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Artisanal Fishing in Kerala Backwaters: A Socioeconomic Assessment of Indian Coracles

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Authors' contributions

This work was carried out in collaboration between all authors. Authors MRR and SS designed the study. Authors MRR wrote the protocol managed literature searches and wrote the first draft of the manuscript. Authors MRR and SM carried out the data collection. Author NRA managed the statistical analyses of the study. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

While considering pollution and economic losses caused by modern fishing systems/fleet to natural environment, traditional fishing techniques have its own relevance as a sustainable way of harvesting systems with least negative impact to the fishing environment. The study focuses on an economic analysis of one of the major time-tested methods of sustainable fishing, 'Indian coracles', operated in the Vembanad backwaters of Kerala. An exploratory study was conducted among the migrated coracle fishers operating in the "Kochi Kaayal" area of Vembanad estuary, Ernakulam district, Kerala during February – May, 2017. Primary data was collected from 15 coracle fishers selected randomly, which cover around 75 per cent of total migrant coracle fishers operating in the area. Fishers were personally interviewed by using a well-structured interview schedule. Major parameters considered include personal as well as family details, education status, income details,

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asset particulars, savings, indebtedness, expenditure pattern, details of migration, reasons for migration, problems during migration, and major socio-economic achievements through migration. The Garrette ranking method and other major econometric tools were used to analyze the problems of, and reasons for, their migration, as well as fishing operation. It was observed that disguised unemployment and competition prevailing in their native place are the major reasons for migration to Kerala coast decades ago. Fishers achieved betterment in socioeconomic conditions with their migration to the Kerala coast. Also, the fishing technique is found to be eco-friendly and hence relevant as a sustainable fishing technique. Immense scope of tourism as well as the significance of spreading awareness among the local fishermen about coracle fishing as a sustainable fishing technique, is highlighted in the study. Present study is relevant as the first of its kind done in the area and in the technique.

Keywords: Coracles; fisheries; sustainable fishing; migration; socio-economics; Kerala, fishermen.

1. INTRODUCTION

Indian fisheries sector, constituting about 6.3 per cent of global fish production, contributes to approximately 1.1 per cent of total Gross Domestic Product (GDP) of the country. Total marine fish landings from the mainland of India during 2016 were estimated as 3.63 million tonnes, with Kerala being the fourth largest producer contributing about 14.4 per cent (5.23 lakh tonnes) of total landings [1]. The inland sector of India contributes around 65 per cent of the total fish production of the country whereas that of Kerala bestows around 29 per cent of the fish production of the State. Also, Kerala contributes around 2.65 per cent of the nation's inland fish production. The state is beatified with 49 inter-connected backwaters, which have an area of 46,129 ha and 84 estuaries in it. Vembanad backwaters form the largest lake of Kerala, which is around 23,350 ha in area and spread across three districts viz., Alappuzha, Kottayam, and Ernakulam. The district of Ernakulam holds around 9,762 ha of Vembanad backwaters of which a portion around Kochi area is known as Kochi kaayal, a vital fishing area in the Vembanad estuary [2]. Amongst the districts of Kerala, Ernakulam is the top producer of inland fish with a production worth of 0.4 lakh tonnes and second largest in total fish production (1.2LT), following Kollam district, in 2015 [3]. Annual average fish production in Vembanad Lake and other backwaters of Kerala was estimated at 14000-17000t [4]. Brackish water fishery resource of the state consists of 75 species comprising 57 species of fish, 6 species of shrimp, 1 species of prawn, 5 species of crab and 6 species of bivalves.

The usage of crafts and gears for fisheries is mainly based upon topography, ecology, and habitat of the available resources. Design of a

craft will be typical to the region where it has to be used and tailored to the hydrographical features of the water body, as well as the targeted fishery resources [5,6]. Coracles, a crude form of boat made up of reeds, bamboo, plastic sheets, and tar, are being used in various parts of the world viz, England, India, Vietnam, Iraq and Tibet, for eons. This keel-less boat has a long history bridging over a thousand years, even evidenced in cave paintings of the Bronze age. Many organizations across the world are promoting the use and history of coracles and their allied crafts. The Coracle Society in United Kingdom, which came into being in 1990 with the aim of promoting knowledge of coracles and to support fishing using coracles, is famous among them. In 2016, the Bangalore research centre of the Central Inland Fisheries Research Institute organized a mass awareness program on safe fishing by using fiber-glass coracles in Wayanad District of Kerala, aimed at empowerment of the unemployed youth of the tribal belt in the district. Seventy two tribal youths were empanelled as members of the fisherman cooperative society, mainly by the joint efforts of scientists of ICAR-CIFRI and the Kerala State Fisheries Department [7, 8]. With their adoption by Institute technology in Karapuzha reservoir, has increased fish catch from 18 kg/ha to 150 kg/ha [7]. The Institute provided Bamboo coracles to active fishermen of this Tribal Fisheries Co-operative society.

