

**THE ROLE OF TILAPIA IN FOOD SECURITY  
OF FISHING VILLAGES IN NIGER STATE, NIGERIA**

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## ABSTRACT

Fish is generally regarded as a primary source of protein for many poor African fishing villages. Most of the fish consumed in the fishing villages in Nigeria consists of freshwater species such as tilapia. Tilapia previously considered of little commercial value is now being considered a human food. The aim of the present study was to determine the importance of tilapia in the diet of fishing villages in Niger state, Nigeria by examining the household consumption of different fish species. A total of one hundred households in fishing villages in five local government areas (LGA) of Niger state were randomly selected for the study. The households consisted of fifty fishing households where active fishing was the primary activity and fifty non-fishing households (where agriculture was the primary activity). A 24 hour recall was used to obtain the amount of fish consumed by each household, the form of fish cooked (fresh, smoked, dried) and the source of fish (whether the fish was purchased in the market or caught directly by household members from local rivers). A general linear model was used to analyse fish consumption to establish significant ( $p < 0.05$ ) differences in monthly fish consumption between fishing and non-fishing households. A total of 24 fish species were recorded in the diet of the people with tilapia contributing the highest percentage (19% by weight) of the fish consumed. All fishing and non-fishing households consumed fish during the survey period. Fish consumption was significantly higher in fishing than non-fishing households. Fishing households consumed an average of 188g of fish per day (69kg/year) compared with 127g fish per day (46kg/year) for non-fishing households. Household consumption of fish varied during the year. The highest fish consumption occurred in March, 2009 in all the households. There was a negative correlation ( $r = -0.124$ ,  $p = 0.013$ ) between fish consumption and income. The study shows a high preference for fresh fish.

**Key words:** fishing villages, tilapia, food security

## INTRODUCTION

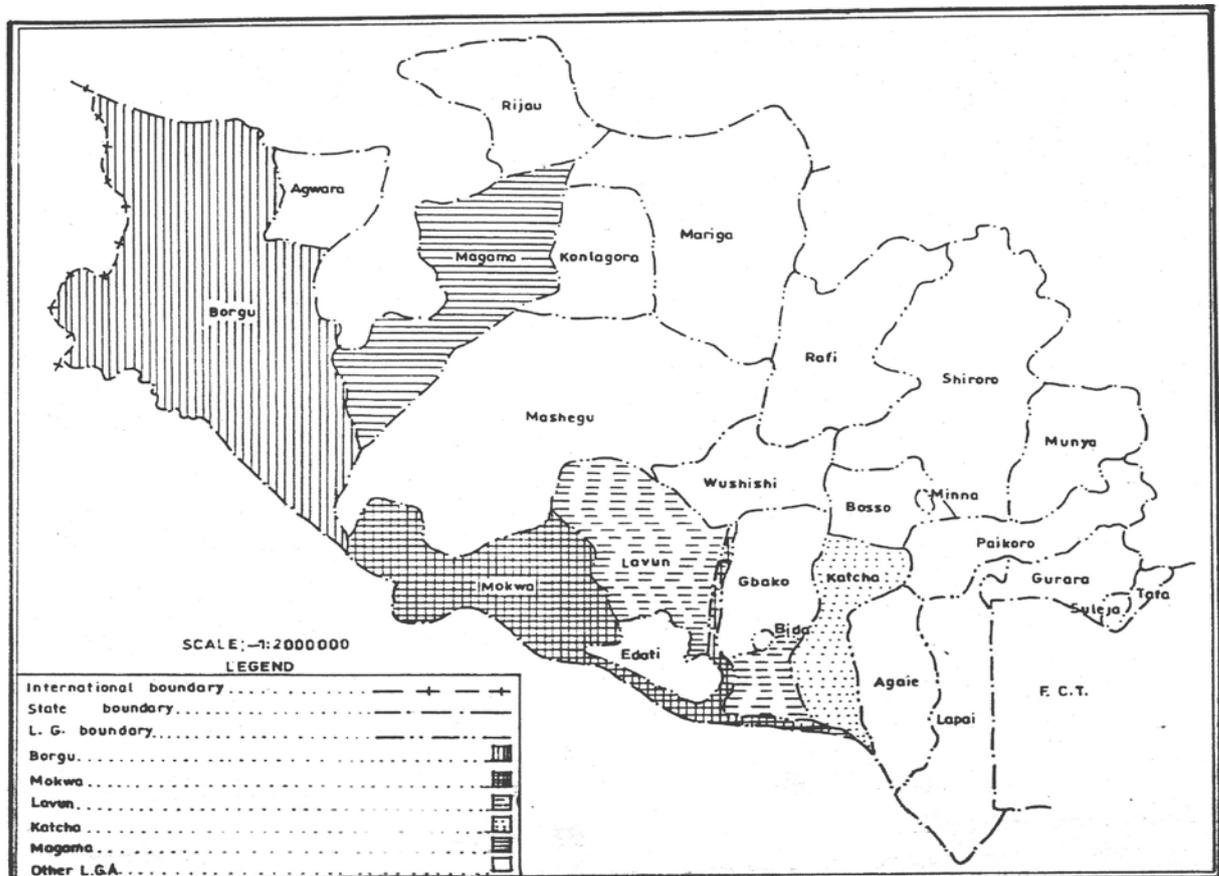
Fish plays an important role in the diet of fishing villages in Nigeria by providing according to one source 77% of the total animal protein intake [1]. Fish represents an essential and often irreplaceable animal food for the poor in developing countries with access to water resources [2]. The dependency on fish in developing countries is high as substitutes in the form of other animal foods are often not available to the poor [3]. Increasing the per capita consumption of fish and shellfish in any country will generally benefit population health. Populations with the highest consumption of fatty fish appear to have the lowest incidence of cardiovascular diseases [4, 5, 6]. Fish consumption has also been linked to reduced hypertension, reduced blood clotting tendencies, and more favourable plasma lipid and lipoprotein levels [7].

