

New York State Department of Health  
Center for Environmental Health

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**HEALTH CONSULTATION:**  
**1996 SURVEY OF HUDSON RIVER ANGLERS**

**HUDSON FALLS TO TAPPAN ZEE BRIDGE  
AT TARRYTOWN, NEW YORK**

**FINAL REPORT**  
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## Summary

The Hudson River PCB (polychlorinated biphenyl) site is a National Priority List (NPL) site including about 200 miles of the Hudson River between Hudson Falls (Washington County) and the Battery in New York City. PCB contamination of fish and the potential for PCBs to cause health effects led the New York State Department of Health (NYS DOH) to issue health advisories encouraging people to limit or avoid eating fish from portions of the river and New York City Harbor. The goals of this study were to measure the awareness and understanding of the fishing public (anglers) of these health advisories and to evaluate changes in this awareness since the 1991-92 survey of anglers conducted on the river by the Hudson River Sloop Clearwater organization. The results of this assessment will be used to inform decisions concerning further education and outreach activities on the Hudson.

This survey included 172 miles of the Hudson River from Hudson Falls to the Tappan Zee Bridge at Tarrytown, but did not include the New York City area, which was surveyed in 1991-92, because of the greater complexity of interviewing anglers there. The study area was divided into three areas that correspond to the different health advisories and fishing regulations. In the Upper Hudson or Area 1 (Hudson Falls to the Federal Dam at Troy), anglers must have a fishing license and fish must be returned to the river (i.e. only catch-and-release fishing is permitted). In Area 2 (the Federal Dam at Troy to Catskill), no fishing license is required, but anglers are advised to eat no fish they catch (except American shad) from this part of the river. In Area 3 (Catskill to the Tappan Zee Bridge), anglers do not need a fishing license and only infrequent eating of fish from this part of the river is advised.

In 1996, 294 anglers fishing in the study area were interviewed about their fishing habits and awareness of health advisories on eating fish from the river. This group was more than the 166 anglers who were interviewed in the same part of the river using the same questionnaire in 1991-92. Because the two studies were very similar in design and represented a similarly broad cross-section of shoreline anglers, the changes over time in angler awareness of the advisories and the factors which influence this awareness are believed to be accurately represented. These surveys do not represent the behavior of boat anglers who may represent about half of all anglers in this part of the Hudson River. The demographic characteristics of all Hudson River anglers may also not be accurately represented by these two samples of primarily shoreline anglers.

As in 1991-92, when Hudson River anglers were also interviewed, about half the anglers knew of the state health advisories. Between the two surveys, awareness of the advisories had increased for anglers fishing in the Upper Hudson River and decreased for those fishing between Catskill and the Tappan Zee Bridge. Most anglers who knew about the advisories had learned of them through publication in the fishing regulations guide provided when they purchased a fishing license. Although a license is not required to fish in the Hudson River, three-quarters of anglers fishing between Troy and Catskill and one-third of anglers fishing between Catskill and the Tappan Zee Bridge had a license. Many anglers learned of advisories through media coverage, word-of-mouth and signs posted in the Upper Hudson.

In both surveys, more than 90% of anglers surveyed said they were fishing primarily for recreation or other similar reasons, and only 6-7% of anglers said they were fishing primarily for food. However, in both surveys, between Catskill and the Tappan Zee Bridge 13-15% of anglers said their primary reason for fishing was food and, in 1996 almost half of anglers fishing in this area said food was one of their reasons for fishing. Upstream of Catskill (in Areas 1 and 2), no one included food as a reason for fishing in 1996 and only 6-7% of 1991-92 anglers said that food was a reason for fishing. In both surveys, half of anglers reported catching fish. In 1996, a

third of all anglers had kept at least some fish that they caught, but this information was not available for the 1991-92 survey. Some anglers (18%) fishing in the Upper River (Area 1) had fish when interviewed, and a few (11%) of the anglers interviewed in Area 1 had kept more than one fish, suggesting that they may eat the fish even though they did not say so when directly asked. In both surveys, about a third of anglers said that they ate fish from the Hudson and they shared their catch with again as many individuals. Most of the individuals with whom fish were shared were women and children who NYS DOH advises to eat no fish from the Hudson.

In both surveys, the most important species (by number) caught by anglers were white perch and blue crab. Striped bass, white catfish and American eel were also important. Blueback herring were important in the 1991-92 survey, but not in 1996. Blueback herring are caught primarily in April and May, before interviewing began in 1996. In 1996 the species and size of fish kept by anglers was recorded. The most important species kept by anglers (by weight and in order) were white perch, white catfish, striped bass and carp. Largemouth and smallmouth bass, bluefish and American eel were also important. These eight species accounted for 83% (by weight) of the fish kept. The weights of blue crab could not be estimated, but crabs were the second most numerous species reported caught by anglers. Eighty three percent of all the fish kept by anglers were from the Hudson River between Catskill and the Tappan Zee Bridge where women and children are advised to eat no fish and others are advised to eat no more than a meal per month of the species that are being kept.

The species of fish kept by anglers are among the species with the highest PCB levels. Using PCB data collected from 1992 to 1996 in Area 3, PCB levels in all the species exceeded the 2 milligrams per kilogram (parts per million - ppm) action level established by the US Food and Drug Administration for fish in interstate commerce. Some anglers and others who eat Hudson River fish are being exposed to PCB levels that are a health concern and are at risk of adverse health effects. Based on ATSDR's present public health category classification (Appendix F), the Hudson River PCB site is a public health hazard. This classification is chosen based on information in the March 31, 1994 Site Review and Update for the Hudson River PCBs site and on information in this health consultation that shows that anglers and others who eat fish from the Hudson River are being exposed to levels of PCBs that are a health concern.

Until PCB levels in fish from the river decline, health advisories should continue to be issued and efforts to inform the public about these advisories should be expanded. In 1999, additional community health education efforts were undertaken to inform those who still fish in the Hudson River of the health risk posed by eating contaminated fish. The following public health actions will be implemented:

1. NYS DOH will continue to evaluate new data regarding contaminants in fish and issue appropriate health advisories as needed.
2. NYS DOH will continue to work with NYS DEC and others to distribute updated versions of the NYS DOH health advisories to anglers who fish in the Hudson River, New York Harbor and other affected marine waters.
3. NYS DOH and NYS DEC will work with local communities, state and federal agencies, non-government organizations and anglers to implement effective ways to inform anglers and others who eat Hudson River fish about the health advisories and ways to reduce their health risks from eating contaminated fish.

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## Background and Statement of Issue

### Introduction

The Hudson River PCB (polychlorinated biphenyl) site is a National Priority List (NPL) site that includes about 200 miles of the Hudson River between Hudson Falls (Washington County) and the Battery in New York City. PCBs in the site have contaminated sediments, water and fish. Because the PCB levels in fish exceed the US Food and Drug Administration action level for PCBs and because eating these fish is a health concern, the New York State Department of Health (NYS DOH) has issued health advisories. These advisories caution people to limit or avoid eating fish from the site and to limit eating striped bass, bluefish and eels from marine waters at the mouth of the Hudson River.

For almost thirty years, the General Electric Company (GE) discharged PCBs into the Hudson River from two capacitor manufacturing facilities at Hudson Falls and Fort Edward, New York (Sofaer, 1976). These discharges probably began as early as 1947 when the Fort Edward facility began operation and were substantially ended in 1977 when GE stopped using PCBs (Horn *et al.*, 1979). However, more recent information suggests that PCBs are seeping into the river from the Hudson Falls plant site (O'Brien and Gere, 1994 and 1998).

In late 1975, the New York State Department of Environmental Conservation (NYS DEC) discovered elevated PCB levels in fish from the Hudson River (Spagnoli and Skinner, 1977). In February 1976, the NYS DEC issued regulations prohibiting all fishing in the Upper Hudson River (from Hudson Falls to the Federal dam at Troy) and prohibiting commercial harvest of most fish from Troy to New York City. The public was advised to eat no fish from the Upper Hudson and to restrict consumption of fish from the rest of the river. These advisories were subsequently modified on several occasions as new data suggested that additional advisories were needed or that existing advisories could be relaxed. In 1985, the advisories were extended to striped bass caught in marine waters and commercial harvest of striped bass in marine waters was prohibited. Appendix D provides a more detailed chronology of events related to PCB contamination of the Hudson River.

For several years, the U.S. Environmental Protection Agency has been reassessing its 1984 interim decision to take no remedial action for the PCB-contaminated sediments in the Upper Hudson River (Area 1). The ecological and human health risk assessments are scheduled to be completed by August 1999. A proposed remedial action plan is currently scheduled for the end of 2000 and a Record of Decision is planned for June 2001. The most important issue is whether, in the foreseeable future, PCB levels in fish will diminish to a point that health advisories are no longer needed without additional remedial action. The known sources of PCBs to the river at the two General Electric facilities have been substantially reduced, but continued low-level releases from the facility sites and/or releases from heavily contaminated river sediments, primarily upstream of the Thompson Island Dam, may be large enough to contaminate fish for many years or could become a significant source of fish contamination in the future.

In 1989, the Agency for Toxic Substances and Disease Registry (ATSDR) completed a health assessment for the site (ATSDR, 1989). This assessment recognized that eating PCB-contaminated fish is the primary exposure pathway of concern to human health. In 1994, the NYS DOH completed a site review and update committing, among other things, to 1) continue community health education; 2) review and revise the consumption advisories; and 3) work with NYS DEC to distribute updated versions of the health advisories to anglers who fish in the Hudson River, New York City harbor and marine waters (NYS DOH, 1994). In 1996, NYS

DOH issued a Public Health Action Plan Update which reiterated these commitments and noted that new brochures were being distributed to Hudson River anglers, particularly targeted at minority and low-income groups who are less aware of the advisories (NYS DOH, 1996). In addition, the update noted that "NYS DOH [was] investigating Hudson River angler's exposure to PCBs from [eating] fish and assessing angler awareness of the advisory."

For many years, NYS DEC and NYS DOH have publicized the health advisories through annual press releases and publication in NYS DEC's fishing regulations guide given to each licensed angler. In recent years, about one million anglers purchase a fishing license each year. Since 1984, NYS DOH has published an annually revised brochure containing the statewide health advisories and additional background information. In recent years, about 20,000 copies have been distributed each year. NYS DOH staff have met with many groups to explain the advisories and county health department staff have also provided information to individuals and groups. From 1994 to 1997, NYS DEC and NYS DOH increased efforts to inform anglers in the Hudson River valley about the health advisories. The NYS DEC effort was focused on minority anglers, most of whom were unlicensed and fishing in the river downstream of the Troy dam, who appeared to be less aware of the advisory. NYS DOH distributed booklets and brochures to local health units, state parks, bait and tackle shops and a number of other groups that might provide information to unlicensed anglers.

In August 1995, fishing regulations were changed to permit catch-and-release fishing in the Hudson River between Hudson Falls and the Troy dam, a portion of the river where fishing had been prohibited since February 1976. With the 1995 change in regulations, a special brochure was prepared and distributed and signs were posted at fishing access points throughout this portion of the river informing anglers of the new regulations and PCB contamination of the fish.

### *Community Health Concerns*

Many individuals and community groups have expressed concern that people are being exposed to unsafe levels of PCBs by eating fish from the Hudson River because many people are not aware of the advisories and others do not follow the advice. In 1991 and 1992, the Hudson River Sloop Clearwater (a not-for-profit environmental education organization in Poughkeepsie, NY) used volunteer staff to interview anglers who were fishing on the Hudson River between Hudson Falls and Staten Island about their fishing habits and awareness of health advisories. The survey found that many Hudson River anglers were not aware of the consumption advisories and others who were aware did not heed the advice (Barclay, 1993). The report highlighted health concerns for people who were eating fish from the river, particularly women of childbearing age and children under the age of 15 who appear to be at particular risk, for non-whites and for low-income people. The author concluded that the prohibition of fishing in the Upper Hudson River and the health advisories were "having only limited success in preventing unsafe levels of exposure to PCBs through consumption of Hudson River fish." The report included thirteen recommendations for improving angler awareness of, and adherence to, the health advisories, including both educational and research efforts.

In New York City, anecdotal reports have expressed concern that minorities and non-English-speaking immigrants are eating contaminated fish from the Hudson River and other waters around New York City. Some reports suggest that subsistence fishing is a concern. Others have suggested that signs and other educational materials need to be available in many languages, e.g. Spanish, Russian, Polish, Hmong, Chinese.

During the public review of this report (March 19, 1999 to May 1, 1999), several concerns were voiced in two written comments, one from an angler and the other from a public agency. Responses to these comments can be found in Appendix E.

### *Study Objectives*

This report describes the results of a resurvey of Hudson River anglers conducted in the summer and fall of 1996. Specifically, the objectives of this study were to:

- measure awareness of the health advisories among Hudson River anglers,
- measure angler understanding of the health advisories,
- measure whether the advisories influenced fishing behavior or whether anglers eat fish,
- assess what characteristics of anglers might contribute to lack of awareness or understanding of or compliance with the advisories, and
- assess whether awareness, understanding or compliance had changed among Hudson River anglers between 1991-92 and 1996.

### **Site Description and Study Area**

Excluding the Niagara and St. Lawrence Rivers on New York's northern border, the Hudson River is New York's largest river, with a watershed of 13,390 square miles. The Hudson River PCB site is the National Priority List (NPL) site which includes 192 miles of the Hudson River between Hudson Falls (Washington County) and the southern tip of Manhattan (Battery Park) in New York City. This survey included 172 miles of the Hudson River from Hudson Falls to the Tappan Zee Bridge (Figure 1).

For this survey, the study area was divided into areas that correspond to the different health advisories and fishing regulations:

- Area 1 - Hudson Falls to Federal Dam at Troy
- Area 2 - Federal Dam at Troy to Catskill
- Area 3 - Catskill to Tappan Zee Bridge

The advisories for Area 3 extend into the New York City Harbor waters, but because of logistical problems, the survey did not include anglers in the New York City area.

In Areas 1 and 3, the advisory and fishing regulations were different at the time of the two surveys (Table 1). In Area 1, fishing was prohibited in 1991-92, but catch-and-release fishing with a fishing license was permitted in 1996. In Area 3, the advisory recommended that no fish except American shad be eaten in 1991-92. By 1996, anglers in Area 3 were advised to restrict eating many fish to no more than one meal per month, but the advisories for women of childbearing age and children remained to eat no fish or crabs (Table 1).

Physically, the river between Hudson Falls and Troy (Upper Hudson River) is quite different from the estuarine portion of the river downstream of Troy. In the Upper Hudson River (Area 1), eight dams make the river navigable to barges and other large boats. These dams create pools which are good habitat for a variety of warmwater fish species. The dams have also slowed the downstream movement of PCB-contaminated sediments. Fish in the pool behind the first dam downstream of Hudson Falls (Thompson Island Dam) are the most heavily



Figure 1. Map of study area.

