

## Fish species and forms consumed in both water and non-water bodies of Oyo State, Nigeria

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### ABSTRACT

Few documented studies on fish demand at the household level exist; despite the high nutritive value of fish protein and its significance to human health. This study was therefore carried out to determine types and forms of fish consumed by rural households in Oyo State, Nigeria. Multi-stage sampling procedure was used to select study's respondents. Thirty percent of the Local Government Areas were randomly selected and resulting ten LGAs were stratified based on the presence of Water Bodies (WB). Twenty villages were selected from each stratum giving 40 villages. Finally, 125 household members were each selected proportionate to size from the forty villages in water body and non-water body strata. Interview schedule was used to obtain information on respondents' socio-economic characteristics, fish species and forms consumed. Data were analyzed using descriptive statistics. Respondents were aged  $55 \pm 7.66$  years with household size of  $6.0 \pm 2.2$  people. The Respondents were mostly males (84.4%) and 75.2% had secondary school certificate. *Scomber* species (Marine) (23.7%), *Clarias gariepinus* (Cultured) (17.1%) and *Heterotis niloticus* (Captured Freshwater Fish) (20.3%) were the most consumed during the rainy season; while in the dry season, cray fish dried (10.4%), *Clarias gariepinus* (27.5%) and *Heterotis niloticus* (12.5%) were the most consumed. Frozen fish is mostly preferred in all seasons with (100.00%) recorded for *Pseudolithus*, *Sardinella* and *Ethmalosa species*; *Clarias gariepinus* was preferred smoked (14.1% in wet season / 25.2% dry season). Households' demand for fish in Oyo State varies in proportions of fish species, forms, and quantity but frozen marine fish was mostly demanded.

**Keywords:** Fish forms, Water and non-water body, Captured *Heterotis niloticus*, Cultured *Clarias gariepinus*

### INTRODUCTION

Fish plays a vital role in feeding the world population and contributes significantly to dietary protein intake. Fish and fishery products represent a very valuable source of protein and essential micronutrients for balanced nutrition and good health (Bene and Heck, 2005). Globally, fish provides about 3.0 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent of such protein. Differences among developed and developing countries are apparent in the contribution of fish to animal protein intake. Despite the relatively lower levels of fish consumption in developing countries, the share contributed by fish was significant at about 19.2 percent, and for Low Income Food Deposit Countries (LIFDCs) it was 24.0 percent (FAO, 2012).

Nigeria's fishery subsector is important and contributes four per cent to the country's Gross Domestic Product. Nigerians are high fish consumers with a total current deficit of 1.9 million metric tonnes per year, but was producing about 800,000 metric tonnes locally (Punch, 2014). This makes Nigeria the highest importer of fish and fishery products in Africa. The composition of the imports is

largely mackerels, sardines, hakes, herrings and croakers caught off the coasts of the Eastern Central Atlantic countries of Senegal and Mauritania and from the North Sea. High cost of available inputs has served as a disincentive to aspiring small-scale producers, dissuading many from creating a stable demand for the inputs. On the other hand, high costs of inputs have resulted in high priced products, which have restrained the sector's growth opportunities despite a burgeoning demand for fish. It is therefore no surprise that imports of frozen fish have increased by almost 20% per annum to meet demand at a price consumers seem willing to pay; domestic farmed fresh fish are retailed at prices as much as 100% to 120% higher than imported frozen fish, while domestic captured fish are priced far higher, by almost 325%. Consequently, import of frozen fish is nearly as large as domestic production (Punch, 2014).

Fish can be consumed in the fresh, frozen fried, smoked and sun-dried forms in accordance with the preference or taste of the consumer. The mix of these various forms of fish in household diets varies from country to country or from tribe to tribe. In Nigeria, fish appears to be more widely consumed in the smoked-dried, fresh and frozen forms. It is also commonly asserted in Nigeria that the dried form is

more widely consumed than the fresh form (Mafimisebi, 2012). Also, there is an avalanche of conflicting reports as to which, between water and non-water body rural households, consume more fish (Omotesho and Mohammed, 2010).

