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Final Report for

**CHESAPEAKE BAY ANGLER INTERVIEWS**

**IDENTIFYING POPULATIONS AT RISK FOR CONSUMING  
CONTAMINATED FISH IN THREE REGIONS OF CONCERN**

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## I. INTRODUCTION AND REVIEW OF LITERATURE

### Introduction

The Chesapeake Bay is North America's largest estuary, and its watershed extends to parts of six states and the District of Columbia (CBP, 2002). The bay's complex ecosystem, unique habitats, and beautiful scenery make it an important ecological and economic entity. For this reason, the human population in many areas surrounding the Chesapeake Bay has risen steadily for the past 300 years (Mertz, 2003). Several large cities such as Baltimore, Washington, DC, and Norfolk have developed along its shores and they owe a substantial portion of their economies to the resources of the Chesapeake Bay and its tributaries.

One such resource is an abundance of recreational opportunities, the most prominent of which is sport fishing (VA Gen. Assembly, Biennial report, 2000). Anglers on non-commercial fishing boats navigate the bay and its rivers daily, and dozens of public parks and piers also give access to shore anglers. Many of these fishermen practice catch and release fishing methods, but state regulations allow anglers to keep a limited number of certain fish each day. These per-day limit regulations, along with similar size restrictions, are primarily in place to help preserve the fish population for future recreational use (Potomac River Fisheries Commission, 2002).

However, as the human population has increased in the region, so too has the pollution in the Chesapeake Bay and its tributaries. Polluted waterways often result in unhealthy contaminant levels in fish, which can be harmful to humans who ingest them. States, therefore, also issue health advisories that recommend limitations on the consumption of certain fish caught from the bay and its tributaries. These advisories inform the public of the potential dangers of consuming the fish that they catch from contaminated waters. Advisories act as guidelines to notify the public about which fishing areas, fish species, and meal sizes and frequencies can pose threats to human safety.

Much literature exists about the increased risks certain populations face from eating fish that have accumulated contaminants in their bodies. Mercury, Kepone, polychlorinated biphenyls (PCBs), and Chlordane are four of the most widespread and pertinent pollutants found in the Chesapeake Bay's tributaries. High mercury levels can disrupt nervous system function in the elderly and cause developmental delays in children (EPA Mercury Update, 2001). Further, fetuses can incur brain damage from maternal ingestion of foods containing elevated levels of PCB and mercury (EPA PCB Update, 1999). Kepone and Chlordane, synthetic chemicals of concern for James River (Kepone) and Potomac River (Chlordane), is believed to have neurological and carcinogenic effects. Any contaminated fish has the ability to transmit dangerous toxins through ingestion, and the risk is believed to increase as the quantity consumed increases.

The purpose of this project is twofold. First, it identifies the populations of anglers in three selected areas of the Chesapeake Bay watershed that are at the greatest risk of consuming contaminated fish based on their race, education, income, and other demographic information, and will assess the nature of the associated risks. Secondly,

the project analyzes the methods by which each of these three regions disseminates advisory information to anglers and identifies areas of success and opportunities for improvement.

Developing a better knowledge of the communities and people most threatened by contaminated fish can help managers better educate those communities through more effective health advisories. By identifying the socioeconomic and demographic populations most likely to consume self-caught fish or provide it to their families, and combining that information with data on successful angler communication methods, public health officials and fisheries managers can better develop and disseminate effective fish consumption advisories in areas with polluted waters.

### **Contaminant Information**

#### *Mercury*

(Information retrieved from EPA Fact Sheet, 2001)

Mercury is addressed in fish consumption advisories more often than any other substance; almost eighty percent of all advisories involve warnings about mercury. The element is found naturally in the environment in air, water, and soils, but human activity has significantly added to those natural levels. In the United States, 87% of mercury emissions originate from solid waste incineration and fossil fuels combustion facilities. Other sources include mining, industrial processes, and cement production. Releases into Chesapeake Bay waterways can occur directly from any of the above sources, or indirectly through precipitation from the atmosphere.

In freshwater rivers, 90-100% of the mercury found in fish tissue is an organic form called methylmercury. Methylmercury binds to the proteins in fish muscle, which is problematic for those consuming the fish because skinning and trimming it often do not significantly reduce the mercury concentration. Mercury bioaccumulates in the fish food chain so that, over time, fish at the top of the food chain – species such as pike and bass in freshwater streams and striped bass in saltwater – can amass a concentration of methylmercury up to ten million times greater than the surrounding water. The most common source of mercury exposure for humans is dietary, and fish and shellfish can contain up to ten thousand times more mercury than other foods.

The Environmental Protection Agency (EPA) has indicated that consumers eating less than ten grams of fish and shellfish per day with mercury concentrations between 0.1 and 0.15 ppm are not considered to be in danger. Eating more than this however, or eating fish with elevated levels of contamination, increases exposure and risk. The populations believed to be most vulnerable to hazards from mercury consumption are young children and women who are or may become pregnant or nursing, and for this reason many states issue “no consumption” advisories for these groups. Since bioaccumulation occurs in humans as well as fish, women can pass accumulated mercury on to fetuses through ingestion and to infants through nursing.

*Polychlorinated Biphenyls (PCBs)*

(Information retrieved from EPA Fact Sheet, 1999)

Polychlorinated biphenyls (PCBs) are a group of synthetic organic chemicals that were banned from production in the United States in 1979. Although there are no known natural sources, PCBs remain pervasive in the environment because of their previous widespread use and persistence in nature. They have been detected in soils, water, air, and plant and animal tissues. The cycling of PCBs most commonly involves evaporation from soil and then redeposition into surface waters through rainfall. Like methylmercury, PCBs are highly soluble. However, whereas mercury binds to the muscle tissues of fish, PCBs rapidly collect in the fat cells of aquatic organisms, with species at the top of the food chain accumulating the highest concentrations. PCB levels in high order fish may be two million times greater than in the surrounding water.

Like mercury, consumption of fish and shellfish is also the greatest source of human PCB exposure. For this reason, twenty-seven percent of fish consumption advisories in the U.S. involve PCB warnings as of 1999, a percentage second only to mercury. Since most PCBs accumulate in the fatty tissues of fish (belly and subcutaneous fat, the lateral line region, dark muscle, and internal organs), the proper removal of skin, fat, and internal organs prior to cooking can significantly reduce the amount of contamination consumed. When PCB levels in fish are around 0.05 ppm, three eight-ounce meals can safely be consumed per month, according to the EPA. However, “no consumption” advisories are still issued by some states for children and women who are pregnant or nursing as they are considered the most sensitive populations to PCB toxicity due to its negative developmental and neurological effects.

*Kepona*

(Information retrieved from Spectrum, 2004)

Kepona is believed to be a human carcinogen. It is a synthetic insecticide once used for leaf-eating insects that is practically insoluble. At high levels, it may cause damage to the skin, liver, and nervous and reproductive systems. It does not dissolve easily in water, and therefore bonds to soil and sediment particles where it may not break down for years. It is not likely to travel through soil and into groundwater, but it can bioaccumulate in fish or other organisms that live in contaminated water or that eat other contaminated materials. It is very stable in the environment, and no degradation products have been identified.

Kepona is no longer used or manufactured in the United States. From 1966 through 1975, Kepona was released into the James River at Hopewell, Virginia (CBP, 1999). In 1975, the Virginia State Health Department ordered the manufacturer to terminate production when several workers developed serious neurological disorders. As a result of the ban, Kepona levels in fish have rapidly declined over the past twenty-five years. However, levels at present are persistent enough to warrant continued advisory issuance.

The primary modes of human exposure to Kepone are inhalation, ingestion, and direct dermal contact. The Food and Drug Administration (FDA) suggests that eating fish and other foods with concentrations of Kepone below 400 ppt will not cause harmful health effects in humans (CBP Web, 1999). However, as with most contaminants, advisories often encourage pregnant and nursing women to avoid foods that contain possible Kepone contamination.

### *Chlordane*

(Information retrieved from EPA Chlordane Fact Sheet, 2004)

Chlordane is a viscous, colorless insecticide liquid that was once used on corn, citrus, deciduous fruits and nuts, vegetables, lawns, and roadsides. Commercial use of chlordane and related products has been banned except in the case of fire ant control in power transformers. This ban went into effect in 1988, and was initiated in an attempt to protect drinking water supplies. However, the contaminant also accumulates in aquatic organisms and therefore is often included in fish consumption advisories. Chlordane is very persistent in the environment and adheres to soil particles, where it can then leach to groundwater supplies. It has been found that Chlordane can be broken down by microbes in soil, but this occurs only over long periods of time. Health effects of chlordane include central nervous and blood system effects in the short term and organ damage in the long term.

## **Risk Assessment and Target Audience Identification**

### *Risk Perception and Assessment*

Angler perceptions of the risks they face by consuming self-caught – and possibly contaminated – fish has been examined at length in the literature. Understanding the audience’s perception of risk is important to fisheries and health planners because successful advisory dissemination depends on the ability to target information to the correct audience in the most appropriate manner. An examination of the risk perceptions of fishermen is particularly critical because they have a greater likelihood than non-fishermen to consume large quantities of fish from waters of concern (Burger et. al., 1999).

One common focus in past studies has been the identification of specific subpopulations that consume self-caught fish, as well as those that are wary of consumption due to information received from health advisories. It has often been concluded that anglers have conflicting, preconceived beliefs that interfere with the advisory communication process. For example, May and Burger (1996) examined a New York and New Jersey estuary where fish consumption advisories were present and found that most people ignored the consumption advisories, believing the self-caught fish to be “fresher” than store bought fish and therefore healthier and safer. The researchers concluded that simply issuing fish consumption advisories and trusting that the public will heed the warnings was not a sufficient approach to increasing the awareness of contamination and adverse health risks.

The importance of targeting an audience was echoed by Velicer and Knuth (1993) on Lake Ontario, where advisories were slightly more successful in reaching most recreational anglers but failed to reach migrant farm workers. Success of the advisory in reaching women of child-bearing age, an important and highly vulnerable subpopulation, was also limited among Lake Ontario anglers. One recommendation generated from this research was that the advisory content and format be adapted to better suit the angler audience. Specific recommendations included providing information on cooking and cleaning methods that could reduce contaminant exposure. To ensure all socioeconomic audiences are reached, integrating health care and social service workers into advisory education techniques was also recommended. These groups could potentially encourage a reduction in contaminated fish consumption among some of the populations that are exposed most often: low-income and subsistence anglers.

Pflugh et. al. (1999) examined the risk perception of contaminated fish consumption specifically among urban anglers. Fishermen were interviewed in the highly industrialized Newark Bay Complex about their attitudes toward risk, advisory knowledge, belief in advisories, perception of safety, and other factors. It was concluded that although more than half of the anglers interviewed in the area had heard of the advisories, most either did not believe the information in them or were unconcerned with the potential health effects resulting from contaminated species. Clinch River (Tennessee) anglers in a far less urbanized, but still contaminated, setting responded that they, too, had heard of local advisories, but half still felt that the fish were safe to eat without limit (Campbell et. al., 2002).

Fisheries and health planners must attempt to understand the causes of these beliefs so that they can incorporate considerations for them into the development of warnings. The Chesapeake Bay watershed includes both urban and suburban areas, so identifying these attitudes about risk perception is integral in developing approaches for risk communication modes and methods.

Perceived hazard is a theme that arises in many studies similar to the current project in the Chesapeake Bay watershed. The perception of risk has been found to affect whether or not anglers consume the fish that they catch (Campbell et. al., 2002, Pflugh et. al., 1999) and whether or not they consume certain species (Burger et. al., 2003). It has also been found to significantly affect the locations at which anglers choose to fish, according to Jakus and Shaw (2003). Their empirical determination found that an angler's belief in potential hazards negatively influenced his site choice for fishing, especially when the angler planned on keeping the fish. The decisions for keeping and eating fish were connected to the perceived severity of contamination at the sites. One indicator that was offered to explain some perceived hazards was angler experience; surprisingly, more experienced anglers appeared not to react as strongly to expert-assessed risk warnings as did less experienced anglers.

Another matter that must be considered in approximating angler risk perception is increased consumption due to the perceived nutritional benefits presented by fish. Understanding angler perception of this value is imperative because it has the potential to



promote consumption among some anglers in lieu of contamination warnings. The benefits of eating fish have been acknowledged extensively by health professionals, government agencies, and others.

For example, the American Heart Association recently reported that eating fish regularly could significantly reduce the risk of heart disease in diabetic women (JAHA, 2003). This is an especially important finding in the realm of risk perception because most fish and health advisories specify that women, particularly those of child-bearing age, are at the greatest risk of incurring the harmful effects of contaminated fish consumption. These benefits must be weighed against the risks when anglers consider consuming or feeding their families self-caught fish from contaminated waters.

Knuth et. al. (2003) determined that fishermen on Lake Ontario were significantly influenced in their decisions to eat fish by the balancing of associated health benefits and risks. When the contamination hazards were elevated, anglers consumed less fish regardless of the benefit level, but when risks were low, consumption rates were found to correlate with the perceived benefit level of eating fish. Therefore, angler knowledge of and reliance on current claims of the nutritional benefits of fish must be examined along with angler perceptions of risk.

#### *Ethnic and Socioeconomic Relationships*

Identifying the relationships between socioeconomic and ethnic background and risk perception patterns is a prevalent theme in many past studies examining angler behavior and consumption. These findings discussed below suggest that advisories are not reaching several of the demographic audiences that need them most, and that risk education for minorities should become more of a priority in advisory dissemination.

Burger et. al. (1999) determined that African-Americans on South Carolina's Savannah River fished more often, ate self-caught fish more frequently, and consumed larger portion sizes than did Whites. They also found that education and income among minorities contributed to variations in fishing and consumption behavior. Low income anglers ate fish more often, and anglers with less education ate fish more often *and* prepared fish with fewer risk-reducing methods than anglers with higher levels of education. Considering the fact that a higher percentage of low income anglers in the study were African-Americans, it was suggested that African-Americans had a disproportionately greater exposure to contaminants than did Whites. This finding was reinforced by data that concluded that African-Americans ate more fish than Whites regardless of their education levels. Campbell et. al. (2002) found similar trends among anglers interviewed on the Clinch River near the Oak Ridge Reservation in Tennessee.

A later study by Burger et. al. (2001) further confirmed this notion by developing a hazard index to analyze ethnic differences in exposure rates specifically involving mercury from fish consumption. The index measured the degree of risk facing a population. That study determined that minorities had both higher hazard indexes and higher consumption rates than Whites. It also found that African-Americans and

Hispanic-Americans were less likely to know about health advisories and the information contained in them than Whites.

Another study likewise maintained that racial groups examined in New Jersey were just as willing to adhere to advisory warnings as were Whites, but that the targeting and communication efforts involved with those advisories were inadequate, leading to decreased compliance in minority populations (Burger et. al, 1999). They recognized that urban angler information generally originated from two major sources: those sources relaying information about fishing in general (mostly bait shops and other fishermen) and the sources that specifically communicate advisory information (mostly newspapers). They suggested that risk-reduction strategies must take into account these urban and ethnic differences in information sources, perceptions about safety and health risks, and consumption patterns in order to successfully communicate warnings to target audiences.

Even when advisories are successful in reaching these demographic and socioeconomic groups, the interpretation of the information is still subject to cultural differences. For instance, Burger and Waishwell (2001) concluded that there were no ethnic differences among fishermen along the Savannah River in South Carolina and Georgia who knew of advisories or understood the message of advisories, but that there were ethnic differences in how people felt that risk could be reduced; Whites felt that the rivers should be improved, while African-Americans thought that more people should be provided with educational materials, such as a fish fact sheet.

One critical consideration in racial and socioeconomic risk assessment is the fact that some anglers' awareness of health risks originate from sources other than official advisories. This trend has been notably observed in several minority populations. A study involving risk knowledge and perception in western New York focused on contaminated fish consumption threats within the cultural context of African-American sport fishing (Beehler, 2001). These fishermen were not subsistence fishermen; they were fishing for relaxation, socialization, although most stated that they ate their catch at least occasionally. Most participants stated that they were unaware of or intended not to use advisory information, but the study stressed that they did not necessarily eat fish without discretion. Instead, they adhered to what was described as cultural or "folk" notions of pollution, including information obtained from other anglers and personal perceptions of the waters they were fishing. Taste was also a big determining factor for cleanliness; if certain species from specific locations did not taste good, then anglers tended to believe that they likely came from bad water and therefore should not be eaten. Similarly, the methods these anglers used to clean fish often reduced contaminant exposure not because they were the methods suggested by advisories, but because they were the methods that maximized the taste of the fish. They largely felt that they had a more comprehensive and intuitive understanding of the natural environment than was captured in officially-issued advisories.

This notion that not all ethnic populations perceive or respond to risks equivalently was again explored in the Great Lakes states (Beehler and McGuinness, 2003). It was found that although the specific information from advisories was not reaching the Hispanic

communities of the Great Lakes states, cultural perceptions of fish safety were well-established. These findings are interesting in that they stress that although advisories may not always reach target audiences, there are still risk perception value systems in place that can effectively reduce (or increase) risk.

The executive branch of the federal government has shown concern over the demographic differences in successful policy implementation with respect to hazard communication. The Presidential Executive Order on Environmental Justice (Clinton, 1994) stressed the importance of examining the effects of fish and wildlife consumption on certain subpopulations, especially those considered to be subsistence populations. It states that federal agencies must “collect, maintain, and analyze information on the race, national origin, income level and other...information for...sites expected to have a substantial environmental, human health, or economic effect on surrounding populations.”

This statement applies directly to that subpopulation of anglers considered to be subsistence anglers. Subsistence anglers are normally defined as anglers who catch fish for the purposes of personal or household consumption as a financial necessity or with the intent of reducing expenses for food. Such fishermen are expected by most professionals to be more at-risk than recreational, non-subsistence fishermen due to the necessary nature of their consumption of fish.

However, though researchers often admit that there is a greater exposure risk inherent among subsistence anglers, there is risk nonetheless involved with any population that consumes fish. Some literature stresses that the difference between subsistence and recreational fishermen is effectively arbitrary and that it clouds the issue of risk. Many argue that, from a risk assessment perspective, what matters is how much of which species containing what contaminant load is consumed, not whether someone is eating the fish or feeding it to his family out of necessity (Burger et al 2001). Though these fishermen may be more likely to consume the fish that they catch, non-subsistence anglers may be just as inclined to consume dangerous species at high volumes. Establishing whether or not this is true is one major goal of this project.

## **Risk Communication**

### *Fish Consumption Advisories*

Fish consumption advisories are the most widely utilized method for communicating the risks associated with contaminated fish and shellfish consumption to target audiences. They are issued by state, tribal, and local governments to inform people of and protect them from the possible risks of eating contaminated fish. Advisories are released when state and local government agencies that monitor waterbodies find certain levels or types of contamination. They can recommend limitations on several factors, such as species that should be avoided, portion sizes that should be eaten, and frequency of consumption that should not be exceeded. They can also discourage eating fish in general from particular waterbodies.

Since the issuance of fish consumption advisories is primarily the responsibility of state, rather than federal, governments, fish advisory programs have been developed independently within each state jurisdiction (EPA, 2004). This has resulted in different approaches to developing and administering the advisories from state to state. It has also resulted in inconsistencies between adjacent states, meaning that some interstate waterbodies, like the Chesapeake Bay, present discrepancies in the advisories present on their tributaries and throughout their watersheds.

Cunningham et. al. (1994), after compiling nationwide data on fish consumption advisories, produced a list of five general types of fish and shellfish consumption advisories and bans present throughout the United States (Table 1.1). The current advisories in most states, including those in the Chesapeake Bay watershed, fit into one or several of these categories.

**Table 1.1. Five common types of fish consumption advisories issued by state and local governments in the United States. Developed by Cunningham et al. (1994).**

<b>ADVISORY TYPE</b>	<b>DESCRIPTION</b>
<b>Commercial Fishing Ban</b>	Prohibits commercial harvest/sale of some or all species
<b>General Population No-Consumption</b>	No consumption of certain species or in certain areas; applies to general public
<b>General Population Restricted Consumption</b>	Limited consumption of certain species or in certain areas; applies to general public
<b>Subpopulation No-Consumption</b>	No consumption of certain species or in certain areas; applies to certain groups
<b>Subpopulation Restricted Consumption</b>	Limited consumption of certain species or in certain areas; applies to certain groups

*Commercial fishing bans* prohibit the commercial harvest and sale of some or all species, and their issuance, development, and enforcement may involve both state and federal agencies since interstate commerce issues may be a concern. The rest of the advisories, however, are primarily administered by state governments. *General population no-consumption advisories* recommend that the broad public not consume any fish and shellfish from a state, region, or waterbody. These can also be applied exclusively to certain species. *General population restricted consumption advisories* suggest that people only limit the consumption of fish, or certain species of fish, rather than eliminate them entirely from their diets. They often involve limits on the number of meals and size of meal portions consumed per unit time. *Subpopulation no-consumption advisories* resemble general population no-consumption advisories, but the recommendations in these advisories apply only to sensitive subpopulations, such as pregnant women, nursing mothers, and children. *Subpopulation restricted consumption advisories* are consumption restrictions that apply only to sensitive groups, and they limit rather than prohibit the intake of fish.

Consumption advisories can apply to any waterbody from which fish are caught and consumed, but nationally, consumption advisories are most often issued for lakes

(Cunningham et. al.1994). As of 2001, 16% of all freshwater lakes in the United States were under some sort of fish consumption advisory. Therefore lake-filled states like Illinois, Wisconsin, Michigan, and Minnesota often have the greatest number of advisories in effect at any one time. The EPA believes that 7% of rivers in the US are under some type of fish consumption advisory.

Cunningham et. al (1994) further determined that seven fish species account for almost 90% of all advisories in the U.S. Some of these are found in the Chesapeake Bay study regions, including carp, bluegill, and bass. Three of the four contaminants described in Chapter 1 of this report (mercury, PCBs, and chlordane) are responsible for a large portion of the advisories currently in effect in the US. The fifth, Kepone, is limited to waterways in the state of Virginia as a result of isolated releases occurring there in the 1960's and 1970's.

#### *Advisory Development and Communication*

Risk communication theory is the basis for advisory development among health and fisheries professionals. As stated by Knuth (1990), it is the framework for developing and distributing advisories. The message being sent to anglers is one that conveys the risks in contaminated fish consumption, and this message and the mechanisms used in its distribution make up the framework of risk communication. Risk communication is an interactive process of information exchange among individuals, groups, and institutions, where the angler ultimately responds to the information by deciding whether or not he should eat a particular fish (Knuth, 1990).

Some research has been conducted on dissemination methods, including the best formats used for risk communication. Fish fact sheets are one of the most commonly utilized methods for state advisory issuance. Burger et. al. (2003) executed a study in Newark Bay, New Jersey that evaluated the effectiveness of these fact sheets in comparison to classroom lessons on the risks of fish consumption. Both instruments were also provided in English and Spanish to determine whether or not one method worked better for non-English speaking anglers. The instruments were tested on women of child bearing age in the region, and both were found to be successful in imparting basic advisory information to most women. However, in all cases, women exposed to the classroom lesson had a better understanding of risk than those who only read the brochure. Ninety-six percent of women who experienced the classroom lesson understood the risks associated with eating fish from the port, while only 72% who read the brochure understood this.

Results from Burger et. al. (2003) favoring the classroom lesson were thought to be the products of time factors (it took less time to view the short presentation than read the brochure), the use of multiple modalities (the presentation used oral commentary, written text, and visual images), the engagement of interest resulting from a "live" presenter, and the interactive format of the classroom mode in which questions and information were exchanged. Some disadvantages to this method were also noted, however. A classroom lesson must have a suitable venue and audiences must be recruited for the lesson, whereas brochures may be either actively or passively distributed. Conducting classroom lessons is also much more expensive, and it places limits on the number of receptors and

the geographic extent of the information being disseminated. The researchers in the project concluded that the best method for communicating advisories was to have both of these instruments available to the public. The lesson provides an in-depth discussion of the problem to those who can attend, while the brochure provides a written and less intrusive reference that may be taken home.

Burger and Waishwell (2001) have also examined the efficacy of a fish fact sheet advisory along the Savannah River in South Carolina and Georgia. They looked into advisory awareness among anglers, the message obtained from the fact sheet, perceptions of the sheet among the audience at which it was aimed, who was most at risk, and what the best method was for disseminating such information. The fact sheet tested was an abbreviated version of the longer, more detailed state consumption advisories. The results indicated that most anglers along the Savannah River had not seen the fish fact sheet, but that half were aware of consumption advisories. It was also noted that interest in the fish fact sheet was undeniable. Ninety-nine percent of all anglers approached agreed to read the sheet and answer questions, which was a half-hour process. This indicated that interest in learning about advisory information was high. Most anglers even asked for additional fact sheets for their families and friends. The majority of anglers were also found to have obtained the intended messages from the fact sheet. The authors suggested that these sheets, including their direct distribution to anglers, could be a strong asset for states in addition to the state-issued advisories since they provide quick, easily accessible information that may be more likely to reach anglers than traditional state-issued advisories. As with the classroom lesson from Burger et. al (2003) mentioned above, one of the more effective components of the fact sheet was likely the element of personal contact and interaction that accompanied fact sheet distribution. This further illustrates the importance and effectiveness of such communication in advisory dissemination.

In all studies, though, many anglers are found to be unaware of existing advisories. Reasons for the lack of angler knowledge have been the subject of discussion among fisheries and health managers. Knuth (1995) believed that anglers are often not familiar with advisories because advisory experts do not understand many of the specific information needs of their audiences. Awareness of advisories varies among target populations, which emphasizes the need for implementing communication strategies specific to each target audience. Furthermore, even when anglers are aware of the advisory, compliance is not always guaranteed (Knuth, 1995). Several factors go into an angler's response to an advisory. One model developed by Knuth et. al. (1993) shows how several external factors such as demographic and socioeconomic factors and fishing related experiences impact the way that information from various sources is interpreted by an individual. The information absorbed then affects the individual's beliefs and attitudes about fishing, fish consumption, and the information sources themselves. Finally, these beliefs and attitudes determine how the person responds through behaviors and actions.

## Project Scope

This project supports a number of goals set by the Chesapeake 2000 Agreement signed in June 2000. Under the Water Quality Protection and Restoration section, a commitment was made to fulfill “the 1994 goal of a Chesapeake Bay free of toxics by reducing or eliminating the input of chemical contaminants from all controllable sources to levels that result in no toxic or bioaccumulative impact on the living resources that inhabit the Bay or on human health.” Simultaneously, the Stewardship and Community Engagement section laid out goals to

1. “Expand citizen outreach efforts to more specifically include minority populations by, for example, highlighting cultural and historical ties to the Bay, and providing multi-cultural and multi-lingual educational materials on stewardship activities and Bay information;” and
2. “By 2005, identify specific actions to address the challenges of communities where historically poor water quality and environmental conditions have contributed to disproportional health, economic, or social impacts.”

In order to meet these goals, the Toxic 2000 Strategy was laid out that directs the Chesapeake Bay Program to “By 2004... assess major fishing areas in the Bay watershed, complete risk screenings, identify specific sub-populations at risk where necessary, and issue consumption advisories where appropriate.”

Accordingly, this project consisted of three major objectives:

1. To identify sensitive populations at greatest risk for consuming contaminated fish in the Chesapeake Bay watershed,
2. To assess the fishing behaviors, fish consumption patterns, perceptions of risk and awareness of fish consumption advisories among these populations, and
3. To develop recommendations for conducting outreach programs regarding risk from consuming contaminated fish that effectively reach these populations.

To meet these objectives, we conducted 8 weeks of on-site angler interviews during the summer of 2004 in the 3 Regions of Concern identified by the Chesapeake Bay Program. The first region was the Baltimore Harbor area, which was expanded in this study to include the Baltimore area in general (the Back and Patapsco Rivers). The second region was the Anacostia River, which was expanded in this study to include the Washington DC region in general (the Anacostia and Potomac Rivers). Finally, the third region was the Elizabeth River in Virginia, which was expanded in this study to include both the Lower James and Elizabeth Rivers.

### *About This Report*

The 3 Regions of Concern identified for this study (Baltimore, Washington DC, and Lower James/Elizabeth Rivers) provide the organizational structure for this report. The results and discussions for each region are addressed in separate chapters. For each region, interview results were analyzed first at a whole population level, then across demographic and socioeconomic variables. Data tables, figures and maps specifically

referenced in the report appear within the main text sections. Frequency distributions for all questions appear at the end of the report as Appendix F (for Baltimore), G (for Washington DC), and H (for Lower James/Elizabeth River). The CD that accompanies the final report includes the electronic versions of all the survey data. This report and other information contained on the CD can be downloaded by interested individuals from the Chesapeake Bay Program website, located at <http://www.chesapeakebay.net>, or from the Conservation Management Institute's website at <http://www.cmiweb.org/hdd.htm>.

Care should be taken in analyzing and reporting the results of this survey beyond what is discussed in this report. While the Conservation Management Institute encourages the use and further analysis of these results as appropriate and appreciates acknowledgement of its role in projects, we cannot be held responsible for the validity of any analyses other than what is specifically discussed in this report.

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## II. SAMPLING METHODS AND INTERVIEW PROTOCOL

The overarching goal of this project is identify groups of people who are greatest risk for consuming unsafe amounts of contaminated fish within specific regions of the Chesapeake Bay watershed. Theoretically, these at-risk populations are composed of two, overlapping population segments. The first segment, and the one most often identified as “sensitive” in advisories, includes children, pregnant and nursing women, and other women of child-bearing age. Their risk stems from a simple toxicological standpoint due to the long-term risks that consuming contaminated fish presents to children, infants, and unborn babies. The second segment of the population that must be considered “at-risk”, however, includes any person consuming fish from contaminated Chesapeake Bay waters who does not know about, understand, or abide by existing consumption advisories.

Therefore, to understand who is at-risk, we must ask two general questions: who is eating potentially contaminated fish, and who among these consumers are lacking a knowledge or understanding of consumption advisories? We explored these questions by conducting on-site angler interviews at various fishing access points within the identified Regions of Concern (Baltimore, Washington DC, and the Lower James and Elizabeth Rivers in Virginia). A stakeholder meeting was also convened in each location to facilitate a discussion about consumption advisory development and dissemination. The methods and protocols used for these steps are described in this chapter.

### Sampling Methods

Numerous fish consumption and risk assessment studies have been performed in the past, and they have utilized a variety of data collection methods, including mail surveys, on-site interviews, and focus groups. Mail surveys have been the traditional data collection format for the New York State Angler Cohort Study (Connelly et al, Knuth et al., and McGuinness et al.) and were also used for fish consumption studies performed in Minnesota and North Dakota (Benson et al. 2001).

On-site interviews have been conducted by a variety of researchers including Burger et al. (New York Harbor, Newark Bay, and surrounding areas; Savannah River, SC; Clinch River, TN) and Russel et al. (San Francisco Bay). Occasionally, a study group performs a telephone survey of a sample identified either through a preliminary mail survey (as in Delaware, with the KCA Research Division, 1994) or as part of a creel survey (such as the National Marine Recreational Fishery Statistics Survey).

For this study, we chose to collect data through on-site interviews because of the desire to collect information on a relatively unknown population in specific geographic areas. Some studies estimate that as many as 25% of anglers—especially urban subsistence anglers—do not obtain licenses to fish. Since these anglers are of particular interest in assessing the risk of contaminated fish consumption, it was critical the survey method chosen be able to reach this population. On-site interviews are effective in this regard. In addition, barriers such as literacy and language are more easily overcome using on-site interviews since the respondent is not required to read the survey. Even when interviews

are unsuccessful due to a language barrier between respondent and interviewer, the magnitude of this barrier within the population can be better estimated than would be possible in a mail survey. The accuracy of fish consumption estimates is also expected to be higher in personal interviews than in mail or telephone surveys because appropriate visual aids can be used, and the interviewer can clarify unclear questions. Finally, the response rate of on-site interviews (>80%) is usually far greater than typical general population mail (~25%) or telephone (~45%) surveys.

The disadvantages of personal interviewers from a data quality standpoint are twofold: 1) the number and complexity of survey questions must be somewhat limited in order to ensure interview completion and 2) fish consumption is difficult to estimate using one-time estimates. To address the first issue, it must be ensured that each question provides valuable data and that the interviewer is trained in conducting the survey in the most efficient manner possible. To address the second issue, angler respondents can be provided with visual aids to help them accurately report meal sizes for themselves and members of their household. On-site interviews generally allow for more questions, and more complex questions, than telephone interviews, but interview length still remains a concern. Therefore, a balance was required between getting the most imperative information and keeping the interview short enough that the response rate was sufficient.

#### *Survey Instrument*

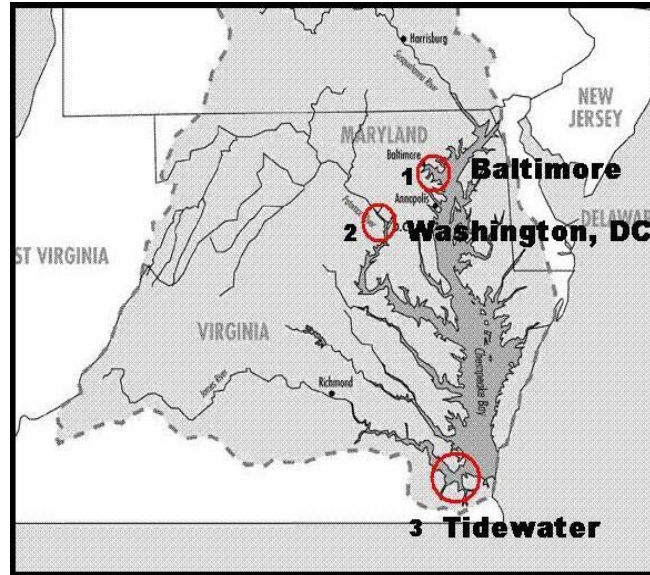
We designed a survey instrument using Apian SurveyPro (version 3.0E, Seattle, Washington) software in coordination with the Fish Advisory Workgroup of the Chesapeake Bay Program for each region of concern. Topics addressed by the questionnaires include:

1. Anglers fishing history (how often, how far, how long),
2. Fish consumption patterns (what species, how often, how much, both for angler and household members),
3. Methods of fish preparation (cleaning and cooking methods used),
4. Advisory awareness (knowledge of advisory, source of information, interpretation of advisory, perception of personal/family risk), and
5. Socio-demographic data and household information (sex, gender, income, race, education, number and ages of other household members).

The core survey instrument was the same for each region where data was collected, but necessary adjustments were made to each instrument to allow for variations in existing advisories. A copy of each of these surveys is included in Appendix A.

#### *Region and Site Identification*

We conducted angler interviews in the 3 Regions of Concern identified by the Chesapeake Bay Program (and expanded upon slightly by the Fish Advisory Workgroup). These regions are referred to in this report as the Baltimore (Lower Patapsco and Back Rivers), Washington, DC (Lower Potomac and Anacostia Rivers), and Tidewater, Virginia (Lower James and Elizabeth Rivers) regions (see Figure 2.1).



**Figure 2.1. Chesapeake Bay regions of concern where angler interviews were conducted during the summer of 2004.**

Within each of Region of Concern, several sites were identified as areas where angler interviews would be conducted. A series of sites were initially selected under the consultation of fisheries managers and available fishing access literature, including the Chesapeake Bay Public Access Guide, the Virginia Department of Game and Inland Fisheries Virginia Boating Guide, and the Marine Recreational Fisheries Statistics Survey fishing sites listing. CMI personnel then personally assessed each site with respect to likely angler activity, types of fishing modes present (i.e. boats vs. shore), and geographic distribution with respect to other sites in the region. Ultimately, nine sites were selected from each region of concern based on these factors. The sites are distributed such that at least two sites are located on or very near each of the two above mentioned polluted waterways in each region. We also ensured that both boat and shore/pier fishing were sampled in each region and that both high- and low-use sites were sampled.

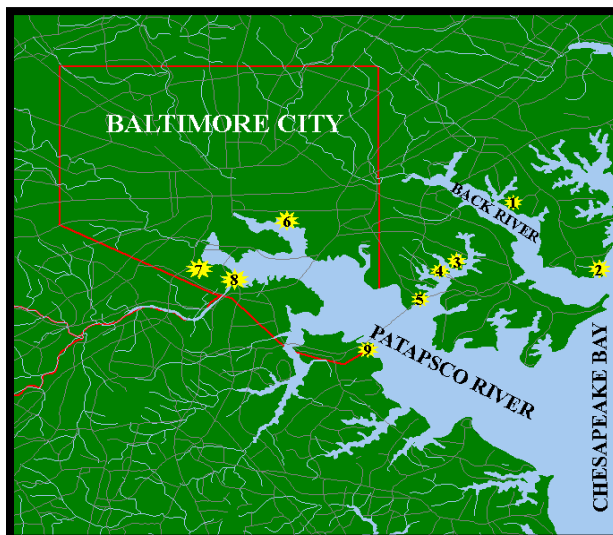
Small maps illustrating the regions of concern are included below here as Figure 2.2. Larger detailed maps, including site names, are included in Appendix B.

### *Survey Pretest*

A pretest of the survey instrument was conducted for each of the three regions of concern from May 17, 2004 to May 21, 2004. In each region, all access points predetermined as probable interview sites were visited by CMI employees. The purpose of the pretest site visits was to:

1. Visually assess the individual sites and make observations on the level of interviewer safety, general characteristics of the sites, and directions for reaching the sites,

a. Baltimore Region of Concern interview sites



b. Washington, DC Region of Concern interview sites



c. Lower James/Elizabeth River Region of Concern interview sites



Figure 2.2. Angler access points within each Region of Concern where interviews were conducted. See Appendix B for larger maps, including site names.

2. Test the survey instrument and survey protocol on as many anglers as possible (the target being at least 5 in each region), noting any problems that arise during interviews including problems with survey wording, survey content, or interviewing protocol; and
3. Make an assessment of each site regarding the likely intensity of angler activity, the likely success in completing multiple angler interviews during the course of an 8-hour time span, and anticipated fishing modes.

Due both to temporal constraints and lack of angler activity during the week, only three interviews were conducted in each of the three regions of concern during the pretest trip rather than the proposed five. This was enough experience, however, to make several changes to the wording and format of the original survey instrument, as well as modifications to the interviewing protocol, in order to increase the quality of data collected from individual interviews. The final interviewing protocol is included in this report as Appendix C.

#### *Site Schedule Design*

After the survey pretest trip, a final determination was made on the sites in each city that would be sampled. Sites with a low likelihood of angler activity, those that were closed, or those for which insufficient information (e.g., driving directions) was available were eliminated. As was previously stated, nine sites were ultimately selected in each region.

In order to capture as wide a range of anglers as possible, the site schedules were designed so that interview teams would be on site conducting interviews during one of two eight-hour shifts: 6:00am-2:00pm (“morning shift”) or 12:00pm-8:00pm (“afternoon shift”). Ideally, these time periods would incorporate both boaters and shore anglers active in morning as well as evening hours while maximizing interviewer safety. In order to capture temporal variation in angler activity, an attempt was made to sample each site during both weekdays and weekend days and during both morning and afternoon time shifts. A total of 40 sampling days were scheduled.

In order to better allocate sampling effort, three strategies outlined by Stanovick and Nelson (1991) were considered. The first was a uniform effort, in which each site is sampled evenly. The second improves efficiency by increasing sampling effort in areas where an increased angling effort exists. The third uses the opinion of experts to formulate quantitative scores and use them as the basis for establishing sampling schedules.

This survey used a modified version of the second method mentioned by Stanovick and Nelson, including some elements of the third. Sites were sampled more intensely where angling activity was expected to be concentrated. This expected intensity, however, was a result of a combination of conversations with fisheries site managers and visual observations by CMI staff. Those sites believed to be most heavily frequented by anglers were weighted for more sampling days. Rained out and/or sick days were rescheduled later in the summer at the same site, same shift, and same period (weekday or weekend).



A master site schedule for all 3 regions is included in Appendix D; these site schedules reflect actual site visits after the necessary revisions were made throughout the summer. Interviews were conducted June 1<sup>st</sup> through August 11<sup>th</sup>, 2004.

## **Interviewing Protocol and Data Handling**

### *Interviewer Training*

Initial interviewer orientation took place in Blacksburg, Virginia, on May 27 and 28, 2004. The interview teams hired for each Region of Concern were introduced to the interview protocol, and interview materials were distributed to them. Mock angler interviews were conducted with CMI personnel, and project supervisors reviewed the interviewers' techniques and corrected their faults in order to improve the degree to which each interviewer followed the established protocol. This initial training helped interviewers to become familiar with the survey instrument and protocol and allowed them to gain experience in oral survey techniques and ways to ensure data quality in the oral survey process.

