

FACTORS AFFECTING USERS' PERCEPTION TOWARDS CONSERVATION OF BIODIVERSITY IN MATANG MANGROVE FOREST RESERVE (MMFR), PERAK, MALAYSIA

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ABSTRACT

MMFR has been recognized as one of the best managed mangrove forest in the world. However, MMFR areas tend to be converted to other land uses such as industrial development, ecotourism areas, shrimp farming, aquaculture, housing area, and agriculture. Identifying the factors that affect the users' perception towards biodiversity conservation may provide beneficial information to stakeholders including policy makers, users and MMFR authorities. This paper aims to explore the dimension of users' perception towards conservation of biodiversity in MMFR. Face-to-face interviews were conducted among fishermen around MMFR and visitors to Matang Mangrove Eco-Education Centre. A factor structure comprised of ten factors within few perceptual dimension was derived. Method that has been used to explore the dimensions is the exploratory factor analysis (EFA). Findings revealed that the perception can be divided into two, among perceptual dimensions, sustainable ecosystem services appeared as the strongest perception followed by biodiversity of flora and fauna. The finding of this study is essential for MMFR management to formulate the appropriate and relevant policy for the MMFR authorities and users to attain long term benefits.

Keywords: Perception; Biodiversity Conservation; Matang Mangrove Forest Reserve; EFA.

1. INTRODUCTION

Perception may influenced by two essential steps of elements for response and recognition towards the stimulus and elements of sensory experience. These beliefs and perceptions are influenced by judgments, prior experience, knowledge and the education and information efforts by policy makers (Kneeshaw et al., 2004; Siow, Ramachandran, Shuib, Afandi & Herman (2013). According to Gifford (2007), physical characteristics of the environment, characteristics of people and social organization

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and norms are three dimensions that may affect or alter the environment perception. Many of the previous studies revealed the perception of the biodiversity conservation are adapted from those three dimensions.

Evenson et al. (2006) mentioned that the multidimensionality of individual characteristics are influenced by expectation, motive, interest, attitude and other external variables for the fundamental environmental perception framework. Besides, the role played by organizational and social norms also may not be disregard (Gifford, 2007).

The destruction of mangrove forest widespread attention lately caused worries by the community. These concerns would result in building concerns and perceptions among community in taking care of their mangrove forest that essentially give them a lot of direct and indirect benefits. Bad consequent will occurs toward future consumption and utilization of natural resources if the natural resources being misbehave exploit (Rahim et al., 2012).

Mangrove forest is intertidal forest of tropical and sub-tropical coastal areas that consist variety of ecosystem services that may yield economic returns from harvested renewable-resources, such as poles production, charcoal production, agriculture, aquaculture, eco-tourism, or recreation benefits. In addition, it can also be the subject of education and researches, wildlife habitat, coastal protection, carbon storage and natural production of fish stocks (Roslan & Nik Mohd Shah, 2014). Asian mangrove area itself help to slow down the global warming process through atmospheric carbon storage.

MMFR located at the border of Straits of Malacca and looks like a crescent moon shape. The MMFR has been sustainably managed for wood production. Since 1902, MMFR has become forest reserve with 19 forest reserves gazette in three ranges of Kuala Trong, Kuala Sepetang and Sungai Sepetang. In Matang, working plan or management have been revised and implement. The 10-year plans provide particular descriptions of resource and schedule for harvesting, regulation of yield, silvicultural operations, protection and conservation. MMFR have been managed sustainably based on five working plans since Malaysia's Independence in 1957 (Dixon, 1959; Mohd Darus, 1969; Haron, 1981; Gan, 1995; Azahar & Nik Mohd Shah, 2003). The sixth since 1957 represent for 2010-2019 working plan.

Recently, MMFR have been promoted for nature education and ecotourism purposes. The uniqueness of MMFR and its success story of its management have attracted the attention of naturalists, mass media and researchers local and abroad. Therefore, MMFR have been reported as one of the best managed mangroves in the world.

