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Attitude of Small-Scale Fishermen Towards Adaptation to Climate Change

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ABSTRACT

It is globally accepted that the earth's climate is changing. Such a phenomenon affects communities across the globe. One of these communities is that of small-scale fishermen. Past studies have shown poor understanding of climate change and low progress in development among fishermen because of the failure among stakeholders in understanding the mindset of beneficiaries such as their attitudinal setting. Much of the top-to-bottom development is impromptu, and most of the time, this makes them disorientated and may open them to the risks associated with climate change. Therefore, a better understanding of their attitude in relation to climate change will provide an important foundation for future planning for climate change mitigation and engagement of fishermen communities with stakeholders. In general, this paper aims to determine the attitude of small-scale fishermen towards adaptation to climate change. The nature of this study is quantitative and the study uses a set of questionnaires and involves a total of 300 respondents from two fisheries districts in Peninsular Malaysia. The fishermen surveyed had a high level of adaptation with regards to attitude towards climate change, while their level of education, catching area, fishing technology, type of vessel and income are confirmed as influential factors.

Keywords: Climate change adaptation, fishermen attitude, small-scale fishermen

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INTRODUCTION

The fisheries sector is an economic contributor for many countries around the world. Indeed, it plays a prominent role in economic earnings for coastal communities.

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Currently, maintaining this role is a challenge as the fishery sector is facing the effects of climate change. Such a phenomenon is expected to result in temperature rise, high density rainfall, storms, big waves and unpredictable weather patterns that will affect small-scale fishermen in all aspects of their life from economic and social activities to safety and health (Intergovernmental Panel on Climate Change [IPCC], 2007; Zarnetske, Skelly, & Urban, 2012).

Previously, small-scale fishermen used the traditional methods of observation and experience to predict the weather. However, due to unpredictable weather conditions nowadays, such traditional methods cannot help much. Information colleted through the use of advanced technology is needed to predict the weather today. According to Allison, Beveridge and Van Brakel (2009), the majority of fisher folk (from 250 million) living in the region are widely exposed to climate change (human-induced), and a big portion of their livelihood resources are dependent on and influenced by climate variation. Most of the countries in Asia-Pacific are coastal countries, while several are landlocked. The majority of coastal communities in the Asia-Pacific region are involved in fisheries-related activities, depend greatly on ocean resources and are highly exposed to the impact of climate change (Heenan et al., 2015).

According to the Department of Fisheries, Malaysia, small-scale fishermen are defined as those working as fishermen in the Zone A catching area, which is from the shoreline up to 5 nautical miles, while vessels operating in the inner zones are allowed to fish in deeper waters (Zones B, C and C2). Small-scale fishermen are also known as traditional fishermen due to their use of traditional fishing gear (tools) and small vessels made from timber or fibre.

In 2010, a study on the impact of climate change on sea-level rise in Malaysia was carried out by the National Hydraulic Research Institute of Malaysia (NAHRIM) to project sea-level rise (SLR) for the Malaysian coast from the year 2010 to 2100. The study showed a tremendeous increase in SLR trend over the recent five years, compared with the SLR trend 20 years ago. NAHRIM also forecast that SLR for the year 2100 in Peninsular Malaysia will range between 0.25 and 0.5 m (Awang & Abdul Hamid, 2013).

The phenomenon of temperature rise is one of the impacts of climate change in Malaysia. Tangang, Juneng and Ahmad (2007) recorded higher temperatures for the East Coast of Peninsular Malaysia. Kota Bharu and Kuantan, for instance, recorded a temperature rise between 0.5°C and 1.5°C over the last 40 years. While scientific studies by Kwan et al. (2013) projected that most areas in Malaysia will be facing an increasing heat pattern at day and night, some areas in Pulau Pinang and Perak are projected to record the highest change in terms of day heat. Several areas in Melaka and Sarawak are projected to record the highest change in terms of increasing heat at night. Climate change was also found

to affect the distribution pattern of the frequency of rainfall in Malaysia. Wan Azli (2010) in his study found that Malaysia is facing frequent rains and floods unnaturally, and the number of days for the occurrence of storm and thunderstorms has increased.

