FACTORS INFLUENCING RESIDENTS' ATTITUDE TOWARDS MARINE RESOURCE UTILIZATION IN TUN SAKARAN MARINE PARK, MALAYSIA

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ABSTRACT

Communities living in the Tun Sakaran Marine Park (TSMP) depend on the marine resources for their livelihood. The marine park is managed by state government, the Sabah Parks, with the main objective of conserving the high marine biodiversity in the area. The communities living in the area use the resources on a daily basis, for family consumption and subsistence. The marine park is also popular for its world class diving sites which has contributed to the growth of the ecotourism industry. The main objective of this study is to determine the socio-demographic characteristics of the resident communities in order to evaluate the factors that determine the attitude of the communities towards the utilization of the marine resources. Data from 116 respondents in three islands in the park were collected using the convenient sampling method. Results of the regression analysis showed that citizenship (non-citizen), education, sense of ownership to the place and responses towards destructive fishing methods had significant influences on the attitudes towards the utilization of the marine resources. Relevant agencies can help to improve the attitudes of the communities by increasing awareness of the communities through informal education and providing extension information to reduce uses of destructive fishing methods.

Keywords: Socio-demography; Local Communities; Marine Protected Area; Fishing Tools; Sabah.

1. INTRODUCTION

Semporna district is located in the southeast coast of Sabah (4°29'N 118°37'E) in the Celebes Sea, and borders with Kalimantan to the South and Mindanao to the East. It covers 7,680 square kilometers with 49 islands scattered around its coast. The Semporna district comprises of 11.48% of Sabah's coastal waters and 545 km of coastline. It is estimated that the population of Semporna was 113,000 in 2011 (WWF, 2017). Located in the 'Coral Triangle' region, Semporna's dynamic mix of ecosystem supports varieties of flora and fauna including mangroves, seagrass beds and coral reefs.

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The ecosystem in Semporna is well known for its exquisite marine biodiversity; the ecosystem is uniquely supported by fringing reefs, patch reefs, barrier reefs, pre-atoll reefs and oceanic reefs (WWF, 2017).

Although most marine resource users in TSMP operate as small-scale fisheries (Wood, 2004), empirical evidence from underwater surveys and consultations with the locals show that the marine resources in this particular focused area are gradually declining (Ho, 2012; Komilus, Chin, Kassem, & Lim, 2011). This decline of marine resources brings about serious concerns for the authorities in TSMP. Unfortunately, existing research has predicted that the survival chances of marine resources in this particular area is quite slim, depending on how the local people manage and utilize resources presently and in the near future (Wood, 2004).

Moreover, while locals in TSMP highly depend on marine resources around the area for food supply and subsistence, it is startling to find that out of the range of methods practiced for extracting the resources in these areas, only a few are sustainable, and these include hook, lure, traps, reef-flats and seaweed farming (Wood, 2004). However, although these methods neither harm the people involved nor the environmental resources in the area, it has been observed that they are basically traditional and primitive. Nevertheless, those who use these methods probably have positive and favorable attitudes towards effective management and utilization of marine resources in TSMP.

The scenario that triggered this study is the controversial fishing methods or gears. Popularly known as 'fish blasting', the method which is rooted from the World War II and which still persists up to contemporary times causes massive destructions of resources in the Semporna seafloor (Ali, 2010). This method is indicative of the negative attitude of certain marine resource users towards the marine resources in TSMP. Besides this unfortunate situation, juvenile fishing, using small mesh sizes for nets, using poison for valuable live fish trade, lack of alternative fishing grounds, as well as hunting or poaching for endangered species are known to happen in the area. Obviously, these methods are not only unsuitable and unsustainable, they are highly destructive and harmful to the people who practice them and to the surrounding environmental resources (Wood, 2004).

