

Fishery Dependent Communities in Coastal Ghana:
Nutritional Security, Gender, and Resilience

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A thesis

Submitted in partial fulfillment of the
requirements for the degree of

Master of Marine Affairs

University of Washington

2017

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Program Authorized to Offer Degree:
School of Marine and Environmental Affairs

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Abstract

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Fisheries are increasingly being considered in dialogues about nutritional security, amid concern for stresses on fisheries production. The people of coastal Ghana, whose livelihood and culture are based on fishing, present an important case in point. Are Ghanaians who live in fishery dependent coastal communities obtaining the nutritionally and culturally appropriate allocations of locally caught fish? If not, is this due to decreased landings of the small pelagic stocks the artisanal fishery relies upon, or is it due to other factors, such as changes in post-harvest distribution of fish within the country, or changes in people's dietary preferences? Does fish continue to be a culturally and nutritionally important food source for coastal Ghanaians? To answer these questions, I conducted structured interview surveys at five study sites in the Western and Central Regions of Coastal Ghana, from October to December 2016 (n=308). I utilized a feminist research approach to survey women fish processors, fish sellers, and fish consumers. I also conducted elite interviews with community leaders, fishery NGO members, and government officials (n=9). My data shows that taste in fish has not changed, and that locally-caught fish continues to be a culturally important food source for coastal Ghanaians, who recognize the role of fish as part of a healthy diet. Decreased landings and a lack of livelihood diversity seem to directly affect the ability of coastal Ghanaians, especially those in the fishery

industry, to obtain fish for themselves and for their families. However, changes in consumer purchasing power due to rising costs in fish and decreased income security for those in the fishery sector, and potential changes in fish distribution, may also affect availability of food fish. There existed key differences between the Western Region study sites and the Central Region site, suggesting that the presence and reliance of a cold store, as was reported in the Central Region, affects the community's nutritional security and vulnerability to declining stocks.

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Abbreviations

EEZ: Exclusive Economic Zone

EU: European Union

FAO: Food and Agriculture Organization

FMP: Fishery Management Plan

GAD: Gender and Development

IUU: Illegal, Unregulated, and Unreported (fishing)

MPU: Marine Police Unit

MSY: Maximum Sustainable Yield (of fish)

MEY: Maximum Economic Yield

NGO: Non-Governmental Organization

PBS: Participant Based Survey

SFMP: Sustainable Fisheries Management Plan

USAID: United States Agency for International Development

UW: University of Washington

WID: Women in Development

Study Site Abbreviations:

- SA: Shama Apo
- SB: Shama Bentsir
- As: Abuesi
- Az: Aboadzi
- W: Winneba

Introduction:

The nutritional richness of fish and other foods from the sea is increasingly being recognized (FAO HLPE, 2016). This is of particular consequence in West Africa, where relative importance of fish to the diet is highest, due to the collision of fish consumption and vulnerability to malnutrition (Golden et al 2016). There are concerns that declines in fish resources and various other stressors are affecting people's access to fish, and therefore their livelihoods, food and nutritional security. Further, there are concerns over food sovereignty, as other, wealthier nations seek access to fisheries of developing nations like Ghana. While these impacts are often debated at high-level (Asche et al 2015, Allison 2011, , Béné et al 2005 & 2007, Kawarazuka, and Béné 2010, McClanahan et al 2015), what is missing is a location specific, on-the-ground assessment of whether access to fish is changing, what is changing it. Of particular interest in this case are reported fish stock declines due to overharvest (Perry and Sumalia 2007, USAID: Ghana issue brief). This is potentially exacerbated by fisheries policy that supports fish exports and revenue generation from licenses issues to foreign fleets, as well as both domestic and foreign illegal, unregulated and unreported (IUU) fishing (Atta-Mills et al 2004, IUU Issue Brief, Kaczynski and Fluharty 2002).

I chose to study this problem by focusing on the small-scale fish processors and traders, who are most often women, who are the key intermediaries in Ghana's domestic fish trade. I also surveyed the women who purchase fish from these traders in local markets, on behalf of their households. They are the intermediaries between those in the fishery industry and the ultimate consumers. The access to fish by these women determines the role it will play in local diets. If their access to fish is changing, it will likely have a direct effect on the nutritious value of their families' diets. I drew upon a feminist research epistemology in the creation, implementation, and processing of this study.

This study aims therefore aims to contribute to an understanding of how access to fish is changing in a coastal developing country with a long history of fishing, fish trade and fish consumption. The study also explores the nutrition and health implications of observed changes in access and resources. In addition, this study attempts to speak to the livelihood dependence of women in the fishery dependent communities on local stocks, which are most often the most affected by fishery decline. Finally, this study categorizes the survey sites in regards to relative potential resilience to the observed changes.

Background of Ghanaian Fisheries

The West African coast of what is now the sovereign state of Ghana has a long fishing tradition, and is a regionally influential fishing nation. The Fante people who live on this coast have influenced small-scale fishing across the Gulf of Guinea for centuries. For example, most canoes used for fishing in the Gulf of Guinea are patterned after the Fante design (Pollnac, 1984). The first written accounts of Fante fishing activity were recorded in 1471 by European explorers (Walker 2002). Much research has been done looking at Fante ethnography (Kronfeld 1973, 1980) describing the kinship terms used and how they affect the structure of Fante fishing society. Further, Fante women have been involved in the fish trade since at least the early 1900s, and likely for longer. Fante women are often canoe owners, putting them in a position to pre-finance fishing trips and maintain economic control of the resource (Walker 2002).

Ghana's history is shaped by European nations and colonialism. It is though that pre-contact, there existed a vast network of tribal and family relations that governed fishing, fish processing, and fish distribution (Walker 2002). Ghana was first contacted by the Portuguese, who built castles along the coast that still stand today. In the 1660s, the Danish arrived to Ghana's coast, and it was during this time that the transatlantic slave trade began harvesting humans from West Africa to be shipped to the New World, many of whom were processed at the Portuguese 'castles' which had been repurposed for forts. After the Dutch abolish slavery, in 1850 they sell their forts and colonies and leave the West African coast. Britain then swooped into the void filled by the Dutch, and Ghana was a British colony from 1867-1957 (McLaughlin and Owusu-Ansah, 1994). The effects of colonialism are still felt in the fisheries sector today. The British applied European models to fish extraction, which codified men's traditional power

but not women's, allowed for open access and the introduction of new, more intensive fishing methods, and denial of local claims to fishing areas (Walker 2002).

Ghanaian fishermen have changed their ways with time, and, pushed by colonial interests, weaknesses have developed in a cultural infrastructure that once was fully sustainable. However, canoe fishermen have survived tumultuous changes in their livelihood and yet have still survived: proof of years of adaptive management and a resilience of the ecosystem (Nunoo et. al. 2006). Regardless of the history of canoe fishing companies being - for the most part - adept managers of their resources, the government has only weakened their infrastructure while making deals with foreign investors to exploit the offshore waters. Policy changes resulting in the creation of Exclusive Economic Zones (EEZs) through the 1980s-1990s created a situation where Ghanaian fishers, many of whom had a long history and society based on seasonal migration, could no longer fish in the neighboring EEZs (Jorion, 1998, Atta-Mills et al. 2004).

Since colonial times, Ghana's marine waters have been open access (Akpalu 2002), so canoe companies compete with each other and the remaining semi-industrial ships fishing in nearshore waters. However, this 'race for fish' using destructive nets was first introduced by colonial British managers, who ruled against the protests of local fishing Chiefs, with reassurance that nets with a small mesh-size would not harm the artisanal fishery, and in fact were necessary for fishing progress, since "the best fishing net is the net that catches the most fish" (Akpalu 2002, page 12). These destructive colonial practices have contributed to the decline of the nearshore fish stocks, which have direct implications for the Ghanaian people dependent on the nutrients provided by these catches.

Ghana has very productive marine fisheries. Speculation by scholars as to why the Fante fishermen have historically been so successful relate in part to the biological conditions of Ghana's waters (Perry and Sumaila 2007). Specifically, the biannual upwelling system brings cold water and large quantities of fish to Ghana's shores, creating seasons of more and less fish. Because of this seasonal nature, fish had to be preserved for consumption during times of low catches. Further, the seasonal fluctuations of fish caused historical migrations of Fante fishermen across the Gulf of Guinea, where they spread their fishing technology and culture (Walker 2002). Further, this seasonality causes income fluctuations for those involved in the fishing sector, such that monthly income may be minimal during the non-seasonal months causing fisher people experience more income inequality and insecurity (Abobi and Alhassan, 2015, FAO profile 2016,). This, together with the recorded decline in the pelagic stocks the canoe fishery depends upon (USAID: Ghana), creates situations where more juveniles are caught to fill the need for fish to land, thus potentially causing fishery collapse. This weakened the ability of the fisher people to have a reliable income, endangering not only their ability to eat enough food, but also directly affecting the amount and quality of the fish landed, thus potentially affecting the food security of many Ghanaians.

Catch sizes from the Ghanaian marine fisheries have been declining. Fish extraction peaked in 1999 at 420,000 tons to 202,000 tons in 2014. Fish exports was at a peak in 2013, at about 60,000 tons of product weight in 2001. However, to meet per capita consumption needs, fish exports have declined while imports have increased. This has caused Ghana to be in a trade deficit of \$319 million (FAO Country Brief 2016). As of 2011, imports volume exceeded export volume by a factor of 14, and placing Ghana as the third largest importer by volume of low value pelagic fish (Gordon 2011). The imported fish are put in cold stores, whereas the fish

caught by artisanal fishers are usually processed immediately in the community. According to the USAID SFMP Baseline survey, 77.8% of respondents in coastal fishery dependent communities surveyed reported that they perceived there to be less fish caught compared to five years ago (USAID SFMP Baseline). Figure 1 shows the near-collapse of the small pelagic fish, which is the backbone of the artisanal fishery

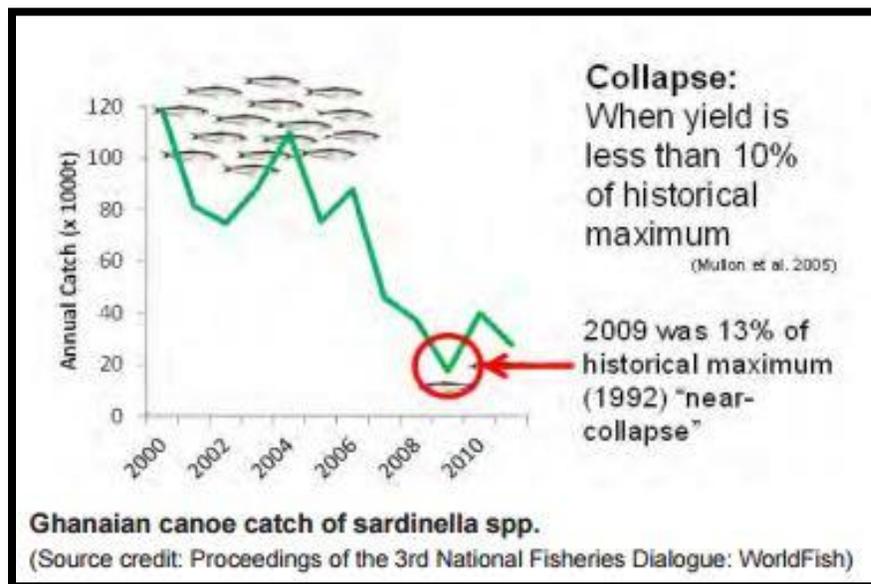


Figure 1: Catches of *Sardinella* from Ghanaian canoe fisheries, 2000-2010 (Source: Proceedings of the 3rd National Fisheries Dialogue, WorldFish/Government of Ghana, 2013, reproduced from USAID: Ghana)

Broadly, the fisheries sector in Ghana is divided in three sectors: the marine capture fisheries, the inland fisheries, and aquaculture. The coastal marine sector is the largest, making up 80% of all local fish consumed in the country. Marine Ghanaian fishers are involved mainly in three types of fishing: artisanal nearshore (also known as canoe fishing), semi-industrial, and industrial offshore (Acquay, 1991). Artisanal canoe fishing communities are mostly made up of Fante tribes (Jorion 1988), thus where I lived, worked, and where I conducted most of my

surveys was in a Fante region and with people whose first language was Fante (the exception being the study site Winneba, in the Central Region, where some of the population is Efutu).

The nearshore fishery has a fully developed economic infrastructure, relying on extensive familial tribal networks of women, who work as fishmongers and processors (Overå 1995, 2000). The artisanal fishery is segregated mostly along binary gender lines, with men going to sea in the canoes and women in control of the post-landing processing. There exist some men in the post-harvesting sector, as I encountered during my data collection, where some men worked as fish processors, and men worked as wholesale fish sellers, transporting the fish from the predominantly female fish processors to the cities where it will be sold. However, much of the post-landing sector is controlled by women, and altogether women make up a network of buyers, processors, and sellers of fish to inland Ghanaians (Overå 1995, 2000, 2011).

The offshore industrial sector is potentially a deterrent for the creation of sustainable nearshore fisheries, able to adequately meet the consumption needs of the Ghanaian population. Industrial fleets also migrate with the fish, but use bigger ships with better motors, nets, sonar and cold storage, targeting highly valued stock like shrimp or tuna (Acquay 1991), and use trawl nets to catch them, regardless of by-catch. Industrial foreign fleets take offshore pelagic and demersal fish whereas the local fishermen are constrained to inshore marine stocks (Payne 1976).

However, in Ghana not all of the by-catch is wasted, as much of it is sold as transshipment fish. Transshipment is illegal in many countries along the west coast; however, it is legal in Ghana if conducted in a port and under supervision of a fisheries manager. In this way, by-catch is not wasted, but is instead consumed (Nunoo et. al. 2009). However, illegal

offshore transshipment or Seiko fishing, which is the movement of bycatch from a trawler to a canoe, happens in open waters, and is considered a major problem for the fisheries' ministry, because Seiko limits the ability of fishing regulatory bodies to conduct accurate counts of stock landings. This limits the ministry's ability to manage for MSY, and because of the differing legality of transshipment, there is an understanding by fishermen that it is legal, and not one of the IUU (Illegal, Unreported, or Unregulated) fishing methods (Issue Brief: IUU Fishing). Thus, by-catch by the industrial fleets cannot be considered a "lost cause" as it can be in many other countries; however, there are ways in which the movement of by-catch to fish-for-food creates managerial problems for the Ghanaian Fisheries Ministry.

A recent survey of fish stocks on the coast of Ghana found that most of the marine nearshore fish caught were small juveniles, demonstrating that these coastal waters are important nurseries (Nunoo et al., 2006). Because of the valuable nature of nearshore waters as a nursery, over fishing can greatly stress fish stocks in ways we do not yet understand. It is likely that stressors from the industrial fleet are causing an increase of catches of juveniles from the canoe fishery. Further, juvenile fish offer less meat per fish, both decreasing the food source and representing a decrease in quality along all parts of the post-landing value chain (Kolding and Van Zwieten, 2011).

Finally, there exists a lack of effective management and political will to address fish stock rebuilding. Politicians often get in the way of affective fishery management, by offering to get fishers out of legal fishing snares if the fisher promises to vote for them (IUU meeting 10/04/16). The increase in IUU fishing, coupled with offshore fishing, causes the artisanal sector to have difficulty competing for decreasing stocks. Hen Mpoano works to address the

lack of political will, by working with politicians and in the media to increase education of the issue of IUU fishing.

NGOS like Hen Mpoano work to rebuild these fish stocks because there is a strong fish-eating culture in Ghana, where fish is understood to be nutritionally important, and it is becoming difficult for fisheries to sustain both the food source and the livelihoods dependent upon them. Coastal fishing communities have long been understood to be of high importance to the nutritional security of Ghanaians, wherein small-scale fisheries provide an important protein source for local populations (Pollnac, 1984). Ghanaian small-scale fisheries provide the majority of the national fisheries catch (Abobi and Alhassan, 2015). Over 250,000 fishers are directly capturing marine resources in Ghana (FAO profile 2016), and, if the members of their households are included, it is estimated that between 1.5 million and 2 million Ghanaians participate in the artisanal fishing sector. A further 500,000 further Ghanaians are employed by the canoe building, processing, trade, packaging and transport sectors that are associated with the artisanal fishing industry (Abane, 2015). According to the FAO, in 2014 there were 77 thousand employed by the marine capture fisheries sector (FAO profile 2016). Altogether, fisheries make up at least 4.5% of the Ghanaian GDP (FMP 2015-2019). There have recently been active efforts by the government to support the nearshore artisanal fishery sector in Ghana (Mutimukuri-Maravanyika et al. 2013), because of their importance as source of both livelihood and nutrition.

The industrial sector is poorly policed, as it does not have to report by-catch, and restrictions to access are based on hull size, not on amount of fish extracted per outing (Kaczynski and Fluharty 2002). Industrial fleets are joint venture, with a Ghanaian crew and foreign captains, and are funded by investors who pay for the best equipment in order to catch,

process and sell valuable stocks (Atta-Mills et. al. 2004). Thus, the industrial fleet provides capital to some Ghanaians, and the fish and nutrients all leave Ghana's shores. The offshore sector is further compromised by the presence of illegal foreign fleets, due to a lack of funding for ocean patrols, the EEZ open access to these ships (Atta-Mills, et. al. 2004).

However, policing efforts have increased in the Ghanaian EEZ. The Ghanaian Fisheries Act of 2002 established the fisheries commission to govern Ghana's EEZ, and established licensing rules for foreign, industrial, and semi-industrial fleets (Fisheries Act 2002). The act was amended in 2014 to include further regulations aimed at reducing illegal, unregulated, and unreported (IUU) fishing (Fisheries Act Amendment 2014). Further, the 2010 Fisheries Regulation Act established the development of Fishery Management Plans (FMPs), increased gear regulations, and established licensing of local and semi-industrial vessels (Fisheries Regulation Act 2010). The 2015-2019 FMP attempts to manage for both maximum sustainable yield (MSY), which is the maximum capacity an ecosystem can produce, and maximum economic yield (MEY), which is the greatest amount of money resource use can generate. Further, biodiversity protection and strengthening of co-management are both listed in the main priorities of this plan. (Fisheries Management Plan 2015-2019). Thus, management is attempting to rebuild stocks and reduce IUU fishing in marine waters. However, IUU fishing continues to be on the rise (Issue Brief: IUU Fishing), wherein 51.7% of surveyed respondents of the USAID SFMP Baseline Survey reported that IUU had "increased a lot," and 17.0% reported "increased somewhat." Therefore, despite managerial efforts to police IUU fishing, the fishing efforts appear to be increasing, making the jobs of the MPU, Fisheries Ministry, and associated NGOS that much harder.

In addition, the Fisheries Ministry issued a Ministerial Directive in 2016, which declared that, as part of the FMP, the Ministry was calling for a closed season for the industrial fleets, spanning from November 1st to November 30th 2016 and February 1st through March 31st 2017. The fine for violation of the declaration ranges from US\$500,000 to US\$2 million, as well as forfeiture of vessel, gear, and catch. Thus, the Fisheries Ministry has been attempting to better govern the EEZ in order to maintain stock levels for regular resource extraction. The European Union has recognized this improvement, and in 2015 changed Ghana's 2012-initiated "yellow card" status to "green card status."¹ This improvement recognized Ghana's efforts to curb IUU fishing, and allowed for increased imports of fish from Ghana into the EU (IUU meeting, 10/04/16). Further, the establishment of the Marine Police Unit (MPU) allowed for better policing of the Ghanaian EEZ and enforcement of the country's increasingly strict management laws. In these ways, the Ghanaian government is working to rebuild declining stocks, which in turn help maintain the livelihoods of those who depend upon the fish.

¹ The EU grants a colored card to countries from which it imports fish based on how the EU perceives the country as addressing IUU concerns. A country with a yellow card has a problem with IUU fishing, and thus the EU will not import from them. A "green card" status demonstrates that the EU will import fish from that country. (EU 2016)

Frameworks

Nutritional Security

Scholars are becoming increasingly aware of the interactions between human rights issues, such as food security, and fishery management. According to Edward Allison et al., “Participatory assessment of vulnerability in African fishing communities shows that priority concerns of fisherfolk are health, food security, access to cash, lack of infrastructure and education (emphasis added).” Neither concern for fish stock numbers nor accessibility were found to be priority resources (Allison et. al., 2012, page 19). Food insecurity therefore can lead to poorly managed fish stocks, which can cause fish stock collapse, leading to further food insecurity. Thus, scholars are working to connect the links between fisheries management and food security (Bené 2007) to better manage fish for food consumption.

