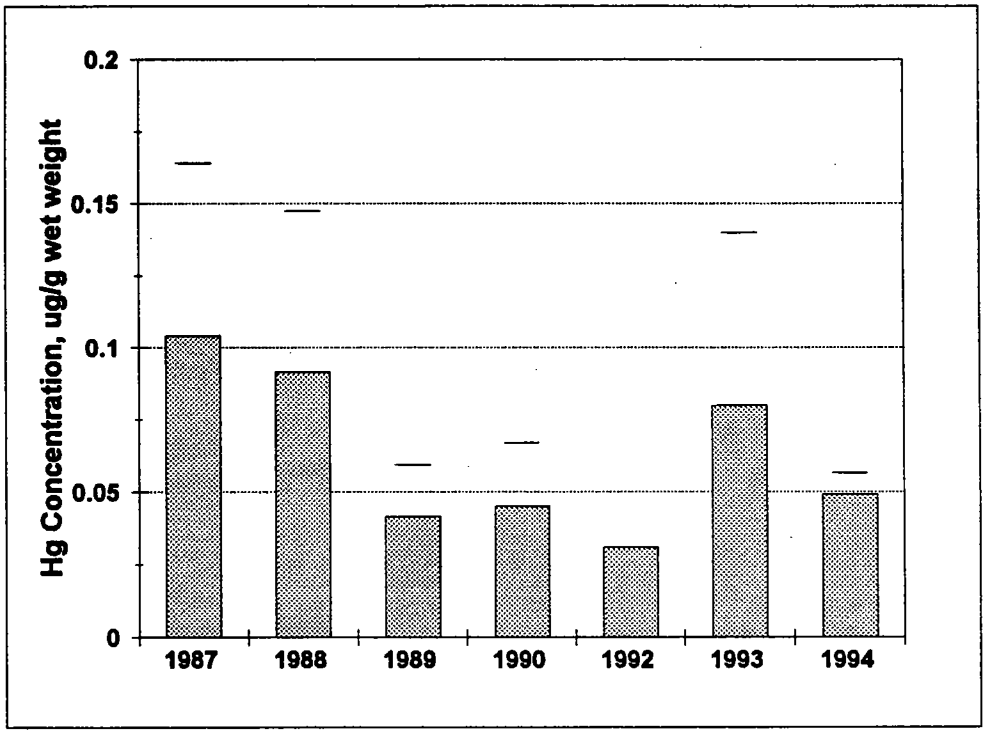


Figure 3. Mercury Concentrations in Flounder Tissue From Deer Island, 1987 to 1994. The lines represent the standard deviation between multiple analyses.

3.2.2 Winter Flounder Liver Tissue Analyses

Concentrations of the target analytes in flounder liver composite samples are presented in Figure 4. With the exception of the Broad Sound and Cape Cod Bay sites, all chlorinated hydrocarbon concentrations are elevated compared with data from 1992 and/or 1993. These increases are slight, with many <25%. Mercury concentrations are down from 1992 values at all locations except the Future Outfall Site. PAH concentrations have decreased dramatically since 1992 — by more than a factor of 10; this may be explained by the distributions of the individual PAH. Figure 5 shows the individual analytes detected in flounder liver samples from the Future Outfall Site from 1992 and 1994. The petroleum-related 2- and 3-ring PAH dominate the PAH distribution in 1992. This type of pattern is often associated with an influx of a petroleum product into the water column or the samples. Such contamination in the field samples may be an artifact of field or laboratory activities. For example, as part of the field protocols followed during 1992, the individual fish were transported to Woods Hole and held in tanks before processing for chemistry. In 1993 and 1994, the fish for chemical analysis were brought back to the laboratory for processing, and all laboratory procedures were performed in a Class-100 clean room. These results particularly emphasize the need to apply "clean" technologies to all phases of sample collection and processing, and brings into question previous results obtained from onboard processing of fish samples. It should also be noted that variabilities between samples and years are almost certainly in part related to the small samples sizes available in 1992 and 1993 for both metals and organic analyses.

3.2.3 Lobster Edible Tissue (Tail Meat) Analyses

Lobsters were collected at the Deer Island site, the Future Outfall Site, and in Eastern Cape Cod Bay. Results of the analyses of lobster tissues are plotted in Figure 6. Between 1993 and 1994, PCB, DDT, and chlordane concentrations increased by at least a factor of two in tissue from the Future Outfall Site. Because the Outfall Site was sampled in April of 1994, and in August 1993, the apparent increase could be related to temporal changes in the concentrations in these organisms. If so, the timing of the sample collections should be evaluated and made very consistent between years. DDT, PCB, and chlordane concentrations changed <15% at the other

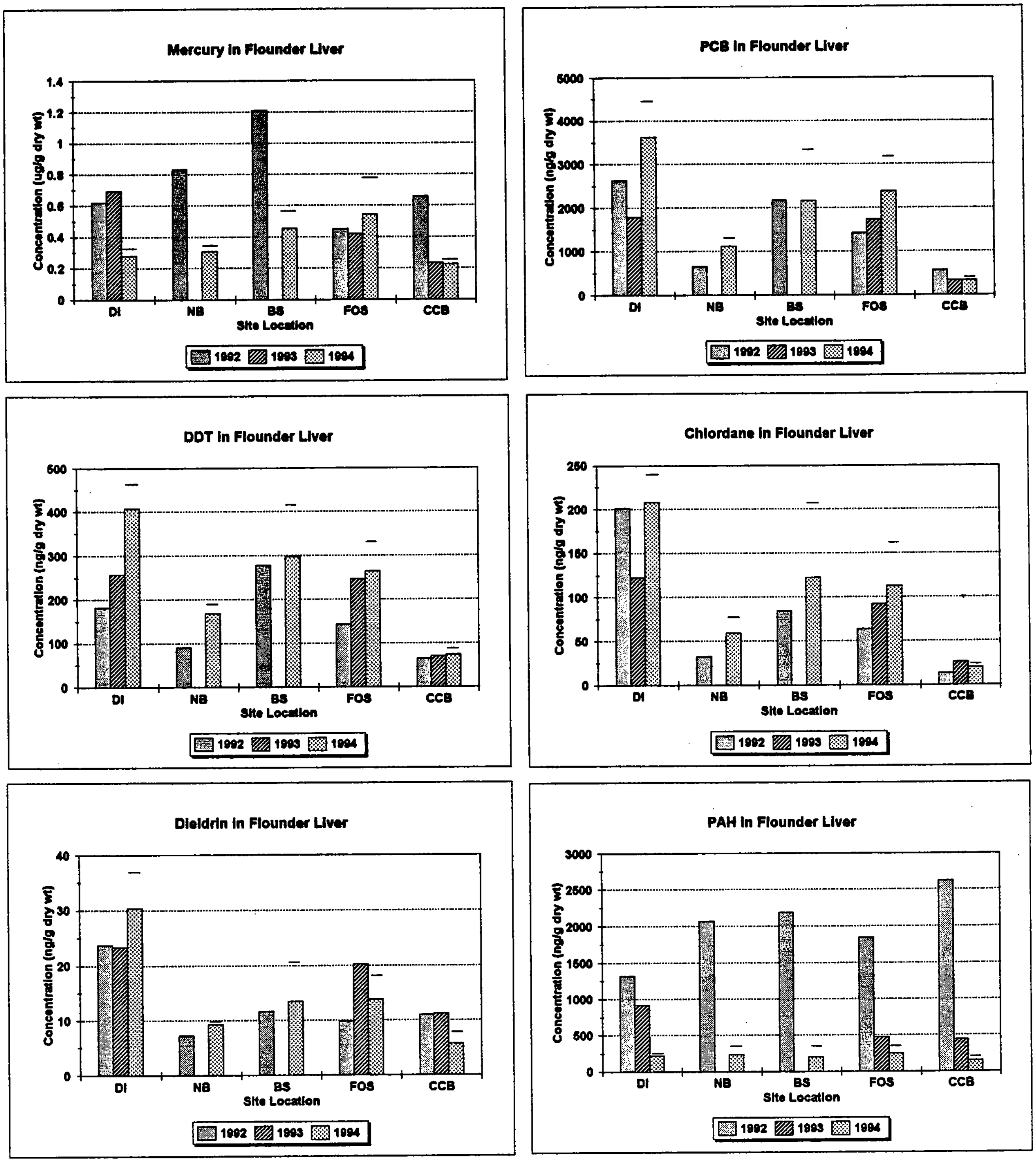


Figure 4. Comparison of Target Analyte Concentrations in Flounder Liver, 1992 to 1994.

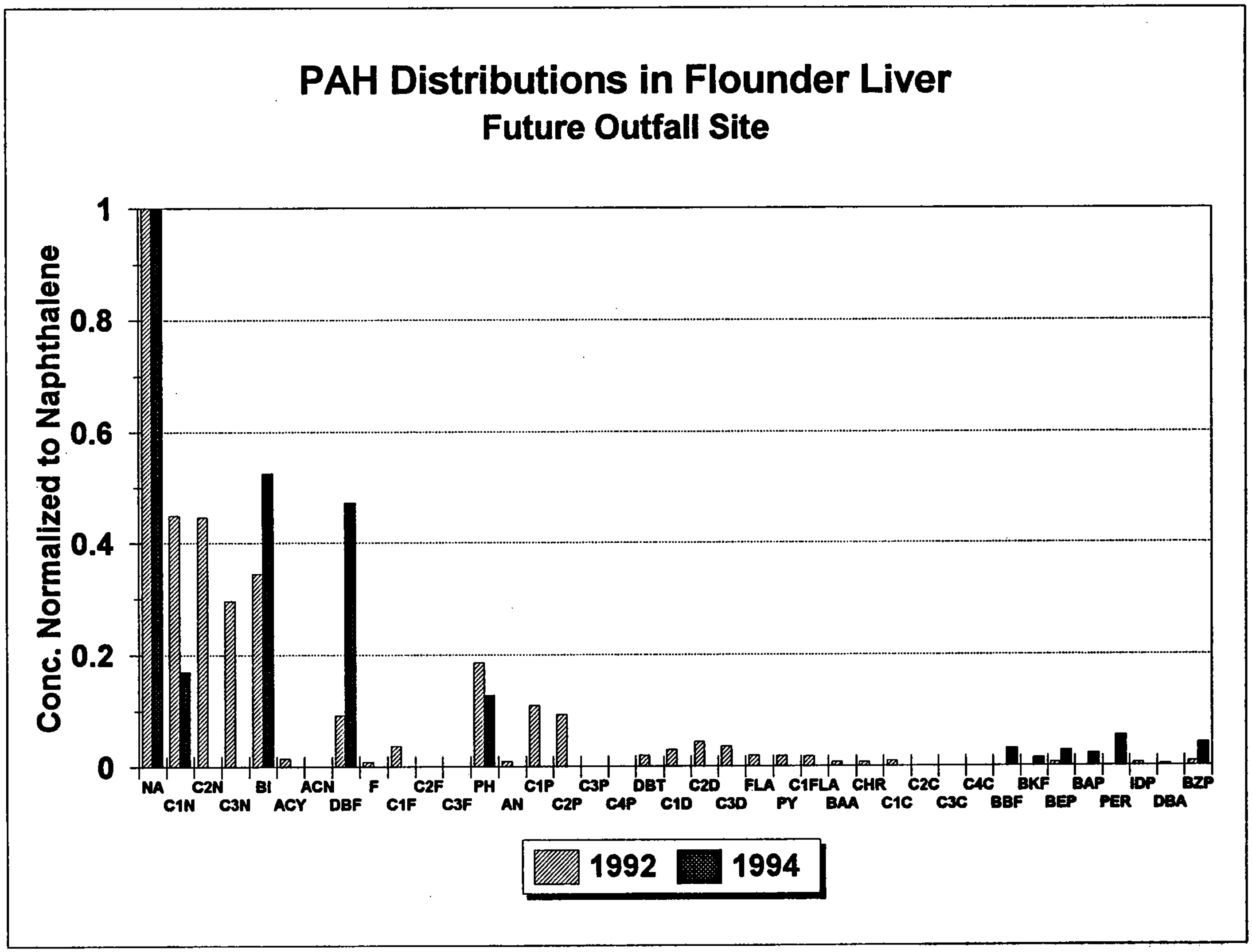
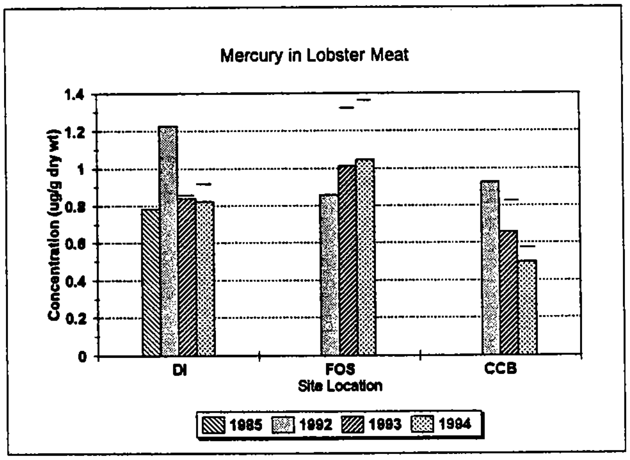
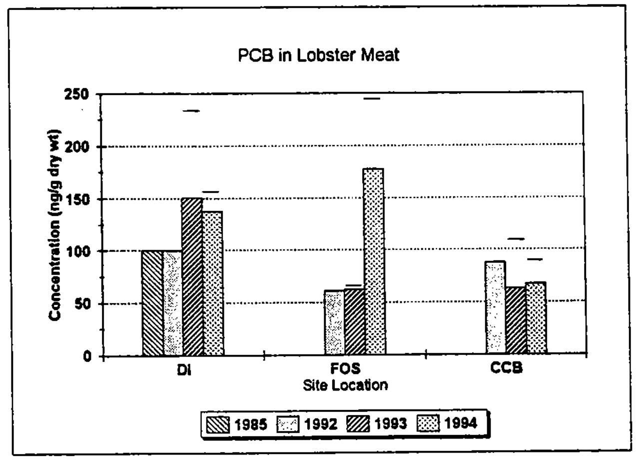
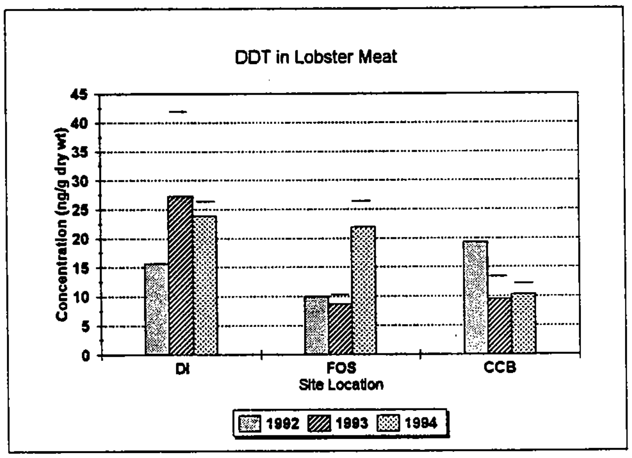
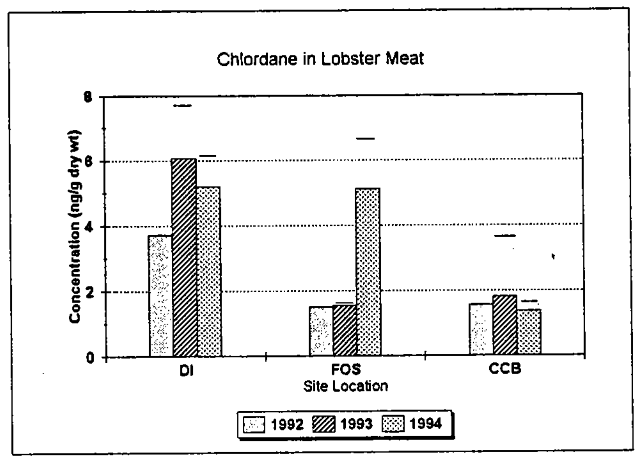


Figure 5. PAH Distribution in Flounder Liver From the Future Outfall Site, 1992 and 1994.