The problem of malnutrition is still wide spread in Nigeria affecting vulnerable groups. These include infants, pre-school children, pregnant and nursing mothers and adults particularly from low income households (Amao *et al.*, 2006). However, there has been no empirical research finding that has compared fish consumption in rural households based on water and non-water bodies and seasons (dry and rainy) of Oyo State. This was the motivation for this study, which compared the consumption of fish forms and the species to accurately determine rural households' demand for fish in Oyo State.

The following question was addressed;

- i. What are the consumption patterns of various types of fish in rural households' water and non-water bodies in Oyo State?

**METHODOLOGY**

**Study area, sampling procedure and data collection**

The study was conducted in Oyo State, Nigeria. Multi-stage sampling procedure was used to select sample for the study. The first stage involved selection of 30% of the ADP Local Government Areas (LGAs). The villages in the resulting ten LGAs were stratified based on the presence or absent of water body or non – water body and 20 villages were

selected from each stratum giving 40 villages - sampling proportionate to size, 125 households each from water body and non-water body strata respectively were selected to give a total of (250 household heads) interviewed. Descriptive statistics was employed to analyse the fish species and forms consumed in both water and non-water body of Oyo State.

**RESULTS AND DISCUSSION**

**Types of fish species consumed by households within the water body**

The water body households as shown in Table 1 established the fact that, marine fish species mostly consumed during the rainy season were: *Scomber Sp.* (23.7%), *Caranx spp.* (16.8%) and *Merluccius Sp.* (14.1%) while the least consumed fish were *Silversmelt-Argentina Silus* (2.4%), *Pseudotolithus sp.* (2.4%) and *Ethmalosa Fimbriata* (2.4%). Data on mostly consumed fish in the dry season were *Panulirus spp.* (10.4%), *Scomber sp.* (7.5%) and *Caranx spp.* (5.6%). The consumption of marine fish species showed varieties exist for consumption. This agrees with (Verbeke and Vackier, 2005), who opined availability of fish consumption in marine water body. It could also be an indication that as the income increased, better and expensive foods such as animal protein, in particular fish, would be consumed but as the percentage of income decreases, less will be purchased. This confirms Engels law which states that, 'the proportion of income spent on food declines as income increases'. *Clarias gariepinus* were good. Hence, there were greater supplies of fish in the dry season compared to rainy season.

**Table 1. Distribution of Fish Species Consumed by (Water body Households)**

Fish Species	Rainy Season		Dry Season	
	Frequency	%	Frequency	%
<b>Capture Marine Shell Fish</b>				
<i>Penaeusnotialis</i> (Shrimps-dry)	0.0	0.0	0.0	0.8
<i>Panulirus spp.</i> (Crayfish-dry)	35	9.3	39	10.4
<i>Marine Distance Fish</i>	89	23.7	28	7.5
<i>Scomber sp. (Mackerel)</i>				
<i>Silversmelt-Argentina silus</i> (Express)	09	2.4	07	1.9
<i>Caranx spp.</i> (Horse Mackerel)	63	16.8	21	5.6
<i>Merluccius sp.</i> (Hake)	53	14.1	17	4.5
<i>Pseudotolithus sp.</i> (Croakers)	09	2.4	06	1.6
<i>Sardinella aurita</i> (Sardine)	18	4.8	06	1.6
<i>Ethmalosa fimbriata</i> (Bonga)	09	2.4	03	0.8
<i>Sardinell aelba</i> (Sardine)	0.0	0.0	01	0.3
<b>Culture Fish</b>				
<i>Clarias gariepinus</i> (African mud fish)	64	17.1	103	27.5
<i>Oreochromis niloticus.</i> (Tilapia)	0.0	0.0	03	0.8

