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Title: Consumer Knowledge, Perception and Practices Associated with the
Handling and Purchase of Fresh Fish

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CONSUMER KNOWLEDGE, PERCEPTION AND PRACTICES ASSOCIATED WITH
THE HANDLING AND PURCHASE OF FRESH FISH.

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ABSTRACT

The purpose of this study was to identify consumers' knowledge, perceptions and practices of food safety issues associated with the safe handling of fish. The objectives were to evaluate consumer's knowledge and perceptions to food safety issues associated with fresh fish and to identify consumers' self reported behaviours and practices when purchasing fresh fish.

The study was conducted via a survey of consumers in Barataria and San Boucoud in Trinidad. The sample population consisted of one hundred and ten (110) male (n= 32)and female (n=77) consumers who purchased fresh fish and had achieved an age of at least twenty. The study was completed over a three week period in the month of February 2010, via a non-probability stratified sampling method. The questionnaire used had 28 items, asking questions on knowledge, attitudes, behaviours and demographic characteristics.

It was found that consumers are well aware of food borne diseases and some of its symptoms. They however have limited knowledge on proper temperature management. It was also found that consumers consider fish sellers and the relevant authorities to be most responsible for food safety. Many desire stronger regulations to ensure safe fish but believe that the authorities are not effective. Respondents were seen to practice high risk activities when purchasing fish. Very little of the sample utilized cooling instruments to ensure proper temperature control for their purchase. They also purchased from vendors with unsanitary or improper conditions and from those that did not display food badges.

Chapter 1

INTRODUCTION

1.1

Background

The Republic of Trinidad and Tobago is an archipelagic state in the southern Caribbean, lying northeast of the South American country of Venezuela and south of Grenada in the Lesser Antilles. Its population is estimated to be 1.23 million (CIA 2010) with English being the official language. The diet on the islands is varied, with foods that are both imported and grown or made locally. Fish is no exception, with 12 993 tons being imported and 4478 tons being exported in the year 2005 (FAO 2010). The fisheries sector impacts the economy significantly, contributing a GPD of US 10 million to Agriculture, Forestry and Fishing at market prices in 2005 as well as providing employment for an estimated 7085 persons via harvesting, processing and purchasing businesses. Popular species harvested include tuna, swordfish, king fish, dolphin fish, snapper, cro-cro, albacore, carite, flying fish and shark. (FAO 2010)

Fish offers high quality protein, is low in saturated fat, sodium and cholesterol, and contains fewer calories than other animal meats of comparable size. It also provides omega-3 fatty acids which are crucial for brain development and may reduce the risk of heart disease (UMMC 2009). Fish can be used as the main protein source of pescetarians as well as a replacement for other meat in omnivorous individuals. There are however, issues concerning the consumption of fish. Mercury containing pollutants released from industrial processes eventually appear in waterways, where they may accumulate in the fish. Mercury, in the body acts as a neurotoxin, disturbing normal brain and neuron function. Knowing the waters fish was harvested in, as well as limiting consumption of fish with high mercury levels (shark, tilefish, marlin etc.) can greatly reduce the amount of mercury ingested.(NRDC) Additionally there are some who are allergic to fish. Allergic reactions are only prevented by avoidance of the respective foods.

Despite the concerns, fish is a common food item in Trinidad, available in both fresh and frozen forms; it is sold in markets and supermarkets and occasionally, by independent vendors, some of whom catch the fish themselves. Fried or grilled fish and chips is a popular fast food that is sold at numerous locations on the island. In homes persons may opt to fry, curry, stuff, bake or steam their fish, using a variety of available seasonings.

1.2

Rationale

The purchase of fresh fish is a common in Trinidad and Tobago, particularly during the Lenten period. Some of the vendors of fresh fish however, have questionable do not conform to fish handling safety guidelines. Research has been published on consumer awareness of household food safety hazards (Badrie et al 2005) and on street food vendors in Trinidad (Benny-Olliviera and Badrie 2006), such but little is known on aspects of consumer awareness concerning safe fish handling practices in Trinidad. This study will serve to expand the knowledge of consumer awareness and perception of food safety.

1.3

Problem Statement

Consumers purchase fish year long and they may be unaware of unsafe handling practices at markets which may lead to purchase and consumption of foods that can cause foodborne illnesses.

1.4.1

General Objective

To identify consumers' knowledge, perceptions and practices of food safety issues associated with the safe handling of fish.

1.4.2

Specific Objectives

- To evaluate consumer's knowledge and perceptions to food safety issues associated with fresh fish.
- To identify consumers' self reported behaviours and practices when purchasing fresh fish.

1.5

Scope

This study would be performed on one hundred and ten persons who purchase fresh fish and are over the age of nineteen.

Chapter 2

LITERATURE REVIEW

Food safety can be defined as the conditions and measures that are necessary during the production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, wholesome, and fit for human consumption (World Health Organization, 1984). A safe food is one that does not exceed an acceptable level of risk (Nestle 2004). One of the more serious consequences of unsafe food is food-borne illness. They are diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food (WHO 2007). Consumption of these unsafe foods can lead to pain, increased medical costs, income loss due to absence from work, loss of leisure time and reduced individual productivity (World Health Organization, 1999). The incidence of food-borne diseases is difficult to specify, but it has been reported that in 2005 1.8 million people worldwide died from diarrhoeal diseases. A large proportion of these cases can be attributed to contamination of food and water (WHO 2007). In 2005, 1104 persons were hospitalised in Trinidad and Tobago for diarrhoea and gastroenteritis of infectious origin (Ministry of Health Annual Statistical Report, 2005) and in 2006, there were 10 642 reported cases of gastroenteritis (CSR 2007). Similarly, a great proportion of these cases may be attributed to contaminated foods. Of note is the fact that many more cases could have occurred but would not have been reported and consequently recorded. The issue of food safety is one of significant importance and several aspects, namely the hazards associated with fish handling, and consumers' knowledge, perception, and behavior regarding food safety will be explored.

Food Hazards

Food hazards can be classified as substances or agents present in food with the potential to cause adverse health effects to the consumer (Chu 2008). They can be further categorized into physical, chemical and biological hazards. Physical hazards are items that are foreign to the food and include dust, dirt, hair and broken glass. Contamination of fresh fish by such hazards can be avoided by wiping and washing work areas frequently. Washing hands and keeping hair restrained area also methods of preventing physical hazards. Chemical hazards are, as implied, food hazards that are the results of exposure to or absorption of chemicals. They can be avoided by proper storage of cleaning solutions and pesticides as well as the washing and/or sanitizing of surfaces that may have come into contact with chemicals. Other chemical hazards include toxic metals, such as Mercury, can be very harmful in high concentrations (Hemminger 2000). Biological hazards are biological agents that have the capacity to cause harmful effects in humans (Chu, 2008). These include bacteria, viruses, parasites, fungi and toxins. They cause foodborne illnesses via two methods- foodborne infections (the ingestion and proliferation of live micro-organisms) and food borne intoxications (ingestion of foods contaminated with bacteria produced toxins) (Hemminger 2000). Some of the most common symptoms of food borne illnesses are nausea, vomiting, abdominal cramps, fever and diarrhea. Less common symptoms include coughing, muscle weakness and bloody stools (Hemminger 2000; Thiel 1999; Novotyn et al. 2004).

