The capacity to adapt, conserve, and thrive?: Marine protected area communities and social-ecological change in coastal Thailand

by

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Bachelor of Education, University of Victoria, 2002
Master of Environmental Studies, Lakehead University, 2009

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Supervisory Committee

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Abstract

Three complicated and interrelated issues are marine conservation, local development, and climate change. To seek insight into the challenges posed by these issues in a particular context, this dissertation focuses on seven communities near marine protected areas (MPAs) on the Andaman Coast of Thailand. The central question was "How can conservation outcomes and community livelihoods and adaptive capacity be enhanced in communities near MPAs on the Andaman Coast of Thailand in consideration of a changing climate?" The objectives were to explore local perceptions of social and environmental change and vulnerability, community opinions of Thailand's National Marine Parks (NMPs), and the adaptive capacity of coastal communities. Literatures on resilience, adaptive capacity, vulnerability, conservation impacts, sustainable livelihoods, and governance and management frame the research. Fieldwork included Photovoice, interviews, and household surveys.

Four stand-alone manuscripts are included in the dissertation: a) "A picture of change: Using Photovoice to explore social and environmental change in coastal communities on the Andaman Coast of Thailand"; b) "Vulnerability to multiple stressors in coastal communities: A study of the Andaman Coast of Thailand"; c) "Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand"; and, d) "The capacity to adapt?:

Communities in a changing climate, environment and economy on the northern Andaman Coast of Thailand".

Broadly, the dissertation offers relevant insights into the complex social-ecological changes being experienced by heterogeneous communities and the multi-faceted and multi-scalar actions required to address increasing challenges. Specifically, it a) demonstrates that Photovoice is an effective method for examining social and environmental change and providing input into community adaptation, conservation, and development processes, b) explores the social-economic and biophysical stressors that contribute to household vulnerability and suggests that multiple stressors, particularly economics and climate change, need to be considered in adaptation planning, c) recommends significant improvements to current NMP governance and management to engender local support for marine conservation, and d) illustrates that communities on the Andaman coast of Thailand are coping with environmental and fisheries declines, reacting to climate change and adapting variably to alternative livelihoods and proposes interventions for improving adaptive capacity.

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Acknowledgments

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Dedication

This dissertation is dedicated to my twins (Sage and Kai) and to the children of the communities where I worked in Thailand, for you will inherit a world in which rapid social and ecological change is the constant.

May you maintain courage and optimism as you adapt, conserve, and thrive.

Chapter 1

Introduction and Overview

Introduction

The importance of the marine environment for both humanity at a global scale and for local communities cannot be overstated. Globally, the ocean represents nothing short of our life support system. At a local level, the ocean provides shoreline protection, cultural and spiritual meaning, building materials, and fisheries livelihoods and sustenance for much of the world's coastal population. Yet the health and productivity of the world's oceans are threatened by overexploitation of resources, destructive fishing practices, unsustainable coastal development, loss of biodiversity and important habitats, climate change, nutrification and pollution (Allsopp, Page, Johnston, & Santillo, 2009; Holland & Pugh, 2010).

Marine protected areas (MPAs) are one tool that has been shown to be effective for the protection of marine habitats such as coral reefs, mangroves, and seagrass meadows and for the management of fisheries (e.g., Halpern, Lester, & Kellner, 2009; Lester et al., 2009; Salm, Clark, & Siirila, 2000). However, the creation of MPAs has resulted in mixed outcomes for local communities (Bennett & Dearden, 2012a). MPAs re-allocate access, withdrawal, and management rights and often require local people to relocate or cease from engaging in traditional livelihood activities in order to achieve conservation objectives (Mascia, Claus, & Naidoo, 2010; Mascia & Claus, 2009). Understandably, when livelihoods and/or survival depend on threatened natural resources, which are then contained in exclusionary protected areas, conflict can ensue. This potentially problematic relationship means that careful and planned consideration of both conservation and development agendas is paramount in order to ensure that conservation goals are met and that local communities benefit socially and economically from the creation of MPAs (Cattermoul, Townsley, & Campbell, 2008).

A further challenge to achieving beneficial ecological and socio-economic outcomes from MPAs is the far-reaching impacts of climate change on marine ecosystems and on

communities with marine dependent livelihoods. Climate change manifests in increasing oceanic and atmospheric temperatures, changing oceanic circulation patterns, rising sea levels, acidifying oceans, changing rainfall patterns and increasing extreme weather events (Parry & IPCC, 2007; Solomon & IPCC, 2007). These climatic changes can have detrimental effects on marine habitats, ecosystems, and species (Brierley & Kingsford, 2009; Ove Hoegh-Guldberg & Bruno, 2010; Parry & IPCC, 2007). The livelihoods, daily lives, and infrastructure of coastal communities can also be highly impacted by these climatic trends and shocks (Marshall et al., 2010; McClanahan & Cinner, 2011; USAID, 2009). Climate change is also not the only change that communities are experiencing. A wide array of social, economic, political, and other environmental changes occurring at multiple scales all challenge the ability of communities to adapt in a manner that will support beneficial environmental and socio-economic outcomes (Armitage & Johnson, 2006; Leichenko & O'Brien, 2008; Moerlein & Carothers, 2012; Tuler, Agyeman, da Silva, LoRusso, & Kay, 2008; Zou & Wei, 2010).

To seek insight into the challenges posed by these problems within a particular context, this research project and dissertation focuses in on seven communities near three MPAs on the Andaman Coast of Thailand. The body of this dissertation explores local perceptions on the nature and severity of socio-economic and environmental changes and stressors that communities are experiencing, queries community opinions on the livelihood impacts and governance and management process of National Marine Parks in Thailand, and examines the adaptive capacity of coastal communities to environmental, climatic, and economic changes. The end goal is to explore solutions to the question: how can community livelihoods and adaptive capacity and conservation outcomes be enhanced in communities near MPAs on the Andaman Coast of Thailand in consideration of a changing climate?

This introductory chapter creates a conceptual roadmap of the thinking that led to and guided this research project through: 1) reviewing the literature on the problematic relationship amongst communities, conservation, and change; 2) familiarizng the reader with the context of the study through describing the Andaman coast of Thailand; 3) introducing the central question and objectives of this study; 4) exploring the theories that

framed the research process and analysis, 5) describing the research process, including the methods, sampling, analysis, and ethical considerations, and 6) situating the researcher through sharing my personal and epistemological narrative.

Introducing the Problem(s): Conservation, Communities, and Change

Several interrelated issues emerged from a review of the literature that pointed to the need for this study:1) the significance of, and mounting threats to, marine ecosystems and thus importance of conservation for both global humanity and local communities, 2) the potential contribution of marine protected areas (MPAs) to conservation and the historically mixed relationship between marine conservation initiatives and local communities, and 3) the far-reaching effects of climatic and other social and environmental changes for coastal ecosystems and marine dependent communities. Each will be reviewed in turn.

Significance of and Threats to Marine Ecosystems

The ocean provides vital services to humanity at a global scale and to local communities. Marine ecosystems are of global importance for oxygen production and carbon absorption, climatic regulation and processes, food and medicine provision, regulation of ecosystem processes and functioning, and maintenance of biodiversity (Guerry, Plummer, Ruckelshaus, & Harvey, 2011; Thorne-Miller, 1999). In their landmark study on the value of the world's oceans, Costanza et al (1997) estimated the value of marine ecosystem services to humanity at US$ 22.1 trillion, representing 65% of the earth's total natural capital. At a local level, the marine environment provides important ecosystems services such as climate regulation, shoreline protection, cultural and spiritual meaning, raw materials for local activities and structures, and is the basis of recreation and tourism. Much of the world's coastal population relies on the marine environment for the commercial and subsistence harvest of fish, seafood, and other natural resources (e.g., Loper et al., 2008; Whittingham et al., 2003). An endless litany of valuation studies have shown the high economic value of marine habitats to local, regional and national economies. For example, Sathirathai & Barbier (2001) suggest that the 20 year value of mangroves in Thailand is USD $27, 264-$35,921 per hectare.

Seenprachawong (2002) estimates that the recreational value of corals on the Andaman coast's Phi-Phi Island is USD $6,243 per hectare.

However, the health and productivity of the marine environment is threatened due to loss of biodiversity, declines in important marine habitats, increasing pollution and nutrification, chronic overfishing and overexploitation of resources, unsustainable marine and coastal development, and shifting climatic conditions (Allsopp et al., 2009; Holland & Pugh, 2010). Many of the world's fisheries are in sharp decline due to increasing pressure on the resource, chronic overfishing and overexploitation, use of destructive fishing gear, lack of stewardship, and mis-management (Longhurst, 2010; Pauly, Watson, & Alder, 2005; Watson et al., 2012; Worm et al., 2009). Important areas of biodiversity and critical marine habitats, such as coral reefs, mangroves, estuaries, and sea grasses, are often threatened by actions taking place at a local and regional scale (Allsopp et al., 2009; Blaber, 2009).

Marine Protected Areas as Solution and Problem

Marine protected areas (MPAs) are an important tool for managing fisheries, conserving species and habitats, maintaining ecosystem functioning and resilience, preserving biodiversity, and protecting the myriad of human values associated with the ocean (Agardy, 1997; Salm et al., 2000; Sobel & Dahlgren, 2004). According to the World Conservation Union (IUCN), an MPA is "[a]ny area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher, 1999). MPAs vary significantly in size and function, level of protection and use, and legal status. Though studies have shown that MPAs can lead to beneficial fisheries and conservation outcomes (Halpern et al., 2009; Lester & Halpern, 2008; Lester et al., 2009), the creation of MPAs has resulted in mixed social and economic outcomes for local communities.

In 1992, Wells postulated that protected areas may be of more benefit to humanity on a global scale than they are to local communities. Others have argued that MPAs *can* lead to beneficial conservation and development outcomes through satisfying the needs and aspirations of local communities (C. Roberts, Hawkins, & Campaign, 2000; Salm et al.,

2000). A number of studies and documents have demonstrated the positive potential of MPAs. For example, Leisher et al (2007) demonstrate that MPAs reduce poverty as a result of employment in tourism while also empowering women and improving governance. MPAs in the Solomon Islands have resulted in improved nutrition and health (Aswani & Furusawa, 2007). Samonte et al (2010) drew on various case studies to show that Marine Managed Areas can result in more diversified livelihoods, improved household income, greater food security, improved human health, greater community participation, enhanced community empowerment, reduced user conflicts, improved compliance, greater recognition of traditional fishing and other user rights, greater environmental awareness, and enhanced social capital and resilience. Through protecting critical habitats such as mangroves, MPAs can also decrease community and household vulnerability to climate change (Dudley et al., 2009).

Though MPAs have the potential to positively impact local communities socially and economically, it has often proved problematic to achieve beneficial outcomes in practice. Negative local social and economic outcomes of MPAs demonstrated by previous case studies include increased conflict and political struggle (Bavinck & Vivekanandan, 2011; Prasertcharoensuk, Shott, Sirisook Weston, & Ronarongpairee, 2010), exacerbated vulnerabilities (Bunce, Brown, & Rosendo, 2010), increased restrictions and displacement (Diegues, 2008; Walker & Robinson, 2009), lack of alternative livelihoods (Ngugi, 2002; Tobey & Torell, 2006), decreased participation in natural resource management and governance (Christie, 2004; Hind, Hiponia, & Gray, 2010), increased social tension (Fabinyi, 2008), inequitable distribution of benefits (Christie, 2004; Young, 2003), further marginalization of marginalized groups and loss of land tenure (Brondo & Woods, 2007), as well as decreased food security in the short term and for some groups (Mallerat-King, 2000). Mascia and Claus (2009) provide a useful discussion of the potential and binary – i.e., positive or negative in different contexts - impacts of MPAs (Table 1). It is important to recognize that in order to achieve their conservation mandate, MPAs necessarily reallocate individual or collective rights, which can lead to a combination of benefits and negative consequences for local communities. Yet, it remains an important task to understand how communities are impacted by MPAs and

how to optimize local benefit in different contexts since levels of benefit may be essential for ensuring long-term support and ultimately the success of MPAs.

Table 1 - The potential socio-economic outcomes of MPAs (after Mascia & Claus, 2009)

Governance
decreased/increased resource control
property lost/gained
use rights lost/gained
conflict resolution mechanisms weakened/strengthened
Economic well-being
employment lost/gained
income lost/gained
assets lost/gained
consumption reduced/increased
benefits distributed equitably/inequitably
Health
health diminished/enhanced
food availability reduced/increased
nutritional status diminished/enhanced
psychological well-being diminished/enhanced
health services reduced/increased
Education
public services lost/gained
human capital lost/gained
education opportunities lost/gained
Social capital
social networks degraded/increased
social status lost/gained
partnerships/alliances lost/increased
trust lost/gained
marginalization increased/gained
Culture
cultural space lost/gained
local knowledge lost/gained
sense of place diminished/enhanced
norms and values undermined/reinforced
traditional management systems undermined/reinforced

Change and Challenge

Further compounding issues related to marine conservation and local community development is the challenge posed by a changing climate to both concerns. Humans are dangerously interfering with the balance of CO2 in the atmosphere and that this is leading to changes in global temperatures and weather patterns (Blockstein, Wiegman, & U.S. National Council for Science and the Environment, 2009; Solomon & IPCC, 2007). Global climate change can have significant impacts on both ecological and social systems at a local level (Millenium Ecosystem Assessment, 2005). Climate change is leading to a number of changes in the marine environment, including rising atmospheric and oceanic temperatures, increases in ocean acidification, changes in ocean circulation, rising sea levels, and increases in severity, duration, and number of extreme weather events (Ove

Hoegh-Guldberg & Bruno, 2010). These changes can lead to a number of impacts on marine ecosystems including coral bleaching, slower growth rates for marine species, increases in marine diseases, loss of habitats, increased extinction rates, and alteration of marine food webs (Brierley & Kingsford, 2009; Harley et al., 2006; Ove Hoegh-Guldberg & Bruno, 2010; Parry & IPCC, 2007).

Coastal and island communities are particularly vulnerable to the impacts of climate change (Leary et al., 2009; Marshall et al., 2010). The degradation of marine resources and habitats caused by climate change can lead to reduced livelihood opportunities and increased vulnerability. For example, climate change has potentially far reaching impacts on coral reef functioning and productivity, and, as a result, detrimental outcomes for coral reef dependent livelihoods (Burke, Selig, & Spalding, 2002; Whittingham et al., 2003; Wilkinson, 2009), including tourism (e.g., Dearden & Manopawitr, 2011). Extreme weather events can increase the risks for those engaged in fisheries livelihoods (Tuler et al., 2008). Rising temperatures and sea levels, changing rainfall patterns, and increasing extreme weather events and storm surges have significant impacts on coastal community infrastructures, household assets, and land-based livelihoods, such as agriculture (Leary, Conde, Kulkarni, Nyong, & Pulhin, 2009; Parry & IPCC, 2007). Climate change has the effect of further marginalizing already poor and vulnerable populations (Jones, LaFleur, & Purvis, 2009; Leary et al., 2009) and may lead to increased conflict and induce migration (Barnett & Adger, 2007; McAdam, 2010).

Clearly coastal communities must adapt to the impacts of climate change. Yet, a wide array of other environmental and socio-economic changes occurring at multiple scales are also being experienced by coastal communities. As discussed previously, coastal resources and habitats are declining or being degraded due to mismanagement and over-exploitation (Allsopp et al., 2009; Holland & Pugh, 2010). Coastal communities are also experiencing the impacts of economic globalization, regional population growth and migration, coastal development, technological changes, and changing resource management regimes (Armitage & Johnson, 2006; Bunce, Rosendo, & Brown, 2010; Hauzer, Dearden, & Murray, 2013; O'Brien & Leichenko, 2000; Perry et al., 2010; Tuler et al., 2008). Zou and Wei (2010) provide a thorough review of the social, cultural, economic, political, and environmental changes inducing social vulnerability in coastal

communities. Exposure to multiple stressors – i.e., the combination of climatic, environmental, and socio-economic changes - poses additional challenges to the likelihood of individuals or collectives adapting in a manner that supports either conservation or development objectives. Thus it behooves us to explore whether and how communities can adapt: a) in a proactive rather than reactive fashion that avoids poverty traps; and b) in a manner that supports the maintenance and enhancement of ecosystem services (Armitage & Plummer, 2011; Berkes, Colding, & Folke, 2003; Carpenter et al., 2009).

Exploring the Place: Contextual Analysis

Extending more than 500km from north to south, the Andaman Coast Bioregion of Thailand is considered to be an area of geographic and ecological significance. The confluence of ocean currents coming from the Bay of Bengal and the Indonesian through-flow via the Straights of Malacca results in an area of high biodiversity and endemism (World Heritage Nomination Document, 2010). The region contains significant areas of mangroves (approx. 180,000 ha), coral reefs (approx. 75-80 km^2 off of 130 islands), and sea grass beds (approx. 29 km^2) and productive fisheries resources (Juntarashote, 2005; Panjarat, 2008). The area is home to dugong and several species of dolphins and sea turtles (Hines, Adulyanukosol, Duffus, & Dearden, 2005; Panjarat, 2008). However, all of these environmental assets are significantly degraded and under threat (BOBLME, 2012; Juntarashote, 2005; World Bank., 2006). Threats to the region's marine environment include overexploitation of resources, degradation of habitats and pollution caused by demographics, unsustainable development, mismanagement, market demand, and governance issues (BOBLME, 2012).

The six coastal provinces of the Andaman coast are also home to more than 2 million people. Many communities on the Andaman Coast of Thailand have been reliant on fishing and subsistence harvest for survival since their inception and fisheries are still central to local livelihoods and the regional economy (Prasertcharoensuk et al., 2010). In 2001, across the six provinces of the Andaman Coast (Ranong, Phang-nga, Phuket, Krabi, Trang, and Satun) there were an estimated 621 fishing villages and 15,742 fishing households (Sielert & Sangchan, 2001). In 2005, capture fisheries in Thailand

represented approximately 2.5% of GDP and 482.5 million USD or 9.85% of the Gross Provincial Product of the six provinces on the Andaman coast (Panjarat, 2008). In addition, approximately 5.5 million tourists visit the region annually bringing significant economic benefits to the region (DOT, 2009). Besides fishing and tourism, development on the Andaman coast consists primarily of resource-based industries of mining, agriculture, rubber and oil palm plantations, logging, and aquaculture.

In order to protect the coral reefs, mangrove forests, and sea grass beds and other natural features both from encroaching development and for tourism, MPAs were created in Thailand as early as the 1970s and onwards (World Heritage Nomination Document, 2010). There are currently 16 designated and 1 proposed National Marine Parks (NMPs) on the Andaman Coast (Figure 1), covering an area of more than 483,990 ha (Christie & Ole-Moyoi, 2011). In addition, there are a number of smaller and otherwise-designated MPAs throughout Thailand including Biosphere Reserves, Ramsar Sites, Fisheries Sanctuaries and Reserves, Naval Protected Areas, 3 km Commercial Fishery Restriction Zones, Seagrass Conservation Zones, and Mangroves Reserves (Hossain, Tripathi, & Gallardo, 2009). The effectiveness of management of Thailand's MPAs is widely questioned and in many MPAs both traditional and destructive forms of fishing may continue unabated due to lack of effective enforcement or even knowledge of restrictions (Cheung, Botengan, & Cruz, 2002; Lunn & Dearden, 2006; World Bank., 2006). Many of the MPAs on the Andaman Coast are important assets for the burgeoning tourism industry but contain unplanned infrastructure, unlimited tourism numbers, and unregulated practices (World Heritage Nomination Document, 2010).

The NMPs on the Andaman Coast were created in a top-down fashion, often with little or no consideration of the local communities that lived in or near the enclosed areas (Prasertcharoensuk et al., 2010). According to Prasertcharoensuk et al (2010), Thailand's MPAs are typified by a lack of inclusion in designation and management, absence of recognition of traditional rights and tenure, unregulated and uncoordinated tourism development, a failure to communicate rules and regulations, and even assaults and destruction of local people's assets. Though tourism has seen rapid growth, the level of benefit seen by local people and communities is a topic that deserves further attention. It is likely that tourism development in these MPAs may provide only marginal levels of

benefit to locals, resulting from outside ownership and in-migration of labour, and may even lead to the relocation of local peoples due to the cost of living and even dispossession of lands (Montgomery, 2008; Prasertcharoensuk et al., 2010). Yet, to date there has not been a comprehensive assessment of the impacts of Thai NMPs on local livelihoods and communities or the factors that could support more beneficial outcomes. Recent analyses of management effectiveness (see Manopawitr, 2012) and governance (Prasertcharoensuk et al., 2010) have been conducted but the first relies on a sample taken only from within the Department of National Parks and the second relies on a single case study.

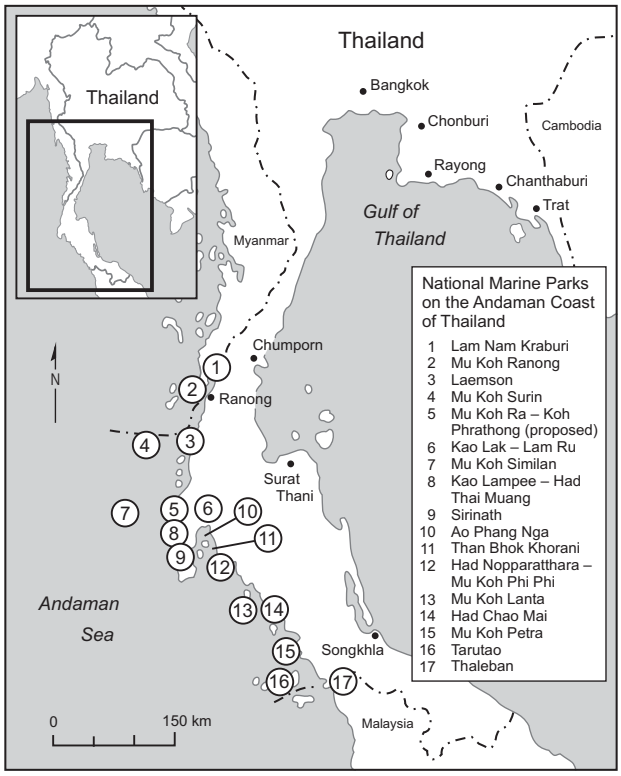


Figure 1 - Marine protected areas on the Andaman Coast of Thailand (Map: Ole Heggen)

Southeast Asia START Regional Center based in Bangkok provides forecasts on climate change in the region. START (2010) estimates that by 2045-2065 climate change will result in increases in average maximum temperature from 32.38^{o}C to 35.57^{o}C, in average minimum temperature from 23.93^{o}C to 27.33^{o}C, and in precipitation from 2,360mm to 2,555mm (+8%). Trends and forecasts suggest more warm days over 35^{o}C

and conversely less cool days. Generally, the dry season is expected to be longer and warmer and the rainy season shorter and warmer. Yet, rainfall during the rainy season is expected to increase in intensity. Sea level in the northern Indian Ocean has historically risen on average 1.29 mm/yr and it is expected to continue rising between 1-2 mm/year (Unnikrishnan & Shankar, 2007). However, there may be significant regional variations: a report on the Krabi province of the Andaman coast suggests that sea level could rise as much as 1.1 cm/year in the next 10 years and an average of 0.84 cm/year over the next 25 years (START & WWF, 2008).

The potential ecological and social implications of the aforementioned climate change trends are significant yet remain largely unexplored in the region. There have been several severe coral bleaching events in 1992, 1998, and 2010. The most recent and extensive coral bleaching event on the Andaman Coast occurred during 2010 as a result of a prolonged period of elevated oceanic temperatures (Phongsuwan, 2011), a climate change manifestation which is expected to increase. Dive tourism is expected to be heavily impacted by recurring coral bleaching (Dearden & Manopawitr, 2011). START and WWF (2008) suggest that current shorelines in the Krabi region could retreat between 10-35 metres/year which will have serious impacts on mangroves. Esser (2010) suggests that intensified rainfall events will lead to increasing sedimentation and decreased salinity, which have implications for coral reefs, sea grass, and mangroves and related livelihoods.

The Research Question and Objectives

A review of the literature and initial site visits indicated that for communities located inside or beside MPAs on the Andaman Coast of Thailand, three salient issues are: the health and productivity of local marine ecosystems, the involvement of local people in socially and culturally appropriate and economically viable livelihoods, and the growing impacts of climatic and other stressors on marine ecosystems and communities. In consideration of the issues raised during the literature review, contextual analysis and initial site visits in February 2011, this multiple case study of communities on the Andaman Coast of Thailand sought to address the following overarching question:

How can community livelihoods and adaptive capacity and conservation outcomes be enhanced in marine protected areas on the Andaman Coast of Thailand in consideration of a changing climate?

In working towards answers to this question, this study had the following four objectives:

1. To explore the relationship between climate change, marine protected areas, and livelihoods;
2. To investigate the types of changes and stressors that are being experienced by communities;
3. To examine the current level of adaptive capacity of marine protected area communities;
4. To explore policy mechanisms and on-the-ground actions to achieve conservation objectives and community socio-economic outcomes.

Framing the Research: Theoretical Approach

To address the question and objectives, this study drew from literatures and theories on resilience and adaptive capacity, vulnerability and multiple stressors, and sustainable livelihoods. These theories and the ways in which they framed the research and analysis are briefly discussed below.

Resilience and Adaptive Capacity

Recent conceptualizations of adaptive capacity have roots in research and scholarship on social-ecological systems and resilience (e.g., Berkes et al., 2003; Berkes & Folke, 1998; Gunderson & Holling, 2002; Holling, 1973, 2001), risk and vulnerability to hazards (e.g., Burton, Kates, & White, 1978, 1993; Mustafa, 1998; Smith, 1991, 2013) and famine (e.g., Sen, 1982; Swift, 1989; Watts & Bohle, 1993), and vulnerability and adaptation to climate change (e.g., McCarthy & IPCC, 2001; Smithers & Smit, 1997; Turner et al., 2003). A review of the development of theory in each of these areas is beyond the purview of the current document and can be found elsewhere (e.g., Neil Adger, 2006; Folke, 2006; Füssel, 2007a; Füssel, 2007b; Gallopín, 2006). However, definitions and several important points stemming from work on resilience and adaptive

capacity deserve mentioning prior to introducing the framework for analysis of adaptive capacity.

Resilience refers to the adaptability of a system to change (Gunderson & Holling, 2002). Resilience in both social and ecological systems is a function of "the amount of change the system can undergo and still retain the same controls on function and structure; the degree to which the system is capable of self-organization; and, the ability [of the system] to build and increase the capacity for learning and adaptation" (Resilience Alliance, 2010). Importantly, resilience thinking prompts us to consider the inherent uncertainty, unpredictability, and complexity of linked social-ecological systems and, since human and natural systems are interdependent, to examine how and whether adaptive responses maintain long-term ecosystem functioning and productivity (Berkes et al., 2003; Carpenter et al., 2009; Holling, 2001). Folke, Colding and Berkes (2003, p. 355) offer four factors that are required for dealing with the dynamism of linked socio-ecological systems: learning to live with change and uncertainty, nurturing diversity for reorganization and renewal, combining different types of knowledge for learning, and creating opportunity for self organization.

Social adaptive capacity can be seen as a measure of social resilience and a means of reducing the vulnerability of social institutions, communities, groups, or individuals to environmental, social, political, or economic changes, shocks, stresses, or trends (Adger, 2000; Marshall et al., 2010). The IPCC (McCarthy & IPCC, 2001, p. 18) refers to adaptive capacity as "the characteristics of communities, countries and regions that influence their propensity or ability to adapt". Drawing on resilience theory, Marshall et al (2010, p. 6) define adaptive capacity as "the ability to respond to challenges through learning, managing risk and impacts, developing new knowledge and devising effective approaches."

