

PREVALENCE OF SUBSISTENCE FISHING IN NEW YORK CITY AND ASSOCIATED POLLUTION CONCERNS: A PILOT STUDY

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ABSTRACT: *This brief research communication shares findings from a pilot study on subsistence fishing and pollution exposure in New York City. We seek to understand whether it is plausible to conduct a full-scale research project on subsistence fishing in New York City. To do so we see (1) how prevalent is subsistence fishing in New York City's waterways, (2) what populations are most likely to engage in subsistence fishing, (3) how urban anglers think about potential pollution contamination in relation to fishing activities, and (4) whether pollution affects attitudes toward fishing (whether recreationally or for subsistence). We find that anglers in the area had mixed responses to answering questions, expressing concerns over potential new limitations to be placed on urban fishing. Despite potential participant hesitation, we identified several potential areas for future research. First, most anglers take what they catch as food at least part of the time indicating potential for a full-scale research project on urban subsistence fishing in the city. These are mixed populations but include otherwise marginalized populations for whom fishing may be a significant food source. Pollution and contamination are concerns for anglers and non-anglers alike and do impact subsistence activity. More research on urban subsistence fishing practices in the New York-New Jersey Harbor Estuary is plausible and could have significant public health and environmental justice implications. There are however high potential costs associated with such a study to reach the widest populations.*

Keywords: *urban angling, subsistence, New York City*

INTRODUCTION

Growing concern about potential pollutants in New York City waterways led to state and federal surveys, which found high concentrations of polychlorinated biphenyls (PCBs) in fish and crab throughout the harbor (Barclay, 1993). Other pollutants of interest include dioxins, per- and polyfluorinated substances (PFAs), and cadmium. Research has found that PCBs, dioxins, and PFAs have similar effects on human health, with the most concerning including increased risk of cancer, reproductive issues, and developmental issues in children (Montano et al., 2022; Fenton et al., 2021). In addition, cadmium can lead to adverse health effects such as kidney, bone, and pulmonary damage (Godt et al., 2006). The New York State Department of Environmental Conservation does monitor these pollutant levels in the Harbor's fish tissues. Monitoring the levels in fish tissue is particularly important as most exposure to these toxins is through dietary intake, primarily through fish. The city typically posts signs at fishing sites describing the advisory information. However, the signs often become damaged, are no longer posted in many areas or are only in English. Due to this, many urban fishers may not be aware of the advisories and the potential long-term health effects of fish consumption (Burger et al., 1993; Pflugh et al., 1999).

The U.S. Environmental Protection Agency (2001) considers urban anglers to be at elevated risk of toxin exposure by consuming fish they catch. This risk increases if urban poor individuals are dependent on the fish they catch as a primary food source, especially if they are limited to more contaminated areas. Burger et al. (1999) focused on urban fishers in the Newark Bay complex of New York and New Jersey, which borders the New York Harbor. They found that urban anglers tended to be lower income, with a median household income of \$25,000-34,999, potentially making them more dependent on the fish they catch. Additionally, the urban fishers often possessed low levels of education, with 28% without a high school diploma and 17% more comfortable reading a different language than English, which may limit their accessibility to posted fish advisories. Previous studies in other urban areas have found comparable results of individuals who were identified as low-income, racial minorities, or immigrant groups having the largest consumption rate from urban fishing (Silver et al., 2007).

However, another critical factor regarding what health risks urban anglers are exposed to is based on their perceptions of pollution and if they feel safe consuming the fish they catch. Previous research in the Newark Bay complex found that urban fishers in this area were not aware of advisories related to fish consumption or purposefully ignored them based on the factors of not believing them or were not concerned with the potential health risks (Burger et al., 1993; Pflugh et al., 1999). When deciding if a fish was safe to consume, they based their decisions on personal experience, advice from other urban fishers, or direct observation. Ramos and Crain (2001) found that 70% of urban anglers who frequently fished in Manhattan in the Hudson River felt it was a safe fishing site. Furthermore, more than half were unaware of limits on fish consumption, and 80% were unaware that limits were due to toxins like PCBs.