Fish Species	Rainy Season		Dry Season	
	Frequency	%	Frequency	%
<i>Cyprinus carpio</i> (Common carp)	9	0.0	0.0	0.0
<b>Capture Freshwater Fish Species</b>				
<i>Heterotis niloticus</i> (African bony fish)	76	20.3	47	12.5
<i>Channa obscura</i> (Snake head)	29	7.4	13	3.5
<i>Gymnarchus niloticus</i> (Trunk fish)	0.0	0.0	08	2.1
<i>Chrysichthys nigrodigitatus</i> (Silver cat fish)	44	11.7	21	5.6
<i>Alestes macrolepidotus</i> (Silverside fish)	16	4.3	10	2.7
<i>Hydrocynus vittatus</i> (African tiger fish)	25	6.7	11	2.9
<i>Ctenopoma kingsleyae</i> (Two sport climbing per)	0.0	0.0	0.0	0.0
<i>Malapterurus electricus</i> (Electric fish)	09	2.4	22	5.9
<i>Synodontis nigrita</i> . (Upside down catfish)	53	14.1	37	9.9
<i>Marcusenius ihuysi</i> (Trunk fish)	0.0	0.0	0.0	0.0
<i>Mormyrops deliciousus</i> (Elephant snout fish)	38	10.1	15	4.0
<i>Mormyrus rume</i> (Elephant snout fish)	0.0	0.0	0.0	0.0
<i>Hyperpiscus bebe</i> (Trunk fish)	0.0	0.0	0.0	0.0
<i>Hemichromis bimaculatus</i> (Banded jewel fish)	36	9.6	15	4.0
<i>Plematochromis guentheri</i> (Guentha mouth)	0.0	0.0	0.0	0.0
<i>Hepsetus odoe</i> (African river pike)	09	2.4	17	4.5
<i>Lates niloticus</i> (Nile perch)	0.0	0.0	0.0	0.0
<i>Auchenoglarus occidentalis</i> (Catfish)	09	2.4	03	0.8

Source: Field Survey, 2009

#### Types of fish species consumed by non-water body households

Table 2 shows the types of fish species consumed by the households in the non-water body communities during the rainy and the dry seasons, among the three classes of fish species, namely: marine, cultured and captured fish species. The marine frozen fish species consumed by households during the rainy season included dried *Panulirus spp.* (Cray fish) (20.0%), *Scomber sp.* (17.6%), *Merluccius sp.* (10.4%) and *Sardinella aurita* (9.6%). The least consumed fish were dry *Penaeus notialis* (2.4%) and *Sardinella elba* (2.4%).

The dry season on the other hand, had dry *Panulirus spp.* (16.7%) and *Scomber sp.* (9.9%) as mostly consumed while others were *Caranx spp.* (8.3%) and *Silversmelt-Argentina silus* (6.9%). However, *Penaeus notialis* were the least consumed. There seems to be a similarity in the consumption pattern of marine fish species in both seasons. This could also be attributed to habit, palatability, availability, taste and purchase intensions for fish. This agrees with Honkannen *et al.*, 2005 who opined that habit has been found to be a strong predictor of purchase intension for fish. Data on consumption of cultured fish shows 28.5% consumed *Clarias gariepinus* during the rainy season compared to 19.1% that consumed it in the dry season. This in effect indicated that cultured fish species were unaffected or

had no influence on rain or dry season as they were available throughout the seasons. The mostly consumed captured fresh water fish species in the rainy season were *Heterotis niloticus* (23.5%), *Synodontis nigrita* (21.1%), *Alestes macrolepidotus* (18.1%) and *Mormyrops deliciousus* (13.9%) while *Gymnarchus niloticus* (2.4%), *Malapterurus electricus* (2.4%) and *Hepsetus odoe* (2.4%) were the least consumed with similar consumption pattern.

Most consumed captured fresh water fish species in the dry season were *Synodontis nigrita* (8.3%), *Heterotis niloticus* (7.8%), *Alestes macrolepidotus* (7.3%) and *Mormyrus deliciousus* (4.6%). However, *Hemichromis bimaculatus* (0.5%) were the least consumed.

