



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

Consumer Perceptions and Preferences of Wild and Farmed Nile Tilapia (*Oreochromis niloticus* L.) and African Catfish (*Clarias gariepinus* Burchell 1822) in Urban Centres in Kenya

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Manuscript Info Abstract

Manuscript History:

Received: 25 May 2014
Final Accepted: 26 June 2014
Published Online: July 2014

Key words:

Consumer fish preference, Nile tilapia, African catfish, Urbancentres, Kenya

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Past fish production research done in Kenya suggests a strong production focus, leaving many fish consumer and marketing questions unanswered. This study investigated consumer fish preferences and trends in demand for Nile tilapia and African catfish in five urban centres in Kenya. A total of 384 questionnaires were administered to fish consumers and retailers in open markets, supermarkets, hotels and landing beaches. Descriptive and inferential analyses were done using SPSS Version 20.0. Female consumers were significantly higher ($p > 0.05$) in all study areas except Nairobi. There were significant differences in levels of preference for either the wild and farmed Nile tilapia ($p > 0.05$). Main reasons for consuming fish by consumers were health benefits of fish, good taste and ease of cooking. Quantities of fish purchased by consumers was generally small ranging from 1.68 ± 0.20 kgs in Kisumu to as low as 0.30 ± 0.04 kgs in Nyeri. The main factors affecting consumer preference of Nile tilapia fish were price, overall fish quality, nutritional value, and healthiness. In order to promote preference and consumption of farmed fish in Kenya, the government should educate consumers about the safety, healthiness and nutritional value of aquaculture products.

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1.0 Introduction

Demand for animal protein in developing countries has been gradually increasing due to rapid human population. This has progressed faster in Africa, where the status of hunger and poverty is high (FAO, 2010). Sustaining fish supplies from capture fisheries has not been able to meet the growing global demand for fish food. As a result, aquaculture has continued to provide fish as an alternative source of proteins (De Silva, 2001; FAO, 2008). In Kenya, the demand for aquaculture products is growing rapidly due to the fast growing population and dwindling catches from Lake Victoria, which is the main fresh water natural source. The Kenyan aquaculture industry has seen slow growth for decades until 2009 when the government-funded Economic Stimulus Program increased fish farming nationwide (Munguti et al., 2014). The program aimed at increasing production of farmed fish from 4000 MT to over 20,000 MT in the medium term and over 100,000 MT in the long term (Charo-Karisa and Gichuri, 2010; Musa et al., 2012). The implementation of this program has led to increased fish production from about 1% (962

metric tons) in year 2002 to over 12% (19,584 metric tons) in year 2011 (Fisheries Statistical Bulletin, 2012). Thus far, the program has resulted in improved food security and reduced poverty levels in many counties, spurred regional development, and led to increased commercialization of Nile tilapia, (*O. niloticus*) and African catfish (*C. gariepinus*) among fish farmers.

Despite the rapid increase in aquaculture production as a result of the stimulus project, the market structure for fish products in Kenya is not well understood (Obiero et al., 2014). Indeed, a review of past fish production research in Kenya suggests a strong production focus, leaving many fish consumer and marketing questions unanswered. According to Hambrey et al., (2001), aquaculture faces fewer marketing problems than wild fish production since it offers better possibilities for relating production to market opportunities. In fact, unlike the 'production-oriented marketing' in capture fisheries, aquaculture provides the opportunity to apply modern concepts of 'market-oriented production'.

Relatively few studies have focused on consumers' fish quality perception and public opinion towards the consumption of farmed fish is poorly understood (Pohar, 2011). In addition, the public has often been presented with conflicting advice about consuming cultured fish (Lofstedt and Schlag, 2010). Studies in some countries have shown that farmed fish species are perceived as of lower quality and less safe than their respective wild equivalents (Polanco and Luna, 2010; Meas and Hu, 2014). In addition, the aquaculture industry has some built-in cost disadvantages especially input costs when compared with capture fisheries, therefore a more competitive strategy would be to make fish production more responsive to the preferences of consumers. This situation calls for a special need to have basic information on consumer preferences of wild and cultured fish within the country that will drive development of desired products, marketing channels, processing and suitable transport system. The objective of this study was to investigate consumer preference of wild and cultured *O. niloticus* and *C. gariepinus* products in selected urban centres in Kenya. It also assessed the factors that influenced consumer purchasing behaviour regarding wild and cultured *O. niloticus* and *C. gariepinus* in the study areas.

2.0 Methodology

2.1 Study Area

The study was carried out in selected urban centres in Kenya which included Nairobi (1°17'S 36°49'E); Kisumu (0°6'S 34°45'E); Eldoret (0°31'N 35°17'E); Nakuru (0°16'S 36°04'E), and Nyeri (0°25'S 36°56'E) (Figure 1). The main reasons for choosing these urban centres was because they have high population density and act as major markets where Nile tilapia and African catfish are sold in Kenya (Mwangi, 2008).

2.2 Data collection and analysis

A survey was done to collect data between July and September 2010 with random sampling method used in the identified areas to select respondents to participate in the study. A total of three hundred and eighty four (384) questionnaires were administered in the five urban centres to fish consumers and retailers in open markets, supermarkets, hotels and landing beaches along Lake Victoria. However, elimination of completed questionnaires with partial incompleteness and ineligibility retained 377 questionnaires for analytical procedure. A master codebook was designed to ensure that all the questionnaires were coded uniformly. Data was entered and analyzed using Statistical Package for Social Sciences (SPSS Inc. version 20.0). Both descriptive and inferential analyses such as percentage distribution techniques, ANOVA, and Chi-square (χ^2) test of goodness of fit were used to analyze the data. Percentage rank scores were calculated for Likert-scale ranked data. For instance, the main factors influencing consumer purchasing behavior were ranked and given relative scores from 1 to 4 (1 - not important; 2 – slightly important; 3 – important; 4 – very important). All the relative scores were then multiplied by the counts (no. of respondents) for each category, to produce indices for each activity, then standardized to a maximum of 100%. All data analyzed was considered significant at 95% confidence interval with 5% error margin.