Most of this previous research on urban fishing—including that done by the National Oceanic and Atmospheric Association (NOAA)—has considered it a purely recreational activity (see Marjadi et al., 2021). That is, urban fishing has been treated as an optional part of everyday life. However, there is an emerging body of research focused on urban *subsistence* fishing and the socioeconomic inequalities that result in their exclusion from urban sustainability and resilience policy. Quimby and colleagues (2020: 1) define subsistence fishing as “a practice vital for the economic, material, or cultural survival of a group or individual.” These practices are specifically non-commercial (and usually non-market) but are also not done purely for recreational approaches, though the social, cultural, and psychological benefits remain an important part of the practice (Quimby et al. 2020). In their analysis of NOAA data on angler activities in New Orleans, LA and Tampa, FL, Marjadi and colleagues (2021) highlight the fact that the misalignment between research which views fishing as a purely recreational activity and the actual practice of urban anglers consuming some portion of their catch could lead to further and as of yet unknown health risks. Because, as their study shows, there is a significant correlation between race and ethnicity and fish consumption treating the lack of information about subsistence fishing as a lack of the practice itself can create a situation where already socially marginalized groups are further exposed to environmental hazards (Marjadi et al., 2021). Boucquey and Fly (2021) see this consumption-oriented fishing practice in Tampa Bay as a form of commoning leading to collective community well-being including increased food security. They also found that while 17% of their survey respondents could be classified as food insecure, 77% of respondents kept some portion of their catch and for 11% fishing “helped prevent them from going hungry” (Boucquey and Fly, 2021: 313). This pilot study seeks to contribute to the growing need for more social data by testing the feasibility of conducting larger-scale research with urban subsistence anglers in New York City to see if and how they think about pollution today.

METHODS

Study Area

The New York Harbor is between the New York City boroughs of Manhattan, Brooklyn, Staten Island, and New Jersey’s Jersey City and Bayonne, extending past the Verrazano-Narrows Bridge. New York State separates the harbor into two, with the Verrazano Narrows Bridge as the divider (NY Department of Environmental Conservation, n.d.). The harbor has been and continues to be a hub of industry for over a hundred years. This main waterway connects and supports New York City and its surrounding areas, with a population of over 9 million. As the main body of water, many sewage water outputs, wastewater treatment plants, and industrial properties line the shores. Thus, due to being a heavily industrialized urban area, the harbor contains substantial amounts of toxic pollutants, with many fish accumulating toxins in their tissues that can negatively affect human health if consumed (NY Department of Environmental Conservation, n.d.).

Observational Methods

Our goal with observing anglers at various fishing sites was to better understand what proportion of urban anglers are engaged in subsistence fishing. We compare this data to the survey and NOAA data to create an overall estimate that we can use in the creation of a more statistically rigorous sample in future research.

Study sites

Observations of urban fishing took place at several sites in Brooklyn and Staten Island with regular visits to 5 locations as well as 3 locations visited based on convenience. We chose sites (Figure 1) based on their being listed as part of New York City's Public Waterfront Access Program and flagged for use as Saltwater Fishing Sites (Ocean Breeze Boardwalk, Veteran's Pier/Shore Road Promenade, Fort Wadsworth) or because of their reputation as locations for saltwater fishing (Pier 4 at Brooklyn Army Terminal, Bush Terminal Waterfront Park). We decided to focus on these areas of Brooklyn and Staten Island after significant discussion with local anglers, due to their relative proximity and significantly different nearby populations, and because they represented a range of risks of contaminant exposure based on their proximity to industrial and organic pollution sources. It is worth noting that NYC identifies 107 distinct Saltwater Fishing Sites and NOAA identifies 70. Comparing information provided in publicly available NOAA and NYC datasets, we estimate that 27 of these sites overlap, meaning there are a total of 150 official saltwater fishing sites in New York City.



Figure 1 - Locations of regular observation of anglers.

Data collection

We visited these sites on various days and times from February 1, 2023 to May 10, 2023 and recorded the total counts of people fishing. We also looked for indicators that the fishing taking place was not just for recreation but potentially for subsistence. To do this, we looked for items that could be used to store and transport caught fish

including the use of stringers, buckets, and coolers specifically for fish. We also looked for fish cleaning supplies and gutted remains and took into consideration other factors on a case-by-case basis (including leaving reels out and not actively fishing due to inclement weather, which we felt was a probable indicator that the activity was not purely recreational). We collected data using ArcGIS Field Maps and rated the likelihood of subsistence fishing activity on scale of *Definitely Not Occurring*, *Probably Not Occurring*, *Not Sure/Unclear*, *Probably Occurring*, *Definitely Occurring*.

