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### RESEARCH ARTICLE

#### ROLE OF WOMEN FISHERS IN INDIGENEOUS FISH PROCESSING AND PRESERVATION IN MANIPUR.

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#### Abstract

Manipur is a state in the North-Eastern part of India which is one of the bio-diversity hot spots. The women fishers in Manipur took active role in the processing and preservation of fish. It prevented the fish from spoilage which may be necessary for later consumption. Most of the methods used by the fishers were of indigenous type. Use of chemicals and deep freezing was very less. Processing started from pulling out the fish from the nets, traps, etc. followed by sorting, washing, cleaning, salting, smoking of the fishes etc. Main preservation method used was salting. Others were icing, refrigeration, fermentation etc. but these were not common. Dry salting was very common here. Smoking and roasting were widely followed by the fisher women. These were short term preservation processes. The species which were generally smoked are *Trichogaster sp.*, *Puntius sps.*, *Amblypharyngodon mola*, *Esomus danricus*, *Labeo rohita*, *Cirrhinus mrigala*, *Cyprinus carpio*, *Channa sps.*, *Glossogobius giuris*, *Notopterus notopterus*, *Hypophthalmichthys molitrix*, *Mastacembalus sps.*, *Barilius sps.*, *Glyptothorax sps.*, prawn, shrimps etc. About 70-80% of these processing, preservation and marketing activities were done by the women. Processing and preservation was mainly at their own home whereas marketing was done on the spot and through markets. Door to door selling was also very popular. Manipuri people were very fond of these smoked fishes. These traditional methods of processing and preservation were very cheap and affordable. It helped in increasing the economic status of the fisher women and needed no technical training. Thus, women fishers took major role and responsibilities in family maintenance and society. There is urgent need for scientific approach and use of modern techniques to enhance this.

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#### Introduction:-

Women take major role in household works, family maintenance, societal programmes, etc. mainly in Manipur – a state in North-east hot spot biodiversity region where women give a large contribution to the society. The state has rich in plant and animal resources from the rivers, lakes, ponds, streams, hills, etc. where exist high medicinal valued products. But, the people cannot utilize this. Fishery is one of the most important resources in Manipur. Women give an extensive contribution to the fish catching, processing and preservation, fish marketing, etc. Fish is

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a good protein source. The Food and Agricultural Organisation (FAO) reported that fish accounted for about one-fifth of the world total supply of animal protein sources (Anonymous, 1991). The importance of fish in human nutrition in particular and for animal feed (fish-meal) as well as for other purposes cannot be gainsaid (Obande and Solomon, 2000). Its biological value in terms of high nitrogen and other nutrient retention in the fish flesh, bones and scales is responsible for the consumption of fish products for health reasons and also for its high protein, which is easily assimilated when compared with other protein sources (Kurien, 1998) & (Asong, et al, 2002). Fish has also been found to be low in cholesterol content, which allows for the enhancement of improved human nutrition (Charcoft, 1976). In addition, fish is noted to be one of the safest sources of calories, protein, fat, calcium, iron, vitamin and essential amino acids (Olayide, et al, 1975).

Fresh fish spoilage can be very rapid after catching as it has high protein content. So, it needs to be preserved as it is highly susceptible to deterioration immediately after harvest and to prevent it from economic loss (Okonta and Ekelemu, 2005). The spoilage process (rigor mortis) will start within 12 hrs in the high ambient temperatures of the tropics (Berkel et al, 2004). Rigor mortis is the process through which fish loses its flexibility due to stiffening of fish muscle after few hour of its death (Adebowale et al, 2008). The spoilage of food products can be due to chemical, enzymatic and microbial activities. Most fish species degrade as a result of digestive enzymes and lipases, microbial spoilage from surface bacteria and oxidation (AMEC, 2003). There, preservation and processing of fish is a very important task in fishery.

