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Cover Page Footnote

1. As with the Alaska Department of Fish and Game, we take subsistence fishing to be defined as the “use of wild, aquatic resources for noncommercial, customary and traditional uses for a variety of purposes, specifically the direct personal or family consumption as food,” although we recognize that others have argued for an expanded notion of subsistence fishing (Schumann and Macinko 2007) Acknowledgments: The authors wish to thank the students of California State University-Dominguez Hills, who assisted in this research, as well as Anna Varney (Northwest Fisheries Science Center) for her aid with map production.

Fishing off the Dock and Under the Radar in Los Angeles County: Demographics and Risks

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Abstract.—The research presented here represents an analysis of pier-based subsistence fishing in Los Angeles County. The researchers conducted surveys and participant observation at 4 field sites on Los Angeles piers. Subsistence fishing among populations in the mainland United States has been neglected as a significant activity of research interest. This may be in part because individuals engaged in subsistence fishing are often members of long established poor, indigenous or diasporic communities. With this project, we analyzed particular marine cultural phenomena, otherwise invisible in a highly bureaucratized system of fisheries management and risk analysis, by researching and describing some of the fishing practices and fishers of Los Angeles County's piers. Ethnographic survey research reports on the unique demographics, risk perceptions, and sociocultural aspects of distinct pier-based fishing communities in Southern California.

Introduction

The nutritional abundance found in relatively wealthy nations, and their concomitant rise in obesity rates, is often contrasted with malnutrition and even famine elsewhere. But, as officials at the World Food Program have noted, a “silent tsunami” finds food price inflation worrying almost every nation, and food insecurity is spreading unevenly into new and unanticipated geographies. Food insecurity, while not necessarily a new phenomenon in some parts of the world, has taken on more urgency as it has begun to touch traditionally wealthy nations (Clemmitt 2008). Important new stressors include climate variability and change, agricultural practices which focus on alternative fuels over food products, and the ubiquity of troubled economies.

Fisheries resources are often cited as key components in maintaining world food security (Kent 1997; Garcia and Rosenberg 2010). This notion is reinforced by the worldwide consumption of seafood, which increased from an estimated 1976 total of 27 pounds per capita to 33.5 pounds per capita in 1996 (FAO 2000). Maintaining a consistent supply of seafood, however, is achieved by intensifying exploitation through commercial fishing, increasing production of the resource through hatchery programs or even supplementing wild resources with farmed species (Bailey et al. 1996; Naylor 2006). As wild catches decrease in volume (Myers and Worm 2003), new species are suddenly considered palatable, and hatchery production increases, as it did in the 1990s and 2000s (FAO 2005). Such large-scale projects mean little at the household level, where people still have to buy these foods, and where the seafood products available are often species destined for elite markets (Pitchon 2001). Non-commercial fishing in U.S. lakes, rivers, and coastal waters is often characterized as recreational, but given rising food and energy costs, this type of fishing can represent much more than a pursuit conducted for its own sake.

Food insecurity is defined as limited or uncertain access to enough quality food for a healthy life (Harrison et al. 2007). In terms of food, definitions of security stress the “assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)” (USDA 2006). Fishing for consumption, while generally accepted socially as compared to other coping strategies, can nevertheless be triggered by lack of access to retail food supplies, thus suggesting that the activity may be an indicator of food insecurity.

In this project, we analyzed a particular marine cultural phenomenon, otherwise invisible in a highly bureaucratized system of fisheries management, by researching and describing some of the fishing practices and fishers of Los Angeles County’s piers. Our multi-sited ethnographic survey research revealed the unique demographics, risk perceptions, and sociocultural aspects of distinct pier-based fishing communities in Southern California. The research presented here puts forward an analysis of pier-based subsistence fishing in Los Angeles County as a possible food insecurity coping strategy. Our research team conducted surveys and participant observation at 4 field sites on Los Angeles piers, where pier-based fishing and catch preparation and consumption are evident.