Observational analysis

Because we were only collecting numeric counts of anglers and informed but usually subjective estimates of subsistence activity, we only calculated basic descriptive statistics using this data in order to understand how likely it would be for a researcher to encounter subsistence anglers on a given trip to a research location. We exported data from ArcGIS Online to CSV format which we could analyze using R and we performed basic descriptive statistics on the data. We used the likelihood scale to create a range of counts by recoding Probably Occurring to 1/n and Definitely Occurring to 2/n where n is the raw estimate of anglers keeping their catch. If the recode resulted in a factor greater than 1 we reduced it to 1. We then multiplied these factors against the raw count to create a range for each observation.

Survey Methods

We collected survey data using Qualtrics between March 9, 2023 and May 10, 2023. The survey questionnaire included basic demographic information (age, race/ethnicity, citizenship status, gender identity, sexual orientation, disability status, annual household income, employment status, education level, and length of residency in New York City), five questions about fishing and subsistence as well as an optional place where individuals could clarify their responses or add more information, four questions on pollution, and an optional text box where respondents could provide any additional information they felt we should know.

Sampling methodology

For this pilot research we relied on convenience sampling (see Stratton, 2021) as there is no extant information on the number or demographics of anglers on which we could base more targeted or probability sampling methods. We encouraged individuals to share the survey with others, but we do not think this was a significant source of responses. We distributed surveys via links posted on reddit and Facebook and shared through local organizations that have some focus on fishing in New York City. Fliers with a QR code were posted at fishing sites, nearby stores and coffee shops, and distributed to bait and tackle shops throughout the city. We also administered the survey face-to-face at popular fishing sites.

Sample Size

Most calculations for considering sample size of pilot studies are focused on biomedical and intervention research or in the construction of research which seeks to understand the statistical significance and power analysis of a research problem (see Johanson and Brooks 2009; Lakens 2022; Viechtbauer, et al. 2015). While we would like to better understand the statistical significance of our preliminary findings, locational data about fishing at less than the state level has not been available since 2019 (Marjadi et al. 2021).

Our target sample size was a minimum of 12 anglers who engaged in subsistence fishing and 12 who did not based on Julious (2005). We also included non-anglers in survey results as a basic comparison in thinking about pollution with a minimum of 12 responses. Because we expect a full-scale survey to require at least 385 responses (based on 5% margin of error, 95% CI, and a potentially unlimited population size), the 36 responses represent 6.5-9.4% of a full survey depending on whether non-anglers would be included. This is also in line with other norms for pilot research in the social sciences (van Teijlingen and Hundley 2001). By comparison, recent surveys in other areas had 300 respondents (Boucquey and Fly 2021) and 106 respondents (Quimby et al. 2020).

One unexpected issue resulting from this target sample size was in having enough angling respondents who did not eat what they catch at least some of the time resulting in a reconsideration of how we defined subsistence. Recent studies have largely defined subsistence fishing as the act of eating what's caught. However, subsistence is better understood as the intent (successful or not) to eat the catch. Because our survey had already been deployed we did not want to rephrase questions and lose previous data. As a result, we further divided our responses among those who indicated that they eat some portion of what they catch about half the time or more and those who indicated that they only eat a portion some of the time but less than half as Recreational/Subsistence Anglers (see Discussion).

Table 1. Number of respondents by category.

Group	# of Respondents
Subsistence Anglers	9
Recreational/Subsistence Anglers	10
Purely Recreational Anglers	5
Non-Anglers	12
Total	36

RESULTS

How prevalent is subsistence fishing in New York City?

Based on fifty-seven observations of 162 anglers at shore-based fishing sites in New York City, we estimate that between 32 (20%) and 68 (42%) were engaged in subsistence activities. Data from the National Oceanic and Atmospheric Administration’s Marine Recreational Information Program show that 352 out of 1331 (26%) of all surveyed fishing trips in NYC in 2022 had fish available for inspection while 43 out of 395 (11%) of shore-based trips did. Adjusted to account specifically for harvest (following Marjadi et al. 2021), 18% (43 out of 395) of shore-based trips resulted in keeping what they catch. Out of the 24 survey respondents who indicated that they fish in New York City, 19 (79%) indicated that they eat the fish that they catch at least some of the time. Nine (37.5%) indicated they always or usually eat what they catch and 10 (42%) that they did less than half the time.

What populations are most likely to engage in subsistence fishing in New York City’s waterways?