The range of fish species consumed by fishing villages are largely unknown although tilapia species that are sourced from open access water bodies make a notable contribution to household consumption [1, 8]. The actual household consumption, however, remains largely undocumented. The aim of the present study was to determine the importance of tilapia in the diet of fishing villages in Niger state, Nigeria by examining the household consumption of different fish species. In this paper, a fishing village is defined as one in which the main occupation of the majority of households is fishing. Fishing villages are frequently identified as being among the “poorest of the poor” and are often characterised by over-crowded living conditions and inadequate services, low levels of education and a lack of skills and assets (particularly land) that would permit diversification of their livelihoods [9, 10].

## METHODOLOGY

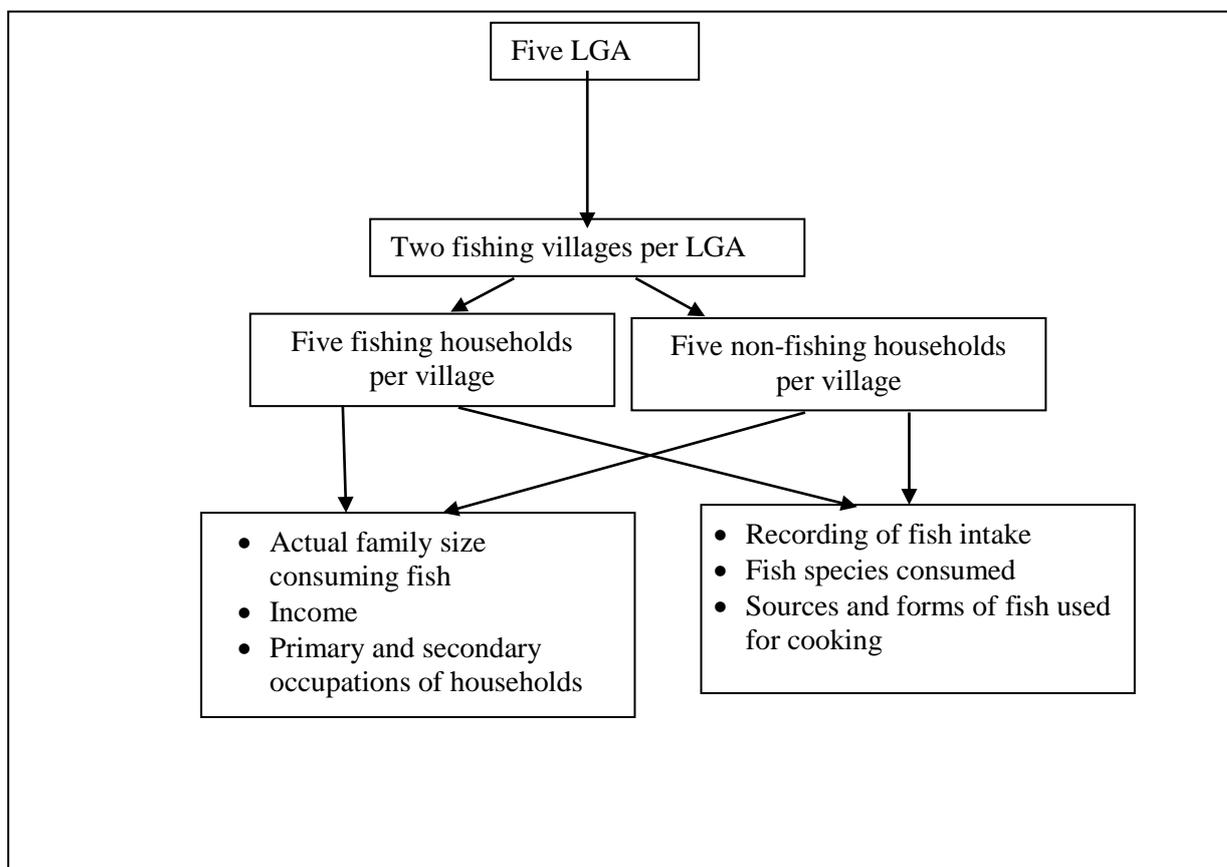
### *Selection of local government areas and households within fishing villages*

Niger state is an inland region that has a total land area of 76,000 km<sup>2</sup> representing about 9% of Nigeria’s total land area [11]. This makes the state the largest in the country. The state has numerous, large, perennial water bodies including major rivers like the Niger, Kaduna and Gurara and three giant man-made lakes (Kainji, Jebba and Shiroro) with an estimated water surface area of 4,360 km<sup>2</sup> [12]. Niger state is made up of 25 local government areas (LGA). Five LGA were selected on the basis of their proximity to the main river systems or lakes for the study. The following LGA were selected: Borgu, Katcha, Lavun, Magama and Mokwa (Figure 1).



