ASSET Series A (2003) 3 (4):101-109

ISSN 1595-9694 ©
UNAAB 2003

SMOKE-CURING OF FISH BY ARTISANAL FISHERFOLKS IN ILAJE, ONDO STATE, NIGERIA

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ABSTRACT

A survey of fish smoking processes was conducted in Ilaje Local Government Area (ILGA) of Ondo State between March and June 2001. Data were collected from fish processors at different fishing communities with the aid of structured questionnaires Data collected were analyzed using descriptive and inferential statistics.

The predominant processing and preservation techniques employed is smoke-drying (93.75%) with sundrying accounting for 6.25%. Two types of traditional smoking kiln used were oil drum and raffia palm racks. Firewood and kerosine are the main combustion fuels used during smoke-drying. Commonly use wood that produced good quality smoked fish were *Rhizophora racemosa, Nauclea diderrichii, Lophira* alata, Nauclea *latifolia,* and *Entadrophragma cylindricum..*

Various fish species and sizes were processed Based on frequency of occurrence the family Clupidae had the highest number of fish processed while shrimp/prawn had the least. Fish smoking procedure starts from collection from the capture site to smoking of fish in the smoking room. Scales of fish are not removed before smoking. Small size fish are smoked singly or in multiples on sticks. Large sized fish are smoked singly or in twos and threes. The same species are always sticked together. Small, medium and large-sized fish were not gutted before smoking while extra large are cut in o chunks before smoking.

Keywords: Preservation, fish, smoking, constraints

INTRODUCTION

Fish is a rich source of lysine suitable for supplementing high carbohydrate diet. It is a good source of thiamin, riboflavin, vitamins A and D, phosphorous, calcium and iron. It is high in polyunsaturated fatty acids that are important in lowering blood cholesterol level (Graham, 1977, Al jedahl *et al.,* 1999). In Nigeria smoked fish products are the most readily form of fish product for consumption. Out of the total of 194,000 metric tons of dry fish produced in Nigeria, 61% (118,340) metric tons) was smoked and 45% of the total artisanal fish utilization was smoked dried (Tobor, 1984). High percentage of landed fish in Nigeria is from artisanal catch. According to Fagade
(1992) artisanal catch made up to about 40% of all the fish consumed in Nigeria. However the artisanal sector's investment in capture, processing and marketing is not encouraging due to scarcity of input and high operational cost. One of the greatest problems affecting the fishing industry all over the world is fish spoilage. In high ambient temperature of the tropics, fish will spoil within 12-20 hours depending on species, methods of captures etc. (Clucas, 1981). Attempt has been made to reduce fish spoilage to the minimum through improved preservation techniques. At harvest time, fish are usually available in excess of demand. This lead to lower market price and fish spoilage but if storage facilities are provided the surplus of the

harvest could be stored and distributed during the off season.

Preservation and processing methods explore ways by which spoilage are stopped or slowed down to give product a longer shelf life. Processing methods usually change the texture, taste, and physical appearance of the fish. FAO (1986) gave three main fish processing methods as drying, salting and smoking. Smoking is the removal of most of the water from the flesh and the depositing of preservating chemical on the fish flesh. According to Rawson and Sai (1966) in the process of drying and smoking, much of the water content of the fish is extracted through heat thus inhibiting the action of microorganism and prolonging the shelf life. Smoke therefore combine three main effects drying, cooking and preservation.

In view of the increasing demand on fish supply it is essential to assess production pattern, problems and the prospect of fish processors using traditional processing methods. In this study smoking methods and the associated problems in Ilaje Local Government area as well as suggested ways of overcoming such problems are highlighted.

MATERIALS AND METHODS

Study area

The area for this study was Ilaje Local Government Area (ILGA) lying between 4 ° 50' and 5 ° 15' E and 6 ° 00' and 6° 25' N. The area is situated at the southern part of Ondo-state. This local government (LGA) comprises of several fishing communities located within the river tributaries discharging into the Atlantic and those
along the coastline. ILGA has the longest coastline in Nigeria (about 78km) with long history in fishing dating back to the pere-colonial days. The communities along the coastline are, the major fish producers. The inhabitants (natives) are the Ilajes. The fishermen are mostly male (i.e husband and male children) while the processors are female (i.e. wives and female children).