The present work is to study the indigenous knowledge of fish processing and preservation. The importance of studying of indigenous knowledge is well described by Mundy and Compton, 1991. Indigenous knowledge represents valuable source of local solutions to the food insecurity in terms of accessibility by the rural population, particularly during seasonal food shortage or major stress periods such as droughts (Fatma, 2012). The traditional fish based beliefs and customs in central valley of Manipur have been reported (Bira, 1999). Indigenous knowledge is knowledge that is unique to a given culture or society (Grenier, 1998). The old and traditional knowledge is mainly neglected by the development planners, policy makers and technologists. Women are the preservers of indigenous knowledge.

#### **Review Literature:-**

Nowadays, the role of women increases its complexity. Wangpittaya, 2005 and Kittasangka, 2002 classified the role of women into three categories i.e. motherhood role, labour in production role and community management role. Women are recognized as agents of changes and development (Olufayo, 2012). It is said that 12 million people are directly engaged in fishing (Sekhar, et al., 2006) and fisheries – related activities provide important sources for livelihoods for nearly 7 million people in India (Handbook of Fisheries, 1996). Fish is a source of food nutrients such as protein, vitamins, minerals, lipids, which are needed in the body for a healthy growth and a productive life (UNICEF, 1990). Study of the indigenous knowledge can improve our livelihood (Dewes, 1993) and a community based knowledge (Grenier, 1998). Studies on women in fisheries so far has been more or less focused on fishing, fish processing and preservations and socio-economic status. Different types of traditional fish processing and preservation techniques described by several scientists are handling, washing, curing, clearing salting, sun drying, smoking, fermentation, brining, freezing, icing, etc. (Ghaly et. al., 2010, Cooke, et. al., 1993, Tawari and Abowei, 2011, Emere and Dibal, 2013 and George, et. al., 2014). However, low temperature storage and chemical techniques for controlling water activity, enzymatic, oxidative and microbial spoilage are the most common in the industry today (Akinola et al., 2006; Berkel et al., 2004). Adams et al., 1987 also reported that fish flesh offers to microorganisms conditions of good nutrient availability coupled with a moderate pH and high water activity. In tropical regions, these conditions coupled a high ambient temperature and unsanitary conditions cause fish spoilage within 12 hours (FAO, 1971).

#### **Material and Methods:-**

The research was totally based on field work in different districts of the state where the fishing activities were done regularly. The survey was seasonally conducted through regular field visit at the respective areas house to house which had included group discussion with the farmers, questionnaires, personal interviews, etc. (Ali. et al., 2014) to access fish processing and preservation techniques. According to the convenience, it was divided into five seasons in a year viz: i) Summer season (April-May), ii) Monsoon season (June-July), iii) Post Monsoon season (August – October), iv) Winter Season (December-January) and v) Spring Season (February-March). The work included group discussion with the villagers and questionnaires for each family. The techniques were personally observed while

operating and necessary photographs were taken. Literature review was done through journal, publications, books, etc.

**Study area:-** The study area was selected randomly through information where fishing was done mainly and covered fish processing communities in different districts of Manipur such as Imphal East, Imphal West, Bishnupur, Chandel, Thoubal district, etc. The work was mainly confined to rural areas where native people were inhibited so that we can collect more ideas related to our tradition.

### **Results and Discussion:-**

The processing and preservation of fish in the state is mainly done by women fishers. Women participate not only in traditional fishery sectors of fish processing and marketing but also in the non-traditional aquaculture, fisheries research, education and extension (Olufayo, 2012). Processing of fish is of utmost necessity to protect it from decomposition. Fish tends to perish immediately after catch, so its processing and preservation is first priority of every fishermen. The methods used by the Manipuri women fishers are based on indigenous type inherited from forefathers and local people. Traditional knowledge and wisdom of the local people is very important to document our heritage and India is a well known country for its traditional knowledge over the years (Patil et al., 2014). Various methods followed by Manipuri fishers are described as follows:

#### **Handling, Sorting of fish and washing:-**

These are the preliminary processes in fish processing. The primary objective of fish handling is to preserve the quality of fish. Maintaining the quality of fish begins from catching till consumption. The harvested fishes are sorted out according to size and species. Every person or family who processed fishes is not fish catchers. Those who caught fishes perform sorting at fishing area or home. But those who processes fishes secondarily starts sorting from market or the area where they are used to be bought. Large fishes are cut into small pieces for convenience and washed.

