

Scope of ethnofisheries and sustainable marine fisheries management in India

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The present global fisheries situation demands solving of the issue of resource depletion and environmental degradation to achieve a sustainable development. Efforts for making sustainable marine fisheries development plans pragmatic, necessitates participatory resource management and biodiversity conservation harmonized with attainment of societal, economic as well as ecological well being. Any scientific intervention attempted in a rural society, without regard for traditional and indigenous knowledge systems of local people has often failed. In recognition of these issues, an attempt was made to study the scope of genesis and development of a new paradigm, ethnofisheries. It deals with the indigenous and traditional knowledge items of marine fisheries sector and its significance in the contemporary fisheries management scenario of India. The perception of the actual repositories of this traditional wisdom was also studied regarding the relevance of conserving and scope of applying this knowledge in the current scenario. The Indigenous Traditional Knowledge (ITK) from a coastal state of Kerala was collected to illustrate the relevance of the traditional wisdom. The significance of ITK of marine sector in the present context is elicited from the viewpoint of policy makers, technocrats as well as fisher folk. The ITKs documented from a coastal state is arrayed to show the scope of ethnofisheries.

Keywords: Ethnofisheries, Indigenous knowledge, Marine fisheries

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As in the case of biodiversity, India is rich in its Traditional Knowledge (TK) also. Though there is some amount of awareness and alertness about the TKs in agriculture and traditional therapeutic measures, the TKs in fisheries sector has gained only scanty attention. But, unlike those sectors, the fisher folk, who are the original custodians of the TKs in fisheries sector, are more emotionally attached to the know-how of their forefathers. As they practice them in their daily life, the fishers are more attached to them. Taking these facts into consideration, database on the know-how and the practice so as to reveal its magnitude, applications and its scope in the current scenario, would be of immense help to researchers as well as policy makers. This carries special relevance especially in the context of resource conservation, reducing the environmental pollution, maximum utilization of locally available resources and cost effectiveness. But regrettably, the documentation / protection of traditional knowledge in marine fisheries have got only scanty attention in India. With this theme in focus, an attempt was made to document the TKs in marine fisheries for exploring the

feasibility of incorporating them into the fishery management practices. An effort is taken to elicit the significance of ethnofisheries including traditional fisheries Knowledge (TFK) and Indigenous Fisheries Knowledge (IFK) for sustainable fisheries. Fishers' concern on significance of and conserving TK is also appraised to assure their role in the conservation efforts. The TKs gathered from the coastal villages of Kerala state is also provided, illustrating the scope of integrating them suitably to the current techniques for sustainable fisheries.

Methodology

Locale of the study was the coastal villages of Kerala (Fig. 1). Random sampling method was adopted for selecting the respondent categories. 300 samples were chosen for the study. For eliciting the information, various tools were made use of. To study the significance of developing the new stream of ethnofisheries and need of preserving TKs, literature search and secondary data were adopted, while personal interview method was adopted to measure the perception of fisher folk about the significance of TK. During 2005, TKs were collected from Kerala coast, using PRA, interviews and interactive group

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discussion in combination. The statistical tools employed were percentage analysis and mean.

Results

Fisher's traditional & indigenous know-how is often discarded while charting out development plans for them. Their attitude towards their ancestor's wisdom is also unknown. With its roots firmly in the past, traditional ecological need is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socioeconomic changes of the present¹. Further, it is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal². A personal interview was conducted during first quarter 2005, among the fishers in Kerala and their perception regarding importance of Indigenous Traditional Fisheries Knowledge (ITFK), need of protecting them, hope of reintroducing those which are not in vogue now etc. were assessed (Table1).

Majority was of the opinion that ITKs are very relevant and to be conserved and utilized properly. They opined that ITK's in marine fisheries sector are to be considered while recommending modern technologies for fishers (Fig. 2). This favourable attitude has got significant importance in Indian context where, efforts for marine resource conservation at Government level are proving to be almost futile without people's participation. In some Pacific Island countries, villagers make far more fisheries regulations than Governments³. Governments may still pass some laws pertaining to indigenous fisheries but Government enforcement is typically low to non-existent. They had a fear that practice of TK's present day's condition will give poor performance only. Hence, serious efforts are to be taken to document as well as finding the scope of integrating them suitably in the modern methods for assuring regulated use of resources.

