Fish Consumption Patterns of Households in Fishing Villages Around Kainji Lake, Niger and Kebbi States, Nigeria

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ABSTRACT

Background: *Fishing villages around Kainji Lake rely heavily on fish as a major source of protein. Eating fish may offer many health benefits, from improving heart health to boosting brain function.*

Objective: *This study determined the fish consumption patterns of households in the fishing villages around Kainji Lake, Nigeria, by examining the consumption of different fish species, sources, and forms of fish used in cooking.*

Methods: *Fifty fishing and 50 non–fishing households were randomly selected from fishing villages around Kainji Lake for the study. Data on the amount of fish consumed by each household, the form of fish cooked, and the sources of fish were collected using 24-hour diet recall. A General Linear Model was used to determine significant differences in fish consumption between fishing and non-fishing households.*

Results: *Twenty species groups were consumed, with tilapia dominating the consumption. Lates niloticus, Gymnarchus niloticus, and catfish were the preferred fish. Fishing households consumed more fish (208.8 ± 28.4g/day) than non-fishing households (154.1 ± 26.1g/day). Fish consumption was higher in male-headed households (182.6 ± 38.2g/day), middle-aged-headed (196.6 ± 30.4g/day), upper-income (189.2 ± 34.9g/day), and primary-educated (192.9 ± 21.7g/day) households. Fish consumption peaked in March and showed a strong preference for fresh fish. Fish consumed by fishing households were caught from Kainji Lake by household members.*

Conclusion: *Kainji Lake remains the primary source of fish for the surrounding fishing communities. Efforts to enhance and sustain the availability of diverse fish species in the Lake should be prioritised to support food security and nutrition in the region.*

Keywords: Fishing and Non – fishing households, Fish species, Fish consumption

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INTRODUCTION

In the low - income societies of the world, fish provides a significant single source of the total dietary animal protein [1]. It is generally regarded as an important source of protein for underprivileged fishing villages in Nigeria. In these communities, fish constitutes 77% of the total animal protein intake [2]. Nigeria is ranked third globally in population dependence on coastal fisheries for food and nutrition security [3]. However, per capita fish consumption in Nigeria is relatively low at 13.3 kg/year, compared to global average of 20.3 kg/capita/year [4]. Increased fish consumption may contribute to alleviating food and nutrition insecurity. Fish provides a good source of readily digested high–quality animal protein together with a high concentration of vitamins A and D, a significant source of phosphorus, copper, zinc, magnesium and iron, as well as high concentrations of calcium in the bones [5]. It is also a good source of selenium, co–enzyme Q_{10} and taurine [5]. Shellfish and salt - water fish are rich in iodine and fluorine, in addition to traces of cobalt, and

for that reason make a valuable contribution to diet [6].

The consumption of fish can help considerably in eradicating the malnutrition that is widespread in the world today. Several studies have shown that fish consumption can help in preventing high blood pressure, cardiovascular diseases, cholesterol, and cancer as well as a significant decrease in age–related memory loss and cognitive function impairment and a lower risk of developing Alzheimer's disease [7, 8, 9, 10, 11, 12]. Studies have indicated that countries with high levels of fish consumption have fewer cases of depression [13, 14]. Fish and shellfish have high values of polyunsaturated fatty acids (PUFA), especially Omega–3 fatty acids, which tend to lower blood cholesterol by depressing low-density lipoprotein (LDL) concentration (15). Fish consumption patterns may vary according to region, reflecting the different levels of availability of the fish in adjacent waters as well as diverse food traditions, tastes, demand, primary occupation, income levels, and social and cultural characteristics of the households [16].

Fishing villages around Kainji Lake depend largely on fish for their protein needs [17]. Despite the importance of fish in these villages, little is known about household fish consumption patterns. The few studies found on fish consumption in the Kainji Lake Area were those reported in previous studies [17, 18]. These studies focused on fish yield, quantitative fish intake and types of fish species consumed. This study assessed the fish consumption patterns of households in fishing villages around Kainji Lake, Niger and Kebbi States, Nigeria. The findings of this study are expected to guide stakeholders in making informed decisions about fish consumption patterns, thereby shaping nutrition policies in the Kainji Lake region and beyond.