#### **Icing:-**

This preservation technique is so simple that fishes are retained in their state of freshness putting ice in it for sometimes. This method is not common in the valley area of the state but widely accepted where situated in low altitude like Moreh (Chandel District), Jiribam (Imphal East). In these areas, icing is the main preservation technique while selling and transportation without any chemicals.

#### **Salting:-**

Salting is considered as an important part of fish preservation. It acts as a preservative and gives desirable texture and flavour characteristics. Salting can be accomplished using either a strong salt solution known as brine or dry common salt (NaCl). Dry common salt is widely used in the state. Common salt retards the activity of bacteria, enzymes and chemicals in fish (Eyo, 2001). Salting is common in all processing techniques like drying, roasting, smoking, etc.

#### **Frying:-**

Frying is most common method followed by every family for household consumption. It can be applied in both large and small fishes. The large fishes are cut into small pieces and fried in edible oil to remove moisture content. Small fishes are fried as such. Sometimes turmeric powder is added to increase texture, flavor and more attractive. Some common species which are consumed as fried *Anabas sps.*, *H. molitrix*, *C. carpio*, *Bariluis sps.*, *Garra*, etc.

#### **Sun drying:-**

Sun drying is the most ancient and cost effective method of fish processing all over the world (Chavan, et. al., 2015 and Pramod, 2015 ) and not only the cheapest and easiest but also ecofriendly (Joshua and Vasu, 2012). It is a physical process in which fishes are exposed to sunlight. Sun drying is suited for small fishes that are unfavourable for frying or smoking. Sun drying allows the salt to penetrate and evenly distribute throughout the fish flesh. Light hardens the surfaces and forms a continuous shiny coat to prevent it entering microorganisms. Sun drying losses some of nutrients like fibres, carbohydrates and essential amino acids but still it is in use as one of the cheap methods (Kamruzzaman, 1992). Commonly, *Puntius sps.*, *Esomus danricus*, *A. mola*, etc. are sun dried. 92% of women fishers involve in sun drying.

**Table 1:-** Statistics of Role of Fishers w.r.t. Gender

Sl. no	Fishing activities	Gender	%	Remarks
1	Fishing	Male	50	Male dominates in fishing. But processing, preservation and marketing is done mainly by women. <i>Khwaairamband Bazar</i> which is famous for women market in the World is the place where most of the women fishers sell fresh, smoked, dried, fermented fish. Rate of availability is also very high.
		Women	40	
		Child	10	
2	Sorting	Male	10	
		Women	80	
		Child	10	
3	Handling	Male	9	
		Women	90	
		Child	1	
4	Washing	Male	Nil	
		Women	90	
		Child	10	
5	Sun drying	Male	3	
		Women	92	
		Child	5	
6	Fermentation	Male	50	
		Women	45	
		Child	5	
7	Smoking	Male	2	
		Women	91	
		Child	7	
8	Marketing	Male	5	
		Women	95	
		Child	Nil	

This table shows the overall gender participation in fishery and fishery related activities. Women take major role in this. But, male participated more in fishing and fermentation with 50% each. Maximum fishery activities are performed by female members.

#### **Fermentation:-**

Fermentation is one of the oldest methods of food processing to make naturally fermented and cultured food worldwide. Fermented foods and beverages are estimated to make up approximately 1/3 of the human diet (Van, et al., 2011). Fermentation enhances the nutritional quality of foods and contributes to food safety particularly under conditions where refrigeration or other foods processing facilities are not available (Motarjemi, 2002). The forefathers used this technology without unknowingly since time immemorial in Manipur. Some fermented food items of the state are fermented bamboo shoots (*Soibum*), soya bean (*Hawaichara*), fermented fish products (*Ngari* and *Hentak*), etc. Sarojnalini and Vishwanath, 1988 studied the chemical composition, total bacterial counts and digestibility of *Hentak* and *Ngari*. They had analyzed and found that the compositions of *Hentak* and *Ngari* were, respectively: cholesterol, 2.67 and 8.37 mg/g; Ca, 12.60 and 6.88mg/g; Fe, 1.29 and 0.51 mg/g; and total viable bacterial counts,  $4.8 \times 10^8$  and  $5.0 \times 10^7$  cells/g. According to them, *Hentak* appears to be a better food in view of its higher Ca, Fe, essential amino acids, lipids and low cholesterol content.