On-site interviewer training was conducted June 1-3, 2004. The purpose of the on-site training sessions was to acclimate interview teams to the interview protocol in real interview situations, further ensuring quality data collection. Each interviewer applied the training received in previous instruction sessions to several actual angler interviews at sites within their regions of concern under the observation of a project supervisor. These practice interviews were taped and then reviewed in detail by the interviewer and project supervisor. After conducting these practice surveys, interviewers were again briefed on ways to improve their methods for interviewing anglers. During this on-site training, the interview teams were also familiarized with each of the nine sites in their Region of Concern.

### *Interview Protocol*

A copy of the Survey Protocol used by each survey team while conducting interviews is attached as Appendix C. The protocol contains all information pertinent to interviewing and data collection procedures, including 1) information on choosing a location within the sites for setup, 2) an inventory of materials required for each interview, 3) strategies for approaching anglers, 4) instructions for recording data, 5) guidelines for reporting daily data, 6) safety precautions, and 7) a comprehensive guide that addresses how each survey question should be posed to anglers. The protocol was developed in consultation with 2 online documents:

- EPA: Guidance for Conducting Fish and Wildlife Consumption Surveys. Includes sample questionnaires: <http://www.epa.gov/OST/fish/fishguid.pdf>
- NMFS: National Marine Recreational Fisheries Statistics Survey. <http://www.st.nmfs.gov/st1/recreational/survey/overview.html>

Two visual aids were developed for use in each Region of Concern. The first was a fish identification guide that interviewers were instructed to show to anglers at specific times during the interview. This guide displayed pictures and names of a variety of commonly caught fish for that area, including all fish that were currently under advisory. This visual

aid served to minimize the use of multiple common names for each species, and helped to jog respondents memories in responding to questions. The second visual aid was a serving size poster developed by project personnel showing serving sizes of 4, 8, and 12 ounces of cooked fish on a dinner plate with eating utensils as a size reference. This poster helped respondents to accurately report their meal sizes of self-caught fish.

Each interviewer in the field was instructed to become very familiar with the protocol and to review the protocol occasionally throughout the angler sampling period. Changes to the interview protocol during the course of the summer were minimal and were implemented to either streamline the interview process or encourage an increase in completed interviews.

### *Data Entry and Analysis*

Data entry was completed using Apian SurveyPro and KeyCollect software (version 3.0E). Initial data entry was accomplished using only the survey instrument without consulting taped interviews. Contact records were summarized in a spreadsheet as a means of determining interview rejection rates and rejection causes.

A quality control check was completed for 20% of the surveys from each region. These quality checks were conducted for individual survey respondents by inspecting the completed survey instrument for that interview while listening to a tape of the interview being conducted. Thus data quality was ensured for both the angler interviewer and the data entry clerk. It was determined that the error rate from both sources was low enough to proceed with the data analysis (<2%).

Data were analyzed using a combination of programs and approaches. SurveyPro, MS Excel 2003, and SPSS (version 13.0) were all utilized for the purposes of data organization and analysis. Trends and tendencies among certain sections of the survey instrument were examined for entire regional angler groups and the most relevant analyses were included in this report. After overall summaries and analyses were conducted additional analyses were carried out to examine demographic, site-specific, and other breakdowns. This analysis was aimed at demonstrating trends present among different groups of anglers within each region. The results of the data analyses for the three regions of concern are located in Chapters III through V.

### **Stakeholder Meetings**

The last step of this project was to bring the results of each region's interviews back to the stakeholders who have responsibilities or interests in the advisory development and dissemination process. We organized and convened three regional meetings – one in each Region of Concern – to present out results and facilitate a discussion about region specific fish consumption advisory issues. To each meeting, we invited representatives from the appropriate state agencies (environmental quality, fish and wildlife, health), federal agencies (EPA, Park Service), academic organizations (e.g., Johns Hopkins, Virginia Institute of Marine Science), and watershed and sportsman's organizations (e.g., James River Association, Anacostia Watershed Alliance, Gwynns Falls Watershed

Association). Each meeting lasted 2.5-3.5 hours, and the agendas were developed to reflect 3 objectives:

- 1) A presentation by a health and/or environmental quality department representative about the status of fish consumption advisories in the area, how they are set, what the contaminants of concern are, and how advisories are disseminated in the region,
- 2) A presentation by project personnel of the results obtained from angler interviews in that area, and
- 3) A discussion amongst participants of the survey results and ideas for improved advisory dissemination.

Participant lists for each meeting and a summary of meeting notes is included in this report following the discussion of interview results for each region.

### III. RESULTS FROM BALTIMORE ANGLER INTERVIEWS

This chapter discusses the results from the Baltimore area angler interviews. The survey instrument used for these interviews is included in Appendix A, a map of the fishing access points surveyed is included in Appendix B, and frequency tables for all closed-ended questions are included in Appendix F.

#### Baltimore Region Advisories

Fish consumption advisories in Maryland are administered by the Maryland Department of the Environment (MDE). Several advisories were in effect during the summer months of 2004 when sampling for this report took place. These are summarized in Table 3.1, and the full advisories are provided in Appendix E. Note that the Baltimore Harbor advisory was update and released in May, 2004, roughly a month before this study commenced. This advisory release was accompanied by an aggressive outreach campaign described below.

**Table 3.1. Summary of fish consumption advisories for the Baltimore region. Fish meals are based on 8 oz. servings for general population, 6 oz. servings for women, and 3 oz. servings for children. A crab meal equals 9 crabs for adults and 4 crabs for children. Where specified, sensitive populations include women aged 18-45 and children aged 0-6 years.**

<b>Fish Species</b>	<b>Back River Advisory</b>	<b>Patapsco River/Harbor Advisory</b>
<b>American Eel</b>	<ul style="list-style-type: none"> <li>• 7 meals/yr, general population</li> <li>• 5 meals/yr, women</li> <li>• 4 meals/yr, children</li> </ul>	No consumption
<b>Channel Catfish</b>	<ul style="list-style-type: none"> <li>• 6 meals/yr, general population</li> <li>• 5 meals/yr, women</li> <li>• 4 meals/yr, children</li> </ul>	No consumption
<b>White Catfish</b>	No advisory	No consumption
<b>White Perch</b>	<ul style="list-style-type: none"> <li>• 22 meals/yr, general population</li> <li>• 17 meals/yr, women</li> <li>• 13 meals/yr, children</li> </ul>	<ul style="list-style-type: none"> <li>• 5 meals/yr, general population</li> <li>• Sensitive populations should avoid</li> </ul>
<b>Striped Bass</b>	For trophy size: <ul style="list-style-type: none"> <li>• 12 meals/yr, general population</li> <li>• 10 meals/yr, women</li> <li>• 8 meals/yr, children</li> </ul>	For trophy size: <ul style="list-style-type: none"> <li>• 12 meals/yr, general population</li> <li>• 10 meals/yr, women</li> <li>• 8 meals/yr, children</li> </ul>
<b>Blue Crab</b>	No advisory	<ul style="list-style-type: none"> <li>• 96 meals/yr, adults</li> <li>• 24 meals/yr, children</li> <li>• All populations avoid mustard</li> </ul>
<b>Brown Bullhead</b>	<ul style="list-style-type: none"> <li>• 33 meals/yr, general population</li> <li>• 25 meals/yr, women</li> <li>• 20 meals/yr, children</li> </ul>	No consumption
<b>Common Carp</b>	No consumption	No consumption
<b>Bass (large/smallmouth)</b>	No advisory, general population 96 meals/yr, sensitive populations	<ul style="list-style-type: none"> <li>• No advisory, general population</li> <li>• 96 meals/yr, sensitive populations</li> </ul>

The Back River advisory was part of a statewide advisory that addressed several rivers, lakes and reservoirs in Maryland (see Appendix E). This advisory listed the applicable waterbodies, suggested serving limitations, and named likely contaminants for each potentially hazardous species. This advisory applied only to the two sites sampled on the Back River. One of these was Cox's Point Park, where more surveys were collected than at any other site, and the other was Rocky Point Beach and Park, where no angler surveys were collected.

The Patapsco River/Baltimore Harbor advisory (Appendix E) applied specifically to the Patapsco River and Baltimore Harbor, where all other angler interviews were collected. This advisory listed several species commonly caught from the Harbor and the Patapsco, and often suggested avoidance by all populations ("no-consumption" advisories). For those species where consumption was still advised, limitations and/or avoidance were often suggested for specified subpopulations, like women of child-bearing age or young children.

MDE has developed brochures that further describe warnings, the reasons for the advisories, reminders, and reference information for anglers who may be consuming self-caught fish. One such brochure was developed to expressly address those fishing in the Patapsco River and Baltimore Harbor, including specific information for women and children. Another brochure was developed to address all women and children fishing in Maryland, and contains reference information for those considering consuming fish from state waters. A third brochure, called a "Recreational Fishing Update," uses a different approach for information communication. It shows a mapped version of the posted advisories, where different species, geographic locations, and limitations are color coded. These brochures are available on the internet, in various health offices, and by request (see <http://www.mde.state.md.us/CitizensInfoCenter/FishandShellfish/>).

Dissemination methods for Baltimore-region advisories varied. Sign postings at fishing sites, brochure distribution, internet posting, and press releases were all utilized. These methods were mostly employed when significant changes to the advisories were made, as was the case in May, 2004, shortly before the start of this study. First, signs were normally posted in areas with high levels of contamination. Second, advisories were included in fishing license guidebooks, which are updated every fall. A reference brochure called the "Recreational Fishing Update" was also available to the public through the internet and at specific locations. It provided anglers with maps color-coded according to contaminant and advisory information. Advisory brochures were occasionally distributed to anglers in the Baltimore Harbor by MDE personnel, where several no-consumption advisories exist. County and city health departments also distributed advisory materials to their program participants. Finally, outreach and training were provided to any interested health departments and watershed organizations.

### **Overall Survey Results**

A total of 135 surveys were collected throughout the summer in the Baltimore region. The response rate for the region, determined by comparing the completed surveys to the total number of unique contacts, was 73%. Some refusals (n=5) were a result of language

barriers. Most anglers for whom interviews were not completed either declined or stated that they did not have time (90% of all refusals). See Appendix F for frequency tables detailing the results described in this section.

### *Demographics*

Nearly half (49%) of all surveys in the Baltimore region were obtained from two sites: Cox's Point located on the Back River (27%), and Merritt Point, a site located on the Bear Creek tributary of the Patapsco River (21%). Distribution among the other sites was relatively even, with each site yielding at least 6 surveys. Nearly half (48%) of the surveys were also completed on weekend days.

Of the anglers interviewed, 87% were male and 86% fished from either the shore or a pier rather than from a boat. Most anglers lived locally, with 99% traveling less than 25 miles to reach their fishing destination. Most anglers had also been fishing in the area for long periods of time; 80% had fished in Baltimore for ten years or more. Finally, the majority of anglers interviewed (67%) had fished in the area on at least 11 separate occasions in the past year with 38% having fished more than 50 times.

The average age for anglers interviewed in the Baltimore area was 48. Most anglers were either Caucasian (64%) or African-American (33%). Two-thirds (67%) of anglers had a high school education or less. The most common range of total household incomes for those interviewed was \$40,000 to \$80,000 per year (46%), followed by \$20,000 to \$40,000 per year (25%). The rest reported incomes of more than \$80,000 (17%) or less than \$20,000 (13%).

### *Fish Consumption Patterns*

The most common motivations for fishing as reported by anglers were relaxation (96% said it was *very important*) and spending time outdoors (85% said it was *very important*). Providing their families with a fresh fish dinner was either *very* or *somewhat* important to 59% of the anglers interviewed (31% *very important*), with 28% claiming that reducing family food expenses was *very* or *somewhat important* (12% *very important*). When asked whether or not they consume the fish that they catch, 53% of Baltimore area anglers stated that they did at least occasionally eat the fish that they caught. Of these, 69% stated that they avoided eating certain species or types of fish. Sixty-two percent of all Baltimore area anglers claimed that they gave away at least some of the fish that they caught.

The warmer months were the anglers' most popular months for fish consumption (June-September), and during these months, most anglers stated that they consumed self-caught fish once or twice per week (43%) or 1-3 times per month (40%). Less than 2% ate fish five or more times per week, and 10% ate fish 3-4 times per week. The least amount of self-caught fish was consumed in the winter months (November-February). During these months, most anglers either did not eat self-caught fish at all or ate them less than once per month (72%). Annually, anglers estimated that on average they ate self-caught fish 1-2 times per week (21%), 1-3 times per month (37%), or less than once per month

(33%). No anglers estimated that they ate fish 5 or more times per week throughout the year, but 7% reported eating fish 3-4 times per week on average throughout the year.

Portion sizes varied, but 74% of anglers claimed to typically 8 ounces or less of fish per meal; 26% ate more than 8 ounces. Most of those who ate crabs claimed to eat at least ten crabs per meal.

When asked about cooking and preparation methods, Baltimore anglers responded that most of the time, they removed at least part of the fish skin (40%), trimmed the fat from the fish (45%), filleted the fish (64%), and fried (52%) or baked (48%) their catch. They also usually froze or canned their catch for later (51%), and those eating crabs usually ate the mustard from the crabs (40%). Overall, the anglers responded that they never ate the fish whole (60%), raw (99%), or as a soup or chowder (70%), and most did not reuse fat or oil from cooking (66%).

#### *Advisory Awareness*

When anglers were asked whether they had heard of the health benefits from eating fish, 64% of anglers responded that they had, but 80% said that this information did not prompt them to eat more self-caught fish as a result. While 38% of Baltimore area anglers believed that the fish from the Patapsco and Back River areas were safe to eat, 30% believed they were unsafe, and 23% responded that “it depends.” A large majority of anglers (91%) were familiar with fish consumption advisories in general, and most (84%) were also aware of existing health advisories that applied specifically to fish in the Baltimore area. Those who had heard of the advisories learned about them mostly through television (58%) and signs or posters at fishing sites (35%). Most (74%) of those knowledgeable about the advisories had seen the information within the last month.

When asked whether they had changed their eating habits as a result of hearing the information in the fish consumption advisories, 79% stated that they had not changed. Of these, almost half (47%) gave the reason that they had never eaten the fish before, and that they still did not eat. Of those who did alter their habits as a result of the advisories, ceasing or limiting consumption of all fish from the area was the most common reaction (65%). Few anglers (17% of those aware of advisories) claimed to have ever referenced an advisory before keeping or eating their self-caught fish.

Finally, of the anglers who had heard of advisories in the area, 79% believed that the advisories could be improved. A large majority (80%) also believed following the information in fish consumption advisories to be *very important*. Anglers felt that the best methods for disseminating advisory information to anglers were posting signs (46%), using television (30%), and talking directly to anglers at popular fishing locations (20%). Note that this was presented as an open-ended question – response options were not read to the angler.

#### **Angler Consumption by Species**

As stated in the previous section, 53% of all anglers interviewed in the Baltimore region stated that they consumed the fish that they caught at least some of the time. Table 3.2

summarizes overall angler consumption according to meal frequencies and species eaten. Anglers were asked to name the four fish or crab species they ate most often, and to estimate the frequency with which they ate each species. Striped bass and white perch were the most commonly consumed species, followed by crabs and catfish. Advisories existed for all four of these species at the time this survey was issued.

**Table 3.2. Overall analysis of Baltimore angler consumption by species and frequency consumed. The most common response for each species with respect to consumption frequency is shaded, and the species to which consumption advisories applied at the time of data collection are underlined. Values represent the number of anglers naming a species.**

<b>Back River Sites</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTALS</b>
<u>White Perch</u>	0	0	0	6	3	9
<u>Striped Bass/Rockfish</u>	0	0	0	5	3	8
<u>Catfish (all)</u>	0	0	0	4	0	4
<u>Blue Crab/Crab</u>	0	0	0	2	1	3
<u>Perch (unspecified)</u>	0	0	0	2	1	3
Trout (all)	0	0	0	0	2	2
Croaker	0	0	0	0	1	1
Spot	0	0	0	1	0	1
<u>Carp</u>	0	0	0	1	0	1
Bluefish	0	0	0	0	0	0
Sea Bass	0	0	0	0	0	0
Crappie	0	0	0	0	0	0
<b>TOTALS</b>	0	0	0	22	11	33
<b>Baltimore Harbor, Patapsco River Sites</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTALS</b>
<u>Striped Bass/Rockfish</u>	0	2	8	9	14	33
<u>White Perch</u>	0	0	8	7	8	23
<u>Blue Crab/Crab</u>	1	1	3	4	10	19
<u>Catfish (all)</u>	0	0	3	0	8	11
Croaker	0	0	3	0	4	7
Yellow Perch	0	0	2	3	1	6
<u>Perch (unspecified)</u>	0	0	1	1	3	5
Spot	0	0	2	0	1	3
Trout (all)	0	0	2	0	1	3
<u>Crappie</u>	0	0	0	2	0	2
Bluefish	0	0	0	1	0	1
Sea Bass	0	0	0	0	1	1
<u>Carp</u>	0	0	0	0	0	0
<b>TOTALS</b>	1	3	32	27	51	114

Note that one category encompasses angler responses referring to perch that were not specified beyond their common name (“perch”). The number of responses in the yellow and/or white perch categories is actually higher as a result. Catfish and crab responses were also often too indistinct to place into more specific categories, so these responses were categorized as “Catfish (all)” and “Blue crabs/crabs.”



Clearly, some of the most contaminated species of fish in the Baltimore region (white perch, catfish, crabs) were also among the most popular for consumption. Figures in Table 3.3 are shaded to show instances where suggested consumption frequencies were definitely or possibly exceeded. Twenty of 28 (71%) instances of self-caught fish consumption in the Back River area were in excess of the recommended allowable meals per year. For the Baltimore Harbor and Patapsco River survey sites, 59 of 91 (65%) instances of consumption were in excess of recommended meal frequencies. Striped bass, crabs, catfish, and white perch were all recommended for limited or no consumption in all advisories for the region, but many who consumed them did so at a frequency greater than was suggested in advisories.

**Table 3.3. Fish consumption among Baltimore anglers in comparison to advisory recommendations. Shaded cells indicate anglers who exceeded or may have exceeded recommended consumption frequencies. The table shows info for the two advisories relevant to this study and the species within those advisories.**

<b>Back River Sites</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTALS</b>
Striped Bass/Rockfish	0	0	0	5	3	8
White Perch	0	0	0	6	3	9
Catfish (all)	0	0	0	4	0	4
Blue Crab/Crab	0	0	0	2	1	3
Perch (unspecified)	0	0	0	2	1	3
Carp	0	0	0	1	0	1
<b>TOTALS</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>8</b>	<b>28</b>
<hr/>						
<b>Baltimore Harbor/ Patapsco River Sites</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTALS</b>
Striped Bass/Rockfish	0	2	8	9	14	33
White Perch	0	0	8	7	8	23
Blue Crab/Crab	1	1	3	4	10	19
Catfish (all)	0	0	3	0	8	11
Perch (unspecified)	0	0	1	1	3	5
Carp	0	0	0	0	0	0
<b>TOTALS</b>	<b>1</b>	<b>3</b>	<b>23</b>	<b>21</b>	<b>43</b>	<b>91</b>

### *A Look at Racial Differences*

Although a later section of this analysis addresses racial trends more specifically, the following tables are included to illustrate some of the key racial differences discovered concerning consumption. Table 3.3 summarizes these results with respect to White (64% of all interviews) and African American (33% of all interviews) anglers.

Among White anglers striped bass was the most commonly consumed species, with 27 anglers mentioning it. More than one quarter of White anglers who ate striped bass did so at least once per week, but the greatest number (41%) ate them one or fewer times per month. White perch, crabs, and catfish rounded out the top four species consumed. One species of particular concern that appears to be frequently consumed by White anglers

was white perch; more than a third (perhaps more considering the unspecified perch responses) who consumed white perch did so at least once per week. Catfish was another species of particular concern being consumed on a somewhat regular basis by some anglers.

**Table 3.3. Fish consumption by species frequency over the course of a year among White and African American anglers. Only species covered in local advisories are included.**

<b>Species</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTAL</b>
<b>White Anglers</b>						
Striped Bass/Rockfish	0	2	6	8	11	27
White Perch	0	0	5	4	4	13
Blue Crab/Crab	0	1	1	5	4	11
Catfish (all)	0	0	1	2	4	7
Perch (unspecified)	0	0	1	2	2	5
Carp	0	0	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>14</b>	<b>21</b>	<b>25</b>	<b>63</b>
<b>African American Anglers</b>						
White Perch	0	0	3	7	7	17
Striped Bass/Rockfish	0	0	2	3	5	10
Blue Crab/Crab	1	0	2	1	5	9
Catfish (all)	0	0	2	2	3	7
Perch (unspecified)	0	0	0	1	1	2
Carp	0	0	0	1	0	1
<b>TOTAL</b>	<b>1</b>	<b>0</b>	<b>9</b>	<b>15</b>	<b>21</b>	<b>46</b>

When African Americans are isolated from other respondents, white perch replaced striped bass as the most commonly consumed species, with at least one-fifth of African-Americans who consumed white perch did so at least once a week. This may be higher, considering the possibility of including some of the “unspecified” perch responses. Striped bass, crab, and catfish were still among the top four species consumed. Nearly one-fifth of those who ate striped bass also did so at least once a week, and again, catfish is a species regularly consumed by some African American anglers.

### **Anglers and Consumption Advisories**

#### *Advisory Awareness*

Baltimore-area anglers were predominately (84%) aware of fish consumption advisories in their area. This section focuses mainly on respondents who had not been exposed to advisories in order to identify some of the needs and potential approaches to reaching populations not currently knowledgeable about advisories. However, anglers who were aware of advisories are included in the discussion where significant differences between them and non-knowledgeable anglers exist. Twenty-one anglers (16% of those interviewed) were not aware of Baltimore advisories.

Fishing mode can be indicative of site selection, and comparing fishing mode to advisory awareness can help planners evaluate the effectiveness of certain dissemination practices. Table 3.4 shows that, proportionally, boaters were slightly more often aware of advisories than were shore anglers. Advisories were commonly posted near the region's public boat ramps, and the greater proportion of boaters knowledgeable about advisories may be a consequence of this.

**Table 3.4. Advisory awareness among Baltimore anglers compared to fishing modes.**

<b>Fishing Mode</b>	<b>% Aware of Baltimore Region Advisories</b>	<b>% Unaware of Baltimore Region Advisories</b>
Shore/Dock/Pier	83	17
Boat	94	6

All of the anglers unfamiliar with consumption advisories lived in the Baltimore area, within 25 miles of the site where they were interviewed. Nearly all (91%) had been fishing in the area for at least three years, and a most (81%) had been fishing in and around Baltimore for at least a decade. Two-thirds (67%) had fished in and around Baltimore ten times or more in the previous year, so very few were inexperienced or infrequent anglers. These characteristics are similar to those of the general population and generally do not represent trends separate from knowledgeable anglers. The distribution of anglers uninformed about advisories among sample sites also did not represent a significant departure from the general population.

There were no significant differences in fishing motivations between those who did not know about fish advisories and the total population of anglers. However, difference in perceptions of risk between the two groups did exist. Only 19% of the non-knowledgeable anglers considered the fish they caught completely safe to eat, while 41% of knowledgeable anglers felt this way. Nearly all anglers (86%) who were not aware of consumption advisories stated that they felt local waters were too polluted for self-caught fish consumption. Some respondents who were aware of advisories also stated this (26%), but a comparable amount (29%) said they had never seen any harmful effects from eating fish, and as a result they believed consumption was probably not dangerous. Both knowledgeable and unknowledgeable groups agreed on the importance of following health advisories, but fewer knowledgeable anglers (79%) felt strongly about this value than those who did not know about the warnings (86%).

When asked about their consumption behaviors, only 29% of the fishermen not knowledgeable about advisories ate at least some of their catch, compared to 57% of those who were aware of advisories. Differences in portion sizes and meal frequencies were minimal. This finding was similar to that reported among Washington, DC area anglers.

One explanation for this counter-intuitive finding is that those anglers who had seen advisories believed the fish to be safer and considered the water less dirty because they felt more comfortable eating fish from Baltimore waters as a result of advisory

knowledge. They may have known the limits of advisories and believed consumption was safe within these limits. Anglers who had not seen advisories may not have been confident enough in their own judgments of fish and environmental health to adopt positive attitudes about these factors. A second, perhaps more likely, scenario is simply that anglers interested in consuming their catch were more attuned to or receptive to advisory messages (i.e., they were more likely to look for them and/or read them if they encountered them) than were anglers not interested in consuming their catch.

In discussing advisory awareness, it is important to point out two difficulties in relying on survey or interview data over actual observational data. First, is the potential for a recall bias. Some of the anglers claiming to have heard of local advisories could recall only limited specifics from the advisory, and may have in fact not known about area advisories. Contrary to what one would assume, educational attainment probably did not have an effect on advisory awareness, as an examination of the education levels between the knowledgeable and non-knowledgeable groups was inconclusive.

A second type of bias is presented itself particularly when conducting personal interviews. When dealing with an interpersonal mode of data collection, respondents often give responses that they believe they are expected to give, even if these responses are not accurate (called prestige, or social desirability, bias). In this case, it is possible that anglers who may feel ashamed or nervous about admitting to an interviewer that they eat fish from Baltimore waters may instead claim to not eat any self-caught fish. This scenario, of course, can apply to all anglers, whether they are aware of advisories or not.

These results are interesting because they might validate past studies by Beehler (2001)<sup>1</sup> who contends that advisory value reaches only so far, and that other factors played significant roles in an angler's decision to consume fish. Most of the anglers who had not seen consumption advisories still believed the water was too polluted to contain healthy fish, as did many of those who had seen advisories. This illustrates that certain perceptions of risk are inherent regardless of advisory presence, and knowing the environmental and other indicators that produce these perceptions are valuable to the development and dissemination of future advisories.

#### *Advisory Content and Dissemination*

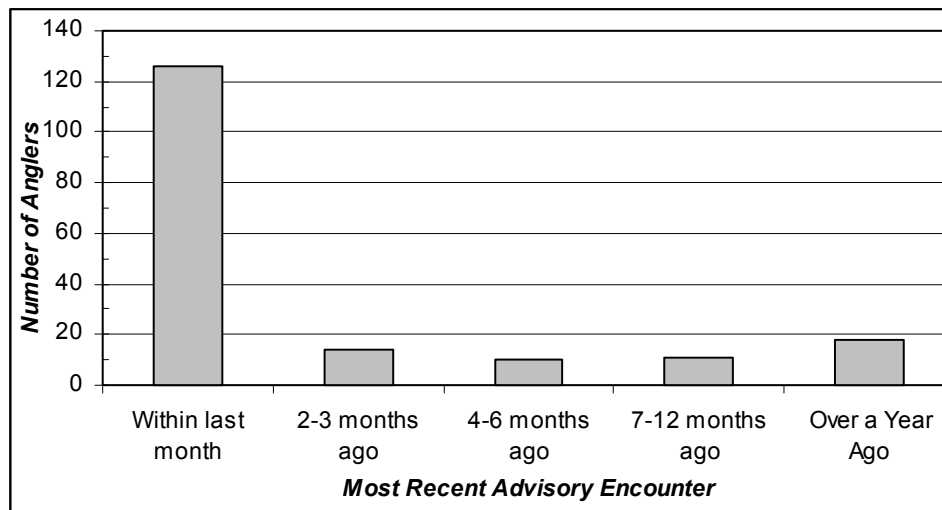
Advisory content and mode of dissemination are two critical factors in advisory effectiveness. This section analyzes survey responses according to the mode by which anglers became aware of fish consumption advisories and how recently they learned of those advisories.

Figure 3.1 illustrated how recently interviewed anglers had last heard about or seen a fish consumption advisory for the Baltimore area. Overwhelmingly, most anglers had been exposed to advisories within a month of their interview. More than 120 anglers responded this way, with fewer than twenty anglers responding in all other categories.

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<sup>1</sup> Beehler, Gregory P., Bridget M. McGuinness, John E. Vena. 2001. Polluted fish, sources of knowledge, and the perception of risk: Contextualizing African American anglers sport fishing practices. *Human Organization*. 60(3): 288-297.

This indicated that most anglers were responding to interview questions guided by the most recent (May, 2004) advisory release.



**Figure 3.1. Distribution of Baltimore area anglers with respect to their most recent encounter with a fish consumption advisory.**

We next asked anglers how they became aware of fish consumption advisories. Figure 3.2 illustrated the frequency with which various modes were mentioned. This was presented as an open-ended question (response options were now read), and anglers were able to list as many mode as they'd encountered, so these numbers are not mutually exclusive. Television, signs, and newspapers were the three most common modes by which anglers learned of advisories. Some of the other strategies currently utilized in the area, such as the fishing regulations books, internet resources, radio announcements, and verbal communications from health officials and doctors, had apparently reached relatively few, if any, anglers that we interviewed, though some anglers may not have listed all modes they'd encountered.

Anglers were also asked to recall content from the advisories they had seen. This information, organized in relation to the mode by which that content was received, is shown in Table 3.5. It should be noted that communication mode responses are not mutually exclusive (many anglers listed more than one), but this breakdown can provide a general idea about what information is successfully being communicated through particular dissemination modes. The warnings most often recalled from local advisories were limitations on certain fish species from Baltimore waters. Warnings about contaminants and toxins in Baltimore-caught fish were the next most commonly-recalled, followed by warnings prohibiting consumption. The most common sources for this information were television and signs posted at fishing sites. Some potential dissemination methods, including many interpersonal methods, (family members, doctors/health providers, and wardens/health officials) were not responsible for any information recalled by anglers.

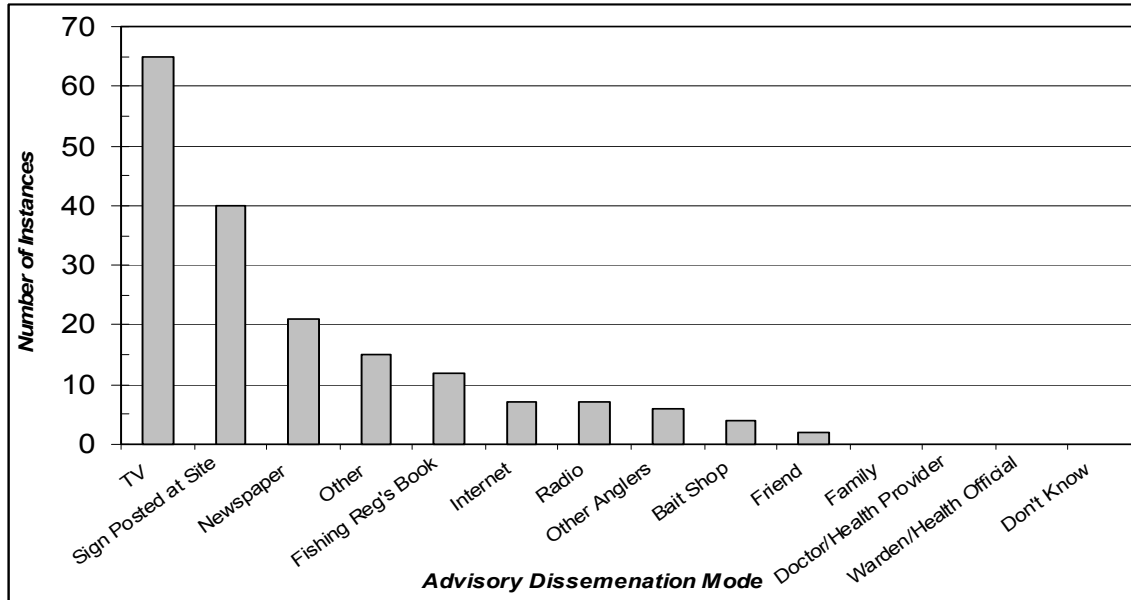


Figure 3.2. Distribution of Baltimore area anglers with respect to their recent modes of encountering a fish consumption advisory.

Table 3.5. Specific content recalled from advisories by those anglers who had heard, seen, or read about them in the Baltimore region, organized according to the mode of learning of the advisory (categories with no responses are shaded).

Advisory Content Recalled	Dissemination Mode by which Angler was Reached														TOTALS
	TV	Sign Posted at Site	Newspaper	Fishing Reg. Book	Other	Internet	Radio	Other Anglers	Bait Shop	Friend	Family	Doctor/Health Provider	Warden/Health Official	Don't Know	
Don't eat more than a certain amount of fish from Baltimore waters	18	21	9	7	6	4	2	1	2	-	-	-	-	-	70
Beware of certain toxins in Baltimore-caught fish	17	12	7	3	5	4	1	1	1	1	-	-	-	-	52
Don't eat certain kinds of fish from Baltimore waters	13	11	2	4	3	-	3	3	-	-	-	-	-	-	39
Don't eat fish from certain Baltimore waters	14	7	3	3	2	-	3	1	2	1	-	-	-	-	36
Other Incorrect Information	8	3	2	1	1	-	1	3	-	-	-	-	-	-	19
Don't know	8	2	2	-	-	1	-	-	1	-	-	-	-	-	14
Pregnant women or children should eat less fish from Baltimore waters	5	1	2	1	2	1	-	-	-	-	-	-	-	-	12
Don't eat any fish from Baltimore waters	3	1	2	1	1	-	1	-	-	-	-	-	-	-	9
Baltimore waterways are polluted/contain contaminants	2	-	1	-	-	1	-	-	-	-	-	-	-	-	4
Certain people should eat less fish from Baltimore waters	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
<b>TOTALS</b>	<b>88</b>	<b>59</b>	<b>30</b>	<b>20</b>	<b>20</b>	<b>11</b>	<b>11</b>	<b>9</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>256</b>

The most frequent responses represent a generalization of actual advisory information and include other possible responses. For example, less than 5% of angler replies to this question included specific recollections about reduced intake for women and children, but the most frequent angler response (“Don’t eat more than a certain amount of fish from Baltimore waters”) can also encompass this category. Less than 6% of the anglers who had seen Baltimore advisories were unable to recall *any* information contained in the advisory.

There are two distinct issues at work in the advisory dissemination process. First, health officials want to make people aware of the advisories, and second, they want people to change their behavior in response. Some dissemination modes may be very effective in creating awareness about the advisories, but less effective at influencing behaviors. Table 3.6 illustrates effectiveness of Baltimore advisory dissemination modes by determining how often a particular mode caused anglers to change their eating habits. Signs were most effective; not only did they reach a large number of people (the second most commonly encountered mode), but they also prompted 33% of the anglers who saw them to alter their fish consumption habits. The internet and fishing regulations booklets, which were not as affective in reaching a large number of anglers, were also effective, influencing 29% and 25% to change, respectively. The efficacy of these modes may rely on their accessibility. Posted signs, regulation booklets, and web-accessed data are easily accessible by anglers and can be revisited as needed, while modes like television and radio cannot be as conveniently referenced by anglers at a later date (Table 3.7). None of the anglers who named radio, bait shops, or friends as sources of advisory information changed their eating habits as a result of seeing or hearing the advisories.

**Table 3.6. Mode of Baltimore advisory dissemination compared to the proportion of anglers who gained awareness of advisories through that mode and changed their eating habits as a result.**

<b>Mode</b>	<b>Changed Eating Habits as a Result of Advisory</b>	<b>Did Not Change Eating Habit as a Result of Advisory</b>	<b>TOTALS</b>	<b>%Who Changed Eating Habits</b>
Sign Posted at Site	13	27	40	<b>33</b>
Internet	2	5	7	<b>29</b>
Fishing Reg's Book	3	9	12	<b>25</b>
TV	11	54	65	<b>17</b>
Other Anglers	1	5	6	<b>17</b>
Other	2	13	15	<b>13</b>
Newspaper	2	19	21	<b>10</b>
Radio	-	7	7	<b>0</b>
Bait Shop	-	4	4	<b>0</b>
Friend	-	2	2	<b>0</b>
Family	-	-	0	<b>0</b>
Doctor/Health Provider	-	-	0	<b>0</b>
Warden/Health Official	-	-	0	<b>0</b>
Don't Know	-	-	0	<b>0</b>
<b>TOTALS</b>	<b>34</b>	<b>145</b>	-	-

**Table 3.7. The most commonly mentioned fish consumption advisory dissemination modes in Baltimore and the rates at which anglers refer back to them when making decision about whether to keep and/or eat self-caught fish. Only modes with 10 or more responses are included.**

<b>Mode</b>	<b>Have Referred Back to Advisories</b>	<b>Have Not Referred Back to Advisories</b>	<b>TOTALS</b>	<b>% USING ADVISORY AS REFERENCE</b>
<b>Fishing Reg's Book</b>	4	8	12	<b>33</b>
<b>Sign Posted at Site</b>	7	32	39	<b>18</b>
<b>Newspaper</b>	3	18	21	<b>14</b>
<b>TV</b>	9	55	64	<b>14</b>

The last series of advisory related question posed to Baltimore anglers asked for suggestions to improve advisory content or dissemination (Table 3.8). Twenty-one percent of anglers who were aware of area advisories felt improvements could be made, while 79% believed the state of the advisories to be acceptable. Of those suggesting improvements, 39% (n=14) stated that signs needed to be posted at more sites, with many also adding that the content of the signs could be improved. Fourteen percent (n=5) thought that the signs should be more specific by elaborating on the problems concerning the Bay's tributaries or local fish populations. However, a similar percentage (11%) felt that advisories needed to be simplified. There were no significant trends in these improvements among anglers who learned of advisories through different modes.

**Table 3.8. Suggested improvements to Baltimore area fish consumption advisories mentioned by interviewed anglers. These responses are not mutually exclusive since anglers were able to name several improvements.**

<b><i>Suggested Improvements</i></b>	<b># of Responses</b>	<b>%</b>
Signs: Improve Them, Post More	14	39
Be More Specific/Include More Specifics	5	14
Simplify the Advisory Info	4	11
Use TV or Radio More	4	11
Be More Forceful	3	8
Site Visits - Talk to Anglers	2	6
Other	4	11

Finally, all anglers (not just those who were already aware of advisories) were asked about their preferred modes for receiving advisory information. These modes are listed in Table 3.9. Sign postings, television notices, and personal contact with anglers were among the most popular communication modes suggested.

Anglers—both those aware and unaware of advisories—often commented that it would be valuable to talk with officials at fishing sites who could answer their questions concerning fish health and consumption hazards. It is interesting to note, however, that none of the anglers included in this study appeared to have gained any of their personal knowledge of consumption advisories through contact with game wardens or health officials (see Figure 3.2). This may signify a potentially effective approach for the future that could have a significant impact on angler compliance.



**Table 3.9. Preferred fish consumption advisory dissemination methods among Baltimore area anglers, regardless of their current knowledge level.**

<i>Dissemination Methods</i>	<b>Number of Anglers</b>	<b>% Total of Named Methods</b>
Post Signs at Fishing Locations	64	31
Television	38	18
Talk to Anglers at Fishing Locations	27	13
Other	19	9
Newspaper	16	8
Signs or Brochures at Bait Shops	14	7
Radio	13	6
Internet	8	4
Provide Info When Purchasing License	3	1
Direct Mail	3	1
Don't Know	3	1
Put it in the Fishing Reg's Book	1	0
Have a Doctor/Health Care Provider Give Info	0	0
<b>TOTALS</b>	<b>209</b>	<b>100</b>

### **Analysis of Racial Differences**

Racial differences among Baltimore anglers were more pronounced than any other demographic. Furthermore, advisory and contaminated fish consumption literature focuses a great deal on racial and ethnic considerations in risk perception and assessment. Consequently, much focus has been given in this report to racial trends, and several issues are discussed in this section.

The two most prominent ethnic groups surveyed among Baltimore anglers were Whites and African-Americans; 82 respondents were White (64%) while 43 were African-American (33%). The remaining anglers were American Indian (3 respondents), and Hispanic (1 respondent), but the sample sizes for these ethnic groups were not large enough to constitute a valid analysis. As a result, racial comparisons in this section will involve only Whites and African-Americans.