Along these lines, in 2016 the FAO released a brief directly relating to strengthening fishery management policies to better manage for nutritional security (FAO Brief 2016). The involvement of large organizations such as the FAO and USAID with projects linking fishery management and nutritional security demonstrate how important these linkages are for maintaining healthy populations. An important distinction is that the current nutritional security projects that relate to fisheries focus not only on the fish as an important source of protein, but of micronutrients essential for health and development (Kawarazuka, and Béné 2010) Nutritional insecurity, especially relating to fisheries, is said by scholars to be caused via three mechanisms: a decrease of a highly nutritious food source, decrease in income and purchasing ability of food due to effects fish stock decline on fishery related livelihoods, and a lack of control by and empowerment of women. The last component is complicated in the case of Ghana, where women have relatively strong resource control, however there are on-the-ground efforts to include women’s voices not only in the management of the resource post-landing, but in

managerial efforts relating to at-sea fish extraction. Women in Ghanaian fisheries are often considered to have more resource control than women with fishery livelihoods in other developing countries, specifically because the fish-processing job is usually gendered (Overå 2011). In Ghana, women often have control over family income and food purchasing decisions, and research supports that enhancing the economic status of women in fishing communities can increase nutritional security (Kawarazuka, and Béné 2010). Hen Mpoano works to empower women in the fisheries sector by making sure women are invited to community events and that they are able to voice their concerns for every aspect of sustainable fishery management. Thus, nutritional security can be directly affected by fishery management.

However, before continuing it is important to define for the scope of the thesis what are the important food and nutritional frameworks used. The original food access framework, and the one most commonly cited, is that of food security. The concept of food security has been written about to great lengths by the Food and Agricultural Organization (FAO) of the United Nations. The first official definition of food security was:

“The availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices (United Nations 1975 cited in FAO 2003).”

This definition is limited in that it does not discuss nutrition, nor the possibility of policy reasons why a community might be food insecure. In 2001, the FAO revised their definition of food security, stating that

“Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. (FAO 2001 cited in FAO 2003)”

This definition expands on the previous to include many important concepts, including nutrition and cultural food preferences. Thus, over time the FAO has attempted to produce more nuanced definitions of food security.

Next, a relevant framework, and the one cited in the title of this thesis, is “nutritional security.” Nutritional security builds upon the food security framework by focusing specifically on the nutritional value of food sources. Nutritional security is defined as “adequate nutritional status in terms of protein, energy, micronutrients, and minerals for all house-hold members” (Quisumbing 1995). Thus, the nutritional security framework expands upon food security by focusing on the nutrient content of food, not just the caloric content. This allows nutritional security concerns to focus on the “hidden hunger” of eating highly caloric, nutrient poor diets (Kennedy et. al, 2003). Further, the nutritional security framework encompasses environmental harms that could contribute to malnutrition (Gross et al 2000). Nutritional security is especially relevant for discussing fisheries, because of the high nutrient content of fish. Increased consumption of fish by the poor is thought to decrease malnutrition (Bené 2005). Thus, most frameworks that discuss the need to manage fish for consumption do so using the “nutritional security” framework.

A final relevant food access framework is that of food sovereignty. According to Patel (2009), the concept of food sovereignty is over defined, with so many versions of the concept that it becomes difficult to concisely define exactly what it means. Patel defines food sovereignty as “a call for peoples’ rights to shape and craft food policy (2009).” This differs from the FAO definitions of food security above because, according to the FAO, food security is

the right to access nutritious food; however, food sovereignty is the right of people to construct their own food policies.

Given the many differing definitions of food sovereignty, it can be difficult to create a food sovereignty model. In fact, according to Windfuhr and Jonsén (2005), claim that, at present, it is impossible to create a fully-fledged ‘food sovereignty model’ in terms of a set of policies that can be used by managers (page xii). They claim that the food sovereignty framework is not finalized, but instead is still being formed. In regards to a definition of food sovereignty, Windfuhr and Jonsén (2005) refer to the 2002 People’s Food and Sovereignty Network Definition:

“Food Sovereignty is the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; to determine the extent to which they want to be self-reliant; to restrict the dumping of products in their markets; and to provide local fisheries-based communities the priority in managing the use of and the rights to aquatic resources. Food Sovereignty does not negate trade, but rather it promotes the formulation of trade policies and practices that serve the rights of peoples to food and to safe, healthy and ecologically sustainable production. (Page xiii)”

The above definition is of particular interest to me, given that it directly addresses the rights of fishery-based communities to access nutritious food. To further define food sovereignty, Windfuhr and Jonsén (2005) also include the International Planning Committee on Food Sovereignty’s definition of food sovereignty:

“Food Sovereignty is the Right of peoples, communities, and countries to define their own agricultural, labour, fishing, food and land policies, which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies. (Page 12)”

It is clear that, given these definitions, there are two main differences between food sovereignty and food security. First, food sovereignty explicitly defines access to nutrition as a right, where food security's language is not that strong. Secondly, food sovereignty relates to the ability of communities to affect policies and the political processes that contribute to food security, whereas food security only describes access to food, and does not detail the need for communities to have political agency in regards to food distribution policies. While both the most recent definitions food security and food sovereignty describe the need for people to eat the foods they desire, food sovereignty places more emphasis on cultural appropriate food sources.

A further aspect of food sovereignty that makes it relevant to my interests is a positive correlation between food sovereignty and resilience (Walsh-Dilley et al. 2016). Resilience theory will be discussed in greater detail next section, however according to Walsh-Dilly et al. (2016), food sovereignty and resilience are linked, since food sovereignty emphasizes “equitable localized control over knowledge about food systems” (page 11). However, although resilience theory has taken hold in development communities, food sovereignty has yet to do so. Walsh-Dilly et al. argue that including food sovereignty principals into resilience models will help bolster both types of models. One of the most important aspects of food sovereignty is the right of people to have agency over food distribution, and “the right to the social, political, and natural resources that allow [resource dependent communities] to determine and define their own systems of food production and consumption” (page 11). Food sovereignty is likely to lead to nutritional insecurity, given that when people have agency over their food system, there is the ability to choose foods for health and nutritional value, not simply based on ease of access to inexpensive calories.

Thus, I have drawn upon food security, nutritional security, and food sovereignty frameworks. The food sovereignty framework is most important for its discussion of resilience within the definition, while the FAO Food security definitions are often the most cited. Food sovereignty is also likely to lead to nutritional security, because of the common correlation between customarily important foods and nutritious ones. For this thesis, I rely most heavily on the nutritional security framework, given that discussions of fish for food often focus specifically on the nutritional value of fish.

In Ghana, fish represents an important source of nutrition. Not only does fish provide Ghanaians on average 8 grams of protein per capita per day (FAO Profile 2016), they are a source of important micronutrients such as protein, iron, calcium, iodine, potassium, and Vitamins A, B2, And B6 (Béné and Heck, 2005). Pelagic fish are the most consumed fish by Ghanaians, and account for about 70% of marine capture fish species (FAO country profile: Fisheries and Aquaculture). However, according to the USAID SFMP Baseline survey, 39.4% of respondents reported “moderate to severe hunger” according to the population based survey (PBS) indicators as designed by the Feed the Future (USAID/BFS 2012). This speaks to a potential for nutritional insecurity in the surveyed fishery dependent communities, but the further metric, that also using the PBS indicators, 40.5% experienced low dietary diversity, potentially shows that there is an even higher likelihood for nutritional insecurity in the communities (USAID SFMP Baseline). Thus, nutritional security is a necessary framework to discuss the consumption of fish in Ghanaian fishery dependent coastal communities, especially given the importance of fish-for-food and the recorded declines of fish stocks.

Resilience

As mentioned above, Nutritional security and resilience frameworks are in ways intrinsically linked. When a people have access to nutritious, culturally appropriate food, they are more likely to be able to overcome shocks. According to Walker and Salt (2012), the definition of resilience is:

“The capacity of a system to absorb disturbance and reorganize so as to retain essentially the same function, structure, and feedbacks – the have the same identity... resilience is the ability to cope with shocks and keep functioning in much the same way (page 3)” Walker and Salt elaborate on the idea of “identity,” which I believe to be of particular importance to this study, as something that

“imports the idea that people, societies, ecosystems, and social-ecological systems can all exhibit quite a lot of variation, be subjected to disturbance and cope, without changing their “identity” – without becoming something else (page 3)”

Thus, the resilience framework contains many of the same themes as the nutritional security frameworks, namely the ability of a people to maintain a certain way of life that they determine.

One of the key tenants of resilience theory is that biological and social dimensions are linked. Walker and Salt site fisheries as an example of how management only using biological data, in this case for stock management based on MSY, and not accounting for economic factors that could influence fishing trends. The resilience framework discusses “thresholds,” defined as “limits to how much a self-organizing system can be changed and still recover” (Walker and Salt 2012, page 4). When fishing management account for only MSY and not social factors that could influence fishing trends, for example poverty, the factor of overfishing due to hunger or immediate need might not be factored into the management plan. This can cause the fishery to cross a threshold, and enter collapse or near-collapse. Importantly, crossing one threshold may cause the cross of multiple thresholds, because of the ways the systems are linked.

Finally, it is important to note that the resilience framework is not about not changing. Resilience “requires changing within limits – in fact, probing those limits.” Thus development, described below, is not counter to resilience framework, but can work in tandem with it. Resilience framework argues that it is possible for there to be resource management that addresses the needs of the resource users as well as the resource itself, as well as proper development practices to meet these goals.

Resilience is often studied in terms of livelihoods, which is of relevance to this study. Livelihoods are defined as the assets, activities, and access to them, that together determine the living gained by an individual or household (Hanazaki et al. 2012). In one case study in Coastal Brazil, the researchers found that, “at the community level, shortage of fish catch is likely to affect the resilience of communities with lower diversity of livelihood options and higher dependence on fishing, but not the resilience of other communities that either have a higher diversity of livelihood options or lower diversity of livelihood option but also a lower dependency on fishing (Hanazaki et. al. 2012, page 162). Further, a case study of small farming communities in northern Ghana concluded that nutritional insecurity was linked, in part, to lack of livelihood diversity and therefor resilience (Hesselberg and Yaro 2006).

Thus, resilience is the ability of a community to change, or recover from crossing a threshold, without losing its core identity. Further, resilience is often bolstered by livelihood diversity. Finally, resilience framework relates both to fishery management and nutritional security, and to development practices, discussed below. In this socioecological ecosystem, the most likely threshold is that of the collapse of the nearshore canoe pelagic fishery. It is likely that livelihood diversity would allow for an increased resilience to this threshold if it were to be

crossed. Thus, the resilience framework was used to construct and interpret the questions relating to livelihood diversity. I was able to ask questions relating to subject's livelihoods, and extrapolate how likely resilient they are to thresholds in the fish stocks.

Gender and Development

The final framework I utilized within this thesis is the Gender and Development (GAD) framework. Development is inherently a part of fisheries management, as new technologies and access to technology affect management strategies. Further, gender empowerment is linked with nutritional security, as described above, as empowering women can potentially improve the nutritional security of a community. Finally, resilience theory contains the idea that women's empowerment can improve the resilience of a people, which is very much in line with the tenants of the GAD framework. In fact, scholars are attempting to explicitly bridge the gaps between resilience framework and gender frameworks, such that research and projects can be conducted with a joint resilience and gendered framework. They found that, while the two frameworks in ways speak to the same problems and desired results, resilience analysis is weakly engaged in gender theory, and gender theory discusses sociological resilience but not ecological resilience (Kawarazuka et. al., 2017). Thus, GAD framework is connected to the previously described frameworks.

GAD is a development framework used to create development projects that include a focus on gender equality. The GAD framework was developed to improve upon the Women in Development (WID) framework. The WID framework is based on empowering women through neoliberal market interventions, and the GAD framework criticizes this, instead advocating for a less market based, more societally aware approach to development. GAD framework instead focuses on the relational position of women within society (Rai 2011).

Further, it is important to define “development” for the scope of this thesis. Bailey and Jentoft (1990) define development as relating to fisheries as “a process of change through which sustainable and equitable improvements are made to the quality of life for all or most members of a society” (page 335). Moreover, just as livelihoods and resilience theory are linked, so are livelihoods and development. Some academics advocate for the use of a “sustainable livelihoods” approach to fisheries development, in order to base development strategies not on increasing profitability of the fishery but on improving the livelihoods of the resource users, again including livelihood diversification (Allison & Ellis 2001). Similarly, GAD framework advocates for development that is equitable, but grounded in gender equity.

The gendered division of labor in the Ghanaian canoe fishery and power of women is well documented. Women fish traders have a power in the food production system rarely seen in other developing countries (Overå 2011). Within the communities, the fish traders are represented by the *kokohene* or Queen Mother, a role analogous to the head fishermen amongst the men (Gordon 2011). Because of these community structures, development and modernization efforts that lead to an increase in production created new opportunities for the fish processors in Ghana (Overå 1993). According to the FAO, in the case of Ghana “it was women’s access to social capital and networks that secured their control over technology and resources” (FAO 2015. page 25). However, it is not just the question of the women in the system; it is a question of how gender affects development. GAD is interested in the power relations between genders, and not just how women operate alone, which they do not in this case. Women in these communities are supported by male fishermen who are often husbands or relatives. Both men and women can own canoes and finance fishing trips, thus owning the resource once it is landed.

I utilized a GAD approach in conjuncture with the feminist methodologies (described below) during multiple parts of the thesis process. First, research design was affected by development metrics, as some study sites were excluded due to being too “developed” and not fishery dependent enough. Further, while doing field observation, I was able to be discerning over what signs of development I looked for: the state of the roads, the accessibility of the town, and the presence or absence of refrigeration for fish. Finally, the GAD framework allowed me to process my data and experience with a critical lens. It would be inappropriate for me to simply state that more “development” would inherently better the community, which is described in more detail in the results section. Without a gendered perspective, a researcher might be enthusiastic to make a development recommendation, which could have potentially unintended negative consequences.

Methods

Feminist Approach

My methods were governed by a feminist research approach. Feminism as a liberation movement is something that has always been important to me, and it was imperative to utilize feminist research methodologies in my study in order to produce the most honest study I thought I could. It was a feminist approach that led me to the women in the Ghanaian fishing industry in the first place, many years ago. When I got to SMEA, it was important for me to attempt to go to Ghana and work with the women in the artisanal industry, and this was largely driven by my passion to be a feminist researcher in the realm of fisheries and equity.

Feminist methodologies focus on an explicit recognition of the power dynamics between the researcher and subject and trouble social hierarchies present in sociological research by establishing rapport with the subjects, from one woman to another. Prominent feminist author Sandra Harding defines a feminist method as the particular research tools and practice used to gather information, whereas a feminist methodology is the theorizing about research practices and their implications for people and communities. Further, DeVault and Gross (2011) expand upon this theory, stating, “Feminist researchers have mostly used standard methods, and that distinctive feminist insights have come in our strategic theorizing about research process and knowledge production” (page 175). For this thesis, I utilized a few key methods.

Mixed Method Methodologies

My research methods included face-to-face structured interview surveys, elite interviews, observations, and a review of the relevant texts (“Background,” page 13). Given that my effort was to attempt to tell the “story” of how women in fishery dependent coastal communities are

relating to and accessing a primary food source, a combination of methods was required. Further, the questions I wanted to ask required in-person interviewing methods, thus my research required me to physically go to coastal Ghana.

To make the best use of my three-month study period, I decided to use the most methods at my disposal, thus this thesis utilizes mixed methods. Mixed methods specifically describe studies wherein quantitative and qualitative methods were utilized. Some scholars believe that mixed methods are strongest, because they provide the most robust assessment of the study subject (Onwuegbuzie 2005, Terrell 2002, Tashakkori and Teddlie 2010). The qualitative research involved structured interviews, elite interviews, observation, and a literature review. The quantitative methods involved testing the results of the structured interview survey, specifically to see if any study site tested as different from the others.

Structured Interview Survey

My primary method was the structured interview survey, using interpretation. A structured survey interview is explicitly different from a survey that is sent in the mail, and can be defined as:

“A structured interview consists of an interview based around a predefined set of questions. The questions provide a consistent structure for the interviews but the interviewer can discover knowledge by seeking confirmatory evidence as necessary. The interviewer can also explore the experience and language of the interviewee to put the answers in context. Thus many of the shortcomings of an independent survey are overcome.” (Snook and Harrison 2001, page 276)

This method was the only appropriate method to attempt to answer my research questions. Given the high rates of illiteracy in the subject communities and the need for interpretation, I would not have been able to have a text only survey. Further, I could observe the respondents’ reactions to the questions, even if I was not able to understand the language. It

became clear which questions respondents mostly thought were ridiculous, amusing, or serious. I was also able to allow subjects to elaborate or interject, if they were inclined. Finally, Snook and Harrison (2001) conclude, “other empirical assessment techniques should be used to test the results of the structured interviews,” which aligns with my statistical methods.

Given that I gathered my survey data using structured interviews, I relied upon feminist interviewing techniques to create rapport with the subjects. Again, feminist interviewing refers mainly to the methodology, not the methods of interview. Thus, I paired the feminist approach with a variety of interviewing techniques I had learned (Dexter 2006, Boynton 2007, Denzin 1994).

I conducted a total of 308 structured surveys (Appendix III), 305 with women. Of the 3 men, two were fish processors in Shama Apo, and one was a little boy selling fish in Aboesi who I thought at first was a girl. During the survey design, I wrote questions that attempted to be two pronged, in order to most easily test for differences between study sites. Whilst conducting surveys, however, I found that most turned into three, with “yes/no” questions turning into “yes/no/other,” wherein the “other” represented an answer of uncertainty. Further, I asked some open-ended questions as a follow up. For example, I asked mothers if they would encourage their child to be in the fishing industry, and if they answered “no,” I would ask “why not?” Due to the nature of the structured interview survey, the data collected was mostly qualitative, some of which could be analyzed qualitatively to discern differences between study sites.

Again, the feminist approach informed the design of this survey, as I chose to speak to women and specifically wanted to study gender issues relating to fisheries and equity. Of

importance was my choice in two female interpreters, both of whom grew up in the communities where they interpreted for me, and who knew or even were related to the women I surveyed.

I looked to feminist literature to inform my survey design and interview implementation. An aspect of the feminist research approach is the relation of the researcher to the subject. While most interview research methodologies favor a separation between the interviewer and interviewee, feminist methodologies encourage the establishment of rapport by blurring the line between researcher and subject (Edwards 1990, McDowell 1992). The relationship between the interviewer and the subject is more intertwined than in non-feminist data collection. In the feminist approach, the relationship between the interviewer and subject is seen as non-hierarchical (Edwards 1990), wherein the researcher makes direct effort to not view subjects as “objects of the researcher’s gaze” but instead as women with whom the researcher shares common interests (DeVault and Gross 2011, page 178). For my researcher, I termed this non-hierarchical relationship “strategic sisterhood,” wherein women can draw upon shared experiences of femininity in order to establish rapport with the research subjects. I attempted to follow the advice that, during research, “commonalities of experience should be recognized and become part of the mutual exchange of views” (McDowell 1992, page 405). Feminist research can draw upon shared understandings and biases to trouble the usual hierarchical relationship of interviewer to interviewee.

As feminist research seeks to make explicit power relations, race is also of relevance, especially as a white woman conducting research in Ghana. The feminist approach helped make me more cogent of this, by teaching me that “the way the gender of black women is constructed differs from the construction of white femininity because it is also the subject of racism” (Carby

1982, page 213). One researcher, Amy Best (2003), drew the following two-fold conclusions: white women cannot rely upon “strategic sisterhood” with women of color because the power relations between the races is so varied, and that in order to overcome this hurdle, the researcher must make explicit her position of racial power before conducting an interview. Feminist methodologies encourage the overt recognition of social differences in the interview setting in order to disrupt the inherent hierarchy of interview situations, thus this disclosure of racial power structures is in lock step with feminist methodologies. Further, a feminist interviewer always needs to situate herself in the relevant power structures in every interview she conducts, no matter if the interviewee is subject to those power inequalities or not (Best, 2003). The relative success of my attempt to utilize feminist methodologies in the structured interview survey are discussed in further detail in the discussions section.

