Available online @ www.actasatech.com

acta **SATECH 3(2): 48 - 51 (2010)**

Biochemical and microbiological quality of frozen fishes available in some supermarkets in Lagos State, Nigeria.

***C. E. Oramadike, Ibrahim A. O. and Kolade O. Y.**
Nigerian Institute for Oceanography and Marine Research P. M. B. 12729, Victoria Island, Lagos.

***Corresponding author:** <chigooramadike2007@yahoo.com>

ABSTRACT
Investigations on biochemical and microbiological qualities of some frozen fishes available in some reputable supermarkets in Lagos State were carried out . The temperature at the time of purchase was -18^{o}C. The free fatty acid (FFA) of all the fishes ranged between 0.13-0.35%, the trimethylamine (TMA) values ranged from 3.69-8.40 mg- N/100g and the total volatile bases (TVB) ranged from 8.4- 21.0 mg- N/100g. Total bacterial count (TVC) ranged between 2.0 x 10^{3}- 7.4 x 10^{3} CFU/g, total coliforms per gram ranged between 0 and 53 MPN/log and did not exceed acceptable total coliforms limit per gram for frozen fish. The sanitary, storage and hygienic conditions of the supermarkets were relatively the same. The study revealed that the sanitary and hygienic condition in which the frozen fishes were kept have a direct bearing on the quality of fish being sold at the supermarket.

Keywords: *free fatty acids, trimethylamine, total volatile bases, total bacterial count frozen fishes*

INTRODUCTION

Seafood has traditionally been a popular part of the diet and main supply of animal protein in many parts of the world. They are prone to contamination at various stages of handling and processing and the quality is a major concern to food processors and public health authorities (Gnanambal and Patterson, 2005). The Food and Agriculture Organization (1994) asserted that fish contributes about 60% of the world's supply of protein and that 60% of the developing world derives more than 30% of their annual protein from fish. However, In Nigeria, fish constitute 40% of the animal protein intake (Olatunde, 1998). This implies that any shortfall in fish availability will affect the animal protein intake of people in tropical countries (Salawu *et al*.,2004). Also in Nigeria the demand for fish is put at 2.10 million metric tonnes with fish imports making up to about three fifth (740,00 M T) of the fish supply (FDF, 2007). Majority of the frozen fishes are sold in the open markets. However, the ones sold in supermarkets are either imported frozen or those caught in Nigerian waters and frozen on board. Ola and Akande (1996) reported on the quality of "Wet" fish in retailing markets in Lagos. Arannilewa *et al*., (2005) noted that protein decreased with increasing duration of frozen storage with fresh samples not frozen having higher protein content. Disadvantages such as product dehydration, rancidity, drip loss and product bleaching have an overall effect on the quality of frozen food (Kropf and Bowers 1992). In spite of some disadvantages associated with frozen storage freezing is accepted as effective way of preserving fish (Arannilewa *e*t *al*., 2005). There is paucity of information on quality of fish sold in Nigeria supermarkets. Due to paucity of information on quality of fish sold in supermarkets, the study was designed to examine the hygienic status of frozen fishes in some reputable supermarkets in Lagos state. In the study, the work reports on total plate count, organisms of public health significance and biochemical aspects for quality.

MATERIAL AND METHODS

The frozen Barracudas, Croakers, Sole, Salmon, Mullet and Red mullet fishes packed in 1Kg packets were randomly selected and 4Kg of each fish were

purchased at regular intervals from five different reputable supermarkets in Lagos State South-west Nigeria: (A), (B), (C), (D) and (E). The samples were collected aseptically and they were transported in an insulated container under chilled condition to the Nigerian Institute for Oceanography and Marine Research laboratory, Victoria Island until analysed 1 to 2 hours after purchase. Random tissue samples were taken for biochemical and microbial analysis.

Biochemical analysis

The total volatile base (TVB) and trimethylamine (TMA) were determined by the micro-diffusion method of Conway (1968) Free fatty acid (FFA) content of the samples were analysed as described by Pearson (1970).