Extreme temperature rise will also be a cause of the occurrence of environmental disasters such as forest fires and the resulting smoke haze pollution and degradation of air quality in several places including Malaysia (Othman, Sahani, Mahmud, & Ahmad, 2014). Such a situation will force traditional fishermen to cancel or delay their fishing routine as most of them are not equipped with advanced navigation technology. This will see a reduction in their economic and social standards.

Badjeck, Allison, Ashley and Nicholas (2009) suggested that priority should be addressed in order to strengthen public lives and establish policies to deal with climate change phenomena. Strengthening individual adaptation to climate change is crucial because it is a mechanism that will reduce the risk of exposure to climate change and enable those affected to be better prepared to cope with extreme weather events. Due to the importance of understanding public engagement with climate change (Wright, Price, & Leviston, 2015), this study was undertaken to discover the factors of attitude among fishermen in relation to climate change adaptation to provide adequate information for drafting a mitigation plan to offset the impact of climate change on the lives and livelihood of small-scale fishermen.

Literature on Attitude

Research into attitude and attitude change is a popular topic in many fields of study including community development. Attitude is defined in psychology as the personal evaluation of specific targets or issues or situations that include mental process, belief and behaviours (Allport, 1935). Zimbardo and Leippe (1991) defined attitude as:

> The belief or affective component consisting of a person's evaluation of, liking of, or emotional response to some situation, object, or person. The cognitive component is conceptualized as a person's factual knowledge of the situation, object, or person, including oneself. In other words, the cognitive component refers to how much a person knows about a topic, such as climate change. The behavioral component of an attitude involves the person's overt behavior directed toward a situation, object, or person.

Through that basic knowledge and resulting evaluation, attitudes are believed to be a personal way that people are likely to act in specific situations. Even though attitudes are not observable, they do serve to help produce observable actions in people (Delamater & Myers, 2010). Several characteristics have been recognised by scholars as helping others to better understand attitudes such as having

a relatively stable relationship between the subject and the object, being motivated by relationship, not naturally existing, being relatively durable, having valence and diversity (Redzuan, 2001). Scholars tend to believe that attitude can be changed using the correct technique. In understanding attitude among fishermen faced by climate change adaptation, the Theory of Reason Action (TRA) was applied by some scholars, who approached the subject through the lens of the functional approach to attitude change (Eagly & Chaiken, 1993; Katz, 1960; O'Keefe, 1990). The functional approach assumes that personality plays an important role in interpreting the needs of attitude change. Katz developed four categories to differentiate the personality function as (a) utilitarian function, (b) knowledge function, (c) ego-defensive function, and (d) value-expressive function. In this study, we used the knowledge function as a basis for interpreting the critical need for attitude change among small-scale fishermen to prepare themselves for an uncertain future.

The main focus of the Theory of Reason Action (TRA) is the influence of attitude, norm and intention towards behaviour (Fishbein & Ajzen, 1975). TRA suggests that the cause of behaviour is the individual's intention to engage in the behaviour. Attitudes influence behaviour through intention, which is the decision to act in a particular way. Besides that, some other variables, especially the existence of demographic factors, have been predicted as influential factors on individual attitude such as age, location, level of education and years of experience (Fishbein & Ajzen, 1975).

Fishermen's Attitudes Towards Climate Change Adaptation

Fishing displays a different risk pattern from that of other professions (Mistiaen & Strand, 2000). Many studies have been conducted across the globe to discover the pattern of impact among fishermen based on climate change events. Fisherman have been seen to be victims of climate change, which has brought big impact on the landscape and the fisheries industry. Fisherman are greatly affected because of poor knowledge and awareness as climate change happens slowly over a long time of period (Huchim et. al, 2016; Kupekar & Kulkarni, 2013). Without proper knowledge, skill and experience on climate change, they may be affected by cyclones, fluctuations of weather and loss in fishing days, all of which lead to reduced income and livelihood. At the same time, all these circumstances will demotivate fishermen and disrupt their wellbeing (Salim & Shridhar; 2014).