METHODS

Selection of Fishing Villages and Households within the Fishing Villages

Kainji Lake, situated in Niger and Kebbi States in North Central Nigeria, was formed in 1968 by damming the river Niger. Mainly built for hydropower production, the creation of the dam has resulted in the formation of the largest man-made Lake in the country which also provides the villages around it with fish [17]. With a surface area of 1270 km^2 and a length of 137 km, the Lake is one of the most important freshwater fish sources in Nigeria and contributes significantly to national fish requirements [17]. There are 316 fishing villages scattered all over the Lake area [18].

Sampling procedure

A multi-stage sampling procedure was employed. A list of the fishing villages was prepared and 25 villages selected randomly for the study. In each village, two fishing and two non–fishing households were selected randomly. The households, therefore, consisted of 50 fishing and 50 non–fishing households making a total of 100 households for the study.

Method of Data Collection

A 24-hour dietary recall was used to obtain the quantity of fish consumed by each household [17]. This approach estimates fish intake based on recall of consumption over the previous 24 – hour period. Assorted batches of gutted fish, ranging from small to one kilogramme in weight were used to enhance the respondents' ability to recall and estimate their fish consumption [19]. The fish samples included a range of forms such as fresh, smoked and dried fish. Quantity consumed was estimated with the use of fish samples. The respondents were requested to name the type(s) of fish consumed during the previous 24 hours and also to indicate whether the fish was bought at the market or caught directly by household members from the Lake.

Data on the socio-economic characteristics of the head of households and fish preference were also collected. The survey was conducted from January to December 2024. Before the commencement of the field work, research assistants underwent training on the 24 – hour recall methodology.

Statistical Analysis

Data were analysed using IBM Statistical Package for the Social Sciences (SPSS) version 22. Descriptive statistics such as frequency, percentages, mean and standard deviations were used to analyse socio-economic characteristics. Pearson correlation was used to analyse the relationship between income and the quantity of fish consumed. General Linear Model was used to determine the significant ($p< 0.05$) differences in monthly fish consumption between fishing and non-fishing households. Bar charts were used to show monthly fish consumption between fishing and non – fishing households and, overall consumption frequencies of fish species.