Quantitative Analysis

For my quantitative analysis, I tested some of the close-ended results of the survey. I tested for frequency differences between sites by using the fisher’s exact variant of a chi-squared analysis to process the data. I chose this variant because it is more conservative, and in some cases, my count of responses was zero. These tests allowed me to report on if there were statistical differences in the frequency of responses across study sites, or if any differences are small enough to be attributable to chance. The analysis of the surveys makes up the bulk of my thesis, and are described in detail below.

Other Qualitative Methods

Further, I utilized two more qualitative methods in order to paint a more complete picture of the fishery dependent communities in coastal Ghana: elite interviewing and observation.

For my elite interviews, I utilized the methods of key informant and elite interviews espoused by Dexter (2006), in which the interview subject is treated as a “VIP expert” in the field of study, and the interviewer relies upon that power dynamic to obtain data. Altogether, I conducted 9 elite interviews with community leaders (1), NGO employees (3), and government officials (5). One of the NGO interviews was conducted before the survey data collection, in order to inform the survey design. The community leader interview was conducted with the Chief Fisherman of Aboesi, the employer of my interpreter Priscilla, who helped explain some of the data I was collecting during the structured interview surveys. The rest of the elite interviews were conducted after the surveys had been completed, in order to help me answer some lingering questions about how the system worked, and help me interpret my data. For example, during the interview with the government officials, I learned that my question “do you consider eating fish an important part of being Ghanaian?” (for which I received a 100% positive response), would have likely met with a decreased positive response had it been posed inland. This was something I suspect, but it was key for an expert to confirm it.

Each of these elite interviews was conducted in English, recorded, and transcribed by myself after the interview was completed. Most of these interviews were one-on-one, with the exception of the interview with members of the fishery commission, the branch of the Ghanaian government that governs fishery management. There, I interviewed five government members at once, which had a different dynamic than one-on-one but allowed the respondents to expand upon each other’s answers. The data collected from these interviews help paint a broader picture of the post-landing value-chain, the associated policies and their implementation.

Finally, in Ghana I utilized observational techniques (Conway 2006, Denzin 1994) while designing the survey instrument, conducting research at the study sites, working at both NGO offices, and while attending two IUU meetings. Elite interviews, meeting attendance, and observation all allow me to supplement the survey information with a more complete understanding of fishery dependent communities in coastal Ghana.

Post Field-Work Analysis

As well as informing interviewing techniques, feminist methodologies also extend to the post-fieldwork analysis, and informed the processing and writing of this thesis. Feminist methodologies continue to center intersectional feminist issues in the forefront of research data processing, forcing the researcher to be explicit about power dynamics of the research process. Of further importance is the methodology used in the theorizing, production, and dissemination of that data. Feminist methodologies can be an important tool to ameliorate unbalanced power structures previously found in interview based research (DeVault and Gross 2011). By having a paper be open access, for example, a researcher is able to disturb the power imbalance that might make it impossible for research subjects to access the research they participated in.

For this thesis, my post-field work analysis included a Gender and Development (GAD) critique. I utilized GAD techniques (described below) to understand not only the gendered relations of the fishing industry in coastal Ghana, but also to analyze my study and potential development related recommendations.

Further, by utilizing a feminist approach I must make explicit to the reader my own reflections on my relative successes and failures to conduct feminist research. This is elaborated on in the “discussion” section.

Field Research

- Hypotheses
- Study Sites Location
- Interpretation
- Creation of the Survey Instrument
- Pre-Implementation Methods
- Survey Respondents
- Sampling Methods
- Survey Implementation

Hypotheses

First, I wanted to see if fish was the preferred protein in my study sites. Changing amounts of fish consumption could be related to changes in taste, and if people are substituting fish protein for other animal protein, which tells a different story than if fish protein is substituted in the diet with carbohydrates. Thus, I hypothesized that fish is the most important protein source, in comparison with other sources of animal protein, to coastal Ghanaians.

Further, I hypothesize that it is more likely that decreases in pelagic stocks is causing nutritional insecurity than changes in preference. If people have the same preferences but are buying and/or consuming less fish, it is likely that fish stock decline is causing the decreased purchasing or consumption of fish.

I also wanted to see if certain groups of women were more prone to nutritional insecurity than others. I hypothesized that widows and unmarried mothers would be the most nutritionally insecure demographic, compared to married women, either with or without children.

Finally, I was curious if there would be any differences between the study sites, especially between the four in the Western Region and the one in the Central. Because there are too many variables, it would be impossible to say what caused any observed differences between the study sites. However, it appeared to me after completion of the surveys that the fish

processors in Winneba were less dependent on fish from the landing beach, and were more likely to buy from a cold store in comparison with the study sites in the Western Region.

Because of this, I hypothesized that the fish consumers in Winneba were noticing less decline in fish numbers compared to the fish processors in the Western region study sites. If the fish processors are not experiencing a decline in fish as sharply, it is possible they have more resilient livelihoods than their counterparts who have less access to, or culture around, the use of a cold store. Further, I hypothesized that residents in Winneba experienced less nutritional insecurity compared to the residents of the four other study sites. Again, there is not an attempt to explain causality as many complicated factors could influence why one region experiences differing rates of nutritional insecurity.

Study Site

I chose five study sites in Coastal Ghana, four in the Western Region: Shama Apo, Shama Bentsir, Aboesi and Aboadzi; and one in the Central Region: Winneba. The study sites can be seen in Figure 2, as generated by the GIS specialist at Hen Mpoano.

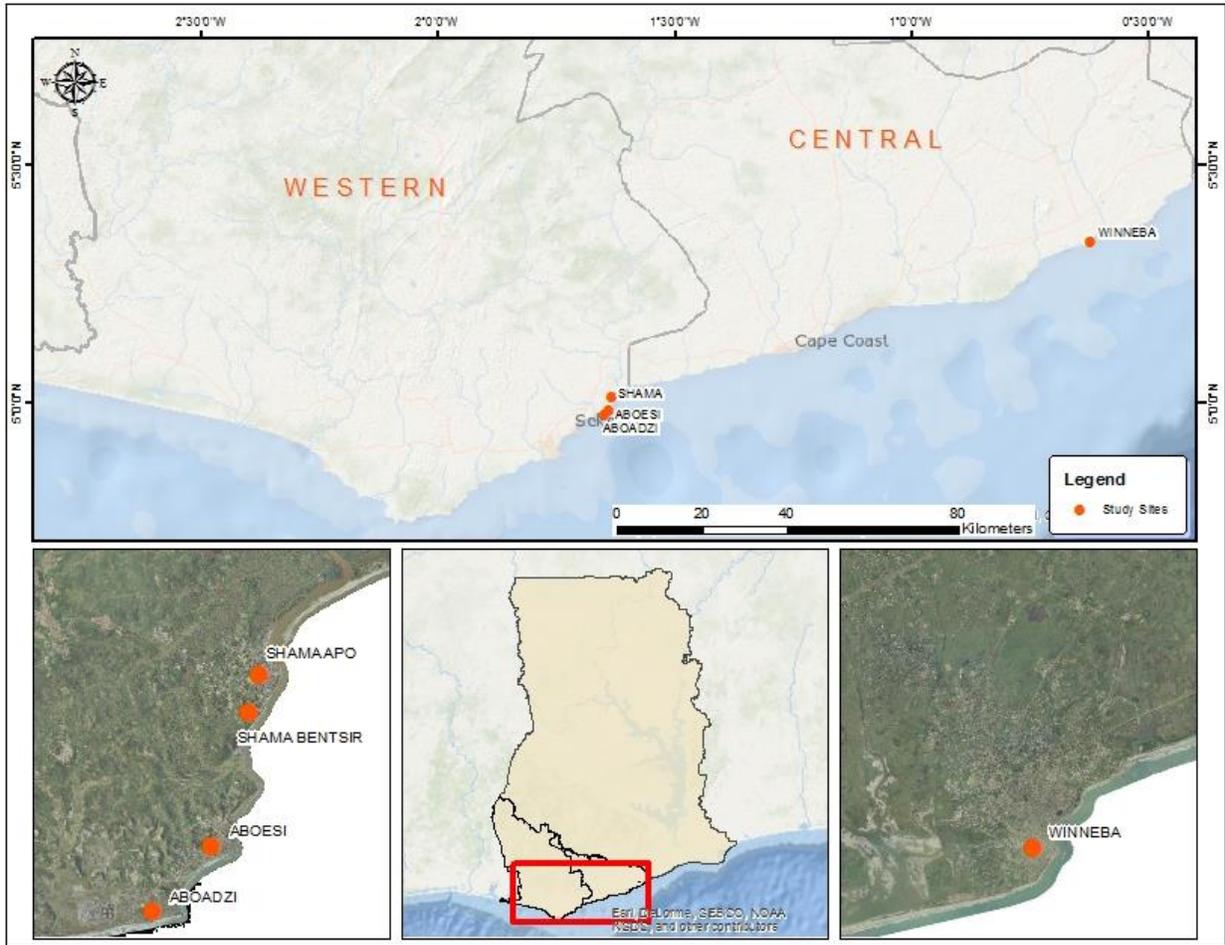


Figure 2: Shows the five study sites on a map of Ghana. Four study sites are grouped closely together in the Western Region, while one is separate in the Central region.

Originally, I had intended to conduct data collection in the twin cities where I was living and working: Sekondi-Takoradi. However, employees at Hen Mpoano advised me to collect data in less urbanized communities, as they correctly understood my objectives to be to gather data from communities that are highly dependent on the fishery resources, and do not have access to a larger variety of jobs. Hen Mpoano suggested the Western Region study sites as close by fishery-dependent communities. In the larger towns, such as Sekondi-Takoradi, there is a large fish trade, but because of widespread livelihood diversification and the prevalence of many other

industries there, the city could not be classified as fishery-dependent. However, in the four study sites in the Western Region, the community completely relies upon the artisanal fishery for livelihood generation, and most families have at least one family member involved in the fishing or fish processing trades. While not falling under the category of “rural” by Ghanaian standards, Shama Apo, Shama Bentsir, Aboesi, and Aboadzi can all be considered traditional fishing villages.

I decided to add Winneba as a study site upon visiting it to meet up with a friend working at the NGO Challenging Heights, which works to end child trafficking and slavery in Ghana. Winneba is also a coastal town where canoe fishing and traditional fish processing are the major sources of income for the community. One of the projects Challenging Heights has undertaken to combat the amount of children being trafficked out of the fishing community in Winneba is to build their “livelihoods site:” a cold store and communal smoke house. Further, Challenging Heights built upwards of 80 private smoke ovens. Challenging Heights also offers loans of fish to help fish processors begin a fish smoking business. By helping women have a more secure livelihood, Challenging Heights helps ensure that women in Winneba do not reach the level of poverty that would cause them to sell their child into slavery, although many are told it will be a better life for their child. Thus, Challenging Heights had already conducted a post-landing fishery project, and were interested in working with me on my nutritional security study, given the potential link between nutritional insecurity and trafficking rates. Further, I was able to utilize Challenging Height’s network and built trust within the fish processing community in order to facilitate survey implementation. Therefore, I decided to add a fifth study site in order to have a comparison point in the Central Region to the Western Region.

Interpretation:

Originally, I had intended to conduct semi structured interviews with each of the study groups at each of the study sites, however on the advice of Hen Mpoano, I changed my method from semi-structured interview to surveys. The major driver for this change was the language barrier – I needed to use an interpreter for my data collection in the traditional fishing villages, given the low rates of literacy in coastal fishing communities (Lokko and Anson 2005). In Ghana, a literate person is someone who is able to read and write in English, the official language of Ghana. As such, I required an interpreter in order to gather data from my research subjects, most of whom spoke Fante, the language of the Fante people who make up the ethnic majority of the area where I conducted my research. Because of this need for an interpreter, much of the nuance that a semi-structured interview relies upon would have been lost in translation. Thus, Hen Mpoano suggested I change my method from the semi-structured interviews to a survey, which would create clearer data that would be less hindered by the language barrier between my research subjects and myself.

For my survey implementation, I required the services of two interpreters: one who lived in the central region, and one who lived in Winneba. I was put in contact with my Western Region interpreter, Priscilla Acquandoh, through Hen Mpoano, who had made use of her services previously. Priscilla grew up in the fishing village Aboesi, and one of her jobs was acting as a secretary to the head fisherman of that community. While we were conducting interviews there and at the neighboring Aboadzi, Priscilla would often encounter family members such as her sister-in-law, aunt, and cousins. If these family members were female, Priscilla and I interviewed them. Thus, Priscilla was well established in the community and I was able to build upon the relationships she had with the local fisherpeople.

My interpreter in the Western Region was Comfort Ekua, a Ghanaian employee of Challenging Heights. She spoke both Fante and Efutu, and informed me that there were times when she needed to speak Efutu to the respondents in order to gain their trust by confirming that she was a member of the community and not an outsider, as I was. However, most of the surveys were still conducted in Fante. Despite not being “literate,” many of the residents of the fishery communities spoke multiple of the Ghanaian tribal languages. Comfort worked with many of the fish processors through the challenging heights livelihood site program, which involved the building of a cold store, communal smoke house, and many private smoke ovens. Thus, Comfort was familiar with many of the women we interviewed, and I was able to capitalize on the trust and relationships they had already built. With one respondent, Comfort asked me if it was all right if they talk about some personal matters for about ten minutes before we continued to find more fish processors, which of course was fine for me. We sat under a tin roof on tilted benches while the rain began to fall around us.

Creation of the Survey Instrument

Upon deciding to utilize a survey instrument for the majority of my data collection, I drafted a preliminary survey. I collaborated with my thesis chair, the staff at Hen Mpoano, and my interpreter Priscilla, in the creation of the final instrument. The survey for fish processors was 21 questions long and included no visual aids, and the survey for the fish sellers was 17 questions long and contained no visual aids. The survey for consumers was considerably longer at 35 questions, where many of the questions in the beginning of the survey were designed to measure the socio-economic status of the respondent. Further, the fish consumer questionnaire ended with a question that required a visual aid, figure 3. This aid was used for the respondents to rank the food animals they consumed in order of preference.

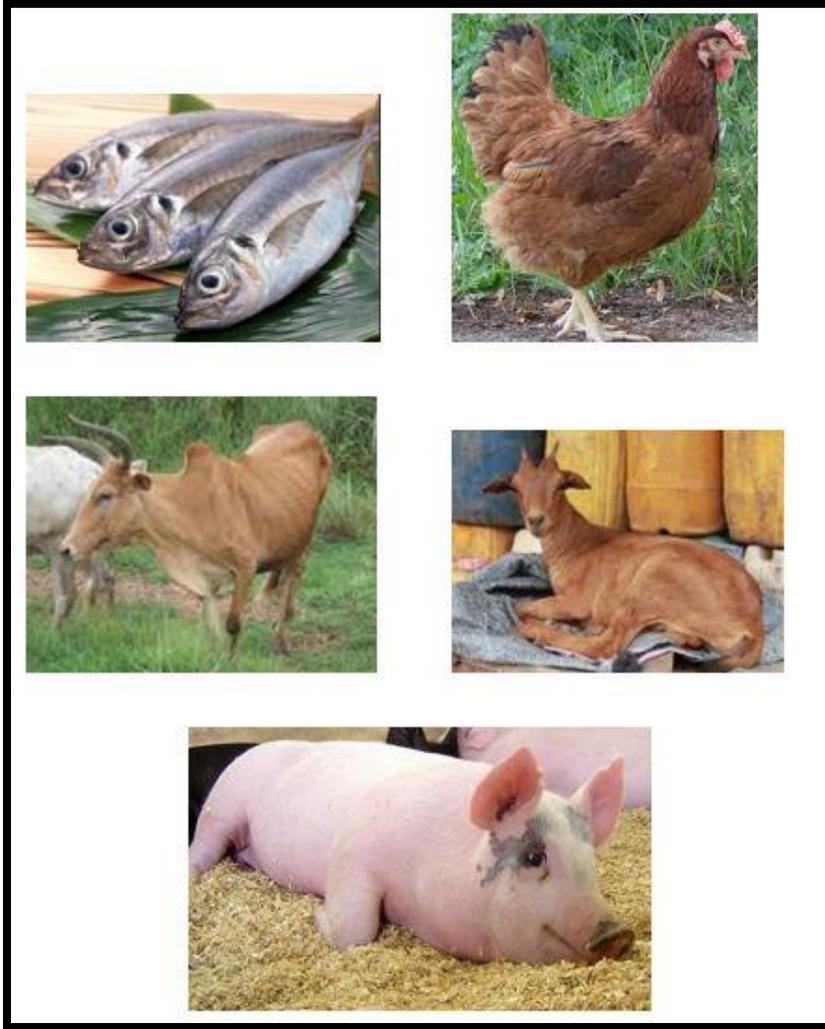


Figure 3: the picture I showed consumers and they pointed to what they liked to eat the most:

The survey instrument can be found in its entirety in Appendix III

Pre-Survey Implementation Methods:

Before conducting the surveys in each of the four study sites in the Western Region, Priscilla and I would meet with the Head Fisherman, which in every case was a man she had worked with or previously knew. We would explain my research project and request permission to speak with the fish processors and community members in the town. The four head fishermen each gave their permission, though some needed more convincing than others.

Notably, in Shama Bentsir, we went to speak to the Head Fisherman at a time that happened to be at the start of the weekly meeting of all the fishermen at Shama Bentsir. As such, we described my research to the crowd of men, and I was met with some backlash from the fishermen. The men told me I was asking the wrong group of people questions, that the fishermen understood what was happening in the sea with the fish much better than the women. I had to explain (luckily some of the men spoke English so much of this conversation was in English) that my work had to do with the post-landing processing, selling, and consumption of fish, and that I in fact did have the correct study group the answer the questions that I was posing. This convinced the head fisherman, who ended the argument amongst the fishermen by saying that I had his permission to conduct the surveys, and to please leave so that they could get on with their meeting.

Survey Respondents

For my survey method, I created three surveys for each of the three corresponding subject groups: fish processors, fish sellers, and fish consumers. I surveyed primarily women for all three groups. I conducted the surveys in each of my five study sites. I attempted to conduct 25 interviews per subject group per study site, reaching a total of 75 surveys conducted per study site and 375 surveys in total. However, I was not able to find 25 fish sellers at every study site, which resulted in me being able to conduct only 308 interviews in total. See Table 1 for a distribution of number of surveys given per study group at each study site.

Study Site	No. Fish Processor Surveys	No. Fish Seller Surveys	No. Fish Consumer Surveys
Shama Apo	25	19	25
Shama Bentsir	25	7	25
Aboesi	25	4	25

Aboadzi	25	3	25
Winneba	25	25	25

Table 1: study sites and sample size per survey type

Of the 308 respondents, 305 of them were women. Of the male respondents, two were fish processors and one was a fish seller. All of the consumers surveyed were female. I chose female fish consumers for a variety of reasons. For one, women often purchase food for the entire family unit. Further, I hoped that having female subjects would help establish a degree of trust between myself a female researcher, a female interpreter, and the research subject. We interviewed women of a variety of ages, marital, and maternal statuses.

Sampling Methods for the Survey Respondents

We utilized snowball and convenience sampling to find the survey respondents. We mainly used snowball sampling for the fish processors, with the women pointing us in the physical direction of where more fish processors may be after the interview was completed. Often we would interview a group of fish processors working at sets of ovens together, rarely did we interview one fish processor working alone. Thus, upon completion of the surveys with each group, one or more women would direct us towards where another group of fish processors was likely to be. We usually took two days to complete the fish processor surveys, with many completed the first day and the rest completed the second.

For the fish sellers and fish consumers, we primarily used convenience sampling. For the cities with a fish market (Shama Apo and Winneba), we walked around the market and interviewed every woman selling fish we could find. For the remaining three locations that did not have fish markets (Shama Bentsir inhabitants use the Shama Apo market, and Aboesi and

Aboadzi residents usually buy directly from the canoe fishermen), we surveyed every person we saw who was selling fish, either for immediate consumption or for meal preparation. It was these communities where we had the lowest numbers of fish sellers found, because of the lack of a fish market.

We also used convenience sampling for the fish consumers. I tried to find a wide variety of ages of women to interview. We would often go to a group of women and be able to conduct surveys for each of them. In Shama Bentsir, we made friends with a family who had a house on the main road and who allowed us to sit on a bench on their front porch and call out to women who walked by, asking them if they had five minutes to talk about their fish-eating habits. In other areas, like in Aboesi, Aboadzi, and Winneba, we walked along main streets looking for women in their places of work, mostly seamstresses, food sellers, and petty traders. Further, we would walk into the community to find women at their houses, usually gathered in groups in communal courtyards or in a shaded area by their front doors. Beyond an attempt on my part to get respondents with an age range from teenager to elderly among the fish consumers, there was no directionality of the data gathering besides who was available and willing to be a respondent.