For this project, we further identified the extent to which “recreational” angling is being pursued as a form of “subsistence” fishing. As with the Alaska Department of Fish and Game, we take subsistence fishing to be defined as the “use of wild, aquatic resources for noncommercial, customary and traditional uses for a variety of purposes, specifically the direct personal or family consumption as food,” although we recognize that others have argued for an expanded notion of subsistence fishing (Schumann and Macinko 2007). The objective was to understand the drivers behind these activities, in urban areas, from the vantage points offered by the collection of sociocultural and demographic data. Issues of ethnicity, citizenship, poverty, and food insecurity were variables of interest in our research. We were also interested in the persistence of fishing and catch consumption activities despite warnings about heavy metals and contaminants that could be consumed along with harvested aquatic species.

Applying an anthropological approach to urban subsistence fishing in California, we researched these questions through a variety of methods, pulled not only from anthropology and its relatively recent emphasis on multi-sited ethnography (Marcus 1995), but from related social science disciplines (see Table 1).

Methods

Methodological Overview

We began this research with the assertions that pier anglers in LA County 1) represent low income populations, and that, accordingly, they are 2) fishing from piers to meet subsistence and income needs. In order to examine these two suppositions concerning pier fishing, we conducted three months of field work at four pier sites in Los Angeles County.

Eighty-eight pier fishers were subjected to both unstructured interviews as well as a formal survey instrument consisting of forty-five questions. Our survey included questions covering fishing habits, demographic information and, importantly, the dietary significance of the catch. Detailed field notes included other relevant information not covered in the survey, and such information was largely collected during open and semi-structured interviews that accompanied the formal survey. Qualitative ethnographic data

Table 1. Research methodologies employed in Los Angeles County pier fishing study.

Multi-sited Ethnographic Methodologies	<ul style="list-style-type: none"> • Semi-structured interviews • Unstructured interviews • Participant observation • Assessments of the social characteristics of anglers in site-specific cultural contexts
Demographic Methodologies	<ul style="list-style-type: none"> • Collection of quantitative demographic baseline data • Identification of sub-populations consuming toxin-exposed fish and shellfish
Sociological Methodologies	<ul style="list-style-type: none"> • Identification of fishermen cohorts • Descriptions of social conditions and fishing practices particularly as they relate to need and food security
Risk Analysis and Perception Methodologies	<ul style="list-style-type: none"> • Assessments of the awareness and perception of contamination of fishing sites • Data collection on the stressors and behaviors within affected fishing groups

was considered in conjunction with the quantitative survey data we collected, in order to provide a more comprehensive and holistic analysis.

Johnson (1998) used the term '*exploratory-explanatory approach*' to describe the sequencing of open-ended and structured methods for testing hypotheses about cultural beliefs and value systems. The two phases of research inherent to Johnson's approach as well as the research presented here pursue different but complementary goals, and have different information-eliciting methods and different sampling strategies. Approaching the qualitative and quantitative segments individually during the data collection phase allowed for a more comprehensive final product. We balance the contextual detail against the predictive power and comparability of results required to examine our two distinct, yet interrelated assertions. Previously, researchers, such as Kempton, Boster and Hartley (1995) and Boster and Johnson (1989), have found success in combining open-ended ethnography and structured questionnaire research to draw on the strengths of both approaches.

Exploratory Phase

The individuals of interest in our research were the shore-based fishers in Los Angeles County, and the target population specifically included those who were engaged in fishing from piers. We began the exploratory phase by observing and establishing fieldsites, establishing key informants through purposive sampling, and conducting unstructured, in-depth interviews about their social and economic circumstances. This phase constituted the ethnographic portion of the research, providing detail on cultural variables that drive pier-based angling but cannot be ascertained through more formal, structured surveys.