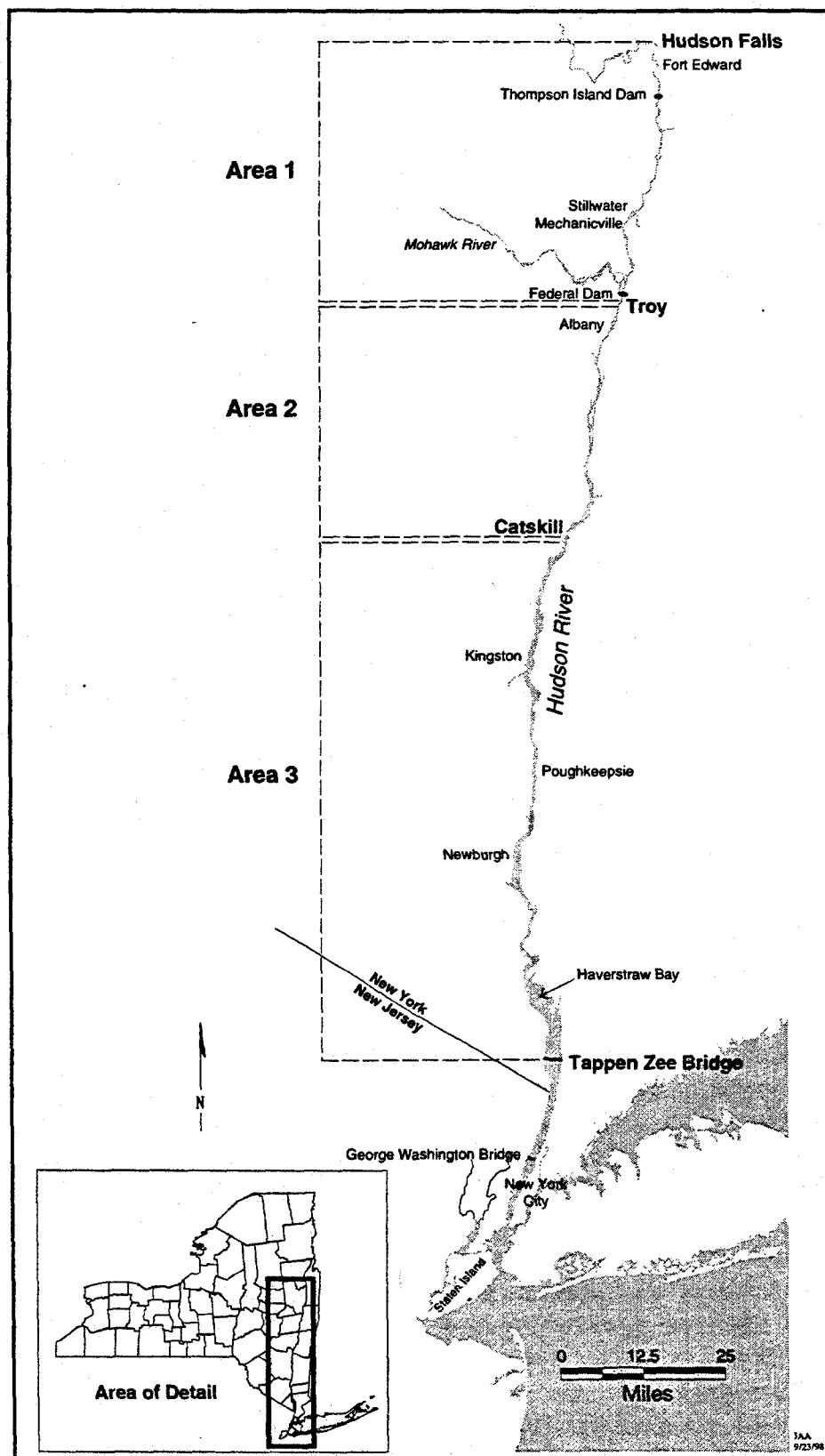


Table 1. Fishing regulations and health advisories for the Hudson River in 1991-92 and 1996.

Area of River	1991-92	1996
Area 1 Hudson Falls to Troy	Fishing prohibited. Eat NONE of any species.	Fishing permitted with license <sup>1</sup> , possession of fish prohibited. Eat NONE of any species.
Area 2 Troy to Catskill	Fishing permitted, no license <sup>1</sup> . Eat NONE of any species except American shad.	Fishing permitted, no license <sup>1</sup> . Eat NONE of any species, except American shad.
Area 3 Catskill to Tappan Zee	Fishing permitted, no license <sup>1</sup> . Eat NONE of any species except American shad.	Fishing permitted, no license <sup>1</sup> . Infrequent eating advised <sup>2</sup> .

<sup>1</sup> North (upstream) of Troy, a state fishing license is required to fish. No license is required to fish in the tidal portion of the Hudson (south or downstream of Troy).

<sup>2</sup> Women of childbearing age, infants and children under the age of 15 are advised to EAT NONE of any species. Other anglers are advised to eat NO MORE THAN SIX PER WEEK for blue crabs and to EAT NONE of the blue crab hepatopancreas (mustard, tomalley or liver); to eat no more than ONE MEAL PER MONTH for American eel, Atlantic needlefish, bluefish, carp, goldfish, largemouth and smallmouth bass, rainbow smelt, striped bass, walleye, white catfish and white perch; For other species, anglers are advised to eat no more than ONE MEAL PER WEEK.

contaminated, and species which anglers catch include largemouth and smallmouth bass, carp, brown and yellow bullhead, yellow perch, white sucker and several sunfish, e.g., pumpkinseed, bluegill, red-breast sunfish, rock bass (see Appendix A for scientific and common names of fish reported in these surveys to have been caught by anglers). Throughout the Upper Hudson River, fish communities are similar to one another, although American eels, white perch, blueback herring and alewife are found in the river near Troy but are not a significant component of the fish communities further up-river. Immediately upstream of the Federal dam at Troy, the Mohawk River joins the Hudson, increasing water flows by 85%.

Downstream of the Federal dam at Troy, the Hudson is an estuary subject to daily tidal cycles. Upstream of Poughkeepsie, the river is always fresh water and downstream of the George Washington Bridge at New York City the river is essentially marine throughout the year. In the estuary (Areas 2 and 3), the fisheries include a number of species not found to any significant extent in the Upper Hudson River, e.g. striped bass, American shad, white catfish, and blue crab. In the Haverstraw Bay/Tappan Zee region of the river, Atlantic tomcod and bluefish are also caught.

## Methods

### *Survey methods*

The 1996 survey used the same questionnaire and interviewing technique (with a few minor modifications) as was used in a 1991-92 survey of Hudson River anglers conducted by the Hudson River Sloop Clearwater organization (Barclay, 1993). Trained interviewers visited known fishing access sites along the Hudson River and asked anglers a series of questions (see Appendix B for a copy of the 1996 survey instrument). In 1996, the questionnaire was the same,

except that a question in the 1991-92 survey about how fish were prepared for eating was deleted and a question was added at the end of the interview that asked whether the angler had a fishing license. In the 1996 survey, interviewers identified, counted, and measured the total length of each fish being kept by anglers. In the 1991-92 survey, the species and number of fish caught were reported, but not their sizes or whether they were kept.

In 1996, an interviewer was assigned to each of the three study areas. During the course of the survey two different individuals conducted interviews in Areas 1 and 2. The interviews were conducted from early June until the end of October. Efforts were made to interview anglers on weekdays as well as weekends and at various times of the day. In 1991-92, 14 interviewers were employed to question anglers, and efforts were made to interview anglers at different times of the week and day.

The 1996 survey did not extend into the New York City metropolitan area as the 1991-92 survey did, because logistical concerns (e.g. finding qualified, multilingual interviewers; supervising their work; ensuring interviewer safety) could not be satisfactorily addressed when the survey was being planned. In the 1991-92 survey, the interviewers visited 20 different sites, but six of the sites were south of the Tappan Zee Bridge, so only 14 sites in Areas 1-3 were visited. During the course of the survey in 1996, interviewers visited the same 14 sites and an additional 18 sites. Very few anglers refused to participate, although some anglers did not respond to all questions. A few anglers did not speak English, but in almost all cases others who were fishing at the same location were able to translate for the interviewer. The actual number of these non-responders was not recorded, but they were few in number.

### *Data Management and Statistical Analysis*

Responses from both surveys were coded and double entered into dBase IV databases. Inconsistencies were corrected and the data then transferred to SAS. Initial data analysis identified a few coding errors, and these were corrected before analysis began. Careful examination of outliers during subsequent data analysis also uncovered a few additional coding errors. The initial analyses described the cohort demographics with calculated distributions of subjects by age, gender, race/ethnicity, income, household number, and possession of a fishing license. Next, specific hypotheses were tested using summary statistics of univariate and bivariate analyses. All the tests were performed using SAS programs (SAS Institute, Cary, North Carolina). To further examine the relationship between respondents' demographic characteristics and their knowledge of health risks and water pollution, a stepwise logistic regression model was used with a 95% confidence level ( $p < 0.05$ ) for including independent variables.

### **Results and Discussion**

In both surveys, several factors may have influenced whether the results represent anglers on the river. Ideally, anglers would have been surveyed randomly. However, the interviewing effort could not be truly randomized for date, day-of-week or time-of-day as the interviewers were part-time employees and data which would permit designing a rigorous random sampling plan were not available. Additionally, in 1996, the surveys did not get underway until June, and therefore, anglers who were fishing for American shad or striped bass in April and May, when these fish are most available in the river, were not surveyed. In both surveys, only a few boat anglers were interviewed. In May through August 1990, Green and Jackson (1991) surveyed 678 anglers fishing in the Hudson River between Stuyvesant and Kingston. They found that about half of the

angler fishing effort is from boaters. Boat anglers were found to target largemouth and smallmouth bass to a greater extent than shore anglers. In April through June 1997, Peterson (1998) assessed the striped bass fishery by aerial survey and interviews of more than 2,700 anglers. He found that 71% of angling effort and 84% of the striped bass catch was from boat anglers. Because neither the 1991-92 nor the 1996 survey interviewed very many boat anglers, the results do not adequately represent the behavior of this group.

In 1996, fewer interviews were conducted in June than in other months and most (52%) were conducted in August and September. During the 1991-92 survey, about half of interviews occurred in June and July and about 18% were conducted in May. About half of the interviews occurred on weekends in both studies. In 1996, most (51%) were conducted in the afternoon or evening (33%) and fewer (16%) were conducted in the morning. In the 1991-92 survey, the interviews were evenly distributed among morning, afternoon and evening. As noted above, during both surveys, the distribution of interviews by date, day and time may have been influenced by the interviewers availability rather than when anglers were actually fishing. Table C-1 summarizes these data (Appendix C).

In 1996, 38 different fishing locations were visited, 8 locations in Area 1, 9 locations in Area 2 and 21 locations in Area 3. A total of 294 questionnaires were completed, with almost half (48%) of the interviews being conducted in Area 3 (Table C-2). The other interviews were evenly divided among Areas 1 and 2. In 1991-92, 323 questionnaires were completed, but at the 14 sites in Areas 1, 2, and 3 (1 in Area 1, 3 in Area 2 and 10 in Area 3), 166 questionnaires were completed. The interviews were more evenly distributed among the areas than in the 1996 survey (each of the three areas had between 30% and 36% of completed questionnaires).

Within each of the three areas, the 1996 survey locations were more broadly distributed than in the 1991-92 survey (Table C-2). For example, in the 1991-92 survey, almost all (82%) of the interviews in Area 1 were from the Mechanicville to Stillwater portion. No interviews were conducted near Catskill (Area 2) or in Haverstraw Bay (Area 3). In 1996, 92 interviews (31% of all interviews) were conducted in portions of the river where no anglers were interviewed in 1991-92.

As discussed earlier, few boat anglers were interviewed and other studies indicate that they may constitute half or more of the fishing effort along the river. So, these surveys do not represent the behavior of boat anglers. These surveys did interview shoreline anglers over a broad range of fishing access sites in each of the three study Areas. The interviews were reasonably evenly distributed over the months surveyed, weekdays and weekends, and time-of-day. These data may not accurately represent the behavior of all shoreline anglers, but because the studies were very similar in design and represented similarly broad cross-sections of the angling public, the changes over time in angler awareness of the advisories and the factors which influence angler awareness are believed to be accurately represented.

### *Demographics*

Respondents to this survey and to the 1991-92 survey had a similar distribution of age; but the distribution of genders, race and income were significantly different between the two surveys ( $p < 0.05$  by  $\chi^2$ , see Table C-3). The majority of anglers were male in both surveys (87-93%), but women were more common in the 1996 survey (13%) than in the 1991-92 survey (8%). This difference was not statistically significant ( $p > 0.05$  by  $\chi^2$ ). In both surveys, most anglers were Caucasian (69-80%). African-Americans were represented equally in the two surveys (12-15%), but in this survey a greater proportion of the anglers were Hispanic (13% versus 4%). Asian,

Amerindian and East Indian anglers represented only 2-5% of the anglers in each survey. A large proportion (13-26%) of anglers did not provide their income bracket, but of those who did respond, almost half had annual incomes less than \$30,000 and about 10% reported incomes of \$50,000 or more. In 1996, about 41% of respondents from Area 3 declined to provide income information, considerably more than in the other areas (5% and 20%) and than in 1991-92 (10-16% for each of the three areas). In both surveys, about half of the anglers reported living in households of 2 or 3 people. Household sizes ranged from 1 to 12.

### *Awareness and understanding of the advisories*

Several questions on these surveys (Questions 20, 28, 29, 31a and 31b) were designed to show how knowledgeable anglers were about fish contamination and water pollution prior to asking whether the angler were aware of "official health warnings" (Question 32). If respondents were aware of the advisories, they were asked how they learned about the advisories (Question 34) and whether and how they had changed their fishing or eating habits in response to learning of the advisories (Questions 37 and 38).

Responding to Question 32, about half of anglers said they knew of health warnings (51% in 1991-92 and 49% in 1996, see Table C-4). In 1991-92, awareness of the health advisories did not differ among the Areas, with 55% of respondents in Area 1 and 3 reporting that they knew of the health warnings and only 42% of anglers in Area 2 saying so. In 1996, the differences among the Areas were more dramatic, ranging from 75% of anglers in Area 1 aware of the health warnings to only 31% of anglers in Area 3. About 58% of anglers in Area 2 were aware of the health warnings. Other interesting patterns include:

1. License-holders were much better informed than unlicensed anglers. About 73% of anglers with a fishing license were aware of the health advisories and only 18% of unlicensed anglers knew about them.
2. In 1996, ethnic minorities were less informed than whites (13-22% compared to 63%). In the earlier survey, awareness of the advisories was more similar between minorities and whites (43-67% for minorities and 50% for whites). However, the observations for 1991-92 are based on only 34 minority responses compared to 90 minority responses in 1996, and therefore this difference may just be the result of the small sample size in 1991-92.
3. In both surveys, men were more aware that the health advisories exist than women (53-54% for men versus 18-27% for women).
4. In general, low-income respondents (less than \$10,000 annual income) were less aware of the health advisories than the others (21-34% compared to 49-75%).
5. Age did not appear to dramatically influence awareness. However, in both surveys the 35-44 year-old respondents were somewhat more likely to be aware of the advisories (56% compared to 40-51% for other ages in 1996 and 72% compared to 17-52% for other ages in 1991-92). Also, in the 1991-92 survey, only 17% of respondents less than 24 years old were aware of the health advisories; but in 1996, 41% of this group were aware of the health advisories. For the other age groups, 40-72% of respondents were aware of the health advisories in both surveys.

The principal mechanism for informing New York anglers about health advisories for sportfish has been through the regulations guide provided when each licensed angler in the state purchases their license. The 1991-92 survey did not ask whether the angler had a fishing license. In 1996, somewhat more than half (58%) of the anglers said that they had a license (Table C-3). However, this percentage varied considerably by area of the Hudson River with 86% of anglers

in region 1 (where a license is required for anglers 16 years and older) saying they had a license. In Area 3, only 32% of anglers had licenses. Some people interviewed in Area 3 did not understand the concept of a fishing license.

In both surveys, the greatest proportion of respondents (37% in 1991-92 and 44% in 1996) became aware of the health advisories by reading them in the regulations guide distributed with fishing licenses (Table C-5). In 1991-92, media (35%) and word-of-mouth (24%) were the only other important sources of information. Media was the primary source of information for the majority of respondents (51%) in Area 3, and the regulations guide was more important in Areas 1 and 2. In 1996, media, posters (signs) and word-of-mouth were the source of awareness for 14-18% of respondents, but the regulations guide was the most important. In Area 1, signs were the second most important source of awareness of health advisories. Even in Area 2, where no signs have been posted, 16% of anglers reported that they became aware of health advisories from postings. The boundary between Areas 1 and 2 is an urban area and some anglers who fish in Area 2 may also fish in Area 1.

Three slightly different questions asked about potential health risks from eating fish. Question 20 asked if any fish in the immediate area of where the person was fishing were "not safe to eat". Question 28 asked if eating fish "poses a serious risk", "a slight risk" or "no risk"; and Question 31b asked "do you believe that eating fish caught at this site would pose a risk to your health?" Two other related questions asked anglers whether they thought the water was polluted (Question 29) or the fish contaminated (Question 31a) where they were fishing. If one looks at the responses of individuals who were consistent in their response to all five of these questions (i.e. answered "yes" to Questions 20, 31a and 31b and thought eating fish posed at least a slight risk and the water was at least slightly polluted), almost half (42%) of respondents responded affirmatively and only 4% consistently said that there was no pollution, no fish contamination and no health risks (Table C-6). In 1991-92, the responses were quite similar with 40% responding affirmatively and only 2% consistently denying any problem or concern. However, in 1996, the responses differed considerably among the areas. About 76% of respondents in Area 1 were consistent in affirming these concerns, while many fewer in Area 2 (46%) and Area 3 (22%) thought so. No one in Areas 1 or 2 consistently denied any problem or concern, but in Area 3 almost 9% of the respondents were consistently unconcerned. In the 1991-92 survey, the responses did not differ much by area, ranging from 33% to 52% for positive responses in each area and 2 to 4% for negative responses in each area.

In both surveys, about half of the individuals who said they were aware of the health advisories also consistently responded in the affirmative on these five questions and no one aware of the health advisories consistently denied any problem or concern. Broadly speaking, in both surveys, few black and Hispanic respondents (10-28%) consistently responded that there was a concern and 10% or fewer consistently denied any problem or concern. Income and age did not appear to influence perceptions of health risk or river pollution in any consistent way.