Survey Implementation:

My interpreters and I conducted all the surveys from one study site before moving on to the next one. After obtaining permission from the head fisherman, we usually started by interviewing fish processors on the first day at each study site. It took two days to complete the surveys at each of the study sites in the Western Region, and three days to complete the surveys in Winneba, in part because of the lay out of the town and the presence of a large market where much of the fish was sold to the community.

Many of the respondents were eager to respond to the surveys, and did not take much convincing. Some respondents, especially old women, became grouchy during the survey process, and gave short, curt answers. A few of the local women were uninterested in responding to a survey. In Shama Bentsir, Priscilla and I were walking around looking for fish processors when we came upon a group. When we asked if they were willing to participate the women said they were not, however at this moment the head fisherman walked by and, overhearing the conversation, forcefully informed the women that they could not refuse my request to answer questions, because he had given me permission. We administered these surveys as quickly as we could.

In Shama Apo, Priscilla and I were yelled at by both women and men for conducting surveys. One woman got in my face saying that I should not be there asking questions. Two men followed us around and were interrupting a few of the surveys before we were able to convince them to leave us alone. They were scolding us for taking the time of the women, but also for refusing to administer the survey to them, as men. Hen Mpoano staff told me that this was likely a response to research fatigue, and that community members were frustrated by what they perceive as a high amount of research being done in the communities but a small amount of action being taken as a response to the research. Along this line, in Shama Bentsir a group of women pleaded with me to put in a cold store, saying that would help with many of their fish processing concerns. Many of the women also asked me to take them, or often their children, back with me to America to go to school.

However, on the whole, most survey respondents were able to answer my questions while conducting the business they were already doing, being it smoking or preparing fish, selling fish, or working at their day job such as sewing, petty trade, and food selling.

Results

From my post-data processing, I was able to conclude that there exists some key similarities and differences between study sites. In terms of similarities, it appears that respondents at all study sites eat fish every week, believe fish to be both a physically and culturally important food source. Further, women who work in the post-landing fishing industry experience little livelihood diversification, and only have the one income source that specifically relates to fish. In terms of differences, I mostly found that Winneba, the Central Region study site, differed from the Western Region sites. While the Western Region sites all reported a decrease in quantity and size of fish, Winneba did not report strong changes. Further, in regards to consumption, fish purchasers in Winneba are less likely to be affected by seasonality in their purchasing, whereas the Western Region study sites are. This leads me to conclude that the Western Region study sites are more landing-beach dependent than Winneba.

To process the survey data, I computed the mean, standard deviation, and 95% confidence interval (assuming the Student-T variant of the normal distribution curve, as for each survey type at each study site, $n < 30$), for all numerical and frequency data. I used Fisher's exact test to test for significance of observed differences in responses between study sites. Most study sites have the complete "n" of 25, however a few study sites had a few respondents who were unable to answer the question, and this lack of response is indicated by a reduced "n." If there was a reason for varying sample sizes, it is explained in detail with the relevant question. This raw data can be found in Appendix IX and is summarized here.

Most of my statistical evaluations involve testing for differences between study sites. As such, I have organized the results by survey respondent type, and further within each type by

tests that were statistically similar among study sites, and tests where at least one study site was statistically different from the others.

Further, the quantitative methods help flesh out conclusions drawn by the surveys. Some of that data is included in this section where relevant.

Part 1: Fish Processors

For this section, I tested to see if there were any differences in the frequency of distribution of answers between the study sites. To test the stated hypotheses (page 41), I wanted to see in part if there were any differences between study sites. Thus, for the tests between study sites, the alternative hypothesis is that at least one study site is different from the others, and my null hypothesis is the standard criteria for a statistical test, that is that any statistical difference in frequency distribution of answers is due to chance. Thus, when I found a statistically significant P value, I failed to reject the null, therefore accepting the alternative hypothesis, showing there exists difference between sites. When the P value was not significant, I failed to reject the null, and assume that any observed differences in frequency distribution of responses to my questions is due to chance.

What Was the Same between Study Sites

For fish processors, the following questions showed no significant difference in the frequency of respondents between study sites. Presented are the questions as written on the survey, the most common answer, and the mean percent of that answer across study sites. Also shown is the P value upon which I based the analysis that there is no statistical variation in responses between study sites besides what is assumed by chance.

These questions tested the following hypothesis:

- Livelihoods are not diverse for fish processors (found to be true)
- Fish processors will not have hope for the future (found to be not true)
- Fish processors will not encourage their children to be fish processors (found to be true).

Question	Most Common Answer	Mean Percent Across Sites	P Value
Do you have another source of income?	No	74%	0.08059
Do you believe the fish-processing job will exist in 5/10/20 years?	Yes	68% - 5 years 61% - 10 years 61% - 20 years	0.5334 0.3878 0.3878
Will you encourage your children to be fish processors?	No	66%	0.283

Table 2: Similarities between study sites, fish processing survey

From answer to the first response, I am first able to conclude that livelihoods are not very diverse among all respondents, and that the women I spoke to were therefore, for the most part, highly dependent on access to fish to maintain their livelihoods.

Further, I wanted to know how confident the fish processors felt the fish processing livelihood would exist in 5, 10, and 20 years. I wanted to see if there was difference between the year metrics, however most respondents answered the same for all three questions, and some were visibly annoyed by the time I asked the third year metric, perhaps feeling that I was asking the same question three times in a row. Again, I found no difference between study sites. I also found that more respondents thought the fish-processing job would exist across all year metrics, than thought it would not exist. Further, many respondents did not answer either “yes,” or “no,” but answered something indicating some degree of hope and inability to affect the system, such as “it depends on God” or “it depends on the sea.” Some reported that they “had hope,” but were not sure that the system would exist in the future.

Finally, I wanted to know if fish processors would encourage their children to be fish processors. I found that there was no difference between study sites, and that the majority of

respondents in across study sites reported that they would not encourage their children to be processors. I think this is interesting in comparison with the above point that there is generally hope that the fishing industry will exist, thus, the reasons a mother might want her children to not be processors likely have less to do with perceptions of the lack of resilience of the fish processing job, but more to do with desire for their children to do something “better.”

If a respondent answered that they would prefer their child not be a fish processor, I asked a follow up question of “why not.” The most common response was that the parent preferred the child go to school (52 respondents), and the next most common were that the work is difficult (12 respondents) and that they child should follow their own dreams (6 respondents). Some mothers said that their children would do both, go to school and learn to process, so that they have the most options, however most mothers expressed school as a way to get out of the fish processing job. Many women reported that the job was difficult and they want their children to have easier lives. An old woman in Abuesi told me that she is going blind due to the smoke, and does not want her children to experience the same hardship.

What Was Different Between Study Sites:

Below are the questions for fish processors where there was a statistically significant difference between the distributions of answers, such that there exists a difference between sites. Looking at the data, I am able to discern that the difference is caused by one or more study sites, and which those are.

These questions answer the following hypothesis:

- Winneba will be less dependent on the landing beach compared to the other communities (found to be true)
- The same species of fish will be processed in all study sites (found to not be true)
- The residents of the Western Region study sites will notice a decrease in quantity of fish (found to be true)

- The residents of the Western Region study site will notice a decrease in size of fish (found to be true)
- All study sites process mostly wholesale (found to not be true)

Question	P Value	Study Site	Interpretation
Do you purchase your fish from the landing beach, cold store, or both?	2.14E-19	Winneba	Western region bought more from the landing beach, Winneba bought most from the landing beach and cold store
Compared to the past 10 years, do you buy the same species of fish to process or different ones?	0.785752	Winneba	Western Region reported species staying the same, while Winneba was split between the same and different.
Compared to the past 10 years, do you buy the same quantity of fish?	0.005181	Winneba	Western Region reported reduced quantity of fish, whereas Winneba reported more with “same” quantity of fish compared to the other study sites.
Compared to the past 10 years, do you buy the same size of fish to process, or a different size?	0.02E-7	Winneba	Western Region reported reduced quantity, whereas Winneba reported the same quantity.
Do you sell your fish wholesale, retail, or both?	0.01578	Winneba	Western Region reported selling mostly wholesale, whereas Winneba was evenly split between the three categories.

Table 3: differences between study sites, fish processor survey

The notable difference across study sites was that Winneba fish processors are most likely to rely on a cold store, whereas the fish processors in my other study sites were more dependent on the local landings. There is a cold store in Winneba, as managed by the NGO Challenging Heights, however many fish processors relied upon the cold store in Tema as well as the Challenging Heights cold store. The residents of Shama Apo have access to a cold store, and thus Shama Apo was the second most likely study site to purchase cold store fish. Notably, the residents of Abuesi and Aboesi were least likely to use a cold store, and most dependent on the local landings.

The cultural and material reliance on a cold store vs. reliance on a landing beach are important because those who rely on the landing beaches are potentially more directly affected

by changes in local stocks, whereas much of the fish in the cold stores are imported. Further, fish in cold storage mean a smaller effect of seasonality, since fish gluts can be saved before processing for leaner times. I call this difference “cultural” as well as material, because it appears that, even without the construction of a cold store in Winneba by Challenging Heights, many of the residents of Winneba still would purchase at a cold store, specifically in Tema. Similarly, the residents of the Western Region study sites could be dependent on cold stores in the closest large fishing port, Sekondi, however I did not find this, and instead found a stricter reliance on the landing beach fish at these sites. There is less fluctuation in the market due to the constraints of the perishability of fish being removed. However, this means that the fish processors could potentially have less power in the economic system, since their worth as a way of preserving fish for consumption is potentially reduced due to the use of cold storage. Despite this potential negative influence of a cold store, there seemed to be interest in having one in the communities I studied where there was not one. A study subject in Shama Bentsir asked me directly if my survey would result in a cold store for the community, and seemed angry or dismayed when I informed her that I do not have that kind of power.



Figure 4: a bucket of smoked juvenile *sardinella*

When I asked about changes in fish species, quantity, and size, I found that Winneba reported less noticed difference in all three categories. This aligned with my observations that Winneba processors were getting similar product due to a reliance on a cold store as opposed to purchasing from the landing beach, where there is more uncertainty and variation. Along these lines, Abuesi and Aboesi both reported the most decreases in quantity and size of fish. When I went to collect data in Abuesi, it was on the day that the women were bundling their fish for sale to the wholesalers. I stood amongst large buckets of fish (figure 4) which were then packed into bags. The women I spoke to would indicate to the buckets, complaining that there is only “small” fish, meaning juveniles, to process. When I walked into the interior of Abuesi, I took the below picture (figure 5), demonstrating the couple of “larger” fish mixed in with the small fish. An elder fish smoker told me that the “large” fish in the picture would have been called

“medium” in the past, but that there are no “large” fish being landed any more so the younger processors call the medium fish “large” fish.



Figure 5: Picture taken at Aboesi, showing what is now considered large and medium fish

Beyond questions about the fish they processed, I asked the processors questions about the livelihood itself. I wondered how diverse the livelihoods of fish processors are, given that there is usually an assumption in fisheries development that an increase of livelihood diversification results in an increase in resilience (Marschke and Berkes, 2006). I found that for most respondents, there was a lack of livelihood diversity.

Thus, while there were differences among the study sites regarding questions of the fish, the study sites were fairly homogenous in regards to livelihood questions. This suggests that the presence or lack of technology affects fish metrics, but not livelihood metrics. Perhaps the lack of resilience caused by decreasing stocks is ameliorated in places like Abuesi and Aboesi by social structures that make sure that all community members obtain at least enough fish to eat.

Part 2: Fish Sellers

The fish seller surveys are the only surveys with large disparities amongst the number of respondents in study groups between study sites. As explained in the introduction to this section, this is due to the structural differences between the towns, and smaller numbers of fish sellers in communities where women purchase fish for consumption directly from the canoes. Similar to above, the hypothesis for these tests is that there exists a statistically significant difference in frequency of responses between study sites, and the null is that there is no statistical difference. Rejecting the null proves that there exists a statistical difference, and failing to reject the null represents a lack of statistical significance.

What Was the Same Between Study Sites:

For these questions, the P value found failed to reject the null hypothesis, and thus the study sites were not statistically different.

These questions answer the following hypothesis:

- Livelihoods among fish sellers are not very diverse (found to be true)
- Fish sellers are selling the same species now compared to ten years ago (found to be true)
- Fish sellers will not have hope that their job will exist in the future (found to not be true).

Question	Most Common Answer	Mean Percent Across Sites	P Value
Do you have another source of income?	No	56.97%	0.3791
Compared to 10 years ago, do you sell the same species of fish or different species?	Same	83.81%	0.3235
Do you feel the fish-selling job will exist in 5/10/20 years?	Yes	68.48%	0.08577
	Yes	68.48%	0.08577
	Yes	67.43%	0.03786

Table 4: what was similar between the study sites, fish selling survey.

First, the question posed about the fish itself, regarding change in species, yielded no significance between the study sites, and a likelihood to be selling the same fish as compared to the past. This correlated with the “species” question in the fish processor survey, where a lack of change of species was also reported.

I asked similar livelihood questions to the fish sellers as I did the fish processors, in order to answer similar questions. First, I asked about livelihood diversification, wherein I found a lack of significance between the study sites, and most study sites had more respondents without a second job than respondents with diverse livelihoods (Aboesi was the only town that was not in this trend, with 2 respondents claiming another job and 1 not). Thus, there is potential for lack of resilience given a lack of diverse livelihoods.

Again, similarly to the fish processors, I asked sellers if they believed the fish selling job would exist in 5, 10, 20 years. The responses were very similar to the fish processors, in that most respondents answered the same for all three questions, and some seemed unsure as to why I was asking basically the same question three times. For the most part, there was no variation between the study sites outside of chance, and in general, respondents were likely to say that they believed the fish-selling job would exist. Of note, for the first two designations, 5 years and 10 years, there is no statistically significant frequency between study sites; however, for 20 years it appears there is statistical significance between the study sites. This change was caused by the one difference in answers, in Shama Apo, one respondent reported that they believe the job will exist in 10 years, but will not exist in 20 years. Given that one data point is affecting the test, it does not seem strong enough to claim that there is statistically significant data to say that there is differentiation between the study sites. Thus, I fail to accept my hypothesis.

What Was Different Between Study Sites:

For this section, the following questions were found to reject the null hypothesis, thus found that there exist statistically significant differences in frequency of distribution of answers between the study sites.

This section answers the hypothesis:

- Women will not encourage their children to be fish sellers in all study site (found to not be true).

Question	P Value	Study Site	Interpretation
Will you encourage your children to be fish sellers?	0.00665	Winneba Shama Apo	Winneba respondents will discourage children to be fish sellers more than other study sites, Shama Apo respondents will encourage children to be fish sellers.

Table 5: what was different between study sites, fish seller survey

Further, I asked if fish sellers would encourage their children to be fish sellers. I found significant difference in the frequencies, with fish sellers in Winneba most likely to discourage their children from being fish sellers. Shama Apo was the only study site where fish sellers were more likely to encourage their children rather than discourage. I feel unable to draw any concrete conclusions from these results, besides to offer that there is a large spread in answers, and that in general mothers were more likely to discourage their children rather than encourage.

In regards to why a fish seller might not wish their child to be a fish seller, the most common responses were “go to school” (25 respondents), “industry hardship” (7 respondents) and that the “child has dreams” (5 respondents).

Part 3: Fish Consumers

For the consumer surveys, I generally wanted to discover how important fish is to the community, if they are eating less of it, something or other.

Again, as the two above survey types, the hypothesis is that there exist statistically significant differences in frequency of answers between study sites, and the null hypothesis is that there does not exist statistically different frequencies between study sites.

What Was the Same Between Study Sites:

These are the questions wherein I failed to reject the null, and found a lack of statistical difference in the frequency distribution of responses.

These questions answer the hypothesis:

- There exists a price at which consumers would stop purchasing fish (found to be true)
 - I asked what that price was, however the answers were not homogenized for quantity of fish per price, thus I was not able to use those results. This is discussed more in the “areas of improvement” section.
- Fish consumers eat the same types of fish now compared to when they were a child (found to be true)
- Fish consumers prefer the same fish as their parents (found to be true)
- Eating fish is culturally important to being Ghanaian (found to be true)
- Respondents eat fish every week (found to be true)
- Respondents prefer fish to other animal-based protein sources (found to be true)

Question	Most Common Answer	Mean Percent Across Sites	P Value
Is there a price at which you would stop purchasing fish?	Yes	72%	0.5392
Do you eat the same fish now compared to when you were a child?	Same	72.67%	0.1559
Do you have the same preferences in fish as your parents?	Same	91.07%	0.6648

Is fish an important part to being Ghanaian?	Yes	100%	N/A
Do you eat fish every week?	Yes	98.4%	0.1935
Which of these (show picture, see figure 3) is your favorite to eat?	Fish	82.4%	0.9528

Table 6: what was similar between study sites, fish consumer survey

First, I asked if there is a price at which respondents would stop purchasing fish. I found there is no significant difference between study sites, and that most respondents report that there is a price at which they would not purchase fish. I asked a follow up question regarding what that price would be, if they answered yes, however upon my return I realized that I did not specify a price for a specific amount, thus the respondents may have widely varying understandings of what “purchasing fish” to mean, for example, it could mean for herself for a day, or for her family for the week, or another metric. As such, I am unable to make any statements regarding where the line is at which respondents would stop purchasing fish. It is important to note that those who answered “no” there is not a price at which they would not purchase fish are perhaps more vulnerable than those who answered “yes,” given that they might make other sacrifices in their lives in order to purchase fish. However, more respondents answered “yes” compared to “no,” thus indicating perhaps a relative amount of resilience within the community to changing fish stocks.

Next, I asked if respondents eat the same type of fish as a child, and I found that there was no significant differentiation between study sites, and that in general respondents were more likely to eat the same fish now as they did when they were children. This indicates a relatively small amount of change in taste in the community. Along these lines, I asked questions about a

respondent's current tastes in fish. I asked if their tastes differed much from their parents, and found that they do in general share the same taste for fish as their parents, and that there is no significant difference between study sites. Thus, I can conclude that there is not much change in preferences in my study.

Further, I asked questions to get at whether fish is important to coastal Ghanaians. I asked if respondents ate fish every week, to which almost all respondents reported that they eat fish every week, without any frequency variation between the study sites (the results were almost homogenous, so this was expected). I also asked if the respondent considered eating fish "important for being a Ghanaian" to which 100% of respondents reported in the positive. While discussing my results with some experts, I was advised that perhaps this result was affected by the coastal proximity of my respondents. The elite interview subjects suggested that had I asked the question inland, I could have had similar results for various meat products, as opposed to fish. Thus, it is most accurate that I couch this question as "for coastal Ghanaians" as opposed to "for all Ghanaians." However, I am able to draw very strong conclusions from these data that fish consumption is very important for coastal Ghanaians. I asked an open-ended question "why is fish important" after asking if they consider it important, and my most regular responses were "protein," "strength," and "energy." Given these responses, it is clear that the coastal Ghanaians surveyed understand the important health benefits of eating fish, and are aware that the nutritional value of fish cannot be easily replaced with other foodstuffs. Further, many respondents indicated throughout the survey process that one "cannot eat without fish," meaning that a meal without fish in it in some form would not be considered food. I posed this question to some of the elite interviewees, and they responded that yes, for many coastal people, food is not food without at least ground up fish in the stew. Interview subjects who grew up in fishing

villages said this is the common way of looking at food, that eating some rice alone wasn't food, but rice with stew that had a little fish ground up in it would be food. Further, they explained that it was more likely that a woman would reduce the quality of fish rather than remove fish from the meal at all; meaning that in many cases women would replace fish meat for ground fish product, so that at least there is some protein in the meal. Further, my interview subjects indicated that it is likely that women will give the fish to the men and growing children in the family, if there is fish meat to be had, believing that they need to the protein and nutrients more than she does. Thus, the notions of "fish" and "food" seem to go hand-in-hand for coastal Ghanaians living in fishery dependent villages.

Finally, I asked respondents to rank pictures of animal protein (Figure 3) for which was their favorite. I coded my data into either "fish" or "not fish" for the other four meat sources. I found that there was no significant difference between study sites, and that between 80%-88% of respondents preferred fish to any other meat source. The potential problem with this question is the fish species used, in that I used a medium-value fish. I may have had different results had I shown a small pelagic fish, which is a more common fish, or had I shown Tilapia, which is a high-value fish (and not a marine species, but rather fished inland at Lake Volta).

