INDIGENOUS TECHNICAL KNOW-HOW OF COASTAL FISHER-FOLK OF SINDHUDURG DISTRICT IN MAHARASHTRA

H. Vivek Nirmale, S. Bharat Sontakki** and R.S. Biradar****

Indigenous knowledge is the knowledge that people in a given community have developed over time and continue to develop. It is based on experience, often treated over centuries of use, adopted to local culture and environment and is dynamic and changing.

Jocano and Velero (1976), Johannes (1981) Smith (1981), and Ruddle (1988) have highlighted the importance of indigenous knowledge in fisheries management. Understanding the fishermen's customary practices of resource allocation will help to define the context in which biological information may best be employed in managing a fishery. Thus, if the decline of commercial fisheries is to be halted throughout the tropics, a method must be found to blend together the traditional, time-honoured techniques that ensure stability and sustained yield of artisanal capture fisheries with the needs and advantages of commercial fisheries. All this calls for concerted efforts to systematically document the indigenous knowledge in coastal fisheries and establish their scientific rationale. Understanding the fishermen's customary practices of resource allocation will help define the context in which biological information may best be employed in managing a fishery. Thus, if the decline of commercial fisheries is to be halted throughout the tropics, a method must be found to blend together the traditional, time-honoured techniques and particularly those that ensure stability and sustained yield of artisanal capture fisheries with the needs and advantages of commercial fisheries. All this calls for concerted efforts to systematically document the indigenous knowledge in coastal fisheries and establish their scientific rationale. With this in the background, the present study was carried out with the objective to document

* *PhD Scholar and ***Principal Scientist, CIFE (Deemed University, ICAR), Versova, Mumbai- 400 001 and ** Senior Scientist, NAARAM (ICAR), Rajendranagar, Hyderabad - 500 030.*

the indigenous knowledge of coastal fisher-folk of Sindhudurg district in Maharashtra.

Methodology

The present study was conducted in the purposively selected Sindhudurg district of Maharashtra state as it is one of the maritime districts where traditional operation of shore-seine forms on important fishery is used. Sindhudurg district has a coastline of 121 km and continental shelf of 16,000 sq. km. There are eight major landing centers and 76 coastal fishing villages. The fishermen population of the district is 24,829, out of which 4,278 are active. The fish production of the district during 1998-99 was 28,235 metric tons. The number of motorized fishing crafts in Sindhudurg is 1,177 while non-motorized fishing crafts numbered 1,781.

Two zones in the district representing the maximum average landings were selected viz. Makarebag and Malwan contributing about 42.6% and 24% to total marine fish landings of the district during year 1996-97. Five villages, covering three from Malwan zone and two from Makarebag zone were randomly selected for the purpose of data collection for the study.

As the topic of study was related to the knowledge of indigenous technologies in fishing activities, respondents were selected based on their experience and those with traditional or recently motorized boats. In all, 50 such fishermen constituted the sample for the study.

Prior to going for actual data collection, personal observation was carried out in the selected villages and preliminary information was gathered. This covered data like, number of fishermen, number of households, motorized and non-motorized boats, etc.

The data was collected with the help of a structured interview schedule incorporating all the items on which information was required. The respondents were contacted individually either at the society, home or at the landing center.

Results and Discussion

Profile characteristics of respondents

Age: Age-wise distribution of respondents (table 1) shows that a majority of them (64%) belong to the middle age category followed by 26 percent and 10 percent in young and old categories respectively. Thus, it could be inferred that nearly six out of every ten fishermen of Sindhudurg district are of middle age.

Table 1: Profile characteristics of the respondents

Sr. No.	Profile characteristics	Categories	Respondents (n = 50)	
			Frequency	Percentage
1.	Age	Young (up to 30 years)	13	26 .00
		Middle aged (31 to 50 years)	32	64.00
		Old (more than 50 years)	05	10.00
2	Marital status	Unmarried	06	12.00
		Married	44	88.00
3.	Education	Illiterate	08	16.00
		Read and write	10	20.00
		Primary school	23	46.00
		High school	09	18.00
4.	Type of family	Nuclear family	40	80.00
		Joint family	10	20.00
5.	Size of family	Small (<4 members)	16	32.00
		Large (>4 members)	34	68.00
6.	Experience in fishing	Up to 10 years	10	20.00
		11 to 20 years	29	58.00
		More than 20 years	11	22.00
7.	Type of house	*Pucca* house	38	76.00
		Thatched hut	12	24.00

Marital status: It is evident from table 1 that a very high majority of the respondents (88%) were married.