According to Roslan & Nik Mohd Shah (2014), mangrove forest ecosystems form productive and complex marine habitats for many marine life. There are 163 species of fish, 37 species of shrimps and prawns and 45 species of crabs have been identified and recorded in Sixth Revision of Working Plan. Recent studies revealed that the conservation of sufficiently large areas of mangroves may be important to some marine fishes especially juveniles of the mangrove snapper (*Lutjanus johnii*) which depend on the various food organisms that are found near to mangrove vegetation flanking their long migration path (more than 15 km) into the estuary (Ogawa, 2003; Tanaka et al., 2011).

Another study on fish larval populations in Matang showed that of the 54 families of recorded fishers, only 17 families had larvae found in the mangrove estuaries, while the rest entered as young juveniles (Ooi & Chong, 2011).

Silvicultural practices in the MMFR, establishment of new stands face two challenges and regeneration are probably not prevalent in natural mangrove forests which caused deep flooding on expose areas and areas that are prone to monkeys and crabs (Azahar and Nik Mohd. Shah, 2003; Cannicci et al., 2008; Abdul Aziz, 2015).

In spite of understanding mangroves functions, their destruction still continues. The mangroves loss might be attributed to information failure ascribed to a lack of awareness among users about the value of conserving mangrove ecosystem (Badola et al., 2012). Thus, a study attempted to identify dimensions or factors that are related to biodiversity conservation perception of users especially in MMFR area.

2. LITERATURE REVIEW

Tsunamis, cyclones and coastal storm have caused loss of many properties and lives which tend to make the study that correlate with the protection function of mangroves been further highlighted (Badola and Hussain, 2005; Kathiresan and Rajendran, 2005; Walters et al., 2008; Das and Vincent, 2009; Barbier et al., 2011)

Unsustainable exploitation of natural resources on earth continuously occurs due to the growing population of human being and also the increasing of consumption per capita (Rands et al., 2010). Chong (2007) & Rahim et al. (2014) reported that the quantity and quality of water in Tasek Bera facing destruction and deterioration condition. Biodiversity of Tasek Bera wetland has been threatened by human activities such as logging operations, shifting cultivation, destruction of watersheds and erosion (Norma-Rashid et al., 2001). In spite of human activities, direct human interventions also contribute to the destruction of this valuable ecosystem. Excessive forestry exploitation, conversion of forest to rural settlements and agricultural land lead to wetland habitat lost (Rahim et al., 2012). The community also should support organizations working to protect marine conservation (Prabhakaran, Nair & Ramachandran, 2016). Many institutes and organizations are fighting to protect ocean habitats and marine wildlife. Stakeholders could consider providing financial support and/or volunteering in support of local conservation efforts. Local people should be encouraged to join with other stakeholders and get involved in the conservation effort, and locals should also seek to influence change in their community (Maddison, 2001). Local community who are impacted from the management could play significant role in decision-making process (Nair, Ramachandran, Shuib, Syamsul & Nair, 2012).

Therefore, an urgent imperative to understand the impact of environmental changing patterns and drivers of resource use for biodiversity conservation, developing human society, ecological, environment and social policies that responds appropriately (Varma et al. 2015). Acknowledge community's perception on degradation of environmental issues are very important in order to conserve the biodiversity of mangrove area.

According to Badola et al. (2012), 336 villages from Bhitarkanika Conservation Area in India were selected using hierarchical cluster analysis revealed positive perceptions towards conservation natural

resources of mangrove forests and the people's attitudes are influenced by their demographic and socio-economic conditions.

Meanwhile, a study by Casado-Arzuaga et al. (2013) showed the results that the demand for ecosystem services in Bilbao Metropolitan Greenbelt (BMG) in Northern Spain did not correspond with the users perceived these ecosystems to provide. There are 500 interviewees from users and interest groups regarding the ecosystem services provided expressed their perceptions regarding to the improvement on management practices in the area, albeit their demand was related to the benefits that BMG have that the users may obtained. Moreover, the users also suggested to the authorities to stress on the role of BMG ecosystems especially on regulating services and cultural values and historic to enhance people's awareness on benefits provided towards society.