Several researchers have confirmed that socio-demographic factors such as age, level of education, household size, income, vessel type, fishermen categories and catching area also have a significant relationship with attitude (Al-Oufi, 1999; Mohamed Shafrill et al., 2013a; Villareal, 2004). In Malaysia, the impact of climate change on human life has been studied by several government agencies, universities and private corporations (Mohamed Shaffril,

Abu Samah, D'Silva, & Md. Yassin, 2013; Tangang, Juneng, & Ahmad, 2007). The findings showed that attitude change was needed to adapt to the changing climate in order to obtain a better livelihood. However, information on small-scale fishermen among and such attitude change is still lacking. Such information is crucial for establishing ways to help small-scale fishermen improve their lives.

METHODS

Data collected for this study was obtained from a survey conducted among fisherment from two selected fisheries districts, namely Kota Bharu in the state of Kelantan and Nibong Tebal, located at the border of the states of Pulau Pinang and Perak. The locations were selected based on specific criteria including the fact that the areas were affected by erosion and sea-level rise (SLR) (Awang & Abdul Hamid, 2013; Toriman, 2006). Besides that, both locations were determined by NAHRIM to be points for the particular study of issues related to the impact of climate change on SLR in Malaysia.

A total of 300 fishermen (150 respondents for each location) were involved in the study and data were collected using a developed questionnaire. This study adopted a 5-point Likert scale pertaining to attitude towards climate change adaptation. For each question, the respondents were given a scale that indicate their level of agreement, from strongly disagree (1) to disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5). A pilot study was conducted among a small set of respondents to test the reliability of the instrument. The results of the reliability test indicated a Cronbach's alpha value of more than 0.699, which met the recommended value of Nunally (1978). Therefore, this instrument was reliable for use among a bigger scale of respondents.

The data were analysed using the SPSS software, from which descriptive statistics such as mean score, frequency and percentage were run. In addition, inferential statistics such as comparison of means tests (t-test and one-way ANOVA) and the Pearson product moment correlation were conducted to illustrate the difference and correlation of fishermen's attitude towards climate change.

RESULTS AND DISCUSSION

The results of the study summarised the respondents' profile and the descriptive and inferential analysis. For inferential analysis, comparison of means tests was applied in order to identify the differences in the fishermen's attitude towards climate change based on selected demographic factors such as level of education, catching areas, category of fishermen, usage of fishing technology, state and type of vessel. In addition, the Pearson product moment correlation analysis was used to identify the relationship between fishermen's attitude towards climate change and the selected demographic factors such as age, monthly income, total catch, household size, experience and frequency of working days.

Respondents' Profile

Table 1 shows the demographic profile of the fishermen based on gender, age groups, education, marital status and monthly income. A huge majority of the respondents were male (99.3%), while 0.7% were female. A total 63.7% of the respondents came from the age group of 40 years old and above, while 36.3% were below 40 years old; the average age was 45 years old. The majority of the respondents had formal education; most had primary education (43.7%), followed by lower-secondary education (26.7%), upper-secondary education (23.3%) and tertiary education (2.7%). A total of 93 fishermen had income from non-fishing activities. As part of the income per month from non-fishing activities, 44.1% of the respondents recorded a monthly income of RM500 and below, followed by those who had an income of RM1001 and above (23.3%). For the majority, spouse's income ranged between RM751 and RM1000 (36.5%), while other household members earned from RM1001 and above (61.8%). More than 76% of the household income was generated by fishing-related activities.

