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To cite this article: Aqilah Abdul Rahim *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **1102** 012086

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Evaluation of knowledge and perception of locals toward the conservation effort in mangrove forest at Delta Tumpat, Kelantan, Malaysia

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Abstract. The importance of mangrove forests in protecting shorelines and mangrove ecosystems is very crucial. Due to industrialization and monetary demands, mangrove forests are at risk of losing their function and integrity over time. The commitment and awareness of the community are critical factors in the success of the mangrove conservation in Tumpat. With a quantitative approach, we collected demographic information from 116 (male 58.6%, female 41.4%) respondents to evaluate their knowledge and perception of mangrove conservation efforts in Tumpat, Kelantan. This study revealed that respondents' level of knowledge and perception is significantly influenced by gender, age, level of education, occupation, income, and locality of residency which was analyzed using the Chi-square test ($p < 0.05$). The importance of conserving the Tumpat mangrove forest and its ecosystems is highly rated by the respondents. Hence, they are eager to engage in any conservation initiatives that the forestry department may provide. However, 9.5% of total respondents are reluctant to cooperate in mangrove protection efforts due to less awareness of the mangrove conservation importance in Tumpat. Further initiatives should be implemented to enhance local community knowledge about the value of mangrove forests as well as to encourage them to participate in mangrove conservation programs.

1. Introduction

Mangrove biodiversity is among the world's largest and ecologically diverse ecosystems, contributing to essential ecosystem services [1]. In the District of Tumpat, the mangrove habitat is unique due to the plain and hundreds of rivers, and islands, and it has the potential to be developed as an international tourist destination while also providing a stream of revenue for local populations and sustaining cultural values [2-3]. However, the effort in conserving and sustaining the mangrove area would be wasted if there is no support from local communities and the public in general, especially the residents living in Tumpat, Kelantan. According to Hashim et al. [4], the local community is still unaware and neglects the need to preserve our precious mangrove forests. Many types of research had been conducted to assess flora, fauna, and conservation activity of mangrove forest in Tumpat [5-9], but study on local



knowledge and perception of mangrove conservation effort is very scarce. Therefore, this study was conducted to assess the level of knowledge and perception of the local community as well as their understanding of mangrove conservation in Tumpat, Kelantan.

2. Material and Methods

The study focuses on mangrove areas in the Delta Tumpat, Kelantan, which lies on the northeast coast of Malaysia in the Kelantan River Delta ($6^{\circ}11'0''$ to $6^{\circ}13'N$; $102^{\circ}9'$ to $102^{\circ}14'E$). There are more than 17 small islands that make up the delta of Tumpat, which covers about 1,200 ha. From the previously mentioned total area, 339.6 ha are covered with mangroves. The community's cultural, economic, and environmental well-being was influenced by the significant forest ecosystem in this delta region [10].

To assess the public knowledge and perception of mangrove forest conservation efforts at Delta Tumpat, the quantitative method using questionnaire surveys and interviews were carried out. The survey instrument consists of multiple-choice closed-end questions to determine the perspective and comprehension of the community towards mangrove protection activity in the study area. To obtain demographic characteristics of the surveyed population, a classifier or background questions were interrogated at the beginning of the survey such as age, gender, occupation, education, and place of residence [11].

Before the real data collection, a pilot test was carried out to test the reliability of the developed questionnaires. It was evaluated by calculating Cronbach's alpha value. A reliable and good questionnaire has a high internal consistency value (> 0.7) following the study by [12]. Collected data were coded and tabulated in SPSS software. The descriptive statistic on demographic data was analyzed. Then, a statistical test on Chi-square (χ^2) was used to assess whether there was a correlation between the two categorical variables in the questionnaires using the formula in Equation 1. If the p -value is lower than 0.05, the null hypothesis is rejected and statistically significant [13]. The Chi-square can provide precise information on not just the significance of any observed differences, but also which categories account for any differences detected [14].

$$\chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i} \quad (\text{Equation 1})$$

Where,

O = frequency of observation,

E = frequency of expectation.

From the Chi-square (χ^2) analysis, knowledge and perception of locals toward the conservation effort in mangrove forest at Delta Tumpat, Kelantan was interpreted.

3. Results

3.1 Respondents Profile

A total of 116 (male 58.6%, female 41.4%) respondents answered the questionnaire survey. The majority of the respondents are Malay (99.1%) and aged between 19 to 40 years old. 46.6% were students and 25.9% did self-employed jobs such as small-medium enterprise (SME) holders and fishermen. The remaining work in private and government sectors, pensioner and 7.8% is unemployed. 39.7% of the respondents have no fixed income and the residual range from RM500 to RM5000. For locality, 54.3% of the respondents are origin from the district of Tumpat and the remaining is outsiders.

3.2 Knowledge of Mangrove

There were 11 questions related to mangrove knowledge in the survey form. The majority of the respondents' answers reflect their knowledge of mangrove forests including information on tree

morphology, functions, and conversation activities in the study area. The Chi-square test results for respondents' knowledge section are shown in Table 1. From the analysis, 6 of 11 questions showed a significant correlation between demographic and knowledge parameters. The most outstanding result detected was on the residency of the respondents highly influenced community understanding of mangroves function as economical areas such for fish and shrimp farming activities. The local residents work as fishermen and people who use mangroves as a source of income are aware of the function and importance of mangrove forests. Besides that, this study found that the female respondents were more knowledgeable about the morphology of mangrove trees. This might be due to their education level which is higher than the male respondents.