**Figure1: Map of Niger state showing the study areas**

Households were selected in a randomly stratified manner. Households were grouped by primary occupation of the head of household. Those heads of households stating fishing as being their primary occupation were classified as fishing households. Households which stated other main occupations but where fishing could be an additional activity were classed as non-fishing. A list of fishing and non-fishing households was prepared in the five LGA selected. In each LGA, two fishing villages were randomly selected. Five fishing and five non-fishing households were randomly selected in each village. The households, therefore, consisted of fifty fishing and fifty non-fishing households. The sampling strategy is outlined in Figure 2.



**Figure 2: Sampling strategy used for selecting households**

***Recording of fish intake***

A 24-hour recall method was used to obtain the amount of fish eaten by each household. This method estimates the food actually eaten, as recalled from memory, in the previous 24 hours. Batches of gutted small fish with a range of sizes up to about one kilogramme individual weight were used to support the respondents recall in giving an estimate of the quantity of fish consumed. The fish samples consisted of fresh, smoked and dried fish. The fish samples were shown to the wife, who was asked to pick the fish (fresh, smoked or dried) similar in size to the one(s) she prepared for consumption the previous day. This fish was then weighed and the result recorded to represent the amount the household had consumed. For intra- household distribution and consumption of fish by head of household, women and children (see Gomna [1]). The wife was also asked to name the type(s) of fish eaten during the past 24 hours and also to state whether the fish was purchased in the market or caught directly by the household members from a river. For each household, the actual family size consuming fish, annual income and occupations of the households were recorded.