There were several important points from previous research on adaptive capacity that were particularly instructive in shaping this study. First, Smithers & Smit (1997) suggest that what differentiates social systems from ecological systems is their potential ability to make logical and proactive decisions that are more likely to lead to positive social and ecological outcomes over the longer term – human's have agency. It is also important to distinguish between coping capacity, which infers short-term survival, and adaptive

capacity, which refers to a longer-term and systematic adjustment processes (Smit & Wandel, 2006). Second, though much of the literature on this topic focuses on measuring adaptive capacity and adaptation at a single scale – e.g., individual, household, community, regional, national (e.g., Brooks, Adger, & Kelly, 2005; Vincent, 2007) - adaptive capacity at any scale is influenced by adaptive capacity at scales both above and below (Adger, Arnell, & Tompkins, 2005; Cinner, Fuentes, & Randriahmahazo, 2009). Third, there are four broadly recognized aspects of adaptive capacity: flexibility and diversity, access to assets, the capacity to learn and the capacity to self-organize (Adger, Hughes, Folke, Carpenter, & Rockstrom, 2005; Carpenter, Walker, Anderies, & Abel, 2001; Cinner et al., 2009; Lebel et al., 2006). Finally, though measures of social resilience may be context specific and adaptations represent the response of space-dependent people to specific perturbations, many measures of social resilience can be gleaned from the literature that offer an important starting place for analyzing adaptive capacity (e.g., Cinner et al., 2009; Folke et al., 2003; Marshall et al., 2010; McClanahan et al., 2009; see also Chapter 5).

Moreover, socio-ecological resilience and adaptive capacity are particularly salient theories given the potential impacts of a changing climate (Gallopín, 2006; Smit & Wandel, 2006; Smith, Klein, & Huq, 2003). Considerations of social adaptive capacity in MPA communities could be particularly important, since climate change has potentially far reaching impacts on ecosystems and the communities themselves (Burke et al., 2002; Wilkinson, 2009). Recent scholarship has aimed to incorporate measures of social resilience or social-ecological resilience into planning and management of MPAs (Cinner et al., 2009; Marshall et al., 2010; McClanahan et al., 2008; McClanahan et al., 2009). In this study, the indicators identified and utilized by these authors were incorporated with emergent results to explore social resilience and adaptive capacity in communities near Thailand's MPAs. Various measures of social resilience and adaptive capacity are summarized under the four aspects of adaptive capacity in Table 2 – which functioned as a framework for research and analysis of indicators of adaptive capacity (see Appendix A). The measures of adaptive capacity contained in this framework are more tangible extensions of less concrete or measurable factors such as culture and power. One limitation is that the indicators-based approach taken for analyzing adaptive capacity may

have de-emphasized past and current adaptive strategies, as suggested in the model by Smit & Wandel (2006, p. 288), and focused instead on conditions that would facilitate or interfere with future adaptation.

Table 2 - Aspects and measures of adaptive capacity (after Cinner et al., 2009; Folke et al., 2003; Marshall et al., 2010; McClanahan et al., 2009)

Aspects	Measures
Flexibility and diversity	• Occupational mobility and attachment to occupation • Occupational multiplicity, livelihood and income diversity • Dependence on natural resources and fisheries • Place attachment
Capacity to organize	• Bonding social capital and networks • Gender relations • Participation in community, regional, and protected area decision-making • Local environmental institutions and social norms • Environmental policies and agencies • Governance and leadership • Levels of corruption • Active risk management • Migration • Perception of risk
Learning and knowledge	• Resource monitoring, feedback, and adaptation mechanisms • Knowledge of climate change • Spaces for learning • Diversity of knowledges for NRM • Change anticipation and response • Recognition of causality and human agency
Access to assets	• Material assets • Infrastructure • Levels of education • Financial status and access to sources of credit • Bridging social capital • Institutional support • Natural capital • Equity and rights

Vulnerability and Multiple Stressors

A related concept that has been explored extensively in recent literature on global environmental change and marine conservation is vulnerability (Adger & Kelly, 2001; McClanahan & Cinner, 2011; Parry & IPCC, 2007). There are several different conceptualizations of vulnerability (Ensor & Berger, 2009; Kelly & Adger, 2000). First, the "end-point" perspective aims to estimate the impacts and costs of hazards or climatic changes with the goal of estimating and reducing overall costs. Second, vulnerability assessments that focus on the "starting-point" emphasize the characteristics of households, regions, sectors, or countries that make them susceptible to change events. This stance often locates vulnerability as the flipside of adaptive capacity (Gallopín, 2006). According to Kalikoski, Neto and Almudi (2010, p. 1) "the vulnerability of a group of people is inversely proportional to their ability to anticipate, work, resist and recover". A third and integrated view locates vulnerability as a function of three factors - exposure (E), sensitivity (S), and adaptive capacity (AC) – where the relationship between the three can be expressed as follows: V=(E+S)-AC (Marshall et al., 2010; Tuler et al., 2008; Turner et al., 2003). Exposure refers to the presence of stressors - trends or shocks that cause stress – and the magnitude, frequency, duration, and extent to which they are being experienced by individuals, collectives, or resources (Marshall et al., 2010). Sensitivity is the level of affect or harm caused by exposure to a stressor and can be seen to extend from contextual factors, such as geography, history, environment, and socio-economics (Marshall et al., 2010; Turner et al., 2003). The combination of exposure and sensitivity determine the potential impact of a stressor. Adaptive capacity – or the ability to respond to change – mitigates against stressors and determines the ultimate impact or overall level of vulnerability.

An implication of the integrated view of social vulnerability is that an understanding of exposure - the types and extent of stressors that are facing the system – is required to inform assessments of adaptive capacity and adaptation policies and plans (Brklacich, Chazan, & Bohle, 2010). As previously discussed, coastal communities are experiencing a wide array of social and biophysical stressors (Zou & Wei, 2010). It is widely acknowledged that multiple stressors occurring simultaneously at various scales interact to produce variable outcomes for communities, groups, and sectors (e.g., Eakin, 2005;

O'Brien & Leichenko, 2000). Yet the impacts of these stressors, and particularly climate change, are often examined and addressed in isolation (Reid & Vogel, 2006; Wongbusarakum & Loper, 2011). On the ground, the dominance of the climate change discourse and agenda may mean that other stressors are ignored or forgotten in adaptation policy and practice. Conservation and development oriented NGOs with long histories of working in certain areas and on certain types of projects may have to re-orient their programmes directions or even locations to capture funding that focuses on climate change adaptation. These concerns compelled me to consider the multiple changes and stressors that were facing communities on the Andaman coast of Thailand.

Sustainable Livelihoods Approach

The Sustainable Livelihoods Frameworks provide useful heuristics for analyzing the various factors that impact on local livelihood strategies, portfolios, and outcomes. The sustainable livelihoods approaches emerged from earlier development research focused on household studies, village studies, and farming systems (Farmer, 1977; Lipton & Moore, 1972; Long, 1984; Moock, 1986). In 1992, Chambers and Conway proposed the following definition of sustainable livelihoods at a time when sustainability, poverty reduction, and people-centred approaches to development were emerging in both political and development discourse:

> A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels in the short and long term. (Chambers & Conway, 1992, p. 6)

In proposing this definition, Chambers and Conway were trying to avoid narrowly defined conceptualizations of poverty and to incorporate concepts of capabilities (Sen, 1982, 1987), assets (Swift, 1989), equity, and sustainability (WCED, 1987). The following years saw a proliferation of definitions and frameworks based on the idea of

sustainable livelihoods emerge from a combination of bilaterals, multilaterals, NGOs, and research institutes (see Hussein, 2002). Carney (1998) and the Department of Foreign Affairs and International Development (DFID, 1999) proposed one of an array of analytical frameworks for examining 'sustainable livelihoods' (Figure 2).

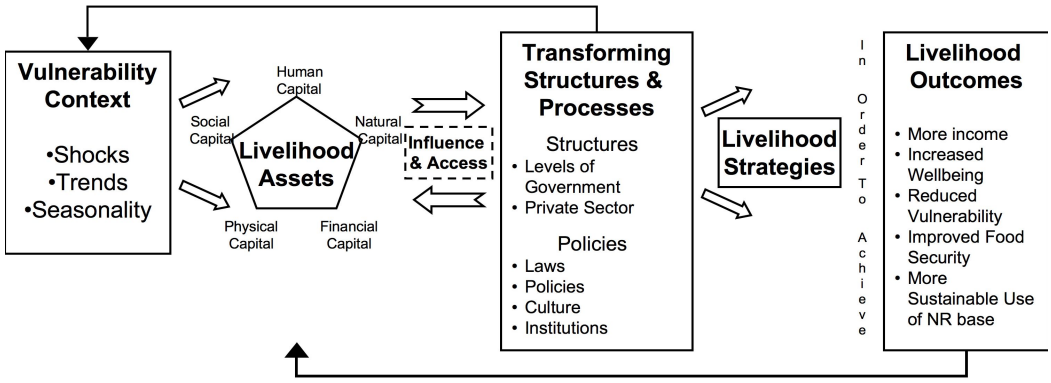


Figure 2 - Sustainable livelihoods framework (after Carney, 1998; DFID, 1999)

The sustainable livelihoods framework proposed by Carney (1998) and DFID (1999) was similar to other frameworks proposed by Scoones (1998) and Ellis (2000) in suggesting that there are a number of micro to macro level contextual factors, including trends, shocks, assets, access, policies, institutions, process, transforming structures, and social relations, that have impacts on livelihood strategies or portfolios and the resultant socio-economic and environmental outcomes. A number of authors have suggested that sustainable livelihoods frameworks provide a useful tool for analyzing the social impacts of conservation (e.g., Bennett, 2010; Igoe, 2006). Though it offers a powerful conceptual toolkit, the sustainable livelihoods approach has been critiqued for downgrading the vulnerability context, paying limited attention to governance, power, rights, and markets, and overlooking the influence of policies, institutions and processes occurring at multiple scales (see Bennett, 2010, p. 11-12 for a review). Of particular interest in this study is how the policies, institutions, and processes associated with Thailand's NMPs impact on local livelihood assets, strategies, and outcomes and, by extension, how these policies, institutions, and processes can be improved.

The Research Process: Methods, Analysis, and Ethics

The research process consisted of the following stages. First, a literature review was conducted to explore previous linkages made between marine conservation, community development and livelihoods, climate change, and social-ecological resilience, adaptation, and vulnerability. A significantly abbreviated literature review is presented earlier in this chapter. Secondly, a review of available English-language secondary data on the state of the environment, conservation and natural resource management, socio-economic development, and climate change projections on the Andaman region was undertaken. Subsequently, I travelled to Thailand in February 2011 to create and solidify regional partnerships and familiarize myself with the research context. After returning to Canada to finalize and defend my research proposal, I applied for ethical approval through the University of Victoria (Appendix B) and a license to conduct research in Thailand (Appendix C). Then I relocated to Thailand for an extended period of fieldwork between June 2011 and April 2012.

After arriving, settling and hiring a research assistant in Thailand, I spent the following month travelling to the various National Marine Parks (NMPs) on the northern Andaman coast of Thailand and visiting as many communities as possible that were situated near their boundaries. Based on initial visits to marine protected areas and villages, a selection of seven (7) villages (see Figure 9 - Chapter 3) situated near four NMPs - Ao Phang Nga, Than Bhok Khorani, Mu Koh Ranong, and the proposed Mu Koh Ra-Koh Phrathong NMP (see Figure 1) - were chosen as study sites. The communities chosen include Baan Tha Khao, Baan Koh Panyee, Baan Lions, Baan Tapae Yoi, Baan Ko Chang, Baan Moken and Baan Koh Sin Hi. Communities were purposefully selected to gain the most insight based on the presence of different livelihood portfolios (level of involvement in tourism, fishing, aquaculture, and agriculture or plantations), habitat types (coral reefs, mangroves, and sea grasses) and ethnic groups (Thai Buddhist, Thai Muslim, Moken, Burmese and Malay). The communities ranged in size from approximately 57 to 1775 inhabitants (see Community Information in Appendix D). In each of the communities, I met with local community leaders to seek feedback on the project's focus

and proposed methods and to ensure support for, and interest in, the project prior to proceeding. In several communities, I was also asked to attend committee meetings, religious group meetings or community meetings to discuss the research. During the following nine months, I employed a triangulation of methods (Photovoice, interviews, and surveys), perspectives (inside and outside communities) and analysis (qualitative and quantitative) to interrogate this study's central question and objectives (Neuman, 2000). The following section discusses the methods and modes of analysis employed and how ethical considerations were taken into account.

Methods, Sampling, and Analysis

Photovoice

The narrative (and reality) of climate change dominates current conservation and development-related work and research. Participatory methods could enable researchers and practitioners to better appreciate the types, extents, and significance of the various changes that communities are experiencing, which may allow for a more holistic approach to understanding vulnerability and building adaptive capacities. A modified Photovoice process was utilized to explore perceived changes to the marine environment and to social aspects of local communities and to examine the place of climate change within these combined social-ecological systems. The use of Photovoice for this function was novel and experimental.

According to the method's originators Wang and Burris (1997, p. 369), photovoice is "a process by which people can identify, represent, and enhance their community through a specific photographic technique. It entrusts cameras to the hands of people to enable them to act as recorders, and potential catalysts for change, in their own communities". The goals of photovoice are threefold: 1) to enable participants to document and reflect on a topic; 2) to promote knowledge creation and sharing about important issues through individual narratives and group discussions of photographs; and 3) to facilitate dialogue with policymakers (Wang & Burris, 1997). Photovoice uses images of the community made by people themselves thus leading to shared understanding and ownership of the research process and outputs (Castleden, Garvin, & Huu-ay-aht First Nation, 2008). Photovoice originated in public health as a method of assessing health needs but has since

been used in numerous settings and with various populations (see Hergenrather, Rhodes, Cowan, Bardhoshi, & Pula, 2009 for a review). It has been used extensively in health, education, psychology, and community development research. Though visual techniques have long been used in natural resource management research (e.g., Dearden, 1984; Petheram, High, Campbell, & Stacey, 2011), Photovoice is only more recently being used in research on human-environment interactions and environmental change (Claudia Baldwin & Chandler, 2010; Beh, 2011; Berbés-Blázquez, 2012; Bosak, 2008; Fresque-Baxter, 2013).

Two Photovoice processes were facilitated with three of the selected communities: the first with Baan Lions and Baan Tapae Yoi; and the second with Baan Tha Khao. These communities were selected as they had different livelihood mixtures and depended on different habitats and fisheries. Initially, we had hoped to do a third Photovoice process in the highly fisheries dependent community of Baan Koh Sin Hi; however, this proved untenable given the lengthiness of the process and the project timeline. The Photovoice process was modified to fit the context and topics under study and consisted of six stages based on those used by Castleden et al (2008; see also Appendix E). First, participants (co-investigators) were recruited to participate in the Photovoice training workshop. In both sites, snowball and purposive sampling (see Neuman, 2000) were used to identify individuals who were particularly knowledgeable about the marine environment and who represented various genders, age groups, socio-economic groups, and livelihood groups. These sampling procedures were chosen to seek insight rather than generalizability. Sampling individuals who were both knowledgeable and representative of these different groups proved to be challenging (see Appendix F). The first Photovoice process in Baan Lions and Baan Tapae Yoi consisted of five (5) males, three (3) females, and one (1) married couple whose ages were between 20-60+ years. In Baan Tha Khao, 7 males, 2 females, and 2 married couples between 40-60 years of age participated.

During the training workshop, we discussed the Photovoice process, learned about cameras and photographic techniques, practiced taking photographs, and proposed the topic of study. The two following questions were posed to participants for investigation through photography: 1) What changes do you see in the natural environment? and 2) What changes do you see in your community? Secondly, participants were given

inexpensive underwater digital cameras (Kodak Easyshare Sport C123) for two weeks to take pictures of social and environmental changes. The number of photographs taken by participants ranged from 16 to 176. Third, following the two weeks with the cameras the photographs were downloaded and printed and narrative interviews were conducted to discuss the stories behind the changes depicted in the photographs. Interviews, which took between 26 minutes and 4 hours and 27 minutes, were translated word for word by a skilled research assistant and extensive notes were taken. During interviews, participants were asked to categorize and name the changes depicted in the photos. This process of co-analysis with the participants served the function of open-coding – exploring, identifying, and labeling key concepts (Benaquisto, 2008a). Fourth, I axial coded the named photos into sub-themes (Benaquisto, 2008b) under the pre-selected categories of environmental and social change using a spreadsheet in Microsoft Excel. Fifth, photographs and sections of the interview narratives representing the emergent themes were incorporated into two books that were co-produced and co-edited with the participants (e.g., Bennett & Dearden, 2012b, 2012c). Finally, these books were returned to communities – in one community as part of a workshop to discuss outcomes and implications and in the other two we were only able to meet with individuals due to the necessity of working during dry season. The data was also re-analyzed by myself at a later date for underlying themes that were integrated into an academic article (Bennett & Dearden, 2013).

Interviews

A series of initial, in-depth, and key informant interviews were conducted with individuals and groups throughout the research process (Appendix G & H). The interviews were qualitative and guided by open-ended questions that focused on 1) the general context of communities and livelihoods, 2) perceived changes and stressors that communities are experiencing, 3) perceptions of MPA policies, institutions, and processes and their impacts on local livelihood assets, strategies, outcomes and potentials, and 4) selected indicators of the various aspects of adaptive capacity (Appendix A). The interview schedule contained in Appendix G served as a guide only and not all questions were asked of any one individual. The interview sample was selected using a

combination of purposive and snowball sampling to privilege those who were knowledgeable or had certain affiliations or differing perspectives (Neuman, 2000) as well as convenience sampling due to the unpredictable nature of the context and the collective orientation of the culture. A total of 85 individual interviews were conducted with "insiders" - including community leaders (n=22), community group leaders (n=5), community members (n=35), and government employees working in the community (n=3) - and with "outsiders" – including academics (n=3), non-governmental organizations (n=7) and representatives of various governmental organizations (n=10). Government representatives who were interviewed came from the Department of National Parks, Wildlife and Plant Protection, the Department of Marine and Coastal Resources, the Ministry of Natural Resources and the Environment, the Office of Rural Development and the Department of Disaster Prevention and Mitigation (Ministry of the Interior), and the Department of Fisheries (Ministry of Agriculture and Cooperatives). Attempts were made to ensure that the sample contained representatives from various groups - ages, genders, ethnicities, socio-economic groups, and livelihoods - in each of the communities. Overall, the majority of interview participants were male (75.3%) and there was a higher representation of interviewees between the ages of 30 and 60 than youth or elders (Appendix I). A total of 23 small group interviews (2-5 people) were conducted with 4 groups of women, 3 groups of men, and 16 mixed gender groups in the communities (Appendix I). Finally, eight (8) key informant interviews (Appendix H) were conducted that focused on community level information on infrastructure items, livelihoods, marine resources harvested, natural resource management and conservation institutions, actions, and mechanisms, community planning, adaptation and governance, and involvement with outside organizations.

Qualitative interviews were conducted in Thai and English. When in Thai, they were translated by a Thai research assistant and extensive field notes were taken. Field notes were later typed and imported into NVivo 10 qualitative research software for analysis (QSR, 2012). Interviews were then coded against the main thematic areas and questions of this study. For example, a pre-arranged coding scheme or frame (Benaquisto, 2008c) was created in NVivo based on the various qualitative measures and indicators of adaptive capacity (Appendix A) prior to starting analysis to facilitate the process.

However, additional codes and themes were also allowed to emerge during the analysis. One topic was also analyzed "in vivo" – i.e., as interviews were conducted and using terminology used by participants (King, 2008): as participants discussed changes and stressors, these were noted for incorporation into the survey instrument.

Surveys

Finally, a quantitative household survey was employed in the seven communities to further our understanding of community vulnerability, adaptive capacity, and perceptions of MPAs. The survey collected data on: i) individual interviewee characteristics (age, class, gender, ethnicity) and household socio-economic data; ii) occupations and livelihood contributions of household members; iii) perceptions of NMP processes and outcomes; iv) measures of the various aspects of adaptive capacity - i.e., flexibility and diversity, capacity to organize, learning and knowledge; access to assets (see Table 2 & Appendix A). Stressors identified during interviews were also incorporated into the surveys for quantitative ranking.

Two additional Thai research assistants were hired and trained to assist with administering the survey. After drafting and editing the survey in English, the survey was forward translated from English to Thai by one member of the survey team and then back translated by a different translator to check for accuracy. The survey team then discussed and refined the survey. Draft surveys were pilot tested in two different communities and additional changes were made to the survey based on feedback from test participants and surveyors (Appendix J & K). Maps of each community were hand-drawn and households were randomly selected by counting every n^{th} house. Due to the small number of houses in each community (n=36-290), between 21-47.7% of houses (n=12-78) in each community were initially selected to increase the sample sizes and statistical significance. Two hundred seventy nine (279) houses were selected but fifteen percent (15%) of houses (n=42) did not respond to the survey due to a variety of reasons, resulting in the completion of 237 surveys (Appendix L).

Paper surveys were completed in the field and administrators double checked surveys at the end of each day and prior to data entry. A Thai research company was hired to enter the data based on a pre-determined coding scheme. Ten percent of surveys were

entered twice to ensure accuracy. The information gained from the survey was imported into SAS quantitative analysis software where additional queries were run and analysis was conducted (SAS, 2013). It was also exported to SPSS 21 for analysis (IBM, 2012). A combination of descriptive statistics and analytical processes have been and will be used where appropriate to describe and explore the data.

Ethical Considerations and Approvals

Due to the potential risks associated with conducting research on and with human subjects, ethical considerations associated with this project included consultation, the balance of risk and benefit, informed consent, anonymity, and confidentiality in accordance with the *Tri-Council Policy Statement for Ethical Conduct for Research involving Humans* (TCPS, 2005). Throughout the research process, we consulted with gatekeepers in each of the local communities throughout the research project, to ensure that there was adequate interest and support and to establish processes and outcomes that were appropriate and met the needs and concerns of the group. There were seen to be minimal risks associated with the interview, survey, and Photovoice research processes for participants; however, interviewing community members and sharing results about current and future livelihoods and adaptive capacity could be delicate and could exacerbate local tensions, claims, and awareness of disparities in the community. Concerns were also expressed by participants: a) about whether the researchers would return to the communities to share results, b) about what would be done with the results, and c) that anonymity would not be maintained about potentially damaging comments that they had made. It was important, therefore, to: a) make a commitment to share the substantive results within and outside the community on terms that the participants were satisfied with; and, b) be very discreet about what is revealed in terms of detail on controversial aspects. A potential benefit of this research was to raise outside awareness of the current changes that communities are experiencing and how they are being impacted by marine protected areas. Participants also concurred that it was important to communicate these results beyond the communities in order to advocate for change in conservation and development policies and programmes. For example, participants and

communities could potentially benefit from this research through improved MPA policies, institutions, and processes and improved livelihood outcomes.

Full disclosure of project rationales, details, processes, and intent was done prior to interviews, surveys, and the Photovoice process and oral consent was obtained from all participants during all phases of the research (Appendix M, N & O). The photovoice process required a number of additional ethical steps to be taken: 1) training of photovoice co-investigators included training in the ethics of photography, which included a discussion of what things were not appropriate to take photographs of, 2) Photovoice co-investigators were instructed to request permission of photographic subjects prior to taking their pictures (Appendix O), and 3) photos and related narratives were discussed with participants prior to sharing or publication in documents (Castleden et al., 2008). Anonymity and confidentiality was and will be maintained in all publications and documents produced as a result of this research project. Confidentiality was and will be ensured through the secure storage of data. All results were stored in a secure location while in the field and records will be kept at the University of Victoria for 7 years as required by university policy. An application for ethical approval was sought through the University of Victoria Research Ethics Board prior to conducting research (Appendix B). A research permit was required for conducting research in Thailand (Appendix C).

Situating the Researcher: Experience, Narrative and Paradigm

According to Krieger (1991, p. 89), "The pot carries the maker's thoughts, feelings and spirit. To overlook this fact is to miss a crucial truth, whether in clay, story, or science." Since the subjectivity and positionality of the researcher can deeply influence the process and the outcomes of research (Maxwell, 2005; Tuhiwai Smith, 1999), it behoves me to let the reader know that I am a Caucasian middle-class male from a medium-sized resource-based based town in Canada. My father was a construction contractor and my mother was an artist and stay-at-home mother. My academic training includes a Bachelor's degree in Elementary Education, a Master's degree in Environmental Studies in Nature-Based Recreation and Tourism, as well as the current

PhD degree in Geography. I have also worked as a construction, silviculture, and farm labourer, an elementary and high school teacher, an adventure guide and outdoor educator, an international development worker, and in the academy as a research assistant, a teacher's assistant, and lecturer. Previous personal and professional experiences have taken me to Mexico, Ecuador, Costa Rica, Korea, and Arctic Canada. This research represents my first, second, and third visits to Southeast Asia. I describe myself as both a conservationist and a humanitarian in acknowledgement of my belief that consideration needs to be given to both nature and society if the other is to thrive, or indeed, survive.

As a researcher, I would situate myself epistemologically as a critical realist. Whereas a positivist epistemology insinuates an ontology and reality that is mind-independent, objective, and measurable and a constructivist approach suggests that reality is socially constructed, value laden, and deeply contingent, critical realism recognizes that there can be "multiple perceptions about a single, mind-independent reality" (Evely, Fazey, Pinard, & Lambin, 2008; Krauss, 2005, p. 761; Yeung, 1997). As a researcher working on issues relating to natural resource management and conservation as well as community social and economic development, a critical realist stance allows me to recognize both individual or collective perspectives on the status of natural resources or on development outcomes as well as objective measures of natural resources, climate or wealth. For example, I acknowledge that the status of fisheries or the climate can be measured or experienced (e.g., hunger, health, weather) quantitatively but it can also be perceived in different ways by local fishers based on belief systems and historically and socially constructed notions of the world. Since many different types of information are deemed valid and important, triangulation of results, mixed methods approaches – e.g., qualitative interviews and quantitative surveys - and both theoretical and empirical work are all insightful means of understanding issues and solutions in combined social-ecological systems.

Overview of Dissertation

The remainder of this dissertation is structured as follows. Since this is a manuscript-based dissertation, the following four chapters are stand-alone manuscripts that present results stemming from the central question and objectives of this project. The papers included herein include the following:

- Chapter 2 – A picture of change: Using Photovoice to explore social and environmental change in coastal communities on the Andaman Coast of Thailand
- Chapter 3 – Vulnerability to multiple stressors in coastal communities: A study of the Andaman Coast of Thailand
- Chapter 4 – Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand
- Chapter 5 – The capacity to adapt?: Communities in a changing climate, environment and economy on the northern Andaman Coast of Thailand

The concluding chapter summarizes and synthesizes the key theoretical, methodological, and practical and policy insights and implications, reflects on the research process and limitations, and suggests some areas of future research. An appendices provides key resources that were used in this study and an overview of survey and key informant interview results (Appendix P & Q).

