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Mapping women's role in small scale fisheries value chain in India for fisheries sustainability

Mapeo del papel de las mujeres en la cadena de valor de la pesca en pequeña escala en la India para la sostenibilidad de la pesca

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ABSTRACT

Sustainability in small scale fisheries is receiving wider acceptance worldwide as the system faces different kinds of exploitations. Gender can play a significant role in achieving sustainability as they are the primary beneficiaries in small scale fisheries. Exploring their level of participation in resource use can provide a database that functions as the key determinants for sustainability. This article looks for empirical evidences on the role of men and women in small scale fisheries through gender structure analysis. The indigenous communities (n=154) in Vazhachal Forest Division, Kerala, southern state in India is considered for the study. Methods adopted includes household survey using semi structured questionnaire, transect walks, focus groups and direct observations. Results reveal that although higher percentage of men (66.20%), women's role is substantial (33.80%) in fisheries value chain including pre harvest, harvest and post-harvest sector. Their presence had a significant relation in supporting men in fisheries activities like collection of baits (χ^2= 6.189, p= 0.013), accompanying men in fishing (χ^2= 4.153; p= 0.042), sorting of fishes (χ^2= 3.566, p=0.059), processing of fishes (χ^2=9.776, p= 0.002) and in mending of nets (χ^2= 4.40, p=0.042). Results, further, reveal that men and women have unique and overlapping roles in small scale fisheries. The key findings of the study provide quantitative evidence to develop strategies for small scale fisheries sustainability.
Keywords: Gender analysis, Small scale fisheries, Indigenous communities, Sustainability

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RESUMEN

La sostenibilidad en la pesca a pequeña escala está recibiendo una mayor aceptación en todo el mundo, ya que el sistema se enfrenta a diferentes tipos de explotación. El género puede desempeñar un papel importante en el logro de la sostenibilidad, ya que son los principales beneficiarios de la pesca en pequeña escala. Explorar su nivel de participación en el uso de los recursos puede proporcionar una base de datos que funcione como determinantes clave para la sostenibilidad. Este artículo busca evidencias empíricas sobre el papel de hombres y mujeres en la pesca artesanal a través del análisis de la estructura de género. Las comunidades indígenas (n=154) en la División Forestal de Vazhachal, Kerala, estado del sur de la India, se consideran para el estudio. Los métodos adoptados incluyen encuestas domiciliarias utilizando cuestionarios semiestructurados, caminatas transversales, grupos focales y observaciones directas. Los resultados revelan que, aunque el porcentaje de hombres es mayor (66,20 %), el papel de la mujer es sustancial (33,80 %) en la cadena de valor de la pesca, incluido el sector de precosecha, cosecha y poscosecha. Su presencia tuvo una relación significativa en el apoyo a los hombres en actividades pesqueras como recolección de carnadas ($\chi2$= 6.189, p= 0.013), acompañamiento de hombres en la pesca ($\chi2$= 4.153; p= 0.042), clasificación de peces ($\chi2$= 3.566, p= 0,059), procesamiento de pescado ($\chi2$=9,776, p= 0,002) y en reparación de redes ($\chi2$= 4,40, p=0,042). Los resultados, además, revelan que los hombres y las mujeres tienen roles únicos y superpuestos en la pesca a pequeña escala. Los hallazgos clave del estudio proporcionan evidencia cuantitativa para desarrollar estrategias para la sostenibilidad de la pesca a pequeña escala.

Palabras clave: Análisis de género, Pesca artesanal, Comunidades indígenas, Sostenibilidad

INTRODUCTION

Small scale fisheries offer multiple benefits to its resource users such as poverty alleviation, food and nutritional security and livelihood (FAO, 2017). It is closely associated with the lives of the community and their tradition. Studies indicate that in rural communities both men and women perform fishing, particularly in inland fisheries, on part time or seasonal period thereby creating an actual contribution towards subsistence or economic benefit (FAO, 2013; Matthews et al. 2017). Their knowledge on the ecosystem forms an important element of sustainability (Berkes, 2012) since small scale fish producers has direct access to resources. However, there is a lack of scientific evidence to detail the relation between the resource use and gender (Leach, 2007; Jonson, 2014). It is important to consider the contribution of men and women in natural resource management (De la Torre-Castro et al. 2017) as management strategies may not be successful if it fails to appreciate the association between gender and environment and

also if there is lack of equal participation of resource users in resolution mechanism (Leach, 2007).