It is important to note that most anglers we met were Chinese and had a limited to no English or Spanish language skills. There was also a small but proportionally significant number of potential participants who primarily spoke an Indigenous language (usually Mixtec, K’iche’, or Nahuatl) and were not comfortable completing the survey in English or Spanish. Because we could not administer the survey in these languages, we do not have an accurate reflection of their demographics. Regardless, in our survey, most subsistence anglers were not white and over the age of 35. Two anglers who responded that they were not a US citizen were subsistence anglers as was the only non-binary/third-gender respondent. Besides this, gender was not a determining variable in part because most NYC anglers (20 out of 24, 83%) self-identified as men.

Table 2 - Recoded survey data showing the counts of respondents for each demographic category.

Race/Ethnicity	Non-Subsistence	Subsistence
<i>American Indian or Alaska Native</i>	1	3
<i>Asian</i>	2	0
<i>Black or African American</i>	1	0
<i>Other</i>	2	2
<i>Prefer not to say</i>	0	1
<i>White</i>	9	3
Age	Non-Subsistence	Subsistence
<i>18-24</i>	0	2
<i>25-34</i>	6	0
<i>35-44</i>	1	3
<i>45-54</i>	3	2
<i>55-64</i>	3	2
<i>65 and over</i>	2	0
Citizenship Status	Non-Subsistence	Subsistence
<i>Not a US Citizen or Permanent Resident</i>	0	1
<i>Permanent Resident</i>	0	1
<i>US Citizen</i>	15	7
Gender	Non-Subsistence	Subsistence
<i>Female</i>	2	1

Prevalence of Subsistence Fishing in New York City

	13	7
<i>Male</i>		
<i>Non-binary/third gender</i>	0	1
<i>Disability Status</i>	<i>Non-Subsistence</i>	<i>Subsistence</i>
<i>No disabilities</i>	13	5
<i>1 or more disabilities</i>	2	1
<i>Prefer not to say</i>	0	3
<i>Income</i>	<i>Non-Subsistence</i>	<i>Subsistence</i>
<i>\$30,000 - \$39,999</i>	2	1
<i>\$40,000 - \$49,999</i>	0	1
<i>\$50,000 - \$59,999</i>	2	0
<i>\$70,000 - \$79,999</i>	1	1
<i>\$90,000 - \$99,999</i>	1	3
<i>\$100,000 - \$149,999</i>	2	1
<i>More than \$150,000</i>	2	0
<i>Prefer not to say</i>	6	2
<i>Employment Status</i>	<i>Non-Subsistence</i>	<i>Subsistence</i>
<i>Employed full time</i>	9	6
<i>Employed part time</i>	0	2
<i>Prefer not to say</i>	2	1
<i>Retired</i>	4	0
<i>Highest level of education</i>	<i>Non-Subsistence</i>	<i>Subsistence</i>
<i>2-year degree</i>	0	2
<i>4-year degree</i>	4	3
<i>Doctorate</i>	1	1
<i>High school graduate</i>	4	1
<i>Less than high school</i>	1	2
<i>Prefer not to say</i>	1	0
<i>Professional degree</i>	3	0
<i>Some college</i>	1	0

How do these urban anglers think about potential pollution contamination in relation to fishing activities?

Eighteen out of 24 angling respondents indicated that they noticed pollution or water contamination while fishing while the other six were not sure. Eighteen respondents (non-coincident) also indicated that they were concerned over pollution in the water while fishing. However, despite most noticing and being concerned about pollution, fewer noticed signage warning about pollution and the potential risks of contamination associated with it. Ten respondents could remember seeing any signage and four subsistence anglers indicated seeing signs about potential pollution. During trips to common fishing sites, both authors documented signs warning about potential pollution and contamination.

While anglers expressed different understandings of pollution, when they offered qualitative feedback, they often drew on diverse knowledge and experiences. One respondent, for example, used to work on tugboats in the harbor and based on those experiences preferred to eat fish caught only in open water or at least further from the city. Another respondent stated that even if it were legal, they would not be interested in eating freshwater fish caught in the city due to concerns about pollution from street runoff and illegal dumping into park waterways. One respondent expressed specific concerns over dumping, noting the elevated radiation levels found at certain parks including Great Kills Park in Staten Island, where elevated levels of radium were found in 2005 and where remediation is still taking place (National Park Service 2023). Great Kills Park is adjacent to Great Kills Harbor, which is home to multiple marinas, fishing charter services, and publicly accessible waterfront sites which could be used for both shore-based and offshore fishing.

