TRADITIONAL KNOWLEDGE AND MANAGEMENT SYSTEMS IN FISHERIES

Editors

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SOCIETY OF FISHERIES TECHNOLOGISTS (INDIA)

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Foreword

Fishing communities all over the world have a wide range of traditional and local knowledge. In recent years there has been a growing interest in the value of this knowledge, particularly in the way communities organize themselves to manage their livelihoods and the natural resources on which they depend. Attention is drawn to the inequalities of resource use and technological advancements within the fisheries sector, reflected as extremes of wealth and poverty. These traditional fishery management practices have evolved over centuries to conserve fishery resources while at the same time providing an equitable distribution of resource wealth among fishing communities.

With the aim of documenting the wisdom developed over many generations through holistic traditional scientific utilization of the natural resources in fisheries sector, the Society of Fisheries Technologists (India), Cochin joined hands with Zonal Technology Management Centre (South Zone), ICAR- CIFT and Bay of Bengal Programme - Inter Governmental Organization, Chennai. A National Seminar on Traditional Knowledge & Management Systems in Fisheriestitled 'FISHFOLK 2012', was organized during October 2012 addressing the areas like Fish Harvesting Technology, Fish Post Harvest Technology, Aquaculture and Fisheries Management.

The Seminar witnessed presentations of interdisciplinary papers on traditional knowledge, innovations and management practices of indigenous and local communities embodying traditional life-styles, by subject experts, indigenous holders of traditional knowledge, and representatives from Government and non-governmental organizations.

This publication is a compilation of selected papers representing the summation of the valuable traditional knowledge. This is brought out as the first step in impinging upon scientific research by providing access to the knowledge and resources of indigenous and local fisheries communities, and by requiring that policy and management be made with their full participation. Scientific community should respond by following these developments, institutionalizing this participation at all levels of scientific activity, and respecting the value of indigenous knowledge.

It is strongly emphasized that the indigenous or local knowledge should not be left out of the equation and it can be validated by scientists, who in turn can enhance the science being used and decisions implemented on the ground.

Ravishankar, C. N.
Director

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Contents

Indigenous Technical Knowledge (ITK) in Capture Fisheries: A Case Study in Vypeen Island of Ernakulam District

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Introduction

Fisheries sector is considered as one of the productive sectors of Kerala and it contributes about 3% to the economy of the state (DoF Kerala, 2011) The population of fisher folk in Kerala is estimated at about 10.85 lakhs of which 6.10 lakhs is involved in marine fishing activity. The total number of fishermen family is around 1.10 lakh with a population density of 2748/fishing village. The fishers engaged in marine fisheries dwell in small houses spread over the coastal areas. The coastal line of the Arabian Sea sprawling on the western part of the state is 590 km in length spread over nine coastal districts with 222 fishing village and 187 landing centres (Marine Fisheries Census, 2010). The total marine fish production in the state is 6.08 lakh t valued at 3803 crores at primary level and 5520 crore at retail level (CMFRI, 2011). The general living conditions and the economic status of the fisher folk in the state is considered not up to the living standards of the general populace of the state with a literacy rate of 72.50%. These fishermen possess rich indigenous technical knowledge and expertise in fishing activities which they transfer from generations to generations.

Indigenous knowledge (IK) or Indigenous Technical Knowledge (ITK) is the local knowledge – knowledge that is unique to a given culture or society and it contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities (Warren, 1991).

Johnson (1992) defines traditional environmental knowledge (TEK) as the body of knowledge built up by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of

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empirical observations about the local environment, and a system of self-management that governs the resource use. The quantity and quality of traditional environmental knowledge varies among community members, depending upon gender, age, social status, intellectual capability and profession. With its root firmly in the past, traditional environmental knowledge is both cumulative and dynamic, building upon the experience of earlier generations adapting to the new technological and socio economic changes of the present.

