

EXAMINING FACTORS AFFECTING CHANGE ADAPTATION PRACTICES AMONG SMALL SCALE FISHERMEN IN KELANTAN AND PULAU PINANG

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ABSTRACT

The study aims to determine individual factors affecting adaptation practices towards climate change among small scale fishermen in Peninsular Malaysia. This study is quantitative in nature and a total 300 respondents were selected via a multi-stage cluster sampling. The analysis performed demonstrated a moderate level of practices towards climate change adaptation among the small scale fishermen. Based on the findings, there are significant differences with regard to adaptation practices in terms of educational achievement, the states and vessel's type, while Pearson product moment correlation confirmed that age, total of catches, household income, years of experience as a fisherman and the days spent on fishing operations all had a significant relationship with adaptation practices.

KEYWORDS: community development, rural development, climate change adaptation

INTRODUCTION

In Malaysia, small scale fishermen are characterized by several characteristics. They operate their fishing routine within the range of five nautical miles and navigate using a small sized vessel (less than 21 feet) equipped with an engine ranging from 15 to 40 horsepower. Poverty among small-scale fishermen is evidently a problem within the coastal community. Due to their subsistence to fishing activities, a number of small-scale fishermen still live below the poverty line (below RM750 per month). The main contributor to such significant problem is due to the impacts of climate change. The scientists in Malaysia have noticed symptoms of climate change with regard to rising temperature, rising sea level, extreme waves, strong winds and unstable northeast monsoon pattern (Shaffril et al., 2017). In addition to causing damages to the environment, such changes are said to affect the routines of those who heavily rely on weather stability. In the case of fishermen, extreme events such as strong winds increase the risks associated with fishing activities and obstruct their fishing activities. As the impacts are forecasted to worsen, the best way to cope with it is by enhancing community adaptation level. According to Smit and Wandel (2006), adaptation is a process, action or outcome in a scheme such as household, community, group, sector, neighborhood or even country, in order to better cope with, manage or adjust of some changing condition, stress, hazard, risk or opportunity in the human setting of planetary change. Brooks (2003) on the other hand, described adaptation as an adjustment to the system's behavior and characteristics that enhance its ability to cope with external stress. Despite its importance, nevertheless, not much is known for small scale fishermen's ability to adapt to climate change. Many existing studies were focused on the

scientific perspectives, which left a huge gap for the social perspective. In response, this study attempts to measure an important issue from the social perspective – individual differences in climate change adaptation practices among small scale fishermen in Malaysia.

CLIMATE CHANGE ADAPTATION

The practice in adaptation may vary for everyone depending on the phenomena of interest and time scale (Smith and Wandel, 2006). Drawing on O'Brien and Holland (1992), adaptation requires adding new approaches; improve new coping strategies with shifting environment, and to reduce the impacts of climate change. There are four steps in public adaptation process suggested by Risbey et al. (1999), namely signal detection (decide what is adapted to and what is ignored); evaluation (where the signal is interpreted and foreseeable consequences are evaluated); decision and response (which results in an observable change in behavior and performance of the system); feedback (involves monitoring of the outcome of decisions to assess whether they are as expected). Klein et al. (1999) also suggested four steps in adaptation process, namely: information collecting and awareness building, planning and design, implementation, and monitoring and evaluation. Adger et al. (2009) argued that there were three adaptation limitations; ecological or physical limits, economic limits, and technological limits, but, at the same time their study also proposed four things to address the limits; ethics (how and what we value), knowledge (how and what we know), risk (how and what we perceive), and culture (how and why we live). Berkhout (2005) on the other hand, stressed on the weakness of adaptation practices among community members was due to their poor knowledge possession; hence it reduces their awareness towards the changes in environment. Similarly, financial and workforce limitation lead to insufficient capacity for timely adaptation. Lack of self-interest on the other hand, causes negative impact such as economic dispositions due to climate change. Moreover, technologically dependent and better resourced fishermen were found to cope better with climate change impacts (Adger et al., 2003).

METHODOLOGY

This study uses quantitative approach; the main tool for the data collection process was a developed instrument (questionnaire). Via a multistage cluster sampling, a total of 300 respondents were recruited among small scale fishermen; 150 respondents were surveyed representing the two states such as Kelantan and Pulau Pinang. The instrument contains three main sections – the respondents' background (9 items), fisheries activities background (8 items) and adaptation practices towards climate change (13 items). This questionnaire's response options ranges from strongly disagree (1) to strongly agree (5). The data collection was assisted by trained and experienced enumerators. On average, the respondents took about 20 to 25 minutes to complete each survey session. The data gained then was analyzed using SPSS (version 21) to explicate descriptive statistics such as frequency, percentage and mean score while inferential analyses such as independent t-test, ANOVA and Pearson product moment correlation were performed to determine any significant difference and relationship that might occur between individual factors and adaptation practices.