*Hentak* is an ethnic fish fermented paste consumed by Meitei community prepared from small fishes like *Esomus danricus* or *Puntius sps*. The finger sized fishes are washed thoroughly and sun-dried for 2/3 days. Then, they are crushed into powder adding petioles of *Alocasia macrorhiza* forming a paste. Sometimes onion, banana, mustard seed, edible oil, etc. are added for increasing its flavour. Then, the paste is made into ball and stored in an earthen pot for 7-9 days and exposed to sunlight. Namrata, 2016 also reported the same idea for *Hentak*. It is given during pregnancy, post pregnant women and sick people. *Ngari* is also another fish fermented product which is a favorite food of the Manipuris. Every household consider it as an important item in each curry. The species mainly used for this is *Puntius sophore*. During its production, fishes are rubbed with salt, sundried for 3-4 days and washed. Then, it spread on bamboo mats. A layer of mustard oil is applied to the inner wall of an earthen pot, which is filled with dried fish and traditionally pressed tightly by foot. The pot is sealed air tight with mud and then stored at room temperature for 4-6 months. It is available at market or local retailers.



**Fig. 1:-** Sorting of fish at home and market



**Fig. 2:-** Putting ice packs to preserve fish

### **Smoking:-**

Smoking is the most common and cheapest technique that is suitable for women fishers in Manipur. The technique is also so simple and easy in handling. About 91% of women fishers participate in smoking. Smoking is a method of preserving fish which combines three effects; preservative value of smoke, drying and cooking (Clucas, 1982; Asita and Campbell, 1990). The fishes to be smoked are washed thoroughly and are arranged into a 4 sq.ft. sieve size. The arrangements of fishes are different with different species. Species like *Puntus* spp., *A. mola*, *Trichogaster* spp., *Barilius* spp., etc. are done in such a way that the posterior part of a fish is kept in touch with anterior part of another fish horizontally. Head-head and tail-tail arrangement is done vertically. It prevents from breakage of fish. Coiling is done for long fishes like *M. alba*, *Mastambul* spp., to protect it from shrinkage of muscles. Larger fishes such *Channa* spp., *Cyprinus* spp., *L. rohita*, *C. mrigala*, *G. giuris*, *N. notopterus*, *Glyptothorax* spp., are kept on the sieve and smoked as such. Based on variations in species and body size the fish are either gutted before drying or dried without gutting as a whole (Babare et al, 2013; Sugumar et al, 1995). For this, a kiln locally known as *Leirang* is required. The kiln is prepared with the help of mud in an enclosure and there are three to four layers of rack so that the smoked fishes are to be kept for hardening of muscles and make it more ripen. The fish arranged sieve is smoked through fire into the kiln. When the colour of the species changes into yellowish brown, it must be upside down with the help of another sieve. It needs skill and experience. The smoked fishes is kept overnight in an open space to cool down and to be ready to serve. For small fishes like *A. mola*, no fire is required but smoked through the remaining red charcoal of the large fishes.



Fig. 3:- Sun drying



Fig. 4:- Storage of Hentak in earthen pot and Ngari available at market



Fig. 5:- Fishes arranging into sieve and smoking of *M. armatus* by coiling



**Fig. 6:-** Smoking at *leirang* and selling of fishes at *Khwairamband Bazar*

### Conclusion:-

Though the state has rich in bio-resources, production is less due to the lack of technology and low level of mechanization in fish processing. Most of the fishers are inhibited in the rural areas which are far from cities. They face many problems in transportation, marketing due to uneven societal problems. They get least help from any Govt./non-Govt/any civil organisations. If the Government or any civil societies encourage the fishers adopting new policies and programmes with financial support, then the output will be increased with enough surplus production of fish and its by-products. This would help to increase the revenue earning of the fishers in particular and socio economic status of the fishery community of the state in general.

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