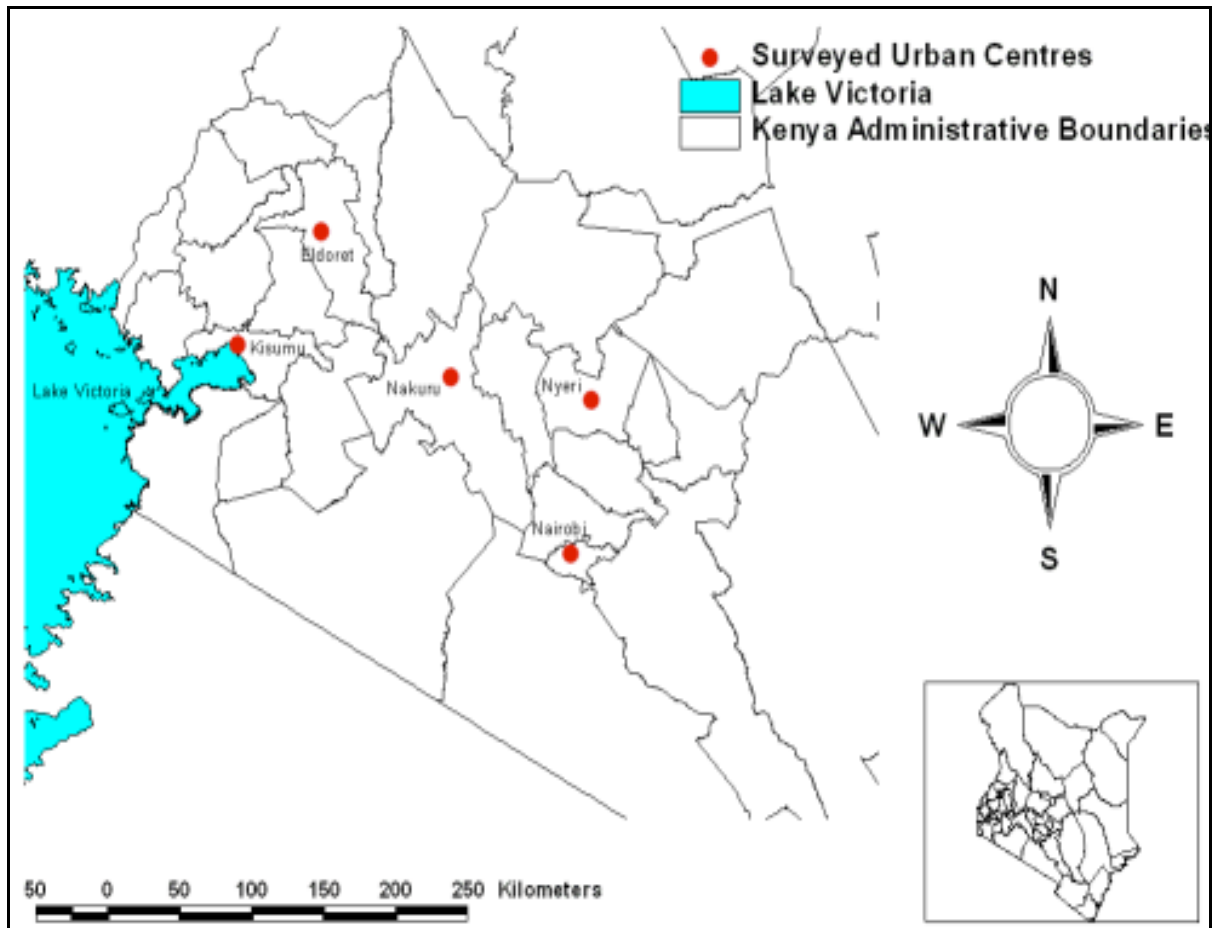


Figure 1: Map of Kenya showing the location of study areas

3.0 Results and Discussions

3.1 Socio-demographic characteristics

Table 1 summarizes the socio-demographic characteristics of fish consumers in the sampled towns. In terms of age distribution, the 19-30 age bracket had the highest number of fish consumers at an average of 42% in the urban centres, followed by those between 31-40 years at 32%, indicating that over 70% of fish consumers are below the age of 40 years. The gender composition of female consumers was significantly higher ($p < 0.05$) than the male consumers at an average of 59% ($n=210$) in the selected urban centres except Nairobi where the male consumers were slightly higher than female consumers. On average, 37% of consumers in all the urban centres had attained secondary education, 26% had attained post-secondary education (vocational or technical and college training), 23% had attained primary education, and 17% had attained university level education. Out of the 377 consumers interviewed, 250 (67%) were married, 92 (24%) were single, 21 (5%) were widowed and 14 (4%) were divorced. Family size of the consumers was divided into three categories i.e. those between 1-5 people, 6-10 people and those above 10. Those consumers with a family size of between 1-5 people formed 82%, without any significant deviations among the towns ($p > 0.05$). About 18% of the respondents had a family size of between 6-10 people while less than 1% had a family size of more than 10 people. An average of 79% of the fish consumers/retailers earned a monthly income of between Kshs 10,000 - 20,000¹, 18% reported earning more than Kshs 20,000 per month, 3% earned between Kshs 5,000-10,000 while only 1% earned Kshs 5,000 and below.