This study will be focused on, but not limited to, biological hazards. The biological hazards most responsible for seafood spoilage are bacteria. After harvest, bacteria invade the flesh of fish and shellfish through the gills, along blood vessels, and directly through the skin and belly cavity lining before multiplying (Price 2007). Some of these bacteria are not normally found on fish but are transmitted via contaminated waters and poor handling techniques. For instance fish can transmit *V. Cholera* if they come into contact with faeces of infected persons (Novotyn et al.

2004; Hemminger 2000). Although different organisms require unique environments for growth, there are specific conditions that encourage growth in numerous types of bacteria. Such conditions include, foods high in protein or carbohydrate, neutral to low acid pH, 40-140°F (the 'danger zone'), and generous moisture content. Under these favorable conditions, bacteria can double their number every twenty (20) minutes. Fish naturally has several such conditions, making it a "potentially hazardous food" (Knight et al. 2003). Alteration of the moisture and protein content of fish may not be possible or desired. It is therefore crucial to control temperature and times, the abuse of which is the main cause of foodborne illnesses (Hemminger 2000).

Viruses do not reproduce in food but can be found in foodstuffs due to poor handling techniques. An example of such a virus is Hepatitis A, which is transmitted via the fecal oral route (Krause). Toxins themselves are poisonous substances produced by living cells or organisms and are also biological hazards. The toxin scombriod has been a significant cause of illness associated with seafood. Histamine, the toxic agent implicated in scombroid poisoning, is formed by bacterial decomposition of histidine in spoiling fish. The fish are not toxic when harvested, but proliferation of bacteria increases the histamine content. High levels of the toxin do not necessarily affect the outward appearance and notably, cooking does not destroy it. (Lehane 2000; Hemminger 2000). Symptoms are similar to an allergic reaction and include flushing, nausea, vomiting, diarrhea, severe headache, palpitations, abdominal cramping, dizziness and dry mouth (Perkins and Morgan 2004).

Consumer attitudes and perception

Trinidad, like other countries has experienced several large food scares. During one such scare in 2006, it was thought that the deaths of some 2000 chickens were due to the H5N1 strain of bird flu, a deadly avian virus that could also infect humans. The deaths were in fact, due to

aspergillosis- a fungal infection unrelated to the H5N1 virus. It is not possible for humans to contract aspergillosis from eating chicken meat, and the infected poultry was disposed of (MDNR 2010; Stapleton 2006). Despite these revelations, individuals were skeptical or at least cautious about purchasing chicken during that period. Logically, the sale of chickens decreased. Additionally, the sale, and consequently prices of fish increased dramatically (Stapleton 2006).c As Aakkula (2004) affirms, consumer perceptions play a major role in demand for food products. Attitudes, which are reasonably permanent, stable evaluative summaries about an item also play an important role, having an influence on behaviours.

In a study in Jamaica (Knight et al. 2003), evaluating consumers' knowledge, attitudes and behaviours, the majority (77%) of respondents had a fair overall attitude to food safety. Many (69%) agreed that it was impossible to avoid some food safety risk. Approximately 30% agreed that "everything they ate was dangerous and some 55% thought that a chance is taken with food safety, as with everything else in life. Such attitudes would very likely affect the habits of the consumers. In another study performed in Trinidad (Boodhu, Badrie and Sookdhan 2007), it was seen that consumers rated microbiological hazards as the most serious threat (81%). Chemical (61%) and physical hazards (55%) followed as the "serious" and "not so serious" threats.

The topic of risk perception has been widely studied and there are several concepts involved. Consumers change their behaviour if they perceive that their current behaviour or certain situations endanger their health and that taking action has a strong likelihood of reducing their risk. This is seen in a study in the United Kingdom, where 45% of consumers reported being discouraged from eating due to possible risk of food poisoning (FDF-IEHO, 1993). Another concept asserts that although consumers generally realize the risks associated the handling of food, they believe that the probability of being adversely affected themselves is lower than that of other consumers. This phenomenon is called optimistic bias and it has the potential reduce

the risks associated with unsafe food. Another of the concepts highlights the significance of the elements of dread and familiarity in risk perception. It implies that familiar risks are perceived as less harsh than unfamiliar ones. Familiarity with a product, process or practice can produce complacency about the degree of risk, especially concerning the probability of occurrence (Grunert 2005; Frewer et al. 2005; Fischhoff et al. 1978).

Consumer Knowledge

Knowledge, is a product of exposure to information sources and personal effort in obtaining information and can shape perceptions and beliefs and ultimately behavior (McIntosh, Christensen & Acuff 1994). In a province in Turkey, research was done on consumer awareness and response to food safety information. Of the three hundred persons surveyed, 74% changed their food purchasing habits after receiving information on food products and health. Of these that altered their habits, 29% gave up purchasing a product they bought before and 5.3% changed shopping places (Koc and Ceylan 2009). When the consumers in Jamaica (Knight et al. 2003) were asked questions based on food safety knowledge, there were mixed results, with many consumers being aware of foodborne illnesses (99%) and its various symptoms but less know about proper temperature control. Similarly, in a study of food safety awareness in university students in the United States of America, the majority of respondents could identify common symptoms of food borne illnesses (84.3%) but a large percentage (73%), could not identify the temperature danger zone (McArthur, Holbert and Forsythe 2007).

Although information is necessary for good purchasing behaviors, knowledge is not always predictor of these behaviours. In fact, several studies have found that higher knowledge results in lower perceived risks (Chen and Li 2007; Klerch and Sweeney 2007; Tuu and Olsen 2009). From the results of a telephone survey of US residents, Altekruise, Street, Fein, and Levy (1996) concluded that specific groups of consumers (namely males, young adults, occasional food

preparers, and those with more than 12 years of education) possessed knowledge of food safety issues similar to that of the sample, but lower rates of self-reported safe practices. The aforementioned optimistic bias effect may contribute to knowledge and behaviour disparities. It can be caused by individual's receipt of information geared towards the general public, leaving them to infer their personal risk status (Wilcock et al. 2003).

Consumer Behaviour

Several studies have sought and discovered insights to the various aspects of consumer behaviour (Bauer / Yeung 1967; Yeung and Morris 2001; Frewer et al 2005). The theory of reasoned action (TRA) was developed in the 1960s and can be applied to explain the relationship between consumer attitude and behaviour (Aakula et al. 2005; Fishbein 1967; Azjen 1998). According to the TRA, individual's behaviour is principally determined by their behavioural intent, which is a combination of perceived social norms and the person's attitude toward performing the behaviour. The attitudes are influenced by the perceived consequences of any particular action and the subjective evaluation of these consequences. Another theory used to explain or predict behaviour is the Health Belief Model. This model suggests that motivation for behaviour is influenced by the perceived threat (severity and susceptibility), constraints, benefits and action cues (Curtis 2000).

