

Opportunities of community capacity building on ornamental fisheries in India

Oportunidades de desarrollo de capacidades comunitarias en la pesca ornamental en la India

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ABSTRACT

The focus of this article is to evaluate the determinants where capacity building on ornamental fisheries would be of benefit for the resource users. It is argued that self-awareness on the potential of the resources available (ornamental value of fishes, demand in national and international trade, harvest and post-harvest techniques) and the interest to perform ornamental fisheries (ornamental fish collection, Live fish keeping, Feeding, Acclimatization, Packing and Disease Management) is associated with self-determined motivation. The responses of a sample of Indigenous communities or Scheduled Tribes (N= 154) of two clans (Kadars and Malayars) associated with fisheries in Vazhachal forest division in Kerala, South India are examined. The tribes are asked about their awareness on the ornamental value of fishes caught by them from the river Chalakkudy, their interest to attend trainings on ornamental fisheries and interests to institute ornamental fish farming. The results show that there is no significant difference among two communities on awareness level regarding ornamental fisheries (Mann Whitney U test; $p > 0.05$). Community wise test statistics (Mann Whitney U test) on training shows that there is no significant difference in interest level among Kadars and Malayars to attend the training ($p > 0.05$). While gender wise analysis reveals that there is a significant difference between men and women in attending training on collection of live ornamental fishes ($p < 0.05$). Independent T test performed on interests in ornamental fish farming shows a variation in interest among two communities. The results indicate lack of awareness on the potential ornamental species and its demand in international or national markets restrains tribes to practise ornamental fisheries. Since the indigenous communities under study are distributed on the river side and the natural resources form the source to subsidize their life, utilising the resources collectively with its value-added characteristics can strengthen their economic conditions. Thus, capacity building can be the step forward to introduce these communities to ornamental fisheries.

Key words: Ornamental fisheries, Indigenous communities, Awareness, Interests, Trainings, Chalakkudy river.

RESUMEN

The focus of this article is to evaluate the determinants where capacity building on ornamental fisheries would be of benefit for the resource users. It is argued that self-awareness on the potential of the resources available (ornamental value of fishes, demand in national and international trade, harvest and post-harvest techniques) and the interest to perform ornamental fisheries (ornamental fish collection, Live fish keeping, Feeding, Acclimatization, Packing and Disease Management) is associated with self-determined motivation. The responses of a sample of Indigenous communities or Scheduled Tribes (N= 154) of two clans (Kadars and Malayars) associated with fisheries in Vazhachal forest division in Kerala, South India are examined. The tribes are asked about their awareness on the ornamental value of fishes caught by them from the river Chalakkudy, their interest to attend trainings on ornamental fisheries and interests to institute ornamental fish farming. The results show that there is no significant difference among two communities on awareness level regarding ornamental fisheries (Mann Whitney U test; $p > 0.05$). Community wise test statistics (Mann Whitney U test) on training shows that there is no significant difference in interest level among Kadars and Malayars to attend the training ($p > 0.05$). While gender wise analysis reveals that there is a significant difference between men and women in attending training on collection of live ornamental fishes ($p < 0.05$). Independent T test performed on interests in ornamental fish farming shows a variation in interest among two communities. The results indicate lack of awareness on the potential ornamental species and its demand in international or national markets restrains tribes to practise ornamental fisheries. Since the indigenous communities under study are distributed on the river side and the natural resources form the source to subsidize their life, utilising the resources collectively with its value-added characteristics can strengthen their economic conditions. Thus, capacity building can be the step forward to introduce these communities to ornamental fisheries.

Key words: Ornamental fisheries, Indigenous communities, Awareness, Interests, Trainings, Chalakkudy river.

