Inequity, Vulnerability and Livelihoods of Small-Scale Fisheries: A Case of No-Take Marine Protected Area in Perhentian Islands, Malaysia

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DECLARATION

I hereby declare that the research project is based on my original work except for quotations and citations that have been duly acknowledged. I also declare it has not been previously or concurrently submitted for any other degree at Universiti Tun Abdul Razak (UNIRAZAK) or other institutions.

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Abstract of the project paper submitted to the Senate of Universiti Tun Abdul Razak in partial fulfilment of the requirements for the Master of Business Administration

ABSTRACT

Small-scale fishers in marine protected areas of Malaysia experience inequitable access to local resources and unfair distribution of benefits. This study attempts to investigate how inequitable access to fisheries and benefits, and the lack of community involvement in resource management, result in income inequity and vulnerability in the livelihoods of small-scale fisheries communities in marine protected areas of Malaysia. The location selected for the research was the Pulau Perhentian Marine Park. This study followed a mixed (qualitative and quantitative) approach where a survey was used to obtain the local community's perspective of inequity in the marine park. Data was collected through face-to-face interviews of respondents with a structured questionnaire. Convenience sampling was used to select respondents drawn from local inhabitants knowledgeable about income distribution; employment conditions; and marine resource conditions and management in the marine park. The data collected was measured with the five-point Likert scale and statistically analysed using the IBM SPSS software to see if the research hypotheses generated are supported. The findings of the research indicate the existence of inequity affecting the income of small-scale fishers in the marine park and their access to resources, which are attributable to social and governance aspects of marine resource management. Viability for the fishers will require government interventions and responses that can result in fair access to employment and equitable distribution of income.

Key words: small-scale fishers, marine protected areas, income inequity, vulnerability, livelihoods, access to resources, lack of community involvement

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ABBREVIATIONS

DFID	Department for International Development, United Kingdom
DMPM	Department of Marine Parks Malaysia
DOFM	Department of Fisheries Malaysia
DOSM	Department of Statistics Malaysia
FGD	Focus group discussion
KMO	Kaiser-Meyer-Olkin
MPA	Marine protected area
MPRMD	Marine Park and Resource Management Division
PCA	Principal component analysis
PPMP	Pulau Perhentian Marine Park
SPSS	Statistical Package for the Social Sciences
UNDRR	The United Nations Office for Disaster Risk Reduction
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER ONE:

INTRODUCTION

1.1 Background of the Study

Small-scale fisheries in Malaysia are generally confined to the coastal areas, operating with small vessels, low engine power, and traditional gear. Small-scale fishing, also known as traditional or artisanal fishing, has been the backbone and primary means of livelihood for the coastal communities in Malaysia for generations, providing them with food, income, and employment.

Marine capture fisheries in Malaysia experienced rapid growth during the late 1960s and early 1970s with the rise of commercial fishing. The problem of fish stock depletion was acknowledged in the early 1980s when the government responded by establishing marine protected areas (MPAs) to protect and conserve coral reefs (Islam et al., 2013, 2016). Malaysia has a total of 53 MPAs, of which 42 coral island MPAs in Peninsular Malaysia were gazetted as marine parks between 1994 and 2008 (DOFM, 2021). Eco-tourism was promoted in marine parks to provide economic benefits to the local communities (Islam et al., 2013) and to contribute towards covering the cost of marine resource preservation ("Total Economic Value", n.d.). Since the 1990s, rapid and large-scale infrastructural development has taken place in marine parks to accommodate the demand of tourism. These physical changes to the islands coupled with unregulated tourist activities have resulted in seawater pollution, sedimentation in coral beds, and damage to coral reefs and fish habitats in the MPAs (Islam et al., 2014b; Maidar, 2018; Reef Check Malaysia, 2011; Tai et al., 2014).

Pollution has become a serious problem in marine parks and the main causes are sewerage discharges from chalets and homes, littering on beaches, oil leakage from boats, and inadequate sanitation facilities. The threat of pollution from tourism activities and infrastructural

development was not adequately addressed during the planning of the marine parks or their current management (Islam et al., 2014b; Maidar, 2018).

Coral reefs shelter and support the habitats of many commercial fish species that serve as a food protein source for the Malaysian population. In addition, healthy coral reefs bring economic benefits to the country through eco-tourism. Marine resource degradation in the MPAs has led to shrinking catch rates and fishing income for local fishers (Islam et al., 2013, 2014b). The livelihoods of coral-based tourism operators in marine parks are also affected by damage to coral reefs as it jeopardizes a key eco-tourism attraction (Islam et al., 2016).

The governing system of the MPAs consists of the following agencies:

- The Marine Park & Resource Management Division (MPRMD) of the Department of Fisheries Malaysia (DOFM) under the federal government is responsible for managing and administering MPAs and overseeing the protection of marine biodiversity and resources in the MPAs (DOFM, 2021).
- The Department of Land and Mines under the respective state governments are responsible for all land-related matters in the MPAs (Islam et al., 2014).

The setting up of MPAs has produced serious consequences for the livelihoods and lifestyle of the local communities. Firstly, fishing is prohibited in the MPAs, forcing local fishers to shift from their traditional fishing grounds to the outlying marine waters. Secondly, marine parks have been widely promoted as eco-tourism destinations, resulting in a high influx of tourists to the islands and rapid infrastructural development to accommodate the growing tourism industry. Thirdly, tourism has replaced fishing as the main income source for the islanders. Fourthly, the natural ecosystems and the marine resources of the MPAs have suffered degradation as a result of pollution, poorly regulated tourism and development activities, illegal fishing, and weak MPA governance.

The MPAs in Malaysia have failed to achieve their fundamental objective of protecting and conserving corals and rebuilding fish biomass because of poor management. Ineffective MPA management is evident from the overexploited state of marine fisheries and the destruction to coral reefs (Islam et al., 2014). The local small-scale fisher communities find themselves worse off now than before the establishment of the MPAs because firstly, the productivity of fishers has decreased and the vulnerability risk of their livelihoods has intensified due to restricted access to fisheries resources and emerging problems e.g. seawater pollution that causes destruction to coral reefs; and secondly, fishers are dissatisfied over unfair distribution of benefits in the MPAs (Islam et al., 2016, 2021; Maidar, 2018).

The intention of this research is to examine the aspects that contribute to social inequity for the artisanal fisher communities in the MPAs and increase the vulnerability risk of their livelihoods. The study location is the Pulau Perhentian Marine Park (PPMP), situated off the East Coast of Peninsular Malaysia. The study site was selected because of its unsatisfactory marine resource condition and its tourism prominence.

1.2 Problem Statement

The livelihoods of the small-scale fishers in the MPAs of Malaysia are subject to socioecological and governance stressors which increase their vulnerability.

The current research is essential because of three reasons:

(i) Poverty of artisanal fishers

Artisanal fishers have remained in the lowest income group of Malaysia for decades (Solaymani & Kari, 2014). Poverty of small-scale fishers have been linked to socio-economic factors such as conflicts with the commercial fishery, inadequate vessels and gear, and lack of alternative income

sources (Smith, 1979); and to the intrinsic biological limits of fisheries resource and resource degradation or depletion (Bene, 2003).

In Malaysia, the prohibition of fishing in the MPAs has severely hampered the fishing activities of local artisanal fishers and increased the economic burdens of the fishing communities who now face shrinking fishing income. Furthermore, as studies conducted in Malaysia reveal, unregulated tourism and development in the coastal region and a general failure in MPA management have led to the deterioration of coral reef habitats and depletion of fish stock (Islam et al., 2013, 2014b, 2016).

Small-scale fishers in Malaysia MPAs are also affected by the negative impacts of climate change on marine resources such as coral bleaching and destructive algae blooms (Muhammad et al., 2016).

More research is needed to understand the stressors that contribute to poverty among artisanal fishers in the MPAs of Malaysia.

(ii) Inequitable distribution of benefits to the fishing communities in Malaysia MPAs

Recent research conducted in the MPAs indicate that the local fishing communities are unhappy over inequitable access to local resources and unfair distribution of benefits from fisheries (Islam et al., 2016, 2021; Maidar, 2018). The problems which result in inequity include the following:

- The fishing ban in MPAs has created a barrier to the pursuit of fishing as a means of livelihood. The local fishers are forced to fish in the open sea for which their small, low-powered boats are inadequate. Local fishing communities are marginalized due to lack of recognition and participation in fisheries management. Studies to understand the causes of vulnerability in the fishing communities are as yet unavailable.

- Income from fishing is irregular because the fishers cannot operate during bad weather conditions when strong winds and heavy rain make it unsafe for them to go out to the open sea to catch fish given their small, low-powered vessels and limited access to technology.
- Fisheries resources are declining due to degradation of coral reefs and fish habitats caused by unsustainable tourism and development activities, and sea water pollution.
- Encroachment and illegal fishing by commercial trawlers have led to depletion of fish stock.
- Poor MPA management has resulted in ineffective coral reef conservation and failure in rebuilding fish stock.
- Tourism has flourished in the MPAs but most of the tourism businesses are owned and managed by expatriates and outsiders from the mainland rather than the locals (Islam et al., 2016; Maidar, 2018); and the major portion of income from tourism business goes to the rich and powerful business groups. The existing power asymmetries in the MPAs have led to the marginalization of the local people and are still not clearly understood.
- The fishers have few alternative sources of income and employment due to their lack of formal education and financial capability. Additionally, they face difficulty in obtaining licenses and bank loans to start and operate businesses.

A significant research gap exists in the area of inequitable access by fishers to local resources in the MPAs and unfair distribution of benefits and burdens affecting them. More studies are crucial to investigate and better understand the situation, and to help find answers to the problems. This study aims to explore the social, governance and ecological factors that affect inequity in the fishing community.

(iii) The lack of participation by the local people in MPA resources management and protection

The current MPA management system does not allow for participation by the local communities, and gives them little say in matters that concern their livelihoods and their islands (Islam et al., 2014, 2016; Maidar, 2018). Although formal affiliations exist in the MPAs e.g., fishermen associations and boatmen associations, their role in the protection of local resources is unclear and they have not been effective in safeguarding the natural assets – fisheries, coral reefs, land and forest. The local communities lack empowerment and capacity to manage their marine resources, establish user rights in the MPAs, and protect the land and forest resources on the islands.

Apart from the government agencies, various social organisations exist in the community to facilitate social and cultural activities – there is a village leader (ketua kampung) in the MPA; the fishermen association; the boatmen association; and other local associations involved in community activities and in providing support to the local people. No investigation has yet been carried out on the roles and functions of these local organisations, their practices, and how they can help with fisheries management and other community development activities.

Research gaps exist on the participation of the local people in the management and protection of resources in Malaysia MPAs, including the functions and roles of local community organisations and associations. It is vital to explore this area with a view to improving MPA resources management, in particular involving the local fishers and fishermen association in the management of fisheries resources.

1.3 Research Objectives

The overarching aim of this study is to obtain the local communities' perspective on social inequity in the MPAs of Malaysia, and on the participation of local inhabitants in the management and protection of resources.

The specific objectives of the study are as follows:

1. To assess how social factors (income, employment, access to fishing, access to business, power relations, and social empowerment) give rise to inequity affecting the livelihoods of small-scale fishers;
2. To investigate how access to various assets and resources can affect the distribution of income and the livelihoods of small-scale fishers;
3. To assess how governance factors (MPA regulations, local institutions, community participation in MPA management, community organisations, and village leaders) influence the equitable income of small-scale fishers; and
4. To examine how ecological factors (pollution, tourism intervention, and loss of coral habitats) affect the equitable income of small-scale fishers.

1.4 Research Questions

This study attempts to answer the following questions:

1. How do socioecological and governance factors create unbalanced access by small-scale fishers to local resources and unfair distribution of benefits from fisheries in the MPAs?
2. Do the local fishers get fair access to the income and employment in the local economy?
3. Do the local fishers have ability or power to manage the fisheries resources of the MPAs?
4. Do the local communities participate in decision making affecting resource management and local development in the MPAs?
5. Do the local communities have ability to enhance sustainable resource management and improve income equity and livelihoods of local fishers?

1.5 Significance of the Study

Social inequity in Malaysia MPAs and its effect on the local small-scale fisher communities remain poorly understood. Formal studies on the negative impacts of income inequity on small-scale fishers' livelihoods in Malaysia MPAs are lacking. In this study, the researcher examined the effect of socioecological and governance factors on access to employment and fisheries resources, and the distribution of income to small-scale fisher communities, in the context of the No-Take Zone MPAs of Malaysia. The findings of this study can help improve policies and governance on MPA management and resource conservation.

The findings of the study provide for a better understanding of socioecological and governance stressors of vulnerability and their impact on inequity in the fisher communities of no-take MPAs in Malaysia. These findings benefit fishers, tourism business sector, non-government organisations, and policy makers and help in the formulating of effective management of MPAs for sustainable livelihoods of the local communities. Existing literature is limited for understanding the use of the I-ADApT framework (Bundy et al., 2016) in explaining the influence of social, ecological and governance factors on vulnerability and inequitable distribution of benefits. The findings of this research can fill an important gap in existing literature by increasing knowledge regarding the explanatory power of the I-ADApT framework in predicting the effect of social, ecological and governance factors on the inequitable distribution of benefits affecting the local fishers in MPAs.

This research is part of the "Vulnerability to Viability: Global Partnership for Building Strong Small-Scale Fisheries Communities" project organized by the University of Waterloo, Waterloo, Ontario, Canada, towards building a global perspective on key vulnerabilities and opportunities associated with small-scale fisheries.

1.6 The Organisation of the Study

This research thesis has five chapters. The first chapter presents the research problem, the research objectives and the research questions. It also provides an overview of small-scale fisheries and MPAs in Malaysia, and introduces the study site, PPMP. The second chapter sets out the relevant literature used in this study, and establishes the theoretical foundation and conceptual framework for the research. The major literature includes those relating to livelihood, vulnerability and social inequity frameworks, as well as those concerning the impact of governance and other forces on the livelihoods of small-scale fisher communities in MPAs. Chapter 3 describes the methods and approach that were used in the study to answer the research questions, and how data for the study were collected, measured and analysed. Chapter 4 discusses the results of the research and the final chapter explains the conclusion arrived at from the research findings.

CHAPTER 2:

LITERATURE REVIEW

2.1 Introduction

This chapter describes the main works related to the topic of this study, and provides a synthesis of currently available knowledge and information drawn from related past research as well as statistics and data obtained from the publications of government bodies and non-governmental organisations. It also explains the literature used to establish the theoretical foundation for this study, and describes the theoretical framework for the research.

2.2 Research Context

This section summarises the literature related to the history and background of the current study.

The Small-Scale Fisheries Sector in Malaysia

In Malaysia, small-scale fishers generally operate less than five nautical miles from the shore using owner-operated fishing vessels of less than 40 gross tonnage and traditional fishing gear (Islam et al., 2014; Mohamed Omar, 2017). Fishing is regulated by means of limited entry license (by zones) which differentiates fishing capacity according to gear type, vessel size, and type of ownership (Islam et al., 2016; Kirkley et al., 2003). Four fishing zones are specified namely, A, B, C and C1; and the inshore belt (Zone A) is designated for small-scale fishers (Mohamed Omar, 2017).

The rise of commercial fishing in Malaysia has resulted in overcapacity and conflicts between commercial fishers and traditional fishers (Butcher, 2004). Small-scale fisheries have been badly affected as fish stocks become overexploited, catch rates fall, and the fishers get crowded out and their gear damaged (Pomeroy et al., 2007). The restriction of trawls from inshore waters is a public policy response by the Malaysian government to reduce the problem of overcapacity and conflicts between commercial fishers and traditional fishers (Kirkley et al., 2003).

Many of the threats and problems that plague small-scale fisheries originate externally, including social and environmental concerns, and public policies and governance issues. Solutions to these problems and enhancements in prospects for small-scale fishers will require major changes and improvements in policies and governance (Andrew et al., 2007).

The Establishment of MPAs

MPAs have been mooted as a vital tool for fishery management particularly in situations where fisheries are overexploited (Alban & Boncoeur, 2006), and for conserving marine habitats and biodiversity (Halpern, 2003; Len et al. 2013; Mora et al. 2006).

When the marine fisheries in Malaysia experienced a decline in the 1980s because of overfishing, it was considered essential to protect the country's coral reefs in order to allow fisheries resources to recover (Islam et al., 2013; "Total Economic Value", n.d.). The setting up of the MPAs was expected to benefit local fishers by increasing their productivity and securing their livelihoods (Islam et al., 2013).

MPAs were first set up in 1983 by the DOFM to address the problem of overfishing and depleting fish stock. The MPAs comprise waters at low tide mark stretching two nautical miles from the outermost points of the islands, except for one nautical mile in the case of Pulau Kapas.

One of the fisheries management mechanisms in the MPAs of Malaysia is the no-take zone concept that prohibits all forms of human disturbance including fishing (Ahmad et al., 2018). All activities damaging coral reefs and marine ecosystems in the MPAs are forbidden (DOFM, 2021). The MPA essentially serves as a safe refuge for fish stock to reproduce and grow, from whence they travel to other areas ("Total Economic Value", n.d.).

For the artisanal fishers in the offshore islands of Peninsular Malaysia, fishing has been their primary means of livelihood for generations. Their traditional fishing grounds were the waters surrounding their islands. The fishing ban in the MPAs came as a devastating blow to the livelihoods of local fishing households and has caused them great hardship as their small vessels are not suitable for going long distances (Islam et al., 2013). Although the principal objective of the MPAs is the preservation of marine resources, it is equally important that the impacts on the local people be given due consideration (Ahmad et al., 2018).

The establishment of MPAs tends to increase the vulnerability risks of local fishers due to restrictions on their access to the protected marine resources (Albasri & Sammut, 2021). According to Maidar (2018), the local fishers in PPMP disagree with the fishing ban and they also believe the small quantity of fish they catch for household consumption has negligible effects on the overall fish population. Many of the inhabitants in PPMP have resorted to fishing illegally for subsistence, especially during the North-East monsoon months from October to February when heavy rain and strong winds make it is unsafe to fish in the open sea, and when tourism activities come to a standstill and tourism income ceases (Islam et al., 2014; Maidar, 2018). Islam et al., (2016) proposed that a multi-use community-managed zone be created in the MPAs where local inhabitants are permitted to fish for subsistence needs.

The Growth of Tourism in Marine Parks

Eco-tourism in the marine parks is an important revenue earner for Malaysia – through conservation fee collected as entrance fee plus tourist spending. Tourism has been successfully promoted in marine parks since the 1990s (Islam et al., 2013). Visitors to Malaysia's marine parks in 2017 exceeded 360,000, of which 30% were foreigners (DMPM Dataset, n.d.).

Many of the local inhabitants of tourism-based marine parks have taken up employment in tourism or started small businesses catering to tourists e.g., guesthouses, boat service, restaurants and souvenir shops. Tourism in the MPAs is seasonal, as most tourism activities cease during the rainy North-East monsoon months from October to February (Islam et al., 2013) when fishing becomes the only source of income for the inhabitants.

Due to heavy tourist traffic to the marine parks the beaches and coral reefs have been subjected to excessive tourism activities such as diving, snorkelling and boating, resulting in damage to coral reefs (Islam et al., 2013). While tourism in the marine parks provides economic benefits to the community and contributes towards covering the cost of marine resource preservation, if not

managed in a sustainable manner it can lead to long-term damage to the environment and marine resources. Towards ensuring sustainable tourism, researchers have highlighted an urgent need to regulate the number of tourists and to lessen the use of coral based recreational activities (Haddock-Fraser & Hampton, 2010; Islam et al., 2013).

Pulau Perhentian Marine Park

The Perhentian islands are located 21 km from the mainland and off the East Coast of Peninsular Malaysia. The two main islands of the marine park are Perhentian Besar (approximately 867 hectares) and Perhentian Kecil (approximately 524 hectares). Figure 1 shows the location of the marine park.