Analysing the interaction between men and women in a social setting facilitate in gendered differentiation and equity. It reflects social cohesion (Jackson, 1994) and the managerial role played by gender (Sprague, 2005). In small scale fisheries men and women are differently placed in the value chain. Men are usually entrusted the task of fishing while women for processing and marketing (FAO, 2013). This differentiation leads to unequal labour distribution and differential labour efficiency (World Fish Center, 2010). The contribution of women in fisheries is depreciated in official statistics as there is gender bias in policies (World Bank, FAO and World Fish Center, 2010; FAO, 2013). Traditional laws and customs further limit women's access to fisheries resources and in decision-making processes. This results in their vulnerability and marginalization (Porter, 2006; FAO, 2007; Okali and Holvoet, 2007). These scenarios urge the need for gender appraisal in fisheries value chain.

With this background the article looks into the empirical evidences related to the participation of indigenous men and women in small scale fisheries in India where forests and river resources forms an importance source of subsistence for them. Indigenous communities in India are officially known as Scheduled Tribes (ST's). 635 ST's are identified all over India. Among these, some groups are with low development indices and experiences population decline. They are classified as Particularly Vulnerable Tribal Groups (PVTG's) and seek special attention at the management level. Economically and socially ST's are least advanced. Hence, they experience deprivation and vulnerability (Mehta and Shah, 2003; Kasi, 2011). Considering their fragile nature and chances of exploitation, Government of India has laid down rules and regulations for the protection of ST's. Tribal development boards are in force at state and regional level for coordinating and implementing development programmes and monitoring the welfare of tribes. In agreement with this it is important that their dependence to resources is analysed. This provides data for resource management and sustainability.

MATERIALS AND METHODS

To address the gap in recording the role of indigenous men and women in small scale fisheries we adopted an exploratory study among ST's in Vazhachal forest division in Kerala, southern state in India. They are distributed on the bank of Chalakudy river that streams within the forest division. This is the 5th largest river in the state which is known for the presence of diverse endemic fishes. Many among these fishes have ornamental value and high demand in aquarium trade. The geographic coordinate system of the river is 10°5' to 100 35' N latitudes and 76°15' to 76°55' E longitudes. The catchment area of the river is 1704 Sq. Km with annual runoff of 3121 million m^3 (Bachan, 2003). This

topography with favourable vegetation and climate supports rich biodiversity of flora and fauna. Hence the tribes rely greatly on natural resource-based activities.

The indigenous communities involved in the study are Kadars and Malayars. They reside in clusters of 10-50 houses known as colonies or settlements. The study was carried out in nine settlements in which Kadars are distributed in seven settlements (Malakkapara, Sholayar, Aanakkayam, Vachumaram Perungalkuthu, Pokalapara and Vazhachal) and Malayars in two settlements (Thavalakuzhipara and Vachumaram). Kadars are PVTG's while Malayars are non PVTG's. During the study the communities contained 300 households. These households engage in diverse livelihood activities, most of which are subsistence based. Major livelihood activities include non-timber forest collection, crop farming, tourism and fishing. The tribes shift their livelihood activities depending on the seasonal availability of resources. Forest resources form the core source for livelihood. Fishing is related to weather conditions. It is mainly practised at the onset of monsoon season (June) as the river dries up during summer and resources become scarce (Bachan, 2003). Since small scale fisheries is the subject focussed, the study concentrated on the tribes who pursue single or multiple livelihood activities but engage in fishing as well. Fisheries in this region is multi species, non-targeted and multi geared.