Traditional environmental knowledge gained international recognition through such documents as the World Conservation Strategy and Our Common Future (WCED, 1987). Both reports emphasized the need to use directly the environmental expertise of local people in managing natural resources. They stressed that sustainable management of natural resources could only be achieved by developing a science based on the priorities of local people and creating a technological base that blends both traditional and modern approaches to solving problems (Johnson, 1992).

Van der Bleik & van Veldhuizen (1993) comprehensively defined IK as ideas, experiences, practices and information that has been generated locally, or is generated elsewhere but has been transformed by local people and incorporated into the local way of life. Indigenous knowledge not only incorporates local technologies but also cultural, social and economic aspects.

Chadwick et al. (1998) opined that contextually people-environment interaction shaped IK. The environment consists of complex conditions shaped by factors such as the physical and biological environment, economic conditions such as market prices, operating costs, cost of production inputs, and socio-cultural conditions such as wishes and demands of formal and informal institutions, and cultural norms. In response to these conditions the stakeholder undertakes actions. In the case of fisher folk these actions relates to decisions such as where and when to fish, equipment purchases, and marketing strategies.

With the advent of technological transformation there exists a paradigm shift in the fisheries sector. There has been technological progress in terms of fishing operation, depth of fishing engine power, fish hold capacity, days of fishing, usage of fish aggregating devices etc. The sector transformed highly during the period as indicated in Table 1. Nevertheless there exists a reduction in the share of the non-motorised fishing craft on account of reducing catch in the sector. This has been due to the capital intensive nature of fishing operation and huge operational cost. It is important to device alternate measures of fishing operations and harness the indigenous technical knowledge available in the fishing sector to bridge the escalating costs and ensure the sustainability of the fisheries sector. Earlier when fishing activities were not modernised, fishermen used to fish based on their traditional knowledge about sea and fish pattern. With the introduction of modern devices like Global Positioning System (GPS), fish finder, echo sounder etc. even the experienced fishermen prefer to use these devices, even though they possess different ITKs regarding fishing operations. As a result young fishermen do not get a chance to know about these ITKs. This may result in the disappearance of these ITKs with this generation. It is high time that we collect these ITKs and document them properly for the benefit of the next generation. Otherwise these treasures will disappear with the passage of time.

Table 1. Fishing craft and gear inventory in Kerala

Craft and gear	2005	2010
Mechanised	5504 (18.86)	4722 (21.68)
Motorised	14151 (48.50)	11175 (51.31)
Non-motorised	9522 (32.64)	5884 (27.00)
Total	29177 (100.00)	21781 (100.00)

Figures in parenthesis indicate percentage to total

There are numerous ITKs in fisheries sector whose technical knowledge has not been disseminated spatially among the fishers by and large. The present study was carried out with the objective of documenting the various indigenous knowledge relating to marine capture fisheries among fishermen in Vypeen Island of Ernakulam district and to analyse its perception across different fisher households.

Materials and Methods

The research study was carried out in Vypeen island of Ernakulam district. Vypeen, one of the Goshree islands is spread in an area of more than 25 km .Till the advent of the Portuguese in the 16thcentury; the island was inhabited by a small indigenous fishing community. Under the influence of the Portuguese, Vypeen developed as one of the island with the highest density of population. Sixty fisher households were randomly selected and interviewed using a pre structured interview schedule. The study analysed the different ITKs available in capture fisheries like identification of fishing ground, time of fishing, weather prediction, movement of currents, determining fish shoals, analysing depth of sea and usage of sinkers and floats. The perception/response of fishermen in Vypeen islands to the different indigenous technical knowledge is depicted in the following tables.

Fig. 1. Map of Ernakulam District

Results and Discussion

The socio economic profile of sample respondents details the particulars on age, experience and the type of fishing that they are engaged in. The total sample selected for the study is 60 fishermen from Vypeen Island. Out of the total sample, 43.33% are engaged in mechanised fishing and 25% in motorised fishing. The traditional fishermen constitute 31.67% of sample respondents (Table 2). Modern equipments are widely used in mechanised and motorised fishing. Naturally in this type of fishing, fishermen make use of the scientific devices rather than depending on their indigenous technical knowledge. The low capital intensive nature of traditional fishing forces the fishermen to adopt to indigenous knowledge for their fishing operation.

