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RIVER AND AQUATIC INSECT: AWARENESS LEVEL OF VISITORS AT RECREATIONAL RIVERS IN THE NORTHERN REGION OF PENINSULAR MALAYSIA

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ABSTRACT

Our government especially the Ministry of Natural Resources and Environment and other non-government organisations (NGOs) have started to feel pressured about the environment, especially the freshwater ecosystem. Thus, several programmes such as "Love Our River" and "One State, One River" have been conducted. This study's aim was to determine the level of river awareness and aquatic insect knowledge among the visitors at recreational rivers, to gauge whether they were willing to participate in awareness programmes, and to educate visitors on the importance of aquatic insects. Overall, 136 respondents were able to complete the face-to-face survey. Despite all the activities executed by the government, the awareness levels among visitors at recreational rivers were considered moderate. Aquatic insects were used as bio-monitoring tools to indicate the health of rivers and balance the river ecosystem. Respondents with higher education levels were expected to be more concerned about the existence of aquatic insects and their importance. Contrary to this study, only a few of them were familiar with aquatic insects. Fewer than half of the respondents were aware and well-informed of the existence of aquatic insects and only one-third of them had knowledge of aquatic insects. Only 63.2% of respondents were willing to take part in the awareness programmes.

Keywords: aquatic insects, biomonitoring, ecosystem services, public awareness

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INTRODUCTION

Freshwater, including rivers, lakes, and ponds is vital to human life and social well-being such as for agricultural and industrial activities and recreational purposes. Rivers have an important relationship with humanity as a recreational resource for many types of leisure activities, from public bathing to kayaking (Ahmad Ainuddin and Ali Muhammad 2013). May (2006) stated that rivers and its surroundings provide several valuable natural and aesthetic sites for cultural, historical and physical attributes for the purpose of recreational users. Thus, its utilisation has long taken precedence over the commodities and services provided by freshwater ecosystems but, this has caused an oversight in its value in supporting the balanced ecosystem.

Human alteration of their habitat and over-exploitation of freshwater rivers have received multiple and ongoing stresses. Aquatic insects such as order *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), *Trichoptera* (caddisfly) and others, are parts of living organism that plays a vital role in the Malaysian freshwater ecosystem (Yule and Yong 2004). Aquatic insects can be used as bio-monitoring tools to measure the health of freshwater ecosystems. Thus, their relative abundance has been used to make inferences about the pollution status of the freshwater as they are classified into very sensitive, sensitive, tolerant and very tolerant groups (Cummins et al. 2008; McGeogh 1998).

Basically, the management of rivers is solely under the government or public agencies' responsibility (Chun, Wan Nor Azmin and Mohd Armi 2012). However, due to an unexpected increase in the complexity of water-related problems, the government has taken several actions to curb the problems and raise awareness among the public regarding rivers. "Love Our Rivers" and "River Adoption" programme were launched by the Department of Irrigation and Drainage, Malaysia in 1993, followed by "River Expedition", "River Beautification" and "River Watch" (Love Our River Campaign 2013). More recently, the "One State, One River" programme known as "Satu Negeri, Satu Sungai" (1N1S) was launched in 2005 by the Ministry of Natural Resources and Environment under the Integrated River Basin Management (IRBM) system which is currently managed by Department of Irrigation and Drainage, Malaysia (Ministry of Natural Resources and Environment Malaysia 2010).

Despite all the programmes related to river awareness conducted by the Malaysian government as well as several other non-governmental organisations (NGOs), are Malaysians aware of government efforts in promoting river awareness? Are Malaysians aware of the existence of aquatic insects? Are they willing to contribute

to increase the level of river awareness and cultivate awareness of aquatic insects among them? Therefore, this study aims to determine the level of river awareness as well as aquatic insect awareness among visitors in recreational rivers, to discover the extent of their willingness to participate in awareness programmes, and indirectly to educate visitors on the importance of aquatic insects as part of the freshwater ecosystem.

METHODOLOGY

Study Site

This study was conducted at six recreational rivers in the northern region of Peninsular Malaysia (Table 1). In this study, visitors who frequented the recreational rivers were the targeted respondents. Generally, all the selected rivers were used for recreation. There were differences in recreational activities done by visitors at selected recreational rivers. Recreational activities such as public bathing, picnic and camping were observed in all the rivers except Bukit Mertajam River. Based on observation, most of the visitors went to the Bukit Mertajam River to hike, jog, cycle and get some relaxation away from the hectic city. In Sedim River, water sports activities such as water rafting were conducted as Sedim River was famous for its extreme cascade.