¹ 1 US\$ is equivalent to 85.00 Kenya Shillings

Table 1: Socio-demographic characteristics of consumers in sampled towns

Characteristics	Sampled Towns					Average percent (%)
	Nairobi (n=125)	Kisumu (n=113)	Eldoret (n=51)	Nyeri (n=51)	Nakuru (n=37)	
Age						
Below 18 years	(3) 2%	(3) 2%	(0)	(1) 2%	(0)	2
19 – 30 years	(70) 56%	(46) 41%	(17) 33%	(17) 33%	(15) 41%	42
31 – 40 years	(36) 29%	(42) 37%	(14) 28%	(17) 31%	(13) 35%	32
41 – 50 years	(13) 10%	(13) 12%	(16) 31%	(6) 12%	(7) 19%	17
Above 50 years	(3) 2%	(9) 8%	(4) 8%	(7) 14%	(2) 5%	7
Gender						
Male	(72) 58%	(42) 37%	(20) 39%	(22) 43%	(11) 30%	41
Female	(53) 42%	(71) 63%	(31) 61%	(29) 57%	(26) 70%	59
Education Levels						
Primary	(24) 19%	(38) 34%	(12) 24%	(9) 18%	(8) 22%	23
Secondary	(70) 56%	(28) 25%	(14) 27%	(20) 39%	(8) 22%	34
Post-secondary	(22) 18%	(34) 30%	(13) 25%	(15) 29%	(11) 30%	26
University	(9) 7%	(13) 12%	(12) 24%	(7) 14%	(10) 26%	17
Marital Status						
Single	(35) 28%	(27) 24%	(12) 24%	(9) 18%	(9) 24%	24
Married	(84) 67%	(69) 62%	(33) 65%	(40) 78%	(23) 62%	67
Divorced	(3) 3%	(4) 4%	(3) 4%	(1) 2%	(3) 8%	4
Widowed	(2) 2%	(13) 12%	(3) 4%	(1) 2%	(2) 6%	5
Family size						
1 – 5 members	(112) 90%	(84) 74%	(41) 80%	(44) 86%	(29) 78%	82
6 – 10 members	(13) 10%	(29) 26%	(10) 20%	(7) 14%	(7) 19%	18
Above 10 members	(0)	(0)	(0)	(0)	(1) 1%	0
Monthly income						
Below 5,000	(0)	(1) 1%	(0)	(1)	(0)	1
5,000-10,000	(2) 2%	(6) 5%	(1) 2%	(1) 2%	(0)	2
10,000-20,000	(94) 75%	(73) 65%	(43) 84%	(40) 78%	(34) 92%	79
Above 20,000	(29) 23%	(33) 29%	(7) 14%	(9) 18%	(3) 8%	18

3.2 Consumer fish preferences in urban centres

Nile tilapia was the most preferred fish as reported by an average 72% of consumers in all the towns, with highest preference being in Nyeri (80%) and lowest in Eldoret (65%) as shown in Figure 2. The second most preferred fish was the Silver sardine locally known as *Omena* at an average of 13%, followed by catfish at an average of 9% in all urban centres. Though *Omena* was not a target species of interest in this study, it was worth presenting its preference since its average preference in all towns was relatively higher (13%) compared to the African catfish. African catfish had an average preference of 9% with the highest preference being in Eldoret (12%) and lowest in Nyeri (6%). Other fish species preferred by consumers which were grouped as 'others' at an average preference of 6% included Nile perch, Lung fish, Haplochromines, Common carp, *Synodontis* spp., and *Barbus* spp.

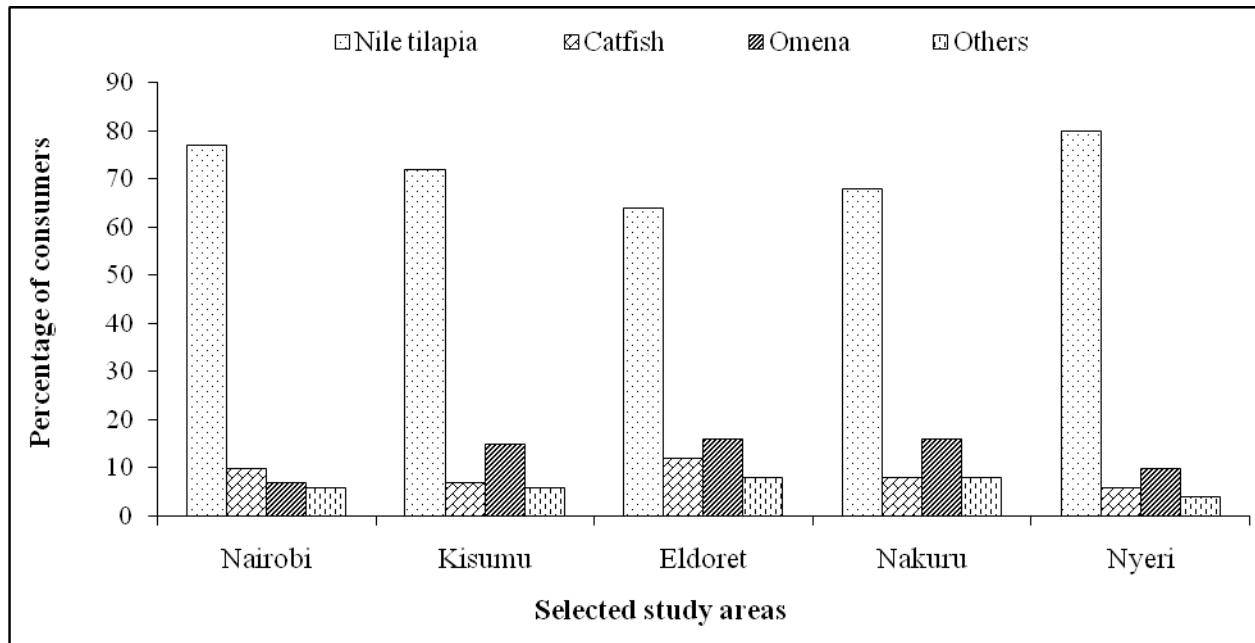


Figure 2: Consumer preference in sampled urban centres

3.3 Preferred source of fish

Figure 3 shows preferred sources of wild and cultured Nile tilapia. There was a highly significant difference in the levels of preference for either both wild and farmed Nile tilapia ($\chi^2 = 563.641$, $df = 1$, $p = 0.000$). Over 80% of consumers in all study areas preferred wild Nile tilapia with the highest preference being recorded in Nakuru (96%). Generally, less than a quarter of fish consumers stated that they mostly preferred farmed fish with the highest preference for farmed fish being recorded in Nyeri (21%). On the other hand, no consumer had any preference for farmed Nile tilapia in Nakuru while 11% of consumers in Nyeri had preference for farmed Nile tilapia. Consumers did not indicate any preference for either wild or cultured African catfish. All the consumers interviewed however, stated that they can consume African catfish from either source, whichever is available in the market.