The Indian coracles, locally called "*Vattavanchi*" or "*Kuttavanchi*" in Kerala, were exclusively used for water transport in swift flowing rivers of South Indian states such as Karnataka and Tamil Nadu, dated back to 15th century. These primitive non-motorized crafts are nowadays used extensively for fishing as well as tourism. The application of indigenous traditional knowledge is a key element of social capital for the poor providing

sustainable development for them. The coracles are traditional, cost effective, eco-friendly and, up to an extent, ensure a sustainable use of scarce fishery resources [9-11].

Fishing operations using coracles are found possible even in shallow waters due to the unique flat bottom of the craft which evenly spread the weight across the boat. Coracle ride is one of the major tourist attractions for years in many rivers of Karnataka and Tamil Nadu. Even though, major crafts and gears in North Indian rivers, like the Ganges, the Brahmaputra as well as those employed along West and East coasts of India, are well documented in the literature[12-15], an economic analysis of the coracles in Vembanad lake, which has become one of the major fishing technique employed in that estuary, is absent. Hence, this study is carried out as an attempt to evaluate the coracle fishing technique employed in the Vembanad estuary for the past many decades.

2. METHODOLOGY

2.1 Location

An exploratory study was conducted among the migrated coracle fishers operating in the Vembanad estuary located in the 'Kochi Kaayal'

area of the Vembanad backwaters of Ernakulam district, Kerala. Location map of study area is indicated in Fig. 1. The much productive Cochin estuary is found to be one of the major fishing grounds where numerous local fishers, Chinese dip nets, shoreline fishers, etc., operates. The coracles started appearing in the Vembanad estuary of the Ernakulam district some decades ago, as part of the migration of fishermen from nearby states.

2.2 Data Collection

The study was conducted by using primary data collected randomly from among the migrant coracle fishers operating in the Vembanad estuary of Ernakulam district, using simple random sampling method. A total sample of 15 coracle fishers were selected randomly, which forms around 75 per cent of the total coracle fishers operating in the estuary and were personally interviewed by using a well-structured interview schedule. The major parameters considered in the study include personal as well as family details, education status, average income, asset particulars, savings, indebtedness, expenditure pattern, details of migration, reasons for migration, problems during migration, and major socio-economic achievements through migration.