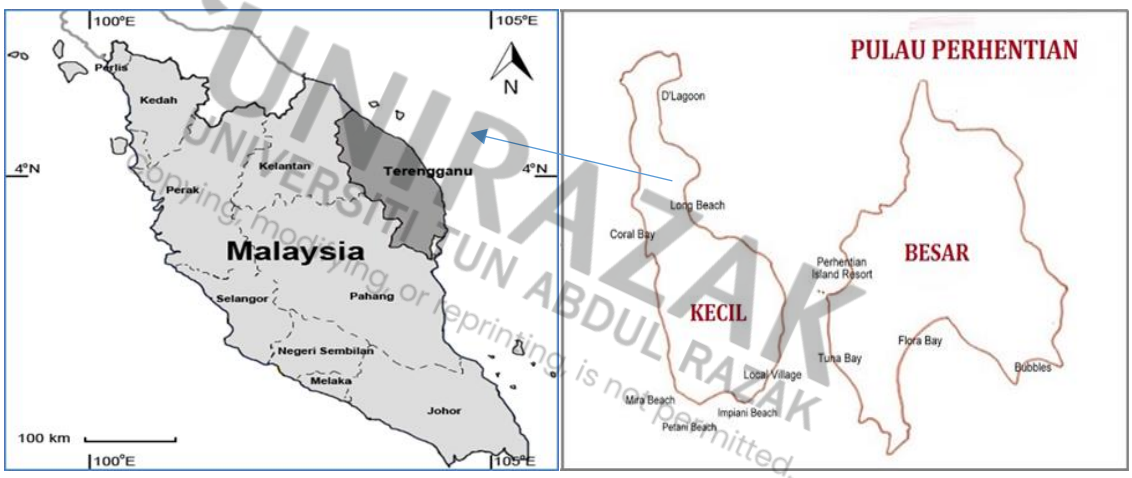

Figure 1: Study location – Pulau Perhentian Marine Park (Islam et al., 2016)

PPMP has a population of 2,300, residing in a single village on Perhentian Kecil. Before the marine park was established, the islanders were mostly fishers; but with the advent of tourism, the majority of inhabitants have shifted to tourism as their main source of income (Islam et al., 2013). Despite their change in occupations, most of the islanders engage in fishing – full-time, part-time or subsistence – especially during rainy monsoon months when the tourism season ends (Islam et al., 2014).

Rapid Infrastructural Development in PPMP

To meet the demand of the expanding tourism industry, huge infrastructural development has taken place in PPMP that went beyond the carrying capacity of the islands, resulting in soil erosion, pollution and destruction of coral habitats and turtle beaches (Tamblyn et al., 2005). The growth of tourism in PPMP has attracted investors from the mainland to take part in development projects and carry out business operations. These investors were mostly motivated by profits and show little concern for the natural environment (Maidar, 2018). Development projects were initiated without any environmental impact assessment to evaluate the potential risks and threats on the flora and fauna of the marine park (Islam et al., 2014).

The Deteriorating Condition of Coral Reefs

Malaysia has a total coral reef cover of 3,600 km^2, most of which has been gazetted as marine parks. Coral reefs support the habitats of a wealth of commercial fish species that provide food for the country's population (Islam et al., 2014b).

Malaysian coral reefs are in danger because of human activities (Burke, 2002); and coral habitats in PPMP are the worst affected among islands in Peninsular Malaysia due to heavy tourism activities (Harborne et al., 2000; Reef Check Malaysia, 2011; Tamblyn et al., 2005).

The threats to coral reefs in PPMP are largely anthropogenic – heavy tourism activities, siltation caused by construction activities, pollution, indiscriminate waste disposal and littering, as well as illegal fishing (Reef Check Malaysia, 2011). Recreational activities such as diving, snorkelling and boating are causing extensive physical damage to coral reefs (Haddock-Fraser & Hampton, 2010; Islam et al., 2013). Construction activities undertaken for tourism are poorly regulated, resulting in sedimentation which impedes photosynthesis and growth in corals. Climate change also endangers corals by causing coral bleaching and algae blooms.

Ineffective Management of MPAs

The management effectiveness of MPAs is concerned with how successful they are in achieving their desired objectives (Tai et al., 2014). Studies reveal that the management of MPAs in Malaysia has been ineffective, resulting in overexploited fisheries and damaged coral reefs (Islam et al., 2014). The failure of Malaysia MPAs is due mainly to weak governance (Islam et al. 2013) compounded by insufficient resources for monitoring and administering MPA rules and regulations (Mohd Nasir et al, 2017). The unsuccessful conservation of coral reefs and failure in rebuilding fish biomass has led to shrinking catches and low productivity for local small-scale fishers.

2.3 Theoretical Foundation

This section introduces and explains the key concepts that lay the theoretical foundation for the present study.

2.3.1 Livelihood Theory

Chambers and Conroy (1991) define a livelihood as the capabilities, assets and activities required for a means of living. People achieve sustainable livelihood from the resources in their possession (Scoones, 1998). In the sustainable livelihood framework, there are five categories of livelihood assets or capital – natural assets, physical assets, financial assets, human assets and social assets (DFID, 1999).

The small-scale fisher communities in the MPAs of Malaysia rely on the following livelihood assets:

i. *Natural assets* – These consist of natural resources such as the land of the MPA islands on which the fisher communities live and the marine waters, coral reefs and fisheries resources that provide them with income and food (DFID, 1999). These natural assets are

now under threat due to excessive tourism activities, over-development, pollution, overfishing and climate change (Islam et al., 2013; Reef Check Malaysia, 2011).

ii. *Physical assets* – These refer to physical goods and basic infrastructure that support livelihoods (DFID, 1999). The local artisanal fishers in the MPAs use small, low-powered fishing vessels and traditional gear to operate. The ban of fishing in the MPAs forces fishers to fish in the open sea for which the physical assets at their disposal are inadequate (Islam et al., 2014; Maidar, 2018).

iii. *Financial assets* – These consist of cash; liquid assets e.g., jewellery; and regular inflow of income e.g., remittance (DFID, 1999). The local fishers in the MPAs have few financial assets and many live in poverty due to their limited income and employment opportunities (Islam et al., 2013).

iv. *Human assets* – These refer to skills, knowledge, capacity to work and health which together enable a person to pursue his livelihood (DFID, 1999). The local fishers in the MPAs use the informal fishing skills and knowledge which they acquired over generations of experience.

v. *Social assets* – These relate to formal and informal relationships from which people derive benefits and opportunities in the pursuit of their livelihoods (DFID, 1999). Although the artisanal fishers of the MPAs are members of fishermen associations, their membership has not been effective in elevating their standard of living (Othman, 2004). The fishers have no political voice to improve their access to resources or to protect their natural assets and their rights to benefits in the MPAs.

2.3.2 Capability Approach to Livelihoods

The capability approach framework is concerned with the well-being of people and how they are able to function with the goods and services at their disposal (Clark, 2005; Sen, 1985). According

to Sen's Capability Approach, poverty is the deprivation of capabilities which limits the freedoms of people to achieve and enjoy key 'beings and doings' that are basic to human well-being (Conconi & Viollaz, 2017; Sen, 1985). Access to the natural assets and local resources of the MPAs in Malaysia is controlled by the MPA authorities through the prevalent policies and regulations. In view of the top-down management system in Malaysia MPAs, the local small-scale fishers have no political voice to influence government decisions or actions concerning the use of local resources, and their livelihoods are vulnerable due to deprivation of capabilities caused by limitations and barriers imposed by governance on their access to the protected resources. In addition, illegal and unregulated fishing by commercial fishers in the MPAs and the artisanal fishing zone has led to overfishing thereby reducing the capability of small-scale fishers to make a living. To enhance the prospect of the artisanal fishers, major changes and improvements will be required in MPA policies and governance to allow them more equitable access to local resources.

2.3.3 Socioecological and Governance Approach to Sustainable Livelihoods

The livelihoods of the small-scale fisher communities in the MPAs of Malaysia are influenced by social, ecological and governance factors.

Social factors – The local community in MPAs do not play any active role in the management of local resources or in safeguarding the natural assets. Besides, outsiders to the islands rather than the local islanders benefit most from tourism and business income derived from the MPAs. The local community lack empowerment and capacity to manage local resources, establish user rights in the MPAs and protect the natural assets of the islands. Perkins (2010) defined empowerment as the collective process that occurs in communities or organisations which involves active participation, awareness and understanding, and through which people gain greater access to resources and control over important decisions. Empowerment strategies can be used to make improvement in community conditions and people's lives by increasing their power so they can

take actions to better their situations. Empowerment approaches for fishers include giving them access and help to increase their production capacity and asset ownership e.g., developing alternative livelihoods and improving access to fundings, fishing technology and market (Dt. Maani et al., 2018). Empowering the local fisher communities in the MPAs of Malaysia can help them to attain fairer access to benefits and resources.

Ecological factors – Successful resource conservation and livelihood sustainability are closely linked and require a synergy of both (Thiault et al., 2020). In resource dependent settings such as marine fisheries, where strong social-ecological relationships exist, unsustainable use of natural resources can cause serious impacts on both the resources and the people who depend on them (Ostrom, 2009). In the MPA islands of Malaysia, unsustainable tourism and development activities, pollution, overfishing and climate change have led to destruction of marine ecosystems. Coral cover and fish biomass in and around Malaysia MPAs are shrinking at an alarming rate (Islam et al., 2013, 2016), and putting the livelihoods of local fishers at risk and increasing their vulnerability.

Governance factors – Governance in the MPAs has important impact on the livelihoods of local small-scale fishers as it affects their access to local resources and use thereof. Ineffective MPA management has resulted in ineffective protection and conservation of coral reef habitats and unsuccessful recovery of fish biomass (Islam et al., 2013). In addition, illegal fishing and encroachment by commercial fishers are rampant because of poor monitoring and enforcement of MPA regulations resulting in overfishing (Islam et al., 2014; Maidar, 2018). Furthermore, the local people have no say in MPA decision making and this has led to suboptimal decisions on matters that affect the livelihoods of the local people (Maidar, 2018). In short, weak MPA governance has resulted in declining catches and income for small-scale fishers leading to greater vulnerability among the fishers in the MPAs.

2.3.4 Vulnerability: Social, Ecological and Political Stressors of Vulnerability

Vulnerability is defined as "the conditions which increase the exposure of an individual, a community, assets or systems to the impacts of hazards and which may be caused by physical, social, economic and environmental factors or processes" (UNDRR, n.d.). Social vulnerability describes the exposure of individuals or groups to unexpected changes and disruptions to livelihoods as a result of social and environmental changes (Adger, 1999).

The stressors of vulnerability that confront the small-scale fisher communities in the MPAs of Malaysia come from three main sources – social, ecological and political.

Social stressors

Fishers in the MPAs of Malaysia are facing shrinking catches and income because of depleted fish stock and limited access to fisheries resources. Moreover, the fishers' income and access to food is affected by weather condition e.g., on many days during the North-East monsoon it is unsafe for them to fish in the open sea (Islam et al., 2013). The situation is made worse by low availability of alternative employment options as well as limited access to business and fundings. The fishers lack empowerment to improve their access to or control over MPA resources. In view of the limited livelihood opportunities, fishers in some of the MPAs are forced to migrate to other areas to search for employment.

Ecological stressors

Malaysia's coral reefs are under threat due to unsustainable tourism activities, overdevelopment and sea water pollution. Development activities in tourism-based MPAs like PPMP are motivated by profits with little concern for the natural environment, and extend beyond the carrying capacity of the islands resulting in damage to the ecosystems of both land and sea. Illegal fishing by trawls in the MPAs and the artisanal fishing zone has also contributed to the damage of corals through discarded fishing gear that gets entangled with the reefs (Islam et al., 2014). Small-scale fishers

in Malaysia MPAs are experiencing shrinking catch because of marine resource degradation and diminishing fish stock. Furthermore, climate change in the form of heavy rainfall and seawater acidification has also caused damage to coral reefs through coral bleaching and harmful algae blooms (Muhammad et al., 2016).

Political stressors

The ban of fishing in the no-take zone MPAs forces local small-scale fishers to fish in the open sea which is made difficult and risky by their inadequate fishing vessels and gear (Islam et al., 2013; Maidar, 2018). The ban also means that the local communities cannot fish in the MPAs even for own consumption. The prohibition of fishing in the MPAs spells the loss of income and a means of subsistence for the local fishers.

Poor MPA governance has led to failure in sustainable fisheries management. The livelihoods of small-scale fishers have been badly affected due to emerging issues of pollution and destruction of coral reefs caused by poor planning and unsustainable tourism and development. Furthermore, the MPA authorities have failed to deal with illegal fishing and encroachment by commercial fishers who frequently disregard licensing and fishing regulations by operating within the MPA waters or in the fishing zone reserved for artisanal fishers. Commercial trawls deplete the fish stock in MPAs and artisanal fishing zone by removing large quantities of fish including juveniles, resulting in low catches for small-scale fishers. In addition, the lack of participation by the local people in policy and management decision making leads to sub-optimal decisions, problems in compliance with MPA rules and regulations, and dissatisfaction among the local population (Islam et al., 2014; Maidar, 2018).

Figure 2 below summarises the livelihood stressors – social, ecological and governance – faced by small-scale fishers in Malaysia MPAs.

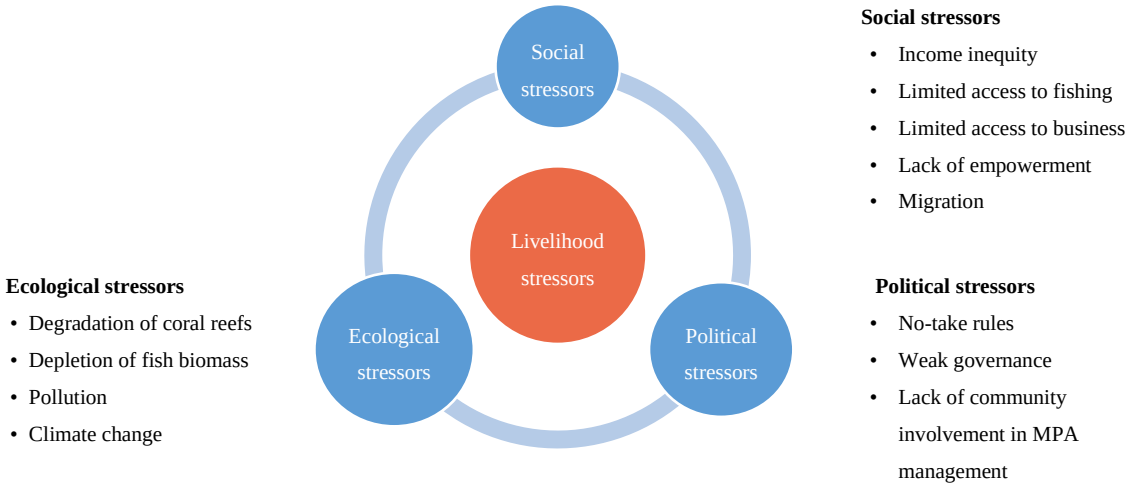

Figure 2: Livelihood stressors (adapted from IMBER-ADApT by Bundy et al., 2016)

2.3.5 Income Inequity

According to Kuznets (1955), in the course of a country's economic growth, inequality in income distribution changes – rising during the early stages of economic growth, slowing in later stages of development before declining. The Environmental Kuznets Curve (EKC) demonstrates that environmental deterioration changes in proportion to economic fluctuations. EKC is a potential link between income inequality and environmental degradation, which is usually depicted as an upturned U-shaped curvature, since income inequality is projected to decrease at the later stage of economic growth. Income inequality is when a considerable portion of a population's wealth or income is concentrated in the hands of a small group of people. It has been defined as the wealth gap between the richest 1% of the population and the rest of the population as explained by Kopp (2019). Economic disparity and pollution have a substantial positive relationship, according to previous studies such as Masud et al. (2018) and Bhattacharya (2020), and some studies presented a negative relationship but without control variables (Gren et al., 2016; Rajah Rasiah et al., 2018). Many proxies for income inequality have been proposed in the literature, including the Gini coefficient (Shi et al., 2019).

In the MPAs of Malaysia, the local communities are experiencing income inequity as the marine parks undergo economic development with the growth of tourism. The disparity of income between the local communities of the marine parks and investors in tourism businesses from outside the islands is resulting in inequity.

2.3.6 The Measurement of Vulnerability

Stressors of vulnerability affect livelihoods of the artisanal fishers in the MPAs of Malaysia by causing income inequity, diminished well-being and social strive. The vulnerability of the livelihoods of the fishers can be measured in terms of loss of income, loss of productivity, loss of food security, loss of jobs, decrease in standard of living, increase in search for alternative employment, loss of trust in the system, etc.

2.4 Empirical Research – Poverty, Vulnerability and Inequity

This section sets out the major literature related to the topic of the research. The literature comprises existing knowledge and information from past studies, as well as data obtained from the publications of government bodies and non-governmental organisations. The literature review is organised under separate captions according to the main subject matter.

2.4.1 Empirical Research: Governance of MPAs

Governance is the structures and processes designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation (UNESCO, n.d.).

Governance factors play a very important role in preserving coral reefs and rebuilding fisheries resources. Studies show that MPA management in Malaysia is unsuccessful because of weak governance. (Islam et al., 2014, 2016).

One of the main obstacles for effective MPA management in Malaysia is the lack of community involvement (Islam et al., 2014). A study by Maidar (2018) in PPMP reveals that the local community are unhappy that they were not consulted on the decision to ban fishing in the marine park. Community involvement is indispensable in ensuring the success of an MPA (Kaza, 1988; Kenchington, 1988; White, 1986). Maidar (2018) proposed adaptive co-management as a governance option for PPMP, an approach that encourages knowledge sharing and joint consultation between the stakeholders. Islam et al. (2014) suggested that local fishing communities take on joint responsibility for conservation and harvesting controls in the MPAs for more effective fisheries management.

In Malaysia MPAs, poor enforcement of MPA and fishing regulations and compliance thereof is a major problem. Rules on fishing ban in the MPAs are frequently broken by both artisanal fishers and commercial fishers. Most of the local people engage in some form of fishing activities in the MPAs, especially during the monsoon season (Islam et al., 2013). However, the locals who fish illegally usually get caught and are punished (Islam et al., 2014; Maidar, 2018).

Rampant encroachment and illegal fishing by commercial trawls are raising grave concern among artisanal fishers in the MPAs. Trawls are prohibited by licensing rules from operating in Zone A, the inshore fishing belt of the marine waters reserved for small-scale fishers. Other zones were allocated for trawls and purse-seiners, and Zone B boats are only allowed to fish in Zone A during the monsoon season with special license from the DOFM (Tai et al., 2014). Trawl operators often defy the licensing rules and fishing ban in the MPAs, using their sophisticated gear and large vessels to procure huge catches including juveniles from Zone A and MPA waters. Such practices result in serious depletion of the fish stock in these areas and set back efforts to rebuild fish population in the MPAs and the open sea. The MPA patrols have been unsuccessful in deterring and catching such errant trawlers, whose high-powered engines enable them to speed off leaving behind their gear that cause damage to coral reefs. Local fishers are dissatisfied with the failure

by the authorities to enforce the fishing rules against the trawlers because it results in unfair distribution of benefits from the fisheries, and they are appealing for stricter enforcement of MPA and fishing regulations (Islam et al., 2014; Maidar, 2018).

The failure of MPA management in Malaysia is mainly attributed to problems of communication and coordination, overlapping roles, and policy synchronicity in the different levels and sectors of government (Islam et al. 2013). Due to Malaysia's polices and institutional frameworks, there is a separation of jurisdiction between federal and state governments; and furthermore, natural resources and local development are under different sectorial administration (Tamblyn et al., 2005). The setting up of MPAs was initiated in 1983 by the DOFM. In 2007, the Department of Marine Parks Malaysia (DMPM) took over the managing and administering of MPAs. In 2018, DMPM was transferred to the DOFM and rebranded in 2019 as the Marine Park and Resource Management Division (MPRMD) of DOFM. The MPRMD, under the federal government is now responsible for managing and administering MPAs and overseeing the protection of marine biodiversity and resources in the MPAs (DOFM, 2021). Meanwhile, land-based development activities in the MPAs falls within the authority of the Department of Land and Mines under the respective state governments (Islam et al., 2014). The lack of coordination between the federal and state governments has been a major impediment to the successful management of MPAs (Gopinath and Puvanesuri, 2006). Poor coordination between the various ministries and agencies, and the lack of sufficient resources for monitoring and administering MPA rules and regulations, have similarly contributed to the failure of MPAs.

Weak MPA governance has resulted in ineffective coral conservation, unsuccessful replenishment of fish biomass and a failure to stop overfishing by commercial fishers.

In terms of formal affiliations, fishermen associations have existed in Malaysia since the 1970's as agents for positive development in the fishing industry but they have not helped improve the

standard of living of artisanal fishers (Othman, 2004). The local fishers in the MPAs lack the ability to influence the distribution of benefits or protect local resources.

2.4.2 Empirical Research: Social Inequity

In Malaysia MPAs, there is growing dissatisfaction among small-scale fishers over inequitable access to local resources and unfair distribution of benefits from fisheries (Islam et al., 2014, 2021; Maidar, 2018). The following are challenges that create inequity in the MPAs:

- Fisheries resources are overexploited due to ineffective MPA management, resulting in shrinking catch and income for the fishers.
- The imposition of the no-take rules in MPAs has hampered the fishing activities of the local fisher community as it restricts their access to fishing and furthermore, their small, low-powered fishing vessels and traditional gear are not suitable for fishing in the open seas.
- During the rainy North-East monsoon months, the fishers cannot go to sea on days of strong winds and heavy rain because of safety reasons, and they have no alternative sources of income for the duration.
- The MPA authorities have been ineffectual in stopping commercial fishers from fishing illegally in the MPAs and encroaching in the artisanal fishing zone. Overfishing by commercial fishers has led to diminishing catch for small-scale fishers.
- The fishers have few alternative income and employment opportunities due to their lack of formal education and financial capability.
- The fishers do not benefit fairly from tourism as the majority of the tourism establishments and businesses are owned and managed by expatriates and people from the mainland, and tourism income is concentrated in the hands of powerful business groups from outside the islands rather than the islanders (Islam et al., 2016).