The data was collected with the help of extension agents from the Agricultural Development Authority. Prior to the actual field work, the extension agents were trained in the methodology of 24 hour recall and a simulated interview was carried out in the local language to improve the interview technique. In addition, problems which might occur during the interview and ways of solving them were discussed.

During the field phase, each village was visited by the survey team a day before the first actual interviews in that village were to be held to share with the head of village the objective of the survey. Fishing and non-fishing households in the village were identified and numbered. The numbers were then written on pieces of papers to represent the households. The papers for fishing households were uniformly folded, put in a container and mixed properly. Those for non-fishing households were also folded, put in a different container and mixed properly. Five pieces of papers were taken at random from each container (see Figure 2). The randomly selected households were then informed of the interview which was to be held the following morning. All the households selected accepted to participate in the interviews.

The survey was carried out in all four seasons during the months of March, June, September and December, 2009 to cover peak and off – peak seasons for fish availability. March and June are periods of peak fish landings while September and December are periods of low fish availability in Niger state, Nigeria. The survey was conducted in the same households during all four seasons.

### **Statistical analyses**

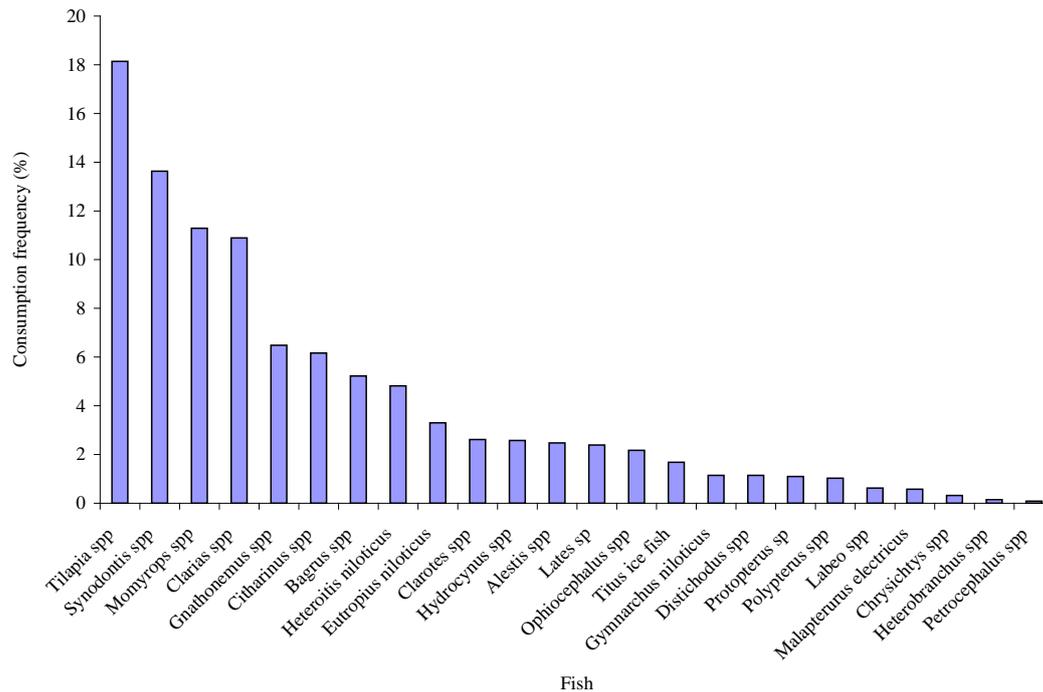
The relationship between fish consumption and income was analysed using a Pearson correlation. A general linear model was used to analyse fish consumption to establish significant ( $p < 0.05$ ) differences in monthly fish consumption between fishing and non-fishing households (Minitab software 14.12; State College, PA, USA). Grouped vertical bars (errors bars) were used in summarising the differences in monthly fish consumption between fishing and non-fishing households. A bar chart was used to show the overall consumption frequencies of fish species.