Microbiological analysis

Fish flesh excised were decimally diluted with diluted peptone water (0.1% w/v) and homogenised in a blender for 60 seconds. Serial dilutions in peptone water (0.1% w/v) were made, 0.1 ml inoculums was added to the surface of duplicate plate count agar (SPCA, Oxoid) plates for total bacterial counts, *Escherichia coli* was determined using standard most probable number (MPN) technique ,*Salmonella and Shigella* were enumerated using *Salmonella and Shigella* agar (SSA) and thiosulphate citrate bile salt sucrose (TCBS) agar for *Vibrio*

Results

Biochemical analysis

Table 1 shows the result of the biochemical analyses of the different fish samples from some of the reputable supermarkets in Lagos State . The free fatty acids (FFA), of frozen Barracudas, Croakers, Sole, Salmon, Mullet and Red mullet from the different supermarkets ranged from 0.13 to 0.35 %. Acidity with most oils begins to be noticeable to the palate when the FFA identified as oleic acid is about (0.5-1.5 %) (Pearson, 1970). The TVB values ranged from 8.4 to 21.0 mg-N/100g and TMA values ranged from 3.69 to 8.40 mg-N/100g.

TABLE 1: BIOCHEMICAL ANALYSIS OF FROZEN FISH SPECIES.

Fish Species	TMA (mg-N/100g)					TVN (mg-N/100g)					FFA (%)				
	SUPERMARKETS					SUPERMARKETS					SUPERMARKETS				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Croakers	6.04	3.69	6.65	7.39	8.87	16.15	12.09	13.70	16.93	19.30	0.15	0.17	0.21	0.13	0.32
Barracuda	6.72	8.06	6.04	5.37	7.39	16.80	18.48	10.08	12.60	18.48	0.25	0.14	0.21	0.19	0.12
Sole	8.40	6.72	7.46	3.73	7.46	21.00	16.80	16.80	8.40	12.60	0.22	0.35	0.17	0.25	0.17
Salmon	3.73	6.72	NA	NA	NA	8.40	16.80	NA	NA	NA	0.26	0.19	NA	NA	NA
Mullet	NA	7.45	NA	7.45	6.72	NA	12.60	NA	19.30	16.93	NA	0.23	NA	0.15	0.24
Red mullet	NA	NA	7.35	NA	6.72	NA	NA	16.80	NA	16.93	NA	NA	0.32	NA	0.24

Key: Supermarkets (A) , (B) , (C) , (D)and (E) - NA- Not Available.

Microbiological analysis

In the study, the total viable count (TVC) for all the frozen fishes ranged from 2.0 $x10^3$ to 7.4 $x10^3$ as shown in Table 2. *Salmonella/ Shigella* and *Vibrio species* were not detected in all the samples. *Escherichia coli* was detected in all the fish samples except Salmon from supermarket A and B, Barracuda from Supermarket A,B and D. The *Escherichia coli* detected ranged from 0 to 53 MPN/Log.

TABLE 2: MICROBIAL ANALYSIS OF FROZEN FISH SPECIES.

Fish Species	TVC (Cfu/g)					*Escherichia coli* (MPN/Log)				
	SUPERMARKETS					SUPERMARKETS				
	A	B	C	D	E	A	B	C	D	E
Croakers	6.4×10^3	6.5×10^3	7.2×10^3	6.2×10^3	7.0×10^3	11	14	10	15	12
Barracudas	5.2×10^3	4.8×10^3	5.3×10^3	5.4×10^3	4.0×10^3	0	0	53	0	2
Sole	7.2×10^3	6.4×10^3	5.4×10^3	6.0×10^3	7.0×10^3	39	11	11	12	15
Salmon	3.0×10^3	2.0×10^3	NA	NA	NA	0	0	NA	NA	NA
Mullet	NA	6.4×10^3	NA	6.0×10^3	7.4×10^3	NA	11	NA	15	20
Red mullet	NA	NA	3.0×10^3	NA	5.0×10^3	NA	NA	0	NA	10

Key: Supermarkets (A) , (B) , (C) , (D) and (E) - NA- Not Available.

Discussion

The frozen fish species, Barracudas, Croakers, Sole, Salmon, Mullet and Red mullet from the different supermarkets, examined were fresh based on the observed values of TMA and TVN based on the acceptable limit of (30-40mg-N/100g) for TVN and (10-15mg-N/100g) for TMA proposed by Connel (1980) for fresh fish. The observed range of the FFA of the frozen fish species showed that the samples evaluated were fresh. Usually, in frozen fish, the oxidation of the oily fish continues during storage and will lead to a loss of eating quality (Lilabati *et al*., 1997). The result obtained showed no indication of decomposition of the fish samples. The presence of pathogenic bacteria should be of concern to fish processors during processing and handling of products. Ideally, microorganisms such as coliforms, *Escherichia coli*, *Staphylococcus* and *Enterococci* should not be found on fresh fish (Liston, 1980). Nevertheless, International Commission on Microbiological Specifications for Foods (ICMSF) (1986) recommended that total coliforms limits per gram for frozen fish should be between 11-500 Cfu/g. In the study, all the frozen fishes from the different supermarkets observed were within the acceptable range. Reducing the number of sanitary indicator microorganism e.g coliforms can be beneficial for assessing effectiveness of safety procedures during processing and handling (Suvanich et al., 2000). The presence of pathogens indicated that contamination must have occurred during handling and frozen storage. However, despite the detection, the samples did not exceed the limit. It should be pointed out that the microbiological result agreed with the chemical results.

