

Assessment of Distribution and Handling Procedures of Imported Frozen Fish in Oyo State, Nigeria

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Abstract

Fish is a highly perishable food and there is dearth of information on quality control along the distribution chain to the final consumer. Therefore quality and handling procedures of imported frozen fish within Oyo state were investigated. The study area was stratified into four Agricultural Development Programme (ADP) zones (Ibadan/Ibarapa, Ogbomoso, Oyo and Saki). All cold store operators (n=67) and 5.0% of registered retailers per zone (n=150) were randomly selected and assessed using 217 structured questionnaires to obtain information on compliance level on temperature management, personal hygiene, facilities' sanitation and handling. Data were analyzed using descriptive statistics and percentages. Compliance level to quality measures by cold store operators in all the zones were 65.7%, 83.6% and 92.5% for temperature management, personal hygiene and facilities' sanitation, respectively. Ibadan/Ibarapa zone had the highest cold storage capacity of 7,433 tonnes and the least was Saki zone with 61 tonnes. Transportation of fish to retail points were by motorcycle (43.3%), taxi cab (31.1%) and by head load (24.0%). Fish was displayed by retailers using bowls (50.0%), wooden tables (36.7%) and wooden boards (10.0%). Only 57.3% of retailers washed their tables daily and none used chlorinated water. Most cold stores met the recommended temperature for cold storage.

Keywords: Frozen fish, Fish storage, Cold store operators, Fish retailers

1. Introduction

Fish is a major source of protein and its harvesting, handling, processing and distribution provide livelihood for millions of people as well as providing foreign exchange earning to many countries (Al-Jufaili and Opara, 2006). Nigeria, according to Akande (2002) is one of the biggest importers of fish and fishery products. This is due to the need to meet the shortfall in domestic demand for fish. Fish demand in Nigeria is about 2 million metric tonnes, while the current domestic fish production is about 0.9 million metric tonnes. The shortfall between demand and supply is made up by importation of more than 600,000 metric tonnes of fish annually (FDF, 2012a). Fish is the preferred source of much desired animal protein compared to poultry, beef, mutton, pork and veal. It is comparatively cheaper and highly acceptable, with little or no religious bias, which gives it an advantage over pork or beef (Johnston *et al.*, 1994 and Feldhusen, 2000). With the need to store and transport the food from one place to another where it is needed, food preservation becomes necessary in order to increase its shelf life and maintain its nutritional value (Ghaly *et al.*, 2010). Frozen fish imports are exclusively limited to small pelagic, most widely distributed in the country, through a network of privately owned cold stores located in major cities (Agbebi, 2010). The high demand for fishery products arise from the awareness of its significance in the local diet and its favourable price compared to its substitutes. In a recent survey by the Federal Department of Fisheries and Federal Ministry of Agriculture and Rural Development on fish price according to states in Nigeria, frozen fish rated as the cheapest of all fisheries products which makes it most widely accepted among the predominantly low income Nigerians (FDF, 2012b). An important social impact of this on the economy is the job opportunity offered to the teeming number of people involved in this sub-sector (Agbon *et al.*, 2000).

The objectives of this study are to: (i) evaluate operations of the frozen fish business across zones in Oyo state, (ii) examine the constraints to frozen fish distribution and management in Oyo state, (iii) determine the wholesaler-retailer relationship and its effects on storage of frozen fish (iv) determine the length of storage of frozen fish across zones.

2. Materials and Methods

2.1 Questionnaire Administration

The areas of study covered the four ADP zones of Oyo state viz: Ibadan/Ibarapa, Ogbomoso, Oyo and Saki zones. The zones are taken as the sampling frames for the study. A sample survey was thereafter carried out to draw the sample needed for subsequent empirical analysis. A total number of 217 respondents for the study included wholesalers and retailers. The wholesalers are the frozen fish dealers, who operate cold stores, while retailers buy from the cold stores and sell to the final consumers.