INTRODUCTION

Aquarium industry is a promising sector at a global scale with financial importance. It is expanding markedly with variety of species being involved and encouraging new varieties to enter in trade. Since ornamental fisheries trade is a major source of foreign exchange, countries tend to be competitive in international market. Resources from marine as well as fresh water have equal demand in the market, but in different perspective. Countries such as Indonesia, Philippines depend on wild collection of marine ornamentals, while Brazil focuses on wild collection of fresh water fishes. Although captive-bred freshwater fishes make a major space in trade, a significant number of species are sourced from wild as well. Tropical rivers are a major contributor of ornamental fishes through its key ecosystem service of fisheries production (Lima et al. 2020).

The importance of ornamental fisheries can be clearly understood by viewing the recent trade statistics. Although it is difficult to quantify the exact data regarding ornamentals entering trade it is estimated that more than 2500 fish species make their presence in global trade and 60% are fresh water fishes (Dey, 2016). It is predictable to be nearly 15 billion US\$, with above 2 billion live ornamental fishes (Satam et al. 2018). As per OATA (Ornamental

Aquatic Trade Association) the trade statistics from 2010-2017 shows the major importer of ornamental fishes by value is UK. The first 5 positions in import are held by Germany, Netherlands, France and Belgium including UK. 2017 data on import of EU member countries reveals freshwater ornamental fish accounted 83.5% and marine fish accounted 16.5% by total value (OATA, 2018). Singapore forms the major sourcing country to EU. Countries such as Indonesia, Israel, Japan, Sri Lanka and Thailand also supply freshwater ornamental fishes to EU. This signifies the potential of ornamental fisheries to draw economic benefit. If managed sustainably, the trade can support the resource users with employment opportunities and generate the concept of conservation of resources.

India, although minimal, finds its niche in the international market by sourcing the products from wild. Rivers and rivulets in India mostly originate from mountain terrains and course through forest covers. They form the major sourcing centres of wild ornamental fishes (Satam et al. 2018). This indicates resources from wild are an integral part in ornamental fisheries sector. This role benefits many people, in particular, the rural communities where the chance for economic diversification is limited. It provides opportunities for resource users to function as ornamental fish collectors and a key link in the value chain.

Skill to collect live fishes and the technological acquaintances of fishers are the other aspects that are greatly needed in ornamental fisheries. Trainings play a significant role to capacitate the fishers and hence emphasize needs to be given to introduce the technical advancements for sustainable collection and post-harvest stages. In this context it is important to understand whether resource users are aware of the potential of the resources accessible to them. This facilitates to exploit the value-added features of the resources and attains a lane to draw revenue effectively.

There are different theories that describe the confidence to exert knowledge over the utilisation of resources and the social environment. Knowledge is a fundamental element as far as the economic resource is concerned (Shaari et al. 2014). It helps in the economic development (Beijerse, 1999). It is also important to share knowledge among the peer groups. Knowledge Sharing or KS is an act that ensures the idea of something is disseminated in an organisation or in an assembly. Various definitions are attributed to KS by different authors (Ryu et al. 2003, Hooff and Ridder, 2004, Christensen, 2007). Through KS, the idea or knowledge is not only disseminated but also received through discussions or interactions. This in turn develops the principle of self-awareness and self-efficacy. There is yet another factor that influences KS. It is called as self-motivation. It can induce or inhibit KS (Sondergaard, 2007) or it may affect the psychological processes in gaining knowledge by self. In this article we address the awareness level of indigenous communities in India on ornamental fisheries and their interests in ornamental fish farming by adopting the awareness theory. We argue that self-awareness on the potential of ornamental fishes and the interest to perform ornamental fisheries is associated with self-determined motivation. Sustainable fisheries can be ensured through analysing these determinants and providing capacity building.