## **RESULTS**

The mean family size consuming fish in both fishing and non-fishing households was 8.0 members. In fishing households, the main income was derived from fishing whereas crop farming was the main income of non-fishing households. About 90% of the fishing households had crop farming as a secondary occupation and 10% were involved in petty trading. About 78% of the non-fishing households had fishing as a secondary occupation while others were involved in hunting and petty trading.

### **Consumption of fish species**

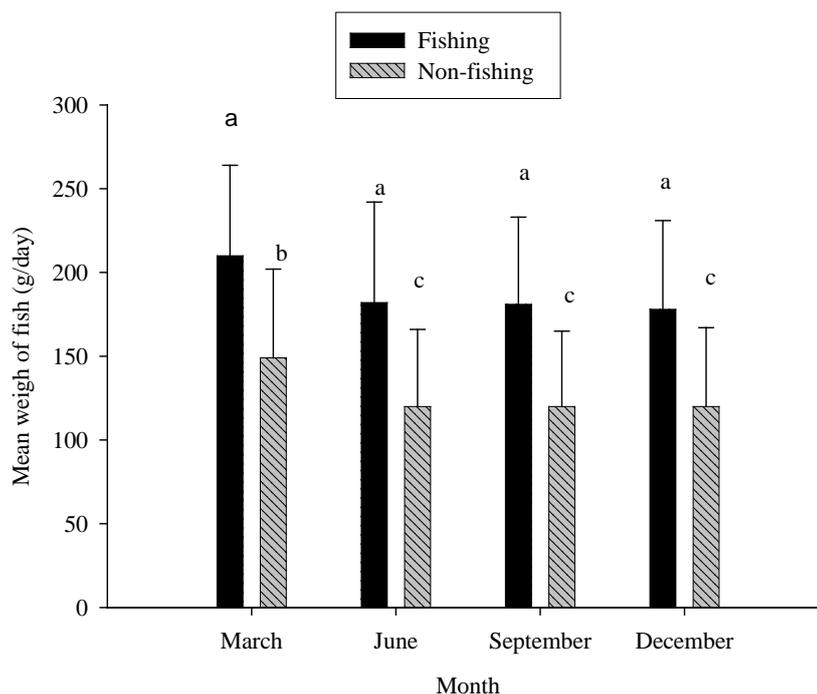
Fish species consumed in the fishing villages are given in Figure 3. In total, 24 different species groups were consumed by respondents during the survey. *Tilapia* species were consumed with the highest frequency (18%), followed by *Synodontis* or catfish (14%) and *mormyrops* or mormyrids (11%).



**Figure 3: Overall consumption frequencies of fish species in fishing villages in Niger state**

**Consumption patterns of fish**

All fishing and non-fishing households selected for the study consumed fish during the survey period. About 80% of the households ate fish twice a day (2 meals/day) while 20% consumed fish once a day (1 meal/day). Members of the households ate every part of the fish. Chewed bones were discarded only when big fish were eaten. Fish consumption was significantly higher in fishing than non-fishing households (Figure 4). Fishing households consumed an average of 188g of fish per day (69kg/year) compared with 127g fish per day (46kg/year) for non-fishing households. Fish consumption was significantly higher in the month of March in all the households (Figure 4). There were significant ( $p < 0.001$ ) differences in overall monthly fish consumption between fishing and non-fishing households. The significant differences are summarised in Figure 4. There was a negative correlation ( $r = - 0.124, p = 0.013$ ) between fish consumption and household income.



**Figure 4: Average daily weights of fish consumed within each month in fishing and non-fishing households in fishing villages in Niger state. Mean values with standard deviations indicated by vertical bars. Values with unlike superscript letters were significantly different ( $p < 0.05$ )**

### Sources and forms of fish used for cooking

About 76% of the fish consumed were caught directly by household members from the local rivers. Most of the fish consumed (90%) during the study were cooked in the fresh form.