The administration of questionnaire was in two stages. The first stage was the selection of all cold store operators (wholesalers) in the four zones of the study area totaling 67. Sequel to this was the random selection of 150 retailers at five percent representation per zone of all registered fish retailers in Oyo state. Questionnaire schedule developed for the study consists of items on personal characteristics of respondents such as age, gender and educational qualifications. Socio-economic parameters, group activities of the fish sellers, transportation,

handling and physical facilities among others were evaluated. The questionnaires were completed by the respondents but where necessary, further in-depth face to face interaction was employed in obtaining accurate data.

2.2 Statistical Analysis

The statistical programme, SPSS, 2003 VERSION 16.0 was used to analyze the result of the treatments. The socio-demographic and socio-economic variables were presented in frequency tables and analyzed using simple percentages.

3. Results

The most common imported frozen fish sold in Oyo state markets included *Sardinella* species, *Micromesistius poutassou*, *Merluccius capensis*, *Scomber japonicus*, *Scomber scombrus*, and others (Table 1). Ibadan/Ibarapa zone had the highest number of cold stores (39) representing 58.2% out of a total number of 67 and the largest capacity of 7,433 tonnes, while the least was Saki zone (5) with capacity of 61 tonnes as shown in Table 2.

Out of the 67 wholesalers interviewed, there were more men (83.6%) in the frozen fish distribution business than women (16.4%). However, out of the 150 retailers interviewed across the zones, none was male (Table 3). On age distribution, 19.4% of wholesalers were above 60 years, 51-60years (25.4%), 41-50years (34.3%), 31-40years (11.9%) and 9.0% fell within 21-30years. Only 3.3% of retailers were older than 60years, 51-60years (12.0%), 41-50years (24.0%), 31-40years (38.7%) and 22.0% were within 21-30 years (Table 4). Refrigerated truck (89.6%) was most commonly used by wholesalers to transport frozen fish round the state (Table 5); while other means were taxi cab (7.5%) and bus (3.0%). Motorcycle (43.3%) remained the major means of transporting frozen fish from cold stores by retailers. Others were taxi cab (31.3%) and head load (24.0%) as shown on Table 6.

Table 1. Common frozen fish species found in Oyo state markets

Local name	Common name	Scientific name
Titus/ Alaran	Mackerel	<i>Scomber japonicus</i>
Agbodo	Bonga	<i>Etmalosa fimbriata</i>
Panla	Blue whiting	<i>Micromesistius poutassou</i>
Panla osan	Alaska/ hake	<i>Merluccius capensis</i>
Apo	Croaker	<i>Pseudolithus species</i>
Kote	Horse mackerel	<i>Scomber scombrus</i>
Sawa	Herring	<i>Sardinella species</i>
Epiya	Tilapia	<i>Tilapia species</i>
Pilchard	Pilchard	<i>Sardine pilchardus</i>
Express	Argentine hake	<i>Merluccius hubbsi</i>
Lady fish	Lady fish	<i>Albula species</i>

Table 2. Distribution and Capacity of Cold Stores in Oyo state

Zone	Number	%	Capacity(tonnes)	%
Ibadan/Ibarapa	39	58.2	7,433	87.03
Ogbomoso	16	23.9	973	11.39
Oyo	7	10.4	74	0.87
Saki	5	7.5	61	0.71
Total	67	100.0	8,541	100.0

Table 3. Gender Distribution of Wholesalers and Retailers across zones

Zone/Gender	Male		Female	
	Wholesaler	Retailer	Wholesaler	Retailer
Ibadan/Ibarapa	31	0	8	97
Ogbomoso	15	0	1	29
Oyo	5	0	2	15
Saki	5	0	0	4
Total (%)	56 (83.6)	(0.0)	11 (16.4)	150 (100.0)