Education: A cursory look at table 1 reveals that a majority of the respondents had formal education as 46% and 18% of them had studied up to primary and secondary levels, respectively. One out of every five respondents (20%) had functional literacy i.e., they were able to read and write. It is quite encouraging to note that illiterates constituted the minority as they accounted for only 16%. In conclusion, it could be inferred that most of the fishermen of Sindhudurg district are literates with primary to secondary levels of schooling.

Family type and size: Findings revealed that four out of every five respondents (80%) belonged to nuclear family. Size-wise, majority of the respondents (68%) had large families (> 4 members) while the rest 32% had small families (<4 members).

Experience: It is clear from the data presented in table 1 that more than half of the respondents (58%) had fishing experience of 11 to 20 years while 22% and 20% of them had fishing experience of more than 20 years and up to 10 years, respectively. This finding is in line with the age-wise distribution of the respondents.

Type of house: Three fourths (76%) of the respondent fishermen are living in *pucca* houses while the remaining 24 percent live in thatched huts. This finding suggests that a majority of fishers can sustain living in a *pucca* house.

Indigenous technical know-how of fisheries management

A summary of the important indigenous technical knowledge items of the respondents along with their rationale for using them is presented in table 2. Practice-wise description of the indigenous knowledge is presented in the following paragraphs.

Indigenous crafts: Operation of shore seine forms an important fishery in this district. The shore-seine is known as *Rampani.*

Operation of net involves use of non-motorized fishing craft known as *hoda.* This boat has an overall length (OAL) varying from 20 ft. to 30 ft. with width between 5 ft. to 10 ft. and depth of 4 ft. to 7 ft. These boats may

Table 2: Indigenous Knowledge of fishers at a glance

S. No.	Indigenous Technical Know-how	Fisher's Rationale
1.	Boat construction material.	
	a) Use of teakwood (Tectona grandis) for entire boat.	sturdy and durable
	b) Use of teakwood for keel and lower hull and babul tree wood (Acacia arabica) for upper plank and deck beams.	*babul* absorbs shocks and does not break easily.
	c) Use of teakwood for upper hull and mango tree wood (Mangifera indica) for keel and lower hull.	entire keel can be carved out of single mango tree trunk
2.	Maintenance of boats	
	Treatment of chandrus (a kind of resin) mixed with groundnut oil. Applied to hull inside and outside.	imparts flexibility to boat and ensures durability
3	Net construction material	
	Use of cotton lines to fabricate long line ropes	facilitate sinking by absorbing water
4.	Maintenance of gears	
	Coloration of cotton ropes by soaking in Ain (Pterocarpus hirsuta) tree bark solution.	increases durability
5.	Method of fish preservation	
	Sundrying of fishes	morphological features are taken into account to enhance sun-drying
7.	Water colour and fish availability	
	Muddy water fetches more catch while clear glossy water yields less or no catch	due to availability of fish food organisms in muddy water.
8.	Effect of tides on fish catch	
	High tide results in more catch to bagnet.	increased water force brings more fish along with it into the net.
9.	Effect of lunar cycle on fish catch	
	a) 12^{th} day to 3^{rd} day of lunar cycle yields more catch to bagnets. 9^{th} day to 11^{th} day yields very less catch while 4thday to 8^{th} day yields very less catch.	the force of water currents is associated with fish catch for stationary nets and vary as per lunar cycle
	b) 4^{th} day to 11^{th} day yields relatively more catch to long lines.	
	c) New Moon day and Full Moon Day yields less catch to gill nets	

S. No.	Indigenous Technical Know-how	Fisher's Rationale
10.	Preference time for fishing	
	a) Bagnets are operated based on the tidal energy 2 to 4 times a day against high or low tide.	operated as per the availability of target
	b) Drift gill nets are operated during 6PM to 4AM	fish/fishes for each gear
	c) Bottom gill nets are operated during 5.30AM to 8.30AM or 5AM to 5AM	and marketing convenience
	d) Trammel nets are operated during 5AM to 11AM	
	e) Long lines are operated between 4AM to 7AM	
	f) Traditional trawlers are operated between 3AM to 9AM	
11.	Indicators of cyclone / storm	
	a) Intensity of water currents increase	rationale not known to the
	b) Winds gust from south direction	fishers, indicators vary
	c) Seawater remains exceptionally calm.	according to different
	d) Nearby features look very clear and close.	locations
	e) Near shore water turns muddy	

be 'U' or 'V' shaped but mostly they are of latter shape with a steep pointed bow. This ensures speed during its operation.