The fish consumption pattern in both the rainy and dry seasons of captured fish indicated similar pattern in the fishes that are highly consumed. However, the observed difference between the fish consumed in the different seasons by types, showed that the most widely distributed fish species consumed in the non-water body were the deep frozen landings of distant water vessels, the marine fish species; which consist of *Scomber sp.*, *Silversmelt-Argentina silus*, *Caranx spp.*, *Merluccius sp.*, *Sardinella aurita* and *Sardinella elba*. This confirmed studies by Kumar and Dey, (2004) that disparities in the fish consumption pattern exist widely across the income groups and location of the households. This could be due to availability as

opposed to seasonality of the captured fresh water fish species in the water body. This also agrees with the studies of Scholderer and Grunert, (2001) that

fish consumption has been found to be positively related to the available fish.

**Table 2: Distribution of Fish Species Consumed by Non-Water body Households**

Fish Species	Rainy Season		Dry Season	
	Frequency	%	Frequency	%
<b>Capture Marine Shell Fish</b>				
<i>Penaeus notialis</i> (Shrimps-dry)	09	2.4	02	0.5
<i>Panulirus spp.</i> (Crayfish-dry)	75	20.0	62	16.7
<b>Marine Distance Fish</b>				
<i>Scomber sp.</i> (Mackerel)	66	17.6	37	9.9
<i>Silversmelt-Argentina silus</i> (Express)	27	7.2	26	6.9
<i>Caranx spp.</i> (Horse Mackerel)	18	4.8	31	8.3
<i>Merluccius sp.</i> (Hake)	39	10.4	24	6.5
<i>Pseudolithus sp.</i> (Croakers)	0.0	0.0	06	1.6
<i>Sardinella aurita</i> (Sardine)	36	9.6	21	5.7
<i>Ethmalosa fimbriata</i> (Bonga)	0.0	0.0	03	0.8
<i>Sardinella elba</i> (Sardine)	09	2.4	19	5.1
<b>Culture Fish</b>				
<i>Clarias gariepinus</i> (African mud fish)	107	28.5	71	19.1
<i>Oreochromis niloticus.</i> (Tilapia)	0.0	0.0	02	0.5
<b>Capture Freshwater Fish Species</b>				
<i>Heterotis niloticus</i> (African bony fish)	88	23.5	29	7.8
<i>Channa obscura</i> (Snake head)	17	4.5	06	1.6
<i>Gymnarchus niloticus</i> (Trunk fish)	90	2.4	03	0.8
<i>Chrysichthys nigrodigitatus</i> (Silver cat fish)	31	8.3	12	3.2
<i>Alestes macrolepidotus</i> (Silverside fish)	68	18.1	27	7.3
<i>Hydrocynus vittatus</i> (African tiger fish)	23	6.1	09	2.4
<i>Ctenopoma kingsleyae</i> (Two sport climbing perch)	0.0	0.0	0.0	0.0
<i>Malapterurus electricus</i> (Electric fish)	09	2.4	03	0.8
<i>Synodontis nigrita.</i> (Upside down catfish)	79	21.1	31	8.3
<i>Marcusenius ihuysi</i> (Trunk fish)	0.0	0.0	0.0	0.0
<i>Mormyrops deliciousus</i> (Elephant snout fish)	52	13.9	17	4.6
<i>Mormyrus rume</i> (Elephant snout fish)	0.0	0.0	0.0	0.0
<i>Hyperpiscus bebe</i> (Trunk fish)	0.0	0.0	0.0	0.0
<i>Hemichromis bimaculatus</i> (Banded jewel fish)	10	2.7	02	0.5
<i>Hepsetus odoe</i> (African river pike)	09	2.4	03	0.8

Source: Field Survey, 2009

**Processed fish forms and seasons by households in water body communities**

The percentage of fish consumption by processed fish forms and season in the water body households in Table 3 show that fresh fish, smoked fish, frozen fish, sun-dried and fried fish were the processed fish forms consumed. It is of importance to note that, the consumption of these value forms depend on what is available at the time of purchase. However, this depends on factors such as price, availability, accessibility, taste, perceived freshness, habit, environmental differences like water body and non-water body areas. This confirms with what Eagly and

Chaiken (1993) described as attitude towards fish consumption. The above scenario is also consistent with the findings of Rortveit and Olsen (2009) who reported similar occurrence where attitude towards fish consumption was described as the extent to which people like and dislike eating fish, gain pleasure /displeasure from eating fish and feel satisfied / dissatisfied after eating fish.