Table 4. Age Distribution of Wholesalers and Retailers

Age (Years)	Wholesaler (%)	Retailer (%)
Above 60	13 (19.4)	5 (3.3)
51-60	17 (25.4)	18 (12.0)
41-50	23 (34.3)	36 (24.0)
31-40	8 (11.9)	58 (38.7)
21-30	6 (9.0)	33 (22.0)
Total (%)	67 (100.0)	150 (100.0)

Table 5. Means of Fish Transportation by Wholesalers across Zones

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Refrigerated truck	36	14	7	3	60	89.6
Taxi cab	3	2	0	0	5	7.5
Bus	0	0	0	2	2	3.0
Total	39	16	7	5	67	100.0

Table 6. Means of Transportation of fish to market by Retailers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Taxi cab	24	15	8	0	47	31.3
Motorcycle	59	1	3	2	65	43.3
Head load	17	13	4	2	36	24.0
No response	2	0	0	0	2	1.3
Total	102	29	15	4	150	100.0

In Table 7, majority of the retailers sold fish at fish market stalls (51.3%), roadside (20.7%), hawking (23.3%), while 4.7% supplied customers and agencies like hotels and institutions. Handling facilities for the display of fish by the retailers included bowls (50.0%), wooden tables (36.7%), wooden boards (10.0%) and others 3.3% (Table 8). Most of the fish traders kept the fish stall clean individually (71.3%), 21.3% cleaned collectively, 6.0% used hired labour, while local government officials (1.3%) were sometimes involved in cleaning (Table 9). More than fifty seven percent of the retailers cleaned their table/slab daily, 25.3% twice a week, 15.3% thrice weekly, while 2.0% cleaned their tables once per week (Table 10). It was observed that none of the retailers used chlorinated water in washing their tables/slabs. Compliance to facilities' sanitation by wholesalers was 92.5% satisfactory (Table 11), while compliance to personal hygiene by cold store workers was 83.6% (Table 12).

Table 7. Methods of Selling fish by Retailers across Zones

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Supplies to people and agencies	3	2	2	0	7	4.7
Public hawking	16	10	7	2	35	23.3
Roadside sales	30	0	1	0	31	20.7
Fish market stalls	53	17	5	2	77	51.3
Total	102	29	15	4	150	100.0

Table 8. Methods of Displaying Fish by Retailers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Wooden table	39	9	5	2	55	36.7
Bowls	56	15	2	2	75	50.0
Wooden board	8	0	8	0	15	10.0
Others	0	5	0	0	5	3.3
Total	102	29	15	4	150	100.0

Table 9. Methods of Keeping the Fish Stalls clean by Retailers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Retailers Collectively	27	3	2	0	32	21.3
Hired Labour	0	5	4	0	9	6.0
Individual Retailer	75	20	8	4	107	71.3
Local Government	0	1	1	0	2	1.3
Total	102	29	15	4	150	100.0

Table 10. Frequency of Washing of Display facilities by Retailers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Daily	69	10	5	2	86	57.3
Once a week	0	1	2	0	3	2.0
Twice a week	20	18	0	0	38	25.3
Thrice a week	13	0	8	2	23	15.3
Total	102	29	15	4	150	100.0

Table 11. Compliance to Facilities' Sanitation by Wholesalers across Zones

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Satisfactory	35	16	7	4	62	92.5
Not Satisfactory	4	0	0	1	5	7.5
Total	39	16	7	5	67	100.0

Table 12. Compliance to Personal Hygiene by Cold store Workers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Satisfactory	36	12	5	3	56	83.6
Not Satisfactory	3	4	2	2	11	11.0
Total	39	16	7	5	67	100.0

3.1 Group Activities

Figure 1 shows that percentage of wholesalers in trade association was highest in Ogbomoso zone, while Saki zone had no Trade association. Altogether, 86.0% of retailers belonged to Trade associations.