Multivariate analyses by means of logistic regression were performed to evaluate whether these and other demographic factors were significantly associated with responses to these five questions. The preliminary assessment suggests that, at the 95% confidence level,

- anglers who were older than 45 years had less knowledge of pollution, fish contamination and health risk issues than those who were younger,
- respondents in Area 2 and 3 had less knowledge of these concerns than those in Area 1 and
- anglers who were aware of the advisories were more likely to consistently respond affirmatively to the five questions.

This analysis suggests that gender, race, income and possession of a fishing license were not statistically significant factors in an anglers response to the five questions about pollution and health risks. Differences between surveys are probably the result of differences in demographic characteristics between the two surveys.

Although the percentages of responses were not exactly the same for the individual questions, the patterns described above were generally the same for responses to each of the five questions separately as for the combined questions.

#### *What are Hudson River anglers catching?*

Anglers were asked to identify what type of fish they were trying to catch (Question 3) and what fish they had caught (Question 5). Many anglers did not know the identity of the fish that they were catching and in some cases identifying the species referred to was difficult. For example, in some instances, names could not be made more specific than "catfish", which can mean white catfish or brown or yellow bullhead. Others like "bass" could refer to largemouth or smallmouth bass or striped bass. In the 1996 survey, when anglers had kept fish, the interviewers recorded the species, number and length of each fish.

Slightly more than half of all anglers surveyed (58% in 1991-92 and 53% in 1996) reported catching fish (Table C-7). In 1991-92, respondents in Area 1 were somewhat more successful than those from Area 2 & 3 (66% compared to 52% and 57%). But in 1996, Area 3 anglers were the most successful (70% compared to 32% of Area 1 anglers and 42% of Area 2 anglers). In the 1991-92 survey, the fish kept by anglers were not reported separately from those said to be caught. In 1996, only 30% of anglers had fish when interviewed. More than three-quarters (76%) of these anglers were fishing in Area 3 where almost half (47%) of anglers there had kept fish. In Area 1, where NYS DEC regulations prohibit keeping fish, 14 anglers (18% of those interviewed in this area) had fish when they were interviewed.

In the two surveys, 25 species of fish were reported to be caught in the three areas combined (Table C-8). About half of the total number of fish caught were white perch, blue crab or striped bass, and only 10 species account for almost 90% of the numbers caught. In 1996, anglers had kept 17 different species (Table C-9). The greatest number of anglers (45% of anglers who kept fish) had kept white perch. Striped bass, American eel, white catfish, bluefish and smallmouth bass were kept by between 10 and 17 anglers each (12-20% of anglers who kept fish). The total weights of each fish were estimated from published regressions based on length (Table C-10). The weights of all the fish kept by anglers were summed for each species and area (Table C-9). Overall, white perch was the most important species (comprising 22% of the catch by weight), followed closely by white catfish (16%) and striped bass (14%). Carp (12%), largemouth and smallmouth bass (7% each), bluefish (7%) and American eel (6%) were also somewhat important contributors to the overall catch which was kept by anglers. These eight species account for 91% of the catch by weight. Striped bass are probably more important than represented by the 1996 survey, because interviews were not conducted in April and May when the striped bass fishery is very active. In addition, blueback herring and shad are caught primarily in April and May, and their importance was therefore under-represented in the 1996 survey.

#### *What are Hudson River anglers doing with the fish they catch?*

Anglers identified up to three reasons why they were fishing. In 1996, most anglers (91%) said their primary reason for fishing was some form of "recreation", and only a small proportion

(6%) of anglers listed fishing for food as the primary reason that they were fishing (Table C-11). All of the anglers who said that they were fishing for food were actually fishing in Area 3, where they comprised 12% of anglers. Less than one quarter (23%) of all anglers included food among the reasons for fishing, but again, all of these anglers were in Area 3. Thus, almost half (47%) of anglers in Area 3 said that food was one of the reasons that they were fishing. No one in Areas 1 and 2 included food as a reason for fishing. In 1991-92, the overall responses were similar; 7% of anglers listed fishing for food as the primary reason that they were fishing. Some of these anglers were from Areas 1 and 2 (1% of all respondents). Only 16% included food among the reasons for fishing. Again, a greater proportion of anglers in Area 3 included fishing for food as a reason for fishing.

In 1996, most anglers (93%) said that they sometimes or often returned fish to the river (Table C-12). About one-third of anglers (36%) reported sometimes or often eating fish they caught from the Hudson. Some of these anglers were from Area 2 (7 anglers, 9% of respondents in Area 2), but everyone in Area 1 responded that they never ate fish they caught from the river. In Area 3, 70% of anglers reported sometimes or often eating fish from the Hudson. As noted earlier, fourteen anglers in Area 1 (18% of those interviewed in Area 1) had fish in their possession when they were interviewed. Eight of the anglers had only one fish and two anglers had three fish. Each angler said he was going to return the fish to the river, but the interviewer did not check to see that the fish were returned. Most of the 24 fish that were kept were largemouth or smallmouth bass or bluegill. Two of the bluegills were only 4 inches long and another bluegill, the rock bass and the striped bass were only 6 inches long. The other fish were all 8 inches or larger and one largemouth bass was 16 inches long. It seems likely that at least some of the fish caught in Area 1 were kept for eating. The six anglers who had more than one fish were 11% of the anglers interviewed in Area 1.

Almost one in four anglers (23%) sometimes or often gave away the fish they caught, and about 35% of anglers at least rarely gave away fish. Some of these anglers were fishing in Area 2, but everyone in Area 1 said they never gave fish away. In Area 3, almost half (46%) of anglers said they often or sometimes gave fish away, and about 65% said they gave fish away at least rarely.

Overall, only a very few individuals (two, less than 1%) reported sometimes or often selling fish, and four others (1%) said they sold fish rarely. A few individuals (4 individuals or 1%) in Area 3 did not respond when asked if they sold fish.

About 30% of anglers reported using the fish they caught for bait at least rarely. All of these anglers were in Areas 2 and 3. Very few anglers said they used the fish they caught for fertilizer (5 individuals or 2%) or threw them in the trash (9 individuals or 3%) sometimes or rarely.

In 1991-92, the pattern of responses was similar, but a greater proportion of anglers said they ate, gave away or sold the fish they caught (Table C-12). The difference in proportion of anglers who said that they ate their catch was not statistically significant, but the greater proportion who gave away or sold their fish in 1991-92 was statistically significant ( $p < 0.05$  by  $\chi^2$ ). A greater proportion of these individuals were fishing in Areas 1 and 2. All but one individual (99%) said they often or sometimes returned fish to the river. About 30% of anglers said they often or sometimes ate the fish they caught, and several were fishing in Area 1. About 40% of anglers responded that they sometimes or often gave fish away, and a few (7 individuals or 5%) said they sold fish at least rarely. Some of the anglers who said they gave fish away were fishing in Area 1. Another 12 individuals (7%) provided no response when asked if they sold fish and half of these individuals were fishing in Area 1.

In both surveys, women were less apt to eat fish from the Hudson than all anglers. In 1996,



10 of the 37 women surveyed (27%) said they ate fish from the river at least rarely. In 1991-92, two of the eleven women surveyed (18%) ate fish. In 1996, 45% of all anglers surveyed in 1996 and 40% of all anglers surveyed in 1991-92 reported eating fish from the river.

#### *How often are Hudson River anglers eating the fish they catch?*

The 133 anglers (45% of those surveyed) who said they ate fish at least rarely were asked how frequently they had eaten fish or crabs from the Hudson River during the last week (i.e. in the last 7 days) and last month (i.e. in the last 30 days). More than half (57%) had not eaten Hudson River fish or crabs in the last week and about a quarter (26%) had not eaten fish in the last month (Table C-13). About half of anglers (i.e. the median angler) who ate fish from the Hudson ate 2 meals or less in the previous month. Five percent of anglers (95<sup>th</sup> percentile consumers) reported eating 3 meals or more in the past week and 12 meals or more in the past month. Four individuals (3% of anglers who reported eating fish) said they had eaten 20 meals in the previous month.

In 1991-92, 66 anglers (40% of those surveyed) said they ate fish or crabs from the Hudson River at least rarely. More than half (65%) had not eaten fish from the Hudson in the previous week and about half (52%) had not eaten fish or crabs in the last month. Thus, the median angler ate less than one meal in the past month from the river. Five percent of anglers reported eating 3 meals or more in the past week and 10 meals or more in the past month. One individual said that he had eaten 30 meals of fish or crabs from the river in the previous month.

In 1991-92, anglers were advised to eat no fish from the study areas, so the 40% of anglers who said they ate fish were not complying with the advisories. In 1996, all anglers were advised to eat no fish caught from the river upstream of Catskill. For many species caught from the river downstream of Catskill (Area 3), men are advised to eat no more than one meal per month and women and children are advised to eat no fish. Compliance with these advisories is more complicated to calculate. The 15 anglers who said they ate fish from Area 2 and the 76 anglers who said they ate more than a meal per month of fish from Area 3 clearly ate more than is advised (Table C-13). Of the 42 individuals who said they ate one meal or less per month, five were women or younger than 15. Thus, in 1996, 96 anglers (33% of all respondents) were not following the advice provided in NYS DOH advisories. Most of these anglers (81 of the 96) were fishing in Area 3, so more than half (57%) of Area 3 anglers were eating more than is advised.

#### *Are others eating Hudson River fish?*

As noted above, about half of all anglers (45% in 1996 and 49% in 1991-92) said they gave fish away to others at least rarely (Table C-12). Most of the anglers who said they gave fish away (90% in 1996 and 85% in 1991-92) thought that the fish were eaten (Table C-14). Very few anglers acknowledged selling fish (2% in 1996 and 5% in 1991-92) or might have sold fish, assuming those who did not respond probably sold fish at least rarely (another 1% in 1996 and 7% in 1991-92).

Compared to 1991-92, many fewer anglers in 1996 said they gave fish away but did not eat the fish themselves (Table C-15). In 1996, about 8% of anglers who said they gave fish away said they did not eat the fish they caught. In 1991-92, 39% of anglers who gave fish away did not eat the fish themselves.

Anglers who responded that they ate fish at least rarely were also asked if they shared fish

that they caught with others. Some anglers were expected to share fish with family members or others that would not have been considered "given away". In both surveys, about two thirds of anglers who ate their fish (68% in 1996 and 64% in 1991-92) said that they did share fish (Table C-16). In 1996, 90 anglers shared fish with 108 other individuals, 70 of whom (65%) were women of child-bearing age and children under the age of 15. In 1991-92, 42 anglers shared fish with 96 other individuals, 42 of whom (44%) were women and children. Women of child-bearing age and children under the age of 15 are advised to eat no fish from these parts of the Hudson River (Table 1).

## **Environmental Contamination and Adult and Children's Health Concerns**

Since 1976, NYS DEC has monitored PCB levels in fish from the Hudson River and marine waters, including the New York City Harbor (Skinner *et al.* 1996, Sloan *et al.* 1984, Sloan and Horn 1986, Sloan and Armstrong 1988, Sloan, Stang and O'Connell 1988, Sloan *et al.* 1988, Sloan and Hattala 1991, Sloan 1994, Sloan *et al.* 1995). For most of this time, some species have been collected annually from about ten different locations throughout the study area (Hudson Falls to the Tappan Zee Bridge). Generally, a standard filet is removed from each fish and each filet analyzed separately for PCBs.

In general, PCB levels in fish were quite elevated when they were first measured. With control of active discharges in the late 1970's, fish PCB levels declined precipitously for several years and continued a very slow decline until they increased dramatically in response to apparently fresh or increased discharges of PCBs near the General Electric facility at Hudson Falls which were discovered in late 1991. Since 1993, fish PCB levels have again generally begun to diminish, but they remain quite elevated (Table C-17). From 1992 to 1996 in Area 1, average PCB levels have ranged from about 6 to 61 milligrams per kilogram wet-weight or parts per million (ppm), depending on species. Largemouth and smallmouth bass comprised 58% by weight of the fish that were kept and averaged 15 and 8.0 ppm, respectively. In Areas 2 and 3, average PCB levels in fish range from less than 1 ppm to about 9 ppm. In Area 2, largemouth and smallmouth bass comprised 81% by weight of the fish that were kept and averaged 4.9 and 7.6 ppm, respectively. In Area 3, the catch was more varied. The most important six species represent 77% by weight of the fish that were kept: white perch (3.9 ppm), white catfish (8.0 ppm), striped bass (2.2 ppm), carp (no PCB data), largemouth and smallmouth bass (no PCB data). Fish that exceed the US Food and Drug Administration tolerance of 2 ppm cannot be sold in the marketplace.

PCBs cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1997). Chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans who are exposed to lower levels over long periods of time. Whether PCBs cause cancer in humans is not known.

PCBs also produce a variety of noncarcinogenic effects, primarily to the skin, liver, and to the nervous, immune and reproductive systems. Some PCBs cause birth defects in offspring born to animals exposed to high levels during pregnancy. Some studies of pregnant women suggest a link between a mother's increased exposure to PCBs from eating contaminated fish or from other environmental sources and slight effects on her child's birth weight, short-term memory, and learning. A recent study suggested that women who eat contaminated fish have slightly shorter menstrual cycles. In all these epidemiological studies, the women were also exposed to other chemicals and the effects of these chemicals on them and their children are not understood. Overall, the data from animal and human studies suggest that the fetus and newborns may be

more sensitive to PCBs than adults.

As noted above (p. 1), a previous health assessment noted that the primary exposure pathway of concern to human health was eating fish. The risks of health effects from eating fish depend primarily on contaminant concentration in the fish, how often an angler eats fish and for how many years. The available data clearly indicate that some anglers and others who eat fish from the Hudson River are being exposed to levels of PCBs that are a health concern and are at risk of adverse health effects.

## Conclusions

Results from this survey and the previous one done in 1991-92 by the Hudson River Sloop Clearwater organization (Barclay, 1993) may not accurately represent all Hudson River anglers. Very few boat anglers were surveyed and information was not available to develop a random sample of the shoreline anglers. Nonetheless, a number of conclusions can be reached from the responses to these surveys:

1. Based on ATSDR's present public health category classification (Appendix F), the Hudson River PCB site is a public health hazard. This classification is chosen based on information in the March 31, 1994 Site Review and Update for the Hudson River PCBs site and on information in this health consultation. The health consultation provides data showing that anglers and others who eat fish from the Hudson River are being exposed to levels of PCBs that are a health concern.
2. Numerous anglers remained unaware of the NYS DOH health advisories for the Hudson River, particularly those who were fishing downstream of Catskill.
3. In 1996, a larger proportion of anglers in the Upper Hudson River were aware of the advisories and appear to be complying with the advice than in 1991-92. Compared to 1991-92, a greater proportion of 1996 anglers in the river between Troy and Catskill said they never ate fish they caught in the Hudson.
4. In 1996, no respondents in the Upper Hudson River said that they were eating, giving away or selling the fish they caught. However, about 18% had fish in their possession when interviewed and 11% had more than one fish. Most of the fish were largemouth and smallmouth bass or bluegill, species that are often eaten. In 1991-92, about 10% of anglers had said that they ate the fish they caught at least sometimes and almost 20% said that they gave fish away sometimes or frequently.
5. In 1996, 10% or fewer of anglers fishing between Troy and Catskill said that they ate, gave away or sold the fish they caught at least sometimes, and 8% actually had fish when interviewed.
6. In 1996, two-thirds of anglers fishing between Catskill and the Tappan Zee Bridge continued to report eating their fish at least sometimes and almost half (46%) of anglers gave fish away sometimes or frequently. More than half (57%) of anglers in this Area ate more fish than is advised by the NYS DOH advisories.
7. Overall, the difference in proportion of anglers who said they ate their catch was not significantly different, but significantly fewer anglers reported giving fish away in 1996 compared to 1991-92.
8. In 1996, half of the anglers who said they ate fish from the Hudson River reported eating two meals or less in the previous month and 5% of these anglers said they ate 12 meals or more in the previous month.

9. In 1996, 8% of anglers who did not eat the fish they caught gave them to others compared to 39% of these anglers in 1991-92.
10. Anglers who eat fish also share the fish they catch with others even though they may not say they gave the fish away. In 1996, anglers said they shared their catch with again as many other people, mostly family members. Most of these people were in the groups advised to eat no fish from the Hudson.
11. In both surveys, the fish that anglers kept were among the most contaminated species in each part of the river.
12. Both surveys suggest that most anglers became aware of the health advisories through the fishing regulations guide provided when they purchased a fishing license or through media coverage. Word-of-mouth was also important, and in 1996, signs placed along the Upper Hudson River, where most anglers had a license, appear to have contributed to improved awareness of the advisories.