- During the issuing of licenses and permits, discrimination and preferential treatment in favour of titled individuals or those with powerful connections are common (Maidar, 2018).

The establishment of MPAs can give rise to social inequity because of the restriction on access to the protected marine resources (Albasri & Sammut, 2021). The wealthier in MPAs tend to benefit more than those who are poorer or have fewer opportunities – a scenario often described as "elite capture" – and hence, interventions for conservation should provide for alternative and diversified livelihoods to improve social equity (Bennett et al., 2020).

A study by Somoebwan et al. (2020) shows that high dependence on fishery resource in the coastal lowlands of Kenya is linked to poverty and inequality because the lack of alternative livelihood options results in low adaptive capacity. According to the authors, poor fishing households experience limited growth in real income and their low access to effective fishing technology increases inequality.

Greater access to income and utilisation of loans by higher income groups tend to increase wealth inequality between the rich and the poor (Shin, 2020). Social equity is instrumental to effective conservation; and improvements to governance actions are needed to enhance social equity in the MPAs (Bennett et al.,2020). According to Coccia (2020), good governance is vital for a reduction of poverty and income inequality in society.

2.4.3 Empirical Research: Climate Change and Inequality

Malaysia experiences climate change in the form of extreme weather conditions (storms and heavy rain), big waves, floods and heat. Climate change negatively affects small-scale fishers and their livelihoods because it endangers the safety, health and productivity of fishers and causes damage to property – fishing vessels and gear, homes, roads and jetties – and ill health to fishers (Muhammad et al., 2016).

Climate change also has serious impact on the marine eco-systems and affects fish distribution, species composition and habitats (Agyapong, 2021). Changes in sea water temperature, acidification and rise in sea level threaten fish productivity and affect the breeding and nursery grounds of aquatic species (Islam, 2013). Water from storm and heavy rain reduce salinity along the coast leading to coral bleaching, while run-off water from land leads to excessive nutrient levels in sea water contributing to algae blooms which can harm corals (Muhammad et al., 2016). Acidification of sea water due to excessive absorption of carbon dioxide decreases the pH level of the sea and raises sea water temperature, causing coral bleaching. In addition, climate change causes uncertain reproductive patterns in aquatic species, diseases in the catch, invasive species, and decrease in catch for fishers as fishes dive deeper in seek of cooler waters (Macusi et al., 2021).

According to Colmer (2021), the poorest and most vulnerable tend to be more exposed to the effect of climate change, lose a greater share of their wealth during disasters, and have fewer resources to cope with the consequences. Islam & Winkel (2017) characterised the impact of climate change on social inequality as a vicious cycle, whereby initial inequality makes disadvantaged groups suffer disproportionate loss of their income and assets, resulting in greater subsequent inequality.

2.5 Empirical Research – Key Dimensions

The empirical studies that examine the livelihoods and vulnerability of small-scale fishers in the MPAs can be categorised under three key dimensions – equity, socioecological and governance.

Equity

Local small-scale fishers find that they are not benefiting from the government's decision to set up MPAs in Malaysia as the expected benefit of increasing productivity of local fishers and securing their livelihoods – through conserving and protecting coral reefs and in rebuilding fish biomass – are not achieved. MPAs management in Malaysia has been ineffective due to weak governance and as a result, the local fishers find their livelihoods and food security under threat.

Depletion of fish stock has caused the catch rates and income of local fishers to decrease. The fishing ban in the MPAs hinders fishing activities and disrupts the pursuit of livelihoods by local fishers. While tourism has brought economic benefits to marine parks, the majority of the tourism establishments and businesses are owned and managed by outsiders who are the ones that benefit most from the tourism income rather than the local inhabitants of the islands. Fishers have limited access to business because of difficulty in obtaining license and financing (Islam et al., 2014; Maidar, 2018). These challenges and problems give rise to inequity to the artisanal fishers in the MPAs and increase their vulnerability.

Socioecological

Economic and infrastructural development in Malaysia MPAs have brought improvement in basic amenities e.g. schools, healthcare, jetties, etc. and there has been greater participation of women in economic activities (Maidar, 2018). However, local fishers in the MPAs struggle to make a living due to shrinking catch rates and decreasing income. During the North-East monsoons, local fishers cannot operate on days of heavy rain and strong winds when it is unsafe to fish in the open sea and as a result, they have no income or access to fish for food during part of these months (Islam et al, 2013). The lack of formal education and financial assets leave the local fishers with few alternative sources of income and employment especially during the rainy months. Fishery resources in the MPAs are in a depressed state due to unsuccessful coral reef conservation and a failure in fisheries resource management. This situation has led to diminishing catches and productivity and less income for the fishers in the MPAs. The local communities lack empowerment and capacity to gain more equitable access to resources, influence the distribution of benefits, or protect local resources.

Governance

The MPAs in Malaysia have failed to protect and preserve coral reefs and rebuild fish biomass due to weak governance. Tourism and infrastructural development activities in the MPAs are

poorly planned and regulated resulting in pollution and destruction to marine resources and natural eco-systems. The MPA authorities have been unsuccessful in deterring encroachment and illegal fishing by commercial fishers leading to overfishing. The top-down MPA management approach does not allow the local communities to participate in MPA decision making leading to sub-optimal decisions and dissatisfaction among the local population. Although fishermen associations have existed in Malaysia since the 1970's as agents for positive development in the fishing industry, they have been ineffective in improving the living standard of small-scale fishers (Othman, 2004).

2.6 Research Gaps

Past research on MPAs tended to focus on management effectiveness and little study had been done on social equity (Bennett et al., 2020; Halpern et al., 2013; Hill et al., 2016; Richmond and Kotowicz, 2015). In Malaysia, previous studies on MPAs were related to their function and effectiveness as a management tool, social change, and environmental damage (Islam et al., 2013, 2014; Maidar, 2018; Reef Check Malaysia, 2011; Tai et al., 2014). Inequity in the MPAs of Malaysia is an issue that has been overlooked by past researchers although the work of Islam et al. (2016, 2021) and Maidar (2018) on PPMP revealed local fishers' discontent over inequitable access to local resources and unfair distribution of benefits from fisheries.

From the reading of secondary data taken from past studies, it is clearly apparent that there has been insufficient research on the following two important areas in Malaysia MPAs:

1. Inequitable access to resources by local fishers and unfair distribution of income and benefits in the MPAs; and
2. Lack of involvement of the local community in the management of local resources and protection of natural assets.

Social inequity increases the vulnerability of fishers in Malaysia MPAs in the pursuit of their livelihoods, and needs to be addressed. It is crucial that more study be conducted in the two important areas highlighted above to gain more knowledge on the subject so that viable solutions can be arrived at to improve the prospect and livelihoods of small-scale fishers in the MPAs. This research aims to fill the gap.

2.7 Underpinning Theory

The theoretical foundation for this study is built on a combination of theories – livelihoods; capability approach to livelihood; vulnerability; income inequity; and socioecological and governance approach to sustainable livelihoods. These theories relate to the present research as, firstly, small-scale fishers in the MPAs of Malaysia are highly dependent on natural assets – marine resources – for their livelihoods. Secondly, the small-scale fishers in the MPAs are deprived of capabilities because coral reefs and other local marine resources are protected by no-take rules which restrict the fishers' access to fisheries resources. Thirdly, government strategies for resource management and protection in Malaysia MPAs have failed because of unsustainable tourism, over-development and weak governance. Fourthly, the artisanal fishers in the MPAs are experiencing increasing stress and vulnerability because of income inequity which is in turn caused by restricted access to fishery resources, marine resource degradation, unfair distribution of benefits from fisheries, disparity in income between outsiders and islanders, inadequate alternative livelihood options, and absence of empowerment to adapt and to cope with their disadvantaged situation.

While the theoretical framework of this study is based on a mix of supporting theories, the principal theory behind this research is that inequity increases the vulnerability of small-scale fishers in Malaysia MPAs and impacts negatively on their livelihoods.

2.8 Proposed Conceptual Framework

This section explains the proposed conceptual framework for the research and describes the variables identified.

Dependent Variable

The dependent variable is income inequity affecting small-scale fishers' livelihoods in PPMP.

Independent Variables

Eight independent variables have been identified, namely

Social factors

1. Access to fishing
2. Access to business
3. Social empowerment
4. Asset (land and capital) ownership

Governance factors

5. No-take rules
6. Community involvement in MPA decision making
7. Community organisations

Ecological factor

8. Healthy coral reef habitats.

Conceptual Model

The conceptual model shown in Figure 3 demonstrates the causal relationships between the independent variables and the dependent variable. The dependent variable and independent variables are defined below, and the direct relationship between the two types of variables are explained.

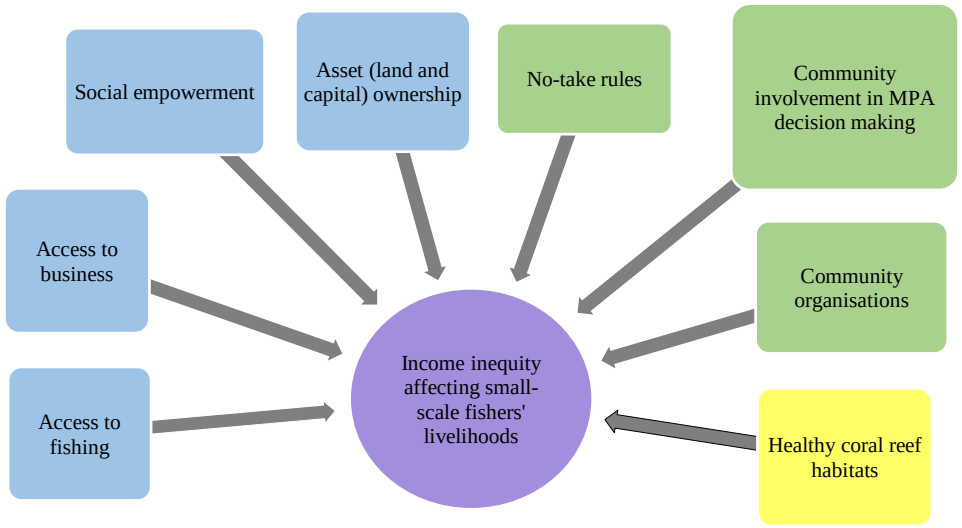

Figure 3: Conceptual model

Dependent variable

Income inequity affecting small-scale fishers' livelihoods – Local fishers of the marine park experience income inequity because of limited access to fisheries resources and unfair distribution of income. To improve the livelihoods of the local fishers, it is essential to reduce income inequity.

Independent variables

1. Access to fishing – Small-scale fishers are allowed to fish only in Zone A, which is the in-shore fishing belt designated for artisanal fishers by licensing rules. Failure in coral reefs conservation in PPMP has led to low fish stock in the artisanal fishing zone. Furthermore, illegal fishing in the marine park by commercial fishers and their encroachment in the artisanal fishing zone have led to overfishing leaving little for the small-scale fishers. To prevent and reduce income inequity for the small-scale fishers in the marine park, the fishers need to have greater access to fishing areas and more abundant fish stock.

2. Access to business – The local inhabitants in PPMP find it hard to start or operate businesses because of difficulty in obtaining licenses and loans for start-up and working capital. Local

small-scale fishers need to have better access to alternative employment including business to reduce income inequity.

3. Social empowerment – Empowering the local fisher community in the marine park can help them to attain more equitable access to benefits and resources and thus reduce income inequity. It also allows the fishers to gain greater control over decisions regarding fisheries management, community's rights in the marine park and the protection of the natural assets of the islands thereby helping to reduce income inequity.

4. Asset (land and capital) ownership – Many of the local fishers no longer own land which could be used for farming or operating businesses, as they have sold their ancestral land to developers of tourism projects. The fishers in the marine park lack capital to start businesses or buy better fishing equipment. Ownership of assets such as land and capital can reduce income inequity for the fishers by providing them with alternative employment and increase their productivity.

5. No-take rules – The no-take rules of MPAs which prohibit fishing in the marine park hinder the fishing activities of local small-scale fishers and restrict their access to fish for food, thereby increasing their vulnerability risk and creating income inequity.

6. Community involvement in MPA decision making – Participation of the local community in MPA decision making is vital for successful resource conservation and promotion of sustainable livelihoods. Joint consultation between the community and the governing authorities can improve decisions on matters that concern the local inhabitants and their islands, and thus contribute positively to the livelihoods of small-scale fishers in the marine park and reduce income inequity.

7. Community organisations – Social affiliations, such as fishermen and other associations, involved in community development activities in PPMP can take on the role of agents for

positive changes in small-scale fisheries and help artisanal fishers in the marine park improve their livelihoods and reduce income inequity.

8. Healthy coral reef habitats – Healthy coral reefs are instrumental in building abundant fish stock and contribute positively to the income and catch sizes of the small-scale fishers in PPMP and thus secure their livelihoods and reduce income inequity.

2.9 Hypothesis Development

Based on the conceptual framework for the study and the variables identified, hypotheses were developed regarding the relationships between the independent variables and the dependent variable. The hypotheses predicted the causal relationship between each independent variable and the dependent variable, which were then statistically tested to see whether the hypotheses were supported and the research questions answered.

The following research hypotheses were developed:

Hypothesis 1: Access to fishing contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 2: Access to business contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 3: Social empowerment of the local community contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 4: Asset (land and capital) ownership contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 5: No-take MPA rules contribute to increasing income inequity for small-scale fishers.

Hypothesis 6: Community involvement in MPA decision making contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 7: Community organisations such as fishermen associations contribute positively to reducing income inequity for small-scale fishers.

Hypothesis 8: Healthy coral reef habitats contribute positively to reducing income inequity for small-scale fishers.

2.10 Summary of Chapter Two

This chapter presents the knowledge and information obtained from the review of literature taken from past studies and other sources related to this research, explains the literature used to establish the theoretical foundation for this study, and describes the theoretical framework for the research.

Section 2.2 introduces the research location and provides a synthesis of the important literature relating to the history and background of the study. Section 2.3 explains the major literature used to establish the theoretical framework for the research, from which the dependent variable and independent variables for the conceptual model were identified. Section 2.4 presents the empirical studies related to the topic of the research which include governance, social inequity and climate change. Section 2.5 summarises the empirical research under three separate dimensions – equity, socioecological and governance. Section 2.6 explains the research gaps identified from the literature review. Section 2.7 specifies the underpinning theory behind this research. Section 2.8 lays down the conceptual model for the research, identifies the dependent and independent variables, and explains the causal relationships between the independent variables and the dependent variable. Section 2.9 presents the hypotheses developed from the conceptual model.

CHAPTER 3:

RESEARCH METHODOLOGY

3.1 Introduction

The main purpose of this research is to examine income inequity affecting livelihoods of small-scale fishers in Malaysia MPAs. This chapter describes the methods and approach employed to collect, measure and analyse data which was then used to answer the research questions.

3.2 Research Design

This research followed a deductive approach, whereby a set of hypotheses were constructed out of existing theory and knowledge and put to test. The study applied the mixed method (qualitative and quantitative) in which a survey was used to elicit the viewpoints and opinions of the community in PPMP on whether the identified independent variables affect income inequity for small-scale fishers in the marine park, and the survey data were statistically analysed to test the research hypotheses.

3.3 Study Population and Sampling Procedures

The primary survey approach was used to obtain data from selected respondents in PPMP. The residents of PPMP are made up of full-time fishers, boat operators, tourism operators and workers, business owners and workers, and others e.g., government servants, housewives, and retired persons.

The survey was conducted on respondents drawn from local inhabitants of the marine park who are knowledgeable about income distribution, employment conditions, as well as marine resource conditions and management in the marine park. The respondents were sorted into five sub-groups according to their occupations – (1) full-time fishers; (2) boat operators; (3) tourism operators and workers (4) business operators and workers; and (5) others.

The marine park has a population of 2,300 residing in a single village on Perhentian Kecil. The convenience sampling method was used based on availability, convenience and accessibility of respondents. The total number of respondents interviewed was 127.

3.4 Data Collection Method

3.4.1 Survey Questionnaire

Data was collected through face-to-face interviews of respondents using a structured questionnaire. The questionnaire was consisted of two separate sections. Section A asked for data on the respondents' sociodemographic profile – occupation, age, gender, household size, number of years of formal education, and whether they are members of any organization/association. Section A also asked whether the respondents are engaged in fishing and, if they answer is in the affirmative, for what purpose (income, consumption or both). The first part of Section B asked the respondents to state their opinions (level of agreement) on income inequity (dependent variable); and the second part on whether the independent variables have affected income inequity for fishers from PPMP. The questions in the second part of Section B focused on social factors (access to fishing, access to business, social empowerment, and asset – land and capital – ownership); governance factors (no-take rules, community involvement in MPA decision making, and community organizations); and ecological factor (healthy coral reef habitats). The third and final part of Section B asked the respondents to state the main current issues about vulnerability affecting the local community and their recommendations to reduce vulnerability.

In developing the survey questionnaire, the researcher drew substantially from the work of Ahmad et al. (2018), Bennett et al. (2020), Dt. Maani et al. (2018), Islam et al. (2013, 2014, 2016), Maidar (2018), and Othman (2004) while developing some of the researcher's own survey items. The survey questionnaire is attached herewith as Appendix A.

3.4.2 Focus Group Discussion

Focus group discussions (FGD) were used to validate the data obtained from the survey questionnaire and to gain more insight for the research. The questions asked during the FGD were concerned with income inequity affecting fishers, the domination of outsiders in the local economy, the shrinking of fish stock, the disparity of income between islanders and outsiders, alternative employments during the monsoon months, conflicts over access to fisheries resources, encroachment by trawlers, access to capital and fundings for business, community involvement in fisheries management and protection of natural assets, seawater pollution, and the outlook for local small-scale fishers. The participants in the FGD included chalet operators, business operators and members of V2V research partner (Fuze Ecoteer). Several of the participants are part-time fishers who fish during the monsoon months. A list of FGD guiding questions and a summary of FGD findings can be found in Appendices B and C respectively.

3.5 Operationalisation and Measurement

The five-point Likert scale was used to measure the respondents' perception for all the questions in Part 1 and 2 of Section B. The survey's answers were scored on the scale 1 "strongly disagree", 2 "disagree", 3 "neither agree nor disagree", 4 "agree", and 5 "strongly agree". The scores of each question were summarised and converted into percentages for analysis purpose.

3.5.1 Survey items

This survey focused firstly on a list of questions related to income inequity and secondly, a set of questions related to the eight independent variables for this study. The second set of questions consisted of four social factors (access to fishing, access to business, social empowerment, and asset – land and capital – ownership); three governance factors (no-take rules, community involvement in MPA decision making, and community organisations); and one ecological factor (healthy coral reef habitats).

Table 1 below summarises the survey items developed for income inequity and the social, governance and ecological factors identified, and the source from which the survey items were adopted.