Chapter 2

A Picture of Change: Using Photovoice to Explore Social and Environmental Change in Coastal Communities on the Andaman Coast of Thailand[1]

Abstract:

Coastal communities experience a wide array of environmental and social changes to which they must constantly adapt. Further, a community's perception of change and risk has significant implications for a community's willingness and ability to adapt to both current and future changes. As part of a larger study focusing on the adaptive capacity of communities on the Andaman Coast of Thailand, we used Photovoice to open a dialogue with communities about changes in the marine environment and in coastal communities. This paper presents the results of two exploratory Photovoice processes and discusses prospects for using the Photovoice method for exploring social and environmental change. Changes examined included a number of broader environmental and social trends as well as ecological specifics and social particularities in each site. Participants also explored the social implications of environmental changes, the impacts of macro-scale processes on local outcomes, and emotive and active responses of individuals and communities to change. Photovoice is deemed a powerful method for: examining social, environmental, and socio-ecological change, triangulating to confirm the results of other scientific methods, revealing novel ecological interactions, and providing input into community processes focusing on natural resource management, community development, and climate change adaptation.

[1] This chapter was also published as Bennett, N. J., & Dearden, P. (2013). A picture of change: using photovoice to explore social and environmental change in coastal communities on the Andaman Coast of Thailand. Local Environment: The International Journal of Justice and Sustainability. doi/abs/10.1080/13549839.2012.748733

Keywords: environmental change, social change, marine environment, coastal communities, Photovoice

Introduction and Overview

Resource dependent coastal communities are often highly vulnerable to change events and at the same time are experiencing changes at an accelerated rate (Marshall et al., 2010). These changes include, for example, declines in fisheries, changes in regulatory frameworks for resource harvesting, different demands from global markets, shifts to new livelihoods, and natural hazards (Cinner et al., 2009). Climate change is arguably one of the most significant changes being experienced by many coastal communities, as climate related changes including intensifying storms, rising sea-levels, acidifying oceans, changing rainfall patterns, and ocean currents lead to a number of stressors on communities and on the ecosystems on which they rely (Parry & IPCC, 2007). The ability of communities to adapt and respond to the changes that are brought about by a diverse array of change events determines their overall vulnerability and has implications for local and regional environmental sustainability. Social adaptive capacity – also called social resilience - refers to "the ability to respond to challenges through learning, managing risk and impacts, developing new knowledge and devising effective approaches" (Marshall et al., 2010, p. 7). Carpenter *et al.* (2001) argue that in explorations of resilience and adaptive capacity explicit attention needs to be paid both to "resilience *of* what" and "resilience *to* what". We agree with this view while also recognizing that there are a complex and interrelated set of changes that are facing coastal communities. An important part of exploring adaptive capacity to change is to first understand the diverse array of changes that communities are undergoing and also the ones that community members perceive as most significant or most important to address. As Marshall *et al.* (2010) suggest, perception of risk is a key determinant of the willingness and ability to adapt.

As part of a multi-faceted research project focusing on marine conservation, climate change, and community adaptive capacity on the Andaman coast of Thailand, we used a community-based Photovoice process to explore the broader array of perceived changes

both to the natural environment as well as to social aspects of several coastal communities. The broader project consisted of a series of interviews and surveys as well as the Photovoice process. The Photovoice aspect of the project had three purposes. First, it sought to understand how narratives and realities of environmental decline, change, and conservation relate to the particularities of people in different communities in a region. Second, the Photovoice portion of the project aimed, in part, to re-examine the idea that climate change is the only or most powerful change event re-shaping the combined social-ecological systems associated with the communities that we work alongside (Graybill, 2011). In much recent work and research on problems related to conservation and development, climate change has become a dominant and overriding narrative. As argued by Swyngeduow (2011), climate change could be seen as the current objet petit a – a Jacques Lacan inspired term which refers to an object of focus (or of desire) that distracts us from having a holistic vision or under- standing – of conservation and development-related work and research. Finally, using Photovoice, we aimed to create a comprehensive picture of the changes that the communities were facing. Moreover, neglecting to explore change in an open-ended fashion risks making ungrounded and faulty assumptions about the types, extents, and significance of the various changes that communities are experiencing, which may in turn lead to an examination of adaptive capacity that is overly focused on a narrow type of adaptation. Photovoice was the method chosen to achieve these purposes because we felt it would provide rich visual data focused on the experience of participants that could be shared both within and beyond the communities that we were working with (Castleden et al., 2008; Harper, 2003; Wang & Burris, 1997)

This paper explores the results of two community-based Photovoice processes that we undertook with several coastal communities on the Andaman coast of Thailand. Prior to exploring the results, we introduce the research sites, provide an overview of Photovoice and the modified process that we used, discuss our sampling strategies, and provide some descriptive statistics. In conclusion, this paper discusses the results in consideration of the aforementioned goals and prospects for future research on social and ecological change using Photovoice.

Description of Site and Regional Changes

This research project was done on the Andaman coast of Thailand - a region that has undergone significant social, economic, environmental, and climatic changes in recent decades. Extending more than 500km from north to south, the Andaman Coast Bioregion of Thailand is considered to be an area of global geographic and ecological significance (World Heritage Nomination Document, 2010). The confluence of ocean currents coming from the Bay of Bengal and the Indonesian through-flow via the Straights of Malacca results in an area of high biodiversity and endemism. The region also contains significant areas of mangroves, coral reefs, and sea grass beds (Juntarashote, 2005); however, all of these environmental assets are significantly degraded and under threat (World Bank, 2006). Major challenges facing these critical habitats in the region include erosion, eutrophication, climate change, coastal development, pollution, overharvesting, and unsustainable fishing and tourism practices (BOBLME, 2012; Dearden, Bennett, & Rollins, 2006; Juntarashote, 2005; World Bank., 2006). Economically, communities across the region have shifted away from fishing and towards tourism and other livelihoods. Communities on the Andaman Coast of Thailand have been reliant on fishing and subsistence harvest for survival since time immemorial and fisheries are still central to the regional economy (Panjarat, 2008). In 2001, across the six provinces of the Andaman Coast (Ranong, Phang-nga, Phuket, Krabi, Trang, and Satun) there were an estimated 621 fishing villages and 15,742 fishing households (Sielert & Sangchan, 2001). In the last few decades, however, increased fishing pressure has led to sharp declines in fish stocks in the region (Panjarat, 2008). Approximately 5.5 million tourists visit the region annually (DOT, 2009). Besides fishing and tourism, development on the Andaman coast consists primarily of resource-based industries of mining, agriculture, rubber and oil palm plantations, logging, and aquaculture.

Another significant change for many of the traditional fishing villages on the Andaman coast of Thailand - that is partially a response to environmental degradation in the region – is the creation of an extensive network of marine protected areas (MPAs) that are under the jurisdication of the Department of National Parks in Thailand. In total, there are 18 MPAs on the Andaman Coast covering an area of more than 538,000 ha (World Heritage Nomination Document, 2010). According to Prasertcharoensuk *et al.*

(2010), these MPAs were created in a 'top-down fashion' with little local inclusion or support for designation and management. Though these areas were intended to be "no-take zones" for fishers, the governance and management of the marine portion of these areas has been critiqued as ineffective (Prasertcharoensuk et al., 2010) and monitoring and enforcement of regulations is almost non-existent (Lunn & Dearden, 2006).

Climate change forecasts suggest that, by 2045-2065, climate change will result in increased maximum (+3.19^{o}C) and minimum temperatures (+3.4^{o}C), an 8% increase in precipitation, more warm days and less cool days, longer and warmer summers and shorter winters, and more intense rainfall during the rainy season (START, 2010). Sea level is expected to continue to rise between 1-2 mm a year in the Indian Ocean (Unnikrishnan & Shankar, 2007). However, a report on the Krabi province of the Andaman coast suggests that sea level could rise as much as 1.1 cm/year in the next 10 years and an average of 0.84 cm/year over the next 25 years which could result in shorelines retreating in the Krabi region between 10-35 metres/year (START & WWF, 2008). Elevated oceanic temperatures associated with a warming climate have already resulted in coral bleaching events in 1992, 1998, and in 2010. The 2010 event was the most significant to date and resulted in high levels of bleaching and mortality across the region (Phongsuwan, 2011). Esser (2010) suggests that intensified rainfall events in the region will lead to increasing sedimentation and decreased salinity, which have implications for coral reefs, sea grass, and mangroves and related livelihoods. These climate-related trends are likely to continue in the foreseeable future.

Our photovoice research was conducted in two sites along the Andaman Coast of Thailand – 1) Baan Lions and Baan Tapae Yoi on Koh Phrathong situated on the outer coast of Phang-Nga province and 2) Baan Tha Khao on Koh Yao Noi located in Ao Phang-Nga (see Figure 3; Note: Baan = village; Koh = island; Ao = bay). These villages were chosen as study sites as they had a mixture of different livelihoods but still relied on the marine environment, were situated within the environs – inside or within 3 kilometers – of an MPA, and were located near a variety of different marine ecosystem types (i.e., corals, mangroves, seagrass). These criteria were used for selection of study sites because we were seeking insight into the experience of coastal communities, rather than generalizability to the entire coast as this would require a much larger sample. The sites

selected for Photovoice were also selected from a larger sampling of 7 communities used in our broader study. According to the health center on Koh Phrathong, Baan Lions has a population of approximately 57 people who are primarily wage laborers and fishers. Baan Lions is an international NGO – i.e., Lions International - created post-tsunami village that was built after another village on the island – Pak Jok – was demolished during the 2004 tsunami. When we were in the village only about 44 of the approximately 165 houses were inhabited. In Baan Tapae Yoi, the population of 119 consists mostly of fishers and wage labourers. The people in both Tapae Yoi and Baan Lions are of Thai-Chinese and Moken ancestry and are largely Buddhist. For infrastructure, Koh Phrathong has one health center, one school, and a Buddhist monastery. Both villages on Koh Phrathong are surrounded by significant areas of mangroves and seagrass and there are coral reefs located offshore (World Heritage Nomination Document, 2010). There is a proposed national park – Koh Ra-Ko Phrathong National Park – on the island and in the marine area around the island that is strongly opposed by locals (World Heritage Nomination Document, 2010). Health center statistics from Koh Yao Noi, a more populated island of approximately 5000 mostly Thai Muslim inhabitants with 7 villages, indicate that Baan Tha Khao has a population of 407 people who work primarily as daily wage labourers, in agriculture, and as fishers. The island has small areas of seagrass and mangroves and is situated near a number of coral reef-fringed islands that are largely situated within Than Bhok Khorani Marine National Park and Ao Phang-Nga Marine National Park (World Heritage Nomination Document, 2010).

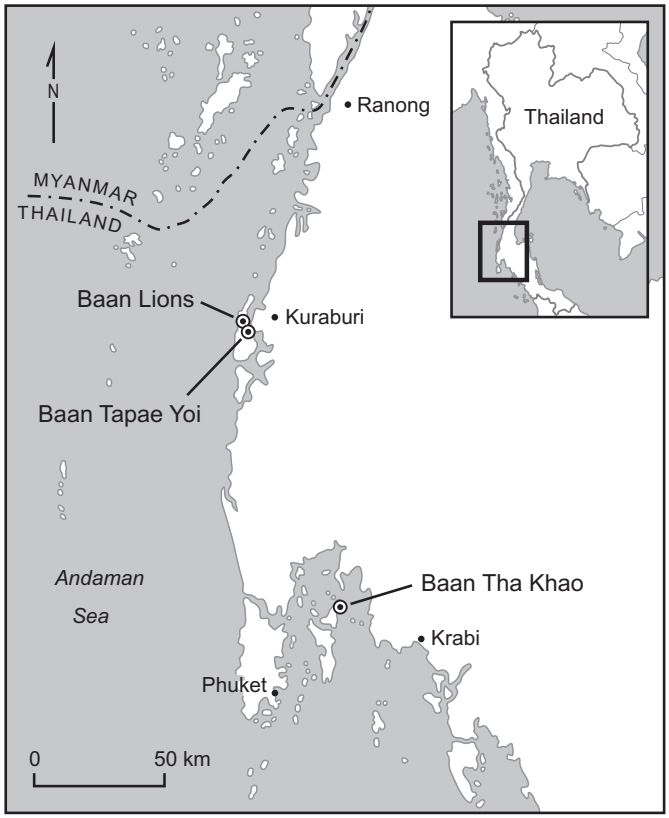


Figure 3 - Map of Photovoice study sites on the Andaman Coast of Thailand (Map credit: Ole Heggen)

The Photovoice Method

Photovoice was used to research social and environmental change in the marine environment and selected coastal communities. Photovoice uses images of the community made by people themselves thus leading to shared understanding and ownership of the research process and outputs (Castleden et al., 2008). According to Wang and Burris (1997, p. 369), Photovoice is "a process by which people can identify, represent, and enhance their community through a specific photographic technique. It entrusts cameras to the hands of people to enable them to act as recorders, and potential catalysts for change, in their own communities". Photovoice originated in public health as a method of assessing health needs (Wang & Burris, 1997) and has since been used in numerous settings and with various populations (see Hergenrather et al., 2009 for a review). The originators suggest that the goals of photovoice are threefold: "(1) to enable people to record and reflect their community's strengths and concerns; (2) to promote

critical dialogue and knowledge about important community issues through large and small group discussions of photographs; and (3) to reach policymakers" (Wang & Burris, 1997, p. 370). Photovoice has seen significant usage in health, education, psychology, and community development research; however, it is only recently emerging as a tool for examining changes in the natural environment or for exploring human environment-interactions. Several noteworthy examples include the following: Berbés-Blázquez (2012) used Photovoice to assess the relationship between ecosystem services and human wellbeing; Bosak (2008) used the process to examine conceptions of nature with communities in India; Baldwin and Chandler (2010) focused on community perceptions of climate change; and, Beh (2011) examines its usefulness for generating conservation knowledge in Kenya. A team from Lakehead University has also recently used Photovoice to explore change in several aboriginal com- munities in Canada (Lemelin et al., 2011). However, our research was the first study that we are aware of that focuses specifically on social and ecological changes in coastal communities and the marine environment.

We utilized a modified Photovoice process that was based on the steps suggested by Castleden *et al.* (2008) and included six steps that are described in Figure 4. First, participants were recruited and a Photovoice training workshop organized. During the workshop, we explained Photovoice, instructed participants on the use of cameras, and posed the central questions of the study. The questions posed were the following: 1) What changes do you see in the natural environment?; and 2) What changes do you see in your community? Secondly, the waterproof digital cameras (Note: we used Kodak's Easyshare Sport C123 Camera as they were low cost and waterproof) were given to the participants for two weeks to give them time to take photographs. We checked in periodically with participants by phone and after the first week visited participants to download the first batch of photographs, remedy any technical issues, and discuss progress. After two weeks, we collected the cameras and downloaded the photographs for printing. Third, after printing the photographs, in-depth semi-structured interviews were undertaken with participants to explore changes portrayed in selected photographs and to learn the narratives behind the photographs. Interviews were done in translation from Thai to English. Fourth, analysis of results was done through initial participatory

exploration (coding, if you will) of the changes shown in photographs and explained in each interview with each participant and then subsequent discussion of the main topics of the interviews (Gotschi, Delve, & Freyer, 2009; Wang & Burris, 1997). The topics discussed by all participants were grouped into main themes for each Photovoice processes. A final layer of qualitative analysis was done by the principal author during the writing of this paper to search for underlying or hidden themes. Fifth, books in Thai and English were produced for and with participants from each Photovoice process through presenting photographs that participants selected and excerpts from the narratives gained during the interviews. The results and translations presented in the book were verified and edited with participants and they were asked to ensure that their voices were accurately represented. Books were produced for all participants, village chiefs, and local schools (Bennett & Dearden, 2012b, 2012c). Finally, in one of the communities a workshop was held to discuss the outcomes and the implications of the Photovoice process. Our intention was to hold a workshop in the second community but our visit was ill-timed – dry season meant that everyone was working hard in fisheries, tourism, and agriculture to make money – so we were only able to meet with participants individually. As such, the substantive results presented herein are based primarily on the photographs and interviews with individual participants and do not include workshop discussions.

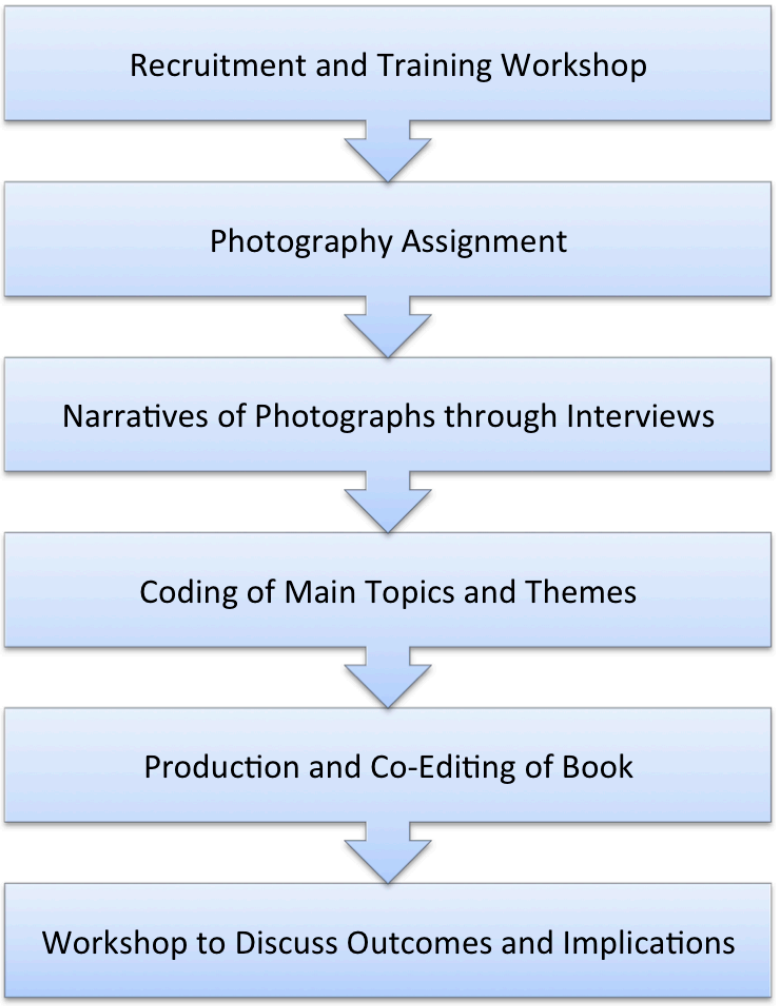


Figure 4 - The modified Photovoice process (after Wang and Burris 1997, Castleden et al. 2008)

Sampling, Selection, and Descriptive Statistics

Two research sites were chosen for the Photovoice process to represent varying livelihood mixtures, different MPA models, and different ecosystems. These villages are described in an earlier section of this article. We had originally intended to conduct a third Photovoice process in another village – one that was solely dependent on fisheries - but time constraints did not allow for this. The photovoice process was conducted with 9 individuals on Koh Phrathong – 4 from Baan Lions and 5 from Tapae Yoi - and 11 individuals in Baan Tha Khao. We used a combination of snowball and purposive

sampling to select individuals who were both a) knowledgeable about the marine environment, and b) representative of various genders, socio-economic groups, ethnicities, and livelihood groups. Snowball sampling is a process whereby an initial contact or community gate-keeper suggest possible participants who in turn make recommendations of additional respondents (Neuman, 2000). Purposive sampling allows for the selection of individuals to represent certain groups or who are knowledgeable on the topics under study and is suitable for an exploratory study such as this (Neuman, 2000).

On Koh Phrathong, 5 females and 5 males were originally selected to participate but one of the males dropped out part way through the process (due to a temporary relocation for work) and in one case a husband participated with his wife. In Baan Thao Khao, 7 males and 4 females were initially selected to participate; however, in two of the cases husbands opted to take pictures and do the interviews alongside their wives. Participant ages ranged between 20-60+ years of age on Koh Phrathong but the majority of participants were between 40-60 years of age in Baan Tha Khao. The generally higher age of the participants in Baan Tha Khao is related to declines in fish and fisheries-based livelihoods and the out migration of youth. Livelihoods of participants ranged from solely fishing, to marine-based tourism, to a mixed portfolio of livelihoods. Participants took between 16 and 176 photographs. The length of the interview ranged between 26 minutes and 4 hours and 27 minutes. Several of the longer interviews took place over several sessions.

Before proceeding with our discussion, we want to recognize the limitations of our process which include our limited sample sizes in both communities, the time of year when the research happened (rainy season), and the limited timeframe spent on this aspect of the research. Though more than a month was spent conducting the research in each community and an additional month was spent doing transcription, analysis, and editing the book for each community, this still felt like a limited amount of time. The results presented here are illustrative and not representative due to the purposive and snowball sampling methods used. Finally, a significant limitation of our application of the Photovoice method is related to, in one case, only a brief concluding workshop and, in the other case, no concluding workshop. Previously recognized challenges and

limitations of the Photovoice method include length of the process, participant retention, and seasonality and weather (Castleden et al., 2008). There can also be challenges associated with portraying intangibles as there are limits to what is observable (Castleden et al., 2008; Rose, 1993). Just as Photovoice can facilitate learning and action, various factors including class, race, age, and gender can influence what pictures are taken (Prins, 2010).

Results

This following section of this paper explores the results of the Photovoice process in three sections: 1) environmental change, 2) social changes, and 3) underlying themes.

Environmental Change

Photographs taken by participants explored a number of themes related to changes in both the marine and terrestrial environment. The changes can be seen as trends, and overviews from both sites are presented in Table 3. There were a number of similarities between the sites. In both sites, environment oriented photographs and narratives focused on declines in fish and other marine species (Figure 5a), increases in erosion on the islands, the impacts of tourism development on nature, and the conservation areas created by the communities. One participant noted how “In the past, I got 100 kilograms of silago per day with no nets. Now it takes more than 10 days to get that many. Now, it is around 10-20 fishes a day. I get a maximum of 10 kilograms.” (Figure 5b). Some participants suggested that the declines were because “Lots of people make a living [from fishing]. There are more humans than fish” and several others blamed the change on commercial boats coming into the area or the use of destructive fishing gears.

Table 3 - Environmental changes portrayed during the Photovoice process

Site A – Baan Lions and Tapae Yoi	Site B - Baan Tha Khao
• Declining fish and other species • Changes in the island forest after the tsunami • Increasing erosion around the island • Erosion in front of community from removing mangroves • Shifts in species composition and arrival of new species • The seagrass areas are more patchy • Increasing mangroves and related resources • Changes in rainy and dry season • More storms • Marine species are dying from too much freshwater • Increasing algal blooms and coral bleaching • More development will cause nature to decline • Island deer are increasing	• Decreasing fish • Increasing erosion • No time for nature to recover • Impacts of tourism on nature • Less damaging fishing gear • Artificial reefs in the ocean • More garbage • Disappearing species of fish • Dead coral on the beach • Less big fish • Community is doing conservation

A number of different themes also emerged from the two Photovoice processes. In Baan Tha Khao, photographs also concentrated on increases in garbage in the ocean and on land (Figure 5c), the negative impacts of artificial reefs in the ocean on fishing gear, the environmental benefits of switching to less damaging fishing gears, and dead coral washing up on the beach. Participants in Baan Tha Khao also explored not only declines in the number of fish but also how there were "less big fish" and how many species of fish were disappearing or going extinct. For example, one participant said "These are big fish. We used to get 20 for a boat. Now we only get 3 of that size." while exploring a picture that he had taken (see Figure 5d). One participant discussed how different species of grouper were disappearing as a result of being targeted for aquaculture and food: "Species of fish do disappear. I am almost 50 and I have seen this change clearly. There are many species in the grouper family and some of them have disappeared….Fish have no time to reproduce….The small ones are sold to aquaculture. The big ones are sold to

middlemen…Groupers are a species that do not migrate." Another participant explored how they don't catch as many of certain species and how some species might be facing extinction: "Some of them we do not catch so much anymore – for example, the "Japanese fish" (i.e. redbelly yellowtail fusilier) and the "goat fish" (i.e. cory catfish). There also used to be more varieties of different fishes. You cannot count them all. Many of them have decreased, including brown marbled grouper, red mouth grouper, goldband fusilier, and whipfin majora." Later in reference to another picture, the participant stated "There used to be lots of them. It raises fears that it might be going extinct."

In Baan Lions and Baan Tapae Yoi, participants explored changes in the density of seagrass bed, post-tsunami impacts on the island's forest, the increased density and abundance of mangrove forests in the area due to the ending of charcoal concessions (Figure 5e) and how this had resulted in increases in marine resources from mangrove ecosystems (e.g., certain species of crabs, oysters, and fish), increases in the number of deer on the island, the arrival of new species in the area, and shifts in the number of certain species relevant to before. For example, one participant showed how one species of starfish was increasing in number (Figure 5f) and also how a new species of sponge started growing in the seagrass meadows after the tsunami. In Baan Lions and Baan Tapae Yoi, there were also a number of climate related changes that were mentioned including changes in rainy and dry season, more storms, increasing algal blooms and coral bleaching, and dying species in the mangroves from too much freshwater. There was only one mention of each of these climate-related themes whereas most of the other themes had multiple mentions. Erosion, an often mentioned change, might also be related to climate change and sea level rise.

Figure 5 - Pictures portraying ecological changes in the marine environment taken by Photovoice participants. Moving clockwise from the top left corner - a) There are less marine resources, b) In the past there were lots of fish, c) The community is not prepared for garbage, d) There are less big fish, e) If the mangroves survive then the community survives, and f) An increasing number of this seastar

Social Change

An overview of the social changes that emerged from the Photovoice process is presented in Table 4. A number of consistent themes related to social change emerged across the two research sites, including declines in fishing livelihoods (Figure 6a), increasing participation in tourism and rubber plantations, the presence of supplementary livelihood workshops (particularly for women) in the communities, increasing conveniences and technologies for doing livelihoods, and the impacts of migration and population growth. The actual or potential impacts of the existing or proposed national parks on fishing and harvesting were also discussed by participants in both sites. For example, in Baan Tha Khao one participant showed us a picture (Figure 6b) and explained “To make a living from the sea, it is not as flowing as it was before. The

national park does not allow people to make a living from the sea. On the island, they don't allow people to enter to collect shells….They want to protect it for when the tourists come." However, there were more differences than similarities between the communities on themes related to social change.

Table 4 - Social changes portrayed during the Photovoice process

Site A – Baan Lions and Tapae Yoi	Site B - Baan Tha Khao
• Shifting to different types of fishing and declining fishing livelihoods • Supplementary livelihoods programs and workshops • Declines in traditional practices and knowledge • No more tin mining or charcoal concessions • Declining aquaculture in the community • Increasing tourism development and livelihoods • Outmigration of locals and in-migration of Burmese • Possible creation of a national park • More sharing and unity • People continue to live simply and from the sea • The change from Pak Jok to Ban Lions after the tsunami • Discovering new uses for plants and species • People come to the island to collect plants and animals • New infrastructure was built after the tsunami • Communities are trying to conserve natural resources • More convenient ways to travel • Expansion of plantations on the island	• Declining fishing livelihoods • Increasing rubber plantations • Declining civic engagement • Creation of the national park • Increasing tourism impacts • Supplementary livelihoods for women • More people moving into the area • More infrastructure • Changing fishing gears • Market prices for fish have increased • More engagement with market economy • Youth are more educated and moving away • More commercial fishing boats • Land is being sold to outsiders • Changing governance structures • Muslim traditions are unchanging • New technologies and conveniences

In Baan Lions and Baan Tapae Yoi, photographs taken by participants also focused on shifts to different types of fishing, the loss of previous developments - tin mining and

charcoal concessions - in the area, declining participation in aquaculture in the community, and declines in traditional practices and knowledge. Two areas where there were declines in traditional knowledge and practices were regarding to finding seafood to harvest and making shrimp paste. One participant explained about her photograph (Figure 6c): "I wanted to show how to look for conch. This is the trace of a dog conch. This is where the mouth comes out. Some people only look for the exposed ones...The new generation does not know how to look for traces like this." Another participant used a series of photographs (Figure 6d) to show the way that shrimp paste was made explicating that before "almost every household would [make shrimp paste]. It is a short-term livelihood but good income. Now, there are less people doing it because there are less krill and shrimp and many people don't know how to do it. The main reason is the loss of methodology." Several post-tsunami changes that were photographed and discussed in Baan Lions and Baan Tapae Yoi included the change from one village to the other, the new infrastructure that came with post-tsunami re-building programs, and the out-migration of local people to post-tsunami villages on the mainland. Several participants also noted the impacts of the post-tsunami funding and developments on levels of social conflict and social life in the community. For example, one participant noted about life in the post-tsunami community of Ban Lions (Figure 6e): "The Lion Foundation built the village and named the village after the foundation. It is good that they built the houses. But there are not enough people for the houses. They are close together and noisy….Life is framed differently in Baan Lions. It is like a gated community in Bangkok. In the old village, you had houses near the sea and when you walk along there are houses along the way." According to one participant, the social conflict was related to corruption due to the influx of financial capital into the region for development projects but since the "corrupt money" had disappeared there was "more unity in the community" (Figure 6f). Participants also expressed concerns about the negative environmental impacts that would come with increasing tourism development in the area.

