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Measuring the Small Scale Fishermen's Adaptation Ability based on their Practices: The Case of Peninsular Malaysia

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Abstract
As climate change is worsening, it is apparent that people would manage several adaptation strategies to confront it in the most effective ways. Adaptation practices is crucial, especially among small scale fishermen whose reliance on the weather state is high. This study aims to measure small scale fishermen's adaptation ability from the angle of their practices. This study is quantitative in nature whereby via a multistage cluster sampling, a total of 200 small scale fishermen were selected as respondent. Findings from this study show Malaysian fishermen's heavy reliance on fisheries activities, their reluctance to venture into new work fields and low confidence in getting a new job as their main weakness when it comes to their adaptation practices, whereas their ability to diversify their catches and catching tools and their courage to explore new catching areas were seen to be their strength. It is hoped that the discussions from this study be considered in any development plan strategized by concerned parties.
Keywords: Community Development, Adaptation Ability, Fisheries Industry Development, Environment Management

Introduction

Similar to other countries across the globe, Malaysia is also subjected to frequent weather occurrence that worsens the impact of climate change on the biophysical, social and economic attributes (Lucie et.al, 2013). This situation should be a concern among the community as this sector has for many years played an important role in the Malaysian economy. Climate change phenomenon such as an increase in sea temperature, the rising of sea-level, affected ocean pH, rainfall and ocean circulation has been affecting and threatening the ocean ecosystem (Brander, 2007; Halpern et al., 2008). Understandably, the quality and the quantity of marine flora and fauna are affected by these changes. Brown et al. (2010) claimed that climate change produces negative impacts on ocean organisms, the composition of marine communities and ecosystem function while previous studies have looked onto the impacts of rising or decreasing temperature (caused by climate change) on the extinction of local living organisms and to the

colonization by species previously absent in those areas (Cheung et al., 2009; Vinagre et al., 2011). Consequently, these impacts have negatively affected the socio-economic aspects of small scale fishermen. The reduced number of marine source quality and quantity means less catches for the fishermen, which then result in less income for them (Gamito et al., 2013; Sumaila et al., 2011; and Harmeling, 2011). Extreme weather resulted from the changing climate on the other hand has increased the risks associated with their fishing routine. Such circumstances will force them into delaying or cancelling their fishing trips as they are only equipped with small vessels, small engine capacity and basic communication tools.

As studies has confirmed on its negative impacts towards fishermen activities, adaptation practices towards it is seen as the best survival response. The Intergovernmental Panel on Climate Change (IPCC) (2007) defined adaptation as

> *Adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*

The focus on adaptation practices has a long history in anthropology (e.g., McCay 1978). Now, it is commonly used to examine how people adjust to and cope with environmental change and uncertainty, with linkages to the strength and weaknesses (Head, 2010). In order to understand the strengths and weaknesses of small-scale fishermen on practices related to climate change adaptation, more studies are needed. To date, few understanding is made as most existing studies has mostly focused on the scientific perspective of climate change (Brander, 2007; Halpern et al., 2008; Lucie et al., 2013; Cheung et al., 2009; Vinagre et al., 2011; Brown et al. 2010). These studies will eventually result in dissimilar interests and intention in future programs as they are not in line with the needs, abilities and interests of small scale fishermen. In response to this gap, the current study aims to provide insights and perspectives related to small scale fishermen practices on climate change adaptation.

Methodology

Based on a multi-stage simple random sampling, 200 fishermen from Peninsular Malaysia were chosen as respondents for this study. During the first stage of sampling, the states are divided into two zones – the west coast and the east coast. Then a state was randomly selected from each group. In this stage, the selected states were Pulau Pinang (representing West Coast) and Terengganu (representing East Coast). In the second stage of sampling, one fisheries district was selected to represent each zone. In this stage, the selected fisheries districts were Central Seberang Perai (Pulau Pinang) Northern Kuala Terengganu (Terengganu). In the last stage of sampling, a simple random sampling was again employed to choose 100 respondents from each fisheries district. Ideas on developing the questionnaire was based on review of literature. As much as possible, the items developed were linked to the operational definition of adaptation towards climate change, however, items from existing studies that were indirectly related to the operational definition of each variable, but are consistent and in line with goal and criteria of the study were considered to be included in the instrument. For each questions asked, the respondents were given a five-point Likert scale option of answers, which ranges from strongly disagree (1), disagree (2), moderately agree (3), agree (4), and strongly agree (5). A survey

technique was used to collect the data needed. Enumerators were hired and trained to conduct the survey. SPSS was used to conduct suitable analyses to answer the dictated objectives. To determine their level of practice, the cumulative mean score was categorized based on the range of score calculation.

$$\frac{\text{Maximum mean score (5.00)} - \text{Minimum mean score (1.00)}}{\text{Number of intended levels (3)}}$$

The calculation, then resulted in a range of 1.33 for each category, which comprises of – low level of practice (mean score between 1.00-2.33), moderate level of practice (mean score between 2.34 – 3.67) and high level of practice (mean score between 3.68 – 5.00).