Simplified, it may be stated that the approaches contend that individuals make sound decisions when they are aware of associated health problems, have some knowledge concerning these problems, and have some judgement as to the level of risk involved in not changing their behaviour (Wilcock et al. 2003). Behaviour change *does* occur, as seen in Jamaican consumers, 68 % of whom discontinued their purchasing habits due to food safety issues. With optimistic bias and limited risk perception present however, it is perhaps no surprise that consumers also partake in unsafe behaviours. In one study at a university in the United States of America, while

68% checked fish to ensure it doesn't smell too "fishy", 12 % only did so on some occasions and 16% never or seldom did (Mc Arthur et al. 2007). In another in Trinidad (Surujlal and Badrie 2004), 4.8% of the sample purchased food from vendors without a food badge and 35.7% "sometimes" bought from such vendors.

There are many different issues in food safety. For consumers to make educated choices, they must have the knowledge, which may not be enough to provoke proper, safe practices. Other factors such as social norms and perceptions –particularly risk perceptions, also have a function in consumer behaviours. The sources of food risk can include physical, chemical and microbiological hazards.

Chapter 3

METHODOLOGY

3.1

Target Population

The study of consumer's awareness and perception was conducted via a survey of consumers in Barataria and San Boucoud in Trinidad. The sample population consisted of one hundred and ten (110) male and female consumers who purchased fresh fish and had achieved an age of at least twenty. Persons who only bought frozen fish at supermarkets were not included.

3.2

Sampling Theories

Selection for the cross sectional study was based on a non-probability stratified sampling process. Trinidad can be segmented into regional corporations, boroughs and cities. The San Juan/ Laventille regional corporation consists of numerous geographic areas. These were stratified into urban/suburban and rural districts. From each of the two strata, a location was randomly selected by assigning numbers to locations. Barataria (urban/suburban) and Sam Boucard (rural) were the villages chosen (See Appendix i). Barataria has a population of 9065 (4576 male, 5029 female) and Sam Boucaud, a population of 1708 (860 male, 848 female) (CSO 2000). Based on the statistics of the regional corporation, the rural area was delegated 22 questionnaires, while 88 of the 110 were distributed in the urban community. Following this, respondents were chosen by convenience. The sample size of a similar study (Knight 2003) was chosen for the survey.

3.3

Data Collection

The study was completed over a three week period in the month of February 2010. Households in both neighborhoods were visited on afternoons/evenings and weekends to increase the chances of finding the participants at home. On visiting the houses, the purpose of the study was explained to individuals who were over the age of twenty and purchased fresh fish. It was also explained that the responses were confidential. The questionnaires were then self-administered at the homes, and usually took under ten minutes to complete.

Instrumentation

A questionnaire (see appendix ii) consisting of twenty-eight questions was designed; the structure and some of the content were based on previous consumer food safety surveys (Knight 2003; Kennedy et al. 2008). There exist four sections- purchasing behaviour/ practices, food safety knowledge, attitudes and perceptions to food safety issues and demographic characteristics. The respective sections contained questions such as “How often do you buy fish; Do you ask to see the seller’s food badge if it is not visible”, “Which is the temperature at which fish in display should be kept; What is the temperature zone that encourages the most growth” and “How concerned are you about food safety; Whom do you think is most responsible for ensuring food safety”. Six of the twenty eight questions covered demographic conditions such as age, sex and marital status. Most of these questions were close ended, with open ended questions present to allow additional responses that were not available as options. A pretest was performed with ten (10) individuals to ensure that the length and comprehension was acceptable. Following this, appropriate adjustments were made.

3.4

Data Analysis

Statistical analysis was performed using SPSS for Windows (version 12.0; SPSS Inc, Chicago, IL) software. Frequencies of the different variables were established and grouped together in either tabular or graphical form. Moreover, chi squared tests were performed to determine the possible relationships among demographics (age, gender, income level etc.) and all other variables. All P-values are two tailed, with a value of less than 0.05 being considered significant. Only significant results were recorded.

Table1. Demographic Characteristics of Sample

Characteristics	Frequency	Valid Percent
<u>Age (years)</u>		
20- 30	27	24.8
31-40	36	33.0
41-50	32	29.4
51- 60	14	12.8
<u>Gender</u>		
Male	32	29.4
Female	77	70.6
<u>Education Level</u>		
Primary	6	5.6
Secondary	45	41.7
Tertiary	46	42.6
Vocational	11	10.2
<u>Marital Status</u>		
Single	42	38.9
Married	51	47.2
Divorced/ Separated	8	7.4
Common Law	7	6.5
<u>Current Employment Status</u>		
Employed	97	89
Unemployed	12	11
<u>Number of Persons in Household</u>		
1-3	48	44.4
4-6	50	46.3
6-8	8	7.4
More than 8	2	1.9