Through the Photovoice process participants in Baan Tha Khao noted declines in civic participation, changes in regional governance structures, and the impact of tourism on social norms in the community. One participant who drove boats for tourists used a

distant photograph of women in bikinis on a beach (Figure 6g) to explain how it impacts on Muslim culture: “Tourism is a change from the past. It is true that having lots of visitors brings work for villagers….A change is the naked Farang [foreigner]. Thai people tend to follow the trend. People on this island, the culture, trends to become like [foreigner] culture. This is a subject that is worrying, don’t you think? People have started to dress like the Farang [foreigner], teenagers. Most people on this island are Muslim. Muslim people pray on Fridays. For tour guides, they don’t get to go to the mosque on Friday.” A number of participants also commented on the social changes – including less sharing in the community - associated with increasing engagement in the market economy resulting from: a) new and different livelihoods that relied directly on the economy (e.g., tourism), b) increased costs of living combined with more material desires, c) increases in prices that you can sell fish, and d) declines in fish catches. One participant commented about his photo (Figure 6h) that “There are more expenses. Everything has to be bought….It all requires money. So instead of sharing [fish], people sell it.” Another photograph was used to show how “Before, you would collect shells and just give them away to your friends. But now, everything has a price.” Participants also expressed their concerns about the permanent outmigration of youth who were going elsewhere to get educated and also and outsiders coming into the area to buy land. Despite all of the other changes, one participant showed a picture of a Muslim ceremony and commented that Muslim traditions were strong and unchanging in the community (Figure 6i).

Figure 6 - Pictures portraying social changes in the communities taken by participants. From left to right – Top row: a) There are less fishing boats in the canal, b) National parks does not allow collecting, c) The trail of a dog conch, Middle row: d) Less people make shrimp paste now, e) Life is framed differently in Baan Lions, f) More unity in the community, Bottom row: g) The impacts of tourism, h) Everything has to be bought, and i) Muslim traditions will not change

Underlying Themes

There were also a number of significant underlying themes that emerged during the participants' descriptions of their photographs including: 1) the impact of ecological changes on social changes and vice versa, 2) the impact of macro-scale processes on local outcomes, 3) the powerlessness felt by local people to address some changes, 4) a sense of hopelessness and sorrow at the loss of fish and fisheries livelihoods, and 5) discussions of resistance to, and adaptation to, changes through local actions.

The impacts of environmental or ecological change can also be felt in the social sphere of the community's life and vice versa – a number of these "socio-ecological"

changes were described during the Photovoice process. First, participants showed and discussed how a number of environmental changes led to social changes within the community and beyond. In Baan Tha Khao, participants felt that declines in fish had led to rises in the prices of fish, fewer livelihoods in fisheries, and declines in sharing within the community. On Koh Phrathong, lower abundance of shrimp and krill was said to have resulted in declines in the number of people doing traditional practices such as making shrimp paste. On Koh Yao Noi, declining fisheries was resulting in less time for fishermen to stop and have lunch together at sea as they needed to rush home and do other livelihoods in the afternoon (Figure 7a). Both smaller and less abundant conch, sea cucumbers, and other subsistence seafood was noted as a rationale for the communities to create small no-take zones in seagrass meadows on Koh Phrathong and no cutting zones in mangrove forests on Koh Yao Noi. Increasing numbers of mangroves were seen to be resulting in higher abundance of harvestable species in mangrove areas, which had a positive impact on the communities on Koh Phrathong. One participant in Baan Lions discussed how more numerous storm events and changes in the rainy and dry season had negative impacts on the livelihoods of fishers, both on the number of days that fishers were able to fish and on the amount of gear that was lost.

Second, social changes were seen to have environmental implications. For example, increases in the amount of tourism and in conveniences and technology were both discussed as resulting in increased amounts of garbage. Declines in fish and fisheries were attributed to changes in the number and efficiency of gears used by fishers, overall increases in the numbers of fishers which did not allow time for stocks to recover, and the number of commercial fishing vessels that were fishing illegally in inshore waters and zones reserved for small-scale fishers (Figure 7b). Some socio-ecological changes were discussed as being cyclical. For example, declines in fish resulted in increasing prices while increasing prices stemmed from more fishing pressure and declines in fish. There were also complex flows of causality across social and environmental spheres that were discussed by participants. For example, one participant on Koh Yao Noi discussed how declines in fisheries had resulted in a greater need to do agriculture and plantations and that this was leading to the destruction of island forests.

An important underlying theme was the uncontrollable impact of macro-scale processes – such as population growth, migration, economics, development, and governance - on local outcomes. For example, the impact of a) population growth at a regional level (e.g., in Ko Yao Noi island communities and in villages within Ao Phang-Nga Bay) and of b) centralization of fishing efforts in, and migration of fishers towards, larger regional centers (e.g., Phuket and Krabi) on fishing pressure and the abundance of marine resources was noted by a number of participants. For example, many participants in both sites made statements such as "There are more humans than fish.", "The sea is never without fishers.", "People come from both sides to collect", and "People come from all over." This was seen as partially to blame for declines in fishing livelihoods within the communities. The impact of macro-economics and market prices beyond the community also impacted on both the price at which people could buy items necessary for livelihoods and the price at which people could sell their products. Participants commented that the price of nets had risen significantly. The price of buying feed – in the form of non-marketable fish from fishing piers - for doing cage aquaculture had also risen, participants on Koh Phrathong felt, because there were more cage aquaculture farmers and thus more demand for feed. It may be that this was also related to smaller fish becoming more economically valuable for other purposes. Market prices for selling rubber and fish were also constantly changing and having large positive or negative impacts on household incomes. Participants did not understand why and how market prices could change so drastically. The creation and management of national parks was discussed as an example of how governance decisions were made beyond the community and that the community did not have any input or control over these decisions. Cross-scale interactions that flowed in the opposite direction – i.e., from the local scale to higher levels - were not mentioned by participants. There were no photos or discussions of how changes at the community level influenced regional or national social or environmental outcomes.

There were several emotive and active responses to the changes that were happening that were discussed by participants of both Photovoice processes that emerged during analysis. First, there was a feeling of powerlessness and hopelessness associated with the aforementioned macro-scale processes and also environmental changes and fisheries

declines. Many participants felt that nothing could be done about declines in the numbers of fish because of several factors, including a) the numbers of fishers and level of fishing pressure, b) lack of adherence to rules and increasing numbers of commercial boats coming into restricted areas, c) the inability of communities to make rules for their fisheries because it remained an open access resource, and d) the lack of capacity of local fisheries officers to enforce rules. Participants also explored how they felt powerless about the increasing number of areas that they could not access or use for livelihoods purposes, including the area contained in the national park and areas purchased by outside religious groups and business people or investors for tourism development or agriculture. As one participant comments: "It is a shame that pieces of land are in the hands of outside businessmen. In Baan Tha Khao, about 40% of the land does not belong to locals….It is a big change from having land to renting houses. For some people, it is probably necessary to do so. But I think it is better to keep the land to make a living for the next generation."

Second, there was a sense of sorrow or mourning associated with the social or community changes associated with fisheries declines. This emotion was apparent in narratives about the loss of fisheries-based livelihoods (Figure 7c), decreases in the number of fishing boats in the community, changes in traditional social structures in the community, loss of traditional knowledge, the lack of participation of youth in fisheries, and the outmigration of youth to get educated.

Finally, participants explored some active changes that represented local adaptations or resistance to the other changes that were happening. As fisheries declined and household expenditures increased, participants explored how people were adapting through engaging in alternative livelihoods such as tourism and desert making (Figure 7d) and also through doing activities associated with the King of Thailand's concept of a "sufficiency economy" such as raising livestock and making gardens (Figure 7e). One participant suggested that to address the increased cost of living people have to "adapt themselves according to the changes that happen" through working harder but also through curbing spending, sharing more, and living within one's means. In both communities, participants discussed the creation of small conservation areas as means of resisting declines in marine species and outside encroachment into the area. Results also

revealed that for a number of participants there was a sense that activities such as "continuing to live simply" (Figure 7f) and maintaining Muslim traditions (Figure 6i) were means of resisting the disruptive power of unwanted social change. All of the means of addressing change through adaptation or resistance that participants mentioned were local-scale or community-based solutions that often did not match the scale of the change that they were addressing.

Discussion and Conclusion

This article presented the results of a community-based Photovoice project conducted on the Andaman coast of Thailand. Our goals were to explore the broader array of changes that were facing communities, to understand how environmental change and decline were impacting on communities in the region, and to re-examine the centrality of climate change within a research project focusing on adaptive capacity. This concluding section discusses the results in light of these goals, and the prospects of the Photovoice method for future research and applied projects in the area of conservation and/or development.

First, Photovoice was a useful process for understanding the broader array of changes that were facing the communities. The environmental results from the Photovoice process were largely confirmatory of what we already know from scientific studies about environmental change and decline in the region. For example, we already know that fishing capacity is too high and that fish are in decline in the region (Panjarat, 2008). This demonstrates that Photovoice can provide an important form of triangulation for scientific and quantitative studies. More interesting perhaps are the ecological specifics that emerged from the Photovoice process, such as the near extinction or disappearance of specific species in Ao Phang-Nga, the declines in groupers from aquaculture in Ao Phang-Nga, the increases in certain species of starfish in the seagrass meadow on Koh Phrathong, and the appearance of new species after the tsunami on Koh Phrathong.

Figure 7 - Pictures portraying underlying themes of socio-ecological change, macro-scale processes, powerlessness, sorrow, and local-scale responses to change. From left to right. – Top row: a) Traditional way the fishers would eat lunch, b) Many anchovy boats come in; Middle row: c) Many fish are declining or disappearing, d) Making deserts to sell; Bottom row: e) The King's sufficiency gardens, f) Continuing to live simply.

The social results often focused on changes that were particular to that one community – such as the way that life has changed in Baan Lions or how there is "less time to sit and talk" in Baan Tha Khao. However, some generalizable themes related to changes that were happening in all of the communities were also discussed, including changes in livelihoods, impacts of the national park, and effects of declines in fisheries. Moreover, we felt that the Photovoice method was a good way to explore the complexities of environmental change, the particularities of social change, and the intricate interplay between all of the changes that are happening within communities and regionally. Often at the end of the Photovoice interview, participants would tell us that it was better to talk about change through taking photographs and then using the photographs as a point of reference for discussion than just through talking about change. Participants commented "Like this you [the interviewer] can see it too." and "Now I know more about the changes that are happening." Throughout our broader research project, we also used in-depth interviews to explore the question of social and ecological change with people. Answers during the interviews were often quite short and participants might only provide one or two examples. The results of the Photovoice process were much richer, more varied, and more in-depth.

Second, Photovoice was a good way to examine the interaction between environmental change and decline and the social sphere of communities. As discussed previously, participants often discussed how fisheries declines changed livelihoods, prices of fish, and the social institutions in the community. The implications of degraded ecosystems and habitats were also discussed. For example, pictures were taken that showed the declining density of seagrass and participants explained how this had a negative impact on conch and sea cucumber and how this made it harder for the community to find seafood to harvest. Similarly, mangroves were shown to be important for erosion control and as a source of food – as one participant noted: "If the mangroves survive, the community survives." Coral reefs were also mentioned important habitats for fish and as places for tourists but no participants took pictures of coral reefs even though they were given underwater cameras. This could have been partly because of the further distance required to travel to the coral reefs or because the cameras only had a maximum depth of 9 feet.

Third, potential environmental impacts arising from climate change did not feature significantly in results emerging from the Photovoice process. Many participants did mention increased erosion in both communities although this was often attributed to local removal of trees or the tsunami. One participant on Koh Phrathong discussed increases in storms and changes in rainy and dry season. Another participant mentioned increases in algae and the impact of this on coral reefs. Yet, overall, the limited amount of discussion given to climate change emerging from the Photovoice process was surprising to us. Interviews and surveys were also conducted in the same communities. Many climate change impacts, particularly storm events, erosion, and changes in seasons, were discussed by participants in interviews. These same three climate-related changes were also ranked highly in surveys (unpublished data). Why these changes did not get as much attention during the Photovoice process could be attributed to the difficulty of photographing these concepts or to the ideological distance of these changes from everyday life. Or, perhaps, climate-related changes are simply not as central to people's qualitative narratives of their environment and their communities in this context.

In conclusion, our research suggests that Photovoice is a powerful method for examining social and environmental change and that results emerging from the process are useful inputs into community dialogues about natural resource management, conservation initiatives, and community adaptive capacity and development. The communities with whom we worked felt that the process was valuable, trusted in the legitimacy of the ideas and knowledge portrayed, and were satisfied with the outcomes. Participants in Baan Thao Khao said that they wanted to do "more of this type of research." However, we want to recognize that, as with most methods, it is preferable to combine Photovoice with other methods to get a more complete picture. Photovoice is also likely to be more effective as a catalyst of change if it is done over a longer timeframe and in an iterative manner as suggested by Castleden *et al.* (2008). In our research, a more effective concluding workshop that explored ways of addressing unwanted changes would likely have added to the power of the Photovoice process. Yet, the Photovoice books produced with the communities (Bennett & Dearden, 2012b, 2012c) also fulfilled part of the role of these workshops through consolidating the knowledge gained from the process and creating shared understandings (Baldwin, 2012;

Baldwin & Chandler, 2010). We also want to recognize that in real-world, community-based and participatory research, prescribed multi-stage processes such as Photovoice should not limit our reflectivity and flexibility because "it is ethical and logical to consult with research subjects and adapt to situations arising in the course of the research" (Sadoway, 2002, p. 35). Books - rather than workshops - were chosen by the participants as an output. Perhaps the most effective and constructive way to use Photovoice would be as part of long-term ongoing conservation, development, or climate change adaptation projects by organizations that are deeply involved with, and committed to, a community so that results and outputs will have immediate and enduring utility for communities and practitioners. Academic researchers are thus likely to be the most useful to communities if they integrate into local community-based organizations and non-governmental organizations when conducting Photovoice.

Chapter 3

Vulnerability to Multiple Stressors in Coastal Communities: A Study of the Andaman Coast of Thailand[2]

Abstract:

Vulnerability and adaptation to climate change has become a dominant theme in development and conservation research and work. Yet, coastal communities are facing an array of different stressors that affect the sustainability of natural resources and the adaptive capacity of local residents. The ability of communities and households to adapt is influenced by the nature, number, and extent of the changes with which they have to contend. In this paper, we present the range of 36 socio-economic (i.e., economic, social, governance and conflict) and biophysical (i.e., climate change and other environmental) stressors that emerged from qualitative interviews in 7 coastal communities on the Andaman coast of Thailand. These stressors were then integrated into a survey of households wherein participants were asked to rate the level of impact of these stressors on household livelihoods. Ratings showed that economic and some climate change stressors – extreme weather events and changes in rainfall patterns and seasons – were scored higher than other stressors. The paper also examines the relationships between community and various individual and household characteristics – such as gender, age, livelihoods, levels of social capital, and socio-economic status - and the perceived level of impacts of various stressors on household livelihood**s.** Overall, community and livelihoods had the most differentiated impacts on perceptions of stressors. In conclusion, this paper discusses the implications of the results for current climate change adaptation policy and practice in Thailand.

Keywords: Multiple stressors, vulnerability, exposure, climate change, socio-economic change, coastal communities

[2] This chapter has been submitted for review with co-authors Philip Dearden and Ana-Maria Peredo

Introduction

Climate change related events, including ocean warming, sea level rise, more intense storms, storm surges, changes in ocean circulation, and ocean acidification, threaten the health and productivity of marine ecosystems and the well-being of coastal communities (Brierley & Kingsford, 2009; Hoegh-Guldberg & Bruno, 2010; Parry & IPCC, 2007). Coastal and island communities are particularly vulnerable to the impacts of climate change due to their direct reliance on the goods and services provided by marine ecosystems, the proximity of houses and infrastructure to rising seas and extreme weather events, and the increasing unpredictability of weather patterns. For this reason, a significant amount of attention has been paid to climate change vulnerability and adaptation policy and practice relating to this context (Klein & Patt, 2012; Marshall et al., 2010; McClanahan & Cinner, 2011; USAID, 2009; Wongbusarakum & Loper, 2011).

However, the climate change adaptation discourse has become so dominant in conservation and development policy and practice that practitioners and policy makers may neglect to incorporate the wide array of stressors that are facing coastal communities. The stressors facing coastal communities, and associated ecosystems, include social, economic, institutional, political, demographic, livelihood, and other environmental changes (see Perry et al., 2010; Zou & Wei, 2010). Many authors have argued that it is important to understand the interactions between global environmental changes, including climate change, and other social, economic, and political changes occurring at multiple spatial and temporal scales in order to create effective adaptation policy (e.g., O'Brien & Leichenko, 2000; Silva, Eriksen, & Ombe, 2010; Turner et al., 2003). Hjerpe and Glass (2012, p. 471), for example, state that the omission of socio-economic stress "leads to critical weakness in local adaptation strategies". A nuanced understanding of the multiple stressors facing communities can allow for the design and prioritization of adaptive strategies to address one or more stressors in order to reduce overall vulnerability of communities.

Similar to elsewhere in the world, coastal communities on the Andaman coast of Thailand have experienced rapid social, economic, environmental, and climatic changes, which will be described in detail later in the paper. It is within this context of rapid socio-economic and biophysical change that the current study was conducted. This particular

study is part of a broader project that explores the impacts of climate change on communities, the relationship between local communities and marine protected areas, and the adaptive capacity of communities. In order to set the context for explorations of adaptive capacity and to understand how significant climate change is perceived to be, we explored the broader array of changes and stressors that communities are experiencing. This paper focuses on qualitative perceptions of the stressors that communities are exposed to, quantitative perceptions of how sensitive households are to these stressors, and potential differential impacts of stressors across communities, households, and groups.

The paper proceeds as follows. First, it briefly reviews theory from the extensive literature on vulnerability, including an introduction to exposure, sensitivity, and adaptive capacity, and describes the context and study sites. Subsequently, we explain the methods used in this study including interviews and surveys followed by an examination of qualitative descriptions of stressors from the interviews, quantitative ratings of stressors from household surveys, relationships between community and household and individual characteristics and perceived impacts. In conclusion, we discuss the implications of these results for climate change adaptation policy and practice related to both development and conservation.

Theory – Vulnerability to Multiple Stressors

Recent academic and applied literatures on global environmental change, marine conservation, and fisheries have focused extensively on vulnerability (Adger & Kelly, 2001; Füssel, 2007b; McClanahan & Cinner, 2011; Parry & IPCC, 2007). Current conceptualizations of vulnerability are rooted in Amartya Sen's perception of vulnerability as entitlement failure (Sen, 1982) or in earlier natural hazards research (see Adger, 2006). Vulnerability is currently viewed in several ways. In the first view, the focus of vulnerability analysis is on the "end-point" impacts of climate change and the effectiveness of adaptation measures (Ensor & Berger, 2009; Kelly & Adger, 2000). The goal of this approach is to estimate and reduce the costs of climate change impacts.

The second view of vulnerability emphasizes the "starting point" through examinations of the characteristics of households, communities, or regions that make them susceptible to change. For example, Vogel (1998, p. 15) saw vulnerability as a "function or characteristic of people and groups that influences their capacity to anticipate, cope with, resist, and recover from the impacts of change" and the IPCC defines vulnerability as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change" (McCarthy & IPCC, 2001, p. 995). These and similar definitions of vulnerability position it in such a way that it is either akin to or the flipside of adaptive capacity (defined below).

The third way of seeing vulnerability is more comprehensive and integrated – conceptualizing vulnerability as a function of interactions between three elements: exposure, sensitivity, and adaptive capacity (Adger, 2003; Marshall et al., 2010; Tuler et al., 2008; Turner et al., 2003). Vulnerability is seen as depending partly on exogenous change occurring at various scales and partly on localized social capacity and technical infrastructure (Eakin, 2005; Leichenko & O'Brien, 2008). In this view, *exposure* refers to the presence of and extent to which stressors – various changes occurring at different scales that cause stress – are experienced by a region, resource, or group (Marshall et al., 2010). *Sensitivity* is the degree to which a system is affected by or harmed by exposure to a stressor (Marshall et al., 2010; Tuler et al., 2008). Turner et al. (2003) suggest sensitivity is related to local social and environmental conditions. The combination of exposure and sensitivity define the potential impact of a stressor (Figure 8). *Adaptive capacity* – which determines the ultimate impact of a stressor or the overall level of vulnerability - can be defined as "the ability to respond to challenges through learning, managing risk and impacts, developing new knowledge and devising effective approaches" (Marshall et al., 2010, p. 5). An integrated view of social vulnerability requires an understanding of exposure - the types and extent of stressors that are facing the system - to inform assessments of adaptive capacity and adaptation plans (Brklacich et al., 2010). In other words, comprehensive vulnerability assessments require examinations of "how?", "why?", and "to what?" people and communities are vulnerable.

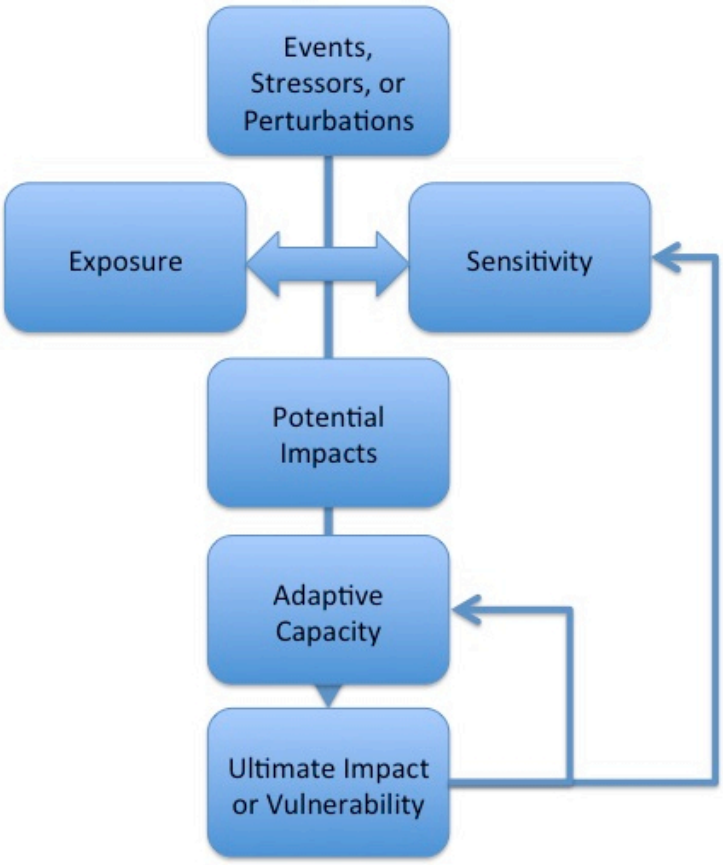


Figure 8 – Vulnerability as a function of exposure and sensitivity to stressors and adaptive capacity (Adapted from Turner et al. 2003; Marshall et al. 2009)

The impacts of biophysical and socio-economic stressors are often examined in isolation (Reid & Vogel, 2006). Yet, there is broad recognition that communities are undergoing a wide array of changes – social, cultural, economic, political, and environmental (Zou & Wei, 2010). Coastal communities are also particularly sensitive to the impacts of climate change, which has led to increasing storm events, storm surges, and erosion and impacts on infrastructure, saltwater intrusion into freshwater areas, impacts on ecosystems and species that are important for livelihoods, and changes in seasons and rainfall patterns leading to less predictability (see McClanahan & Cinner, 2011). Explicit recognition of multiple stressors and socio-economic stress is essential for successful adaptation planning and policy (Hjerpe & Glaas, 2012). The theory of "double exposure" recognizes that there are multiple stressors that are simultaneously impacting

individuals, communities, groups, or sectors and interacting to produce both positive and negative outcomes (Leichenko & O'Brien, 2008; O'Brien & Leichenko, 2000). Most work in this area focuses on the dual impacts of stressors related to economic globalization and global environmental change (Eakin, 2005; Leichenko & O'Brien, 2002; O'Brien et al., 2004). However, some authors apply the term more loosely to refer to the coupled impacts of global environmental change and any other socio-political changes that are occurring or simply discuss *multiple stressors* (Bunce, Rosendo, et al., 2010; Mubaya, Njuki, Mutsvangwa, Mugabe, & Nanja, 2012; Reid & Vogel, 2006). Double exposure theorists also argue that there are differential impacts of stressors – i.e., that some individuals, groups, households, or communities may be more or less exposed to, sensitive to, or able to adapt to one or multiple stressors (O'Brien & Leichenko, 2003; Tuler et al., 2008).

In proposing the "double exposure" framework, Leichenko and O'Brien (2000) identified the need for both qualitative and quantitative analysis on exposures including case studies, comparative work, and cross-scalar examinations. Though a growing body of work on multiple exposures and double exposure has emerged since 2000 (e.g., Mubaya et al., 2012; Paavola, 2008; Silva et al., 2010), Zou and Wei (2010, p. 919) suggest that there is still a "tremendous gap between conceptual theoretical work on vulnerability and empirically based case studies." Indeed there are still relatively few examinations of how global environmental changes are experienced by local social systems, individuals, or communities with the focus instead being on clarifying uncertainties in global to regional models (Barnett, Matthew, & O'Brien, 2010), which "capture neither the complex experiences nor the uneven distributions of vulnerabilities within heterogenous communities" (Brklacich et al., 2010, p. 47). Bunce et al (2010, p. 408) also argue that "There is a critical need to investigate and illuminate how these multiple stressors may affect the ability of households and communities to respond to climate change, and how it will affect their ability to secure and sustain livelihoods, future well-being, and life opportunities." These authors all argue for increased focus on place-based analysis and echo earlier writings suggesting the need to focus on the perspectives of "the vulnerable" (Chambers, 1984, 1995; Eakin, 2005). Holistic understandings of vulnerability have also lead social scientists to explorations of human

perceptions (Brklacich et al., 2010). A focus on local perspectives in vulnerability and adaptation research is apposite since perceptions of risk can determine adaptation or coping measures and lead to actions to reduce risk (Mubaya et al., 2012; Tuler et al., 2008). Furthermore, a focus on structural causes, impacts, or responses to change suggests a passive or static understanding of vulnerability – which deemphasizes human agency and the role that this plays in mediating and responding to stressors or changes. Differentiating between the perspectives of different groups is also important for understanding how they are differently impacted by change.