There are over 80 fishing communities along the coastline and are the major fish producer in Ondo State (AkegbejoSamsons, 1995). A few of them were selected for this study. To the eastern side of the coast line are Idiogba, Alagbon. Odofado, Bijimi, Oroto, Ikorigho and Oghoye while to the western side of the coast line are Eruna Ero, Asisa. Ori oke iwamimo, Ereke, Ogogoro, Majofadun. Zion pope, Araromi seaside and lyabokoda. This location was chosen for its valuable fish resource in Ondo State According to FAO (2000), average Fishery Statistics for 1997-1999, Nigeria does not export any quantity of fish but in addition to her fish production still imports a huge amount of fish all of which is consumed. There is therefore the need to improve local production methods as well as preserve the caught fish that it would attract higher price. Hence a look at the traditional ways of processing , chief among which is smoke-curing, would expose the necessary lapses and identify possible solutions.

Data collection and analysis

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Data collection nit-:hods for this study are through primary and secondary sources, personal interview and structured questionnaires designed to highlight smoking methods, problems and possible solution. Most of the respondents were illiterates hence the language used during

part of the survey was Yoruba while some questionnaires were completed by few literate processors. In addition to questionnaires, questions were asked and observation made on fish smoking procedure, materials used as well as the problems encountered.

A total of 100 questionnaires were administered to fish -smoking communities, out of these 20 were voided/ not returned. The remaining eighty (80) questionnaires (i.e. 80%) were used for analysis. The data generated were analyzed using descriptive statistics and charts of explanatory variable.

RESULTS

Data collection was disturbed by high cost of transportation (due to the distance of most communities to the local government headquarters (Igbokoda) through road), ethnic clashes and skeptism on the part of some respondent who misconstrued interviewers as either rate collectors, or a way of assessing their income.

Table 1. Respondents' Ages group distribution

Age of respondents	; Number of respondents	
21-30	13	16.25
31-40	7	33.75
41-50	27	; 33.75
51-60		10.00
61 And above		6.25
Total	80	100

Source: Field survey, 2001

Socio-demographic characteristics Age group distribution of respondents

Table l shows the age group pattern of the respondents. Age group between 31- 50 years formed 67.5% of respondents. Therefore, fish processing within the LGA is carried out by this age bracket.

The result showed that out of a total number of 80 respondents 9 (or 11.25%) were male while female respondents were 71 (or 88%.) (Table 2).

Table 2. Sex distribution of respondents.

Alternatives	Number of respondents	
Male	9	
Female		88.75
Total	80	100

Source: Field survey, 2001

Table 3 showed that 88.75% of the respondents were married. 32.5% were illiterate while 67.5% were literate having primary, secondary or higher education (Table 4).

Table 3. Marital Status of Respondents

Marital status	Number of Respondents	
Single	3	3.75
Married	71	88.75
Widows		7.5
Total	80	100

Source: Field Survey, 2001

Table 4. Educational level of Respondents

Educational level `~	Number of respondents	
No Education	26	32.5
Pry. Education	3	38.75
I Sec. Education	18	22.5
Post-secondary Education	5	6.25
Total	80	100

Sources: Field Survey, 2001

On the size of family 56.25% respondents have between I to 5 children while others have more than 5 children (Table 5). All members of the family were seen engaged in fish processing operations.

Table 5. Family Size of Respondents

Number of chil- dren	Number of respondents	
1-5	45	56.25
6-10	0	37.5
11 And above	5	6.25
Total	80	100

Sources: Field Survey, 2001

The processing and preservation techniques employed by the communities/respondents were for the various fish species and sizes. Only 6.25% of the respondents sundried their fish while 93.75% used smoke drying (Table 6). None of the respondents reported freezing and icing as method of fish processing in this area. Improved smoking equipments were not found with the processors.

Table 6. Preservation Techniques used by Respondents

Preservation methods	No of respondents	
Freezing	-	-
Sun-drying	5	6.25
Smoke-drying	75	93.75
Total	80	100

Source: Field Survey, 2001

The species of fish processed by the respondents are presented in Figure 1. Clupidae is the dominant species processed, while the least processed are Aridea and Cynoglossidea. Shrimp are rarely processed in large quantity.

Fish smoking process

Long distance were covered between the point of catch to the fishing villages or landing site resulting in a lot of spoilage. Also catches are left in the canoe under intensive sunlight where they struggle and die-off. In most cases they are covered with dirty nets that were used to harvest them. These have in no small measure led to high percentage losses. Also there was always a battle between the processors and flies during handling. This is due to lack of processing facilities.