Table 1: Table of survey items

Variables	Survey items	Source
Income inequity	1. MPA has contributed to the income of local residents.	Bennett et al. (2020)
	2. MPA provides balanced sharing of access to resources (fisheries or tourism) among stakeholders.	Ahmad et al. (2018); Bennett et al. (2020); Islam et al. (2013)
	3. Coral reef habitats are protected for the socio-economic sustainability of local communities.	
	4. Local fishers migrate to other areas for alternative income.	Maidar (2018)
	5. Local people receive a fair share of income from tourism business.	Maidar (2018)
	6. The major share of income goes to the owners of tourism businesses residing outside the island.	
Social factors		
Access to fishing	7. Local fishers engage in fishing for subsistence need in the marine park.	Islam et al. (2014); Bennett et al. (2020)
	8. Fisheries stock has increased in the MPA.	Ahmad et al. (2018); Maidar (2018); Bennett et al. (2020)
	9. Fishers from outside the area often carry out fishing activities surrounding the marine park.	Islam et al. (2016); Maidar (2018)
Access to business	10. It is easy for local residents to participate in business activities on the island.	Maidar (2018)
	11. It is easy for the local people to get loans and credits for business purposes.	
Social empowerment	12. The lives of fishers are easier due to available alternative sources of income and employment.	Dt. Maani et al. (2018)
	13. The local community have power to influence MPA rules and decisions.	Islam et al. (2014); Maidar (2018)

	14. Generally, people in the community get together to jointly inform and influence government officials or political leaders for the benefit of the community.	
Asset (land and capital) ownership	15. Most of the local people own land on the island. 16. Selling and renting of land on the island has increased compared to five years ago. 17. The local people have access to financial resources for business.	Maidar (2018)
Governance factors No-take rules	18. The local people are satisfied with the enforcement of MPA rules and regulations. 19. The no-take MPA fishing rules make the fishermen's lives better in the community. 20. MPA no fishing rules should be changed to protect coral reef habitats. 21. Fishermen should be able to fish in the MPA area for livelihoods security. 22. The local community do not care about MPA rules (fisheries and tourism related).	Islam et al. (2014); Maidar (2018) Maidar (2018) Islam et al., 2014; Maidar (2018)
Community involvement in MPA decision making	23. The local people participate in MPA management decision making. 24. The local community are consulted and their consent obtained before MPA decisions are made. 25. It is important for the local community to participate in MPA management. 26. Fisheries management will be more effective if the local fishers share responsibility in it. 27. The local community have the ability to manage and protect the resources of the marine park. 28. The local community are willing to participate in MPA management.	Islam et al., 2014; Maidar (2018); Bennett et al. (2020) Maidar (2018); Bennett et al. (2020) Islam et al., 2014; Maidar (2018); Bennett et al. (2020) Islam et al. (2014); Islam et al. (2014); Maidar (2018)
Community organisations	29. Fishermen associations are more active now compared to five years ago. 30. Local organisations and associations do not discuss about the fisheries in the MPA area.	Othman (2004)

	31. Fishermen associations can play a more positive role in the protection of resources in the marine park.	
Ecological factor Healthy coral reef habitats	32. The health of coral reefs has deteriorated compared to five years ago. 33. Pollution in the marine park has worsened compared to five years ago.	Islam et al. (2013); Maidar (2018) Islam et al. (2013); Maidar (2018)

3.6 Data Analysis Techniques

The data collected using the survey questionnaire was statistically analysed to see if the hypotheses generated are supported and the research questions answered.

The participants' responses were coded by assigning an identification number to each questionnaire completed, and this number was written on the first page of said questionnaire. A coding sheet was then used to transcribe the data from the questionnaires before transferring it to the analytical software. The coding sheet was prepared on a Microsoft Excel spreadsheet, in which each column represented a question and each row represented a respondent.

The analytical software IBM SPSS Version 29 was used to analyse the data collected. The data was imported digitally into the IBM SPSS from the Microsoft Excel file (coding sheet).

Descriptive analysis – The sociodemographic characteristics of the respondents (e.g., occupation, age, gender, household size, number of years of formal education, involvement in fishing, etc.) were summarised and converted into frequencies and percentages using IBM SPSS, and descriptive statistics of the data e.g., the mean and standard deviation were calculated. Charts and graphs were prepared using both IBM SPSS and Microsoft Excel. The scores of each survey question were summarised – firstly, descriptive statistics were compiled for each question and secondly, composite score for the dependent variable and each of the independent variables was calculated.

Inferential analysis – The data collected from the survey sample were used to draw conclusions about the perception of the community in PPMP and test whether the research hypotheses developed were supported. The methods that were applied in this study for conducting inferential analysis are factor analysis and multiple regression analysis.

3.6.1 Factor Analysis

The principal component analysis (PCA) technique was used to reduce the large number of survey items into principal components. The components were extracted using Kaiser's criterion – based on eigenvalues greater than 1.0 (Kaiser, 1960). The components generated were rotated using the oblique method, Direct Oblimin. The oblique method was used as it allows for some degree of correlation between the principal components in arriving at a simple structure (Reise et al., 2000). Items in the components with factor loading below 0.3 were suppressed (Field, 2013) and no item cross-loaded between components by a ratio of more than 75% (Samuels, 2017).

The number of components was optimized to 13 in total – income inequity factors (three), social factors (five), governance factors (four) and ecological factor (one) – and only items with factor loadings of 0.5 and higher were retained within a component.

3.6.2 Regression Analysis

Multiple regression analyses were carried out to examine the significant relationships between the dependent variable and the independent variables. The social, governance and ecological components (principal factors) from the factor analysis and selected sociodemographic characteristics were used as independent variables for the regression analyses. The model for the multiple regression analysis is presented below.

$$Y = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + ... + \beta_p X_{ip} + \epsilon \quad (1)$$

where, for $i = p$ observations:

Y = dependent variable

X_i = independent variable

β_0 = Y-intercept (constant term)

βp = slope coefficient for each independent variable

ϵ = the model's error term

Before running the regression analysis, a composite index was created for each principal factor using equation 2 below.

$$X_{ij} = \sum_{k=1}^{m} V_{ijk} W_{kj} \quad (2)$$

where

X_{ij} = the weighted value of the principal factor j for respondent i

V_{ijk} = the observed value of variable k for principal factor j and respondent i

W_{kj} = the weight associated with variable k and principal factor j

i = number of observations

j = number of principal factors

k = number of variables included in the constitution of principal factor j

The weight associated with each principal factor in equation 2 was derived from the normalized value of the factor loading of each variable of the factor from the factor analysis (Islam et al., 2016; Krishna and Uphoff, 1999). The weight for each variable in a principal factor was computed by adding the factor loadings of all the variables making up the factor and dividing the factor loading of each variable by the total loading – the weight of each variable lies between 0 and 1.

3.7 Summary of Chapter Three

Chapter 3 describes the methods and approach used to answer the research questions for this study and to test the hypotheses generated. It gives details of how samples were designed, and how data

were collected, measured and analysed. It describes the survey items used and explains the methods of analyses employed.

CHAPTER 4:

RESULTS AND DISCUSSION

4.1 Introduction

This chapter describes the results of analyses of the data obtained from the survey of respondents. Section 4.2 discusses the descriptive analysis of sociodemographic characteristics of the respondents interviewed. Section 4.3 discusses the results of the factor analysis carried out on the data, while Section 4.4 explains the regression analyses performed using the data. The final section, 4.5 summarises the three dimensions – social, governance and ecological – that drive income inequity in PPMP.

4.2 Sociodemographic Profiles of Respondents

4.2.1 Occupation

The main income earning activities of the respondents fall under five major groups as show in Table 2 below.

Table 2**:** Main occupations of the respondents

Occupation	N	%
Full-time fisher	6	4.7
Boat operator	32	25.2
Tourism operator or worker	35	27.6
Business operator or worker	39	30.7
Others	15	11.8
Total	127	100

Business operators or workers are the largest group (30.7%) followed by tourism operators or workers (27.6%) and boat operators (25.2%). Full-time fishers make up the smallest group at under 5%. Figure 4 shows the details of the occupations of the respondents.

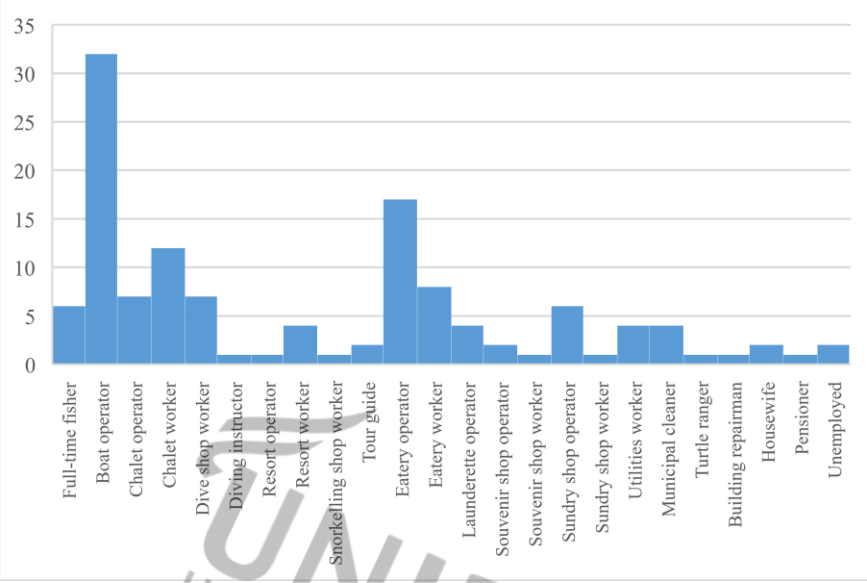

Figure 4: Occupations of survey respondents

In addition to their daily jobs, six respondents – three boat operators, one chalet operator, one tour guide and one dive shop worker – are engaged in fishing as a second job. Furthermore, seven respondents were previously full-time fishers who have switched to tourism work – boat operators (six) and chalet operator (one).

4.2.2 Gender

The gender composition of the respondents is 56.7% for male and 43.3% for female as shown in Figure 5.

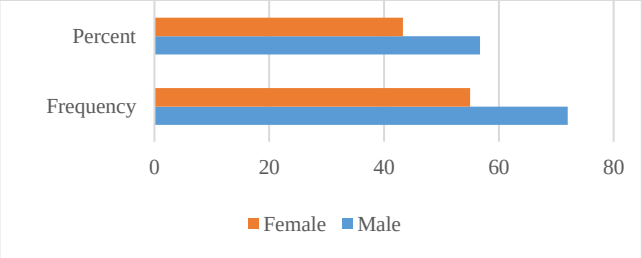

Figure 5: Distribution of respondents by gender

4.2.3 Involvement in Fishing Activities

Respondents were asked whether they engage in fishing activities.

Table 3: Respondents engaged in fishing

Fishing involvement	N	%
No	65	51.2
Yes. For income only	2	1.6
Yes. For consumption only	23	18.1
Yes. For both income and consumption	37	29.1
Total	127	100

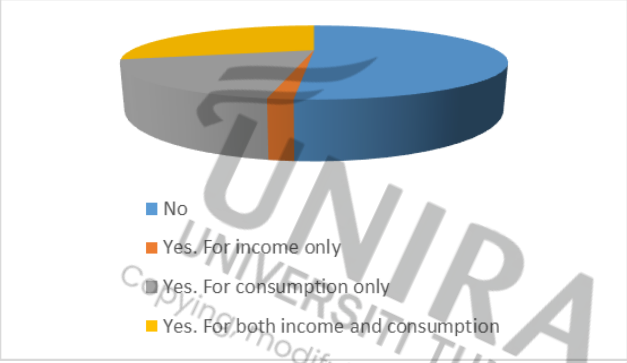

Figure 6: Respondents' engaging in fishing

Table 3 and Figure 6 show 48.8% of the respondents are engaged in fishing, especially during the North East monsoon season when tourism activities cease and fishing is the only employment available. Respondents who fish for consumption only make up 18.1%, while 29.1% fish for both income and consumption. Out of the respondents who do not engage in fishing, 70.8% are female and 29.2% are male. Going by gender, 73.6% of male respondents fish compared to 16.4% for female.

4.2.4 Respondents' Age

The age (in years) of respondents interviewed was from 18 to 77. Slightly more than half (52.8%) of those interviewed were between the ages of 26 to 45 years and the mean age is 40 years. The distribution of respondents' age is shown in Figure 7 and Table 4.

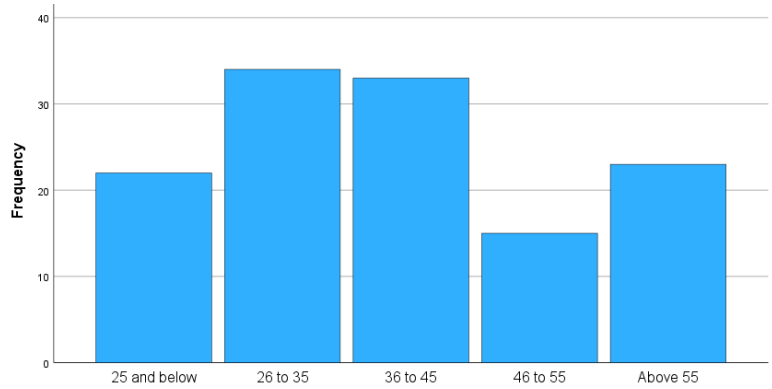

Figure 7: Distribution of respondents' age in years

Table 4: Respondents' age distribution (years)

Mean	39.96
Minimum	18
Maximum	77
N	127

4.2.5 Household Size

The range of household sizes with the highest frequency is between 4 to 6 persons, which accounts for 46.5% of respondents interviewed (see Table 5). The mean household size is 6.6 compared to the national average of 3.8 in 2020 (DOSM, 2022). Household sizes of 10 and above are fairly common and account for 16.5% of the respondents. The concept of extended families consisting of several generations living under the same roof is a unique characteristic of the island community.

Table 5: Respondents' household size

Household size	N	%
1 to 3	19	15.0
4 to 6	59	46.5
7 to 9	28	22
10 and above	21	16.5
Total	127	100
Mean		6.57

4.2.6 Number of Years of Formal Education

The respondents' level and number of years of formal education is summarised in Table 6.

Table 6: Respondents' educational status (level and years)

Level of education	N	%
Primary school (6 years or less)	34	26.8
Lower secondary school – SRP/PMR* (7 to 9 years)	22	17.3
Secondary school – SPM** (10 to 11 years)	44	34.6
STPM***/ certificate/ diploma (12 to 15 years)	17	13.4
Bachelor degree and above (more than 15 years)	10	7.9
Total	127	100.0

* SRP – Sijil Rendah Pelajaran; PMR – Penilaian Menengah Rendah
** SPM – Sijil Pelajaran Malaysia
*** STPM – Sijil Tinggi Persekolahan Malaysia

The level of education that occurs most frequently among the respondents is secondary school level followed by primary school. Generally, respondents above the age of 55 attained formal education up to primary school level. Respondents between the ages of 18 and 35 who have studied only up to primary school level or lower secondary level are fairly common because many young islanders prefer to stop going to school and start earning income after completing primary school or lower secondary school. The drop-out rate from secondary school is high among the islanders and the reason is that the sole school in the village only offers primary school education, and islanders have to attend lower secondary school and beyond on the mainland. Many children leave school after completing Primary 6 on the island as they do not want to move to Besut to continue with their secondary school education. Parents accept the situation as the children can help out with family businesses.

4.2.7 Membership in Community Organisations/Associations

The number of respondents who join community organisations or associations is fairly low. The percentage of respondents who are currently members of organisations or associations is 18.9% while the percentage of those who were previously members is only 7.9%, as shown by Table 7.

Table 7: Respondents' membership with community organisations (number)

Member	Currently member		Previously member	
	N	%	N	%
No	103	81.1	117	92.1
Yes	24	18.9	10	7.9
Total	127	100	127	100

Table 8 shows the most common organisations or associations of which respondents are members. Some respondents have membership in more than one organisation or association. The Residents' Cooperative has the greatest number of members among the respondents, who are those involved in businesses. This is followed by the Water Taxi Association the members of which are boat operators. The Neighbourhood Association carries out community projects in the village. The Fishermen Association is an affiliation of fishers which, while not active in the past five years, is now being revived.

Table 8: Respondent's membership with organisations or associations

Type of organisation/association	Number of respondents who are members
Residents' Cooperative (Koperasi Penduduk)	11
Water Taxi Association	7
Neighbourhood Association (Kesatuan RukunTetangga)	4
Fishermen Association	3

4.2.8 Summary of Respondents' Sociodemographic Characteristics

Following is a summary of the descriptive statistics of three key sociodemographic characteries – age, household size, and number of years of formal education.

Table 9: Summary of respondents' key sociodemographic characteristics

	N	Mean	Std. Deviation
Age (years)	127	39.96	13.954
Household size	127	6.57	3.626
Number of years of formal education	127	9.81	3.177

4.3 Factor Analysis

Factor analysis is a linear statistical model used to explain the variance among the observed variables and condense a set of the observed variable into the unobserved variables called factors.

A factor analysis was carried out on the data collected from the survey with the PCA technique as elaborated in Section 3.6.1. PCA is the extraction method used to summarize available information from the total number of variables and reduce it to a smaller number (Smith, 2002). The initial analysis is done to determine eigenvalues for each factor. Eigenvalues greater than 1.0 were chosen as the basis for extracting the appropriate amounts of variances from the data. The oblique rotation method, Direct Oblimin, was used in this study for generating the factors.

Sampling adequacy tests were carried out on the data using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and the Bartlett's Test of Sphericity. The KMO test is used to prove the sampling is sufficient for analysis and should be higher than 0.70. The Bartlett's Test is used to test whether the correlation between items is large enough for exploratory factor analyses and is accepted at a significance level of < 0.05 (Mthembu et al., 2016). The results of the tests are summarised in Table 10.

Table 10: KMO and Bartlett's Test

Factors	KMO	Bartlett's Test of Sphericity		
		Chi-square (χ^2)	df	Sig.
Income Inequity factors	0.664	103.639	15	< .001
Social factors	0.496	193.560	55	< .001
Governance factors	0.573	428.873	91	< .001
Ecological factor	0.500	69.985	1	< .001

Table 10 shows that all the indicators of the study – income inequity, social, governance and ecological – are significant at the 0.05 level.

To assess the reliability of the measurement scale, the Cronbach's Alpha reliability test was carried out. The Cronbach's Alpha criteria is > 0.6, and most studies suggest that a Cronbach's Alpha

value between 0.7 to 0.8 is an acceptable value. The value of Cronbach's Alpha for the constructs used in this study range between 0.37 and 0.85 (Table 11) which means that the constructs are acceptable, and the survey questionnaire has internal consistency.

Table 11: Results of reliability analysis for constructs used in this study

Construct	Number of items	Cronbach's Alpha
Income inequity index (INE)	3	.715
Access to Fisheries (SAF)	2	.471
Access to Business (SAB)	2	.496
Access to Capital, Fishing and Representation (SACFR)	3	.367
Involvement in Fisheries Management (GIFM)	3	.849
Participation in MPA Management (GPMM)	3	.419
MPA Rules and Enforcement (GMRE)	3	.565
Recognition (GR)	2	.540
Coral Reef Health (ECRH)	2	.791

4.3.1 Income Inequity Factors

The PCA has extracted three factors (i.e., components) for income inequity, all with eigenvalues above 1.0. The three factors consist of six items which the survey respondents agree are variables that affect income inequity of small-scale fishers of the marine park. The income inequity factors have a total eigenvalue of 4.299, accounting for 71.7% of the total variance of the data (Table 12).

Table 12: Income inequity factors

Factor/Item	Factor loading			% of load
	Factor 1	Factor 2	Factor 3	
Factor 1 – The MPA Contributes to Coral-Based Livelihoods (ICBL)				
1. MPA has contributed to the income of local residents.	.855			36.3
2. Coral reef habitats are protected for the socio-economic sustainability of local communities.	.796			33.7
3. MPA provides balanced sharing of access to resources (fisheries or tourism) among stakeholders.	.707			30
	2.358			100

Factor 2 – Unfair Distribution of Income (IUDI)				
1. Local fishers migrate to other areas for alternative income.		.873		62.8
2. Local people receive a fair share of income from tourism business.		.517		37.2
		1.390		100
Factor 3 – Tourism Business Benefits Outsiders (ITBO)				
1. The major share of income goes to the owners of tourism businesses residing outside the island.			.983	100
Variance Explained	Factor 1	Factor 2	Factor 3	Total
Eigenvalue	2.110	1.165	1.024	4.299
% of variance	35.166	19.424	17.064	71.654

Income Inequity Factor 1– The MPA Contributes to Coral-Based Livelihoods (ICBL)

The first income inequity factor has three items. The factor has an eigenvalue of 2.110 and it explains 35.2% of the total variance of the data set.

The variables of this factor are concerned with whether the marine park has contributed to the income and socio-economic sustainability of the islanders through fishing and tourism, and whether it provides for balanced sharing of access to resources among stakeholders. The establishment of the MPA has contributed to the income of the islanders through tourism but income from fishing has declined. Tourism has increased employment opportunities in the marine park and many women have benefited through operating small business that cater to tourists e.g., eateries and launderettes. Small-scale fishers, on the other hand, have not benefited as fishing is prohibited in the marine park. The respondents do not believe that there is balanced sharing of access to resources among the stakeholders, and that tourism is favoured over fishing as fisheries resources of the marine park are restricted. Life is tough for artisanal fishers as they have to travel two nautical miles outside the marine park to fish which incur high fuel cost with no guarantee of harvest. Furthermore, their small fishing vessels are not suitable for going long distance. To quote a respondent (a full-time fisher), "There are limited opportunities for artisanal fishers in the marine park as tourism is prioritized and fishers do not get any aid from the government". In terms of

coral reef protection, respondents are of the opinion that the marine park management needs to improve on the supervision of tourist activities and the maintenance of reef indicators.

Income Inequity Factor 2 – Unfair Distribution of Income (IUDI)

The second factor for income inequity has two items. It has an eigenvalue of 1.165 and explains 19.4% of the total variance of the data.