Table 1
Demographic background of the fishermen

Variable	n	%	M
Gender			
Male	298	99.3	
Female	2	0.7	
Age group (years)			45
<40	109	36.3	
>40	191	63.7	
Education achievement			
Never been to school	11	3.7	
Primary school	131	43.7	
Lower secondary school	80	26.7	
Upper secondary school	70	23.3	
Tertiary level	8	2.7	
Income/month (non-fishing activities) (n = 93)			1318.6
<RM500	41	44.1	
RM501-RM750	9	9.7	
RM751-RM1000	21	22.6	
>RM1001	22	23.7	
Income/month (Spouse) (RM) (n=52)			930.8
<RM500	16	30.8	
RM501-RM750	9	17.3	
RM751-RM1000	19	36.5	
>RM1001	8	15.4	

Table 1 *(continue)*

Variable	n	%	M
Income/month (Other household members) (n=102)			1752.0
<RM500	8	7.8	
RM501-RM750	11	10.8	
RM751-RM1000	20	19.6	
>RM1001	63	61.8	
Percentage of household income generated by fishing-related activities (%)			75.9
<50%	76	25.3	
51-75%	47	15.7	
>76%	177	59.0	

Table 2 presents the background information on the fisheries activities engaged in by the respondents. Most of the respondents were the skipper of the crew (65.7%), while the rest were crew members (34.3%). The majority of the respondents used fibre boats with a length size that was less than 21 ft (53%) as their vessel for their fisheries activities. Hence, the catching areas were suitable for coastal areas only (72%). Based on the findings of this study, most of the fishermen had more than 21 years of experience (43.3%), and spent between 16 and 20 days/month (54%) on fishing activities. A total of 30.3% of the respondents recorded a monthly income between RM751 and RM1000, followed by 27.3% whose income was RM1001 and above, 22.4% with income ranging from RM501 to RM750 and 20% with an income of RM500 and below. Most of the total catch recorded was below than 50 kg per week (40%), followed by 101 kg and above per week (30.3%) and 51 to 100 kg per week (29.7%). A large proportion of them used *pukat* (net) (66%), while 64% did not use fishing technology (GPS, echo sounder etc.).

Table 2
Fisheries activities background

Variable	n	%	*M*
Fishermen category			
Skipper	197	65.7	
Crew members	103	34.3	
Vessel type			
Sampan	29	9.7	
Fibre (<21 ft)	159	53.0	
Boat (Wood)	46	15.3	
Fibre (>21 ft)	66	22.0	

Table 2 *(continue)*

Variable	n	%	*M*
Catching areas			
Deep sea	84	28.0	
Coastal	216	72.0	
Experience as a fishermen (Years)			21.7
<10	88	29.4	
11-20	82	27.3	
>21	130	43.3	
Number of days spent on fishing operation (per month)			20.5
<15	45	15.0	
16-20	162	54.0	
>21	93	31.0	
Income per month (Fishing activities)			1288.3
<500	60	20.0	
RM501-RM750	67	22.4	
RM751-RM1,000	91	30.3	
>1,001	82	27.3	
Total catch (kg/week)			137.0
<50 kg	120	40.0	
51-100kg	89	29.7	
>101kg	91	30.3	
Main fishing tool			
Bubu	23	7.7	
Pukat (Net)	198	66.0	
Fishing rod	63	21.0	
Others	16	5.3	
Using fishing technology			
Yes	108	36.0	
No	192	64.0	

The findings capture the real-life picture of the current situation among small-scale fishermen, in particular, in region that are not much different from those studied in other research (Al-Oufi, 1999; Mohamed Shaffil et al., 2013a; Mohamed Shaffril, Abu Samah, & D'Silva, 2013b). As predicted, the majority of the fishermen were poorly educated. Even though the majority of the respondents had worked for many years as fishermen, they showed a positive number of working days i.e. they were still engaged in fishing-related activities for more than 15 days a month. However, they received

very little monthly income i.e. it was below RM1000.00. They were also still using traditional equipment and not any current technology. Studies have shown that they were heavily impacted by climate change, especially the small-scale fishermen, and that this demotivated them. Without proper intervention, the fisheries industry will collapse, severely impacting on the supply of marine products.