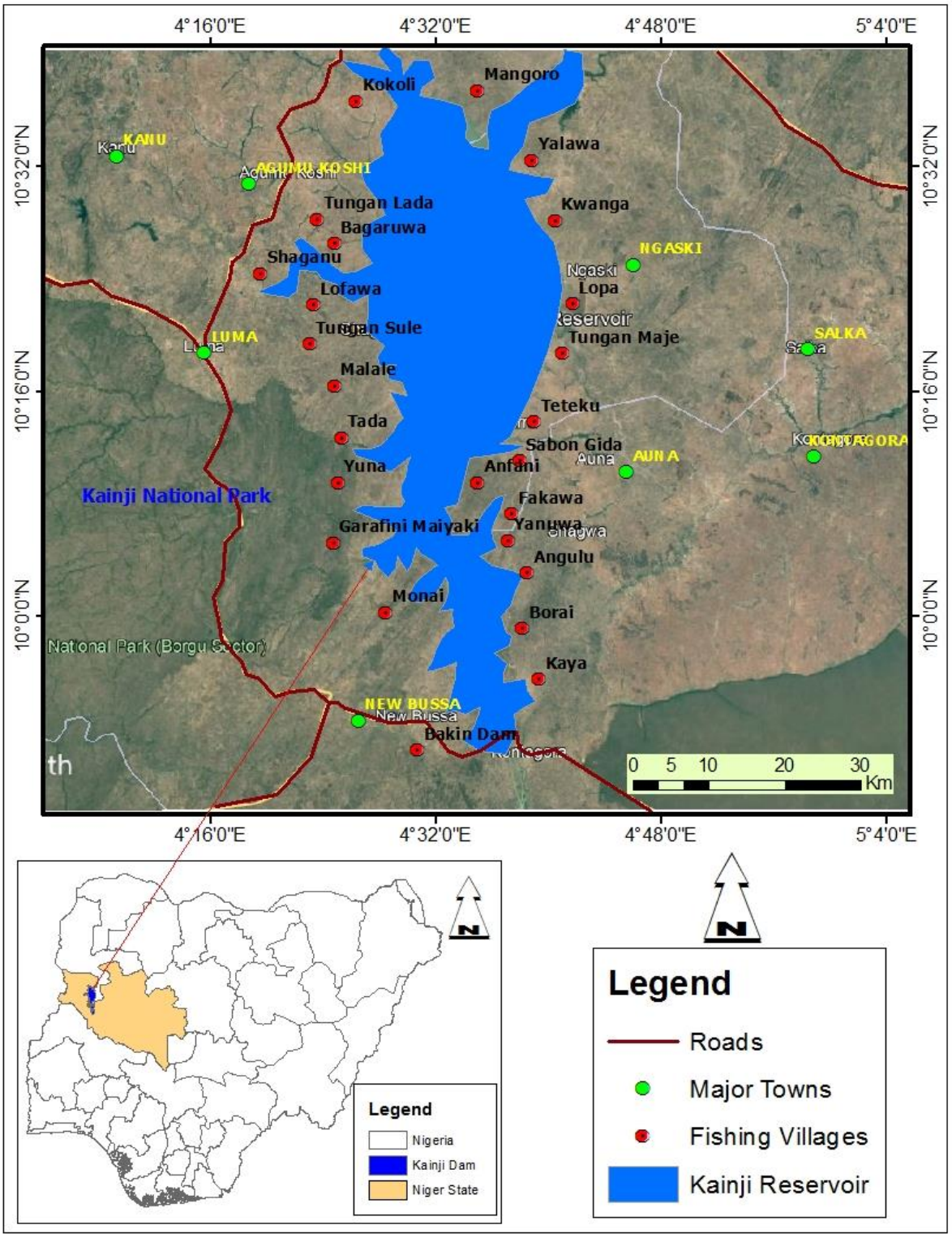

Figure 1: Map of Kainji Lake showing the study areas

RESULTS

Socio-economic characteristics of head of households

Socio-economic characteristics of heads of households are presented in Table 1. Majority of the head of households were in the age bracket of 35 – 55 years with a mean age of 51.1 ± 9.3 years. Ninety-eight percent of heads of fishing households were males compared with 92% for non-fishing households. Ninety-six per cent of the heads of fishing households and 90% of non-fishing households were married. The mean family size consuming fish in both fishing and non-fishing households was 5.9 ± 3.0 members.

Majority (60%) of heads of fishing households had no formal education, compared to 70% of non-fishing households. Fishing was the primary source of income for fishing households while crop farming was the main source of income for non–fishing households. Eighty-four per-cent of the fishing households had crop farming as a secondary occupation and 16% were involved in petty trading. Seventy per cent of the non–fishing households had fishing as an additional occupation while others were involved in petty trading and hunting. Seventy-eight per-cent of heads of fishing households had a monthly income above N50, 000.00 compared with 64% for non – fishing households.

Table 1: Socio-economic characteristics of head of households

Variable	Fishing households		Non – fishing households	
	Frequency(50)	Percentage	Frequency(50)	Percentage
Age (years)				
Less than 35	5	10	10	20
35 - 55	40	80	30	60
Above 55	5	10	10	20
	Mean = 52.0 ±7.6		**Mean = 50.2** ±10.6	
Sex				
Male	49	98	46	92
Female	1	2	4	8
Marital Status				
Married	48	96	45	90
Separated	2	4	5	10
Household size				
1-4	20	40	15	30
5-10	28	56	30	60
More than 10	2	4	5	10
	Mean = 5.5 ± 2.9		**Mean = 6.2** ± 3.1	
Education status				
No formal Education	30	60	35	70
Primary education	5	10	3	6
Secondary Education	14	28	10	20
Higher Education	1	2	2	4
Secondary occupation				
Farming	42	84	0	0
Fishing	0	0	35	70
Trading	8	16	8	16
Hunting	0	0	7	14
Income level / month(N)				
< 20,000	1	2	2	4
20,000 – 50,000	10	20	16	32
Above 50,000	39	78	32	64
	Mean = 50,000.0 ± 403.4		**Mean =46,000.0 ± 604.1**	

Source: Field survey, 2024

Fish species consumed

Fish species consumed in the fishing villages are given in Figure 2. In total, 20 different species groups were consumed by households during the survey period. Tilapia was the highest consumed fish species in terms of weight (189g/day) and frequency (19%), followed by *Synodontis* (15%) and *Citharinus* (12%).

Mean household consumption of fish

Fish consumption was significantly higher in the month of March in the fishing households (Figure 3). General Linear Model revealed significant ($p < 0.001$) differences in overall monthly fish consumption between fishing and non–fishing households.