Explanatory Phase

The explanatory phase began with a sampling procedure to identify and secure representative groups of individuals for study. A limited sampling frame was not feasible given the absence of a comprehensive list of anglers from either fishing licenses or other sources, and public pier fishing in California is not typically licensed. We therefore used

an intercept technique that allowed for representation of the multiple ethnic populations within the study locations, and for the best available sampling approach (Bernard 2002).

The survey questionnaire was designed to gather information needed to address the specific objectives identified within the project's inception. The questionnaire included questions on ethnicity, income, education, age, fishing frequency, amount of fish consumed, types of fish consumed, preparation and cooking methods, others in the household consuming the catch, and awareness and knowledge of the state's health advisories vis-à-vis locally caught seafood.

In addition to demographics, this research revealed socio-cultural and risk characteristics associated with fishing activities, including potential exposure to toxicity. We also examined risk perceptions associated with the consumption of local catch, qualitative data on cultural identities and expressions of cultural community, and economic incentives regarding subsistence fishing. These data may inform culturally appropriate advisories to high-risk sub-populations of fishers.

Study Sites

Los Angeles County is not known for its idyllic fishing grounds and, in a sprawling, highly urbanized context, environmental threats are often competing for public attention with a host of salient concerns. Despite its place as the second largest urban hub in the U.S., however, Los Angeles County is home to communities of people who directly depend on the region's natural resources for sustenance and otherwise.

As a region with a notably high cost of living, high rates of immigration, and, accordingly, well documented issues related to localized food insecurity, Los Angeles County represents an appropriate location to investigate the subculture of subsistence living. In order to provide a suitable view on subsistence fishing activities in Los Angeles County, we selected four field sites that served as representative illustrations within the County (Fig. 1). The study piers were and are frequented by diverse racial and ethnic groups.

Many pier fishers and study participants do not live in the city in which they fish, and so the piers themselves, as locations of the activity of interest, served as the centers for community identification and our attendant survey work. With respect to subsistence harvests, pier fishing culture in Los Angeles County was evident across the research loci. There is an established subsistence fishing culture on these piers and such cultures served as the foci "communities" for this project. The target piers were the Belmont Pier in Long Beach, the Redondo pier in Redondo Beach, Hermosa Beach Pier, and Cabrillo Beach Pier. Notably, the small-scale, consumptive fishing at the Cabrillo pier occurs in the shadow of the San Pedro area of Los Angeles, one of the major current and historical centers for commercial fishing in Southern California. In the port of San Pedro, commercial fisheries were valued at \$19,444,000 in landing revenues alone (Norman, et al. 2007).

Theoretical and Analytical Framework

Subsistence fishing among non-indigenous populations in the United States has long been ignored as a significant coastal and aquatic activity. However, preliminary research has shown that small-scale fishing for individual dietary needs does occur nationwide (Jepson, et al. 2005). Knowledge regarding U.S. subsistence fishing remains shallow, however, due to both a paucity of research and the interpretation of the term *subsistence*, which in important institutions has been applied only to fishing as a primary source of