MATERIALS AND METHODS

Study area and group: The study is conducted in one of the largest west flowing rivers in Kerala, southern India called Chalakudy river. The river supports different varieties of fishes and many among them are ornamentals. They have demand in national as well as international aquarium trade. This river originates from mountain regions of Anamalai and Nelliampathy hills and streams within the forest areas. For administrative purpose, the forest area in the state is divided into different circles and forest divisions. This study considered a part of the river stretch that comes under the jurisdiction of Vazhachal Forest Division of central circle, Thrissur; a district in Kerala. The administration activities of this division are implemented through ranges and forest stations (Kerala Forest Department, 2020). In this forest division, on the riverside, there is the distribution of indigenous communities. They are officially named as Scheduled Tribes. They belong to two different communities called Malayars and Kadars (Bachan, 2003). In this, Kadars belong to the special category known as PVTG's (Particularly Vulnerable Tribal Groups) due to their characteristic features such as declining population, subsistence level of economy and pre-agriculture level of technology. These clans are distributed as colonies in 10 different destinations (Vazhachal, Pokalappara, Perungalkuthu, Vachumaram, Thavalakuzhippara, Aanakkayam, Sholayar and Malakkapara). Based on the statistic provided by the forest division, a total of 300 households are present in the study area. From the population, 154 tribal people performing inland fisheries from Chalakkudy river are randomly selected as the study group.

Data collection and analysis: The study used thin ethnography for collecting the data. It is the systematic study among tribal groups through an extensive fieldwork in the selected locale. The survey is conducted among the selected respondents through schedule method using a semi structured questionnaire. The questionnaire is divided into three sections. The awareness of scheduled tribes in ornamental fisheries is covered in first section. The trainings received by tribes with respect to fisheries is covered in second section and their interest in ornamental fish farming is covered in third section. Five statements were framed to collect data on awareness on ornamental fisheries. Using a five-point Likert scale the statements were measured in 5 levels such as highly aware (1), aware (2), neutral (3), unaware (4) and highly unaware (5) and codes of the scale are given in parenthesis. Similarly, their interest to attend trainings on ornamental fisheries is measured using a five-point Likert scale where the code 1 signifies highly interested and 5 signify highly uninterested. The study also considered the interest of tribes in fish farming.

Data collected were analysed using appropriate test statistics in SPSS 23 (Statistical Package for Social Sciences). The questionnaire is pretested and the internal consistency or the reliability of the scale is measured using Cronbach's alpha. The alpha value greater than 0.6 and lesser than 0.9 is considered as reliable (Cronbach, 1951). Cronbach's alpha value of 0.851 is obtained for the awareness scale and 0.779 is obtained for interest in attending training. Both the values indicate high reliability of the scale.

Descriptive statistics such as frequency and percentage are used to describe the training attended by tribes in relation to fisheries. The distribution of the data was analysed and found that it is not normally distributed (skewed). Mann Whitney U test is used as test statistic for testing the research hypothesis as the data met two criteria.

Data is non normally distributed

Data is ordinal.

The interest to take up fish farming was tested using independent T test. Test statistic considered 0.05 as the level of significance (α) for the variables. Data analysis is performed with the help of SPSS (Statistical Package for Social Sciences) version 23.

RESULTS

From Table 1 it can be observed that there is no significant difference among two communities on awareness level as $p > 0.05$. When the mean rank and sum of the ranks are considered, the observed difference is in favour of Kadars. That is, compared to Malayars, Kadars have higher awareness on the ornamental value of fishes. The awareness on the market demand of fishes shows the individuals who are not aware of the demand of ornamental fishes in markets are higher among Malayars than in Kadars. Similarly, the results on awareness on stocking as live fishes, harvest methods and rearing of ornamental fishes shows mean rank higher for Malayars than Kadars which indicates awareness level was low for Malayars. This indicates Malayars are highly unaware of the sub dimensions of ornamental fisheries.