Table 2. Type of fishing

Type	No. of Fishers
Mechanised	26 (43.33)
Motorised	15 (25.00)
Traditional	19 (31.67)
Total	60 (100.00)

Figures in parenthesis indicate percentage to total

The age wise distribution of fishers indicate that about 11.67 % of the respondents belong to the category of age group less than 30. It is interesting to note that about 88.33% of the respondents were above the age of 30 (Table

3). It was found that fishermen were actively engaged in fishing even after the age of 55. However, the better employment opportunities available in other fields motivate youngsters to move away from fishing. The age wise distribution of the respondents shows that number of young fishermen is less which is in conformity with the study conducted by Shyam (2011).

Table 3. Age wise distribution of fishers

Age	No. of Fishers
< 30	7 (11.67)
30-55	26 (43.33)
> 55	27 (45.00)

Figures in parenthesis indicate percentage to total

The results on the experience in fishing of respondents indicated that about 13.33 per cent of the samples had less than ten years of experience in fishing. The respondents with 10-20 years of experience constitute 16.67% of the sample. Another important fact is that 36.67% of the fishermen had 20 to 30 years of experience. While 33.33% of the sample had more than 30 years of experience (Table 4). Most of the fishermen enter into the fishing activity at a young age of 15. This enables them to inculcate adequate experience in the field. The study indicates that there is a positive correlation between the age and experience of the fishermen. The experienced fishermen who are still active in fishing activity possess various ITKs. They can easily identify fishing ground based on their indigenous knowledge.

Table 4. Experience of fishers

Experience	No. of Fishers
< 10	8 (13.33)
10-20	10 (16.67)
20-30	22 (36.67)
> 30	20 (33.33)

Figures in parenthesis indicate percentage to total

Indigenous technical knowledge regarding fishing operations

The study reveals that fishermen possess indigenous technical knowledge regarding different fishing operations. Fishermen acquire this knowledge from their forefathers and their long fishing experience. Indigenous technical knowledge in fishing like identification of fishing ground, time of fishing, birds as indicator of shoals, fish shoals, usage of sinkers and floats, weather prediction, determination of depth of water, fish aggregating device and determination of speed and direction of water were analysed in this section.

Indigenous technical knowledge among fishermen relating to identification of fishing ground is that fishes can be easily identified by the colour of surface water. Different colours on the surface of water indicate different fishes. According to 70% of fishermen, black colour on the surface water indicates presence of sardine (*Sardinella longiceps*) in the near vicinity. This blackish colour is almost like the shadow of clouds. Green colour on the surface of the water is an indication of the presence of mackerel (*Rastrelliger kanagurta*) in the neighbourhood which can be identified by 63.33% of the sample respondents. Presence of black pomfret (*Parastromateus niger)* can be identified by observing white colour on the surface of water similar to the brightness of a tube light as suggested 35% of the respondents (Table 5).

Table 5. Identification of fishing ground

Colour	**Type of fish**	**Fisher's response**
Black	Sardine	42 (70.00)
Green	Mackerel	38 (63.33)
White	Black Pomfret	21 (35.00)

Figures in parenthesis indicate percentage to total

There were differences in the fish catch depending on different time. About 75% of sample respondents are of the view that fish catch is more in morning (during the time) between 5 to 8 am, the time period is known as 'velluppu'. The evening time which was found more suitable for fishing is between 5 to 7 pm. This time is known as 'karippal' which is known to 65% of the sample respondents. Fish catch is more during these specific times compared to normal times (Table 6).