One respondent noted seeing and hearing reports of more marine mammals in the area as an indicator of general environmental improvement. Another respondent stated that they “feel that NYC's water has been steadily improving. Things were a lot worse when I was young. There has been a lot of effort put in to removing pollution and there has been a lot more migratory fish, as well as humpback whales becoming a more regular occurrence in our summer months.” According to data from the Environmental Protection Agency’s Toxic Release Inventory, the annual

total and average Risk-Screening Environmental Indicators (RSEI) scores have decreased since 2012, though the 2021 total and average scores remain high. Despite their current optimism about the improving quality of the water ways, this same respondent also expressed concerns about eating fish caught in those waters and preferred “eating the fish I catch in open waters, away from areas where rivers, creeks, and streams run off into the sea.” Another respondent made a similar comment, saying “I know the [East River] is a LOT cleaner now than it used to be, but it still has some connotations that make me feel a little iffy [about eating anything caught in the river].”

How does pollution affect attitudes toward fishing?

Subsistence anglers were more likely to avoid fishing due to concerns over pollution than other anglers. While only one (4%) of the non-subsistence anglers indicated that pollution in the water had stopped them from fishing in the past, three (33%) subsistence anglers indicated that it had. Likewise, 8 (67%) non-anglers indicated that concerns over pollution had kept them from fishing.

One respondent specifically mentioned the New York State Department of Health’s safe consumption categories in determining whether they consume caught fish. These focus on a narrow set of potential chemical contaminants including Polychlorinated Biphenyls (PCBs), Dioxin, Cadmium, and Per- and Polyfluorinated Substances (PFAS). However, the EPA Toxic Release Inventory shows that most releases into New York City area waterways over the past decade of available data (2012-2021) have included toxic bioaccumulators including lead (5.59% of total releases) and lead compounds (4.69%), toluene (4.57%), polycyclic aromatic compounds (3.79%), water dissociable nitrate compounds (3.59%), and other metals including copper (3.37%), zinc (2.96%), nickel (2.39%), chromium (2.33%), manganese (1.04%), and mercury compounds (.88% of total releases). By comparison, dioxin accounts for only .37% of releases, PCBs .19%, and cadmium .07%. Likewise, the NY-NJ Harbor National Estuary Watershed, where most urban fishing activities take place, includes 536 Combined Sewer Overflow outlets which can lead to further chemical contamination beyond toxic chemical release sites (see Petrie 2021). These also release significant amounts of Fecal Coliform Bacteria and Enterococci Bacteria into these waterways which may increase risks of exposure to toxic pollutants as anglers are exposed to potentially contaminated water with few sanitation options at fishing sites. All 107 NYC saltwater fishing sites are within 500 feet of a CSO outlet as are 18 out of 70 (25.7%) of the active NOAA identified sites.

DISCUSSION

In New York City, the New York State Department of Health’s New York City Region Fish Advisories acknowledge the potential of subsistence fishing. The advisories identify edible species by area, potential contaminants, and outline how much (if any) of a species one should eat. The Department of Health categorizes advice by age and gender, with categories for Men Over 15 and Women Over 50, and Women Under 50 and Children Under 15. The New York State Department of Environmental Conservation also tacitly acknowledges subsistence fishing in setting regulations on minimum size and daily possession by fish species, but specifically refers to this as a recreational activity (NY DEC 2022). This is in line with classifications used by NOAA which sees all marine coastal fishing activity as recreational (see Marjadi et al. 2021). A search for “fish,” “fishing,” and “angling” on the New York City Department of Environmental Protection’s document portal returned only a single result relating to freshwater recreational fishing in the far northern portion of the NYC Watershed (NYC DEP 2019).

The policy gap highlighted by Marjadi and colleagues shows the possibility for additional research on urban subsistence fishing in New York City and given our general interactions with anglers it would be possible to carry out such a study. However, definitions of subsistence and time of year will affect the actual proportion of the population who are engaged in this activity, with higher levels during Striped Bass season (April-November) and lower levels in the winter, for example. In this pilot study we found that, for estimation purposes (e.g. in building out the sample size of a larger study), a range of 11-42% would cover most cases of subsistence, in line with research in other urban coastal areas. This lower count is in line with Bocquey and Fly (2021) who found that 11% of their respondents identified fishing as a means for avoiding hunger. This number could be used for stricter definitions of subsistence.

