

## INDIGENOUS KNOWLEDGE SYSTEM IN FISHERIES: A REVIEW.

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### ABSTRACT

Scientists and researchers agree that developmental projects should have impact on the targeted groups. In this context a review was made on the indigenous knowledge system in fishery with a view to elucidating the indispensability of the system due to the increasing acceptance globally. The importance of the system and the factors militating against it were shown. The relationship between fisheries science and the fisher's knowledge was also discussed. Some indigenous practices as well as equipment used by different people were cited. It was concluded that local knowledge of the environment and resources used, as well as the society within which the resultant goods and benefits are distributed is fundamental to the continuity of sound community based management practices. Recommendation was made for research to be conducted in every facet of fishery traditional system with a view to fusing the two; the indigenous and scientific to complement each another.

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### INTRODUCTION

In Nigeria, a good proportion of capture fishes are produced at the subsistent level by small-scale fisher folks. Several studies have shown that the return they get is low compared to their input; the studies attributed such low catch to practices and the equipment used. Ayanda and Alamu (1990) reported that the low return of Kainji fishing industry as compared to the effort put in, is due to the unavailability of modern fishing equipment coupled with socio-cultural factors. Several attempts were made to improve the situation through the introduction of innovations and the application of scientific methods in the area of fishing system vis-à-vis fishing methods, gear technology, handling, processing, preservation and packaging. Results from such studies showed rather low and discouraging level of acceptance by the fisher folks. Some recommendations were made as to the need to find local, inexpensive and culturally compatible alternatives. Thus, the need for a painstaking understanding of the indigenous system of these folks. (Ayanda and Okomoda, 1997; Ovie and Adepoju, 1996).

This paper is divided into four parts: In the first part, indigenous knowledge system is elucidated. The second part shows the relationship between fishery science and the fishers' knowledge. The third part highlights some of the indigenous practices and the equipment that are commonly used. The fourth part contains recommendations on the possible areas that will require more attention.

### INDIGENOUS KNOWLEDGE: ITS IMPORTANCE AND THE FACTORS MILITATING AGAINST IT.

Warren and Rajeskar (1995) define indigenous knowledge as local knowledge that is unique to a given culture or society. A systematic body of knowledge acquired by local people through the accumulation of experience and informal experiment in a given culture. Indigenous knowledge has value not only for the culture in which it evolve, but also for scientist and planners from outside. Developmental professionals appreciate the importance of this type of knowledge. According to Olukosi and Warren (1992), indigenous knowledge adapted to local and environmental conditions are often superior to modern technology.

According to the International Labour Organisation there are about 5000 indigenous or tribal people living in seventy countries in the world (Emery, 2000). The colonial mentality of viewing the African peasant as lazy, ignorant, culture bound and irrational is fast giving way for a new respect for his indigenous harmony with his natural environment in a way that minimises his risk both as a producer and consumer. At every stage from harvest to consumption of fish, the fisher folks employ indigenous knowledge and practices.

Long and Chapell (1997) asserted that local knowledge could indicate the presence or absence of fish species, food habits of spawning fish, long term understanding of how a specific fish population behaves; more than many two year studies, which can only speculate about long term changes. Indigenous knowledge include not only knowledge of ecology and behaviour of fish, oceanography, navigation, fishing methods, processing and preservation of fish, but also the socio-economic, governance structure and processes that operate at the community level. Fishers are not just concerned with the sector in which they make their income, but have often accumulated knowledge in other areas such as health, agriculture, forestry and so on. Whilst majority of knowledge used by fishers is self generated, there are instances where they contract or consult with formal researchers while trying to solve a need.

### **IMPORTANCE OF INDIGENOUS PRACTICES**

Indigenous fishers often possess unique and important knowledge about their local environment and the inhabitants. Johannes (2003) highlighted some information provided by the fishers:

- Knowledge of fish species going into extinction. Such information could help the biologist or researcher not assume that such species are unimportant and help in determining the cause of extinction and how such threat could be corrected or reversed.
  - Fishers often know for example, the timing and location of important, and especially vulnerable, life history events such as migratory and spawning aggregations, recruitment and nursery areas, or the locations of rare or endangered species.
  - They could provide information on how innovations could be implemented in their local communities.
  - They also provide information on the various human impediments to the application of pure biological solutions to resource management control.
- We can also learn from fishers whether their communities possess the basic conservation ethics. Where conservation ethic exist, the relevant concept could be studied and form the foundation for local conservation education.