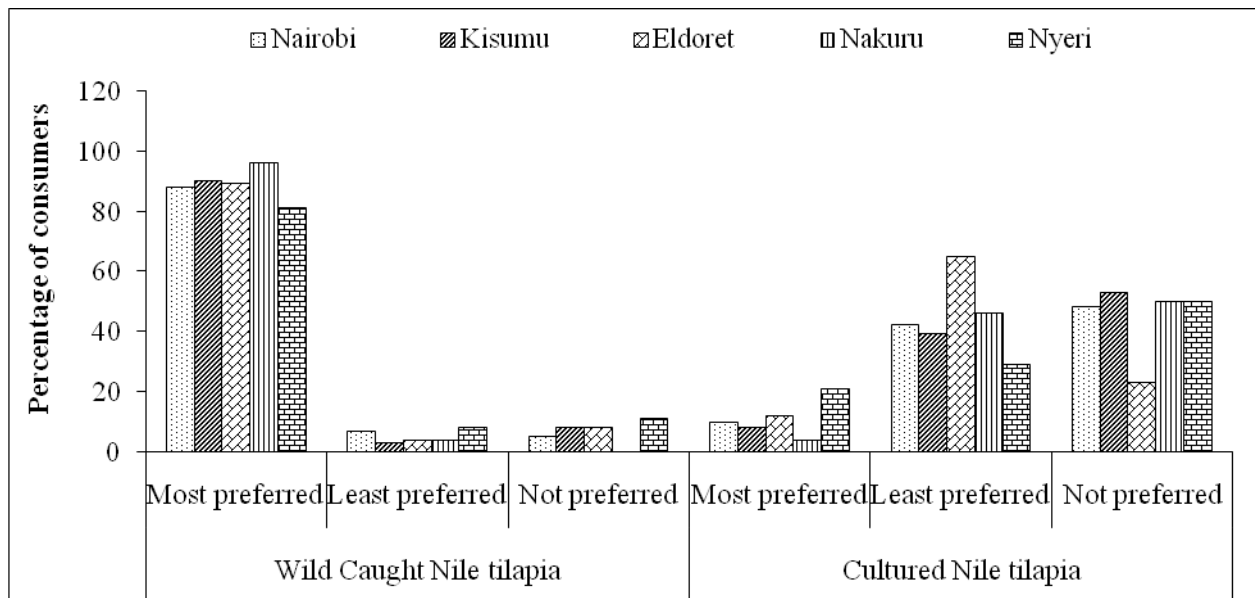


Figure 3: Preferred sources of Nile tilapia

3.4 Reasons for consuming fish

There were varied reasons why consumers purchased fish regardless of the species as shown in Table 2. When considered collectively, the main reasons given by consumers for consuming fish were because they perceive fish as a healthy food source (40%), has good taste (35%) and easy to cook (12%) while availability (8%), price of fish products (3%) and social status (2%) ranked lowest as main reasons for consuming fish. Results also show that the reasons for consuming fish were different among consumers in the selected urban centres. Health consciousness was higher in Nairobi (48%) while taste (52%) was regarded highly in Kisumu since fish consumption is culturally attached to the Luo who predominantly inhabit Kisumu and its environs.

Table 2: Reasons for consuming fish in different urban centres in Kenya

General reasons for fish preference by consumers	Urban Centres					Average percent (%)
	Nairobi (n=125)	Kisumu (n=113)	Eldoret (n=51)	Nakuru (n=51)	Nyeri (n=37)	
Easy to cook	(19) 15%	(20) 18%	(7) 14%	(2) 5%	(3) 6%	12
Like the taste	(37) 30%	(59) 52%	(13) 27%	(12) 32%	(17) 33%	35
Cheaper	(1) 1%	(4) 4%	(3) 6%	(1) 3%	(1) 2%	3
Fish readily available	(6) 5%	(13) 12%	(4) 8%	(2) 5%	(5) 10%	8
Healthy	(60) 48%	(18) 16%	(20) 41%	(19) 51%	(23) 45%	40
Social status	(2) 2%	(0)	(2) 4%	(0)	(0)	2
Lack of substitute	(0)	(0)	(0)	(1) 3%	(0)	0

3.5 Place of purchase of fish

The most preferred place to purchase fish within the selected urban centres was in open air markets according to 69% of consumers, followed by supermarkets at an average of 18% as shown in Figure 4. However, there was no significant difference in place of purchase of fish among the urban centres ($\chi^2 = 1.443$, $df = 3$, $p = 0.422$). In Kisumu, besides the open air markets, fish were purchased from the landing sites according to 33.3% of consumers due to close proximity to the lake. Other places of purchase such as hotels and fish farms ranked 12% in Eldoret and 8% in Nyeri while in other towns sales of fish was less than 2% from fish farms and hotels.