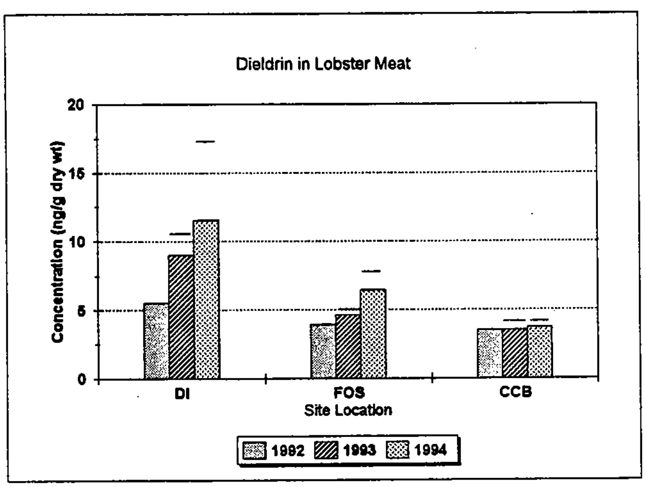


Figure 6. Comparison of Target Analyte Concentrations in Lobster Tail Meat, 1992 to 1994.

two sites during this same time period. Data for PCB and mercury in lobsters from Deer Island from 1985 (Wallace, 1988) are also included in Figure 6. Mercury concentrations from 1985 are very similar to those detected in 1993 and 1994. The PCB concentrations are higher in 1994 than in 1985; however, the total PCB concentrations decreased slightly between 1993 and 1994. Dieldrin concentrations increased at Deer Island between 1992 and 1993, and again in 1994. The sample extracts were re-analyzed on a second analytical GC column and the identification of dieldrin in these tissues has been confirmed.

Lobster data from Schwartz *et al.* (1993) and current MWRA data for mercury are plotted in Figure 7. Although both studies intended to represent contaminant concentrations in lobster "edible tissue," the definition of edible tissue varies between the two studies. The samples from 1987 to 1990 (Schwartz, *et al.*, 1993) represent concentrations in homogenate made from a mixture of lobster tail, claw, hepatopancreas, and gonads, while the MWRA concentrations are from tail meat only.

Comparison of the PCB concentrations in lobster edible tissue based on the sum of the 10 target congeners common among these studies, show that the concentrations detected by Gardner and Pruell (1988) in 1987 (tail only, n=16) were higher than those determined in 1985 by Wallace *et al.* (1988) (tail+claw, n=24), and in 1994 by Battelle (tail only, n=3) (0.05, 0.013, and 0.012 μg/g wet weight, respectively). In both the 1985 and 1994 studies, the total PCB concentrations in lobster muscle tissue from Deer Island were approximately one-fourth the concentration detected in Quincy Bay in 1987. These data suggest that the PCB concentrations were higher in Quincy Bay in 1987 than in Deer Island in 1985 and Deer Island in 1994. The reasons are not clear, however one must consider differences in extraction, analysis, and quantitation methods between the three studies. For example, the GC/ECD analysis program followed by Gardner and Pruell (1988) was three times faster than the program followed by Battelle on a comparable instrument (30 minutes vs. 90 minutes). This means that several individual congeners that possibly eluted as one primary peak in 1987 may have been resolved as individual peaks in 1994. Several of the 10 congeners have very close eluters that are major contributors to Aroclor formulations. For example, Cl_6(153) elutes very closely to Cl_6(132) and Cl_5(105). In Aroclor 1254, Cl_6(153) contributes 4.26% to the total

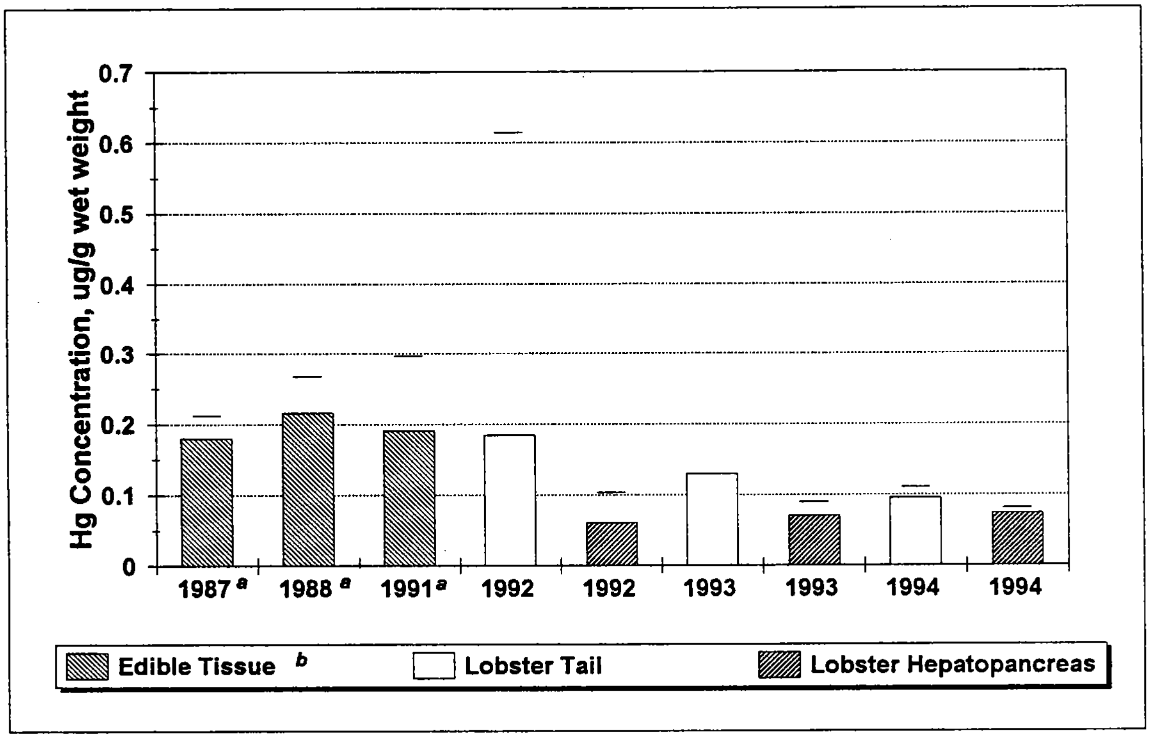


Figure 7. Mercury Concentrations in Lobster From Deer Island, 1987 to 1994.
(a) Data from Schwartz *et al.* (1993)
(b) Claw, tail, hepatopancreas, gonads

Aroclor concentration, and $Cl_6(132)$ and $Cl_5(105)$ contribute 1.98% and 3.83% respectively. Since $Cl_6(153)$ was a major contributor to the total PCB concentration, the coelution of multiple peaks may have artificially elevated that total. The concentration of congener $Cl_6(153)$ was 3 times higher in the 1987 lobster muscle samples than those analyzed in 1994, and 10 times higher in the hepatopancreas samples.

3.2.4 Lobster Hepatopancreas Analyses

Results of the analysis of lobster hepatopancreas samples are presented in Figure 8. Concentrations of all chlorinated hydrocarbons and PAH were highest in tissue from the Deer Island Site. The mean mercury concentrations were highest in tissue from the Future Outfall Site. In tissue from the Outfall Site, concentrations of mercury, PCB, and DDT increased between 1993 and 1994. Concentrations of PCB, chlordane, dieldrin, and PAH in hepatopancreas from the Cape Cod Bay site all decreased more than 50% between 1993 and 1994.

Schwartz noted (personal communication, March 1995) that the mean PCB concentrations (calculated as the sum of the 10 common congeners between the studies) in lobster hepatopancreas from Quincy Bay detected by Gardner and Pruell (Wallace *et al.*, 1988) were over an order of magnitude higher than those determined in the 1994 study (8.5 μg/g wet weight vs. 0.5 μg/g wet weight). Wallace *et al.* measured hepatopancreas PCB levels in only one animal from Deer Island, thus definitive comparisons between 1985, 1987, and 1992 through 1994 data are not possible. The *total* hepatopancreas PCB concentration in the animal analyzed was 32 μg/g wet weight which is three orders of magnitude higher than the muscle tissue samples from that study. This value is also twice the total reported in the 1987 Quincy Bay study, and approximately 20 times the 1994 Deer Island data. The differences between the 1987 data and the 1992 through 1994 data may be related to improvements in analytical methodology or to improved conditions in the Harbor.

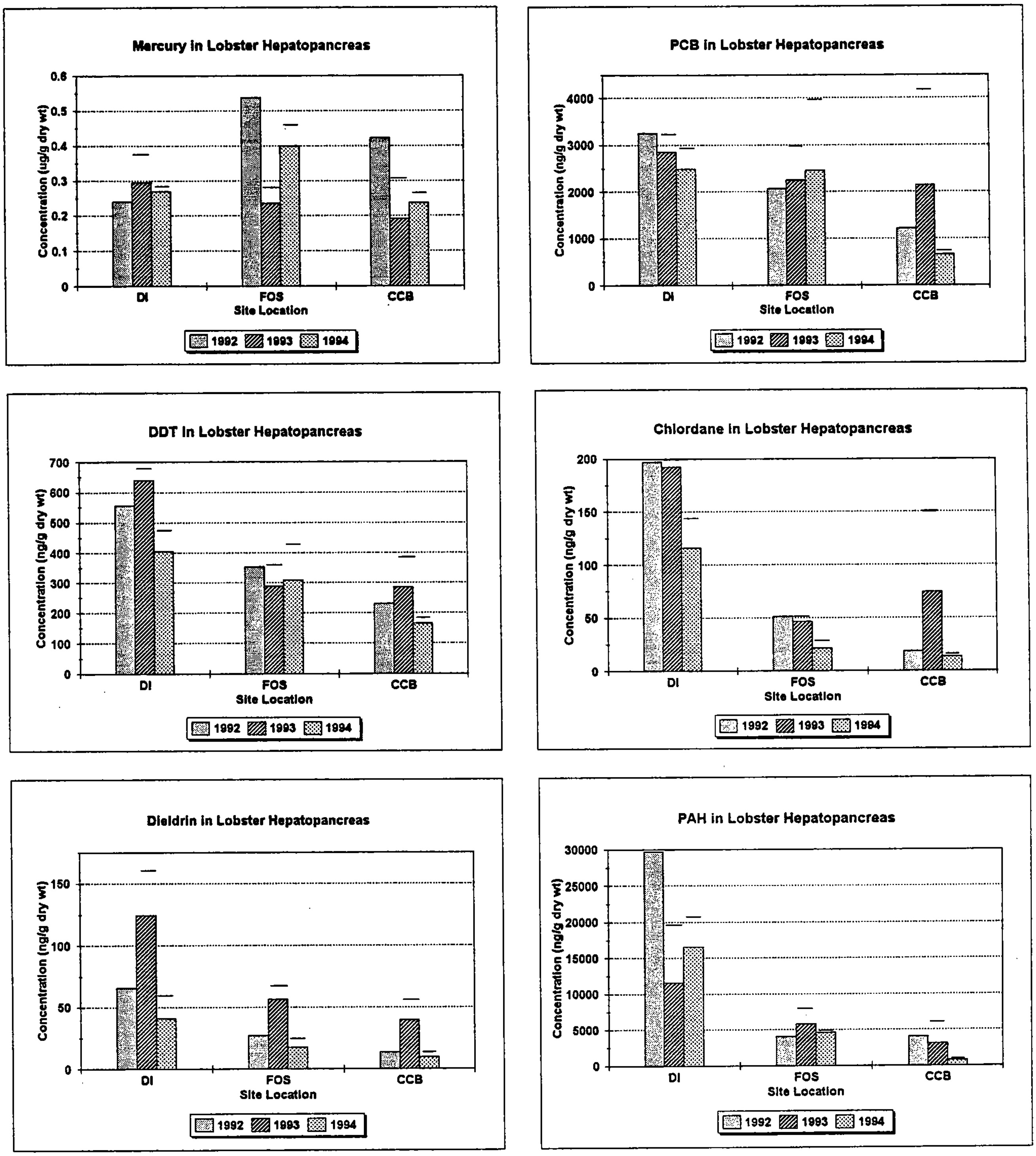


Figure 8. Comparison of Target Analyte Concentrations in Lobster Hepatopancreas, 1992 to 1994.

3.3 Relationship of Contaminant Levels to FDA Action Limits

Figure 9 shows a comparison between concentrations of PCB and mercury in various tissue types and the FDA Action Limits for these contaminants in edible tissues. No exceedences were detected. In each case, the detected concentrations were at least four times lower than the FDA Action Limit. Mercury concentrations in both lobster and flounder tissues ranged from 12 times (flounder tissue from Broad Sound site) to 46 times (flounder tissue from Eastern Cape Cod Bay) lower, and PCB levels in flounder tissue were 22 (Deer Island site) to 184 (Eastern Cape Cod Bay site) times lower than the prescribed limits. PCB concentrations in lobster hepatopancreas were the closest to the FDA Action Limit, ranging from four times lower at the Future Outfall Site to 15 times lower at the Cape Cod Bay site.

Unlike 1987 where there were exceedences in FDA Action Limits, the PCB concentrations in tissue and hepatopancreas are all clearly below the prescribed concentration limits.

3.4 Detectable Change

To evaluate the effectiveness of the tissue sample compositing relative to detectable change and programmatic costs, a reverse power analysis was performed on selected analytes and tissue types. These included contaminants that most closely approach FDA action limits, and which incidentally had analytical variability (as %CV) among the highest of all parameters. These were selected to determine the level of detectable change under worst case conditions. Based on this selection criteria, all other parameters would have detectable change less than those presented in the table below.