Furthering complications with regards to fish-blasting around TSMP, is the uncertainty of the actual number of people involved in the act. Although it is speculated that immigrants and undocumented residents are the ones involved (Daily Express, 2015), there has never been clear evidence to support this claim. Thus, this claim might be biased and therefore, it becomes quite crucial and important to investigate the scenario by conducting research. In sum, the circumstances affecting the marine resources in TSMP and the statements mentioned above have significantly contributed to the issues that provoked this study. Hence, the study attempts to investigate the influence of demographic background of the residents in TSMP, their attachments to the Park and their behavioral tendencies towards marine resources based on the perspectives of the fishermen in the area, in order to determine their overall attitude towards the utilization of marine resources.

2. TUN SAKARAN MARINE PARK

Marine resources are seen as so important that it defines certain communities' socio-economic and cultural well-being (Wood, 2006). Known as a fishers' community, fishing practices are the way of life inherited from parents or grandparents (Daw, 2004; Wood, 2006). The fragile coral reef

ecosystem is where the fishing communities are concentrated, to extract resources through different methods from net fishing to gleaning. Though it is can be concluded that these residents in the Park are only concentrated on small-subsistence scale fishing activities, large commercial fishing vessels with frozen facilities, namely, purse seiner and mid-trawler, are seen to carry out fishing just off the Park boundaries, targeting pelagic species of fish (Komilus et al., 2011). The marine resources in the area can be roughly divided into two spatially-based categories; coral reefs resources, and pelagic resources. The coral reefs resources, from the source of fish, shellfish and other invertebrates and are extracted by nearly everyone who lives in the Park (Wood, Dipper, & Angkaji, 2006).

The Tun Sakaran Marine Park (TSMP) covers 350km² of area, with a population of 3157 individuals in 443 houses, as of 2015. The coral reefs of TSMP are important fishing grounds for communities, since the islands first settlers in the late 1880s (Wood, 2006). Reef surveys in TSMP show reef covered seafloor and species diversity but low availability of food fish such as snappers, sweetlips, emperors and groupers species (Wood, 2006). The population density of edible invertebrates is also low, and the largest species of giant clam *Tridacna gigas* has been made locally extinct (Wood et al., 2006). It is also pointed out that if the existing level of fishing activities continues (heavy pressure combined with habitat destruction caused by fish blasting and poisoning), resource use is unsustainable. Marine litter is one of the universal pollution problems afflicting the world's seas and water channels. Nets, food wrappers, plastics, cigarette filters, plastic bottles and other debris objects can ensure severe impacts on marine habitat, and its safety (Prabhakaran, Nair & Ramachandran, 2016).

3.　MATERIALS AND METHOD

3.1.　*Sample size and sampling*

This survey applies a non-probability sampling technique of 'convenience sampling' to select its sample. Often called as haphazard or accidental sampling, this technique is proposed in consideration by the nature of the sample availability. This is due to the fact that some places in the park are quite difficult to reach, depending on the scattering of houses and boat (mostly located at the back reefs) and tide patterns. Furthermore, Selakan, Bodgaya and Maiga islands provide very good sampling units that represent the whole population in TSMP, as there is representative of every resident category in the Park in these three islands.

According to Leedy, Newby, & Ertmer, (1997), a sampling size refers to 'a representation of the elements of the target population'. The target population for the study is defined according to the needs of the sampling unit in the study. Determining adequate sample size plays a vital role in gaining explanations of outcomes. Following advice from (Leedy et al., 1997) if the population size is N≥1500, 20% - 25% of it should be sampled. Hence, to ensure stability in data analysis, a maximum percentage of 30% will be taken.

Based on the February 2015 census, the entire population of TSMP is 3157 individuals belonging to 443 households. Out of the total, 1742 individuals (252 households) live in the Kia-Kia reefs. Since almost the entire Kia-Kia population is involved in seaweed farming and the area is quite difficult to reach by boat during low tides, the Kia-Kia community has not been included in the study population.

Of the rest of the population, 1392 individuals (from 191 households), 56 households are Bajau, 63 households are Sama Dilaut and 34 are Taosug households.