Chapter 4

RESULTS

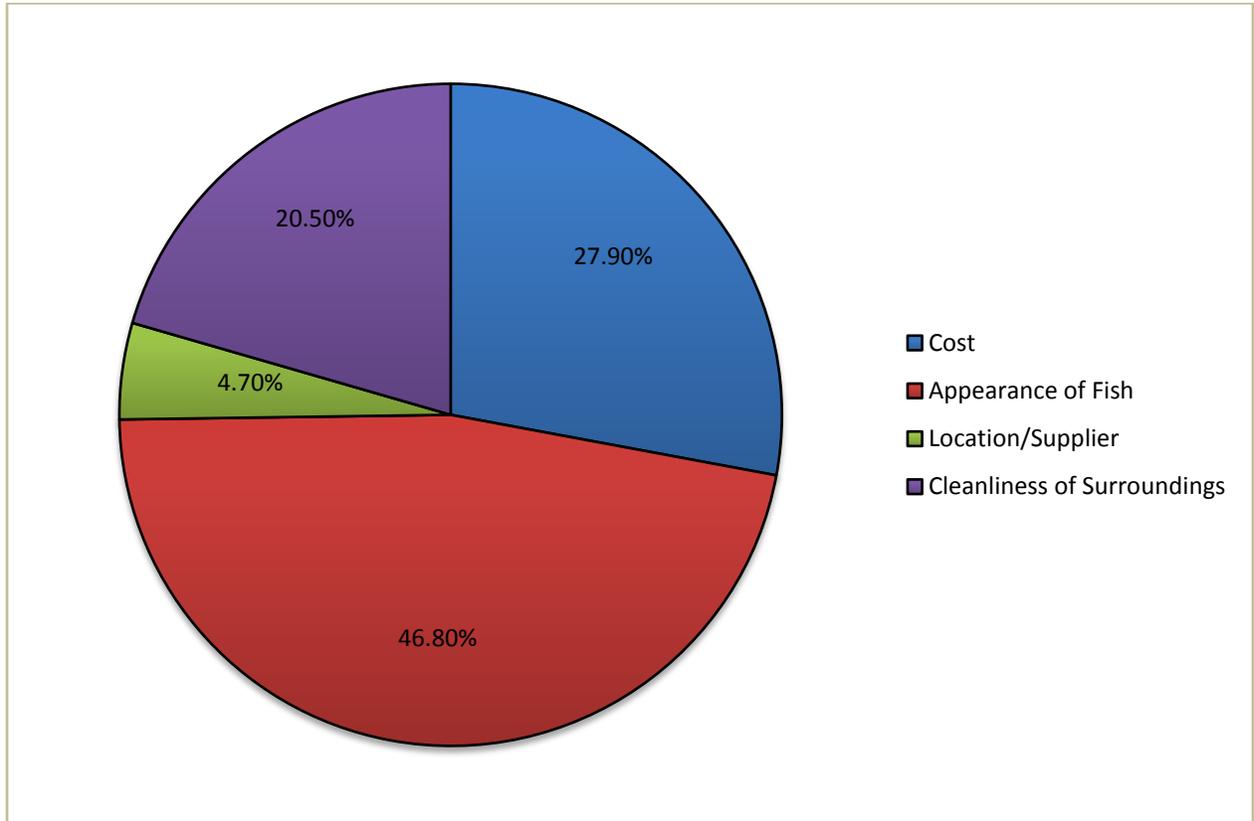


Figure1. Factors Most Influencing Fish Purchase

The above figure highlights the factors influencing fish purchase. The most influential factor is appearance of the fish (46.8%). Cost was the second most influential factor (27.9%), with cleanliness of surroundings (20.5) being the third most influential factor. The location was the least influential factor, with 4.7% of the sample choosing that option.

Table 2. Sample Purchasing Practices and Behaviours

Purchasing Practices		Frequency	Valid Percent
Frequency of fish purchase	At least once a week	12	10.9
	2-3 times a week	29	26.4
	About once a month	33	30.0
	Several times during the year	36	32.7
Locations at which fish are most purchased	Fish Market	58	53.2
	Street/ Roadside Vendors	25	22.9
	Beaches/ Harbour	26	23.9
Usually purchase from the same vendor/ market	Yes	69	63.9
	No	39	36.1
Request to view seller's food badge if not visible	Yes	11	10.0
	No	99	90.0
Average time it takes from purchase to storage	Less than 1 hr.	81	75.0
	1-2 hours	22	20.4
	More than 2 hours	2	1.9
	I don't know	3	2.8
Use a cooler with ice to store fish after purchase	Yes	23	21.7
	No	83	78.3
Discontinued purchasing habits due to fish safety issues	Yes	26	24.1
	No	82	75.9

From Table 2, it can be seen that the majority (32.7%) of persons buy fresh fish several times a year, while a similar amount (30%) purchase approximately once a month . More than half (63.9 %) usually purchase from the same vendor, with 53.2% of the sample buying from fish markets , 22.9% from street vendors and 23.9% from beaches/harbours. Ninety percent (90%) of respondents do not ask about the seller's food badge if it is not displayed. Most (75%) of the respondents take less than one hour to transport the fish from the purchase site to a storage

site. Additionally, a large percentage of persons (78.3%) of respondents admitted to not using a cooler to store their purchase.

Table 3. Characteristics observed by respondents at respective fish purchase sites.

Characteristics of location	Yes (%)	No (%)	Don't Know (%)
Source of running water near service area	66.1	26.6	7.3
Fish on display packed in ice	59.6	37.6	2.8
Clean surroundings	81.7	18.3	-----
Flies in service area	53.3	42.9	3.8
Clean clothes/apron on fish handler	51.9	42.5	5.7
Vendors smoking in service area	23.1	63.0	13.9
Vendors that are sick	25.7	67.0	7.3
Food badge on handlers	32.7	50.0	17.3

Table 3, shown above, shows that 66.1% of the sample observed a source of running water when buying fish and 59.6% saw fish being packed in ice. Most of the sample (81.7%) reported clean surroundings. Approximately half of the consumers (53.3%) noticed flies in the service area while 23% and 26% observed vendors that were smoking in the service area and sick respectively. It was also indicated that clean clothes (42.5%) and food badges (50%) were not observed by some.

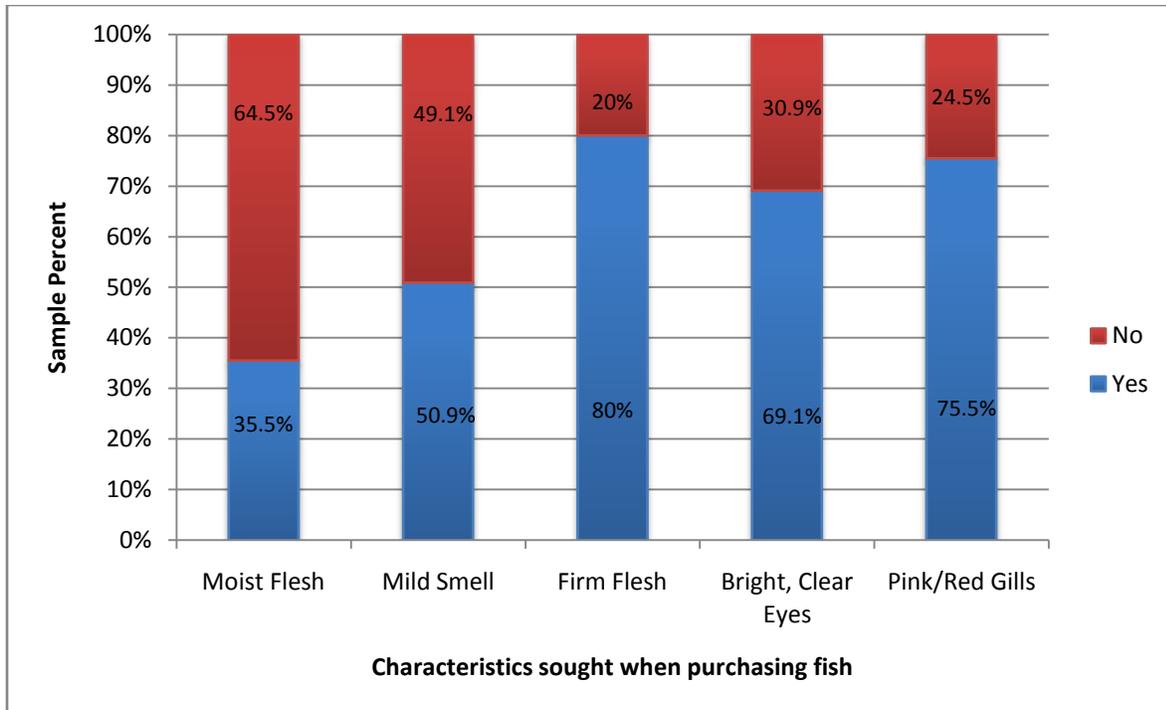


Figure 2. Characteristics of fish chosen by sample when purchasing

In Fig.2 above, it can be seen that the majority of consumers (80%) looked for firm flesh when buying fish. A large percentage (75.5%) looked for pink or red gills and bright, clear eyes (69%). The characteristics least selected by the sample were mild smells (50.9%) and moist flesh (35.5%).