A preliminary survey held in the fishing villages of the coastal state of Kerala, gave some basic information regarding the potential locations and the people to be approached. Interviewing, direct observation, interaction with older generation and recalling the past for recording those practices, which are not in vogue together appeared to be the best mix of methods to the bring pieces of information together. After a pilot survey, the TKs were classified into 6 major domains for the ease of segregation of

data and documenting (Fig. 3). Many of them were not in practice now, but were acquired from the memory of elderly fisher folk. While gathering information, both the TKs, which were in use by the ancestors, but not prevalent now, and those, which are still in vogue, were collected from the elders. Also the local terminologies as well as list of materials and methods were collected for the sake of documenting, without digging into the scientific rationale behind them.

Table1— Fishers' perception regarding the significance of ITFK N=300

Statements	Strongly agree (%)	Agree (%)	Disagree (%)
ITK's in marine fisheries sector are very precious.	78	14	8
ITK's are more environment friendly compared to modern technologies.	66	29	5
Practice of ITK's present day's condition will give poor performance only.	71	16	13
ITK's in marine fisheries sector are to be considered while recommending modern technologies for fishers.	84	4	12
Many of the ITK's are just superstitions without any base.	23	8	69
ITK's of the ancestors are the base for many of the present day's modern technologies.	73	18	9
Spending money and effort for studying the ITK's are simple wastage.	9	12	79
Traditional know-how demands less money and leaves no bad consequences.	91	9	-
Many of the ITK's have scientific rationale underlying unknowingly behind them.	67	12	21
ITK's are outdated and not all practical now a days.	56	18	26
If technological recommendations are made based on ITK's of a community, adoption will be easier.	64	13	13
Traditional knowledge of our forefathers are to be documented properly.	83	14	3

Major TK domains studied

1 Craft and gear making and maintenance

The variations observed in the materials used for making craft as well as gear, owing to differences in traits, the local methods employed, the methods and materials used for extending the life of craft and gear were covered under this domain. It was one of the most interesting areas with lot of information. In Kerala, for craft making, wood of *Punna* [(Alexandrian laurel) *Calophyllum inophyllum* L. (Clusiaceae)], *Anjily* [(Ayani) *Artocarpus hirsutus* Lam.], *Mavu* [(Mango tree) *Mangifera indica* Linn.], *Plavu* [(Jack fruit tree) *Artocarpus heterophyllus* Lam.], *Elavu* [(Semul) *Bombax ceiba* Linn.], *Paini* [*Pajanelia longifolia* K. Schum.] and *Thanni* - *Terminalia bellerica* Roxb. trees were used. The criteria for selection of wood were traditional knowledge and belief of people about the strength, durability in salt water, weight and kind of craft to be made. A single block of wood was carved at centre by skilled men and made into crafts of varying sizes under the supervision of expert fellows called, *Ottathadi maram* (dug out canoe), who are now very few in number. Mango tree and *Anjily* wood were used for the purpose.

1.1 Types of crafts

Boat seines (*Thangu vala*) of different dimensions, shore seine and gillnets are the age-old traditions practiced in Kerala till trawling came into practice by mid 1960 followed by commercial purseining by late 1970 (Figs. 6 & 7). By early 1980, the country crafts were motorized. *Maram*, *Thadi*, *Cchalathadi* were *Katamaran* types. *Vanchy*, *Cheruvanchy*, *Vallam*, *Murivallam*, *Odham*, *Ottathadi*, etc. were the dug out canoes, *Kochu vallam*, *Kkattu vallam*, *Thangu vallam*, etc. were the plank built boats.

In certain areas of the Kerala coast, mini-trawl is practiced, which is a reinvention by the fishers (Fig. 8). Here, the practice is to cut a traditional fishing canoe into two and convert each of the parts into a mini-trawl boat driven by outboard motor.

1.2 Maintenance of crafts

Sardine oil

The most prevalent practice in Kerala coast to safeguard wooden boats from fungal attack was applying sardine oil. Sardine oil is extracted from the common fish, Indian oil sardine (*Sardinella longiceps* Linn., Fig. 4). For this purpose, poor quality oil

sardine fish from landing centre was collected and boiled in water in big earthen pots. The oil extruding when comes to the surface, is extracted in separate vessels. It is done for few days and the oil collected is used for applying through the small perforations in the body of the craft. It was believed to give good temper also to strengthen the wood.