The different stages involved in fish smoking processing in ILGA are graphically displayed below:

Chart 1. Fish smoking procedure:

Smoking process

Capture fish

1

Washing

1

Gutting

1

Cutting

1

Tenting

1

Smoking

1

Cooling

1

Storage

1

Packaging

Fish smoking procedures

About 1-5% of the total catch is reportedly lost to spoilage because fish were purchased from different landing sites. At these sites fish are either left struggling in canoes or on bare ground open to flies until they die. When fish are conveyed to the kitchen/smoking room they are dumped on the bare floor before washing them in batches in two different plastic bowls of brackish water. The same bowl of water is often used for a single consignment. Scales of fish are not removed before smoking. This is because this would waste the time of

the processors and fish smoking folks do not regard moreso the need for this stage as essential. Fish are then sorted into different sizes- small, medium large and extra large and treated as follows. Small whole fish were smoked singly or in multiples (either on sticks in fives or tents). Ten pieces of medium sized fish of the same species were arranged side by side on sharp sticks before smoking commenced. Large sized fish are smoked singly or in twos and threes. Small, medium and large-sized fish were not gutted before smoking. Extra large fish are gutted and cut into chunks. After washing. (cutting, gutting) and sticking, fish are allowed to drip on the same spherical wire mesh trays on which the fish would be smoked.

Smoking kilns:

The two types of smoking kilns in use by fish processors of ILGA are racks and oil drums (either full or half drum)

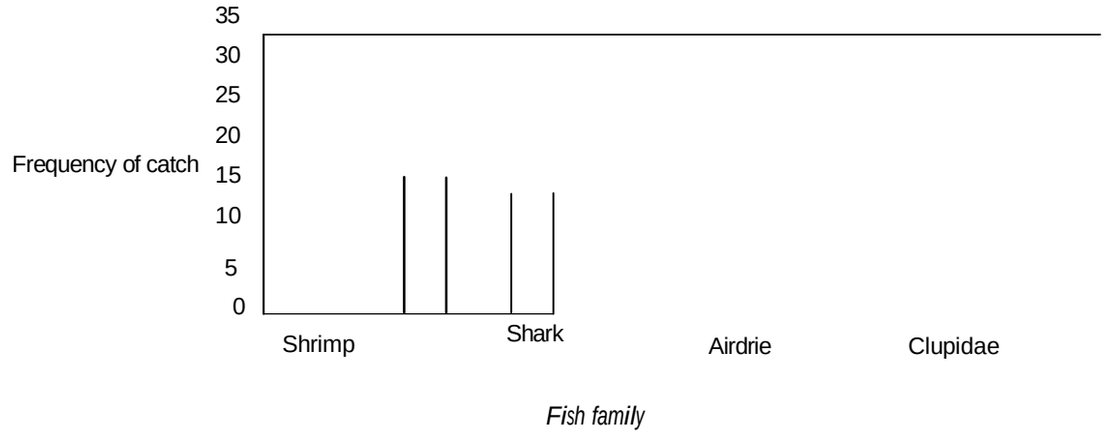
Smoking on oil drum kilns

Only single combustion chamber is made in the oil drum. The kilns are not permanently erected in the smoking room. Chunks of wood are placed in-between two wire mesh trays as fish support. Smoke drying on oil drums takes between 5 and 8 hours. With intensive heat smoking about two or three sets of fish can be smoked within a day. When large quantities of fish were processed smoking may be done through out the night when mesh trays would be replaced or interchanged periodically.

Smoking on racks

Racks are locally made from wood stumps on which sticks are arranged . Such platforms are usually raised to a height of

Fig 1. Species of fish processed



about 1-1.2 metres above ground. Such' racks are permanent structures inside the smoking kitchen. Close arrangement of sticks to form the platform prevents fish from falling off the rack. Unlike the oil drum double combustion chamber could be prepared under the racks. Heat is first produced under the rack before the fish are arranged on top. The fish laid are covered with woven mats produced by the women. Smoke drying on racks takes between 18 to 24 hours depending on the number and size of fish smoked at a time and the intensity of the fire. Only a set of fish could be smoked per day..

Firewood and kerosine are the main combustion fuels used during smoke drying. Commonly use wood that produced good quality smoked fish were *Rhizophora racemosa, Nauclea diderrichii, Lophira alata, Nauclea latifolia,* and *Entadrophragma cylindricum.*

Problems encountered by fish processors

Fish processors stacked too many wire trays at a time oil the smoking drums making control difficult. There is also poor distribution of heat among smoked products and low volume of smoking capacity i.e. only few quantity can be smoked (batch by batch) at a time compared to modern smoking kilns and this has resulted in continuous smoking for several hours (or throughout the day and might). The methods employed are always hazardous. Due to incomplete combustion, processors suffer from poor vision, lungs problems and regular body ache. Stacked layers of spherical wire mesh trays carrying the fish and racks could turn upside down. This may lead to total charring of the lower layer or total charring of the whole set of smoked product. At times in the night, processors sleep off which may result in great inferno. Several infernos occurring from fish smoking has consequently resulted in Joss of fish, properties, houses and valuable. Exposure of fresh fish leads to high presence of flies. Other associated problems include high cost and irregular availability of wood and kerosene, long distance between fishing site and processing kitchen, lack of good and standard storage facility which could lead

to attack by rodents, insects and mould, unhygienic personal procedures by processors and small scale traditional processing methods.