The marine fish species under the rainy season indicated that *Scomber sp.* (10.1%) and *Caranx spp.* (14.3%) were consumed by the households as smoked fish. Frozen fish consumed by the households were:- *Scomber sp.* (89.8%) *Silversmelt-*

Argentina silus (100%), *Caranx spp.* (85.7%) and *Merluccius sp.* (64.4%). and *Pseudotolithus sp.*, *Sardinella aurita*, *Ethmalosa fimbriata* all representing (100%). Sun-dried were consumed as dried *Panulirus spp.* (100%) and *Merluccius sp.* (33.9%).

The marine fish species consumed during the dry season indicates that dried *Penaeus notialis* (50.0%) and *Silversmelt-Argentina silus* (28.6%) were consumed by the households as fresh. *Scomber sp.* was consumed as smoked and also, *Scomber* (89.3%) and *Silversmelt-Argentina silus* (71.4%) were consumed as frozen while *Penaeus notialis* (50.0%) and *Panulirus spp.* (100.0%) were consumed as sun-dried. From the above, there seems to be a similarity in the processed fish forms of marine fish species consumed in the rainy season, due to their availability at all seasons. The cultured fish species in the rainy season clearly revealed that *Clarias gariepinus* (14.1%) were consumed as smoked fish during the season, but the same *Clarias gariepinus* (74.8%) and *Oreochromis niloticus* (100%) were consumed as fresh fish in the dry season.

The captured fresh water fish species during the rainy season, established the fact that fish species were all consumed as fresh fish: *Heterotis niloticus* (52.6%), *Channa obscura* (79.3%), *Chrysichthys nigrodigitatus* (100%), *Alestes macrolepidotus* (100%), *Hydrocynus nigrita* (94.3%), *Mormyrops deliciosus* (100%), *Hemichromis bimaculatus*

(100%), *Hepsetus odoe* (100%) and *Auchenoglarus occidentalis* (100%). The smoked capture fish species which were consumed among the households were *Heterotis niloticus* (47.4%), *Channa obscura* (21.0%) and *Synodontis nigrita* (5.6%).

The captured fresh water fish species in the dry season reflects a similar consumption pattern with that of the rainy season based on seasonality, availability, abundance, taste, habit and perceived freshness. This agrees with Olsen (2004) that freshness may be a key determinant of quality evaluation. Captured fresh water fish species consumed fresh among the water - body households were:- *Heterotis niloticus* (73.9%), *Channa obscura* (69.2%), *Gymnarchus niloticus* (87.5%), and *Chrysichthys nigrodigitatus* (95.3%).

The smoked fish demanded by the households included *Heterotis niloticus* (26.1%), *Channa obscura* (30.8%), *Gymnarchus niloticus* (12.5%), *Chrysichthys nigrodigitatus* (4.7%) and *Synodontis nigrita* (5.6%). The processed fish forms comes about as a result of high spoilage rate of fish caused by micro-organisms and have to be preserved into other forms to extend the shelf life of the products. This agrees with a research carried out by Eyo (2001) that, fish in small scale are generally sun-dried, smoked or frozen by individual fisher men or fish monger to prevent spoilage. However, very high percentage of the households consume their fish as fresh, smoked or frozen, while very few consumed dried-fish.