For mercury in flounder muscle tissue, the change that could be detected using composite samples (95% confidence level and power of 0.80, n=3), was 158% of the site mean. For PCB, the detectable change was 125% of the mean which is approximately two times higher than estimated in 1993 based on ten individual animals. Generally, examination of the coefficient of variation among the other tissues and parameters suggests better ability to detect change than in 1993. Regardless, the ability to detect a factor of 2 to 2.5 change is sufficient to

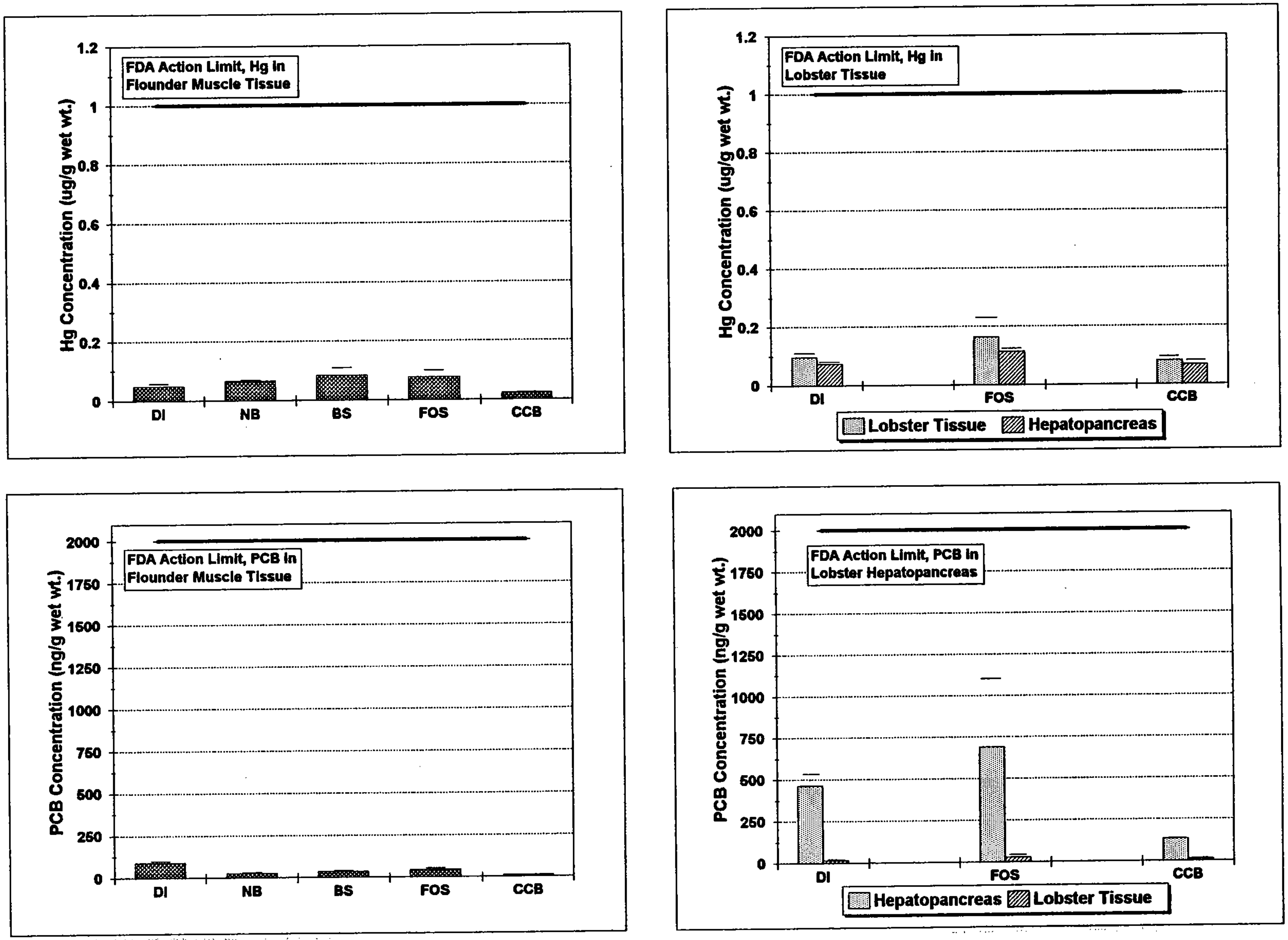


Figure 9. Comparison of FDA Action Limits to Analyte Concentrations Detected in Fish and Shellfish Tissues in 1994.

Station	Year	Tissue Type	Compound	n	Average (dry weight)	Standard Deviation	%CV	Detectable Change (P80)
BS	1994	Flounder Muscle	PCB	3	194.18 ng/g	48	24	125
DI	1993	Flounder Muscle	PCB	10	200.39 ng/g	95	47	62.6
BS	1994	Flounder Muscle	Mercury	3	0.48 ug/g	0.15	31	158
DI	1993	Flounder Muscle	Mercury	10	0.46 ug/g	0.33	72	95.4

determine if contaminant concentrations in the tissues are potentially increasing and allow potential problems to be further addressed. Note the results from 1994 are not inconsistent with the general results produced from analysis of multiple individual organisms in 1993. However, the effort required to achieve this level of detectable change decreased by more than a factor of three relative to 1993. Thus, while compositing five animals into each of three analytical samples lost information on individual organisms, information sufficient to monitoring the status of contaminants in the organisms was generated at a lower cost than 1993.

3.5 Relationship of Contaminant Levels to Histopathology

It has been shown in previous reports (Moore, 1991; Moore *et al.*, 1992; Moore and Stegeman, 1993; Shea, 1993) and discussed elsewhere (Johnson *et al.*, 1992) that the incidence of hydropic vacuolation was closely related to chemical contamination, particularly by chlorinated hydrocarbons. Between 1993 and 1994, there were essentially no changes in the prevalence of hydropic vacuolation at any of the five sites, and nothing more than a slight change from 1993 to 1994 in chlorinated hydrocarbons at the three sites (Deer Island, Future Outfall, and Cape Cod Bay) where hydrocarbons in tissues were measured in 1993. Hydrocarbon concentrations at Broad Sound and Nantasket Beach in 1994 were not very different from concentrations measured at the three core sites. While the prevalence of hydropic vacuolation at Broad Sound was similar to the prevalence observed at Deer Island, it was about twice that recorded for Nantasket Beach, suggesting that, while chlorinated hydrocarbons might be implicated in prevalences of hydropic vacuolation, other factors or contaminants might be involved synergistically. Further, as shown previously, PAH concentrations have decreased sharply since 1992 while hydropic vacuolation has remained about the same.

Apart from changes in macrophage aggregate prevalences, the only large changes in liver lesion prevalences have been the substantial decreases in biliary proliferation at Broad Sound, Nantasket Beach, and the Future Outfall Site; the increase in biliary proliferation at the Eastern Cape Cod Bay site; and the increases in balloon hepatocytes at Deer Island, the Future Outfall Site, and especially at the Eastern Cape Cod Bay site. It is not apparent that there are any patterns in contaminant levels in the flounder livers that relate directly to these changes.

At this point, few conclusions relative to the relationship between contaminant levels and pathology in winter flounder or to trends in pathology can be drawn. Concerning relationships between chemistry and pathology, there have been no two years when sample handling techniques and initial processing have been consistent. In addition, variability in contaminant concentrations in tissues is commonly 50-100% from one year to the next, as has been demonstrated numerous times in the National Status and Trends Mussel Watch Project (*e.g.*, O'Connor, 1991). Further, there are only two years, 1993 and 1994, of a similar analytical approach to assessing pathology in the winter flounder. Two sampling periods are not sufficient for establishing trends. Several years of data are required, produced each year by the same sampling, processing, and analytical procedures. If data from different monitoring programs are to be compared, systematic procedures must be defined for all aspects of the programs; comparison of results obtained from incompatible procedures is ill advised.

4.0 CONCLUSIONS

With only several notable exceptions, between 1993 and 1994 there were few differences in the parameters established for study in the long-term fish and shellfish monitoring plan begun with the April 1993 collections. There were no significant differences among stations or between years in ages or lengths of the fish collected in 1994. Prevalences of the principal histopathological lesion studied, hepatocellular hydropic vacuolation, were essentially the same as in 1993. Hydropic vacuolation continued to occur in the highest prevalences at the Deer Island and Broad Sound sites and lowest at the Eastern Cape Cod Bay site.

The lesions referred to as "balloon hepatocytes" remained at the same levels at the Deer Island, Broad Sound, and Nantasket Beach sites, but increased sharply at the Future Outfall and Eastern Cape Cod Bay sites. There is no evidence that this lesion is related to contaminant levels and it is concluded that, while it could be a manifestation of apoptosis, as has been suggested previously, it might also have a viral etiology.

5.0 RECOMMENDATIONS

Based on the results of the 1994 Fish and Shellfish Task, several recommendations for future efforts are suggested.

- A retrospective analysis of the 1987 to 1992 WHOI flounder archive should be carried out to establish whether the "balloon hepatocyte" lesion is a new event or whether it was previously present but unrecorded.

- Because of the prevalence and severity of balloon hepatocytes, an effort should be made to determine the exact nature of the lesion. There is no indication that it is contaminant associated, but it might be significantly affecting the winter flounder populations.

- Macrophage aggregates should be eliminated as a principal lesion. Because they may occur as the result of natural as well as toxicopathic factors, they are too unspecific to be reliable biomarkers for assessing outfall relocation.

- All analytical techniques for pathology and chemistry should be consistent in future years to facilitate statistical treatment of the data for the purpose of determining trends over time.

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APPENDIX

KEY TO ABBREVIATIONS

ST = Station
FI1 = Deer Island
FI2 = Nantasket Beach
FI3 = Broad Sound
FI4 = Future Outfall Site
FI5 = Eastern Cape Cod Bay
ID = Identification number
YR = Age
TL = Total length
SL = Standard length
WT = Weight (grams)
FIN = Fin erosion score
GS = Gross lesion score

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	CENTROTUBULAR HV A 1	A 2	B 1	B 2	C 1	C 2	TUBULAR HV A 1	A 2	B 1	B 2	C 1	C 2	FOCAL HV A 1	A 2	B 1	B 2	C 1	C 2	MACROPHAGE A 1	A 2	B 1	B 2	C 1	C 2	BILIARY PROLIFERATION A 1	A 2	B 1	B 2	C 1	C 2
FI1	299	F	5	36	29	600	0	0	Y TO YB	3	3	3	4	3	3	2	2	0	2	1	1	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	1	1	0
FI1	300	F	4	34.5	28.5	550	0	0	YB	3	3	2	3	2	3	2	2	2	2	1	2	0	0	0	0	0	0	2	2	1	2	1	1	2	1	1	0	0	0
FI1	301	F	4	38	32	600	0	0	B	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	1	0	1	0	0	0
FI1	302	F	7	41.5	34	1150	0	0	B	2	3	3	3	3	3	0	0	1	2	1	2	0	0	0	0	0	0	1	2	2	3	2	2	1	1	1	1	1	1
FI1	303	M	5	38.5	31.5	750	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0
FI1	304	F	4	37.5	31	700	0	0	YB	3	3	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0
FI1	305	F	6	41	33.5	800	0	0	YB	3	3	3	3	3	3	1	1	2	2	3	2	0	0	0	0	0	0	2	2	2	2	3	2	1	0	0	0	0	0
FI1	306	F	3	30	25	400	0	0	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI1	307	M	4	34	28	550	0	1	B	2	3	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI1	308	F	4	33	27	500	0	0	B	3	4	3	4	3	3	1	0	1	0	1	0	0	0	0	0	0	0	3	2	2	2	1	2	0	0	0	1	0	2
FI1	309	F	4	37	30	750	0	0	B	3	3	3	3	3	3	3	3	3	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	0	1	2	2	2	2
FI1	310	F	4	34	28	550	0	2	B	3	2	2	2	2	2	2	1	1	1	1	1	0	0	0	0	0	0	2	2	2	2	2	2	2	2	1	1	2	1
FI1	311	M	5	35.5	29	700	0	1	YB TO B	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1
FI1	312	F	5	39	31.5	800	0	1	YB	3	3	2	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	1	1	0	1	1
FI1	313	F	7 (8)	41	33.5	950	0	1	B	3	3	3	3	3	3	1	1	1	1	1	1	0	0	0	0	0	0	4	4	4	4	4	4	0	0	1	3	3	4
FI1	314	F	5	38	31	700	0	0		3	3	2	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0	2	2	1	1	1	1	1	1	1	1	0	0
FI1	365	F	3	30	25	400	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI1	366	F	5	41.5	33.5	750	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	2	2	2	2	1	1
FI1	367	F	4	38	31.5	600	0	1	YB	3	3	3	3	2	2	1	0	1	2	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0
FI1	368	F	4	34	28	550	0	1	YB	3	3	3	2	2	2	0	0	1	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	0	0	0	0	0	0
FI1	369	F	4	38.5	31	700	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	1	1	2	1	1
FI1	370	M	3	32.5	28	500	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1
FI1	371	F	3	33.5	28	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
FI1	372	F	5	41	33.5	900	0	0	YB	2	3	3	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	1
FI1	373	F	3	32	26.5	500	0	1	PT	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI1	374	F	3	31.5	26	450	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1
FI1	375	F	3	32.5	27	550	0	0	YB TO B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	1	1	1	2	3	3
FI1	376	F	3	36	29.5	650	0	1	YB	3	3	3	3	3	3	3	3	3	4	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2	3	4	3	3
FI1	377	F	3	35.5	29	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	3	2	2	2	2
FI1	378	F	6	44	33	850	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	2	1	1	2	2	2	2
FI1	379	F	4	36.5	29.5	700	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	1	1	1	1
FI1	380	F	6	43	35	950	0	0	YB	4	4	4	4	4	4	3	3	3	3	3	3	0	1	0	1	0	0	3	3	3	3	3	3	1	2	2	2	2	2
FI1	381	F	3	31.5	26	400	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	3	3	3	2	2
FI1	382	F	3	33.5	28	550	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	2	0	0	0	0
FI1	383	F	6	41	33.5	1000	0	0	B TO YB	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	4	4	4	1	2	2	1	2	2
FI1	384	F	4	32.5	27	450	0	1	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
FI1	385	F	4	38.5	31	700	0	1	YB	3	3	3	3	2	3	2	2	2	2	1	2	0	0	0	0	0	0	3	3	3	2	1	1	0	1	1	1	2	3
FI1	386	F	4	32	26.5	500	0	2	Y	2	2	2	2	2	2	2	2	1	1	1	1	0	0	0	0	0	0	2	2	2	2	2	2	1	1	1	1	1	1
FI1	387	F	6	41.5	33	900	0	0	YB	2	2	3	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	1	2	2	0	0
FI1	388	F	4	32.5	27.5	500	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI1	389	M	4	34	27.5	550	1	0	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI1	390	F	3	34.5	29	600	2	0	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI1	391	F	4	32.5	27	600	0	1	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0
FI1	392	F	5	38.5	32	750	1	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	0	0	0
FI1	393	F	7	43	35	950	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	1	1	1	1	1	1
FI1	394		7	45	36.5	1050	3	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	3	4	4	3	3	3	2	3	3	3
FI1	395		3	31	25.5	500	1	1	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	0	1	1	2	2	1	1
FI1	396		7	44	36.5	900	1	2	B	4	4	4	4	3	3	3	3	3	3	2	2	1	1	2	2	0	0	3	3	3	3	3	3	1	1	1	2	2	2
FI1	397	F	4	36.5	29.5	650	1	1	B TO YB	3	3	3	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	1	1	3	1	1