Table 1: Location of study sites

Recreational river	Abbreviation	Coordinate
Batu Hampar Recreational Forest	BHP	N05° 47’ 33.66”, E100° 24’ 11.04”
Titi Hayun Recreational Forest	THY	N05° 47’ 36.74”, E100° 24’ 12.42”
Bukit Hijau Recreationa Forest	BHJ	N05° 30’ 03.73”, E100° 46’ 18.78”
Sedim	SDM	N05° 24’ 47.88”, E100° 46’ 51.80”
Taman Rimba Bukit Mertajam	BMJ	N05° 26’ 48.87”, E100° 12’ 58.58”
Taman Rimba Teluk Bahang	TBH	N05° 21’ 27.53”, E100° 29’ 36.04”

Data Collection

This survey was distributed to the visitors who visited and performed activities along selected recreational rivers. Altogether, 136 respondents were able to complete the interview. The respondents consisted of Malays, Chinese, Indians and other races which represented the ratio of races visiting selected recreational rivers. This survey was conducted face-to-face, adopting the method of Gorard

(2003). This method allowed the researchers to reduce the number of damaged surveys and the researchers were able to help whenever the respondents were confused by explaining to them about the survey questions. This survey was conducted in three languages which were Malay, English and Mandarin (Chinese). The first construct of the questionnaire concerned with the respondents' backgrounds. Four close-ended questions were asked with multiple-choice categorical answers. The second construct of this questionnaire consisted of questions regarding respondents' knowledge on the existence of aquatic insects. This section also consisted of four items with multiple-choice and open-ended questions. In this part, respondents were asked whether they knew the existence of aquatic insects or not. If respondents answered "yes" to this question, respondents were required to give examples of aquatic insects and proceeded with the questions on knowledge and the importance of aquatic insects. Respondents were given score "1" for each item if they were able to provide examples, knowledge, and importance of aquatic insects and a zero score for any "do not know" answer. If respondents answered "no" to the first question of this part, respondents were asked to proceed the next section of the questionnaire.

The third construct of the questionnaire was composed of seven items about respondents' awareness of rivers and aquatic insects. This part was related to the respondents' awareness of the river and aquatic insect campaigns and how they came to know about it. The respondents were also asked about the type of medium they preferred to receive any information pertaining to the river and aquatic insects. The respondents were required to give their opinion on how to promote awareness on river and aquatic insects to the public in this part. The last item in this part dealt with the respondents' willingness to take part in any river and aquatic insect awareness programme.

Statistical Analysis

All completed survey data were recorded and analysed by the Statistical Package for Social Sciences (SPSS) version 22.0. The tests by SPSS included frequencies and crosstab between the variables.

RESULTS

Respondents' Backgrounds

There were 136 respondents who completed the interview consisting of 85 males and 51 females from various races. The respondents' racial backgrounds in this

study comprised 125 Malays, seven Chinese, one Indian and three respondents from other races which represented the ratio of visitors at recreational rivers. Figure 1 shows the distribution of respondents based on gender and race.

The distribution of ages of the respondents is illustrated in Figure 2, where most of the respondents belonged in the youth-aged group which was between 18 and 25 years old, with 63 respondents. It was then followed by the respondents aged between 26 and 35 years old with 33 respondents and 26 respondents aged above 45 years old. There were three respondents younger than 18 years old and 11 respondents from the group aged between 36 and 45 years old.

Education level of the respondents was also a part of the questionnaire requirement. The education level of the respondents was divided into four categories: 1 = did not complete high school; 2 = completed high school but no further schooling; 3 = with certificate (Sijil Tinggi Pendidikan Malaysia [STPM], Sijil Tinggi Agama Malaysia [STAM], matriculation certificate, A-Level and skills certificate); and 4 = universities graduate (bachelor's degree, master's degree and doctorate). Overall, 24 respondents were from category 1 of educational level, 57 respondents were in category 2, while categories 3 and 4 comprised 43 and 12 respondents, respectively (Figure 3).