Counter to previous studies, both income and education level among subsistence anglers were not significantly lower than others. We believe there are two possible reasons for this. The first is the limited sample size of the pilot and our inability to include certain groups in data collection (as noted below). Had we been able to conduct the survey with more language options we believe we would likely have found lower incomes through more inclusion

of the Chinese population assuming that population was coming largely from nearby communities. This would be an interesting variable to track in a larger dataset and could warrant qualitative follow-up interviews with respondents to better understand motivations behind subsistence practices. Second is that we are using a relatively narrow definition of subsistence compared to other recent studies which include all anglers who eat some portion of their catch, as noted previously.

Anglers may also provide a vital source of information in better understanding the dynamics of urban pollution as well, particularly through citizen science programs which allow them to share information on apparent water quality and CSO status or through training in water and catch sample collection. Likewise, anglers who offered qualitative responses often noted specific geographies of where they felt safe. Using mapping enabled survey software could allow for people to mark areas of perceived safety and concern, allowing for more targeted water quality research in those areas rather than current testing which takes place at fixed locations. A mixed methods study which included ethnographic data collection could be a significant benefit in highlighting the nuances at play within subsistence fishing communities.

Limitations

Because we did not keep specific track of individual anglers at each location during our observational analysis, it's likely that we counted some anglers more than once. We tried to minimize the effects of this by varying the times and days of our observations. Likewise, our use of visual cues to determine the likelihood of subsistence activity may result in some false positives and negatives. However, as our goal was to see whether it is feasible to conduct research among the fishing population and due to the number of observations and our erring to less definitive responses we believe we have minimized these effects.

As noted in the results section, there are many anglers in New York City who speak only Chinese or who speak a language indigenous to Central or South America. The variety of languages spoken in even this small sample of New York City fishing locations made finding a single translator or translation team who would be capable of meeting ethical research criteria difficult with a limited budget. As a result, we could only conduct our survey in English and Spanish. Another concern is that our samples draw heavily from those who are literate in either English or Spanish and tech-savvy enough to complete the survey on their own. This means that some of the most vulnerable populations are not included in the results (Marjadi et al. 2021; see also Furman 2023). There is a significant cost associated with including these populations that involves a larger research team and potentially payment to outside consultants. These limitations need to be addressed in any full study as even a relatively simple exclusion can potentially significantly skew demographic data.

CONCLUSION

In this pilot we sought to better understand how prevalent subsistence fishing is in New York City and to see whether and how pollution factored into people's thinking about eating their catch. Our goal was to determine whether further research would be possible and if it could have potential impacts on urban public health policy. We found that there is a potentially large population of urban anglers from across demographic backgrounds who eat some portion of their catch at least some of the time. We found that there is a potentially significant population that eats a portion of their catch at least half of the time. Future research should have careful consideration of both factors and use these to create a working and perhaps context-specific definition of subsistence fishing. There is a need for a clearer definition of urban subsistence fishing that can account not only for the number of fish being taken but also whether the intent is to catch fish for food and how often people are fishing with the intent of eating what they catch in addition to their success doing so. Our pilot survey did not allow us to capture this nuance creating unforeseen issues. This information is likewise not captured in large angler surveys such as the NOAA Marine Recreational Information Program which is focused only on effort and catch and not motivation. Continuing to treat all urban fishing as recreational and therefore optional may pose a significant barrier to effective public health communication. Angler concerns over and cognition of pollution are also a potential source for citizen science monitoring of pollution related to a larger scale study and anglers were generally eager to share that information.

Based on our findings that at least by our definition, subsistence fishing is a regular practice among urban anglers in New York City and that the majority of those engaging in subsistence fishing are from marginalized groups, we believe that additional research on the political, economic, and cultural motivators of such behavior could have a

potentially significant impact on urban public health. Because subsistence anglers appear to be more acutely aware of pollution risks, we also believe that additional research on the specific environmental health risks is necessary for developing a more robust water pollution policy. However, a better definition of subsistence in terms of urban angling is necessary and may need to be developed in culturally, geographically, and contextually specific ways (cf. Quimby et al. 2020). Regardless, in treating all urban fishing as recreational, current approaches do not account for the ways that these activities intersect with urban political economies, particularly in times of crisis where food from traditional commercial sources may be more difficult to obtain due to excessive costs.

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