Table 1 Mann Whitney U test of awareness scale on ornamental fisheries

Variables	Community	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig.
Ornamental value	Kadar (129)	77.66	10018.00	1592.000	-.111	0.912
	Malayar (25)	76.68	1917.00			
Market demand	Kadar (129)	76.59	9879.50	1494.500	-.671	0.502
	Malayar (25)	82.22	2055.50			
Stocking as live fishes	Kadar (129)	76.72	9896.50	1511.500	-.580	0.562
	Malayar (25)	81.54	2038.50			
Harvest methods	Kadar (129)	77.04	9938.50	1553.500	-.340	0.734
	Malayar (25)	79.86	1996.50			
Rearing of fishes	Kadar (129)	77.37	9980.50	1595.500	-.098	0.922
	Malayar (25)	78.18	1954.50			

As seen in Table 2 the percent of respondents who have not attended fisheries training (61.0%) is higher than the respondents who have attended fisheries training (39.0%) among two communities. More specifically it can be stated that 31.8 % of Kadar community and 7.1% of Malayar community have attended the training on fisheries while 51.9% of Kadars and 9.1% of Malayars have not attended the training.

Table 2 Descriptive statistics on fisheries training attended by tribal communities

Community	Training		Total
	Not Attended	Attended	
Kadar	80 (51.9%)	49 (31.8%)	129 (83.8%)
Malayar	14 (9.1%)	11 (7.1%)	25 (16.2%)
Total	94 (61.0%)	60 (39.0%)	154 (100%)

The mean ranks and sum of ranks of interests to attend training on ornamental fisheries is considered. The actual significance value of the Mann Whitney U test is represented in Test statistics table (Table 3). It specifically demonstrates the p value to justify the significant difference on the parameters listed in table 3. Community wise test statistics on ornamental fisheries training shows that there is no significant difference in interest level among Kadars and Malayars to attend the training as $p > 0.05$ for all the parameters tested.

Table 3 Mann Whitney U Test of interest of tribes in attending training on ornamental fisheries

Interest in	Community	N	Mean	Sum of	Mann-Whitney U	Z	Sig
			Rank	Ranks			
Collection of live fishes	Kadar	129	76.07	9812.50	1427.500	-.939	0.348
	Malayar	25	84.90	2122.50			
Live keeping of fishes	Kadar	129	76.92	9922.50	1537.500	-.410	0.682
	Malayar	25	80.50	2012.50			
Feeding	Kadar	129	76.98	9930.00	1545.000	-.387	0.699
	Malayar	25	80.20	2005.00			
Acclimatization	Kadar	129	76.85	9913.50	1528.500	-.488	0.626
	Malayar	25	80.86	2021.50			
Packing	Kadar	129	77.34	9976.50	1591.500	-.122	0.903
	Malayar	25	78.34	1958.50			
Disease management	Kadar	129	77.43	9989.00	1604.000	-.049	0.961
	Malayar	25	77.84	1946.00			

The gender wise rank values (mean rank and sum of ranks) of the variables listed in relation to ornamental fisheries training is calculated. These were validated with Mann Whitney U test and determined the significance difference with the p value (Table 4). Test statistics results (Table 4) reveals that there is a significant difference in interest level among genders in attending the training on collection of live ornamental fishes as $p < 0.05$. However, interest level on other parameters such as to keep as live fishes, feeding, acclimatisation and packing and disease management did not show any significant difference ($p > 0.05$).

Table 4 Mann Whitney U test on Training interest on ornamental fisheries among gender

Variables					Mann-Whitney Z	Sig	
	Gender	N	Mean Rank	Sum of Ranks	U		
Collection of live fishes	Male	102	66.09	6741.00	1488.00	-4.605	0.000*
	Female	52	99.88	5194.00			
Live keeping	Male	102	77.02	7856.00	2603.00	-.209	0.835
	Female	52	78.44	4079.00			
Feeding	Male	102	78.79	8036.50	2520.50	-.588	0.557
	Female	52	74.97	3898.50			
Acclimatization	Male	102	79.24	8082.50	2474.50	-.804	0.422
	Female	52	74.09	3852.50			
Packing	Male	102	79.29	8087.50	2469.50	-.830	0.407
	Female	52	73.99	3847.50			
Disease management	Male	102	79.52	8111.00	2446.00	-.933	0.351
	Female	52	73.54	3824.00			

* Significant- $p < 0.05$

In the group statistics (Table 5) the mean value on interest to take up ornamental fish farming by Kadars is 3.58 and that of Malayars is 4.20. This shows the magnitude of difference between two groups. The higher mean value for Malayars indicates they are highly uninterested than compared to Kadars.