### *Demographics*

The average age of anglers in the Baltimore region was fairly comparable when broken down by race; the average White angler was 47 and the average African-American angler was 49. An analysis of income categories shows that the household incomes reported by White anglers were, on average, skewed toward slightly higher values than the incomes reported by African-Americans. Forty-seven percent of African-American anglers in the Baltimore region reported household incomes of less than \$40,000 per year, with 19% below \$20,000. White anglers were slightly higher: 35% reported combined household incomes of less than \$40,000 and 10% of the incomes were less than \$20,000 per year. It

should be noted that the response rate for this question was lower than most questions (~70%) due to the reluctance of anglers to report their financial situations.

### *Fishing Locations and Habits*

Table 3.10 summarizes the site distribution of interviews conducted on all African-American and White anglers. Most interviews with White anglers were at Cox's Point Park on the Back River and Merritt Point and Turner's Station parks along the Patapsco River. All three of these parks were located in Baltimore County. African-American anglers also heavily fished the Cox's Point site, but their next highest representations were in Baltimore City, at the Middle Branch and Fort Armistead parks.

**Table 3.10. Distribution by race of all Baltimore anglers interviewed amongst the nine survey sites.**

<b>SITES</b>	<b>Whites</b>		<b>African-Americans</b>	
	<b># of Interviews</b>	<b>% of Interviews</b>	<b># of Interviews</b>	<b>% of Interviews</b>
Cox's Point Park	20	24	16	37
Rocky Point Beach and Park	0	0	0	0
Inverness Park	9	11	0	0
Merritt Point Park	24	29	1	2
Turner's Station Park	12	15	2	5
Canton Waterfront Park	4	5	1	2
Middle Branch Park	2	2	12	28
Broening/Ferry Bar Marine Parks	2	2	4	9
Fort Armistead Park	9	11	7	16
<b>TOTALS</b>	<b>82</b>	<b>100</b>	<b>43</b>	<b>100</b>

The types of fishing conducted by White and African-American anglers varied considerably. All African-American respondents fished from either the shore or small docks at the sample sites; none of those interviewed had been fishing from boats or any other type of watercraft. However, 21% of White anglers were fishing from boats. One notable trend shows that the 3 sites where the most White angler interviews were conducted (Cox's Point, Merritt Point, Turner's Station) all contained boat launches. The presence of a boat launch likely affected the site choice among White anglers. Conversely, none of the African-American anglers in this study had been fishing from boats – although some made note that they did occasionally use boats when fishing recreationally. Aside from the most popular overall site (Cox's Point), the next two most popular sites among African-Americans (Middle Branch, Fort Armistead) did not contain boat launches.

This fact might normally suggest that the population of African-Americans anglers in Baltimore was comprised of a greater number of local residents who had traveled short distances to arrive at their angling sites, and that White anglers sought out their choices of fishing sites based on the presence of boat launches. The data, however, refutes this: more White anglers (85%) reported traveling less than 10 miles to arrive at their

destinations than did African-Americans (67%). However, when the distance is increased to 25 miles, the population proportions are similar (99% of Whites traveled less than 25 miles compared to 97% of African-Americans).

The levels of fishing experience are also different among the two populations. Most fishermen in each group had been fishing for more than 10 years, but the proportion of Whites (87%) was significantly higher than African-Americans (65%). The frequency of fishing (number of times fishing in the last year) did not vary significantly between the two races.

### *Fish Consumption Patterns*

Several differences were uncovered between White and African-American anglers concerning their fish consumption patterns (Table 3.11). Sixty-five percent of all African-Americans interviewed stated that they consumed the fish or crabs that they caught, and of these, 100% responded that they provided some fish to their households as well. Among Whites, 45% said that they ate their self-caught fish or crabs, and less than half of these (43%) said that they provided it to their households.

**Table 3.11. Proportion of White and African-American anglers in Baltimore who reported consuming at least some of the fish or crabs that caught.**

<b>Angler Subpopulation</b>	<b>% of Anglers Consuming Self-Caught Fish</b>	<b>% of Those Consuming Fish Who Also Provide it to Household Members</b>
Whites	45	43
African-Americans	65	100

These figures naturally lead into an analysis of racial differences among motivating factors for fishing (Table 3.12). Sixty-five percent of African-American fishermen said that having a fresh fish dinner or providing freshly-caught fish to their families was a *very or somewhat important* motivator for fishing, and 44% said the same about fishing as a way of reducing family food expenses. Fewer Whites, however, answered affirmatively to these questions; 54% said that having a fresh fish dinner was *very or somewhat important*, and only 17% said the same about fishing as a way of reducing food expenses. These considerable differences suggest that African-Americans, on the whole, were consuming self-caught fish at a higher rate than Whites, and that many more were also doing it as an attempt to save money on food.

**Table 3.12. The importance of subsistence fishing related motivations among White and African-American anglers in Baltimore. Numbers represent the percentage of anglers who classified these motivations as either very or somewhat important.**

<b>Angler Subpopulation</b>	<b>Very or Somewhat Important Motivations for Fishing (% of Anglers)</b>	
	<b>Providing a Fresh Fish Dinner</b>	<b>Reducing Food Expenses</b>
Whites	54	17
African-Americans	65	44

When asked about commonly used fish cleaning and preparation methods, distinct racial trends once again became evident (Table 3.13). Note that all statistics presented here reflect a response of “most of the time.” African-Americans were more likely than Whites to eat the whole fish (including the skin and fat, 31% vs. 22%) and pan or deep fry their catch (69% vs. 41%) and were less likely to puncture or remove skin or fat (27% vs. 67%) or filet the fish (46% vs. 70%) prior to cooking. Each of these differences leads to the conclusion that African-Americans more often prepare their fish in ways that do not significantly reduce the contaminant content of a fish once it is caught. More than half of African-Americans (compared to 33% among Whites) also reported that they freeze or can self-caught fish at least some of the time, leaving open the possibility of regular self-caught fish consumption during the less-productive summer fishing months.

**Table 3.13. Self-caught fish and crab cleaning and preparation methods employed by White and African-American anglers in Baltimore. The percentages in the two right columns represent the proportion of anglers from each race answering “most of the time” to each of the preparation and cooking methods.**

Preparation/Cooking Methods	% Responding "Most of the Time"	
	Whites	African-Americans
Eat Mustard from Crabs	46	41
Eat Whole Fish, Including Skin and Fat	22	31
Puncture/Remove Skin Before Cooking	67	27
Trim Fat from Fish before Cooking	50	31
Filet the Fish	70	46
Eat the Fish or Crabs Raw	3	0
Pan Fry or Deep Fry	41	69
Re-use Fat or Oil from Cooking	6	15
Steam, Poach, or Boil	17	23
Broil, Grill, Bake, or Roast	47	46
Make Soup or Chowder	5	4
Freeze or Can it for Later	49	54

On other preparation methods, however, both racial groups displayed similar levels of risk-reducing or non-risk-reducing behavior. Many Whites (46%) and African-Americans (41%) responded that they consumed the mustard from crabs “most of the time”, which is expressly advised against in Baltimore-region advisories. However, less than 3% of Whites and no African-Americans responded that they typically ate their fish or crabs raw, one of the more hazardous methods for fish consumption. Furthermore, neither ethnic group typically re-used fat or oil from cooking.

These differences arising along racial lines may have been due to cultural behaviors or learned habits. Future studies might specifically ask respondents why they prepare their catch the way they do in an attempt to understand the relationship these trends have with advisory comprehension and cultural differences in fish preparation methods. Regardless, these data suggest evidence of heightened exposure to contaminants among African-Americans as a result of their reported fish cooking and preparation tendencies.

Young children, nursing and expectant mothers, and other women of childbearing age, are particularly vulnerable to the ill effects of contaminated fish. As mentioned before, African-Americans said they sometimes provide the fish they caught to their families at a

greater rate than Whites (100% vs. 43%, see Table 3.11). Less than 3% of anglers from each race, however, reported having women who were currently pregnant and/or nursing, and the presence of women aged 18-44, young children (5 years or younger), and older children (aged 6-15) were found to be nearly equal (proportionally) between the two ethnic groups. However the simple facts that African-American anglers more often consume their catch, more often provide it their families, and more often use non-risk reducing cleaning and preparation methods mean that African-Americans and their households are exposed to higher levels of contamination.

#### *Risk Perception and Advisory Awareness*

Data concerning risk perceptions and advisory issues were collected from all anglers, not just those who consumed or provided it to their families. One half (50%) all African-American anglers considered the fish from Baltimore waters safe to eat; while only 32% of Whites considered the fish safe. Furthermore, 37% of Whites stated that they explicitly believed the fish were not safe, compared to 21% for African-Americans. The remaining anglers either replied “it depends” or “not sure”.

Reasons anglers gave for their perceptions of fish safety varied by race. Among White anglers, 43% stated that they did not believe the fish to be safe because the water was too polluted. Another 17% said that they did not trust the fish because advisories in the area had stated that they were unsafe. For those White anglers who did believe the fish to be safe, the most common reason given for this perception (31%) was that they and other anglers had been eating the fish for years with no ill effects, therefore they must be safe.

Reasons given by African-Americans for their perceptions were somewhat different from those given by White anglers. Only 23% said that they thought that the water was too dirty (compared to 43% for Whites), and 47% thought that eating the fish was fine because they and others had been eating for years and no ill-effects had appeared (compared to 31% of White anglers. Twenty-three percent of African-American anglers indicated that eating fish was probably safe in moderation. This information may be a result of advisory exposure, but only 7% of all or African American anglers said that they were wary of fish safety specifically as a result of advisory information.

Most anglers from both ethnic groups reported knowledge of the existence of fish consumption advisories and knew generally what they were. They also were mostly aware of such advisories issued in the Baltimore area, with a slightly greater proportion of African-American anglers reporting that they knew of the advisories (88%) than White anglers (81%). African-American anglers also reported having seen the advisories more recently than White anglers: 75% of African-Americans had seen it within the last two or three months, compared to 60% of Whites.

Almost all of the anglers, regardless of race, said that they had no problems understanding the information contained in the Baltimore advisory. Further, less than one quarter of the anglers from each race who were aware of advisories (21% of Whites, 24% of African-Americans) felt that existing advisories could be improved. However, only 24% of White anglers and 14% of African-American anglers said that they altered their

eating habits as a result of information from the advisory. The most common reasons the anglers gave for not altering their eating habits was that they either ate within recommended guidelines already or that they did not eat self-caught fish even before seeing the advisory. Few anglers from each racial group said they actually referred back to the advisories to make decisions about keeping eating their fish. However, White anglers were twice as likely as African-American anglers to state that they had ever referred back to advisory information (20% and 10%, respectively).

These figures contrast with their perceptions about the importance of following fish consumption advisories: both races generally felt that following the advice in health consumption advisories was *very important* (77% of Whites and 83% of African-Americans) and less than 3% of each race did not consider it at all important.

### *Summary*

Several notable differences were uncovered by analyzing data from the Baltimore region along racial lines. African-Americans and Whites constituted the vast majority of anglers interviewed and were therefore the central groups analyzed. An analysis of fishing habits and behavior can identify some important considerations crucial to the dissemination of health advisories, such as critical locations for advisory postings and useful ways to target specific populations. The geographic distribution of White and African-American anglers was uneven, and this may serve as a reference for future advisory postings.

More African-Americans in the Baltimore region consumed self-caught fish than Whites, and considerably more reported that they also provided these fish to other family members. African-American anglers also considered providing fresh fish to their families to be a more important motivation for fishing, and they considered a reduction in food expenses to be considerably more important than did White anglers. Finally, African-Americans were less likely than Whites to prepare their fish using risk reduction techniques (e.g., removing skin and fat, avoiding frying). Each of these findings leads to the conclusion that African-Americans are at a greater risk of exposure to the negative effects of contaminants in fish.

This conclusion is further supported by the fishing habits, advisory perceptions, and risk perceptions reported by anglers. White anglers were found to be more likely to refrain from eating the fish that they caught than African-Americans, most likely as a result of their negative perceptions of water cleanliness. Less than 20% of each of the populations stated that information derived from fish consumption advisories was their basis for fish avoidance, and less than a quarter of each groups altered their fish consumption habits based on advisories. Furthermore, 20% or less of each racial group had used advisories as a reference for keeping and eating fish. These data conflict with the angler's attitudes toward fish consumption rates: nearly all Whites and African-Americans considered following advisory information to be at least somewhat imperative.

## Other Demographics

### *Income*

There were a few considerable differences between anglers from different income categories in the Baltimore region, but many of the most imperative comparisons were consistent across all groups. This section will discuss those items found to be represented differently across income categories. The income categories used were combined household incomes as reported by the anglers. The categories were \$0-20,000/year, \$20,001-\$40,000/year, \$40,001-\$80,000/year, and more than \$80,000/year.

No trends in fishing motivations were evident across income categories. Anglers in the \$20,001-\$40,000/year group most often reported that a reduction of food expenses was at least somewhat important motivation for fishing (40%), and those in the \$0-20,000/year group least frequently reported this (0%). There were also no obvious consumption trends, as anglers with incomes of \$40,001-\$80,000/year most often reported consuming at least some of their self-caught fish (57%), and those with incomes of more than \$80,000/year least often reporting this (41%).

Differences in risk-reducing preparation and cooking methods were, however, evident between the different income groups. The lower two income groups were more likely than the higher income brackets to eat the whole fish most of the time (including the skin and fat, 47% vs. 13%, respectively), less likely to remove the skin (47% vs. 68%, respectively), and less likely to trim the fat from self-caught fish (27% vs. 58%, respectively) prior to cooking them. They were also more likely to pan or deep fry their catch (65% vs. 44%, respectively). This indicates that anglers with lower incomes are generally not preparing their self-caught fish in a manner that reduces the level of contaminants in the fish.

Angler differences in the species consumed and frequency of consumption did not show considerable trends, with the exception of one. Consumption among anglers in the lowest income category focused more heavily on crabs than the rest of the consumed species when compared to anglers with higher incomes. This, however, did not translate into an increased consumption of crab mustard among anglers with lower incomes.

Angler responses concerning advisory content showed that anglers from lower income categories were typically more aware of advisories than anglers from higher income brackets (Table 3.14). Although the majority of all income groups were aware of advisories, the two highest proportions of knowledgeable anglers were found in the two lowest income categories. In combination with the above mentioned relative lack of risk-reducing behavior and increased consumption of certain advisory species (e.g., crabs), this occurrence indicates a potential problem. Anglers with low incomes are just as, if not more, aware of fish consumption advisories as higher income anglers, but they are not heeding the recommendations in those advisories with respect to many items, including self-caught fish preparation.

**Table 3.14. Percent of anglers aware of Baltimore area fish consumption advisories according to angler household income category.**

<b>Annual Household Income (dollars)</b>	<b>Aware of Advisories</b>	<b>Unaware of Advisories</b>	<b>TOTAL</b>	<b>Percent Aware</b>
0-20,000	12	1	13	<b>92.3</b>
20,001-40,000	23	3	26	<b>88.5</b>
40,001-80,000	35	12	47	<b>74.5</b>
more than 80,000	15	2	17	<b>88.2</b>
<b>TOTALS</b>	85	18	103	<b>82.5</b>

*Age and Education*

The ages of anglers were not found to present substantial trends with respect to fish consumption, advisory awareness, or other demographics. Angler ages ranged from 18 to 83, with the average being 48 and the median and mode being 47 and 46, respectively.

Two-thirds (67%) of anglers had a high school education or less. The degree of education was not valuable in determining trends with respect to consumption, advisory awareness, or other demographics.

**Stakeholder Meeting**

The stakeholder meeting for the Baltimore region of concern took place on January 19, 2005 at the MDE headquarters in Baltimore from 9:00am until approximately 12:30pm. Email invitations were sent out to members of various public and private organizations, including the MDE, the Maryland Department of Natural Resources, county and city health departments for the area (including Women, Infants, and Children programs), various watershed groups, area universities (particularly departments in toxicology and environmental and public health), the Maryland Watermen's Association, and environmental conservation groups. In the end, there were a total of 21 people registered to attend and 22 people actually in attendance. These individuals, along with their affiliations and contact information, are listed in Table 3.15.

**Table 3.15. List of participants attending the Baltimore region stakeholder workshop to discuss survey results related to Baltimore area fish consumption advisories.**

<b>Name</b>	<b>Affiliation</b>	<b>Email</b>
Beth McGee	Chesapeake Bay Foundation	<a href="mailto:bmcgee@cbf.org">bmcgee@cbf.org</a>
Thaddeus Graczyk	John Hopkins University	<a href="mailto:tgraczyk@jhsp.edu">tgraczyk@jhsp.edu</a>
Ellen Silbergeld	John Hopkins University	<a href="mailto:esilberg@jhsp.edu">esilberg@jhsp.edu</a>
Eric Fine, MD	Baltimore County Health Department	<a href="mailto:efine@co.ba.md.us">efine@co.ba.md.us</a>
Katherine Squibb	University of MD, Baltimore	<a href="mailto:ksquibb@umaryland.edu">ksquibb@umaryland.edu</a>
Greg Allen	EPA, Chesapeake Bay Program	<a href="mailto:Allen.Greg@epamail.epa.gov">Allen.Greg@epamail.epa.gov</a>
Maureen Edwards, MD	DHMH, Maternal and Child Health	<a href="mailto:medwards@dnhm.state.md.us">medwards@dnhm.state.md.us</a>
Anne Bailowitz, MD, MPH	Balt. City Health Dept, Maternal & Child	<a href="mailto:anne.bailowitz@baltimorecity.gov">anne.bailowitz@baltimorecity.gov</a>
Mary Dallavalle, RD, LD	DHMH, WIC Program	<a href="mailto:dallavalle@dnhm.state.md.us">dallavalle@dnhm.state.md.us</a>
Barnard Kozlovsky	Resident, Preventive Medicine, UM	<a href="mailto:bkozlovs@epi.umaryland.edu">bkozlovs@epi.umaryland.edu</a>
Ray Bahr	MDE, Stormwater	<a href="mailto:rbahr@mde.state.md.us">rbahr@mde.state.md.us</a>
Ray D. Bahr, MD	Baltimore Harbor Watershed Association	<a href="mailto:rdbgo@aol.com">rdbgo@aol.com</a>



Phil Heard	MDE	<a href="mailto:pheard@mde.state.md.us">pheard@mde.state.md.us</a>
Rosanna Kroll	MDE	<a href="mailto:rkroll@mde.state.md.us">rkroll@mde.state.md.us</a>
Sharon Schueler	Gwynns Falls Watershed Association	<a href="mailto:Sharonpiscs22@cs.com">Sharonpiscs22@cs.com</a>
Simon Brown	EPA, Chesapeake Bay Program	<a href="mailto:Brown.simon@epa.gov">Brown.simon@epa.gov</a>
David Riter	Baltimore County Dept of Environment	<a href="mailto:driter@co.ba.md.us">driter@co.ba.md.us</a>
Anna Soehl	MDE	<a href="mailto:asoehl@mde.state.md.us">asoehl@mde.state.md.us</a>
George Harman	MDE	<a href="mailto:gharman@mde.state.md.us">gharman@mde.state.md.us</a>
Joe Beaman	MDE	<a href="mailto:jbeaman@mde.state.md.us">jbeaman@mde.state.md.us</a>
Joshua Gibson	Virginia Tech, project personnel	<a href="mailto:jogibso1@vt.edu">jogibso1@vt.edu</a>
Julie McClafferty	Virginia Tech, project supervisor	<a href="mailto:jmccclaff@vt.edu">jmccclaff@vt.edu</a>

The meeting started out with a presentation by Joseph Beaman, MDE, of the Maryland fish consumption advisory process and an update on the current status of Baltimore area advisories and dissemination methods currently employed. Next, Dr. Ellen Silbergeld presented the results of a study performed by Johns Hopkins University during the summer of 2002 and spring of 2003. This study included a mail survey of Maryland licensed anglers and interviews of urban anglers in Baltimore to determine risk levels for exposure to chemical and microbiological contaminants. Next, Josh Gibson, Virginia Tech, presented the results of the angler interviews we conducted in the Baltimore area during the summer of 2004. Each presentation was followed by a question and answer session. Finally, a discussion ensued regarding possible ways to improve advisory knowledge and compliance among area anglers.

The information presented below is an overall summary of the discussions that took place at all three stakeholder meetings, with notes specific to the Baltimore area. Because the meetings were very different in terms of how much discussion took place and the individuals involved, each region can benefit from the breadth of topics discussed at all three meetings.

The group discussions as a whole revolved around two themes: ways to reach the target audience, and ways to improve message content. It became clear that a comprehensive outreach program with multiple communication modes is, indeed, needed because posting fish consumption advisories only in fishing regulation books does not reach a substantial portion of the audience. First, many urban anglers simply do not purchase fishing licenses, and secondly, the fishing regulations books do not target the sites at which people are fishing (i.e., where the exposure occurs). The multi-pronged outreach program currently in use for the Baltimore area advisories goes a long way in reaching those at-risk populations, but meeting participants had several suggestions for further improvements. These include talking to local watershed organizations (which would require meetings outside the normal working hours since many of these individuals are volunteers) and attending community events to train other community members in advisory issues. This would effectively increase the number of people available in the community able to help spread the word, and anglers may be more likely to accept and adhere to advisory recommendations if the message is coming from someone in their own community. It was also suggested that a study be conducted to look the actual risk levels among participants in the community health programs (e.g., Women, Infants, and Children) to determine if current programs are, in fact, reaching those people and whether those families are at special risk. One additional audience that was suggested, and that

may be an avenue for future research, is to talk to fish market managers that purchase fish from local anglers in order to determine what they are buying and selling and possibly create another avenue for advisory communication. Each of these suggestions involves an increase in the level of interpersonal communication modes, which we also found to be a potentially useful mode in our study.

Message content was talked about specifically in relation to public health outreach programs (e.g., Women, Infants, and Children Programs) and the general population. In both cases, it was stressed that messages needed to be simple, positive, and relevant. First, messages should be created at an appropriate reading level (e.g., 5<sup>th</sup> grade), and should simplify advisory recommendations enough so that the message is still the same, but people are not required to perform mental calculations or keep track of multiple figures. Baltimore area advisories were considerably more complex than those issued for the other 2 regions of concern; anglers are asked to comply with a system of 8 different meal frequency recommendations (depending on fish species and age/gender of household members) and 3 different servings sizes (depending on age/gender of household members). It was suggested that the message be kept simple enough that the recipient is asked to retain just 2 or 3 main points. Second, a positively framed message can greatly improve both message reception and behavior modification. One participant suggested that, while it's important to stress which fish are potentially unsafe to eat, it is equally important to point out species that are safe. Third, incorporating positive cultural references into the advisory message can make at-risk populations more receptive as well. This can be done by recognizing that people are using the fish that they catch in economic or culturally important ways and suggesting risk-reducing behavioral modifications that allow them to continue to meet those needs. Finally, the use of visual and tactile aids in communicating advisories was suggested as a way to improve reception and retention among all audiences.

### **Conclusions and Recommendations**

Anglers in the Baltimore region of concern were, for the most part, aware of the advisories in effect for the area (84%). However, it should be noted that an aggressive dissemination campaign was mounted by MDE less than a month prior to the start of our angler interviews in order to communicate the new advisories to the anglers in the area. This may be an important factor to keep in mind when viewing advisory data from this study since most anglers stated that they had seen their latest advisory within a month of their interview. With sustained efforts, it is possible that such a successful communication effort can be maintained, but future studies similar to this would be helpful in order to determine how well advisories are being communicated after they have been in effect for a longer period of time.

The advisory dissemination materials issued by the MDE for the Baltimore area are likely the most thorough among the three Chesapeake Bay regions we examined. The advisories and their supplementary materials provide abundant information on which chemical contaminants are present, risk reducing cooking and preparation methods, which fish species are affected, and specific actions recommended for at-risk populations.

It should also be noted that the Baltimore area advisories themselves were significantly more complex than the advisories in the other two regions examined. First, Baltimore based their advisories on separate meal sizes for each target population (i.e., 8 ounces for the general population, 6 ounces for women of childbearing age, and 3 ounces for children aged 5 and younger). Our findings did not support variable meal sizes, particularly for women. Most anglers who provided fish to their families reported that the women in the household eat about the same serving size as the angler, and 8 ounces was the most commonly reported serving size. Reported serving sizes for children, on the other hand, were smaller at 4 ounces or less. Second, Baltimore advisories rely on a complex 8-tier meal frequency recommendation system (i.e., no advisory, 8 meals/month, 4 meals/month, 2 meals/month, 1 meal/month, 5 meals/year, and no consumption). The combination of variable serving sizes, many different consumption levels, and individual fish species can make it difficult for individual anglers to understand and remember. The anglers interviewed in this study, for the most part, reported that they understood the advisory information and were able to recall at least some of the information contained in the advisories. However, a simplification of the meal frequency decision tree would likely improve information retention even more.

About half (53%) of the anglers in the Baltimore region reported that they consumed at least some of the fish that they caught while fishing local waters. However, although advisory knowledge was relatively widespread and many anglers practiced catch and release, most anglers who were consuming the species under advisory were consuming more than was recommended. Indeed, 78% of all instances of fish consumption reported by species were in excess of advisory recommendation. Furthermore, most of the species of fish and crab that were the most popular for consumption (including the four most popular: striped bass, white perch, catfish, and crabs) were species considered to have high levels of contamination. Although anglers overwhelmingly believed advisories were important and most indicated that they were aware of the advisories and that they understood them, most anglers who consume self-caught fish are not adhering to them.

Unlike other regions, the tourist population did not appear in this study to have an effect on advisory awareness (all anglers lived within 25 miles of their fishing sites). However, boaters were slightly more aware of the advisories than shore fishermen, possibly as a result of sign postings near many boat launches throughout the summer. One possible suggestion for future dissemination campaigns is an increase in sign postings (i.e., at regular distance intervals) along areas popular among shore and dock fishermen.

One possibly positive trend in the Baltimore region was the fact that anglers who were aware of advisories were more likely to consume their self-caught fish (57% consumed) than those who were not aware of area advisories (29% consumed). This is encouraging, since recreational fishing is such an important cultural and economic activity for the region. The data suggest that advisory issuance in the area does not necessarily discourage anglers from fishing in the area or from eating the fish that they catch altogether (although many are still eating considerably more than is recommended). This trend, however, should also be re-examined after advisories have been in effect for a longer period of time.

The mode of advisory most effective in reaching anglers was television, which is interesting since MDE did minimal outreach through television outlets. The major television efforts were actually news stories picked up by local outlets – commercials and public service announcements were minimal. Since so many anglers learned about advisories through the limited exposure the advisories received on television, this is a possible avenue of increased focus in future widespread advisory communications, especially if the focus is on creating widespread awareness of advisories. As reported here, however, television reached a great number of people but was not as effective, proportionally, as other modes in actually changing angler behavior.

Signs, a dissemination mode used more often by MDE, were also highly effective in communicating advisories. In fact, the most commonly suggested improvement among anglers was an increase in sign postings, indicating that local anglers viewed that method favorably. Signs at fishing sites were also the most effective mode for changing consumption behavior, prompting more anglers to change their behavior than any other communication mode. The internet was also effective in changing behavior, but very few anglers named this as one of the ways by which they learned of advisories and few also named it as a preferred communication mode. Many fisheries managers rely largely on internet dissemination, but this study seems to suggest that it is not currently among the most effective ways of communicating a message of risk to area fishermen on a large scale. Internet is, however, a relatively inexpensive communications mode, and should not be abandoned entirely.

Many anglers stated that interpersonal modes of advisory communication, such as talking to anglers at fishing sites, were a preferred mode of communication. This is a trend that arose in each of the three regions of concern. Interpersonal modes (like site visits by fisheries managers or health officials) are not the most financially or labor-efficient ways to communicate advisories, but some integration of interpersonal contact at popular fishing spots may be an effective tool in future dissemination protocol improvements. One proposed idea from the regional stakeholder meeting was to have MDE and health officials visit community meetings, organization meetings, or neighborhoods in general. This method ensures that as many people in certain locales or interest groups (such as watershed organizations or women's health groups) are aware of advisories and possible steps to learn more about them. In this way, a whole community of communicators can be developed, and those who attend such meetings or events can then pass the information on to other anglers that they encounter.

Another product of the focus groups was the suggestion that a questionnaire be distributed at health clinics and to participants in community health programs (e.g., Women, Infants, and Children) that contains questions directed at determining whether an individual is at risk for contaminant consumption. This method, it is believed, may not result in completely accurate reporting by individuals, but can at least 1) give a general idea of which populations are at particularly high risk and 2) serve as yet another form of advisory education. This method – along with many others – can be less successful, however, depending on literacy levels of the individuals involved.

One of the goals of the study was to identify at-risk populations in each region of concern and to determine whether some subpopulations of anglers were being exposed to contaminated fish more often than others. One of the most valuable ways of attempting this is to analyze some of the data according to racial groups. Consumption among different ethnicities appeared to be significantly different; 45% of White anglers consumed their catch, compared to 65% of African-American anglers. Just as notable was the fact that all African-Americans who consumed their catch stated that they provided their catch to their families (compared to 43% of Whites). Further, African-Americans were significantly less likely to use risk-reducing cleaning and preparation techniques for the self-caught fish that they consumed. These three factors translate to an increased exposure for African-American anglers and their households.

Consumption trends among the two most prominent ethnicities also raised interesting points about advisory awareness. African-Americans were slightly more aware of advisories than Whites, yet they consumed more advisory species and provided them more often to their families. They also felt more strongly than Whites that following the information in advisories was “*very important*”, yet many more African-Americans than White believed area fish to be safe for consumption. The motivating factors for fishing also suggested more risks for minorities, since 44% of African-Americans said that reducing food expenses was at least a *somewhat important* reason they fished (compared to 17% of Whites).

It seems that minority anglers, although they were more aware of advisories than Whites and often placed more importance in the warnings, were not following advisories as often as Whites. Although they considered the advisories to be important, fewer African-Americans referred to the advisories than Whites (20% to 10%) and fewer also said that they changed their consumption patterns after encountering advisories (24% to 14%).

African-Americans, regardless of income category and education, can be identified as a population of anglers that has the potential of a greater exposure risk than other ethnicities. Targeting this population can be accomplished in many ways, including utilizing site-distribution data from this report (people from specific ethnicities often favored certain sites). Unfortunately, preferred and effective modes of communication were not considerably different by race.

In conclusion, anglers in the Baltimore region of concern were found to be relatively knowledgeable about advisories, and nearly half claimed that they did not ever consume any sport-caught fish. Many also placed considerable importance in the advisories and believed them to be sufficient in their current form. However, there are several opportunities for improvement with respect to outreach methods and targeting strategies to those anglers who do consume their catch, and the challenge will be in reaching those anglers who are aware of the advisories, yet continue to eat more than is recommended. Two possible reasons for this trend are 1) because people believe they are currently eating within advisories (where perhaps a food journal approach might be helpful to help consumers keep track of their meals), and 2) because they choose to ignore the advisories

(in which case different message formats and communications formats such as interpersonal communication are needed). In either case, a simplification of the advisories themselves is warranted, and a shift towards the use of more interpersonal forms of communication will likely improve advisory compliance.

#### IV. RESULTS FROM WASHINGTON, DC ANGLER INTERVIEWS

This chapter discusses the results from the Washington, DC area angler interviews. The survey instrument used for these interviews is included in Appendix A, a map of the fishing access points surveyed is included in Appendix B, and frequency tables for all closed-ended questions are included in Appendix G.

##### Washington, DC Region Advisories

Fish consumption advisories in Washington, DC are administered by the Washington, DC Department of Health (DOH) (see Appendix A). Table 4.1 shows a summary of the fish consumption advisory in effect for the District of Columbia during the months when angler interviews took place (June-August, 2004). The advisory involved a commercial fishing ban due to PCBs, no-consumption warnings for some sport-caught fish, and limited consumption warnings for others. The advisory also provided advice on how to prepare self-caught fish to minimize contaminant exposure. Directions stated that one should “always skin the fish, trim away fat, and cook fish to drain away fat because chemical contaminants tend to concentrate in the fat of the fish.” The advisory further encouraged the consumption of younger and smaller fish of legal size of all species, including those not specifically listed in the advisory, and the DOH encouraged the practice of catch and release in all DC waterways. Finally, an addendum to the advisory asks the public to report fish kills if seen in the DC area, an indication of contaminant or toxic releases.

**Table 4.1. Fish consumption recommendations in effect for the Potomac and Anacostia Rivers, Washington, DC. A ban on all commercial fishing in DC waters was in place in addition to the recreation fish consumption advisory**

<b>Fish Species</b>	<b>Consumption Recommendation from DC Advisory</b>
<b>Catfish</b>	No consumption
<b>Carp</b>	No consumption
<b>Eel</b>	No consumption
<b>Largemouth Bass</b>	Limited to one half-pound per month
<b>Sunfish/Other Fish</b>	Limited to one half-pound per week

Two statements from the DOH concerning fish consumption are also provided. One makes note of the commercial fishing ban and stresses that because of it, fish in markets, restaurants, and grocery stores do not come from the Anacostia or Potomac Rivers and are therefore safe to eat. The other statement notes that other species of fish found in the District's waters that were not identified in the advisory did not have elevated levels of PCBs or pesticides.

No formal advisory dissemination protocol exists, but several communication modes are routinely employed including sign postings, internet postings, a listing in the fishing regulations book and on the back of the fishing license, press releases, Internet distribution, and printed pamphlets and fact sheets (Ira Palmer, Fish and Wildlife Division, personal communication). The DC Department of Health has these materials available in English and in Spanish. Advisories are issued whenever new data become

available, and the public can obtain copies of printed advisory materials from the Health Department, state fisheries office, and businesses that issue fishing licenses.

Three of the 9 sites in the Washington, DC region were located within the Commonwealth of Virginia (LBJ Park/Columbia Island Marina, Gravelly Point/Roaches Run, and Dangerfield Island/Washington Sailing Marina), were located on the Potomac River in close proximity to the other Washington, DC region sites. Advisories from the District of Columbia applied to these sites. All other sites were within DC borders.

### **Overall Survey Results**

A total of 247 surveys were collected from the Washington, DC sampling sites. The response rate in this region was 86% of all unique. A few anglers contacted had been interviewed before during the course of the summer (9% of all contacts), and were not interviewed again. Since one member of the interview team was bilingual, 6% of the surveys collected were administered in Spanish. Beyond those surveys, 5 of the refusals (<2% of all contacts) involved a language barriers and the rest of the contacts for whom interviews were not completed were anglers who did not have time or otherwise declined the interview. See Appendix G for frequency tables detailing the results described in this section.

#### *Demographics*

Most interviews in the Washington, DC area were collected along the Potomac River, the most actively sampled sites being Fletcher's Boat House (24%) and Hains Point/East Potomac Park (32%). Anacostia Park South (13%) was the most active site on the Anacostia River. Only one site, Theodore Roosevelt Island, yielded no surveys. Sunday was the most productive day of the week (29% of all interviews), followed by Wednesday (18%) and Saturday (17%).

A large proportion (91%) of the interviewed anglers was male, and 75% were fishing from the shore rather than from a boat. Most (89%) had traveled less than 25 miles to reach their fishing location, and 57% had fished in the Washington, DC area for more than a decade. The distribution of fishing frequency was fairly even: 20% had fished in the DC area more than 50 times in the past year, 30% had fished 3-10 times, and 24% had fished once or twice.

The average age of anglers interviewed in the Washington, DC area was 45. Half (50%) of the anglers interviewed were African-American, about a third were Caucasian (33%), 10% were Hispanic and 6% were Asian. Four other ethnicities were also reported by anglers, including Bosnian, African, Caribbean, and Arab-American, with one respondents each. About half (49%) of anglers interviewed reported having a high school education or less. Most household incomes for Washington, DC anglers either exceeded \$80,000 per year (39%) or fell between \$40,000 and \$80,000 per year (31%), with 31% making less than \$40,000 per year and 9% making less than \$20,000 per year.



### *Fish Consumption Patterns*

The most common motivations for fishing were relaxation (93% said this was *very important*), spending time outdoors (92% said *very important*), and experiencing the challenge or sport of fishing (63% said *very important*). Slightly over 35% considered reported that providing their family with a fresh fish dinner was either *very* or *somewhat important*, but only 16% responded that reducing family food expenses was either *very* or *somewhat important*.

Only 37% of Washington, DC anglers reported that they ate at least some of their catch, and of these, 75% still avoided eating certain species. However, more than half (54%) of the fishermen said that they sometimes gave away the fish that they caught, an interesting finding in that only 37% of anglers each the fish themselves. Indeed, 50% of the anglers who stated that they *did not* consume fish from Washington, DC waters themselves reported that they *did give away* at least some of the fish that they caught.

Warmer months were the most popular for eating self-caught fish (April-September) and 53% of anglers who eat their self-caught fish did so 1-3 times per month during these months. No one reported that they ate fish 3 or more times per week, and 20% said they ate fish once or twice per week. November through February were the least popular months for eating fish, and 69% of anglers who sometimes eat their catch said they ate no self-caught fish during that time. Anglers estimated that, on average throughout the year, they ate self-caught fish less than once per month (44%) or between one and three times per month (29%). Only 2% reported that they ate self-caught fish more than twice/week throughout the year.

The DC DOH uses 8 ounce serving sizes to set advisory recommendations. Most Washington, DC anglers (78%) estimated their typical portion sizes to be 8 ounces or less, with remaining anglers who consumed self-caught fish stating that they typically ate more than 8 oz. in a single meal (22%). Interestingly, 67% of those who ate crabs considered more than 15 crabs to be a normal serving, though the sample size for crab-eaters in Washington, DC was very small (n = 6).

When preparing self-caught fish, most anglers punctured or removed the skin (61%), trimmed the fish fat (59%), filleted (61%), and/or fried (77%) their fish most of the time. Most (68%) also answered that they never ate the fish whole (including the skin and fat), ate the fish raw (94%), steamed/poached/boiled their catch (60%), or made soup or chowder (67%). About 73% claimed that they canned or froze their catch for later at least some of the time.

The most common reasons given for not consuming self-caught fish among caught fish are shown in Table 4.2. Most non-consuming anglers considered DC-area waters to be too polluted to consume fish (59%), with another 6% stating explicitly that they were adhering to advisory warnings. It is likely that some of the anglers who were adhering to advisories were captured in the “water pollution” responses since DC-area advisories mention poor water quality and contaminants among their warnings. Another 10% stated that their main reason for not eating is that they only fished for fun.

**Table 4.2. Reasons given by Washington, DC anglers for not consuming self-caught fish.**

<b>Reasons for not Eating Their Catch</b>	<b>Anglers</b>	<b>% of Angers who do not Consume</b>
Pollution	84	<b>59</b>
Fish for Fun	15	<b>10</b>
Don't Know	8	<b>6</b>
Listen to Advisory	8	<b>6</b>
Dislike Taste	7	<b>5</b>
Other	6	<b>4</b>

### *Advisory Awareness*

Most Washington, DC anglers were aware of the health benefits of consuming fish (75%), but only 18% of them said that they ate more self-caught fish as a result of that information. Many anglers refrain from consuming recreationally-caught fish due to perceptions about their safety or cleanliness. Only 30% of anglers felt that fish from the Potomac and Anacostia Rivers were safe to eat, while 39% responded that they felt the fish were not safe to eat. Fourteen percent responded “it depends”, and 17% were uncertain. Although more than two-thirds of interviewed anglers (69%) were familiar with fish consumption advisories in general, only 56% had specifically heard of the advisories in the Washington, DC area. Of these, most anglers had learned of the advisories from the television (28%), newspapers (27%), and fishing regulations books (25%). Anglers were split on the last time they had seen or heard the DC advisories, as 33% said it was within the last month and 37% claimed that it had been over a year since they had seen or heard an advisory.

Twenty-six percent of anglers who said they knew of the DC area advisories also reported that they had actually changed their eating and/or fishing habits as a result. Of these, 31% said that it made them change the species of fish that they ate, 23% said that they started to limit the amount of fish they ate from the area, and 20% said they refrained from eating any more self-caught fish.

Of the nearly three-fourths (74%) of anglers who did not change their habits as a result of seeing an advisory, about 73% said that they already either did not eat fish or ate very little prior to the advisory, and 8% claimed to already eat fish within the limits of the advisory. A few anglers also stated that they did not change because they believed the warnings to be inaccurate (8%) or unimportant (4%), and another 7% thought that there was no reason to change since they were unaware of anyone becoming sick from eating local fish. Thirty percent claimed to have referred back to the advisory at some time about keeping and eating certain fish.

When asked about possible improvements to the DC area advisory, only 36% of those who had seen the advisory for the Washington, DC area indicated that it could be improved upon. Although few anglers claimed to have referred to the advisories (30%), more than 85% felt that heeding the information contained in the local advisories was

*very important.* The most popular methods that the anglers suggested for disseminating advisory information to the public were posting signs at fishing locations (39%) and placing advisory information on television (21%) and in newspapers (18%).