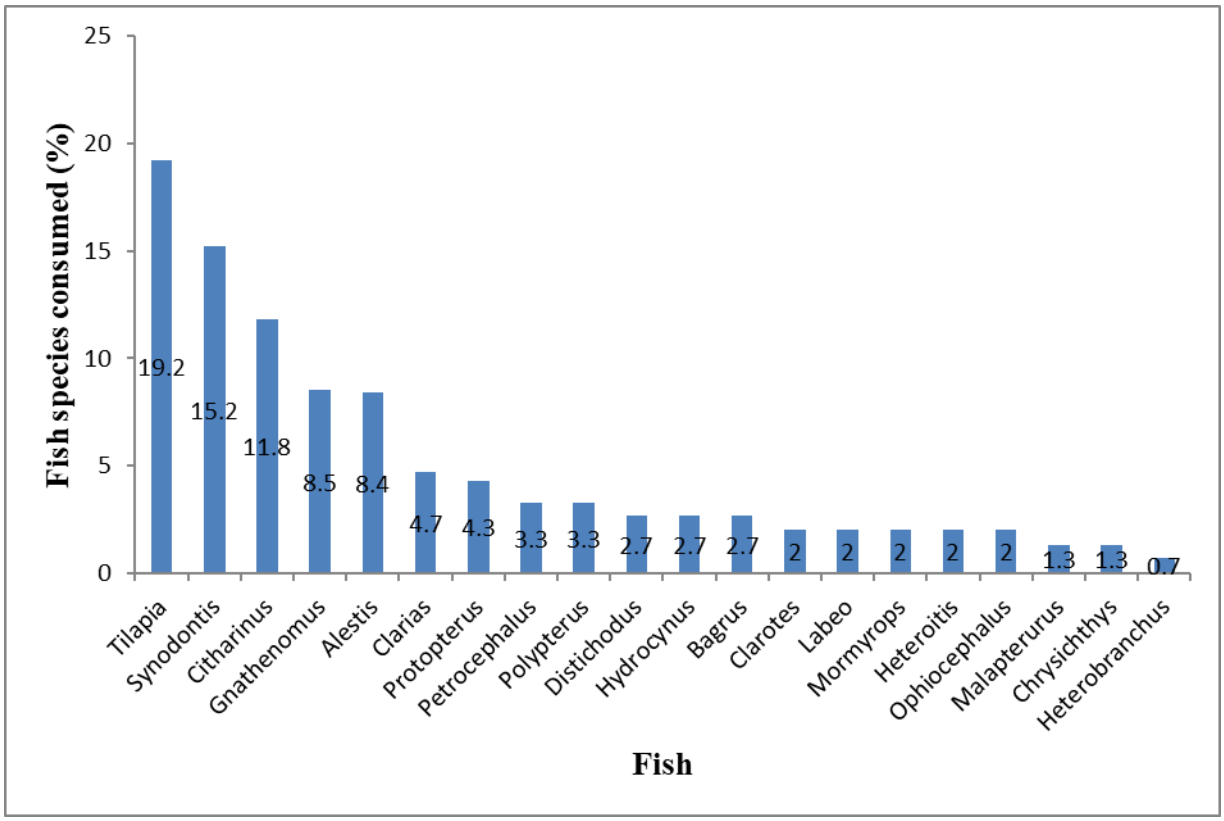

Figure 2: **Fish species consumed in fishing villages around Kainji Lake, Nigeria**