3.2 Constraints to Frozen Fish Distribution and Management

Problems encountered by wholesalers in fish distribution, handling and management as shown in Figure 2 included power outage (electricity), scarcity of fish, debt by customers, transportation cost, fuel cost and shortage of technical personnel. Ninety seven percent across the zones identified electricity as a problem in fish business. Eighty two percent of the wholesalers did not experience fish scarcity. Most of the wholesalers sold on credit to retailers; therefore the problem of debt recovery from retailers was 65.0%. More than eighty percent identified fuel cost as a problem because the fuel used to power generating sets increased the bill of maintaining cold store facilities. The problem of technical personnel handling the repairs of facilities was 17.4%, while 47.8% of the wholesalers identified transportation as a problem.

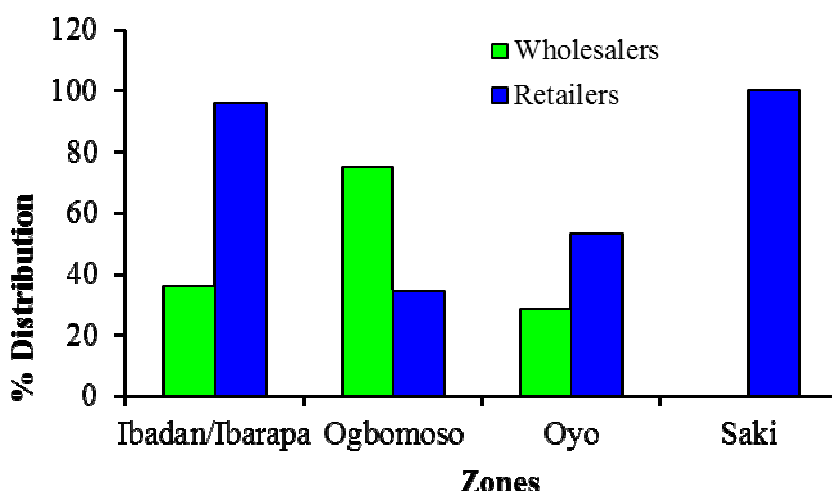


Figure 1. Distribution of Wholesalers and Retailers in Trade Association

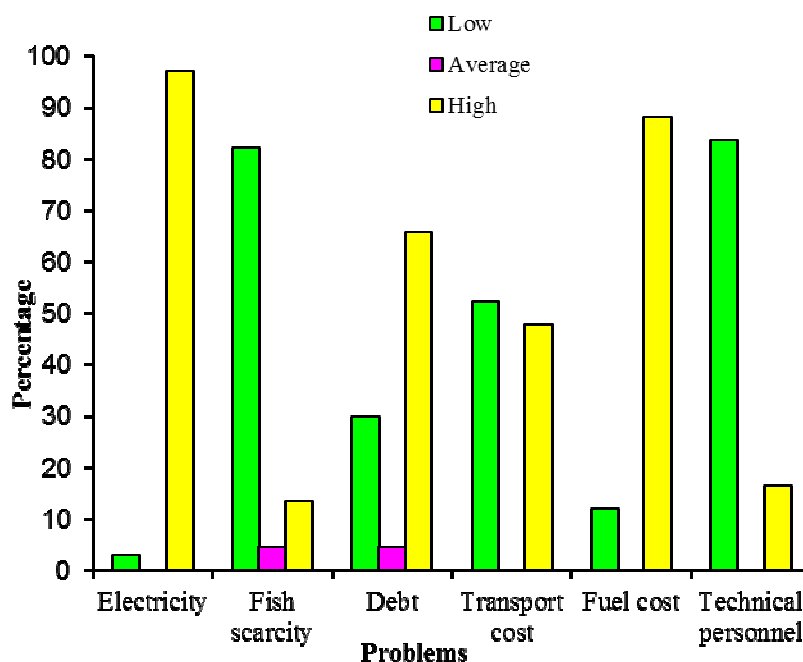


Figure 2. Problems encountered by Wholesalers of Imported Frozen Fish in Oyo state

3.3 Storage of Frozen Fish

Duration of storing fish in the cold store between 1-2 weeks by wholesalers was 92.5% (Table 13), after which new fish was brought in. On temperature management, most cold stores (71.6%) were maintained at -11 to -18°C (Table 14). The total percentage of cold stores that maintained the recommended storage temperature for frozen fish (-18°C) across the four zones as shown in Table 15 was 65.67%. Eighty six percent of the cold stores were maintained below -18°C in Oyo zone, followed by Ibadan/Ibarapa (74.3%), while the least was Saki zone with 40.0%.