Mixed method approach was followed in this study by making multiple visits in the settlements between April 2019 and August 2019. It involved quantitative as well as qualitative method including surveys, interviews, focus group discussions and direct observations. Harvard Analytic framework is used in this study as it highlights the gendered division of labour at the household or community level (Okali, 2012). It assists in identifying the activities of men and women in fisheries and their dependency towards similar assets (Harrison, 2000).

In the following sub sections, we describe the legal clearance for the study, data collection method and data analysis.

Legal clearance for conducting the study: Accounting the vulnerable nature of tribes, Government of India has taken protective measures to safeguard them. To visit tribal settlements or to perform activities in tribal areas special consent from concerned authorities is mandatory. As a part of this study, the lead author applied for permission to the Directorate, Scheduled Tribe Development Board, Trivandrum, Kerala, the central administration of ST's in the state. The sanction order received from the Directorate was then directed to the regional Tribal office at Chalakudy, Thrisur district, Kerala as the study area is under its purview. A Memorandum of Understanding (MoU) was signed between the lead author and the Tribal Development Officer, Chalakudy on the agreement that the study will not distract the lives of tribes, influence their culture and habitual life and will follow the government protocols. Similarly, permission from the forest department was also mandatory since the study area is a forest area. The permission was received from

Divisional Forest Officer, Vazhachal Forest Division, Thrissur. The protocol refrain outsiders from staying at tribal settlements. The visiting time to tribal areas was reserved as 10 am to 5pm. From each settlement a member of the community was authorised as the facilitator. The time of our entry and exit to tribal areas must be recorded in the log book at range office.

Data collection: The details regarding the tribal settlements were collected from Chalakudy Divisional Forest Office, Kerala. Field trips were conducted to familiarize the study area. A pre tested semi structured questionnaire was formulated based on pilot study. A household survey of 154 tribal people selected through random sampling was performed. Questions in the survey focussed on fishing frequency, gears operated, mode of fishing and fish resource utilisation. These data gave insights on the similarities and differences in fishing activities between men and women. This was followed by focus group discussions with 5-7 members. Different participatory rural appraisal (PRA) tools were used to describe their fisheries such as transect walks, which are the observatory walks to understand the nature and composition of settlement and identify the resources and resource map to describe the nature of fishing grounds. They also demonstrated the mechanism of gear operations, their indigenous methods of fishing by plates and clothes. This ensured the active participation of the respondents. Verbal communication was promoted in discussion instead of written methods since the tribal communities in this study are having low literacy level. Regional language (Malayalam) was used to communicate with the respondents. The facilitator helped to translate the queries in tribal dialect. Verbal response was recorded in the structured recording sheet by the lead author.

Data Analysis: The collected data were analysed using Statistical Package for the Social Sciences (SPSS) version 23. The fishing nature, fishing mode, fishing frequency between men and women were represented in simple descriptive statistics. Chi square test of independence or Pearson's Chi square test was carried out to statistically analyse the interdependence of the variables. This was followed by a strength statistic, Cramer's V. This is one of the most useful statistics applicable for nominal data and $p < 0.05$ was considered as the level of significance. The categorical variables analysed through chi square test includes fishing pattern between men and women; participation of women among two communities in bait collection, accompanying men for fishing, sorting of fishes, fish processing and net mending. Garrett Ranking analysis was done to identify the preferences in catch utilisation and the most preferred gear between men and women. In this method the respondents are advised to rank the variables. The assigned rank is converted to score value by the following formula:

Percent position= $100(R_{ij}- 0.5)/ N_j$ where:

$R_{ij=}$ Rank assigned for the i^{th} variable by j^{th} respondents

Nj= Number of variable ranked by j^{th} respondents

The percent position calculated was then converted into scores by comparing with Garrette's table. For each factor, the scores of each respondent are added and then total score and average score was estimated. The variable with high average score signifies the most preferred factor.