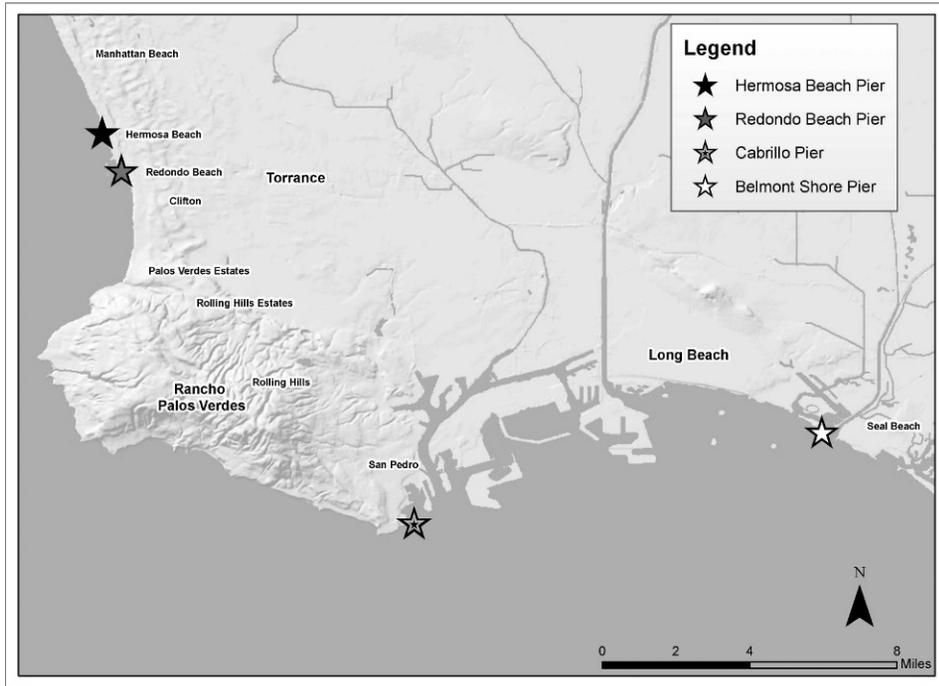


Fig. 1. Pier-fishing study sites in Los Angeles County.

food for a specific community (Schumann and Macinko 2007). Even for indigenous groups, subsistence hunting and fishing activities are sometimes called into question in the context of mixed economies or complicated sharing networks (Caulfield 1992). Ultimately, consistent and agreed-upon terminologies for describing local, non-commercial fisheries aimed not at recreation, but at individual and community consumption are lacking (Berkes 1998).

Prior seafood consumption studies in California and elsewhere have focused predominantly on demographics (Allen et al. 1006; APEN 1998; SFEI 2000), and at best have begun to introduce basic risk analyses (Connelley et al. 1996; Egeland and Middaugh 1997), leaving a gap between risk statistics and socio-cultural factors. While demographic data provide excellent baseline information, these data are often inadequate for defining what constitutes and defines these subsistence fishing communities, as well as their interest in subsistence fishing activities.

One of the suggested drivers for subsistence fishing is food insecurity, which is distinct from more extreme forms of hunger. Food insecurity is, in effect, a less visible status that is managed in inventive ways. Food insecurity coping practices include parents going hungry in order to transfer their meals to their children, or, for example, families repeatedly serving the same inexpensive foods. Food insecurity is overcome when families or individuals can maintain the “assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)” (USDA 2006).

Risks associated with inadequate food security involve not just shortages, but also the consumption of contaminated foods threatening human health. Fish resources are often promoted as the healthy dietary choice, the “brain food” rich in nutrients (Gomez-Pinilla

2008). Increasingly, however, health risks are included in statements about benefits. Fish consumption advisories are presented so that the subsistence or sport fisherman has to assess the risks of toxic exposure versus the benefits afforded in eating fish (Egeland and Middaugh 1997; Arnold et al 2005). In areas known to be at risk due to various forms of marine pollution, fishermen are often still present, their fishing activities undeterred. The oft cited reasons for ignoring warnings include distrust of the information provided in advisories and the assumption that larger closures would be enacted if the threats were serious (Burger and Gochfeld 1991; May and Burger 1996).

On the U.S. East Coast, in South Carolina, for example, education level, age, economic status, and ethnicity have all been found to correlate with the quantity of fish consumed (Burger et al 1999a). Ethnicity has also been found to affect how people receive information on fish consumption advisories and is related in general to their compliance with these warnings (Burger et al. 1999b). Along with Native American populations for whom wild caught fish consumption presents ceremonial, traditional and subsistence interests, Asian immigrant populations on the U.S. West Coast seem particularly at risk from consumptive, nearshore fishing (Sechena, et al. 1999).