## **Recommendations**

Until the PCB levels in fish from the river decline, health advisories should continue to be issued and efforts to inform the public about the advisories should be continued. NYS DOH should continue to review data on levels of fish contamination and public health risks and revise the health advisories accordingly. The federal Agency for Toxic Substances and Disease Registry (ATSDR) and NYS DOH should continue to review all data to determine the need for additional actions at the site.

The findings of this study reinforce the recommendation in the NYS DOH 1994 Site Review and Update that "[a]dditional community health education efforts may be needed to inform those who still fish in the Hudson River of the health risk posed by PCB exposure to contaminated fish." Particular needs identified by this study and others are:

1. Additional educational efforts should be focused on the Lower Hudson River and contiguous waters with the same advisories (e.g., Harlem and East River, New York Harbor).
2. New techniques should be explored for finding those people who are eating Hudson River fish. Individuals who do not speak or read English may need to receive particular attention, especially in the New York City area.
3. Additional assessments are needed to more accurately estimate what Hudson River and New York Harbor anglers are eating, giving away or selling and to better understand how to convince anglers to follow the health advice.

## **Public Health Action Plan**

The Public Health Action Plan (PHAP) for the Hudson River PCB site contains a description of the actions to be taken by the US EPA, ATSDR, and/or the New York State Department of Health (NYS DOH) at or near the site subsequent to the completion of this health consultation. The purpose of the PHAP is to ensure that this health consultation not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the ATSDR/NYS DOH to follow-up on this plan to ensure that it is implemented. The following public health actions related to the health advisories for eating fish have been taken or will be implemented.

### *1999 Actions*

1. NYS DOH evaluated 1997 data regarding PCBs and mercury in fish and modified the health advisories for some fish species between the Federal dam at Troy and Catskill.
2. NYS DOH provided the modified health advisories to NYS DEC for publication in the 1999-2000 fishing regulations guide.
3. Beginning October 1998, US EPA awarded the state a one-year grant to significantly increase education and outreach in the Hudson River estuary and New York Harbor area. NYS DOH and NYS DEC worked with local communities, state and federal agencies, non-government organizations and anglers to develop and implement effective ways to inform anglers and others who eat Hudson River fish about the health advisories and ways to reduce their health risks from eating contaminated fish. Six student intern rangers visited fishing access sites along the Hudson River from Fort Edward to New York City. They made almost 1150 site visits and spoke with almost 500 anglers, providing information about the advisories and learning about angler perceptions of them. Signs notifying anglers about the advisories were developed with assistance from three focus groups comprised of Hudson River anglers. The signs were distributed to owners or managers of marinas, parks, boat launching sites and other fishing access sites for posting along the river. Fish advisory brochures in English and Spanish were updated and distributed to bait and tackle shops, maritime museums and community groups. Radio public service announcements were prepared in Spanish and English and broadcast during prime time from mid-July through August 1999.

### *Actions Planned*

1. NYS DOH will continue to evaluate new data regarding contaminants in fish and issue appropriate health advisories as needed.
2. NYS DOH will continue to work with NYS DEC to distribute updated versions of the NYS DOH health advisories to anglers who fish in the Hudson River, New York Harbor and other affected marine waters.
3. NYS DOH and NYS DEC will work with local communities, state and federal agencies, non-government organizations and anglers to implement effective ways to inform anglers and others who eat Hudson River fish about the health advisories and ways to reduce their health risks from eating contaminated fish.

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## Preparers of Report and Acknowledgments

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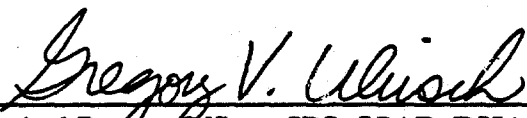
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## Certification

The Health Consultation for the Exposure Investigation at the Hudson River PCB site was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

  
Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

  
Acting Chief, SSAB, DHAC, ATSDR



## Appendix A - List of Common and Scientific Names of Fish and Crabs Reported Being Caught

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
Alewife	<i>Alosa pseudoharengus</i>	Clupeidae
American eel	<i>Anguilla rostrata</i>	Anguillidae
American shad	<i>Alosa sapidissima</i>	Clupeidae
Atlantic silverside	<i>Menidia menidia</i>	Atherinidae
Black crappie	<i>Pomoxis nigromaculatus</i>	Centrarchidae
Blueback herring	<i>Alosa aestivalis</i>	Clupeidae
Blue crab	<i>Callinectes sapidus</i>	Portunidae
Bluefish	<i>Pomatomus saltatrix</i>	Pomatomidae
Bluegill	<i>Lepomis macrochirus</i>	Centrarchidae
Brown bullhead	<i>Ameiurus nebulosus</i>	Ictaluridae
Brown trout	<i>Salmo trutta</i>	Salmonidae
Carp	<i>Cyprinus carpio</i>	Cyprinidae
Channel catfish	<i>Ictalurus punctatus</i>	Ictaluridae
Freshwater drum	<i>Aplodinotus grunniens</i>	Sciaenidae
Golden shiner	<i>Notemigonus crysoleucas</i>	Cyprinidae
Largemouth bass	<i>Micropterus salmoides</i>	Centrarchidae
Northern pike	<i>Esox lucius</i>	Esocidae
Pumpkinseed	<i>Lepomis gibbosus</i>	Centrarchidae
Red hake	<i>Urophycis chuss</i>	Gadidae
Rock bass	<i>Ambloplites rupestris</i>	Centrarchidae
Smallmouth bass	<i>Micropterus dolomieu</i>	Centrarchidae
Striped bass	<i>Morone saxatilis</i>	Moronidae
White catfish	<i>Ameiurus catus</i>	Ictaluridae
White perch	<i>Morone americana</i>	Moronidae
White sucker	<i>Catostomus commersoni</i>	Catostomidae
Yellow perch	<i>Perca flavescens</i>	Percidae

More than 200 species of fish have been reported from the Hudson River. The species listed above were reported caught by anglers surveyed in 1996 and 1991-92.



## Appendix B - Survey Instrument

### QUESTIONNAIRE - HUDSON RIVER ANGLER SURVEY, 1996

Interviewer: \_\_\_\_\_

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Day of Week: \_\_\_\_  
month day year

Time Started: \_\_\_\_\_ Time Finished: \_\_\_\_\_

Site: \_\_\_\_\_

Gender of Person Being Interviewed: M F

1) I am taking a survey of fishing activity along the Hudson River. May I ask you some questions?

\_\_\_\_ Yes

\_\_\_\_ No - (THANK PERSON AND TERMINATE INTERVIEW)

2) Have you already been interviewed this year about recreational fishing?

\_\_\_\_ Yes - (END INTERVIEW)

\_\_\_\_ No

3) What types of fish are you trying to catch? (LIST)

4) What fishing or crabbing equipment are you using today?

\_\_\_\_ Hook and line

\_\_\_\_ Trap

\_\_\_\_ Net

\_\_\_\_ Other: \_\_\_\_\_

5) Have you caught anything here today, and if so, what?

Species

Number caught

Size (MEASURE!)



6) How many times have you fished or crabbed on the Hudson River in the last seven days (that is from \_\_\_\_\_ until today)?

7) How many times have you fished or crabbed on the Hudson River in the last month (that is from \_\_\_\_\_ until today)?

8) What is the main reason that you fish or crab?

9) For what other reasons do you fish or crab?  
(LIST IN ORDER GIVEN)

10) We would like to know what you do with the fish or crabs that you catch. Do you do any of the following with your catch—often, sometimes, rarely, or never?

(READ FROM THE LIST BELOW, CHECK EACH APPLICABLE ANSWER)

	OFTEN	SOMETIMES	RARELY	NEVER
Eat:				
Toss back:				
Fertilizer:				
Bait:				
Throw in trash:				
Give away:				
Sell:				

If you give them away, what do the people you give them to do with them?

Eat: \_\_\_\_\_  
Fertilizer: \_\_\_\_\_  
Bait: \_\_\_\_\_  
Other: \_\_\_\_\_ (WHAT)  
Don't know: \_\_\_\_\_

If you sell them, what do the people you sell them to do with them?

Eat: \_\_\_\_\_  
Fertilizer: \_\_\_\_\_  
Bait: \_\_\_\_\_  
Other: \_\_\_\_\_ (WHAT)  
Don't know: \_\_\_\_\_

- 11) What do you think most people here do with their catch?  
(RECORD IN ORDER GIVEN)

(IF RESPONDENT DOES NOT EAT CATCH, CONTINUE. IF THEY DO EAT CATCH, SKIP TO QUESTION 17)

- 12) Have you ever eaten fish or crabs from here in the past?

Yes \_\_\_\_\_ (SKIP TO QUESTION 14)  
No \_\_\_\_\_

- 13) Why don't you eat your catch?

(SKIP TO QUESTION 20)

- 14) What kind of fish or crab did you eat?  
(RECORD ALL ANSWERS GIVEN)

15) How often during the fishing season did you eat these fish or crabs? **(READ ALL CHOICES)**

4 or more times a week \_\_\_\_\_  
2 or 3 times a week \_\_\_\_\_  
once a week \_\_\_\_\_  
2 to 3 times a month \_\_\_\_\_  
once a month \_\_\_\_\_  
less than once a month \_\_\_\_\_

16) Why did you stop eating these fish?

**(SKIP TO QUESTION 20)**

-----  
**(RESUME QUESTIONS HERE IF RESPONDENT DOES EAT THEIR CATCH)**

17) How many times in the last week (that is from \_\_\_\_\_ until today) did you eat fish or crabs from the Hudson River?

# of meals \_\_\_\_\_ **(EMPHASIZE NUMBER OF MEALS, NOT FISH)**

18) How many times in the last month (that is from \_\_\_\_\_ until today) did you eat fish or crabs from the Hudson River?

# of meals \_\_\_\_\_ **(EMPHASIZE NUMBER OF MEALS, NOT FISH)**

19) Who, besides yourself, eats the fish or crabs you catch from this area? **(FOR EACH PERSON LISTED, RECORD THE FOLLOWING)**

-Relation to respondent

-Age

-What kind of fish or crab they eat

-Whether they eat more, the same, or less than respondent

Relation    Age    Type of fish/crab    Amount (more, same, less)

**(RESUME QUESTIONING HERE WITH ALL RESPONDENTS)**

20) Are there any fish or crabs that people catch here, that are not safe to eat?

Yes \_\_\_\_\_

No \_\_\_\_\_ **(SKIP TO QUESTION 26)**

No opinion/Don't know \_\_\_\_\_ **(SKIP TO QUESTION 26)**

21) What fish or crabs that people catch here are not safe to eat?

22) Is it the whole fish or crab that is not safe to eat, or just parts of them?

23) Why are they not safe to eat?

24) What would happen if you ate them?

25) If you ate these fish or crabs and had no reaction within a day or two, would that mean the fish or crabs are safe to eat?

Yes \_\_\_\_\_

No \_\_\_\_\_

Don't know \_\_\_\_\_

26) How can you tell if the fish or crabs caught here, or their parts, are safe to eat?

27) Is there any way to make the fish or crabs that are caught here safer to eat after they have been caught?

No \_\_\_\_\_

If yes, what are they?

28) For the fish or crabs that you catch here, would you say that eating them: **(READ ALL CHOICES)**

Poses no risk at all \_\_\_\_\_

Poses a slight risk \_\_\_\_\_

Poses a serious risk \_\_\_\_\_

29) Would you say the water here is: **(READ ALL CHOICES)**

Not at all polluted \_\_\_\_\_

Slightly polluted \_\_\_\_\_

Quite polluted \_\_\_\_\_

30) **(IF RESPONDENT BELIEVES THAT THE WATER IS MORE POLLUTED THAN THE FISH- COMPARE ANSWERS TO 28 & 29):** If the water is slightly/quite polluted, why does eating the fish pose no risk/a slight risk?

31) Please answer yes, no, or don't know for each of the following questions:

-Do you think the fish you catch here are contaminated?

-Do you believe that eating fish caught at this site would pose a risk to your health?

-Would you like more information about the potential risks from eating fish that are contaminated

-Would you like more information about how you can control the risks from eating contaminated fish?

	Yes	No	Don't Know
-Do you think the fish you catch here are contaminated?			
-Do you believe that eating fish caught at this site would pose a risk to your health?			
-Would you like more information about the potential risks from eating fish that are contaminated			
-Would you like more information about how you can control the risks from eating contaminated fish?			

32) Do you happen to know if there are any official health warnings about eating the fish that are caught here?

Yes \_\_\_\_\_

No \_\_\_\_\_ (SKIP TO QUESTION 39)

Don't know \_\_\_\_\_ (SKIP TO QUESTION 39)

33) What warnings are you aware of?

34) How did you originally learn about them?

35) Do you happen to know who makes these health advisories?

(READ ALL CHOICES)

Federal gov't \_\_\_\_\_  
State gov't \_\_\_\_\_  
County \_\_\_\_\_  
Town \_\_\_\_\_  
Other \_\_\_\_\_  
Don't know \_\_\_\_\_

36) Do you agree, disagree, or have no opinion about the following statements?

The health advisories provide me with enough information to decide whether or not to eat certain fish.

Many of the health advisories are not needed or are exaggerated.

Agree Disagree No Opinion


37) Since you learned about the health advisories, have you made any changes in either your fishing habits or in eating the fish you catch?

Yes \_\_\_\_\_

No \_\_\_\_\_ (SKIP TO QUESTION 39)

38) What changes have you made since you learned of the health advisories? Do you: **(READ, CHECK EACH THAT APPLIES)**

No longer eat the fish you catch	_____
Eat less of the fish you catch	_____
Eat more of the fish you catch	_____
Clean or cook the fish differently	_____
Fish in different locations	_____
Fish less often	_____
Fish more often	_____
Change the type of fish you try to catch	_____

Other: \_\_\_\_\_

39) What age group are you in? **(READ)**

under 10	_____	35-39	_____
10-14	_____	40-44	_____
15-19	_____	45-49	_____
20-24	_____	50-54	_____
25-29	_____	55-59	_____
30-34	_____	60+	_____

40) What is your race or ethnic background?

41) In what range is your yearly household income before taxes?  
**(READ CHOICES)**

<\$10,000	_____
\$10,000-\$29,999	_____
\$30,000-\$49,999	_____
\$50,000-\$69,999	_____
\$70,000-\$89,999	_____
\$90,000+	_____

42) How many people are there in your household?

43) Do you have a New York fishing license?

Yes \_\_\_\_\_  
No \_\_\_\_\_

THANK YOU VERY MUCH FOR YOUR TIME!

## Appendix C - Detailed Data Tables

Table C-1. Distribution of interviews by area and time. Number and percentage of interviews conducted in each area by month, day of week and time of day.

Interview Variables		1991-92 Survey				1996 Survey			
		Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
		n (%)	n (%)	n (%)	N (%)	n (%)	n (%)	n (%)	N (%)
Month	May	11 (19.6)	10 (20.0)	8 (13.3)	29 (17.5)	-	-	-	-
	June	7 (12.5)	12 (24.0)	24 (40.0)	43 (25.9)	5 (6.6)	14 (18.4)	17 (12.0)	36 (12.2)
	July	11 (19.6)	9 (18.0)	21 (35.0)	41 (24.7)	16 (21.1)	19 (25.0)	18 (12.7)	53 (18.0)
	August	5 (8.9)	6 (12.0)	4 (6.7)	15 (9.0)	25 (32.9)	5 (6.6)	43 (30.3)	73 (24.8)
	September	10 (17.9)	6 (12.0)	2 (3.3)	18 (10.8)	28 (36.8)	14 (18.4)	38 (26.8)	80 (27.2)
	October	8 (14.3)	7 (14.0)	1 (1.7)	16 (9.6)	2 (2.6)	24 (31.6)	26 (18.3)	52 (17.7)
	Nov.-Dec.	4 (7.1)	-	-	4 (2.4)	-	-	-	-
Day	Weekday	24 (42.9)	13 (26.0)	34 (56.7)	71 (42.8)	47 (61.8)	33 (43.4)	69 (48.6)	149 (50.7)
	Weekend	32 (57.1)	37 (74.0)	26 (43.3)	95 (57.2)	29 (38.2)	43 (56.6)	73 (51.4)	145 (49.3)
Hour	Morning	21 (37.5)	14 (28.0)	15 (25.0)	50 (30.1)	15 (19.7)	9 (11.8)	22 (15.5)	46 (15.6)
	Afternoon	17 (30.4)	15 (30.0)	22 (36.7)	54 (32.5)	36 (47.4)	23 (30.3)	90 (63.4)	149 (50.7)
	Evening	18 (32.1)	21 (42.0)	16 (26.7)	55 (33.1)	25 (32.9)	44 (57.9)	30 (21.1)	99 (33.7)
	Unknown	-	-	7 (11.7)	7 (4.2)	-	-	-	-
TOTAL		56 (33.7)	50 (30.1)	60 (36.1)	166 (100)	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)



Table C-2. Distribution of interviews among the survey areas. Number and percentage of completed surveys in each area.