Figure 1: Map of TSMP with surveyed area show in yellow font

Source: Google Earth Landsat image

3.2.   *Data collection*

The actual survey collected 116 respondents from three out of eight islands in the park and they were generalized as the whole population of the park. Preliminary analyses show that the data were fit for further parametric analyses.

3.3.   *Data analysis*

Data obtained from the final collection was statistically analyzed using descriptive and inferential tests. Descriptive was used to explore and summarize a large amount of data information into meaningful interpretations (Leedy et al., 1997). Parametric statistical analysis was employed with the early assumption that all of the requirements were not violated, that the data were normally distributed, homogeneity of variance was met, linearity was met and sample size was relatively large, i.e. N ≥100. All data were stored and analyzed using IBM SPSS 21.0. The confidence level for this study was set at 0.05 (95%), which was deemed as adequate for social sciences research.

4.   RESULT AND DISCUSSION

4.1.   Reliability test

A pilot survey was done in the Semporna area, to pre-test the instrument. The pilot test covered 32 respondents of Semporna fishers from various demographic backgrounds, identical to the resident communities in the Park. A reliability test was conducted to determine whether items generated were consistent with one another, in that they represented one, and only one dimension, construct, or area of interest throughout the test. It was a measure to produce consistent results (fit together or belong together), using same entities measured under different conditions (Field, 2006; Pallant, 2013). The Cronbach Alpha result was in the range of 0.6 – 0.7 to show that all of the items were reliable.

4.2.   Socio-demographic characteristics

More than 70% of respondents had no formal education, and among them, some were illiterates. Though, the literacy rate in Malaysia is quite high, the findings in Semporna show that there was still a significant amount of illiterate residents at the remote areas. However, this was a mix citizenship study and the number of respondents included non-citizens and stateless people, who arguably, did not have the right to access formal education in the country. Age of respondent ranged from 15 to 70 years old and most were male. Majority of the respondents were young adults between the ages of 26 – 47, and made up half of the total respondents. The result suggested that almost one-third on the respondents were of the average age and that most of the heads of households were within this age range. Respondents within this age group were responsible for subsistence and thus meant that those in this age group actively worked and made decision for the family. Two-thirds permanently lived inside the TMSP area, but a significant number of them were non-citizens (36%) and undocumented (39%).

A majority of the respondents had a monthly income below RM500 (71.6%), the rest of them (28.4%) earned RM501 – RM3000 per month. In a 2004 survey, the income mode was RM300, with a mean of RM436.60 (Wood, 2004). After more than a decade, the income level has not improved. Sabah recorded a significant reduction of domestic household income from 19.7% to 8.1% in 2009 to 2012, and thus remains as the lowest generated household income in Malaysia (Department of Statistics Malaysia, 2015). In 2012, the monthly household income mean in rural areas was only RM3, 080. Comparatively, the average household income in this area was below the hard-core poverty rate (Department of Statistics Malaysia, 2015). This phenomenon of extreme poverty often happen to communities which depend heavily on natural resources for their livelihoods and are most vulnerable to environmental change (Network, 2012).

4.3.   Multiple Regression

By using the Enter method, regression analysis revealed four factors that have significant causal relationships with communities' attitude towards sustainable use of marine resources. Below is the equation:

$$Y_{(attitude)} = \beta_0 + \beta_1 DV_{gender} + \beta_2 AGE + \beta_3 INCOME + \beta_4 DV_{per} + \beta_5 DV_{tem} + \beta_7 DV_{baj} + \beta_8 DV_{tao} + \beta_{10} DV_{cit} + \beta_{11} DV_{non} + \beta_{13} eEDUCATION + \beta_{14} INVOLVEMENT + \beta_{15} OWNERSHIP + \beta_{16} PRACTICE + \beta_{17} RESPONSES + e$$