Other advantages of traditional knowledge in research include:

- Reduction of losses
- Improved interaction amongst participants
- Success of projects through improving sustainability
- Prevention of litigation.

Ruddle (1994) summarised some contemporary importance of local knowledge as:

- practical usefulness in traditional management methods, conservation, stock assessment, environmental impact assessment, local hydrography, mapping, and fishing technologies.
- inherent academic interest
- an instrument of empowerment

### **FACTORS MILITATING AGAINST INDIGENOUS KNOWLEDGE**

The psychological qualities regularly attributed to creative innovators include openness to new experience, ability to channel unconscious energy, confidence in judgement, satisfaction in problem solving and the strong need for achievement. However, The New Nigeria (2003), recorded that one major factor that affects innovation is secrecy, determined by the following:

- Inadequate rent from innovation
- Absence of public protection of intellectual property rights
- Threat of business stealing and obsolescence by the arrival of new innovators

It is apparent here that in the absence of public incentives and protection, the qualities listed for a creative innovator can be thwarted and directly lead to secrecy. Most researchers working on coastal management projects are too busy gathering data. They find asking the unlettered people about their marine biological knowledge too humbling, unstructured and unsuitable for statistical analysis, therefore, valuable information necessary to their statistical analysis gets lost.

### **RELATIONSHIP BETWEEN FISHERIES SCIENCE AND FISHERS' KNOWLEDGE**

Campbell and Salagrama (2000) asserted that a vital part of developmental process is the generation and the use of new knowledge. Generally, this has been taken to mean the knowledge produced by formal scientific research. However much literature now exists on traditional indigenous knowledge systems and their efficacy in tackling the necessities of the rural communities.

Relationship between fisheries science and the fishers' knowledge has been conceptualised in the following ways:

- Political hierarchy, which entails that fishery science is trumps, but often for political instead of intellectual reasons
- Epistemological synthesis implies that the fishery science and the indigenous knowledge can be fused to provide a closer approximation of the truth about fish but invariably turns out to be an alienating take-over of fishers' knowledge by a domineering fisheries science.
- Social integration entails that interaction between fisheries scientist and fishers will uncover the common ground that unites them but frequently ends up leaving fishers marginalised.

All three ways of the conceptualisation ended up with some implication in favour of fishery sciences. It was concluded that though the antagonism between the two theories of knowledge remains -with signs of diminishing- both fisheries scientists and the fishers recognised the value of cooperation. The fisheries scientists have seen that they may get more extensive and reliable data from fishers by working closely with them. While the fishers realised that they may be able to influence the scientific advice that is sent to the fishery managers if they work closely with the fisheries scientists. Gray (2002) extolled the value of these epistemological synthesis, arguing that science and practical knowledge should be seen as complementary and interactive source of wisdom, and not mutually exclusive.

### **SOME INDIGENOUS PRACTICES**

According to Reed *et al* (1967), because habits and habitats of more than half of the 150 species of fish in the northern Nigerian waters that are in commercial catches vary greatly largely due to seasonal changes, so also the gears used in capturing them and the patterns of fishing. This must occur if fishermen are to make a living. Some materials, which are readily available and can be used in making fishing gear at no cost include the following: palm, vines, cane, lianas, reed, grasses, and bark of plants. Most of the traditional fishing apparatuses are very efficient, often about the optimum for the problem at hand. They indicate that local fishermen possess a high degree of technical skills and ingenuity and they are willing to experiment and change when they can see that those changes will benefit them.

A close examination and understanding of these traditional gears should help those who might try to introduce more modern fishing techniques. Such background of information is also necessary for others responsible for formulating management programmes for the fisheries of an area. Reed further asserted that the efficiency of the local fisherman could undoubtedly be improved by the selection of a few gears, though most indigenous apparatuses will compete favourably with modern ones.

