

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.

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

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.

Back River Sites	5 + Times/Week	3-4 Times/ Week	1-2 Times/ Week	1-3 Times/ Month	Less Than Once/ Month	TOTALS
<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
TOTALS	0	0	0	22	11	33
Baltimore Harbor, Patapsco River Sites	5 + Times/Week	3-4 Times/ Week	1-2 Times/ Week	1-3 Times/ Month	Less Than Once/ Month	TOTALS
<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
TOTALS	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.

Back River Sites	5 + Times/Week	3-4 Times/ Week	1-2 Times/ Week	1-3 Times/ Month	Less Than Once/ Month	TOTALS
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
TOTALS	0	0	0	20	8	28
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Baltimore Harbor/ Patapsco River Sites	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	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
TOTALS	1	3	23	21	43	91

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.

Species	5 + Times/Week	3-4 Times/ Week	1-2 Times/ Week	1-3 Times/ Month	Less Than Once/ Month	TOTAL
White Anglers						
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
TOTAL	0	3	14	21	25	63
African American Anglers						
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
TOTAL	1	0	9	15	21	46

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.

Fishing Mode	% Aware of Baltimore Region Advisories	% Unaware of Baltimore Region Advisories
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)¹ 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.

¹ 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.

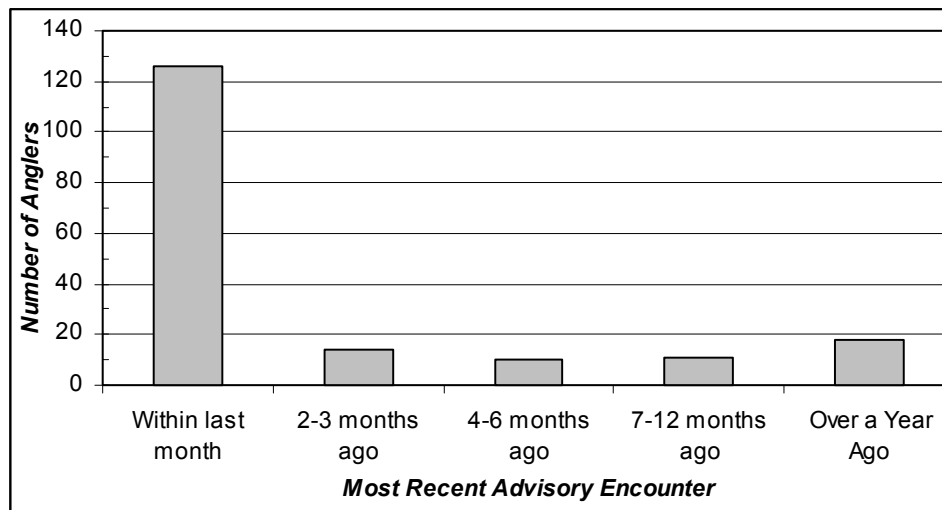


Figure 3.1. Distribution of Baltimore area anglers with respect to their most recent encounter with a fish consumption advisory.

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.

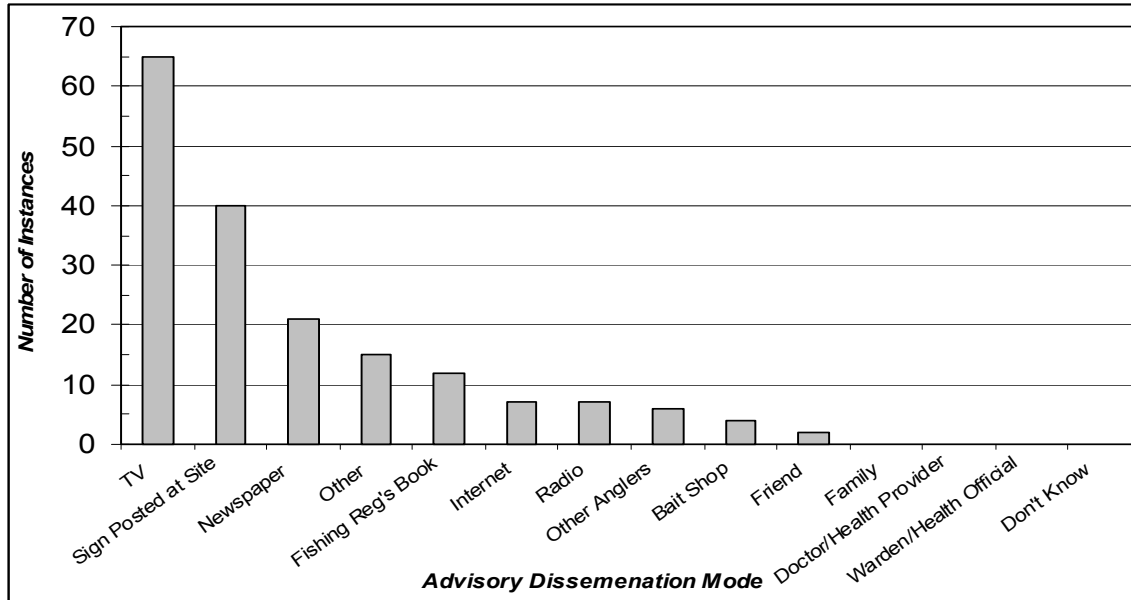


Figure 3.2. Distribution of Baltimore area anglers with respect to their recent modes of encountering a fish consumption advisory.

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
TOTALS	88	59	30	20	20	11	11	9	6	2	0	0	0	0	256

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.

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

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.

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

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.

Suggested Improvements	# of Responses	%
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>	Number of Anglers	% Total of Named Methods
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
TOTALS	209	100

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.

SITES	Whites		African-Americans	
	# of Interviews	% of Interviews	# of Interviews	% of Interviews
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
TOTALS	82	100	43	100

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.

Angler Subpopulation	% of Anglers Consuming Self-Caught Fish	% of Those Consuming Fish Who Also Provide it to Household Members
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.

Angler Subpopulation	Very or Somewhat Important Motivations for Fishing (% of Anglers)	
	Providing a Fresh Fish Dinner	Reducing Food Expenses
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.

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

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.

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

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

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., 5th 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.

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