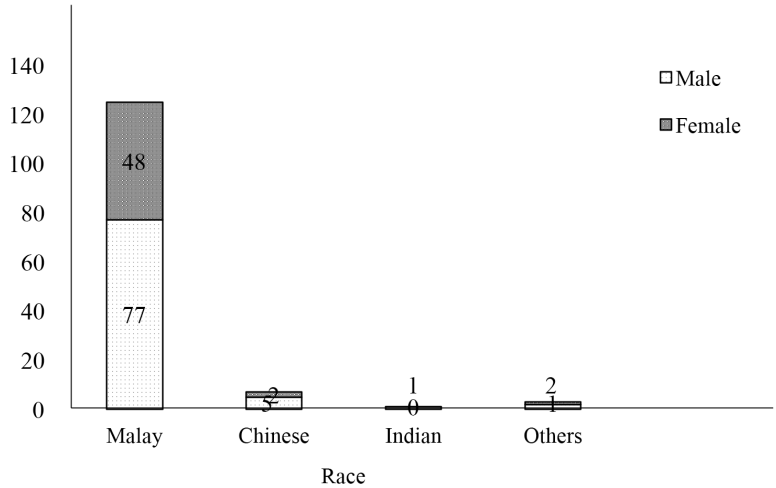

Figure 1: The distribution of respondents based on gender according to race.

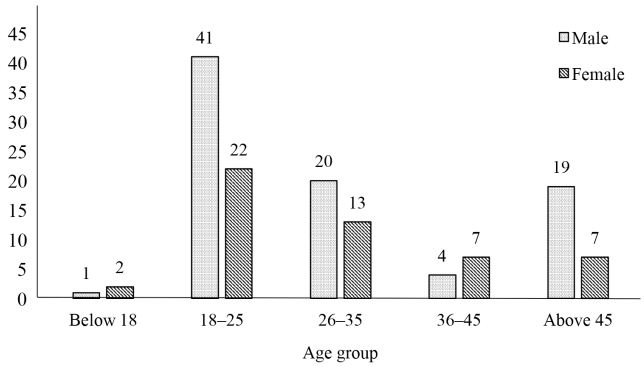

Figure 2: The distribution of respondents' age based on gender.

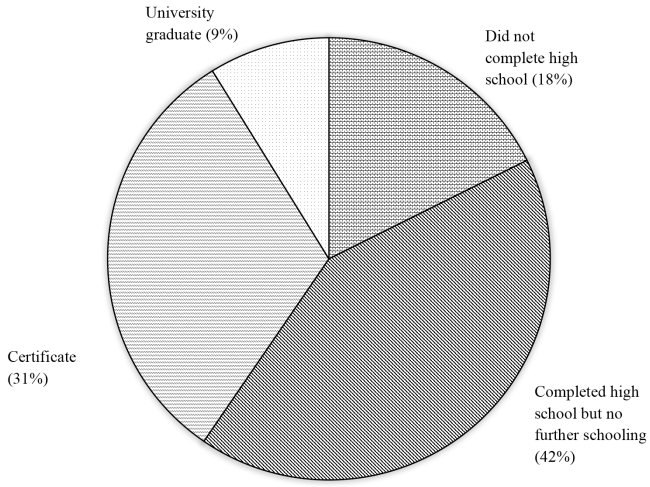

Figure 3: The distribution of respondents' educational level.

Respondents' Knowledge on Aquatic Insects

Respondents with higher educational levels were expected to have a higher percentage of knowledge about aquatic insects. However, Table 2 presents a contrary finding in that education level of the respondents did not tally with the awareness of aquatic insects, where the percentage of respondents who were unaware of aquatic insects was high. Overall, only 44.1% of respondents knew about the existence of aquatic insects, while another 55.9% of respondents did not know what aquatic insects were.

Table 2: Awareness level of respondents on the existence of aquatic insects

Education level		Aquatic insect		Total
		Yes	No	
Did not complete high school	Count	11	13	24
	Expected count	10.6	13.4	24.0
	Within education level (%)	45.8	54.2	100.0
	Within aquatic insect (%)	18.3	17.1	17.6
	Total (%)	8.1	9.6	17.6
Completed high school but no further schooling	Count	27	30	57
	Expected count	25.1	31.9	57.0
	Within education level (%)	47.4	52.6	100.0
	Within aquatic insect (%)	45.0	39.5	41.9
	Total (%)	19.9	22.1	41.9
Certificate	Count	20	23	43
	Expected count	19.0	24.0	43.0
	Within education level (%)	46.5	53.5	100.0
	Within aquatic insect (%)	33.3	30.3	31.6
	Total (%)	14.7	16.9	31.6
University graduate	Count	2	10	12
	Expected count	5.3	6.7	12.0
	Within education level (%)	16.7	83.3	100.0
	Within aquatic insect (%)	3.3	13.2	8.8
	Total (%)	1.5	7.4	8.8
Total	Count	60	76	136
	Expected count	60.0	76.0	136.0
	Within education level (%)	44.1	55.9	100.0
	Within aquatic insect (%)	100.0	100.0	100.0
	Total (%)	44.1	55.9	100.0