Table 1. The Chi-square test results on respondent's knowledge of mangrove

Demographic	Asymptotic Significance (2-Sided)					
	Q8	Q2	Q3	Q5	Q6	Q7
Gender	-	-	-	0.030	0.009	-
Age	0.001	0.045	0.000	-	-	-
Level of education	0.002	-	-	-	0.000	-
Occupation	-	0.017	-	0.039	-	-
Level of income	0.024	-	0.034	-	-	-
Living area	-	-	-	-	-	0.047

3.3 Perception of Mangrove

To evaluate the respondent's perception of mangrove conservation efforts, 17 questions were asked in the survey questionnaire. The average mean of perception questions is 4.1 and the Chi-square showed that 13 of the question have a significant correlation to demographic parameters (Table 2). All respondents with various backgrounds agreed that illegal logging and mangrove tree harvesting (Q10 and Q13) will affect the ecosystem of mangrove forests. However, occupation type and level of income did not affect the respondents' perception of the idea of Delta Tumpat as a shelter for exotic flora and fauna. From this study, we found out that female respondents have a more positive perception of the Delta Tumpat mangrove forest as an ecotourism area compared to the male respondents.

Table 2. The chi-square results for the surveys in the perception of the mangrove section

Demographic	Asymptotic Significance (2-Sided)												
	Q10	Q13	Q1	Q8	Q15	Q12	Q4	Q9	Q11	Q16	Q2	Q6	Q7
Gender	0.002	0.046	0.001	0.014	0.015	0.029	-	0.011	0.016	-	-	0.004	-
Age	0.014	0.000	0.021	-	0.019	-	-	-	-	0.022	-	-	-
Level of education	0.002	0.040	0.005	0.031	0.008	-	0.024	0.002	-	-	0.047	-	-
Occupation	0.009	0.033	-	0.048	0.047	0.021	-	-	0.044	0.022	-	-	0.005
Level of income	0.027	0.037	-	-	-	-	-	-	-	-	-	-	-
Living area	0.039	0.008	0.015	0.006	-	0.017	0.047	-	-	-	-	-	-

This study also presented that different occupation type gives a different perception of the mangrove conversation program. Looking at respondents' perception of the conservation program that has been carried out in this study, students enjoyed the activities more than retirees. Due to age constraints, pensioners have less interest in involving physical activity that required high stamina compared to the youth. Examined on community's willingness to involve in mangrove conservation activities, 68.10% agreed and were willing to play a part in any event related to mangrove conservation efforts. The remaining is unsure and disagreed as shown in Figure 1. This might be due to the lack of awareness of mangrove forest conservation efforts and their function as well as less exposure to information about this precious area. A recent study by

[15], found that the percentage of local residents' awareness and public understanding of the mangrove ecosystem is decreased. Hence the mangrove forest had also declined over time. Therefore, planting more new seedlings is the main conservation effort to ensure that future generations experience the beauty of mangrove forests for now and in the future. To mitigate the lack of information among the community, in the future, it is suggested to plan and build an information center that could act as an edutourism spot in the study area, especially in Pulau Bedal which has vigorous mangrove stands and is rich in biodiversity.

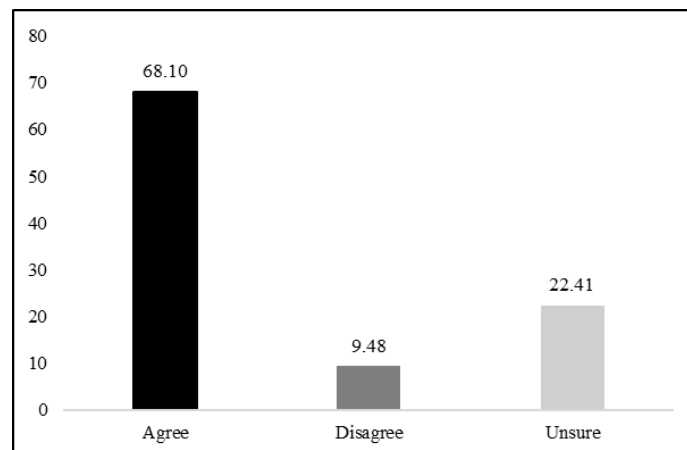


Figure 1. The percentage of the respondents agree, disagree, and are unsure to participate in mangrove conservation activities

4. Conclusion

According to the results of a survey on respondents' knowledge and perceptions regarding conservation efforts in mangrove forests in Delta Tumpat, the local community still does not fully understand the function, morphology, and interest in ensuring the sustainability of the forest. They need more information regarding the mangrove ecosystem and function as well as awareness activities to conserve this area. Community involvement in maintaining the ecosystem of the mangrove forest was at a moderate level. Therefore, the government and related agencies should collaborate to strengthen the community's enthusiasm and appreciation of the importance of mangrove forests to the ecosystem's health as well as the local flora and fauna.

Acknowledgment

The author would like to thank Kelantan State Forestry Department for its cooperation in knowledge and information sharing related to the Delta Tumpat mangrove forest conservation efforts.

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