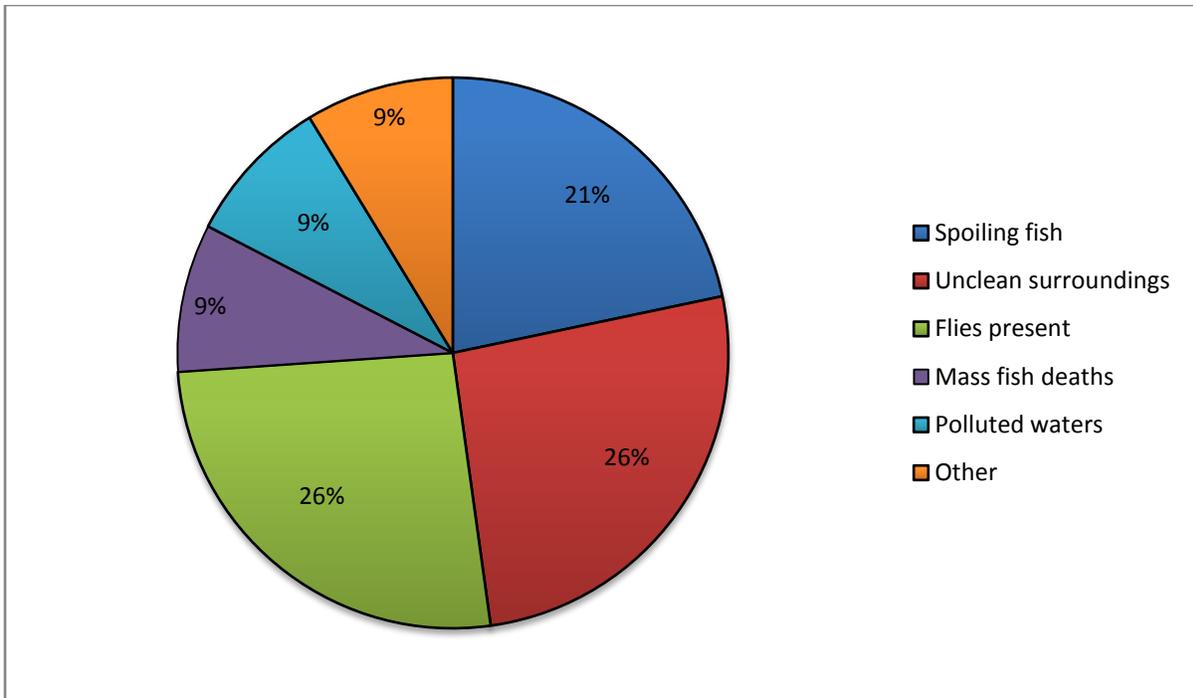


Figure 3. Reasons for discontinuation of purchasing habits and the sample percents

When the questioned on the reasons they discontinued their fish purchasing habits, 26% of respondents reported that it was due to both the presence of flies and the same amount implicated unclean surroundings as can be seen in Fig3. Others discontinued due to spoiling fish (21%), mass fish deaths, polluted waters and other reasons (each 9%). These “other” reasons included allergies and a disreputable vendor.

Table 4. Consumers' knowledge of food safety issues

	Response	Frequency	Valid Percent
Familiarity with term "food borne" illness	Yes	89	82.4
	No	19	17.6
Occurrence of food borne illness in past year	Yes	29	27.1
	No	78	72.9
Ideal temperature at which fish being displayed should be kept	0 °	15	14.2
	15°C	11	10.4
	30° C	2	1.9
	Unsure	78	73.6
Aware that temperature affects bacterial growth	Yes	106	97.2
	No	3	2.8
Knowledge of temperatures that encourage most growth	30 °C- 50 °C	22	21.4
	4 °C – 60 °C	8	7.8
	25 °C- 45 °C	7	6.8
	Don't Know	66	64.1
Familiarity of Food borne illness symptoms	Vomiting	86	78.9
	Nausea	55	50.9
	Headache	28	25.7
	Diarrhoea	92	84.4
	Stomach Pains	73	67.6
	Other (Weakness/ Rash)	2	1.8

Most of the sample (82%), indicated familiarity with the term food "borne illness"; about 73% believed that they did not have a food borne illness in the past year and 27% did not. Some 14% of respondents believed that fish should be kept at a temperature of 0° C. The majority (74%) did not know the correct temperature and the others chose 15 °C and 30° C (10% and 2% respectively). Almost everyone (97%) was aware that temperature affects bacterial growth. When asked about the temperature range, 64% indicated that they did not know and others selected 30-50° C (21%), 4-60 ° C(8%) and 25-45 ° C (7%). The sample was generally familiar

with symptoms of food borne illness with more than 50% selection for vomiting, nausea, diarrhoea and stomach pains with headache (26%) being the least familiar symptom.