The variables of the factor relate to the unfair distribution of income to small-scale fishers from the marine park and the unbalanced sharing of income from tourism business. In view of the decline in fishing income and an increase in economic burdens for artisanal fishers caused by the fishing ban, local fishers are forced to seek alternative income. Very few of the fishers migrate to other areas for alternative employment; the majority of them switch to the tourism sector e.g., boatmen or operators of small businesses catering to tourists. In terms of sharing of income from tourism, the respondents generally believe there is a disparity as the sector is dominated by people from the mainland. In the marine park, only 30% of the tourism businesses are owned by islanders, with the rest owned by outsiders. Islanders own chalets on Perhentian Kecil except those at Long Beach, while outsiders own the majority of chalets and resorts on Perhentian Besar. About 35% of the workers in tourism businesses are islanders from PPMP, and the rest are made up of Malaysians from other districts (mainly from Besut) and foreign workers.

Income Inequity Factor 3 – Tourism Business Benefits Outsiders (ITBO)

The third factor of income inequity has only a single item. The factor's eigenvalue is 1.024 and it accounts for 17.1% of the total variance of the data. Overall, the respondents agree that outsiders, who own 70% of the tourism businesses in the marine park, receive the major share of the income from the sector. One respondent said, "Outsiders dominate businesses in the marine park because they have access to more capital and have better business expertise and networking compared to us islanders".

4.3.2 Social Factors

There are five social factors consisting of nine items. All factors have eigenvalues above 1.0 that sum up to 7.276, and they explain 66.1% of the total variance of the data (see Table 13).

Table 13: Social factors

Factor/Item	Factor loading					% of loading
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	
Factor 1 – Access to Fisheries (SAF)						
1. Fishers from outside the area often carry out fishing activities surrounding the marine park.	.881					63.8
2. Local fishers engage in fishing for subsistence need in the marine park.	.500					36.2
	1.381					100
Factor 2 – Access to Business (SAB)						
1. It is easy for the local people to get loans and credits for business purposes.		.834				53.6
2. It is easy for local residents to participate in business activities on the island.		.722				46.4
		1.556				100
Factor 3 – Access to Capital, Fishing and Representation (SACFR)						
1. The local people have access to financial resources for business.			.715			36.3
2. Generally, people in the community get together to jointly inform and influence government officials or political leaders for the benefit of the community.			.642			32.6
3. Fisheries stock has increased in the MPA.			.612			31.1
			1.969			100
Factor 4 – Sale and Renting of Land (SSRL)						
1. Selling and renting of land on the island has increased compared to five years ago.				.920		100
Factor 5 – Land Ownership (SLO)						
1. Most of the local people own land on the island.					.877	100
Variance Explained	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Total
Eigenvalue	2.066	1.742	1.231	1.170	1.067	7.276
% of variance	18.785	15.833	11.191	10.641	9.699	66.149

Social Factor 1 – Access to Fisheries (SAF)

The first social factor has two items and an eigenvalue of 2.066, and it explains 18.8% of the total variance of the data set.

The factor relates to competition between PPMP's small-scale fishers with fishers from outside the area, and fishing by islanders in the marine park. Fishers from Besut, Thailand and Vietnam often fish in the waters surrounding the marine park. In addition, encroachment in the artisanal fishing zone by trawlers from Besut, Pahang, Johor, Thailand, and Vietnam happen frequently mostly during the monsoon season. Trawlers from Thailand and Vietnam come with twin-trawls, which is illegal in Malaysia. As the trawlers' boats are far bigger than those of PPMP's small-scale fishers, the difference in their catch size is immense. Furthermore, the islander fishers do not have sonar technology to help them locate fish, unlike their competitors from outside the marine park.

Despite the no-fishing rules, the islanders do fish in the marine park especially during the monsoon months and mostly for subsistence. It is learned from the FGD that there was an agreement (albeit verbal) between the Marine Park Department and the local Fishermen Association representatives, prior to the gazette of the marine park, that islanders would be allowed to fish for their subsistence in the marine park. The matter was discussed again in a similar meeting between village representatives and officers from DOFM two years ago and the same promise was extracted but with no written agreement. The islanders have acted on the faith of the verbal agreements but they get penalized when caught fishing by the marine park patrol. The villagers are disappointed at the marine park authority's failure to keep its promises. One respondent shared, "The no-fishing rule is too rigidly enforced, even against islanders who merely fish for subsistence".

Social Factor 2 – Access to Business (SAB)

The second social factor has two items. It has an eigenvalue of 1.742 and explains 15.8% of the total variance of the data set.

The factor relates to whether it is easy for the islanders to obtain loans for business purposes and whether it is easy for them to participate in business activities in the marine park. According to the respondents, it is difficult for the islanders to get loans from banks as they lack guarantors, a fixed income, or collaterals. The islanders find it is easier to get loans from financial agencies such as Tekun, Amanah Ikthiar, the Foundation for Family Development (Yayasan Pembangunan Keluarga), and the Foundation for Entrepreneur Development (Yayasan Pembangunan Usahawan) than from banks. However, the islanders prefer to borrow from their friends on the islands, and the villagers often help each other with loans to operate small businesses. A respondent said, "Small businesses do not rely on bank loans as villagers with money help out other villagers who need a loan". The main challenges of the islanders who wish to participate in business activities are firstly, the shortage of capital and secondly, the lack of land or space as business plots are limited. The islanders also find it harder to apply for business license compared with outsiders.

Social Factor 3 – Access to Capital, Fishing and Representation (SACFR)

The third social factor has three items and an eigenvalue of 1.231, and it explains 11.2% of the total variance of the data set. This factor relates to the financial resources that islanders have at their disposal to raise capital for business, the level of fisheries stock, and availability of collective representation. The islanders have few financial resources for raising business capital, and most of them rely on savings or pawn their jewellery. It is hard for the islanders to get fish as the fisheries stock has declined compared to five years ago and continues to decrease annually. The islanders do discuss problems and issues among themselves before making a collective representation to the relevant authorities but no actions are taken by the authorities concerned to improve their situation. The villagers' voice does not appear to have reached the top level of those in authority. Furthermore, local level marine park officers often gather villagers e.g., chalet owners and ask for their opinions but these discussions do not translate into positive responses or actions from those in authority.

Social Factor 4 – Selling and Renting of Land (SSRL)

The fourth social factor has only one item. The factor has an eigenvalue of 1.170 and explains 10.6% of the total variance of the data. The selling and renting of land on the islands have increased compared to five years ago but it is easier to rent than to sell as the price of land on the islands is very high. The islanders generally rent out the land to outsiders to operate businesses or tourist accommodation as outsiders have more money (higher capital). Some of the villagers have even sold their chalets or resorts.

Social Factor 5 – Land Ownership (SLO)

The fifth and final social factor has one item. The factor has an eigenvalue of 1.067 and explains 9.7% of the total variance of the data set. The owning of land is important for business ventures in the marine park. The land currently owned by the villagers were handed down from older generations, and the younger generation do not own land. Land has become limited as a lot of the land belonging to the islanders were sold for development in the past.

4.3.3 Governance Factors

There are four governance factors, consisting of eleven items (Table 14). All the factors have eigenvalues above 1.0 adding up to 7.741, and they explain 55.3% of the total variance of the data.

Table 14: Governance factors

Factor/Item	Factor loading				% of loading
	Factor 1	Factor 2	Factor 3	Factor 4	
Factor 1 – Involvement in Fisheries Management (GIFM)					
1. Fishermen associations can play a more positive role in the protection of resources in the marine park.	.874				34.0
2. Fisheries management will be more effective if the local fishers share responsibility in it.	.856				33.3
3. The local community have the ability to manage and protect the resources of the marine park.	.840				32.7
	2.570				100

Factor 2 – Participation in MPA Management (GPMM)					
1. It is important for the local community to participate in MPA management.		.788			38.6
2. The local community are willing to participate in MPA management.		.662			32.5
3. MPA no fishing rules should be changed to protect coral reef habitats.		.589			28.9
		2.039			100
Factor 3 – MPA Rules and Enforcement (GMRE)					
1. Fishermen should be able to fish in the MPA area for livelihoods security.			.737		36.1
2. The local people are satisfied with the enforcement of MPA rules and regulations.			.711		34.9
3. The no-take MPA fishing rules make the fishermen's lives better in the community.			.592		29.0
			2.040		100
Factor 4 – Recognition (GR)					
1. The local people participate in MPA management decision making.				.789	53.7
2. The local community are consulted and their consent obtained before MPA decisions are made.				.680	46.3
				1.469	100
Variance Explained	Factor 1	Factor 2	Factor 3	Factor 4	Total
Eigenvalue	2.776	1.992	1.602	1.371	7.741
% of variance	19.828	14.231	11.446	9.788	55.293

Governance Factor 1 – Involvement in Fisheries Management (GIFM)

The first governance factor has three items. The factor has an eigenvalue of 2.776 and it explains 19.8% of the total variance of the data set.

This factor relates to how, if given the opportunity, the fishermen association can play a positive role in the protection of resources and local fishers contribute to effective fisheries management by sharing responsibility in it. This is on the premise that the local community has the ability to manage and protect the resources of the marine park. In the respondents' opinion, the islanders know more about local conditions and what should be done for the management and protection of resources, compared to outsiders. The participation of local fishers, according to the respondents,

can contribute to more comprehensive fisheries management. The fishermen association is no longer active in PPMP as there is more focus on tourism, but it is being revived and young people are encouraged to join. The respondents believe the fishermen association can act as the liaison or voice of the islanders and is important for representation.

Governance Factor 2 – Participation in MPA Management (GPMM)

The second governance factor consists of three items, has an eigenvalue of 1.992 and explains 14.2% of the total variance of the data set.

The factor is about the importance of local community participation in MPA management, their willingness to participate and whether no-fishing rules should be changed to protect coral reef habitats. The respondents believe that it is important for the local community to participate in MPA management given their knowledge of the area and understanding of local conditions, and it is suggested that a committee of islanders be appointed for the purpose. If the opportunity is there, the local community are willing to participate in MPA management. Most of the respondents believe that the no-fishing rules should be changed to protect coral reefs as despite the rules, a lot of corals are damaged due to human activities, in particular diving and snorkelling. It is also suggested that the fishing restriction in the marine park be relaxed to allow islanders to fish in the marine park using non-destructive techniques e.g., hook and line, that do not harm coral reefs.

Governance Factor 3 – MPA Rules and Enforcement (GMRE)

The third governance factor has three items. It has an eigenvalue of 1.602 and accounts for 11.4% of the total variance of the data set.

The factor relates to whether the fishers should be allowed to fish in the marine park, whether the local people are satisfied with the enforcement of MPA rules and regulation, and whether the no-take rules make the fishers' lives better.

The respondents are strongly in favour of small-scale fishers of PPMP (and not those from outside areas) being allowed to fish in the marine park for livelihood security. The fishing zone allocated to artisanal fishers is two nautical miles from the islands, which is too long a distance for them to travel in their small vessels besides raising the problems of safety and high fuel cost with little likelihood of getting a good harvest. According to the FGD, the relaxation of the no-take rules for the villagers is justified as islanders are adept at balancing the need of fishing for livelihood security and that of protecting fisheries resources – the islanders know where the coral reefs are as well as the importance of the coral reefs in fisheries – and they can fish without causing damage to the reefs. The respondents know to fish in the marine park using non-destructive techniques e.g., hook and line.

The islanders are, generally, not satisfied with the enforcement of MPA rules and regulation. Firstly, the marine park authority and the DOFM do not keep their promises to allow the villagers to fish in the marine park for subsistence (see discussion on Social Factor 3 under 4.3.2). The islanders who were caught fishing had their fishing gear destroyed and their harvest confiscated without warning or reminder. Secondly, the islanders feel that enforcement of the no-take rules is unfairly administered as fishers from outside PPMP are treated with more leniency compared to the islanders, and the enforcement officers often turn a blind eye towards the transgressions of outside fishers, including trawlers.

The villagers understand the purpose of the no-take rules – to protect fisheries and rebuild fish stock – but the same rules make lives harder for the small-scale fishers from the marine park. The rules disrupt the fishing activities of the islanders, and as one respondent (full-time fisher) said, "The fishing ban in the marine park causes hardship for fishers, creates burdens for them, and ruins their livelihoods". Another respondent said, "Islanders are prohibited from obtaining resources from their own area and forced to compete with fishers from outside areas who use sophisticated gear".

Governance Factor 4 – Recognition (GR)

The fourth and final governance factor has two items. It has an eigenvalue of 1.371 and accounts for 9.8% of the total variance of the data set. This factor is concerned with the recognition of the rights, livelihood needs and knowledge of island community. The islanders are unhappy as the wishes of the community are disregarded in the formulating of MPA rules. Although meetings were held between marine park officers and villagers' representatives to obtain the islander's views on MPA management matters, what were agreed upon in these meeting were not followed in the implementation. Promises made to the villages by the marine park officers and the DOFM officers in the past were not kept. The islanders feel powerless when it comes to decisions made by the marine park authority that affect their lives and their islands.

4.3.4 Ecological factor

There sole ecological factor consists of two items. The factor has an eigenvalue of 1.656 and it explains 82.8% of the total variance of the data set, as shown in Table 15 below.

Table 15: Ecological factor

Factor/Item	Factor loading	% of loading
Factor 1 – Coral Reef Health (ECRH)		
1. Pollution in the marine park has worsened compared to five years ago.	.910	50
2. The health of coral reefs has deteriorated compared to five years ago.	.910	50
	1.820	100
Variance Explained		Total
Eigenvalue		1.656
% of variance		82.787

Ecological Factor 1 – Coral Reef Health (ECRH)

This factor is concerned with deterioration of coral reef health and pollution in the marine park. Past studies show that coral reefs in PPMP are under threats mainly of human origin – heavy tourism activities, siltation caused by construction activities, pollution, improper waste disposal,

littering and illegal fishing (Reef Check Malaysia, 2011). Moreover, excessive coral-based tourism activities such as diving, snorkelling and boating are resulting in physical damage to coral reefs (Haddock-Fraser & Hampton, 2010; Islam et al., 2013). According to the respondents interviewed, the health of coral reefs is bad at snorkelling and diving areas. One respondent said, "Local (Malaysian) tourists cause a lot of damage to coral reefs as they come ill-equipped with knowledge on the correct way to treat coral reefs e.g., 'no picking' and 'no stepping'. Local tourists also have a higher tendency to litter. Foreign tourists are better informed and more well-behaved."

The respondents generally identify sewerage discharge as the biggest cause of pollution in the marine park. The existing sewerage system is inadequate to handle the current volume of tourist arrivals and desludging needs to be done.

4.4 Multiple Regression Results

The multiple regression method was used in this study for conducting inferential analysis. The data from the survey were analysed using multiple regression and the results from the analyses were used to determine whether the research objectives were achieved and to test whether the hypotheses developed for the study are supported.

The study has the following objectives:

1. To assess how social factors (income, employment, access to fishing, access to business, power relations, and social empowerment) give rise to inequity affecting the livelihoods of small-scale fishers;
2. To investigate how access to various assets and resources can affect the distribution of income and livelihoods of small-scale fishers;

3. To assess how governance factors (MPA regulations, local institutions, community participation in MPA management, community organisations, and village leaders) influence the equitable income of small-scale fishers; and
4. To examine how ecological factors (pollution, tourism intervention, and loss of coral habitats) affect the equitable income of small-scale fishers.

In order to get answers for these objectives, several hypotheses were developed to examine the direct effect of social, governance and ecological factors on improving the equitable income and livelihoods of fisher households in PPMP. These hypotheses are as follows:

Hypothesis 1: Access to fishing contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 2: Access to business contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 3: Social empowerment of the local community contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 4: Asset (land and capital) ownership contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 5: No-take MPA rules contribute to increasing income inequity for small-scale fishers.

Hypothesis 6: Community involvement in MPA decision making contributes positively to reducing income inequity for small-scale fishers.

Hypothesis 7: Community organisations such as fishermen associations contribute positively to reducing income inequity for small-scale fishers.

Hypothesis 8: Healthy coral reef habitats contribute positively to reducing income inequity for small-scale fishers.

Multiple regression analyses were carried out to examine the significant relationships between the dependent variable and the predictor variables. A composite index was created for each of the principal factor used in the regression by means of equation 2 – as explained in 3.6.2 – and descriptive statistics were computed for each of the predictors.

The principal factor that explains the highest amount of variance in the income inequity data set – The MPA Contributes to Coral-Based Livelihoods (ICBL) – was used as the dependent variable for the regression analyses. The independent variables for the regression were made up of the social factors, the governance factors, and the ecological factor extracted from the factor analysis as well as sociodemographic characteristics of the stakeholders. Potential predictors were chosen from sociodemographic characteristics based on the researcher's knowledge of the context and literature, as factors that might influence perception on inequity (Bennett et al, 2020).

In selecting the best regression model, the backward elimination method was used whereby all the identified variables were included in the equation and removed sequentially. In considering variables for potential elimination from the model, the p-value of each variable was examined and, at a confidence level of 90%, statistically insignificant variables (with p-value > 0.1) were removed starting with the one having the highest p-value. The final model chosen was one with the highest R^2, adjusted R^2 and F-value and the lowest p-value.

The dependent variable (the income inequity index), consisted of three indicators used to assess income equity, as shown in Table 16.

Table 16: Income inequity index

Item	Factor loading	% of loading
1. MPA has contributed to the income of local residents.	.855	36.3
2. Coral reef habitats are protected for the socio-economic sustainability of local communities.	.796	33.7
3. MPA provides balanced sharing of access to resources (fisheries or tourism) among stakeholders.	.707	30
	2.358	100

The three indicators of the income inequity index represent variables that will promote income equity. The first variable in the index is related to the improvement in income and employment opportunities that has resulted from the setting up of the marine park. The community's perception is that the local residents have benefited through tourism in the marine park in term of income and employment opportunities but small-scale fishers have lost their fair share of income because of the fishing ban in the marine park. Most of the islanders who were previously artisanal fishers have switched to tourism for their livelihoods. Although tourism is the primary source of income for the island community now, fishing is still important because tourism work is seasonal. When tourism activities in the marine park shut down during the North-East monsoon, the islanders have to turn to fishing for their livelihoods. Furthermore, many of the islanders fish part-time in addition to their tourism work. Thus, the "No-Take Zone" MPA inhibits the income earning capabilities of the island community. For the second income inequity variable, the general perception is that coral reefs are protected in the marine park by MPA rules. In the case of the third and final income inequity variable, the islanders' perception is that there is unbalanced sharing of resources among stakeholders because fishers have lost their access to fisheries resources in the marine park and outsiders are benefitting more than the islanders from resources (both fisheries and tourism).

The independent variables used in the final regression model are defined, and their descriptive statistics are shown, in Table 17.

Table 17: Definition and descriptive statistics of regression variables

Predictor Variable	Definition	Mean	Standard Deviation
SAF	Access to Fisheries	2.398	0.887
SAB	Access to Business	2.780	1.383
SACFR	Access to Capital, Fishing and Representation	3.104	0.726
SSRL	Sale and Renting of Land	1.874	1.374
SLO	Land Ownership	4.039	1.287
GIFM	Involvement in Fisheries Management	4.227	0.852
GPMM	Participation in MPA Management	4.317	0.529
GMRE	MPA Rules and Enforcement	4.141	0.960
GR	Recognition	3.580	1.144
ECRH	Coral Reef Health	3.193	1.621
Age	Age (years)	39.96	13.954
Household	Household size (number)	6.57	3.626
Fish	Engage in fishing (1 = Yes, 0 = No)	0.49	0.502
Member	Membership in organisations/associations (1 = Yes, 0 = No)	0.19	0.393
N = 127			

Table 17 shows the mean and standard deviation of the list of independent variables. It indicates that the respondents' perspective is skewed towards the negative in respect of access to fisheries and businesses. This is because the no-take fishing rules and competition with outside fishers are considered as contributing strongly to income inequity for artisanal fishers from the island. Similarly, difficulty in obtaining loans from financial institutions and the shortage of land for operating business are factors that give rise to income inequity. The respondents' perspective on Access to Capital, Fishing and Representation hovers around neutral; and this is because low availability of capital for business and exhausted fisheries stock are serious problems for the livelihoods of the islanders but the community are united in trying to solve these issues together and in making joint representation to the authorities concerned. The selling and renting of land (to outsiders) is viewed by the respondents as a cause of income inequity because the transactions result in outsiders getting a bigger share of the tourism businesses and income in the marine park.

The respondents agree that land ownership is important for income equity as land is essential for business ventures and is currently scarce.

The mean scores of the predictor variables as shown in Table 17 indicate that the respondents consider the governance factors – Involvement in Fisheries Management, Participation in MPA Management, MPA Rules and Enforcement, and Recognition – as significant for income equity in the marine park. Governance has an important impact on income equity in the marine park as it affects access to fisheries resources and the effectiveness of resource management and protection. The opinion of respondents is divided on the effect of the ecological factor Coral Reef Health on income equity although most of them agree that the health of coral reefs has deteriorated compared to five years ago. The table shows that the mean age of the respondents is 40 years while the average household size is 6.6. Based on the table, about half of the respondents engage in fishing activities whilst membership in organisations/associations is low.

The correlations of the variables used in the multiple regression can be found in Appendix D.