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	CENTROTUBULAR HV A 1	A 2	B 1	B 2	C 1	C 2	TUBULAR HV A 1	A 2	B 1	B 2	C 1	C 2	FOCAL HV A 1	A 2	B 1	B 2	C 1	C 2	MACROPHAGE A 1	A 2	B 1	B 2	C 1	C 2	BILIARY PROLIFERATION A 1	A 2	B 1	B 2	C 1	C 2
FI1	398	F	5	39.5	31	800	1	1	YB	3	3	3	3	3	3	1	1	1	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	1	1	1	1	0	0
FI2	499	F	3+	32	26	500	1	1	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI2	500	F	5	42.5	32	900	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0
FI2	501	F	4	33.5	27	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
FI2	502	M	4	32.5	36.5	450	0	1	DB	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	503	M	3+	32.5	26	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	3	3	3	1	2	1	1	1	1
FI2	504	F	4	35	28.5	600	0	1	PT	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
FI2	505	F	3	31	25.5	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	2	2	2	1	2	1	1	1	1
FI2	506	F	4+	36.5	29.5	650	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	1	1	0	0	0	0
FI2	507	F	4	31.5	25.5	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	1	1	1	2	1
FI2	508	M	4	34.5	39	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
FI2	509	F	4	34	28	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	510	F	4	35	29	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
FI2	511	F	7	40.5	33.5	900	0	1	B	3	3	3	3	3	3	1	2	2	1	1	1	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	512	F	3	31	25.5	550	0	1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	0	0	0	0	0	0
FI2	513	F	4	34	27.5	550	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	514	F	7	41.5	34	950	0	1	B	4	4	3	4	3	3	3	3	3	3	3	3	0	2	0	0	0	0	4	4	4	3	3	3	2	3	2	2	2	2
FI2	515	M	4	33.5	27.5	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	516	F	4	34	28.5	550	1+	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	2	2	2	0	0	0	0	0	0
FI2	517	F	4	32.5	27	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI2	518	F	3	30.5	25.5	500	1	1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	519	F	3	33	28	500	1	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	520	F	4	34	28.5	550	1	1	TB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	521	F	3	32.5	26.5	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	522	F	5	41	34.5	850	0	1	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2	2	2	1	1	0	0	0	1
FI2	523	F	4	34	29	550	0	1	B	3	3	3	3	3	3	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2
FI2	524	F	4	30.5	25.5	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	3	0	0	0	0	0	0
FI2	525	M	5	34.5	28.5	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	2	1	1	0	0	0	0	0	0
FI2	526	F	3+	34	28.5	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI2	527	F	3	32	26	500	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	0	0	0	0	0	0
FI2	528	M	3	31	25	500	1	1	DB	4	4	4	4	4	4	3	3	3	3	2	2	2	2	1	1	1	1	2	3	3	3	3	3	1	2	2	2	2	2
FI2	529	F	4	32.5	26.5	550	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	530	F	4	34	28	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	531	F	4	32.5	26	550	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
FI2	532	F	4	35	29	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
FI2	533	F	5	39.5	33	800	1+	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	2	2	2	2	2
FI2	534	F	6	38.5	31.5	750	0	1	DB	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
FI2	535	F	4	33.5	27.5	600	0	0	YB	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	536	F	3	31	25.5	600	1	1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI2	537	F	4	31.5	26	550	1	0	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
FI2	538	F	4	34.5	28	650	0	1	YB	3	3	3	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	0	0	0	0	0
FI2	539	F	4	35	28.5	600	1+	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	540	F	4	32	27	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	541	M	4	35	29	550	1+	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI2	542		4	32	26	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	0	0	0
FI2	543		4	30.5	25	450	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0
FI2	544		4	37	30.5	650	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI2	545	M	4	35.5	29	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	1	1	1	1	0	0
FI2	546	M	4	32	27	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2	2	2	0	1	1	1	1	1

										CENTROTUBULAR HV						TUBULAR HV						FOCAL HV						MACROPHAGE						BILIARY PROLIFERATION					
ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2
FI2	547	M	3	33	28	550	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	0	0	0	0	0	0
FI2	548	M	4	35.5	29	650	0	1	DB	3	4	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	2	0	0	0	0	0	0
FI3	315	F	4	37	29.5	650	0	0		1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	316	M	3	32.5	26	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	2	0	0
FI3	317	M	3	31.5	25	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	0	0	0	1
FI3	318	F	4	34.5	28	500	0	1	B	2	2	3	2	2	3	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
FI3	319	M	4	35	28.5	600	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	1	1	1	0	0	0
FI3	320	F	4	33	27.5	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	321	M	6	41	32.5	800	0	0	RB	3	3	3	3	3	3	2	2	3	3	3	2	0	0	0	0	0	0	3	3	3	3	3	3	2	2	2	2	2	2
FI3	322	M	4	34	28	500	0	1	B	4	4	4	4	3	3	4	3	3	3	2	2	1	1	2	2	1	1	3	3	3	3	3	3	1	1	1	1	1	0
FI3	323	F	8	50	41.5	2000	1	1	B TO YB	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	3	4	4	4	4	4	1	1	1	2	2	2
FI3	324	F	5	37	30.5	750	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	1	1	0	0
FI3	325	M	3	32	26	450	1	1	B	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
FI3	326	F	3	32.5	27	450	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
FI3	327	F	7	43.5	35	920	0	1	YB	3	3	3	3	3	3	0	0	0	1	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	2	2	2	2	2
FI3	328	F	3	32	26.5	460	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	1	0	0	0	0	0	0
FI3	329	F	5	40	33	825	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	2	1	0	0	0	0	0	0
FI3	330	M	4	36	28.5	600	0	1	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	0	0	0
FI3	331	F	4	35	29	575	1	1	B	3	3	3	3	3	3	3	3	3	3	2	2	0	0	0	1	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI3	332	F	5	37.5	31	700	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	1	1	2	1	1	1	1
FI3	333	M	5	38	30.5	700	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	1	1	0	0	0	0
FI3	334	F	3	32	26	525	2	2	YB TO B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	335	F	4	37	30	700	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	336	F	3	30	25.5	400	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	337	M	3	35	28.5	550	0	0	DB	3	4	4	3	2	2	3	3	3	3	1	1	2	2	1	1	0	0	4	4	4	4	4	3	1	1	1	1	1	0
FI3	338	M		40.5	33.5	950	1	0	DB TO RED	2	2	2	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	1	1	1	1	1	1
FI3	339	F	4	38	31	750	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
FI3	340	F	4	39	32	825	1	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	341	F	3	31	26	450	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
FI3	342	M	3	30.5	25	400	1	1	B	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	0	0
FI3	343	F	5	36.5	30	650	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	2	1	1	0	0	0	0	0	0
FI3	344	M	3	31.5	25	450	2	1	YB TO B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1	1
FI3	345	M	3	30.5	25	460	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI3	346	F	4	33	27	550	1	1	YB	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI3	347	F	4	38.5	32	820	1	1	PALE Y	1	1	2	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI3	348	F	4	37.5	31	700	0	1	YB	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI3	349	F	4	30	24	450	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
FI3	350	F	3	30.5	25	400	0	0	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1	0	0	0	0	0	0
FI3	351	F	4	36	29	575	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	0	1	0	0	0	0	0	0
FI3	352	F	3	33.5	27	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
FI3	353	F	4	35.5	29.5	600	0	0	YB	3	2	2	2	2	2	3	3	3	3	2	1	0	0	0	0	0	0	2	2	2	2	1	1	1	1	0	0	0	0
FI3	354	F	3	32.5	27	500	2	1	B	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	355	F	3	32.5	27	500	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
FI3	356	F	3	31	25.5	450	0	0	YB TO B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	357	F	3	33.5	27.5	450	0	1	RED-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
FI3	358	F	4+	37.5	30	620	0	1	B	1	1	2	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI3	359	F	4	37	30	675	1	1	PALE-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	360	F	4	38	31.5	700	0	1	B	2	3	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	361	M	3	31	25.5	425	0	1	B	3	3	3	3	3	3	2	2	2	2	2	2	1	1	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	CENTROTUBULAR HV						TUBULAR HV						FOCAL HV						MACROPHAGE						BILIARY PROLIFERATION					
										A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2
FI3	362	F	4	35	28.5	600	0	1	PALE-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	1	0	0	0	0	0	0
FI3	363	F	3	32.5	26.5	500	0	1	B	2	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI3	364	F	3	32	26.5	450	0	0	YB	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	2	2	2	2	2	2
FI4	399	F	4	31.5	25	400	2	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	400	F	3	30	25.5	400	1	2	RT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
FI4	401	F	3	30	25	450	3	2	B	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	0	0	0	0	0	0
FI4	402	M	4	34.5	27.5	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	403	M	4	36	29	500	0	1	B	3	3	3	3	2	2	0	1	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0	0	0	0	0
FI4	404	F	4	32	25.5	450	0	0	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FI4	405	F	3+	33	27	500	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0
FI4	406	F	5	40	32.5	750	0	0	YB-B	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1	1	0	0	3	3	3	3	3	3	1	2	2	2	1	0
FI4	407	F	3	30	24.5	400	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	1	0	0	0	0	0	0
FI4	408	F	4	32	26.5	450	0	1	B	0	0	2	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	1	1	0	0
FI4	409	F	4+	31.5	25	500	0	1	PT	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
FI4	410	F	4	35	28.5	650	0	0	YB	2	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	411	F	4	34.5	29	600	0	0	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	412	F	4	32.5	27	450	0	0	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
FI4	413	F	4	31.5	25.5	500	1+	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	0	0	0	0	0	0
FI4	414	F	3	30	24.5	400	1+	1	B	2	2	2	3	2	2	0	1	1	2	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	415	F	4	33	27	450	0	1	B	2	2	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	3	3	2	2	2	2	0	0	0	0	0	0
FI4	416	F	6	41.5	35	1100	0	2	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2	1	1	0	1	1	2	0	0
FI4	417	F	4	30.5	25	400	1+	1	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	418	F	3	30	24	350	1+	0	B	3	3	3	3	2	2	2	1	2	2	1	1	0	0	0	0	0	0	1	1	2	2	2	2	0	0	0	0	0	0
FI4	419	F	3+	31	25.5	450	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	420	F	4	32.5	26.5	450	0	1	B	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	421	F	3+	32.5	26	500	0	0	Y-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0
FI4	422	F	9	49	41	1450	0	1	DRB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	0	0	0	0	0	0
FI4	423	F	4	36.5	29	800	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	424	F	3	30.5	24.5	400	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	2	0	0	0	0	0	0
FI4	425	F	3+	29.5	23	400	0	1	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	426	F	5	40.5	33	1000	1+	0	YB	3	3	3	3	3	3	2	2	2	2	1	1	0	1	0	1	0	0	4	4	4	4	4	4	2	1	2	2	2	2
FI4	427	F	4	32.5	26.5	450	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	0	0	0	0	0	0
FI4	428	F	4	34.5	28.5	550	1	0	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	0	0	0	0	0	0
FI4	429	F	4	32.5	26.5	500	1	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	1	0	0
FI4	430	F	4	31.5	25.5	450	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
FI4	431	F	4	36.5	29.5	850	1	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI4	432	F	3	30.5	25.5	450	1+	1	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI4	433	F	3	30	25.5	400	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI4	434	F	4	36	30.5	600	1	0	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0
FI4	435	M	3	29	24	400	2	1	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
FI4	436	F	3	31	25	450	0	0	B-YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0
FI4	437	F	4	33	27	500	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0
FI4	438	F	3	30.5	24.5	400	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	0	0	0
FI4	439	F	3	29	23	350	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
FI4	440	M	4	35	28.5	600	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
FI4	441	F	4	32.5	26	450	0	0	B	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0
FI4	442	F	3	29	23.5	400	0	1	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
FI4	443	F	4	29	23.5	400	0	1	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
FI4	444	F	3	30	24	450	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	CENTROTUBULAR HV						TUBULAR HV						FOCAL HV						MACROPHAGE						BILIARY PROLIFERATION					
										A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2
FI4	445	F	3	32.5	27.5	600	0	1	MB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI4	446	F	4	33.5	26.5	550	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	0	0	0	0	0	0
FI4	447	F	4	30.5	25.5	500	1+	1	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	1	0	0	0	0	0	0
FI4	448	F	5	39.5	29.5	600	1	1	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	3	2	0	0	0	0	0	0
FI5	449	F	4	32.5	27	450	0	0	PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI5	450	F	5	45.5	30	600	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	2	1	0	0
FI5	451	F	4	33	26.5	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI5	452	F	4	34	27.5	500	0	1	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	0	1	0	0	0	0
FI5	453	M	4	30	24.5	400	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2	2	2	1	1	0	0	0	0
FI5	454		4	32.5	27	450	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI5	455		3+	30	24.5	400	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	3	2	0	0	0	0	1	1
FI5	456		4	37	30	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	0	0	0	0	0	0	0
FI5	457		6	40.5	34	750	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	1	1	1	1	1	1
FI5	458		4	34	29.5	550	0	0	YB-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	2	2	2	0	0	0	0	0	0
FI5	459		4	31.5	26	450	1+	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	0	0	0	0	0	0
FI5	460		3	33.5	28	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI5	461		7	41	34	800	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	0	0	0	1	0	0
FI5	462		4	37	30.5	650		1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI5	463		3	31.5	27.5	500	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
FI5	464		3	34	28.5	550	1	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
FI5	465		4	36	30.5	650	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1
FI5	466		3	32.5	27.5	450	0	1	YB-B	1	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
FI5	467		3	33.5	28	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	2	1	0	0	0	0	0	0
FI5	468		4	37.5	33	450	1+	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	1	1
FI5	469		3	34	28.5	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	1	1	1
FI5	470		4	30	27.5	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	2	2	2	2	1
FI5	471		3	33	27.5	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	2	2	1	1	1	1
FI5	472		4	37.5	30.5	700	0	1	Y	3	3	2	2	2	2	2	2	2	2	1	1	0	0	0	0	0	0	2	2	1	1	2	2	1	1	1	2	2	1
FI5	473		4	30.5	25	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	2	2
FI5	474		4	32.5	27	450	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1
FI5	475		4	33	27	500	0	1	YB-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	2	2	2	1	1
FI5	476		3	33.5	27.5	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	1	2	2	1	0
FI5	477		3	30.5	25	450	0	0	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2
FI5	478		4	36	30	600	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	1	1	1	1	1
FI5	479		3	31.5	26	500	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1
FI5	480		5+	40	33	900	0	1	DRB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	1	1	1	1	1	1
FI5	481		3+	34	28	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2	2	2	2	2
FI5	482		5	39	32	800	1	1	B	1	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	1
FI5	483		6	37.5	30.5	850	1	2	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	1	1	1	2	2	2
FI5	484		4	32.5	26.5	550	0	2	YB-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	1	1	2	2	2	2	1	1
FI5	485	F	4	33.5	27.5	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	1	1	1	1	2	2
FI5	486	F	4	37	31	700	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1
FI5	487	F	3	30	25.5	450	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	2	2	1
FI5	488	F	4	34.5	29	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	2	1	2	2	2	1	2
FI5	489	F	4	31	25.5	400	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	1	1	1	1	1	1
FI5	490	F	4	33.5	27.5	550	0	0	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	3	2	1	2	2
FI5	491	M	4	33	27.5	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2	2	2	1	0	0	0	0	0
FI5	492	F	4	32	26.5	450	1	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	2	1	1	1
FI5	493	F	5	37	29.5	750	1+	2+	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	CENTROTUBULAR HV A1	A2	B1	B2	C1	C2	TUBULAR HV A1	A2	B1	B2	C1	C2	FOCAL HV A1	A2	B1	B2	C1	C2	MACROPHAGE A1	A2	B1	B2	C1	C2	BILIARY PROLIFERATION A1	A2	B1	B2	C1	C2
FI5	494	F	3	32	26.5	550	0	1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
FI5	495	F	5	39.5	34	900	1	1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1
FI5	496	F	4	33.5	27.5	500	1	1	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
FI5	497	M	4	35	28.5	550	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	1	2	1	1	1	1	1	1
FI5	498		3	30.5	26	450	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	0	1	1	2	2	2