Table 5. T Test on interest in ornamental fish farming among communities

Interests in fish farming		Statistic	Bootstrap			
			Bias	Std. Error	95% Confidence Interval	
					Lower	Upper
Kadar	N	129				
	Mean	3.58	.00	.11	3.36	3.79
	Std. Deviation	1.254	-.006	.078	1.075	1.392
	Std. Error Mean	.110				
Malayar	N	25				
	Mean	4.20	.01	.16	3.88	4.52
	Std. Deviation	.816	-.039	.168	.470	1.095
	Std. Error Mean	.163				

Independent T test (Table 6) is performed to validate the significant difference on interests to take up ornamental fish farming between Kadars and Malayars. Levene's test for equality of variances, which determines the two communities have about same or different amounts of variability between scores shows sig. value of 0.02 which is less than 0.05. This indicates the variability in Kadars and Malayars are not the same. That is, the variability is significantly different.

Table 6 Independent sample test on interest in ornamental fish farming

Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Farming	Equal variances assumed	6.400	.012	-2.367	152	.019	-.619	.261
	Equal variances not assumed			-3.138	49.05	.003	-.619	.197

t test shows if the mean of the two groups were statistically different. From the Sig (2 tailed) value (0.019) it is clear that there is a statistically significant difference between the mean value of interest on ornamental fish farming for Kadars and Malayars. Since in the group statistics the mean for Malayars was greater than Kadars it can be concluded that Malayars are highly uninterested to take up ornamental fish farming than Kadars.

DISCUSSION

Natural resources form the primary element for rural population to meet their subsistence. For the riverine communities it ensures food security as well. This is apparent in tribal communities in India where a major proportion inhabit in forest areas in isolation from the mainstream community. For the tribes of Vazhachal forest division, fisheries and other non-agricultural activities like forestry and non-timber product collection are the main activities to meet their needs. Their distribution within the forest area along the river and lack of accessibility to urban regions for job opportunities impart their primary interest to these activities. While there are records on presence of edible as well as ornamental fishes in Chalakkudy river (Ajithkumar et al. 1999; Biju et al. 2000; Raghavan et al. 2008) and species preferred in export portfolio, the awareness of tribes on ornamental species in the river system is negligible. This is confirmed by the inferential statistics ($p > 0.05$) that no significant difference is found among Kadars and Malayars on ornamental fisheries awareness. This reveals that they have not exploited the ornamental perspective of these resources and received benefit from it. To add this, similar results achieved for the parameters tested such

as market demand of the fishes, harvest and post-harvest techniques and rearing of ornamental fishes validates their unawareness on ornamental fishes and its technological aspects. Awareness can be built through environmental education. It develops a sense of guardianship as well as brings behavioural change (Aydın and Kaya 2011) among communities. Considering the importance of ornamental fisheries and availability of ornamental fishes in their regions, adopting ornamental fishing and trading can anticipate a secure livelihood for tribes with continuous source of income. For this creating awareness among tribal communities is very essential.