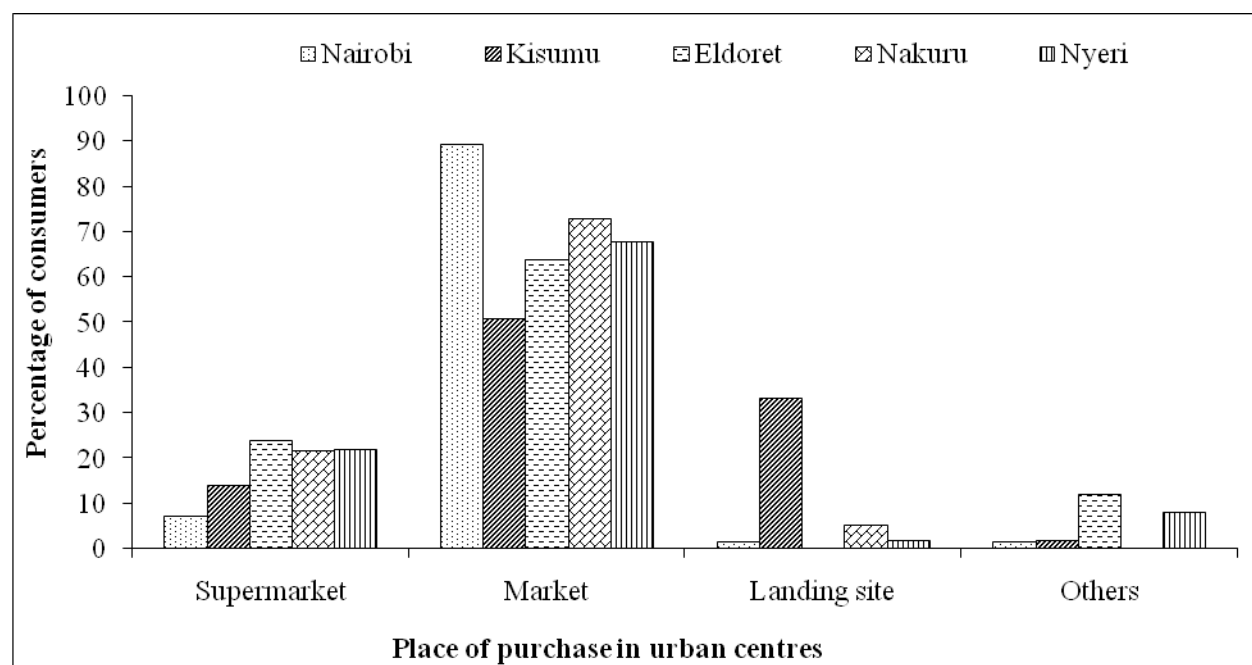


Figure 4: Places from which fish is purchased in the selected urban centres

3.6 Frequency of fish purchase

Frequency of fish purchases in the urban centres is shown in Figure 5. There was a significant difference in the frequency of fish purchases among the consumers in the urban centres ($\chi^2 = 34.223$, $df = 4$, $p = 0.0027$). On average, 61% of consumers purchased fish once a week, 23% bought fish once in a fortnight, 8% purchased fish daily while only 7% of consumers purchased fish once in a month.

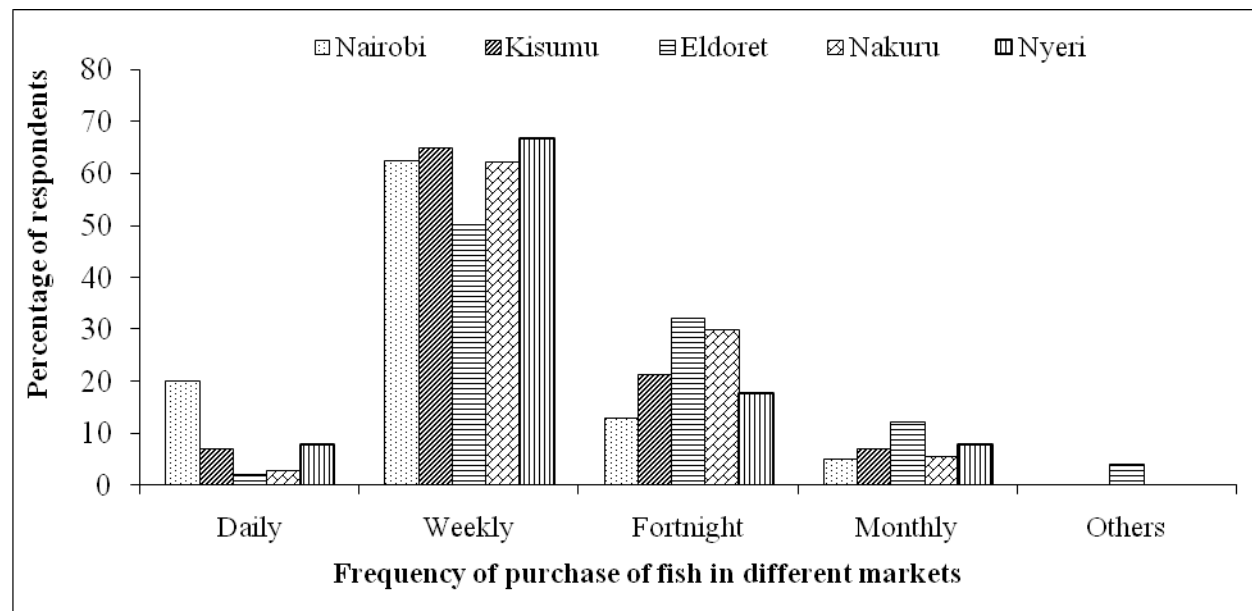


Figure 5: Frequency of fish purchases in selected urban centres in Kenya

3.7 Quantity of fish purchased

The quantity of fish purchased in the selected urban centres is shown in Figure 6. From ANOVA results, there were significant differences in the quantity of fish purchased by the consumers ($F = 19.87$, $df = 4$, $p = 0.005$) within the selected urban centres. The highest consumption of fish occurred in Kisumu (1.68 ± 0.20 kgs) followed by Nairobi (1.39 ± 0.17 kgs), Nakuru, (0.92 ± 0.11 kgs) and Eldoret (0.62 ± 0.07 kgs), while most of the respondents in Nyeri purchased very low quantities of fish (0.30 ± 0.04 kgs).