Context

Andaman Coast of Thailand

Coastal communities on the Andaman coast of Thailand have experienced rapid socio-economic and biophysical changes over the last few decades due to a variety of factors. The 500-kilometer stretch of coast, situated between Malaysia and Myanmar on the Bay of Bengal and encompassing approximately 116,000 km^2 of marine area is recognized as being ecologically significant and high in biodiversity and productivity with important areas of seagrass, coral reefs, and mangroves (Juntarashote, 2005; World Bank, 2006). The six coastal provinces on the Andaman coast were home to over 2 million people living in several larger centers and over 1800 villages, including 621 fishing villages (Panjarat, 2008). Livelihoods in the region consist mainly of fisheries, agriculture and plantations, and tourism.

At a national level, Thailand has experienced rapid economic growth and expansion of industries with annual growth of exports exceeding 30% annually during the 1990s and rapid growth of foreign investments (Leinbach & Ulack, 2000). According to the World Bank, Thailand's Gross National Income (GNI) per capita has risen from US$1870 in 1992 to US$4420 in 2011 (World Bank, 2012). The 2004 *Millennium Development Goals Report* for Thailand shows that overall well-being has rapidly improved – particularly in the areas of poverty, gender equality, HIV/AIDS, and malaria - but points out that disparities persist and that rural regions in particular still need improved infrastructure, education, and health programs (UNDP, 2005). Partially as a

result of economic growth and opportunity, Thailand, like much of Southeast Asia, has experienced rapid urbanization and internal migration and in-migration (Leinbach & Ulack, 2000). Politically, recent years have seen a significant number of changes of power in Thailand - which has often resulted in political unrest and demonstrations in Bangkok (Baker & Phongpaichit, 2009).

Rapid economic and population growth in Thailand has long threatened the health and productivity of the environment (Rigg, 1995). The main threats to the marine environment on the Andaman Coast include degradation of habitats, overexploitation of resources, and pollution (BOBLME, 2012). Extensive commercial fisheries and small-scale fleets that serve both domestic and international markets have lead to overfishing for the past few decades and caused fisheries declines in territorial seas on the Andaman (see Panjarat, 2008). Partially in response to changing environmental conditions, a system of 18 marine protected areas under national jurisdiction were created in this area (World Heritage Nomination Document, 2010). Alongside the other environmental changes, climate change is already having very real impacts in the region and it is projected that climate change impacts will increase. For example, Thailand's coral reefs have experienced coral bleaching events in 1991, 1995, 1998 and in 2010 a severe coral bleaching event resulted in between 25-99% mortality of corals across reefs in the region (Phongsuwan, 2011). Regional models and forecasts suggest that climate change will result in increased maximum and minimum temperatures (greater than 3^0C), more warm days, increased precipitation (8%), more intense rainfall in the rainy season, and longer dry seasons (START, 2010). Sea level is expected to rise by 1-2mm annually (Unnikrishnan & Shankar, 2007).

Study Sites

Seven communities were chosen for insight on the basis of the following criteria: proximity to a marine protected area, diversity of livelihood portfolios and levels of dependence on fishing, and proximity to a variety of marine habitat types including mangroves, coral reefs, and seagrass areas. All of the communities chosen were on islands. Financial and temporal feasibility were also taken into account when choosing

the number of communities and the choice to conduct an insight-based rather than a generalizable study. The multiple-case study approach used in this study allowed for a comparison of households and communities with different livelihood mixtures, ethnic backgrounds, and ecosystem dependencies but generalizability to other communities cannot be assumed.

The seven communities included in this study are Baan Tha Khao and Baan Koh Panyee in Ao Phang-Nga, Baan Lions and Baan Tapae Yoi on Koh Phrathong, Baan Koh Chang and Baan Moken on Koh Chang, and Baan Ko Sin Hi in Ranong (Figure 9; Note: Baan=Village; Koh=Island; Ao=Bay). Baan Tha Khao is situated in Ao Phang-Nga on the small island of Koh Yao Noi, is a small community (pop. 486; Koh Yao Island Health Centre) primarily Muslim community that relies on fishing, rubber tapping, and tourism for livelihoods. Locals tend to own their own boats for fishing, land for rubber, and bungalows for tourism rather than working for other people. Fishers from Bhan Tha Khao primarily fish near a number of reefs in Ao Phang-Nga. Due to the popularity of the karst formations (including James Bond Island popularized after being included in the 1974 movie *Man with the Golden Gun*), beaches and snorkeling in Ao Phang-Nga, the "floating" Muslim community of Baan Koh Panyee (pop. 1440; Community Health Centre) has become almost primarily dependent on day-trip tourism through sales, restaurants, and sea canoe tours. The island can receive as many as 1000 tourists in a day (interviews) with the national park in which it is situated receiving up to 202,808 visitors annually (World Heritage Nomination Document, 2010). Fishing and fish-cage aquaculture remain important livelihoods for a smaller portion of the community.

After Baan Pak Jok was destroyed in the 2004 tsunami, Lions International built the village of Baan Lions (pop. 57; Ko Phrathong Health Centre) further inland on Koh Phrathong with a pier in a nearby mangrove canal. Currently, only 44 of the 165 houses in the community are occupied and the school is not in operation. For many inhabitants, livelihoods are a problem with the majority of the remaining population working in fishing, tourism, and agriculture. There is also a growing community-based tourism group that has been supported by Andaman Discoveries and Mangrove Action Project (see Andaman Discoveries, 2012). About 4 kilometers away via motorbike track on Koh Phrathong, Baan Tapae Yoi (pop. 119; Ko Phrathong Health Centre) is a community of

mixed Buddhist and Moken ancestry that was not heavily impacted by the tsunami. Many residents still rely on fishing but they are increasingly reliant on wage labor.

The resident population of Baan Koh Chang (pop. ~300; key informant interview) is primarily involved in agriculture (rubber and cashew plantations) and small-scale tourism development (bungalows on the beach) with fewer households relying on fisheries. Situated at the far northern end of Koh Chang, Baan Moken (pop. ~175; key informant interview) was built by a Christian missionary group from the United States in conjunction with a Christian group from Thailand after the tsunami. The community is occupied by a group of stateless Moken – a nomadic indigenous group that lived on the Andaman coast between Myanmar, Thailand, and Malaysia (see Arunotai, 2006; UNESCO, 2007). Though their previous village on Baan Koh Lao had been little affected by the tsunami, the new community allowed a segment of the population from the over-crowded old village to claim new homes on the island. This also allowed them to "escape" from previous working arrangements and indebtedness to a wealthy Thai family on Baan Koh Lao (anonymous interviewee). Most of the community relies on crab fishing on several nearby reefs, collection of recyclable plastics, and subsistence harvesting in mangrove areas and on nearby islands. Finally, Baan Koh Sin Hi (pop. 1775; Community Health Centre) is located on an island north of Koh Chang and west of Ranong city near the unresolved maritime border with Myanmar. This community contains a mixture of people of Malaysian, Thai, and Burmese descent who rely primarily on fishing – often across the border in Myanmar - and temporary out-migration to do wage labour in construction and agriculture.

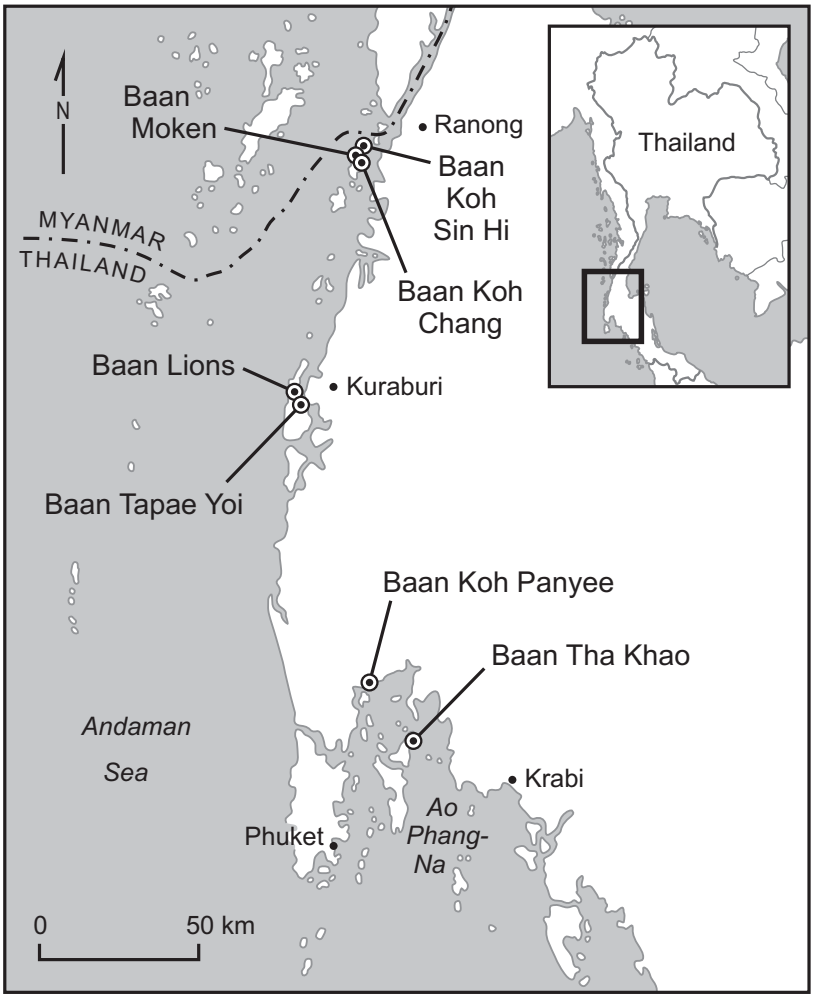


Figure 9 - Map of study sites on the Andaman Coast of Thailand

Methods and Sampling

This study used a mixed-methods approach, including both qualitative interviews and quantitative surveys. To explore the types of stressors affecting the communities, we initially conducted a series of in-depth interviews guided by open-ended questions with a purposive sample of community leaders, community members, NGO representatives, scientists, and government agency representatives along the northern Andaman coast of Thailand. Interviews were guided by a diverse array of questions related to this study's broader themes: the impacts of global environmental change on communities, the adaptive capacity of communities, and the impact of marine protected areas on communities. One part of the interview questions focused on the types of social and

ecological changes that were being experienced by households and communities on the Andaman coast. Participants were also asked to specify if the changes had a negative or positive impact on their households or the communities. Negative changes – or stressors - that emerged during these interviews were noted and later coded and incorporated into the survey.

Subsequently, we conducted a survey with a random sample of 237 households in the 7 communities. The survey questions included individual (e.g., interview participant's ethnicity, age, gender, occupation) and household level characteristics (e.g., household income, assets, livelihoods, ethnicity, number of people), various indicators of adaptive capacity, and perceptions of the effects of national parks on the community. One aspect of the survey also focused on the perceived level of impact of the stressors on household livelihoods using the list of coded stressors that emerged from the interviews. Prior to conducting the surveys, all sections were translated from English to Thai and back-translated by a different translator from Thai to English to ensure accuracy. Discrepancies were rectified and an additional stage of forward and back translation was done. The surveys were also pilot tested in two different communities and changes were made to the survey based on feedback of test participants and surveyors. In the final version, survey participants were asked to rate a list of 36 stressors (see Figure 10) on a Likert scale from 1-5 where 1 = no impact, 2 = very little impact, 3 = medium level of impact, 4 = high level of impact, 5 = very high level of impact, and 6 = don't know.

Due to shortages of household lists or community maps, household maps were hand-drawn for each community. A member of our survey team who was not familiar with the community would then randomly select every n^{th} house. We decided on this method of sampling due to the lack of available household lists in each community and the geographical segregation of communities by ethnic, livelihood, and family groupings.. Surveys were conducted by trained Thai field staff. The field staff completed the paper surveys and then double-checked their results after each field visit. Paper surveys were coded and entered in an electronic format by a data entry company and 10% of the surveys were double-entered to ensure accuracy. After data entry, the survey data was imported into SAS v9.1 (SAS Institute, Carey NC) for additional data cleaning and analysis. Additional queries of the data were also run in SAS.

Descriptive statistics were generated for each individual participant and for household level results. For each stressor, mean scores for all participants and sites were calculated to determine generalized impacts. Subsequently, means scores for each community were calculated and compared using ANOVA to explore how community level factors relate to perceived impacts. A range of household and individual characteristics - including household most important livelihood by income, household dependence on marine for livelihood, household income, number of household appliances, household land ownership for livelihood purposes, primary occupation of interviewee, age of interviewee, gender of interviewee, level of formal education of interviewee, occupational mobility of interviewee, individual mobility of interviewee, social capital or level of community involvement, and number of climate change information - were considered as possible predictors of stressor scores using regression and ANOVA. Livelihood categories included fisheries, tourism, agriculture and plantations, other (i.e., govt. employee, store, construction, community cooperative, recycling), subsistence, and unemployed or student. Significant results were further analyzed to explore the mean differences between groups to understand where differential vulnerabilities could occur.

There were several limitations to this research approach. The first is that due to the emergent nature of the research using interviews with a purposive sample we may have missed some stressors. A later participatory stage of research, for example, pointed to several internal socio-economic stressors that were not included in the survey. This included internal population growth, outmigration of youth, changes in regional governance structures, and centralization of wealth and power within communities. A second limitation is the non-random or comprehensive sample of communities used during the survey, which limits the generalizability of the results. Finally, the wording of several stressors – e.g., “government policies” – may have been unclear.

Results

Qualitative Interview Results

Stressors that emerged from the interviews were characterized as either socio-economic or biophysical (Table 5). Socio-economic stressors were further categorized under *social*, *economic*, or *governance and conflict*. Social stressors mentioned by participants included the in-migration of people (especially foreign workers) to the area and household health issues. The main economic stressors included rising costs of living, for livelihood supplies, and of gas as well as declining prices and demand for livelihood products. Both rising costs and increasing demands are related to increasing levels of household debt, which may partially be caused by increasing material desires and resultant purchases beyond means. Under governance and conflict, Many types of conflicts were described by participants, including between communities, between groups of small-scale fishers, between small-scale fishers and commercial fisheries, between communities and outside business people encroaching on land, between fishers/harvesters and the tourism industry, within communities, and with fishers who were fishing illegally. Fishers, or their family members, described being arrested or having gear taken when travelling across the border to fish in Myanmar. Interviewees also mentioned various national level policies, including fisheries gear restrictions, declining agricultural subsidies, a focus on only rubber development, and an emphasis on large-scale tourism development, that negatively impacted local development outcomes. The creation of the National Marine Parks were also seen to restrict local livelihoods both on land and at sea. Unrest in Thailand following changes in national governments was also seen to have a negative impact on tourism.

Table 5 - Qualitative descriptions of stressors that communities are exposed to including sphere, category, and scale

Sphere	Category	Stressor (as coded and used in survey)	Scale of Driver	Description
Socio-Economic	Economic	Declines in the price that you can sell fish	National	Fish prices fluctuate at markets in nearby cities but prices to local fishers are often steady or declining.
		Nobody wants to buy the product I am selling	Local to Global	Market demand for livelihood products - agriculture, fisheries, tourism - declines and people cannot sell products.
		The price of rubber declining	Global	The price of rubber is declining after a historic high and period of heavy investment in the industry, which for many has led to significant household debt.
		The rising price of supplies needed to do my livelihoods	National to Global	The price of agricultural (fertilizers), fisheries (gear), and tourism (building supplies) inputs is steadily increasing.
		The increasing price of gas	Global	The price of gas has been steadily rising over the last couple of decades due to global price increasing, leading to higher travel costs to mainland, market, and for fishing.
		Rising cost of living	Local to Global	The price of household needs, including food, is increasing. At the same time local desires for material goods is on the rise.
		Increasing levels of household debt	Local to Global	Related to all of the previous economic stressors – economic gains (incomes) are not keeping pace with outputs (expenditures).
	Social	More people moving into the area	Regional to Global	Economic opportunities in Thailand are leading to significant regional in-migration of labor and localized in-migration of people. The first is leading to ready supplies of cheap labor, undermining reliance on local labor. The second is driving prices up.
		Health problems of members of your household	Local	Individuals with health issues in the household are likely unemployed and financially dependent.
	Governance and Conflict	Commercial fishers coming into inshore waters (within 3000 meters)	National to Global	Commercial trawlers, squid boats, and seiners fish within the 3000 meter limit reserved for small-scale fishers. Enforcement is limited or non-existent.
		Conflict with other small-scale fisheries or fishers	Local and regional	Small-scale fishers from different communities or using different gears come into conflict with each other due to gear loss, gear damage, or gear theft. Spatial limits, when in place, are not enforced.
		Exclusion from doing livelihoods in certain areas because of tourism industry	Local to Global	Fishers, gleaners, and others are disallowed to enter or harvest in areas where there are resorts or that are used by national and international tourists.
		Trawlers taking or destroying my gears	National	Commercial trawlers fishing inshore can snag and destroy fishing gears, including traps and set nets.
		Destructive and or illegal fishing practices	Local	Local norms and values and middlemen providing illegal gears can lead to destructive or illegal practices.
		Getting arrested when traveling across the border to fish	National to Regional	Less fish in Thai waters can lead fishers to risk fishing on the Burmese side of the border leading to arrests by the Burmese navy.
		Gear or boat being taken when traveling across the border to fish	National to Regional	Same as above. Burmese officials extort money and gear from fishers on the water or hold boats for payment after releasing those arrested.
		Conflict within the community	Local to National	Internal divisions – familial, historical, leadership – and conflicts with district governance structures (i.e., tambon administration office) created by national government.
		Conflict with other communities	Local to National	Conflicts with other communities can be over land encroachment, fisheries, or district governance.
		Corruption in Thailand	Local to National	Perceptions of corruption included with individuals, sectors, or levels of government - effects individuals (property destruction or loss), communities (infrastructure), and sectors (small-scale fisheries).
		Land encroachment in the area	Local to Regional	Outside business and local people encroach into public and private land for agricultural and tourism purposes.
		National government policies	National	National government creates policies that negatively impact fisheries (rights, gear restrictions), tourism (focus on large-scale dev.), and agricultural (reducing subsidies, focus on single crop - rubber) development.
		The national park	Local to National	Implementation and management of national park impacts fishers' livelihoods and loss of land for livelihoods.
		The change of national governments	National	Leadership changes lead to unrest and leads to declines in tourists and ineffective governance.
Biophysical	Climate Change	Extreme weather events such as storms	Global	There are more storms per year and stronger storms than there used to be.
		Changes in rainy and dry seasons or changing rainfall patterns	Global	In the past, dry and rainy seasons used to be more defined – it would only rain in rainy season, there were few sunny days in dry season. Now weather is less predictable making it harder for agriculture (e.g., can't grow cashews anymore, rubber tapping) and fisheries (loss of gear in storms during dry season, more risk).
		Coral bleaching	Global	Increased water temperature leads to bleaching and mortality of corals, affecting fisheries and tourism.
		Increased freshwater in mangrove areas making water less salty	Global	Increasing rains and storms, especially during wrong season, lead to mortality of crustaceans and bivalves.
		Rising sea levels compared to the past	Global	Sea level is higher than it used to be leading to increased erosion and it is going above current walkways and floors – cause unknown.
		Salt water coming up in drinking water or agricultural water sources	Global	Individual households, tourism businesses, and agricultural areas had experienced brackish water in wells or agricultural sources.
		Coastal or beach erosion	Local to Global	Localized removal of mangroves, increases in storminess, and rises in the ocean lead to erosion threatening houses, land, and infrastructure.
		Flooding	Local to Global	Localized flooding caused by outflow from rivers after storms combined with unusually high tides in monsoon season.
	Environmental	Increasing of sediments in the waters	Local to Regional	Sedimentation in coastal waters stems from agricultural practices, logging, coastal development, aquaculture, mangrove destruction, erosion, and sand/gravel mining in Burmese waters.
		Overfishing	Local to Regional	Population growth, increasing numbers of fishers, more numerous and efficient gears, increasing technology on commercial vessels, commercial vessels coming into inshore waters are leading to overfishing.
		Increased garbage in the ocean	Local to National	Increasing garbage in the ocean from boats, tourists, islands, fishers (gears), and regional cities interferes with tourism and fisheries.
		Landslides	Local	Clearing of forests and plantations leads to landslides and damage to housing and infrastructure.
		More pollution in the ocean	Local to Regional	Polluted water coming from boats and regional ports scares the fish away and damages the environment.

Biophysical stressors were categorized under *climate change* or *environmental*. Climate change related stressors mentioned by participants included flooding, saltwater intrusion, rising sea levels, coral bleaching, increasing precipitation leading to inflows of freshwater into mangrove habitats, erosion, changes in rainy and dry season, and increasing storm events. The last three stressors were mentioned the most often by participants – perhaps because they each had the most direct impact on community infrastructure and household assets or on livelihood outcomes. Storm events and seasonal changes were seen to particularly increase the risks for fishers, forcing them to make difficult decisions between loosing gear or endangering life and limb. Other environmental stressors discussed by participants included pollution and garbage in the ocean, sedimentation, landslides and overfishing. Overfishing was used synonymously with declines in fish and catches. Descriptions of the stressors (as they were described by interview participants) and analysis of the scale of the drivers causing the changes are shown in Table 5. Note that we chose to remove "tsunami" from the list of stressors as this was obviously the most impactful event that many of these communities had experienced and we felt that including it would skew the survey results.

Surveys Descriptive Statistics

The number of houses in each community ranged from 36 to 290. As there were relatively few households in each community, initially between 21-34.9% (Mean=28.4%) of households were sampled (e.g., every 2nd to every 5th house depending on the community) to increase sample sizes and thus statistical power of the results. Fifteen percent (15%; n=42) of houses were not sampled due to not wanting to participate (n=6), double sampling (n=3), absence for work (n=16), relocation (n=5), time or age restrictions (4), house rented to foreigners (n=2), or unknown absence (n=6). After subtracting houses that were not sampled, in total across the seven communities, 237 households were sampled with samples ranging from 11 households to 64 households and representing between 18.5-34.9% of households. The mean length of time that it took to conduct the survey was 54 minutes. Surveys were conducted with one person in the

household with 59.1% (min=40.0%; max=72.7%) of those sampled being female (n=140 of 237). The mean age of interviewees was 42.1 years (min=14.0; max=72.0).

The following household level statistics by community give a sense of the heterogeneity of the communities being researched. The mean annual household income for all communities was 206,000 Thai baht/year (equivalent to approx. $6600USD/year or $550USD/month) with a minimum mean income of 108,000 Thai baht/year ($3500USD) in Baan Koh Sin Hi and maximum mean income of 315,000 Thai baht/year ($10000USD) in Baan Koh Panyee (sig. diff.=<.001). The mean number of people living in a household across all communities was 4.2 people (community mean max.=5.2; community mean min.=1.9; sig. diff.=<.001). The mean number of years that interviewees lived in the community in all sites was 27.3 years with a community mean minimum of 4.8 years in Baan Moken due to it being a post-tsunami community and a mean maximum of 33.8 years in Baan Koh Panyee. The "household most important livelihood in terms of income", across all the communities, was fisheries at 35.4% (min=6.7%; max=81.8%; sig. diff=<.001), then tourism at 22.8% (min=0%; max=39.6%; sig. diff.=<.001), then other (i.e., govt. worker, store, recycling, construction) at 19.8% (min=9.1%; max=26.7%; sig. diff. =<.001), then agriculture and plantations at 11.8% (min=0%; max=38.7%; sig.diff.=<.001). The other households relied on subsistence-based livelihoods (0.8%), were unemployed (7.2%), or were not specified (2.1%). Finally, though economic dependence on fisheries was declining among households subsistence needs remained high with 60% of households across all communities eating seafood 7 nights of the week.

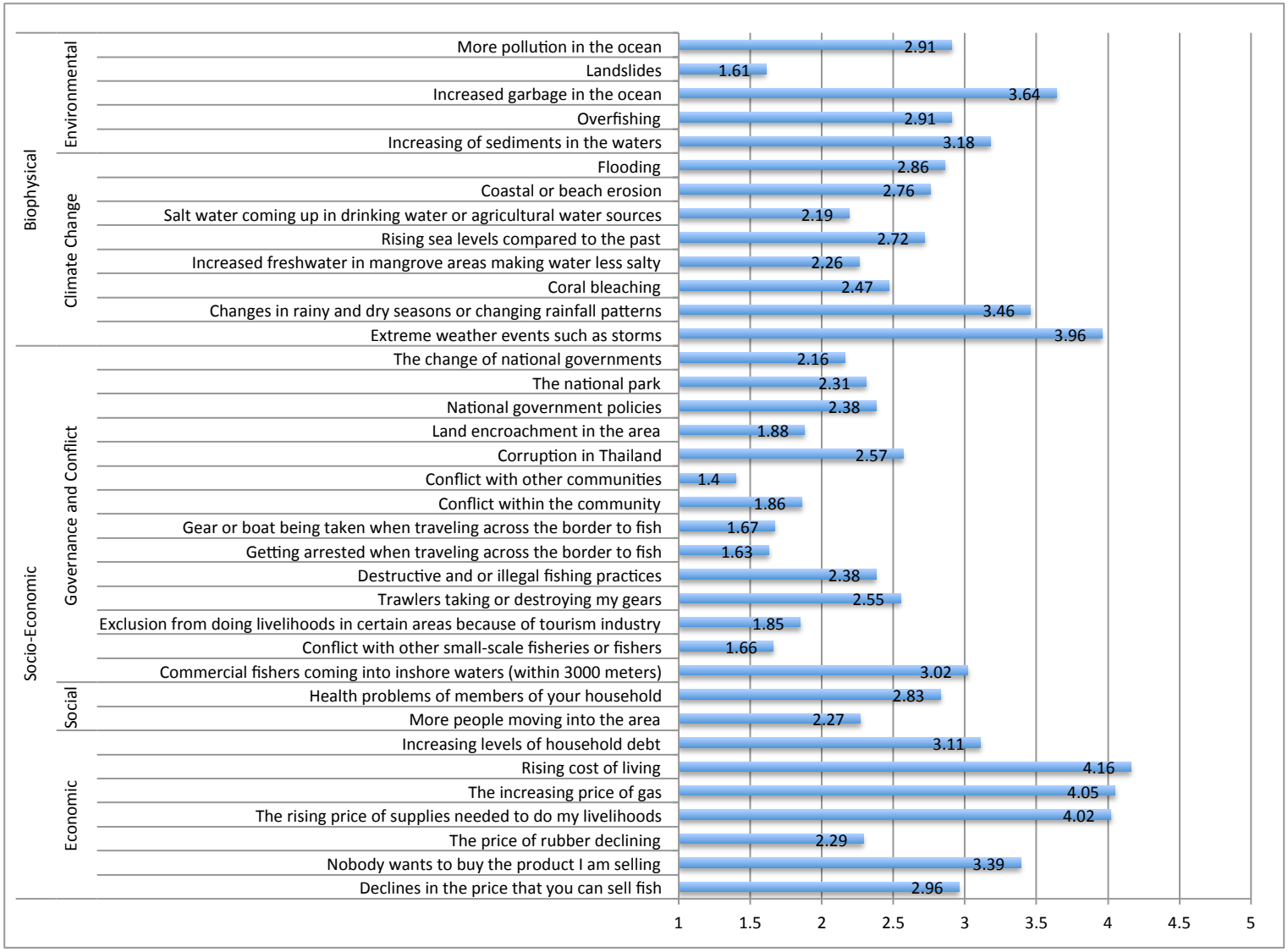
Survey Results

The mean scores of the impacts of stressors revealed some interesting results (see Figure 10). First, the mean scores of socio-economic stressors showed great variability (lowest=1.4; highest=4.16; average=2.54) but the highest rated stressors were related to economics. Governance and conflict indicators were not as highly rated – remaining within the 1.4 to 3.02 range (average=2.09). The only governance and conflict stressor rated higher than 3 was "commercial fishers coming into inshore waters". Though it was

discussed quite often in the interviews, quantitative results suggest that the national (marine) park - rated at 2.31 – contributes only marginally to overall household vulnerability. Social indicators were rated between 2.37 and 2.83 (average=2.6) – with "health problems of members of your household" being the highest ranked social stressor. Economic stressors received much higher ratings overall with a range of 2.29 to 4.16 (average=3.43) and 5 out of 7 stressors being rated higher than 3. "Rising cost of living", "The increasing price of gas", and "The rising price of supplies needed to do my livelihoods" were ranked highest at 4.16, 4.05, and 4.02 respectively. Stressors related to market demand – including "Nobody wants to buy the product that I am selling", "Declines in the price that you can sell fish", and "The price of rubber declining" – were rated lower at 3.39, 2.96, and 2.29. "Increasing levels of household debt" was rated at 3.11.