Liver Color (LC) Codes:

Y	Yellow
YB	Yellow Brown
B	Brown
TB	Tan Brown
RT	Rose Tan
PT	Pale Tan
LT	Light Tan
DB	Dark Brown
G	Green
MB	Mottled Brown
DRB	Dark Red Brown
RB	Red Brown
M	Maroon

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	NEOPLASM A 1	A 2	B 1	B 2	C 1	C 2	BALLOON HEPATOCYTE A 1	A 2	B 1	B 2	C 1	C 2
FI1	299	F	5	36	29	600	0	0	Y TO YB	0	0	0	0	0	0	2	2	2	2	2	2
FI1	300	F	4	34.5	28.5	550	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI1	301	F	4	38	32	600	0	0	B	0	0	0	0	0	0	3	3	3	3	3	3
FI1	302	F	7	41.5	34	1150	0	0	B	0	0	0	0	0	0	4	3	1	3	1	3
FI1	303	M	5	38.5	31.5	750	0	1	YB	0	0	0	0	0	0	1	1	0	1	0	1
FI1	304	F	4	37.5	31	700	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI1	305	F	6	41	33.5	800	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI1	306	F	3	30	25	400	0	0	RB	0	0	0	0	0	0	2	1	2	1	2	1
FI1	307	M	4	34	28	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI1	308	F	4	33	27	500	0	0	B	0	0	0	0	0	0	3	2	2	2	2	2
FI1	309	F	4	37	30	750	0	0	B	0	0	0	0	0	0	3	2	2	2	3	3
FI1	310	F	4	34	28	550	0	2	B	0	0	0	0	0	0	2	2	1	1	1	1
FI1	311	M	5	35.5	29	700	0	1	YB TO B	0	0	0	0	0	0	0	0	1	1	1	1
FI1	312	F	5	39	31.5	800	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI1	313	F	7 (8)	41	33.5	950	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI1	314	F	5	38	31	700	0	0		0	0	0	0	0	0	4	4	4	4	4	4
FI1	365	F	3	30	25	400	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI1	366	F	5	41.5	33.5	750	0	0	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	367	F	4	38	31.5	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI1	368	F	4	34	28	550	0	1	YB	0	0	0	0	0	0	2	2	2	3	2	2
FI1	369	F	4	38.5	31	700	0	0	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	370	M	3	32.5	28	500	0	2	B	0	0	0	0	0	0	4	4	4	4	4	4
FI1	371	F	3	33.5	28	650	0	1	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	372	F	5	41	33.5	900	0	0	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI1	373	F	3	32	26.5	500	0	1	PT	0	0	0	0	0	0	2	3	3	3	3	3
FI1	374	F	3	31.5	26	450	0	0	B	0	0	0	0	0	0	4	4	4	4	4	4
FI1	375	F	3	32.5	27	550	0	0	YB TO B	0	0	0	0	0	0	4	4	4	4	4	4
FI1	376	F	3	36	29.5	650	0	1	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI1	377	F	3	35.5	29	650	0	1	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	378	F	6	44	33	850	0	0	B	0	0	0	0	0	0	1	1	2	2	2	2
FI1	379	F	4	36.5	29.5	700	0	1	B	0	0	0	0	0	0	4	4	3	3	3	3
FI1	380	F	6	43	35	950	0	0	YB	0	0	0	0	0	0	3	3	3	3	4	4
FI1	381	F	3	31.5	26	400	0	0	B	0	0	0	0	0	0	4	4	4	4	4	4
FI1	382	F	3	33.5	28	550	0	1	YB	0	0	0	0	0	0	3	2	3	3	3	3
FI1	383	F	6	41	33.5	1000	0	0	B TO YB	0	0	0	0	0	0	2	2	3	3	3	3
FI1	384	F	4	32.5	27	450	0	1	PT	0	0	0	0	0	0	4	4	4	4	4	4
FI1	385	F	4	38.5	31	700	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI1	386	F	4	32	26.5	500	0	2	Y	0	0	0	0	0	0	2	2	2	2	2	1
FI1	387	F	6	41.5	33	900	0	0	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	388	F	4	32.5	27.5	500	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI1	389	M	4	34	27.5	550	1	0	RB	0	0	0	0	0	0	4	4	4	4	4	4
FI1	390	F	3	34.5	29	600	2	0	PT	0	0	0	0	0	0	4	4	4	4	4	4
FI1	391	F	4	32.5	27	600	0	1	PT	0	0	0	0	0	0	4	4	4	4	4	4
FI1	392	F	5	38.5	32	750	1	0	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI1	393	F	7	43	35	950	0	0	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI1	394		7	45	36.5	1050	3	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI1	395		3	31	25.5	500	1	1	PT	0	0	0	0	0	0	4	4	4	4	4	4
FI1	396		7	44	36.5	900	1	2	B	0	0	0	0	0	0	1	1	2	2	2	2
FI1	397	F	4	36.5	29.5	650	1	1	B TO YB	0	0	0	0	0	0	3	3	3	3	3	3

										NEOPLASM						BALLOON HEPATOCYTE					
										A	A	B	B	C	C	A	A	B	B	C	C
ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	1	2	1	2	1	2	1	2	1	2	1	2
FI1	398	F	5	39.5	31	800	1	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI2	499	F	3+	32	26	500	1	1	B-YB	0	0	0	0	0	0	0	0	0	0	1	1
FI2	500	F	5	42.5	32	900	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI2	501	F	4	33.5	27	600	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI2	502	M	4	32.5	36.5	450	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	503	M	3+	32.5	26	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	504	F	4	35	28.5	600	0	1	PT	0	0	0	0	0	0	0	0	0	0	0	0
FI2	505	F	3	31	25.5	450	0	1	B	0	0	0	0	0	0	1	1	1	1	2	2
FI2	506	F	4+	36.5	29.5	650	0	1	B	0	0	0	0	0	0	0	0	0	0	0	1
FI2	507	F	4	31.5	25.5	500	0	0	B	0	0	0	0	0	0	1	2	3	3	3	3
FI2	508	M	4	34.5	39	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	509	F	4	34	28	600	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	510	F	4	35	29	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	511	F	7	40.5	33.5	900	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	512	F	3	31	25.5	550	0	1	T	0	0	0	0	0	0	0	0	0	0	0	0
FI2	513	F	4	34	27.5	550	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	514	F	7	41.5	34	950	0	1	B	0	0	0	0	0	0	4	3	3	3	3	3
FI2	515	M	4	33.5	27.5	550	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	516	F	4	34	28.5	550	1+	1	B	0	0	0	0	0	0	1	0	0	1	0	0
FI2	517	F	4	32.5	27	500	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI2	518	F	3	30.5	25.5	500	1	1	T	0	0	0	0	0	0	0	0	0	0	0	0
FI2	519	F	3	33	28	500	1	0	B	0	0	0	0	0	0	1	1	2	2	2	2
FI2	520	F	4	34	28.5	550	1	1	TB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	521	F	3	32.5	26.5	500	0	1	B	0	0	0	0	0	0	1	1	1	1	1	1
FI2	522	F	5	41	34.5	850	0	1	B-YB	0	0	0	0	0	0	2	2	1	1	1	1
FI2	523	F	4	34	29	550	0	1	B	0	0	0	0	0	0	1	1	1	1	1	1
FI2	524	F	4	30.5	25.5	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	525	M	5	34.5	28.5	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	526	F	3+	34	28.5	650	0	1	YB	0	0	0	0	0	0	0	0	1	1	1	1
FI2	527	F	3	32	26	500	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	528	M	3	31	25	500	1	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	529	F	4	32.5	26.5	550	0	1	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI2	530	F	4	34	28	600	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI2	531	F	4	32.5	26	550	0	0	YB	0	0	0	0	0	0	1	1	1	1	2	2
FI2	532	F	4	35	29	600	0	1	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI2	533	F	5	39.5	33	800	1+	1	YB	0	0	0	0	0	0	1	1	1	1	2	2
FI2	534	F	6	38.5	31.5	750	0	1	DB	0	2	1	1	1	1	1	1	1	1	1	1
FI2	535	F	4	33.5	27.5	600	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	536	F	3	31	25.5	600	1	1	T	0	0	0	0	0	0	0	0	0	0	0	0
FI2	537	F	4	31.5	26	550	1	0	LT	0	0	0	0	0	0	0	0	0	0	0	0
FI2	538	F	4	34.5	28	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	539	F	4	35	28.5	600	1+	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI2	540	F	4	32	27	500	0	1	YB	0	0	0	0	0	0	0	0	1	1	0	0
FI2	541	M	4	35	29	550	1+	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI2	542		4	32	26	500	0	0	B	0	0	0	0	0	0	1	1	2	1	1	1
FI2	543		4	30.5	25	450	1	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	544		4	37	30.5	650	0	1	DB	0	0	0	0	0	0	0	0	0	1	2	2
FI2	545	M	4	35.5	29	650	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI2	546	M	4	32	27	500	0	1	B	0	0	0	0	0	0	2	2	2	1	1	2