### **NETS**

Prior to the introduction of nylon nets, local nets were hand-braided with fibres from a variety of certain local plants. The fishermen know the importance of sun drying their natural fibre nets for efficient subsequent usage. They however apply the same method to the nylon net resulting to rapid spoilage of the equipment. This practice could be traced down to the knowledge of the fishermen of the durability of their local gears. Another practice by the fishermen for better catches is dyeing their nets red with extracts from kola nuts. A study of the Siene net made of alternate sections of white and blue nylon was observed for a few weeks during the dry season when water was clearer than usual. It was found that fewer fish escaped by leaping over the blue parts than over the white sections of the net. Other colours such as green and brown might give better result.

### **LINES**

A wide variety of lines are used in the northern region of Nigeria. The most common fish hooks are the Japanese made hooks, flattened and without eyes. The local method of attacking using the line and hook is worth mentioning. A piece of twine is doubled and a clove hitch is thrown around the shank of the hook in the centre or bight of the twine. Each of the strands is then twisted very tightly and laid together to form a single strand, which becomes the snood.

### **TRAPS**

In northern Nigeria, canes, lianas, palm frond and reed are in abundance. Through the ages of trial and error, sophisticated and extremely efficient traps have been developed to replace imported and often scarce fishing nets. In an investigation by Ita (1996) to verify the validity of the allegation that 'saba' (a traditional fishing method) is a noxious fishing method, the investigation credited the method as the most effective passive

method of catching Tilapias alive in the bushy in-shore areas of most lakes and reservoirs not usually fished with active gears such as siene or cast nets. This traditional method of fishing takes cognisance of the lateral migratory movement behaviour of fish from deep waters inshore at night to feed along the shallow littoral margins. At the first sign of day break the fish migrate back to the deeper waters and on coming in contact with obstruction attempt jumping over the fence only to be trapped by the over hanging gill net (this method is mostly used for Tilapias).

### **SPEARS**

No account of the local fishing gear would be complete without some reference to the variety of spears that are used by most fishermen. Different names are often for different designs, but they are generally called *mashi* in Hausa or *marshi* in Nupe. The spear head are usually fastened to wooden shafts two metres long with a buoyant wooden bulb at the end. They are usually used alone or in conjunction with nets and weak lines. When a large fish is caught by net or line, it is usually speared before being boated, lest it breaks the gear and escape.

### **CANOES**

The dugout canoes are mainly and exclusively in use as local fishing craft and they are propelled manually by paddle and poles. The three main types listed by Reed *et al* (1967) are,

1. Ambara canoe (Hausa, Nupe) - the most suitable for fishing.
2. Ayakedya (Nupe), dankaro (Hausa) - they are usually flat-bottom suitable for large transporters. However, they are heavy and not suitable as fishing crafts.
3. Jirgin dinki (Hausa), Ayagbogunji (Nupe) - they are the most remarkable of all local canoes used in up stream of Bussa.

### **HANDLING**

1. The use of broadleaves to cover catches in order to cool the fish and avoid spoilage.
2. The use of containers with lids, improvised structures on fishing canoes, salting, gutting, washing and so on.

### **PROCESSING**

The methods still in use include traditional mud, well oven, coal pit, steel drum, open dug pit, rack/raised platforms. In Nigeria there are other methods adapted from other countries e.g. *chikor* (Ivory Coast), *altona watanbe* (Burkina Faso).

### **PRESERVATION/STORAGE**

Different traditional methods of preserving cured fish amongst certain tribes or region of Africa include; Nigeria: dried pepper, salt, vegetable oil, citrus peel, and exposure of cured fish to constant heat in the kitchen.

-Casamance-Senegal: fish fat, palm oil, lime juice, exposure to the sun, salting and pepper.

-Cote D'Ivoire: Acacia and Attieke leaves, earthenware pot (Awomi, 1990).

-Sierra Leone: Hot pepper and Dema fish method.

It was argued by Tetegan(1996) that scientists should play their part in improving traditional methods, ascertaining that despite the existence of some insecticides such as actellic and deltamethrin which are used during processing, they cannot be afforded or used by about 90% illiterate West African artisanal fishery professionals as specified by the manufacturers without dangers. Makane and Mgawe (1991) in their study of the construction and performance of insulated containers concluded that local materials such as dry banana pseudo stem sheaths (leaf base), very long African grass, sawdust and coconut husk are as good insulators as expanded polystyrene.