Sixty respondents who had knowledge of the existence of aquatic insects were able to give examples of aquatic insects they knew. Water striders and water bugs were the most common answers given by the respondents. Respondents were able to describe water striders and water bugs as they live on the surface of the water and it can be seen clearly compared to other aquatic insects which live in the water such as *Ephemeroptera*, *Trichoptera* and *Plecoptera*.

Although 44.1% of respondents were aware of the existence of aquatic insects, not all of them knew much of it. Only 35.3% of respondents were able to explain more about aquatic insects. Another 8.8% of them happened to know about aquatic insects because they saw only at the surface of water. About 25.7% of respondents knew the importance of aquatic insects as bio-monitoring tools and balancing river ecosystems from reading materials and television programmes, namely Discovery Channel. Meanwhile, the remaining respondents admitted to not knowing the importance of aquatic insects. Figure 4 shows the summary of the respondents who had knowledge of aquatic insects.

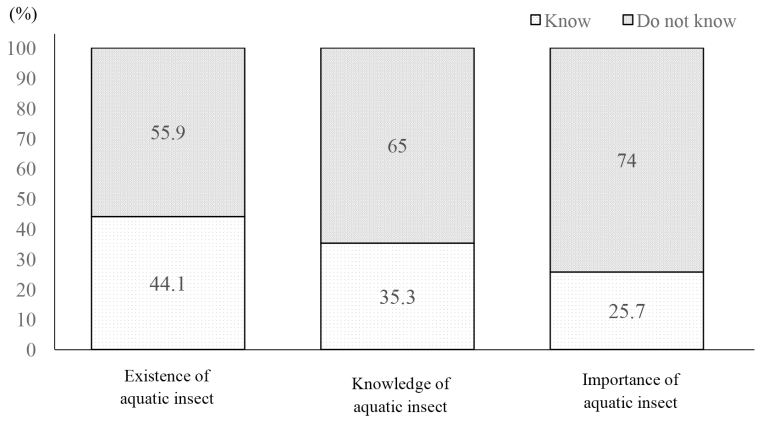

Figure 4: The summary of respondents' knowledge on aquatic insects.

Respondents' Awareness Regarding River and Aquatic Insects

Despite several programmes related to the river being conducted by the government and water-related agencies, only 70.6% of respondents had been exposed to river campaigns whereas almost one-third (29.4%) of respondents had never been exposed to river campaigns. Based on interviews conducted, respondents were exposed to river campaigns mostly via the electronic mass media and advertisements in newspapers. From this survey, 99.3% of respondents had never been exposed to

aquatic insect awareness, hence not many of them realised the existence of aquatic insects. Only one respondent gained information about aquatic insect from reading a scientific magazine.

Most of the respondents agreed that electronic mass media such as advertorial videos on television was one of the most important platforms for promoting river and aquatic insect awareness. The second most-preferred medium chosen by respondents was a pamphlet or brochure with information regarding rivers and aquatic insects which could easily be distributed to the public at recreational rivers.

Respondents were also asked about their opinions on how to create awareness of river and aquatic insects among Malaysians since public awareness was still unsatisfactory. An interesting river and aquatic insect awareness event with the public at recreational rivers with mass media coverage was the suggestion opted for by most of the respondents, followed by campaigns in public areas. River and aquatic insect awareness in school and the distribution of pamphlets had also been suggested by respondents.

Respondents were also asked about their willingness to participate in the river and aquatic insect awareness programmes (Figure 5). With 63.2%, more than half of respondents were willing to participate in an awareness programme. Meanwhile, 28.7% of respondents were not willing to participate and another 8.1% of respondents were unsure of their participation in the said programme.