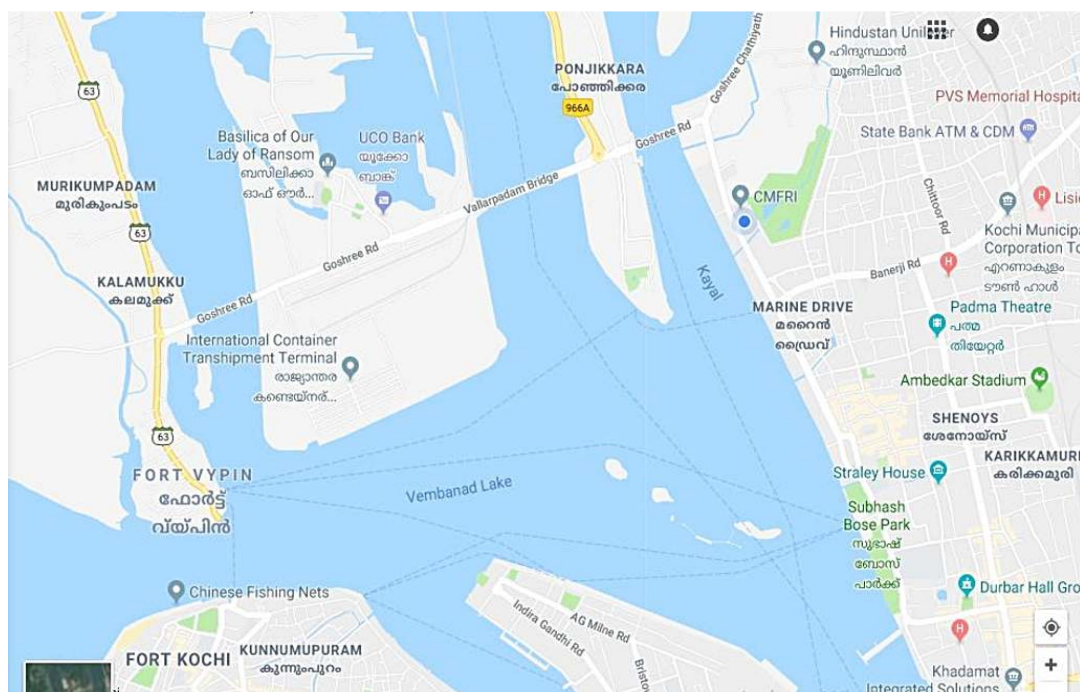


Fig. 1. Study Area - Kochi Kaayal area of Vembanad estuary

Descriptive statistical analysis was done on the data using excel and R language. The Garette ranking technique is used to analyze the rankings given by the respondents for both reasons and problems of migration.

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics

Survey was conducted among the heads of fishermen families. Respondents of age between 20 and 40 years were found to be most abundant (50 per cent), followed by those from 40 to 60 years age group (30 per cent) and less than 20 years (15 per cent). Meanwhile, considering families, it was found that they migrated with whole family including children of age ranging from four months to 14 years old. Majority of the families are of size less than three members (40 per cent) followed by size seven members (35 per cent) and three to five members (25 per cent). The families were found living in groups under bridges and in rented rooms. The living places were found to be less hygienic, with lack of basic amenities and security.

Details furnished in Table 1. clearly depicts that more than half of the respondents were illiterate while 30 per cent of them possessed primary education. All of them were following their traditional occupation and were interested in migration. Hence, providing even primary education to the children was of least concern.

3.2 Religion and Nativity

Present study observes that all coracle fishers operating in Ernakulam district are from Hunsur taluk of Mysore district, Karnataka. All of them are traditional inland fishers, who were operating in various reservoirs and dams of Karnataka. Due to disguised unemployment emerged with the turn up of Tamil fishermen in the area, they migrated to various parts of Kerala, decades ago. All of them were found following Hindu religion.

3.3 Asset Creation, Valuation and Savings

All of the respondents possessed their own houses and vehicles (two wheelers) at their native place. It was difficult to find out the savings of them, still it is reported that most of them are having their own agriculture fields

which is leased out for corn cultivation and allied activities at an average annual rent of amount Rs. 50,000. Income details, explained by the fishermen, indicate that all of them are categorized Below Poverty Line (BPL) on account of the Karnataka government. No much money is spent on clothing and accessories as the community was found least interested in extravagance and is following a very simple life.

3.4 Details of Migration

Present investigation revealed that coracle fishermen reached the backwaters of Kerala around 15 years ago along with their family. They had travelled through almost all the coastal districts of the state and had finally settled at the district of Ernakulam. The group consists of a lot of children including infants. The children are not given any school education and are supposed to follow the migratory tradition and coracle fishing. The major reasons for migration opined are analyzed and explained under reason analysis.

3.5 Reason Analysis

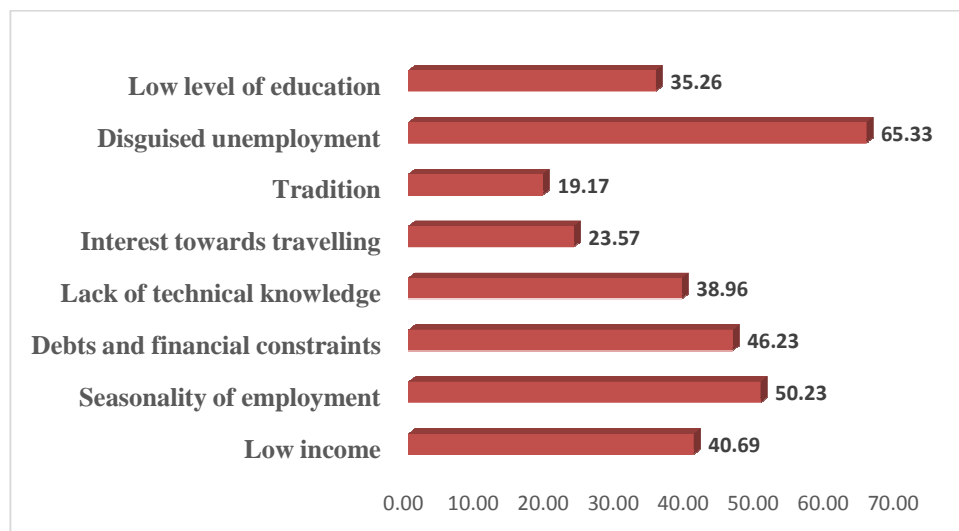
Reason analysis was done using Garrett ranking technique on the basis of opinions provided by respondents as the reasons for their migration. Garrett's ranking technique is usually used to rank preference indicated by the respondents on different factors. Ranks assigned by respondents for different factors are converted into scores. Factor with highest mean value or Garrett score was considered to be the most important factor.