This study has revealed that the ultimate quality of the frozen fishes is decided by the sanitary and hygienic conditions prevalent in the supermarkets. The frozen fishes sold in some of the reputable supermarket in Lagos State, South-West Nigeria are not spoilt, but are contaminated with pathogens ,which did not exceed the acceptable limits ,due to handling during processing. This therefore necessitates that proper sanitary care will help reduce the contamination and also care should be taken during processing and preservation to ensure the safety of consumers.

Acknowledgements

The authors wish to express their appreciation to Dr. G.R Akande, head of Fishtech/biotech Department of Nigerian Institute for Oceanography and Marine Research Victoria Island, Lagos and also to Mrs Pat Ozor and Mrs B. Adeniyi for their suggestions and useful criticisms.

References

Arannilewa, S.T., Sorungbe, A.A. , Ola-Salawu, B.B. and Salawu, S.O. (2005). Effect of frozen period on the chemical, microbiological and sensory of frozen fish tilapia fish (*Sarotherodun galilaenus*). African J. Biotechnol., 4: 852-855.

Connell, J.J. (1980) Control Of Fish Quality. Farnham, Surrey. England. Fishing News (Books) Ltd,2nd Edition. pp.240

Conway, E.J. (1968) Micro diffusion Analysis and Volumetric Error. London, Grossly, Lockwood and Son pp.467

Fishery Statistics of Nigeria. Federal Department of Fisheries (FDF) Abuja. Fourth Edition 1995-2007 pp 49.

Food and Agriculture Organisation (1984). World catch and trade of fisheries and products in 1984. Info fish Marketing Digest. No. 25.

Ola, J.B. and Akande, G.R (1996).Quality of 'Wet' Fish in Retail Markets of Lagos. Report and Proceedings of the 6th FAO Expert Consultation on Fish Technology in Africa on 27-30 August 1996, Kisumu, Kenya. FAO Fisheries Technical Report 574: 190-193. Rome. (Teutscher, F. ed.)

Food and Agriculture Organisation of the United Nations (1994). Review of the State of the World Fishery Resources; Marine Fisheries. FAO Fishery circular No 920. Rome.

Gnanambal, K. and Patterson, J. (2005) Biochemical and Microbiological quality of Frozen Fishes available in Tuticorin Supermarkets. Fishery Technology Vol.42 (1) pp.83-84.

International Commission On Microbiological Specifications For Foods. (ICMSF) . 1986. Microorganisms In Foods 2. Sampling For Microbiological Analysis, Principles And Specific Applications. Toronto Ontario Canada. University Of Toronto Press (2nd Edition) pp 22.

Kropf ,D.H, and Bowers, J.A. (1992). Meat and meat products. In Bowers (eds.), Food Theory and applications. New York: Macmillan publishing company.pp.22-29.

Liston J. 1980. Microbiology in fishery science. In: Connell JJ, editor. Advances in Fish Science and Technology. Farnham, Surrey, U.K.: Fishing News Books. p 138-157.

Lilabati, H., Bijayanthi, N. and Vishwanath, W. (1997). *Fish Technol*. 34 pp 21-25.

Olatunde, A.A. (1998). Approach to the study of fisheries biology in Nigerian inland water. Proceedings of the International Conference of two decades of research in lake Kainji, pp. 338-541.

Pearson, D. (1970). The Chemical Analysis Of Foods. 6th Edition. J and A Churchill, London. pp. 513.

Salawu, S.O., Adu, O.C., and Akindahunsi, A.A., (2004). Nutritive value of fresh and brackish water catfish as a function of size and processing methods. Eur. Food Res. Technol vol. 220: 531-534.

Suvanich,V. , Marshall, D. L., and Jahncke M. L., (2000). Microbiology and color quality changes of channel catfish frame mince during chilled and frozen storage. Journal of food science. vol. 65, issue 1. Pg 151-154.

Willman, R., Halwart, M., Barg, A. (1998). Integrating fisheries and agriculture to enhance fish production and food security. FAO Aquaculture. Newsletter. 20: 3-12.