Fisheries consumption studies to date have focused on toxicity risk through the consumption of sport-caught fish. Given the lack of socio-cultural data specific to this activity, however, it is important to determine the potential threat to human health posed by consumption of contaminated seafood, and to develop socio-culturally appropriate means for reducing exposure to toxins, while simultaneously discussing other drivers behind pier-caught fish consumption.

Results

Demographics, Food Security and Catch “Consumers”

Our set of demographic questions provided baseline information on survey respondents, including basic information about educational background, age, ethnicity and income levels of Los Angeles’ pier-based fishers. Among those who indicated that they ate their wild catch, at least occasionally, 68% of the respondents answered that they had completed at least one year of college. While this descriptive measure reflected a somewhat surprising result in that we had posited little or no higher education experience for those we identified as catch “consumers,” the fact is that our “consumer” survey respondents were defined as a much narrower group.

Catch “consumers” were identified as those survey respondents who consumed their pier-based catch at least 1–3 times or more in a two week period. These individuals were of particular interest to us in terms of environmental justice resource management policies, toxin exposure risks and data “gaps” in nearshore fishery management.

Research team members observed an array of ethnicities and languages on the four pier study sites. 43% of the respondents who claimed to eat the fish they caught identified their ethnicity as Spanish, Hispanic or Latino. Nevertheless, research team members observed a response bias which may have selected against Asian pier fishers. Asian pier-based fishers tended to decline to participate in the survey or were not proficient in English such that, absent a language-specific translator, research team members were not able to work with them in completing the survey. The Asian and Polynesian languages represented on the piers included Tongan, Samoan, Vietnamese, Tagalog and Chinese.

One important aspect of this survey was revealed in both the respondent comments and observations of pier fishers during our time in the field. Many of the pier-fishers typically had more than one fishing pole in the water per individual in the group, and subsequently

indicated that the quantity of catch was important to them. While most of the respondents indicated that they went fishing with friends, family members or both (60%), the goal of the outing was specifically to catch fish of a particular species meant for consumption. For example, 38% of survey respondents were specifically targeting halibut in their pier fishing efforts. Though it was then recommended that mackerel, for example, be consumed four times per month at most, the species was nevertheless targeted and eaten by 35% of those who consumed what they caught.

Slightly more than half of survey respondents identified “recreation” as the driver of their activities, as opposed to food or income. The 42% of research subjects who identified sustenance intentions over a recreational pursuit in their pier fishing activities were of particular interest to our research team. Indeed, 27% of all survey respondents indicated that they consumed their catch at least 1–3 times over a two-week period, placing one quarter of those surveyed in our catch “consumer” category.

Despite the fact that 77% of those respondents who ate the fish they caught claimed to make an annual salary of at least \$50,000, 13% of these “higher income respondents” claimed that they sometimes or often did not have enough food to eat, indicating a possible discrepancy in the accuracy of reported income. This notion that income was inaccurately reported was posited again when our results demonstrated that 10% of these “higher income respondents” reported fishing mostly for food or income, and nearly one quarter said that they were fishing for both recreation *and* food or income.

Nevertheless, 23% of the catch “consumers” who indicated that they eat the fish they catch said that they depended on their self-caught marine resources as a cost-saving food source and as a dietary supplement. Another 31% suggested that they sometimes or often worried whether their food would run out before they had money to buy more, and 24% described not being able to eat balanced meals in the past year.

Pier Fishing and Risk Awareness

Our findings demonstrated that 85% of our survey respondents indicated a general awareness of the health warnings pertaining to the fish they caught. Despite the absence of written warnings as observed by the research team, many of the pier-based anglers were indeed aware of potential health risks through “word-of-mouth” and other means. Nevertheless, survey respondents disregarded these risks, and identified several reasons for doing so. The most prevalent reason given by respondents was that the printed material was simply not disseminated on a regular basis, and that their knowledge of the contamination levels of frequently caught fish was mainly distributed by “word of mouth,” so it may have been arriving late into the formal identification and dissemination of a warning. Twenty-seven percent of the study participants responded that they consumed their catch at least one to three times over a two-week period, indicating that either they ignored the warnings or, that they were consuming the fish they caught as a cost-saving (23%) and/or supplemental dietary source (36%), regardless of warnings.