What was Different Between Study Sites:

For this section, I present the questions where the respondents rejected the null hypothesis, thus showing that there exists a statistically significant difference in distribution of answers between study sites.

This section tests the hypothesis:

- Respondents at all study sites eat less now compared to the past (found to not be true)

- Respondents at all study sites buy less fish now compared to the past (found to not be true)
- Fish is both festive and utilitarian, and fish is consumed for a holiday at every study site (found to not be true)
- Fish is purchased seasonally at the Western Region study sites, but not at Winneba (found to be true)
- Consumers notice changes in seasonality at the Western Region study sites, but not at Winneba (found to be true)

Question	P Value	Study Site	Interpretation
Do you eat more, the same or less fish now compared to the past?	4.28E-06	Winneba Aboesi	Winneba respondents reported eating “more,” whereas the other respondents reported the highest frequency of “less.” Aboesi reported the highest frequency of “same.”
Do you buy more, the same, or less fish now compared to the past?	2.14E-09	Winneba	Western Region study sites reported buying “less” fish, whereas Winneba reported buying “more.”
Is there a holiday when you prefer to eat fish?	0.01819	Shama Bentsir, Winneba	Shama Bentsir respondents reported the fewest “yes” responses, whereas Winneba reported the fewest “no” respondents.
Do you purchase fish seasonally?	4.11E-05	Winneba	Winneba respondents reported the most “no” to buying seasonally, whereas the Western regional predominantly reported purchasing seasonally
If you purchase seasonally, do you notice a change in seasonality?	0.001829	Winneba	Winneba respondents were evenly split between noticing and not noticing a change in seasonality, whereas the Western Region all reported a change.

Table 7: what was different between study sites, fish consumer survey

First, to follow the question regarding taste now compared to as a child (see above), I asked if the respondents ate the same amount of fish now compared to the past. I found that there was significant difference amongst the sites, with Winneba the only site where more than half of the respondents reported eating more fish now. This data point continues the story first told by the fish processors, that Winneba does not strongly feel the effects of the declining local fish stocks. Besides Winneba, all other study sites reported more residents eating “less”

compared to “more” or “same” amounts of fish. Because of these results, it is more likely that the Western Region study sites are experiencing nutritional insecurity compared to Winneba.

Second, I compared metrics of purchasing fish. I asked a similar question to the consumption question, asking if respondents were purchasing more, less, or the same amount of their preferred fish now compared to the past. I found that Winneba residents had statistically the lowest frequency of “less” answers. Besides Winneba, all other study sites represented places where 76%-100% of residents are purchasing less fish. These are very striking results, and they demonstrate that there is a lack of ability to obtain fish. I did not ask why residents were purchasing less fish, however some offered reasons for purchasing less fish, which for the most part was either related to finances (the price of fish was too high, the person did not have enough money, or a combination of the two) or related to decreased stocks. Given that this information was offered without being prompted, it indicates how aware consumers are in these fishery dependent communities, both of market and stock fluctuations.

Next, I asked if there is a holiday during which the respondents preferred to eat fish, in order to judge if fish was considered a “special” food or just an “every day food.” I found that for all study sites except Shama Bentsir, respondents preferred to eat fish during a holiday. The “holidays” mentioned ranged from the religious (Easter, Christmas) to local holidays, to Tuesday the fishing holiday (eat fish on Wednesday). Thus, in general, fish is not only considered an everyday food but is considered a festive one as well

Further, I asked questions relating to seasonality. I asked if respondents purchased fish following seasonal patterns of fish. I found that there is a clear and statistically significant frequency difference amongst the sites, largely driven by Winneba, where almost half of the

respondents reported that they do not purchase seasonally. In contrast, all other study sites reported at least 84% respondents purchasing seasonally. This data point again continues the story that Winneba residents are less affected by marine changes, such as seasonality or stock decrease, perhaps due to the ability to buffer for these changes using a cold store. To follow up, I asked the respondents who answered that they purchase seasonally if they have noticed a change in seasonality. Again, I found a statistically significant frequency difference, and again this was driven by Winneba. This tells me that those who do purchase seasonally do not notice a change in seasonality in Winneba as much as at the other study sites, where at least 83% of respondents noticed a change in seasonality. There are many reasons I could have this result, including: (a) the marine fisheries in Winneba are experiencing less stock reduction, (b) the cold stores are stocking up on fish in a manner which mimics the seasons, (c) the cold stores in Tema specifically are relied upon by many surrounding fishery dependent communities, so perhaps there is an effort to import fish such that seasonal patterns are mimicked. I cannot compare across study subjects within a study site, therefore I am unable to compare if there is a relationship between cold-store use in Winneba and consumer awareness of seasonality

Other Tests

This section reports on tests that did not compare across study sites, but instead compared aggregated the study sites and compared across two different variables. For both tests, I tested the five study sites together, and also ran a test only aggregating the four Western Region study sites, in order to determine if there were similarities between the two tests. For both of these tests, the first variable was the question assessing if respondents purchased more, less, or the same amount of fish now compared to the past.

First, I asked a question regarding if the respondents owned unsewn yards of fabric, as I had been informed this was an adequate metric of wealth. However, I found that there is no statistically significant frequency difference between those with fabric and those without in regards to their ability to purchase fish (P value: 0.7147). When I tested the Western Region study sites, I found that they were experiencing similar results, with a P value of (0.3877).

Similarly, I compared against the “buy fish” question various “woman types,” which I created from the questions “do you have children” and “are you married.” These resulted in five types: unmarried without children, unmarried with children, married without children, married with children, and widowed. However, I again found no significant result saying that one group was more insecure than others were (P value: 0.3542). When I tested the Western Region study sites, I found a P value of 0.1567, showing that Winneba was not masking an important frequency result. I also computed these tests into bar graphs, Figures 6 and 7. Figure 6 shows the Western Region test, and figure 7 shows all study sites. As can be seen, the bars are all very similar looking between the two graphs, thus Winneba was not masking a frequency result. Further, the distribution of results per woman type is similar within each bar graph, showing that woman-type was not affecting their purchasing ability.

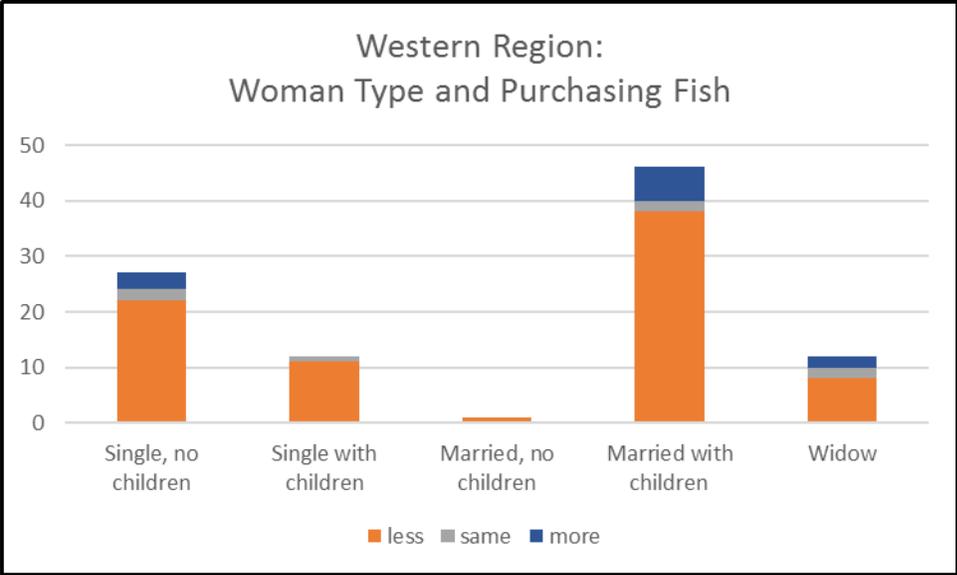


Figure 6: a bar graph comparing the count of responses of fish purchasing question between the five “woman types” in the Western Region

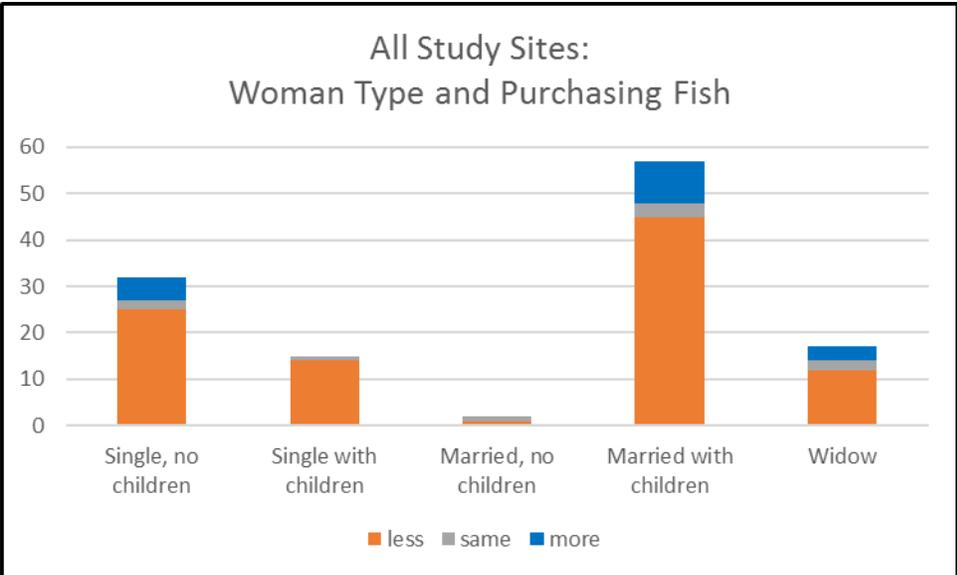


Figure 7: a bar graph comparing the count of responses of fish purchasing question between the five “woman types” in all study sites

Thus, my tests that aggregated across study sites did not produce statistically significant results.

Discussion

- Discussion of Study Site Results
 - Nutritional Security
 - Livelihoods
 - Development
- Feminist Reflections
- Areas of Improvement
- Recommendations
- Future Research Questions

Discussion of Study Site Results:

Nutritional Security

The study I conducted was able to answer some, but not all, of my research questions. Most importantly, in regards to nutritional insecurity, it appears that the four Western Region study sites may experience nutritional insecurity, based on purchasing and eating less fish compared to the past. A more complete study would assess the nutrition levels of the community in order to definitively establish that nutritional insecurity exists, however nutritional insecurity is likely given the decreased purchasing and consumption of fish in the Western Region study sites. This change in trend, however, does not seem to be related to a change in food preferences, as fish was reported to be the preferential animal protein source, and that taste for fish had not changed, among all study sites. It must therefore be driven by either a change in livelihood status (people are becoming poorer, relative to the price of food), a change in the demand for fish (driving up the price) or a change in the supply of fish (with scarcity driving up price) – or, indeed, a combination of all three.

What is clear is that fish remains a culturally important food source. Further, respondents seemed aware of the nutritional value of fish, citing nutritional rationale for “why” they consider fish to be important. Thus, the decreased consumption and purchasing of fish in

the Western Region sites is due to the decreased landings in those sites, given that other possibilities were ruled out, and both financial barriers and decreased stocks caused a decrease of fish purchasing for every level of the post-landing value chain surveyed. There is a correlation between which sites reported decreased size of fish and quantity of fish between which sites reported experiencing nutritional insecurity. Further, the consumers who reported the potential nutritional insecurity also reported a reliance on seasonal purchasing, and a noticed change in seasonality. Thus, what is affecting the landings of fish is directly affecting the consumption of it. Finally, consumption respondents reported that they two main reasons they were not purchasing fish were either financial or due to decreasing stocks. This demonstrates that two of the three criteria of potential nutritional insecurity are being met: there is a decreased in food source, and livelihood insecurity is causing nutritional insecurity.

Livelihoods

Livelihoods were not very diverse, though more diverse for fish sellers than fish processors. Women in the post-landing fishing industry have hope that their jobs will exist in the future, however, and somewhat contradictory to this, they do not wish their children to enter the industry, overall. This suggests that the reasons that mothers would encourage their children to pursue different careers is not due to worries about future fish landings and availability, but more to do with an idea of the child having a better life than the parent – indicated through the responses that mothers want their children to go to school, that the child should be able to follow their own dreams, and that the fish processing work is especially hard on the body.

Finally, I did not find that my metric for wealth, or that the marriage or motherhood status of women were strong indicators of likely nutritional insecurity. It is possible that there is a better metric for wealth that would allow to test for if wealth status or assets affected

nutritional insecurity, however all my other questions to test wealth status (“do you have a car? Do you own a house”) were so often “no” that I was unable to use them as a metric to create groups of two differing wealth status.

Development

Though my study sites were chosen for relative similarity between them, after spending days in each site I came to think of them as existing in three categories of development, with development largely defined in terms of availability of physical infrastructure (roads, markets, cold-stores, etc.) and degree of integration with the national regional and global market economy (barter vs. sale, local sale vs. national, regional or global sales). Winneba was the most developed study site, had the largest population, and was most dependent on modern technology, such as the cold store. There are two large markets where fish are sold, and which are very busy during market days. Most of Winneba was accessible by road, although some of it was dirt, not paved.

The next category, relative mid-development, encompassed Shama Apo and Shama Bentsir. These two towns somewhat blended together, with very little to delineate where one ended and the other began. Both use the same single marketplace where fish and other provisions are sold. There are main roads through the towns, however many of the residences and processing sites are only accessible by foot.

Finally, Abuesi and Aboesi were the least developed of my study sites. Abuesi had a small formal market, however it appeared most of the transactions were done by barter, as opposed to with cash. There were no fish seller stands in either of these sites, and as such, I had a very difficult time finding fish sellers to interview. The few “fish seller” respondents for those

study sites were women who were walking around town with fish in buckets on their heads, to sell for more immediate consumption. Abuesi and Aboesi each has a road that goes up to a larger circular paved area and dead ends there, where one must proceed by foot into the town. The roads were difficult to navigate and it was very easy to get lost amongst the houses and fish processing shacks. The head fisherman at Abuesi proudly told me that the residents of his town never go hungry, because the women get fish directly from the canoes and have private smoking ovens. In these two sites, women are more likely to process fish for their own family whether that is their livelihood or not, compared to the other sites, where fish is purchased at designated market areas. My interpreter in the Western Region, Priscilla, had many family members in Abuesi and Aboesi, some of whom were included in my study. Priscilla pointed out that, while it is important that the community take care of its members, that not having a market to buy fish would make it very difficult for someone to move to the area and establish themselves. If a family moved to Abuesi or Aboesi, they would have to establish a relationship with a fishing venture to procure fish, and build a personal smoking oven, in order to have non-perishable fish. These barriers to entry are not present in the other three study sites.

Thus, I tend to think of the study sites as along a continuum of development, in order: Winneba, Shama Apo, Shama Bentsir, Abuesi, and Aboesi. I based this continuum on variety of infrastructure observations, including condition of the roads, from many paved to some dirt roads (Winneba) to one main paved road and many footpaths but no set roads or city construction (Aboesi). In addition, the more developed communities had a designated shopping area, while the least developed towns did not, and wares were sold mostly by women walking with them on their heads or at small stores interspersed among the houses. Further, I believe the

reliance on a cold store on the “more developed” end of the spectrum, and reliance on canoe landings on the other; drive many of my study results across all respondents.

Feminist Reflections

As a white woman conducting research on female subjects in Ghana, I had mixed success using feminist methodologies. As described in “Feminist Approach” (page 33), feminist methodologies influence all aspects of a research project, from design to publication.

In regards to survey design, I chose female research subjects in order to attempt to utilize strategic sisterhood. I wrote the questions with input from women, including my interpreter and the woman in charge of Women’s Empowerment at Hen Mpoano. However, I did not attempt to “build” strategic sisterhood directly through the wording of my questions. I am not sure if I could do this, given that I relied upon interpretation.

During survey implementation, there was a degree to which I was able to rely upon strategic sisterhood. I was able to sit with a group of women as they cut up onions in Winneba, and felt that I was more welcome to that space than perhaps a man would be. I interviewed a woman wearing only a “three-yard” (three yards of unsewn fabric wrapped around the body) and nothing else, as well as women breast-feeding children, and in none of these cases did the women appear to be worried about their nakedness in front of me. It is important to note that they also seemed unconcerned about their nakedness in front of Ghanaian men, but it would be possible that they would have had a different reaction to a white man. I did feel a certain degree of comfortableness and warmth from the women I interviewed because I am a woman.

However, I also failed to fully establish strategic sisterhood, because of the racial and power dynamics. I did not, as is prescribed by feminist research methods, make explicit my

racial and socioeconomic status with the women I interviewed; at the time, this seemed like it would be an insult to them and a waste of their time. While processing the data, I agree with my on-site conclusions, feeling that that level of explicitly would have come across as condescending. As it was, there was often a strong hierarchical power dynamic, where women would often get a chair or stool brought for me to sit on, sometimes giving me the seat they themselves were occupying. I got the sense that it was a matter of pride to provide a seat for the white woman, and that if I declined, it would be an insult. Further, I experienced a good degree of heat stroke in the field, so the seats were honestly needed. Many of the women asked me if I could take their children with me to America, which broke my heart; because I of course had to tell them that, I could not. One woman in Aboesi told me she hopes her child can be like me, “a scholar,” and she begged me to take the child with me.

Finally, I have attempted to use feminist methodologies in this post-data processing, in part by writing this section. I think it is important to be explicit with how uncomfortable I continue to feel discussing my research, and how it makes me feel like it looks like I am fetishizing my subjects. I worry that perhaps I am. There was a degree of defensiveness when I discussed my research before I went, and now that I have been working with the data, I feel mostly ashamed of how much I will have profited from the information of these Ghanaian women who are not getting enough to eat, and how little I am able to give back to them. However, I do not want to center this research on my own white tears and fragility, what is most important is to attempt to affect change through the data presented here. My hope is that this research can be used to help the fishing dependent communities, and that it will be of use to USAID and the SFMP, or to FAO, or Hen Mpoano, or the Ghanaian Fisheries Ministry. In terms of access to the research, because I have yet to attempt to publish it, I am not sure whether

it will be open access. My hope is that I will be able to publish this research such that it makes the biggest impact. However, the subjects themselves are mostly illiterate and without internet access, thus no degree of open access will make this research available to them. My hope is that Hen Mpoano might have an opportunity to disseminate the data at any future meetings with important people in the fishing industry.

Areas of Improvement

This study could have been improved in a variety of ways. Most importantly, the survey instrument could have been better crafted. One flaw in the instrument is that some important questions were only asked to one study group (usually the consumer group) and not the other two. A stronger survey would be able to discuss fish consumption among all groups, not just the “consumer” group. Further, the questions about seasonality and changes of seasonality should have been applied to all group. An additional error in the creation of the instrument was that for the fish processors, I originally had one question asking if fish had “changed” now compared to ten years ago. This question was too open ended, and for the later surveyed sites got changed to three questions, one about species, one about size, and one about quantity. Another flawed question was the one with pictures for the fish consumers. When I spoke with the USAID office before my return to the States, they informed me that the fish I chose for the picture of fish was not a *sardinella*, and because it was a higher value fish it might have affected my answers. Fortunately, I did not choose a high value fish, such a tilapia, but instead chose one of medium value, but one not as common as the *sardinella* species. A picture of *sardinella* would have been most appropriate. Also in the fish consumer survey, I asked respondents if there is a price at which they would stop purchasing fish, and if so, what was that price. The problem with the follow up question is that I did not specify a volume, thus the prices were not homogenized, and

due to interpretation, I was not able to get a sense if the volumes were even close. Thus, I was not able to process that follow up question at all, and a better version would ask the question with volume of fish, and/or species of fish, specified.

Finally, I asked if the fish seller had any unsold fish at the end of the day ten years ago, and if they usually have any unsold fish at the end of the day today. I wanted to see if, for example, more unsold fish in the past compared to today would mean that there is perhaps a higher demand for fish today, and that fish sellers are maxing out of their stock. However, this question was somewhat inherently flawed, because each woman would have a different metric for what “unsold fish” meant. For example, many women reported that there is always unsold fish, given that they have bulk product and if they run out at the market, they just go home to procure more. Thus, the concept of “unsold fish at the end of the day” was perhaps a bit of a Western one, and did not translate well to Ghanaian culture or daily life. I found statistical significance between the study sites, but it is difficult to attribute this to anything, given that it is possible that the question was misinterpreted. Further, I did not find significance when comparing the “unsold now” and “unsold 10 years ago” results.