Y	= Attitude towards sustainable use (in level; higher level implies positive attitude.
β_0	= Constant intercept
DVgender	= Gender of respondent (Dummy variable that equals to 1 if male, 0 if female)
AGE	= Age of respondent (in years)
INCOME	= Monthly income of a household in Ringgit Malaysia (RM)
DVper	= Dwelling status of respondent (Dummy variable that equals to 1 if permanent, 0 if others)
DVtem	= Dwelling status of respondent (Dummy variable that equals to 1 if temporary, 0 if free moving)
DVbaj	= Ethnic of respondent (Dummy variable that equals to 1 if Bajau, 0 if others)
DVtao	= Ethnic of respondent (Dummy variable that equals to 1 if Taosug, 0 if Sama Dilaut)
DVcit	= Citizenry of respondent (Dummy variable that equals to 1 if citizen, 0 if others);
DVnon	= Citizenry of respondent (Dummy variable that equals to 1 if non-citizen, 0 if undocumented)
EDUCATION	= Number of years of formal education (in years)
INVOLVEMENT	= Involvement in society (in level); higher score implies better involvement 1- never; 2- little of the time; 3- when necessary; 4- some of the time; 5- all of the time
OWNERSHIP	= Sense of ownership (in level); higher score implies better sense of ownership; 1- never; 2- little of the time; 3- when necessary; 4- some of the time; 5- all of the time
PRACTICE	= Practicing destructive fishing (in level); 1- very often; 2- occasionally; 3- depends; 4- rarely; 5- never
RESPONSES	= Responses witnessing destructive fishing (in level); 1- participate; 2-encourage; 3- Do nothing/ ignore it; 4- Advice the offenders to stop; 5- Report to Sabah Parks
e	= Random error

Table 1: Multiple regression on the predictors of attitude towards marine resource sustainability use.

Variables	B	SE	β	t	p
(Constant)	78.093	11.086		7.044	.000
Noncitizen			.280	2.927	.004
Education			.215	2.033	.045
Ownership			.238	2.737	.007
Responses			.267	2.753	.007
	R=0.641	R²=0.411	F=6.977**		

They are: citizenship (non-citizen), education, sense of ownership to the place and responses towards destructive fishing methods. The determination coefficient, R^2 measures the proportion of the variation in the dependent variable explained by the independent variables. A higher R^2 would imply that the calculated Y equation line fits closer to the data points (Ahmad, 1994). The R² for the equation suggests that the model can explain 41% of variance (R²= .411) in the attitude while F test value indicates that the equation is acceptable (F= 6.977). F-ratio is the average variability in the data that this model can explain to the average variability unexplained by the same model. It is used to test the overall fit of the model (Field, 2013). To be exact, the regression is used to estimate best linear

combination of independent variables to predict attitude. This combination has significantly predicted the attitude towards marine resources use [$F(4, 116) = 6.977$, $p<.001$]. All four variables significantly contribute to the equation. According to Cohen (1992), this is a large effect.

Table 2: Equation for citizenry

Equation for citizenry:	
Attitude = $\beta_0 + \beta_1 (X_1)$ + e	
Non-citizen (1):	Undocumented (0):
Attitude = $\beta_0 + \beta_1 (1)$	Attitude = $\beta_0 + \beta_1 (0)$
= 78.093 + .28	= 78.093 + .28
= 78.373	= 78.093

The result for citizenry differences shows that non-citizen respondents have a more favorable attitude compared to undocumented respondents with gap values of 78.373 and 78.093 respectively. This could be due to the educational background of non-citizens back in their country (refer to Table 4.6) while undocumented respondents receive no formal education at all. Besides that, according to descriptive analysis, it is shown that non-citizens earn more in terms of monthly income and they are less dependent on marine resources for living. Hence, relative independence from the use of resources increases the importance of resource sustainability, as opposed how best to use them extensively (Hoehn & Thapa, 2009).

Receiving formal education influences people's points of view in consuming resources. Those who have backgrounds in receiving education show a better attitude as compared to those who do not. Because the variable is measured in a continuous number of years, an additional year of education increases the attitude level by .215. The finding is in line with previous studies that prove education is a significant factor in determining people's attitude (Badola et al., 2012; Cinner & Pollnac, 2004; Mehedi & Kari, 2012; Oonyu, 2009; Shuib et al., 2012). One of the possible explanations of this is that education equips people with knowledge, hence fostering awareness and appreciation of their environment and resources.