### Angler Consumption by Species

Most recreational anglers in the Washington, DC region of concern did not eat the fish that they caught from DC waters (63%). The rest (37%) stated that they did consume self-caught fish at least some of the time. Table 4.3 summarizes the fish consumption by DC-region anglers according to the species they named and the frequency at which these species were consumed. Anglers were asked to name up to 4 species. Catfish was the fish most commonly named, 59 anglers listing this among the species they eat. While anglers often specific a certain type of catfish, these have been collapsed into a generic “Catfish (all)” category here to reflect the advisory.

**Table 4.3. Summary of fish species consumption based on consumption frequency among Washington, DC area anglers. The most common consumption frequency response for each species is highlighted, and fish species specifically mentioned in the DC fish consumption advisory are underlined. The “Bass (general)” category includes anglers who did not specify largemouth or smallmouth.**

Fish Species	5 + Times/Week	3-4 Times/Week	1-2 Times/Week	1-3 Times/Month	Less Than Once/Month	TOTALS
<u>Catfish (all)</u>	<u>0</u>	<u>2</u>	<u>7</u>	<u>17</u>	<u>33</u>	<u>59</u>
Stripers/Rockfish	0	0	2	9	24	35
<u>Largemouth Bass</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>17</u>	<u>22</u>
Crappie	0	0	2	4	14	20
Bluegill	1	1	1	6	9	18
White Perch	0	0	0	4	8	12
Yellow Perch	1	0	0	4	5	10
Perch (general)	0	0	0	3	6	9
Smallmouth Bass	0	1	0	4	3	8
<u>Carp</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3</u>	<u>3</u>
<u>Bass (general)</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>2</u>
Croaker	0	0	0	1	0	1
Spot	0	0	0	1	0	1
Trout	0	0	0	0	1	1
Brown Bullhead	0	0	0	0	1	1
Walleye	0	0	0	0	1	1
<b>TOTALS</b>	<b>2</b>	<b>6</b>	<b>14</b>	<b>56</b>	<b>124</b>	<b>202</b>

In the Washington, DC region, the most commonly consumed species were types of catfish, which were included in Washington, DC’s no-consumption advisory. Forty-four percent of all anglers who reported eating self-caught catfish did so at least once per month. Carp, another of the no-consumption species, was listed by only three anglers (all at a frequency of once/month or less), and the third banned species, eel, was not listed by any DC anglers we interviewed. Largemouth bass consumption was recommended at less than one serving/month in the advisory, and 23% of anglers who listed this species reported eating more than this recommendation. The sunfish advisory, which suggested a

limitation of one serving/week or less was followed more closely with only 2 or 3 anglers reporting a consumption in excess of recommendations.

Table 4.4 highlights advisory compliance and non-compliance by species consumed. All instances of catfish and carp consumption exceeded the no-consumption recommendation, and as a result catfish consumers exceeded advisories more often than consumers of any other fish. However, largemouth bass and bluegill consumers also occasionally exceeded advisory recommendations.

**Table 4.4. Summary of fish species consumption and frequency among Washington DC anglers highlighting instances of consumption exceeding fish consumption advisory recommendations. Cells shaded in gray are consumption frequencies that exceeded the limitations suggested in DC advisories (based on 8 ounce serving sizes). Only species specifically listed in the advisory are included here.**

<b>Fish Species</b>	<b>5 + Times/Week</b>	<b>3-4 Times/ Week</b>	<b>1-2 Times/ Week</b>	<b>1-3 Times/ Month</b>	<b>Less Than Once/ Month</b>	<b>TOTAL</b>
Catfish (all)	0	2	7	17	33	59
Largemouth Bass	0	2	2	1	17	5
Bluegill	1	1	1	6	9	3
Carp	0	0	0	0	3	0
Bass (general)	0	0	0	2	0	0
<b>TOTAL</b>	<b>2</b>	<b>8</b>	<b>21</b>	<b>35</b>	<b>69</b>	<b>132</b>

It should be noted that the frequencies in Table 4.4 considered to be in excess of advisory recommendations are based on 8-ounce meal sizes. The question from the angler survey instrument corresponding to this data refers to the number of meals in certain time periods, while DC consumption advisories are issued according to the number of ounces per time period. This means that these estimates of fish consumption frequencies in excess of recommendations are approximations based on a general 8-oz meal size assumption, and that the actual advisory exceedence rate may be higher or lower, depending on meal sizes. However, 78% of anglers reported eating 8 ounces or less during a typical meal, which supports this assumption.

## **Anglers and Consumption Advisories**

### *Advisory Awareness*

As stated earlier, more than half (56%) of Washington, DC-region anglers were aware of fish consumption advisories in effect for the waters they were fishing. This section focuses mainly on those respondents who had not been exposed to advisories in order to identify some of the needs and potential approaches to reaching these populations. However, anglers who were aware of advisories are included in the analysis in cases where significant differences between them and non-knowledgeable anglers exist. There were 135 anglers (out of 237 surveyed) who were not aware of Washington, DC advisories, or 44% of the sample population.

Fishing mode can be indicative of site selection parameters, and comparing fishing mode to advisory awareness can help planners evaluate the effectiveness of certain

dissemination practices. Table 4.5 shows that, proportionally, boaters were only slightly more aware of advisories than were shore anglers, which indicated that dissemination methods currently used are equally effective for both types of fishermen.

**Table 4.5. Awareness of fish consumption advisories among Washington, DC anglers compared to the anglers fishing mode at the time of the interview.**

<i><b>Fishing Mode</b></i>	<b>% Aware of DC Region Advisories</b>	<b>% Unaware of DC Region Advisories</b>
<b>Shore/Dock/Pier</b>	55	45
<b>Boat</b>	58	42
<b>TOTAL</b>	<b>56</b>	<b>44</b>

Most (69%) of the anglers unaware of fish consumption advisories lived within ten miles of the site where they were fishing, and 91% lived within 25 miles of the site. These figures are not considerably different from those of knowledgeable anglers. The level of fishing experience among anglers unaware of DC advisories, however, was slightly different from those who knew about advisories. Forty-five percent of non-knowledgeable anglers had been fishing in the area for a decade or more, whereas two-thirds (67%) of knowledgeable anglers had at least a decade of experience. Furthermore, 22% of non-knowledgeable anglers had been fishing for less than a year while only 10% of anglers aware of advisories had been fishing for a year or less.

Fishing frequency trends were also different among knowledgeable and non-knowledgeable anglers. Generally, anglers who fished on a regular basis were more aware of advisories than those who did not. Twenty-six percent (26%) of the anglers who knew of advisories had fished at least 50 times in the last year, compared to 11% of those not knowledgeable of advisories. The majority of non-knowledgeable anglers (73%) had been fishing 10 times or less in the last year, compared to only 39% of knowledgeable anglers. These results are encouraging since they show that people who regularly fish in the Washington, DC area are more familiar with advisories than less frequent fishermen.

There were no significant differences in fishing motivations between those who did not know about fish advisories and the total population of anglers. However, differences in perceived risk were present. Nearly half (46%) of fishermen aware of DC advisories explicitly believed that fish from DC waters were unsafe for consumption, while only 31% of non-knowledgeable fishermen believed this. When asked why they felt the way they did about the safety of fish consumption, the most frequent answer by both involved pollution; mostly, anglers responded that the water was “too dirty”. When asked whether or not they eat any of their catch, only 31% of the fishermen unaware of advisories ate their catch, compared to 43% of those who were aware of advisories. This finding was similar to that reported among Baltimore area anglers.

One explanation for this counter-intuitive finding is that those anglers who had seen advisories believed the fish to be safer and considered the water less dirty because they felt more comfortable eating fish from Washington, DC waters as a result of advisory knowledge. They may have known the limits of advisories and believed consumption

was safe within these limits. Anglers who had not seen advisories may not have been confident enough in their own judgments of fish and environmental health to adopt positive attitudes about these factors. A second, perhaps more likely, scenario is simply that anglers interested in consuming their catch were more attuned to or receptive to advisory messages (i.e., they were more likely to look for them and/or read them if they encountered them) than were anglers not interested in consuming their catch.

In discussing advisory awareness, it is important to point out two difficulties in relying on survey or interview data over actual observational data. First, is the potential for a recall bias. Some of the anglers claiming to have heard of local advisories could recall only limited specifics from the advisory, and may have in fact not known about area advisories. Contrary to what one would assume, educational attainment probably did not have an effect on advisory awareness, as an examination of the education levels between the knowledgeable and non-knowledgeable groups was inconclusive.

A second type of bias is presented itself particularly when conducting personal interviews. When dealing with an interpersonal mode of data collection, respondents often give responses that they believe they are expected to give, even if these responses are not accurate (called prestige, or social desirability, bias). In this case, it is possible that anglers who may feel ashamed or nervous about admitting to an interviewer that they eat fish from Washington, DC waters may instead claim to not eat any self-caught fish. This scenario, of course, can apply to all anglers, whether they are aware of advisories or not.

These results are interesting because they might validate past studies by Beehler (2001)<sup>1</sup> who contends that advisory value reaches only so far, and that other factors played significant roles in an angler's decision to consume fish. Most of the anglers who had not seen consumption advisories still believed the water was too polluted to contain healthy fish, as did many of those who had seen advisories. This illustrates that certain perceptions of risk are inherent regardless of advisory presence, and knowing the environmental and other indicators that produce these perceptions are valuable to the development and dissemination of future advisories.

#### *Advisory Content and Dissemination*

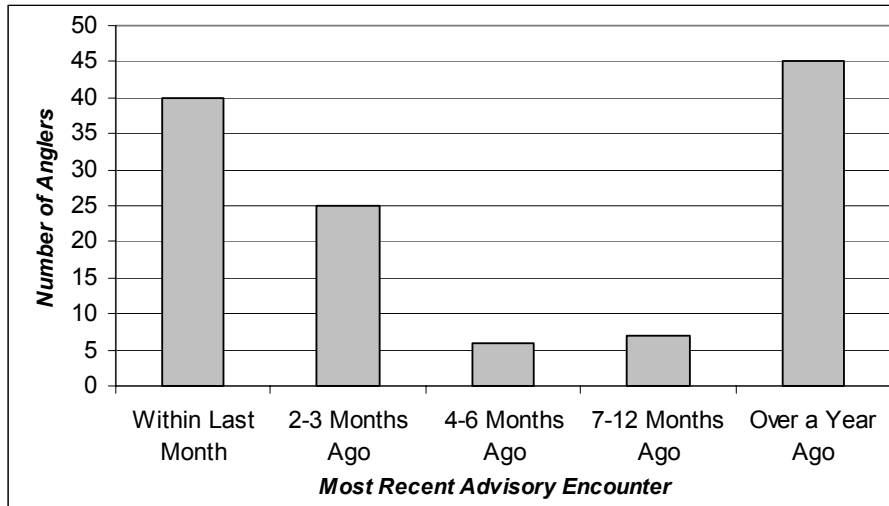
Advisory content and the mode of dissemination are two critical factors in advisory effectiveness. This section analyzes survey responses according to the mode by which anglers became aware of fish consumption advisories and how recently they learned of those advisories.

Figure 4.1 shows trends in how recently anglers had heard about or seen a fish consumption advisory for the Washington, DC area at the time of the interview. Many anglers aware of advisories (45, or 37%) reported that they had seen their most recent advisory over a year ago. However, another 40 (33%) anglers reported having seen an

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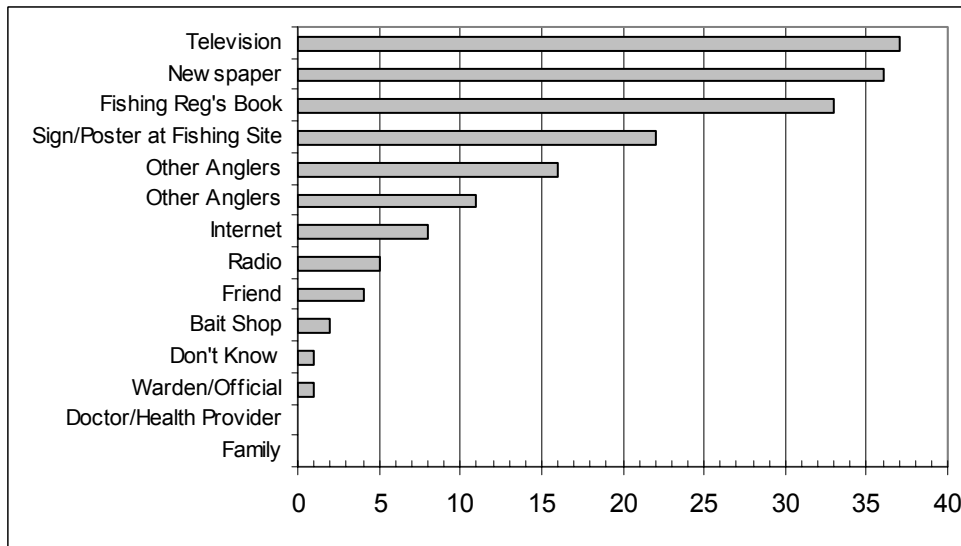
<sup>1</sup> Beehler, Gregory P., Bridget M. McGuinness, John E. Vena. 2001. Polluted fish, sources of knowledge, and the perception of risk: Contextualizing African American anglers sport fishing practices. *Human Organization*. 60(3): 288-297.

advisory in the last month and a total of 65 (53%) said they had seen advisories within 3 months. There were few other trends regarding how recently anglers had seen advisories; dissemination methods, site choice, and angler demographics yielded little explanation for the distribution of when anglers had last encountered an advisory. An analysis of fishing experience, both with respect to the number of years fishing in the area and the number of fishing trips in the last year, also offered little explanation.



**Figure 4.1. Distribution of Washington, DC anglers with respect to their most recent encounter with a local fish consumption advisory.**

Figure 4.2 shows the modes by which anglers became aware of fish consumption advisories. This was presented as an open-ended question (response options were now read), and anglers were able to list as many mode as they'd encountered, so these numbers are not mutually exclusive. Television, newspapers, fishing regulations books, and signs posted at fishing sites were the 4 most frequently listed dissemination modes by



**Figure 4.2. Distribution of Washington, DC anglers with respect to their recent modes of encountering a fish consumption advisory.**

which anglers learned of advisories. Some of these are modes currently utilized by health and environmental managers in the DC region, while others (such as media sources) are a result of news stories picked up by local media outlets.

Two of the top four mentioned modes for dissemination are fishing regulations books and signs posted at fishing sites. This may explain one reason why regular fishermen are more aware of advisories than infrequent fishermen. Signs and fishing booklets are more likely to be encountered or noticed by those fishing on a regular basis. Some of the other strategies currently utilized in the area, such as internet issuance and verbal communications from health officials and doctors, had reached a comparatively low number of anglers in this survey. Some of the potential dissemination methods (family members, doctors/health providers) were not responsible for any information recalled by anglers.

Anglers who reported they were aware of area advisories were then asked to recall content from the advisories they had seen. This information, organized in relation to the mode by which that content was received, is shown in Table 4.6. Again, these responses are not mutually exclusive and many anglers listed more than one mode, but this breakdown can provide a general idea about what information is successfully being communicated through particular dissemination modes.

**Table 4.6. Specific content recalled from advisories by those anglers who had heard, seen, or read about them in the DC region, organized according to the mode by which the anglers reported learning of the advisory.**

Advisory Content Recalled	Dissemination Mode by which Angler was Reached														TOTAL
	Fishing Reg's Book	TV	Newspaper	Sign/Poster at Sites	Other Angler	Internet	Friend	Radio	Bait Shop	Warden/ Other Official	Doctor/Health Provider	Family	Don't Know	Other	
Don't eat more than a certain amount of fish from DC waters	24	11	19	15	3	3	1	1	1	0	0	0	1	5	84
Don't eat certain fish from DC waters	17	9	10	10	3	3	1	1	1	0	0	0	1	2	58
The DC waterways are polluted	2	9	4	2	4	0	1	2	0	0	0	0	0	1	25
Beware of certain toxins in some DC-caught fish	2	4	1	2	0	2	0	0	0	1	0	0	0	1	13
Don't eat fish from certain DC waters	0	3	3	1	2	0	0	1	0	0	0	0	0	1	11
Don't eat any fish from DC waters	2	0	0	3	1	0	0	0	0	0	0	0	0	1	7
Pregnant women/children should eat less fish from DC waters	2	1	1	1	0	0	0	0	0	0	0	0	0	0	5
Certain people should eat less fish from DC waters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	6	12	8	2	5	0	1	0	0	0	0	0	0	3	37
Don't know	1	5	3	1	0	2	1	0	0	0	0	0	0	5	18
<b>TOTAL</b>	<b>56</b>	<b>54</b>	<b>49</b>	<b>37</b>	<b>18</b>	<b>10</b>	<b>5</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>19</b>	<b>258</b>



The warnings most often recalled from local advisories were limitations on certain fish species from DC waters. Warnings about non-consumption of certain species of DC-caught fish were the next most commonly-recalled, followed by warnings about water pollutants. The most frequent responses represent a generalization of actual advisory information and include other possible responses. For example, only 5 angler responses included specific recollections about reduced intake for women and children, but the most frequent angler response (“Don’t eat more than a certain amount of fish from DC waters”) can also encompass this category. Only 2 of the 133 anglers (less than 2%) who had heard of DC advisories were unable to recall any of the information contained in the advisory.

There are two distinct issues at work in the advisory dissemination process. First, health officials want to make people aware of the advisories, and second, they want people to change their behavior in response. Some dissemination modes may be very effective in creating awareness about the advisories, but less effective at influencing behaviors. Table 4.7 details the effectiveness of Washington, DC advisory dissemination modes by determining how often a particular mode caused anglers to change their eating habits. Conversations with a warden and learning from the radio were the two modes with the highest degrees of change (6 total responses), but out of the more common modes of advisory dissemination, fishing regulations booklets and signs at fishing sites were most effective. Regulations books prompted 31% of anglers who saw them to change their eating habits, and 29% of those seeing signs and posters also changed their eating habits. The only mode of dissemination that did not prompt any change in angler eating habits was learning of advisories from bait shops, a category that included only two responses.

**Table 4.7. Mode of Washington, DC fish consumption advisory dissemination according to the proportion of anglers who gained awareness of advisories through that mode and subsequently changed their eating habits as a result.**

<b>Mode</b>	<b>Changed Eating Habits</b>	<b>Did Not Change Eating Habits</b>	<b>TOTALS</b>	<b>%e Who Changed Eating Habits</b>
Warden/ Other Official	1	0	1	<b>100</b>
Radio	2	3	5	<b>40</b>
Fishing Reg's Book	10	22	32	<b>31</b>
Sign/Poster at Sites	6	15	21	<b>29</b>
Other Angler	3	8	11	<b>27</b>
Friend	1	3	4	<b>25</b>
TV	8	29	37	<b>22</b>
Newspaper	7	28	35	<b>20</b>
Other	2	11	13	<b>15</b>
Internet	1	7	8	<b>13</b>
Family	0	0	0	<b>0</b>
Doctor/Health Provider	0	0	0	<b>0</b>
Bait Shop	0	2	2	<b>0</b>
<b>TOTALS</b>	<b>42</b>	<b>128</b>	<b>170</b>	<b>25</b>

The efficacy of these modes may be determined by their accessibility. Posted signs and regulation booklets are easily accessible by anglers, while modes like television and newspapers cannot be as conveniently reproduced or recalled by anglers for use as a reference. The information in Table 4.8, however, does not necessarily support this idea. More than any other mode, anglers who learned of advisories through television said that they had referred back to the advisory source to make a decision about keeping and eating a self-caught fish. It is far less convenient to wait on more television announcements than to reference fishing regulations booklets, or the internet. However, since anglers were able to name multiple responses to this question, it is possible that those learning of advisories from television could refer back to some other mode, such as signs or the internet.

**Table 4.8. The most commonly mentioned fish consumption advisory dissemination modes in Washington DC and the rates at which anglers refer back to them when making decision about whether to keep and/or eat self-caught fish.**

<b>Dissemination Mode</b>	<b>Have Referred Back to Advisories</b>	<b>Have Not Referred Back to Advisories</b>	<b>TOTALS</b>	<b>% Using Advisory as a Reference</b>
TV	14	19	33	<b>42</b>
Newspaper	8	20	28	<b>29</b>
Sign/Poster at Sites	4	11	15	<b>27</b>
Internet	1	3	4	<b>25</b>
Fishing Reg's Book	4	15	19	<b>21</b>

One question in the survey asked anglers who knew about advisories what suggestions they would give in order to improve advisory content or dissemination modes (Table 4.9). Thirty-six percent (36%) of anglers stated that improvements could be made to the advisories, and 64% felt the current advisories were sufficient. The most common responses regarding improvements included the desire for more specifics in the advisory (18% of comments), a need to publicize and release advisories more often (18%), suggestions to provide the advisories in a variety of languages (16%), and improvements or increases in the number of signs (13%). Some other anglers felt that more pictures would be helpful, particularly those who also mentioned providing the advisories in additional languages. Some felt that the advisories should be simplified, while other thought that a more forceful approach may inspire a greater degree of compliance.

**Table 4.9. Suggested improvements to Washington, DC area fish consumption advisories mentioned by interviewed anglers. These responses are not mutually exclusive since anglers were able to name several improvements.**

<b>Suggested Improvements</b>	<b>Percent Total</b>
Include More Specifics	18
Publicize more and release advisories more often	18
Provide advisories in different languages	16
Signs: Post more, improve	13
Improve/include more pictures	7
Simplify the advisories	7
Be more forceful about warnings	4
Other	18

All anglers, regardless of whether or not they were aware of existing advisories, were asked about their preferred modes for receiving advisory information. These modes are listed in Table 4.10. Sign postings, television notices, newspaper announcements, and personal contact with anglers were among the most popular methods suggested. Some of the other methods currently utilized by officials in Washington, DC were less popular with anglers, such as internet and fishing regulations book dissemination.

**Table 4.10. Preferred fish consumption advisory dissemination methods among Washington, DC area anglers, regardless of their current knowledge level.**

<b>Preferred Dissemination Modes</b>	<b># of Anglers</b>
Post Signs at Fishing Locations	94
Television	50
Newspaper	44
Talk to Anglers at Fishing Locations	42
Radio	25
Signs or Brochures at Bait Shops	23
Provide Info When Purchasing License	16
Put it in the Fishing Regulations Book	9
Internet	9
Don't Know	7
Have a Doctor/Health Care Provider Give Info	4
Direct Mail	3

Anglers - both those aware and unaware of advisories - often commented that it would be valuable to talk with officials at fishing sites who could answer their questions concerning fish health and consumption hazards. It is interesting to note, however, that only one angler included in this study appeared to have gained any of their personal knowledge of consumption advisories through contact with game wardens or health officials (see Figure 4.2). This may represent a potentially effective approach for the future that could have a significant impact on angler compliance.

Many also felt that an increase in the presence of visual aides (e.g., figures, illustrations) of fish included in the advisory, waterways that should be avoided or limited, and proper fish preparation methods would help increase compliance among anglers from different educational and ethnic backgrounds. Finally, many anglers noted that advisories needed to be provided in different languages to cater to the varied ethnic population of DC fishermen. The inclusion of illustrations may meet this need to a degree.

### **Analysis of Racial Differences**

Racial differences among Washington, DC anglers were often more evident than other demographic factors. Furthermore, advisory and contaminated fish consumption literature focuses a great deal on the racial and ethnic considerations in risk perception and assessment. Consequently, much focus has been given to racial trends in our analysis, and several issues are discussed in this section.

As stated earlier in this chapter, one half of all anglers interviewed (50%) were African-Americans, and 33% were White. Hispanics constituted the next biggest minority (10%),

followed by Asians (6%). Four other ethnicities were also reported by anglers, including 1). The sample sizes of the 4 remaining ethnicities reported by anglers (Bosnian, African, Caribbean, and Arab-American) were too small to include in the racial analysis. Therefore only the four most prominent ethnicities will be analyzed here. It should be noted that the figures contained in this section mostly describe four subpopulations of DC anglers: African-Americans, Whites, Hispanics, and Asians who consumed the fish they caught and/or provided it to their families.

### *Demographics*

The average ages of anglers in the Washington, DC region were fairly comparable when broken down by race; there was no considerable variance from the 45 year-old overall group median within any of the racial subpopulations. An analysis of income categories shows that household incomes reported by White anglers were skewed toward higher income categories than were other races. Most White anglers (65%) had household incomes of more than \$80,000 a year, and Whites had the smallest proportion of anglers under \$20,000 (3%). African-Americans had the highest proportion of anglers with incomes under \$20,000 (15%) but Hispanic anglers likely had the lowest annual incomes of all anglers, with more than half of all Hispanic anglers (53%) earning \$40,000 or less.

### *Fishing Locations and Habits*

Fishing site distribution among ethnic groups can be important to fisheries and health managers who want to target advisories or advisory dissemination modes to certain populations of anglers. Table 4.11 reports the number and proportion of anglers from each race interviewed at various DC-region sampling sites. The shaded figures highlight the most prominent ethnic group for each sample site. Either Whites or African-Americans were the most prominent races at each of the DC angler sites. African-Americans were most prominent at Anacostia Park, East Potomac Park, and the Water Street Marina. Whites were most prominent at the Gravelly Point, Lady Bird Johnson Park, and Daingerfield Island sites. Hispanics were most prominent at Fletcher's Boat House, and Asians were most prominent at Fletcher's Boat House and the Monument Tidal Basin.

**Table 4.11. Distribution by race of all Washington, DC anglers interviewed amongst the 9 survey sites. Figures represent the number of anglers, with the percentage of all anglers at that site in parenthesis. The race encountered most frequently at each survey site is shaded.**

SITES	Whites	African-Americans	Hispanics	Asians	TOTAL
East Potomac Park/Hains Point	5 (7%)	62 (84%)	4 (5%)	3 (4%)	74 (100%)
Fletcher's Boat House	25 (43%)	11 (19%)	16 (28%)	6 (10%)	58 (100%)
Gravelly Point/Roaches Run	29(88%)	3 (9%)	0 (0%)	1 (3%)	33 (100%)
Anacostia Park South	1 (3%)	28 (93%)	1 (3%)	0 (0%)	30 (100%)
Lady Bird Johnson Park/Columbia Island Marina	13 (72%)	3 (17%)	1 (6%)	1 (6%)	18 (100%)
Monument Tidal Basin	1 (11%)	5 (56%)	1 (11%)	2 (22%)	9 (100%)
Water Street Marina Area	0 (0%)	8 (89%)	0 (0%)	1 (11%)	9 (100%)
Daingerfield Island/Washington Sailing Marina	5 (83%)	1 (17%)	0 (0%)	0 (0%)	6 (100%)
Theodore Roosevelt Island	0	0	0	0	0
<b>TOTAL</b>	<b>79</b>	<b>121</b>	<b>23</b>	<b>14</b>	<b>237</b>

Trends in fishing habits by race varied considerably, especially between Whites and other minorities. Whites were the only group in which anglers fishing from boats constituted the majority of the group. Only 35% of White anglers were fishing from the shore, while most African-Americans (96%), Hispanics (100%), Asians (86%), and other races (60%) were fishing from the shore. Table 4.12 details these racial differences in fishing mode distributions for Washington, DC anglers.

**Table 4.12. Modes by which anglers were fishing during Washington, DC angler interviews, broken down by race.**

Fishing Mode	RACE					TOTAL
	Whites	African-Americans	Hispanics	Asians	Others	
SHORE	<i>n</i> 27	115	22	12	3	177
	% 35%	96%	100%	86%	60%	75%
BOAT	<i>n</i> 51	5	0	2	2	60
	% 65%	4%	0%	14%	40%	25%

Site choice among White anglers is likely affected by the presence of a boat ramp, since most White anglers were boaters. The information in Table 4.11 supports this idea, since the two most popular sites among Whites (Gravelly Point and Fletcher's Boat House) were among the few that also had a public boat launch. The presence of a boat launch probably did not heavily influence other minorities. For African-Americans, who had a very low percentage of boaters, the two most popular sites (East Potomac Park/Hains Point and Anacostia Park South) did not have public boat launches.

Proximity also appeared to influence site choice among anglers, and it did so more strongly in some ethnic groups than in others. Most African-Americans were fishing at sites within 10 miles of their homes (83%), with Asians (64%), Whites (54%), and Hispanics (48%) progressively less likely to be fishing within 10 miles of home. However, at least 75% of anglers of all races had traveled less than 25 miles to their fishing site.

There were also considerable differences in fishing experience between ethnic groups. A greater proportion of African-Americans (71%) and Whites (53%) had been fishing in the Washington, DC region for over 10 years than had Asians (36%) or Hispanics (9%). A greater percentage of Asians (36%) and Hispanics (35%) had also been fishing for less than a year than Whites and African-Americans (both 12%). Finally, fishing frequency also contributes to experience. African-Americans fished most often (25% fished more than 50 times in the last year) followed by Whites (17%) and Asians (14%). Asians were very frequent fishermen when considering anglers that fished more than 25 times per year (36%).

#### *Fish Consumption Patterns*

Most recreational fishermen in the Washington, DC region of concern did not eat their catch, but more than one-third (36%) did report consume their self-caught fish or crabs at least some of the time. Overall consumption in the region, organized by race, is shown in

Table 4.13. Whites were the ethnic group least likely to consume their fish (30% consumed) while Hispanics and Asians were most likely to consume (43% and 64%, respectively).

**Table 4.13. Proportion of anglers, by race, in the Washington, DC region who reported consuming at least some of the fish or crabs that they caught.**

Consumption	RACE					TOTAL
	Whites	African-Americans	Hispanics	Asians	Others	
Eat Self-Caught Fish	30%	36%	43%	64%	40%	36%
Do Not Eat Self-Caught Fish	70%	64%	57%	36%	60%	64%

These figures lead into an analysis of racial differences among motivating factors for fishing (Table 4.14). Minorities in general were more likely than Whites to consider a fresh fish dinner to be a very important motivating factor for fishing. However, results were mixed among all ethnic groups when asked about the importance of reducing food expenses, with a higher percentage of Hispanics than any other race stating that obtaining a fresh fish dinner (39%) or reducing family food expenses (26%) was a *very important* motivation for fishing. No Asians felt that expense reduction was a *very important* motivation for recreational fishing.

**Table 4.14. The importance of subsistence fishing related motivations among White, African-American, Hispanic, and Asian anglers in Washington, DC. Numbers represent the percentage of anglers who classified these motivations as being “very important”.**

Motivation	RACE				
	Whites	African-Americans	Hispanics	Asians	Others
Fresh Fish Dinner	11%	24%	39%	23%	20%
Reduce Food Expenses	13%	12%	26%	0%	0%

These considerable differences insinuate that Hispanics, on the whole, were consuming self-caught fish at a higher rate than Whites and African-Americans, and that many more were also doing it as an attempt to save money on food. Asians also appeared to consume at a high rate, but did so in order to have fresh fish rather than as a way to save money on food expenses. There were few racial differences in the reasons anglers gave for not consuming fish, but it should be noted that concerns about pollution were the most common responses among each racial group.

When asked about commonly used fish cleaning and preparation methods, distinct racial trends once again became evident (Table 4.15). Note that all statistics presented here reflect a response of “most of the time.” Whites were most likely to undertake preparation methods that reduce risk, while various minorities were more likely to prepare fish in ways that do not reduce the concentrations of contaminants in fish. No Whites or Hispanics responded that they ate crab mustard, but a few African-Americans

(8%) and Asians (14%) did. This is a practice advised against in most warnings, but was not mentioned in Washington, DC advisories.

**Table 4.15. Self-caught fish and crab cleaning and preparation methods employed by anglers in Washington, DC, broken down by race. Percentages represent the proportion of anglers from each race answering “most of the time” in response to a question about how frequently they employ each of the preparation and cooking methods in preparing their self-caught fish.**

Fish Preparation Methods	Percent Responding "Most of the Time"			
	Whites	African-Americans	Hispanics	Asians
Eat Mustard From Crabs	0%	8%	0%	14%
Eat Whole Fish, Including Skin and Fat	9%	27%	20%	0%
Puncture or Remove Skin	76%	53%	60%	63%
Trim Fat/Belly Meat	77%	46%	70%	75%
Filet Fish	77%	58%	50%	57%
Pan or Deep Fry	76%	83%	90%	75%
Re-Use Fat	0%	10%	0%	25%
Steam/Poach/Boil	5%	18%	20%	25%
Broil/Grill/Bake/Roast	41%	40%	40%	25%
Make Soup or Chowder	0%	3%	50%	25%
Freeze or Can for Later	27%	28%	30%	13%
Eat Fish Raw (% Sometimes)	0%	0%	10%	38%

African-Americans (27%) and Hispanics (20%) were most likely to eat fish whole, without skin and fat removal. Conversely, Asians (63%) and Whites (76%) were more likely than African-Americans (53%) and Hispanics (60%) to puncture or remove fish skin before cooking. The DC-region advisory does specifically mention skinning and trimming fish as a way to reduce contaminants.

Pan- and deep-frying fish locks in contaminants rather than let them drain away, and most anglers in all fishing groups said that they fried their catch most of the time. African-American (83%) and Hispanics (90%) reported doing this more often than others. However, few anglers of any race reporting re-using the oil and fat used in frying most of the time, an act that normally increases the contaminant intake from fried fish. Hispanics and Asians were more likely to make soup or chowder, and most anglers in all groups did not eat their fish raw, although Asians were much more likely than others to do this.

These differences arising along racial lines may have been due to cultural behaviors or learned habits. Future studies might specifically ask respondents why they prepared their catch the way they did in an attempt to understand the relationship these trends have with advisory information and comprehension and cultural differences in fish preparation methods. However, these data suggest evidence of a heightened risk of contaminant consumption among minorities compared to Whites as a result of their reported fish cooking and preparation tendencies.

Young children, nursing and expectant mothers, and other women of childbearing age, are particularly vulnerable to the ill effects of contaminated fish. Asians (50%) and Hispanics (39%) were more likely to provide self-caught fish to their families or other household members than African-Americans (28%) and Whites (25%), but no ethnic group appeared to have considerably more individuals from at-risk subpopulations in their households than others. Very few women in the households of DC-region anglers were pregnant or nursing at the time of survey administration, and none of these consumed self-caught fish.

#### *Risk Perception and Advisory Awareness*

Data concerning risk perceptions and advisory issues were collected from all anglers, not just those who ate their catch or provided it to their families. Washington, DC advisories mention the existence of contaminants such as PCBs in fish from DC waters. However, angler perception of various risks can strongly effect decisions to consume or provide for consumption self-caught fish. Overall, 29% of DC anglers believed the fish that they caught from Washington, DC waters were explicitly safe to eat. Conversely, 39% indicated that the fish were not safe to eat. The rest either responded “not sure” or “it depends”.

White and African-American anglers more skeptical of fish from DC waters (23% and 30% considered them safe, respectively) than were Hispanics and Asians (43% and 50% respectively). This may at least partially explain the higher proportion of minority anglers who consume self-caught fish and crabs. Only 26% of Hispanics and only 29% of Asians believed fish from DC waters were explicitly unsafe, while 42% of Whites and 41% of African-Americans believed this. This is further indication that risk perception may have affected consumption rates.

The reasons anglers gave for their perceptions of fish safety varied by race. These statements are included in Table 4.16, with numbers representing the proportion of each race responding in a certain way. The most popular responses referenced water pollution and contaminants. Proportionally, more Whites were wary of DC water pollution than other races. One notable trend involved anglers who were less skeptical about the water quality. Many Hispanics (19%) and African-Americans (18%) believed that since they and no one they knew had experienced any undesirable effects from consuming fish, the fish were more than likely safe. Fewer Whites (8%) and no Asians believed this.

**Table 4.16. The reasons given by Washington, DC anglers as to why they believed self-caught fish was safe or unsafe for consumption, by percentage.**

<b>Reasons for Fish Safety Perceptions</b>	<b>Whites</b>	<b>African-Americans</b>	<b>Hispanics</b>	<b>Asians</b>
Too much pollution	51	37	38	31
Depends on the species	18	9	0	0
Don't trust the fish	8	10	10	0
Never experienced/heard of ill effects from eating	6	18	19	8
Adhering to advisory	4	8	5	0
Water is clean	4	6	0	8
Don't know	3	1	5	8
Other	3	5	14	15



No advisories are out, so must be safe	1	2	0	15
Depends on preparation methods	1	3	5	8

Eight percent or less of each racial group, and only 6% of the overall population of anglers, stated that their major reason for considering the fish to be safe or unsafe was observance of advisory information. However, even though many anglers did not specifically state that they relied on advisories to formulate their perception of fish safety, many of the responses listed in Table 4.16 (i.e., pollution, species-dependent, preparation methods, etc.) could have originated from the information in fish consumption advisories.

Most anglers in the Washington, DC region reported that they were familiar with fish consumption advisories in general (69%), but only 55% were also aware of the existence of such advisories issued in the Washington, DC region. African-Americans were the group most often aware of the advisories (59%), followed by Whites (52%), and Hispanics and Asians (each 50%). African-Americans also reported having encountered the advisories most recently (35% had seen it in the last month). Whites more often reported having not encountered an advisory in over a year (42% of all Whites) than anglers in any other group.

Nearly all anglers felt the information was easy to understand, but only 26% of the overall population changed their eating habits as a result. African-Americans most commonly changed their consumption habits as a result of seeing the advisories (27%) and Asians were least likely (14%). The reasons given for not changing eating habits did not vary considerably among racial groups, the main response being “I did not eat self-caught fish prior to seeing the advisory, and I still do not”.

Most anglers from each race did not believe that DC advisories needed to be improved. Among those who did, the only considerable trends in suggested improvements existed among Whites and African-Americans. Many Whites believed that signs should be posted more often and in more areas, and also felt that posting signs in multiple languages would be very helpful. African-Americans mostly believed that advisories should be publicized or promoted more, and that released advisories (including posters and signs) should include more specifics.

Thirty percent of all anglers reported having referred back to advisories to make a decision about whether or not to keep and eat a fish. This figure was slightly higher for African-Americans and Hispanics (both 33%) and slightly lower for Whites (25%) and Asians (14%). These figures contrast with their perceptions about the importance of following fish consumption advisories: all races overwhelmingly felt that following the advice in health consumption advisories was “very important”.

### *Summary*

Several notable differences were uncovered by analyzing data from the Washington, DC region along racial lines. African-Americans and Whites constituted the majority of anglers interviewed with small samples of Hispanics and Asians also interviewed. An analysis of fishing habits and behavior can identify some important considerations crucial

to the dissemination of health advisories, such as critical locations for advisory postings and useful ways to target specific populations. The geographic distribution of the 4 races was uneven, and this may serve as a reference for future advisory postings.

A greater proportion of Hispanic and Asia anglers in the Washington, DC region consumed self-caught fish than other races, and a greater proportion of anglers in these races also reported that they also provided these fish to other family members. Hispanic anglers also considered and reducing food expenses to be a more important motivation for fishing, than other races, indicating an economic reliance on self-caught fish. Asians, on the other hand placed a high importance on obtaining a fresh fish dinner, but little importance in reducing food expenses, which suggest more of a cultural reliance on self-caught fish. Finally, African-Americans, Hispanics, and Asians were less likely than Whites to prepare their fish using risk reduction techniques (e.g., removing skin and fat, avoiding frying). Each of these findings leads to the conclusion that non-White anglers are at a greater risk of exposure to the negative effects of contaminants in fish, although all races participated to some degree in risky behaviors.

This conclusion is further supported by the fishing habits, advisory perceptions, and risk perceptions reported by anglers. White and African-American anglers were found to be more likely to refrain from eating the fish that they caught than other races, most likely as a result of their negative perceptions of fish safety. Less than 8% of each of the populations specifically stated that information derived from fish consumption advisories was their basis for fish avoidance, and less than a quarter of each group altered their fish consumption habits based on advisories. Furthermore, 270% or less of each racial group had used advisories as a reference for keeping and eating fish. These data conflict with the angler's attitudes toward fish consumption rates: nearly all anglers of all races considered following advisory information to be at least somewhat imperative.