It is possible that there exists a better metric for wealth in these communities besides “yards of unsold fabric,” which was suggested to me by Hen Mpoano. However, every other metric I tried, such as owning a house, a car, a bike etc., was met with laughter and confusion – these items were far too expensive for most of the respondents to own. Thus, my test shows either that “unsold fabric” is a poor metric of wealth, or that there were few differences of wealth between the respondents, or potentially it shows that wealth status does not affect nutritional

insecurity. Because of my lack of certainty about this metric, I am not able to draw as strong of a conclusion.

Further, there was need for improvement with the qualitative methodologies. First, there were occasions where I should have recorded but did not. I used my recorder for every officially set up “elite interview,” but upon my return, I realized that I could have recorded the entirety of the IUU meetings, in addition to my notes.

Recommendations

In Shama Bentsir, one of the women I surveyed was showing signs of research fatigue, expressing that too many people had come to ask questions and there had not been enough improvements to the area as a result. She told me she wanted a cold store, and then asked if I would be able to get one built for them. I told them that I could not, that it was outside the scope of my study. However, because of this, and because of the narrative of the cold store culture vs. landing beach cultures, it is clear that my recommendation will be that a cold store should be put in where the landing-beach dependent communities can store their fish. However, is that the best solution? The issue of a cold store is a complicated one. Right now, fish processors in towns that do not have a cold store have, essentially, a monopoly on fish preservation. Without a cold store, fish that is landed has to be purchased quickly, thus the fish processors have some influence in the buying process. However, a cold store would increase the amount of fish aggregate, because less spoilage would ultimately occur. Further, a cold store could give some freedom to fish processors to process when they need to, and be less dependent on seasonal gluts and depressions. The cold store at Winneba is successful because it is managed by an outside entity, Challenging Heights, who provide the staff for the store, maintenance, and electricity. Just building a cold store in any of the Western Region locations without the proper

infrastructure to maintain it and to moderate access to the cold store could be a wasted effort. It could be possible to structure management of such a development project within the already existing social hierarchy within the communities, but this would still require organization from an outside entity.

The literature that discuss building cold stores in the framework of development also gives mixed recommendations for building a cold store in regards to women's empowerment. Building a cold store or increased refrigeration has often been a mechanism of development agencies; however, there is not a consensus among scholars that a cold store would be directly helpful for the economic situation of the resource users. Further, development projects that focus on increasing nutritional security that advocate for building a cold store need regular government supervision, something the government may not be able to provide (Robinson and Lawson, 1986). Others make the point that building a cold-store in cultural systems where the fish will then be processed may have a myriad of consequences for the varying groups involved in the post-landing value chain, perhaps to the detriment of women fish processors. However, there is likely more resilience in these social ecosystems compared to those where the fish requires a network of cold storage systems, suggesting that, in the case of Ghana, there may be more ability to adapt to development (Morrissey 1988). Thus, the issue of a cold-store is a complicated one, and I am not comfortable recommending the building of one without further study, perhaps to the dismay of fish processors in the study sites.

Besides a cold store, increased access to education is a potential recommendation. Increased educational opportunities could help increase livelihood diversity in these communities, and is something the survey respondents reported to me that they would like. As

discussed above, livelihood diversification can increase resilience, in this case to the potential threshold of fishery collapse. Programs that focus on the education of children specifically from fishery dependent communities might be especially beneficial to the nutritional security of the entire country. According to the USAID SFMP Baseline study, 84.3% of women in fishery dependent coastal communities are illiterate (USAID SFMP Baseline). Fewer people involved in the artisanal fishing industry creates less stress on the stocks, and allows for ease of entry into the industry for those who have no other means of earning a living. Thus, moving people out of the fishing sector allows for more flexibility within the sector itself for potential influxes of new fisher people.

Future Research Questions

This research has led me to think of a variety of research questions, many of which require differing backgrounds than my own. These questions would be excellent candidates for collaborative efforts between academics with a variety of expertise.

First, I became increasingly interested in the effects of processing fish on the health, especially fish caught with chemicals during IUU fishing. During one of the IUU meetings, we watched a video that showed a woman fish processor saying that when she processes fish landed with poison (often DDT), it burns her hands. Therefore, I began wondering what are the health damages of processing poisoned fish, specifically to the hands but also to the lungs. In addition, what are the health damages of consuming the smoked, poisoned fish? One of my elite interviewees told me that the fishermen and fishing communities usually keep the non-poisoned fish for themselves, and send the poisoned fish inland. This does not protect the fish processors, but does perhaps protect children from consuming poisoned fish. Thus, I believe there are an important series of questions to be asked relating to health and IUU fishing.

Further, I think it would be interesting to conduct a study on seasonality of landings and potential changes in it, by surveying both fishers and fish processors. My questions about seasonality were only posed to the consumers, and I would be interested to know if the fish processors and fishers were noticing changes in seasonality. I would be curious if a cold store affected these questions, and for which study groups?

Relating to nutritional insecurity, I believe it would be of importance to conduct a more thorough study on the nutritional status of families in fishery dependent coastal communities. USAID has conducted health studies on farming communities in Northern Ghana for the “Feed the Future” initiative, and similar metrics could be modified and applied to coastal communities and a fish-based diet (Zereyesus et al 2014).

In regards to health metrics, as the reduction of IUU fishing is currently of the upmost concern for the Fisheries Ministry, I think it would be important to study nutritional security metrics, livelihood metrics, and fish stock assessments across study sites, comparing between those with rampant IUU fishing and those where it is better “controlled.” This would have to be handled with some sensitivity, as illegal fishing efforts can be difficult to learn about. However, it would be key for the Ghanaian fishery managers to have a study that directly states that nutritional insecurity is worse in areas with rampant IUU fishing (if this is truly the case). Thus, I think it would be interesting and of importance to study what the effects of IUU fishing are on fish stock numbers and size, fishing livelihoods, and nutritional insecurity.

Conclusion

While there exists much discussion in scholarly circles regarding the role of fishery management for meeting nutritional security needs, there appeared to be a lack of site-specific data on access to fish, and trends in fish consumption. This study attempted to address that information deficit.

In doing so, this study found that there is the potential for nutritional insecurity in four out of five study sites, all located in the Western Region. Further, any decrease of fish consumption in all study sites was found to be due to decreased local fish stocks, not in any changes in preference. Fish was recognized as a culturally and physically important food source, with respondents citing health reasons for regularly eating fish. Further, there was found to be a relative lack of livelihood diversity, which could lead to a lack of resilience to declines or changes in seasonality in fish availability in the communities where such changes are most likely to result in livelihood and nutritional insecurity. Livelihood insecurity and nutritional insecurity can be compounding woes, leading to a more stressed socio-ecological system. There are many reasons why residents of Winneba, the Central region study site, could be less likely to experience nutritional insecurity, but an important one is the reliance on a cold store, both locally and at the closest large fishing port. However, putting a cold store in the Western Region sites could be both empowering or disempowering for the fishery dependent community. Many mothers reported that they want their children to be able to go to school and not be in the fisheries business, and it is likely that increased access to education would help increase livelihood diversity in the communities.

Further, I found that it was possible to utilize a feminist approach and mixed methods with a focus on structured interview surveys in order to gather sociological data. These methods

could be applied to a variety of socio-ecological ecosystems, in both developing and developed contexts, and in other ecological systems outside of fisheries. Research is increasingly aware of the importance of gender dynamics, especially in questions of equity, access, and resilience.

In conclusion, there appears to be the continued need to manage fish stocks in Ghana explicitly for meeting nutritional security needs. Any development measures taken should first undergo testing and careful design, perhaps rooted in a GAD framework, in order to make sure that the most vulnerable members of the population benefit from the projects. The women I surveyed asked me for help; the government of Ghana and the local NGOs are working hard to see it is brought to them.

Acknowledgements

First, I would like to thank everyone at SMEA who made this thesis possible. I would like to foremost acknowledge the help and advice from my advisor, Eddie H Allison, without whom I would not have been able to follow my dream to go to coastal Ghana. It has been a pleasure and honor to work with you. Next, I would like to thank Marc Miller, for teaching me the interviewing methods I used while in coastal Ghana and for always believing that I could be an expert. Also to Ryan Kelly for the help with writing the code in r and figuring out how exactly to run the fisher's exact tests. To my fellows in MARINA lab for discussing the thesis with me and helping me workshop presentation versions of it. Thanks of course to Tiffany Dion, for always being available for any questions or help.

I would also like to especially thank the Boeing Corporation for the generous fellowship that allowed me to travel abroad to collect data for my research. I am honored to be chosen for this prestigious award.

Next, I would like to thank everyone in Ghana who made this work possible. First and most importantly to everyone at Hen Mpoano for housing me, taking care of me, driving me, and helping me craft my research: I learned so much from you, and so enjoyed getting to know you all. Thanks to Kofi Agbogah for endorsing my research at Hen Mpoano. Thanks also to Stephen Kankam, who initiated this research collaboration and who facilitated the data collection. Also, much thanks to Cephas Asare of Hen Mpoano who, along with his wife Josephine, housed and took care of me while in Sekondi, and was my first resource if I had any cultural, directional, monetary, and otherwise pertinent questions. Thank you for your hospitality and warmth; I wish you both the very best! Thanks to Ali and Youssef for driving me to and from the study sites. Many thanks to Justice Camillus Mensah for the GIS map of the

study sites, and to Adiza Ama Owusu for helping me understand the gender dynamics of the coastal fishing communities. Thanks to the entire staff for helping me construct the survey instrument, and interpret my data. Outside of Hen Mpoano, I would like to offer many heartfelt thanks to my two interpreters, Priscilla Acquandoh and Comfort Ekua, who were instrumental to the gathering of data. Also thanks to the staff of Challenging Heights for hosting me while in Winneba, and especially to Christine Bedenis for housing me and helping me understand Ghanaian and Fante culture from the perspective of another *oburoni*. Finally, I would like to say *Medaase* to the women I interviewed: thank you for your time and hospitality.

I would like to acknowledge my family, friends, and partner who supported me throughout my thesis. Deborah and Rodger Russell, Kent Harbor, Bradley Hammerson, and Nadya Pierre: thank you; I love you.

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Appendices:

Boeing Application

IRB Human Subjects Exemption Letter

Survey Instrument

Results Tables

I: Boeing Travel Fellowship Application



2016-2017 Application Form
International Research and Study Fellowships
Application Deadline: February 8, 2016, 12 noon PST

PERSONAL INFORMATION

Last Name	<input type="text" value="Russell"/>	First Name	<input type="text" value="Hannah"/>
Preferred Name	<input type="text" value="Hannah"/>	Student Number	<input type="text" value="1522788"/>
Academic Department	<input type="text" value="School of Marine and Environmental Affairs"/>		
Email Address	<input type="text" value="hanruss@uw.edu"/>	Phone	<input type="text" value="909-630-9272"/>
Affiliation Institution (if any)	<input type="text" value="Hen Mpoano"/>		
Birthplace	<input type="text" value="California"/>	Citizenship	<input type="text" value="United States"/>
Academic Standing	<input checked="" type="radio"/> Master's student <input type="radio"/> Ph.D. student	GPA	<input type="text" value="3.87"/>

FOREIGN LANGUAGE AND TRAVEL EXPERIENCE

Please indicate your foreign language ability:

Language 1	<input type="text"/>	Proficiency	<input type="text"/>
Language 2	<input type="text"/>	Proficiency	<input type="text"/>
Language 3	<input type="text"/>	Proficiency	<input type="text"/>

Please give location, dates, and purpose of previous foreign study and travel:

STATEMENT OF PURPOSE (please include your statement at the end of this document)

In **no more than three double-spaced pages** (12 pt, Times New Roman, 1-inch margins), please write a statement indicating how this period of research or study will further your short-term and longer-term academic goals. Footnotes may be 10 pt but are included in the page limit. Applicants may also submit a separate bibliography, not to exceed ONE page, 12 pt Times New Roman font, with 1-inch margins. Address the following selection criteria in the statement:

- explanation of the research and/or study that will be done on the fellowship
- evidence of the relationship between the proposed study/research and the applicant's academic program
- evidence of the necessity to go overseas to conduct the study/research and the relevance of the university or locale to the planned research (including evidence of affiliation, if required or appropriate, to carry out the proposed project); and
- evidence of appropriate language competence

TIMELINE (please include at the end of this document)

In no more than **one page** (single spaced is okay), please provide a proposed timeline (by week) of your planned research or study activities.

ACADEMIC RECOMMENDATIONS

Recommendations should be sent directly from the recommender to <https://catalyst.uw.edu/collectit/dropbox/mdrapek/36533>. If the recommender does not have a UW net ID, the letter can be emailed as an attachment to gradappt@uw.edu.

Recommender 1

Name	<input type="text" value="Edward Allison"/>	Title	<input type="text" value="Advisor / Professor"/>
Institution	<input type="text" value="University of Washington"/>	Dept/School	<input type="text" value="SMEA"/>

Recommender 2

Name	<input type="text" value="David Fluharty"/>	Title	<input type="text" value="Professor"/>
Institution	<input type="text" value="University of Washington"/>	Dept/School	<input type="text" value="SMEA"/>

By submitting this form, you are certifying that all the information included is accurate.

PLEASE NOTE: If the research includes systematic collection of information about or from humans, disbursement of the fellowship will be contingent upon the student receiving approval or an exemption from the Human Subjects Division. Completing the process may take several months. Further information may be found at <http://depts.washington.edu/hsd/>. Complying with **Human Subjects Division** review is the responsibility of the student, in coordination with his/her faculty advisor and department chair.

Application Deadline: February 8, 2016, 12 noon (PST)

Complete applications include:

1. Cover sheet
2. Three page statement of purpose (double-spaced, 12 pt Times New Roman, 1-inch margins). Footnotes may be single-spaced in 10 pt font, but are included in the three-page limit. Applicants may submit a separate bibliography not to exceed one page, single-spaced, 12 pt Times New Roman, 1-inch margins.
3. Brief weekly timeline of expected activities during fellowship quarter (maximum one page, single-spaced)
4. Documentation of affiliation (if applicable)
5. Curriculum vitae
6. UW unofficial transcript (printable PDF version from MyUW)
7. Two letters of recommendation, which the recommenders **send directly to:**
<https://catalyst.uw.edu/collectit/dropbox/mdrapek/36533>

Students should submit the completed application form, statement, timeline, affiliation documentation, CV, and transcript to: <https://catalyst.uw.edu/collectit/dropbox/mdrapek/36533>

PLEASE NOTE:

- Successful applicants are expected to be in-country for the three months of the quarter in which they receive the award.
- Successful applicants are *not* allowed to receive funding or salary from any other source comparable to the International Research/Study Fellowship. One-time travel or research grants may be acceptable. You must receive approval from the Office of Fellowships and Awards to accept any additional funds.
- You will be required to register through UW Study Abroad and to meet their deadlines and requirements.
- Travel to countries under U.S. State Department warnings may not be allowed on this fellowship.

If you have questions about any of these requirements, please contact the Office of Fellowships and Awards: gradappt@uw.edu or 206-543-7152.

The University of Washington provides equal opportunity in education without regard to race, color, creed, religion, national origin, sex, sexual orientation, age, marital status, disability, or status as a disabled veteran or Vietnam era veteran in accordance with University of Washington policy and applicable federal and state statutes and regulation.

Statement of Purpose:

I propose to conduct a survey of fish landings and nutritional security for coastal Ghanaian communities. Specifically, I am interested in the highly nutritious small, nearshore fish that are traditionally landed, traded and consumed by lower-income consumers. Worldwide, fish are important source of nutritious calories, especially for poor or otherwise disadvantaged populations (Thilstead et al. 1997). Growing market demands and changes in preferences, however, have the potential to decrease people's access to these local fish (Atta-Mills et al. 2004). I want to study this process, in order to inform attempts by communities and development actors (including USAID) to secure the rights of local people to access the fish that is caught on their shores. This is an especially prevalent problem in Ghana, where fisheries are recovering after decades of ineffective management and foreign harvesting that has depleted fish stocks and decreased availability of fish to local consumers (Nunoo et al. 2014).

There have recently been active efforts to support the nearshore artisanal fishery sector in Ghana (Mutimukuri-Maravanyika et al. 2013), because of their importance as source of both livelihood and nutrition. However, studies have focused on fish stock management and fish capture, with little research "following the fish" from the harvester, to the buyers, processors and traders, and on to the

consumer. This post-harvest value chain is the focus of my research. My particular interest is in how access to fish is mediated by social demography: Do children get adequate access to fish? Do gender relations play a part in determining access to fish as part of a nutritious diet? Is social or economic class a barrier to access – have nutritious local fish become unaffordable for the coastal poor? How do current demands and trends of which fish is “popular” affect the ability of people to access their local fish?

To this end, my advisor and I have been in communication with Hen Mpoano, a registered Ghanaian NGO. Hen Mpoano (“Our Coast”) focuses on management of coastal Ghana, focusing on simultaneous socio-economic and ecological benefits. Their mission is to provide support to coastal communities in order to promote building of healthy fisheries, coastal ecosystems and, and local populations². Specifically of interest to me is their work on local food security, as part of a five-year Sustainable Fisheries Management Project (SFMP), funded by the United States Agency for International Development (USAID), which has contributed about \$24 million to this Ghanaian project in order to contribute to local food security. The project does not, however, currently look at cultural and demographic aspects of access to fish; therefor my project contributes to filling an important knowledge gap.

The Coastal Resource Center at the Graduate School of Oceanography, University of

Rhode Island is the lead on the SFMP. It was at a conference at this University that David

Fluharty, one of my professors at the School of Marine and Environmental Affairs (SMEA), met Stephen Kankam of Hen Mpoano. When Mr. Kankam proposed to Professor Fluharty that Hen Mpoano collaborate on a fisheries project with the University of Washington, Professor Fluharty directed his attention to my advisor, Professor Edward Allison. Professor Allison has worked extensively on African fisheries (including in Ghana) and is currently working on a global review of the links between fish consumption, nutrition status and health. Knowing my interest in Ghanaian fisheries and social justice issues, Professor Allison included me in the project. Going to Ghana is imperative to my research; this is not work that can be done from a desk in Seattle. In collaboration with Hen Mpoano I would be able to gather data from fishing communities and fish consumers. The culmination of this project would be a published collaborative paper between myself, Professors at UW, and Hen Mpoano.

My proposed research into food security and fisheries in Ghana relates very well to my academic work at the University of Washington. SMEA is interested in environmental justice and human rights issues in relation to the management of marine ecosystems; food security and fisheries fit squarely in this purview. My short term academic goals are to explore these connections between human rights and fishery management. Long term, I am interested in becoming a fishery manager, with a focus on disadvantaged populations and small-scale commercial fishing. Given that the SMEA program is only two years long, the time that I would best be able to go to Ghana to gather data for this project would be over the summer quarter.

Currently I am in my second quarter as a master’s student at the School of Marine and Environmental Affairs (SMEA). As an advisee of Professor Allison, I am a member of

² <http://www.henmpoano.org/about.html>

MARINA Lab³. I received my BS from the University of California, Berkeley in 2010 in Conservation and Resource Management. My major focused on social theory, political ecology, common pool property rights, stewardship theory, and resource management. I also participated in an internship at the Environmental Defense Fund, under the mentorship of Rodney Fujita⁴. There, we worked on a project focused on the potential for cooperative management in rockfish fisheries along the California coast, culminating in authorship of a peer reviewed paper (Fujita et al. 2010). Upon beginning my master's at SMEA and with Professor Allison as my advisor, I began to expand my interest in social justice to include food security and rights to nutrition. His background in the area of food security and fisheries (McClanahan et al. 2015) fit well with my desire to study social justice concerns in fishery management.

References

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McClanahan, T., Allison, E. H., & Cinner, J. E. (2015). Managing fisheries for human and food security. *Fish and Fisheries*, 16(1), 78-103.

Mutimukuru-Maravanyika, T., Asare, C., Ameyaw, G., Mills, D., & Agbogah, K. (2013). *Ghana coastal fisheries governance dialogue: Developing options for a legal framework for fisheries co-management in Ghana*. WorldFish.