3.4 Daily Handling of Unsold fish by Retailers

Findings showed that not all the fish were sold daily by retailers. More than sixty three percent of retailers refrigerated the unsold fish, 24.7% smoked the fish and 1.3% gave fish out after daily sales (Table 16), while virtually all retailers (98.7%) sold the left-over fish the following day. The consequences of not immediately cold storing the left over fish after daily sales by retailers as discovered in the course of this research work included:

- Obvious drip loss from the frozen fish when not stored in time. As the fish thawed, a large amount of fluid is lost; resulting in dry tough flesh and the fish usually became difficult to cut.
- There was incidence of dehydration of fish which resulted in the unusual dryness of the fins, most

prominently the caudal fin.

- The fish lost its economic value as it did not appeal to customers due to changes in physical appearance.

Table 13. Duration of Fish Storage by Wholesalers across Zones

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
1- 2 wks	37	14	6	5	62	92.5
3-4 wks	2	2	0	0	4	6.0
Others	0	0	1	0	1	1.5
Total	39	16	7	5	67	100.0

Table 14. Temperature of Cold stores across Zones

Temperature	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
-1 to -5 ⁰ C	0	2	0	1	3	4.5
-6 to -10 ⁰ C	3	2	0	1	6	9.0
-11 to -18 ⁰ C	29	10	7	2	48	71.6
Unknown	7	2	0	1	10	14.9
Total	39	16	7	5	67	100.0

Table 15. Percentage Temperature range of Cold Stores above and below -18⁰C across Zones

	Zone				Total/ (%)
	Ibadan/Ibarapa/(%)	Ogbomoso/(%)	Oyo/(%)	Saki/(%)	
-18 ⁰ C and below	29(74.35)	7(43.75)	6(86.0)	2(40.0)	44(65.67)
Above -18 ⁰ C	3(7.69)	7(43.75)	1(14.29)	2(40.0)	13(19.40)
Unknown	7(17.95)	2(12.5)	-	1(20.0)	10(14.93)
Total	39(58.21)	16(23.88)	7(10.45)	5(7.5)	67(100.0)

Table 16. Methods of preserving the unsold fish by Retailers

	Zone				Total	Percentage
	Ibadan/Ibarapa	Ogbomoso	Oyo	Saki		
Smoking	22	11	2	2	37	24.7
Refrigeration	70	13	10	2	95	63.3
Give out	0	2	0	0	2	1.3
Others	10	3	3	0	16	10.7
Total	102	29	15	4	150	100.0

4. Discussion

Out of all the common frozen fish found in Oyo state markets, only *Sardinella* species and *Micromesistius poutassou* are available all year round, widely spread across the zones, affordable and consumed by a larger percentage of the populace. Research showed that *Scomber japonicus* is highly priced and out of reach of the common man, while *Scomber scombrus* (horse mackerel) is seasonal.

The chain of distribution of frozen fish is from the industrial trawlers to the fish firms (producers) based in Lagos and Port Harcourt. They sell to the cold store operators (wholesalers) spread across the state, through the retailers who sell directly to the final consumers. This was supported by Esiobu and Onubuogu (2014) who stated that marketing channel for frozen fish is a clear and concise one from producer through the wholesalers, retailers and to the final consumer.

Dominance of men in the wholesale sector could be attributed to the heavy capital investment required for procuring and maintaining the equipment needed for the smooth running of the business which included cold store and refrigerated trucks. The strong gender linkage in frozen fish retailing was probably due to the existence of gender bias for women in the South West Nigeria, occasioned by cultural belief that retailing is not strenuous and is a woman's job. This was in agreement with Cheke (2012) and Babalola *et al.* (2015), who identified retail sector as female dominated in the distribution chain of frozen fish.