	1991-92 Survey N (%)	1996 Survey N (%)
<b>Area 1</b>	<b>56 (33.7)<sup>1</sup></b>	<b>76 (25.9)</b>
Thompson Island Pool (RM 187-196)	7 (12.5)	6 (7.9)
Stillwater Pool (RM 167-182)	-	22 (28.9)
Mechanicville-Stillwater (RM 154-166)	46 (82.1)	48 (63.2)
<b>Area 2</b>	<b>50 (30.1)</b>	<b>76 (25.9)</b>
Albany-Troy (RM 140-153)	45 (90.0)	43 (56.6)
Stuyvesant-Coxsackie (RM 115-139)	5 (10.0)	21 (27.6)
Catskill (RM 110-114)	-	12 (15.8)
<b>Area 3</b>	<b>60 (36.1)</b>	<b>142 (48.3)</b>
Kingston-Esopus (RM 90-109)	15 (25.0)	6 (4.2)
Poughkeepsie (RM 70-89)	17 (28.3)	18 (12.7)
Hudson Highlands (RM 43-69)	26 (43.3)	54 (38.0)
Haverstraw Bay (RM 34-42)	-	58 (40.8)
Tappan Zee Bridge-Croton Pt (RM 24-33)	2 (3.3)	6 (4.2)
<b>Total</b>	<b>166<sup>1</sup> (100)</b>	<b>294 (100)</b>

RM is the river mile index. The value is the number of miles along the river centerline upstream from the Battery (southern tip of Manhattan).

<sup>1</sup> In the 1991-92 survey, the location of 3 responses could not be accurately determined within Area 1. Thus, the totals are larger than the sum of locations that include Area 1 in 1991-92.

Table C-3. Demographic characteristics of anglers responding to 1991-92 and 1996 surveys.

Demographic Variables		1991-92 Survey				1996 Survey			
		Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
		n (%)	n (%)	n (%)	N (%)	n (%)	n (%)	n (%)	N (%)
Age	<24 yrs	15 (26.8)	11 (22.0)	9 (15.0)	35 (21.1)	19 (25.0)	8 (10.5)	12 (8.5)	39 (13.3)
	25-34 yrs	14 (25.0)	11 (22.0)	19 (31.7)	44 (26.5)	19 (25.0)	26 (34.2)	31 (21.8)	76 (25.9)
	35-44 yrs	10 (17.9)	13 (26.0)	16 (26.7)	39 (23.5)	24 (31.6)	22 (28.9)	50 (35.2)	96 (32.7)
	45-59 yrs	13 (23.2)	9 (18.0)	10 (16.7)	32 (19.3)	5 (6.6)	13 (17.1)	29 (20.4)	47 (16.0)
	60 + yrs	4 (7.1)	6 (12.0)	6 (10.0)	16 (9.6)	9 (11.8)	7 (9.2)	19 (13.4)	35 (11.9)
	Refusal	-	-	-	-	-	-	1 (0.7)	1 (0.3)
Gender	Male	54 (96.4)	43 (86.0)	58 (96.7)	155 (93.4)	65 (85.5)	66 (86.8)	126 (88.7)	257 (87.4)
	Female	2 (3.6)	7 (14.0)	2 (3.3)	11 (6.6)	11 (14.5)	10 (13.2)	16 (11.3)	37 (12.6)
Race/Ethnicity	White	53 (94.6)	42 (84.0)	37 (61.7)	132 (79.5)	75 (98.7)	60 (78.9)	69 (48.6)	204 (69.4)
	Black	2 (3.6)	6 (12.0)	16 (26.7)	24 (14.5)	1 (1.3)	6 (7.9)	29 (20.4)	36 (12.2)
	Hispanic	-	1 (2.0)	6 (10.0)	7 (4.2)	-	3 (3.9)	36 (25.4)	39 (13.3)
	Others	1 (1.8)	1 (2.0)	1 (1.7)	3 (1.8)	-	7 (9.2)	8 (5.6)	15 (5.1)
Income	<10 K	9 (16.1)	8 (16.0)	11 (18.3)	28 (16.9)	11 (14.5)	13 (17.1)	20 (14.1)	44 (15.0)
	\$10-29 K	18 (32.1)	19 (38.0)	21 (35.0)	58 (34.9)	33 (43.4)	20 (26.3)	28 (19.7)	81 (27.6)
	\$30-49 K	15 (26.8)	12 (24.0)	15 (25.0)	42 (25.3)	15 (19.7)	27 (35.5)	22 (15.5)	64 (21.8)
	50+ K	5 (8.9)	5 (10.0)	7 (11.7)	17 (10.2)	2 (2.6)	12 (15.8)	14 (9.9)	28 (9.5)
	Refusal	9 (16.1)	6 (12.0)	6 (10.0)	21 (12.7)	15 (19.7)	4 (5.3)	58 (40.8)	77 (26.2)
Household	1 person	11 (19.6)	7 (14.0)	9 (15.0)	27 (16.3)	8 (10.5)	10 (13.2)	16 (11.3)	34 (11.6)
	2 people	17 (30.4)	11 (22.0)	13 (21.7)	41 (24.7)	21 (27.6)	27 (35.5)	48 (33.8)	96 (32.7)
	3 people	15 (26.8)	16 (32.0)	12 (20.0)	43 (25.9)	14 (18.4)	23 (30.3)	17 (12.0)	54 (18.4)
	4 people	9 (16.1)	5 (10.0)	11 (18.3)	25 (15.1)	20 (26.3)	10 (13.2)	27 (19.0)	57 (19.4)
	5 + people	4 (7.1)	11 (22.0)	15 (25.0)	30 (18.1)	13 (17.1)	6 (7.9)	34 (23.9)	53 (18.0)
License	Yes	-	-	-	-	65 (85.5)	58 (76.3)	46 (32.4)	169 (57.5)
	No	-	-	-	-	11 (14.5)	18 (23.7)	96 (67.6)	125 (42.5)
TOTAL		56 (33.7)	50 (30.1)	60 (36.1)	166 (100)	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)

Table C-4. Angler awareness of health advisories. Responses to Question 32.

Demographic Variables		1991-92 Survey				1996 Survey			
		Yes	No	Don't know	Total	Yes	No	Don't know	Total
		n (%)	n (%)	n (%)	N (%)	n (%)	n (%)	n (%)	N (%)
Age	<24 yrs	6 (17.1)	14 (40.0)	15 (42.9)	35 (21.1)	16 (41.0)	9 (23.1)	14 (35.9)	39 (13.3)
	25-34 yrs	23 (52.3)	12 (27.3)	9 (20.5)	44 (26.5)	38 (50.0)	14 (18.4)	24 (31.6)	76 (25.9)
	35-44 yrs	28 (71.8)	5 (12.8)	6 (15.4)	39 (23.5)	54 (56.3)	11 (11.5)	31 (32.3)	96 (32.7)
	45-59 yrs	19 (59.4)	7 (21.9)	6 (18.8)	32 (19.3)	19 (40.4)	4 (8.5)	24 (51.1)	47 (16.0)
	60 + yrs	9 (56.3)	5 (31.3)	2 (12.5)	16 (9.6)	18 (51.4)	5 (14.3)	12 (34.3)	35 (11.9)
	Refusal	-	-	-	-	-	-	1 (100)	1 (0.3)
Gender	Male	83 (53.5)	36 (23.2)	36 (23.2)	155 (93.4)	135 (52.5)	31 (12.1)	91 (35.4)	257 (87.4)
	Female	2 (18.2)	7 (63.6)	2 (18.2)	11 (6.6)	10 (27.0)	12 (32.4)	15 (40.5)	37 (12.6)
Race/Ethnicity	White	66 (50.0)	37 (28.0)	29 (22.0)	132 (79.5)	129 (63.2)	31 (15.2)	44 (21.6)	204 (69.4)
	Black	14 (58.3)	3 (12.5)	7 (29.2)	24 (14.5)	8 (22.2)	6 (16.7)	22 (61.1)	36 (12.2)
	Hispanic	3 (42.9)	2 (28.6)	2 (28.6)	7 (4.2)	5 (12.8)	1 (2.6)	33 (84.6)	39 (13.3)
	Others	2 (66.7)	1 (33.3)	-	3 (1.8)	3 (20.0)	5 (33.3)	7 (46.7)	15 (5.1)
Income	<10 K	6 (21.4)	14 (50.0)	8 (28.6)	28 (16.9)	15 (34.1)	10 (22.7)	19 (43.2)	44 (15.0)
	\$10-29 K	31 (53.4)	18 (31.0)	9 (15.5)	58 (34.9)	40 (59.4)	17 (21.0)	24 (29.6)	81 (27.6)
	\$30-49 K	30 (71.4)	4 (9.5)	8 (19.0)	42 (25.3)	48 (75.0)	4 (6.3)	12 (18.8)	64 (21.8)
	50+ K	10 (58.8)	2 (11.8)	5 (29.4)	17 (10.2)	19 (67.9)	4 (14.3)	5 (17.9)	28 (9.5)
	Refusal	8 (38.1)	5 (23.8)	8 (38.1)	21 (12.7)	23 (29.9)	8 (10.4)	46 (59.7)	77 (26.2)
Area	1	31 (55.4)	13 (23.2)	12 (21.4)	56 (33.7)	57 (75.0)	15 (19.7)	4 (5.3)	76 (25.9)
	2	21 (42.0)	14 (28.0)	15 (30.0)	50 (30.1)	44 (57.9)	23 (30.3)	9 (11.8)	76 (25.9)
	3	33 (55.0)	16 (26.7)	11 (18.3)	60 (36.1)	44 (31.0)	5 (3.5)	93 (65.5)	142 (48.3)
License	Yes	-	-	-	-	123 (72.8)	24 (14.2)	22 (13.0)	169 (57.5)
	No	-	-	-	-	22 (17.6)	19 (15.2)	84 (67.2)	125 (42.5)
TOTAL		85 (51.2)	43 (25.9)	38 (22.9)	166 (100)	145 (49.3)	43 (14.6)	106 (36.1)	294 (100)

Table C-5. How anglers became aware of health advisories and their general opinion of them.

	1991-92 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
<i>How did you learn about advisories?</i>								
Pamphlet with fishing license	12 (38.7)	13 (61.9)	6 (18.2)	31 (36.5)	23 (40.4)	22 (50.0)	19 (43.2)	64 (44.1)
Media	8 (25.8)	5 (23.8)	17 (51.5)	30 (35.3)	6 (10.5)	9 (20.5)	11 (25.0)	26 (17.9)
Posters (signs)	2 (6.5)	-	-	2 (2.4)	13 (22.8)	7 (15.9)	-	20 (13.8)
Word-of-mouth	9 (29.0)	2 (9.5)	9 (27.3)	20 (23.5)	8 (14.0)	2 (4.5)	12 (27.3)	22 (15.2)
Handouts	-	-	-	-	-	2 (4.5)	-	2 (1.4)
Environmental organizations	-	-	-	-	1 (1.8)	-	-	1 (0.7)
NYS DEC	-	-	-	-	1 (1.8)	1 (2.3)	2 (4.5)	4 (2.8)
Don't know or no response	-	1 (4.8)	1 (3.0)	2 (2.4)	5 (8.8)	1 (2.3)	-	6 (4.1)
<i>Do you agree that health advisories provide you with enough information?</i>								
Yes	16 (51.6)	12 (57.1)	11 (33.3)	39 (45.9)	33 (57.9)	33 (75.0)	30 (68.2)	96 (66.2)
No	14 (45.2)	7 (33.3)	14 (42.4)	35 (41.2)	16 (28.1)	8 (18.2)	-	24 (16.6)
No opinion	1 (3.2)	2 (9.5)	8 (24.2)	11 (12.9)	8 (14.0)	3 (6.8)	14 (31.8)	25 (17.2)
<i>Do you agree that health advisories are not needed or are exaggerated?</i>								
Yes	6 (19.4)	5 (23.8)	14 (42.4)	25 (29.4)	2 (3.5)	8 (18.2)	1 (2.3)	11 (7.6)
No	24 (77.4)	13 (61.9)	14 (42.4)	51 (60.0)	40 (70.2)	30 (68.2)	12 (27.3)	82 (56.6)
No opinion	1 (3.2)	3 (14.3)	5 (15.2)	9 (10.6)	15 (26.3)	6 (13.6)	31 (70.5)	52 (35.9)
<i>Have you made any changes since learning about the advisories?</i>								
Yes	12 (38.7)	11 (52.4)	12 (36.4)	35 (41.2)	23 (40.4)	4 (9.1)	18 (40.9)	45 (31.0)
No	19 (61.3)	10 (47.6)	21 (63.6)	50 (58.8)	34 (59.6)	40 (90.9)	26 (59.1)	100 (69.0)
TOTAL	31 (36.5)	21 (24.7)	33 (38.8)	85 (100)	57 (39.3)	44 (30.3)	44 (30.3)	145 (100)

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Table C-6. Angler understanding of the advisories. Combined responses to questions 20, 28, 29, 31a and 31b.

Demographic Variables		1991-92 Survey				1996 Survey			
		Yes	No	Don't know	Total	Yes	No	Don't know	Total
		n (%)	n (%)	n (%)	N (%)	n (%)	n (%)	n (%)	N (%)
Age	<24 yrs	12 (34.3)	-	23 (65.7)	35 (21.1)	24 (61.5)	-	15 (38.5)	39 (13.3)
	25-34 yrs	20 (45.5)	-	24 (54.5)	44 (26.5)	35 (46.1)	2 (2.6)	39 (51.3)	76 (25.9)
	35-44 yrs	20 (51.3)	2 (5.1)	17 (43.6)	39 (23.5)	42 (43.8)	2 (2.1)	52 (54.2)	96 (32.7)
	45-59 yrs	11 (34.4)	2 (6.3)	19 (59.4)	32 (19.3)	12 (25.5)	5 (10.6)	30 (63.8)	47 (16.0)
	60 + yrs	4 (25.0)	-	12 (75.0)	16 (9.6)	11 (31.4)	3 (8.6)	21 (60.0)	35 (11.9)
	Refusal	-	-	-	-	-	-	1 (100)	1 (0.3)
Gender	Male	61 (39.4)	2 (1.3)	92 (59.4)	155 (93.4)	112 (43.6)	7 (2.7)	138 (53.7)	257 (87.4)
	Female	6 (54.5)	2 (18.2)	3 (27.3)	11 (6.6)	12 (32.4)	5 (13.5)	20 (54.1)	37 (12.6)
Race/Ethnicity	White	59 (44.7)	3 (2.3)	70 (53.0)	132 (79.5)	104 (51.0)	4 (2.0)	96 (47.1)	204 (69.4)
	Black	6 (25.0)	1 (4.2)	17 (70.8)	24 (14.5)	10 (27.8)	3 (8.3)	23 (63.9)	36 (12.2)
	Hispanic	1 (14.3)	-	6 (85.7)	7 (4.2)	4 (10.3)	4 (10.3)	31 (79.5)	39 (13.3)
	Others	1 (33.3)	-	2 (66.7)	3 (1.8)	6 (40.0)	1 (6.7)	8 (53.3)	15 (5.1)
Income	<10 K	10 (35.7)	2 (7.1)	16 (57.1)	28 (16.9)	20 (45.5)	2 (4.5)	22 (50.0)	44 (15.0)
	\$10-29 K	21 (36.2)	2 (3.4)	35 (60.3)	58 (34.9)	45 (55.6)	3 (3.7)	33 (40.7)	81 (27.6)
	\$30-49 K	19 (45.2)	-	23 (54.8)	42 (25.3)	30 (46.9)	1 (1.6)	33 (51.6)	64 (21.8)
	50+ K	8 (47.1)	-	9 (52.9)	17 (10.2)	10 (35.7)	-	18 (64.3)	28 (9.5)
	Refusal	9 (42.9)	-	12 (57.1)	21 (12.7)	19 (24.7)	6 (7.8)	52 (67.5)	77 (26.2)
Area	1	29 (51.8)	1 (1.8)	26 (46.4)	56 (33.7)	58 (76.3)	-	18 (23.7)	76 (25.9)
	2	18 (36.0)	2 (4.0)	30 (60.0)	50 (30.1)	35 (46.1)	-	41 (53.9)	76 (25.9)
	3	20 (33.3)	1 (1.7)	39 (65.0)	60 (36.1)	31 (21.8)	12 (8.5)	99 (69.7)	142 (48.3)
Warning	Yes	42 (49.4)	-	43 (50.6)	85 (51.2)	95 (65.5)	-	50 (34.5)	145 (49.3)
	No/Don't know	25 (30.9)	4 (4.9)	52 (64.2)	81 (48.8)	29 (19.5)	12 (8.1)	108 (72.5)	149 (50.7)
License	Yes	-	-	-	-	91 (53.8)	2 (1.2)	76 (45.0)	169 (57.5)
	No	-	-	-	-	33 (26.4)	10 (8.0)	82 (65.6)	125 (42.5)
TOTAL		67 (40.4)	4 (2.4)	95 (57.2)	166 (100)	124 (42.2)	12 (4.1)	158 (53.7)	294 (100)

Yes is counted only if all 5 questions were answered "yes", and no is counted only if all 5 questions were answered "no".