Accordingly the most important reason for migration conceived by respondents was disguised unemployment, with highest Garrett score of 65.33, as depicted in Fig. 2. Fishers reported that the encroachment of fishermen from Tamil Nadu into their native places gave rise to disguised unemployment and competition. The second most given reason was seasonality of employment (50.23), followed by debts and financial constraints (46.23), low income (40.69), etc. Lack of technical knowledge or alternative avocations was also reported as one of the major reasons, with a Garrett score of 38.96. Even though they were not much worried about their low level of education affecting their life, it was also pointed out as the reason (35.26) for migration. Interest in travelling (23.57), as well as their tradition of migration (19.17), was also mentioned by the respondents.

Table 1. Socio-economic characteristics

Age distribution (years)		Education status		Family size	
Age range	Frequency	Grade	Frequency	Size range	Frequency
<20	3 (15)	Illiterate	11 (55)	<3	8 (40)
20 to 40	10 (50)	Primary	6 (30)	3 to 5	5 (25)
40 to 60	6 (30)	High School	3 (15)	5 to 7	7 (35)
>60	1 (5)	Higher Secondary	0 (0)		

Figures in parentheses indicates percentage to total


Fig. 2. Reasons for migration – Garrette score

3.6 Details of Fishing Operation

The study revealed that all of the respondents are traditional coracle fishers and fishing is their main occupation. Even though they have agriculture fields as family property, they are keener to do fishing in various areas. The fields are all leased out for corn farming and allied activities. Each family owns at least one coracle and some gill nets. Cane, bamboo, tar, tarpaulin, plastic sheets etc. are the major raw materials used to build coracles. Coracles are found to be low-cost, simple, and durable, which are in tune with the findings of Manna et al. 2011. Major details regarding the fishing operations in Vembanad backwaters are furnished in Table 2.

According to the study, average cost of constructing a coracle amounts Rs. 10,000, which may last for an average of one year. Gill nets are the most popular fishing gear in coracles, which costs around Rs 4,000 and lasts for about six months depending upon operations. An average number of 10 fishing nets are used in each coracle which carries out around two fishing

trips daily. According to the respondents, major species harvested from the backwaters are cat fish and catla, having an average market price of Rs. 90 and Rs. 170 respectively. Average maximum quantity yielded per day is found to be 50 kg till time, which earned them an average of Rs. 970 per day, from a single coracle. The fishes are sold at roadsides near to their living place.

3.7 Problem Analysis

Only an efficient paddler can ride a coracle as high risk is involved in riding. A coracle is very light, tippy and highly affected by wind and hence will go 'where the wind blows' and also where the stream takes her. A coracle, if capsized, offers no floatation and hence is highly dangerous. The fishers found in the Vembanad backwaters are traditional coracle paddlers and hence are highly efficient. They seldom faced any accidents while fishing and the major constraint for them is the polluted backwaters. Also, no health issues were reported from them, even though they are living in unhygienic conditions under the bridges. Analyses were done over the extensive problems

Table 2. Details of fishing operation

Parameter	Coracle	Gear (net)
Average cost (Rs.)	10,000	4,000
Average life (years)	1	0.5
Average number of nets used in a coracle	10	
Type of gear used	Gill net	
Average maximum catch yet	Quantity (Kg)	Amount (Rs.)
	50	970
Average fishing trips per day	2	
Major species caught and respective average price per kg	Species	Price per kg (Rs.)
	<i>Heteropneustes fossilis</i> (Cat Fish)	90
	<i>Catla catla</i> (Catla)	170

and constraints opined by the fishers through the Garrett ranking technique and are represented in Table 3, which retrieves a picture of the problems.