**Table 3: Distribution of households by processed fish forms and seasons in water body**

Fish Species	Rainy Season					Dry Season				
	Fresh	Smoke	Frozen	Sun Dried	Fried	Fresh	Smoke	Frozen	Sun Dried	Fried
<b>Capture Marine Shell Fish</b>										
<i>Penaeus notialis</i>	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0	0.0
<i>Panulirus spp.</i>	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0
<b>Marine distance Fish</b>										
<i>Scomber sp.</i>	0.0	10.1	89.8	0.0	0.0	0.0	10.7	89.3	0.0	0.0
<i>Silversmelt Argentina silus</i>	0.0	0.0	100.0	0.0	0.0	28.6	0.0	71.4	0.0	0.0
<i>Caranx spp.</i>	0.0	14.3	85.7	0.0	0.0	0.0	14.3	85.7	0.0	0.0
<i>Merluccius sp.</i>	0.0	0.0	66.4	33.9	0.0	0.0	5.8	58.8	35.2	0.0
<i>Pseudotolithus sp.</i>	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Sardinella aurita</i>	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Ethmalosa fimbriata</i>	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Sardinella elba</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<b>Culture Fish</b>										
<i>Clarias gariepinus</i>	85.9	14.1	0.0	0.0	0.0	74.8	25.2	0.0	0.0	0.0
<i>Oreochromis niloticus.</i>	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<b>Capture Fresh Water</b>										
<i>Heterotis niloticus</i>	52.6	47.4	0.0	0.0	0.0	73.9	26.1	0.0	0.0	0.0

Fish Species	Rainy Season					Dry Season				
	Fresh	Smoke	Frozen	Sun Dried	Fried	Fresh	Smoke	Frozen	Sun Dried	Fried
<i>Channa obscura</i>	79.3	21.0	0.0	0.0	0.0	69.2	30.8	0.0	0.0	0.0
<i>Gymnarchus niloticus</i>	0.0	0.0	0.0	0.0	0.0	87.5	12.5	0.0	0.0	0.0
<i>Chrysichthys nigrodigitatus</i>	100.0	0.0	0.0	0.0	0.0	95.3	4.7	0.0	0.0	0.0
<i>Alestes macrolepidotus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hydrocynus vittatus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Nile Perch</i>	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Synodontis nigrita</i>	94.3	5.6	0.0	0.0	0.0	94.4	5.6	0.0	0.0	0.0
<i>Mormyrops deliciousus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hemichromis bimaculatus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hepsetus odoe</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Auchenoglarus occidentalis</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0

Source: Field Survey, (2009)

**Processed fish forms and season in non – water body communities**

The distribution of processed fish form and season in the non-water body households were as shown in (Table 4). The processed fish forms consumed included fresh, smoked, frozen, sun-dried and fried fish so as to prevent spoilage. The marine fish species consumed during the rainy season, shows that *Sardinella elba* (100%) was consumed smoked, while *Scomber sp.* (100%), *Silversmelt-Argentina silus* (100%), *Caranx spp.* (100%) *Merluccius spp.* (53.8%) and *Sardinella aurita* (100%) were all consumed as frozen fish species. On the other hand, the fish consumed by the households in the dry season: - were *Silversmelt-Argentina silus* (3.8%), *Caranx spp.* (9.7%), *Merluccius sp.* (4.2%), *Pseudolithus sp.* (16.7%) and *Sardinella elba* (33.3%) and were all consumed as smoked fish.

Consumed frozen fish by households were: *Scomber sp.* (100%) *Silversmelt-Argentina silus* (96.2%), *Caranx spp.* (90.3%), *Merluccius sp.* (66.7%), *Pseudolithus sp.* were all consumed as sun-dried. The fish consumed by households in both rainy and dry season showS similar pattern because almost the same types of fish species were consumed. This means the fish species depended on availability and accessibility of the product, hence uniformity of demand by households. This could also be attributed to availability and purchase intensions for fish. This agrees with Honkannen *et al.*, (2005) who opined that habit has been found to be a strong predictor of purchase intension for fish. The cultured fish species demand by the households during the rainy season however indicated that *Clarias gariepinus* (41.1%)

were consumed fresh while *Clarias gariepinus* (58.8%) were also consumed as smoked fish. Similarly, the consumption in the dry season reveals that *Clarias gariepinus* (25.5%), (72.1%) and (1.4%) were consumed as fresh, smoked and frozen fish respectively, but *Oreochromis niloticus* (100%) was consumed as smoked fish. This clearly showed that *Clarias gariepinus* were abundant and available to the households in both seasons.