										NEOPLASM						BALLOON HEPATOCYTE					
ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	A 1	A 2	B 1	B 2	C 1	C 2	A 1	A 2	B 1	B 2	C 1	C 2
FI2	547	M	3	33	28	550	0	1	DB	0	0	0	0	0	0	0	0	1	1	1	1
FI2	548	M	4	35.5	29	650	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	315	F	4	37	29.5	650	0	0		0	0	0	0	0	0	0	0	0	0	0	0
FI3	316	M	3	32.5	26	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	317	M	3	31.5	25	450	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	318	F	4	34.5	28	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	319	M	4	35	28.5	600	0	2	B	0	0	0	0	0	0	1	1	1	1	1	1
FI3	320	F	4	33	27.5	500	0	1	B	0	0	0	0	0	0	1	1	2	2	3	3
FI3	321	M	6	41	32.5	800	0	0	RB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	322	M	4	34	28	500	0	1	B	0	0	0	0	0	0	0	1	1	1	1	1
FI3	323	F	8	50	41.5	2000	1	1	B TO YB	0	0	0	0	0	0	4	4	4	4	4	4
FI3	324	F	5	37	30.5	750	1	1		0	0	0	0	0	0	3	3	3	3	3	3
FI3	325	M	3	32	26	450	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	326	F	3	32.5	27	450	1	1	YB	0	0	0	0	0	0	2	3	3	3	3	3
FI3	327	F	7	43.5	35	920	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI3	328	F	3	32	26.5	460	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI3	329	F	5	40	33	825	1	1	YB	0	0	0	0	0	0	2	3	3	3	3	3
FI3	330	M	4	36	28.5	600	0	1	RB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	331	F	4	35	29	575	1	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI3	332	F	5	37.5	31	700	0	1	YB	0	0	0	0	0	0	2	2	2	2	3	2
FI3	333	M	5	38	30.5	700	1	1	B	0	0	0	0	0	0	1	1	1	1	1	1
FI3	334	F	3	32	26	525	2	2	YB TO B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	335	F	4	37	30	700	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	336	F	3	30	25.5	400	0	0	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI3	337	M	3	35	28.5	550	0	0	DB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	338	M		40.5	33.5	950	1	0	DB TO RED	0	0	0	0	0	0	0	0	0	0	0	0
FI3	339	F	4	38	31	750	0	1	YB	0	0	0	0	0	0	2	2	2	2	1	1
FI3	340	F	4	39	32	825	1	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	341	F	3	31	26	450	1	1	YB	0	0	0	0	0	0	2	2	1	2	2	1
FI3	342	M	3	30.5	25	400	1	1	B	0	0	0	0	0	0	0	0	1	1	1	1
FI3	343	F	5	36.5	30	650	0	1	B	0	0	0	0	0	0	3	3	4	4	2	2
FI3	344	M	3	31.5	25	450	2	1	YB TO B	0	0	0	0	0	0	2	2	1	2	2	2
FI3	345	M	3	30.5	25	460	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	346	F	4	33	27	550	1	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI3	347	F	4	38.5	32	820	1	1	PALE Y	0	0	0	0	0	0	3	3	3	3	3	3
FI3	348	F	4	37.5	31	700	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI3	349	F	4	30	24	450	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	350	F	3	30.5	25	400	0	0	Y	0	0	0	0	0	0	1	2	2	2	2	2
FI3	351	F	4	36	29	575	0	1	B	0	0	0	0	0	0	2	2	1	1	1	1
FI3	352	F	3	33.5	27	500	0	1	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI3	353	F	4	35.5	29.5	600	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI3	354	F	3	32.5	27	500	2	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI3	355	F	3	32.5	27	500	1	1	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI3	356	F	3	31	25.5	450	0	0	YB TO B	0	0	0	0	0	0	2	1	2	1	2	2
FI3	357	F	3	33.5	27.5	450	0	1	RED-B	0	0	0	0	0	0	2	3	3	3	3	3
FI3	358	F	4+	37.5	30	620	0	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI3	359	F	4	37	30	675	1	1	PALE-YB	0	0	0	0	0	0	0	0	0	0	1	2
FI3	360	F	4	38	31.5	700	0	1	B	0	0	0	0	0	0	3	3	3	3	2	3
FI3	361	M	3	31	25.5	425	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	NEOPLASM A 1	A 2	B 1	B 2	C 1	C 2	BALLOON HEPATOCYTE A 1	A 2	B 1	B 2	C 1	C 2
FI3	362	F	4	35	28.5	600	0	1	PALE-YB	0	0	0	0	0	0	2	2	2	2	2	2
FI3	363	F	3	32.5	26.5	500	0	1	B	0	0	0	0	0	0	1	1	0	0	0	1
FI3	364	F	3	32	26.5	450	0	0	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI4	399	F	4	31.5	25	400	2	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI4	400	F	3	30	25.5	400	1	2	RT	0	0	0	0	0	0	0	0	0	0	0	0
FI4	401	F	3	30	25	450	3	2	B	0	0	0	0	0	0	0	0	0	0	0	0
FI4	402	M	4	34.5	27.5	500	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0
FI4	403	M	4	36	29	500	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI4	404	F	4	32	25.5	450	0	0	Y	0	0	0	0	0	0	2	2	2	2	2	2
FI4	405	F	3+	33	27	500	0	0	YB	0	0	0	0	0	0	0	0	0	0	0	0
FI4	406	F	5	40	32.5	750	0	0	YB-B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	407	F	3	30	24.5	400	0	1	YB	0	0	0	0	0	0	1	2	2	2	2	2
FI4	408	F	4	32	26.5	450	0	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	409	F	4+	31.5	25	500	0	1	PT	0	0	0	0	0	0	2	2	2	2	2	2
FI4	410	F	4	35	28.5	650	0	0	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI4	411	F	4	34.5	29	600	0	0	LT	0	0	0	0	0	0	2	2	2	3	3	3
FI4	412	F	4	32.5	27	450	0	0	LT	0	0	0	0	0	0	3	3	3	3	3	3
FI4	413	F	4	31.5	25.5	500	1+	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI4	414	F	3	30	24.5	400	1+	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	415	F	4	33	27	450	0	1	B	0	0	0	0	0	0	2	3	2	2	2	2
FI4	416	F	6	41.5	35	1100	0	2	YB	0	0	0	0	0	0	1	1	2	2	2	2
FI4	417	F	4	30.5	25	400	1+	1	B-YB	0	0	0	0	0	0	2	2	2	2	2	2
FI4	418	F	3	30	24	350	1+	0	B	0	0	0	0	0	0	1	2	2	2	2	2
FI4	419	F	3+	31	25.5	450	0	0	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI4	420	F	4	32.5	26.5	450	0	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	421	F	3+	32.5	26	500	0	0	Y-YB	0	0	0	0	0	0	1	2	2	2	2	2
FI4	422	F	9	49	41	1450	0	1	DRB	0	0	0	0	0	0	4	4	4	4	4	4
FI4	423	F	4	36.5	29	800	0	0	B	0	0	0	0	0	0	1	1	2	2	2	2
FI4	424	F	3	30.5	24.5	400	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI4	425	F	3+	29.5	23	400	0	1	B-YB	0	0	0	0	0	0	0	0	0	0	0	0
FI4	426	F	5	40.5	33	1000	1+	0	YB	0	0	0	0	0	0	2	2	3	3	3	3
FI4	427	F	4	32.5	26.5	450	1	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	428	F	4	34.5	28.5	550	1	0	RB	0	0	0	0	0	0	2	3	3	3	2	3
FI4	429	F	4	32.5	26.5	500	1	0	B	0	0	0	0	0	0	3	3	3	3	3	3
FI4	430	F	4	31.5	25.5	450	1	1	YB	0	0	0	0	0	0	3	3	3	3	2	2
FI4	431	F	4	36.5	29.5	850	1	0	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI4	432	F	3	30.5	25.5	450	1+	1	M	0	0	0	0	0	0	0	0	0	0	0	0
FI4	433	F	3	30	25.5	400	0	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI4	434	F	4	36	30.5	600	1	0	B-YB	0	0	0	0	0	0	3	3	3	2	2	2
FI4	435	M	3	29	24	400	2	1	PT	0	0	0	0	0	0	0	0	1	1	1	1
FI4	436	F	3	31	25	450	0	0	B-YB	0	0	0	0	0	0	2	2	2	2	2	2
FI4	437	F	4	33	27	500	0	0	YB	0	0	0	0	0	0	0	0	0	0	1	1
FI4	438	F	3	30.5	24.5	400	1	1	B	0	0	0	0	0	0	2	2	2	3	2	2
FI4	439	F	3	29	23	350	0	1	B	0	0	0	0	0	0	3	3	3	2	2	1
FI4	440	M	4	35	28.5	600	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI4	441	F	4	32.5	26	450	0	0	B	0	0	0	0	0	0	0	0	0	0	0	0
FI4	442	F	3	29	23.5	400	0	1	LT	0	0	0	0	0	0	0	0	0	0	0	0
FI4	443	F	4	29	23.5	400	0	1	Y	0	0	0	0	0	0	1	1	1	1	1	1
FI4	444	F	3	30	24	450	0	1	YB	0	0	0	0	0	0	2	2	2	2	2	2

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	NEOPLASM A 1	A 2	B 1	B 2	C 1	C 2	BALLOON HEPATOCYTE A 1	A 2	B 1	B 2	C 1	C 2
FI4	445	F	3	32.5	27.5	600	0	1	MB	0	0	0	0	0	0	0	1	0	0	0	0
FI4	446	F	4	33.5	26.5	550	0	1	YB	0	0	0	0	0	0	2	2	3	3	3	3
FI4	447	F	4	30.5	25.5	500	1+	1	PT	0	0	0	0	0	0	0	0	0	0	0	0
FI4	448	F	5	39.5	29.5	600	1	1	RB	0	0	0	0	0	0	1	1	1	1	1	1
FI5	449	F	4	32.5	27	450	0	0	PT	0	0	0	0	0	0	2	2	2	2	2	2
FI5	450	F	5	45.5	30	600	0	0	B	0	0	0	0	0	0	2	2	2	2	2	2
FI5	451	F	4	33	26.5	500	0	1	YB	0	0	0	0	0	0	1	1	2	2	2	2
FI5	452	F	4	34	27.5	500	0	1	RB	0	0	0	0	0	0	3	3	4	4	4	4
FI5	453	M	4	30	24.5	400	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	454		4	32.5	27	450	0	0	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI5	455		3+	30	24.5	400	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI5	456		4	37	30	650	0	1	YB	0	0	0	0	0	0	2	2	3	3	3	3
FI5	457		6	40.5	34	750	1	1	B	0	0	0	0	0	0	4	4	4	4	4	4
FI5	458		4	34	29.5	550	0	0	YB-B	0	0	0	0	0	0	3	3	4	4	4	4
FI5	459		4	31.5	26	450	1+	0	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI5	460		3	33.5	28	600	0	1	YB	0	0	0	0	0	0	3	3	3	3	4	4
FI5	461		7	41	34	800	0	0	B	0	0	0	0	0	0	4	4	4	4	4	4
FI5	462		4	37	30.5	650		1	B	0	0	0	0	0	0	4	4	4	4	3	3
FI5	463		3	31.5	27.5	500	1	1	B	0	0	0	0	0	0	3	2	2	2	2	3
FI5	464		3	34	28.5	550	1	0	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI5	465		4	36	30.5	650	0	0	B	0	0	0	0	0	0	1	1	1	2	2	2
FI5	466		3	32.5	27.5	450	0	1	YB-B	0	0	0	0	0	0	1	1	1	1	1	1
FI5	467		3	33.5	28	500	0	1	YB	0	0	0	0	0	0	4	4	4	4	4	4
FI5	468		4	37.5	33	450	1+	1	B	0	0	0	0	0	0	4	4	4	4	4	4
FI5	469		3	34	28.5	650	0	1	YB	0	0	0	0	0	0	4	4	3	3	3	3
FI5	470		4	30	27.5	500	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	471		3	33	27.5	650	0	1	YB	0	0	0	0	0	0	3	3	2	2	2	3
FI5	472		4	37.5	30.5	700	0	1	Y	0	0	0	0	0	0	2	2	2	2	2	2
FI5	473		4	30.5	25	500	0	0	B	0	0	0	0	0	0	3	4	4	4	4	4
FI5	474		4	32.5	27	450	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI5	475		4	33	27	500	0	1	YB-B	0	0	0	0	0	0	2	2	2	2	2	2
FI5	476		3	33.5	27.5	550	0	1	B	0	0	0	0	0	0	2	2	2	2	2	2
FI5	477		3	30.5	25	450	0	0	RB	0	0	0	0	0	0	3	3	4	4	4	4
FI5	478		4	36	30	600	0	2	B	0	0	0	0	0	0	2	2	2	2	2	2
FI5	479		3	31.5	26	500	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3
FI5	480		5+	40	33	900	0	1	DRB	0	0	0	0	0	1	3	3	3	3	3	3
FI5	481		3+	34	28	550	0	1	B	0	0	0	0	0	0	4	4	4	4	4	4
FI5	482		5	39	32	800	1	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	483		6	37.5	30.5	850	1	2	YB	0	0	0	0	0	0	2	2	2	2	2	2
FI5	484		4	32.5	26.5	550	0	2	YB-B	0	0	0	0	0	0	4	4	4	4	4	4
FI5	485	F	4	33.5	27.5	500	0	0	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	486	F	4	37	31	700	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	487	F	3	30	25.5	450	0	0	YB	0	0	0	0	0	0	1	1	1	1	1	1
FI5	488	F	4	34.5	29	550	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	489	F	4	31	25.5	400	0	1	B	0	0	0	0	0	0	3	3	3	3	3	3
FI5	490	F	4	33.5	27.5	550	0	0	RB	0	0	0	0	0	0	2	2	2	2	2	1
FI5	491	M	4	33	27.5	500	0	1	B	0	0	0	0	0	0	1	1	1	1	1	1
FI5	492	F	4	32	26.5	450	1	1	DB	0	0	0	0	0	0	1	1	1	1	1	1
FI5	493	F	5	37	29.5	750	1+	2+	YB	0	0	0	0	0	0	3	3	3	3	3	3

ST	ID	SEX	YR	TL	SL	WT	FIN	GS	LC	NEOPLASM A 1	A 2	B 1	B 2	C 1	C 2	BALLOON HEPATOCYTE A 1	A 2	B 1	B 2	C 1	C 2
FI5	494	F	3	32	26.5	550	0	1	T	0	0	0	0	0	0	2	2	1	1	2	1
FI5	495	F	5	39.5	34	900	1	1	T	0	0	0	0	0	0	2	2	2	2	3	2
FI5	496	F	4	33.5	27.5	500	1	1	Y	0	0	0	0	0	0	1	1	1	1	1	1
FI5	497	M	4	35	28.5	550	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0
FI5	498		3	30.5	26	450	0	1	YB	0	0	0	0	0	0	3	3	3	3	3	3

Liver Color (LC) Codes:
Y Yellow
YB Yellow Brown
B Brown
TB Tan Brown
RT Rose Tan
PT Pale Tan
LT Light Tan
DB Dark Brown
G Green
MB Mottled Brown
DRB Dark Red Brown
RB Red Brown
M Maroon

Percent Dry Weight Information

Matrix (composite)	Deer Island	Nantasket Beach	Broad Sound	Future Outfall Site	Eastern Cape Cod Bay
Lobster tail					
Average:	11.57			15.11	16.22
Standard Deviation:	0.75			1.84	0.60
Lobster hepatopancreas					
Average:	27.58			28.98	28.19
Standard Deviation:	2.38			1.36	2.32
Flounder meat					
Average:	17.28	17.60	17.70	17.81	18.13
Standard Deviation:	0.16	0.27	0.32	0.65	0.58
Flounder liver					
Average:	20.77	22.44	17.39	21.70	20.14
Standard Deviation:	3.47	2.04	5.40	3.74	1.74

Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
Trace Metals Data Reported in ug/g dry weight

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	PB	HG	NI	AG	CD	CR	CU	ZN
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder		0.23						
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder		0.34						
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder		0.29						
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	1.87	0.22	0.26	3.86	0.45	0.22	64	112
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84-MEAN	Flounder Liver	0.98	0.27	0.21	3.15	1.86	0.1	40.34	111.8
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	1.4	0.34	0.24	4.26	0.63	0.25	51.1	113
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder		0.39						
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder		0.39						
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33-MEAN	Flounder		0.35						
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	1.35	0.29	0.21	5.74	0.82	0.06	63.2	137
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	1.61	0.36	0.29	8.2	1.03	0.06	100.1	151
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	1.99	0.27	0.31	3.07	0.64	0.19	78.1	142
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder		0.45						
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder		0.67						
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder		0.31						
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	9.52	0.44	0.51	10.12	0.94	0.18	141.7	137
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	5.38	0.6	0.79	6.63	1.45	0.21	88	134
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	4.65	0.32	0.53	6.55	0.89	0.12	79.4	143
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder		0.29						
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder		0.6						
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder		0.41						
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	8.26	0.37	0.58	4.68	0.97	0.14	79.4	136
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	5.57	0.87	0.55	7.49	1.61	0.15	85.2	164
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	4.83	0.39	0.67	18.17	3.91	0.14	172	162
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder		0.12						
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder		0.11						
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder		0.13						
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	2.47	0.22	0.41	7.02	0.99	0.12	120	204
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	5.38	0.19	0.26	6.82	0.6	0.08	112.2	176
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	4.6	0.26	0.43	4.49	1.32	0.1	131.7	150
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster		0.84						
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster		0.93						
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster		0.7						
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	0.47	0.28	0.34	16.87	7.25	0.29	386	72
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	0.38	0.25	0.5	8.56	6.17	0.25	516	76.5
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	0.44	0.28	0.47	6.78	11.5	0.2	709	90.5
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster		1.36						
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35-MEAN	Lobster		0.73						
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	0.48	0.46	0.77	5.26	14.6	0.2	494	91
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46-MEAN	Lobster Hepato.	0.61	0.34	1.17	9.67	9.99	0.78	621.01	103.88
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster		0.46						
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster		0.61						
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster		0.42						
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	0.1	0.24	1.18	11.72	15.86	0.15	232	77.1
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	0.12	0.27	1.07	20.64	22.45	0.16	457	84.1
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	0.06	0.2	1.31	11.54	10.12	0.26	162	86.9