The regression model was developed to examine the influence of important factors of income inequity and access to various resources on the livelihoods of local residents in PPMP. The equity in income (INE) was the dependent variable and several explanatory factors and sociodemographic characteristics were included as independent variables in the model, which is as follows

$$INE = \beta_0 + \beta_1(SAF) + \beta_2(SAB) + \beta_3(SACFR) + \beta_4(SSRL) + \beta_5(SLO) + \beta_6(GIFM) + \beta_7(GPMM) + \beta_8(GMRE) + \beta_9(GR) + \beta_{10}(ECRH) + \beta_{11}(Age) + \beta_{12}(Household) + \beta_{13}(Fish) + \beta_{14}(Member) + \epsilon$$

where INE is equity in income, β_0 is the constant term, β_1 to β_{14} are coefficients for the independent variables and ϵ is the error term.

The results of the regression are shown in Table 18 where the R^2, adjusted R^2, F-value and p-value show that the regression model significantly predicted the dependent variable. The values of R^2 and adjusted R^2 were 42% and 34% respectively, which is acceptable in social sciences research. The results indicate that the inequity model has explained 42% of variances.

The p-values from the analysis indicate that two independent variables were highly significant and six variables were moderately significant.

Table 18: Results of multiple regression

Description		Unstandardized Coefficients		t-Value	p-Value
		B	Std. error		
(Constant)		2.915	0.993	2.936	0.004***
GR	Recognition	0.370	0.084	4.435	0.000***
SSRL	Selling and Renting of Land	-0.212	0.064	-3.327	0.001***
GMRE	MPA Rules and Enforcement	-0.228	0.094	-2.434	0.017**
GIFM	Involvement in Fisheries Management	0.256	0.110	2.322	0.022**
SAF	Access to Fisheries	0.217	0.097	2.234	0.027**
SACFR	Access to Capital, Fishing and Representation	-0.239	0.126	-1.887	0.062*
Household	Household size	-0.051	0.024	-2.161	0.033**
Age	Age (years)	-0.012	0.006	-1.984	0.050*
R	.642				
R^2	.412				
Adjusted R^2	.338				
F statistics	5.596				
Significance	< .001				

Dependent variable: Income inequity index – The MPA Contributes to Coral-Based Livelihoods (ICBL)
Significance levels are denoted by *** at the 0.01 level (1-tailed), ** at the 0.05 level (1-tailed) and * at the 0.1 level (1-tailed).

The regression results show that the governance factor Recognition (GR) had a positive coefficient and was significant at 1% level, which implied that recognition of the rights, livelihood needs and knowledge of the island community by the marine park authorities will increase income equity.

This will include allowing the island community to participate in MPA decision making, and consulting the local inhabitants and getting their consent before MPA decisions are made.

The social factor Selling and Renting of Land (SSRL) had a negative coefficient and strong significance which suggested that an increase in the selling and renting of land by the island community causes income inequity. This is because the selling and renting of land by the islanders are made to outsiders who use the land for tourism and related businesses, thus allowing the outsiders to gain a greater share of income from tourism businesses in the marine park and reducing the share for the local community.

There were six moderately significant predictors altogether in the regression model at the 5% level and 10% level. The governance factor MPA Rules and Enforcement (GMRE) was negatively correlated with the income inequity index, which suggested that the current MPA rules and enforcement of the rules cause income inequity. This is because the no-take MPA fishing rules restrict the access of the islanders to fisheries resources and make the lives of fishers difficult. Thus, income inequity can be reduced by relaxing the no-take fishing rules for the islanders and allowing them to fish for livelihood security. Clemency from fishing restriction during the monsoon months has been long sought after by the artisanal fishers from the island as they have no other source of livelihoods during those months. Furthermore, the islanders are adept in telling where the coral reefs are and they know how to fish without damaging the corals or jeopardising the protection of fisheries resources. In the case of rules enforcement, the islanders are dissatisfied as they find it unfair to them because outside fishers (mainly trawlers) who fish in the marine park and encroach on the artisanal fishing zone are treated with leniency by the enforcement officers. To ensure income equity, it is important for enforcement of MPA rules to be impartial and strictly administered against outside fishers and for encroachment by trawlers to be stopped. This is to prevent the exhaustion of fish stock in the marine park and artisanal fishing zone, and hence reduce the unfair distribution of benefits from fisheries.

The coefficient for the governance factor Involvement in Fisheries Management (GIFM) was positive which suggested that income inequity can be reduced if local fishers and the local level fishermen association are allowed to play a bigger role in fisheries management and the protection of resources in the marine park. This is because the islanders are knowledgeable about local resources and conditions and can thus contribute positively towards effective management and protection of local resources that can then be enjoyed by the local community.

The social factor Access to Fisheries (SAF) had a positive coefficient which implied that greater access to fisheries can reduce income inequity. This observation is to be expected as the local community has for year been entreating the marine park authority and the DOFM to have the no-take fishing rules in the marine park relaxed especially during the monsoon. Additionally, at present the islanders have to undergo unfair competition with fishers from outside areas mainly from Thailand, Vietnam, Besut, Pahang and Johore who have much bigger boats and access to new fishing technology. Restriction of fishers from outside the areas will allow fairer access by islanders to fisheries resources and reduce disparity of income between fishers from the marine park and fishers from outside.

The coefficient for the social factor Access to Capital, Fishing and Representation (SACFR) was negative and there are a number of reasons for this observation. Firstly, the islanders have little financial resources that can be used as start-up or working capital for businesses and they usually have to pawn their jewellery to get the money or borrow from other islanders. Secondly, fisheries stock in the marine park and artisanal fishing zone has decreased in the last five years and continues to decline annually which means that the catch size and income of the local fishers are getting smaller. Thirdly, although the local community get together to discuss issues that affect them and they have representatives to speak on their behalf to the relevant parties, their requests and views tend to fall on deaf ears and there is little hope of getting any response or action from

the parties concerned. Thus, if access to capital, fisheries stock and effective representation is improved, income inequity can be reduced.

Household size had a negative coefficient and this is because the more people there are in a household, the more resources is needed and consumed. Household sizes are relatively bigger on the island with a mean household size of 6.6. The perception of the local community is that islanders are not getting a fair share of tourism income which is mostly concentrated in the hands of outsiders as tourism and businesses in the marine park are dominated by outsiders from the mainland. Furthermore, the percentage of islanders who are employees or workers in tourism establishments is much lower compared to outsiders. Respondents with bigger household sizes tend to have a more negative perception of income equity in the marine park in terms of employment opportunities and distribution of income.

The age of the respondents also had a negative coefficient. The ages of islanders interviewed ranged from 18 to 77 and the mean age was 40 (see section 4.2.4). The older islanders were previously fishers who have switched to tourism occupations after the imposing of the fishing restriction in the No-Take Zone marine park. The older islanders have a perception of unfair income distribution among the local people in marine park.

The findings from the study were used to test whether the hypotheses developed for the research are supported. The summary of hypotheses of the direct relationship between explanatory factors and household income inequity in PPMP are shown in Table 19. The result of the test on each of the hypothesis is shown in the last column of the table which indicates whether the hypothesis should be rejected or otherwise.

Table 19: Direct relationship between dependent and independent variables

Hypothesis	Statement	Reject hypothesis?
H1	Access to fishing contributes positively to reducing income inequity for small-scale fishers.	Do not reject
H2	Access to business contributes positively to reducing income inequity for small-scale fishers.	Reject
H3	Social empowerment of the local community contributes positively to reducing income inequity for small-scale fishers.	Do not reject
H4	Asset (land and capital) ownership contributes positively to reducing income inequity for small-scale fishers.	Do not reject
H5	No-take MPA rules contribute to increasing income inequity for small-scale fishers.	Do not reject
H6	Community involvement in MPA decision making contributes positively to reducing income inequity for small-scale fishers.	Do not reject
H7	Community organisations such as fishermen associations contribute positively to reducing income inequity for small-scale fishers.	Do not reject
H8	Healthy coral reef habitats contribute positively to reducing income inequity for small-scale fishers.	Reject

Hypotheses 1, 3, 4, 5, 6 and 7 were supported by the findings from the study whilst hypotheses 2 and 8 were rejected.

The following hypotheses were supported by the results of the study:

H1: This hypothesis is supported by the p-value of 0.027 for the principal factor SAF and the p-value of 0.062 for the principal factor SACFR. Thus, income inequity for small-scale fishers in the marine park can be reduced if there is more abundant fish stock, and if the fishers have greater access to fisheries resources through the relaxation of no-take rules and the eradication of unfair competition from outside fishers.

H3: This hypothesis is supported by the p-value of 0.062 for the principal factor SACFR. Therefore, income inequity for the local small-scale fishers can be mitigated by social empowerment of the fishers whereby they gain greater access to resources and fundings and more control over important decisions.

H4: This hypothesis is supported by the p-value of 0.001 for the principal factor SSRL and the p-value of 0.062 for the principal factor SACFR. Thus, asset (land and capital) ownership can reduce income inequity for the local small-scale fishers. This statement is borne out by the rise in income inequality between outsiders and locals resulting from the sale or renting of land by the islanders to outside investors who use the land for tourism and business. The sale and renting of land deprive fishers of the benefit of using the land for business and at the same time allow the buyer or tenant (outsiders) to gain a bigger share of income from tourism and business. On the other hand, greater access to capital for business provides the small-scale fishers with alternative employment opportunities, while availability of funds for buying better fishing equipment can help the fishers improve their productivity – both are factors that can reduce income inequity for the small-scale fishers.

H5: This hypothesis is supported by the p-value of 0.017 for principal factor GMRE. Thus, income inequity for the local artisanal fishers can be reduced if no-take rules are relaxed to allow islanders to fish for livelihood security, and stricter enforcement of rules are taken against illegal fishing by outside fishers and encroachment by trawls.

H6: This hypothesis is supported by the p-value of 0.000 for the principal factor GR and the p-value of 0.022 for the principal factor GIFM. Thus, involving the local community in MPA decision making can contribute to reducing income inequity for the local small-scale fishers, and in several ways. Firstly, involving fishers in fisheries management can result in more effective management and protection of fisheries resources because of their knowledge of local resources and conditions. In addition, the rights and the livelihood needs of the local community will be given due consideration when policymakers make decisions on MPA. Furthermore, the knowledge of the local community and their familiarity with local conditions can help make better decisions that affect their income and livelihoods.

H7: This hypothesis is supported by the p-value of 0.022 for the principal factor GIFM. Community organisations such as fishermen associations can contribute to reducing income inequity for the local small-scale fishers and to improving their livelihoods. This is because the knowledge and experience of the local members with regards to the conservation site can allow them to play effective roles in the management and protection of local resources which can then be enjoyed by the local community. In addition, community organisations can act as agents for positive changes that improve the livelihoods of local small-scale fishers.

H2 is rejected as the regression results show that Access to Business is not significantly related to the dependent variable. Similarly, H8 is rejected as based on the results, Healthy Coral Reef Habitats are not significantly related to the dependent variable.

4.5 Results of the Main Drivers of Inequity

Figure 8 shows the three dimension – social, governance and ecological – considered in the survey based on their mean scores of respondents interviewed.

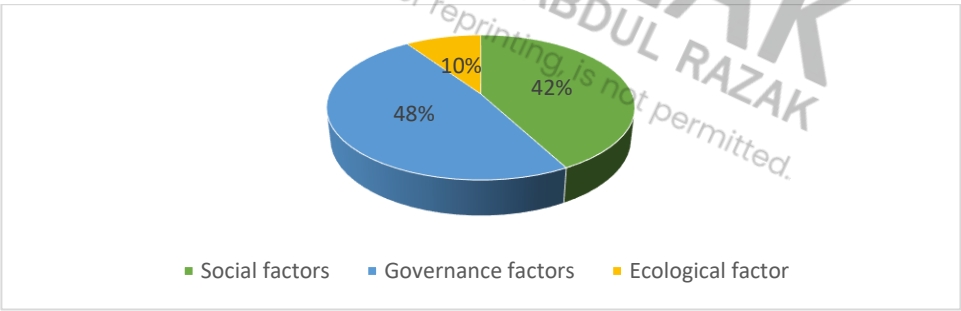

Figure 8: Three dimensions considered in the survey – Social, Governance and Ecological

The chart shows that, in the opinion of the local community, governance factors account for 48% of income inequity for artisanal fishers in the marine park, while social factors and ecological factor drive 42% and 10% respectively of the inequity.

The local community perceive governance factors as the main driver of income inequity – restricted access to fisheries resources; poor enforcement of MPA rules against outside fishers and

trawls; the lack of say by the islanders in MPA decision making; and the disregard of the livelihood needs of the local fishers. Social factors are viewed as the second most important driver of income inequity – inequitable access to income and employment; limited access to capital and fish stock; and lack empowerment of the local community to improve their livelihoods. While degradation of coral reefs in the marine park is of great concern, ecological factor is considered as contributing the least to income inequity among the 3 drivers.

CHAPTER 5:

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the concluding remarks and recommendations of the researcher based on findings of the study.

This study examined social equity in the MPAs of Malaysia by assessing the effect of social, governance and ecological factors on income inequity for small-scale fishers in PPMP. The primary survey approach was used to elicit the viewpoints and opinions of the community in PPMP to understand and examine how different factors contribute to equity in income in the marine park. Data was collected through face-to-face interviews of respondents using a structured questionnaire. The respondents were drawn from local inhabitants of the marine park who are knowledgeable about income distribution, employment conditions, as well as marine resource conditions and management in the marine park. The respondents were selected based on their occupations – full-time fishers; boat operators; tourism operators and workers; business operators and workers; and others. Focus group discussions were used to validate the data obtained from the survey questionnaire and to gain more insight for the research.

The data was examined through linearity, normality, multicollinearity and homoscedasticity tests in order to derive meaningful results. Factor analyses were conducted to measure the correlation between the items and variables used in this study. Descriptive and inferential analyses were conducted to measure the correlation between variables. Multiple regression analyses were conducted to measure the relationship between independent variables and dependent variable.

5.2 Conclusions of the study

The previous chapter laid out the main findings of the study. The overall conclusion from the study is that there is social inequity affecting the small-scale fishers in PPMP and the inequity is attributable mainly to governance and social factors. The key determinants that affect income equity and the livelihoods of small-scale fishers in the marine park are summarized below:

- The perception of the local community is that there is income inequity in the marine park which arise from unbalanced sharing of benefits between fishers and the tourism sector – tourism is prioritized over fishing; disparity in income between outsiders and the locals – outsiders benefit more than the locals; inequitable access to fisheries resources; and the lack of political voice of the local people to improve their lives. The stakeholders most seriously affected by the inequity are the local small-scale fishers because the restriction on their access to fisheries resources creates much hardship and burdens for them, and there is no government assistance to help them adapt.

- Fishing is a vital source of livelihood for the islanders in PPMP when the tourism season comes to an end from November to February every year during the North-East monsoon. The no-take MPA creates vulnerability for the livelihoods of the local artisanal fishers as their small boats are not suitable for going long distances. In addition, their traditional gear (plus lack of fishing technology) are inadequate for fishing far from the land. Furthermore, fish stock is decreasing due to overfishing by commercial fishers from outside areas. High fuel

cost, decreasing and uncertain harvest, and shrinking income are among the challenges that the artisanal fishers have to deal with.

- The recognition of the local community's rights, livelihood needs and knowledge when making MPA decisions can reduce income inequity significantly for small-scale fishers and other inhabitants in the marine park. The lack of active organisations and local institutions is the main barrier for the fishers to make their voice heard.
- The selling and renting of land on Perhentian contribute significantly to income inequity as the buyers or tenants are invariably outsiders who use the land for tourism and related businesses thus resulting in greater disparity of income between outsiders and the local people.
- Income inequity for artisanal fishers from the marine park can be reduced through the relaxation of no-take fishing rules for the islanders and allowing them to fish for livelihood security. It also calls for more effective enforcement of MPA rules against illegal fishing by outside fishers and the encroachment by trawls.
- In view of their knowledge of local resources and conditions, given the opportunity, the artisanal fishers and fishermen association from the marine park can contribute to the effective management and protection of local resources through their participation and involvement and thus reduce income inequity for the small-scale fishers.
- Access to fisheries resources in the marine park and restriction of fishers from outside areas can reduce income inequity for artisanal fishers of the island.
- Easier access to capital for business, more abundant fisheries stock, and more effective community representation on issues affecting the islanders can contribute to reducing income inequity for small-scale fishers in the marine park. Due to the lack of political power and capacity, fishers are not able to get access to key resources and financial capital. There is a

need for support from government agencies to help fishers gain fair access to the benefits, resources and fundings.

- Viability for small-scale fishers from the marine park will require government interventions and responses that can result in fair access to employment and equitable distribution of income.

5.3 Recommendations of the Study

The study results confirm that the inequity model, which constitutes the social aspect (socio-economic and demographic) and governance of marine resources management, are applicable in the context of No-Take Marine Protected Areas in Malaysia.

The findings indicate that artisanal fishers in PPMP face social inequity which has serious implications on their livelihoods – loss of income and livelihood security, higher operating costs, marginalisation, and social exclusion. The loss of income and livelihood security stems from fishing restrictions in the no-take MPA in addition to shrinking catch size. Operating costs have increased as more fuel is needed to travel outside the MPA to fish. Fishers in the marine park are marginalised as tourism is prioritised and favoured by the authorities over fishing. The fishers have neither the means nor the capabilities to cope with the new challenges, and they are left to fare on their own as they cannot get government assistance. The strict fishing restrictions compelled the fishers to take tourism occupations for income and employment.

The results of the study suggest that governance factors are linked to the people's access to resources and income distribution. As mentioned earlier, no-take fishing rules have severely curtailed the fishing activities of the local small-scale fishers. Furthermore, poor enforcement of rules has allowed illegal fishing by outsiders and encroachment by trawls to go unchecked and resulting in depletion of fish stock. These findings can help the policymakers in Malaysia in their decisions to allow fishing activities in the specific months of the year and special locations in

MPAs. It is hereby recommended that special zones be created within the MPA where the local community are allowed to fish during the monsoon months or for subsistence. Similarly, it is recommended that enforcement of rules be tightened against illegal fishing by outsiders and encroachment by trawls.

The findings of the study show that governance factors affect the local people's access to income distribution. There are currently no policies to prioritise participation of the local community in tourism or businesses in the marine park, or the employment of the islanders in the local economy, resulting in unbalanced access to income and employment. Government policy strategy should focus on the priority to employ local people in tourism activities and distribute the income from tourism activities fairly among the stakeholders.

Based on the discussion of the multiple regression results in Section 4.4 and the findings from the survey and FGD, a number of major observations were made. One of the observations of the study (from the discussion of the Income Inequity Index, INE, and that of the significant predictor SSRL) is that outsiders are getting a greater share of tourism income than the islanders due to their dominance of tourism businesses. Investors from outside the marine park have bought up a lot of land, and are also renting land, from islanders for their tourism and related businesses. Outsiders own 70% of tourism establishments and 90% of overall businesses. To allow for fairer sharing of economic benefits by stakeholders, it is recommended that restrictions be imposed on outside investors setting up tourism or other businesses in the marine park including the issuing of licenses and permits.

Another observation based on the discussion of multiple regression results in Section 4.4 (with regards to significant predictor SACFR) and the FGD findings is that the islanders have little financial resources that can be used as start-up or working capital for businesses and they usually have to pawn their jewellery to get the money or borrow from other islanders. It is hereby recommended that the policymakers improve the access of the local community to fundings and

government loans so that it is easier for the islanders to raise capital, as this will enable them to find alternative employment besides fishing.

From the FGD findings, current initiatives by government agencies are insufficient to help islanders sustain their livelihoods. The results from this study can help the government develop and implement poverty eradication policies that enable local fisher households in MPAs to gain sustainable and equitable access to income and employment. Such policies may include financial assistance for the small-scale fishers that ease the pursuit of their livelihoods e.g., subsidies to cover fuel cost for fishing and for operating boat services. The government should also provide assistance that help small-scale fishers increase their productivity and income e.g., loans to invest in better boats, and greater access to fishing technology. In addition, there should be more capacity building programmes and training that increase the skill sets of the small-scale fishers so that they can adapt to livelihood challenges. Furthermore, the government should create job opportunities for the fishers that allow them to use their knowledge of local conditions for more effective resource management and protection in the MPA in particular, fisheries management.

As a final recommendation, it is very important for policymakers when making decisions, to understand local conditions at the MPA site level as circumstances at the conservation site could be different or unique in each case. In this regard, the involvement and participation of the local communities will be invaluable to make for more effective management and decision making.

5.4 Contributions of the Research

This study makes some important contributions that may be useful for researchers and policymakers. It provides valuable insights for informing and guiding policies and governance in MPAs and resource conservation.