Table C-7. Anglers who had fish when interviewed in 1996.

	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	N (%)
Caught fish in 1991-92				
Yes	37 (66.1)	26 (52.0)	34 (56.7)	97 (58.4)
No	19 (33.9)	24 (48.0)	26 (43.3)	69 (41.6)
TOTAL	56 (33.7)	50 (30.1)	60 (36.1)	166 (100)
Caught fish in 1996				
Yes	24 (31.6)	32 (42.1)	99 (69.7)	155 (52.7)
No	52 (68.4)	44 (57.9)	43 (30.3)	139 (47.3)
Kept fish in 1996				
Yes	14 (18.4)	6 (7.9)	67 (47.2)	87 (29.6)
No	62 (81.6)	70 (92.1)	75 (52.8)	207 (70.4)
TOTAL	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)

Table C-8. Numbers of fish reported as caught by anglers.

	Area 1		Area 2		Area 3		Total	
	Ang (%) <sup>1</sup>	n (%) <sup>2</sup>	Ang (%) <sup>1</sup>	n (%) <sup>2</sup>	Ang (%) <sup>1</sup>	n (%) <sup>2</sup>	Ang (%) <sup>1</sup>	n (%) <sup>2</sup>
<b>1991-92 Survey</b>								
White perch	9 (24.3)	45 (19.7)	4 (15.4)	63 (30.9)	8 (23.5)	28 (12.2)	21 (21.6)	136 (20.5)
Blue crab	-	-	-	-	12 (35.3)	126 (54.8)	12 (12.4)	126 (19.0)
Blueback herring	2 (5.4)	43 (18.9)	4 (15.4)	37 (18.1)	-	-	6 (6.2)	80 (12.1)
Striped bass	4 (10.8)	15 (6.6)	7 (26.9)	26 (12.7)	10 (29.4)	27 (11.7)	21 (21.6)	68 (10.3)
White catfish	2 (5.4)	2 (0.9)	4 (15.4)	38 (18.6)	9 (26.5)	25 (10.9)	15 (15.5)	65 (9.8)
Black crappie	2 (5.4)	32 (14.0)	-	-	-	-	2 (2.1)	32 (4.8)
Brown bullhead	7 (18.9)	22 (9.6)	2 (7.7)	5 (2.5)	-	-	9 (9.3)	27 (4.1)
Smallmouth bass	10 (27.0)	16 (7.0)	3 (11.5)	4 (2.0)	-	-	13 (13.4)	20 (3.0)
American eel	2 (5.4)	3 (1.3)	3 (11.5)	5 (2.5)	6 (17.6)	10 (4.3)	11 (11.3)	18 (2.7)
Yellow perch	6 (16.2)	16 (7.0)	2 (7.7)	2 (1.0)	-	-	8 (8.2)	18 (2.7)
American shad	1 (2.7)	1 (0.4)	3 (11.5)	17 (8.3)	-	-	4 (4.1)	18 (2.7)
Carp	1 (2.7)	1 (0.4)	-	-	3 (8.8)	11 (4.8)	4 (4.1)	12 (1.8)
Rock bass	2 (5.4)	12 (5.3)	-	-	-	-	2 (2.1)	12 (1.8)
Largemouth bass	5 (13.5)	5 (2.2)	2 (7.7)	5 (2.5)	-	-	7 (7.2)	10 (1.5)
Bluegill	2 (5.4)	3 (1.3)	1 (3.8)	1 (0.5)	1 (2.9)	2 (0.9)	4 (4.1)	6 (0.9)
Pumpkinseed	4 (10.8)	6 (2.6)	-	-	-	-	4 (4.1)	6 (0.9)
Northern pike	4 (10.8)	6 (2.6)	-	-	-	-	4 (4.1)	6 (0.9)
Alewife	-	-	1 (3.8)	1 (0.5)	1 (2.9)	1 (0.4)	2 (2.1)	2 (0.3)
Total	37 (38.1)	228 (34.4)	26 (26.8)	204 (30.8)	34 (35.1)	230 (34.7)	97 (100)	662 (100)
<b>1996 Survey</b>								
White perch	-	-	9 (20.0)	27 (22.3)	4 (3.4)	257 (35.0)	13 (6.8)	284 (31.4)
Blue crab	-	-	-	-	22 (19.0)	146 (19.9)	22 (11.5)	146 (16.1)
Striped bass	1 (3.3)	1 (2.0)	3 (6.7)	3 (2.5)	20 (17.2)	105 (14.3)	24 (12.6)	109 (12.0)
Largemouth bass	11 (36.7)	26 (52.0)	4 (8.9)	38 (31.4)	6 (5.2)	10 (1.4)	21 (11.0)	74 (8.2)
Atlantic silverside	-	-	-	-	2 (1.7)	67 (9.1)	2 (1.0)	67 (7.4)
Bluefish	-	-	-	-	12 (10.3)	62 (8.4)	12 (6.3)	62 (6.9)
American eel	-	-	7 (15.6)	12 (9.9)	15 (12.9)	30 (4.1)	22 (11.5)	42 (4.6)
White catfish	-	-	6 (13.3)	14 (11.6)	12 (10.3)	21 (2.9)	18 (9.4)	35 (3.9)
Smallmouth bass	10 (33.3)	14 (28.0)	4 (8.9)	7 (5.8)	4 (3.4)	4 (0.5)	18 (9.4)	25 (2.8)
Bluegill	5 (16.7)	6 (12.0)	5 (11.1)	5 (4.1)	5 (4.3)	13 (1.8)	15 (7.9)	24 (2.7)
Brown bullhead	-	-	3 (6.7)	7 (5.8)	1 (0.9)	1 (0.1)	4 (2.1)	8 (0.9)
Carp	-	-	-	-	4 (3.4)	6 (0.8)	4 (2.1)	6 (0.7)
Golden shiner	1 (3.3)	1 (2.0)	1 (2.2)	2 (1.7)	1 (0.9)	2 (0.3)	3 (1.6)	5 (0.6)
White sucker	1 (3.3)	1 (2.0)	-	-	3 (2.6)	3 (0.4)	4 (2.1)	4 (0.4)
Red hake	-	-	-	-	1 (0.9)	2 (0.3)	1 (0.5)	2 (0.2)
Freshwater drum	-	-	-	-	1 (0.9)	2 (0.3)	1 (0.5)	2 (0.2)
Yellow perch	-	-	-	-	1 (0.9)	1 (0.1)	1 (0.5)	1 (0.1)
Pumpkinseed	-	-	-	-	1 (0.9)	1 (0.1)	1 (0.5)	1 (0.1)
Brown trout	-	-	-	-	1 (0.9)	1 (0.1)	1 (0.5)	1 (0.1)
Rock bass	1 (3.3)	1 (2.0)	1 (2.2)	1 (0.8)	-	-	2 (1.0)	2 (0.2)
Northern pike	-	-	2 (4.4)	5 (4.1)	-	-	2 (1.0)	5 (0.6)
Total	30 (15.7)	50 (5.5)	45 (23.6)	121 (13.4)	116 (60.7)	734 (81.1)	191 (100)	905 (100)

<sup>1</sup> Ang is the number of anglers who had at least one of the species listed. The total is the number of anglers who caught fish (from Table C-7).

<sup>2</sup> n is the number of fish reported caught for that species.

Table C-9. Number of anglers who kept fish and number and weight of fish kept by anglers in 1996 survey.

Fish Species	Area 1			Area 2			Area 3			Total		
	Ang <sup>1</sup> (%)	n <sup>2</sup> (%)	Weight <sup>3</sup> (%)	Ang <sup>1</sup> (%)	n <sup>2</sup> (%)	Weight <sup>3</sup> (%)	Ang <sup>1</sup> (%)	n <sup>2</sup> (%)	Weight <sup>3</sup> (%)	Ang <sup>1</sup> (%)	n <sup>2</sup> (%)	Weight <sup>3</sup> (%)
White perch				2 (33.3)	7 (33.3)	211 (3.8)	37 (55.2)	227 (44.2)	15498 (25.6)	39 (44.8)	234 (41.9)	15709 (22.0)
White catfish				2 (33.3)	8 (38.1)	786 (14.0)	11 (16.4)	20 (3.9)	10512 (17.3)	13 (14.9)	28 (5.0)	11298 (15.8)
Striped bass	1 (7.1)	1 (4.2)	37 (0.7)				16 (23.9)	84 (16.4)	10068 (16.6)	17 (19.5)	85 (15.2)	10105 (14.2)
Carp							4 (6.0)	6 (1.2)	8209 (13.5)	4 (4.6)	6 (1.1)	8209 (11.5)
Largemouth bass	3 (21.4)	3 (12.5)	1605 (31.2)	1 (16.7)	2 (9.5)	2332 (41.5)	1 (1.5)	1 (0.2)	1348 (2.2)	5 (5.7)	6 (1.1)	5285 (7.4)
Smallmouth bass	7 (50.0)	11 (45.8)	2211 (42.9)	2 (33.3)	3 (14.3)	2242 (39.9)	1 (1.5)	1 (0.2)	648 (1.1)	10 (11.5)	15 (2.7)	5101 (7.1)
Bluefish							11 (16.4)	60 (11.7)	4954 (8.2)	11 (12.6)	60 (10.8)	4954 (6.9)
American eel				1 (16.7)	1 (4.8)	51 (0.9)	13 (19.4)	27 (5.3)	4139 (6.8)	14 (16.1)	28 (5.0)	4190 (5.9)
White sucker	1 (7.1)	1 (4.2)	192 (3.7)				2 (3.0)	2 (0.4)	2256 (3.7)	3 (3.4)	3 (0.5)	2448 (3.4)
Bluegill	5 (35.7)	6 (25.0)	818 (15.9)				4 (6.0)	11 (2.1)	1162 (1.9)	9 (10.3)	17 (3.0)	1980 (2.8)
Rock bass	1 (7.1)	1 (4.2)	87 (1.7)							1 (1.1)	1 (0.2)	87 (0.1)
Freshwater drum							1 (1.5)	2 (0.4)	634 (1.0)	1 (1.1)	2 (0.4)	634 (0.9)
Brown bullhead							1 (1.5)	1 (0.2)	323 (0.5)	1 (1.1)	1 (0.2)	323 (0.5)
Pumpkinseed							1 (1.5)	1 (0.2)	268 (0.4)	1 (1.1)	1 (0.2)	268 (0.4)
Brown trout							1 (1.5)	1 (0.2)	244 (0.4)	1 (1.1)	1 (0.2)	244 (0.3)
Atlantic silverside							2 (3.0)	67 (13.1)	213 (0.4)	2 (2.3)	67 (12.0)	213 (0.3)
Golden shiner	1 (7.1)	1 (4.2)	200 (3.9)				1 (1.5)	2 (0.4)	140 (0.2)	2 (2.3)	3 (0.5)	340 (0.5)
TOTAL	14 (16.1)	24 (4.3)	5150 (7.2)	6 (6.9)	21 (3.8)	5622 (7.9)	67 (77.0)	513 (91.9)	60616 (84.9)	87 (100)	558 (100)	71388 (100)

<sup>1</sup> Ang is number of anglers who had at least one of the species listed. The total is the number of anglers who kept fish (from Table C-7).

<sup>2</sup> n is number of fish reported caught for that species.

<sup>3</sup> Weight is sum of weights (in grams wet-weight) estimated from regressions on length as noted in Table C-10.

N.B. In Area 2, one angler had kept 5 white catfish, but the lengths were not recorded and weights could not be estimated.



Table C-10. List of regression equations used for calculating weights of Hudson River fishes.

<u>Species</u>	<u>Equation</u>	<u>Source</u>
American eel	$\ln \text{ wt(g)} = -14.631 + 3.253 \ln \text{ TL(mm)}$	Helfman <i>et al.</i> 1984- Georgia estuary
Atlantic silverside	$\log \text{ wt(g)} = -4.2538 + 2.5234 \log \text{ TL(mm)}$	Wilk <i>et al.</i> 1978 - New York Bight
Bluefish	$\log \text{ wt(g)} = -4.9533 + 3.0359 \log \text{ TL(mm)}$	Wilk <i>et al.</i> 1978 - New York Bight
Bluegill	$\log \text{ wt(g)} = -5.515 + 3.371 \log \text{ TL(mm)}$	Carlander 1977 - Pennsylvania
Brown bullhead	$\log \text{ wt(g)} = -5.061 + 3.065 \log \text{ TL(mm)}$	Carlander 1969 - p. 535
Brown trout		Use table, p. 213 in Carlander 1969
Carp	$\log \text{ wt(kg)} = 1.86 + 0.027 \text{ TL(cm)}$	Mongomery & Schmidt 1993 - Hudson River
Freshwater drum		Use table, p. 815 in Scott & Crossman 1972
Golden shiner		Use table, p 409 in Carlander 1969
Largemouth bass	$\log \text{ wt(g)} = -5.11 + 3.117 \log \text{ TL(mm)}$	DEC - Hudson River
Pumpkinseed	$\log \text{ wt(g)} = -5.213 + 3.262 \log \text{ TL(mm)}$	Carlander 1977 - Pennsylvania
Rock bass		Use table, p. 21-22 in Carlander 1977
Smallmouth bass	$\log \text{ wt(g)} = -5.53 + 3.248 \log \text{ TL(mm)}$	DEC - Hudson River
Striped bass	$\log \text{ wt(g)} = -5.019 + 3.028 \log \text{ TL(mm)}$	Hoff <i>et al.</i> 1988 - Hudson River
White catfish	$\log \text{ wt(g)} = 5.46 + 3.24 \log \text{ TL(mm)}$	Hughes & Carlson 1986 - Hudson River
White perch	$\log \text{ wt(g)} = -4.9513 + 3.0249 \log \text{ TL(mm)}$	Klauda <i>et al.</i> 1988 - Hudson River
White sucker	$\log \text{ wt(g)} = -3.885 + 2.5914 \log \text{ TL(mm)}$	Carlander 1969 - upstate New York

Table C-11. Reasons anglers gave for fishing.

**Primary reason**

	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)
<b>1991-92 Survey</b>				
Recreation	54 (96.4)	48 (96.0)	49 (81.7)	151 (91.0)
Food	1 (1.8)	1 (2.0)	9 (15.0)	11 (6.6)
Other	1 (1.8)	1 (2.0)	1 (1.7)	3 (1.8)
No response	-	-	1 (1.7)	1 (0.6)
TOTAL	56 (33.7)	50 (30.1)	60 (36.1)	166 (100)
<b>1996 Survey</b>				
Recreation	74 (97.4)	72 (94.7)	120 (84.5)	266 (90.5)
Food	-	-	18 (12.7)	18 (6.1)
Other	2 (2.6)	4 (5.3)	4 (2.8)	10 (13.2)
TOTAL	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)

**Any reason**

	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)
<b>1991-92 Survey</b>				
Recreation	56 (100)	49 (98.0)	57 (95.0)	162 (97.6)
Food	4 (7.1)	3 (6.0)	21 (35.0)	28 (16.9)
Other	2 (3.6)	2 (4.0)	3 (5.0)	7 (4.2)
TOTAL	56 (33.7)	50 (30.1)	60 (36.1)	166 (100)
<b>1996 Survey</b>				
Recreation	75 (98.7)	73 (96.1)	129 (90.8)	277 (94.2)
Food	-	-	67 (47.2)	67 (22.8)
Other	5 (6.6)	6 (7.9)	9 (6.3)	20 (6.8)
TOTAL	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)

*Recreation* included: recreation, socialize, be alone, enjoy outdoors.

*Food* included: food, get fish for friends.

*Other* included: get bait, reward for tags, other.

Table C-12. Use of fish caught by anglers.