PAH Spreadsheet Column	Full Analyte Name	MWRA Code	PCB/Pesticide Spreadsheet Column	Full Analyte Name	MWRA Code	Metals Spreadsheet Column	Full Analyte Name	MWRA Code
naphthalene	naphthalene	91-20-3	CL2(08)	CL2(08)	34883-43-7	PB	LEAD	7439-92-1
C1-naphthal	C1-naphthalenes	MWRA64	HEXACHLOROB	HEXACHLOROBENZENE	118-74-1	HG	MERCURY	7439-97-6
C2-naphthal	C2-naphthalenes	MWRA7	LINDANE	LINDANE	58-89-9	NI	NICKEL	7440-02-0
C3-naphthal	C3-naphthalenes	MWRA10	CL3(18)	CL3(18)	37680-65-2	AG	SILVER	7440-22-4
C4-naphthal	C4-naphthalenes	MWRA11	CL3(28)	CL3(28)	7012-37-5	CD	CADMIUM	7440-43-9
biphenyl	biphenyl	92-52-4	HEPTACHLOR	HEPTACHLOR	MWRA25	CR	CHROMIUM	7440-47-3
acenaphthyl	acenaphthylene	208-96-8	CL4(52)	CL4(52)	35693-99-3	CU	COPPER	7440-50-8
acenaphthen	acenaphthene	83-32-9	ALDRIN	ALDRIN	309-00-2	ZN	ZINC	7440-66-6
dibenzofura	dibenzofuran	132-64-9	CL4(44)	CL4(44)	41464-39-5			
fluorene	fluorene	86-73-7	HEPTACHLORE	HEPTACHLOREPOXIDE	MWRA24			
C1-fluorene	C1-fluorenes	MWRA65	CL4(66)	CL4(66)	32598-10-0			
C2-fluorene	C2-fluorenes	MWRA6	2,4-DDE	2,4-DDE	MWRA34			
C3-fluorene	C3-fluorenes	MWRA66	CL5(101)	CL5(101)	37680-73-2			
phenanthren	phenanthrene	85-0108	CIS-CHLORDA	CIS-CHLORDANE	5103-71-9			
anthracene	anthracene	120-12-7	TRANS-NONAC	TRANS-NONACHLOR	24143-69-9			
C1-phenanth	C1-phenanthrenes/anthracenes	MWRA67	DIELDRIN	DIELDRIN	60-57-1			
C2-phenanth	C2-phenanthrenes/anthracenes	MWRA57	4,4-DDE	4,4-DDE	75-55-9			
C3-phenanth	C3-phenanthrenes/anthracenes	MWRA52	CL4(77)	CL4(77)	MWRA76			
C4-phenanth	C4-phenanthrenes/anthracenes	MWRA54	2,4-DDD	2,4-DDD	MWRA33			
dibenzothio	dibenzothiophene	127330-66-9	ENDRIN	ENDRIN	72-20-8			
C1-dibenzot	C1-dibenzothiophenes	MWRA68	CL5(118)	CL5(118)	31508-00-6			
C2-dibenzot	C2-dibenzothiophenes	MWRA5	4,4-DDD	4,4-DDD	72-54-8			
C3-dibenzot	C3-dibenzothiophenes	MWRA9	2,4-DDT	2,4-DDT	789-02-6			
fluoranthen	fluoranthene	206-44-0	CL6(153)	CL6(153)	35065-27-1			
pyrene	pyrene	129-00-0	CL5(105)	CL5(105)	MWRA13			
C1-fluorant	C1-fluoranthenes/pyrenes	MWRA69	4,4-DDT	4,4-DDT	50-29-3			
benz[a]anth	benz[a]anthracene	56-55-3	CL6(138)	CL6(138)	MWRA16			
chrysene	chrysene	218-01-9	CL5(126)	CL5(126)	MWRA77			
C1-chrysene	C1-chrysenes	MWRA70	CL7(187)	CL7(187)	MWRA17			
C2-chrysene	C2-chrysenes	MWRA4	CL6(128)	CL6(128)	38380-07-3			
C3-chrysene	C3-chrysenes	MWRA71	CL7(180)	CL7(180)	MWRA14			
C4-chrysene	C4-chrysenes	MWRA72	MIREX	MIREX	2385-85-5			
benzo[b]flu	benzo[b]fluoranthene	205-99-2	CL7(170)	CL7(170)	MWRA15			
benzo[k]flu	benzo[k]fluoranthene	207-08-9	CL8(195)	CL8(195)	MWRA18			
benzo[e]pyr	benzo[e]pyrene	192-97-2	CL9(206)	CL9(206)	MWRA19			
benzo[a]pyr	benzo[a]pyrene	50-32-8	CL10(209)	CL10(209)	2051-24-3			
perylene	perylene	198-55-0	DBOFB	DBOFB	DBOFB			
indeno[1,2,	indeno[1,2,3-c,d]pyrene	193-39-5	CL5(112)	CL5(112)	MWRA78			
dibenz[a,h]	dibenz[a,h]anthracene	53-70-3						
benzo[g,h,i	benzo[g,h,i]perylene	191-24-2						
naphthal-d8	naphthalene-d8	D8_91-20-3						
acenaph-d10	acenaphthene-d10	D10_83-32-9						
chrysened12	chrysene-d12	D12_218-01-9						

Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	Lipid (%)	naphthalene	C1-naphthal	C2-naphthal	C3-naphthal
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	98.5	105.53	96.92	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	75.1	81.18	84.69	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	84.3	96.14	100.17	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	72.4	30.56	61.89	186.76	555.46
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	71.5	56.51	63.26	198.04	482.87
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	67.5	59.65	75.28	220.3	669.42
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	38.9	84.94	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	34.2	104.9	66.87	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	41.8	98.81	51	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	104.1	206.26	151.65	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	33.9	67.84	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	54.1	87.66	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	37.4	111.17	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	35.6	83.82	50.01	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	31.4	99.42	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	59.2	56.55	52.95	61.15	102.74
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	56.5	28.42	28.94	46.29	67.29
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	34.2	72.17	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	14.7	108.88	82.8	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	50	82.33	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	79	43.52	34.74	35.38	41.96
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	67.3	34.88	28.28	28.31	44.34
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	61.7	26.15	23.95	33.56	48.56

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	C4-naphthal	biphenyl	acenaphthyl	acenaphthen	dibenzofura
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	48.15	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	803.84	9.22	13.03	21.41	39.85
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	601.84	8.55 f	13.43	26.55	42.75
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	1028.56	4.76 f	4.52 f	19.78	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	85.5	a	a	87.03
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	60.66	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	103.51	a	a	80.41
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	51.22	a	a	58.74
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	111.92	10.77	6.59 f	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	143.05	8.35 f	11.1	8.53	26.55
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	59.77
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	a	5.14 f	2.83 f	2.32 f	11.2
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	a	3.93 f	a	3.53 f	10.19
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	a	4.68 f	a	a	a

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	fluorene	C1-fluorene	C2-fluorene	C3-fluorene	phenanthren
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	16.65
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	34.2	148.59	666	578.33	154.48
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	42.88	154.62	626.8	476.39	250.31
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	34.81	154.28	809.26	820.24	249.91
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	28.84
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	28.55
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	58.11
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	22.63
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	37.18
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	26.57	63.25	139.14	125.35	164.31
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	28.99	37.9	80.08	79.78	227.14
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	23.26
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	11.86	25.57	75.41	56.59	26.25
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	10.25	30.09	94.8	58.44	30.36
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	8.73	24.01	78.72	48.15	26.16

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	anthracene	C1-phenanth	C2-phenanth	C3-phenanth	C4-phenanth
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	37.17	640.81	1089.35	740.1	389.68
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	66.33	619.95	822.81	616.49	478.79
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	72.84	805.56	1515.84	1034.12	623.81
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	13.92	138.47	197.56	220.58	102.99
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	79.67	147.29	126.68	147.21	133.93
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	2.17 f	39.6	40.14	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	2.19 f	41.67	45.29	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	2.56 f	36.7	41.39	a	a

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
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Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	dibenzothio	C1-dibenzot	C2-dibenzot	C3-dibenzot	fluoranthen
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	21.77	185.71	514.14	422.27	1030.24
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	28.51	176.9	351.65	300.44	983.94
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	24	226.51	725.45	622.66	1762.45
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	8.82	36.43	102.27	83.55	382.89
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	12.72	25.53	49.99	47.46	569.85
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	1.78 f	10.14	24.03	a	90.27
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	2.38 f	11.39	22.64	a	102.27
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	2.41 f	9.62	18.67	a	87.17

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	pyrene	C1-fluorant	benz[a]anth	chrysene	C1-chrysene	C2-chrysene
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	8	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	625.18	558.91	255.15	805.3	388.74	289.75
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	748.82	684.32	846.16	1514.97	1491.63	680.71
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	1359.64	1118.67	945.41	2288.91	1093.26	662.33
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	272.42	205.67	138.2	445.31	206.2	161.64
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	387.7	291.41	281.84	490.26	214.98	122.79
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	28.1	24.93	7.12 f	69.97	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	42	35.97	8.31 f	101.31	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	22.67	19.32	5.03 f	40.88	a	a

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
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Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	C3-chrysene	C4-chrysene	benzo[b]flu	benzo[k]flu	benzo[e]pyr
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	a	a	233.34	99.9	221.46
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	a	a	517.05	241.05	702.62
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	a	a	976.18	443.42	540.88
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	a	9.06 f	4.29 f	8.25
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	a	a	229.7	109.69	120.71
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	a	a	256.79	106.25	176.42
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	a	a	19.77	8.46	18.02
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	a	a	27.63	13.12	36
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	a	a	10.77	5.2	10.37

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1994 Tissue Chemistry - Task 17
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PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	benzo[a]pyr	perylene	indeno[1,2,	dibenz[a,h]	benzo[g,h,i
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	a	6.95 f	a	8.67
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	a	a	a	a
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	a	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	116.38	38.9	58.82	11.24	55.81
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	322.15	64.07	110.94	28.42	71.06
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	610.33	90.66	222.72	40.11	128.58
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	a	a	a	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	a	a	a	a
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	a	a	a	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	6.42	15.94	a	a	12.06
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	103.06	11.23	63.24	11.17	34.93
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	183.37	42.84	88.4	15.82	61.23
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	5.53 f	a	9.77
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	4.79	7.12	9.06	a	7.86
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	9.07	11.02	11.78	2.31 f	13.72
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	3.83	6.4	5.63 f	1.18 f	4.77 f

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
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PAH Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	naphthal-d8 (%)	acenaph-d10 (%)	chrysened12 (%)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	55	65	70
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	57	66	65
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	58	70	69
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	66	81	58
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	67	81	40 g
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	69	91	48 g
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	61	70	72
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	51	65	71
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	54	64	71
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	50	64	72
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	57	68	68
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	50 g	67	73
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	52	62	69
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	57	66	71
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	57	64	76
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	62	82	52
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	63	82	61
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	52	65	73
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	60	68	80
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	56	66	70
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	63	76	57
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	67	81	65
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	58	79	74

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1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	Lipid (%)	CL2(08)	HEXACHLOROB	LINDANE	CL3(18)	CL3(28)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	4.4	1.64	0.91	0.1	0.56	3.77
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	4.7	1.42	0.73	0.11	0.33	2.1
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	5.5	1.66	0.85	0.15	0.6	4.1
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	98.5	19.79	11.07	a	14.87	60.99
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	75.1	15.41	7.57	a	6.96	37.6
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	84.3	13.14	8.41	a	4.99	56.64
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	10.9	1.06	0.93	a	a	2.88
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	9.7	0.93	0.66	a	a	2.23
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	6.2	1.12	0.77	a	a	3.21
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	72.4	a	6.68	a	a	52.77
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	71.5	a	8.51	a	a	25.72
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	67.5	a	5.91	a	a	55.86
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	5.3	1.41	0.76	a	a	0.84
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	3.4	1.15	0.61	a	a	0.57
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	6.2	1.17	0.5	a	a	1.13
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	38.9	10.51	5.42	a	a	13.36
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	34.2	9.32	7.2	a	a	14.92
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	41.8	12.27	6.03	a	a	13.39
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	6.1	1.44	0.55	a	a	0.95
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	3.8	1.44	0.61	a	a	0.93
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	5.2	1.15	0.99	a	a	0.63
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	104.1	25.9	14.17	a	a	59.59
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	33.9	8.28	6.12	a	a	14.96
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	54.1	10.25	7.13	a	a	11.07
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	6.5	1.43	0.51	a	0.15	1.24
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	3.6	1.06	0.62	a	a	1.07
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	37.4	17.65	8.48	a	a	35.75
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	35.6	11.24	5.84	a	a	20.73
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	31.4	11.58	6.78	a	a	13.41
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	6.3	1.35	0.64	a	a	0.99
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	13.4	1.23	0.69	a	a	1.64
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	9.4	1.67	0.78	a	a	1.59
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	59.2	a	8.53	a	a	28.66
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	56.5	a	2.38	a	a	9.65
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	6.3	1.26	0.38	a	a	0.31
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	6.5	1.53	0.5	a	a	0.52
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	3.5	1.38	0.91	a	a	0.66
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	34.2	6.25	4.83	a	9.75	6.17
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	14.7	7.69	4.45	a	a	10.8
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	50	10.53	6.51	a	a	9.2
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	5	1.29	0.67	a	a	0.56
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	4.8	1.21	0.6	a	a	0.53
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	4.9	1.6	0.62	a	a	0.59
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	79	a	26.84	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	67.3	a	49.79	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	61.7	a	3.17	a	a	5.23

Description of Qualifiers:
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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	HEPTACHLOR	CL4(52)	ALDRIN	CL4(44)	HEPTACHLORE
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	a	2.16	a	0.71	0.79
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	a	2.03	a	0.73	0.66
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	a	2.69	a	0.75	0.74
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	33.2	8.75	10.58	4.24
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	24.27	5.12	8.03	5.05
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	30.16	10.85	6.77	4.78
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	0.36	1.83	0.39	0.47	0.4
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	a	1.85	1.06	0.74	0.3
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	0.52	2.51	0.5	0.67	0.47
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	5.34	26.59	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	54.38	19.56	a	a	a
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	6.55	36.64	a	6.08	a
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	a	0.74	a	0.39	0.46
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	a	0.49	a	0.32	0.3
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	a	0.99	a	0.41	0.35
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	12.53	7.74	5.05	2.11
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	8.84	11.65	5.64	1.74
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	12.49	11.15	6.23	1.7
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	a	0.89	a	0.31	0.43
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	a	0.7	a	0.27	0.4
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	a	0.48	a	0.33	0.42
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	30.86	32.17	14.32	6.07
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	8.09	16.84	3.66	2.14
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	6.3	6.76	4.77	1.68
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	a	1.18	a	0.37	0.37
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	a	1.18	a	0.38	0.34
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	25.94	14.94	8.55	2.45
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	16.22	10.24	6.04	1.98
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	16.38	8.41	7.21	a
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	a	1.21	a	0.41	0.34
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	1.35	2.13	0.4	0.22	0.33
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	0.43	0.78	0.44	0.33	4.26
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	a	a	a	a	a
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	a	a	a	a	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	a	0.42	a	0.26	0.17
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	a	0.7	a	0.37	0.22
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	a	1.13	a	0.43	0.21
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	4.56	7.1	3.73	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	6.95	19.69	6.54	a
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	7.48	12.25	4.58	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	a	0.67	0.54	a	0.47
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	a	0.47	0.46	0.44	0.33
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	a	0.75	0.51	a	0.46
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	a	a	a	a	a
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	a	a	a	a	a