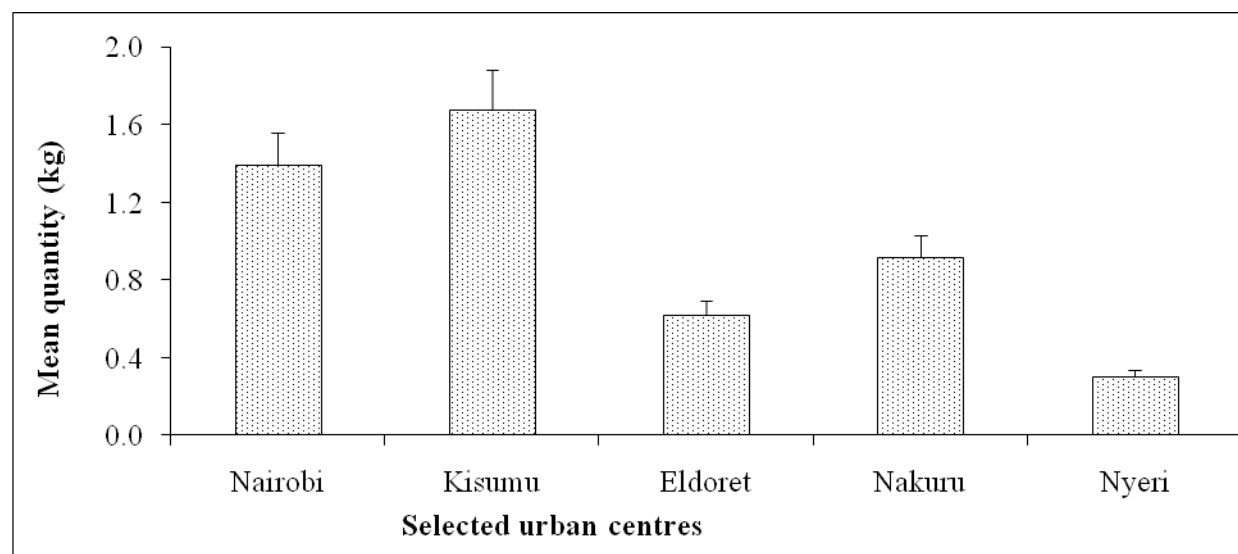


Figure 6: Quantity of fish purchased in selected urban centres in Kenya

3.8 Factors influencing consumer purchasing behavior

The main factors influencing consumer purchasing behavior of Nile tilapia in the study areas are presented in Figure 7. The key factors regarded as very important in influencing purchase of a fish product were price with a median score of 92% (interquartile range [IQR], 84-99%); nutritional value at 88% (IQR 83-95), quality of fish product at 88% (IQR 82-94%), health consciousness at 84% (IQR 77-89), taste of fish at 78% (IQR 69-85) and product form especially fresh whole fish at 77% (62-86%). Other factors regarded as important included: size 74% (IQR 65-78%), ease of availability in market (71%), wild sourced fish (69%), appearance (67%), and smell (62%). These factors differed among the urban centres sampled; however, there was no significant difference in factors influencing fish purchase ($P>0.05$). Factors which ranked lowest included processed products in form of smoked, salted or fried at 60% (IQR 55 – 65%), colour at 60% (IQR 50 – 68%), farmed fish at 57% (50 – 71%), social status at 55% (52 – 59%) and processed fish (cut into pieces or fillets) at 52% (46– 62%). However, these factors were not presented for African catfish since consumers purchasing this species were very few (only 9 % on average) and indicated that they do not consider any qualities when purchasing this fish but get what is available in the market. In addition, they stated that African catfish is rare in the market thus limiting their choices.

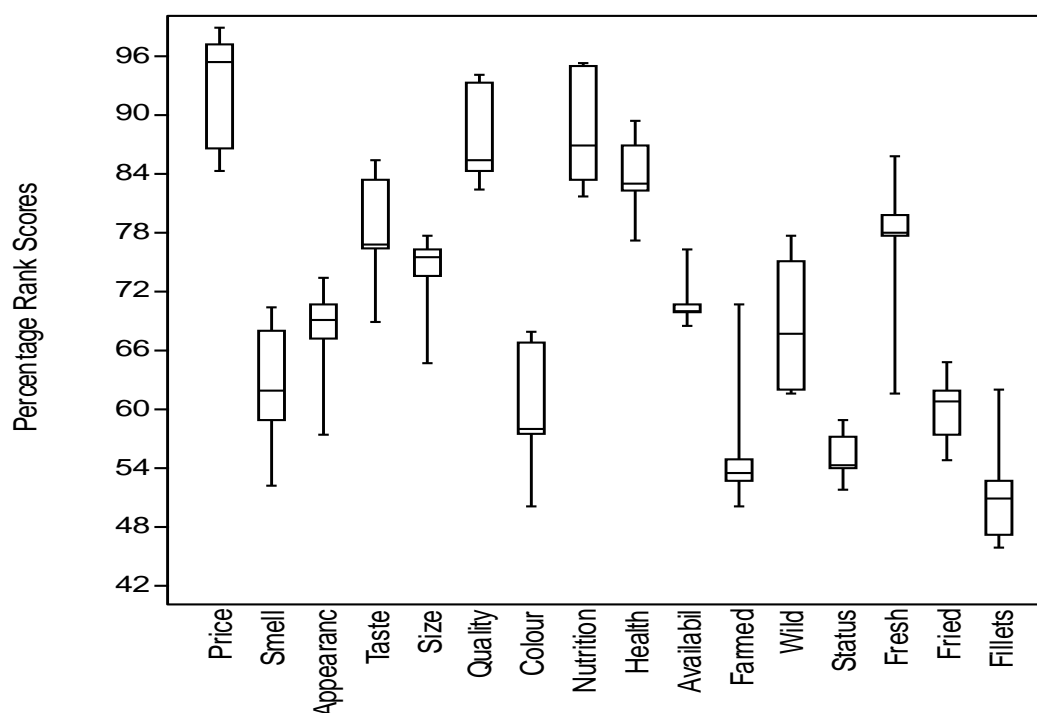


Figure 7: Factors influencing consumer purchasing behaviour in the selected urban centres in Kenya