### **PACKAGING**

The materials commonly used for these practice include; raffia basket, jute sacks, wooden materials, open basin, cartons and so on.

## TRANSPORTATION

In most parts of West Africa, especially in the riverine communities of Nigeria, fishermen take advantage of their traditional and indigenous experience in offsetting transportation difficulties with the following structures:

- Construction of hanging footbridges across the breadth of the river
- The use of dugout canoes and rafts
- Combination of baskets and calabashes

Other empirical evidences in transportation method have been documented by Adam-Etuk (1980) that smoked fish were held by tender sticks, which makes it easy for package, storage and distribution. Wet fishes are usually packed in large baskets, covered with green leaves, and transported to the market centres. Insulated plywood box has been reported to have capacity of preserving for about 15 hours before spoilage (Nsetip, 1980). According to Immink et al (1996), in West Bengal (India), producers of hatchlings transport their products in oxygen packs containing about 20% water inflated from compressed oxygen cylinders and packed into cardboard boxes. The oxygen increases the transport time to several days and the cardboard provides limited insulation against temperature fluctuations. For more local transportation, 'Hundis' are used. Red soil is some times added to the hatchlings transported in Hundis as they think this increases the hardness of the fish.

## MARKETING

The major channels recognised here are:

- On site sales of captured fishes.
- Sales at the local marketing centres in the rural areas.

The on site sales are done at the river banks where the surplus are either taken home or sun dried on wooden racks at the capture site. Here wholesalers and retailers alike come to buy fresh or smoked/dried fish at slightly reduced price compared to those transported to the local market centres.. Baskets, large open calabashes and beautifully carved bark of large trees are common sights at such markets.

## AQUACULTURE

Aquaculture is being practised in different parts of the world by indigenous people. Immink et al (1996) showed that although west Bengal and Bihar states are among the poorest areas in India identified together with rural people with a lot of constraints including access to ponds, environmental and technical facilities, they still practice rain fed farming with West Bengal being a major fry production centre in Asia, from which huge numbers of seed are exported throughout India annually; the rural people acclaimed that among two methods of spawning and hatching known to them vis: the Chinese hatcheries and traditional 'bundhs' or earthen 'hapas', the quality of the seed produced using the more traditional system is higher than that of the Chinese style hatcheries and are a less intensive approach.

## CONCLUSION

It is becoming a widely acceptable fact that the traditional folks have their own vast knowledge and understanding of means of livelihood, and it is a proven fact that for a very long time these practices will continue to be harnessed by them. Osuji (1977) affirmed that despite the setbacks attributed to traditional fish handling and processing, methods of fish curing in Nigeria are likely to remain traditional for years to come, primarily because they are simple and inexpensive. Ruddle (1994) observed that local knowledge in communities serves as resource guide and sustains the operations of traditional community based management systems. Thus, local knowledge of the environment, resources used, as well as the society within which the resultant goods and benefits are distributed is fundamental in the continuity of sound community based management practices. Long and Chapell (1997) pointed that we serve people and not fish. If research findings merely validate what is known locally, then we may not gain the respect and cooperation of those people whose resources we are managing. As the fisher folks become more educated about fishery research process, the information they provide becomes more useful; therefore, the fisher folk and their fishing system must be the centre- piece of the policy analyst as well as the operational focus of the research scientists.

## RECOMMENDATION

Thorough research should be conducted in every aspect of fishery by comparing and contrasting scientific knowledge with the traditional one with a view of embedding the two to complement one another. For it is only through this channel that sound and dependable results can be achieved which will have the desired impact on the targeted populace and the society as a whole.