Shoal of fish is located by a scouting boat called *dinghi* or *tony* and scout is known as *telani*. The OAL of these boats varies between 10 to 15 ft. with width between 2 ft. to 3 ft. and height 1.5 ft. to 2.5 ft.

Gill-netter is usually referred to as *hodi*. They are fitted with outboard engine (8-15 H.P.). It's OAL ranges between 15 ft. to 27 ft., width between 3 ft. to 6 ft. and depth between 2.5 ft. to 3.5 ft. Small gill-netters are known as *pagar*. They are dugout canoes operated at a nearby coast.

Hoda and gill-netters, whose width is more than 3 ft. are provided with outrigger to ensure stability. These boats are constructed of mango wood and *undal* tree wood. Only the keel of these boats is made up of mango wood as it is possible to carve out the whole keel from the mango tree trunk. The planks for the hull and deck are made up of *Undal* tree wood, as it is cheap and easily available. The *pagar* is also made of mango wood.

Maintenance of crafts: Depending on the requirements, the fishing boats are given treatment of *Chandrus* (a type of resin) and oil (like groundnut oil, cashew oil, *undal* oil, *and karanjel* oil). The above ingredients are mixed in a ratio of 1-2: 5, boiled for 3-4 hours and then applied to the boat using cloth or brush after cooling. This treatment is done 2-3 times a year to protect the boat from parasites, borers and foulers. As opined by respondents, it imparts elasticity to boat due to its stickiness. Some respondents add lime to the mixture to avoid the growth of algae. Fishermen also make a paste of the above ingredients (oil: *chandrus*: lime) in 1: 1 : 1 proportion to fix the leak, which takes about two hours for drying.

Indigenous gears: Beach seine *Rampani* is used for catching shoaling fishes (mackerel, sardines, squid, etc.). Large *rampanis* are operated with 30-40 fishers while smaller ones with the help of 10-15 fishers. The length of the net varies from 900 ft. to 8,000 ft. and the height varies from 20 to 30 ft. Mesh size is about 12 mm at the center and 30 mm outside the center. The net is made up of nylon/hemp. On locating the shoal, one end of the leading rope is handed over to the men on shore and the net is carried by *hoda.* The net is laid out in a semi-circular fashion and the other end of the rope is brought to another point on shore. The depth of operation is 4-5 fathom.

The shoals are identified/located by scout called *Telani.* Mackerel shoal is blackish oval-shaped and swims with upturned mouth above the surface (sometimes detected as bubbling shoal). Oil sardine shoal is fast swimming with the front side of the shoal thrusting forward and coming above the surface. Other sardine shoals make a splashing sound owing to the splashing of tail on water.

Large *rampani* boats are provided with wooden plates of *pangara* tree wood as floats, which are light and readily available. These floats make splashing sound on the water surface, when the net is being hauled. This sound forces the fish shoal to move towards the shore. The fishery lasts from August to January.

The rest of the fishing is focused on gill netting with few resorting to long lines. The gill nets are specific, each with different mesh-size for different species.

Gill nets for mackerel are called *tiyani.* They are made up of nerlon (a type of nylon). Its mesh size is 2.5 inch. It is operated in 10-15 fathom depth. Fathom is referred to as *wav* in fisher's language. The season is October to January.

Gill nets for seer-fish are called *Iswan*. They are made up of Garfield (a type of nylon). Its mesh size varies from 6-7 inch and is usually operated beyond the 20-25 fathom depth. The season is from October to January.

Gill nets meant for prawns are 3 layered (trammel net) and are known as disco. The mesh size for the inner net is 1 to 1.75 inch and outer nets it is 7-8 inch. These nets prevent the escape of prawns by forming a type of purse. These are operated near the shore in 8-12 fathom depth. These are also made up of nerlon and the operating season is March to June.

Gill nets used for pomfret have a mesh size of 4-5 inches. The season is from August to November. These are operated in required layers with an increase or decrease in the number of floats and sinkers, as per the availability of fish. Fibre floats, cork rings, wooden floats, thermocol were used as floats, while stones and lead as sinkers.

The long lines were operated in 30-50 fathoms depth. Two hundred hooks are suspended per part and 10 such parts are employed per long line. It is meant to catch sharks and catfish. Fishers lay the line in such a way that half of the hooks are above the muddy bottom and half on the rocky bottom. The demarcation they believe is in about 30 fathom depth. This may be attributed to the availability of fish on the respective bottom.