The captured fish species consumed by the households during the rainy season in the non-water body established the following levels of consumption: *Heterotis niloticus* (100%), *Chrysichthys* (100%), *Aletes macrolepidotus* (91.2%), *Hydrocynus vittatus* (100%), *Lates niloticus* (100%). The following fishes were also consumed by the households as smoked fish: *Channa obscura* (64.7%), *Gymnarchus nitoticus* (100%), *Alestes macrolepidotus* (8.8%) and *Synodontis nigrita* (15.2%).

The distribution of households by fish form during the dry season showed the following fresh fish consumption: *Heterotis niloticus* (100%), *Chrysichthys nigrodigitatus* (100%), *Alestes macrolepidotus* (100%), *Hydrocynus vittatus* (100%), and *Hepsetus odoe* (100%). The smoked fish consumed by the households includes: *Heterotis niloticus* (6.9%), *Channa obscura* (66.7%) and *Synodontis nigrita* (16.7%). However, the result of households by processed fish forms and season under the captured fish exhibits a uniform level of consumption which may be due to availability and abundance hence same level of consumption.

**Table 4: Distribution of Households by Processed Fish Forms and Seasons in non-water body**

Fish Species	Rainy Season					Dry Season				
	Fresh	Smoke	Frozen	Sun Dried	Fried	Fresh	Smoke	Frozen	Sun Dried	Fried
<b>Capture Marine Shell Fish</b>										
<i>Penaeus notialis</i>	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0
<i>Panulirus spp.</i>	0.0	0.0	0.0	88.0	0.0	0.0	0.0	0.0	92.5	0.0
<b>Marine Distance Fish</b>										
<i>Scomber sp.</i>	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Silversmelt Argentina silus</i>	0.0	0.0	100.0	0.0	0.0	0.0	3.8	96.2	0.0	0.0
<i>Caranx spp.</i>	0.0	0.0	100.0	0.0	0.0	0.0	9.7	90.3	0.0	0.0
<i>Merluccius sp.</i>	0.0	0.0	53.8	46.2	0.0	0.0	4.2	66.7	29.2	0.0
<i>Pseudolithus sp.</i>	0.0	0.0	0.0	0.0	0.0	0.0	16.7	83.3	0.0	0.0
<i>Sardinella aurita</i>	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Ethmalosa fimbriata</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
<i>Sardinella elba</i>	0.0	100.0	0.0	0.0	0.0	0.0	33.3	66.7	0.0	0.0
<b>Culture Fish</b>										
<i>Clarias gariepinus</i>	41.1	58.8	0.0	0.0	0.0	22.5	76.1	1.4	0.0	0.0
<i>Oreochromis niloticus.</i>	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
<b>Capture Fresh Water Fish</b>										
<i>Heterotis niloticus</i>	100.0	0.0	0.0	0.0	0.0	93.1	6.9	0.0	0.0	0.0
<i>Channa obscura</i>	35.3	64.7	0.0	0.0	0.0	33.3	66.7	0.0	0.0	0.0
<i>Gymnarchus niloticus</i>	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Chrysichthys nigrodigitatus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Alestes macrolepidotus</i>	91.2	8.8	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hydrocynus vittatus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Nile Perch</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Synodontis nigrita</i>	84.8	15.2	0.0	0.0	0.0	83.3	16.7	0.0	0.0	0.0
<i>Mormyrops deliciosus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hemichromis bimaculatus</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Hepsetus odoe</i>	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
<i>Auchenoglarus occidentalis</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Field Survey, (2009)

#### CONCLUSION AND RECOMMENDATION

This study examined rural households demand for fish species, forms and quantities in water body and non-water body in Oyo State. The types of fish species consumed by households within the water body shows: - *Scomber spp.* (89.0%), *Merluccius sp.* (53.0%), *Caranx spp.* (63.0%), *Clarias gariepinus* (64%), *Heterotis niloticus* (76%), and *Chrysichthys nigrodigitatus* (44%) and *Synodontis nigrita* (53%). *Silversmelt – Argentina silus* (09%), *Pseudolithus sp.* (09%), *Ethmalosa fimbriata* (09%), *Cyprinus carpio* (09%), *Malapterurus electricus* (09%), *Hepsetus odoe* (09%), *Auchenoglarus occidentalis* (09%), *Hemichromis bimaculatus* (36%), *Hydrocynus vittatus* (25%), *Mormyrus deliciosus* (38%).