Table 3. Problems at work place – Garrette ranking

Parameters	Score	Rank
Pollution	60.56	1
Marketing	55.14	2
Difficulty in language	42.00	3
Cultural lag	32.57	4
Competition	26.54	5
Risk in fishing	13.21	6

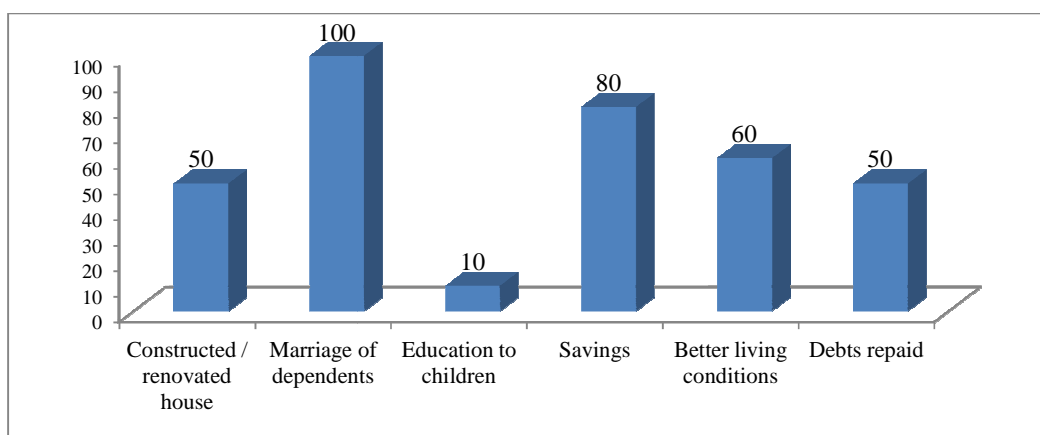
The fishermen were found worried not with the riskiness of coracle operation but with polluted backwaters. Apart from the micro-plastic pollution in Vembanad lake reported by Sruthy et al. [16], the backwaters were found strongly deteriorated with plastic debris, thermocols, sanitary pads, etc. Presence of water hyacinth in huge quantities is also noted as a menace for coracle fishers. The scenario is found problematic not

only for local inland fishers, but also for dip-nets of Chinese fishers operating in the estuarine area.

Fishes were sold near roadsides and are not taken to the markets. Marketing is also expressed as one of the major issues due to lesser varieties of catch available. A comparatively good number of consumers are found for coracle-caught fish due to its freshness. According to fishers, the local fishermen behave very friendly and no relevant competition in the fishing grounds. Also, the respondents were not worried about the climatic changes occurring, as it seldom affect their lives.

3.8 Effect of Migration on Socioeconomic Status

According the respondents, their socioeconomic status has much improved through migration, which can be ascertained with analyses conducted within. The major achievements through migration, according to the details collected are depicted in Fig. 3, which shows that


Fig. 3. Major achievements through migration

all the families had earned well enough to conduct marriages in their families through time. Lifestyle of coracle fishers is quite simple and less expensive. Hence they are found to have a good amount of savings, but they were not very disposed to reveal saving details. Around 80 per cent of the families opined that savings represented as their second major achievement, followed by better living conditions (60 per cent), renovation of house (50 per cent) and repayment of debts (50 per cent).

Present study highlights the lack of awareness regarding education among the fishers. Even though the groups consisted of many children below the age of 14, none of them are regularly attending schools. An infinitesimally small portion of the fishers (10 per cent) are caring about education. The simple and less expensive life style is helping them to earn much and hence they are not very interested in other jobs.

4. CONCLUSION

The study throws light on the operation of one of the time-tested methods of sustainable fishing, Indian coracles, operated in the Vembanad estuary. Even in the era of mechanization, these coracles are found to be attractive as a more economical way and have its own relevance as a sustainable way of harvesting systems with least negative impact to the fishing environment. Arrangements similar to the mass awareness program conducted by the Bangalore research centre of Central Inland Fisheries Research Institute on safe fishing by using fiberglass coracles in Wayanad District of Kerala in 2016 for the tribal youth, has to be organized at various parts of the state aiming at empowerment of unemployed youth.

Also, a coracle ride is a thrilling experience and is one of the major tourist attractions in South Indian streams and waterfalls. All of the respondents reported the scope of tourism in the coracles of Vembanad. As Kerala backwaters, especially the Vembanad estuary, has a prominent place in the tourist map of the state, coracle expeditions could be developed as a tourist attraction and as an alternative livelihood for inland fishers of the locality. Since the introduction of new fishing technology has frequently led to a decline in fish stocks and the destitution of traditional subsistence fishermen, more effective use of existing skills and technology are found to be economical, profitable and more vital for sustainable development.

Hence preservation and promotion of sustainable traditional fishing practices is a key element of social capital for the poor, providing sustainable development.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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