RESULTS AND DISCUSSION

Referring to Table 1, 99.3% of the respondents were male and only 0.7% were female. The average age of respondents was 45.4 years. A few of them have a higher level of education as only 2.7% completed the tertiary level while in terms of marital status, majority of them (77.3%) are married. The recorded average income per month was RM1288.30. 93 respondents had a second income and on average it contributes to their monthly household income by RM1318.60. Out of the 52 working spouses, 30.8% of them earned an income of less than RM500 while 15.4% earned more than RM1000 per month. For other working household members, nearly every one of them (61.8 %) contributed more than RM1000 towards their total household income. It can be seen that more than half the respondents (59.0%) relied heavily (more than 76%) on fishing related activities to generate income.

Table 1: Respondent background

Factor	Frequency	Percentage	Mean
Gender			
Male	298	99.3	
Female	2	0.7	
Age group (years)			45.4
<40	109	36.3	
>40	191	66.7	
Educational 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	
Marital status			
Single	50	16.7	
Married	232	77.3	
Divorced	18	6.0	
Income per month (fishing activities) (RM)			1288.3
<500	60	20.0	
501-RM750	67	22.3	
751-RM1000	91	30.3	
>1001	82	27.3	
Income per 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 (spouse) (RM) (n =52)			930.8
<RM500	16	30.8	
RM501-RM750	9	17.3	
RM751-RM1000	19	36.5	
>RM1001	8	15.4	
Income (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 demonstrates the respondents' fisheries activities. On average the total catches per week recorded was 137 kg. In terms of experience as a fisherman, on average, the respondents had 22 years of experience in conducting fishing activities. Most of them (54.0%) spent between 16 to 20 days in a month to go out fishing. 65.7% of them were skippers and the remaining 34.3% were crew members. More than half of the respondents (53%) used fibre boats and 72% had operated their fishing routine in the coastal areas. Merely 36% of them used advance fisheries technology and 66% used trawl as their main fishing tool.

Table 2: Fisheries activities background (n=300)

	Frequency	Percentage	Mean
Total catches (per week) (kg)			137.0
<50 kg	120	40.0	
51-100kg	89	29.7	
>101kg	91	30.3	
Experience as a fisherman (years)			21.7

<10	88	29.3	
11-20	82	27.3	
>21	130	43.3	
Number of days spent for fishing operation (per month)			20.5
<15	45	15.0	
16-20	162	54.0	
>21	93	31.0	
Fishermen category			
Skipper	197	65.7	
Crew members	103	34.3	
Vessel type			
sampan	29	9.7	
Fibre	159	53.0	
Boat (wood)	46	15.3	
Fibre (>21 feet)	66	22.0	
Catching areas			
Deep sea	84	28.0	
Coastal	216	72.0	
Use off fisheries technology			
Yes	108	36.0	
No	192	64.0	
Main fishing tool			
Portable traps	23	7.7	
Net	198	66.0	
Fishing rod	63	21.0	
Others	16	5.3	

Table 3 demonstrates moderate level of adaptation practices towards climate change (M = 3.28) 3.28. Table 4 later depicts statements measuring the respondents' adaptation practices towards climate change. Out of 13 items, five items recorded a high level of mean score (mean score between 3.68-5.00), six items recorded a moderate level of mean score (mean score between 2.34-3.67) and two items recorded a low mean score (mean score between 1.00-2.33). to the statement 'Cooperation practices have become a culture among the fishermen in this area' recorded the highest mean score

(M = 4.51) while statement related to ‘I market my own catches without going through a middle man’ recorded the lowest mean score (M = 1.63).

Table 3: Overall mean score on adaptation practices towards climate change among small scale fishermen (n=300)

Level	Frequency	Percentage	Mean score
Low (1.00-2.33)	10	3.4	3.28
Moderate (2.33-3.67)	220	73.3	
High (3.68-5.00)	70	23.3	

Table 4: Statements measuring adaptation practices towards climate change among small scale fishermen