Nunoo, F., Asiedu, B., Amador, K., Belhabib, D., & Pauly, D. (2014). Reconstruction of marine fisheries catches for Ghana, 1950–2010. *Vancouver (Canada): Fisheries Centre, University of British Columbia*.

³ www.Marinalab.org

⁴ <https://www.edf.org/people/rod-m-fujita>

Thilsted, S. H., Roos, N., & Hassan, N. (1997). The role of small indigenous fish species in food and nutrition security in Bangladesh. *Naga, The ICLARM Quarterly*, 20(3-4), 82-84.

Before departure: (from date I receive decision - June 15th)

In collaboration with Hen Mpoano, design research to align with their institutional priorities and research needs;

Develop and refine research questions

Research questions will be developed following detailed analysis of the literature. This has begun, though one of my current courses (SMEA 501). My research requires understanding of literatures on food systems, informal and formal markets and value chains, and the governance of fisheries.

Develop outline methodology

Once research questions have been defined and agreed with Hen Mpoano, I will address these questions using the most appropriate methodology. Since I am researching both markets, food systems and governance systems, research is likely to be mixed methods and this will require development of questionnaires and interview schedules.

Define preliminary null and alternative hypothesis.

Develop data gathering, storage and analysis protocols

Develop questionnaire and survey outlines; discuss with Hen Mpoano how to phrase survey questions as to be culturally sensitive and relevant

Write survey questions that can easily be computed into quantifiable data;

Develop and test statistical analyses that I will need to run on the data upon my return. Throughout this period, I will be in contact with Hen Mpoano to ensure that the research meets their needs and expectations, as well as fulfills my interest and thesis requirements.

Weeks 1-3: Introduction (June 16 – July 8)

Week 1 (June 16 – June 25): Meet members of Hen Mpoano, discuss research protocol, become acclimated to the area

Week 2 (June 26-July 2): Introduction to study sites

Week 3 (July 3--July 9): Visits to local and traditional authority with members of Hen Mpoano.

Weeks 4- 9 Participant Observation Study (July 10 – August 20)

Week 4(July 10-July 16): Survey and interview fishmongers

Week 5 (July 17-July 23): Survey people who purchase fish from fishmongers

Week 6 (July 24-July29): Survey and interview food and nutrition-insecure groups within communities, which have been identified beforehand by Hen Mpoano

Week 7 (August 1 – August 6): Survey and interviews community leaders

Week 9 (August 7-August 13): Survey and interview health workers and public health and nutrition personnel from both government and NGO sectors, and the donor community

Week 9 (August 14-August 20): Contingency week to complete any tasks not undertaken. **Weeks 10-12: Conclusions: data manipulation, reporting back (August 21 - September 15)** Week 10 (August 21-August 27): Data Entry, synthesizing, discussions of findings.

Week 11 (August 28-September 3): Report Findings back to Hen Mpoano, discussion of findings, collect responses to research (if any).

Week 12 (September 4- September 15): Report Findings back to community. Talk to community members, see if they have anything to say about surveys or speaking with me.

After: Upon completion of my study, I will first analyze the data. I will standardize and quantify the survey response data. I will run appropriate statistical studies on this. I will use interview transcript to provide triangulation and amplification of survey response, and to analyze causal relationships. These studies will be included in my thesis, which I hope to publish in a peer reviewed journal.



38 J. Cross Cole street, Windy Ridge Ext PO Box AX 296, Takoradi-Ghana +233 (031) 2035100
Info@henmpoano.org

February 4, 2016

To Whom It May Concern:

Re: Collaboration with Hanna Russell on a Fishery-Related Project

Hen Mpoano is prepared to provide both technical and logistical support to Hannah Russell during her stay, and research work on, fisheries and food security in Ghana. Hannah's work complements the USAID-funded fisheries and food security project (currently being implemented by Hen Mpoano and a consortia of partners, with the Coastal Resources Center of the University of Rhode Island, USA, as lead.

Hen Mpoano is a Ghanaian non-profit making organization that provides technical, policy and extension support to coastal communities, emerging civil society groups, traditional authorities, government institutions and the private sector through research, capacity building, networking and project development in fisheries and coastal ecosystem governance (see <http://www.henmpoano.org/sfmp.html>)

Please do not hesitate to contact me at kagbogah@henmpoano.org if you have any questions or concerns relative to this collaboration.

Sincerely,

Kofi Agbogah

Director

Hannah Russell

School of Marine and Environmental Affairs

University of Washington

hanruss@uw.edu

SUMMARY OF RESEARCH INTERESTS

I am an interdisciplinary scholar interested in the societal aspects of fishery management.

Specifically, I am interested in how management of small scale fisheries affect the food security of nearby local populations. I would like to apply this thought to small scale nearshore fisheries on the coast of Ghana. I am interested in how demographics affect who is able to eat the small, nutritious fish caught off Ghana's shores. My previous studies have focused on political ecology, common pool resource theory, cooperative management, stewardship theory, and ecosystem based management. I have always been interested in holistic resource management that encompasses the entire ecological and socio-political spheres of an area being managed in order to best manage for healthy and stable communities.

EDUCATION

Current **Masters of Marine Affairs** at the School of Marine and Environmental Affairs, University of Washington

2010 **BS** in Conservation and Resource Management, College of Natural Resources, University of California, Berkeley.

PROFESSIONAL HISTORY

January 2013 – March 2015

Temporary Legal Patent and Contracts Assistant Randstad USA, Prothema Biosciences Inc.

South San Francisco, California

June 2012 – August 2012

Temporary Secretary, Receptionist

Robert Half International, Revels M. Cayton, M.D., Inc. Oakland, California

January 2009 - October 2010

Front Desk Receptionist, File Clerk

Dr. Fiscella's Family Practice

Draft 3

Berkeley, California

January 2008 - January 2009

Paid Intern

Environmental Defense Fund

San Francisco, California

Curriculum Vitae

February 2016

PUBLICATIONS

Fujita, R. M., Honey, K. T., Morris, A., Wilson, J. R., & Russell, H. (2010). Cooperative strategies in fisheries management: integrating across scales. *Bulletin of Marine Science*, 86(2), 251-271.

Draft 3

UNIVERSITY OF WASHINGTON Page 1 of 1

UNOFFICIAL ACADEMIC TRANSCRIPT

Prepared on 2/8/2016

 * ANY ALTERATION OR MODIFICATION OF THIS RECORD *
 * OR ANY COPY THEREOF MAY CONSTITUTE A FELONY *
 * AND/OR LEAD TO STUDENT DISCIPLINARY SANCTIONS. *

GRE SCORES : VERBAL:160 QUANT:149 ANAL/WRITE:055

DETAIL OF TRANSFER CREDIT:
 UNIV OF CALIFORNIA: BERKELEY , CA (4 YEAR SCHOOL)
 ATTENDED 2006-2010 DEGREE: BS 12/10
 TOTAL CREDITS EARNED: 0.0

SUMMARY OF TRANSFER CREDIT:	LD	UD	TOTAL
TOTAL CREDITS EARNED:	0.0	0.0	0.0
TOTAL TOWARD DEGREE:	0.0	0.0	0.0

AUTUMN 2015		SMA	8
Q SCI 381	INTRO PROBABIL&STAT	5.0	2.9
SMEA 500	HUMAN DIMENSIONS	3.0	3.7
SMEA 521	GOV RESP CLIMATE CHG	3.0	3.9
SMEA 550	SPECIAL TOPICS	3.0	4.0
QTR ATTEMPTED: 14.0		EARNED: 14.0	GPA: 3.87
QTR GRADED AT: 9.0		GRADE POINTS: 34.8	
CUM ATTEMPTED: 14.0		UW EARNED: 14.0	TTL EARNED: 14.0
CUM GRADED AT: 9.0		GRADE PTS: 34.8	CUM GPA: 3.87

 CUMULATIVE CREDIT SUMMARY:
 UW CREDITS ATTEMPTED 14.0 UW CREDITS EARNED 14.0
 UW GRADED ATTEMPTED 9.0 EXTENSION CREDITS 0.0
 UW GRADED EARNED 9.0 TRANSFER CREDITS 0.0
 UW GRADE POINTS 34.8 -----
 UW GRADE POINT AVG. 3.87 CREDITS EARNED 14.0

***** WORK IN PROGRESS *****
 WINTER 2016 SMA 8
 OCEAN 591 MS IN COASTAL ZONE 3.0
 SMEA 501 MAR AFFAIRS PRACTICE 3.0
 SMEA 539 US FISH MGT POL 3.0
 SMEA 550 SPECIAL TOPICS 1.0
 SMEA 600 INDEPNNT STDY/RSCH 1.0
 PB AF 599 SPECIAL TOPICS 4.0
 QTR REGISTERED: 15.0
 ***** END OF RECORD *****

IRB Exemption Letter



7/26/2016

PI: Hannah Russell
Student
School of Marine and Environmental Affairs

CC: Edward H. Allison
Professor
School of Marine and Environmental Affairs

RE: HSD study #52353 "Food and Nutritional Security of Fishery Dependent Communities in Takoradi, Ghana"

Dear Russell:

The University of Washington Human Subjects Division (HSD) has determined that your research qualifies for exempt status in accordance with the federal regulations under 45 CFR 46.101/ 21 CFR 56.104. Details of this determination are as follows:

Exempt category determination: 2

Although research that qualifies for exempt status is not governed by federal requirements for research involving human subjects, investigators still have a responsibility to protect the rights and welfare of their subjects, and are expected to conduct their research in accordance with the ethical principles of *Justice, Beneficence* and *Respect for Persons*, as described in the Belmont Report, as well as with state and local institutional policy.

Determination Period: This exempt determination is valid for the life of the study, as long as the nature of the research activity remains the same. If there is any substantive change to the activity that has determined to be exempt, one that alters the overall design, procedures, or risk/benefit ratio to subjects, the exempt determination will no longer be valid.

Revisions: Only modifications that are deemed "minor" are allowable, in other words, modifications that do not change the nature of the research and therefore do not affect the validity of the exempt determination. Please refer to the Guidance document for more information about what are considered minor changes. If changes that are considered to be "substantive" occur to the research, that is, changes that alter the nature of the research and therefore affect the validity of the exempt determination, a new *Exempt Status Request* must be submitted to HSD for review and determination *prior to implementation*.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events or any problem that may increase the risk to the human subjects and change the category of review, notify HSD promptly. Any complaints from subjects pertaining to the risk and benefits of the research must be reported to HSD.

Please use the HSD study number listed above on any forms submitted which relate to this research, or on any correspondence with the HSD office.

Good luck in your research. If we can be of further assistance, please contact us at (206) 543-0098 or via email at hsdinfo@uw.edu. Thank you for your cooperation.

Sincerely,

Nat Krancus, MA |
IRB Administrator | Committee D
University of Washington

4333 Brooklyn Ave. NE, Box 359470 Seattle, WA 98195-9470

main 206.543.0098 fax 206.543.9218 hsdinfo@uw.edu www.washington.edu/research/hsd

W UNIVERSITY of WASHINGTON
 HUMAN SUBJECTS DIVISION
 Box 359470
 Seattle, WA 98195-9470
 Phone: 206-543-0096
 Fax: 206-543-9218

**PAPER APPLICATION:
 Determination, Exempt Status
 (Word)**

FOR HSD OFFICE USE ONLY		
APPLICATION NUMBER: 52353	COMMITTEE: ED	DATE RECEIVED STAMP:
<input type="checkbox"/> MASTER COPY	<input type="checkbox"/> ACCEPTED - See Notice of Determination	RECEIVED Human Subjects Division JUL 21 2016 UW
<input checked="" type="checkbox"/> RESEARCHER COPY	EXEMPT CATEGORY: 2	
HSD STAFF SIGNATURE:	<i>Hannah Russell</i>	
SIGNATURE DATE:	7/26/2016	
<input type="checkbox"/> DOES NOT QUALIFY		

1. Research Study & Contact Information

Full Application Title:	IRB # (if assigned):	Committee: (if assigned)
Food and Nutritional Security of Fishery Dependent Communities in Takoradi, Ghana		
Lead Researcher Information		
Name:	Title:	Position (e.g. Asst. Professor or Director):
Hannah Russell	Student	Masters Student
Home Institution (or source of paycheck): UW Student? Home Institution is UW.	Other Institution:	
UW		
UW Department:	UW Division (Department of Medicine):	
School of Marine and Environmental Affairs		
UW Position or Appointment (choose the most appropriate one)		
Faculty:	<input type="checkbox"/> Regular Faculty Appointment	<input type="checkbox"/> Research Faculty Appointment
	<input type="checkbox"/> Affiliate Faculty Appointment	<input type="checkbox"/> Visiting Faculty Appointment
	<input type="checkbox"/> Other (Describe):	<input type="checkbox"/> Clinical Faculty Appointment
Student:	<input checked="" type="checkbox"/> Graduate or Professional Student (Matriculated or Approved "On Leave")	<input type="checkbox"/> Matriculated Undergraduate Student
		<input type="checkbox"/> WWAMI Student
<input type="checkbox"/> UW Resident, Fellow or Post Doc.	<input type="checkbox"/> UW Administration or Staff	<input type="checkbox"/> None
Phone #:	Campus Box#:	Email:
909-630-9272	355685	Hanruss@uw.edu
		Other address if not at UW:
		5814 22 nd Ave NW, Seattle 98107
Contact Person (if other than lead researcher)		
Name:	Title:	Position (e.g. Asst. Professor or Director):
Home Institution (or source of paycheck):	Other Institution:	
UW Department:	UW Division (Department of Medicine):	
Phone #:	Campus Box #:	Email:
		Other address if not at UW:

Survey Instrument

Fish Processors

I'm hoping to gather information from this group regarding where the fish they process is sold to in order to paint a picture of the value-chain of the small pelagic stocks. I would like to know if the practice of processing and selling fish wholesale has changed recently.

Date & Location of Survey

How long have you worked as a fish processor?

Do you buy from the landing beach, cold store or both?

- Which landing site?
- Where is the cold store located?
- Do you know where the fish in the cold store comes from? Where?

How long does it take you to travel to purchase fish?

Ten years ago (or less, if that's the amount of time the person has worked), how long did you have to travel to purchase fish?

Compared to the past 10 years (or less, if that's the amount of time the person has worked), do you sell mostly the same species of fish, mostly different fish, or a combination?

Draft 3

Compared to the past 10 years, is the quantity of fish you sell the same, less, or more?

Which species of fish do you prefer to buy to process?

Where do you sell your fish?

Is it sold wholesale or do you sell directly to the consumer?

Do you smoke, salt, sell fresh, or otherwise process the fish?

How long does the fish you process keep before it spoils?

Do you have another source of income besides processing fish?

- If Yes: What is it?

Yes or no, do you feel secure that this job will exist in:

- 5 years?
- 10 years?
- 20 years?

Do you/will you encourage your children to be fish processors?

Fish retail sellers/fish mongers

I am hoping to gather information on the process of selling fish to the consumer, and how vulnerable a person who sells fish is to changes in landing amounts or consumption preferences

Date & location

How long have you been doing this job?

Yes or no, do you have another occupation besides selling fish?

- If yes: What is it?

What kind of species of fish do you sell?

Do you purchase fish from a fish processor?

- IF YES: For what period of time have you purchased fish from the person you purchase fish from?
- IF NO: are you yourself also a fish processor?
- IF NO: do you buy fresh?
 - For what period of time have you purchased fish from the person you purchase fresh fish from?

Are you buying the same kinds/species of fish to sell now than you were purchasing 10 years ago?

Draft 3

- If you are purchasing different fish to sell, why?

Do you have any unsold fish at the end of the day?

Ten years ago, did you have unsold fish at the end of the day?

Yes or no, do you feel secure this job will exist in:

- 5 years?
- 10 years?
- 20 years?

Yes or no: Will / do you encourage your children to be fish sellers?

Draft 3

Consumers/Households

I would like to gather information regarding you and your household's eating habits relating to fish

Date & Location of survey

What is your age?

What is your career?

Do you own:

- A car?
- Motor bike?
- Bicycle?
- Land?
- A house?

Do you have unsewn pieces of fabric?

- IF YES: how many yards?

Do you own any pieces of gold jewelry?

Are you married?

Draft 3

Do you have children?

Do you eat fish every week?

How many times a week, on average?

Do you eat more, less, or the same amount of fish per week now compared to when you were a child?

Which types of fish is your favorite to eat?

Do you eat the same types of fish you ate as a child, or different types? Why?

What types of fish do you most often buy?

Are you buying more/less/same of those types of fish compared to the past?

- If less: what is different?

If have children: Do your children prefer a specific type of fish?

Are your preferences for fish the same as your parents?

Are there seasonal reasons why you would buy fish, such as:

- Time of year when a certain type of fish is more abundant?
- Specific holiday?
- Has the time of year that you prefer to buy fish changed in the last ten years? Have you noticed a change in fish abundance in specific months?

Where do you purchase or obtain your fish?

Is there a price at which you would stop purchasing fish?

- If so, could you estimate that price?

Do you consider eating fish an important part of being Ghanaian?

- If yes, how so?

Do you consider eating fish a culturally important part of being a coastal dweller?

What is your favorite kind of fish: salted, smoked, dried, fried, or fresh?

Draft 3

How do you prefer eat fish – in a stew, in a soup, fried, or other?

Can you rank the following meat sources in order of preference?

- #1 Favorite:
- #2:
- #3:
- #4:
- #5:



Results Tables

Part 1: Fish Processors:

Survey Question: Do you purchase your fish from the landing beach, cold store, or both?

Results:

		landing		cold store		both	
Site	n	#	%	#	%	#	%
Sa	25	19	76.00%	0	0.00%	6	24.00%
Sb	25	21	84.00%	1	4.00%	3	12.00%
As	25	25	100.00%	0	0.00%	0	0.00%
Az	25	23	92.00%	0	0.00%	2	8.00%
W	25	6	24.00%	2	8.00%	17	68.00%
Mean		18.8		0.6		5.6	0.224
SD		7.496666		0.894427		6.730527	
95% CI		1.327151		0.158342		1.19152	
P Value:		2.14E-09					
Conclusion:		Reject the null					

Survey Question: Do you buy the same species now as compared to 10 years ago, or different?

Results:

		different		same	
Site	n	#	%	#	%
Sa	25	2	8.00%	23	92.00%
Sb	25	2	8.00%	23	92.00%
As	25	1	4.00%	24	96.00%
Az	25	0	0.00%	25	100.00%
W	25	11	44.00%	14	56.00%
Mean		3.2		21.8	
SD		4.438468		4.438468	
95% CI		0.785752		0.785752	
P Value:		3.55E-05			
Conclusion:		Reject the null			

Survey Question: Compared to the past 10 years, is the quantity of fish you sell the same, less, or more?

Results:

For this section, I coded the data into “reduced,” “same” “more,” and “other.” The other category includes answers that were indecisive, such as “it varies” or “it is seasonal.” Note that not all respondents answered this question, thus changing the n for some of the study sites.

		reduced		same		increase		other	
Site	n	#	%	#	%	#	%	#	%
Sa	13	12	92.31%	1	7.69%	0	0.00%	0	0.00%
Sb	22	19	86.36%	2	9.09%	1	4.55%	1	115.79%
As	22	20	90.91%	2	9.09%	0	0.00%	0	0.00%
Az	25	25	100.00%	0	0.00%	0	0.00%	0	0.00%
W	25	14	56.00%	7	28.00%	1	4.00%	1	178.57%
Mean		18		2.4		0.4	0.017091	0.4	0.588722
SD		5.147815		2.701851		0.547723		0.547723	
95% CI		0.986656		0.51785		0.104979		0.104979	
P Value:		0.005181							
Conclusion:		Reject the null							

Survey Question: Compared to the past 10 years, has the size of fish you’ve processed changed?

Results:

Note that this question was not explicitly asked at the two “Shama” sites, however some respondents commented on size without prompting, and their results are included.

		reduced		same	
Site	n	#	%	#	%
Sa	1	1	100.00%	0	0.00%
Sb	2	2	100.00%	0	0.00%
As	24	23	95.83%	1	4.17%
Az	25	23	92.00%	2	8.00%
W	20	6	30.00%	14	70.00%
Mean		11		3.4	
SD		11.11306		5.98331	
95% CI		2.61144		1.406009	
P Value:		3.02E-07			
Conclusion:		Reject the null			

Survey Question: Do you sell your fish wholesale, retail, or both?