RESULTS

Characteristics of the settlements: Sex disaggregated data of 154 respondents shows 102 (66.20%) males and 52 (33.80%) females were engaged in fishing (Table 1). In this, women in the age group of 26-35 years (34.6%) and men with above 45 years (33.3%) predominated. Educational status shows majority of women were illiterate (63.5%) while 44.1% men were literate with primary education.

Table 1. Characteristics of the settlements

Settlements	Range	Community	Number of household	Number of respondents	Gender	
					Male	Female
Malakkapara		Kadar	47	17	12	5
Sholayar	Sholayar	Kadar	20	12	8	4
Aanakkayam		Kadar	17	16	10	6
Thavalakuzhipara		Malayar	43	16	11	5
Vachumaram	Kollathirumedu	Malayar	11	9	2	7
		Kadar	42	18	10	8
Perungalkuthu	Vazhachal	Kadar	28	23	19	4
Pokalappara		Kadar	25	21	12	9
Vazhachal	Charpa	Kadar	67	22	18	4
Total			300	154	102	52

Fishing pattern of Tribal fishers: To know the fishing pattern among men and women it was categorised as casual, full time, part time and seasonal (Table 2). Descriptive statistics shows that a greater number of women preferred fishing as casual activity (75%) while most men preferred it as part time (52%) or seasonal activity 36.3%). Significant variation was recorded in fishing pattern between men and women (χ^2 = 90.40, df= 3, p= 0.00).

Gears used by tribal fishers: Multiple gears were operated by the tribal people for fishing. Depending on its operation fishing method was categorised as active or passive. Active mode represents the gears that can be moved or dragged like hooks and lines while passive gears represent those that are placed stable for a fixed period before retrieval like gill nets. Majority of women (25.32%) opted active mode of fishing while majority of men

(29.22%) preferred both active and passive mode of fishing. In total 35.06% of tribal fishers preferred both the categories. Garette ranking analysis was done to identify the most preferred gear among these individuals.

Table 2. Fishing pattern between men and women

Fishing	Gender		Cramer's V	*p*
	Women	Men		
Casual	39 (75%)	4 (3.9%)		
Full time	3 (5.8%)	8 (7.8%)	0.766	0.00
Part time	10 (19.2%)	53 (52%)		
Seasonal	0(0.0%)	37 (36.3%)		

Of the various gears operated (Table 3) gill net was the most preferred gear among tribal fishers (highest mean score of 71.94). Second most preferred gear was lines and hooks (mean score 62.87). Gears categorised as others indicate miscellaneous activities including fishing by indigenous methods. A commonly practised indigenous method among the communities was fishing using plate and cloth. In this a cloth with a small hole at the centre is wrapped on a plate and placed in shallow water with baits (small balls of rice and coconut oil mixture) in it. Small fishes enter the plate through the holes for feeding. Once the fishes aggregate in the plate, it is drifted for collecting the fish. The fishes caught by this means were either used as fish bait or for household consumption.

Table 3. Garette ranking analysis on the preference of gear

Gears	Rank					Total score	Average score	Rank
	1	2	3	4	5			
Line and Hook	11	42	1	0	0	3395	62.87	2
Gill net	43	11	0	0	0	3885	71.94	1
Cast net	0	1	5	48	0	2230	41.29	4
Trap	0	0	0	0	54	1296	24	5
Others	0	0	48	6	0	2640	48.88	3

Utilisation of fish resource by men and women: Garette ranking analysis was performed to systematically record the resource utilisation by men and women. There are differences and similarities between them (Table 4 & 5). Majority of men drew their catch primarily for commercialization while women for household consumption. It is important to note that this aspect is gendered as fishing activity of men has strongly supported in income generation while the catch of women favoured food security of the household (mean score- 74.84). The factors such as place of fishing, gears used and time of fishing

have an influence on the catch size. Women usually preferred fishing in the places adjacent to their houses or in shallow waters in morning hours with hooks and lines. Once they receive the catch of considerable size for consumption, the activity is reduced to a halt. On the contrary, men explore distant places for fishing. Since the major gear used by them is gill net and it needs to be kept undisturbed for a fixed period before retrieval, it is usually operated during evening. Nets are hauled early morning; fishes are separated from nets and sold at cooperative societies.