4.0 Discussion

Socio-demographic information from respondents such as age, gender, marital status, family size, income levels and household size have been used as explanatory variables in previous fish preferences and market research (Green et al., 2006; Erickson et al., 2007). The present study showed that age distribution of consumers was skewed towards the youth that form the most economic active group in the society and thus were easily found in the urban centres where majority were either in employment or seeking for jobs. There were slightly high proportions of female consumers which is consistent with the culture in most parts of Africa where the principal shoppers of households are predominantly matured females (Darko, 2011; Obiero et al., 2014). Women mostly participate at the peripheral parts of the fish value chain, such as fish post-harvest processing, marketing and trading. Over 80% of consumers had attained secondary education and above. Studies have shown that consumers with higher education levels are enlightened about health and other benefits of fish consumption, which influences the preference of consumers positively (Kinnucan et al., 1993). Most consumers (82%) had a family size of between 1–5 members which reflect a fairly small number of individuals or mouths to feed due to increased cost of living in urban centres. Three

quarters of consumers earned a household monthly income of between Kshs 10,001 - 20,000 (US \$118-235) implying that their standard of living is relatively low. This threatens household food security due to purchase and consumption of low quality food items to satisfy the large household especially in cases where income is low.

The most preferred species was Nile tilapia by 70% of consumers in all the urban centres, which is in agreement with recent studies concerning consumer preference of wild and farmed fish in Kenya (Darko, 2011; Obiero et al., 2014). Worth noting is that fish preference varied slightly from one region to another, with highest preference levels reported in Nyeri and Nairobi City indicating changing feeding habits among Kenyans as they move towards healthier living, with more emphasis being given to white lean meat. The Economic Stimulus Program jump started fish farming activities in many parts of Kenya thus encouraging fish eating even among communities like the Kikuyu, Kamba, Meru who were not traditionally fish eaters. This is in contrast to cultural traditions and beliefs that fish consumption is mainly concentrated in regions inhabited by ethnic groups living near major water bodies like Lake Victoria (Abila, 2003). As a matter of fact, the Luo ethnic group who live around Lake Victoria are traditionally major fish consumers followed by the Luyha ethnic group. This 'ethnic tag' associated with fish consumption seems to have disappeared with time as fish is now used in many households across the country. Currently, fish consumption patterns in many households have shifted from depending on tradition and proximity to taste and availability (Lauber et al., 2011; Jacobi, 2013). However, consumers reported that the African catfish was less available in the markets which made them choose what was available, particularly *Omena* which is relatively cheap in the market. As a result, they had no option concerning the source (farmed or wild), form (fresh, fried or dried) and other considerations they made when purchasing this fish species.

As expected, there were higher preferences for captured compared to cultured Nile tilapia, which concurs with recent preference studies in Kenya (Darko 2011; Obiero et al., 2014). The main reason behind preference for Nile tilapia was ease of availability of wild-caught Nile tilapia compared to cultured Nile tilapia whose supply is seasonal. It was observed that rather small amounts (< 20kg) of fish are produced from culture systems to be sold on local markets. This is probably due to a common tendency for fish farmers selling their fish at the farm gate and very little gets to the market (Kaliba et al., 2007). These findings are in agreement with those of Keriko et al., (2010) who found that 33% of the inhabitants of Lake Naivasha environs consumed fish due to availability. The other reasons for high preference for wild Nile tilapia were consumer's perception that wild Nile tilapia is tasty and healthy. They reported that wild-caught Nile tilapia has a distinct taste associated with natural food items found on the bottom mud of lake waters. It is widely believed that most of the residents living around lakes are used to eating wild fish than farmed fish and therefore are likely to have natural liking for the wild fish. Although a considerable proportion of consumers indicated indifference between farmed and wild Nile tilapia, most consumers generally do not ask about the mode of production of fish they purchase. Other reasons for low preference of farmed Nile tilapia include consumer's dislike of its 'mud taste' and health concerns among certain consumers who felt that cultured fish were produced with genetically modified feed ingredients or chemicals like growth hormones (e.g. 17 alpha Methyl testosterone) and pesticides.

The main reasons for consuming fish by consumers were perceived health benefits of fish, good taste and ease of cooking. Health awareness and consciousness was higher in Nairobi while taste was regarded highly in Kisumu since fish consumption is culturally attached to the Luo who predominantly inhabit Kisumu and its environs. Most consumers were aware of the health benefits of eating fish as part of their diet and stated fish consumption reduces the risk of heart diseases, increases intelligent quotient especially when taken by pregnant mothers and children, and has low fat content. These consumer perceptions are consistent with findings of Nauman et al., (1995) conducted in Malaysia where 44% of respondents consumed fish for health and nutrition reasons while 57% stated that taste was one of the major factors that influenced their decision to consume fish. Oomen et al., (2000) also reported frequent consumption of fish, especially those with Omega-3 fatty acid which is reported to lower coronary heart diseases and stroke.