Results:

		wholesale		retail		both	
Site	n	#	%	#	%	#	%
Sa	25	18	72.00%	3	12.00%	4	16.00%
Sb	25	11	44.00%	9	36.00%	5	20.00%
As	25	16	64.00%	8	32.00%	1	4.00%
Az	25	15	60.00%	8	32.00%	2	8.00%
W	25	7	28.00%	9	36.00%	9	36.00%
Mean		13.4		7.4		4.2	0.168
SD		4.393177		2.50998		3.114482	
95% CI		0.777734		0.444347		0.551364	
P Value:		0.01578					
Conclusion:		Reject the null					

Survey Question: Do you have another source of income?

Results:

		yes		no	
Site	n	#	%	#	%
Sa	25	11	44.00%	14	56.00%
Sb	25	3	12.00%	22	88.00%
As	25	4	16.00%	21	84.00%
Az	25	8	32.00%	17	68.00%
W	25	7	28.00%	18	72.00%
Mean		6.6		18.4	
SD		3.209361		3.209361	
95% CI		0.56816		0.56816	
P Value:		0.08059			
Conclusion:		Fail to reject the null			

Survey Question: Do you feel the fish processing job will be secure in 5 years? 10 years? 20 years?

Results:

I coded the results as “yes,” “no,” and “other,” wherein “other” represents the responses that fall between “yes” and “no,” such that they respondents expressed some uncertainty (“don’t know,”) or a degree of uncertainty mixed with hope (“it is up to God”).

	n	5 years						10 years						20 years					
		yes		no		other		yes		no		other		yes		no		other	
Site		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Sa	25	15	60.00%	1	4.00%	9	36.00%	13	52.00%	2	8.00%	10	40.00%	13	52.00%	2	8.00%	10	40.00%
Sb	25	18	72.00%	3	12.00%	4	16.00%	17	68.00%	3	12.00%	5	20.00%	17	68.00%	3	12.00%	5	20.00%
As	25	17	68.00%	3	12.00%	5	20.00%	13	52.00%	5	20.00%	7	28.00%	13	52.00%	5	20.00%	7	28.00%
Az	25	16	64.00%	3	12.00%	6	24.00%	15	60.00%	3	12.00%	7	28.00%	15	60.00%	3	12.00%	7	28.00%
W	25	19	76.00%	0	0.00%	6	24.00%	18	72.00%	0	7.00%	7	28.00%	18	72.00%	0	0.00%	7	28.00%
Mean		17		2		6		15.2		2.6		7		15.2		2.6		7.2	
SD		1.581139		1.414214		1.870829		2.280351		1.81659		1.788854		2.280351		1.81659		1.788854	
CI		0.279912		0.250361		0.331197		0.403696		0.321595		0.316685		0.403696		0.321595		0.316685	
P Values:		0.5334						0.3878						0.3878					
Conclusions:		Fail to reject the null						Fail to reject the null						Fail to reject the null					

Survey Question: Will you encourage your children to become fish processors?

Hypothesis: More mothers will discourage their children to be fish sellers rather than encourage.

Results:

I coded the data as “yes,” “no,” and “other,” wherein other represented cases where the mother has different desires for different children, and answered that some already work as fish processors, or some will, and some will not. Some of the “no” answers were swayed by the fact that the children are male, and thus would not be qualified to enter the fish processing sector. However, some respondents with male children said they would encourage the male children to be fish processors, so it’s not a hard rule that all male children are counted in the “no” category.

		yes		no		other	
Site	n	#	%	#	%	#	%
Sa	25	5	20.00%	19	76.00%	1	4.00%
Sb	25	9	36.00%	15	60.00%	1	4.00%
As	25	10	40.00%	15	60.00%	0	0.00%
Az	25	10	40.00%	15	60.00%	0	0.00%
W	25	3	12.00%	18	72.00%	2	8.00%
Mean		7.4		16.4		0.8	0.032
SD		3.209361		1.949359		0.83666	
95% CI		0.56816		0.345099		0.148116	
P Value:		0.283					
Conclusion:		Fail to reject the null					

Common Responses: The most common reason why a mother would not encourage her children to not become a fish processor is that she would prefer the child go to school. The following is a breakdown of the five most common reasons why a mother answered “no” for the above question.

		school		hardship		stock decline		male children		child has dreams	
Site	n	#	%	#	%	#	%	#	%	#	%
Sa	16	7	43.75%	4	25.00%	1	6.25%	1	6.25%	3	18.75%
Sb	14	8	57.14%	3	21.43%	1	7.14%	2	14.29%	0	0.00%
As	14	10	71.43%	3	21.43%	0	0.00%	0	0.00%	1	7.14%
Az	13	9	69.23%	2	15.38%	1	7.69%	0	0.00%	1	7.69%
W	19	18	94.74%	0	0.00%	0	0.00%	0	0.00%	1	5.26%

Part 2: Fish Sellers

Survey Question: Do you have another source of income?

Results:

		yes		no	
Site	n	#	%	#	%
Sa	19	10	52.63%	9	47.37%
Sb	7	3	42.86%	4	57.14%
As	4	1	25.00%	3	75.00%
Az	3	2	66.67%	1	33.33%
W	25	7	28.00%	18	72.00%
Mean		4.6		7	
SD		3.781534		6.819091	
CI		0.994304		1.792989	
P Value:		0.3791			
Conclusion:		Fail to reject the null			

Survey Question: Do you sell the same species of fish as you did 10 years ago, or a different species?

		different		same	
Site	n	#	%	#	%
Sa	19	6	31.58%	13	68.42%
Sb	7	0	0.00%	7	100.00%
As	3	0	0.00%	3	100.00%
Az	3	1	33.33%	2	66.67%
W	25	4	16.00%	21	84.00%
Mean		2.2		9.2	
SD		2.683282		7.886698	
CI		0.71197		2.092623	
P Value:		0.3235			
Conclusion:		Fail to reject the null			

Survey Question: Do you have any unsold fish at the end of the day? 10 years ago, did you have any unsold fish at the end of the day?

Results:

		Unsold now						Unsold 10 years ago					
		yes		no		other		yes		no		other	
Site	n	#	%	#	%	#	%	#	%	#	%	#	%
Sa	19	12	63.16%	2	10.53%	5	26.32%	16	84.21%	2	10.53%	1	5.26%
Sb	7	2	28.57%	4	57.14%	1	14.29%	1	14.29%	5	71.43%	1	14.29%
As	4	2	50.00%	1	25.00%	1	25.00%	0	0.00%	3	75.00%	1	25.00%
Az	3	1	33.33%	2	66.67%	0	0.00%	1	33.33%	2	66.67%	0	0.00%
W	25	22	88.00%	2	8.00%	1	4.00%	20	80.00%	5	20.00%	0	0.00%
Mean		7.8		2.2		1.6		7.6		3.4		0.6	
SD		9.121403		1.095445		1.949359		9.607289		1.516575		0.547723	
CI		2.398351		0.288033		0.512558		2.526108		0.398763		0.144016	
P Value:		0.005458						0.0001					
Conclusion:		reject the null						reject the null					

Further, I aggregated across study sites and compared the “unsold now” results to the “unsold 10 year ago”

	n	5 years	10 years
yes	77	39	38
no	28	11	17
other	11	8	3
sum:		58	58
P value:		0.1567	
Conclusion:		Fail to reject	

Thus, I did not find that there were significant differences between unsold now and unsold 10 years ago.

Survey Question: Do you feel the fish selling job will exist in 5 years? 10 years? 20 years?

Results:

		5 years						10 years						20 years					
		yes		no		other		yes		no		other		yes		no		other	
Site	n	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Sa	19	9	47.37%	4	21.05%	6	31.58%	9	47.37%	4	21.05%	6	31.58%	8	42.11%	5	26.32%	6	31.58%
Sb	7	6	85.71%	0	0.00%	1	14.29%	6	85.71%	0	0.00%	1	14.29%	6	85.71%	0	0.00%	1	14.29%
As	4	4	100.00%	0	0.00%	0	0.00%	4	100.00%	0	0.00%	0	0.00%	4	100.00%	0	0.00%	0	0.00%
Az	3	1	33.33%	1	33.33%	1	33.33%	1	33.33%	1	33.33%	1	33.33%	1	33.33%	1	33.33%	1	33.33%
W	25	19	76.00%	0	0.00%	6	24.00%	19	76.00%	0	0.00%	6	24.00%	19	76.00%	0	0.00%	6	24.00%
Mean		7.8		1		2.8		7.8		1		2.8		7.6		1.2		2.8	
SD		6.906519		1.732051		2.949576		6.906519		1.732051		2.949576		6.8775		2.167948		2.949576	
CI		2.050905		0.262937		0.736222		2.050905		0.262937		0.736222		1.998318		0.315524		0.736222	
P values:		0.08577						0.08577						0.03786					
Conclusions:		Fail to reject the null						Fail to reject the null						reject the null					

For the first two designations, 5 years and 10 years, there is no statistically significant frequency between study sites, however for 20 years it appears there is statistical significance between the study sites. This change was caused by the one difference in answers, in Shama Apo, one respondent reported that they believe the job will exist in 10 years, but will not exist in 20 years. Given that one data point is affecting the test, it does not seem strong enough to claim that there is statistically significant data to say that there is differentiation between the study sites. Thus, I fail to prove my hypothesis.

Survey Question: Will you encourage your children to be fish sellers?

Results:

I coded the data as “yes,” “no,” and “other,” wherein other represented cases where the mother has different desires for different children, and answered that some already work as fish processors, or some will, and some will not. Some of the “no” answers were swayed by the fact that the children are male, and thus would not be qualified to enter the fish processing sector. However, some respondents with male children said they would encourage the male children to be fish processors, so it’s not a hard rule that all male children are counted in the “no” category.

Site	n	yes		no		other	
		#	%	#	%	#	%
Sa	19	12	63.16%	7	36.84%	0	0.00%
Sb	7	2	28.57%	5	71.43%	0	0.00%
As	4	2	50.00%	2	50.00%	0	0.00%
Az	3	0	0.00%	2	66.67%	1	33.33%
W	25	3	12.00%	18	72.00%	4	16.00%
Mean		3.8		6.8		1	
SD		4.711688		6.610598		1.732051	
CI		1.238875		1.738168		0.45542	
P Value:		0.00665					
Conclusion:		reject the null					

Common Responses: The most common reason why a mother would not encourage her children to not become a fish seller is that she would prefer the child go to school. The following is a breakdown of the five most common reasons why a mother answered “no” for the above question.

Site	n	school		hardship		male children		child has dreams	
		#	%	#	%	#	%	#	%
Sa	6	4	66.67%	1	16.67%	0	0.00%	1	16.67%
Sb	5	2	40.00%	1	20.00%	1	20.00%	1	20.00%
As	2	1	50.00%	1	50.00%	0	0.00%	0	0.00%
Az	3	1	33.33%	1	33.33%	0	0.00%	1	33.33%
W	21	17	80.95%	2	9.52%	0	0.00%	2	9.52%
Mean		5		1.2		0.2		1	
SD		6.819091		0.447214		0.447214		0.707107	
CI		2.814782		0.184601		0.184601		0.291879	

Part 3: Consumers

Survey Question: Do you eat fish every week?

Results:

		yes		no	
Site	n	#	%	#	%
Sa	25	25	100.00%	0	0.00%
Sb	25	25	100.00%	0	0.00%
As	25	23	92.00%	2	8.00%
Az	25	25	100.00%	0	0.00%
W	25	25	100.00%	0	0.00%
Mean		24.6		0.4	
SD		0.894427		0.894427	
95% CI		0.158342		0.158342	
P Value:		0.1935			
Conclusion:		Fail to reject the null			

Survey Question: Do you eat more, less, or the same amount of fish per week now compared to when you were a child?

Results:

		less		same		more	
Site	n	#	%	#	%	#	%
Sa	25	23	92.00%	0	0.00%	2	8.00%
Sb	25	15	60.00%	4	16.00%	4	16.00%
As	25	11	44.00%	10	40.00%	4	16.00%
Az	25	14	56.00%	6	24.00%	5	20.00%
W	25	11	44.00%	0	0.00%	14	56.00%
Mean		14.8		4		5.8	0.232
SD		4.91935		4.242641		4.711688	
95% CI		0.870883		0.751084		0.83412	
P Value:		4.28E-06					
Conclusion:		Reject the null					

Note that the sample size for Shama Bentsir is 23 for this test, which is because at that site, two respondents answered, “depends,” the only occurrence of this response in all of my tests. Thus, I did not include those two survey results.

Survey Question: Do you eat the same type of fish you ate as a child?

Results:

		same		different	
Site	n	#	%	#	%
Sa	24	15	62.50%	9	37.50%
Sb	25	18	72.00%	7	28.00%
As	25	20	80.00%	5	20.00%
Az	23	14	60.87%	9	39.13%
W	25	22	88.00%	3	12.00%
Mean		17.8		6.6	
SD		3.34664		2.607681	
95% CI		0.59985		0.467399	
P Value:		0.1559			
Conclusion:		Fail to reject the null			

Note: some sample sizes are less than 25 in cases where respondents did not know how to answer, or were unsure.

Survey Question: Do you buy more, less, or the same amount of the fish you purchase the most often?

Results:

		less		same		more	
Site	n	#	%	#	%	#	%
Sa	25	19	76.00%	0	0.00%	6	24.00%
Sb	24	21	87.50%	1	4.17%	3	12.50%
As	25	25	100.00%	0	0.00%	0	0.00%
Az	24	23	95.83%	0	0.00%	2	8.33%
W	25	6	24.00%	2	8.00%	17	68.00%
Mean		18.8		0.6		5.6	0.225667
SD		7.496666		0.894427		6.730527	
95% CI		1.338114		0.15965		1.201362	
P Value:		2.14E-09					
Conclusion:		Reject the null					

Survey Question: Are your fish preferences the same as your parents?

Results:

		same		different	
Site	n	#	%	#	%
Sa	25	23	92.00%	2	8.00%
Sb	25	23	92.00%	2	8.00%
As	25	23	92.00%	2	8.00%
Az	24	20	83.33%	4	16.67%
W	25	24	96.00%	1	4.00%
Mean		22.6		2.2	
SD		1.516575		1.095445	
95% CI		0.269585		0.194725	
P Value:		0.6648			
Conclusion:		Fail to reject the null			

Survey Question: Is there a holiday where you like to eat fish?

Results:

		yes		no	
Site	n	#	%	#	%
Sa	25	15	60.00%	10	40.00%
Sb	25	6	24.00%	16	64.00%
As	25	13	52.00%	12	48.00%
Az	25	15	60.00%	10	40.00%
W	25	19	76.00%	6	24.00%
Mean		13.6		10.8	
SD		4.774935		3.63318	
95% CI		0.845317		0.64319	
P Value:		0.01819			
Conclusion:		Reject the null			

Survey Question: Is there a time of year when fish is more available?

Results:

		yes		no		other	
Site	n	#	%	#	%	#	%
Sa	25	21	84.00%	2	8.00%	2	8.00%
Sb	25	24	96.00%	0	0.00%	1	4.00%
As	25	23	92.00%	2	8.00%	0	0.00%
Az	25	22	88.00%	3	12.00%	0	0.00%
W	25	13	52.00%	12	48.00%	0	0.00%
Mean		20.6		3.8		0.6	0.024
SD		4.393177		4.711688		0.894427	
95% CI		0.777734		0.83412		0.158342	
P Value:		4.11E-05					
Conclusion:		Reject the null					

Of note: one of the “no” data points in Abuesi is from a woman who said she does not purchase when there is an abundance of fish, instead is able to get it for free on the landing beach. In the next question, the same woman noted that she notices a decrease abundance of fish, and sometimes the fishermen come back empty handed. Further, two of the “no” data points in Aboesi are from women who said “not anymore,” and who also indicated that they noticed a decrease in seasonal availability of fish.

Survey Question: Have you noticed changes in the seasonal availability of fish?

Results:

Site	n	yes		no	
		#	%	#	%
Sa	25	23	92.00%	2	8.00%
Sb	25	23	92.00%	2	8.00%
As	24	20	83.33%	4	16.67%
Az	25	25	100.00%	0	0.00%
W	13	7	53.85%	6	46.15%
Mean		19.6		2.8	
SD		7.266361		2.280351	
95% CI		1.360557		0.426974	
P Value:		0.001829			
Conclusion:		Reject the null			

Of note, the differing sample sizes above reflect answers to the previous question if the respondents purchase fish seasonally or no

Survey Question: Is there a price at which you would stop buying fish?

Hypothesis: More respondents will say there is a price at which they will stop buying fish compared to respondents who say there is no price at which they would not buy fish

Results:

		yes		no		other	
Site	n	#	%	#	%	#	%
Sa	25	18	72.00%	5	20.00%	2	8.00%
Sb	25	19	76.00%	5	20.00%	1	4.00%
As	25	19	76.00%	6	24.00%	0	0.00%
Az	25	14	56.00%	9	36.00%	2	8.00%
W	25	20	80.00%	5	20.00%	0	0.00%
Mean		18		6		1	0.04
SD		2.345208		1.732051		1	
95% CI		0.415177		0.306629		0.177032	
P Value:		0.5392					
Conclusion:		Fail to reject the null					

Survey Question: Is eating fish an important part of being Ghanaian?

Results:

		yes		no	
Site	n	#	%	#	%
Sa	25	25	100.00%	0	0.00%
Sb	25	25	100.00%	0	0.00%
As	25	25	100.00%	0	0.00%
Az	25	25	100.00%	0	0.00%
W	25	25	100.00%	0	0.00%

Because all of my respondents answered “yes” and none answered “no,” there is no confidence interval or standard deviation for these data. Because my results are homogenous, there is no reason to run a frequency test. There is no difference between study sites.

Many respondents gave similar answers as to why they consider fish important. Below is a count of some of the responses:

Why?	Count
Protein	67
Strength	22
Energy	25

Further, many respondents answered that fish was important for “health” though they did not elaborate about what is healthy about fish. Also, many respondents, especially in Winneba, responded that you “cannot eat without fish” such that fish is in every meal. Finally, some respondents answered interesting unique reasons, such as it makes you look good, or that eating fish is generational equity given that fish is what their forbearers ate, or that in the past fish used to be ground into a paste for medicine, but now cannot be used as such given the chemicals that are used in IUU Fishing. All of these various reasons paint a clear picture that fish consumption is important to the respondents.

Survey Question: What is your favorite food among the following pictures (figure 3):

Hypothesis: Fish is the most preferred food source across all study sites

Results:

Site	n	Fish		Other meat	
		#	%	#	%
Sa	25	20	80.00%	5	20.00%
Sb	25	21	84.00%	4	16.00%
As	25	20	80.00%	5	20.00%
Az	25	20	80.00%	5	20.00%
W	25	22	88.00%	3	12.00%
Mean		20.6		4.4	
SD		0.894427		0.894427	
CI		0.158342		0.158342	
P Value:		0.9528			
Conclusion:		Fail to reject the null			

Other Tests

First, I wanted to see if relative wealth affected the respondent's ability to purchase fish. I asked my respondents "do you own unsewn yards of fabric" as a method of determining the relative wealth of the woman. I was advised to use this metric by the staff at Hen Mpoano, who grew up in households where unsewn fabric was an indicator of liquid wealth, as it could be used if needed, or sold for cash if times called for it. Thus, I aggregated across study sites and compared the yes/no responses to owning unsewn fabric against buying more, less, or the same amount of fish. As can be seen below, there is no statistical correlation between yards of fabric and fish purchasing ability of women. Further, my contingency table looks pretty similar between the "yes" and "no" rows, further suggesting that there is no correlation.

		buy fish		
Fabric	n	less	more	same
yes	65	50	9	6
no	58	47	8	3
Sum:	123	97	17	9
P value:		0.7141		
Conclusion:		Fail to reject the null		

The second test I ran was to see if there was a correlation between a woman's marital and maternal status and her ability to buy fish. Thus, I categorized my respondents into five categories: not married no children, not married with children (which included divorcees), married without children, married with children, and widowed. I coded these as types 1-5, in order. I then aggregated data across study sites and compared against the question "do you buy more, less, or the same amount of fish compared to the past?"

Results:

woman type	n	responses		
		less	more	same
1	32	25	5	2
2	15	14	0	1
3	2	1	0	1
4	57	45	9	3
5	17	12	3	2
Sum:	123	97	17	9
P Value:	0.3542			
Conclusion:	Fail to reject the null			

I am able to see from this table that there is no statistical relationship between “woman type” and ability to buy fish. What also stands out is that by far most of my respondents were women who were married with children, and who are buying less fish