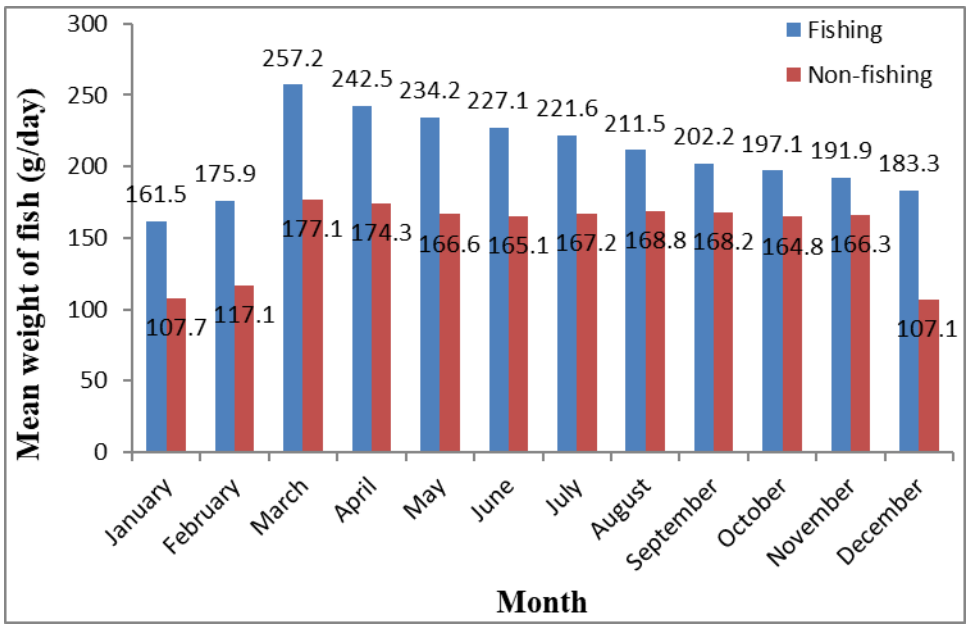

Figure 3: Monthly fish consumption between fishing and non – fishing households

Source and preference of fish among households

Fish consumption preferences among households are given in Table 2. All fishing households and 80% of the non – fishing households consumed fish because of availability and, the preferred type of fish for majority of the households was *Lates niloticus* followed by *Gymnarchus niloticus* and catfish. All fishing households preferred fresh fish as compared to 80% of the non – fishing

households. The entire fishing households and 80% of non-fishing households consumed fish twice a day (2 meals/day). Only a few of the households consumed fish once a day (1 meal/day). Fish consumed by fishing households were caught directly by household members from Kainji Lake as compared to 70% of the non–fishing households. Few non–fishing households bought fish at the landing sites and market

Socio-economic characteristics and mean household consumption of fish

All households, regardless of their involvement in fishing, consumed fish during the survey period (Table 3). Fish consumption was significantly ($P < 0.001$) higher in fishing than non–fishing households. Fishing households consumed an average of 208.8 ± 28.4g of fish per day compared with 154.1 ± 26.1g fish per day for non-fishing households. Male-headed households consumed an average of 182.6 ± 38.2g of fish per day compared with 163.6 ± 41.0g for female-headed households. Fish consumption (196.6 ± 30.4g/day) was higher in households headed by middle-aged individuals. Upper-income households had higher fish consumption (189.2 ± 34.9g/day) compared to other income groups. There was a positive correlation ($r = 0.275$, $P < 0.001$) between fish consumption and household income. There was also a positive correlation ($r = 0.193$, $P < 0.001$) between fish consumption and family size. Households with primary–educated heads consumed more fish (192.9 ± 21.7g/day) than households headed by individuals with other educational qualifications.

Table 2: Source and preference of fish among households

Source and preference of fish	Fishing Households		Non – fishing Households	
	Frequency (50)	Percentage	Frequency (50)	Percentage
Source of fish				
Kainji Lake	50	100	35	70
Landing site	00	0.0	10	20
Market	00	0.0	5	10
Preferred type of fish				
Lates niloticus	30	60	25	50
Gymnarchus niloticus	10	20	15	30
Catfish	10	20	10	20
Reason for fish consumption				
Availability	50	100	40	80
Taste	00	0.0	05	10
Affordability	00	0.0	05	10
Preferred form of fish consumption				
Fresh				
Smoked	50	100	40	80
	00	0.0	10	20
Consumption frequency				
Twice a day	50	100	40	80
Once a day	00	0.0	10	20

Table 3: Chi-square analysis of socio-economic characteristics and mean household consumption of fish

Characteristic of household	Fish consumption (g/day) (Mean ±SD)	*P* – Value
Occupation		
Fishing	208.8 ± 28.4	< 0.001
Non – fishing	154.1 ± 26.1	
Age		
Young (< 35 years)	148.7 ± 26.8	
Middle – aged (35 – 55 years)	196.6 ± 30.4	< 0.001
Elderly (Above 55years)	143.6 ± 36.4	
Gender		
Male	182.6 ± 38.2	< 0.001
Female	163.6 ± 41.0	
Income class/month (N)		
Low income (< 20,000)	125.6 ± 26.7	
Middle income (20,000 – 50,000)	166.8 ± 40.1	< 0.001
Upper income (Above 50,000)	189.2 ± 34.9	
Education Status		
No formal education	184.2 ± 41.9	
Primary education	192.9 ± 21.7	< 0.001
Secondary education	176.7 ± 27.1	
Higher education	131.1 ± 35.3	

DISCUSSION

In this study, the mean age of the heads of households was 51.1 ± 9.3 years, suggesting that they were adults and likely to be productive. This result is similar to the mean age of 43.4 ± 16.2 years obtained in a study of fish consumption pattern among adults of different ethnics in Peninsular Malaysia [20]. The majority of heads of households were males, and most were married. The findings are consistent with a previous study, which reported that 71.10% of heads of households in Enugu State were males and 83.94% were married [21]. In contrast to previous findings [19], the mean family size consuming fish in both fishing and non-fishing households was 5.9 ± 3.0 members. A study on fish consumption behaviour and perception of food security among low-income households in urban Ghana found that 39.09% of the respondents lacked formal education similar to the findings of this study [22].