Shuib, Yee & Edman (2012), applied exploratory factor analysis towards 326 local communities from 15 villages in the mukim of Semantan, Santubong, Lundu and Matang in Kuching, Sarawak. The results showed there are nine factors have been identified that reflect the villagers' attitudes towards the conservation of mangrove forest resources include payment for conservation, protection of fauna, ecotourism, damage and losses, economic and commercial values, management and conservation programs, government responsibility, physical impacts and knowledge. Age, occupation, gender and mangrove replanting have significant relationship with villagers' attitudes and majority of the villagers who living close with the mangrove forest appeared positive attitude on mangrove forest resources conservation.

3. METHOD

3.1. Sampling

The research has been carried out using judgmental sampling at the jetties around MMFR for the fisherman respondents and inside Matang Mangrove Eco-Education Centre (MMEC) for the visitor respondents. There were 300 fishermen (consumptive direct users) who also local communities around MMFR and second group was 401 visitors (non-consumptive direct users) of MMEC data collected through face to face personal interviews. Data cleaning, data cleansing or data scrubbing is used to correct and detect corrupt or inaccurate records from data set. After cleaned the data and eliminated 15 visitors with unusable, missing and incomplete data, resulted 385 data for visitors can be used for further analysis.

3.2. Data Collection

Primary data has been collected using main instrument which was structured questionnaires and the questionnaire was separated into two sections to fulfill the research objectives. Section 1 was about perception of users towards mangrove biodiversity conservation. While section 2 was confined to asking the socio economic characteristics which concerns on gender, age, income and many more. Ten statements about users' perception towards biodiversity conservation in MMFR have been asked.

4. RESULT

4.1. *Socio-Demographic Characteristics*

The socio-demographic characteristics of the users' of MMFR divided into two categories of users, 43.8% consumptive direct users (fishermen) and 56.2% non-consumptive direct users (visitors). Table 1 shows the age distribution of users around MMFR. Most of the non-consumptive users were from the adult group with 32% of them aged between 31 to 40 years old. This was followed by age group from 21 to 30 years old with about 30%. Least of the visitors belongs to the age group of 20 years old and below with only 3%. It is presumed that elder people able to spend their time and money to visit MMEC compared to younger people who are still studying. While fishermen, majority of the fishermen were from the adult group, aged between 41 to 50 years old with 35% from total fishermen. Minority of the respondent with the age from 20 years and below was 2%.

From ethnicity aspect, visitors were mainly from Malay ethnic with high percentage of 85% and same goes with 56% of the fishermen were Malay ethnic. Studied found that married group for visitors was higher scored compared to married group for fishermen with 78% and 91% respectively. Those results similar with Wang et al. (2012), studied that also got married respondents more than single respondent with 64% were married and 36% were single.

Based on Table 1, it was found that most of the non-consumptive direct user had income of more than RM5000 with 39% and least of them with 7% earned RM1000 and below for every month. This is due to the higher number of visitors were degree holder with higher amount of salary. Otherwise, income for fishermen showed largest percentage was RM1000 and below with 61% and none of them able to get salary exceed RM5000 a month.

With regard to household category, the highest percentage revealed many of the visitors live with two number of household with 53%. Then, 7% of them live with nine and above household. For fishermen, majority of them have three to eight number of household with percentage of 71% and some of them have one number of household.

There were a lots of visitors of MMEC employed in private sector with 39%. Meanwhile, few of the visitors working as factory worker with only 2%. Fishermen definitely 100% of them were mainly work as a fisherman. From this study, explained that visitors from private sector workers choose to go to MMEC to escape from the hustle and bustle of their lives.