In view of the importance given to the physical features of ornamental fishes in aquarium industry, technical skill to handle ornamental fisheries is fundamental. Technologies are available at every stage of the value chain, beginning from its collection, acclimatisation, disease management and other post-harvest methods. As the tribes of study regions do not carry out ornamental fisheries, they are not skilled to exercise the harvest or post-harvest methods of these fisheries. They need to be trained to equip with these technologies. Conducting trainings on ornamental fisheries, its harvest and post-harvest methods can make the participants understandable of the actions and guide to be skilled. Trainings thus function as a channel to empower the community. This is evident from the study areas where tribes are skilled in mending nets through training. At present most of the members in the settlements perform the activity of mending nets or repairing the damaged nets by themselves as per their requirements. This has facilitated them to reduce the capital cost for fishing gears as well as to be self-reliant. The study noted that except the tribes in Pokalapara settlement, none of the tribal people in study regions have attended training related to ornamental fisheries. Training conducted by the state government in the past had created a positive impact on the activities of tribal communities. Similarly, if they are trained on sustainable fish collection and activities related to ornamental fisheries, they would be able to perform these activities and take up as a livelihood. To impart training systematically and develop competence and stability in the society (Goswami, 2011) identifying the beneficiaries is a prerequisite. It can be identified by analysing the interest of the populace to attend the programme. This indicates measuring the interest levels is a sensible tool in development programmes. In this study a preponderance of positive response towards training among Kadars and Malayars shows members of both the communities are interested in attending training. This signifies their interest to receive knowledge on fishing technologies. Analysing the interest level of each parameter specifically can be advantageous since it gives accurate statistics at individual level and increases the chances to identify the individuals having interests in specific areas. Accordingly, training can be imparted to expertise them in that particular area. This in turn facilitate to create clusters of trainees who are proficient in each task and thus individual or community level ornamental fisheries units can be developed. From the analysis, significant difference is not recorded on interest to attend training related to fish collection, to keep as live fishes, acclimatisation, packing as well as disease management among Kadars and Malayars. This indicates both the communities have similar interests and training can be conducted devoid of community-based categorisation. Conversely, gender wise analysis found that there is significant difference among males and females on interest in receiving training on ornamental fish collection. A greater interest exhibited by males on this activity can be attributed to the frequency of their fishing activities than females. Except this, other parameters showed

similar results indicating that there is no significant difference to receive training at gender level as well. Thus, training objectives can be set based on these findings and empower the tribes to perform ornamental fisheries. Scheduling the training based on the convenience of the trainees can draw maximum participation. Attention needs to be given to meet training objectives to benefit the trainees' maximum (Ogunremi, 2016).

Considering the interest of tribes to take up ornamental fish farming is other decisive factor linked with ornamental fisheries. Major proportion of the tribes is not interested to take up fish farming. The rationale to express this response is due to the different constraints faced by them in their settings. In discussion with tribes the study noted that in Malakkapara settlement the tribes face severe water scarcity during summer season. This is a major constrain to maintain fish farms. They pointed out that if the authorities can come up with a resolution for this constrain, they are interested to perform the activity. The concern of the tribes of Aanakayam settlement is different. The effect of two consecutive deluges in the study areas in 2018 and 2019 has shifted them to temporary settlements. Uncertainty exists on re shifting of these tribes to their permanent settlements. The current place of stay is not compatible to carry out fish farming. In the case of tribes at Vachumaram settlement, they expressed lack of facility as well as space as constraints to carry out ornamental fish farming. The terrain of Perungalkuth retrieves the tribes of this region from fish farming while Tribes of Vazhachal settlement considers lack of time as their constraints. These are important issues that need to be tackled with prior considerations and draw maximum participation of tribal people into this activity.

As conclusion, despite the presence of ornamental fishes in Chalakudy river, the tribes do not take advantage of these fishes available in their settings. Lack of awareness on the potential species and its demand in international or national markets restrain tribes to practise ornamental fisheries. Given that the natural resources form the source to subsidize tribal life, utilising the resources collectively with its value-added characteristics can strengthen their economic conditions. As a preparatory stage, creating awareness among tribes on ornamental fisheries and its prospects is necessary. The tribes need to be skilled to handle and keep ornamental fishes in live conditions. Though a major section of both the communities have received training on net mending and fisheries in general, they lack skills on harvest and post-harvest methods of ornamental fisheries. Conducting trainings and capacity building on sustainable catch, aquarium keeping, rearing of fishes and disease management can be an effective strategy to equip them to adapt and thrive in this area. The statistics on interest to attend training reveals the scope to conduct training and its acceptance among tribes. Once they are skilled on sustainable collection and handling ornamental fishes, it would infuse a sense of ownership among tribes, which in turn tunes them to manage their resources by themselves.

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