Statement	Mean score
1. Cooperation practices have become a culture among fishermen in this area	4.51
2. For safety purposes, I am always sensitive to the occurring climate change	4.39
3. I often share weather information with friends	4.36
4. I can adapt to the circumstance of changing climate	4.32
5. If I accidentally catches small fishes, I will release them	3.90
6. I often explore new areas to increase my catches	3.57
7. I save money to cope with any possible event	3.54
8. My wife and other family members are working to help me earn extra family income	2.83
9. I use a variety of tools to increase my catches	2.64
10. I do more than one job (apart from fishing activities / non-reliant on fisheries resources) to supplement my family income	2.45
11. I learn additional skills (apart from fishing activities / non-reliant on fisheries resources) to improve my alternative skills	2.34
12. I was involved with environmental conservation activities here (e.g. Mangrove replanting, place new reefs)	2.27
13. I market my own catches without going through a middle man	1.63

Via an independent t-test, the study tries to examine any significant differences on adaptation practices that might occur in individual factors such as educational achievement, catching areas, category of fishermen, use of fisheries technology, and the state. The analysis revealed that Educational achievement does have an influence on adaptation practices. This was due to whether they have completed their (M = 3.36, SD = .570) primary school or below and (M = 3.16, SD = .477; $t(200) = 2.766, p = 0.006$) secondary school or higher. Based on the findings, it was confirmed that those with higher education background have better adaptation practices compared to those with a lower education background and this is in line with Berkhout (2005). Berkhout (2005) claimed that poor knowledge possession causes the society to have inadequate level of awareness towards surrounding changes. The study concluded significant differences between fishermen in Pulau

Pinang and Kelantan based on ($M = 3.35$, $SD = .589$) for Pulau Pinang and ($M = 3.21$, $SD = .465$; $t(200) = 2.184$, $p = 0.03$). Based on the resulted analysis, the fishermen in Pulau Pinang were found to have better adaptation practices towards climate change compared to those in Kelantan.

Table 5: Differences in adaptation practices towards climate change among small scale fishermen in selected independent variables using independent t-test

Variables	Mean score	S.D	t	P
Educational achievement			2.766	.006*
Primary school or below	3.19	.477		
Secondary school or higher	3.36	.570		
Catching areas			.775	.439
Coastal	3.27	.525		
Deep sea	3.32	.557		
Category of fishermen			.970	.333
Skipper	3.26	.541		
Crew members	3.22	.520		
Usage of fisheries technology			1.285	.200
User	3.33	.512		
Non-user	3.25	.545		
State			2.184	.030*
Pulau Pinang	3.35	.589		
Kelantan	3.21	.465		

The types of vessel navigated by fishermen was found to have significant influence on fishermen’s adaptation practices towards climate change based on (F value ($5,200$) = 2.669, $p < 0.05$) (Table 6). Further analysis using Post Hoc test concluded those who navigated using fiber boats (> 21 feet) had better adaptation towards climate change compared to other types of vessel.

Table 6: Differences in adaptation practices towards climate change among small scale fishermen in selected independent variables using ANOVA

Variables	Mean score	S.D	t	P
Vessel type			2.669	.048*
Fibre boat	3.22	.380		
Sampan (small wooden boat)	3.27	.562		
Big Boat (wood)	3.16	.431		
Fibre boat (> 21 feet)	3.43	.564		

The study also examined the relationship between selected independent variables with climate change adaptation practices. Out of the six variables measured, the only factor that did not produce any significant relationship with adaptation was the number of household. Income (from fishing activities) ($r=0.114$) and total of catches (per week) ($r=0.163$) have a positive relationship with practices. It denotes that the more income and catches they earn the stronger their adaptation practices towards climate change. Meanwhile age ($r=-0.132$), days spent for a fishing operation (in a month) ($r=-0.166$), and experience as a fisherman ($r=-0.167$) had a negative relationship with adaptation practices towards climate change among small scale fishermen. It denotes that the older the fishermen is, the longer they spent on fishing operation days and years of experience causes fishermen to have weaker adaptation practices.

Table 7: Relationship between adaptation practices towards climate change among small scale fishermen and selected independent variables using Pearson Product Moment Correlation

Factor	r	p
Age	-.132	.022*
Income (from fishing activities)	.114	.049*
Total catches (per week)	.163	.005*
Household number	.070	.226
Experience as a fisherman	-.167	.004*
Days spent for a fishing operation (in a month)	-.166	.044*

CONCLUSION

Adaptation practices to climate change are an adjustment of a system to help overcome the impacts of climate change. The study concluded that the small scale fishermen in Malaysia had a moderate level on adaptation practices towards climate change. The performed inferential analyses has confirmed the ability of factors such as age, income, total catches, experience and days spent for a fishing operation to influence adaptation practices among small scale fishermen. It is suggested that the concerned agencies should consider factors such as age, income, total catches, experience, and days spent for fishing operation and educational achievement in any community adaptation plan.

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