Cashew kernel oil

Cashew (*Elavu*, *Anacardium occidentale* Linn.) kernel oil is used to make *Katamaran*, as the wood is light weight and lasting.

Oil and lime mixture

A paste made of any waste oil mixed with lime was applied in the craft after making small perforations.

Marotti oil

Oil taken from fruits of *Marotti Hydnocarpus pentandra* Buch-Ham was also applied on wooden crafts for protecting it from fungal attack.

1.3 Gear Making and gear categories

Cotton and jute threads were mainly used for making gear and were mainly mended by women. Cotton threads normally last for 3 yrs. It will last long if made thicker, mending 3-5 threads together. In rough season, 6-9 threads were mended together to make the net further strong. Different mesh size (10-25 mm) were used for making nets depending on the size of different species of fish and different crafts, which helped for reducing juvenile fishing through targeted fishery. The cotton threads made of 3 or more individual threads are soaked in plain water for 3 days. Every day the water is changed and fresh water is kept. Third day it is taken out and water is drained off, hanged on bamboo sticks for drying. Then, it is twirled in *Thiryada* (a local spinning machine) for strengthening. The tightened threads are soaked in *Kanjivellam* (rice water, usually consumed by the household members is collected from different households in a big pot) and kept for drying turning over bamboo polls. Dried threads are again spinned in *Thiryada*. Again, it is rolled over coconut trunk or bamboo polls for drying, not loosing the tense. Then, made into rolls and hanging these rolls in hand, starts making nets using locally made needle, *Olakkol*.

Kerala coast had a wide variety of locally adapted gears. *Chavittu vala*, *Kamba vala*, *Karamadi* belong to Shore seines, *Chooda vala*, *Netholi valai* (for *Stolephorus* species) *Ayila kolli vala*, *Kudukku vala*, *Disco vala*, *Koru vala*, *Mathy* (sardine) *valai*, *Chala*

Vala for (sardine), Paithu vala, Thattu madi, Rani vala, etc. belonged to Boat seine, Echam vala, Ozhukku vala, Parava valai (*Lactarius* spp), Pattu vala, Ral vala, Thirachy vala, Ayala vala (for mackerel and tuna), Mathi kolli, Valaiozhukku valai, Odu valai, Chemmeen (prawn) valai, Chittakonju vala, Thada vala (36-38) for (*Raconda russeliana*), Karichala vala (30-31 mm), Kamba vala (tying two country crafts together), Nool vala, etc. belong to Gillnets and Choonda, Veppu, Othakar, Nangoora choonda, etc. were the hooks and line category. In Venal, (summer) season, 5-6 threads made in local Charkas (spinning machine) are tied while in varsham (monsoon) season, 6-9 numbers of threads are tied together for strength.

1.4 Maintenance

For maintenance of these nets, it was boiled in cow dung slurry and dried in hot sun. It was done once in a month. Another method was to boil along with dried seeds of tamarind, which gave strength as well as a colour to the threads. Life of the gear was up to 10 yrs. Cotton nets were used to dip in solution of mashed *Kadukka* (*Terminalia chebula* Retz., *Terminalia reticulate* Roth) seeds (Fig. 9). The decoction is boiled and gives a dark colour, which when imparted to the cotton nets, is believed to strengthen and improves the efficiency of the gear by making it not easily visible. Cotton nets were also used to be kept dipped in gun powder solution. A mixture of ghee and powdered charcoal was used as an antifouling agent and was applied especially on the dug out canoe. Wide variety of materials and indigenous techniques were used in making crafts and gear. The natural wood as well as the cotton and jute threads used for gear making was ecofriendly, local resource based and low cost. A wide variety of species specific gears were in practice, which indicated the targeted fishing techniques practiced by the older generation. This also helped to avoid depletion of resources by reducing the quantity of discards. Likewise, the craft and gear maintenance methods using natural materials surely avoided the pollution effects by way of synthetic antifouling paints.