Methods of fish preservation: Salting, followed by drying is the most commonly followed method of fish preservation. Fishes such as mackerel, sardine, *dhoma,* when abundant are washed with seawater. An alternate layer of salt is given between fish kept in a bamboo cane basket. It is kept for about two days. After about two days the fish are overturned and again salted with new salt. Generally salt is used in 1:5 ratio. It is again washed with water and then dried on either coconut tree leaves spread on sand floor or on only a sand floor. This method is cheap and involves less energy and money input. The fish preserved in this way last for about one month.

Effect of wind direction on fish catch: Most of the fishermen opined that wind blowing from north direction is favourable as it brings more fish. It usually flows in the months of August to September. While the wind blowing from south direction is not good as it takes away the fish. It usually

starts with the commencement of monsoon. Other wind directions do not hold any significance as far as fish catch is concerned, as opined by majority of the fishers.

Effect of tides on fish catch: As far as gill net fishery is concerned, the fishermen were of the opinion that the transition time between low tide and high tide is good for gill netting. Some told that a good catch is expected for gill net during low tide. These can be attributed to less force of water during low tide and stability of net.

In case of *rampani*, low tide is ideal and preferred for operation for three main reasons. More space is available for net operation, receding water brings shoal to the middle of the net and the low water level facilitates hauling.

Majority of the fishermen were of the opinion that the occurrence of tides is based on moonrise and moonset. High tide starts after moonrise and lasts for six hours, while low tide starts after declination of moon and lasts again for six hours.

Effect of lunar cycle on fish catch: Most of the gill netters experienced less catch on full moon day and new moon day, while shore seine operation had moderate catch around full moon day. Some fishermen experience a good catch on the fourth day after full moon day. Less catch to gill net may be attributed to increase in current of water during New Moon Day and Full Moon Day. Fishes are attracted towards moon during full moon day, as opined by some fishers operating shore seine.

Preference time for fishing: *Rampani* nets are operated during morning between 3-4 a.m. and 6-7 a.m. and during evening from 6.00 p.m. to 9.00 p.m.

Disco net for prawns are operated in morning from 4.00 a.m. to 8.00 a.m. As monsoon approaches, prawns come closer to shore.

Gill net for seer fish are operated during evening from 4.00 p.m. till midnight or early morning. Most fishermen opined that the fish come to water surface during morning. This can be due to lowering of surface temperature.

Water colours and availability of fish: Most fishermen are uncertain about water colours and availability of fish. Majority of them, however, opined

that muddy water yields more fish catch especially catfish and glossy water yields very less or no fish catch. Muddy water is due to the presence of suspended particles and bottom fauna of diatoms and zooplankton. Glossy water lacks fish food organisms so fishes are not available in such water.

Sometimes fluorescent bacteria are present in the waters due to which it shines in the night. This effect is seen around New Moon Day when moonlight is absent. Fishes are able to see the nets and avoid crossing it in case of gill nets. few fishermen opined the availability of sardine in bluish water.

Indicators of cyclone: A wide variation was noticed in the opinions expressed by fishermen regarding indicators of cyclone. Most of the fishermen opined that the gathering of black clouds at the horizon and wind blowing from south are the indicators of cyclone. Some opined that exceptionally calm seawater and clearer and near look of nearby mountains are the indicators of cyclone. Few remarked that formation of a kind of ring that encircles the sun is a positive sign of occurrence of a cyclone. Very few told that small sea snakes get curled about each other and come to the surface or in the net. Most of these phenomena are associated with occurrence of storms during monsoon.

Summary and conclusions

The major findings of the present study can be summarized as

i. Fishermen are employing indigenous techniques, however the rationality of some of these is still unclear.

ii. *Rampani* is the most popular indigenous net being used by fishers as the sandy long coastline in the district makes its operation is easier.

iii. Muddy water fetches more catch.

iv. Most of the fishing crafts are locally designed.

v. Wind blowing from the north direction brings more catch.

vi. Low tide is more effective for operation of shore-seine.

vii. Salting followed by sun drying is an effective method of fish preservation.

viii. Most fishermen prefer morning hours and evening for fishing as more fish catch is expected.

ix. Gathering of black clouds at horizon with winds blowing from south direction is an important indicator of occurrence of storm.

In conclusion, it can be said that indigenous technical knowledge in fisheries is neither static nor ignorant. The indigenous ideas and practices are suited to their localities and even after 40 years of development of fisheries, it is still largely in use. They are also mostly environmentally benign. If present day scientists, fisheries planners and traditional fishermen could work together and pool their information and then interact, fishing methods, that are ideally suitable to local conditions and profitable without being exploitative, could be developed.

Documentation and compilation of indigenous knowledge, thus, should become part of the process aimed at sustainable fisheries development.

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