Age distribution also showed that there were more youths in fish retailing than wholesaling. This is similar to the findings of Coster and Otufale (2010) who identified that fish retailing is dominated by young individuals who are active and within the productive age and with the potential and drive to sustain frozen fish marketing. However, literacy level was generally high in both wholesalers (80.6%) and retailers (69.3%). This is similar to the work of Esiobu and Onubuogu (2014), who reported 65% literacy level in fish marketers. The most common means of transportation among wholesalers was refrigerated truck while motorcycle was used by the retailers.

Fifty seven percent of the retailers washed their slab daily which shows a considerable high level of hygiene but none of them used chlorinated water. Majority of the retailers sold fish at fish market stalls, while others sold by the roadside or hawked in public using handling facilities such as bowls, wooden tables and wooden boards. This corroborated earlier work by Krone (1977) who stated that frozen fish was primarily retailed in developing countries in unsophisticated bulk packs and its distribution depended in many instances on the traditional fish trade in public markets or sometimes in fishmongers' shops. However, most of the cold store workers across the zones (83.6%) wore insulated clothing into the refrigerated trucks and cold stores during loading and unloading.

Unlike in retail trade, membership of Trade associations was not mandatory in the wholesale. This informed the higher percentage of retailers (86.0%) in trade association than wholesalers (45.2%). The main constraint to frozen fish distribution is poor power supply. Electricity was neither regular nor consistent. It was observed that all wholesalers made use of alternative power source (generator). This was also identified by Bada (2010), who stated that marketers solved this problem through self generation of power. This explains why majority (65.7%) met the -18°C retail temperature for frozen fish. Though most of the wholesalers did not buy on credit, majority sold to retailers on credit. There was therefore problem of debt recovery from defaulters which was as high as 65.0%. In the same vein, inadequate finance limited the number of entrants into wholesale business due to the high cost of construction of cold stores, maintenance and other functional services in transporting fish to the cold stores.

Although the study indicated that there was less number of wholesalers dealing with large number of retailers, the wholesaler-retailer relationship operated on a system of minimum wastage and the storage facilities helped to maintain the frozen fish quality. The wholesalers gave preservative assistance to the retailers to enable them to sell on subsequent days. This is in agreement with the findings of Ladipo and Fabiyi (1986) that in frozen fish marketing, arrangement were usually made by wholesalers to enable the retailers return the left-over fish to the cold store for preservation.

The drip loss experienced in left-over fish was corroborated by Aitken *et al.* (1982) who posited that a badly stored fillet or fillets from a badly stored whole fish would feel hard, stiff and would release copious drip. The storage temperature of fish determines the extent of drip loss (Oyelese, 2007). As the fish thaw out due to temperature abuse, water-holding capacity of the fish tissue is reduced leading to drip loss which contains protein components (Chevalier, *et al.*, 1999; Zaritzky, 2008).

5. Conclusions and Recommendations

The result of analysis indicated that the wholesale business of fish was dominated by male, while the female dominated the retailing sector. The age distribution also showed that the population of youth in the fish retailing business is higher than in the wholesaling business. The wholesalers were older and better placed financially. The medium of transportation by wholesalers was the refrigerated truck, while most retailers preferred motorcycle. The frozen fish was usually packaged in plastic film (bags) and transported in cartons or boxes of between 10kg to 30kg depending on species. The facilities for storing the products were cold stores and deep freezers and majority (65.67%) met the recommended temperature for cold storage. Imported frozen fish moved from the firm to wholesalers and then to the retailers and finally to the consumers.

Wholesalers are under close supervision of regulatory bodies thereby all measures aimed at improving frozen fish distribution and marketing in Oyo State should concentrate on the retailers' practices and tools. Consumers should however ensure that only properly cooked fish is consumed.

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