To begin, this is the first study that explicitly focuses on social inequity in Malaysia MPAs. It is a new contribution about the issue of inequity of income and access to resources in the MPAs. The findings of the study provide a better understanding on socioecological and governance

stressors of vulnerability and their impact on inequity in the fisher communities of no-take MPAs in Malaysia. These findings benefit fishers, tourism business sector, non-government organisations, and policy makers and help in the formulating of effective management of MPAs for sustainable livelihoods of the local communities. Existing literature is limited for understanding the use of the I-ADApT framework (Bundy et al., 2016) in explaining the influence of social, ecological and governance factors on vulnerability and inequitable distribution of benefits. The findings of this research can fill an important gap in existing literature by increasing knowledge regarding the explanatory power of the I-ADApT framework in predicting the effect of social, ecological and governance factors on the inequitable distribution of benefits affecting the local fishers in MPAs.

Secondly, the findings of the study can be useful for policymakers in Malaysia in understanding social inequity in MPAs and in formulating policy responses or changes in governance to improve existing situations. The findings could also be adapted, improved on and applied in developing future policies and guidelines for resource conservation.

Thirdly, the study can contribute to building a global perspective on key vulnerabilities and opportunities associated with small-scale fisheries under the Vulnerability to Viability: Global Partnership project organized by the University of Waterloo, Waterloo, Ontario, Canada.

Lastly, the findings of the research can add to existing literature on socioecological and governance conditions in Malaysia MPA.

5.5 Limitations and Recommendations for Future Studies

One of the main limitations of this study is the small sample size, where 127 respondents were interviewed because of time and budget constraints. Due to the small sample, the results of the reliability test of internal consistency for some of the constructs used in the study were low. Therefore, higher sample sizes would be recommended for future studies.

Another limitation is the use of convenience sampling method where respondents were drawn from the population based on availability, convenience and accessibility, as a result of which the results may not be representative of the entire population.

One final limitation is the shortage of literature on the topic of the study for the researcher to build upon to develop the research objectives. The study of income inequity in the Malaysia MPA context is new, and it is predicted that more studies would be needed to improve understanding of the topic.

BIBLIOGRAPHY

Adger, W.N. (1999). Social Vulnerability to Climate Change and Extremes in Coastal Vietnam. Pergamon World Development Vol. 27, No. 2, pp. 249–269, 1999. PII: S0305-750X(98)00136-3.

Ahmad, S., Aswani, F. M.N., Ahmad, A., Tai, S. Y., Kusairi, M. N., and Gazi, M. N. I. (2018). Reviewing and Documenting the Functions of the No-Take Zone in Marine Parks Malaysia Redang Island and Tioman Island, Research Report submitted to Department of Marine Park, Malaysia, 48pp

Agyapong, R.A. (2021). Building Local Resilience to Climate Vulnerability In Small-scale Fishery Communities of Lake Volta, Ghana.

Alban, F. and Boncoeur, J. (2006). Assessing the impact of marine protected areas on recreational uses of a marine ecosystem: the case of scuba diving. In *Proceedings of the Thirteenth Biennial Conference of the International Institute of Fisheries Economics & Trade*, July 11-14, 2006, Portsmouth, UK: Rebuilding Fisheries in an Uncertain Environment. Compiled by Ann L. Shriver. International Institute of Fisheries Economics & Trade, Corvallis, Oregon, USA, 2006. CD ROM.

Albasri, H. and Sammut, J. (2021). A Comparison of Vulnerability Risks and Conservation Perceptions between Mariculture, Fishery and Ecotourism Livelihood Groups in a Multi-Use MPA in Indonesia. MDPI. Sustainability 2021, 13, 12897. https://doi.org/10.3390/su132212897. https:/www.mdpi.com/journal/sustainability

Andrew, N. L., Be´ne´, C., Hall, S. J., Allison. E. H., Heck, S. and Ratner, B. D. (2007). Diagnosis and management of small-scale fisheries in developing countries, FISH and FISHERIES, 2007, 8, 227–240.

Bhattacharya, H. (2020). Environmental and socio-economic sustainability in India: evidence from CO2 emission and economic inequality relationship. Journal of Environmental Economics and Policy Volume 9, 2020 - Issue 1. Pages 57-76. https://doi.org/10.1080/21606544.2019.1604267

Bennett, N.J., Calò, A., Di Franco, A., Niccolini, F., Marzo, D., Domina, I., Dimitriadis, C., Sobrado, F., and Santoni, M.C. (2020). Social equity and marine protected areas: Perceptions of small-scale fishermen in the Mediterranean Sea. Biological Conservation. Version of Record: https://www.sciencedirect.com/science/article/pii/S0006320719312935. Manuscript_c57943af61dd4d840921a9745964563d. https://www.elsevier.com/open-access/userlicense/1.0/

Bene, C. (2003). When fishery rhymes with poverty, a first step beyond the old paradigm on poverty in small-scale fisheries. World Dev. 31 (6), 949e975.

Bundy, A., Chuenpagdee, R., Sarah R Cooley, S.R., Defeo, O., Glaeser, B., Guillotreau P., Isaacs M., Mitsutaku M. and Perry, R.I. (2015). A decision support tool for response to global change in marine systems: the IMBER-ADApT Framework. John Wiley & Sons Ltd, FISH and FISHERIES, 17, 1183–1193

Burke, L., Selig L., & Spalding, M. (2002). Reefs at Risk in Southeast Asia, World Resources Institute. Washington DC, USA. Retrieved from: http://www.wri.org/publication/reefs-risk-southeast-asia

Butcher, J. (2004). The Closing of the Frontier - A history of the marine fisheries of Southeast Asia. Leiden: KITLV Press, 1850–2000

Chambers, R., & Conway, G. (1991). Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. Retrieved February 3, 2010, from http://www.smallstock.info/reference/IDS/dp296.pdf

Clark, D.A. (2005). The Capability Approach: Its Development, Critiques and Recent Advances GPRG-WPS-032

Coccia, M. (2021). How a Good Governance of Institutions Can Reduce Poverty and Inequality in Society? Legal-Economic Institutions, Entrepreneurship, and Management. ISBN: 978-3-030-60977-1

Colmer, J. (2021). How does climate change shape inequality, poverty and economic opportunity?

Conconi, A. and Viollaz, M. (2017). "Poverty, Inequality and Development: A Discussion from the Capability Approach's Framework". The Age of Perplexity: Rethinking the World We Know. Madrid: BBVA, 2017.

Department for International Development, United Kingdom (1999). Sustainable livelihoods guidance sheets.

Department of Fishery Malaysia Official Portal (2021). Retrieved from https://www.dof.gov.my/en/corporate-info/divisions-units/marine-park-resource-management-division/

Department of Marine Parks Malaysia Dataset (n.d.) https://www.data.gov.my/data/en_US/organization/department-of-marine-park-malaysia.

Dt. Maani, K., Firnaldi, A. and Fajri, H. (2018). Fisherman Empowerment and Poverty in Pesisir Selatan Rejency. MATEC Web of Conferences 229, 01004. ICDM 2018. Https://doi.org/10.1051/matecconf/201822901004.

Department of Statistics Malaysia official portal (2022) https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=117&bul_id=akliVWdIa2g3Y2VubTVSMkxmYXp1UT09&menu_id=L0pheU43NWJwRWVSZklWdzQ4TlhUUT09. Released 14 February 2022.

Field, A. (2013) Discovering Statistics using SPSS, 4th edn. London: SAGE.

Gopinath, N. and Puvanesuri, S. S. (2006). Marine Capture Fisheries. Aquatic Ecosystem Health & Management, 9(2), 215-226. http://dx.doi.org/10.1080/14634980600721086

Gren, IM., Campos, M. and Gustafsson, L. (2016). Economic development, institutions, and biodiversity loss at the global scale. Reg Environ Change 16, 445–457. (2016). https://doi.org/10.1007/s10113-015-0754-9

Haddock-Fraser, J., and Hampton, M.P. (2010). Multistakeholder Values on the Sustainability of Dive Tourism: Case Studies of Sipadan and Perhentian Islands, Malaysia. ISSN 1748-7595

Halpern, B.S. (2003). The Impact of Marine Reserves: Do Reserves Work and Does Reserve Size Matter? *Ecological Applications*, 13(1), 117-137pp.

Halpern, B.S., Klein, C.J., Brown, C.J., Beger, M., Grantham, H.S., Mangubhai, S., Ruckelshaus, M., Tulloch, V.J., Watts, M., White, C. and Possingham, H.P. (2013). Achieving the triple bottom line in the face of inherent trade-offs among social equity, economic return, and conservation. Proc. Natl. Acad. Sci. 110, 6229–6234. https://doi.org/10.1073/pnas.1217689110

Harborne, A., Fenner, D., Bames, A., Beger, M., Harding, S., & Roxburgh, T. (2000). Status report on coral reefs of the East Coast of Peninsular Malaysia, Kuala Lumpur. Report prepared to Department of Fisheries, Malaysia. Retrieved from http://www.dmpm.nre.gov.my/files/Status%20Report%20on%20The%20Reefs%20of%20The%20East%20Coast%20of%20Peninsular%20Malaysia.pdf

Hill, L.S., Johnson, J.A. and Adamowski, J. (2016). Meeting Aichi Target 11: Equity considerations in Marine Protected Areas design. Ocean Coast. Manag. 134, 112–119. https://doi.org/10.1016/j.ocecoaman.2016.09.017

International Bureau of Education, UNESCO (n.d.). "Concept of Governance". Retrieved from http://www.ibe.unesco.org/en/geqaf/technical-notes/concept-governance

Islam, Gazi Md Nurul, Kusairi M.N., Tai S.Y., Aswani F.M.N. (2013). Assessing Environmental Damage to Marine Protected Area: a case of Perhentian Marine Park in Malaysia, *Journal of Agricultural Science*, Vol. 5, No. 8, ISSN 1916-9752, E-ISSN 1916-9760

Islam, Gazi Md Nurul, Tai S.Y., Kusairi M. N., Ahmad S., Aswani F.M.N., Muhamad Senan, M.K.A., and Ali, A. (2014). Community Perspectives of Governance for Effective Management of Marine Protected Areas in Malaysia.

Islam, Gazi Md Nurul, Tai S.Y., Kusairi M. N., and Aswani F.M.N. (2014b). Community's Perspectives towards Marine Protected Area in Perhentian Marine Park, Malaysia. Open Journal of Marine Science, 4, 51-60. http://dx.doi.org/10.4236/ojms.2014.42007

Islam, Gazi Md Nurul, Tai S.Y., Kusairi M. N., Ahmad S., Aswani F.M.N., Muhamad Senan, M.K.A., and Ali, A. (2016). "Community perspectives of governance for effective management of marine protected areas in Malaysia." Ocean & Coastal Management 135 (2017): 34-42.
doi: 10.1016/j.ocecoaman.2016.11.001.

Islam, Gazi Md Nurul, Ngui, B.C.P., Revarunan S., and Quilter, D. (2021). A Situational Analysis of Small-Scale Fisheries in Peninsular Malaysia: From Vulnerability to Viability. V2V Working Paper No. 2021-5. Vulnerability to Viability Global Partnership.

Islam, M. M. (2013). Vulnerability and adaptation of fishing communities to the impacts of climate variability and change: insights from coastal Bangladesh. University of Leeds.

Islam, S.N. and Winkel, J. (2017). Climate Change and Social Inequality. Department of Economic and Social Affairs. DESA Working Paper No. 152 ST/ESA/2017/DWP/152

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. Educational and Psychological Measurement, 20, 141–151. http://dx.doi.org/10.1177/001316446002000116

Kaza, S. (1988). Community involvement in marine protected areas. Oceanus. 31(1):75-81.

Kenchington, R.A. (1988). Managing reefs and inter-reefal environments and resources for sustained exploitive, extractive and recreational uses. Proceedings of the 6th International Coral Reef Symposium, Australia. 1:81-87.

Kirkley, J.E., Squires, D., Alam, M.F.; and Omar, I.H. (2003). "Capacity and Offshore Fisheries Development: The Malaysian Purse Seine Fishery". VIMS Books and Book Chapters. 64. https://scholarworks.wm.edu/vimsbooks/64

Kopp, C. M. (2019). Income inequality. Retrieved from https://www.investopedia.com/terms/i/incomeinequality.asp

Krishna, A. and Uphoff, N. (1999). Mapping and Measuring Social Capital: A Conceptual and Empirical Study of Collective Action for Conserving and Developing Watersheds in Rajasthan, India. Social Capital Initiative Working Paper, No. 13. The World Bank, Washington, D.C.

Kuznets, S. (1955). Economic Growth and Income Inequality. The American Economic Review, Vol. 45, No. 1. (Mar., 1955), pp. 1-28.

Thiault, L., Gelcich, S., Marshall, N., Marshall, P., and Chlous, F. (2020). Operationalizing vulnerability for social-ecological integration in conservation and 2020natural resource management. Conservation Letters, Wiley, 2020, 13 (1), ff10.1111/conl.12677ff. ffhal-03034233ff

Len, R.G., Michael, D.P., Mark, H.T., Silvestre, G.T. (2013). Evaluating the management effectiveness of three marine protected areas in the Calamianes Islands, Palawan Province, Philippines: Process, selected results and their implications for planning and management, *Ocean and Coastal Management,* Volume 81, Pages 49-57.

Macusi, E.D., Camaso, K.L., Barboza, A. and Macusi, E.S. (2021). Perceived Vulnerability and Climate Change Impacts on Small-Scale Fisheries in Davao Gulf, Philippines. Frontiers in Marine Science. July 2021. Volume 8. Article 597385. doi: 10.3389/fmars.2021.597385.

Maidar, D. (2018). Exploring Social-Ecological Regime Shift and Governance: Coastal-Marine Systems in the Gulf of Thailand, Malaysia.

Mohamed Omar, A. F. (2017). Fisheries Country Profile: Malaysia – SEAFDEC. Regional Fisheries Policy Network (RFPN) Member for Malaysia

Mohd Nasir., N, Ibrahim, M., Mahamod, L.H., and Othman, R. (2017). Challenges to Implement Carrying Capacity Framework: A Case Study of Pulau Perhentian Marine Park Institutional Framework. Journal of the Malaysian Institute of Planners VOLUME 15 ISSUE 1 (2017), Page 163 – 168.

Mohd Saad, J., (2014). "The State of the Coral Triangle: Malaysia", The Ocean Research for the National Oceanography Directorate of the Ministry of Science, Technology, and Innovation. Asian Development Bank (2014). Retrieved from https://www.adb.org/sites /default/files/publication/42373/state-coral-triangle-malaysia.pdf

Mora, C., Andrefouet, S., Costello, M.J., Kranenburg, C., Rollo, A., Veron, J., Gaston, K.J. and Myers, R.A. (2006). Coral Reefs and the Global Network of Marine Protected Areas. *Science*, 312, 1750–1751pp.

Mthembu, Thuli G, Roman, Nicolette V, & Wegner, Lisa. (2016). An exploratory factor analysis into the applicability of the Spirituality Care-Giving Scale, the Spirituality and Spiritual Care Rating Scale and the Spirituality in Occupational Therapy Scale to the South African context. South African Journal of Occupational Therapy, 46(1), 74-82. https://dx.doi.org/10.17159/2310-3833/2016/v46n1a14

Muhammad, M., Idris, K., Ariffin, E.H., Shaffril, H.A., Abu Samah, B. and Suandi, T. (2016) "The Impact of Climate Change on Small-Scale Fishermen in Malaysia" Medwell Journals.

Muhammad Mehedi Masud, Fatimah Binti Kari, Hasanul Banna & Md. Khaled Saifullah (2018) Does income inequality affect environmental sustainability? Evidence from the ASEAN-5, Journal of the Asia Pacific Economy, 23:2, 213-228, DOI: 10.1080/13547860.2018.1442146

Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. American Association for the Advancement of Science. Science, Vol. 325, No. 5939 (Jul. 24, 2009), pp. 419-422.

Othman, J. (2004). A Critical Appraisal of the Strategy and Structure of the Fishermen's Associations in Malaysia.

Perkins, D.D. (2010). Empowerment. In R.A. Couto (Ed.), Political and Civic Leadership: A Reference Handbook (Pp. 207-218). Thousand Oaks, Ca: Sage. DOI: 10.4135/9781412979337.n25.

Pomeroy, R., Parks, J., Pollnac, R., Campson, T., Genio, E., Marlessy, C., et al. (2007). Fish wars: conflict and collaboration in fisheries management in Southeast Asia. Mar. Policy 31, 645–656. doi: 10.1016/j.marpol.2007.03.012

Rajah Rasiah, Fatimah Kari, Yuri Sadoi & Nazia Mintz-Habib (2018). Climate change and sustainable development issues: arguments and policy initiatives, Journal of the Asia Pacific Economy, 23:2, 187-194, DOI: 10.1080/13547860.2018.1442140

Reef Check Malaysia. (2011). Status of Coral Reefs in Malaysia. Retrieved from www.reefcheck.org.my

Reise, S. P., Waller, N. G. and Comrey, A. L. (2000) Factor analysis and scale revision. Psychological Assessment, 12(3), pp. 287-297.

Richmond, L. and Kotowicz, D. (2015). Equity and access in marine protected areas: The history and future of 'traditional indigenous fishing' in the Marianas Trench Marine National Monument. Appl. Geogr. https://doi.org/10.1016/j.apgeog.2014.11.007

Samuels, P. (2017) Advice on Exploratory Factor Analysis, Technical Report · June 2017. ResearchGate. https://www.researchgate.net/publication/319165677_Advice_on_Exploratory_Factor_Analysis

Sen, A.K. (1985). Commodities and Capabilities, Oxford: Elsevier Science Publishers.

Shi, Y.B., Zhao, X.X., Jang, C.L., Qiang, F. & Chang, C.P. (2019). Looking at the Impacts of Income Inequality on Environmental Governance in China. PROBLEMS OF SUSTAINABLE DEVELOPMENT 2019, vol. 14, no 2, 63-70

S. Solaymani and F. Kari (2014). Poverty evaluation in the Malaysian Fishery Community, Ocean & Coastal Management 95 (2014) 165e175, journal homepage: www.elsevier.com/locate/ocecoaman

Scoones, I. (1998). Sustainable Rural Livelihoods. A Framework for Analysis. IDS Working Paper

Shin, K.Y. (2020). A new approach to social inequality: inequality of income and wealth in South Korea. The Journal of Chinese Sociology (2020) 7:17 https://doi.org/10.1186/s40711-020-00126-7

Smith, I. (1979). A research framework for traditional fisheries. ICLARM Studies and Reviews No. 2, International Center for Living Aquatic Resources Management, Manila.

Smith, L. I. (2002). A tutorial on Principal Components Analysis (Computer Science Technical Report No. OUCS-2002-12). Retrieved from http://hdl.handle.net/10523/7534

Somoebwan, M.I., Ayuya, O.I., and Mironga, J.M. (2021). Marine fishery dependence, poverty and inequality nexus along the coastal lowlands of Kenya. National Accounting Review. NAR, 3(2): 152–178. DOI: 10.3934/NAR.2021008.

Tai S.Y., Kusairi M.N., Ahmad S., Gazi Md Nurul Islam, Aswani F.M.N., Ali, A., Muhamad Senan, M.K.A. (2014). "Project Title: The Value and Effectiveness of Marine Protected Areas as a Management Tool for the Management of the Seas of Malaysia".

Tamblyn, A., Turner, C., O'Malley, R., Weaver, N., Hughes, T., Hardingham, S., & Roberts, H. (2005). Malaysia Tropical Forest Conservation Project, Report of the Perhentian Island, Coral Cay Conservation Ltd. London, SW19 2JG, UK. Retrieved from www.coralcay.org/app/.../malaysia_t_2005_perhentian.5pdf.pdf

"Total Economic Value of Marine Biodiversity - Malaysia Marine Parks" (n.d.). Jabatan Taman Laut Malaysia, Kementerian Sumber Asli dan Alam Sekitar. Retrieved from https://wdpa.s3.amazonaws.com/Country_informations/MYS/TOTAL%20ECONOMIC%20VALUE%20OF%20MARINE%20BIODIVERSITY.pdf

The United Nations Office for Disaster Risk Reduction (n.d.). Retrieved from https://www.undrr.org/terminology/vulnerability

The United Nations Educational, Scientific and Cultural Organization (n.d.). Concept of Governance – International Bureau of Education. www.unesco.org. https://www.ibe.unesco.org/en/geqaf/technical-notes/concept-governance.

White, A.T. (1986). Marine reserves: how effective is management strategies for Philippines, Indonesian and Malaysian coral reef environments? Ocean Management. 10:137-159.