## **Other Demographics**

### *Income*

Several income-related trends were evident among Washington, DC anglers. Income data refers to total household income, and was collected by asking anglers to place themselves into 1 of 4 categories: \$20,000/year, \$20,001-\$40,000/year, \$40,001-\$80,000/year, and more than \$80,000/year. Most anglers in the Washington, DC region were willing to provide income information to interviewers (87% of all anglers interviewed responded to this question). As stated in an earlier section, most household incomes for Washington, DC anglers either exceeded \$80,000 per year (39%) or fell between \$40,000 and \$80,000 per year (31%), with 31% making less than \$40,000 per year and 9% making less than \$20,000 per year.

Site choice by DC anglers was related to income with respect to both proximity and fishing mode. Anglers with lower incomes generally traveled shorter distances than anglers with higher incomes; 85% of those making less than \$40,000 a year traveled less than ten miles to arrive at their sites, while only 62% of those making more than \$40,000 traveled this distance. This trend may have been related to the presence or absence of a boat ramp. All anglers in the lowest income category were shore fishermen, while only

49% of anglers in the highest income category were shore fishermen; the rest (51%) fished from boats. The proportion of boating fishermen was also positively correlated with household income in the remaining income categories.

The motivations for fishing also varied among income categories. When asked about the importance of providing a fresh fish dinner to self or family, no relationship was evident. However, lower income anglers did place a considerable importance in fishing as a motivation to reduce food expenses, especially when compared to higher income groups. 17% of the anglers earning 40,000/yr or less said it was *very important*, compared to 3% of wealthier anglers. This suggests that more low-income anglers are consuming fish and are at least occasionally doing so in order to save money on food. However, an analysis of angler consumption with respect to income did not yield considerable trends (Table 4.17).

**Table 4.17. Proportion of Washington, DC anglers who consume at least some of the fish that they catch, broken down by household income category.**

Income Categories	% Consuming Self-Caught Fish
Less than \$20,000	30
\$20,001-\$40,000	46
\$40,001-\$80,000	36
More than \$80,000	33

One interesting trend involves the relationship between angler income and DC region advisory awareness. Advisory awareness was negatively correlated with household income. More anglers with incomes in the “less than \$20,000/year” group were aware of advisories than any other group (63%). Conversely, there were fewer anglers aware of DC advisories in the highest income category (more than \$80,000/year) than any other income level (50%). This shows that advisories in the Washington, DC region are successfully reaching most lower-income anglers, and are also reaching many higher income anglers.

### *Education*

Nearly half (49%) of the anglers interviewed in the Washington, DC region reported high school or less as their highest levels of education, and 16% had not finished high school. The remaining anglers (51%) had completed at least some.

Site choice, fishing mode, and distance traveled were unrelated to education. Results for fishing motivations among anglers with different education levels were mixed. The importance of having a fresh fish dinner varied between education groups, and no trends were evident. However, there was a slight tendency for less educated anglers to fish in order to reduce food expenses more often than educated anglers (Table 4.18) shows that anglers with a high school education or less were less were twice as likely to consider fishing to be either *somewhat* or *very important* in reducing food expenses more often than anglers with higher education levels.

**Table 4.18. Percent of Washington, DC area anglers who considered recreational fishing to be either very or somewhat important in the reduction of food expenses.**

<b>Education Level</b>	<b>% Responding that Reducing Food Expenses was "Very" or "Somewhat Important"</b>
High School or less	18
Some College or more	9

There was also a slightly negative relationship between education level among Washington, DC anglers and the likelihood that an angler consumes self-caught fish. Thirty-eight percent (38%) of anglers with a high school education or less reported consuming their self-caught fish, while only 20% of anglers with at least a Bachelor's degree consume their catch.

### Stakeholder Meeting

The stakeholder meeting for the Washington, DC region of concern took place on January 27, 2005 at the DC Department of Health headquarters in Washington, DC from 1:00pm until approximately 3:00pm. Email invitations were sent out to members of various public and private organizations, including the DC Environmental Health Administration (Water Quality and Fisheries and Wildlife Divisions), the public health departments for the area (including Women, Infants, and Children programs), the National Park Service, various watershed groups, area universities (particularly departments in toxicology and environmental and public health), the local Watermen's Association, and environmental conservation groups. In the end, there were a total of 19 people registered to attend and 16 people actually in attendance. These individuals, along with their affiliations and contact information, are listed in Table 4.19.

**Table 4.19. List of participants attending the Washington, DC region stakeholder workshop to discuss survey results related to Washington, DC area fish consumption advisories.**

<b>Name</b>	<b>Affiliation</b>	<b>Email</b>
Greg Allen	EPA, Chesapeake Bay Program	<a href="mailto:Allen.Greg@epamail.epa.gov">Allen.Greg@epamail.epa.gov</a>
Jim Cummins	ICPRB	<a href="mailto:jcummins@icprb.org">jcummins@icprb.org</a>
Curtis Dalpra	ICPRB	<a href="mailto:cdalpra@icprb.org">cdalpra@icprb.org</a>
John Galli	Metro. Wash. Council of Gov.	<a href="mailto:jgalli@mwkog.org">jgalli@mwkog.org</a>
Simon Brown	EPA, Chesapeake Bay Program	<a href="mailto:Brown.simon@epa.gov">Brown.simon@epa.gov</a>
Lucretia Brown	DC DOH, Water Quality	<a href="mailto:Lucretia.brown@dc.gov">Lucretia.brown@dc.gov</a>
Jon Siemien	DC DOH, Fisheries and Wildlife	<a href="mailto:Jon.siemien@dc.gov">Jon.siemien@dc.gov</a>
Theodore Byers	DC DOH, Fisheries and Wildlife	<a href="mailto:Theodore.byers@dc.gov">Theodore.byers@dc.gov</a>
Sylvia Whitworth	DC DOH, Fisheries and Wildlife	<a href="mailto:Sylvia.whitworth@dc.gov">Sylvia.whitworth@dc.gov</a>
Nicoline Shulterbrandt	DC DOH, Water Quality	<a href="mailto:Nicoline.shulterbrandt@dc.gov">Nicoline.shulterbrandt@dc.gov</a>
Robert Boone	Anacostia Watershed Society	<a href="mailto:Robert@anacostiaws.org">Robert@anacostiaws.org</a>
Rob Danno	National Park Service	<a href="mailto:Rob_danno@nps.gov">Rob_danno@nps.gov</a>
Rob Gydus	National Park Service	<a href="mailto:Rob_gydus@nps.gov">Rob_gydus@nps.gov</a>
Ira Palmer	DC DOH, Fisheries and Wildlife	<a href="mailto:Ira.palmer@dc.gov">Ira.palmer@dc.gov</a>
Joshua Gibson	Virginia Tech, project personnel	<a href="mailto:jogibso1@vt.edu">jogibso1@vt.edu</a>
Julie McClafferty	Virginia Tech, project supervisor	<a href="mailto:jmccclaff@vt.edu">jmccclaff@vt.edu</a>

The meeting started out with a presentation by Ira Palmer, DC DOH Fisheries and Wildlife, of the Washington, DC fish consumption advisory process and an update on the current status of DC area advisories and dissemination methods currently employed. Next, Josh Gibson, Virginia Tech, presented the results of the angler interviews we conducted in the Washington, DC area during the summer of 2004. Each presentation was followed by a question and answer session. Finally, a brief discussion ensued regarding possible ways to improve advisory knowledge and compliance among area anglers.

The information presented below is an overall summary of the discussions that took place at all three stakeholder meetings, with notes specific to the Washington, DC area. Because the meetings were very different in terms of how much discussion took place and the individuals involved, each region can benefit from the breadth of topics discussed at all three meetings.

The group discussions as a whole revolved around two themes: ways to reach the target audience, and ways to improve message content. It became clear that a comprehensive outreach program with multiple communication modes is, indeed, needed because posting fish consumption advisories only in fishing regulation books or on licenses does not reach a substantial portion of the audience. First, many urban anglers simply do not purchase fishing licenses, and secondly, the fishing regulations books do not target the sites at which people are fishing (i.e., where the exposure occurs). The outreach program currently in use for the Washington, DC area advisories is not as aggressive as the program in Baltimore, which is likely reflected in the comparatively low advisory awareness and compliance rates. Meeting participants in each region had several suggestions that may improve DC dissemination efforts. These include talking to local watershed organizations (which would require meetings outside the normal working hours since many of these individuals are volunteers) and attending community events to train other community members in advisory issues. This would effectively increase the number of people available in the community able to help spread the word, and anglers may be more likely to accept and adhere to advisory recommendations if the message is coming from someone in their own community. It was also suggested that a study be conducted to look the actual risk levels among participants in the community health programs (e.g., Women, Infants, and Children) to determine if current programs are, in fact, reaching those people and whether those families are at special risk. One additional audience that was suggested, but may not be applicable in DC due to the ban on commercial fishing, is to talk to fish market managers that purchase fish from local anglers in order to determine what they are buying and selling and possibly create another avenue for advisory communication. Each of these suggestions involves an increase in the level of interpersonal communication modes, which we also found to be a potentially useful mode in our study.

Message content was talked about specifically in relation to public health outreach programs (e.g., Women, Infants, and Children Programs) and the general population. In both cases, it was stressed that messages needed to be simple, positive, and relevant. First, messages should be created at an appropriate reading level (e.g., 5<sup>th</sup> grade), and

should simplify advisory recommendations enough so that the message is still the same, but people are not required to perform mental calculations or keep track of multiple figures. It was suggested that the message be kept simple enough that the recipient is asked to retain just 2 or 3 main points. The Washington, DC advisory, unlike the Baltimore advisory, is already in a fairly simple, straightforward format that lends itself well to simple messaging. Second, a positively framed message can greatly improve both message reception and behavior modification. One participant suggested that, while it's important to stress which fish are potentially unsafe to eat, it is equally important to point out species that are safe. Third, incorporating positive cultural references into the advisory message can make at-risk populations more receptive as well. This can be done by recognizing that people are using the fish that they catch in economic or culturally important ways and suggesting risk-reducing behavioral modifications that allow them to continue to meet those needs. Finally, the use of visual and tactile aids in communicating advisories was suggested as a way to improve reception and retention among all audiences.

### **Conclusions and Recommendations**

Advisories in the Washington, DC region of concern have been in effect for about 16 years in some form. This presents an excellent opportunity for reviewing current outreach methods, identifying effective actions, and improving on areas needing attention because unlike the other regions of concern, advisories there have been established for a long period of time. The advisories in effect during this study addressed PCBs and other contaminants, such as pesticides and metals. They included three no-consumption species, and several more limited-consumption advisories. Catch and release practices were promoted on all advisory materials, as were contaminant-reducing preparation methods. The major communication methods included signs at angling sites, press releases, information issued with the fishing regulations booklets and licenses, and other fact sheets, all of which are available to the public in English and Spanish.

Far fewer anglers (37%) fishing on the Potomac and Anacostia Rivers reported that they consumed their catch compared to the other regions of concern we surveyed. Possible reasons for this include poor angler perception of fish safety and water quality, a high proportion of anglers who fish solely for recreational purposes, and DC Department of Health advisory efforts. Many anglers reported that they did not consume their catch because they believed that the water in the Anacostia and Potomac Rivers was too dirty and therefore fish from the rivers would be unsafe for eating. Additionally, many stated that they fished only for recreational purposes, such as relaxation or for sport. These two groups encompassed 69% of the non-consuming anglers. Very few cited advisories in their responses; only 6% of anglers noted specifically that they were adhering to advisories by not consuming their catch. Instead, the largest proportion of DC anglers indicated that the water from which they were fishing was explicitly unsafe (39%).

Despite their continued presence over a long period of time, fish consumption advisories in the District of Columbia were familiar to just over half of the anglers interviewed (56%). Many had seen the advisories within the last month (33%) but the largest group

of anglers who were aware of the advisories had not seen the warnings for over a year (37%). Regardless of advisory knowledge, catfish (a no-consumption species according to advisory recommendations) was the most popular fish for consumption. In addition to its popularity, many anglers who reported consuming catfish stated that they did so at least once per month or more (44%). Largemouth bass, another species mentioned in advisories, was also popular in relation to other species.

As stated above, most anglers in the District of Columbia region did not eat the fish they caught (63%), but those who did often surpassed limits in advisories. In fact, more than half of all instances of consumption (51%) were in excess of the advisory-recommended amounts. Portion sizes were another area where an increased risk of exposure may exist. Meals in DC advisories are based on 8-ounce meal sizes, which was the portion size most often reported by anglers (38%). However, many more anglers reported meal sizes categories above 8 ounces (40%) than below (22%), suggesting that anglers, on average, are eating more than 8-ounces of self-caught fish at meals. This is a tendency that may need to be explored further before future advisories are issued.

Experienced fishermen (i.e., those that fish many times a year and that have fished the area for many years) were more likely to be aware of advisories than infrequent fishermen. This is good news because it suggests that the word is getting out to those who fish on a regular basis, and that many of the people who do not know about advisories are not regular fishermen.

Another trend that has been evident in all three regions of concern is the number of anglers who give away their catch. More than half of the anglers in this study (54%) gave away the fish that they caught, and this included 50% of the anglers who did not eat the fish themselves. The recipients of these hand-outs are unknown consumers of sport-caught fish. We were unable to capture them in this report, yet their numbers are substantial. Additional data on these people is needed so that fisheries planners can learn how best to communicate risk to them without relying on anglers to provide the message.

The mode of advisory dissemination most effective in reaching anglers was television, which is interesting since the DC Department of Health did minimal outreach through television outlets. The major television efforts were often news stories picked up by local outlets; commercials and public service announcements were not used. Since so many anglers learned about advisories through the limited exposure the advisories received on television, this is a possible avenue of increased focus in future widespread advisory communications aiming to increase advisory awareness, especially if the focus is on creating widespread awareness of advisories. The same is true for newspaper information, the next most common mode for informing anglers. As reported here, however, television and newspapers reached a great number of people but were not as effective, proportionally, as other modes in actually changing angler behavior. Fishing regulations booklets available and signs posted at fishing locations were the next most frequently encountered dissemination mode.

Signs, a dissemination mode used often by DC Department of Health, were an effective and popular dissemination mode among interviewed anglers. In fact, some of the most commonly suggested improvements among anglers involved signs, indicating that local anglers viewed that method favorably. One popular suggestion was an increase in the visual graphics on signs and brochures, stating that seeing pictures of fish and meal sizes is more helpful than writing them. Many anglers mentioned a desire for more specifics in the advisories, citing a lack of information regarding fish species and contaminants. They also believed advisories should be released more often and should be more widespread. Many fishermen suggested that the signs or other advisory-related materials be provided in different languages. Although advisories are currently available in Spanish, it was evident that several anglers were not aware of that. As stated in the report, an inclusion of more graphics in advisories is one way anglers believe problems involving different languages can be partially resolved.

The fishing regulations booklet (and the information contained in it pertaining to advisories) was the most effective mode at changing angler consumption habits. Signs were next, followed by other anglers. Radio and interpersonal modes (doctor, or game/health official) also changed behavior, but represented very small sample sizes.

Many anglers stated that interpersonal modes of advisory communication, such as talking to anglers at fishing sites, were a preferred mode of communication. This is a trend that arose in each of the three regions of concern. Interpersonal modes (like site visits by health officials) are not the most financially or labor-efficient ways to communicate advisories, but some integration of interpersonal contact at popular fishing spots may be an effective tool in future dissemination protocol improvements. One proposed idea from some of the regional stakeholder meetings was to have health and fisheries officials visit community meetings, organization meetings, or neighborhoods in general. This method ensures that as many people in certain locales or areas of interest (such as watershed organizations or women's health groups) are aware of advisories and possible steps to learn more about them. In this way, a whole community of communicators can be developed, and those who attend such meetings or events can then pass the information on to other anglers that they encounter.

One of the goals of the study was to identify at-risk populations in each region of concern and to determine whether some subpopulations of anglers were being exposed to contaminated fish more often than others. One of the most valuable ways of attempting this is to analyze some of the data according to racial and ethnic groups. Differences in consumption among different ethnicities in the Washington, DC region appeared to be considerable: 30% of White anglers consumed their catch, compared to 36% of African-Americans, 43% of Hispanics, and 64% of Asian anglers. Just as notable was the fact that minorities who consumed their catch stated that they provided their catch to their families more often than Whites. Further, minorities tended to prepare their fish in less risk-reducing ways (i.e., tended to fry more often, remove skin and/or fat less often, ate fish raw more often). These three factors can mean increased exposure for minority anglers and those in the households of minorities.



Among the two largest ethnic groups (Whites and African-Americans), slightly more African-Americans (59%) were aware of advisories than Whites (52%). Yet minorities were less skeptical of water cleanliness, more likely to eat self-caught fish, and less likely to employ risk-reducing preparation activities. Although only 26% of anglers stated that they changed their consumption habits after seeing advisories, African-Americans were most likely to do so and Asians were least likely to do so.

These trends present problems for fisheries managers because, although many anglers place a high level of importance in advisories (85% of all anglers indicated that it is very important to follow them) and many minorities seem more aware of advisories than Whites, many are still not complying with advisory suggestions.

In summary, most anglers in the Washington, DC region of concern refrained from eating fish from the Potomac and Anacostia Rivers (63%), usually a result of their reservations regarding water cleanliness. This, of course, translates into overall compliance in the region, but among the anglers who do consume their catch, many are doing so at hazardous frequencies and meal sizes. Some improvements can be made to the dissemination protocol for the region, and the ethnic group characteristics may help pinpoint what these improvements should be. Minority anglers appear to be less likely to comply with advisory suggestions, even though in many cases, they are more familiar with the advisories and claim to place more importance in the advisories. This puts minority populations at risk for an increased exposure to the contaminants in self-caught fish. Targeting minority anglers is very possible by angling site (many sites were favored among certain groups, as were fishing modes), and that data is included in this report. Additionally, outreach methods beyond those focusing on specific fishing access points can be targeted toward minority populations, such as community group meetings, neighborhood visits, or church group meetings. These possibilities were discussed at focus group meetings, and present an excellent opportunity for communicating risks to targeted populations.

## V. RESULTS FROM VIRGINIA ANGLER INTERVIEWS

This chapter discusses the results from angler interviews conducted in the Tidewater, VA area, which included fishing access points on the Lower James and Elizabeth Rivers. The survey instrument used for these interviews is included in Appendix A, a map of the fishing access points surveyed is included in Appendix B, and frequency tables for all closed-ended questions are included in Appendix H.

### Tidewater, Virginia Region Advisories

Fish consumption advisories in the Commonwealth of Virginia, is developed by the Virginia Department of Health (VDH) and Department of Environmental Quality (DEQ) and distributed jointly by the VDH and the Virginia Department of Game and Inland Fisheries (VDGIF). The advisories in Virginia are arranged by waterbody, and the listing includes lakes, reservoirs, and rivers. Table 5.1 summarizes the portions of the Virginia advisory that apply to the area sampled in this study. The full Virginia fish consumption advisory in place during the summer of 2004 is provided in Appendix E.

**Table 5.1. Summary of advisories for Lower James and Elizabeth Rivers during study period. Fish meals are based on 8 oz. Servings. Where specified, sensitive populations include women aged 18-45 and children aged 0-6 years.**

Contaminant	Recommendations
<b>Kepone Advisory</b> (updated 7/1/88)	All Species: "A fish-eating advisory exists for those who consume fish from these waters on a daily basis."
<b>PCBs</b> (effective 6/15/04)	Blue catfish: No consumption, all people
	Carp: 2 meals/month, general population No consumption, sensitive populations

Advisories are currently being disseminated over the internet (VDH and DGIF websites), through press releases, in fishing regulations books, and occasionally through signs posted at fishing access points. Only one advisory (Kepone) was in place during study design and at the time interviews commenced, and this advisory that had been in place, without significant updates, since the releases ceased in Hopewell, Virginia nearly 30 years ago. The Kepone advisory was a general warning informing anglers who consume fish on a daily basis that the contaminant may be found in the fish and may be harmful. However, on June 14, 2004, several weeks after anglers interviews started, the VDH issued a slightly revised advisory that extended a previous James River PCB advisory down into the Lower James and Elizabeth Rivers. The new advisory includes a general population no-consumption advisory on blue catfish and recommends no more than two 8 oz. meals per month of carp (no consumption for sensitive populations). Beyond consumption suggestions, the VDH also lists information in the advisory about minimizing the hazards associated with consuming contaminated fish, such as which sizes to keep and a description of the most effective cooking and cleaning methods.

Note that we did not ask advisory specific questions during angler interviews in this region. The Kepone advisory was very general and only applied to individuals consuming James River fish on a daily basis. Further, the PCB advisory was not in place during our study design or when interviews commenced, and we were not aware that the VDH would be updating these advisories during the field season. Therefore, questions about specific advisories in the area were omitted. General questions about attitudes towards advisories and fish safety were, however, still asked.

In October 2004, after angler interviews had been completed, the VDH issued a large number of new advisories for the state due to a reduction in the trigger level for key contaminants. Many of these new advisories apply to the area addressed in this report, with specific consumption recommendation listed for 19 species. The results presented in this chapter can serve as both a valuable tool in planning an effective advisory development/dissemination program and a useful baseline for comparing consumption and advisory awareness among anglers before and after this new advisory issuance.

### **Overall Survey Results**

A total of 493 surveys were completed in the Tidewater, Virginia region, more than the other two regions combined. There was a 78% completion rate among all of the anglers contacted. Ten percent of the anglers contacted had been interviewed before (and were not interviewed again), 3% of the refusals (n=4) were due to language barriers, and most simply either declined or had no time for the interview (97%). See Appendix H for frequency tables detailing the results described in this section.

#### *Demographics*

Nine sites were surveyed in the Tidewater region of Virginia for this project (Table 2.1). Five of these sites were located on or near the James River main channel and four were located on the Elizabeth River and its tributaries. A site map of the region is found in Appendix B. Only one site (Haven Creek Boat Ramp/Lafayette City Park) accounted for less than 35 interviews (n=10). Most interviews were collected from sites on or very near the James River (69%), but Great Bridge Lock Park was the most popular site among anglers fishing the Elizabeth River and 31% of all interviews were collected in sites on the Elizabeth River or its tributaries. Two adjacent sites on the James River (the James River Bridge Fishing Pier and Huntington Park Boat Ramp) accounted for 45% of all surveys. Most interviews (59%) were conducted on weekends, between Friday and Sunday.

The majority of anglers interviewed were male (86%), and a large portion were fishing from boats (47%) or piers (40%). Thirteen percent were fishing from the shore. The largest proportion of anglers traveled less than ten miles to reach their fishing destinations (46%), but the next largest group traveled over 100 miles (26%), indicating a large tourist segment that was not present in either the Baltimore or Washington, DC angler population. About half (51%) of the anglers had been fishing the area for more than ten years but most (63%) had fished ten times or less in the last year. Ten percent, however, did report having fished 50 or more times in the past year, and 8% had fished between 26 and 50 times.

The racial composition of the anglers interviewed in the Tidewater region was mostly Caucasian (56%) and African American (42%). Just over half (53%) of the anglers interviewed had obtained a high school education or less; the remainder reported having some college (30%), a bachelor's degree (15%) or a graduate degree (4%). The average age of anglers in the Tidewater region was 56, about 10 years older than the average age in the other two regions of concern. When asked about total household income 22% of anglers reported an income of more than \$80,000, 41% reported a total household income between \$40,000 and \$80,000, 28% reported \$20,000-\$40,000, and 9% earned less than \$20,000 a year.

### *Fish Consumption Patterns*

Relaxation, spending time outdoors, and the challenge or sport of fishing ranked as being *very important* fishing motivations by most anglers (90%, 89%, and 66% respectively). Half (50%) of all anglers rated obtaining fish for a fresh fish dinner as being a *very important* motivation. In addition, while 58% of anglers felt that reducing food expenses was *not at all* important, another 19% reported it as a *very important* motivation.

Of all Tidewater region fishermen, 91% claimed that they did eat at least some of the fish that they caught from the James and Elizabeth Rivers, a percentage that was far higher than reported by Baltimore (53%) or Washington, DC (37%) anglers. A little more than half (51%) of these also stated that although they would eat their catch, there were still certain species that they would avoid. A large majority of all anglers (85%) also said that they did give away at least some of the fish or crabs that they caught. Interestingly, more than half (62%) of the anglers who stated that they *did not* consume fish themselves from the Lower James and Elizabeth Rivers responded that they *did give away* at least some of the fish that they caught. This means that although many respondents in this survey stated that they did not eat their catch, they may have kept the fish and given them away to individuals who did consume the fish.

May through September were the most popular months for consuming self-caught fish, and 81% ate their fish between once/month and twice/week during these months, with 7% eating 3-4 times/week and only 1% eating 5 or more times/week. Most anglers ate the least fish between November and March, when most of them ate fish either three times/month or less (48%) or not at all (42%). The largest proportion of anglers in the DC area stated that they ate self-caught fish 1-3 times per month (41%), followed by less than once per month (31%). Twenty-four percent (24%) of anglers in the Tidewater area responded that they consumed fish once a week or more on average throughout the year, only 3% ate fish 3-4 times/week and 1% reported eating self-caught fish an average of 5 times or more/week throughout the year.

The Virginia advisories use 8 oz. serving sizes in its recommendations, and most anglers reported that they typically ate that amount or less at a meal (60%). The remaining anglers who consumed self-caught fish stated that they typically ate more than 8 oz. in a single meal (40%). In comparison to the other regions we surveyed, Virginia anglers more often reported that their typical serving size was greater than 8 ounces; 74% of Baltimore

anglers and 78% of Washington DC anglers reported typical servings sizes of 8 ounces or less. Of the 35% of anglers who crabbed in the Tidewater region, 49% said that their typical portion sizes were ten crabs or more.

When asked about fish preparation methods, most anglers (82%) reported that they pan or deep fried their catch most of the time, although many fishermen claimed to broil, bake, or grill their catch some (53%) or most (22%) of the time. Only 1% of anglers made soup or chowder most of the time and more than 99% never ate their fish raw. Many anglers indicated that they fillet their catch most (45%) or some (40%) of the time, but 45% stated that they never punctured or removed the skin before cooking. Fifty-seven percent (57%) also stated that they never removed the fat before cooking. Few anglers reuse oil or fat from cooking (72% reported never doing this). Finally, most of the anglers who consume self-caught crabs (84%) said that they never ate the mustard from the crabs.

Among those anglers who did not eat self-caught fish, the most common reasons for non-consumption are shown in Table 5.2. Most non-eating anglers (20) reported that their main reason for not eating their catch was that they did not eat fish for one of a variety of reasons, including taste, health reasons such as allergies, and difficulties involved in cooking and cleaning. Other anglers said that they had not caught fish large enough yet (5) or they only fished for sport (4). Pollution was a major concern in other regions, but only 4 anglers in the Tidewater area refrained from eating fish because of poor water quality. Only one angler cited advisory adherence as the main reason for non-consumption.

**Table 5.2 Reasons given by Tidewater, VA anglers for not consuming self-caught fish.**

<b>Reasons for not Eating Catch</b>	<b>Anglers</b>
Do Not Eat Fish (taste, allergies, preparation difficulty)	20
Have not Caught Big Enough Fish to Eat Yet	5
Pollution Concerns	4
Fish Only for Sport	4
First Time	3
Other	2
Advisory Adherence	1

#### *Advisory Awareness*

Almost three-quarters (72%) of area anglers had heard of the health benefits of consuming fish, but 69% of them stated that they did not eat more fish as a result of this information. Most fishermen (81%) felt that the fish in the Elizabeth and Lower James Rivers were safe to eat. Only 3% stated that the fish were explicitly not safe to eat, while another 16% said either “it depends” or were uncertain.

Reasons given by anglers for their fish safety perceptions are listed in Table 5.3. The most frequent response from anglers stated that they believed self-caught fish were fine

for consumption since there have been no ill effects among the people they knew (35% of all responses). Other common responses given by anglers for why they believe the fish to be safe to eat included the lack of advisories or warning signs (18% of responses) and that the water seems clean (12% of responses). Many interesting responses resulted from this survey question. For instance, several anglers incorrectly believed that pan-frying or deep-frying fish would kill any contaminants. Several also felt that fish were cleaner the closer one fished to the ocean

**Table 5.3. Reasons given by Lower James/Elizabeth River anglers for why they perceived area fish to be safe or unsafe for consumption.**

<b>Responses</b>	<b># of Anglers</b>	<b>%</b>
Nothing has happened/been eating for years/never heard of ill effects	159	35
Would hear of advisories/there would be sign postings if fish unsafe/haven't seen any	81	18
Water seems clean	55	12
Too much pollution/don't trust water	30	7
Appearance-fish look ok	30	7
Have heard of advisories/warnings	21	5
Just Fell that way/don't know	18	4
Depends on place/location	17	4
Saltwater/migrating fish more clean	13	3
Other	12	3
Cooking kills it	3	1
Believe fish are clean enough to eat	6	1
Don't trust fish	3	1
Depends on: cooking/ preparation, species, or population consuming the fish	6	1
<b>TOTAL</b>	<b>454</b>	<b>100</b>

Five percent of all anglers stated that their major reason for considering the fish to be safe or unsafe was observance of advisory information. However, even though many anglers did not specifically state that they relied on advisories to formulate their perception of fish safety, many of the responses listed in Table 5.3 (i.e., pollution, species or location dependent, preparation methods, etc.) could have originated from the information in Virginia fish consumption advisories.

When asked whether they were aware of the existence of fish consumption advisories that some states sometimes issued, 70% answered affirmatively, and almost all of these anglers (97%) considered following the information in health advisories to be somewhat or very important. When asked what the best way would be to disseminate advisory materials, should an advisory be issued for the area, anglers most often suggested television (35%), newspapers (22%), and personal contact (21%) or signs (17%) at fishing locations as the best methods

### Angler Consumption by Species

As stated earlier, a large majority of recreational anglers in the Tidewater, Virginia region ate the fish or crabs that they caught from area waters (91%). Table 5.4 summarizes this consumption according to the species anglers named and the frequency at which these species were consumed. Anglers were asked to name up to 4 species. Croaker was by far the most commonly consumed fish, named by anglers nearly twice as often as the next most common species. Spot and flounder were the next most commonly consumed, followed by striped bass, crabs, and trout. Blue catfish and carp are the only species mentioned specifically in the advisories for the Tidewater, Virginia region. Carp was not consumed by any anglers in the area, and catfish (a “no consumption” species) was the seventh most commonly-consumed species (n=31). Most anglers did not specify the types of catfish they consumed; therefore, all catfish responses are included in this category. The Kepone advisory applied to all species in the James River, but only to anglers consuming fish on a daily basis (e.g., more than 5 times/week).

**Table 5.4. Summary of fish species consumption based on consumption frequency among Tidewater, VA area anglers. The highlighted species, catfish, was the only fish species under advisory (a “no consumption” advisory) in the region that anglers reported consuming. No anglers named carp among their 4 species. The “general” categories include anglers who did not specify species.**

Species	5+Times/Week	3-4 Times/Week	1-2 Times/Week	1-3 Times/Month	Less Than Once/Month	TOTAL
Croaker	1	10	118	128	110	<b>367</b>
Spot	0	5	42	64	75	<b>186</b>
Flounder	0	0	32	45	40	<b>117</b>
Rockfish/Striped Bass	0	1	16	24	35	<b>76</b>
Blue Crab	2	2	13	16	27	<b>60</b>
Trout	0	1	10	25	17	<b>53</b>
Catfish (all)	0	1	2	12	16	<b>31</b>
Crabs (unspecified)	0	1	5	7	1	<b>14</b>
Drum	0	0	1	2	9	<b>12</b>
Bluefish	0	0	1	6	2	<b>9</b>
Perch	0	0	3	3	3	<b>9</b>
Bass (unspecified)	0	0	2	5	1	<b>8</b>
Tautog	0	1	1	0	2	<b>4</b>
Crappie	0	0	0	1	2	<b>3</b>
White Perch	0	0	1	1	1	<b>3</b>
Cobia	0	0	0	0	2	<b>2</b>
Sea Mullet	0	0	0	0	2	<b>2</b>
Bluegill	0	0	0	1	0	<b>1</b>
Shark	0	0	0	1	0	<b>1</b>
Black Bass	0	0	0	0	1	<b>1</b>
Yellow Perch	0	0	0	0	1	<b>1</b>
Eel	0	0	0	1	0	<b>1</b>
Sheep's Head	0	0	1	0	0	<b>1</b>
<b>TOTAL</b>	<b>3</b>	<b>22</b>	<b>248</b>	<b>342</b>	<b>347</b>	<b>962</b>

An analysis of consumption frequencies within each species illustrates trends evident among different species. For example 52% of catfish consumption is less than once per month, while only 32% of trout are consumed less than once per month. Seventy percent

of all anglers who ate the most commonly consumed species (croaker) did so at least once/month.

### **Anglers and Consumption Advisories**

The survey instrument in the Tidewater, VA region did not include sections designed to analyze angler awareness of existing advisories (these sections were present in the Baltimore-area and DC-area survey instruments). The state issued a new advisory, with limited dissemination efforts, for the area several weeks after angler interviews had begun. With such an abbreviated period of time for anglers to become familiar with advisory information or even come in contact with advisories, and in order to keep consistency in angler interview data, specific advisory inquiries were avoided. This section focuses on those portions of the survey instrument that did address advisory-related issues; however, none directly analyze the effectiveness of advisories in the Lower James and Elizabeth River region of concern.

#### *Advisory Awareness*

Since health benefits are often included as a part of advisory-released information, anglers were asked whether they were aware of the health benefits of consuming fish, and whether that knowledge caused them to consume more fish. Most anglers (68%) stated they were aware of the health benefits from consuming fish, and 31% stated that they consumed more self-caught fish as a result of this knowledge. This was a higher proportion that reported in the other two regions of concern (18% in Washington, DC; 20% in Baltimore).

Angler perception of safety concerning both fish and water can effect both the perception of advisories and the decisions to eat self-caught fish with or without advisories. A large portion of Tidewater anglers (81%) believed implicitly that fish in the area were safe for consumption, and only a small minority (3%) believed them to be implicitly unsafe. The rest responded either “it depends” or “unsure”.

Rather than being asked to address specifics about the newly released advisories in the region, Tidewater anglers were asked about the value they assigned to fish consumption advisories in general. Most anglers (80%) stated that following fish consumption advisories, once they were issued, was very important; only 4% stated that following the information in these warnings was not at all important.

Table 5.5 shows how anglers reported they would respond (hypothetically), in terms of recreational fishing and fish consumption behaviors, if they became aware of an advisory in that area. Anglers felt most strongly about the first possible change; 84% said that that if they saw an advisory, they would be likely to change their self-caught fish consumption patterns. More than two-thirds (68%) stated that they would probably continue to fish at that location, but nearly the same percentage (67%) also said that they would go to other areas to fish or crab at least some of the time.

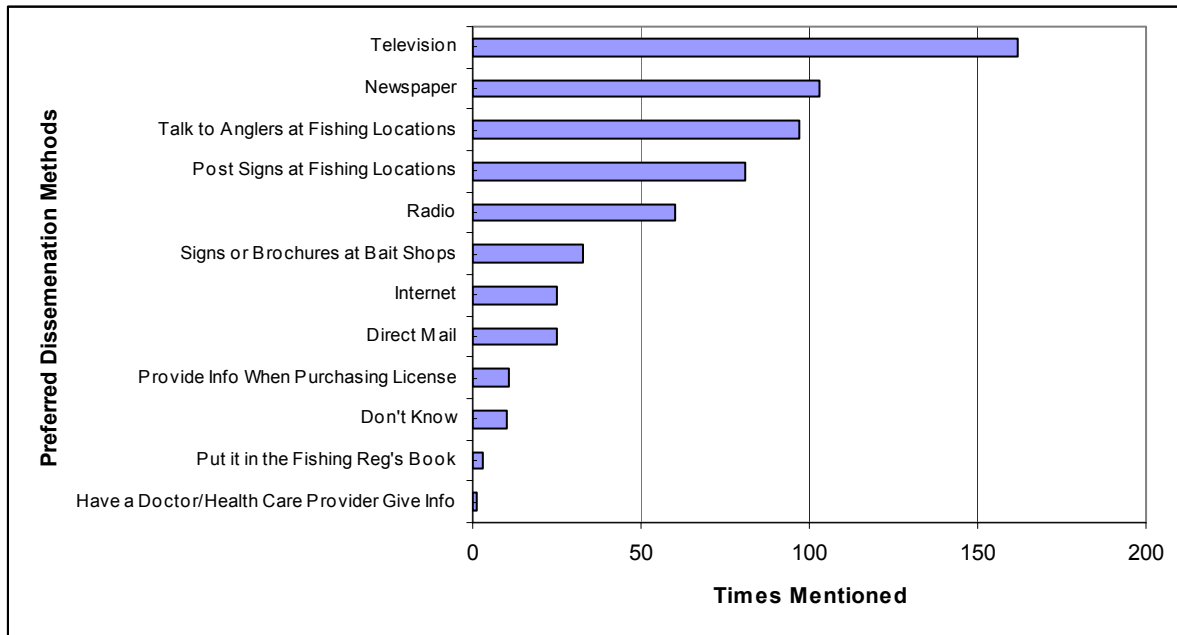


**Table 5.5. Anglers responses when asked how they would (hypothetically) changed their recreational fishing and self-caught fish consumption behaviors if advisories were issued.**

Changes in Behavior	% Yes	% No	% Not Sure
Would make changes to eating patterns for self caught fish	84	12	4
Continue to fish here	68	26	6
Fish or crab elsewhere at least some of the time	67	30	3

### *Advisory Content and Dissemination*

Anglers were next asked what he/she believed would be the best way to reach people with advisory information. This was posed as an open-ended question (no response options were read), and anglers were able to list as many as they wanted. Preferred communication methods can help fisheries and health managers know where to direct resources, especially with respect to certain populations. Dissemination methods preferred by anglers in the Tidewater, VA region are listed in Figure 5.1. Television was the most popular method mentioned, followed by newspaper releases, personal contact with officials at fishing sites, and signs posted at fishing sites.



**Figure 5.1. Preferred dissemination methods for fish consumption advisory information named by anglers in the Lower James and Elizabeth River area.**

The third most common response (“talk to anglers at fishing locations”) is one that has surfaced in each of the regions of concern. Anglers appear very interested in being able to ask questions of game and health officials in person regarding fish consumption and

water quality. Though site visits may be administratively and financially difficult, it may be a potentially valuable communication mode for future advisories.

### Analysis of Racial Differences

Racial differences among Tidewater, Virginia-region anglers were often more evident than other demographic factors. Furthermore, advisory and contaminated fish consumption literature focuses a great deal on the racial and ethnic considerations in risk perception and assessment. Consequently, much focus has been given to trends in race and several issues are discussed in this section.

Most of the anglers interviewed (98%) were reported as one of two ethnic groups. More than half of the population was White (56%), and 42% were African-American. Asians and American Indians constituted the next biggest minorities (1% each). There was one Hispanic respondent and one Pacific Islander respondent; these respondents represented less than one half a percent of the total, and therefore are not included in racial analyses. It should be noted that the figures contained in this section mostly describe four subpopulations of Virginia anglers: Whites, African-Americans, Asians, and American Indians who consumed the fish they caught and/or provided it to their families. Some analyses include Whites and African-Americans only due to low numbers among other races.

### Demographics

The average ages of anglers interviewed in the Tidewater region were considerably different when broken down by race. The average overall age of anglers was 56 years, the average age for White anglers was 62, compared to 49 for African-Americans, 48 for Asians, and 41 for American Indians. This age discrepancy may explain several factors, including risk perception, trust in advisories, and motivations for fishing.

An analysis of income categories (Table 5.6) shows that household incomes reported by White anglers were skewed toward the higher income categories more than African-Americans (due to low representation, Asians and American Indians were omitted from this analysis). More White anglers (27%) had household incomes of more than \$80,000 a year, and Whites also had the smallest proportion of anglers under \$20,000 (4%). African-Americans had a higher proportion of anglers with incomes under \$20,000 (16%) and only 16% reported incomes of over \$80,000/year. However, the largest income category for each race was \$40,001-\$80,000/year.

**Table 5.6. Distribution of household income categories amongst White and African-American anglers in the Lower James/Elizabeth River area.**

Income Categories	% Whites	% African-Americans
less than \$20,000/year	4	16
\$20,000-\$40,000/year	27	30
\$40,000-\$80,000/year	42	38
More than \$80,000/year	27	16
<b>TOTAL</b>	<b>100</b>	<b>100</b>

### *Fishing Locations and Habits*

Site distribution within ethnic groups can be important to fisheries and health managers who want to target advisories or advisory dissemination modes to certain populations of anglers. Table 5.7 reports the number of anglers from each race interviewed at various Tidewater region sampling sites. Since trends among other minorities were not evident, only Whites and African-Americans are addressed here. The greatest number of White anglers was interviewed at Huntington Park Boat Ramp. African-Americans were most often interviewed at the adjacent James River Bridge Fishing Pier.