Common places that consumers purchased fish from urban centres were in open markets and supermarkets. An exception occurred in Kisumu where besides the open markets, fish were purchased from fish landing beaches due to their proximity to the lake. Most consumers purchased fish once a week or once a fortnight while a few bought fish daily. These findings slightly concurs with that of Keriko et al., (2010) who found that 36% of the inhabitants of Lake Naivasha consumed fish more than once a week, 23% did it two to three times a month, 17% ate once a week and only 6% consumed once a month. A study conducted by Abila et al., (1998) in the Kenyan part Lake Victoria region found that majority (61%) of the interviewed households consumed fish twice in a week. Quantities of fish

purchased by consumers was generally small ranging from 1.68Kg in Kisumu to as low as 0.30kg in Nyeri. This scenario can probably be attributed to product knowledge or experience in fish consumption in different regions in Kenya. Sujan and Dekleva (1987) suggested that increased expertise or product knowledge enhances the ability to categorise products more specifically hence higher consumption. For instance, what is simply a fish for a novice consumer may be labeled as a catfish by a more knowledgeable consumer and even a farm-raised catfish by an expert consumer. Using this logic, a consumer in the lakeside town of Kisumu may be considered experienced and therefore more likely to have more specific and heterogeneous sets of choosing a fish product compared to their less experienced counterparts in Nyeri.

Food purchasing decisions are affected by a series of factors, including cultural, psychological, lifestyles, culinary trends and diet restrictions (Asp, 1999; Polanco and Luna, 2010). The main factors influencing consumer purchasing behavior of Nile tilapia in this study included price, overall quality standards, nutritional value, and healthiness. Other factors included taste, availability, fresh whole fish, size, and wild caught. Most consumers reported that due to recent economic hardships in Kenya, the price of fish is the main constraint especially when compared to other sources of meat. That notwithstanding, consumers were aware of the health benefits of eating fish and thus the quality, nutritional value and healthiness were regarded as very important factors. The findings concur with those of Ahmed et al., (2011) who studied the determinants of fresh fish purchasing behavior among Malaysian consumers and found that 68.6% of the respondents reported price to be the most important factor, 67.8% indicated quality of fish, 44.1% alluded to taste while 41.6% agreed that nutritional value is the most important factors when purchasing fish. A further 38.4% indicated availability as a reason affecting purchasing of fresh fish while ease of preparation and/or cooking and the colour of fish were not very important factors when considering purchasing fresh fish. Elsewhere, Quagraine et al., (2008) reported that 80% of the respondents specified that appearance of fish was very important. Price and size were also indicated as important and somewhat important respectively while the origin of fish was the least important factor to the consumers.

In order to promote preference and consumption of farmed fish in households in Kenya, the general public should be educated about the safety, healthiness and nutritional value of farmed fish and aquaculture products in general. Consumers should be made aware of the fact that farmed fish and other aquaculture products are wholesome and they contain similar values as the farmed fish. This can be done through government-sponsored or subsidized radio and television advertisements. There is need to inspect and promote safety of fish products to dispel myths surrounding the sale and consumption of farmed raised fish. Another possible alternative to increase the market value of farmed species is to take advantage of the market appraisal of their wild equivalents. This can be done through labeling products by method of production (farmed raised versus wild caught) which may have a positive impact on consumers that associate farmed fish product with a higher level of safety and quality standards (Holland and Wessells, 1998). Increasing aquaculture profits could be achieved by improving the marketing of farmed fish through improved availability of storage and cooling facilities. Even though Jacobi (2013) stressed that market availability in Kenya's Lake Victoria region is not a problem, access to the markets was often complicated for the farmers mainly by poor road network. Improving road infrastructure would possibly help to alleviate this problem.

5.0 Conclusions and Recommendations

5.1 Conclusions

- i) The most preferred fish species was Nile tilapia followed by *Omena* while the African catfish was least preferred among the fish species considered. The main reasons for fish consumption were because consumers perceived fish to be tasty and healthy. It was also clear that wild Nile tilapia fish was more preferred than farmed fish in all the major urban centres of Kenya due to ease of availability.
- ii) Fish markets located within the central business districts of the sampled urban centres were the main areas where fish was frequently purchased. Based on the frequency of purchases, it was established that most of the respondents in the urban centres purchased fish weekly followed by fortnightly, with few cases making daily or monthly purchases. The highest consumption of fish occurred in Kisumu.
- iii) Factors affecting consumer preference of Nile tilapia fish in Kenyan urban centers were price, overall fish quality, nutritional value, and healthiness. These factors were found to differ between urban centres. Due to the low supply of African catfish in the market, consumers tended to purchase it without making considerations that determine the purchase of Nile tilapia.

5.2 Recommendations

Based on the study findings and the conclusions above, the following recommendations are suggested:

- i) In order to promote preference and consumption of farmed fish in households in Kenya, it is important that the general public is educated about the safety, healthiness and nutritional value of farmed fish and aquaculture products in general. Consumers should be made aware of the fact that farmed fish and other aquaculture products are wholesome and they contain similar values as the farmed fish. This can be done through government-sponsored or subsidized radio and television advertisements.
- ii) One of the major problems facing aquaculture is lack of market information for farmed fish against the growing demand for fish. Fish marketing associations or Cooperatives can use the information generated in this study to improve market access for farmed fish in far flung areas and not only at the farm gates that fetch low prices.
- iii) Although this study has not looked at the underlying reasons why consumers prefer the taste of the wild Nile tilapia, it is recommended that further studies be done to determine the perceived likeness of wild fish including taste evaluations.
- iv) The government of Kenya through the State Department of Fisheries should encourage more supply of African catfish in the market both from wild and farmed sources. These efforts should be complemented with education and awareness creation to enhance the market for the African catfish and reduce overdependence on the wild tilapia.

Acknowledgements

The authors wish to thank the Aquaculture and Fisheries Collaborative Research Support Programme (AquaFish CRSP) coordinators for funding this research. Special thanks to Ministry of Fisheries Development in Kenya for technical and logistical support during data collection.

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