Table 4. Garette ranking analysis on fish resource utilisation by tribal women

Purpose	Rank						Total score	Average score	Rank
	1	2	3	4	5	6			
Food	44	8	0	0	0	0	3892	74.84	1
Medicine	0	2	39	11	0	0	2738	52.65	3
As aquarium fishes	0	0	0	0	52	0	1924	37	5
To suppliers or exporters of ornamental fishes	0	0	0	0	0	52	1196	23	6
To cooperative society	8	36	7	1	0	0	3308	63.6	2
Rituals	0	6	6	40	0	0	2542	48.88	4

Table 5. Garette ranking analysis on fish resource utilisation by tribal men

Purpose	Rank						Total score	Average score	Rank
	1	2	3	4	5	6			
Food	41	61	0	0	0	0	7000	68.62	2
Medicine	0	0	85	17	0	0	5372	52.66	3
As aquarium fishes	0	0	0	0	102	0	3774	37	5
To suppliers or exporters of ornamental fishes	0	0	0	0	0	102	2346	23	6
To cooperative society	61	40	1	0	0	0	7271	71.28	1
Rituals	0	1	12	89	0	0	4805	47.10	4

Cooperative societies mentioned in the study are the institutions functioning with the participation of tribal people who manage a business and the benefits are distributed based on use and ownership. In the study settlements fishers sold their catch to society with a minimum fixed price (150 INR/Kg). Societies support the tribal people by providing the services of marketing the fishes as well as social security. Outsiders, mainly hotel owners participate in the auction and the secretary in charge of the society maintains the log book of sale on a daily basis. The particulars such as date of sale, name of customer,

weight of fish in kilogram and the rate of fishes sold are recorded. Fig. 1 shows the channel of supply of fishes caught by tribes.

In addition to household consumption and sales, fishes were also utilised for miscellaneous activities such as medicinal purposes and customary purposes. This scored third and fourth rank respectively in garette ranking. The study noted that selective fish species were used for medicinal purposes. *Anguilla bicolour* is one among the preferred species with medicinal value and particularly valuable to treat asthma. The study also recorded an important finding that despite the river being known for the presence of indigenous ornamental fishes reported from the state, none of the respondents' used the fishes for aquarium purpose or supplied the catch to exporters/suppliers of ornamental fishes.

Participation of indigenous women in small scale fisheries: Determining the ways women support men in fishing gives us a clear understanding on their level of participation in small scale fisheries. Five variables were listed to compare women's activities in different stages of the value chain (pre harvest, harvest and post-harvest) in communities and their active involvement with men (Table 6).

Table 6. Chi square test on participation of women in small scale fishing value chain

Variables	Response	Kadars	Malayars	Cramer's V	*P*	X^2 value
Accompany in fishing	Yes	59 (45.73%)	17(68%)	0.164	0.042	4.153
	No	70 (54.26%)	8(32%)			
Bait collection	Yes	48(37.20%)	16(64%)	0.200	0.013	6.189
	No	81(62.79%)	9(36%)			
Sorting of fishes	Yes	56(43.41%)	16(64%)	0.152	0.059	3.566
	No	73(56.58%)	9(36%)			
Fish Processing	Yes	21(16.27%)	11(44%)	0.252	0.002	9.776
	No	108(83.72%)	14(56%)			
Net mending	Yes	54(41.86%)	16(64%)	0.164	0.042	4.140
	No	75(58.13%)	9(36%)			

The first variable tested was women accompanying men in fishing. 68% of the respondents in Malayar community and 45.73% of the respondents in Kadar community were of the opinion that women accompanied men in fishing. As majority of men go far off places from their settlements, they use canoes for fishing expeditions. Since river streams intensely, especially during monsoon season, balancing the canoes is a tough task. In such instances women's participation has supported them in paddling and balancing the canoes.