**Table 5.7. Distribution by race of all Tidewater area anglers interviewed amongst the nine survey sites. Figures represent the number of anglers, with the percentage of all anglers at that site in parenthesis. The race encountered most frequently at each survey site is shaded. No trends were evident among other races, and were therefore omitted from this table.**

<b>SITES</b>	<b>Whites</b>		<b>African-Americans</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Great Bridge Lock Park	42	81	8	15
Portsmouth City Park	36	78	9	20
Jones Creek Boat Ramp	24	69	11	31
Huntington Park Boat Ramp	69	68	30	30
Peterson Yacht Basin/Anderson Park	20	49	20	49
Elizabeth City Boat Landing and Park	19	48	21	53
James River Bridge Fishing Pier	43	37	70	60
Denbigh Park	11	30	24	65
Haven Creek Boat Ramp/Lafayette City Park	1	11	8	89

Trends in fishing habits also race varied considerably between Whites and African-Americans. Fishing mode was one area where trends were evident (Table 5.8). The majority of White anglers were fishing from boats (60%), while only 28% of African-Americans were boat fishermen. However, most African-American anglers (60%) and one quarter of White anglers (25%) were fishing from piers when interviewed. The remaining anglers (13% of Whites and 11% of African-Americans) were fishing from the shore at the survey sites.

**Table 5.8. Modes by which anglers were fishing during angler interviews in the Lower James/Elizabeth River area, broken down by race.**

<b>Fishing Mode</b>	<b>Whites</b>	<b>African-Americans</b>
Shore	35 (13%)	23 (11%)
Pier	67 (25%)	121 (60%)
Boat	161 (61%)	56 (28%)
<b>Total</b>	<b>100%</b>	<b>100%</b>

Site choice among Whites is likely affected by the presence of a boat ramp, since most White anglers were boaters. The information in Table 5.7 supports this idea, since the most popular sites among Whites all contained at least one public boat launch. The presence of a boat launch probably did not influence other minorities as heavily, the accessibility of shore fishing may have been a factor.

There were no significant racial differences in distances traveled by anglers or the level of fishing experience. The largest proportion of both White and African-American anglers traveled either less than 10 miles (44% and 48%, respectively) or more than 100 miles (25% and 26% respectively). Similarly, half of the anglers of each race (51% and 50%, respectively) had been fishing in the Lower James/Elizabeth River area for over 10 years. A small percentage of every race (7% or less) had been fishing for less than a month. Finally, the largest portions of both Whites (40%) and African-Americans (42%) reported that they had fished in the area between 3 and 10 times in the last year.

### *Fish Consumption Patterns*

Most recreational fishermen interviewed in the Tidewater, Virginia region reported that they did consume at least part of the fish they caught. Overall, 91% of all anglers consumed their catch. Racial trends in self-caught fish consumption are shown in. African-Americans were slightly more likely to consume fish than Whites (94% vs. 90%). In addition, 4 of the 5 Asians anglers interviewed consumed self-caught fish (80%), and all 4 of the American Indians interviewed consumed their catch. There were few racial differences in the reasons anglers gave for not consuming fish, but it should be noted that concerns about pollution were the most common responses among each racial group.

These figures echo the trends evident in responses given when anglers were asked about their motivating factors for fishing (Table 5.9). A majority of each race considered a fresh fish dinner to be at least a somewhat important motivation for fishing. However, African-Americans generally considered reducing food expenses to also be an important motivation (52% said it was at least *somewhat important*) more often than other races. Thirty-four percent of Whites also reported that reducing food expenses was at least *somewhat important*. Four of the 5 Asians interviewed and 1 of the 4 American Indians reported that reducing food expenses was at least a *somewhat important* motivation. With such small sample sizes, it is difficult to assign a great deal of validity to the motivational data concerning Asians (5 anglers) and American Indians (4 anglers). However, responses from Whites and African-Americans were abundant. The differences insinuate that African-Americans, on the whole, considered consuming self-caught fish to be a slightly more important motivation for fishing than Whites, and that they place a greater importance on reducing food expenses than Whites.

A summary of information concerning self-caught fish preparation methods among White and African-American anglers is contained in Table 5.10. Few distinct racial trends were evident. African-Americans (42%) were slightly more likely than Whites (31%) to eat their fish whole, including the skin and fat. A similar tendency was found with other risk-reducing or risk-enhancing behaviors. Virginia advisories specifically mention

**Table 5.9. The importance of subsistence fishing related motivations among White, African-American, Hispanic, and Asian anglers in the Lower James/Elizabeth River area. Numbers represent the percentage of anglers who classified these motivations as being “very important.”**

Motivation	% Whites	% African-Americans	% Asians (N=5)	% American Indians (N=4)
<b>Fresh Fish Dinner</b>				
Very Important	47	53	20	75
Somewhat Important	32	26	40	0
<b>Total</b>	<b>79</b>	<b>79</b>	<b>60</b>	<b>75</b>
<b>Reduce Food Expenses</b>				
Very Important	14	26	20	25
Somewhat Important	20	26	20	0
<b>Total</b>	<b>34</b>	<b>52</b>	<b>40</b>	<b>25</b>

skinning and trimming fish as a way to reduce contaminants. Pan- and deep-frying fish locks in contaminants more than other cooking methods, and both Whites (71%) and African-Americans (79%) said that they regularly fried their catch. However, very few anglers reported that they re-used the oil and fat used in frying most of the time. Finally, very few anglers responded that they ate crab mustard most of the time (1% of Whites and 3% of African Americans). This is a practice advised against in many fish consumption warnings, but was not mentioned in any Lower James or Elizabeth River advisories.

**Table 5.10. Self-caught fish and crab cleaning and preparation methods employed by anglers in the Lower James/Elizabeth River area, broken down by race. Percentages represent the proportion of anglers from each race answering “most of the time” in response to a question about how frequently they employ each of the preparation and cooking methods in preparing their self-caught fish.**

Fish Preparation Methods	% Responding “Most of the Time”	
	% Whites	% African-Americans
Eat Mustard From Crabs	1	3
Eat Whole Fish, Including Skin and Fat	31	42
Puncture or Remove Skin	28	23
Trim Fat/Belly Meat	25	25
Filet Fish	48	33
Pan or Deep Fry	71	79
Re-Use Fat	10	9
Freeze or Can for Later	48	55
Eat Fish Raw (% Sometimes)	12	8

The differences in fish preparation methods arising along racial lines may have been due to cultural behaviors or learned habits. Future studies might specifically ask respondents

why they prepared their catch the way they did in an attempt to understand the relationship these trends have with advisory information and comprehension and cultural differences in fish preparation methods. However, these data suggest overall evidence of a heightened risk of contaminant consumption among minorities, namely African Americans, compared to Whites as a result of their reported fish cooking and preparation tendencies.

Young children, nursing and expectant mothers, and other women of childbearing age, are particularly vulnerable to the ill effects of contaminated fish. Most White (85%) and African-American (84%) anglers reported that they provided self-caught fish to their families or other household members. The same was true for Asians (4 of the 5 respondents) and American Indians (3 of the 4 respondents), but no ethnic group appeared to have considerably more individuals from at-risk subpopulations than others.

#### *Risk Perception and Advisory Awareness*

Data concerning risk perceptions and advisory issues were collected from all anglers, not just those who ate their catch or provided it to their families. Virginia advisories mention the existence of contaminants such as PCBs in fish from area waters, and angler perception of various risks (whether or not they are mentioned in an advisory) can strongly effect decisions to consume or provide for consumption self-caught fish. Overall, 81% of Tidewater-region anglers believed the fish that they caught from area waters were implicitly safe to eat. Conversely, only 3% felt that the fish were completely unsafe to eat. The remainder responded either “not sure” (6%) or “it depends” (10%). No distinct racial trends were evident in the perceived safety of consuming self-caught fish. The literature strongly supports risk perception as an indicator of consumption likelihood, and high rates of consumption in the Tidewater area can be partially explained by such optimistic perceptions of fish safety. There were no significant differences among races in reasons anglers gave for their perception of fish safety.

Anglers overwhelmingly responded that adhering to the information in health advisories was very important. However, White anglers showed a lower level of confidence in advisories, with only 69% indicating that following advisories was *very important* (compared to 87-100% of other races) (Table 5.11). Much of the literature suggests that minorities are more likely to be skeptical of fish consumption advisories and instead adhere to their own cultural or folk notions of fish safety, but the results in the Tidewater region challenge this.

**Table 5.11. Angler perceptions about the importance of following fish consumption advisories in the Lower James/Elizabeth River area, broken down by race.**

<b>Importance</b>	<b>% Whites</b>	<b>% African-Americans</b>	<b>% Asians</b>	<b>% American-Indians</b>
Very Important	69	87	100	100
Somewhat Important	23	8	0	0
Not at All Important	5	2	0	0
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

One possible explanation for this is an adherence to traditional or folk notions among older anglers. As mentioned earlier in this chapter, White anglers were significantly older than anglers of other races (average age of 69 years vs. 41-49 for other races). There is little literature to suggest that this is the case, but this may be an avenue for future research. It may also be a useful observation to assist with planning advisory dissemination methods at certain sites that attract older vs. younger anglers.

## Other Demographics

### *Income*

Several income-related trends were evident among Tidewater, Virginia anglers. Income data refers to total household income, and was collected by arranging angler responses into four categories (also noted above): \$20,000/year, \$20,001-\$40,000/year, \$40,001-\$80,000/year, and more than \$80,000/year. Most anglers in the Virginia region were willing to provide income information to interviewers (87% of all anglers interviewed responded to this question). As stated earlier, the greatest number of anglers reported combined household incomes of between \$40,000 and \$80,000/year (41%), and the lowest income category (less than \$20,000/year) was least common among anglers (9%).

Household income among Tidewater anglers was related closely to fishing mode (Table 5.12). Differences in fishing modes were very evident among anglers from different income categories. As would be expected, anglers with progressively higher incomes were also progressively more likely to fish from a boat. In fact, 60% of anglers in the highest income category were boat anglers. Anglers in the lowest income category were more likely than any other group to fish from the shore (18%) or a pier (51%). They were also least likely to be fishing from boats (31%). Pier and boat fishermen were both heavily skewed: pier fishing was skewed towards lower incomes, and boat fishing was skewed towards higher incomes. No significant relationship was found between income and distance traveled to the fishing site

**Table 5.12. Angler fishing mode distribution, broken down by reported household income.**

<b>Income Categories</b>	<b>% Shore</b>	<b>% Pier</b>	<b>% Boat</b>	<b>Total</b>
Less than \$20,000/year	18	51	31	100
\$20,000-\$40,000/year	13	46	40	100
\$40,000-\$80,000/year	13	40	46	100
More than \$80,000/year	12	28	60	100

The motivations for fishing varied among different income categories (Table 5.13). When asked about the importance of obtaining fish for a fresh fish dinner to self or family, low income anglers tended to state that it was a very important motivation for fishing more often. Furthermore, lower income anglers placed considerably more importance on fishing in order to reduce food expenses (41% said it was very important) than higher income groups (11%-29% found it very important). This suggests that more low-income anglers place a high value in consuming self-caught fish and are often doing so in order to save money on food. However, there was no relationship between income

and the likelihood of anglers to consume their catch or the frequency with which they did so.

**Table 5.13. Percent of anglers, broken down by household income, responding “very important” when asked about certain motivations for fishing in the Lower James/Elizabeth River area.**

Motivations	Income			
	% Less than \$20,000/year	% \$20,000-\$40,000/year	% \$40,000-\$80,000/year	% More than \$80,000/year
Fresh Fish Dinner	64	56	50	38
Reduce Food Expenses	41	29	14	11

### Education

Just over half (52%) of the anglers interviewed in this area had a high school education or less. Education levels did not appear to influence site choice, distance traveled, or frequency of fish consumption. Boat fishermen were, however, slightly more common among higher education groups.

A relationship between fishing motivations and angler educational attainment was relatively clear (Table 5.14). As education level increased, the value of fresh fish from recreational fishing decreases. The tendency was the same for reducing food expenses. Fewer highly educated anglers reported that reducing food expenses was a *very important* motivation for their fishing, while more than a third (38%) of anglers from the lowest education group considered it *very important*. A similar trend was present in relation to household income (see Table 5.13), and it is not clear which factor (income or education) is the underlying cause.

**Table 5.14. Percent of Lower James/Elizabeth River area anglers who considered a reduction of family food expenses to be a *very* or *somewhat important* motivation for their recreational fishing**

Motivations	% < High School	% High School	% Some College	% Bachelors/ Equivalent	% Masters/ Equivalent
Fresh Fish Dinner	69	49	47	41	25
Reduce Food Expenses	38	20	19	10	6

### Stakeholder Meeting

The stakeholder meeting for the Lower James/Elizabeth River region of concern took place on January 24, 2005 at the VA DEQ Piedmont Regional Office just outside of Richmond, VA from 1:00pm until approximately 3:30pm. Email invitations were sent out to members of various public and private organizations, including the VA DEQ, DOH, DGIF, Department of Conservation and Recreation, and Marine Resources Commission, the public health departments for the area (including Women, Infants, and Children programs), the various watershed groups, area universities (particularly



departments in toxicology and environmental and public health, plus the Institute for Marine Science), local Watermen’s Associations, and environmental conservation groups. In the end, there were a total of 19 people registered to attend and 20 people actually in attendance. These individuals, along with their affiliations and contact information, are listed in Table 5.15.

**Table 5.15. List of participants attending the Lower James/Elizabeth River region stakeholder workshop to discuss survey results related to the area’s fish consumption advisories.**

<b>Name</b>	<b>Affiliation</b>	<b>Email</b>
Alex Barron	VA Dept. of Environmental Quality	<a href="mailto:ambarron@deq.virginia.gov">ambarron@deq.virginia.gov</a>
Bud Laroche	VA Dept. of Game and Inland Fisheries	<a href="mailto:Bud.laroche@dgif.virginia.gov">Bud.laroche@dgif.virginia.gov</a>
Fred Leckie	VA Dept. of Game and Inland Fisheries	<a href="mailto:Fred.leckie@dgif.virginia.gov">Fred.leckie@dgif.virginia.gov</a>
Bob Greenlee	VA Dept. of Game and Inland Fisheries	<a href="mailto:rgreenlee@dgif.virginia.gov">rgreenlee@dgif.virginia.gov</a>
Ram Tripathi, PhD	VA Dept. of Health	<a href="mailto:ram.tripathi@vdh.virginia.gov">ram.tripathi@vdh.virginia.gov</a>
Jim Pletl	Hampton Roads Sanitation District	<a href="mailto:jpletl@hrsdc.com">jpletl@hrsdc.com</a>
Patty Lee	Hampton Roads Sanitation District	<a href="mailto:plee@hrsdc.com">plee@hrsdc.com</a>
Erica Holloman	VA Inst. of Marine Science	<a href="mailto:elhollom@vims.edu">elhollom@vims.edu</a>
Jeff Hancock	VA Dept. of Conservation & Recreation	<a href="mailto:Jeff.Hancock@dcv.virginia.gov">Jeff.Hancock@dcv.virginia.gov</a>
Rick Browder	VA Dept. of Environmental Quality	<a href="mailto:rgbrowder@deq.virginia.gov">rgbrowder@deq.virginia.gov</a>
Chuck Fredrickson	James River Association	<a href="mailto:keeper@jamesriverassociation.org">keeper@jamesriverassociation.org</a>
Jutta Schieder	VA Dept. of Environmental Quality	<a href="mailto:jschneider@deq.virginia.gov">jschneider@deq.virginia.gov</a>
Lewis Gillingham	VA Marine Resources Commission	<a href="mailto:lewis.gillingham@mrc.virginia.gov">lewis.gillingham@mrc.virginia.gov</a>
Jennifer Palmore	VA Dept. of Environmental Quality	<a href="mailto:jvpalmore@deq.virginia.gov">jvpalmore@deq.virginia.gov</a>
Warren Smigo	VA Dept. of Environmental Quality	<a href="mailto:whsmigo@deq.virginia.gov">whsmigo@deq.virginia.gov</a>
Donald Smith	VA Dept. of Environmental Quality	<a href="mailto:dsmith@deq.virginia.gov">dsmith@deq.virginia.gov</a>
Mark Richards	VA Dept. of Environmental Quality	<a href="mailto:marichards@deq.virginia.gov">marichards@deq.virginia.gov</a>
Pete Clifford	Norfolk Naval Shipyard	<a href="mailto:CliffordPJ@nnsy.navy.mil">CliffordPJ@nnsy.navy.mil</a>
Joshua Gibson	Virginia Tech, project personnel	<a href="mailto:jogibso1@vt.edu">jogibso1@vt.edu</a>
Julie McClafferty	Virginia Tech, project supervisor	<a href="mailto:jmclclaff@vt.edu">jmclclaff@vt.edu</a>

The meeting started out with a joint presentation by Alex Barron, VA DEQ, and Dr. Ram Tripathi, VA DOH, of the Virginia consumption advisory process and an update on the current status of Lower James/Elizabeth River advisories and dissemination methods currently employed. Next, Josh Gibson, Virginia Tech, presented the results of the angler interviews we conducted in the Lower James/Elizabeth River area during the summer of 2004. Each presentation was followed by a question and answer session. Finally, a brief discussion ensued regarding possible ways to improve advisory knowledge and compliance among area anglers.

The information presented below is an overall summary of the discussions that took place at all 3 stakeholder meetings, with notes specific to the Tidewater area. Because the meetings were very different in terms of how much discussion took place and the individuals involved, each region can benefit from the breadth of topics discussed at all 3 meetings. It was clear that Virginia health and resource managers felt overwhelmed by the task of disseminating all the new advisories to such a large audience over such a large geographic area. The below discussion may provide some ideas to help them focus their efforts.

The group discussions as a whole revolved around two themes: ways to reach the target audience, and ways to improve message content. It became clear that a comprehensive outreach program with multiple communication modes is, indeed, needed because posting fish consumption advisories only in fishing regulation books or only on the Internet does not reach a substantial portion of the audience. First, many anglers may or may not actually purchase a fishing license (and may or may not have access to the regulations book). Secondly, the fishing regulations books and Internet postings (the two major dissemination methods used in Virginia) do not actively target the sites at which people are fishing (i.e., where the exposure occurs). The outreach program currently in use for the Virginia area is quite conservative, although this is understandable due to the new nature of most advisories, the large area that these outreach methods must cover (most of the state), and the limited financial resources at hand. Nonetheless, the lack of a comprehensive dissemination program is likely reflected in the comparatively low advisory awareness and compliance rates.

Meeting participants in each region had several suggestions that may help improve these efforts. These include talking to local watershed organizations (which would require meetings outside the normal working hours since many of these individuals are volunteers) and attending community events to train other community members in advisory issues. This would effectively increase the number of people available in the community able to help spread the word, and anglers may be more likely to accept and adhere to advisory recommendations if the message is coming from someone in their own community. It was also suggested that a study be conducted to look at the actual risk levels among participants in the community health programs (e.g., Women, Infants, and Children) to determine if current advisory programs are, in fact, reaching those people and whether those families are at special risk. This study may not be as critical in the Tidewater area as in other areas, simply because a large segment of the angling population are tourists. One additional audience that was suggested, is to talk to fish market managers that purchase fish from local anglers in order to determine what they are buying and selling and possibly create another avenue for advisory communication. Each of these suggestions involves an increase in the level of interpersonal communication modes, which we also found to be a potentially useful mode in our study.

Message content was talked about specifically in relation to public health outreach programs (e.g., Women, Infants, and Children Programs) and the general population. In both cases, it was stressed that messages needed to be simple, positive, and relevant. First, messages should be created at an appropriate reading level (e.g., 5<sup>th</sup> grade), and should simplify advisory recommendations enough so that the message is still the same, but people are not required to perform mental calculations or keep track of multiple figures. It was suggested that the message be kept simple enough that the recipient is asked to retain just 2 or 3 main points. The Virginia advisories, including the newest release, are already in a fairly straightforward format that lends itself well to simple messaging within individual watersheds such as the Lower James/Elizabeth River. Moving across watersheds, however, will be a challenge. Second, a positively framed message can greatly improve both message reception and behavior modification. One

participant suggested that, while it's important to stress which fish are potentially unsafe to eat, it is equally important to point out species that are safe. Third, incorporating positive cultural references into the advisory message can make at-risk populations more receptive as well. This can be done by recognizing that people are using the fish that they catch in economic or culturally important ways and suggesting risk-reducing behavioral modifications that allow them to continue to meet those needs. Finally, the use of visual and tactile aids in communicating advisories was suggested as a way to improve reception and retention among all audiences.

### **Conclusions and Recommendations**

As mentioned earlier, new fish consumption advisories for the Lower James and Elizabeth Rivers and their tributaries were issued just after the start of interviews in June, 2004. The interview instrument for the Tidewater region originally did not assume that anglers were aware of advisories because at interview initiation, none existed. The Kepone advisory for the James River has been a factor for many years (releases ceased in the 1970's) but that advisory applies only to anglers who eat fish from the James on a daily basis. The Tidewater interviews, therefore, did not include the extent of questions involving advisory knowledge and dissemination methods included in the survey instruments for other regions. However, the discussion in Chapters 3 (Baltimore) 4 (Washington, DC) about advisory awareness, content, and dissemination may be useful references for managers charged with designing and executing the fish consumption advisory outreach program in Virginia as well.

The advisory released in June, 2004 applied to the James and its tributaries downstream from Richmond, and involved polychlorinated biphenyls (PCBs). The advisory warned against any consumption of blue catfish, and limited carp to no more than two 8-ounce meals per month for the general population with a "no consumption" advisory for children and women of childbearing age. Dissemination of this advisory was executed by Virginia Department of Health and the Department of Game and Inland Fisheries, and included internet postings with occasional sign postings at fishing sites.

Five of the 9 sites surveyed in Virginia were located on or near the James River; the remaining 4 were on the Elizabeth River or its tributaries. About a third of interviews came from the Elizabeth River sites, and the rest came from the James River sites. Almost half of the region's interviews were conducted at one of two sites: James River Bridge Fishing Pier and Huntington Park Boat Ramp.

The proportion of anglers in the Tidewater area who eat the fish that they catch was very high – nearly all anglers said that they consume what they caught (91%). The high rate (compared to other regions) may be partially due to the salinity of water at many of the sites; it was suggested during the stakeholder meeting that saltwater anglers are much more likely to consume their fish than freshwater anglers, although only 53% of Baltimore anglers reported consuming their catch. Less than 3% of all anglers stated that they were concerned about pollution, and of the relatively small number of anglers who did not consume their catch, most said that they refrained because they simply did not eat

fish. Of all anglers, 81% believed that fish from local waters was explicitly safe for consumption.

The most common species consumed were croaker, followed by spot, flounder, and striped bass. There were 31 instances of catfish consumption (*blue catfish* were an advisory “no-consumption” species), and 48% of these are eating catfish at least once per month. As is noted in the report, however, these instances of catfish consumption may include other species beyond blue catfish (separate categories were not warranted due to lack of angler specificity). Only one species (carp) is listed in the advisory by consumption size and frequency, and no anglers listed carp among their 4 most commonly eaten fish. The meal size used by the VDH in setting advisory recommendations is 8 ounces. Many anglers reported eating larger portions than that (40%). Most anglers stated that they ate self-caught fish either 1-3 times/month or 1-2 times/week on average throughout the year.

A trend that has been evident in all three regions of concern is the number of anglers who give away their catch. Most of the anglers in this study region (85%) reported that they give away at least some of the fish that they catch, and this included 62% of the anglers who did not eat the fish themselves. The recipients of these hand-outs are unknown consumers of sport-caught fish. We were unable to capture them in this report, yet their numbers are substantial. Additional data on these people is needed so that fisheries planners can learn how best to communicate risk to them without relying on anglers to provide the message.

The main reason anglers believed that fish were safe to eat was that they had been eating fish from local waters for years and had not seen or experienced any bad effects. The next most common response among anglers was that if the fish were unsafe, there would be sign postings and the anglers would have heard of advisories. Only 5% mentioned that they had seen advisories during the interview, even though they had been in effect throughout most of the interviewing period.

Another aspect of this data that should be kept in mind among public health and fishery managers is there is a large tourist population fishing in the Tidewater area. More than a third (39%) of all anglers had traveled more than 50 miles to reach their fishing site, 26% had traveled more than 100 miles. This accounts for nearly two out of every five interviews, a tendency that simply did not occur in other regions.

Site distribution among demographic populations was clear, especially for ethnic groups. Great Bridge Lock Park, Portsmouth City Park, and Jones Creek and Huntington Park boat ramps were predominantly White anglers, while Haven Creek and Elizabeth City boat ramps, Denbigh Park, and James River Bridge Fishing Pier sites were predominantly African-American anglers. Whites were more also often fishing from boats (61%) than African-Americans (28%).

Racial differences can be important for certain targeted dissemination tactics in the future. For instance, although most anglers from each race consumed their self-caught

fish (90% of Whites, 94% of African-Americans), more than half of African-Americans stated that they fished to reduce food expenses, compared to about a third of Whites. In addition, Whites generally took part in more risk-reducing practices than did African-Americans. However, most anglers from each race provided fish to their families (at least 84%) and each also strongly believed the fish were safe simply because they had not seen negative effects after years of consuming the fish.

Other demographic trends may also be useful. Low-income anglers were far more likely to fish from the shore or, especially, piers. Higher income anglers, on the other hand were far more likely to be boat fishermen. Anglers in this lowest category also put more importance in fishing to reduce food expense than anglers with higher incomes. The largest category of angler household income was \$40,000 to \$80,000 per year, but about one in ten made less than \$20,000, and these were more likely to be African-Americans than Whites.

Although new advisories have been issued for the Tidewater region by the Virginia Department of Health, several results from this report may help future advisory and dissemination developments. One of the major modes by which advisories were disseminated was the internet. However, when anglers were asked about the best way to reach them with advisory information, far fewer anglers said internet than other modes, such as television, newspaper, personal site visits, and signs at fishing locations.

Signs are currently utilized occasionally for communication purposes, and were often suggested by anglers as good way to disseminate information, but even signs were less popular among anglers than interpersonal modes. Many anglers stated that interpersonal modes of advisory communication, such as talking to anglers at fishing sites, were a preferred mode of communication. This is a trend that arose in each of the three regions of concern. Interpersonal modes (like site visits) are not the most financially or labor-efficient ways to communicate advisories, but some integration of interpersonal contact at popular fishing spots may be an effective tool in future dissemination protocol improvements. One proposed idea from some of the regional stakeholder meetings was to have health and fisheries officials visit community meetings, organization meetings, or neighborhoods in general. This method ensures that as many people in certain locales or areas of interest (such as watershed organizations or women's health groups) are aware of advisories and possible steps to learn more about them. In this way, a whole community of communicators can be developed, and those who attend such meetings or events can then pass the information on to other anglers that they encounter.

Advisories are a somewhat new undertaking in the Tidewater region of Virginia, especially now that fish tissue standards have changed. With such a high rate of consumption as exists in the Lower James/Elizabeth River area, determining at-risk populations is less critical presently than simply communicating a message of risk.

**APPENDIX A:  
ANGLER SURVEY INSTRUMENTS**

**APPENDIX B:**  
**ANGLER INTERVIEW SITE MAPS**

## BALTIMORE REGION ANGLER SAMPLING SITES



MAP KEY	SITE NAME
1	Cox's Point Park
2	Rocky Point Beach and Park
3	Inverness Park
4	Merritt Point Park
5	Turner's Station
6	Canton Waterfront Park
7	Middle Branch Park
8	Broening Park/Ferry Bar Marine Park
9	Fort Armistead





## WASHINGTON, DC REGION ANGLER SAMPLING SITES



MAP KEY	SITE NAME
1	Fletcher's Boat House
2	Theodore Roosevelt Island
3	Lady Bird Johnson Park/Columbia Island Marina
4	Gravelly Point/Roaches Run
5	East Potomac Park/Haines Point
6	Monument Tidal Basin
7	Water Street Marina Area
8	Dangerfield Island/Washington Sailing Marina
9	Anacostia Park South



## TIDEWATER REGION ANGLER SAMPLING SITES



MAP KEY	SITE NAME
1	Denbigh Park
2	Huntington Park Boat Ramp
3	James River Bridge Fishing Pier
4	Peterson Yacht Basin/Anderson Park
5	Jones Creek Boat Ramp
6	Haven Creek Boat Ramp/Lafayette City Park
7	Elizabeth City Boat Landing and Park
8	Portsmouth City Park
9	Great Bridge Lock Park



**APPENDIX C:**  
**ANGLER INTERVIEW PROTOCOL**

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## Handbook for Angler Interviewers

General Interviewing Protocol	Page 1
Instructions for the Survey Instrument Items	Page 6
Logistical Concerns/Safety Plan	Page 12

### Emergency Phone Numbers:

Josh Gibson (cell phone): 540-320-4593  
CMI (Karen Hockett): 540-231-9605  
CMI Main Office (Shelia Ratcliffe): 540-231-7348

DC Team cell phone (Lily & Marc): 540-357-0238  
Baltimore Team cell phone (Ryan and Meaghan): 540-357-0261  
VA Team cell phone (Melanie and Peter): 540-357-0338

### Interviewing protocol:

Each day, you will have a set access point to which both interviewers should report at a specific time. On some days, there may be more than one site to visit. To help ensure statistically valid results, it is important that you be at the designated access points during the designated times. Many factors that define the angling population can vary significantly between weekends and weekdays and mornings and afternoons/evenings. The access point schedule provided to you considers this, and if your visits vary from this schedule, the representativeness of the data you collect data may be in jeopardy. It is critical that the balance of weekends and weekdays and mornings and evenings be maintained! If for some reason (e.g., poor weather), one or more site visits need to be canceled, notify Josh Gibson immediately so he can schedule an appropriate time to make up those visits.

When you arrive at the designated access point, decide on the method of surveying. Choose from one of these two options:

- 1) Select a location to set up such as a parking lot, picnic area, boat launch area (do NOT set up ON a pier or boat dock). Feel free to set out lawn chairs or make use of nearby picnic tables.
- 2) If this will be a roving shore survey, gather necessary supplies and carry them with you. A backpack or fanny pack will be helpful.

NOTE: At some access points, particularly in Baltimore, there will signs posted containing information about the fish consumption advisories in effect there. DO NOT set up your survey station in front of or near these signs, as it may bias angler responses to many questions and we may then get an overestimate of the knowledge of and

compliance with advisories among the fishing public. Try to set up as far as possible from these signs. If, at the end of the interview, the angler asks for information about the advisory, you may give them a copy of the Advisory Contact Information and direct them to the sign.

At many sites, you will likely be doing both types of surveys, and it may be best if one interviewer stayed at the boat dock to catch boaters while the other walks the shore to intercept shore anglers. In either case, make sure you have:

- Blank survey forms - both Spanish and English
- Contact record sheet
- Tape recorder w/ spare batteries
- Blank tapes (figure 4 interviews/tape)
- Extra pens
- Folders for completed surveys
- Clipboards for surveys and contact records
- Fish species visual aid
- Serving size visual aid
- Local and regional map visual aids
- Sunscreen and water for interviewers

If you are running out of any items, please call Josh Gibson, or if the need is urgent, purchase the necessary supplies yourself and provide Josh with the receipts and your social security number for reimbursement at his next site visit.

In case of inclement weather, interviewers will need to make a judgment call on whether to make site visits that day. If in doubt, call Josh Gibson for consultation. Keep in mind that “weathered-out” assignments will need to be rescheduled as much as possible later on. In general, if the weather is such that there will be no anglers, do not attempt the assignment. If there are small craft warnings, do not attempt assignments in places where only boating anglers would be intercepted. If an assignment is “weathered out”, call Josh Gibson immediately so the assignment can be re-scheduled.

The same situation holds true if you are sick. If you need to cancel an interview day due to illness, notify your teammate (no one is to do an assignment alone!), and notify Josh Gibson immediately so the assignment can be re-scheduled.

When performing interviews, you should **always be wearing your nametag** that identifies you as working with Virginia Tech. This will help to lend credibility to your request and give the angler a point of reference throughout the interview.

*When interviewing boating fishermen:* As they arrive or leave the site, approach them and use the appropriate greeting from the survey instrument. If there are picnic tables nearby, you may invite him/her to sit down if they agree to the interview.

*When interviewing shore anglers:* Walk the shoreline, approaching anglers while they fish. Be sure to not approach a shore angler while he/she is baiting or reeling in a line. Wait until they are relaxed, and then approach them using the appropriate greeting from the survey instrument. If they agree to the interview, you may ask to sit down beside them. NOTE - at some sites, all “shore” fishing may be done from piers, jettys, bridges, etc. In cases where there is a prominent point of egress (parking lot, etc), the interviewer may set up there. However, for many shore surveys, it may be most productive for the interviewer to canvass or rove the shore, walking up and down to approach anglers. This can often be done during the “down” times for the boat ramps on site (which are busiest first thing in the morning and later in the afternoons).

To start out with, approach every angler you encounter (adults only, age 18 or older – ask if you aren’t sure), recognizing that some will inevitably be missed while other interviews are being conducted. If interviews are completed at a rate faster than anticipated after the first couple of weeks (more than 8 per day on average), then the field supervisor may make the decision to start approaching every other angler or use another similar sampling scheme. For groups of anglers, try to interview one person within the group. Approach one of the group members and ask if someone would be willing to participate. If more than one angler wants to participate, stress that you can only interview one person within the group.

Be friendly and helpful, and let the anglers know that you value their input and hope they will complete the survey. Recognize, also, that many anglers love to talk about fishing, and this is a great way to break the ice and ensure a successful interview. However, once the tape recorder is running, try to keep to the survey as much as possible. If needed, explain to the angler that you’d be more than happy to talk after the interview is completed and the tape is no longer running. You do not need to memorize the greetings, but keep the gist in mind when you make the initial contact with the anglers.

If an angler that you approach for an interview does not appear to comprehend English, ask him or her: “*Habla Espanol?*” If he or she responds “*Si*” or nods affirmatively, then hand him or her the Spanish language version of the paper survey with the clipboard and pen. If he/she begins to speak to you in Spanish tell him/her “*No habla Espanol,*” and point to the survey again. Alternatively, if one of the interviewers speaks Spanish, then direct that interviewer to conduct the interview in Spanish. If the angler does not appear to understand either English or Spanish, you may approach another adult member of that group. If none of these options is feasible, simply record it on the contact record as a language barrier, identifying as well as possible the language which was needed.

*Record of Survey Contacts:* The record of angler contacts is a very important record keeping tool. It tells us how effective our protocol is in initiating interviews, what barriers exist interviewing certain populations of people, and helps us determine how representative our data is of the general angling public in the end. You play an essential role in data quality control and establishing a response rate for this survey, which are steps that are required of us by our quality assurance plan in file with the EPA. It is critical that you record ALL angler contacts on this sheet, whether they result in a

completed interview or not. Instructions for completing this form after every contact appear on the Record of Survey Contacts form.

*During an interview:* Follow the survey instrument carefully (see page 6). If anglers have any problems understanding or answering the questions that you ask them, note that on the survey instrument and ask them to answer the best that they can.

Answer any questions from the anglers that you can or provide a clear point of contact for questions you are unable to answer. You will be provided with copies of contact information on where anglers can get more information about existing advisories. To avoid biasing future interviews through angler socialization, DO NOT hand out copies of the advisory or attempt to explain the contents of the advisory to anyone. If respondents ask questions about the advisories and appear interesting in learning more about them, 1) explain to them that you cannot give them the information they want and 2) give them a copy of the contact information so that they can get the information on their own.

If the anglers have any questions about why the survey is being conducted or how the information will be used, explain that we are collecting information to help the management agencies learn more about who is fishing at these locations and how much fish is being eaten from these waters. The information will be used to help agencies better manage the resource and meet the needs of the anglers. If other questions arise, have them contact the project manager, Julie McClafferty at Virginia Tech (540-231-8709 or [jmclaff@vt.edu](mailto:jmclaff@vt.edu)).

*At the end of each interview:* Thank the angler, and say goodbye. Once alone:

1. Record the interview end time, and complete the top part of the survey form if not done already,
2. Review the data sheet to clarify any marks that you made and add any notes you deem necessary,
3. Ensure that responses are legible and accurate.
4. If the interview was taped, make sure the tape is numbered accurately and that this number is recorded on the survey instrument.
5. Record the interview on the contact record.

*NOTE ABOUT NUMBERING:* All materials (contact records, completed survey forms, and audio tapes) should be coded with a region code and a sequential number. Please ensure that this numbering scheme is upheld throughout the project to make data compilation possible. For example, DC surveys would be coded DC-1, DC-2, etc. and DC tapes would be coded DC-1, DC-2, etc. These numbers do not need to correspond, but the survey number should be recorded on the interview contact record, and the tape number should be recorded on the survey data sheet. To ensure that surveys are not double-numbered, each team member should be assigned even or odd numbers for the duration of the data collection period. Gaps in numbers are fine, but NO numbers should be used twice for the same type of form. Regional Codes are:

DC: All DC Team Materials  
BC: All Baltimore Team Materials  
VA: All VA Team Materials

At the end of each day/site visit: review all data sheets from that day to make sure they are numbered and dated appropriately, labeled with the site name, and referenced to the corresponding tape. Pack up supplies and make sure supplies are sufficient for the next site visit. Before leaving for the day, call Josh Gibson to report the number of completed interviews and any issues that arose during the day. Turn all data sheets, contact records, and taped interviews in to Josh at his next site visit.

At the end of the summer, get a UPS account number and billing reference number from Shelia Ratcliffe (540-231-7348) and mail any remaining supplies (recorders, tapes, completed surveys and contact records, supply bins, etc.) back to Josh Gibson at:

Josh Gibson  
Conservation Management Institute  
1900 Kraft Drive, Suite 250  
Blacksburg, VA 24061



**Instructions for the Survey Instrument Items**

Once the angler has agreed to participate in the interview, and it has been determined that the angler has NOT been interviewed for this project before, then the interview may begin.

Clerical Information:

The top portion of every survey instrument requests information that is CRITICAL to our data management and data quality standards. This portion can be completed at the beginning of OR at the end of the interview (except for the “Time Begin” field which should be completed at the start of the interview), but it MUST be completed in it’s entirety for each interview. Instructions for specific fields follow:

- Surveyor Name: Record YOUR name as the interviewer
- Survey Location: Record the name of the access point you are currently visiting, as it appears on the summer schedule
- Date: Record the current date - month, day, and year
- Day of Week: Record the current day of the week
- Survey Number: Record the survey number. This should be a sequential number that follows in order from all previous surveys done in that region. DO NOT restart the numbering each day, but continue with sequential numbers through the summer. Each interviewer should be assigned even or odd numbers to prevent number duplication.
- Time Begin: Record the time that the interview starts, to the nearest minute.
- Time End: Record the time that the interview ends, to the nearest minute.
- Length of Interview: Calculate the length of time that the interview took by subtracting the begin time from the end time. Record the number of minutes.
- Observed Sex: Record the observed sex of the angler (male or female)
- Fishing Mode: Record whether the angler is fishing from a boat, off a pier (while standing/sitting on a pier) or from the shore (includes wading in water). Ask the angler if this mode is not clear.

***General Survey Instructions***

1. Wording - The questions to put to the angler are written out in full for a purpose. Methodological studies have shown that even the slightest change in wording

- (e.g., “should” vs. “could”) drastically influence item response. Please, read each item exactly as it is written
2. Provide Definitions, not Answers - If the angler asks for your opinion about an item, you may provide a brief definition, but do not supply an actual response. For instance, if the angler asks questions about the advisories during that part of the survey, you may explain what advisories are/do in general, but do NOT say whether or not there are/are not advisories in place or what they recommend.
  3. Notes - Room for notes is left for many questions so that the interviewer can expand upon the choices given. We have tried to cover what most of the responses will be, but if the angler’s response to these questions does not fit in any of the choices, please use the notes sections.
  4. Refused Question - Leave the response section blank and write “RF” in the left hand margin next to the question for any question that the angler refuses to answer. This lets the data entry person know that the question was skipped for a reason, not out of interviewer error.
  5. Best Use of Time - There will be times during the day when you will seemingly have little to do. This time can be used to review, editing, and “clean-up” completed survey forms and organize data sheets/supplies.