These data are important on several levels. First, despite obligatory efforts through the Montrose Settlements Restoration Program in collaboration with the United States Environmental Protection Agency to produce and disseminate printed material and to hold workshops regarding the risks of consuming pier-caught fish, the material is still not being presented to a large portion of the pier-based fishers in Los Angeles County. Additionally, pier fishers continue to target species that have high levels of contamination, including, for example, mackerel. These risk-oriented practices suggest that material communicating

consumption limits should be more widely available. Current permanent signage that exists at all four of the piers warns only of the harms associated with the consumption of white croaker (*Genyonemus lineatus*) and mussels (*Mytilus californianus*).

Pier Fishing, Food Security and Contaminant Risk

The majority of the pier fishermen with which we worked came from Los Angeles' immigrant populations. Immigrant populations of undocumented and unemployed adults constitute the highest risk for household food insecurity, and have not been part of an overall improvement in food security over the last several years (Harrison et al. 2007). Many of the Asian/Pacific Islander members of the pier fishing communities, despite precautionary measures taken by the U.S. Environmental Protection Agency (USEPA), as well as other locally oriented organizations, to warn against the danger of contaminated fish, were regularly seen fishing and preparing fish for consumption. These observations are in keeping with research from other areas of the U.S. West Coast (Sechena, et al. 1999). Our survey of these activities in Los Angeles County demonstrated that individuals from various ethnic groups do consume fish from LA County piers, as many as 27% of our respondents did so, despite problems with seafood contamination in the area.

While consumption of locally caught seafood by sport anglers may decrease issues of food insecurity, the practice nonetheless creates important issues related to potential toxin exposure. Fish consumption surveys have in fact revealed a threat to public health (West, et al. 1992; Allen, et al. 1996; SFEI 2000; Knuth, et al. 2003.) These studies have been carried out both in urban areas in California – Santa Monica Bay and San Francisco Bay (APEN 1998; SFEI 2000), as well as rural areas in the Great Lakes (West, et al. 1992), New York (Connelley, et al. 1996), King County, Washington (Sechena, et al. 1999; Sechena, et al. 2003), and at other sites.

Such studies have provided data relevant to the research presented here, in that they demonstrate which sub-populations are at the highest risk for contamination through consumption of pier-caught fish. For example, Asian anglers in the San Francisco Bay had the highest consumption rates, followed by African Americans and Latinos (APEN 2000). While these demographic data were and are important, an analysis of the underlying drivers for pier fishing activities was absent. In this research, we sought to compare our results to these prior research results while simultaneously examining the potential drivers for pier-based fishing. Our research furthered the notion that these contaminant risks were driven by issues of food insecurity at the pier fisher household level.

Part of the explanation for the risks associated with consuming pier-caught fish in the Los Angeles area are bound up in a history of local industries having discharged large amounts of dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCBs) into the ocean off the Southern California coast. Discharge associated with industrial production occurred from the late 1940s to the early 1970s, and the majority of the DDT came from the Montrose Chemical Corporation's pesticide manufacturing plant in Torrance, California. The plant discharged waste into Los Angeles County Sanitation District sewers that empty into the Pacific Ocean at White Point, on the Palos Verdes shelf.

While the United States banned the use of DDT in 1973, and PCBs in 1977, these contaminants are nonetheless slow to break down due to their stable chemical structure, and remain in the marine environment, accumulating in plants and animals. The United

States Geological Survey conducted surveys in 1992 and 1993 and found more than 100 metric tons of DDT and 10 metric tons of PCBs that still remain in benthic sediments of the Palos Verdes Shelf (Lee 1994). The sediment contamination extends from Santa Monica Bay to the Los Angeles/Long Beach harbors.