Women also helped in operating the gears. Since most men preferred gill net, its efficient operation requires assistance. Women performed this function by knotting the gear in suitable places and dragging nets. Chi square results shows women's participation in this sector to be significant (χ^2 =4.153, p= 0.042).

The second factor considered was the involvement of women in bait collection. A major proportion of women (64%) from Malayar community and 37.20% of women from Kadar community showed their presence in bait collection. Fishing in shallow waters by scooping or by indigenous method is a common practise observed among women in the settlements. Since bait collection is an important pre harvesting activity in fishing, the effort of women in this activity has reduced the time spent by men in bait collection. Chi square analysis confirms this view as there is a significant effect (χ^2 =6.189, p= 0.013) observed in the presence of women in supporting men by bait collection in two communities.

The third factor considered was women's participation in fish sorting. 43.41% of women in Kadar community and 64% of women in Malayar community were involved in this activity. No significant relation was present on the role of women in sorting the fishes between the communities (χ^2 = 3.566, p= 0.059). This could be because that once the gears are knotted at selected fishing sites it is hauled after specific time interval, mostly at dawn. Women are not usually accompanied for performing this task. Fishes are sorted from nets by men and taken for marketing. Thus, the role of women is insignificant in this process.

Fourth variable considered was women's role in fish processing, a post harvesting method in fisheries. Fish processing was not commonly observed among tribes. However, from the participants who practised fish processing it was noted that compared to Kadar community higher proportion was observed among Malayar community (44%). A significant association was found on the presence of women in fish processing between the communities (χ^2= 9.776, p= 0.002). An open-ended query followed to understand the ways in which fishes were processed. Salt drying was the common method noted among the interviewees where fishes were cleaned and sun dried on rocks by applying salt. Another method followed was drying with turmeric powder and salt. Apart from this smoking was also practised for processing. Dried fishes fetched higher amount than the fresh products. However least preference was given to commercialize processed fish due to the time consumption and effort required to perform this task. It was usually used for family consumption and seldom sold in markets.

Fifth factor was on the role of women in net mending. 41.86% interviewees of Kadars and 64% interviewees of Malayars indicated women participated in mending nets. Their presence in this activity was significant (χ^2= 4.140, p= 0.042). This helped the communities to lower the expenditure in buying and repairing nets.

DISCUSSION

Livelihood diversification is a common phenomenon in indigenous people as it supports and sustains their life (Kalafatic, 2004). The indigenous communities (ST's) in this study show a similar pattern where they are involved in multiple livelihoods including small scale fisheries. The geographic distribution and the ecosystem values influence them to depend on the natural resource-based activities. The river flowing nearby the settlements is advantageous to the communities to practise fishing. The result shows that men and women in indigenous communities participate in small scale fisheries. The difference observed in their fishing pattern can be attributed to the diverse livelihood opportunities available to them and the physical characteristics of the river. Fish resource availability depends on the seasonal variations. During summer the water level in the river may decline or dries up (Bachan, 2003), so fish resources become scare. Accordingly, they divert to other livelihood strategies. This signifies how the dependence on ecosystem services varies with the seasonal changes (Geheb and Binns, 2001). Various other studies have recorded diversification adding to livelihood security, especially in rural communities (Ellis, 2000; Kalafatic, 2004) and non-timber products playing a substantial role in the livelihood of indigenous groups; especially for women (Neumann and Hirsch, 2000; Shillington, 2002).