Secondly, biophysical stressors showed less variability (lowest=1.61; highest=3.96) but were rated slightly higher overall (average=2.84). Five of the seven climate change related factors (lowest=2.19; highest=3.96; average=2.84), including "coral bleaching", "coastal or beach erosion", "salt water coming up in drinking water or agricultural water sources", "rising sea levels compared to the past", and "increased freshwater in mangrove areas making water less salty", were rated between 2 and 3. However, "changes in in rainy and dry seasons or changing rainfall patterns" and "extreme weather events such as storms" were rated higher at 3.46 and 3.96 respectively. Other environmental factors were rated between 1.61 and 3.64 (average=2.85). "Increased garbage in the ocean" was rated highest at 3.64 and "increasing of sediments in the waters" was rated second at 3.18. "Overfishing" and "more pollution in the ocean" were both rated at 2.91.

Figure 10 – Bar graph showing mean ratings of the relative impact of all stressors on household livelihoods (Likert scale of 1-5: 1 = no impact, 2 = very little impact, 3 = medium level of impact, 4 = high level of impact, 5 = very high level of impact)



Modeled impacts of community and individual and household characteristics on perceptions of stressors showed that *community* as well as individual and household *livelihoods* were the most significant predictors overall (see Table 6). Otherwise general relationship patterns between household and individual characteristics and perceptions of stressors were somewhat unclear. The impact of community was the strongest for the most stressors (Relationships with sig<.01=15 and sig<.05-.01=4) with more significant differences across communities in the perceived impacts of economic prices, fisheries conflicts, and climatic changes. The household's most important livelihood by income influenced perceptions of many stressors, particularly those stressors directly related to livelihoods (e.g., prices, fisheries conflicts, overfishing). For example, fisheries-based livelihoods increased the overall perceived impact of the price of fish and agriculture-based livelihoods was related to a higher perceived impact of the price of rubber. Households that were more dependent on fisheries-based livelihoods were also more concerned about the price of gas. Households dependent on tourism were more troubled by interest in their product and flooding. The level of household dependence on marine for livelihoods was significantly related to perceptions of increased impacts from a number of stressors including the price of fish and fisheries-related conflicts as well as extreme weather events and overfishing. Household incomes were related to higher anxiety about interest in products, intra-community conflict, and overfishing and lower anxiety about several fishing related stressors. Concerns about the price of fish, trawlers, and cross border arrests were lower for those households with more appliances. Yet households with more appliances were often more concerned about conflicts and governance, in-migration, increasing debts, market interest, and prices of rubber. Land ownership for livelihoods led to more concern about government policies, changes in seasons and rainfall, levels of debt, the price of rubber, and commercial fishers and less anxiety about fish prices and health problems.

The primary occupation of the interviewee also influenced the perceptions of many stressors, including increasing concerns about specific livelihood-related stressors. Individuals who identified in fishing-based livelihoods indicated an increased for stressors that were fishing related. Those interviewees with primary livelihoods of subsistence, fisheries, and other were more concerned about extreme weather events than

those most dependent on tourism and agriculture and plantations. Interviewees dependent on tourism or who were unemployed were the least anxious about the price of gas. The price of supplies was the highest concern for those with primary livelihoods of other, tourism, and subsistence. Older interviewees were marginally (.05-.01) less worried about in-migration, cross-border fishing, intra-community conflict, changing governments, storms, and salt water in freshwater sources. A number of stressors showed a relationship with gender - women tended to be more concerned about economic costs, the impact of health of their family members, extreme weather events, changing rainfall, flooding, sediments, and garbage whereas men were more concerned about things which related to fishing and their ability to conduct their livelihood. In general, the higher the level of formal education of the interviewee the more concerned they were about prices of rubber, levels of debt, and conflict and corruption and the less concerned they were about the price of fish and cross-border fishing. Interviewees with higher occupational mobility were less worried by a number stressors including landslides, saltwater intrusion, rising sea levels, weather events, land encroachment, and the outcomes of cross-border fishing. Individuals with less mobility – i.e., those who had lived in the community longer - were more anxious about in-migration, the cost of living, rising debts, the price of rubber, the national park, and market interest. Increasing levels of involvement in community organizations (aka – social capital) was related to higher scores for coastal or beach erosion and saltwater intrusion as well as a number (7) of factors related to governance and conflict. Finally, the number of sources from which interviewees had learned about climate change was related to increased concern about coral bleaching but did not influence levels of concern about other climate change related stressors.

Table 6 – Modeled impacts of community, individual and household characteristics on perceptions of stressors, model significances

Sphere	Category	Stressors \ Individual and Household Characteristics	Comm	Household Characteristics					Individual Characteristics							
			Community (a)	HH Most Important Livelihood - Income (a)	HH Dependence on Marine for Livelihoods (b)	HH Income (b)	Number of HH appliances (b)	HH Land ownership for livelihood purposes (a) ##	Primary occupation of interviewee (a)	Age of interviewee (b)	Gender of interviewee (a) #	Level of formal education of interviewee (a)	Occupational Mobility of interviewee (b)	Individual mobility of interviewee (b)	Social capital - Level of involvement (b)	Number of sources that learned about CC (b)
Socio-Economic	Economic	Declines in the price that you can sell fish	****	****	****↑	**↓	****↓	** Y=↓	****			** ↓				
		Nobody wants to buy the product I am selling	****	*		*↑	**↑		***					*↑		
		The price of rubber declining	****	****			****↑	**** Y=↑	****			* ↑		***↑		*↑
		The rising price of supplies needed to do my livelihoods						** Y=↑	*		* M=↓					**↑
		The increasing price of gas		*					**		** M=↓					
		Rising cost of living												**↑		
		Increasing levels of household debt	*				*↑	* Y=↑				*↑		*↑		*↑
	Social	More people moving into the area	**				*↑			*↓		* ↑		*↑		****↑
		Health problems of members of your household						* Y=↓	*		* M=↓					
	Governance and Conflict	Commercial fishers coming into inshore waters (within 3000 meters)	****	**	***↑			* Y=↑	**						**↑	
		Conflict with other small-scale fisheries or fishers			**↑											
		Exclusion from doing livelihoods in certain areas because of tourism industry									* M=↑				*↑	*↑
		Trawlers taking or destroying my gears	***	****	***↑	*↓	**↓		****		* M=↑					
		Destructive and or illegal fishing practices			**↑	*↓									**↑	
		Getting arrested when traveling across the border to fish	****	****	****↑		**↓		****	*↓		** ↓	*↓			
		Gear or boat being taken when traveling across the border to fish	****	***	***↑				*	*↓			*↓			
		Conflict within the community				*↑	*↑			*↓		*** ↑			*↑	**↑
		Conflict with other communities														*↓
		Corruption in Thailand					*↑					* ↑				**↑
		Land encroachment in the area										* ↑	**↓		*↑	*↑
		National government policies					**↑	** Y=↑				** ↑				**↑
		The national park	***				*↑					* →		*↑	**↑	*↑
		The change of national governments					**↑			*↓					*↑	
Biophysical	Climate Change	Extreme weather events such as storms	``	***	**↑				*	*↓	* M=↓		*↓			
		Changes in rainy and dry seasons or changing rainfall patterns						* Y=↑			** M=↓					
		Coral bleaching	**													**↑
		Increased freshwater in mangrove areas making water less salty	*	*	*↑	*↓			*	*↓						
		Rising sea levels compared to the past	***										*↓			
		Salt water coming up in drinking water or agricultural water sources	***	*					*	*↓			*↓		*↑	
		Coastal or beach erosion	**												*↑	
		Flooding	*	***					**		* M= ↓					
	Environmental	Increasing of sediments in the waters			*↑				*		* M=↓					
		Overfishing	***	****	***↑	**↑			****							
		Increased garbage in the ocean									** M=↓					
		Landslides	**										*↓			
		More pollution in the ocean		*	*↑											

Notes: Significance - * = .05-.01, ** = .01-.001, *** = .001-.0001, **** = <.0001; ↑↓ = Direction of relationship; Tests of sig. - a = ANOVA, b = Regression; #=Male (M) or Female (F); ##=Yes (Y) or No (N)

Discussion and Conclusion

The qualitative results from interviews showed the multiple stressors that communities are experiencing. The 36 stressors that emerged from the interviews were categorized as socio-economic stressors (i.e., social, governance and conflict, economic) and biophysical (i.e., climate change and other environmental). The stressors identified in this case study are not unique to this locale (Zou & Wei, 2010). The rating of these stressors through a household survey demonstrated that certain stressors were perceived to have a higher impact – particularly economic stressors and some climatic and environmental stressors – than others. These results suggest that both some climate change stressors – extreme weather events and changes in weather patterns - and economic globalization – through shifting commodity prices and market demands - are being felt profoundly by coastal communities in Thailand, which is a significant concern as both processes are likely to continue and to accelerate (O'Brien & Leichenko, 2000). Thus these results could be seen as confirmatory of a "Double Exposure" scenario (i.e., Leichenko & O'Brien, 2008); yet, clearly the wider array of stressors that emerged from interviews suggest that "multiple exposures" is a better term. Our results showed that economic considerations were scored higher than climate change stressors, which differs from several other studies from very different contexts that have rated climate change as the most impactful stressor (Bunce, Rosendo, et al., 2010; Mubaya et al., 2012). The high scores associated with rising costs and debts suggest that in Thailand, despite increasing economic opportunities, incomes in coastal communities may not be keeping pace with the rising costs associated with livelihoods or households. Similarly, Tuler et al (2008, p. 177) comment that "the cost of fuel, insurance, gear, and bait have all gone up, while the price for fish has not" for US fishers. Additionally, increasing household costs may be as related to increasing local desires and expectations as to increasing costs at both the local (e.g., water, food) and global (e.g., gas, food, supplies). Marine protected areas and resource conservation measures, other studies have shown, can add increased stress to local communities (Bunce, Brown, et al., 2010; Bunce, Rosendo, et al., 2010) whereas in this study MPAs were perceived to have a fairly low amount of stress. This might,

however, be due to the limited enforcement of MPA regulations in the Thai context. Finally, it was unexpected that "overfishing" did not score higher, perhaps this is because major fisheries declines are already a distant artifact (Panjarat, 2008).

Modeled impacts of community, individual characteristics, and household characteristics using ANOVA and regression showed that community and livelihoods had the most consistent impacts on perceptions of stressors. It is not surprising that there were significant differences across communities since they were chosen for heterogeneity; however, even while choosing communities we were struck by the vast differences between communities that were only 10 kilometres apart so this difference would have likely persisted with a more randomized sample. The fact that livelihoods groups had different perceptions was often related to particular stressors that would impact that livelihood directly - for example, local small-scale fishers were more concerned about commercial fishers whereas tourism operators were more concerned about flooding – while all groups were equally anxious about stressors such as the cost of living or the cost of livelihood supplies. We expected to see more clearly differentiated responses to stressors by specific groups other than households or livelihoods as suggested by several authors (Brklacich et al., 2010; O'Brien & Leichenko, 2003) – for example, genders or socio-economic groups – however, these differences by group were not particularly distinct. We were also surprised that increasing involvement in organizations (i.e., social capital) was related to increased concern about conflicts and governance but that it did not lead to significant differences in perceptions across all economic stressors and most biophysical stressors. This may also be because formal organizations are responsible for addressing conflicts or governance issues whereas informal social organization and communication plays a more significant role in leading to collective or shared understandings of economic and environmental woes.

Various authors have suggested that multiple stressors may further increase vulnerability and undermine the adaptive capacity of households and communities faced with the impacts of climate change. Since it was beyond the scope of this research to examine how the various stressors interact, we will extrapolate on these findings to explore how this will influence the ability of households and communities to adapt. First,

economic difficulties or stressors may lead individuals, households or communities to abandon or ignore environmental risk mitigation behaviors (see also Eakin, 2005). In particular for fishers, climate change affects them both on land and at sea and may exacerbate dangers faced at sea (Tuler et al., 2008). Economic stress may lead to decisions - such as making shortcuts on boats, housing, or infrastructure or risking life, injury, or loss of property through continuing to work in hazardous conditions or attempting to rescue valuable gear (nets or traps) from impending storms - that may make individuals and households more vulnerable to environmental stresses over the longer term. Climate change stressors that households rated as having a high level of impact – i.e., storm events and changing seasons - tend to be more random and less predictable making it harder to plan for these events. For households that are already impoverished or vulnerable, a sporadic climate related event that impacts a house or a boat, leads to the loss of fishing gear, or causes injury would likely lead to increasing household debt, impoverishment, or overall vulnerability. Rising debts and costs may also constrain people's abilities to take actions even when based on knowledge of impending climatic events – for example through radio forecasts.

Secondly, the other stressors identified during this research that were rated lower in the surveys – i.e, governance and conflict, social, and other environmental – would also increase vulnerability and decrease adaptive capacity. Health issues or persistent conflicts within a community would add to the stress experienced by households. Pollution, sediments, and garbage challenge the health and productivity of ecosystems and thus the viability of fisheries and tourism livelihoods. Many interviewees also discussed how the post-tsunami reconstruction efforts were rife with corruption or how even smaller infrastructure projects did not get completed due to corruption. Corruption has major implications for adaptation policy and projects, particularly where large sums of money from outside donors or international transfer payments are concerned. Some of the stressors that were less highly rated (quantitatively) in the survey may also be more qualitatively important or impactful. For example, corruption or commercial boats fishing in areas reserved for small-scale fishers are highly emotive topics that lead to a sense of injustice or anger whereas economics and climate change may be more emotionally

distant. These emotive responses may influence what communities (and higher level governments) discuss and plan for, which may undermine their ability to adapt to less blameworthy but more quantitatively important stressors.

Third, economic stressors combined with biophysical (environment and climate change) stressors may be leading to significant declines in quality of individual and community life particularly for more vulnerable households and communities with less options. Qualitative results support this assertion. For example, many interviewees commented that the rising price of living means that people need to work harder and longer than they used to make ends meet. Increasing costs combined with environmental declines (e.g., fisheries) and climate stressors have led many fishers to fish longer or to engage in additional livelihoods. Observed impacts of these changes included more hours spent working, decreasing free time, less sharing within the community, and declines in voluntarism and civic engagement (unpublished data).

There are a number of important implications of the results and discussion presented in this paper for future research, policy and practice. Most importantly, the presence of multiple stressors needs to be taken into account in the planning of adaptation policy and programs and for the design and prioritization of adaptive strategies to reduce overall vulnerability. This requires a nuanced qualitative and quantitative understanding of the types, severity, and impacts of these stressors as they are experienced by people in different communities, groups, industries, and regions. Thus, we reiterate calls for increased empirical studies that focus on double and multiple exposures with an additional focus on the perceived and experienced interactions between the stressors – and between social and ecological systems. The measurement of perceptions, as in this study, of multiple stressors may be a useful proxy when doing rapid rural assessments or could be done in conjunction with an array of other technical or participatory assessments. We also recommend the development of comprehensive vulnerability frameworks that bring together previous research on the many stressors that communities are experiencing in many different environments to act as checklists for future qualitative or quantitative explorations or for practical use in vulnerability, adaptive capacity, or adaptation projects. Two additional areas for research are to further clarify the role of

various social, cultural, institutional, economic, and political factors in mediating the impact of and response to multiple stressors and to connect the stressors, as they are felt by local communities, more directly to the multi-scalar environmental, economic, and socio-political drivers that are causing them.

In conclusion, the presence of stressors occurring at multiple scales and the overall prevalence of stressors that are driven by changes occurring at higher scales, that are less predictable, and that shift the locus of control away from vulnerable groups affirms the need for programs of mitigation and adaptation that are occurring at multiple scales simultaneously (Brklacich et al., 2010; Ostrom, 2010). We also concur with Eakin (2005, p. 1923) who states that "[t]he dominance of economic uncertainty over environmental risk in households' decision-making implies a continued role for government [and other external organizations] intervention in climate change adaptation". Indeed, there are many important places for outside programs, both from civil society and government organizations, that focus on reducing vulnerability and building adaptive capacity through contributing funding, strengthening national policy on adaptation and rural development, improving infrastructure, providing climate change education, facilitating contextualized adaptation programs, and diversifying livelihoods. Finally, the relative importance given to climate change stressors in this analysis suggests that adaptation to climate change (in conjunction with the multiple stressors facing communities) needs to be planned for *now* not at some distant point in the future.

Chapter 4

Why Local People Do Not Support Conservation: Community Perceptions of Marine Protected Area Livelihood Impacts, Governance and Management in Thailand[3]

Abstract

Conservation success is often predicated on local support for conservation which is strongly influenced by perceptions of the impacts that are experienced by local communities and opinions of management and governance. Marine protected areas (MPAs) are effective conservation and fisheries management tools that can also have a broad array of positive and negative social, economic, cultural, and political impacts on local communities. Drawing on results from a mixed-methods study of communities on the Andaman Coast of Thailand, this paper explores perceptions of MPA impacts on community livelihood resources (assets) and outcomes as well as MPA governance and management. The area includes 17 National Marine Parks (NMPs) that are situated near rural communities that are highly dependent on coastal resources. Interview participants perceived NMPs to have limited to negative impacts on fisheries and agricultural livelihoods and negligible benefits for tourism livelihoods. Perceived impacts on livelihoods were felt to result from NMPs undermining access to or lacking support for development of cultural, social, political, financial, natural, human, physical, and political capital assets. Conflicting views emerged on whether NMPs resulted in negative or positive marine or terrestrial conservation outcomes. Perceptions of NMP governance and management processes were generally negative. These results point to some necessary policy improvements and actions to ameliorate: the relationship between the NMP and communities, NMP management and governance processes, and socio-economic and conservation outcomes.

[3] This chapter has been accepted for publication as Bennett, N. J. & Dearden, P. (in press). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy*.

Keywords: marine protected areas, conservation impacts, livelihoods, governance, management

Introduction

Marine protected areas (MPAs) are an important instrument for conservation and fisheries management. MPAs can protect habitats, ecosystem structure, functioning and integrity, and species diversity, richness, size and density (Angulo-Valdés & Hatcher, 2010; Lester et al., 2009; Salm et al., 2000). These conservation and fisheries benefits are particularly evident in "no-take" MPAs (Lester & Halpern, 2008). Their import as a management tool has lead to increasing numbers of MPAs around the world – more than 6800 MPAs covering ~2.86% of Exclusive Economic Zones in 2010 (Toropova, Meliane, Laffoley, Matthews, & Spalding, 2010) – and global commitments to scale up the coverage of MPAs to 10% aerial coverage by 2020 (CBD, 2010).

The management and conservation benefits of MPAs can also lead to positive outcomes for local communities through spillover of fish into local fisheries (Aswani & Furusawa, 2007; Gell & Roberts, 2003; Halpern et al., 2009; Jiang et al., 2008; C. M. Roberts, Bohnsack, Gell, Hawkins, & Goodridge, 2001; Sanchiroco & Wilen, 2002), mitigation of climatic and environmental threats (MacKinnon, Dudley, & Sandwith, 2011), and tourism livelihood benefits (Agardy, 1993; Leisher et al., 2007; Merino, Maynou, & Boncoeur, 2009; Oberholzer, Saayman, Saayman, & Slabbert, 2010). Yet MPAs have also been criticized for leading to negative social, economic, cultural and political impacts for local people and communities (see literature review below). This is problematic since support for and the success of MPAs is predicated on positive local perceptions of socio-economic and ecological outcomes in many locations (Agardy et al., 2003; Christie, 2005; Christie et al., 2003; Heck, Dearden, & McDonald, 2012). Support is also dependent on perceptions of the effectiveness and quality of management and governance policies, institutions, and processes (Hind et al., 2010; Lockwood, 2010; Pomeroy, Parks, & Watson, 2004; Webb, Maliao, & Siar, 2004).

Situated between Malaysia and Myanmar and facing the Bay of Bengal, the Andaman coast of Thailand is an area of high biodiversity and ecological importance (World Heritage Nomination Document, 2010). Within the 116,000 km^2 of marine area, there are important areas of seagrass, coral reefs, and mangroves (Juntarashote, 2005; World Bank, 2006). However, the ecological health of the area is threatened by overexploitation and destructive fishing, degradation and loss of habitats, and pollution and fisheries are in decline (BOBLME, 2012; Panjarat, 2008; World Bank, 2006). There are a number of MPAs in the area, including several smaller community-based MPAs (Sudtongkong & Webb, 2008), one non-hunting area, several environmental protected areas, 12 fisheries sanctuaries, and 16 established and 1 proposed National Marine Parks (NMPs) that are under the jurisdiction of the Department of National Parks, Wildlife and Plant Conservation (DNP) of Thailand (Christie & Ole-Moyoi, 2011). The NMPs cover a total area of 483,990 hectares and have a threefold mandate: conservation, education/research, and tourism/recreation. However, the region is highly populated (> 2 million inhabitants in 6 provinces) and reliant on fisheries, and the NMPs are situated in areas near or around many of the 621 small-scale fishing communities along the coast (Panjarat, 2008).

It is important that community perceptions of NMP impacts on local livelihood outcomes and assets as well as of governance and management are examined so that NMP processes can be adapted and outcomes improved. This paper presents results of a multiple case study of 7 communities situated near 4 NMPs on the Andaman coast of Thailand. The analysis of perceptions is framed around various aspects of the sustainable livelihoods (Carney, 1998; Ellis, 2000; Scoones, 1998), governance (Graham, Amos, & Plumtree, 2003; Lockwood, 2010), and management (Hockings, Stolton, Leverington, Dudley, & Courrau, 2006; Pomeroy et al., 2004) literatures. The paper proceeds with a review of literature on the impacts of MPAs on local communities and the theories that frame the analysis prior to describing sites and methods and presenting results.

Review and Theory

MPAs and Local Communities

MPAs can benefit local communities. Proponents have long suggested that MPAs can lead to empowerment, improved governance, alternative livelihoods, improved fisheries, and social, educational, and cultural benefits (Agardy, 1993; Gubbay, 1995; Kelleher, 1999; Salm et al., 2000; Sobel & Dahlgren, 2004). In practice, however, MPAs have lead to quite divergent outcomes (Table 7). For example, one study (Leisher et al., 2007) revealed that MPAs can lead to poverty reduction through tourism jobs, better governance, health improvements, and empowerment of women. Pacific island MPAs improved fisheries landings, governance, community organization, resilience and adaptation, health, integration, traditional management measures, and security of tenure (Cohen, Valemei, & Govan, 2008). On the other hand, Christie (2004) demonstrated that MPAs in Phillipines and Indonesia were "biological successes and social failures" through limiting participation, inequitably sharing economic benefits, and lacking in conflict resolution mechanisms. Cayos Cochinos MPA in Honduras has restricted livelihoods without providing alternatives and limited access to traditional areas that are now open to tourists (Brondo & Woods, 2007). Bavinck et al. (2011) showed that the Gulf of Mannar National Park and Biosphere Reserve in India has exacerbated pre-existing conflict and led to violence against officials. Even in the flagship Apo Island Marine Protected Area in the Philippines, support for the MPA has declined due to a switch from community-based to centralized national management and governance (Hind et al., 2010). What all of these studies and broader more integrative studies confirm is the importance of considering community livelihoods, particularly when "no-take" MPAs are employed, as well as governance and management for the success of MPAs (Alder, Zeller, Pitcher, & Sumaila, 2002; Bennett & Dearden, 2012a; Cattermoul et al., 2008; Pomeroy et al., 2004).

Table 7 – Potential socio-economic impacts of marine protected areas on local communities

Benefits	Consequences
• Increased food security • Increased wealth • More household assets • Higher levels of employment • Diversified livelihood options • Greater access to health and social infrastructure • Revitalized cultural institutions • Improved governance • Greater community organization • More participation in natural resource management • Increased empowerment of women • Reinvigorated common property regimes • Increased resilience	• Decreased food security • Increased restrictions • Decreased power and alienation from NRM • Forced migration • Loss of assets • Increased poverty • Loss of social and educational facilities • Inequitable distribution of benefits • Loss of tenure • Increased social tension • Increased conflict and political struggles • Exacerbated vulnerabilities • Negative socio-cultural changes • Reduced adaptive capacity

Sources: (Aswani & Furusawa, 2007; Bavinck & Vivekanandan, 2011; Brondo & Woods, 2007; Bunce, Brown, et al., 2010; Camargo et al., 2009; Diegues, 2008; Dixon, 1993; Fabinyi, 2008; Gjertsen, 2005; Govan et al., 2009; Hargreaves-Allen, Mourato, & Milner-Gulland, 2011; Hind et al., 2010; C Leisher et al., 2007; Mallerat-King, 2000; Mascia et al., 2010; Merino et al., 2009; Ngugi, 2002; Oberholzer et al., 2010; Prasertcharoensuk et al., 2010; Ransom & Mangi, 2010; Russ, Alcala, Maypa, Calumpong, & White, 2004; Samonte et al., 2010; Sanchirico, Cochran, Emerson, Defense, & Rader, 2002; Sunde & Isaacs, 2008; Svensson, Rodwell, & Attrill, 2010; Tobey & Torell, 2006; Walker & Robinson, 2009; Webb, Mailiao, & Siar, 2004; Weiant & Aswani, 2006; White, Courtney, & Salamanca, 2002; Young, 2003)

Framework for Analysis

The sustainable livelihoods literatures provided a frame of reference for our research and analysis. Sustainable livelihoods frameworks proposed by Carney (1998), DFID (1999), Scoones (1998) and Ellis (2000) suggest that there are a number of micro to macro level contextual factors - including trends and shocks as well as policies, institutions, and processes - that transform and mediate access to assets and have impacts on livelihood strategies or portfolios and the resultant socio-economic and environmental outcomes (Figure 11). Central to the sustainable livelihoods frameworks are a number of capitals or assets that are the platform for livelihood strategies. These assets include natural, social, human, physical, financial, cultural, and political capitals - definitions of each provided in Table 8. In the context of this framework, a marine protected area can

be seen as a social institution that is comprised of a series of laws, policies and processes that are enacted by various levels of government (as well as private sector and civil society actors) through applied governance and management. It has been suggested elsewhere that the SL framework is useful as a tool for analyzing the impacts of protected areas on livelihood outcomes and assets and the role of protected area policies, institutions, and processes (i.e., management and governance) in producing these outcomes with the ultimate goal of improving conservation practice (Bennett, 2010; Igoe, 2006).