APPENDICES

APPENDIX A

Inequity, Vulnerability and Livelihoods of Small-Scale Fisheries: A Case of No-Take Marine Protected Area in Perhentian Islands, Malaysia

SURVEY QUESTIONNAIRE

Respondent ID | | | | | | Survey date | | | | | | |

Category of respondents: (circle the category)

Occupation: (a) Fisher (current/previous); (b) Tourism/business (specify)_____

(c) Boat operator; (d) Others (specify)_____

Respondent's name:_____

Respondent's phone contact _____ Email: _____

Time of interview: Start: _____ End: _____

Enumerator's comment: _____

_____

SECTION A: RESPONDENT'S PROFILE

1. Do you engage in fishing? Yes ☐ No ☐

   If YES, please indicate whether

   For income only ☐

   For consumption only ☐

   For both income and consumption ☐

2. What is your main income earning activity?

   Full-time fisher ☐

   Tourism owner/worker ☐ Please specify _____

   Business owner/worker ☐ Please specify _____

   Others ☐ Please specify _____

3. Age _____ years

4. Gender: Male ☐ Female ☐

5. Household size (including you): _____

6. Number of years of formal education _____ years

7. Are you a member of any organization/association/committee? Yes ☐ No ☐

   If YES, please specify _____

8. Were you involved in any organization/association/committee previously? Yes ☐ No ☐

   If YES, please specify _____

<u>SECTION B</u>: Respondent's Assessment of Income Inequity and of Social, Governance and Ecological Factors Affecting the Livelihood Change of Fishers in the Pulau Perhentian Marine Park

Please state your level of agreement with the following statements under B.1 to B.9.
(Scale: 1-strongly disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, 5-strongly agree)

<u>Part 1</u>

B.1 Income inequity

B.1(a)	MPA has contributed to the income of local residents.	
B.1(b)	MPA provides balanced sharing of access to resources (fisheries or tourism) among stakeholders.	
B.1(c)	Coral reef habitats are protected for the socio-economic sustainability of local communities.	
B.1(d)	Local fishers migrate to other areas for alternative income.	
B.1(e)	Local people receive a fair share of income from tourism business.	
B.1(f)	The major share of income goes to the owners of tourism businesses residing outside the island.	

<u>Part 2</u>

SOCIAL FACTORS

B.2 Access to fishing

B.2(a)	Local fishers engage in fishing for subsistence need in the marine park.	
B.2(b)	Fisheries stock has increased in the marine park.	
B.2(c)	Fishers from outside the area often carry out fishing activities surrounding the marine park.	

B.3 Access to business

B.3(a)	It is easy for local residents to participate in business activities on the island.	
B.3(b)	It is easy for the local people to get loans and credits for business purposes.	

B.4 Social empowerment

B.4(a)	The lives of fishers are easier due to available alternative sources of income and employment.	
B.4(b)	The local community have power to influence MPA rules and decisions.	
B.4(c)	Generally, people in the community get together to jointly inform and influence government officials or political leaders for the benefit of the community.	

B.5 Assets (land and capital) ownership

B.5(a)	Most of the local people own land on the island.	
B.5(b)	Selling and renting of land on the island has increased compared to five years ago.	
B.5(c)	The local people have access to financial resources for business.	

GOVERNANCE FACTORS

B.6 No-take rules

B.6(a)	The local people are satisfied with the enforcement of MPA rules and regulations.	
B.6(b)	The no-take MPA fishing rules make the fishermen's lives better in the community.	
B.6(c)	MPA no fishing rules should be changed to protect coral reef habitats.	
B.6(d)	Fishermen should be able to fish in the MPA area for livelihoods security.	
B.6(e)	The local community do not care about MPA rules (fisheries and tourism related).	

B.7 Community involvement in MPA decision making

B.7(a)	The local people participate in MPA management decision making.	
B.7(b)	The local community are consulted and their consent obtained before MPA decisions are made.	
B.7(c)	It is important for the local community to participate in MPA management.	
B.7(d)	Fisheries management will be more effective if the local fishers share responsibility in it.	
B.7(e)	The local community have the ability to manage and protect the resources of the marine park.	
B.7(f)	The local community are willing to participate in MPA management.	

B.8 Community organisations

B.8(a)	Fishermen associations are more active now compared to five years ago.	
B.8(b)	Local organisations and associations do not discuss about the fisheries in the MPA area.	
B.8(c)	Fishermen associations can play a more positive role in the protection of resources in the marine park.	

ECOLOGICAL FACTOR

B.9 Healthy coral reef habitats

B.9(a)	The health of coral reefs has deteriorated compared to five years ago.	
B.9(b)	Pollution in the marine park has worsened compared to five years ago.	

Part 3

B.10 Respondents remarks about the problem and recommendation for the solution to the inequity problems:

Main current issues about vulnerability
1. _____
2. _____
3. _____

Viable solutions to reduce vulnerability
1. _____
2. _____
3. _____

APPENDIX B

FOCUS GROUP DISCUSSION GUIDING QUESTIONS

Income inequity

1. How many hotels, chalets, shops, diving centres and snorkelling centres are owned by islanders and how many are owned by outsiders? Provide number or percentages.
2. What are the percentages of islanders and outsiders among employees/workers in these businesses?
3. Does tourism have any effect on the income of women from the island? If yes, in what ways?
4. Are there people who are losing their fair share of income?
5. Who benefit most from tourism income – islanders or outsiders?
6. Is it difficult for fishers to find alternative employment/income? What are the reasons?
7. Do islanders migrate to other places to find job opportunities? If yes, is it permanent or seasonal?
8. Is agriculture or fruit farming still actively done on the island?
9. How do the islander market and sell their catch (fish) during the monsoon season?
10. How do the islanders earn alternative income during the monsoon season apart from fishing activities?
11. Why are outsiders more successful in business ventures here compared to the islanders?
12. How does the use of technology affect the disparity of income between local fishermen and outsiders?

Access to fishing

13. Is fishing important for the islanders?
14. Has fish stock increased compared to five years ago?
15. Are there ongoing conflicts over access to fisheries resources?
16. What is the current status of the conflict?
17. What is the outlook for fishing as a source of livelihood?
18. Does encroachment by trawlers happen frequently?
19. What are the effects of the encroachment on the livelihood of the islanders?

Access to business

20. Is it easy to obtain license for business?
21. What are the challenges in starting up a business?

22. Is it easy to obtain financial aid from agencies such as *Yayasan Pembangunan Keluarga, Yayasan Pembangunan Usahawan, Amanah Ikthiar* and *Tekun* for business start-ups?

23. How do the islanders get capital for their business ventures?

24. Is owning of land important for business ventures?

Social empowerment

25. Are there any capacity building initiatives to increase the skill sets of the islanders?

26. Will access to new technology help fishers to increase their income and productivity? If yes, in what way?

27. Are the islanders united in speaking up for their rights or addressing issues to the authorities?

28. Are the current initiatives by government agencies sufficient to help islanders sustain their livelihood?

29. The village has only a primary school. How does that affect the education of the islanders?

Asset (land and capital) ownership

30. Has the selling and renting of land on the island increased compared to five years ago?

31. Are the islanders able to rent out their properties at market rate?

No-take rules

32. Should fishers be allowed to fish in the MPA area for livelihoods security?

33. If yes, how can it be managed effectively without jeopardizing the protection of fisheries resources?

34. Is the enforcement of the no-take rules effective and just?

35. Islanders complain about the failure by DOF in keeping their promise of leniency during the monsoon, and about gear destroyed and harvest confiscated. What could be the cause of the conflict?

Community involvement in MPA decision making

36. If islanders are given the training and appointed to supervise the fishing actvities in the island, will the fisheries management improve?

Community organisations

37. Should the local Fishermen Association be revived?

Healthy coral reef habitats

38. Are there any issues of pollutions taking place?
39. Has the sewage water treatment system improved in the last 5 years?
40. What are other factors that negatively impact the health of coral reefs?
41. Should the number of tourists be regulated?
42. Are there any difficulties in identifying areas where corals are situated?

Recommendations for viable solutions to reduce vulnerability of artisanal fishers from the marine park:

APPENDIX C

FOCUS GROUP DISCUSSION – SUMMARY OF FINDINGS

Income inequity

Contribution of the MPA to coral-based livelihoods

The establishment of the marine park has increased employment opportunities through eco-tourism and related businesses such as tourist accomodation, diving and snorkeling centres, boat service, restaurants, launderettes, sourvenir shops, etc. These work opportunities have enabled women from the island to earn income outside their homes and many of them now own businesses especially eateries or work in chalets/resorts. Fishers, on the other hand, have lost their fair share of income and access to resources because of the fishing ban in the marine park.

Alternative employment for fishers

Most of the islanders who were previously fishers have switch to tourism for their livelihoods and there are now very few fishermen per se. There is some small-scale farming (durians, bananas and rambutans) where the harvests are sold within the island community as the amount is not substantial. Rarely do fishers migrate permanently to look for jobs elsewhere except for a few who moved to Pulau Redang. Instead they change jobs and now work as boatmen or operate chalets and small businesses e.g. food stalls.

Sources of income during off-tourism season

Tourism in the marine park is seasonal and during the monsoon when there is no tourism work, the majority of the islanders turn to fishing as a source of income and subsistence. Some who have orchards, tend to their fruit trees (durians and bananas) during this time while others go to the mainland to search for short-term jobs. There are also islanders who own businesses in Besut and they spend the monsoon months on the mainland.

Selling of fish caught during the monsoon

The harvest during the monsoon is usually small (between 20kg to 30kg). Some is used for own consumption and the rest is sold to the villagers. On rare occasions when the catch comes to 200kg, part of it is sold to people on the mainland.

Tourism benefit outsiders more than islanders

About 70% of the hotels, chalets, dive shops and snorkelling centres in the marine park are owned by outsiders. Most of the employees who work in these establishment are Malaysian from other districts (mainly from Besut) or foreign workers, and only 35% are islanders. In the case of businesses overall, only about 10% of the owners are from the island and the rest are from outside. Compared to islanders, outsiders are more successful in business because they have more financial resources and greater access to loans. Also, outsiders bought up a lot of land cheaply before tourism was introduce when the islanders did not know of the tourism potential of the islands. The outsiders used the land they bought for development into tourism businesses. In addition, outsiders rent land from islanders (at market rate) to operate tourist accommodation or businesses. In view of the dominance of tourism and related businesses by outsiders, the major share of income from tourism goes to outsiders rather than the islanders.

Disparity of income between local fishermen and outside fishers

Outsiders have way bigger boats and can make hundreds of thousands in income compared to traditional fishermen from the island who, with very small boats, aim for a few hundred Ringgit. Furthermore, the islanders use traditional gear e.g., hook and line and traps and they do not have access to fishing technology unlike fishers from outside e.g., sonar that is used by deep sea fishermen to locate fish. The islanders cannot compete with the outside fishers in term of catch size and income.

Access to fishing

The importance of fishing to the islanders

Tourism is the primary source of income these days but the industry is seasonal. Tourism activities shut down from November to February because of the North-East monsoon during which time the islanders have to depend on fishing for a livelihood. Besides that, many of the islanders do tourism work during the day and fish at night or they have fishing as a second job. So yes, fishing is still important in PPMP.

Fish stock

Fish stock has decreased and continues to decline annually.

Conflicts over access to fisheries resources

Fishing is forbidden in the marine park. Before Perhentian was gazetted as a marine park, there was an agreement between the Marine Park Department and the local Fishermen Association representatives that islanders would be allowed to fish here for their subsistence. A similar promise was made two years ago by DOFM officers to our village representatives. However, no agreement was made in writing in both cases and the promises were given verbally only. The authorities did not keep their promise of leniency to the villagers who have had their fishing gear destroyed and their catch confiscated by marine park officers when caught fishing in the marine park.

Encroachment by trawlers

Encroachment in fishing Zone A by fishing trawls from Besut, Pahang, Johor, Thailand, and Vietnam are very frequent, mostly during the monsoon, and there are many of them. Thai and Vietnamese fishermen come with twin trawls (bot tunda berkembar) and this fishing gear is illegal in Malaysia. Their boats are also big. So of course, there is a stark difference between their catch size and income as compared to those of the islanders.

Outlook of fishing as a livelihood

The islanders now totally focus on the tourism industry except for an extremely small percentage of islanders who still fish for a livelihood throughout the year. Youngsters are not interested to continue fishing as a livelihood, and many of them work as dive masters and boatmen. Fishing requires hard work yielding little and unpredictable returns whereas tourism work is relatively easy and the income is much better, so most islanders prefer tourism work over fishing. The islanders have been dealing with the fishing restrictions for a long time now and they do not want to continue living feeling restricted. They only fish part-time or for subsistence nowadays but during the monsoon, they have to depend on fishing as there is no tourism work to do then.

Access to business

License and permits for business

It is easy to obtain trade license but harder to get District Council permits for setting up stalls/shops.

Challenges in starting a business

The main challenges are raising capital and of obtaining land or plot for the business.

Raising capital to start-up businesses

It is not easy to get loans to startup businesses even from agencies such as Yayasan Pembangunan Keluarga, Yayasan Pembangunan Usahawan, Amanah Ikthiar and Tekun. To raise the capital they need, the people here ask their friends for loans and the islanders borrow from each other. Otherwise, they pawn their jewellery to get the money.

Land ownership

Owning of land is very important for business ventures.

Social empowerment

Capacity building initiatives

There are courses organised by government agencies e.g. food and beverage management course. There are also programmes every year e.g., courses for divers and snorkelling, sponsorship of boatmen licenses, etc. However, due to poor dissemination of information (the benefits), promotion and timing of programmes, participation is low.

Access to new technology by fishers

The islanders use traditional fishing gear and do not use new technology. If they have access to new technology, e.g. sonar to locate fish, it will certainly improve their catch and income.

Collective action by islanders to address issues

The islanders sit down together to discuss issues before bringing it up to the authourities. They are united in speaking for their rights.

Government initiatives to help islanders

Current initiatives by government agencies are insufficient to help islanders sustain their livelihood.

Education in the village

There is only a primary school on the island. Many children drop out from school after completing Primary 6 on the island as they do not want to move to Besut to continue with their secondary school education. The drop-out rate from secondary school is very high. Parents accept the situation as the children can help out with family businesses.

Asset (land and capital) ownership

<u>Selling and renting of land</u>

The selling and renting of land on the islands have increased compared to five years ago. The selling and renting are made to outsiders for their business purposes. The islanders are able to rent out their properties at higher than market rate.

No-take rules

<u>Relaxing no-take rules</u>

The islanders should be allowed to fish in the MPA area for livelihoods security. It can be done without jeopardising the protection of fisheries resources as islanders are adept in identifying where coral reefs are and in ensuring the safety of the corals. Islanders have always known the importance of coral reefs as fish habitats and value them. The islanders will not employ destructive methods of fishing plus they will not engage in acts that will destroy their fishing gears (which are expensive). In short, the islanders know how to fish without causing damage to coral reefs. The relaxation of no-take rules should only apply to islanders and not to outside fishers.

<u>Effectiveness and fairness in the enforcement of no-take rules</u>

The enforcement of no-take rules in the marine park is neither effective nor fair. The enforcement is unfair towards the islanders as marine park officers tend to focus on catching and punishing islanders who fish during the monsoon but not fishers from outside the island. The officers are more lenient towards outsiders e.g., those from Tok Bali and Besut and often turn a blind eye. The villagers are unhappy about the situation as they have no other jobs/income during the monsoon.

<u>Failure by DOFM to keep promise of leniency</u>

Islanders complain about the failure by DOFM in keeping their promise of leniency during the monsoon, and about the destroying of gear and confiscation of harvest by marine park officers. Rules are not spelled out clearly and most of the promises made by marine park officers to the villagers are verbal only. Villagers are invited by the local level marine park officers for joint consultation (libat urus) but decisions rarely reach the top in the DOFM. Administration-wise, DOFM HQ makes the rules which those lower down have to execute; due to a deficiency of understanding of their roles and lack of empowerment of officers on the ground, enforcement runs into problem. There is a need for better communication between the marine park authority and the local stakeholders.

Community involvement in MPA decision making

<u>Involvement in fisheries management</u>

Supervising fishing activities is the roles of DOFM and Marine Park officers but to improve fisheries managment, islanders should be involved in taking care of the natural resources of the island.

Community organisations

Local fishermen association

The local fishermen association has been inactive because of the current focus on tourism. However, the association should be revived as the islanders fish throughout the monsoon season and fisheries management is needed during that period.

Healthy coral reef habitats

Issues of pollutions taking place

The biggest pollution issue is waste water (sewerage discharge into the sea). The existing sewerage system was not designed to handle the current volume of tourists. There is ongoing discussions with Indah Water for waste water treatment and for a disludging system to be installed. There is also the issue of rubbish washed down to the island areas by the rain, which happens during the monsoon every year. The origin of the rubbish is unknown but it happens every time when it rains heavily and there is flooding. One suspected source of the rubbish is trawls that tend to empty their rubbish in island waters.

Other factors that negatively impact the health of coral reefs

Stepping on corals by inexperienced Malaysian tourists at swimming/snorkelling/diving areas is quite serious. Climate change and wave action are also damaging to corals.

The question of regulating the number of tourists

The tourists who come to Perhentian are backpackers and budget tourists rather than luxury tourists. This means the islands have to rely on quantity of tourists for income rather than quality (high price). The island is not looking at reducing the number of tourists yet but there will come a time when this would be necessary. The issue of controlling the number of tourists coming to the islands is made more complicated by poor communication between the Ministry of Tourism and the marine park authority, and the same between the state government and the marine park authority. There is also a lack of understanding of local conditions by policy makers in the mainland as some of their decisions are not suitable in the islands.

Recommendations for viable solutions to reduce vulnerability of artisanal fishers from the marine park:

1. Government agencies need to help islanders to have fair access to the benefits and resources in the marine park.
2. Islanders should be encouraged and given opportunities to play bigger roles in the management and protection of local resources.
3. There needs to be a lot more involvement from government agencies to help improve the quality of life of the fishermen/islanders.
4. The authorities should create special zones within the marine park where the islanders are allowed to fish.
5. Part of the entrance fee collected at the jetty should be used to improve the lives of the people living on the island.

APPENDIX D

PEARSON CORRELATION TABLE FOR VARIABLES USED IN MULTIPLE REGRESSION

	INE	SAF	SAB	SACFR	SSRL	SLO	GIFM	GPMM	GMRE	GR	ECRH	Age	Household	Fish	Member
INE	1														
SAF	0.271***	1													
SAB	0.126*	-0.064	1												
SACFR	0.009	0.046	0.084	1											
SSRL	-0.225***	0.079	0.016	-0.015	1										
SLO	0.004	0.097	0.062	0.123*	0.048	1									
GIFM	0.178**	0.075	0.181**	0.174**	-0.082	0.113	1								
GPMM	0.097	-0.14*	0.156**	-0.001	-0.152**	0.017	0.158**	1							
GMRE	-0.325***	-0.15**	-0.166**	-0.055	0.035	0.107	-0.095	0.156**	1						
GR	0.304***	0.23***	-0.023	0.265***	0.037	0.248***	-0.178**	-0.052	-0.045	1					
ECRH	0.05	-0.062	0.131*	0.195**	-0.288***	-0.093	-0.083	0.286***	-0.13*	-0.007	1				
Age	-0.144*	-0.054	0.118*	-0.077	-0.098	0.053	-0.073	0.054	0.193**	0.113	0.142*	1			
Household	-0.139*	-0.038	-0.039	0.055	0.003	0.094	0.153**	-0.095	0.042	0.094	-0.06	-0.05	1		
Fish	-0.134*	-0.021	-0.007	-0.156**	-0.209***	0.081	-0.052	0.002	0.1	-0.177**	0.078	0.132*	-0.094	1	
Member	-0.126*	-0.004	0.172**	0.133*	-0.103	-0.031	-0.044	0.09	0.086	0.042	0.111	0.187**	0.146*	0.092	1

Significance levels are denoted by *** at the 0.01 level (1-tailed), ** at the 0.05 level (1-tailed) and * at the 0.1 level (1-tailed).

APPENDIX E

PHOTOGRAPHS TAKEN DURING THE SITE VISIT

The survey team

Signboard of PPMP

Survey team members interviewing respondents

Focus group discussion held at the village

View of the village

Marine Park Centre

Tourist resort at Long Beach

Chalets at the village

Dive shops at Long Beach

Advertisements for tourism activities

Main jetty at the village

Water taxis awaiting customers at jetty

Food stalls on the beach at the village

Souvenir shop at Perhentian Kecil

View of boats in the morning

Fishing boats from outside area

APPROVAL PAGE

TITLE OF PROJECT PAPER:		**INEQUITY, VULNERABILITY AND LIVELIHOODS OF SMALL-SCALE FISHERIES: A CASE OF NO-TAKE MARINE PROTECTED AREA IN PERHENTIAN ISLANDS, MALAYSIA**
NAME OF AUTHOR	**:**	**BETTY NGUI CHIEW PIENG**

The undersigned certify that the above candidate has fulfilled the condition of the project paper prepared in partial fulfilment for the degree of Master of Business Administration.

SUPERVISOR

Signature : _____

Name :

Date :

ENDORSED BY:

_____

Dean

Graduate School of Business

Date :