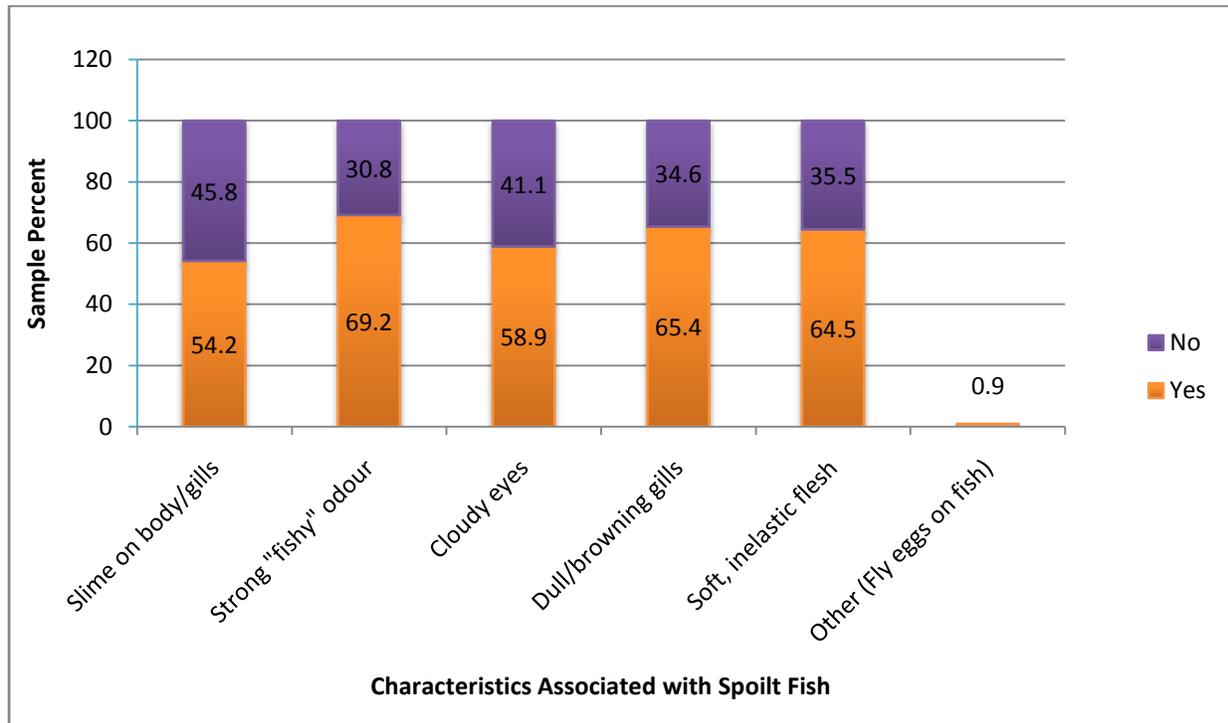


Figure 4. Characteristics respondents associated with spoiled fish

Most persons (69%) associated a strong “fishy” odour to be a sign of spoilage. Additionally, around 65% of the sample considered dull gills and inelastic flesh characteristics of spoiling fish. The characteristic respondents least associated with spoilage (54%) was slime on the body and gills of the fish.

Table 5. Sample's perceptions of food hazards and food safety responsibility

		Frequency	Valid Percent
Microorganisms	Small Effect	8	8.0
	Large Effect	92	92.0
Chemicals (including metals)	Small Effect	14	14.6
	Large Effect	82	85.4
Insects/dirt etc	Small Effect	36	36.7
	Large Effect	62	63.3
Most responsible for ensuring food safety	Government Department/Agencies	39	28.1
	Fish Sellers	66	47.5
	Food Distributors	18	12.9
	Consumers	16	11.5

In Table 5, it can be seen that in terms of harmful consequences, most persons (92%) felt that microorganisms had a large effect. A similar amount (85%) believed that chemicals had a large effect and 63% responded that insects/dirt etc. had a large effect. When asked with whom the responsibility lay for food safety, 47.5% of the sample indicated fish sellers. The second highest choice was government department and agencies with 28%; approximately 13% and 12% respectively, selected distributors and consumers.

Table 6. Attitudes to various fish and food safety issues

Statement	Agree (%)	Disagree (%)	Unsure(%)
Cooking fish thoroughly will eliminate any harmful effects	50.0	34.0	16.0
Everything we eat has its risks- there's no need to worry excessively	23.1	71.2	5.8
I may have eaten lots of unsafe fish over the years- nothing horrible has happened, so there's no need to change anything or worry	8.2	84.5	7.3
I believe the food industry tries hard to provide us with safe fish.	44.5	23.6	31.8
The government/ authorities should ban the sale of foods that are less safe even if they flavourful or convenient.	79.6	10.2	10.2
I would like to know more about fish handling safety	88.2	7.3	4.5
It doesn't make sense reporting/complaining to the authorities about safety since nothing gets done.	45.0	47.7	7.3
The effects of foodborne illness are mild- I can afford to take some risks.	7.4	88.0	4.6

Table 6 shows that half the sample agreed with the statement “cooking fish thoroughly will eliminate an harmful effects” while 16% were unsure. A majority disagreed that everything has its risks (71.2%), that there is no need to change anything since nothing bad has happened (84.5%) and the effects of food borne illness are mild so risks can be afforded (88%). Conversely, a majority of persons *agreed* that the food industry tries to provide safe fish (44.5%), and that they would like to know more about fish handling safety (88.2%). Some 45% agreed with the statement “It doesn't make sense reporting/complaining to the authorities about safety since nothing gets done .”

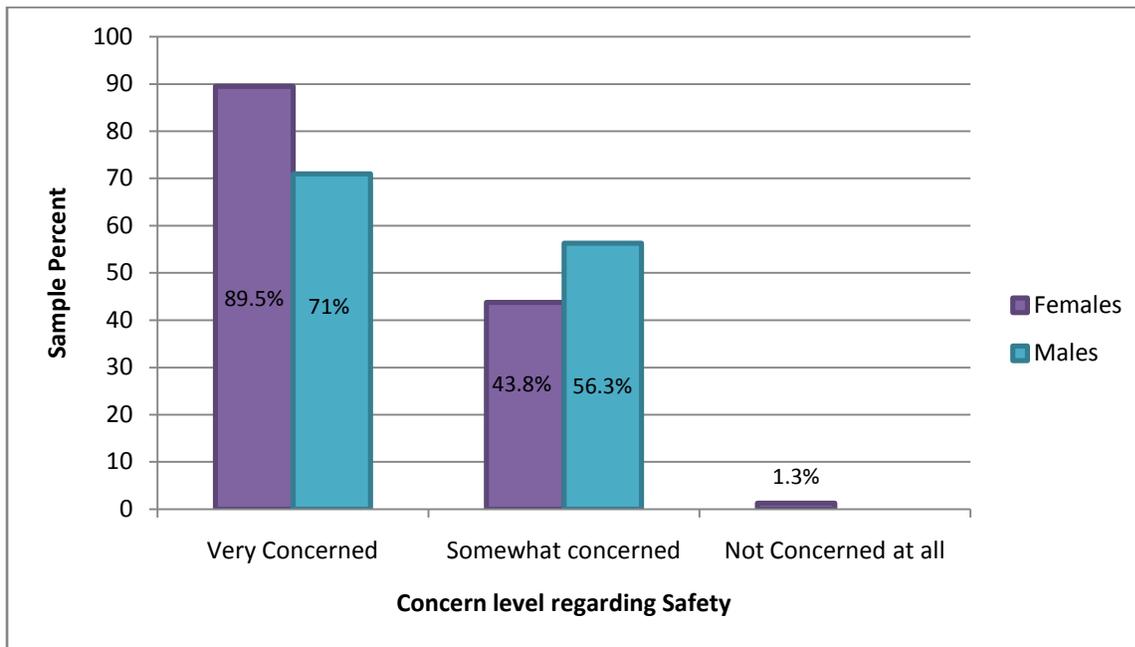


Figure 5. Male and female's level of concern regarding food safety.

In the figure above 89% of females are very concerned while 71 % of men are. Moreover 43.8% females and 56.3% of males are somewhat concerned.

Table 7. Significant associations of demographic characteristics and various variables

Associations	Pearson Chi -Square	Asymp. Sig (2-sided)
Sex and Inquire about Food Badges if not visible	11.10	0.022
Age and Bright, clear eyes looked for when purchasing fish	9.31	0.025
Age and Discontinued fish purchasing habits due to safety issues	10.50	0.015
Age and Recognition of inelastic flesh as sign of spoilage	9.897	0.019
Age and Contracted a food borne illness in the past year	12.32	0.006
Marital Status and Contracted food borne illness in the past year	7.88	0.049

Table 7 above shows the significant results of the chi- square analysis. Data with more than 25% cells having an expected count less than 5 were excluded. Tables with a minimum expected count less than 1 were also excluded.