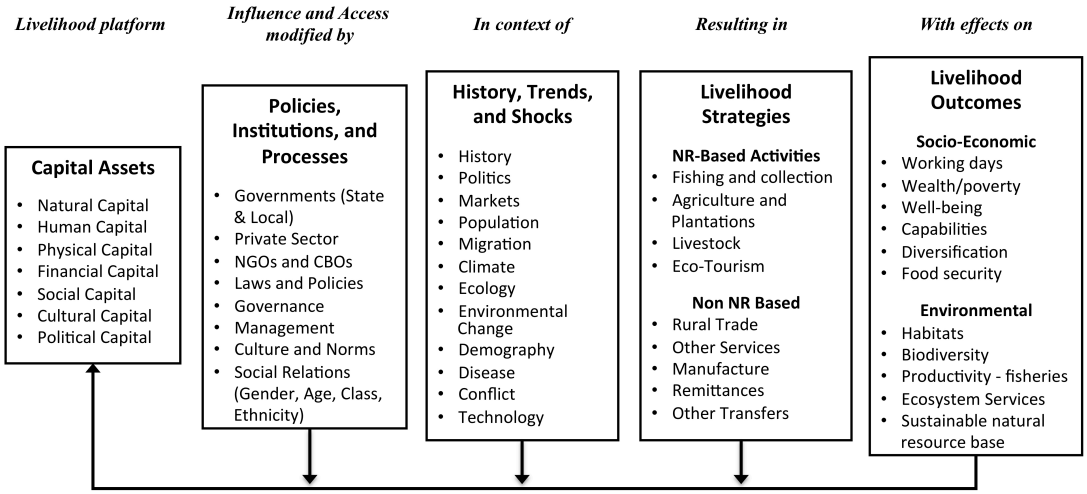


Figure 11 - Modified sustainable livelihoods framework (adapted from Carney, 1998; Ellis, 2000; Scoones, 1998)

Since the sustainable livelihoods literatures provided little guidance on management and governance, literatures on protected areas governance (Graham et al., 2003; Lockwood, 2010) and management (Hockings et al., 2006; Pomeroy et al., 2004) were also used when analyzing results of this study. Good governance is promoted through legitimacy, transparency, accountability, inclusiveness or participation, fairness or equity, integration or coordination, capability, and adaptability. Effective MPA management requires adequate capacity and resources, effective communication of rules and regulations (e.g., boundaries), extensive programs of education and outreach, participatory processes of creation and management structures, consideration of the values of all stakeholders, relationships built on trust, coordination with other

management institutions, integration of scientific and traditional knowledges, and mechanisms for conflict resolution and to ensure transparency and accountability. Effective management also relies on monitoring, evaluation and adaptation of actions based on a management plan.

Table 8 - Definitions of the capital assets (Bennett, Lemelin, Koster, & Budke, 2012; Carney, 1998; Scoones, 1998)

	Capital Assets
Natural Capital	The natural resource stocks from which resource flows useful for livelihoods are derived (e.g., land, water, wildlife, biodiversity, environmental resources).
Social Capital	The social resources (networks, membership of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods.
Human Capital	The skills, knowledge, ability to labor and good health important to the ability to pursue different livelihood strategies.
Physical Capital	The basic infrastructure (transport, shelter, water, energy, and communications) and the production equipment and means that enable people to pursue their livelihoods.
Financial Capital	The financial resources which are available to people (whether savings, supplies of credit or regular remittances or pensions) and which provide them with different livelihood options.
Cultural Capital	The practices, traditions, and resources that are central to a people's identity and the means and processes to maintain these.
Political Capital	The policies and legislations, political supports, governance processes, and formalized institutions that facilitate or hinder the transformation of the other capital assets.

Site Description and Methods

Study Sites

Seven communities, situated near 4 different MPAs, were chosen for the purposes of this study. The communities included in this study were Baan Tha Khao and Baan Koh Panyee near Ao Phang-Nga NMP and Than Bhok Khorani NMP, Baan Lions and Baan Tapae Yoi near the proposed Koh Phrathong NMP, and Baan Koh Chang, Baan Moken and Baan Ko Sin Hi near Mu Koh Ranong NMP (Figure 12; Note: Baan=Village; Koh=Island). The NMPs under question were all located on the northern Andaman coast of Thailand. They each contain important areas of seagrass, mangroves, or coral reefs and all have forested islands within their boundaries. Tourism visitations varied significantly across the sites with Ao Phang Nga NMP (202,808 visitors) receiving the highest average visitation between 2002-2007, followed by Than Bhok Khorani (84,506), Mu Koh

Ranong (3,267), and Mu Koh Rah-Koh Phrathong (355) (World Heritage Nomination Document, 2010). The communities were chosen for diversity – of livelihoods, population, ethnicity, geography, and marine habitat dependencies – but also for feasibility. Livelihoods in the communities consisted primarily of fisheries, agriculture and plantations, tourism, and migration for wage labour. Populations ranged from 57-1775 people. Ethnic groups in the communities included Thai Muslim, Thai Buddhist, indigenous Moken (Arunotai, 2006; Wasinrapee, 2006), as well as Malaysian and Thai diaspora.

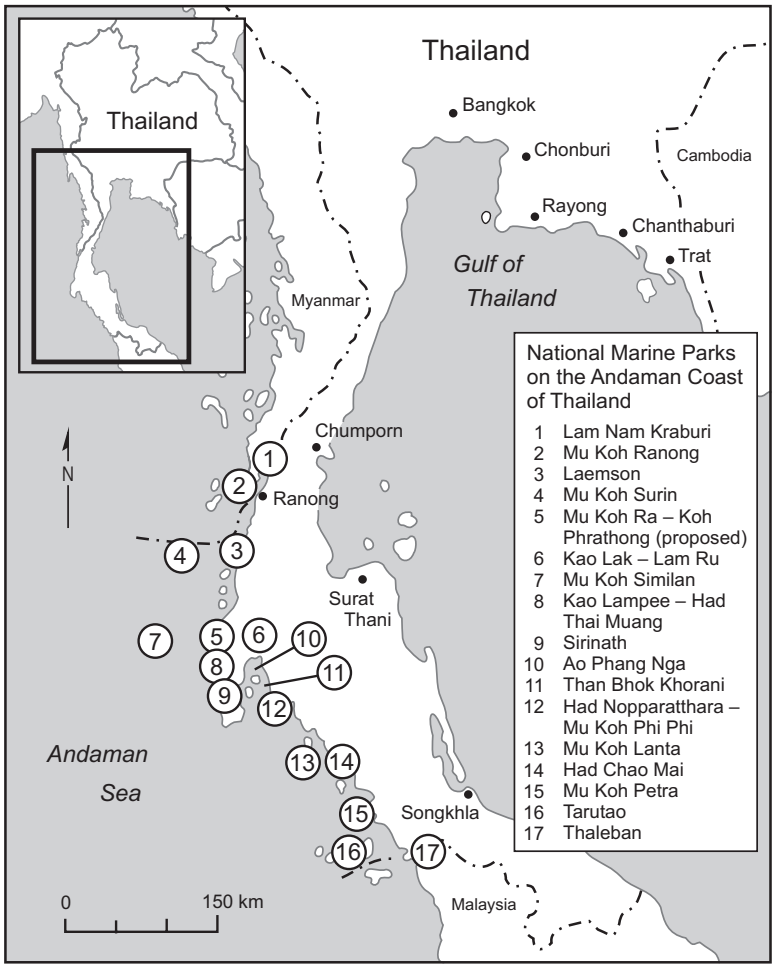


Figure 12 - Map of MPAs on the Andaman Coast of Thailand

Methods, Analysis and Limitations

A mixed-methods approach, including interviews and household surveys, was chosen to examine perceptions of the MPA impacts on neighboring communities as well as perceptions of governance and management processes. This study was part of a broader study that also focused on environmental change, vulnerability, and adaptive capacity. Exploratory and in-depth individual interviews (total=85) were conducted with community leaders (n=22), community group leaders (n=5), community members (n=35), government employees (n=3), NGO representatives (n=7), academics (n=3), and government agency representatives (n=10). The sample included 24 females and 61 males. In addition, 23 interviews were facilitated with groups of 2 to 5 community members. Surveys were completed with 237 households in the 7 communities representing between 21-47.7% of households in each community. Households were selected randomly from community maps by selecting every n^{th} house. Survey participants were 40.9% male and were an average of 42.1 years old. The majority of the survey was focused on adaptive capacity; however, several sections also focused on perceptions of the NMPs. In particular, participants were asked whether they agreed, disagreed, or were neutral on questions related to the impact of the MPA on marine conservation, terrestrial conservation, participation in management, knowledge or nature and support for conservation, tourism jobs and benefits, and access to livelihood resources.

Trained research assistants translated interviews as they were conducted. Field notes were taken, transcribed, and uploaded into NVivo qualitative research software (QSR, 2012). Analysis was conducted in an inductive fashion and then thematically organized under the various components of the sustainable livelihoods framework: livelihood strategies, livelihood outcomes, livelihood resources (i.e., capital assets), and policies, institutions and processes (i.e., governance and management). Survey data was analyzed in SAS and SPSS quantitative research software (IBM, 2012; SAS, 2013).

Limitations of this study include a gender bias in the interview sample and potential cultural misunderstandings or language mistranslations. The selective sampling of communities means that results are not generalizable to all communities and NMPs but provide important insights.

Results

Livelihood Strategies and Socio-Economic Outcomes

Across all of the sites, the most discussed and worrying effect of the creation of the NMPs was the impact on livelihood strategies and outcomes. Opinions about observed or possible outcomes varied depending on livelihood strategies (Table 9). Participants were most often concerned about the exclusion of fishers and subsistence harvesters from the area. This was more of a concern in the communities near the proposed Koh Ra-Koh Phrathong NMP where a commonly expressed opinion was "if there is a demarcation of a controlled zone then people cannot make a living from fishing and collecting shells". In the NMPs that had already been created, participants also discussed the negative impact on fishers and gleaners. However, many participants in these areas observed that there had been minimal impact on fishers because either a) DNP regulations allowed small-scale fishing in the NMP as long as fishers followed Department of Fisheries (DoF) regulations or b) DNP regulations did not technically allow fishing in the NMP but the managers did not enforce the regulations. A fisher from Koh Panyee in Ao Phang-Nga said "Locals can still fish there with no problems." Fishers near Mu Ko Ranong MNP would express sentiments such as "I did not hear anything about any new rules. I have not changed anything from the past." Lower level management and staff in the DNP offices showed empathy towards local fishers – "As long as the gear is not against the [DoF] law we don't intervene, because it is people's livelihoods." – and said that this was the reason that rules were not enforced for local fishers. Participants often said that it was only in areas where there were tourists that the DNP enforced the rules. For example, in Than Bhok Khorani "DNP does not allow you to collect shells on some islands. It is restricted. On some touristy islands they do not allow [harvesting] but on the [islands] that are not so well known it is allowed." Quantitative survey results showed that participants were more likely to feel that the MNP would decrease access to natural resources for livelihoods and household use (Figure 13).

Table 9 – Summary of qualitative discussions of perceived impact of NMP on livelihood strategies and outcomes

Livelihood Strategy	Perceived Impact	Perceived Outcomes
Fishing and Harvesting (for Income or Subsistence)	Neutral to very negative	• No impact to increased poverty • No impact to decreased food security • No impact to decreased well-being (e.g., traditions, culture, social, conflicts) • No impact to decreased access
Plantations	Neutral to very negative	• No impact to less diverse livelihood options
Aquaculture - Pond	None	• None as no local involvement
Aquaculture - Cages	Slight negative	• More vulnerable to risks
Management	Slight negative to slight positive	• Minimal increases in employment • Minimal increases in wealth • Decreased well-being (e.g., dignity)
Tourism	Fairly positive to fairly negative	• Increased employment to minimal and seasonal employment • Increased wealth to decreased wealth • Inequitable distribution of wealth • Rising costs and expenses • Decreased well-being (e.g., social impacts of tourism) • Displacement from accessing or using some areas

Perceived livelihood outcomes of the potential loss of access to fish and harvest for livelihoods and subsistence were varied, ranging from that the NMP would a) have no impact on incomes or households if the rules were not enforced to b) concerns that the loss of rights to fish and harvest would result in increased poverty, decreased wellbeing, increased conflict, and declining food security. Participants from near Koh Ra-Ko Phrathong NMP often discussed the example of Mu Koh Surin MNP where the DNP stopped the traditional Moken community from fishing and harvesting in the area without providing other livelihoods options. They felt that this had made traditional local fishers into criminals: “They have to steal from the sea to make a living. They have lived there

for 10 generations, but they have no choice…Everything they do is illegal, they cannot even collect seashells in their own home. They become worthless." Participants discussed arrests that had happened in the past and were apprehensive that this would continue to happen. Both in the communities and amongst NGO and academic representatives, there was a deep sense of injustice that "poor", "local", "traditional", and "small-scale" fishing and gleaning practices would be excluded from the area. In Koh Rah-Koh Phrathong NMP, this had lead locals to protest the creation of the NMP and to burn down the national parks office.

Other extractive livelihood strategies that could be impacted by the NMP included aquaculture and plantations. Interviews showed that locals did not have any involvement – either as owners or laborers – in pond aquaculture so there were no perceived impacts in this area. Participants understood that fish cage aquaculture was not allowed in the NMP but showed that the DNP did not enforce this rule. However, since the cages were illegal this meant that owners could not get insurance from fisheries for the fish cages in case of disease or failure. This meant increased risk and vulnerability for these households. The NMPs, it was felt, had more of an impact on plantations. In communities near Ao Phang Nga NMP, locals often discussed how the DNP came to cut down plantations that were owned by local people and that have been there since long before the park: "Rubber plantations is an occupation that was passed on from my grandfather's generation which dated back to 70 years ago. My plantation is inside the park. They often come to cut them down". In several communities, it was perceived that the rules were not applied judiciously to plantations owned by "outside businessmen" even though they were the ones who were often encroaching and trying to expand their plantations. In the more recent Mu Ko Ranong and Koh Rah-Koh Phrathong NMPs, boundaries were created to try to exclude plantations and areas that were owned by local people. Participants in Koh Chang felt that the national park had done a reasonable job of excluding plantations so there would be no impact on local plantation owners. In Koh Ra-Koh Phrathong, however, DNP attempts to consider plantations and ownership did not seem to assuage local people's concerns that plantations would be included within the boundaries of the national park thus undermining local livelihood options for diversification both now and in the future.

Two potential alternatives to these extractive livelihood strategies that could emanate from the creation of the NMP were related to tourism and management. For tourism, survey results indicated an overall neutral perception of whether NMPs would "improve tourism jobs and financial benefit for the local community" (Figure 13). These results were the result of highly polarized views with 39.2% of participants disagreeing and 38.0 % agreeing that "the park has or will improve tourism jobs and financial benefit". Results varied significantly (Chi square p-value=~0.004) across communities suggesting that perception of the benefits from tourism were spatially segregated, which was matched by survey data and observations. In Ao Phang Nga NMP, Ko Panyee received high visitation from tourists but the next community (Koh Mai Pai) only 5 kilometers away had no visitors. Similarly, Koh Chang had a growing tourism industry while Koh Sin Hi did not receive any visitors. Though tourism jobs were perceived to be a likely outcome of NMPs many participants discussed how there were limited benefits to most locals because of elite capture of financial benefits, outside ownership of businesses and resorts, hiring of outside laborers, or because the DNP managers owned restaurants and tourism businesses and were keeping the benefit for themselves. There was a general feeling that the NMP would result in increased sales of crafts and souvenirs, which would bring some benefit to communities. Many participants were also concerned that a growing tourism industry would also result in increased household costs (e.g., for food, water, and electricity) but also rising costs for land because of increased demand by outside business people. Finally, tourism development was seen to have significant social costs – including cultural appropriation and displacement. Participants discussed how the Moken community on Koh Surin was moved close to the national parks office so that they could charge tourists to go to the Moken community: "The national park thinks that the Moken belong to them and they are a selling point for tourists. Tourists want to see the traditional fishermen in their environment." However, collected fees are not re-directed towards the Moken community. Interviewees also discussed how areas with resorts or that were used by tourists were no longer accessible to local people.

There were several ways that locals could be employed in management: as rangers, as managers, as contractors, and as maintenance staff. Yet participants felt that only a minimal amount of additional employment in management would result from the NMPs

and they were concerned both about the amount of pay and the potentially demeaning nature of the job. Overall it was perceived that there was limited hiring of locals into management positions and as one participant stated "I doubt that this would happen." The exception to this was on Koh Panyee where "4-5 people from Panyee are working at Ao Phang Nga NP out of 40 staff." One interviewee who had previously worked as a ranger for the DNP in Ao Phang Nga had quit because they did not pay well enough and even neglected to pay employees sometimes. Few people expressed willingness to work as maintenance staff because they felt that the NP did not pay enough and also that it was demeaning work. Referring to Mu Koh Surin, one participant told us: "The NP pays them 100 baht per day to cook, clean and run boat service. It is not enough." In addition, some participants saw the maintenance positions as undignified: "Maybe in 20 to 30 years, I will be collecting garbage like the Moken on Surin."

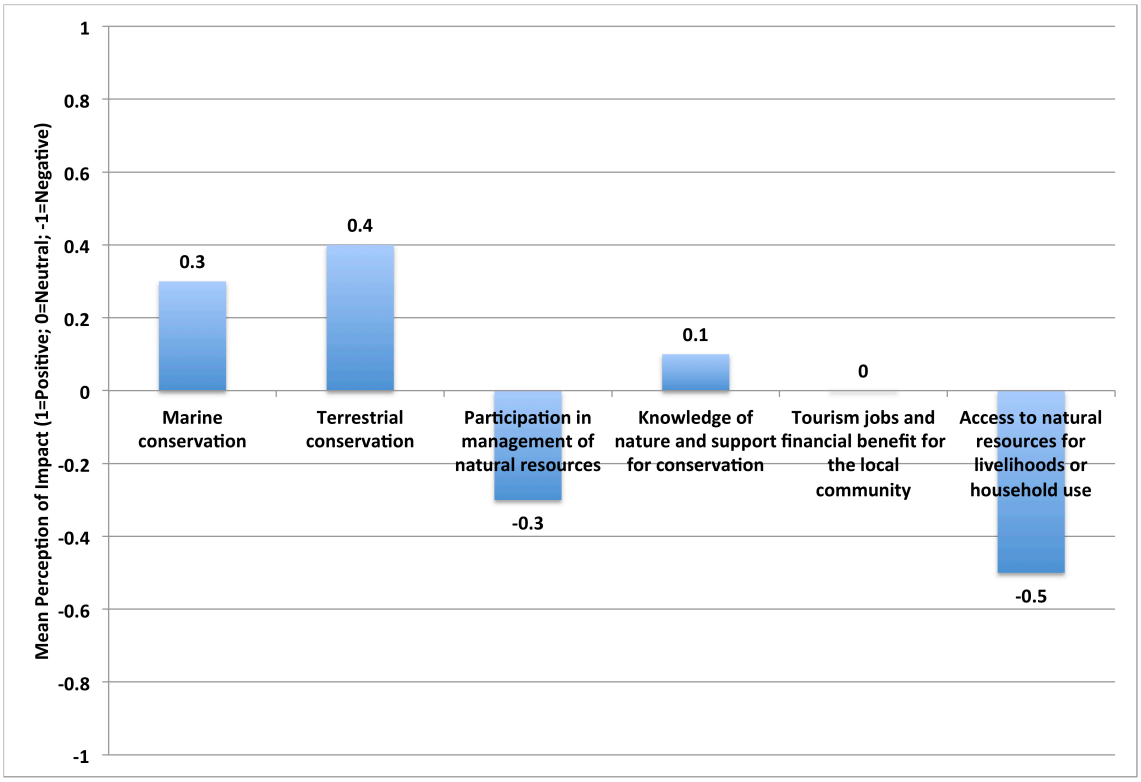


Figure 13 - Perceived impacts of the national marine parks on selected conservation, management, and livelihoods indicators (Mean score where 1=positive, 0=neutral, -1=negative)

Livelihood Resources

Assets form the basis of livelihoods. Livelihood assets were felt to be influenced by the NMPs in two ways. First, the policies, institutions and processes of the NMPs directly influenced access to assets. Second, livelihood outcomes could further support or undermine future access to assets. For example, the wealth earned from tourism development could promote further local development and gains or be centralized with a wealthy external elite. Due to length restrictions, it is beyond the purview of the current paper to provide specific narratives or examples but an overview of perceptions of how livelihood resources are impacted by the NMP is provided in Table 10. In summation, while NMPs are perceived to undermine access to resources necessary for traditional livelihoods, it appears that DNP and NMP managers do not adequately consider the means (assets) that are required to ensure that locals benefit from alternative livelihoods. For example, DNP management and policies fail to consider local values and development needs, support local capacity building, or promote local businesses.

Table 10 - Perceived influence of the national marine park on livelihood resources

Capital Asset	Perceived Influence of NMP
Natural Capital	• Positive impacts on terrestrial resources • Mixed impacts on marine resources • Undermines access to marine resources • Undermines local land ownership
Social Capital	• Conflictual relationships with managers and governors • Creation of inter-community conflicts • Undermines community relationships with other agencies and organizations
Human Capital	• Interferes with social programs or alternative livelihood programs initiated by outside organizations • No provision of training or capacity building for local people to participate in tourism or management
Physical Capital	• Creation of NMP related tourism infrastructures (e.g., piers, campsites, bathrooms, restaurants) • Does not support the development of social (health, education) or basic (transportation, water, communications) infrastructures • Limits the growth of houses and community boundaries • Confiscates and destroys illegal fishing gears
Financial Capital	• No additional access to finances to support local development • National park fees are centrally administered • Minimal economic benefit from tourism to be redirected towards development • Economic capital retained by elite, outside business people, or managers
Cultural Capital	• Undermines traditional livelihoods and cultural practices • Lack of support for maintenance and use of traditional knowledge
Political Capital	• The DNP mandate for national parks supports tourism development • Lack of policies and mechanisms to incorporate local values and knowledge • Minimal provisions for participation in management processes • Lack of policies to ensure local benefit and to support local development

Conservation Outcomes

Qualitative and quantitative perceptions of participants differed on the perceived conservation outcomes of the NMPs, particularly regarding the marine environment. It was agreed across all sites that terrestrial conservation was part of the mandate of the DNP. However, qualitative perceptions of the effectiveness of terrestrial conservation differed amongst areas. Interviewees in villages in Mu Koh Ranong and Ao Phang Nga NMPs all thought that the national park would result in protection of forested areas on the islands. Conversely, the majority of interview participants near the proposed Koh Rah-Koh Phrathong NMP believed that the national park would not protect the forested area effectively. This belief was alleged to be true for two reasons: there would be encroachment by outside businessmen for plantations and there would be illegal logging and hunting by the protected area superintendents and managers. Interviews revealed widespread confusion about whether the DNP mandate included the protection or management of the marine environment. Many interviewees expressed sentiments such as “The islands are under DNP, but there is no control over the sea” or “If there were new rules, we would know”. A minority of participants did recognize that the NMPs were also intended to protect marine habitats and resources. Yet even these participants were often skeptical that the NMP would actually result in marine conservation benefits because of lack of active management or enforcement. Even upper level management in one of the parks admitted that the DNP has “…no knowledge of the condition of the fisheries resources. The DNP only really manages the land.”

In brief, interview participants were split on whether NMPs were effective in protecting the terrestrial environment and largely in agreement that they would not effectively protect the marine environment. Survey results regarding perceived terrestrial and marine conservation outcomes were somewhat positive overall but views varied significantly (Figure 13). Approximately fifty four percent (53.6%) of participants felt that the NMP would improve marine conservation compared with only 24.9% who thought it would worsen (Chi square p-value=<0.001). Slightly more (57.8%) were in

agreement that terrestrial conservation would be improved by the NMP while 22.4% disagreed (Chi square p-value=~0.003).

Institutions and Organizations: Management and Governance

Beliefs about livelihood and conservation outcomes were intricately linked with perceptions of management and governance. Overall, perceptions of participants on the quality and effectiveness of management and governance were quite critical.

The legitimacy of DNP governance was broadly questioned on the grounds that governors and managers were not personally invested in local community or conservation outcomes and that the NMPs did not meet their lawful obligation to manage the resource. According to one participant "The park managers don't have any investment in the area. They have somewhere to escape to afterwards, a house in Bangkok, no relationships or social ties in the area." Participants often mistrusted the DNP and felt that local people would do a better job of protecting the area. According to one NGO representative, though Thai law grants the authority to manage the resource to the DNP "…they misuse the authority. They don't take care of the resource, they just act as if they own it." The inability to manage the area was attributed to lack of capacity within the agency and coordination with other agencies by NGO representatives, academics, and individuals from other government agencies. An often discussed issue that led to a lack of capacity, was the political appointment of superintendents by each subsequent government rather than hiring based on skills and knowledge. In Thailand's uncertain political climate, this happened often, leading to a lack of trust and uncertainty in communities about whether "the rules are going to change under the next superintendent". The DNP was also noted for being particularly challenging to work alongside by interview participants from the Navy, the Department of Marine and Coastal Resources, the Department of Fisheries, regional Tambon Administration Offices, and the Ministry of the Interior. They noted a lack of willingness to coordinate activities, which was partially related to unclear or overlapping jurisdictions. One upper level NMP manager noted "A key conflict between DNP and other government departments is that other agencies bring development."

Lack of coordination may be partially due to the centralized and top-down governance structures and processes that participants felt had also resulted in a lack of consideration and participation during creation and ongoing management of the NMPs. In recent years, DNP policies did require that national parks create committees for participation in management to increase coordination with other agencies and inclusion of local people and values. Yet DNP managers and one academic who sits on a committee told us that these committees consisted largely of regional business people and politicians and included few people from local communities. Furthermore, one participant who was on one of these committees suggested that they were ineffective and that superintendents did "not know what to do with them." In several instances, we learned that the DNP was trying to engage with communities more during creation and management but local elites and politicians in the communities would not allow NMP officials to enter their communities to meet and discuss ideas. Interviewees suggested that these individuals felt that their personal interests and-or those of their communities were threatened. On the other hand, in Koh Chang local leaders had allowed the DNP onto the island leading to a locally acceptable arrangement for land allocation. Overall, a somewhat negative perception (-0.3) was held by survey participants about the impact of the NMP on levels of participation in management of natural resources (Figure 13).

Several additional governance concerns were transparency, accountability, and fairness or equity. Participants felt that there was a lack of transparency in the DNP about programs of work, management plans, park fees and funding allocations, park creation processes, and appointment of superintendents. One NGO representative likened the DNP to "a twilight zone" where the reasons for decisions were not clear and one could not get answers to questions: "It is hard for locals to understand what is going on." This also led to challenges in holding managers accountable for their actions. There were widespread perceptions that the DNP and superintendents were corrupt. This often extended from anecdotes about managers extorting money from locals and business people, making financial claims for extra staff who were non-existent, logging and fishing in the area, and claiming a portion of park entrance fees. Local people felt that NMPs were inequitable in two ways: they were only accessible to wealthy tourist who could afford the fees and financial benefits went mostly to those who already had money or power.

Finally, participants noted that the DNP was not adaptable or open to feedback and that managers were "not interested in improving themselves" so governance was unlikely to change. Moreover, as one participant said referring to conversations that he had had with people from communities near several different NMPs: "Everywhere it is the same. The feeling is not good."