#### Item-by-Item Instructions

Many survey items are self-explanatory. Items where special instructions are needed are included below.

***NOTE: DO NOT read the response options for any question unless it is either noted on the survey to do so (e.g., for Item 3) OR the angler has trouble answering the question otherwise.***

Question 1: Taped Interview? If the angler declines the taped interview, mark this on the survey form and make sure the angler sees you put the recorder away in the “off” position. If the angler agrees to a taped interview, 1) Record the tape number on the survey and 2) start the interview by recording onto the tape the survey number (Say something like “Begin Interview Number 32” into the recorder) before asking any more questions.

Question 2: Fishing history. If the angler has trouble answering any part of this question, ask for a best estimate.

Question 3: Reasons for fishing. **Make sure to read the options to the angler for this question.**

*CONSUMPTION PATTERNS: READ the introduction to this section!*

Question 4: Personally Eat? Ask all anglers if they, personally, eat what they catch. If their family eats it but the angler doesn't, then the answer to this question is "NO" (skip to Q14). (NOTE: If this is the angler's first time fishing in the area (Q2a), ask if they PLAN to eat the fish or crabs that they catch. Then, for Question 5, ask what they hope to catch, and for Question 6, ask if there is anything they would not eat. Then skip to Q14.)

Question 5: Species most often eaten. Show visual aid of fish species. Ask angler to list the four species he/she most often consumes from his/her catch. Make it clear that the fish listed by the angler may be ones shown in the visual aid OR any others that the angler mentions. List the species name and check the frequency with which the angler eats it.

Question 6: Avoided fish. If the angler responds "Yes" to this question, ask them to indicate what it is they avoid, and why they avoid it. Write the responses in the space provided.

Questions 7-9: Seasonal Patterns. Make it clear that we are only interested in sport-caught fish from the surrounding area, NOT fish bought in a market. For seasonal questions, mark as many months as the angler mentions. If the angler simply says "summer" or "winter", prompt him/her to clarify which months he means (e.g. "Does that mean June, July, and August? Would you include September in that?")

Question 10: Meal size. Show visual aid of serving sizes. Ask angler to indicate the photo that best represents the amount of fish they eat in a meal. They may either select one of the photos (4, 8, or 12 ounces) OR they may indicate that the most accurate answer is somewhere between two of the photos (e.g., less than 4, 4-8, 8-12, or more than 12). Mark the appropriate response.

Question 11: Meal size - crabs.

Question 12: Preparation Methods. You may ask this question in a variety of ways. Experiment during the training session. Perhaps start with "How do you typically clean your fish or crabs?" And then ask how frequently they do each item (Most of the time, Sometimes, Never). If angler does not mention all the items on the list, prompt them (e.g., do you ever eat the skin on the fish? Do you ever freeze your fish for later? Do you ever eat your fish raw?) Make sure to fill out a response for each item, even if the angler says it doesn't apply to them (e.g., they don't eat crabs) – just mark N/A in this case. **Make sure to read the options to the angler for this question.**

*HOUSEHOLD MEMBERS: READ the introduction to this section!*

Question 13: Household consumption.

Question 14: Household composition. Include the angler in the total people count. After asking about each category, indicate if the angler places him/herself in any of them.

Question 15: Household consumption patterns. Show visual aid of serving sizes. Only ask about the categories they indicated in Question 14. Ask angler to indicate how often each category of people in their household eats the fish that they catch (READ response options!!!) AND to indicate the serving size photo that best represents the amount of fish that each category eats in a typical meal. They may either select one of the photos (4, 8, or 12 ounces) OR they may indicate that the most accurate answer is somewhere between two of the photos (e.g., less than 4, 4-8, 8-12, or more than 12). Mark the appropriate responses on BOTH scales for all applicable household member categories. Ask only about the categories that the angler responded as being greater than zero in Q15. For all other categories, mark “Not Applicable” or “N/A” in the response scales.

Question 16: Give away fish?

*ADVISORY AWARENESS*

*(NOTE: the starred items do not appear in the VA survey. Numbers in parenthesis represent item numbers for the VA survey from this point on.)*

Question 17: (17) Health Benefits.

Question 18: (18) Perceived Safety. If the angler responds “Yes”, “No”, or with some form of “It Depends” (e.g., “Sometimes”, “Most of the time”, etc.), ask them why they think this way and write their response in the space provided. If the respondent answers “Uncertain”, “Not Sure”, “Don’t Know” etc., mark the “Uncertain” box and skip to question 19.

Question 19: (19) Advisory alertness.

\*\*Question 20: Local Advisory awareness.

\*\*Question 21: Source of Advisory info. Don’t read options, but let angler tell you where he heard of it. After he answers, prompt further with “Did you see or hear about it anywhere else?” When done, move to next question.

\*\*Question 21a: Time of last info.

\*\*Question 22: Ease of Understanding.

\*\*Question 23: What did the Advisory say? DON'T READ OPTIONS. Mark the responses (all that apply) that most closely matches the angler's definition. If the angler cannot give any definition, then mark "Don't Know". If the angler gives a definition that is not reflected by the options listed, or part of his/her definition is not listed, then mark "Other" and write in the appropriate response. NOTE - it is acceptable to mark both the listed options (one or more than one) AND the "Other" category if the angler's definition has multiple parts. The important thing here is to capture, as closely as possible, what the angler says, while helping us to categorize his/her knowledge.

\*\*Question 24: Species under advisory. Show species visual aid! The angler may select any species shown in the picture OR any other species. Check all that apply. If the angler lists species NOT shown in the picture, then Mark "Other", and write in the response in the space provided.

\*\*Question 25: Advisory effects on angler. If yes to Q25, go to 25a. If NO to Q25, go to 25b. For both 25 a and b, do NOT read response options. Mark the responses (all that apply) that most closely matches the angler's response. If the angler gives a response that is not reflected by the options listed, or part of his/her response is not listed, then mark "Other" and write in the appropriate response. NOTE - it is acceptable to mark both the listed options (one or more than one) AND the "Other" category if the angler's response has multiple parts. The important thing here is to capture, as closely as possible, what the angler says, while helping us to categorize his/her behavior.

\*\*Question 26: Suggested improvements.

\*\*Question 27: Advisory referencing.

Question 28: (20) Perceived advisory importance. READ response options.

(21) Potential advisory effects. (Appears ONLY in VA survey)

Question 29: (22) Media options. Don't read response options, but check up to three. If angler give only one, prompt with "Are there any other ways that would effectively reach local fishermen?" If the angler still gives only one or two, that's fine.

*DEMOGRAPHICS: READ the introduction to this section!*

Question 30: (23) Age.

Question 31: (24) Ethnicity. If angler ethnicity/race is obvious, mark it down without asking. Otherwise, ask this question and read options only if angler has trouble answering. If angler gives more than one category (e.g., White and Hispanic), check all that apply.

Question 32: (25) Education. Ask for anglers education level and then ask him what levels of education the other adults in his household have attained (part a) – check all that apply.

Question 33. (26) Income. We are dividing up income into three categories, and the way we ask it here should minimize the refusal rate. Make sure to follow the diagram careful when asking about he right categories. However, many still will not answer this question. Record a refusal as an RF in the left margin.

END OF INTERVIEW.

Thank the respondent. If he/she asks for more information about the local advisories, hand out the contact information sheet so they can obtain that information at their leisure. If they continue to ask you questions, explain to them that they need to talk to a member of the local Health Department (the contact info on the sheet) to get that information and that you do not have the advisory specifics.

## **Logistical Concerns**

### Payroll and time sheets:

Wage employee hours must be submitted to Josh Gibson by the 15<sup>th</sup> and 30<sup>th</sup> of each month. All interviewers will be provided with time sheets for recording their hours throughout the summer. This form can be faxed directly to Shelia (540-231-7019) if access to a fax machine is available. Otherwise, call Josh (540-231-7348) by the 15<sup>th</sup> and 30<sup>th</sup> of each month and tell him your hours, and he will turn them in to Shelia within 2 business days.

Pay dates are on the 1<sup>st</sup> and 16<sup>th</sup> of each month, therefore there will be a 2 week lag time between when hours are claimed and when they are paid. All employees are required to take direct deposit of paychecks and any reimbursements - your pay will be automatically deposited into your bank account. Please check on the first couple of deposits to make sure they are being processed correctly.

### Use of cell phones:

Each team will be provided with a University cell phone. This phone is under a specific plan that allows a certain number of minutes. This phone is only to be used 1) in the case of emergencies during interview assignments, and 2) to speak with the field supervisor (Josh Gibson, 540-320-4593). If there are occasional personnel related questions that Josh is unable to answer or obtains answers for, you may call Shelia Ratcliffe (540-231-7348) using the cell phone. Any other calls should be made on personal phones - including calls between team members regarding late arrivals, etc. Each cell phone bill will be reviewed closely and questionable numbers will be checked carefully with the interview team. One member of each interviewer team will be charged with being responsible for keeping up with the cell phone and charging the battery each night. These people are:

DC Team: Lily Whitesell  
VA Team: Peter Moody  
Baltimore Team: Ryan Bell

### Travel and purchase reimbursements:

All interviewers should have completed an Authorization form for direct deposit of travel and supply purchase reimbursements. If not, see Julie McClafferty or Shelia Ratcliffe to do so immediately. Before any travel is undertaken (including the trip for orientation), a travel approval form must be filled out and signed by the traveler and submitted for signatures to Shelia Ratcliffe. It is critical that this form be on file, as it is submitted along with the reimbursement request. After traveling, all lodging receipts, travel dates, starting points and destinations, and mileage (if using a private car) to and from the destination should be sent to Shelia Ratcliffe for travel reimbursement processing. Travelers will need to sign this reimbursement form, and reimbursement will then be deposited into your bank account within 3-4 weeks. \*\*\*At this time, the only travel

expenses authorized for reimbursement are the expenses for traveling to and from Blacksburg for orientation May 27-28.

NOTE - for the orientation trip, all this paperwork will be taken care of before you leave Blacksburg. However, you will need to fill out the direct deposit authorization form (because it requires your bank's signature) before arriving in Blacksburg so that the payment can be processed.

We are trying to provide ample supplies at the beginning of the summer. However, if supplies run low, contact the field supervisor and he will bring more next time he visits. If the need is urgent, you may find it necessary to purchase field supplies (e.g., more copies of survey, batteries, or blank tapes) yourself. In this case, keep the receipts and submit them to Josh Gibson for reimbursement during his next site visit.

### **Health and safety precautions:**

It is CMI policy that the health and safety of our staff is paramount in all work performed. It is impossible to address all risks in all situations, but we expect our staff to plan for and address potential hazards. We expect our staff to pay attention to potentially hazardous situations and avoid risks to themselves and others. All staff are expected to take responsibility for keeping themselves safe.

Risks to interviewers addressed in this plan include:

- Sunburn, overexposure to sun, and heat illness,
- Trips, slips, or falls due to wet, slippery pavement at fishing access points,
- Potential threats to personal security, and
- Exposure to hazardous weather.

Policies for minimizing these risks are as follows:

- 1) Wear proper clothing.
  - a. No bathing suits.
  - b. Long pants are preferred. If shorts are worn, See # 2.
  - c. All clothing must stay on at all times (this means you cannot take off your shirt to cool off).
  - d. Rubber soled sneakers are preferable to other types of shoes. Open-toed shoes/sandals are strongly discouraged (See #2 and #5).
  - e. Always bring and wear a hat - wide-brimmed preferred.
  - f. Always wear sunglasses with UV protection.
- 2) Apply SPF30 or higher sunscreen (provided) liberally to all exposed skin at the beginning of each assignment and every two hours during peak sun exposure hours (10AM-4PM).
- 3) Always bring an ample supply of water and drink it frequently to stay hydrated. Bring more (and drink more) water than you think you need.



- 4) If shaded picnic areas or other similar area is available at the assignment, you are encouraged to set up there for the day. You may also choose to bring an umbrella to sit under.
- 5) Take care when walking, particularly on gravel surfaces or wet access areas. These present slipping/tripping hazards and could result in injury.
- 6) A basic first aid kit will be supplied to each team in case you need one.
- 7) Seek shelter during hazardous weather. If hazardous weather occurs while you are on assignment (e.g., lightning storms strikes), seek shelter in the nearest covered location (e.g., your car, covered pavilion) until the situation passes.
- 8) Abide by basic personal safety guidelines:
  - a. No interviewer should be on assignment alone. If one interviewer must step away for a few minutes, this should NOT occur before 8am or 6pm, and such instance should be kept as brief as possible. The buddy system is a critical part of maintaining personal security.
  - b. Each team will have a cell phone for use in case of emergencies.
  - c. Interviewers are advised to always let someone off-site know where they will be each day and what time they will return.
- 9) Note that ear plugs (for DC team who has two sites adjacent to an airport) and bug spray have been provided to increase your comfort level at certain sites. Feel free to use them as needed.

**APPENDIX D:**

**SITE SCHEDULES FOR INTERVIEWER SITE VISITS**

**APPENDIX E:**  
**ADVISORIES IN EFFECT DURING SUMMER 2004**

**APPENDIX F:**

**FREQUENCY DISTRIBUTIONS FOR ALL CLOSE-ENDED ITEMS:  
BALTIMORE REGION OF CONCERN**

## Frequency Tables for Baltimore Angler Interviews

### Survey Location:

	Counts	Percents
B1	37	27.4%
B4	29	21.5%
B9	17	12.6%
B5	16	11.9%
B7	14	10.4%
B3	10	7.4%
B6	6	4.4%
B8	6	4.4%
Totals	135	100.0%

### Day of Week:

	Counts	Percents
Sunday	38	28.1%
Saturday	27	20.0%
Thursday	27	20.0%
Wednesday	14	10.4%
Tuesday	12	8.9%
Friday	10	7.4%
Monday	7	5.2%
Totals	135	100.0%

### Observed Sex:

	Counts	Percents
Male	117	88.6%
Female	15	11.4%
Totals	132	100.0%

**Length of Interview:**

	Counts	Percents
10	42	31.1%
15	19	14.1%
7	12	8.9%
12	10	7.4%
5	10	7.4%
20	8	5.9%
11	6	4.4%
8	5	3.7%
25	4	3.0%
9	4	3.0%
14	3	2.2%
13	2	1.5%
16	2	1.5%
6	2	1.5%
(SA)	1	0.7%
Other	5	3.7%
Totals	135	100.0%

**Fishing Mode?**

	Counts	Percents
Shore	64	48.1%
Pier	51	38.3%
Boat	18	13.5%
Totals	133	100.0%

**1. Is it ok if I tape the interview so that we don't miss anything?**

	Counts	Percents
Yes (Taped)	88	66.7%

Totals	132	100.0%
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## 2. About how many miles did you have to travel to get here today?

	Counts	Percents
10 miles or less	107	79.3%
11-25 miles	26	19.3%
26-50 miles	2	1.5%
51-100 miles	0	0.0%
more than 100 miles	0	0.0%
Totals	135	100.0%

### 2a. How long have you fished or crabbed in the Baltimore area?

	Counts	Percents
10 years or more	108	80.0%
5-9 years	10	7.4%
1-2 years	7	5.2%
3-4 years	4	3.0%
Less than one month	3	2.2%
This is my first time (SKIP to Q3)	2	1.5%
More than a month, less than a year	1	0.7%
Totals	135	100.0%

### 2b. In the past year, how many times would you say that you have fished or crabbed in the Baltimore area?

	Counts	Percents
more than 50 times	49	37.7%
3-10 times	31	23.8%
11-25 times	22	16.9%
26-50 times	16	12.3%
1-2 times	12	9.2%
Totals	130	100.0%

## 3. Fishing Motivations: How important are the following motivations in your reasons for fishing?

	Very Important	Somewhat Important	Not at all Important	Totals	Mean

a. Treat yourself or your family to a fresh fish or crab dinner?	41.0 30.6%	37.0 27.6%	56.0 41.8%	134.0 100.0%	2.11
b. Relax?	129.0 95.6%	5.0 3.7%	1.0 0.7%	135.0 100.0%	1.05
c. Spend time outdoors?	115.0 85.2%	17.0 12.6%	3.0 2.2%	135.0 100.0%	1.17
d. Reduce your family food expenses?	16.0 11.9%	21.0 15.7%	97.0 72.4%	134.0 100.0%	2.60
e. Experience the challenge or sport?	83.0 61.9%	37.0 27.6%	14.0 10.4%	134.0 100.0%	1.49

#### 4. Do you, personally, eat any of the fish or crabs that you catch in the Baltimore area?

	Counts	Percents
Yes (SKIP to Q5)	71	53.0%
No (CONTINUE)	63	47.0%
Totals	134	100.0%

#### 5. What types of self-caught fish or crabs do you, personally, most often eat, and how often would you say you eat them over the course of a year? You can list up to four.

Species Consumed	5 + Times/Week	3-4 Times/Week	1-2 Times/Week	1-3 Times/Month	Less Than Once/Month	TOTALS
Striped Bass/Rockfish	0	2	8	14	17	41
White Perch	0	0	8	13	11	32
Blue Crab/Crab	1	1	3	6	11	22
Catfish (all)	0	0	3	4	8	15
Croaker	0	0	3	0	5	8
Yellow Perch	0	0	2	3	1	6
Perch (unspecified)	0	0	1	3	4	7
Spot	0	0	2	1	1	4
Trout (all)	0	0	2	0	3	5
Crappie	0	0	0	2	0	2
Bluefish	0	0	0	1	0	1
Sea Bass	0	0	0	0	1	1
Carp	0	0	0	1	0	1
TOTALS	1	3	32	27	51	147

#### 6. Are there any kinds of self-caught fish or crabs that you won't eat or purposefully eat less of?

	Counts	Percents
Yes (CONTINUE)	48	68.6%



Totals	70	100.0%
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**7. During which months of the year would you say that you, personally, eat the MOST self-caught fish or crabs**

	Counts	Percents
July	37	56.9%
August	34	52.3%
June	29	44.6%
September	27	41.5%
October	16	24.6%
May	11	16.9%
November	9	13.8%
April	8	12.3%
All months the same (SKIP TO Q8)	4	6.2%
March	3	4.6%
January	2	3.1%
February	2	3.1%
December	2	3.1%
Don't Know (SKIP TO Q9)	0	0.0%
Totals	65	n/a

**7a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
1-2 times per week	27	42.9%
1-3 times per month	25	39.7%
3-4 times per week	6	9.5%
Less than once per month	4	6.3%
5+ times per week	1	1.6%
Don't eat fish then	0	0.0%
Totals	63	100.0%

**8. During which months of the year would you say that you, personally, eat the LEAST self-caught fish or crabs?**

	Counts	Percents
January	29	48.3%

December	25	41.7%
February	22	36.7%
November	19	31.7%
March	14	23.3%
June	10	16.7%
July	9	15.0%
August	9	15.0%
October	9	15.0%
April	8	13.3%
May	7	11.7%
September	4	6.7%
Don't Know (SKIP TO Q9)	2	3.3%
Totals	60	n/a

**8a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
Don't eat fish then	26	43.3%
Less than once per month	17	28.3%
1-3 times per month	11	18.3%
1-2 times per week	6	10.0%
5+ times per week	0	0.0%
3-4 times per week	0	0.0%
Totals	60	100.0%

**9. How frequently would you say that you eat the fish or crabs you catch in this area on average throughout the year?**

	Counts	Percents
1-3 times per month	22	36.7%
Less than once a month	20	33.3%
1-2 times per week	13	21.7%
3-4 times per week	4	6.7%
Don't Know	1	1.7%
5 or more times per week	0	0.0%
Totals	60	100.0%

**10. How much self-caught fish do you, personally, typically eat during a meal?**

	Counts	Percents
8 oz	26	44.8%
4 oz	13	22.4%
12 oz	12	20.7%
4-8 oz	3	5.2%
8-12 oz	2	3.4%
<4 oz	1	1.7%
>12 oz	1	1.7%
Totals	58	100.0%

**11. How many self-caught crabs, do you, personally, typically eat during a meal?**

	Counts	Percents
Don't eat	19	29.7%
10-15 crabs	16	25.0%
more than 15 crabs	12	18.8%
6-9 crabs	11	17.2%
3-5 crabs	4	6.3%
1-2 crabs	2	3.1%
Totals	64	100.0%

**12a. How often do you eat the mustard from crabs?**

	Counts	Percents
Most of the time	28	40.0%
N/A	15	21.4%
Never	14	20.0%
Sometimes	13	18.6%
Totals	70	100.0%

**12b. How often do you eat the whole fish, including skin and fat?**

	Counts	Percents
Never	41	60.3%
Most of the time	16	23.5%
Sometimes	6	8.8%
N/A	5	7.4%

Totals	68	100.0%
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### 12c. How often do you puncture/remove skin from fish before cooking?

	Counts	Percents
Most of the time	36	53.7%
Sometimes	15	22.4%
Never	11	16.4%
N/A	5	7.5%
Totals	67	100.0%

### 12d. How often do you trim fat from fish before cooking?

	Counts	Percents
Most of the time	30	44.8%
Never	20	29.9%
Sometimes	11	16.4%
N/A	6	9.0%
Totals	67	100.0%

### 12f. How often do you filet the fish?

	Counts	Percents
Most of the time	44	63.8%
Sometimes	14	20.3%
Never	6	8.7%
N/A	5	7.2%
Totals	69	100.0%

### 12g. How often do you eat the fish or crabs raw?

	Counts	Percents
Never	65	98.5%
Sometimes	1	1.5%
Most of the time	0	0.0%
N/A	0	0.0%
Totals	66	100.0%

**12h. How often do you pan fry or deep fry?**

	Counts	Percents
Most of the time	36	52.2%
Sometimes	21	30.4%
Never	7	10.1%
N/A	5	7.2%
Totals	69	100.0%

**12i. How often do you re-use fat or oil from cooking?**

	Counts	Percents
Never	44	65.7%
Sometimes	12	17.9%
Most of the time	6	9.0%
N/A	5	7.5%
Totals	67	100.0%

**12j. How often do you steam, poach, or boil?**

	Counts	Percents
Sometimes	26	38.8%
Never	26	38.8%
Most of the time	13	19.4%
N/A	2	3.0%
Totals	67	100.0%

**12k. How often do you broil, grill, bake, or roast?**

	Counts	Percents
Most of the time	32	47.8%
Sometimes	24	35.8%
Never	6	9.0%
N/A	5	7.5%
Totals	67	100.0%

**12l. How often do you make soup or chowder?**

	Counts	Percents
Never	49	70.0%

Sometimes	18	25.7%
Most of the time	3	4.3%
N/A	0	0.0%
Totals	70	100.0%

**12m. How often do you freeze or can it for later?**

	Counts	Percents
Most of the time	35	50.7%
Sometimes	18	26.1%
Never	15	21.7%
N/A	1	1.4%
Totals	69	100.0%

**13. Do any other members of your household eat any of the fish or crabs that you catch?**

	Counts	Percents
Yes (CONTINUE)	69	51.9%
No (SKIP TO Q16)	64	48.1%
Totals	133	100.0%

**14. How many total people are there in your household, including adults and children?**

	Counts	Percents
1 to 2	7	10.0%
2 to 3	15	21.4%
3 to 4	19	27.1%
4 to 5	18	25.7%
5 to 6	3	4.3%
6 to 7	7	10.0%
Other	1	1.4%
Totals	70	100.0%
Mean	3.29	

**14 a. How many children aged 5 or younger are there?**

	Counts	Percents
0 to 1	57	82.6%
1 to 2	8	11.6%

2 to 3	3	4.3%
Other	1	1.4%
Totals	69	100.0%
Mean	0.25	

**14 b. How many children between the ages of 6 and 15 are there?**

	Counts	Percents
0 to 1	44	63.8%
1 to 2	13	18.8%
2 to 3	9	13.0%
3 to 4	3	4.3%
Totals	69	100.0%
Mean	0.58	

**14 c. How many adults aged 60 or older are there?**

	Counts	Percents
0 to 0	50	71.4%
1 to 1	9	12.9%
2 to 2	11	15.7%
Totals	70	100.0%
Mean	0.44	

**14 d. How many women are there between the ages of 18 and 45?**

	Counts	Percents
0 to 1	27	38.6%
1 to 2	36	51.4%
2 to 3	5	7.1%
Other	2	2.9%
Totals	70	100.0%
Mean	0.86	

**14d, continued, IF GREATER THAN ZERO... Are any of these women currently pregnant or nursing or were within the last year?**

	Counts	Percents
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No	43	91.5%
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### 15. How often do the \_\_\_\_\_ eat your self-caught fish or crabs?

	More often than me	About the same	Less often than me	Don't eat at all	NA	Totals
a. Children 5 or younger	1.0 3.3%	0.0 0.0%	9.0 30.0%	1.0 3.3%	19.0 63.3%	30.0 100.0%
b. Children 6-15	2.0 5.0%	12.0 30.0%	11.0 27.5%	1.0 2.5%	14.0 35.0%	40.0 100.0%
c. Adults 60 or older	2.0 6.5%	10.0 32.3%	1.0 3.2%	2.0 6.5%	16.0 51.6%	31.0 100.0%
d. Pregnant or nursing women	0.0 0.0%	1.0 4.3%	2.0 8.7%	0.0 0.0%	20.0 87.0%	23.0 100.0%
e. Other women 18-44	3.0 6.0%	23.0 46.0%	10.0 20.0%	1.0 2.0%	13.0 26.0%	50.0 100.0%
Whole Group	5.2 8.5%	24.0 39.3%	12.8 21.0%	2.4 3.9%	16.6 27.3%	61.0 100.0%

### 15a. Children 5 or younger-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	19	65.5%
4 oz	6	20.7%
<4 oz	3	10.3%
12 oz	1	3.4%
4-8 oz	0	0.0%
8 oz	0	0.0%
8-12 oz	0	0.0%
>12 oz	0	0.0%
Totals	29	100.0%

### 15 b. Children 6-15-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	15	41.7%
4 oz	14	38.9%
8 oz	4	11.1%



<4 oz	2	5.6%
12 oz	1	2.8%
4-8 oz	0	0.0%
8-12 oz	0	0.0%
>12 oz	0	0.0%
Totals	36	100.0%

### 15 c. Adults 60 or older-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	19	61.3%
4 oz	8	25.8%
8 oz	3	9.7%
12 oz	1	3.2%
<4 oz	0	0.0%
4-8 oz	0	0.0%
8-12 oz	0	0.0%
>12 oz	0	0.0%
Totals	31	100.0%

### 15 d. Pregnant/nursing women-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	20	87.0%
8 oz	2	8.7%
4 oz	1	4.3%
<4 oz	0	0.0%
4-8 oz	0	0.0%
8-12 oz	0	0.0%
12 oz	0	0.0%
>12 oz	0	0.0%
Totals	23	100.0%

### 15 e. Other women 18-44-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	15	30.6%

8 oz	12	24.5%
12 oz	3	6.1%
4-8 oz	2	4.1%
8-12 oz	2	4.1%
<4 oz	1	2.0%
>12 oz	0	0.0%

**16. Do you give away any of the fish or crabs that you catch?**

	Counts	Percents
Yes	83	62.4%
No	50	37.6%
Totals	133	100.0%

**17. Have you heard of any health benefits from consuming fish?**

	Counts	Percents
Yes (CONTINUE)	87	64.4%
No (SKIP TO Q18)	48	35.6%
Totals	135	100.0%

**17a. If Yes, do you eat more self-caught fish than before as a result of this information?**

	Counts	Percents
No	71	79.8%
Yes	18	20.2%
Totals	89	100.0%

**18. Would you say that the fish you catch here are safe for you and your family to eat?**

	Counts	Percents
Yes	51	38.1%
No	40	29.9%
It Depends	31	23.1%
Uncertain	12	9.0%
Totals	134	100.0%

**19. Have you ever seen, heard, or read about health advisories that some states issue to limit consumption of locally caught fish?**

	Counts	Percents
Yes	122	91.0%
No	12	9.0%
Totals	134	100.0%

**20. Are you aware of any such warnings that have been issued for the Baltimore area?**

	Counts	Percents
Yes (CONTINUE)	114	84.4%
No (SKIP TO Q28)	21	15.6%
Totals	135	100.0%

**21. If yes, how did you learn about it?**

	Counts	Percents
Television	66	58.4%
Sign/Poster at fishing site	40	35.4%
Newspaper	19	16.8%
Internet	7	6.2%
Radio	7	6.2%
Other angler	6	5.3%
Fishing Regulations book	5	4.4%
Bait shop	4	3.5%
Friend	2	1.8%
fishing license	2	1.8%
fishing magazine	2	1.8%
license	2	1.8%
Advisories issued with license	1	0.9%
came with license	1	0.9%
DNR	1	0.9%
Other	6	5.3%
Totals	113	n/a

**21a. When did you last see or hear about the advisory?**

	Counts	Percents
within the last month	83	73.5%
more than a year ago	12	10.6%
2-3 months ago	8	7.1%
4-6 months ago	5	4.4%
7-12 months ago	5	4.4%
Totals	113	100.0%

**22. Would you say that the information you got was easy to understand?**

	Counts	Percents
I had no problems understanding it.	109	96.5%
I had some difficulties, but got the main points.	2	1.8%
I had a lot of trouble understanding it.	2	1.8%
Totals	113	100.0%

**23. What did the advisory say?**

	Counts	Percents
Don't eat more than a certain amount of fish from Baltimore waters	39	34.8%
Beware of certain toxins in some Baltimore-caught fish	31	27.7%
Don't eat certain kinds of fish from Baltimore waters	26	23.2%
Don't eat fish from certain Baltimore waters	19	17.0%
Don't Know	9	8.0%
Pregnant women or children should eat less fish from Baltimore waters	7	6.3%
Don't eat any fish from the Baltimore waters	5	4.5%
The Baltimore waterways are polluted	3	2.7%
Certain people should eat less fish from Baltimore waters	1	0.9%
algae in the water	1	0.9%
Certain number of crabs. Don't eat mustard from crabs.	1	0.9%
Don't eat crab mustard	1	0.9%
Don't eat mustard from crabs.	1	0.9%
Hurricane contaminated.	1	0.9%
Inspect for marks on fish.	1	0.9%

Totals	112	n/a
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**24. From the pictures shown here, which types of fish did the advisory you saw for this location apply to?**

	Counts	Percents
Blue crab	31	28.4%
White perch	31	28.4%
Channel catfish	27	24.8%
Blue catfish	26	23.9%
White catfish	25	22.9%
Striped bass	17	15.6%
Carp	12	11.0%
American eel	12	11.0%
Yellow perch	10	9.2%
bay fish in general	7	6.4%
Didn't know.	4	3.7%
Don't know	4	3.7%
Brown bullhead	2	1.8%
Bay fish in general	2	1.8%
Don't remember	2	1.8%
Other	28	25.7%
Totals	109	n/a

**25. Has any of the information from the fish consumption advisories caused you to change your eating habits?**

	Counts	Percents
No (GO TO 25b)	89	78.8%
Yes (GO TO 25a)	24	21.2%
Totals	113	100.0%

**25a. If YES, How did you change your eating habits?**

	Counts	Percents
I stopped eating all self-caught fish from this area	8	34.8%
I limit the amounts of fish I eat from this area	7	30.4%
I limit the amounts of certain kinds of fish I eat from this area	2	8.7%

I started fishing somewhere else	2	8.7%
I stopped eating all self-caught fish	1	4.3%
I release more of the fish that I catch	1	4.3%
I changed the species that I fish for	1	4.3%
I inspect fish more carefully in areas with advisories	1	4.3%
More aware.	1	4.3%
I changed the sizes of fish that I eat	0	0.0%
I changed the species of fish that I eat	0	0.0%
I cook and/or clean the fish I catch differently	0	0.0%
Other	0	0.0%
Totals	23	n/a

### 25b. If NO, Why didn't you change your eating habits?

	Counts	Percents
I didn't eat it before, and I still don't	40	47.1%
I didn't eat very much fish to begin with	11	12.9%
I already eat within the recommended guidelines	11	12.9%
People have been eating the fish caught here for years and they aren't sick	6	7.1%
I don't think the warning is accurate	3	3.5%
I don't think the warning is important	3	3.5%
At my age I'm not worried about it	1	1.2%
Didn't say the fish were harmful so I still eat them	1	1.2%
Don't take advisories seriously.	1	1.2%
Don't eat crabs from around here.	1	1.2%
Don't eat fish in areas where there are advisories	1	1.2%
Don't eat fish much anymore, used to but don't now	1	1.2%
Eat more bought fish than self-caught fish.	1	1.2%
good health	1	1.2%
I check for lesions.	1	1.2%
Other	7	8.2%
Totals	85	n/a

## 26. Are there any ways you can think of that would make the advisory easier to understand and follow?

	Counts	Percents
No	89	78.8%
Yes	24	21.2%
Totals	113	100.0%

### 26a: If YES, what improvements would you suggest?

If YES, what improvements would you suggest?

- Use the TV news
- radio - a lot of people don't watch TV
- people need to pay attention better
- should be more signs in better locations
- More cohesion in policy-making
- Be more forceful in the warnings
- post on fishing license and at bait shops
- Be plain and simple and tell the truth
- put poster in better, more visible places
- include figures on the number of people who got sick from eating
- identify specific fish and locations
- Post signs.
- Post signs that are more up to date about fish.
- Specify toxicity of fish. Statistics of health problems. Specify nature of health problems.
- Make it simpler for common people. Make it easier to see.
- Be more direct with information in simple terms
- Be more forceful in the message.
- Read up about different species to give better information. Anglers need to educate themselves.
- Have flyers more visible. Put info in fishing gear areas. Distribute info to fishing organizations and explain why the fish are not good to eat.
- Better updates. Face to face talks.
- Point of distribution - better distribution methods. Point of Purchase - accurate information.
- Post signs that identify toxins in the water.
- Pictures of what to look for
- some people in the area cant read, so posting signs isn't the best way, but more frequent TV ads would be good

## 27. Have you ever referred back to the advisory information to make a decision about keeping or eating your fish?

	Counts	Percents
No	92	82.9%
Yes	19	17.1%
Totals	111	100.0%

**28. How important do you think it is to follow health advisories about what kinds of fish and how much fish is safe for people to eat?**

	Counts	Percents
Very Important	107	79.9%
Somewhat Important	25	18.7%
Not at all important	2	1.5%
Totals	134	100.0%

**29. What do you think would be the best way for us to reach people fishing in this area with information about fishing and health?**

	Counts	Percents
Post signs at fishing locations	62	46.3%
Television	40	29.9%
Talk to anglers at fishing locations	27	20.1%
Newspaper	16	11.9%
Radio	15	11.2%
Signs or brochures at bait shops	11	8.2%
Internet	10	7.5%
Don't Know	4	3.0%
Provide information when purchase license	3	2.2%
Direct mail	3	2.2%
Put it in the Fishing Regulations book	1	0.7%
Annual report in laymen's terms - mailing list	1	0.7%
better locations	1	0.7%
close down the area to fishing	1	0.7%
Fishing book that comes with your registration	1	0.7%
Other	13	9.7%
Totals	134	n/a

**30. How old are you?**

	Counts	Percents
20 to 30	13	9.8%
30 to 40	22	16.7%
40 to 50	39	29.5%



60 to 70	18	13.6%
70 to 80	6	4.5%
80 to 90	2	1.5%
Other	1	0.8%
Totals	132	100.0%

### 31. How would you describe your race or ethnicity?

	Counts	Percents
White	82	64.6%
African American	43	33.9%
American Indian	3	2.4%
Hispanic	1	0.8%
Asian	1	0.8%
Other	0	0.0%
Totals	127	n/a

### 32. What is the highest level of education that you've completed?

	Counts	Percents
High School	63	50.8%
Some College (including Associates)	27	21.8%
Less than high School	20	16.1%
Bachelor's or equivalent	10	8.1%
Master's or equivalent	4	3.2%
PhD, M.D. or equivalent	0	0.0%
Totals	124	n/a

### 32a. How about the other adults in your household?

	Counts	Percents
High School	65	60.7%
Some College (including Associates)	21	19.6%
Bachelor's or equivalent	13	12.1%
Less than high School	12	11.2%
Master's or equivalent	5	4.7%

Totals	107	n/a
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### 33. Is your household income less than \$40,000 per year?

	Counts	Percents
No	64	61.0%
Yes	41	39.0%
Totals	105	100.0%

### 33a. If Yes, is it less than \$20,000 per year?

	Counts	Percents
No	27	67.5%
Yes	13	32.5%
Totals	40	100.0%

### 33b. If No, is it less than \$80,000 per year?

	Counts	Percents
Yes	47	73.4%
No	17	26.6%
Totals	64	100.0%

**APPENDIX G:**

**FREQUENCY DISTRIBUTIONS FOR ALL CLOSE-ENDED QUESTIONS:  
WASHINGTON, DC REGION OF CONCERN**

## Frequency Tables for Washington, DC Interviews

### Survey Location:

	Counts	Percents
D5	78	31.6%
D1	60	24.3%
D4	35	14.2%
D9	31	12.6%
D3	19	7.7%
D6	9	3.6%
D7	9	3.6%
D8	6	2.4%
Totals	247	100.0%

### Day of Week:

	Counts	Percents
Sunday	71	28.7%
Wednesday	45	18.2%
Saturday	42	17.0%
Thursday	32	13.0%
Friday	31	12.6%
Tuesday	26	10.5%
Totals	247	100.0%

### Observed Sex:

	Counts	Percents
Male	225	91.1%
Female	22	8.9%
Totals	247	100.0%

### Length of Interview:

	Counts	Percents
10	31	12.6%
6	25	10.1%
7	25	10.1%

9	23	9.3%
5	21	8.5%
8	20	8.1%
11	15	6.1%
12	12	4.9%
14	9	3.6%
20	9	3.6%
15	8	3.2%
13	7	2.8%
16	7	2.8%
17	5	2.0%
19	3	1.2%
Other	27	10.9%
Totals	247	100.0%

### Fishing Mode?

	Counts	Percents
Shore	181	74.5%
Boat	60	24.7%
Pier	2	0.8%
Totals	243	100.0%

### 1. Is it ok if I tape the interview so that we don't miss anything?

	Counts	Percents
Yes (Taped)	164	68.6%
No (Paper Only)	75	31.4%
Totals	239	100.0%
Mean	1.69	

### 2. About how many miles did you have to travel to get here today?

	Counts	Percents
10 miles or less	170	69.1%
11-25 miles	48	19.5%
26-50 miles	23	9.3%

more than 100 miles	0	0.0%
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### 2a. How long have you fished or crabbed in the Washington DC area?

	Counts	Percents
10 years or more	139	56.7%
5-9 years	24	9.8%
1-2 years	23	9.4%
3-4 years	23	9.4%
More than a month, less than a year	14	5.7%
This is my first time (SKIP to Q3)	12	4.9%
Less than one month	10	4.1%
Totals	245	100.0%

### 2b. In the past year, how many times would you say that you have fished or crabbed in this area?

	Counts	Percents
3-10 times	70	29.8%
1-2 times	57	24.3%
more than 50 times	47	20.0%
11-25 times	40	17.0%
26-50 times	21	8.9%
Totals	235	100.0%

### 3. Fishing Motivations: How important are the following motivations in your reasons for fishing?

	Very Important	Somewhat Important	Not at all Important	Totals	Mean
a. Treat yourself or your family to a fresh fish or crab dinner?	51.0 20.9%	35.0 14.3%	158.0 64.8%	244.0 100.0%	2.44
b. Relax?	227.0 93.0%	14.0 5.7%	3.0 1.2%	244.0 100.0%	1.08
c. Spend time outdoors?	224.0 91.8%	15.0 6.1%	5.0 2.0%	244.0 100.0%	1.10
d. Reduce your family food expenses?	21.0	17.0	206.0	244.0	2.76

e. Experience the challenge or sport?	153.0	64.0	26.0	243.0	1.48
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#### 4. Do you, personally, eat any of the fish or crabs that you catch in the Washington DC area?

	Counts	Percents
No (CONTINUE)	152	63.1%
Yes (SKIP to Q5)	89	36.9%
Totals	241	100.0%

#### 5. What types of self-caught fish or crabs do you, personally, most often eat, and how often would you say you eat them over the course of a year? You can list up to four.