Descriptive Analysis

The description of the overall mean core and each statement is presented in Table 3 and 4. To test the level of attitude towards climate change adaptation, the cumulative mean score for the eight statements was used as the attitude scale measurement was obtained. Subsequently, it was divided into three levels based on the mean score: low (1.00 to 2.339), moderate (2.34 to 3.669) and high (3.67 to 5.00). Table 3 shows that the respondents in this study recorded a high level of attitude towards climate change adaptation with overall mean score of 3.96 and at a high percentage of 67%. The outcome of this study is similar to that obtained by Mohamed Shaffril et al. (2013a), who showed a high level of adaptation with regard to attitude towards climate change among small-scale fishermen in the East Coast of Peninsular Malaysia.

Table 3
Overall mean score on attitude towards climate change adaptation

Level	n	%	*M*
			3.96
Low (1.00-2.339)	9	3.0	
Moderate (2.34-3.669)	90	30.0	
High (3.67-5.00)	201	67.0	

Table 4 demonstrates the mean score of each statement for measuring attitude towards climate change adaptation. The respondents had the highest mean score on the statement "I value the friendship with my fellow fishermen," with a mean score of M=4.70. Based on observations and verbal information obtained during the data collection process, the bonds of friendship between the fishermen are very strong and this reflects the importance of friendship among them.

The majority of the respondents agreed with the statement, "It is important for me to preserve the ocean and its environment," which yielded the second highest mean score (M=4.43). A study by Muhammad et al. (2016) showed that the coastal area of the fishermen's community was still natural and protected, while many other natural coastal areas such as mangrove swamps, wetlands and sea reclamation land had become deteriorated due to the development of tourism activities.

Table 4
Statement measuring attitude towards climate change adaptation

No.	Statement	M
1.	I value the friendship with my fellow fishermen.	4.70
2.	It is important for me to preserve the ocean and its environment.	4.43
3.	I would like more information regarding climate change (causes, effects towards sea, fish and community).	4.39
4.	I am willing to explore new areas to increase my catch.	3.98
5.	It is important to perform extra jobs in order to increase my family income.	3.73
6.	I like to use fisheries technology as it helps a lot with my fishing activities (e.g. dealing with uncertainties in the weather).	3.59
7.	I encourage my wife and other family members to work in order to increase our family income.	3.58
8.	I am interested to learn new skills (besides fishing activities/besides depending on fisheries resources).	3.31

Source: Authors' research

A majority of the fishermen also agreed to the statement of "I would like more information regarding climate change" (M=4.39). This reflected their desire for better understanding of the causes of climate change and their effects on the sea, fish and community. Although the fishermen had good knowledge of the ocean based on their experience, their knowledge of climate change was only general (Mohamed Shaffril et al., 2013a).

According to psychologists, attitude can be assessed through cognitive, affective and behavioural elements that can be computed from several psychometrical statements. Based on the combination of eight statements measuring attitude in this study, the fishermen were found to show a moderate and high level of mean, portraying a positive attitude towards adaptation. Scholars who subscribe to the functional approach of attitude believe that in order to create a new form of attitude towards acceptance of and readiness for adaptation in environmental phenomenon such as climate change, a positive change of attitude is essential (Eagly & Chaiken, 1993; Katz, 1960; O'Keefe, 1990). Therefore, before stakeholders plan to move in and penetrate particular communities with their ideas and programme intervention, they must explore the current status of the community regarding their perception, attitude, knowledge, skills, experience and local setting (Muhammad et al., 2016).

Although this study did not focus on influential factors on adaptation, we believe that the current positive attitude among small-scale fishermen was due to their long tenure as fishermen. They realised that environmental changes were a fact, in addition to other influential factors such as government agencies' intervention, the news and other fishermen communities.