The type of fish species consumed by non-water body households on the other hand reveals: - dried *Panulirus sp.* (75%), *Scomber spp.* (66%), *Silversmelt – Argentina silus* (97%), *Heterotis niloticus.* (88%), *Gymnarchus niloticus* (90%), *Alestes macrolepidotus* (68%), *Synodontis nigrita* (79%), *Channa obscura* (17%), *Chrysichthys nigrodigitatus* (31%), *Hydrocynus vittatus* (23%), *Malapterurus electricus* (09%), *Mormyrops deliciosus* (52%), *Hemichromis bimaculatus* (10%), *Hepsetus odoe* (09%). *Merluccius spp.* (39%) *Sardinella aurita* (36%). The types of fish consumed by both water body and non – water bodies shows similar pattern, while the marine distance frozen fish in both bodies shows the widest distribution.

The processed fish forms in rainy seasons by

households in water body communities reveals:-  
 Fresh Fish: *Clarias gariepinus*, *Heterotis niloticus*, *Channa obscura*, *Chrysichthys nigrodigitatus*, *Alestes macrolepidotus*, *Hydrocynus vittatus*, *Malapterurus electricus*, *Synodontis snigrita*.  
*Mormyrops deliciosus*, *Hemichromis niloticus*, *Hepsetus odoe* and *Auchnoglarus occidentalis*.  
 Smoked Fish: *Scomber spp.*, *Caranx spp.*, *Clarias gariepinus*, *Heterotis niloticus*, *Channa obscura* and *Synodontis nigrita*.  
 Frozen Fish: *Scomber spp.*, *Silversmelt –Agentina silus*, *Caranx spp.*, *Merluccius spp.*, *Pseudolithus elongatus*, *Sardinella aurita* and *Ethmalosa Fimbriata*.  
 Sun Dried: *Panulirus spp.* and *Merluccius spp.*

The processed fish forms in dry season shows:- Fresh Fish: *Clarias griepinus*, *Oreochromis niloticus*, *Heterotis niloticus*, *Channa obscura*, *Gymnarchus niloticus*, *Chrysichthys nigrodigitatus*, *Alestes macrolepidotus*, *Malapterurus electricus*, *Synodontis spp.*, *Mormyrops deliciosus*, *Hemichromis bimaculatus*, *Hepsetus odoe*, *Auchenoglarus occidentalis*.  
 Smoke Fish: *Scomber spp.*, *Caranx spp.*, *Merluccius spp.*, *Clarias gariepinus*, *Heterotis niloticus*, *Channa obscura*, *Gymnarchus niloticus*, *Chrysichthys nigrodigitatus* and *Synodontis spp.*  
 Frozen Fish: *Scomber spp.*, *Caranx spp.*, *Merluccius spp.*, *Silversmelt – Agentina silus*, *Pseudolithus*, *Sardinella aurita / Elba*, and *Ethmalosa fimbriata*.  
 Sundried Fish: *Merluccius spp.*

However, the fish forms in the non-water body are not quite different from the water body because they show uniform pattern of consumption which may be due to availability, accessibility and proximity of the communities. The processed fish forms comes about as a result of high fish spoilage rate of fish and have to be preserved by frozen, smoke and sun dried to extend the shelf life

Based on the findings of the study, the following recommendations are made:

- To increase the protein intake of Oyo State, there is need to promote greater investment in aquaculture and improve artisanal, inland and marine fisheries
- Efforts should be made to encourage the local fish farmers through incentives and also discourage importation of distance frozen fish to boost local production.
- The fish farmers should be granted loans/subsidies to enable them purchase modern equipment in order to increase supply.
- The government and all stakeholders should encourage the production of fish in its entirety through the exploitation of the vast water resources available in Oyo State.

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