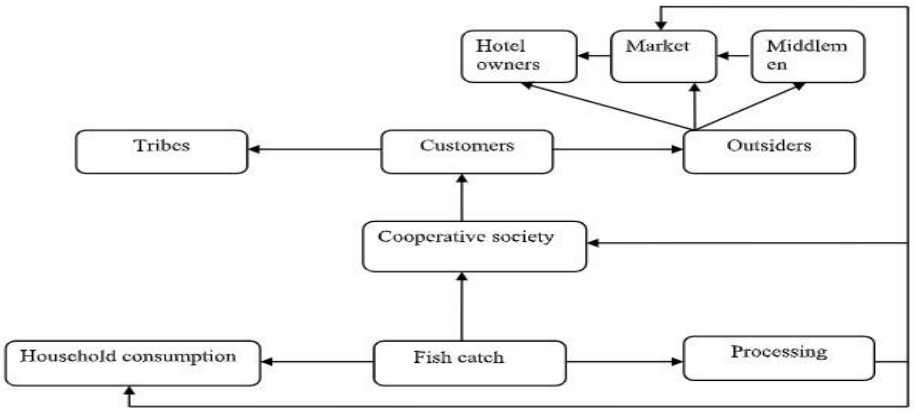

Fig. 1. Channel of distribution of fish caught by tribal fishers.

The main stimulus to the indigenous communities for fishing is meeting their nutritional and economic demand. This is in agreement with the findings of Dinesh et al., 2010 and Raghavan et al. 2011 that the tribes in Kerala show their dependence on freshwater fishes for livelihood and nutrition. The fishes caught by them passes through different channels as in fig. 1. The economic needs of the communities are achieved through commercialising the catch while nutritional demand is met through household consumption. Commercialisation of catch is mainly carried out via cooperative societies

that functions within the forest division. It is graded as local self-government where the duties are entrusted to the tribal people. It guarantees a platform for marketing their products and save the time and capital for marketing their product to far-away places. The financial returns to the fishers are assured through marketing. This also guarantees employment opportunities and food security (Dubey et al. 2009; Sahoo et al. 2020) to the communities.

The difference in resource use pattern observed between men and women signifies it is gendered. This may be due to the variation in catch per effort between them. This in turn is influenced by various other factors such as the gears used for fishing and place of fishing. From the multiple gears operated by tribal fishers, the most preferred gear among men being gill net and hooks and lines among women can be attributed to the diversity in the space used by them and the nature of the river. Men usually go to distant places for fishing while women fish in shallow waters nearby to their settlements. The river has strong bedrock surface with deep crevices and pool and many rapids and falls, well known being the Athirappilly falls (Biju et al. 2000) which hinder other gears to operate. In the case of women, they show a divergence from men due to their household responsibilities. They are engaged in fisheries either to support household or as a leisure activity with children or their community members. They move either individually or in groups to spend their time in evening nearby their settlements. As they consider it as recreational, active mode of fishing using hooks and lines are preferred. They consider it as an opportunity for social bonding which is one of the important factors that determine the value of life (Camfield et al. 2009). This validates the view that subsistence fishing is a common practise among the rural inhabitants who have access to water bodies (Hoggarth et al. 1999; Hossain, 2001). At certain circumstances women play the role beyond subsistence. It is evident from the supply of their excess catch to cooperative society thereby meeting the need of additional income in their household.

It is interesting to note that among the fishes caught, selective fish species are used for medicinal purposes. *Anguilla bicolour* is one among the preferred species with medicinal value. It is particularly valuable to treat asthma and these communities have traditional way of preparing medicine. This may be due to the presence of vitamins such as A, C, D, B1, B2 and B6, fatty acids like Eicosapentaenoic acid and Docosahexaenoic acid and other minerals that this species is considered as medicinal value (Roos et al. 2007; Hakim et al. 2016). It is also important to note that fishes caught are not used for aquarium purpose. However, literature shows that this river is having ornamental potential fishes with wide acceptance in export consignments (Raghavan et al. 2008).