Comparisons of Means

Analysis of the data confirmed that there were significant differences between those who had primary-school education or below (M=3.86) and those who had secondary-school education or higher (M=4.04) (t=0.058, p=0.040), between the coastal (M=3.86) and deep-sea fishermen (M=4.21) (t=3.591, p=0.0001) and between fishermen who used technology in fisheries (M=4.20) and fishermen who did not (M=3.83) (t=4.198, p=0.0001). No significant differences were detected in the attitude towards climate change (t=1.370, p=0.172) between skippers (M=3.92) and crew members (M=4.05) and between fishermen in Penang (M=3.89) and those in Kelantan (M=4.04). Further analysis using ANOVA confirmed significant differences [F=6.517, p =0.0001] between different types of vessel towards climate change. To summarise, level of education, catching area, fishing technology usage and vessel type were factors that influenced attitude towards climate change adaptation among small-scale fishermen (Table 5).

Table 5
Differences in attitude towards climate change adaptation among small-scale fishermen in selected independent variables using t-test and ANOVA analysis

Variable	M (S.D)	T	*p*	Variable	M (S.D)	F	*p*
Education Level		2.058	0.040*	Vessel type		6.517	0.0001*
Primary school or below	3.86 (0.744)			Fibre boat	3.83 (0.599)		
Secondary school or higher	4.05 (0.770)			*Sampan*	3.82 (0.819)		
				Big boat (Wood)	4.11 (0.620)		
Catching area		3.591	0.0001*	Fibre boat (>21 ft)	4.26 (0.672)		
Coastal	3.86 (0.787)						
Deep sea	4.21(0.633)						
Category of fishermen		1.370	0.172				
Skipper	3.92 (.788)						
Crew members	4.05 (.704)						
Usage of fishing technology		4.198	0.0001*				
User	4.20 (0.790)						
Non-user	3.83 (0.630)						
State		1.759	0.080				
Pulau Pinang	3.89 (.801)						
Kelantan	4.04 (.715)						

Notes: *Denotes significance at p<0.05

Correlations

Income was the only factor that recorded a significant positive linear relationship with attitude towards climate change adaptation (Table 6). However, the strength of this relationship was negligible (r=0.146, p=0.011). Such findings denote that a higher income will produce a better attitude towards climate change.

Table 6
Relationship between attitude towards climate change adaptation and selected independent variables

Variable	*r*	*p*
Age	-0.088	0.127
Income (from fishing activities)	0.146	0.011
Total catches (kg/week)	0.101	0.334
Household size	-0.085	0.547
Experience as a fisherman	-0.024	0.677
Days spent on fishing operation (in a month)	0.000	0.994

CONCLUSION

Fishermen are an important group, particularly in their role as protein suppliers for the community. However, their high reliance on weather stability has resulted in climate change bringing a negative impact on their fishing routine. The effects are even worse for small-scale fishermen who operate their fishing routine traditionally and at subsistence level. The results of this study showed that small-scale fishermen in two states in Peninsular Malaysia, Kelantan and Pulau Pinang, have a high level of positive attitude towards climate change adaptation. This study also indicated that the differences in education background, catching areas, fishing technology usage and type of vessel can be independent factors that influence fishermen's attitude towards climate change adaptation. However, it was found that only income as a factor had a significant relationship between attitude towards climate change adaptation.

Based on the findings of this study, it is necessary to widely expose the information regarding climate change from related parties to the public, especially to communities with high vulnerability towards the impact of climate change i.e. small-scale fishermen in this context. This is very important because such information will enable small-scale fishermen to be better prepared to cope with the phenomenon of extreme weather events in order to reduce the risk of exposure to climate change.

The use of technology in fishing activities is one of the factors that influence attitude towards climate change. Besides helping to increase the catch, the use of technology can also help in terms of safety while at sea through the use of GPS, for instance, in addition to using a safety jacket and communication devices such as mobile phones and walkie-talkies. Improving safety conditions will strengthen the level of adaptation to climate change among fishermen.

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