Use	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Tossback								
Often	51 (91.1)	43 (86.0)	34 (57.6)	128 (77.6)	76 (100)	73 (96.1)	54 (38.0)	203 (69.0)
Sometimes	4 (7.1)	7 (14.0)	26 (44.1)	37 (22.4)	-	3 (3.9)	66 (46.5)	69 (23.5)
Rarely	-	-	-	-	-	-	16 (11.3)	16 (5.4)
Never	1 (1.8)	-	-	1 (0.6)	-	-	6 (4.2)	6 (2.0)
Eat								
Often	3 (5.4)	5 (10.0)	19 (32.2)	27 (16.4)	-	2 (2.6)	61 (43.0)	63 (21.4)
Sometimes	3 (5.4)	6 (12.0)	14 (23.7)	23 (13.9)	-	5 (6.6)	38 (26.8)	43 (14.6)
Rarely	5 (8.9)	3 (6.0)	8 (13.6)	16 (9.7)	-	8 (10.5)	19 (13.4)	27 (9.2)
Never	45 (80.4)	36 (72.0)	19 (32.2)	100 (60.6)	76 (100)	61 (80.3)	24 (16.9)	161 (54.8)
Give away								
Often	4 (7.1)	3 (6.0)	7 (11.9)	14 (8.5)	-	-	7 (4.9)	7 (2.4)
Sometimes	7 (12.5)	11 (22.0)	35 (59.3)	53 (32.1)	-	4 (5.3)	58 (40.8)	62 (21.1)
Rarely	3 (5.4)	4 (8.0)	8 (13.6)	15 (9.1)	-	6 (7.9)	28 (19.7)	34 (11.6)
Never	42 (75.0)	32 (64.0)	10 (16.9)	84 (50.9)	76 (100)	66 (86.8)	49 (34.5)	191 (65.0)
Sell								
Often	-	-	1 (1.7)	1 (0.6)	-	1 (1.3)	1 (0.7)	2 (0.7)
Sometimes	-	-	3 (5.1)	3 (1.8)	-	-	-	-
Rarely	-	-	3 (5.1)	3 (1.8)	-	1 (1.3)	3 (2.1)	4 (1.4)
Never	50 (89.3)	50 (100)	47 (79.7)	147 (89.1)	76 (100)	74 (97.4)	134 (94.4)	284 (96.6)
No Response	6 (10.7)	-	6 (10.2)	12 (7.3)	-	-	4 (2.8)	4 (1.4)
Fertilizer								
Often	-	-	1 (1.7)	1 (0.6)	-	-	-	-
Sometimes	2 (3.6)	1 (2.0)	2 (3.4)	5 (3.0)	-	2 (2.6)	1 (0.7)	3 (1.0)
Rarely	-	-	2 (3.4)	2 (1.2)	-	1 (1.3)	1 (0.7)	2 (0.7)
Never	54 (96.4)	49 (98.0)	55 (93.2)	158 (95.8)	76 (100)	73 (96.1)	139 (97.9)	288 (98.0)
No Response	-	-	-	-	-	-	1 (0.7)	1 (0.3)
Bait								
Often	4 (7.1)	3 (6.0)	2 (3.4)	9 (5.5)	-	3 (3.9)	8 (5.6)	11 (3.7)
Sometimes	15 (26.8)	12 (24.0)	23 (39.0)	50 (30.3)	-	11 (14.5)	41 (28.9)	52 (17.7)
Rarely	6 (10.7)	2 (4.0)	6 (10.2)	14 (8.5)	-	13 (17.1)	13 (9.2)	26 (8.8)
Never	31 (55.4)	33 (66.0)	29 (49.2)	93 (56.4)	76 (100)	49 (64.5)	79 (55.6)	204 (69.4)
No Response	-	-	-	-	-	-	1 (0.7)	1 (0.3)
Trash								
Often	-	-	-	-	-	-	-	-
Sometimes	-	-	1 (1.7)	1 (0.6)	1 (1.3)	1 (1.3)	3 (2.1)	5 (1.7)
Rarely	1 (1.8)	-	2 (3.3)	3 (1.8)	1 (1.3)	1 (1.3)	2 (1.4)	4 (1.4)
Never	55 (98.2)	50 (100)	57 (95.0)	161 (97.6)	74 (97.4)	74 (97.4)	137 (96.5)	285 (96.9)
TOTAL	56 (33.7)	50 (30.1)	60 (36.1)	166 (100)	76 (25.9)	76 (25.9)	142 (48.3)	294 (100)

Table C-13. How often anglers ate fish.

Meals in last month	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
0	9 (81.8)	12 (85.7)	13 (31.7)	34 (51.5)	-	9 (60.0)	25 (21.2)	34 (25.6)
1	-	1 (7.1)	8 (19.5)	9 (13.6)	-	2 (13.3)	17 (14.4)	19 (14.3)
2	-	1 (7.1)	8 (19.5)	9 (13.6)	-	3 (20.0)	18 (15.3)	21 (15.8)
3	-	-	2 (4.9)	2 (3.0)	-	-	12 (10.2)	12 (9.0)
4	1 (9.1)	-	2 (4.9)	3 (4.5)	-	-	6 (5.1)	6 (4.5)
5	1 (9.1)	-	-	-	-	-	6 (5.1)	6 (4.5)
6	-	-	-	-	-	-	4 (3.4)	4 (3.0)
7	-	-	1 (2.4)	1 (1.5)	-	-	3 (2.5)	3 (2.3)
8	-	-	2 (4.9)	2 (3.0)	-	-	5 (4.2)	5 (3.8)
10	-	-	4 (9.8)	4 (6.1)	-	1 (6.7)	9 (7.6)	10 (7.5)
12	-	-	-	-	-	-	7 (5.9)	7 (5.3)
15	-	-	-	-	-	-	2 (1.7)	2 (1.5)
20	-	-	-	-	-	-	4 (3.4)	4 (3.0)
30	-	-	1 (2.4)	1 (1.5)	-	-	-	-
0-1	9 (81.8)	13 (92.9)	21 (51.2)	43 (65.2)	-	11 (73.3)	42 (35.6)	53 (39.8)
>1	2 (18.2)	1 (7.1)	20 (48.8)	23 (34.8)	-	4 (26.7)	76 (64.4)	80 (60.2)
TOTAL	11 (16.7)	14 (21.2)	41 (62.1)	66 (100)	-	15 (11.3)	118 (88.7)	133 (100)

1991-92 Median consumer = 0 meals per month  
 1991-92 95<sup>th</sup> percentile consumer = 10 meals per month

1996 median consumer = 2 meals per month.  
 1996 95<sup>th</sup> percentile consumer = 12 meals per month

Meals in last week	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
0	9 (81.8)	12 (85.7)	22 (53.7)	43 (65.2)	-	13 (86.7)	63 (53.4)	76 (57.1)
1	1 (9.1)	1 (7.1)	8 (19.5)	10 (15.2)	-	-	30 (25.4)	30 (22.6)
2	1 (9.1)	1 (7.1)	5 (12.2)	7 (10.6)	-	1 (6.7)	19 (16.1)	20 (15.0)
3	-	-	3 (7.3)	3 (4.5)	-	1 (6.7)	2 (1.7)	3 (2.3)
4	-	-	1 (2.4)	1 (1.5)	-	-	3 (2.5)	3 (2.3)
5	-	-	1 (2.4)	-	-	-	-	-
6	-	-	-	-	-	-	1 (0.8)	1 (0.8)
7	-	-	1 (2.4)	1 (1.5)	-	-	-	-
0-1	10 (90.9)	13 (92.9)	30 (73.2)	53 (80.3)	-	13 (86.7)	93 (78.8)	106 (79.7)
>1	1 (9.1)	1 (7.1)	11 (26.8)	13 (19.7)	-	2 (13.3)	25 (21.2)	27 (20.3)
TOTAL	11 (16.7)	14 (21.2)	41 (62.1)	66 (100)	-	15 (11.3)	118 (88.7)	133 (100)

1991-92 Median consumer = 0 meals per week  
 1991-92 95<sup>th</sup> percentile consumer = 3 meals per week

1996 median consumer = 0 meals per week  
 1996 95<sup>th</sup> percentile consumer = 3 meals per week

Table C-14. What anglers think recipients do with fish given to them.

Expected use	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Eat fish	8 (57.1)	15 (83.3)	47 (94.0)	70 (85.4)	-	10 (76.9)	85 (91.4)	95 (89.6)
Use as bait	1 (7.1)	-	-	1 (1.2)	-	-	1 (1.1)	1 (0.9)
Fertilizer	-	-	-	-	-	-	1 (1.1)	1 (0.9)
DK / NR <sup>1</sup>	5 (35.7)	3 (16.7)	3 (6.0)	11 (13.4)	-	3 (23.1)	6 (6.5)	6 (5.7)
TOTAL	14 (17.1)	18 (22.0)	50 (61.0)	82 (100)	-	13 (12.3)	93 (87.7)	106 (100)

<sup>1</sup> DK / NR - Don't know / No response.

Table C-15 Anglers who said they gave fish away but did not themselves eat the fish.

Eat fish	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Yes	5 (35.7)	10 (55.6)	35 (70.0)	50 (61.0)	-	6 (46.2)	89 (95.7)	95 (89.6)
No	9 (64.3)	8 (44.4)	15 (30.0)	32 (39.0)	-	4 (30.8)	4 (4.3)	8 (7.5)
TOTAL	14 (17.1)	18 (22.0)	50 (61.0)	82 (100)	-	10 (9.7)	93 (90.3)	103 (100)

Table C-16. Distribution of relatives and friends with whom anglers shared fish.

Group	1991-1992 Survey				1996 Survey			
	Area 1	Area 2	Area 3	Total	Area 1	Area 2	Area 3	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Anglers								
Shared fish	4 (36.4)	8 (57.1)	30 (73.2)	42 (63.6)	-	8 (53.3)	82 (69.5)	90 (67.7)
Total	11 (16.7)	14 (21.2)	41 (62.1)	66 (100)	-	15 (11.3)	118 (88.7)	133 (100)
Recipients								
Women <15	2 (15.4)	3 (13.0)	1 (1.7)	6 (6.3)	-	-	22 (22.4)	22 (20.4)
Women 15-49	2 (15.4)	4 (17.4)	18 (30.0)	24 (25.0)	-	3 (30.0)	19 (19.4)	22 (20.4)
Women >49	1 (7.7)	1 (4.3)	8 (13.3)	10 (10.4)	-	3 (30.0)	9 (9.2)	12 (11.1)
Men <15	4 (30.8)	2 (8.7)	6 (10.0)	12 (12.5)	-	2 (20.0)	24 (24.5)	26 (24.1)
Men >=15	2 (15.4)	8 (34.8)	18 (30.0)	28 (29.2)	-	1 (10.0)	16 (16.3)	17 (15.7)
Others <sup>1</sup>	2 (15.4)	5 (21.7)	9 (15.0)	16 (16.7)	-	1 (10.0)	8 (8.2)	9 (8.3)
High risk group <sup>2</sup>	8 (61.5)	9 (39.1)	25 (41.7)	42 (43.8)	-	5 (50.0)	65 (66.3)	70 (64.8)
TOTAL	13 (13.5)	23 (24.0)	60 (62.5)	96 (100)	-	10 (9.3)	98 (90.7)	108 (100)

<sup>1</sup> Others are those for whom the gender was not specified in the responses.<sup>2</sup> High risk group is women of childbearing age (age 15-49) and children less than age 15 (<15).

Table C-17. PCB levels in selected fish species from Hudson River from 1992-96.

Location/Fish Species	1992	1993	1994	1995	1996	Average
<b>Hudson Falls to Troy (RM 154-196)</b>						
American eel	33.70(1)	-	-	-	-	33.70(1)
Black crappie	24.77(17)	21.81(40)	-	-	-	22.69(57)
Brown bullhead	13.35(44)	14.85(17)	14.05(34)	10.81(39)	7.04(9)	12.61(143)
Carp/Goldfish	68.11(18)	73.28(4)	49.74(7)	35.64(12)	108.78(4)	60.67(45)
Largemouth bass	11.94(52)	25.41(40)	13.58(39)	15.81(40)	10.08(28)	15.49(199)
Northern pike	7.23(17)	25.82(5)	3.20(1)	-	-	11.10(23)
Pumpkinseed	7.75(37)	21.29(6)	-	5.13(4)	-	9.26(47)
Pumpkinseed (yearling)	-	12.37(51)	13.25(60)	7.59(40)	8.06(61)	10.48(212)
Rock bass	3.70(10)	-	-	-	-	3.70(10)
Smallmouth bass	8.02(27)	-	-	-	-	8.02(27)
Walleye	22.35(6)	3.50(2)	-	-	-	17.64(8)
White perch	6.31(21)	-	-	-	-	6.31(21)
Yellow bullhead	-	9.58(4)	7.16(5)	-	10.73(2)	8.69(11)
Yellow perch	7.19(34)	40.52(24)	-	-	-	20.98(58)
<b>Troy to Catskill (RM 110-154)</b>						
American eel	5.92(20)	6.95(21)	-	-	-	6.45(41)
Atlantic shad	0.62(15)	0.67(7)	-	-	-	0.64(22)
Black crappie	2.20(13)	2.70(5)	-	-	-	2.34(18)
Blue crab (hepatopancreas)	5.01(3)	-	-	-	-	5.01(3)
Blue crab (muscle)	0.05(6)	-	-	-	-	0.05(6)
Blue crab (whole)	0.73(3)	-	-	-	-	0.73(3)
Blueback herring	1.25(14)	-	-	-	-	1.25(14)
Brown bullhead	3.11(2)	4.99(5)	-	3.78(20)	3.15(4)	3.85(31)
Carp/Goldfish	9.21(6)	3.92(4)	-	-	-	7.09(10)
Largemouth bass	4.16(19)	6.93(18)	7.15(20)	3.95(40)	3.71(23)	4.92(120)
Pumpkinseed	1.85(15)	-	-	-	-	1.85(15)
Pumpkinseed (yearling)	-	3.07(3)	3.11(10)	3.65(16)	2.00(12)	2.99(41)
Red-breasted sunfish	2.85(9)	-	-	-	-	2.85(9)
Rock bass	1.09(2)	0.10(1)	-	-	-	0.76(3)
Smallmouth bass	5.53(27)	11.81(17)	10.79(20)	-	3.57(20)	7.59(84)
Striped bass	7.91(30)	7.83(38)	5.00(50)	5.32(81)	3.13(34)	5.68(233)
Tiger muskellunge	-	4.42(9)	-	-	-	4.42(9)
Walleye	4.66(2)	8.46(2)	-	-	-	6.56(4)
White catfish	8.84(10)	8.80(1)	-	-	-	8.84(11)
White perch	7.05(20)	2.77(40)	3.08(39)	1.89(20)	4.20(39)	3.63(158)
Yellow perch	2.36(13)	1.27(18)	0.56(10)	-	-	1.44(41)
<b>Catskill to Tappan Zee (RM 24-110)</b>						
American eel	4.69(18)	-	-	-	-	4.69(18)
Atlantic shad	0.43(10)	0.51(2)	-	-	-	0.44(12)
Atlantic sturgeon	-	2.64(1)	2.72(5)	-	-	2.71(6)
Atlantic tomcod	0.30(10)	-	-	-	-	0.30(10)
Black crappie	1.34(2)	-	-	-	-	1.34(2)
Blue crab (hepatopancreas)	7.03(21)	11.31(8)	-	-	-	8.21(29)
Blue crab (muscle)	0.09(21)	0.06(8)	-	-	-	0.08(29)
Blueback herring	0.80(19)	-	-	-	-	0.80(19)
Bluefish	6.07(5)	-	-	-	-	6.07(5)
Pumpkinseed	-	1.48(3)	-	-	-	1.48(3)
Pumpkinseed (yearling)	0.84(21)	0.98(14)	2.22(23)	-	1.19(12)	1.38(70)
Striped bass	2.66(157)	2.89(171)	1.91(225)	1.74(174)	1.84(132)	2.20(859)
White catfish	7.96(23)	-	-	-	-	7.96(23)
White perch	3.85(22)	-	-	-	-	3.85(22)
Yellow perch	-	1.14(20)	-	-	-	1.14(20)

Data from Ron Sloan, NYSDEC, on January 20, 1999. The data files are checked and updated periodically for completeness and accuracy. Values are PCB concentrations as micrograms per gram wet weight (parts per million or ppm) with the number of individual fish analyzed in parenthesis. Except where noted, PCB analyses were performed on standard filets, quantified as Aroclors and summed. The average PCB is sample-weighted. Fish that exceed the US Food and Drug Administration tolerance of 2 ppm cannot be sold in the marketplace.