Chapter 5

DISCUSSION

Purchasing Behaviours / Practices

As can be seen in Fig. 1, the appearance of the fish was the most influential factor when purchasing. The aesthetic value of a product pertains to the pleasure derived from viewing the product, without consideration of its usefulness. When alternatives are similar in function and price, consumers will prefer the one that appeals the most to them aesthetically. (Creusen and Schoormans 2002). The appearance fish may also alert consumers to the quality of the fish. (Hoyle 1999). Fish markets are available at fixed locations and usually open at known times. This may be a reason for the majority of respondents choosing this location (Table 1). Harbours and street vendors despite being less popular, were frequented by a moderate percentage of persons. On the harbours fish can be purchased soon after the catch whereas street vendors are often a convenient choice for busy customers.

In a study in Ireland, 83% of respondents did not use a cooler bag to transport purchased meat to their homes. Similarly in this study, most of the sample did not utilize an iced cooler to store fish after purchase (Table 1). Bacteria can double their number in as little as 20 minutes when in an environment between the temperature range of 4 and 60° C (40- 140°F). High temperatures also increase enzyme activity and other chemical reactions (such as the oxidation of oils). Temperature-time monitoring is therefore crucial to ensuring the safety of fish. Fresh seafood should ideally be kept at 0° Celsius or lower. At this temperature, bacterial growth is stunted. It is also advised that potentially hazardous foods such as fish stay no longer than 2 hrs in room temperature (Hemminger 2000). Trinidad having tropical climate makes it is even more important to keep fresh fish at low temperatures. It may seem that the respondents escape perpetrating time- temperature abuse because it takes the majority of them less than one hour

to store the fish. It is however, unknown if, and how long the purchase was previously in the temperature danger zone. Moreover, it was found that chilled foods placed in the trunk of vehicles for 1 hr periods at temperature of 23-27° had unacceptably high internal temperatures (Gilbert et al. 2007)

Based on the FDA's Food Code for optimum safety (FDA 1997), fish dealers should be attired in clean clothing, should not be sick or have open wounds and should not be smoking. They also instruct that fish should be displayed on a thick bed of ice. While the about half of the consumers observed fish packed in ice, many did not, as seen in Table 3. Some replied that they did not notice clean clothes on the handler. Additionally, sick and smoking vendors were also seen at the purchase site by the respondents. This shows inconsistencies in the guidelines and actual practices. According to the World Health Organization (1984), street vendors in various parts of the world, having no source of running water have been known to wash their utensils, in water that has been used previously- a scenario that leaves opportunities for contamination. Fortunately, most consumers observed a source of running water at the respective sites. They also reported clean surroundings. In spite of this, more than half reported seeing flies in the service area. Flies are attracted to garbage and anywhere food is handled, and can be transmitters of food borne diseases as a result of feeding on garbage (Hemminger 2000).

In addition to this, half of the respondents reported no food badges on handlers. The display of the food badge is an indicator that the vendor is certified to sell food to the public. The Public Health Department of the Ministry of Health, Trinidad and Tobago, stipulates various guidelines to obtain a food-vending badge. These include a medical certificate of good health from a medical practitioner and attendance at a food safety lecture. (Benny-Olliviera and Badrie 2006). As well as purchasing from sellers with no food badge, the vast majority of consumers conveyed

that they did not inquire of food badges, if they were not displayed (Table 2). Although food badges do not necessarily denote safe practices, it is one of the signs of a safe handler.

Fresh fish (i.e. unspoilt fish) have bright eyes that are clear and protruding. As quality decreases, the eyes often turn pink and become cloudy and sunken. The skin should be bright and shiny with no discoloration and scales cling tightly. Gills should be pink or bright red and both skin and gills should be free of slime. The flesh on fresh fish is moist, firm, elastic and not separating from the bones (Brochetti 2009; Hoyle 1999). As seen in Fig. 2, when purchasing fish, consumers looked mostly for attributes such as firm flesh red gills, and bright clear eyes. Only half of the respondents checked the smell to ensure that it was mild, and even less looked for moist flesh when purchasing. The fact that some do not look for the characteristics of fresh/safe fish may result in receipt of hazardous food. Others *do* however actively look for ways to ensure they buy safe fish. In the study approximately a quarter of the sample discontinued purchasing habits due to fish safety issues (Table 2). Another study in Jamaica stated that consumers (68%) also discontinued purchasing habits albeit due to various household safety concerns (Knight 2003). The reasons for discontinuation are illustrated in Figure 3. Individuals changing their behaviour due to fish deaths and polluted fishing waters highlight that some are aware that the origins of can affect the safety of their purchase and are consequently concerned. The reasons for the changes of the others included unclean surroundings, the presence of flies and spoiling fish.

The reasoning behind behaviour change can often be linked to risk perception. When consumers perceive risk, they often develop strategies to reduce risk that enable them to act with relative confidence and ease in situations (Bauer 1967; Cox 1967). Consumers may attempt to reduce perceived risk by changing current behaviours, be it stopping the purchase of the offending product, reducing the purchasing of the product or switching to a product with less perceived risk (Yeung and Morris 2001). Of note are the “Don’t know” responses (Table 3). For

instance, some do not know if the fish vendors wear food badges, others do not know if the vendors smoke. This suggests that these persons may know or actively look for the signs of a safe establishment/ site.

Consumer Knowledge

Most of the consumers were familiar with the term food borne illness as seen in Table 4. This is a similar result to the study performed in Jamaica (Knight et al. 2003), where 99% of the sample recognized the term. Some of the respondents believed that they had contracted a food borne illness within the last year. In a food safety perception study in Trinidad and Barbados, a comparable amount of persons (29.7%) in Trinidad had experienced food borne illness within the last twelve months.

Despite the majority of consumers being aware that temperature encourages bacterial growth, very few knew the temperature range, with some choosing an incorrect answer and the majority selecting the “Don’t know” option. As in this study, it was reported by Mc Arthur et al. (2007) that the percentage of persons who knew the temperature range (27%) was much smaller than those that did not. It is of concern that some of the consumers believed that the range started at 30 ° C, a temperature distant from the actual one of 4° C. Expectedly, few also knew the temperature at which the fish on display should be stored. One of the core principle in keeping food safe is to keep it out of the “temperature danger zone” (40–140°F or 4–60°C), where harmful micro-organisms can proliferate rapidly (Hemminger 2000). The lack of this information could be one of the reasons why consumers purchase fish that is not in ice as well as transport their purchase without a cooler.