DISCUSSION

The hazards and rigors involved in fish processing operation might be the reason while less number of children and old age brackets were involved. Females represent the largest number of respondents indicating that male participation in smoking is low. Therefore fish smoking operations in ILGA area are basically women business. This study showed that majority of fish smokers were married women. This may be attributed to the fact that most respondents' husbands were fishermen therefore they are opportune in having more fish to process than the unmarried and widows of the communities. The number of children per respondent gave an indication that each respondent has enough helping hands at their disposal thereby reducing the number and cost of hired labour required.

More than 50% of the respondents are literate this may be the reason why most respondents proved difficult during interview misconstruing the researcher as tax collectors and the questionnaire as a way of assessing their resources.

On method of preservation, none of the respondents freeze nor iced their fish. This showed that they do not have assess to freezing and icing equipment. Processing and preservation techniques employed by processors are limited to sun-drying and smoke drying of fish. The low percentage of respondents involved in sun-drying of fish in the study area agrees with the report of Osuji (1976) that sun-drying of fish is limited to the arid parts of the country where dry season extends through most months of the year. Lack of improved smoking equipments common among the processors might be responsible for the drudgery associated with smoke-drying techniques in the LGA. Eyo, (1977) agreed that a fishermen may not be able to afford any of the modern smoking kilns in-spite of their obvious advantages unless the kiln are sold at subsidized rate.

Watanabe, (1991) observed that gutting Tilapia species is of value in reducing spoilage of the fish. Gutting should be carried out in such a way that the gut is fully removed as remains of the gut if not removed hasten spoilage. The processors at ILGA do not degut nor de-scale the small and medium sized fish before smoking. These two major aspects that are ignored may generally be responsible for the low quality of smoked fish. The practice of throwing the fishes on the bare ground before washing, most especially when they have large quantity of fish to process does not help matters as traces of sand and bitter taste felt during eating might be due to this poor sanitation practice.

Most dressing operations are performed outside the smoking room (usually in front of the kitchen), rather than in the smoking rooms. This could have reduced the number of flies. Personal hygiene of the fish processors is also important. Regular rubbing and cleaning of nose as well as cleaning of hands wit,'- dirty cloths should be discouraged, as these would contaminate the products. Processing operation should follow as son as possible after the fish has been prepared.

Although processors sort their fish before smoking but sticked, unsticked fishes and

chunks are smoked simultaneously together on the same wire mesh trays consequently the product are not uniformly dried. Apart from this indiscriminate size smoking, different species were also smoked together. For better operation small, medium, large and extra large fish sizes should be smoked batch by batch. Igene, (1987) reported that for efficient drying the drying constant for different species of fish of commercial value need to be determined.

In order to surmount the aforementioned short-comings and to reduce wastage associated with traditional smoking methods a lot of improvement and development is necessary. FAO (1987) agreed that for effective and efficient utilization of the different fish species in our water bodies effort must be made to improve the present traditional kilns taking into accounts all factors and the disadvantages of traditional kiln.

In line with these results processors could increase quality of their products if they have assess to electricity supply, cold storage and modern smoking kilns. Government could install a pilot modern smoking kiln at every community if possible where local fish processors can have access to smoke-dry their fish at reduced cost. In the alternative government could sell such kiln to local fish processors at subsidized rates. Where the government could not do these, processors should form them self into cooperative bodies at every village level to purchase large modern kilns and stores which could be of tremendous benefit to members. All these will go a long way to reduce the drudgery involved in the traditional smoking methods On no account should fish be thrown on hare ground either before pre-drying or before smoke drying. Dressing should be done on clean tables of working height (between 0.8m to lm) made of good materials.

Fish extension agents has an important role to play in giving relevant health talks.. Extension agents should be adequately financed to regularly visit and educate the farmers, processor/marketers within the locality on good pattern of handling, processing and storage of fish. And any problem the farmer and the extensional cannot solve immediately could be directed to resource personnel.

If all these improvements are made, better quality and prolonged shelf life smoked product is possible.

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