A wide range of fish species were consumed in the fishing villages, with tilapia accounting for the largest share. This result confirms the findings of the previous studies [1, 2, 19, 23]. High consumption of tilapia species in the fishing villages around Kainji Lake suggests that they are the most available fish species in the Lake. The current study revealed that availability of fish species play significant role in fish consumption in the fishing villages. The fact that fish species were available, accessible and used by the fishing villages suggests their importance in food security. The fishing villages benefited from open access to Kainji Lake's fisheries, allowing them to harvest and consume most of the species at no cost.

The preferred fish species by fishing villages around Kainji Lake are *Lates niloticus, Gymnarchus niloticus* and catfish. However, *Lates niloticus* and *Gymnarchus niloticus* were rarely consumed by the households probably due to their high market price resulting in fishing households selling the species for income and non-fishing households not been able to afford to purchase them. This result supports the findings of an earlier study [17], which reported that the unit price of fish was highest for *Lates niloticus,* which likely contributed to its low consumption.

All households, regardless of their involvement in fishing, consumed fish during the survey period. The fish consumption was significantly higher in fishing than non– fishing households. Similarly, previous studies [17, 18] found higher consumption of fish in fishing households compared to non-fishing households. Having unrestricted access to Kainji Lake enabled fishermen to catch and consume fish, leading to higher consumption rates. The present study revealed that the fish consumed by fishing households were caught directly by household members from the Lake thus highlighting the importance of Kainji Lake to food security and livelihoods of the fishing villages. Earlier studies [17, 18] on fish consumption patterns of fishing communities around Kainji Lake have also highlighted the importance of the Lake to food

security of the villages. Majority of the households consumed fish twice a day (2 meals/day), thus confirming the findings of previous study which reported that more than half (55 - 57%) of the study subjects consumed seafood at least one to two meals per day [20]

In contrast to earlier studies [20, 24, 25], this study showed that fish consumption was higher in households headed by middle-aged individuals, probably due to more energy demands by the head of households since this is a productive age group. Male-headed households consumed higher amount of fish than female-headed households. This result is contrary to a previous study [24] which found higher fish consumption in females (3.76 ± 2.99kg/year) than males (2.59 ± 1.69kg/year). There was a positive correlation between fish consumption and income with households in the upper income group consuming more fish, consequently, confirming the findings of prior studies [23, 26]. In contrast, a previous study [27] reported that as income increased, the relative preference for fish declined. They noted that the households in the lower socio-economic strata spent more of their income on fish. There was also a positive correlation ($r = 0.193$, $P < 0.001$) between fish consumption and family size. As the household size increases, there may be tendency for the household to consume more fish.

Households with primary-educated heads consumed significantly higher amounts of fish than households headed by individuals with other educational qualifications. This result is contrary to the findings of existing literature on fish consumption [24], which reported higher consumption in individuals with a graduate degree (3.76 ± 2.70kg/year).

Fish consumption exhibited seasonal variation, with the majority of households reporting higher monthly consumption in March, which corresponded with peak landings [17]. The low consumption of fish in the months of December, January and February coincided with period of low availability of fish in Kainji Lake largely due to harmattan. Fresh fish was highly preferred in this study. Several studies also indicated strong preference for fresh fish [21, 26, 28, 29, 30, 31]. Fresh fish consumption is crucial, as post-harvest processing methods like sun-drying and smoking compromise nutritional value, despite enhancing availability [32, 33, 34].

CONCLUSION

Although a wide range of fish species were consumed, a few species dominated consumption with tilapia accounting for the largest proportion. Fishing households consumed significantly higher amount of fish than non – fishing households. The study showed strong preference for fresh fish. Kainji Lake remains the primary source of fish for surrounding fishing villages. Efforts to enhance and sustain the availability of diverse fish species in the Lake should be prioritised to support food security and nutrition in the region.

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CONFLICT OF INTEREST

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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