In fact, the visitors mostly had a Malaysian Higher School Certificate and Malaysia Certificate of Education holder which took 18 years of education with 55%. About 19% of them were postgraduates. Only 1% of the visitors do not come to school. It shows that those with higher education level are more likely to visit the MMEC. Fishermen revealed majority of them were studied until Lower Secondary Assessment and least of them got a Diploma holder. This results shows that less of the fishermen studied until higher level.

Gender for visitors were 65% were male, another 35% were female, meanwhile, 98% of the fishermen were male and only 2% of the fishermen were female. The percentage explained that male was more than female for both category; visitors and fishermen.

Table 1: Socio-economics of visitors and fishermen around MMFR

Characteristic	Visitors (n = 401)		Fishermen (n = 300)	
	Frequency	%	Frequency	%
<i>Age</i>				
20 years & below	3	0.75	2	1.00
21-30 years	122	30.42	29	9.67
31-40 years	132	32.92	38	12.67
41-50 years	91	22.69	104	34.67
51-60 years	45	11.22	89	29.67
61-70 years	8	2.00	25	8.33
More than 70 years	-	-	12	4.00
<i>Ethnic</i>				
Malay	340	84.79	168	56.00
Chinese	50	12.47	132	44.00
Indian	7	1.75	-	-
Others	4	1.00	-	-
<i>Marital status</i>				
Single	89	22.19	26	8.67
Married	312	77.81	274	91.33
<i>Income class (RM)</i>				
1000 and below	28	6.98	183	61.00
1001-2000	66	16.46	102	34.00
2001-3000	55	13.72	12	4.00
3001-4000	53	13.22	1	0.33
4001-5000	42	10.47	2	0.67
More than 5000	157	39.15	-	-
<i>Household category</i>				
One	57	14.21	7	2.33
Two	52	12.97	13	4.33
Three-Five	212	52.87	134	44.67
Six-Eight	73	18.20	134	44.67
Nine & above	7	1.75	12	4.00
<i>Job category</i>				
Government sector	146	36.41	-	-
Private sector	157	39.15	-	-
Business	67	16.71	-	-
Fisherman	14	3.49	300	100
Factory worker	6	1.50	-	-
Others	11	2.74	-	-
<i>Year of education</i>				
Zero	2	0.50	5	1.67
Six	10	2.49	70	23.33
Nine	17	4.24	75	25.00
Eleven	87	21.70	144	48.00
Fourteen	44	10.97	4	1.33
Eighteen	222	55.36	2	0.67
Twenty	13	3.24	-	-
Twenty four	6	1.50	-	-

Table 1: Socio-economics of visitors and fishermen around MMFR (cont.)

Characteristic	Visitors (n = 401)		Fishermen (n = 300)	
	Frequency	%	Frequency	%
<i>Gender</i>				
Male	260	64.84	293	97.67
Female	141	35.16	7	2.33

5. DISCUSSION

5.1. Exploratory Factor Analysis

The perception of users about biodiversity conservation on MMFR were measured by the respondents' level of agreement with 10 statements using a five-point interval scale with anchors of 1 = 'very not important', 2 = 'not important', 3 = 'moderately important', 4 = 'important' and 5 = 'very important'. Two factors have been found that reflect the perception of users on biodiversity conservation of MMFR. The perception dimensions of this study were constructed by using exploratory factor analysis with varimax rotation and extraction of factors with eigenvalue above 1 (Kinnear & Taylor, 1996; Mooi & Sarstedt, 2011).

The factor analysis results in Table 2 show that between two perceptual dimensions, sustainable ecosystem services was the strongest perception, followed by biodiversity flora and fauna. Sustainable ecosystem services portrayed of the ecosystem services (regulating, provisioning, habitat and supporting and cultural) comprised of eco-tourism opportunity, education and scientific research about natural protection, shelter for water quality, sustainable function for local community, next future plan visit, opportunity for natural activities, beauty of nature and green lung area in Matang. This is because the majority of users wanted to conserve the biodiversity of MMFR because they have desire to make MMFR sustain with the ecosystem services provides by mangroves (Tscharnke et. Al, 2005).