As a result, many of the most commonly caught and consumed wild fish in the LA area have levels of DDT that have prompted the State of California to issue consumption advisories, and many of these species have levels of PCBs that present additional concerns in terms of human consumption. While there are currently eight species or species groups that fall under the California State advisory for consumption, our research revealed that the permanent signage posted on each of the four piers surveyed only indicate a consumption advisory for white croaker and, in the case of Redondo Beach pier, mussels. Warning materials are available online in a variety of languages. However, despite three months of a varied daylight research presence on four of the most frequented Los Angeles piers, research team members did not encounter written fishing warning materials, suggesting that the material was not reaching all possible pier-based anglers.

Discussion

Across California, families are finding it increasingly difficult to cope with economic stagnation and disruptions in the economy. California's high cost of living often forces families to make difficult budgetary decisions. The California Budget Project found that a family of four would need to earn about \$72,000 annually to make ends meet, though only one half of California's workers earn this amount even with two full-time workers contributing to the household (California Budget Project 2007). This lack of financial stability puts 30 percent of low-income California adults in a category of being unable to put adequate food on the table on a consistent basis, a percentage that has been rising since 2001 (Harrison, et al. 2007).

Los Angeles County, in particular, has an estimated 777,000 low income adults reporting hunger or food insecurity, with an estimated 1,734,000 other people living in these households, meaning that California has a 30% rate of food insecurity (California Food Policy Advocates 2008). More than three-quarters of a million low-income adults in Los Angeles County live with hunger or make daily decisions about whether to eat or pay for other essential needs such as shelter or clothing, according to a UCLA Center for Health Policy Research Report (Harrison, et al. 2007).

By focusing on poor, minority and immigrant populations who may indeed be accessing nearshore fisheries to cope with food insecurity issues, this research was organized around two broad policy goals: expanding the examination of communities in fisheries management, and advancing potential "environmental justice" research in the intersecting realms of fishery dependence, management and marine resource toxin risk.

Through the course of this survey, we have identified several regional regulatory agencies that would benefit from the data collected, as well as further research on coastal subsistence fishers, including the California Regional Water Quality Control Board, which ranks accounting of subsistence fishing high on its list of priority issues, (Los Angeles County Department of Public Health 2007). Additionally the work presented here could inform the Environmental Protection Agency, an agency that recognizes subsistence fishing to be substantial enough to have a clause in the Palos Verdes Shelf Superfund Site document. This clause states that the Montrose Settlements Restoration Program must create "improved recreational and subsistence fishing opportunities to

offset the impairment of fishing caused by contamination present in sports fish caught off the coast of Southern California.” For the 27% of pier fishing catch “consumers” identified earlier, their use of the adjacent piers for sustenance only amplifies the importance of this clause.

Conclusion

Our research represents an overview of the nature of, and the problems associated with, pier fishing in Los Angeles County. Our findings therefore provide an understanding of the socioeconomic characteristics of sport anglers’ seafood consumption from areas known to contain species exposed to toxins. Data on pier-based fishing activities and their linkages with consumption and food security may be used to direct further toxicity studies and more importantly, to inform efforts by local, state and federal government agencies and non-governmental organizations to identify at-risk groups and further develop socio-culturally appropriate education and outreach strategies that targets these groups.

Because fisheries management in general can prove to be complex, information about the social and economic values and uses of these fisheries, even at - indeed particularly at - a scale as small as the pier-based subsistence fisher, is an important asset for fishery managers, pollution mitigation policymakers and the greater public interested in coastal natural resources and food insecurity “creep.” In Los Angeles County and in other West Coast urban areas, the fixture of the pier-based fishermen is not merely an expression of a quaint pastime, but may in fact be an indicator of the salient and entangled issues of food security and nearshore and human health.

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