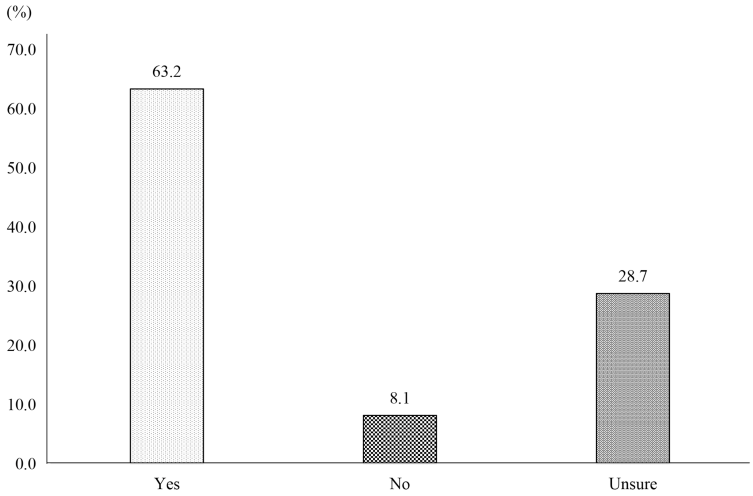

Figure 5: Level of visitors' willingness to participate in awareness programme.

DISCUSSION

As a developing country, Malaysia follows the examples of successful programmes related to river management from developed countries. Water-related agencies try to adopt a similar approach of involving the public to participate in river management (Rasagam and Chan 2002). The "Love Our Rivers" campaign, which was launched in 1993 by the Department of Irrigation and Drainage, Malaysia, and lasted until 2006, was deemed a failure (*UnderwaterTimes News* 2007) due to the increasing number of the polluted rivers from time to time.

Besides that, in 2005, the 1N1S programme was launched and the government allocated about RM5 million to achieve the objective of the programme and to ensure the river water quality would achieve a minimum of second class in water quality index by 2015, and rivers would become recreational areas free from flood and rubbish (Ministry of Natural Resources and Environment Malaysia 2010). Nevertheless, in spite of all of the efforts taken by the government, especially the Ministry of Natural Resources and Environment and Department of Irrigation and Drainage, the success of such programmes especially 1N1S has yet to materialise (Chun, Wan Nor Azmin and Mohd Armi 2012).

Respondents with higher education were expected to be more concerned about river awareness programmes conducted previously. Unfortunately, from this study, irrspective of education level, not many respondents were aware of the government's effort in cultivating awareness among Malaysians. With more than half of respondents were not aware of the river campaign, the respondents' awareness level can be interpreted as "moderate."

According to Rezeai, Khalilzadeh and Soleimani (2021), knowledge is one of the factors affecting a person's behaviour and it is closely related to the person's intention. In contrast to the statement, respondents seemed to be lacking knowledge regarding aquatic insects. Some respondents with higher educational levels did not even know the existence of aquatic insects. This might be due to a lack of information on aquatic insects. Therefore, several actions must be taken in order to promote aquatic insects as well as their importance as freshwater bio-indicators to Malaysians.

From census statistics on household characteristics by the Department of Statistics Malaysia (2010), with 86.5%, the percentage of television ownership was the highest compared to other households. Therefore, electronic mass media outlets such as television can be a successful medium in promoting awareness related to rivers as well as other awareness programmes. Newspaper is the most preferred

reading material of Malaysians thus information regarding rivers in newspapers also plays an important role to cultivate public awareness about rivers as well as aquatic insects. Besides, mass media must actively participate in awareness programmes to ensure information related to the awareness programmes is reaching the public continuously. Hence, both electronic and printed mass media hold a vital function in promoting river awareness to the public.

CONCLUSION

Nowadays, the government and other water-related agencies feel the pressure of the freshwater environment and have started to implement IRBM to overcome the problem and have conducted a 1N1S programme to create awareness among the public. Many developed countries adopted the concept of sharing the responsibility of river management. However, the river awareness level among Malaysians is comparatively moderate due to, as pointed out by the respondents, lack of enforcement, lack of proper management of recreational rivers and non-continuous promoting of awareness. Therefore, environmental education from primary school must be employed to cultivate responsibility towards the environment in children from early age. Respondents lacked knowledge of aquatic insects as they were not able to receive any information regarding aquatic insects through formal study. Some of them knew about it from observation, reading and television programmes. Thus, respondents suggested that information regarding aquatic insects should be included in the school syllabus, so that students will be more aware of their existence and importance as biological indicators as well as in balancing the freshwater ecosystem services.

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