The second perception was biodiversity of flora and fauna whereby the users would love to protect the biodiversity of flora and fauna in MMFR. Minority of users like to conserve the biodiversity of MMFR because of it variety of flora and fauna. The reason is because the users directly depends on the ecosystem function that has been provided by mangrove forest.

Table 2: Factor Analysis of Users Perception on Biodiversity Conservation in MMFR

Perceptual Dimension	Statement	Loading	Communalities
1 Sustainable Ecosystem Services	Eco-tourism opportunity	.850	.730
	Education and scientific research about natural protection	.826	.689
	Shelter for water quality	.720	.519
	Sustainable function for local community	.658	.553
	Next future plan visit	.632	.564
	Opportunity for natural activities	.606	.536
	Beauty of nature	.511	.463
	Green lung area in Matang	.502	.464
2 Biodiversity of Flora and Fauna	Uniqueness of flora, fauna, ecosystem and genetics resources	.899	.813
	Habitat and protection of wildlife	.883	.782

Table 3 shows the rotation sums of squared loading for the components of sustainable ecosystem services and biodiversity of flora and fauna. Both dimensions interpret 61.12% of the variance in the perceptual data set retrieved from the surveyed questionnaires of the users.

Table 3: Rotation Sums of Squared Loading of Users' Perception towards Biodiversity

Component	Rotation Sums of Squared Loadings	
	% of Variance	Cumulative %
Sustainable Ecosystem Services	42.489	42.489
Biodiversity of Flora and Fauna	18.628	61.117

After data cleaning through the process of eliminating and verifying, the data were analyzed for reliability to ensure that the degree to which a responses towards perception statements are free of error. The value shown on Cronbach coefficient alpha will reflect the level or condition of the items either they positively correlated to one another or not. If the value of alpha is 1 and above, it shows that the internal consistency is high (Shariff & Abidin, 2015). Table 4 illustrates the reliability of ten perception statements. Every perception statement has its own perceptual dimension with different reliability values. Based on Table 4, sustainable ecosystem service shows the highest reliability value.

Table 4: Reliability for Users' Perception towards Biodiversity Conservation in MMFR

Perception Statement	Sustainable Ecosystem Services	Biodiversity of Flora and Fauna
	$\alpha = 0.855$	$\alpha = 0.830$
Eco-tourism opportunity	0.829	
Education and scientific research about natural protection	0.833	
Shelter for water quality	0.842	
Sustainable function for local community	0.835	
Next future plan visit	0.834	
Opportunity for natural activities	0.837	
Beauty of nature	0.846	
Green lung area in Matang	0.846	
Uniqueness of flora, fauna, ecosystem and genetics resources		0.829
Habitat and protection of wildlife		0.831

6. CONCLUSION

The purpose of this study is to identify perception of users towards biodiversity conservation and the socio-economic factors of users around MMFR. More specifically, this explorative research of users' MMFR contributes insights into the factors that makes users wanted to conserve MMFR and revealed the description of socio-economic background of users. These findings have implications especially towards management and related authorities of MMFR as it paves the way to unfold extension strategies to conserve the biodiversity of MMFR as the first rank best in management of mangrove forest in the world. Besides, the outputs also beneficial to the practitioners and researchers in education purposes and tourism settings.

Through the perceptual dimension, we have identified sustainable ecosystem services perception was the strongest users' perception towards biodiversity conservation. Hence, management of MMFR should focus more on these perceptions so that they can obtain higher participation of users as well as the riser number of visitors. Moreover, MMFR may also get more profit. MMFR able to enhance the users on information to conserve MMFR through attractive and quality interpretation that allocates useful, favorable and excitement experiences when users may know deeply about mangrove forest rather than current non-verbal and passive messages delivered. In short, MMFR not only the best management of mangrove forest in the world but also essential as local community sustainable use, protection from disasters for our future lifespan.

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