Results & Discussion

Respondents' demographic data

To obtain the respondent's demographic data, a total of nine questions was asked. Based on the obtained results, it was determined that 15% of the respondents were aged 30 and under, 39% were aged 31 to 50, while of the remaining 46% were aged 51 and above. Only 5% of the respondents had never been to school, 31.5% possessed a primary school level of education as well as the number of respondents who possessed an upper secondary school level of education, while 29.5% of the respondents possessed a lower secondary level of education. The remaining 5% of the respondents possessed a tertiary level of education. The majority of the respondents were married (82%), 14% were single and only 4% were divorced/widowed. In this study, the fishermen were divided into three different categories; full time fishermen, fishermen with side income related to fisheries activities and fishermen with side income unrelated to fisheries. 77%, 4.5% and 18.5% of the total number of respondents were respectively recorded in three categories. The mean score recorded for monthly income was RM890. Most of the respondents (35.5%) earned between RM701 to RM1000 per month. The majority of the respondents' income were generated from fisheries related activities, 60.5% of fishermen had more than 76% of their income from fisheries. Based on the mean score recorded for experience as a fisherman (M = 24.3 years), it can be concluded that the majority of these fishermen was considered "senior" in terms of their experience level. About 32.0% of the respondents had 16-30 years of experience as a fisherman and spent 19 days a month out at sea. In addition, 97.5% of the respondents used fiber boats to conduct their fisheries activities.

Table 1: Demographic data

Variables	Frequency	Percentage	Mean
Age (years)			48.69
<30	30	15.0	
31-50	78	39.0	
>51	92	46.0	

Education achievement			
Never been to school	10	5.0	
Primary school	63	31.5	
Lower secondary school	59	29.5	
Upper secondary school	63	31.5	
Tertiary level	5	2.5	
Marital status			
Single	28	14.0	
Married	164	82.0	
Divorced/Widowed	8	4.0	
Fishermen category			
Full time fishermen	154	77.0	
With side income (fisheries related)	9	4.5	
With side income (non-fisheries related)	37	18.5	
Income per month (from fisheries activity)			890.00
<RM500	57	28.5	
RM501-RM700	36	18.0	
RM701-RM1000	71	35.5	
>RM1001	36	18.0	
Percentage on income generated from fisheries related activities			75.5
<30%	21	10.5	
31-50%	47	23.5	
51-75%	11	5.5	
>76%	121	60.5	
Experience as a fisherman (years)			24.3
<5	24	12.0	
6-15	51	25.5	
16-30	64	32.0	
>31	61	30.5	
Days spent at the sea for fishing operation in a month			18.9
<15 days	53	26.5	
16-20 days	105	52.5	
>21 days	42	21.0	
Vessel type			
Fibre boat	195	97.5	
Sampan	5	2.5	

Fishermen practices in adapting towards the changing climate

A total of 15 items was used to measure the small scale fishermen's adaptation practices. Approximately, four items had recorded a high level of mean score while another 11 items only recorded a moderate level of mean score. Items related to difficulties to leave their job as a fisherman yielded the highest mean score (M = 4.23) (Table 2). The result of this finding is not surprising as it is associated with their life-long experience within the fisheries sector (M = 24.3 years, refer to Table 1). Although their difficulties in leaving their current job as a fisherman recorded the highest mean score, nevertheless it still demonstrated a weak adaptation practice. As these fishermen relied heavily and solely on fishing routines as a major economic activity and at the same time faced difficulties to leave this job, this group of community is expected to face problem in the future as the impacts of climate change is forecast to be ever-changing. This problem is expected to worsen as the data demonstrated that small scale fishermen were reluctant to venture into new fields, while at the same time they were not confident they will get another job (other than fishing related) easily due to having a low education achievement.

In terms of their strength in adaptation practices, the small scale fishermen were able to diversify their marine catches and catching tools. Portable traps (for crabs) for example, during the wait for their catches, had no problem in diversifying their use of nets to catch other species such as fish, cuttlefish and prawn. This group has demonstrated less hesitance and has the courage to explore new catching areas if extreme local weather forced them to do so. Having to face all these phenomenon is expected to increase their productivities and strengthen their financial capacity, which according to Shaffril et al. (2016) is vital in strengthening a fisherman's adaptation ability.

Table 2: Fishermen practices to adapt to the changing climate

Statement	Mean score
It's hard for me to leave my job as a fisherman	4.23
There is a lot of job opportunities (fisheries related) here	3.48
There is a lot of job opportunities (not fisheries related) here	3.48
I like to learn new skills related to fishing activities (e.g.: aquaculture, processing salted fish) - (semi-maritime)	3.03
I like to learn new skills - that are not related to fisheries and agriculture (e.g.: - entrepreneurial, vocational)	3.07
If I want, with the level of education / skills that I have I can get another job other than the fishermen	2.99
I can diversify marine catches other than fish	3.71
I can use any fishing equipment other than the equipment I use for now	3.81
I don't have any problem to learn to use the new technologies such as GPS, sonar and echo sounders in order to face the uncertainty of the weather	3.67
I would like to change to bigger and stronger boats to face the uncertainty of the weather	3.46
I doubled my trip fishing operations	3.25
I extend my time fishing operations	3.52
I have no problem to explore new fishing areas	3.76
I encourage my wife / my children to work outside the field of employment that I operate to help me increase revenue	3.32
If the bad weather continues, the possibility for me to venture in a new field is high	2.84

Conclusion and Recommendations

As climate change is expected to worsen, the small-scale fishermen need to be more proactive and responsive in their adaptation efforts. The findings from this study has shown that Malaysian fishermen's heavy reliance on fisheries activities, their reluctance to venture into new fields and low confidence in getting a new job as their main weaknesses in adaptation practices, while their ability to diversify their catches and catching tools and their courage to explore new catching areas are seen to be the main strength in their adaptation practices.

To further strengthen their adaptation strategy, the small scale fishermen should be informed of the short and long term of climate change impacts. To realize this, fisheries extension officers, the public and advisory services plays a major role in providing fishermen with information, technology usage and education on the best adaptation practices towards climate change. Due to the importance of the fisheries sector in Malaysia, the government should consider to elevate efforts to strengthen the adaptive abilities of fishermen towards the impacts of climate change.

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