Fish Species	5 + Times/Week	3-4 Times/Week	1-2 Times/Week	1-3 Times/Month	Less Than Once/Month	TOTALS
Catfish (all)	0	2	7	17	33	59
Stripers/Rockfish	0	0	2	9	24	35
Largemouth Bass	0	2	2	1	17	22
Crappie	0	0	2	4	14	20
Bluegill	1	1	1	6	9	18
White Perch	0	0	0	4	8	12
Yellow Perch	1	0	0	4	5	10
Perch (general)	0	0	0	3	6	9
Smallmouth Bass	0	1	0	4	3	8
Carp	0	0	0	0	3	3
Bass (general)	0	0	0	2	0	2
Croaker	0	0	0	1	0	1
Spot	0	0	0	1	0	1
Trout	0	0	0	0	1	1
Brown Bullhead	0	0	0	0	1	1
Walleye	0	0	0	0	1	1
<b>TOTALS</b>	<b>2</b>	<b>6</b>	<b>14</b>	<b>56</b>	<b>124</b>	<b>202</b>

#### 6. Are there any kinds of self-caught fish or crabs that you won't eat or purposefully eat less of?

	Counts	Percents
Yes (CONTINUE)	63	75.0%
No (SKIP TO Q12)	21	25.0%
Totals	84	100.0%

**7. During which months of the year would you say that you, personally, eat the MOST self-caught fish or crabs?**

	Counts	Percents
July	41	49.4%
June	40	48.2%
August	33	39.8%
May	30	36.1%
April	20	24.1%
September	19	22.9%
October	12	14.5%
Don't Know (SKIP TO Q9)	10	12.0%
March	8	9.6%
All months the same (SKIP TO Q8)	6	7.2%
November	4	4.8%
December	2	2.4%
January	0	0.0%
February	0	0.0%
Totals	83	n/a

**7a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
1-3 times per month	37	52.9%
Less than once per month	18	25.7%
1-2 times per week	14	20.0%
Don't eat fish then	1	1.4%
5+ times per week	0	0.0%
3-4 times per week	0	0.0%
Totals	70	100.0%

**8. During which months of the year would you say that you, personally, eat the LEAST self-caught fish or crabs?**

	Counts	Percents
January	43	55.1%
December	43	55.1%



February	41	52.6%
November	35	44.9%
March	20	25.6%
October	19	24.4%
Don't Know (SKIP TO Q9)	15	19.2%
August	12	15.4%
September	8	10.3%
April	7	9.0%
May	6	7.7%
June	6	7.7%
July	6	7.7%
Totals	78	n/a

**8a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
Don't eat fish then	45	69.2%
Less than once per month	14	21.5%
1-3 times per month	5	7.7%
1-2 times per week	1	1.5%
5+ times per week	0	0.0%
3-4 times per week	0	0.0%
Totals	65	100.0%

**9. How frequently would you say that you eat the fish or crabs you catch in this area on average throughout the year?**

	Counts	Percents
Less than once a month	36	43.9%
1-3 times per month	24	29.3%
Don't Know	11	13.4%
1-2 times per week	9	11.0%
5 or more times per week	1	1.2%
3-4 times per week	1	1.2%
Totals	82	100.0%

**10. How much self-caught fish do you, personally, typically eat during a meal?**

	Counts	Percents
8 oz	30	37.5%
4 oz	20	25.0%
12 oz	13	16.3%
4-8 oz	9	11.3%
<4 oz	3	3.8%
>12 oz	3	3.8%
8-12 oz	2	2.5%
Totals	80	100.0%

**11. How many self-caught crabs, do you, personally, typically eat during a meal?**

	Counts	Percents
Don't eat	77	92.8%
more than 15 crabs	4	4.8%
1-2 crabs	1	1.2%
10-15 crabs	1	1.2%
3-5 crabs	0	0.0%
6-9 crabs	0	0.0%
Totals	83	100.0%

**12a. How often do you eat the mustard from crabs?**

	Counts	Percents
N/A	70	87.5%
Never	5	6.3%
Most of the time	4	5.0%
Sometimes	1	1.3%
Totals	80	100.0%

**12 b. How often do you eat the whole fish, including skin and fat?**

	Counts	Percents
Never	58	68.2%
Most of the time	15	17.6%

N/A	0	0.0%
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### 12 c. How often do you Puncture/remove skin from fish before cooking?

	Counts	Percents
Most of the time	52	61.2%
Never	16	18.8%
Sometimes	15	17.6%
N/A	2	2.4%
Totals	85	100.0%

### 12 d. How often do you trim fat from fish before cooking?

	Counts	Percents
Most of the time	50	58.8%
Never	24	28.2%
Sometimes	9	10.6%
N/A	2	2.4%
Totals	85	100.0%
Mean	--	

### 12 f. How often do you filet the fish?

	Counts	Percents
Most of the time	51	60.7%
Sometimes	19	22.6%
Never	13	15.5%
N/A	1	1.2%
Totals	84	100.0%

### 12 g. How often do you eat the fish or crabs raw?

	Counts	Percents
Never	80	94.1%
Sometimes	4	4.7%
N/A	1	1.2%
Most of the time	0	0.0%
Totals	85	100.0%

**12 h. How often do you pan fry or deep fry?**

	Counts	Percents
Most of the time	65	76.5%
Sometimes	16	18.8%
Never	4	4.7%
N/A	0	0.0%
Totals	85	100.0%

**12i. How often do you re-use fat or oil from cooking?**

	Counts	Percents
Never	67	78.8%
Sometimes	11	12.9%
Most of the time	6	7.1%
N/A	1	1.2%
Totals	85	100.0%

**12j. How often do you steam, poach, or boil?**

	Counts	Percents
Never	51	60.0%
Sometimes	21	24.7%
Most of the time	12	14.1%
N/A	1	1.2%
Totals	85	100.0%

**12k. How often do you broil, grill, bake, or roast?**

	Counts	Percents
Most of the time	34	40.0%
Sometimes	30	35.3%
Never	20	23.5%
N/A	1	1.2%
Totals	85	100.0%

**12l. How often do you make soup or chowder?**

	Counts	Percents
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Never	57	67.1%
Sometimes	19	22.4%
Most of the time	8	9.4%
N/A	1	1.2%
Totals	85	100.0%

### 12m. How often do you freeze or can it for later?

	Counts	Percents
Sometimes	40	47.1%
Most of the time	22	25.9%
Never	22	25.9%
N/A	1	1.2%
Totals	85	100.0%
Mean	--	

### 13. Do any other members of your household eat any of the fish or crabs that you catch in this area?

	Counts	Percents
No (SKIP TO Q16)	167	69.9%
Yes (CONTINUE)	72	30.1%
Totals	239	100.0%

### 14. How many total people are there in your household, including adults and children?

	Counts	Percents
2 to 3	19	26.4%
3 to 4	16	22.2%
4 to 5	18	25.0%
5 to 6	10	13.9%
6 to 7	2	2.8%
9 to 10	3	4.2%
Other	4	5.6%
Totals	72	100.0%
Mean	3.96	

**14a. How many children aged 5 or younger are there?**

	Counts	Percents
0 to 1	58	80.6%
1 to 2	8	11.1%
2 to 3	5	6.9%
Other	1	1.4%
Totals	72	100.0%
Mean	0.29	

**14b. How many children between the ages of 6 and 15 are there?**

	Counts	Percents
0 to 1	38	52.8%
1 to 2	22	30.6%
2 to 3	9	12.5%
3 to 4	2	2.8%
Other	1	1.4%
Totals	72	100.0%
Mean	0.74	

**14c. How many adults aged 60 or older are there?**

	Counts	Percents
0 to 1	54	75.0%
1 to 2	10	13.9%
2 to 3	5	6.9%
4 to 5	2	2.8%
Other	1	1.4%
Totals	72	100.0%
Mean	0.43	

**14d. How many women are there between the ages of 18 and 45?**

	Counts	Percents
0 to 1	24	33.3%
1 to 2	36	50.0%
2 to 3	8	11.1%
3 to 4	2	2.8%

Other	2	2.8%
Totals	72	100.0%
Mean	0.93	

**14d continued: IF GREATER THAN ZERO... Are any of these women currently pregnant or nursing or were within the last year?**

	Counts	Percents
Yes	4	8.3%
No	44	91.7%
Totals	48	100.0%
Mean	1.08	

**14 continued: Do you place yourself in any of these categories? If yes, Which one?**

	Counts	Percents
no	23	60.5%
d	7	18.4%
c	6	15.8%
No'	1	2.6%
Over 60	1	2.6%
Totals	38	100.0%

**15. How often do the \_\_\_\_\_ eat your self-caught fish or crabs?**

	More often than me	About the same	Less often than me	Don't eat at all	na	Totals
a. Children 5 or younger	1.0 1.8%	4.0 7.1%	6.0 10.7%	2.0 3.6%	43.0 76.8%	56.0 100.0%
b. Children 6-	2.0 3.3%	13.0 21.3%	12.0 19.7%	4.0 6.6%	30.0 49.2%	61.0 100.0%
c. Adults 60 or older	2.0 3.8%	5.0 9.6%	4.0 7.7%	0.0 0.0%	41.0 78.8%	52.0 100.0%
d. Pregnant/nursing women	0.0 0.0%	3.0 6.0%	2.0 4.0%	0.0 0.0%	45.0 90.0%	50.0 100.0%
e. Other women 18-44	2.0 3.3%	22.0 36.1%	15.0 24.6%	1.0 1.6%	21.0 34.4%	61.0 100.0%

**15a. Children 5 or younger-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	41	77.4%
4 oz	5	9.4%
<4 oz	3	5.7%
8 oz	2	3.8%
8-12 oz	2	3.8%
4-8 oz	0	0.0%
12 oz	0	0.0%
>12 oz	0	0.0%
Totals	53	100.0%

**15b. Children 6-15-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	33	56.9%
4 oz	13	22.4%
8 oz	5	8.6%
4-8 oz	3	5.2%
<4 oz	2	3.4%
12 oz	2	3.4%
8-12 oz	0	0.0%
>12 oz	0	0.0%
Totals	58	100.0%

**15c. Adults 60 or older-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	38	74.5%
4 oz	3	5.9%
4-8 oz	3	5.9%
12 oz	3	5.9%
8-12 oz	2	3.9%
<4 oz	1	2.0%
8 oz	1	2.0%
>12 oz	0	0.0%
Totals	51	100.0%



**15d. Pregnant/nursing women-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	43	87.8%
4 oz	2	4.1%
8 oz	2	4.1%
8-12 oz	1	2.0%
12 oz	1	2.0%
<4 oz	0	0.0%
4-8 oz	0	0.0%
>12 oz	0	0.0%
Totals	49	100.0%

**15e. Other women 18-44-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	22	37.3%
4 oz	13	22.0%
4-8 oz	6	10.2%
8 oz	6	10.2%
<4 oz	5	8.5%
12 oz	5	8.5%
8-12 oz	2	3.4%
>12 oz	0	0.0%
Totals	59	100.0%

**16. Do you give away any of the fish or crabs that you catch?**

	Counts	Percents
Yes	128	54.2%
No	108	45.8%
Totals	236	100.0%

**17. Have you heard of any health benefits from consuming fish?**

	Counts	Percents
Yes (CONTINUE)	183	75.3%

Totals	243	100.0%
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**17 continued: If Yes, do you eat more self-caught fish than before as a result of this information?**

	Counts	Percents
No	142	81.6%
Yes	32	18.4%
Totals	174	100.0%

**18. Would you say that the fish you catch here are safe for you and your family to eat?**

	Counts	Percents
No	95	38.9%
Yes	73	29.9%
Uncertain	42	17.2%
It Depends	34	13.9%
Totals	244	100.0%

**19. Have you ever seen, heard, or read about health advisories that some states issue to limit consumption of locally caught fish?**

	Counts	Percents
Yes	166	69.2%
No	74	30.8%
Totals	240	100.0%

**20. Are you aware of any such warnings that have been issued for the Washington DC area?**

	Counts	Percents
Yes (CONTINUE)	133	55.4%
No (SKIP TO Q28)	107	44.6%
Totals	240	100.0%

**21. If yes, how did you learn about it?**

	Counts	Percents
Television	37	28.0%
Newspaper	36	27.3%
Fishing Regulations book	33	25.0%

Sign/Poster at fishing site	22	16.7%
Other angler	11	8.3%
Internet	8	6.1%
Radio	5	3.8%
Friend	4	3.0%
Bait shop	2	1.5%
Fishing license	2	1.5%
When he got license	2	1.5%
Warden or other official	1	0.8%
Don't Know	1	0.8%
Dumping at treatment plant.	1	0.8%
Fishing reports	1	0.8%
Other	10	7.6%
Totals	132	n/a

### 21a. When did you last see or hear about the advisory?

	Counts	Percents
more than a year ago	45	36.6%
within the last month	40	32.5%
2-3 months ago	25	20.3%
7-12 months ago	7	5.7%
4-6 months ago	6	4.9%
Totals	123	100.0%

### 22. Would you say that the information you got was easy to understand?

	Counts	Percents
I had no problems understanding it.	119	91.5%
I had some difficulties, but got the main points.	8	6.2%
I had a lot of trouble understanding it.	3	2.3%
Totals	130	100.0%

### 23. What did the advisory say?

	Counts	Percents
Don't eat more than a certain amount of fish from Washington, DC waters	61	46.2%

The Washington, DC waterways are polluted	21	15.9%
Don't Know	14	10.6%
Beware of certain toxins in some Washington DC-caught fish	11	8.3%
Don't eat fish from certain Washington DC waters	9	6.8%
Don't eat any fish from the Washington DC waters	6	4.5%
Pregnant women or children should eat less fish from Washington DC waters	4	3.0%
Size	2	1.5%
Airplane fuel, parasites.	1	0.8%
Anacostia	1	0.8%
Anacostia is dirty. Also, fish have diphtheria.	1	0.8%
Anacostia, sores	1	0.8%
bacteria, lesions	1	0.8%
Be careful	1	0.8%
Other	18	13.6%

**24. From the pictures shown here, which types of fish did the advisory you saw for this location apply to?**

	Counts	Percents
Channel catfish	75	69.4%
White catfish	68	63.0%
Blue catfish	65	60.2%
Carp	37	34.3%
American eel	24	22.2%
Striped bass	21	19.4%
Largemouth Bass	16	14.8%
Smallmouth bass	15	13.9%
all fish	13	12.0%
Blue crab	8	7.4%
Brown bullhead	7	6.5%
Crappie	7	6.5%
Yellow perch	7	6.5%
White perch	7	6.5%
Bluegill	6	5.6%
Other	23	21.3%
Totals	108	n/a

**25. Has any of the information from the fish consumption advisories caused you to change your eating habits?**

	Counts	Percents
No (GO TO 25b)	95	74.2%
Yes (GO TO 25a)	33	25.8%
Totals	128	100.0%

**25a. If YES, How did you change your eating habits?**

	Counts	Percents
I changed the species of fish that I eat	11	31.4%
I limit the amounts of fish I eat from this area	8	22.9%
I stopped eating all self-caught fish	7	20.0%
I stopped eating all self-caught fish from this area	5	14.3%
I limit the amounts of certain kinds of fish I eat from this area	1	2.9%
I started fishing somewhere else	1	2.9%
I release more of the fish that I catch	1	2.9%
catfish	1	2.9%
Caution-I carefully examine the fish I keep.	1	2.9%
I changed where I fish	1	2.9%
I took a closer look.	1	2.9%
Scale	1	2.9%
Take a hard look at them. If it looks sick or like it has any sores at all, I throw them back.	1	2.9%
I changed the sizes of fish that I eat	0	0.0%
I changed the species that I fish for	0	0.0%
Other	0	0.0%
Totals	35	n/a

**25b. If NO, Why didn't you change your eating habits?**

	Counts	Percents
I didn't eat it before, and I still don't	57	63.3%
I didn't eat very much fish to begin with	9	10.0%
I already eat within the recommended guidelines	7	7.8%
I don't think the warning is accurate	7	7.8%

I don't think the warning is important	4	4.4%
Buy fresh fish at Wharf.	1	1.1%
Cooks it right	1	1.1%
fish places other than DC	1	1.1%
he could tell when he caught the fish	1	1.1%
I avoid sick fish. Cooks them up special.	1	1.1%
I like the fish. We might be more cautious, but we still eat the fish.	1	1.1%
Never felt sick	1	1.1%
I didn't understand the warning or recommendations	0	0.0%
I need the fish I catch to feed myself or my family	0	0.0%
Other	1	1.1%

## 26. Are there any ways you can think of that would make the advisory easier to understand and follow?

	Counts	Percents
No	81	64.3%
Yes	45	35.7%
Totals	126	100.0%

### 26a: If YES, what improvements would you suggest?

If YES, what improvements would you suggest?

- Put it in Spanish. (signs and newspaper)
- Publicize it more
- Just put out a blanket advisory about fish.
- Stricter regulations. Game wardens.
- Put White Perch and Crappie in the fishing regulations book. Stock Crappie.
- Provide a more generalized amount/time that is easier to remember. Reduce the number of group divisions. (Pregnant women, seniors, etc.)
- More in depth and specific. Out more often so it sinks in.
- Post it in more newspapers. Local newspapers. Post in tackle stores.
- Use more forceful language, or ban the fish.
- Tell people the following:- Don't eat fish in the Tidal Basin- Watch out for sores- Mention fish you can eat- Limit amount
- Carefully examine your fish. Soak them in salt water.
- More impact study of the river. Spend more money on getting the word out.
- Specific information about what sites are or are not good to fish at.
- Government should give full warnings and not allow rumors
- Post signs more. More pictures, less writing.
- Have a follow up with more information.
- Post it more often.
- Have a map of the river with areas of greater and lesser pollution coded.

- Reliable sources
- I don't know
- Put it in Ebonics, Chinese, and other languages.
- More graphics
- In Spanish, Asian-Vietnamese at Chain Bridge; At fishing sites-not by boats
- Show the picture. Post them at fishing sites.
- Pictures
- Put it on labels
- Put more signs saying if fish is healthy or not.
- Circle a catfish w/an X on the sign
- Post at ramps.
- Have them in other languages.
- There is only information at the beginning of the fishing season. Put info in Spanish.
- Have information memos posted. Mail it to people.
- Just say flat out that the river is polluted.
- Get info out to more people
- Get the message out. Don't just scrape, be safe. Let it go if you see lesions or boils.
- Issue with fishing license. Enforce the regulations.
- Some people don't speak English. Use visuals.
- several languages
- More signs.
- Post more signs
- Keep information posted.
- Crack down on polluters, enforce regulations. Name other sources of pollution that could happen - hepatitis, cancer, AIDS
- Just repeat it more
- be more specific about which kinds of fish are not safe and why, and why other are; break it down to people
- fisherman are responsible for learning/reading more

**27. Have you ever referred back to the advisory information to make a decision about keeping or eating your self-caught fish?**

	Counts	Percents
No	88	70.4%
Yes	37	29.6%
Totals	125	100.0%

**28. How important do you think it is to follow health advisories about what kinds of fish and crabs are safe to eat?**

	Counts	Percents
Very Important	205	85.1%
Somewhat Important	30	12.4%
Not at all important	6	2.5%
Totals	241	100.0%

**29. What do you think would be the best way for us to reach people fishing in this area with information about fishing and health?**

	Counts	Percents
Post signs at fishing locations	94	39.0%
Television	50	20.7%
Newspaper	44	18.3%
Talk to anglers at fishing locations	42	17.4%
Radio	25	10.4%
Signs or brochures at bait shops	23	9.5%
Provide information when purchase license	16	6.6%
Put it in the Fishing Regulations book	9	3.7%
Internet	9	3.7%
Don't Know	7	2.9%
Have doctor or health provider give information	4	1.7%
Direct mail	3	1.2%
Fliers	2	0.8%
In Spanish	2	0.8%
Post information at marina.	2	0.8%
Other	48	19.9%
Totals	241	n/a

**30. How old are you?**

	Counts	Percents
10 to 20	7	2.9%
20 to 30	21	8.7%
30 to 40	63	26.0%
40 to 50	69	28.5%
50 to 60	50	20.7%
60 to 70	22	9.1%
70 to 80	8	3.3%
80 to 90	2	0.8%
Totals	242	100.0%
Mean	44.59	

**31. How would you describe your race or ethnicity?**



	Counts	Percents
African American	121	50.0%
White	79	32.6%
Hispanic	23	9.5%
Asian	15	6.2%
Arab-American	1	0.4%
Bosnian	1	0.4%
Caribbean--Antigua	1	0.4%
North African	1	0.4%
Vietnamese	1	0.4%
American Indian	0	0.0%
Other	0	0.0%
Totals	242	n/a

### 32. What is the highest level of education that you've completed?

	Counts	Percents
High School	81	33.3%
Some College (including Associates)	64	26.3%
Less than high School	39	16.0%
Bachelor's or equivalent	30	12.3%
Master's or equivalent	23	9.5%
PhD, M.D. or equivalent	6	2.5%
Totals	243	n/a

### 32a. How about the other adults in your household?

	Counts	Percents
High School	91	43.1%
Bachelor's or equivalent	59	28.0%
Some College (including Associates)	49	23.2%
Master's or equivalent	23	10.9%
Less than high School	17	8.1%
PhD, M.D. or equivalent	7	3.3%
Totals	211	n/a

### 32b. Is your household income less than \$40,000 per year?

	Counts	Percents
No	153	69.5%
Yes	67	30.5%
Totals	220	100.0%

**32c: If Yes, is it less than \$20,000 per year?**

	Counts	Percents
No	46	69.7%
Yes	20	30.3%
Totals	66	100.0%

**32d: If No, is it less than \$80,000 per year?**

	Counts	Percents
No	84	56.0%
Yes	66	44.0%
Totals	150	100.0%

**APPENDIX H:**

**FREQUENCY DISTRIBUTIONS FOR ALL CLOSE-ENDED QUESTIONS:  
LOWER JAMES/ELIZABETH RIVER REGION OF CONCERN**

## Frequency Tables for Lower James/Elizabeth River Angler Interviews

### Survey Location:

	Counts	Percents
V3	117	23.7%
V2	104	21.1%
V9	54	11.0%
V8	47	9.5%
V4	44	8.9%
V7	43	8.7%
V1	37	7.5%
V5	37	7.5%
V6	10	2.0%
Totals	493	100.0%

### Day of Week:

	Counts	Percents
Sunday	111	22.5%
Saturday	99	20.1%
Friday	81	16.4%
Tuesday	72	14.6%
Thursday	65	13.2%
Wednesday	65	13.2%
Totals	493	100.0%

### Observed Sex:

	Counts	Percents
Male	420	86.2%
Female	67	13.8%
Totals	487	100.0%

### Length of Interview:

	Counts	Percents
9	78	16.1%
8	76	15.7%

10	70	14.5%
7	62	12.8%
6	37	7.6%
11	27	5.6%
12	20	4.1%
15	18	3.7%
5	17	3.5%
14	15	3.1%
13	12	2.5%
3	9	1.9%
4	8	1.7%
16	7	1.4%
17	4	0.8%
Other	24	5.0%
Totals	484	100.0%

### Fishing Mode?

	Counts	Percents
Boat	232	47.3%
Pier	194	39.6%
Shore	64	13.1%
Totals	490	100.0%

### 1. Is it ok if I tape the interview so that we don't miss anything?

	Counts	Percents
Yes (Taped)	411	83.9%
No (Paper Only)	79	16.1%
Totals	490	100.0%

### 2. About how many miles did you have to travel to get here today?

	Counts	Percents
10 miles or less	226	46.0%
more than 100 miles	126	25.7%
51-100 miles	63	12.8%
11-25 miles	47	9.6%

26-50 miles	29	5.9%
Totals	491	100.0%

### 2a. How long have you fished or crabbed in the Elizabeth and Lower James River area?

	Counts	Percents
10 years or more	247	50.6%
5-9 years	77	15.8%
3-4 years	65	13.3%
1-2 years	56	11.5%
This is my first time (SKIP to Q3)	22	4.5%
Less than one month	14	2.9%
More than a month, less than a year	7	1.4%
Totals	488	100.0%

### 2b. In the past year, how many times would you say that you have fished or crabbed in the Elizabeth and Lower James River area?

	Counts	Percents
3-10 times	201	42.3%
1-2 times	99	20.8%
11-25 times	90	18.9%
more than 50 times	48	10.1%
26-50 times	37	7.8%
Totals	475	100.0%

### 3. Fishing Motivations: How important are the following motivations in your reasons for fishing?

	Very Important	Somewhat Important	Not at all Important	Totals	Mean
a. Treat yourself or your family to a fresh fish or crab dinner?	245.0 49.7%	146.0 29.6%	102.0 20.7%	493.0 100.0%	1.71
b. Relax?	445.0 90.4%	43.0 8.7%	4.0 0.8%	492.0 100.0%	1.10
c. Spend time outdoors?	434.0 88.8%	49.0 10.0%	6.0 1.2%	489.0 100.0%	1.12
d. Reduce your family food expenses?	93.0 19.1%	111.0 22.8%	283.0 58.1%	487.0 100.0%	2.39
e. Experience the challenge or sport?	324.0	125.0	40.0	489.0	1.42

	66.3%	25.6%	8.2%	100.0%	
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**4. Do you, personally, eat any of the fish or crabs that you catch in the Elizabeth and Lower James River area?**

	Counts	Percents
Yes (SKIP to Q5)	442	91.7%
No (CONTINUE)	40	8.3%
Totals	482	100.0%

**5. What types of self-caught fish or crabs do you, personally, most often eat, and how often would you say you eat them over the course of a year? You can list up to four.**

Species	5+Times/Week	3-4 Times/Week	1-2 Times/Week	1-3 Times/Month	Less Than Once/Month	TOTAL
Croaker	1	10	118	128	110	367
Spot	0	5	42	64	75	186
Flounder	0	0	32	45	40	117
Rockfish/Striped Bass	0	1	16	24	35	76
Blue Crab	2	2	13	16	27	60
Trout	0	1	10	25	17	53
Catfish (all)	0	1	2	12	16	31
Crabs (unspecified)	0	1	5	7	1	14
Drum	0	0	1	2	9	12
Bluefish	0	0	1	6	2	9
Perch	0	0	3	3	3	9
Bass (unspecified)	0	0	2	5	1	8
Tautog	0	1	1	0	2	4
Crappie	0	0	0	1	2	3
White Perch	0	0	1	1	1	3
Cobia	0	0	0	0	2	2
Sea Mullet	0	0	0	0	2	2
Bluegill	0	0	0	1	0	1
Shark	0	0	0	1	0	1
Black Bass	0	0	0	0	1	1
Yellow Perch	0	0	0	0	1	1
Eel	0	0	0	1	0	1
Sheep's Head	0	0	1	0	0	1
<b>TOTAL</b>	<b>3</b>	<b>22</b>	<b>248</b>	<b>342</b>	<b>347</b>	<b>962</b>

**6. Are there any kinds of self-caught fish or crabs that you won't eat or purposefully eat less of?**

	Counts	Percents
Yes (CONTINUE)	224	50.6%
No (SKIP TO Q12)	219	49.4%
Totals	443	100.0%

**7. During which months of the year would you say that you, personally, eat the MOST self-caught fish or crabs?**

	Counts	Percents
July	322	72.4%
August	276	62.0%
June	263	59.1%
September	125	28.1%
May	105	23.6%
October	63	14.2%
November	37	8.3%
April	32	7.2%
December	20	4.5%
All months the same (SKIP TO Q8)	20	4.5%
March	10	2.2%
Don't Know (SKIP TO Q9)	9	2.0%
January	8	1.8%
February	7	1.6%
Totals	445	n/a

**7a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
1-2 times per week	173	40.9%
1-3 times per month	170	40.2%
Less than once per month	42	9.9%
3-4 times per week	31	7.3%
5+ times per week	5	1.2%
Don't eat fish then	2	0.5%
Totals	423	100.0%

**8. During which months of the year would you say that you, personally, eat the LEAST self-caught fish or crabs?**

	Counts	Percents
January	279	66.9%
December	271	65.0%



November	154	36.9%
March	122	29.3%
October	93	22.3%
April	79	18.9%
September	52	12.5%
May	42	10.1%
August	29	7.0%
June	18	4.3%
July	13	3.1%
Don't Know (SKIP TO Q9)	4	1.0%

**8a. During these months (repeat months checked above), how frequently do you eat them?**

	Counts	Percents
Don't eat fish then	174	41.8%
1-3 times per month	113	27.2%
Less than once per month	88	21.2%
1-2 times per week	39	9.4%
3-4 times per week	2	0.5%
5+ times per week	0	0.0%
Totals	416	100.0%

**9. How frequently would you say that you eat the fish or crabs you catch in this area on average throughout the year?**

	Counts	Percents
1-3 times per month	180	41.3%
Less than once a month	137	31.4%
1-2 times per week	89	20.4%
3-4 times per week	14	3.2%
Don't Know	13	3.0%
5 or more times per week	3	0.7%
Totals	436	100.0%

**10. How much self-caught fish do you, personally, typically eat during a meal?**

	Counts	Percents
8 oz	184	43.3%
12 oz	117	27.5%
4 oz	59	13.9%
>12 oz	34	8.0%
8-12 oz	16	3.8%
4-8 oz	14	3.3%
<4 oz	1	0.2%
Totals	425	100.0%

**11. How many self-caught crabs, do you, personally, typically eat during a meal?**

	Counts	Percents
Don't eat	254	65.1%
10-15 crabs	39	10.0%
3-5 crabs	31	7.9%
6-9 crabs	29	7.4%
more than 15 crabs	25	6.4%
1-2 crabs	12	3.1%
Totals	390	100.0%

**12a. How often do you eat the mustard from crabs?**

	Counts	Percents
N/A	240	63.0%
Never	118	31.0%
Sometimes	13	3.4%
Most of the time	10	2.6%
Totals	381	100.0%

**12b. How often do you eat the whole fish, including skin and fat?**

	Counts	Percents
Never	202	46.2%
Most of the time	170	38.9%
Sometimes	50	11.4%

Totals	437	100.0%
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### 12c. How often do you puncture/remove skin from fish before cooking?

	Counts	Percents
Never	196	44.5%
Most of the time	126	28.6%
Sometimes	103	23.4%
N/A	15	3.4%
Totals	440	100.0%

### 12d. How often do you trim fat from fish before cooking?

	Counts	Percents
Never	252	57.4%
Most of the time	124	28.2%
Sometimes	47	10.7%
N/A	16	3.6%
Totals	439	100.0%

### 12f. How often do you filet the fish?

	Counts	Percents
Most of the time	200	45.4%
Sometimes	176	39.9%
Never	50	11.3%
N/A	15	3.4%
Totals	441	100.0%

### 12g. How often do you eat the fish or crabs raw?

	Counts	Percents
Never	433	99.1%
Sometimes	4	0.9%
Most of the time	0	0.0%
N/A	0	0.0%
Totals	437	100.0%

**12h. How often do you pan fry or deep fry?**

	Counts	Percents
Most of the time	359	82.0%
Sometimes	52	11.9%
Never	20	4.6%
N/A	7	1.6%
Totals	438	100.0%

**12i. How often do you re-use fat or oil from cooking?**

	Counts	Percents
Never	313	72.3%
Sometimes	65	15.0%
Most of the time	46	10.6%
N/A	9	2.1%
Totals	433	100.0%

**12j. How often do you steam, poach, or boil?**

	Counts	Percents
Never	237	54.2%
Sometimes	122	27.9%
Most of the time	78	17.8%
N/A	0	0.0%
Totals	437	100.0%

**12k. How often do you broil, grill, bake, or roast?**

	Counts	Percents
Sometimes	229	52.3%
Never	108	24.7%
Most of the time	96	21.9%
N/A	5	1.1%
Totals	438	100.0%

**12l. How often do you make soup or chowder?**

	Counts	Percents
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Sometimes	59	13.5%
Most of the time	5	1.1%
N/A	1	0.2%

**12m. How often do you freeze or can it for later?**

	Counts	Percents
Most of the time	242	55.3%
Sometimes	131	29.9%
Never	63	14.4%
N/A	2	0.5%
Totals	438	100.0%

**13. Do any other members of your household eat any of the fish or crabs that you catch in this area?**

	Counts
Yes (CONTINUE)	409
No (SKIP TO Q16)	64
Totals	473

**14. How many total people are there in your household, including adults and children?**

	Counts	Percents
0 to 10	411	99.0%
10 to 20	3	0.7%
Other	1	0.2%
Totals	415	100.0%
Mean	3.41	

**14a. How many children aged 5 or younger are there?**

	Counts	Percents
0 to 1	354	86.8%
1 to 2	37	9.1%
2 to 3	13	3.2%
3 to 4	4	1.0%
Totals	408	100.0%

Mean	0.18
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#### 14b. How many children between the ages of 6 and 15 are there?

	Counts	Percents
0 to 1	270	65.9%
1 to 2	85	20.7%
2 to 3	42	10.2%
3 to 4	7	1.7%
4 to 5	4	1.0%
Other	2	0.5%
Totals	410	100.0%
Mean	0.53	

#### 14c. How many adults aged 60 or older are there?

	Counts	Percents
0 to 1	284	69.4%
1 to 2	73	17.8%
2 to 3	50	12.2%
3 to 4	2	0.5%
Totals	409	100.0%
Mean	0.44	

#### 14d. How many women are there between the ages of 18 and 45?

	Counts	Percents
0 to 1	185	45.2%
1 to 2	176	43.0%
2 to 3	39	9.5%
3 to 4	8	2.0%
Other	1	0.2%
Totals	409	100.0%
Mean	0.69	

#### 14d continued: IF GREATER THAN ZERO... Are any of these women currently pregnant or nursing or were within the last year?

	Counts	Percents
Yes	15	6.9%

No	202	93.1%
Totals	217	100.0%
Mean	1.07	

**14 continued: Do you place yourself in any of these categories? If yes, Which one?**

	Counts	Percents
No	104	51.7%
C	69	34.3%
D	18	9.0%
Woman between 18 and 45	4	2.0%
60 or older.	3	1.5%
60 or older	2	1.0%
1	1	0.5%
Totals	201	100.0%

**15. How often do the \_\_\_\_\_ eat your self-caught fish or crabs?**

	More often than me	About the same	Less often than me	Don't eat at all	NA	Totals
a. Children 5 or younger	1.0 0.3%	29.0 10.1%	14.0 4.9%	8.0 2.8%	234.0 81.8%	286.0 100.0%
b. Children 6-15	12.0 3.8%	88.0 27.7%	31.0 9.7%	10.0 3.1%	177.0 55.7%	318.0 100.0%
c. Adults 60 or older	6.0 2.0%	79.0 26.2%	12.0 4.0%	0.0 0.0%	204.0 67.8%	301.0 100.0%
d. Pregnant/nursing women	2.0 0.7%	6.0 2.2%	2.0 0.7%	1.0 0.4%	263.0 96.0%	274.0 100.0%
e. Other women 18-44 or crabs?	18.0 5.4%	125.0 37.3%	48.0 14.3%	8.0 2.4%	136.0 40.6%	335.0 100.0%

**15a. Children 5 or younger-How much do they typically eat in a meal?**

	Counts	Percents
(N/A)	244	85.9%
4 oz	24	8.5%
<4 oz	9	3.2%
8 oz	5	1.8%
8-12 oz	1	0.4%

4-8 oz	0	0.0%
>12 oz	0	0.0%

### 15b. Children 6-15-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	192	60.6%
4 oz	64	20.2%
8 oz	29	9.1%
12 oz	15	4.7%
<4 oz	7	2.2%
4-8 oz	6	1.9%
>12 oz	3	0.9%
8-12 oz	1	0.3%
Totals	317	100.0%

### 15c. Adults 60 or older-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	206	70.3%
4 oz	37	12.6%
8 oz	33	11.3%
4-8 oz	6	2.0%
12 oz	6	2.0%
8-12 oz	3	1.0%
>12 oz	2	0.7%
<4 oz	0	0.0%
Totals	293	100.0%

### 15d. Pregnant/nursing women-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	263	96.3%
8 oz	4	1.5%
4 oz	3	1.1%
>12 oz	2	0.7%
12 oz	1	0.4%



<4 oz	0	0.0%
4-8 oz	0	0.0%
8-12 oz	0	0.0%
Totals	273	100.0%

### 15e. Other women 18-44-How much do they typically eat in a meal?

	Counts	Percents
(N/A)	149	45.2%
4 oz	67	20.3%
8 oz	64	19.4%
12 oz	26	7.9%
4-8 oz	12	3.6%
<4 oz	5	1.5%
>12 oz	4	1.2%
8-12 oz	3	0.9%
Totals	330	100.0%

### 16. Do you give away any of the fish or crabs that you catch?

	Counts	Percents
Yes	397	84.8%
No	71	15.2%
Totals	468	100.0%

### 17. Have you heard of any health benefits from consuming fish?

	Counts	Percents
Yes (CONTINUE)	336	72.4%
No (SKIP TO Q18)	128	27.6%
Totals	464	100.0%

### 17a. If Yes, do you eat more self-caught fish than before as a result of this information?

	Counts	Percents
No	214	68.6%
Yes	98	31.4%
Totals	312	100.0%




**18. Would you say that the fish you catch here are safe for you and your family to eat?**

	Counts	Percents
Yes	385	80.9%
Uncertain	48	10.1%
It Depends	30	6.3%
No	13	2.7%
Totals	476	100.0%

**19. Have you ever seen, heard, or read about health advisories that some states issue to limit consumption of locally caught fish?**

	Counts	Percents
Yes	329	70.3%
No	139	29.7%
Totals	468	100.0%

**20. How important do you think it is to follow health advisories about what kinds of fish and how much fish is safe for people to eat?**

	Counts	Percents	Percents
			0 100
Very Important	372	79.7%	
Somewhat Important	77	16.5%	
Not at all important	18	3.9%	
Totals	467	100.0%	

**21a. If advisories were issued, would you make any changes to your eating patterns for fish or crabs caught here?**

	Counts	Percents
Yes	380	84.4%
No	54	12.0%
Not Sure	16	3.6%
Totals	450	100.0%

**21b. If advisories were issued, would you continue to fish and/or crab here?**

	Counts	Percents
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No	121	25.7%
Not Sure	29	6.2%

**21c. If advisories were issued, would you fish/crab somewhere else instead, either some or all of the time?**

	Counts	Percents
Yes	312	66.5%
No	141	30.1%
Not Sure	16	3.4%
Totals	469	100.0%

**22. What do you think would be the best way for us to reach people fishing in this area with information about fishing and health?**

	Counts	Percents
Television	162	34.5%
Newspaper	103	21.9%
Talk to anglers at fishing locations	97	20.6%
Post signs at fishing locations	81	17.2%
Radio	60	12.8%
Signs or brochures at bait shops	33	7.0%
Direct mail	25	5.3%
Internet	25	5.3%
Provide information when purchase license	11	2.3%
Don't Know	10	2.1%
Phone	5	1.1%
Phone.	4	0.9%
Telephone	4	0.9%
Put it in the Fishing Regulations book	3	0.6%
Bulletin boards.	2	0.4%
Other	81	17.2%
Totals	470	n/a

**23. How old are you?**

	Counts	Percents
10 to 20	4	0.8%
20 to 30	38	8.0%
30 to 40	72	15.2%
40 to 50	129	27.3%
50 to 60	123	26.0%
60 to 70	78	16.5%
70 to 80	25	5.3%
80 to 90	4	0.8%
Totals	473	100.0%
Mean	48.73	

**24. How would you describe your race or ethnicity?**

	Counts	Percents
White	265	55.6%
African American	203	42.6%
Asian	5	1.0%
American Indian	4	0.8%
Hispanic	3	0.6%
Hawaiian/pacific islander	1	0.2%
Other	0	0.0%
Totals	477	n/a

**25. What is the highest level of education that you've completed?**

	Counts	Percents
High School	188	40.2%
Some College (including Associates)	138	29.5%
Bachelor's or equivalent	68	14.5%
Less than high School	58	12.4%
Master's or equivalent	16	3.4%
PhD, M.D. or equivalent	4	0.9%
Totals	468	n/a

**25a. How about the other adults in your household?**

	Counts	Percents
High School	224	53.8%
Some College (including Associates)	84	20.2%
Bachelor's or equivalent	81	19.5%
Less than high School	28	6.7%
Master's or equivalent	22	5.3%
PhD, M.D. or equivalent	2	0.5%
Totals	416	n/a

**26a. Is your household income less than \$40,000 per year?**

	Counts	Percents
No	276	62.4%
Yes	166	37.6%
Totals	442	100.0%

**26b. If Yes, is it less than \$20,000 per year?**

	Counts	Percents
No	123	75.9%
Yes	39	24.1%
Totals	162	100.0%

**26c. If No, is it less than \$80,000 per year?**

	Counts	Percents
Yes	176	64.9%
No	95	35.1%
Totals	271	100.0%