2. Shoal Identification

From the water movement and colouration, a general guess was made by the fishers on presence of shoal. The kind of fish availability was guessed by associating with the season, which was almost fully

correct. Another observation was that fish shoals will come up when the temperature is low, that is during evenings and mornings. Otherwise it will be in deeper layers. The movement of *Edi*, a marine organism feeding on fish, indicates the direction of occurrence of fish shoals. When sardine is there, water will appear blue. Appearance of *Kadal kaakka* (sea gull) scooping into the water frequently and a bird *karimandu*, flying just above water surface, etc. indicate the presence of fish. Sardine shoals will be characterized by presence of small bubbles, oily appearance on the top of water. The presence of silver belly is indicated by a white colouration of water. Muddy water in some seasons indicates good shoals on the next day. The leader of the crews will hear the sound of fish by keeping the edge of oar close to his ear, keeping the other end immersed deep in water. He was able to identify the presence of fish from smelling the bottom of nets once used. During nights of *Karkkidakom* and *Kanni*, (months as per *Malayalam* calendar) more fish will be there. The traditionally practiced shoal identification techniques show the sound knowledge and close association of the older generation with the nature. The warnings and guidance given by the nature were believed and followed by the fishermen. It allowed a natural mutual association of the man and nature, which indirectly helped to put some restrictions over the continuous depletion of resources.

3. Harvesting methods

Fishermen in ancient days never used to go to far outer seas commonly; the physical strength and logical analysing capacity of possible risks were important for a successful trip. For this, the experience, the traditional skills and ethics were believed to be important. They had their own techniques to locate the correct direction (based on position of stars, moon, distant mountains, wind blowing direction and time, etc.) and also to overcome natural hazards. *Thandu ketti valikkuka*, *Chukkan pidikkuka*, (rowing with wooden oars of varying sizes), *Paya ketti pokuka* (mat), etc. were common methods. *Palmyra* leaf mat, mat made of *Cora* cloth (thick fine cotton cloth), etc. tied on bamboo poles were the common methods. The movement of craft was dependent on the wind force and direction, surely reducing the fuel expenses. Success of fishing was dependent on the strength of men and natural forces like wind. One experienced person will climb on the highest point on the body of



Fig.1 Kerala coast



Fig. 2 Nets, floats and ropes

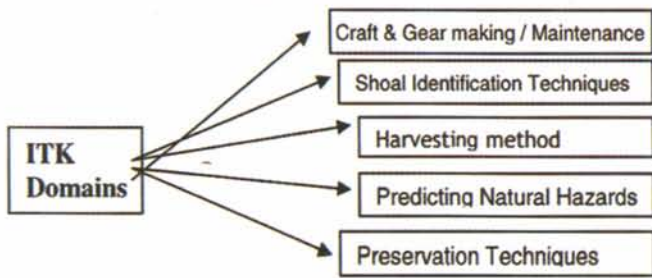


Fig. 3 Major TK domains



Fig. 4 Indian oil sardine (*Sardinella longiceps*)



Fig. 5 Traditional fish preservation



Fig. 6 Traditional Chinese dipnet



Fig. 7 Mini trawl boat



Fig. 8 Mini trawl reinvented by fishers



Fig. 9 Kadukka

the boat and used to guide the crew. He was respected and obeyed by all the crewmembers. He could identify the shoals and predict the occurrence of strong wind or rain. Length of craft was about 13-14 *Kol* (1 *kol* is equal to 72 cm). Good vision and experience as well as expertise were the aspired characteristics for the leader. Mostly, two boats used to move together in sea.

Among tools and techniques used, included spears, hook and line, *Chattuli* (a kind of chisel), and in the case of collecting mussel from rock bottoms of three men depth using a sharp chisel and hand. Long spears made of iron with a tongue like modification at the edge is used to pierce fishes like ray fish, crabs etc. Crafts of 10.5 *Kol* length and 35 *Angulam* (1 *Angulam* is equal to 3 cm) width were used and 2-3 folks used to go for fishing. Hooks were put at a distance of 10 m and up to 200 hooks were used hanging from arecanut fronds. Sardine, mackerel and red worms were used as prey. *Chattuli*, a modification of spear, made of iron, 20.25 cm long was used in this method. Sharp bone pieces and rock pieces were also used for this purpose in older days. At the end, there will be a hook like modification to avoid the fish escaping. This will be fitted at the end of 4-5 m long strong reaper of arecanut, which is tied at the end of 50 m long coir rope. After fish is caught, the rope will be relaxed and the fish when gets tired, will be collected. It is used to catch ray fish and shark.