## REFERENCES

- Adam Etuk, R.U. (1980) Fish Preservation and Storage in Cross Rivers State: In Proceedings of the first Cross River State Fisheries Conference, Calabar, May 1980.
- Ayanda, J.O. and Alamu, S.O. (1990). The socio-economic survey of fishing technology in kainji lake basin, NIFFR Annual Report. Pp.178-181.
- Ayanda, J.O. and Okomoda, J.K. (1997). Assessment of adoption level and impact of post harvest fisheries technology in the central zone of Nigeria. A Report submitted to the Nigerian German Kainji Lake Promotion Project, New Bussa.
- Alan, R.E. (2000). Integrating indigenous knowledge in project planning implementation
- Awomi, M.D.(1990). Some Experiments on the Control of Insect Pest of Dried Fish in the Kaiji Lake Basin. In: NIFFR annual report. Pp.110-121.
- Campbell, J. and Salagrama, V. (2000). NEW APPROACHES TO PARTICIPATION IN FISHERIES RESEARCH. A discussion document commissioned by FAO and SIFAR-June2000.Pp.1-5. <file://A:\Indigenouspeoples,IndigenousKnowledge.htm>. Retrieved on 9/8/2003.
- Emery, K. (2000). Indigenous Peoples, Indigenous Knowledge and Innovations and the Convention on Biological Diversity. In: Indigenous People's Biodiversity Network (IPBN). <file://A:\Indigenouspeoples,IndigenousKnowledge.htm>. Retrieved on 9/8/2003.
- Gray, T (2002). Fisheries Science and Fishers' Knowledge. In: EUROPEAN FISHERIES ECOSYSTEM PLAN. Pp. 1-8. <http://www.ncl.ac.uk/enssus/>.
- Ita, E.O. (1996). Preliminary Investigation on the Efficacy of a Traditional Fish Fence "SABA" for the Capture of Jumping Tilapia. In: NIFFR, Annual Report. Pp.25-31.
- Immink, A., Dutta, G., Kumar, B and Little, D. (1996). Fry Supply Across West Bengal. In: Aquaculture News. March 2001, No.27. Pp. 13-14.
- Iwuafor, E.N.O. (1994). Indigenous knowledge in fertility management in the Nigeria savannah. P. 1-5.
- Johannes, R.E. (2003). The need for a centre for the study of indigenous fishers' knowledge. In: SPC Traditional Information Bulletin # 13. <file://r/A:\Theneedforacentreforthestudyofindigenousfishers'knowledge.htm>. Pp. 1-3. Retrieved on 9/8/2003.
- Long, J. and Chapell, S. (1997). Anglers as experts: Integrating Angler knowledge into Fisheries Research and Management. AFS Annual Report vol.22, No.8 P.24.
- Makane, J. and Mgawe, Y. (1991). Insulations for Local Insulated Containers. In: Proceedings of The FAO Expert Consultation on Fish Technology in Africa, Accra, Ghana, 22-25 oct. 1991. Pp. 38-42.
- Nsetip, U.N. (1980). Introduction of Indian Type of Transportation Container for Fresh Fish in Nigeria.
- Olukosi, J.O. and Warren, D.M. (1992). Indigenous knowledge and farming systems, National farming system research network newsletter 10:1
- Ovie, S.I. and Adepoju, F. (1996). Evaluation of the effectiveness of the local fabrics for zooplankton harvest. In: NIFFR annual report.
- Osuji, F.N.C. (1997). The Influence of Traditional Handling Methods On The Quality of Processed Fish In Nigeria. In: Proceedings of The Conference On The Handling, Processing and Marketing of Tropical Fish. Pp. 319-322.
- Ruddle, K. (1994). Local Knowledge in The Future Management of Inshore Tropical Marine Resources and Environments. Pp. 1-2.
- Reed, W., Burcham, J., Hopson, A.J., Jennes, J. and Yaro, I. (1967). Fish and Fisheries of Northern Nigeria. Ministry of Agriculture, Northern Nigeria, Zaria. Pp. 1-45.
- The New Nigeria, (2003). Indigenous Knowledge notes Economics of Africa Indigenous Knowledge. April, 10, p.13.
- Tetegan, L.A. (1996). Nigeria: Smoked Fish Trade. In: NEST Forum, Issue No.18, December, 1996. P. 6.
- Warren, D.M and Rajesekaran, B. (1995). Using indigenous knowledge for sustainable dry land management; a global perspective. In social aspect of sustainable dry land management, Daniel Stiles (ed). P. 192-309