A sense of ownership to the place triggers a favorable attitude in consuming the resources as compared to those who lack this feeling. For every unit that increases in sense of ownership, attitude also increases by 0.238 unit; every 1% in sense of ownership increases a favourable attitude by 0.24%. This finding is similar to the finding in Kuna Yala, Panama where ownership and empowerment influence local livelihood to promote sustainable use of marine resources (Hoehn & Thapa, 2012).

The resident communities who respond in witnessing destructive fishing practices are obviously those who indicate a favorable attitude. Tasmanian fishermen who actively participate in local decision making for instance, have a more positive attitude towards conservation projects (Hoehn & Thapa, 2012). A multiple regression test of this study particularly, shows that responses towards destructive fishing is a determinant of a favorable attitude towards sustainability. Being more responsive by 1% influences favorable attitudes by 0.26%. Being positively responsive towards destructive fishing practices means that the community is actively participating in sustainable conservation efforts of resources in the area. Previous studies have concluded that lack of local participation is often associated with lack of information and communication on resource conservation and management (Kunasekaran, Ramachandran, Yacob, & Shuib, 2011; Hoehn & Thapa, 2012; Kunasekaran, Gill, Talib, & Redzuan, 2013; Johari, Ramachandran, Shuib, & Mohamad Afandi, 2015; Ng, Chia, Ho, & Ramachandran, 2017).

5. CONCLUSION

On average, the age of respondents which are also head of households range between 26 – 47 years old. They are the decision makers in the family and in this case, they actively working on the resources. Implementation focusing on policies or designing activities in the Park should mainly target this group. On the other hand, men and women show no significant differences in attitude. Hence, a holistic approach can be achieved when both genders are involved in activities and planning in the Park. Even though income level is not a significant factor to influence their attitude, immediate income is related to education. This situation may lead to the classical 'Tragedy of the commons' and according to the Maslow's theory, this factor sits at lowest hierarchy, where the basic needs should be fulfilled first before a person can think of conservation efforts (Oleson, 2004). It is found that this community depends highly on fishing and thus would have no intention to allow the resources to recover.

Hence, an alternative livelihood should be introduced, such as sustainable farming of resources so that the people would be less likely to depend on wild stocks to make a living. Following this philosophy of community development, authorities should start with what they know, build on what they have and plan with the people. Since the current political and legal framework in Malaysia strongly favors centralized management on fisheries resources, it removes all forms of traditional community-based management that may have any serious support from communities (Pomeroy, Parks, & Balboa, 2006). Nevertheless, it is important to understand communities' needs, identify their traditional skills but they may need professional help to empower them; this is when the roles of NGOs and local authorities are needed in capacity building with focus on enhancing assets and abilities for community development (Mehedi & Kari, 2012).

Education is a significant causal factor that influences attitude and is linked to ignorance on sustainability awareness. Unfortunately, more than 70% of resident communities have no formal education - only one respondent has a degree qualification. According to the chi square test, education level is significantly related to their citizenry. Those that contribute to the figure are mostly undocumented and non-citizen. Though, those people have no access to Malaysian formal education, alternative educational programs can be seen as a solution.

This can be done through a series of outreach and awareness activities, like reaching the boat dwellers community by 'boatshow' to ensure they are not left behind. Education and awareness outreach should be maintained and expanded to enable and empower community wellness in terms of generating knowledge. Investment in MPA education and outreach can generate an increase in local knowledge and positive attitudes, as well as change knowledge and attitudes that can contribute to the long-term compliance with MPA regulations (Leisher et al., 2012). Results of the ANOVA tests on demographic profile of ethnicity, types of dwelling and citizenry status indicate that these factors have significant differences in relation to attitude towards conservation. Information with regards to these factors are important for planning processes and development. These significant relationships to attitude would always become necessary conditions in shaping their attitudes towards conservation.

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