There is a general concept that due to the prevailing household responsibilities and the differential influencing factors, women's role is concentrated mainly on the pre and post-harvest sector (World Fish Center, 2010; FAO, 2013; Szymkowiak and Rhodes-Reese,

2020). In most countries there is a lapse in tracking their actual contribution or categorising them as assistant to men. Due to these women are still marginalised, their contributions are undervalued in fisheries and quoted as invisible (Zhao et al. 2013; Pettersen, 2018; Salmi and Sonck-Rautio, 2018). Close examination of the functionalities of this sector reveals indigenous women's role in fisheries is substantial than generally hypothesized. They have direct as well as indirect contribution in fisheries that is revealed by the sex disaggregated data in this study. Women in the communities show direct participation in fishing expeditions with men. Cultural norms that restrict women in exploring the space for fishing (De la Torre-Castro et al. 2017; Frangoudes and Gerrard, 2019) are not observed among these groups; rather their participation is highly appreciated. The presence of women has contributed in paddling the canoes, knotting the gears and other assistance to men. A similar finding is seen in Lao PDR's Nam Ngum Reservoir where women accompany men for fishing in mechanized boats. While men concentrate on diving, women take part in controlling the boats, dragging nets and collecting fishes. (Viravongsa, 2000).

The study also confirms women's participation in pre harvesting activities such as bait collection and net mending. The tribal fishers preferably use small fishes as fish bait. They collect these fishes either by scooping or by indigenous methods (plates and rice bowls), especially by women. This resembles the gleaning activities of women in coastal areas (World Fish Centre, 2010). Gleaning, the process of collecting marine organisms in coastal areas by rural people is an important livelihood activity and moreover a group activity among women (Grantham et al. 2020). There are economic as well as social perspectives in women participating in gleaning. In the case of women, they may have limited economic source to own the gears for fishing or limited access to space which draws them in gleaning in near shore (Kleiber et al. 2013) or else due to the importance given to the social values (Grantham et al. 2020). Similarly, the women in the tribal communities preferably follow indigenous method of fishing. It is advantageous for them as they do not need to invest much amount in buying the gears. Also, this method requires a time interval for fish aggregation where the plates are kept idle in shallow waters. This time can be efficiently used to perform household activities like cooking or care giving to their children or elder ones. This signifies the social commitments of indigenous women in tribal setting. A major share of this collection is used as fish bait by men. This effort of women has contributed significantly in reducing the time spent in bait collection by men. This in turn helped them to utilise more time in fishing.

The indigenous women show their prevalence in mending nets as well. They efficiently perform this activity as per the requirement or repairing the damaged nets. Through this activity the chances of procuring new nets is reduced and reusing the product becomes possible. Women's participation in this sector is reported in other studies as well

(Mercier, 2001; Lukanga, 2018; Szymkowiak, 2020). These activities need to be valued as it supports the spouse and the family wellbeing.

Women in processing sector are a common practice in developing countries (Ahmed et al. 1999; Kolawole et al. 2010). Indigenous women also show their presence in the post harvesting sector. But contrary to the statement that processing sector is stamped to be a women dominant activity and men in the commercialization of catches this study result shows that men also participate in fish processing. They consider it as a family activity where they perform these activities irrespective of gender. This indicates the social nature exhibited by the indigenous communities. An array of methods is used for processing such as salt drying, sun drying, and smoking and using turmeric powder. Many other factors also influence the variation in processing methods such as the preference of the consumers, labour and the tolerance required for the process (Medard et al. 2002). An advantage of processed food being that it can be preserved and used at a later stage, the nutritional security of the communities is ensured by this activity. Processed fishes are seldom sold in markets. Higher prices are received for processed fishes on marketing than fresh fishes. But tribal people refrain from these activities due to time and effort required for performing this task.

As conclusion and implications the findings highlight that indigenous woman are equally efficient as that of men in tribal social setting including household management, food and nutritional security and even the economic security. Participation of women in fishing has contributed in household subsistence and supporting men at various levels of fishing value chain. This indicates women exhibit unique as well as complementary roles in fishing activities. Considering their central role in fisheries, the opinion of women in fisheries needs to be valued and adopted as the variables for fisheries management decision making process. Policy makers can consider these evidences to develop gender action plan and strategies for sustainability in fisheries. The study also highlight that the indigenous communities are unaware of the ornamental value of fishes caught by them and their demand in aquarium purpose. This is a research gap. This can be filled by creating awareness on the importance of ornamental fishes in the aquarium industry and capacity building on sustainable collection of live fishes.

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