In Kollam and Thiruvananthapuram (two southern districts), a special method of moving a small craft in to and fro motion over the rocky areas is practiced to catch fish from the rocky bottom. Small sized gear is operated there by experienced crews so that the gear is not damaged much. Whatever damage is caused, it is repaired there itself. Lanterns or petromax lamps were used to attract fish and catch them. Large twigs of trees like *Punna* and peduncle of coconut tied together with huge stones, etc. were put in the near shore areas, as a traditional practice of artificial fish habitats. These caused no environmental pollution and also improved the catch. The variety of harvesting methods practiced shows the skills acquired by fishers according to their needs, local situation, the way of catching and depth/distance ventured differently by different sectors of the society traditionally. These varied practices indicate the controlled conditions under which the traditional fishing communities practiced fishing, which automatically regulated the resource use. Likewise, appropriate utilization of local

techniques assured maximum utilization of local resources and manpower.

4. Predicting natural hazards

If the water flow direction in sea is from South, there is chance of heavy rain and wind. If water is seen in deep blue shade in a broad stretch towards east, it indicates the chance of occurrence of heavy wind and sea may get violent. By seeing the bottom portion of the net after first trial for temperature, nature of mud and smell, the nature of sea and water current can be understood for shoal availability. Bubbles of big size will come to surface and burst with sound if good shoal is available. The discoloration of sky, direction and strength of wind, the origin, direction of blackish clouds, wave action, etc. were the criteria for the fishers in earlier time, with the help of which they exactly predicted the natural hazards. The time of occurrence, intensity and duration of wind and rain was predicted almost precisely by the experienced fishers. Presence of certain birds, movement of clouds, etc. were also taken as indicators for predicting natural hazards. Depending upon the nature of movement or behaviour of natural elements, the ancestors could exactly predict the incidence of natural hazards. Even the timing, intensity, etc. were also predicted almost correctly. The methods were cost effective and closely relating people with nature.

5. Preservation techniques

Fresh fish sprinkled with wet sand was believed to preserve the fish daylong. It is still in vogue. The fish brought to shore in late night/ balance after evening sale were applied sea water, and spread on beach sand and exposed to moon light in the belief that the practice will lessen decay. The fishes like ray fish, shark, etc. got in hook and line was kept in pits dug on beach itself just in the reach of waves and covered with sand to avoid easy decay (Fig. 5). The pits were of size 30 x 45 x 30 cm. The common practice of salting fish in earthen vessels and keeping for two days and drying for 3-4 days in hot sun was practiced almost widely in the state. Salted fish was mostly dried spreading on bare beach sand, on mats made of bamboo/pandanus plant threads, or on gunny bags. Fish salted and without salting were hanged above the *choola* (fire place) in small quantities. It was practiced in all seasons, but during the rainy season, this was the only method in rural areas. Many of the indigenous preservation methods were cheaper and

free from harmful chemicals. The scientific rationale of most of these methods are not sure, but were safely followed by fisher folk traditionally.

Conclusion

While the massive exploitation of marine resources continues, the ecosystem weakens, posing the threat of ruin more on the indigenous communities. The indigenous knowledge contains ideas of limited use of resources, if not of conservation directly. As the production targets are on the hike every year, the TKs hardly fit as a substitute for modern methods even though conservation is high in the agenda. Though new technology becomes highly imperative for those in the fishing occupation, they are not fully abandoning the traditional techniques owing to the emotional binding. At the same time, there is a growing concern among the fishers on issues like the vanishing of certain species, which were very common earlier, reducing catch, and degrading coasts. The different regulations introduced in these communities are not acceptable to the community. Hence, there is a scope for introducing participatory

resource conservation means incorporating people's know-how. However, it is an ideological bridge to the future and in practice it seems not to be that straightforward, especially when fisheries makes up a very small part of national income and fisheries management would need to transcend the arduous but incomplete present technocratic exercise.

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