Table 6. Time of fishing

Time	**Vernacular name**	**Fisher's response**
5 – 8 am	Velluppu	45 (75.00)
5 – 7 pm	Karippal	39 (65.00)

Figures in parenthesis indicate percentage to total

Birds can be indicators of the presence of fish in the sea. 100% of the fishers have an idea that the presence of birds like cormorants (*Phalacrocorax fuscicollis*) in the sea indicate fish in the near vicinity. It was also found that catch of the previous day which was dumped into the sea attracts the birds. This is also an indication of presence of fish in the nearby areas. About 68.33% of the respondents know that appearance of black seagulls cautions rough sea. Out of the total respondents 71.67% are of the view that appearance of white seagull is an indication of normal sea (Table 7).

Table 7. Birds as indicator of shoals

Indicators	Fisher's response
Presence of birds like cormorant in the sea indicate fish in the area.	60 (100.00)
Appearance of black seagulls cautions rough sea.	41 (68.33)
Appearance of white seagull favours normal sea.	43 (71.67)

Figures in parenthesis indicate percentage to total

Fish shoals can be identified based on the movement of water. There will be differences in the movement of water, depending on the type of fish. Out of the total sample respondents 60% observed that sardine creates air bubbles in the water. By observing these air bubbles in the water they can easily identify the presence of sardine in the area. Tuna (*albacares*) and seer fish (*Scomberomorus commersoni*) move rapidly and jump over the water. About 40% of the sample respondents possess this knowledge (Table 8). The movement of large fishes like Tuna and Seer fish is very noisy. Fishermen can identify these large fishes even from a long distance.

Table 8. Water movement as indicators of fish shoals

Fish Species	Indicator	Fisher's response
Sardine	Creates air bubbles in the water	36 (60.00)
Tuna & Seer fish	Rapid movement and hop in the water	24 (40.00)

Figures in parenthesis indicate percentage to total

Out of the total sample, 50% of sample respondents were aware of the usage of different wood as floats. These wood vary from place to place which includes ‘Pongu’, ‘Aryaveppu’ (*Azadirachta indica*) etc. Iron chain was used as sinkers by 57% of the sample respondents which is not popular now (Table 9).

Table 9. Usage of sinkers and floats

Sinkers and floats	Fisher’s response
Piece of wood is used as floats	30 (50.00)
Iron chain is used as sinkers	34 (56.67)

Figures in parenthesis indicate percentage to total

According to the fishermen, weather predictions can be done based on the colour of the clouds. About 68% of the sample respondents know that white clouds lead to wind and 72% know that black clouds result in rain (Table 10). They were aware that sometimes a cylindrical shape from the clouds may appear which leads to cyclone.

Table 10. Weather prediction

Cloud indicator	Result	Fisher’s response
Occurrence of white clouds	Wind	41 (68.33)
Occurrence of black clouds	Rain	43 (71.67)

Figures in parenthesis indicate percentage to total

Determination of depth of water

The entire sample respondents have same indigenous knowledge regarding the determination of depth. They use ‘Katti’ to measure the depth of water. A ‘Katti’ (weight) is tied to a string and dropped into the water. They then measure the length of that string with their arms and determine the depth. The depth is measured in a unit of ‘Bagham’, which means twice the arm length. The response shows that this is common knowledge among these fishers.

Light as fish aggregating device

Fishermen use various fish aggregating devices to attract the fish. These fish aggregating devices vary from place to place. About 24% of the sample respondents use lights to attract fish during night. When the lights are switched on, this can attract the fish towards the fishing nets which ensures a good catch.

Determination of speed and direction of water

By observing the movement of craft and gear, fishermen can calculate speed and direction of water. About 83% of the respondents can determine the speed and direction of water in this manner.

The study indicated that there exist numerous ITKs in fisheries sector practised over more than a decade and possess unique qualities for usage in terms of easiness, cost effectiveness and durability. The study reveals that ITKs are more practised among the traditional fishermen compared to fishers involved in the mechanized sector. There is an innate fear of ITKs disappearing in future on account of capital intensification in fishing and improved technologies in fish aggregating devices among the traditional fishermen. These treasure houses of knowledge which are based on the practical experience of indigenous people needs to be documented and validated for the sustainable development of the fisheries sector for the future.

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