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	CL4(66)	2,4-DDE		CL5(101)	CIS-CHLORDA	TRANS-NONAC	DIELDRIN
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	16.95		a	15.47	6.92	13.45	3.97
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	12.08		a	10.2	5.58	9.22	2.69
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	18.38		a	16.33	6.03	12.96	4.02
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	172.11		a	210.06	87.08	161.5	39.59
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	150.79		a	150.44	68.64	107.72	24.16
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	158.38		a	202.73	68.09	116.71	27.07
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	5.85	1.01		3.57	1.24	1.84	7.29
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	5.51	12.09		6.88	4.08	1.39	19.67
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	9.44	0.56		4.68	2.07	2.9	7.62
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	141.5	7.14		104.66	27.36	50.26	23.55
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	88.3	26.04		83.37	66.74	30.05	67.8
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	210.76	8.26		128.03	36.46	71.83	30.89
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	4.21		a	4.06	1.96	4.27	1.26
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	2.76		a	2.68	0.93	1.8	0.98
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	5.7		a	6.13	2.57	4.07	1.21
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	46.13		a	60.59	26	49.65	9.56
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	33.57		a	35.63	11.27	19.98	8.45
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	46.39		a	66.76	26.15	38.23	9.77
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	5.19		a	6.52	1.81	4.72	1.54
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	5.55		a	6.89	2.76	6.33	1.28
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	3.08		a	3.95	2.27	3.71	0.94
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	144.6		a	216.42	62.01	173.35	23.44
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	51.64		a	72.53	22.92	48.73	8.76
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	23.86		a	51.68	19.35	31.67	8.19
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	6.29		a	7.44	2.18	4.16	1.58
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	6.69		a	8.02	2.7	5.99	1.1
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	122.26		a	142.15	37.44	67.59	20
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	104.08		a	126.04	45.72	127.66	11.31
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	60.4		a	87.58	20.28	35.84	10.15
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	5.26		a	7.12	2.27	4.3	1.44
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	6.81	4.34		3.39	1.14	0.76	7.83
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	4.74	2.32		2.17	0.93	1.05	5.03
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	33.06	6.7		67.83	16.34	11.99	24.38
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	34.44	3.99		26.89	7.46	7.05	9.79
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	1.5		a	2.06	0.95	1.86	1.24
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	2.16		a	2.98	0.86	1.81	1.33
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	2.07		a	3.23	0.92	1.8	1.43
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	11.48		a	18.08	6.13	8.42	3.95
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	14.22		a	23.81	8.43	10.85	4.37
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	22.61		a	31.73	10	14.34	8.59
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	2.84		a	1.56	0.45	0.64	3.09
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	1.52	0.08		0.95	0.23	0.41	4.13
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	2	0.45		0.93	0.35	0.74	3.96
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	34.92	9.45		52.49	7.54	9.21	4.39
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	10.45	13.23		14.59	7.56	1.99	9.65
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	29.95	3.37		15.53	3.04	10.29	14.17

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Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	4,4-DDE	CL4(77)	2,4-DDD	ENDRIN	CL5(118)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	27.87	a	2.72	a	50.78
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	28.47	a	2.27	a	43.56
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	34.11	a	2.47	a	54.63
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	295.01	a	37.95	a	617.16
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	230.53	a	26.11	a	413.25
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	245.07	a	26.76	a	448.84
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	17.23	0.33	a	a	19.46
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	12.19	a	0.35	a	18.66
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	19.25	a	0.74	a	29.26
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	265.14	a	12.33	a	302.41
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	214.35	a	9.27	a	265.62
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	357.83	a	19.36	a	476.57
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	12.4	a	1.22	a	14.04
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	13.65	a	0.99	a	11.57
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	14.91	a	1.31	a	18.77
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	125.5	a	13.51	a	149.49
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	102.97	a	8.21	a	95.38
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	131.47	a	13.15	a	160.78
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	18.09	a	1.33	a	19.79
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	23.2	a	1.66	a	25.18
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	13.8	a	1.14	a	12.6
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	317.44	a	33.84	a	430.14
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	165.71	a	15.28	a	199.51
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	154.77	a	10.44	a	140.78
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	16.27	a	1.43	a	22.68
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	18.37	a	1.71	a	28.7
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	185.46	a	21.59	a	289.44
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	246.5	a	30.51	a	424.32
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	124.26	a	12.41	a	158.29
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	14.4	a	1.21	a	17.96
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	18.72	a	0.23	a	30.05
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	13.12	a	a	a	16.97
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	354.24	a	7.02	a	419.33
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	158.64	a	2.96	a	139.1
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	9.8	a	0.61	a	5.85
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	12.21	a	0.74	a	7.74
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	10.94	a	0.62	a	6.25
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	47.02	a	2.84	a	36.01
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	57.95	a	2.95	a	40.37
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	84.22	a	4.68	a	55.11
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	10.73	a	a	a	25.64
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	6.94	a	0.15	a	7
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	8.18	a	a	a	9.53
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	112	a	a	6.04	141.8
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	142.33	a	a	13.3	84.47
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	159.73	a	a	a	134.88

Description of Qualifiers:
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g = recovery below data objectives

Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
Product Number MWR9436.chemistr.wb1
PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	4,4-DDD	2,4-DDT	CL6(153)	CL5(105)	4,4-DDT	CL6(138)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	4.41	3.62	108.26	12.44	4.1	112.06
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	2.75	3.36	75.15	11.56	3.52	83.08
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	4.04	3.69	98.07	13.21	4.07	104.96
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	87.07	28.38	845.48	269.51	38.88	1299.82
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	52.18	19.03	478.67	166.65	25.32	720.93
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	62.01	20.79	565.29	182.79	26.82	821.7
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	1.58	a	20.02	5.3	0.43	22.77
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	1.19	a	23.99	5.38	a	31.4
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	2.56	2.28	24.55	10.56	a	33.59
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	42.76	21.44	311.4	102.32	14.45	448.55
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	33.78	29.2	356.7	268.33	35.79	495.18
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	72.06	30.22	468.16	156.39	15.21	715.26
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	0.86	1.61	32.12	4.06	1.47	38.78
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	0.69	1.15	27.11	2.98	1.31	29.38
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	0.9	1.88	37.45	4.6	1.44	40.71
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	21.88	11.36	275.13	56.99	12.49	316.12
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	14.83	5.66	161.47	45.32	7.02	215.26
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	19.48	10.88	261.01	73.29	7.68	311.21
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	1.24	1.99	41.25	7.5	2.32	46.02
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	0.89	2.73	49.02	4.48	2.23	52.29
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	0.72	1.35	33.18	2.7	1.61	30.09
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	53.06	28.23	830.51	211.55	30.67	936.36
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	15.29	11.49	303.45	46.42	13.6	384.69
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	18.59	10.3	255.65	56.17	14.14	268.65
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	1.01	2.02	46.08	5.62	1.88	50.15
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	0.97	2.18	52.52	5.85	1.75	55.97
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	33.75	17.21	558.03	124.09	14.44	570.42
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	27.95	19.41	611.32	150.37	17.04	831.52
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	18.05	11.32	243.72	67.77	12.43	293.54
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	1.03	2	36.02	3.27	1.76	47.71
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	1.1	1.9	50.32	12.07	a	48.65
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	0.79	1.35	17.99	6.17	a	20.46
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	22.65	28.52	628.52	267.12	8.54	987.51
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	11.37	12.82	222.22	37.31	a	201.53
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	0.44	0.9	11.05	1.65	0.44	12.45
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	0.74	1.07	14.83	1.43	0.46	15.16
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	0.73	1.12	12.01	1.45	0.64	12.59
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	6.71	2.01	47.13	12.53	1.95	59.73
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	6.48	a	a	80.05	a	69.5
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	a	91.1	16.17	3.81	100.96
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	1.11	1.06	19.68	8.03	a	18.72
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	0.42	0.62	7.62	2.72	a	8.32
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	0.34	0.81	10.86	2.72	a	11.09
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	12.33	16.46	136.64	42.27	a	145.88
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.			115.75	23.02	a	126.42
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	12.63	15.16	183.17	30.52	a	182.19

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Massachusetts Water Resources Authority
1994 Tissue Chemistry - Task 17
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PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	CL5(126)	CL7(187)	CL6(128)	CL7(180)	MIREX	CL7(170)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	a	24.05	6.07	162.39	0.89	34.76
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	a	17.69	5.73	144.17	0.47	36.14
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	a	21.82	6.29	171.69	0.81	32.5
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	a	276.45	81.09	560.24	9.12	248.69
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	a	160.31	55.77	277.34	3.73	127.7
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	a	190.81	57.84	274.57	4.77	162.1
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	a	6.3	2.86	8.65	0.16	8.18
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	a	15.11	3.14	16.54	0.32	9.56
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	a	8.62	4.86	12.01	0.3	7.28
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	a	121.4	52.94	107.31	a	53.41
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	a	353.97	53.4	480.83	a	161.32
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	a	163.84	79.98	159.44	a	71.29
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	a	9.17	2.3	32.23	0.38	7.46
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	a	6.78	1.22	24.27	0.31	4.2
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	a	10.25	3.41	38.13	0.38	8.75
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	a	97.76	24.98	107.79	3.85	53.83
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	a	62.58	13.03	84.36	1.85	38.36
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	a	93.91	32.81	79.64	4.23	54.04
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	a	11.61	2.89	36.81	0.5	26.17
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	a	16.33	3.76	42.85	0.55	29.07
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	a	8.62	1.95	17.64	0.33	10.17
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	a	266.42	94.12	257.91	7.87	217.71
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	a	145.39	34.01	133.45	4.34	74.69
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	a	106.56	23.79	121.43	3.33	58.86
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	a	14.03	4.42	52.68	0.42	26.48
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	a	14.71	4.92	53.75	0.43	69.14
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	a	178.09	56.02	253.23	4.16	114.83
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	a	217.69	99.55	399.16	6.2	153.59
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	a	113.7	26.53	130.75	2.94	62.84
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	a	11.34	2.85	37.75	0.51	18.14
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	a	21.19	5.61	36.83	0.32	20.29
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	a	7.88	3.37	6.85	a	19.07
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	a	418.07	78.59	707.88	a	240.96
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.		79.11	26.87	91.53	a	34.78
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	a	3.83	1.22	4.24	0.21	5.33
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	a	4.5	1.1	4.72	0.14	12.6
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	a	4.46	0.7	3.93	0.19	5.31
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	a	21.45	5.1	15.38	a	8.67
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	22.68	5.02	17.64	a	12.3
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	a	38.45	7.68	25.91	a	14.83
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	a	4.45	3.73	4.32	0.36	5.58
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	a	3.77	1.46	2.84	0.19	6.5
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	a	3.93	1.74	2.58	0.33	7.37
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	a	36.48	23.47	39.74	a	18.43
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.		48.15	19.4	43.63	a	38.1
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	a	59.43	23.76	49.13	a	24.1

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PCB/Pesticide Data Reported in ng/g dry weight unless otherwise noted

Event	Station	Latitude	Longitude	Date	Sample ID	Lab ID	Fraction	CL8(195)	CL9(206)	CL10(209)	DBOFB (%)	CL5(112) (%)
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU28	Flounder	2.38	1.74	0.8	66	71
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU29	Flounder	1.75	1.59	0.82	67	64
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OU30	Flounder	2.24	2.16	0.95	73	67
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV83	Flounder Liver	31.71	25.68	7.18	60	70
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV84	Flounder Liver	18.14	14.72	4.87	52	74
F9401	FI1	42.3500	-70.9727	25-Apr-94	FI1	OV85	Flounder Liver	23.31	21.13	7.05	60	76
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV31	Lobster	0.41	0.31	0.25	79	100
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV32	Lobster	2.18	3.22	0.36	88	97
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV33	Lobster	0.48	0.2	0.27	88	88
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV42	Lobster Hepato.	9	9.83	3.03	83	111
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV43	Lobster Hepato.	61.71	127.05	6.88	103	118
F9403	FI1	42.3392	-70.9392	13-Jul-94	FI1LOBSTER	OV44	Lobster Hepato.	11.4	9.96	2.74	97	124
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU31	Flounder	0.86	0.85	0.51	73	74
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU32	Flounder	0.66	0.72	0.64	70	72
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OU33	Flounder	0.94	0.97	0.72	64	67
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV89	Flounder Liver	9.43	8.57	3.67	63	76
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV90	Flounder Liver	7.95	8.82	5.01	55	76
F9401	FI2	42.2892	-70.8598	29-Apr-94	FI2	OV91	Flounder Liver	10.41	9.47	5.61	57	75
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU34	Flounder	1.05	1.01	0.94	66	67
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU35	Flounder	1.64	1.84	0.95	67	66
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OU36	Flounder	0.91	0.96	0.56	60	73
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV86	Flounder Liver	27.67	26.03	10.74	52	74
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV87	Flounder Liver	18.98	21.25	8.71	60	76
F9401	FI3	42.4068	-70.9620	25-Apr-94	FI3	OV88	Flounder Liver	12.45	14.24	5.98	60	76
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU37	Flounder	2.07	2.71	1.47	68	64
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU38	Flounder	1.52	1.67	0.74	63	66
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV92	Flounder Liver	28.63	31.12	11.8	56	73
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV93	Flounder Liver	30.99	33.34	11.6	62	78
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OV94	Flounder Liver	14.14	14.76	6.12	60	79
F9401	FI4	42.3888	-70.8295	26-Apr-94	FI4	OU39	Flounder	1.33	1.65	0.95	70	66
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV34	Lobster	2.44	1.28	0.35	83	80
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV35	Lobster	0.6	0.47	0.26	75	82
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV45	Lobster Hepato.	53.36	42.08	6.58	178 g	101
F9403	FI4	42.3902	-70.8295	26-Apr-94	FI4LOBSTER	OV46	Lobster Hepato.	7.86	12.41	1.44	123	129
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU40	Flounder	0.33	0.39	0.47	75	70
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU41	Flounder	0.37	0.45	0.38	75	70
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OU42	Flounder	0.31	0.4	0.27	60	70
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV95	Flounder Liver	1.86	a	a	63	75
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV96	Flounder Liver	a	a	a	66	80
F9401	FI5	41.9600	-70.1212	28-Apr-94	FI5	OV97	Flounder Liver	3.66	3.47	2.13	62	74
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV36	Lobster	0.34	0.18	0.27	84	86
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV37	Lobster	0.32	0.27	0.29	81	81
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV38	Lobster	0.22	0.12	0.27	82	80
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV47	Lobster Hepato.	3.51	5.48	2.22	58	126
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV48	Lobster Hepato.	4.43	8.11	4.59	150	135
F9403	FI5	41.8323	-70.1385	20-Jul-94	FI5LOBSTER	OV49	Lobster Hepato.	3.67	4.58	0.68	89	113

Description of Qualifiers:
a = not detected
f = reported value below method detection limit
g = recovery below data objectives

The Massachusetts Water Resources Authority
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