The sample was generally familiar with the common symptoms of food borne illness (Table 4). Diarrhoea was the most familiar symptom, with the least recognized symptoms being nausea and headache. Without the information on how food borne illnesses present themselves,

persons may have symptoms and be unaware of the nature of their condition. It has been reported that food borne illnesses may not be perceived as symptoms of a disease, but as natural occurrences, as a result of indigestion and consumption of spicy foods for instance (Fein et al.1995). If consumers “misdiagnose” themselves, they may not be conscious that the foods consumed were contaminated. This may lead to a continuation of the unsafe practices that lead to the foodborne illness.

When questioned on the spoilt or spoiling fish, more than half the sample knew each of the characteristics (Fig 4.).The characteristic least associated with fresh fish was slime on the body and gills. While spoilage is generally a subjective judgment by consumers, (Nychas et al. 2007) the typical signs of spoilage, such as those in the figure should ideally be easily recognizable to avoid the purchase substandard products.

It is said that knowledge is associated with current practices and can affect willingness to change if it is learned that current practices are unsafe (McIntosh et al. 1994). Knowledge may not always induce behaviour change, but is a necessary factor in the process.

Consumer Attitudes and Perception

The results in Table 5 show that most respondents believe that microorganisms have a large effect on food safety. The responses are very similar to those of Trinidadian and American consumers surveyed previously (Boodhu et al. 2008; Hoban 1999). Since microbiological hazards are the most serious threat to persons, this is an indication that persons can identify the hazards associated with food safety, a phenomenon which Brown (1999) states is the first step in guarding against food borne illnesses.

Most of the sample believed that the fish sellers themselves are most responsible for ensuring safety (Table 5). Bailar et al. (1998) is also of this view, maintaining that it was the private sector’s responsibility to provide wholesome foods to the public. Unlike the consumer’s of this

study, however, the authors stressed the importance of the consumer's role. The food system revolves around their purchasing power and decisions, making them critical to the food safety system. The government is not omitted in this scenario- they too have a vital role. They practice surveillance, research, educate, regulate and enforce, or at least are supposed to do so. All parties have parts to play and consumers realizing their responsibilities and power could lead to better choices.

Half of the persons in this study believed that heating fish thoroughly would eliminate any harmful effects as seen in Table 6. This attitude may result in unsafe habits, with the belief that any danger can be "undone". Toxins are not always inactivated by heat. Scombrotoxin for instance are very heat stable (Lehane 2000). Many also persons believed that the food industry tries hard to provide them with safe fish. This is similar to the outcome of a study by Knight et al. (2003). Additionally, many respondents believed that authorities should ban the sale of foods that are less safe despite their conveniences. Almost half believed that there was no point in reporting or complaining to the authorities since nothing is resolved. If one makes a report there is a chance that "nothing will be done", if *no* complaint is made however, it is very likely that nothing would change. The attitudes suggest a desire for regulations and enforcements but a lack of confidence in the relevant authorities. There will need to be efforts on both sides to ensure an effective food safety system; consumers ought to report unsatisfactory conditions as is their right, and authorities should respond accordingly as well as attempt to gain the public's trust.

The majority of consumers disagreed with statements such as "Everything we eat has its risks- there's no need to worry excessively", "I may have eaten lots of unsafe fish over the years- nothing horrible has happened, so there's no need to change anything or worry" and "The effects of food borne illness are mild- I can afford to take some risks." This could imply that consumers are aware of the risks associated with fish and that they are not complacent

regarding these risks. Judging by the frequency of “unsure” replies, many persons seemed unsure as to what their opinions were. It is notable though, that the vast majority of consumers expressed a desire to know more about safety in fish handling. This may perhaps make any education strategies more successful.

Table 7 shows the significant associations found in the study. It was found that males were more likely to ask to see the food badge than women. This may be due to women feeling uncomfortable asking such questions. Age had several significant associations. Age and the act of looking for bright clear eyes, for instance. Within the “bright clear eyes” characteristic, it was found that the 41-50 year old group was more likely to look for bright, clear eyes. Regarding the recognition of inelastic flesh as a sign of spoilage however, the 51-60 age group however were most likely to do so. Persons of the 41-51 group contracted food borne illnesses the most of the age groups. This is different from another study, which reported that persons aged 18-39 years of age were more likely to believe that they had experienced food borne illness (Wilcock et al. 2003). In the set of persons that changed their purchasing habits, the 41-51 group again had the majority of persons changing. Younger persons may be feel more comfortable taking more risks (Wilcock et al. 2003) or they may not know what warrants behavior change. Interestingly, it was found that divorced individuals were more likely to report a food borne illness in the past year. Perhaps their changed lifestyle is one that allows more risk that what they were previously used to.

Figure 5 shows the difference ($P \leq 0.05$) male and female consumers had, regarding concern towards food safety. It is unsurprising that females are more concerned, seeing that they traditionally handle the meals in the home as well as the shopping (Knight et al. 2003). A lack of concern, as shown by the males usually translates into unsafe practices. They may be more difficult to educate and creative methods may be needed.

CONCLUSION

The objectives of this study were

1. To evaluate consumer's knowledge and perceptions to food safety issues associated with fresh fish.
2. To identify consumers' self reported behaviours and practices when purchasing fresh fish.

Both of the objectives of the study were met. Consumers are well aware of food borne diseases and some of its symptoms. Their responses indicated that they were familiar with some of the signs of fish spoilage. They however have limited knowledge on proper temperature management.

Concerning their perceptions, consumers consider fish sellers and the relevant authorities to be most responsible for food safety. Many desire strong regulations to ensure safe fish but believe that the authorities are not responsive. Additionally, the sample acknowledged the risk of unsafe foods and expressed their willingness to learn about safe handling.

The study has shown that the consumers practice high risk activities when purchasing fish. Very little of the sample utilized cooling instruments to ensure proper temperature control for their purchase. They also purchased from vendors with unsanitary or improper conditions and from those that did not display food badges.

Overall, consumers are not aware of many dangers associated with the handling and purchase of fish. They partake in risky behaviours, perhaps due to a lack of knowledge of proper techniques. Widespread measures are necessary to increase public awareness and decrease the incidence of food borne illnesses.

RECOMMENDATIONS

Based on the results of the study the following recommendations are suggested:

- ❖ The government should regulate the fishing trade so that recreational fishermen would be made accountable for their businesses.
- ❖ The government could initiate HACCP systems in fish markets.
- ❖ The Public Health Department and /or the Fisheries Division could introduce public health programs that educate the public on safe fish handling and how to spot safe handlers. There is currently a handout produced by Fisheries (see appendix iii) that is currently out of print and can be modified and used.
- ❖ The lectures attended when receiving the food badge could be made more specific so that fish vendors may learn about safe practices.
- ❖ Primary and secondary schools' curriculum could be adjusted to include lessons on food safety, especially of potentially hazardous foods such as fish.
- ❖ Larger studies can be performed to get a more accurate view of the situation

LIMITATIONS

- ❖ The study was based on non-probability sampling, which incorporates errors into the research.
- ❖ The sample size was relatively small so some patterns or relationships may not have been observed.

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APPENDIX I

Appendix II

Appendix III