## DISCUSSION

### *Consumption of fish species*

A large number of fish species (24) were consumed in the fishing villages with *tilapia*, *synodontis* (catfish) and mormyrids dominating consumption. High consumption of these species in the fishing villages suggests that they are the most abundantly caught fish species in the local rivers [13]. The high consumption of these species may, however, also be due to preference for the species and low market prices resulting in fishing households consuming these species rather than selling them and non-fishing households being able to afford to purchase them [14, 15]. The price of fresh tilapia was at that time 2.1 times lower than that of *Gymanrchus niloticus*; the highest-priced fish in Niger state [14].

The fact that fish species were available, accessible and used by the fishing villages suggests their importance in food security. Food security is achieved, if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily used by all individuals at all times to live a healthy and happy life

[16]. The fishing villages had access to open water bodies to fish and did not have to pay for most (76%) of the fish species consumed.

### ***Household consumption patterns of fish***

In the present study, fish consumption was significantly higher in fishing than non-fishing households (Figure 4). This higher consumption was probably the consequence of the access that fishermen had to open bodies of water to fish and not having to pay for the fish they consumed.

Households' pattern of fish consumption varied during the survey period. In all the households, more fish were consumed in the month of March which coincided with peak landings [15]. The low consumption of fish in June and September coincided with the rainy season. During this period, fishermen also work on their farmlands devoting more time to farming activities leading to a reduction in fishing activities. Low consumption of fish during this period may also be attributed to bulk sales of fish catches to generate income to procure seeds and other farm inputs such as fertilizer and, to hire labourers to assist in farming activities.

In the current study, fish consumption was negatively related to income and supports the observations of Jolly and Clonts [17]. The authors reported that as income increased, the relative preference for fish declined and that for red meat increased. They noted that the households in the lower socio-economic strata spent more of their income on fish than meat.

About 90% of the fish consumed during the study were cooked in the fresh form, which agrees with the findings of Adeniyi [18]. The consumption of fresh fish is important since processing after harvest, such as sun-drying and smoking, reduces its nutritional quality [19, 20, 21], although it does make it available when fish might otherwise not be available. The present study suggests that most of the fish consumed were caught directly by household members from rivers and supports the observations of Jolly and Clonts [17]. The high consumption (76%) of fish from rivers or capture fisheries highlights the importance of these ecosystems to the livelihoods of the fishing villages.

In the current study, small fish were eaten whole but chewed bones were discarded when large fish were eaten. Small whole fish tend to contribute far more to dietary balance than do prepared portions of larger fish [22]. This is particularly so as fish bones are rich in calcium which could help in body development especially in children [23, 24]. Increased fish consumption by children may be beneficial in areas where lactose intolerance is common or milk is expensive or in short supply [3]. The author recommended the use of fish as a weaning food since small children are vulnerable to malnutrition.

## CONCLUSION AND RECOMMENDATION

Although a large number of fish species were consumed, a few species dominated consumption, tilapia being the most important. The present study suggests that most of the fish consumed were caught directly by household members from local rivers. Priority should therefore be given in Niger state to promoting and enhancing the availability and access to fish in the local aquatic systems.

The current study suggests that small fish such as clupeids that are caught mainly in small meshed beach seine are rarely consumed by fishing villages in Niger state. The introduction of new fishing methods or new mesh sizes for an optimal exploitation of fish may therefore not have negative effect on the food security of the fishing villages. Nutrition counselling for nursing mothers on weaning practices using fish should be carried out by the relevant departments of Health. The nutrition programme should include cooking demonstrations particularly on how to put fish into powdered form for enrichment of porridge especially for children. The department of Agriculture should advise the fishing villages on the diversification of food crops and methods of improving quantity and quality of harvests such that during periods of fish shortage, other protein rich foods such as beans and groundnuts should be available in the households.

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