## Appendix D - Chronology of PCB Actions Regarding Hudson River Fisheries

<u>Date</u>	<u>Action</u>
3/18/72	Proposed PCB tolerance level of 5.0 ppm in fish flesh - US Food and Drug Administration (FDA) action. [37 FR 5705-5707]
12/6/74	Temporary tolerance level of 5.0 ppm adopted by FDA for fish. [39 FR 42746-42748]
Fall 1975	Finding of elevated PCB levels in Hudson River fish.
2/25/76	New York State Department of Environmental Conservation (NYS DEC) Regulation (6 NYCRR 12.19) adopted prohibiting taking and possession of fish in the Hudson River and its tributaries to the first impassable falls from Fort Edward to the Federal dam at Troy. Taking of American eel prohibited throughout Hudson River. Health advisories issued concurrently.
2/26/76	Amended 6 NYCRR 12.19 to permit sale of commercially taken Atlantic sturgeon over four feet in length, goldfish and American shad.
7/14/76	The taking and sale of bait-fish in the estuarine portion of the Hudson River permitted; includes bait fish as defined in regulation plus anchovies, killifish and silversides.
7/19/76	Menhaden added as bait fish in 6 NYCRR 12.19.
4/1/77	FDA proposed lowering the temporary tolerance level for PCB in fish from 5.0 ppm to 2.0 ppm. [42 FR 17487-17494]
10/14/77	Taking of American eel in Harlem and East Rivers prohibited (6 NYCRR 12.15). Renumbered to 6 NYCRR 11.2 on 8/22/78.  Renumbered and divided regulations on Hudson River fisheries 6 NYCRR 12.19 becomes 6 NYCRR 11.4 for striped bass and 6 NYCRR 11.2 for other Hudson fisheries.
3/10/78	PCB "hotspot" dredging proposal announced by DEC.
7/25/78	Data for collections of fish before and after termination of PCB discharges publically released by DEC. No significant change noted. PCB levels found to be up to 50 times the temporary tolerance level of 5.0 ppm.
11/10/78	Blueback herring, alewife, Atlantic tomcod and blue crab removed from commercial fishing closure. Striped bass commercial closure reaffirmed.



<u>Date</u>	<u>Action</u>
6/29/79	FDA announced final rule of 2.0 ppm PCB in fish effective 9/28/79. [44 FR 38330]
10/5/79	FDA confirmed date of final rule for PCBs in foods, but stayed final tolerance for fish and shellfish pending hearings. [44 FR 57389]
5/1/81	FDA announced hearings on "magnitude of the human food loss" from reduction of tolerance. [46 FR 24551-24553]
6/10/81	NYS DOH issued health advisory for blue crabs due to cadmium and PCB contamination.
10/9/81	Striped bass commercial fishing closure reaffirmed based on 1981 spring collections.
2/23/82	Emergency regulation enacted to permit taking and sale of American eel to foreign countries. Strict limitations placed on sales and foreign certification of acceptance.  Commercial fishing regulation (6 NYCRR 11.2) restructured to allow all species except white catfish, white perch, carp (except as bait), and goldfish (except as ornamentals). Commercial fishing for striped bass remains prohibited under 6 NYCRR 11.4.
3/9/82	US FDA announced availability of initial decision (issued 2/8/82) regarding reduction of PCB tolerance for fish and shellfish. [47 FR 10079-10080]
4/29/82	Emergency regulation which permitted the taking and sale of American eel to foreign countries expired. All certifications were found to be unacceptable. Remainder of the restructured regulation (6 NYCRR 11.2) made permanent.
10/15/82	Striped bass commercial fishing closure reaffirmed based on PCB data from spring 1982. Findings of dibenzofurans (a contaminant of PCB) and 2,3,7,8-TCDD (dioxin) in striped bass also announced.
12/13/82	Commercial fishing restrictions and health advisories announced by New Jersey for New Jersey portions of Hudson River and New York Harbor. Restrictions essentially echo New York restrictions.
12/30/82	EPA Administrator Anne Gorsuch announced withholding \$20 million allocated by Congress from New York for PCB dredging project. Commissioner Robert Flacke denounced action.

<u>Date</u>	<u>Action</u>
10/11/83	Contaminant study of waterfowl from Hudson River and other state waters announced. Study to be completed in 1985.
11/15/83	Striped bass commercial fishing closure in Hudson River again reaffirmed. Future fishing regulations for striped bass discussed with commercial fishermen. PCB levels close to the PCB temporary tolerance level of 5.0 ppm.
5/10/84	Federal funds for PCB cleanup released in an agreement that ends state lawsuit against EPA. Agreement signed in US District Court in Manhattan. Another suit for same cause had been filed by several environmental groups and the Hudson River Fishermen's Association.
5/22/84	FDA announced adoption of new PCB tolerance level for fish of 2.0 ppm, effective August 20, 1984. [49 FR 21514-21529]
6/25/84	Based on elevated PCB levels, NYS DOH added advisory to EAT NONE for carp and goldfish taken from the Hudson between Troy and Catskill.
11/15/84	NYS DOH added advisories for several Hudson River species, based on reduction of the PCB tolerance to 2 ppm.
11/30/84	Emergency regulation (6 NYCRR 36.1) prohibited use of any gill nets in Hudson River during striped bass closed season (12/1-3/14). Regulation made permanent on 2/15/85.
2/8/85	6 NYCRR 11.2 amended to prohibit commercial fishing for several additional minor fisheries (black crappie, brown bullhead, and pumpkinseed).
3/31/85	Governor Mario Cuomo announced several actions to be taken regarding striped bass in Marine District. They include: closing commercial fisheries in New York Harbor, the New York Bight and waters off western Long Island, a certification and tagging program for striped bass caught off eastern Long Island, restrictive health advisories for all striped bass, and a program of financial assistance to affected commercial fishermen.
5/1/85	Emergency regulations (6 NYCRR 11.5, 11.6 and 43.1) filed effective 5/8/85 to implement regulation of commercial harvest and sale of striped bass. Refilled on 7/12/85, 9/10/85 and 11/7/85.
5/2/85	Details of the striped bass certification and tagging program announced for eastern Long Island commercial striped bass fishery. New intensive PCB study formalized for striped bass.

<u>Date</u>	<u>Action</u>
2/18/86	New Policy on Contaminants in Fish adopted by NYS DEC. Policy formalizes NYS DEC procedures when contaminants are found in recreational and commercial fisheries.
4/18/86	Public meetings announced to discuss new findings of PCB in striped bass in the Marine District and potential regulatory alternatives.
5/5/86	Emergency regulation filed, effective 5/8/86, to prohibit all possession and sale of striped bass in New York. 6 NYCRR 11.3, 11.4, 11.5 and 11.6 consolidated into 6 NYCRR 11.3. 6 NYCRR 43.1 amended. Emergency regulation extended on 7/3/86.
7/15/86	Permanent regulation adopted prohibiting commercial and recreational taking, possession and sale of striped bass statewide. 6 NYCRR 11.3 and 43.1 consolidated into 6 NYCRR 11.3.
7/13/87	NYS DOH added advisories to EAT NONE for walleye and striped bass and EAT NO MORE THAN A MEAL PER MONTH for bluefish, northern pike taken from Troy to and including the New York Harbor.
6/21/88	NYS DOH added advisory to EAT NO MORE THAN A MEAL PER MONTH for bluefish from marine waters.
4/16/92	NYS DOH revised advisories for the Hudson south of the Troy dam for (1) black crappie, brown bullhead and pumpkinseed to EAT NO MORE THAN ONE MEAL PER WEEK from eat no more than one meal per month and (2) walleye and largemouth bass to EAT NO MORE THAN ONE MEAL PER MONTH from eat none. An advisory for smallmouth bass was added to EAT NO MORE THAN ONE MEAL PER MONTH. The advisory was revised for striped bass from the Tappan Zee Bridge south to and including the New York Harbor to EAT NO MORE THAN ONE MEAL PER MONTH from eat none. These changes were in response to new data which showed decreases in PCB levels.
7/20/93	Renumbered 6 NYCRR 36.1 which prohibited use of any gill nets in Hudson River during striped bass closed season (12/1-3/14) to 6 NYCRR 36.3.
4/21/94	NYS DOH revised advisories for the Hudson River between Troy and Catskill to EAT NONE for all species except American shad and to EAT NO MORE THAN A MEAL PER MONTH for most species from the Hudson south of Catskill. New data showed that PCB levels had increased in most species. Simplified advisory format was adopted to more clearly describe the advisories.
4/19/95	NYS DEC Commissioner Zagata requested that NYS DOH review the public health implications of allowing catch-and-release fishing in the Hudson River between Hudson Falls and Troy.

<u>Date</u>	<u>Action</u>
5/1/95	NYS DOH Commissioner DeBuono certified that there is "no compelling public health reason for keeping the Upper Hudson River closed to recreational fishing."
5/18/95	NYS DOH changed advisory for Hudson River south of Catskill from "all species" to species-by-species advisory to remove confusion regarding several salt water fish that are found in these waters. Added a clear definition for the waters of the New York Harbor where advisories apply.
5/31/95	Governor Pataki announced NYS DEC proposal to amend 6 NYCRR 10.3 and 11.2 to permit catch-and-release fishing in the Hudson River between Hudson Falls and Troy.
6/14/95	NYS DEC proposed to amend 6 NYCRR 10.3 and 11.2 to permit catch-and-release fishing in the Hudson River between Hudson Falls and Troy.
7/31/95	Comment period on the proposed amendment closed after two public meetings and hearings on 7/17 and 7/24.
8/30/95	Effective date of 6 NYCRR 10.3 and 11.2 to permit recreational catch-and-release fishing on the Hudson River between Hudson Falls and Troy.
4/4/96	NYS DOH revised advisory for striped bass taken from Jamaica Bay from eat no more than one meal per month to EAT NO MORE THAN ONE MEAL PER WEEK.

-modified from an original by  
Lawrence C. Skinner  
and Edward G. Horn  
of August 11, 1986  
November, 1998



## Appendix E - Interim Public Health Hazard Categories

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
<b>A. Urgent Public Health Hazard</b> This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.
<b>B. Public Health Hazard</b> This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.
<b>C. Indeterminate Public Health Hazard</b> This category is used for sites in which "critical" data are <i>insufficient</i> with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.
<b>D. No Apparent Public Health Hazard</b> This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.
<b>E: No Public Health Hazard</b> This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.	Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	

\*Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.



## Appendix F - Summary of Public Comments and Responses

This summary was prepared to address comments and questions on the public comment draft of the Hudson River Health Consultation. The public was invited to review the draft during the public comment period, which ran from March 19, 1999 to May 1, 1999. We received two written comments, one from an angler and the other from a public agency. Similar comments were consolidated or grouped together and some statements reworded to clarify the comment. If you have any questions about this summary, you may contact the New York State Department of Health's (NYS DOH) Outreach Unit at the toll free number: 1-800-458-1158, extension 27530.

**Comment #1** - Why does this report extend into other bodies of water? It appears that you are trying "guilt by association" as a scare tactic.

**Response #1** - This report commented on findings from a previous, similar study that surveyed anglers in the same part of the Hudson River but also interviewed anglers further south to the Battery and into New York City Harbor waters. The health advisories for eating fish from the Hudson River south the Tappan Zee Bridge and the New York City Harbor waters are the same as for the Hudson north of the Tappan Zee Bridge to Catskill because PCB contamination of fish is similar throughout this part of the Hudson and the New York City Harbor.

**Comment #2** - Presentation of statistical analysis makes the report less readable.

**Response #2** - The report was prepared for an audience with a variety of backgrounds. The summary avoided statistical jargon to improve readability for the general public.

**Comment #3** - The NYS DOH is using old and outdated data. Table C-17 displays PCB data for selected fish species from 1992-1996. Newer data would show that fish are safe to eat.

**Response #3** - The survey was conducted in 1996. The most recent PCB data available when the data were being analyzed were also from 1996. Because many species were not sampled in 1994-1996, we included data from earlier years to show the PCB levels in the variety of species that were sampled (see Table C-17 in the report).

**Comment #4** - PCB levels in crab meat were last measured at 0.06 ppm PCB and the advisory is to eat no more than six crabs per week. Atlantic shad were 0.51 ppm yet the advice is to eat as much as you want. How is this possible?

**Response #4** - Blue crabs are also contaminated with cadmium. The advisory for blue crabs is based primarily on the cadmium contamination. The health advisory notes that no one should eat more than one meal per week of fish from any fresh water, the Hudson estuary and a number of other waters around New York City. Atlantic shad are covered by this advice. Women of childbearing age, infants and children under the age of 15 are advised to not eat any fish from the Hudson estuary, including Atlantic shad. However, the advisory does note that

"[a] few meals of Hudson River shad meat and roe, especially using cooking and trimming methods that minimize PCB content, would not pose an unacceptable health risk for women of childbearing age and children, assuming this is their only significant exposure to PCBs."

**Comment #5** - Table C-17 should be expanded greatly by species, parts of fish and section of river (including Tappan Zee to the Battery) so fishermen can judge the validity of the NYS DOH health advisories.



**Response #5** - For 1992-1996 and the portion of the Hudson surveyed, no other fish species were sampled than those listed in Table C-17. For most of the species listed, fish were collected from only one or two locations within each of the three reaches presented in the Table. For some individual locations within the areas that were combined for Table C-17, the number of analyses are limited and therefore the data may not represent the actual levels of PCB contamination. This table was included to show that many fish from the Hudson are significantly contaminated with PCBs. As noted in the footnote to Table C-17, the samples were standard filets (edible portions) of individual fish. With the exception of blue crabs, other parts of the fish have not been analyzed and few data are available. Samples that were analyzed as whole fish were not included in the Table as most people do not eat the whole fish.

**Comment #6** - It would be helpful to clarify that this Health Consultation is not a health risk assessment and to move the objectives section prior to the background section.

**Response #6** - The Environmental Contamination section has been renamed to "Environmental Contamination and Health Concerns" and a statement has been added to clearly state that a quantitative health risk assessment is beyond the scope of this report. The background discussion and description of community health concerns are presented first to provide the rationale for the study objectives.

**Comment #7** - Comparison values should be incorporated in the appendices to aid in interpretation of the sampling results.

**Response #7** - A newly renamed section "Environmental Contamination and Health Concerns" now includes a brief discussion of health concerns associated with exposure to PCBs such as from eating fish from the Hudson River. Reference to the United States Food and Drug Administration (FDA) tolerance level for PCBs in fish has been added to this newly renamed section and to the footnote in Table C-17. Appendix D already includes the administrative history of the FDA tolerance level (see p. 44 [3/18/72, 12/6/74, 4/1/77], p. 45 [6/29/79, 10/5/79, 3/9/82] and p. 46 [5/22/84]).

**Comment #8** - A summary of PCB standards, monitoring activities and when PCB fish sampling was performed for the Hudson River and by whom should be added to the report.

**Response #8** - As explained in Response #7, reference to the FDA tolerance level has been added to the report. The newly renamed section "Environmental Contamination and Health Concerns" explains in somewhat more detail the nature and extent of fish monitoring efforts on the Hudson River.

**Comment #9** - Have there been any outbreaks of food-borne diseases from eating fish from the Hudson River?

**Response #9** - Outbreaks of food-borne diseases from seafood are generally caused by eating inadequately cooked shellfish contaminated with bacteria, viruses or other microorganisms. Fish are rarely a source of these outbreaks.

**Comment #10** - Information about background levels of PCBs in fish in the Hudson River, how often levels are monitored, clean-up efforts and health effects associated with eating PCB-contaminated fish at various levels should be available in a Fact Sheet format for the public.

**Response #10** - Numerous fact sheets describing the clean-up efforts have been prepared by the US Environmental Protection Agency and NYS Department of Environmental Conservation. The health advisory booklet issued by NYS DOH includes a section describing potential health concerns associated with eating fish contaminated with PCB and other contaminants. The ATSDR has published a Toxicological Profile for PCBs that includes a Fact Sheet format discussion of health concerns related to PCB exposure including exposure from eating PCB-contaminated fish.

**Comment #11** - Are there any plans to conduct a similar study in the Hudson River south of the Tappan Zee Bridge and the New York City metropolitan area?

**Response #11** - At this time, the NYS DOH is not planning to conduct a similar systematic survey of anglers in the Hudson River south of the Tappan Zee Bridge and the New York City metropolitan area. However, we are focusing on educating people who may be eating fish from the Hudson and New York City metropolitan area waters about the fish advisory.

In an effort to reduce the costs of printing and postage,  
please notify us if you wish your name to be deleted  
from our mailing list or if your address has changed.

New York State Department of Health  
Center for Environmental Health  
Outreach Unit  
547 River Street, Room 316  
Troy, NY 12180-2216  
1-800-458-1158, Ext. 27530  
(518) 402-7530