Management shortcomings were largely seen to extend from these issues with governance. There had never been programs of education or outreach in any of the communities that we visited. Despite this, there was a slightly positive perception (+0.1) that the NMP would increase knowledge of nature and support for conservation (Figure 13). Yet communities lacked knowledge of rules and regulations, the locations of boundaries, or even the existence of a park because there was little communication emerging from management offices. Access to park management plans was denied to our research team in all but one of four park offices that we visited without a letter from the DNP head office. If it occurred, enforcement of rules and regulations was seen to be inconsistent – due to minimal and seasonal monitoring - and inequitable – favoring outside business and landowners and commercial fishers over local people. Participants often discussed how there were no mechanisms for participation in creation or management, for consideration of local values and development considerations, for transparency and accountability, for resolving conflicts, or for integrating local and traditional knowledge into management. The one exception was on Koh Chang, where locals had been consulted extensively during the creation of Mu Koh Ranong. Still it was felt by many participants that park managers did not understand local communities in large part because the "superintendent and assistant superintendent never come out into the park".

Discussion

This paper makes a contribution to the literature on the impacts of conservation and MPAs in a particular context. This study suggests that local perceptions of NMPs, under the jurisdiction of the DNP, are fairly negative in coastal communities in Thailand. Perceived impacts of NMPs on livelihood strategies and outcomes are mixed. Fishing and

harvesting livelihoods are generally seen to be negatively impacted by NMPs except in cases where rules were misunderstood or not applied. Participants felt there were no impacts or negative impacts for plantation owners or laborers. NMPs were seen to lead to marginal employment or monetary benefits from tourism for most except for a select elite who would gain significantly. There was perceived to be little potential for benefit from employment in NMP management. Negative impacts were seen to stem from reduced access to or lack of development of social, cultural, human, political, natural, physical, and financial assets. Conservation outcomes were perceived to be mostly positive for terrestrial environments and quite mixed for marine environments. Opinions of DNP governance and management were quite negative. Moreover, the NMPs provided little incentive for local people to participate in or support conservation (Jones, Qiu, & De Santo, 2011, 2013).

Perceived impacts are not the same as actual (or even intended) impacts but they are instructive nonetheless. The results presented in this paper point to a problematic relationship between NMPs and local communities that is likely to undermine the success of marine conservation initiatives in Thailand. While these results cannot be assumed to be representative of the situation in all communities near all NMPs, interviews with those familiar with other areas and site visits by members of our research team suggest that many of the critiques are applicable to other NMPs on the Andaman coast of Thailand. Furthermore, the critical nature of these results are largely consistent with those presented elsewhere regarding Thai NMP governance, management, and impact on communities (e.g., Lunn & Dearden, 2006; Prasertcharoensuk et al., 2010) but provide a much more nuanced perspective. Cheung et al (Cheung et al., 2002, p. 89) also suggest that in Thailand "management of MPAs is generally weak…".

Yet, despite the negative sentiments of local communities towards the NMPs, they remain an important policy mechanism for marine management and conservation in Thailand. MPAs have the potential to conserve the environment and increase fisheries while contributing positively to social and economic development in local communities *if* a) local development considerations are taken into account and b) they are effectively managed and governed. If applied judiciously, support for MPAs may also increase over time as benefits are realized. However, the effective application of MPAs requires that

they are not islands of protection but situated within a suite of management actions and frameworks (Christie et al, 2002; Halpern et al, 2010; Agardy et al, 2011). In the Thai context, this includes local community institutions for fisheries and natural resource management, broader-scale fisheries management actions through the Department of Fisheries, and Integrated Coastal Zone Management through the Department of Marine and Coastal Resources. However, these other conservation and management initiatives may not boast the additional benefits of MPAs and can also be met with resistance or ineffectively applied or enforced in Thailand (e.g., Panjarat & Bennett, 2012). Similarly, these initiatives benefit from local support and require attention to management, governance, and local development to ensure effectiveness.

Rather than dwell on the deleterious situation it is more useful to reflect on how to overcome the issues presented herein through recommending well-acknowledged policy improvements and concrete actions. Though livelihood and rights trade-offs are an inherent part of implementing successful conservation initiatives (Mascia & Claus, 2009), the relative balance of negative consequences to benefits can be overcome through specific attention to livelihoods, governance, and management (Alder et al., 2002; Bennett & Dearden, 2012a; Camargo et al., 2009; Cattermoul et al., 2008; Hockings et al., 2006; Lockwood, 2010; Pomeroy et al., 2004).

First, concrete changes should be made at the policy level to address fundamental issues with the overall system of governance by cultivating DNP wide mechanisms to increase transparency, accountability, participation, coordination, legitimacy and adaptability. Transparency could be improved through making annual reports and management documents freely available in park offices and online and accountability through regularly conducted external audits and reviews of management effectiveness. Effective participation requires new processes and equitable involvement of all stakeholders. Enhanced inter-agency coordination – with the Department of Marine and Coastal Resources and Department of Fisheries – could facilitate integrated coastal management (Kelleher, 1999; Pomeroy et al., 2004). Legitimacy might be improved through increasing the presence of local people in management and ensuring that trusting relationships are built with long-term and respected managers who demonstrate attachment to the place and socio-economic and conservation outcomes. The current

policy of re-appointing NMP superintendents after each election should be reconsidered. The performance of park managers should be monitored and corrective actions taken accordingly. Implementation of ongoing programs of monitoring and evaluation of ecological, governance, and socio-economic indicators could improve adaptability (Pomeroy et al., 2004).

Secondly, fairness or equity could be increased through creating means to share benefits of conservation locally, particularly by supporting local economic and tourism development, capacity building programs, and hiring practices. Specific consideration should be given to how to support the development of alternative livelihoods and increase access to assets, which will likely require partnering with other governmental and non-governmental organizations.

Third, management capacity needs to be enhanced through cultivating managerial skills – such as facilitation, communication, education, and conflict resolution. Management in each NMP will also need to engage in: programs to effectively communicate rules and regulations (e.g., marking boundaries), programs of outreach and education, processes to improve participation in management and incorporate local values and knowledge, and activities to increase trust and resolve conflicts. Actions should be taken to improve transparency in each individual NMP and accountability in each park management unit. These management actions will require adequate capacity, resources and massive changes in DNP's organizational culture.

These changes and actions should build on several defunct or ongoing policy initiatives in Thailand's system of NMPs that offer glimmers of hope. The first is the Joint Management of Protected Areas (JoMPA) Program – a co-management pilot project that was initiated in Laem Son National Park between 2004-2006. Even though this project was seen to have had a positive impact on NMP-community relationships, it was abandoned after donor funding from Danida was completed (ONEP, 2005; World Heritage Nomination Document, 2010). The second is the Strengthening Andaman Marine Protected Areas Network (SAMPAN) Project that is a partnership between the DNP and World Wildlife Fund with funding from the French Development Agency. One of the project's aims is to "develop a model for co-management and implement it using participatory principles and management effectiveness framework" (SAMPAN, 2013);

however, few of their activities are focused at the community level. There was also a recent evaluation of the management effectiveness of Thailand's NMPs with the goal of improving their management (Manopawitr, 2012). Yet the management effectiveness document is not publicly available, potentially undermining accountability, and additional concrete steps will need to be formulated and taken to address identified shortcomings. There are also ongoing attempts to address corruption within the NMPs on the Andaman coast and the agency overall (Lem, 2012; Pongrai & Pongphan, 2011). Yet these current initiatives are limited in scope, scale, and longevity and have the potential to be undermined by previous issues with governance and management, particularly corruption, lack of accountability and ineffective mechanisms for participation.

Conclusion

Thailand has an extensive system of MPAs that is unlikely to achieve its conservation potential without significant improvements to governance and management and increased attention to local development. Enhanced NMP governance and management processes could build trust and ameliorate relationships with local communities and might lead to improved conservation outcomes through engendering support and compliance. However, improving conservation outcomes will require that the broader array of issues, and their root causes, are taken into account and that management actions are coordinated between agencies and across the Andaman coastal zone. Bettering socio-economic development processes and outcomes will also necessitate partnerships with organizations that are better equipped to address development issues. These initiatives would oblige DNP governors and managers to cast a much broader net – to be amenable to coordinating with other governmental and non-governmental organizations and to including local communities more fully in NMP management and related initiatives.

Chapter 5

The Capacity to Adapt?: Communities in a Changing Climate, Environment, and Economy on the Northern Andaman Coast of Thailand[4]

Abstract

The health and productivity of marine ecosystems, habitats, and fisheries are deteriorating on the Andaman coast of Thailand. Due to their high dependence on natural resources, and proximity to the ocean, coastal communities are particularly vulnerable to these declines and climate-induced changes in the marine environment. These communities must also adapt to the impacts of management interventions and conservation initiatives, including marine protected areas, which have livelihood implications. Further, communities on the Andaman coast are also experiencing a range of new economic opportunities associated in particular with tourism and agriculture.

These complex and ongoing changes require integrated assessment of, and deliberate planning to increase, the adaptive capacity of communities so that they may respond to: 1) environmental decline through effective management interventions or conservation initiatives, 2) new economic opportunities to reduce dependence on fisheries, and 3) the increasing impacts of climate change.

This paper presents results of a study that examined multiple dimensions of adaptive capacity of seven island communities near marine protected areas on the Andaman coast of Thailand. Results show that communities had low adaptive capacity with respect to environmental declines, particularly in fisheries, and to management and conservation interventions, while they had inconsistent levels of adaptive capacity to economic opportunities. Though participants were experiencing the impacts of climate change – especially storm events, changing seasons and weather patterns, and erosion – households and communities were reacting to these changes with limited knowledge of climate

[4] This chapter been submitted for review with co-authors Philip Dearden, Grant Murray, and Alin Kadfak.

change per se. This paper concludes by recommending leverage points at multiple scales for increasing adaptive capacity.

Keywords: adaptive capacity, coastal communities, climate change, marine protected areas, fisheries management, alternative livelihoods, Thailand

Introduction and Overview

Globally, coastal communities are experiencing a broad array of socio-economic and biophysical changes ranging from shifting economic situations and political settings to environmental degradation, fisheries declines and climatic changes. On the Andaman coast of Thailand, the health and productivity of marine ecosystems, habitats, and fisheries are deteriorating (Juntarashote, 2005; Panjarat, 2008; World Bank., 2006), as a result of overfishing, destructive fishing, coastal development, and pollution (BOBLME, 2012; Cheung et al., 2002). This situation has repercussions for the estimated 621 fishing communities with 47,537 fishers who are dependent on fisheries and coastal resources (Panjarat, 2008, p. 29). Thailand's coastal communities must also adapt to the livelihood impacts of management interventions and conservation initiatives, including 26 large national marine parks (NMPs) (World Heritage Nomination Document, 2010). Fortunately, economic growth is bringing a range of new livelihood opportunities to communities, particularly in tourism and agriculture, which could diversify livelihoods and reduce pressure on marine resources (Ellis & Allison, 2004). Coastal communities are also particularly vulnerable to climate-related changes, including rising ocean temperatures, extreme weather events and changing seasons, as well as to increasing ocean acidification, which all have both direct impacts on them (e.g., infrastructure damage, erosion) and the ecosystems on which they depend (e.g., coral bleaching, mangroves retreating), as well as indirect impacts associated with resource dependent livelihoods (Marshall et al., 2010). Regional climate change projections suggest that the region will experience $>3^0$C increases in mean maximum and mean minimum temperatures, more warm days, an 8% increase in precipitation, more intense rainfall and monsoons in the rainy season, longer dry seasons, and an annual rise in sea level of 1-

2mm (START, 2010; Unnikrishnan & Shankar, 2007). There have also been a number of significant coral bleaching events – in 1991, 1995, 1998, and again in 2010 - along the Andaman coast (Phongsuwan, 2011).

In this context of complexity and persistent change along with the socio-economic and ecological importance of the marine environment, our mixed-methods study sets out to explore whether or not coastal communities along the northern Andaman Coast of Thailand are able to respond to these changes in a manner that supports positive social-ecological outcomes. Drawing on a multi-scalar analysis, we examine whether or not these communities were able to adapt to 1) environmental declines through accommodating outside management or conservation initiatives *or* developing local management or conservation responses, 2) non-fisheries economic or livelihood opportunities in order to reduce pressure on marine systems, and 3) climate related changes. The paper proceeds as follows. First, we introduce the adaptive capacity framework that guided our research. Second, we describe the sites, methods, analysis, and limitations. Third, we present results and examine their implications for policy and action.

Framework for Analysis of Adaptive Capacity

This research drew on theories of social-ecological resilience (e.g., Berkes et al., 2003; Marschke & Berkes, 2006) and social resilience or adaptive capacity (e.g., Adger, 2000; Marshall et al., 2010). Social adaptive capacity is a measure of resilience and a means of reducing the vulnerability of social institutions, communities, groups, or individuals to environmental, social, political, or economic changes, shocks, stresses, or trends. Marshall et al. (2010, p. 6) refer to social adaptive capacity as "the ability to respond to challenges through learning, managing risks and impacts, developing new knowledge, and devising effective approaches." Though previous research on adaptive capacity has tended to focus at a single scale or on singular stressors, it is broadly recognized that communities are experiencing multiple stressors (Bunce, Rosendo, et al., 2010; Leichenko & O'Brien, 2008; O'Brien & Leichenko, 2000; Ommer & Team, 2007)

and that the ability to adapt is influenced by actions at multiple scales: international, national, community, and household (Adger et al., 2005; Cinner et al., 2009).

Many indicators of social resilience can be found in the literature. Measures of adaptive capacity from various fields include livelihood diversification and mobility (Adger, Kelly, Winkels, Huy, & Locke, 2002; Ellis, 2000), levels of social, cultural, economic, human, and natural capital (Berkes & Folke, 1998; Carney, 1998), institutional and governance processes and arrangements (Ostrom, 1999), a culture of learning (Hagmann & Chuma, 2002), redundancy of function in organizations (Staber & Sydow, 2002), access to resources (Scoones, 1998), diversity of resource dependence (Bailey & Pomeroy, 1996), supportive public policies and institutions (Kalikoski et al., 2010), and levels of income and social stability (O'Garra, 2007). Adger (2003) suggests that adaptive capacity is directly linked to social capital, which can be defined as relationships built on trust, networks, and reciprocity, and the resultant willingness and ability of groups to act collectively. Governance, civil and political rights and literacy, Adger and Vincent (2005) show, are linked to national adaptive capacity to climate change related events in Africa. Adaptive capacity is co-related with economic development and well-being (Brooks et al., 2005; McCarthy & IPCC, 2001). The various components of adaptive capacity that guided our research and analysis are summarized under the four categories originally proposed by Folke et al (2003): flexibility and diversity, capacity to organize, learning and knowledge, and access to assets (Table 11). The components of adaptive capacity utilized in this study were chosen to reflect the ability of communities to adapt to a) climate change, b) alternative forms of development or livelihoods, and c) environmental declines through maintaining ecosystem functioning and productivity. There is significant overlap between the factors that enable adaptation to each of these three spheres of change.

Table 11 - Categories and components of adaptive capacity (after Cinner et al., 2009; Folke et al., 2003; Marschke & Berkes, 2006; Marshall et al., 2010; McClanahan et al., 2009)

Categories	Components
Flexibility and diversity	• Occupational mobility and attachment to occupation • Occupational multiplicity, livelihood and income diversity • Dependence on natural resources and fisheries • Place attachment
Capacity to organize	• Bonding social capital and networks • Gender relations • Participation in community, regional, and protected area decision-making • Local environmental institutions and social norms • Environmental policies and agencies • Governance and leadership • Levels of corruption • Active risk management • Migration • Perception of risk
Learning and knowledge	• Resource monitoring, feedback, and adaptation mechanisms • Knowledge of climate change • Spaces for learning • Diversity of knowledges for NRM • Change anticipation and response • Recognition of causality and human agency
Access to assets	• Material assets • Infrastructure • Levels of education • Financial status and access to sources of credit • Bridging social capital • Institutional support • Natural capital • Equity and rights

Site Description and Methods

A multiple case study approach was chosen to seek insight into real life phenomena rather than generalizability (Yin, 2009). Seven communities - Baan Tha Khao, Baan Ko Panyee, Baan Lions, Baan Tapae Yoi, Baan Koh Chang, Baan Moken, and Baan Koh Sin Hi - were selected along the northern Andaman coast of Thailand (Figure 14). Selection of communities was based on the following criteria: proximity (within 3 km) to a marine protected area, presence of different habitats (coral reefs, mangroves, and seagrass), existence of an assortment of ethnic groups, a range of populations, and a variety of

livelihood portfolios (Table 12). These criteria were chosen to explore how contextual and cultural factors influenced adaptive capacity. The marine protected areas were all national marine parks (NMP) under the jurisdiction of the Department of National Parks (DNP) and are technically "no-take" areas.

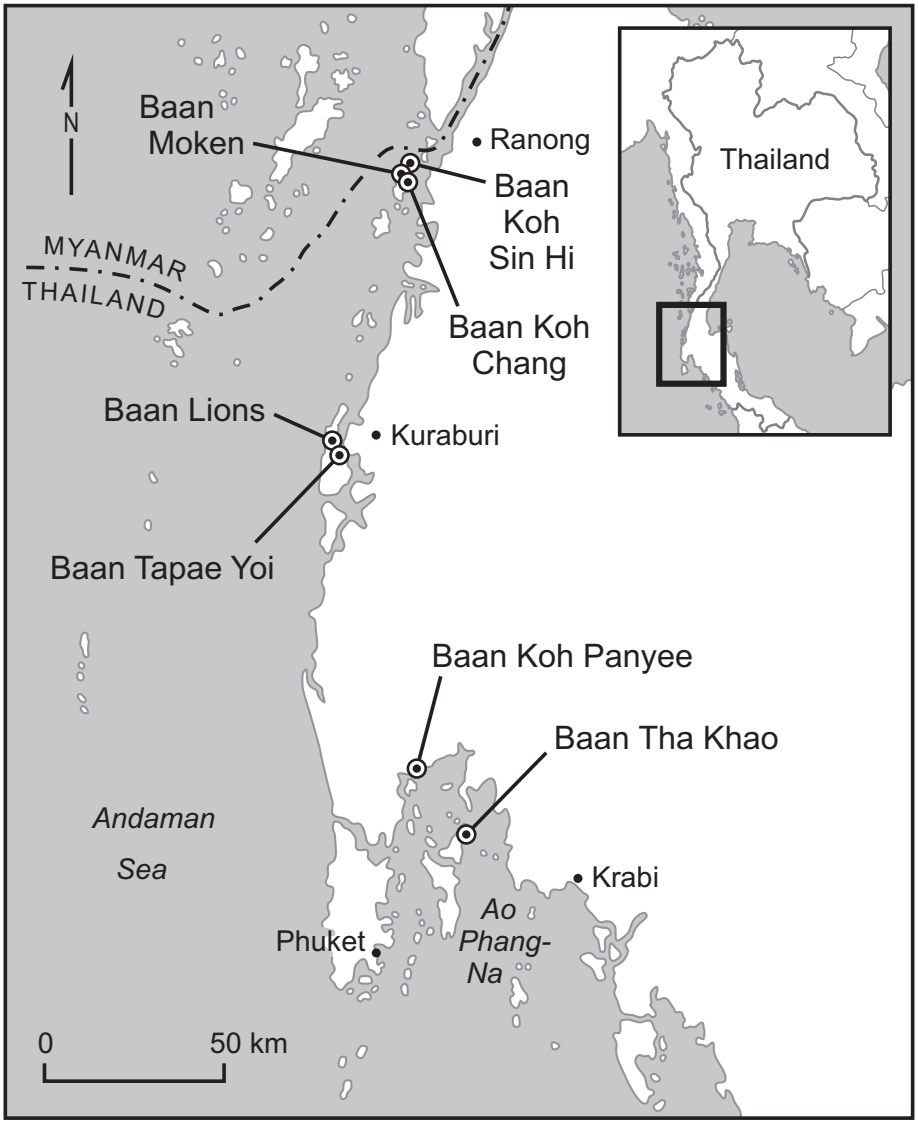


Figure 14 - Map of research sites on the Andaman Coast of Thailand

A mixed-methods approach was employed to assess the adaptive capacity of the selected communities over a 10-month period in 2011-2012. Research included a review of secondary documents, a series of key informant and in-depth interviews, and

community household surveys. An overview of the specific methods that were used to assess each aspect and component of the adaptive capacity framework (Table 11) can be found in Appendix A. A total of 85 individual interviews were conducted with community leaders (n=22), community group leaders (n=5), community members (n=35), and government employees in the communities (n=3) as well as outside government (n=10), NGO (n=7), and academic (n=3) representatives. An additional 23 small group (2-5 people) interviews were conducted with community members. The sample included 24 females, 61 males, 6 groups of men, and 17 mixed gender groups. Interviews were conducted with trained local research assistants and in the local dialect. Between 21-47.7% of households in each community were selected for the household survey by selecting every n^{th} house from hand-drawn community maps. In total 237 of 280 selected households were surveyed with a completion rate of 85%. Survey participants had a mean age of 42.1 years and were 59.1% female.

Interviews were translated while they were being conducted and field notes were taken. Interview and field notes were later transcribed and imported into NVivo 10 qualitative research software for analysis (QSR, 2012). Qualitative data were coded against indicators related to components of the adaptive capacity framework. Survey data were uploaded into SAS quantitative research software where additional queries were run and then exported to SPSS 21 for final analysis (IBM, 2012; SAS, 2013). This article relies on a descriptive analysis of the interview and survey data.

Several limitations should be recognized: 1) potential inaccuracies of language and cultural translations; 2) a gender bias in the interviews towards male participants and in surveys towards females; 3) sampling of communities for insight limits the generalizability of results; and, 4) results were not verified with communities as analysis was done after returning from field research. Determining the relative levels of fisheries or environmental degradation across the sites was beyond the scope of the current research.

Table 12 – Community information and household (hh) survey sample

Community (Baan)	National Marine Park	Habitats	Livelihoods (listed by importance)	Ethnic Groups	Population - #	Households (hh) - #	Sample - # (%) of hh	Completed Surveys - # (%) of hh
Baan Tha Khao	Ao Phang Nga and Than Bhok Khorani	Coral reefs, mangroves	Rubber plantations, tourism, fishing, gleaning	Thai Muslim	486	142	47 (33.1)	41 (28.9)
Baan Koh Panyee	Ao Phang Nga	Mangroves	Tourism, fishing	Thai Muslim	1440	286	60 (21)	53 (18.5)
Baan Lions	Mu Koh Rah-Koh Phrathong	Seagrass, mangroves, coral reefs	Tourism, mixed plantations, fishing, gleaning	Thai Buddhist, Moken	57	44	21 (47.7)	15 (34.1)
Baan Tapae Yoi	Mu Koh Rah-Koh Phrathong	Mangroves, seagrass	Fishing, plantations, tourism, gleaning	Thai Buddhist, Moken	119	63	22 (34.9)	22 (34.9)
Baan Koh Chang	Mu Koh Ranong	Mangroves, coral reefs	Rubber and cashew plantations, tourism, fishing	Thai Buddhist	300	126	39 (31)	31 (24.6)
Baan Moken	Mu Koh Ranong	Coral reefs, mangroves	Fishing, gleaning	Moken	175	36	12 (33.3)	11 (30.6)
Baan Koh Sin Hi	Mu Koh Ranong	Mangroves, seagrass, coral reefs	Fishing, migration for work, gleaning, rubber plantations	Malay Muslim, Burmese	1775	290	78 (26.9)	64 (22.1)

Results

Adapting to Environmental Decline?

Both interview and survey participants discussed environmental degradation and fisheries declines at length. Across all of the communities, interviewees consistently commented that fish were not as large as they had been in the past, that fishers and gleaners could not harvest as much as they did in the past, and that some species had disappeared altogether. Eighty seven percent (87%) of survey respondents felt that marine resources and the number of fish in the sea had "decreased". There were several possible adaptive responses that might increase the health and resilience of the marine environment and fisheries yields for local communities. First, effective fisheries regulations established by the Thai Department of Fisheries (DoF) might allow for the sustainable management of fisheries. Second, the creation of large-scale no-take marine protected areas by the Thai Department of National Parks (DNP) could support the

preservation of habitats, including coral reefs, mangroves, and sea grass areas, and thus lead to fisheries increases (Halpern et al., 2009; Lester et al., 2009). For the first two interventions to be effective, communities would need to be willing and able to adapt to these management and conservation interventions initiated through external *environmental policies and agencies* (Hereafter, italicized terms refer to components of the adaptive capacity framework in Table 11 and Appendix A). Finally, communities might adapt to environmental declines through the development of *local institutions and social norms, resource monitoring and feedback mechanisms,* and *spaces for learning* to sustainably manage local resources (Charles, 2001; Hauzer et al., 2013; Ostrom, 1990, 1992).

Overall, it appeared that fishers in most of the research communities tended to follow the Department of Fisheries (DoF) gear restrictions of which they were aware, but fishers did not follow regulations related to species, sizes, or areal or seasonal closures. Interview participants told us that locals followed regulations, but the gears used were also apparent as fishing gears (even illegal ones) were left lying openly around the village, in boats or at piers. There were several exceptions: in Koh Panyee several illegal gears including pongpang nets (i.e., set bag nets) were used in the mangrove canals, and bay closing nets with "mosquito net" mesh were used for miles along the mangroves; and in Koh Sin Hi some fishers used anchovy nets (approx. 1.5 cm mesh) for fishing other species. However, there was sometimes a lack of knowledge of the specific rules for each gear type. For example, the mesh sizes for grouper and snapper traps were too small in Baan Tapae Yoi and Baan Koh Panyee. Fishers claimed that this was not illegal and justified the smaller mesh size and the collection of juveniles for the purpose of fattening them in fish cage aquaculture. Though participants told us that there had been a decline in the use of illegal gears by locals, in all communities participants suggested that "outsiders" were using illegal gears and that commercial fishers were entering inshore waters (within 3000m). There was agreement among all interview participants that the DoF did not effectively or equitably enforce the rules for these intrusions. Fishers suggested several reasons why DoF was not able to enforce the rules: lack of capacity (i.e., staff and boats), lack of political will, the danger of apprehending commercial boats, and corrupt relationships between government officials and the fishing industry.

Interviews and observations showed that fishers did not follow fisheries regulations and recommendations to not catch species at certain life stages (e.g., juveniles or during spawning season): for example, the spawning season closure measure in Ao Phang Nga was ignored by fishers in Baan Thao Khao and Baan Koh Panyee (Panjarat & Bennett, 2012). As crabs with eggs were a prized-commodity that fetched a higher market price and participants felt they were more delicious, fishers admitted not releasing them.

Across all of the research sites except Koh Chang, fishers appeared either a) unwilling or unable to adapt to the presence of the national park or, b) ignorant of the presence of or regulations associated with the marine portion of the national park. Results suggest that there are three reasons why this might be: 1) perceived negative livelihood and community impacts; 2) shortcomings of management, and/or 3) the ineffective functioning of governance. Participants consistently discussed how the presence of a national park interfered with the livelihoods of local people, particularly with fisheries but also with agriculture and plantations. A commonly expressed sentiment was that, "The national park does not allow people to make a living from the sea" (interview participant). Most participants felt that it was unjust that local, impoverished and small-scale fishers were not allowed to fish within the NMPs. Fishers and gleaners, people who collect seafood by walking and gathering, discussed how they had no other options. Tourism opportunities were rarely seen to be related to the presence of a national park.

Several significant management shortcomings appear to be contributing to lack of support or lack of knowledge. First, the NMPs were created in a top-down fashion with limited or no participation during their creation (Prasertcharoensuk et al., 2010). Second, there were and are extremely limited programs of outreach, education, and awareness building. None of the communities that we worked with had ever had a visit from DNP staff for this purpose. This meant there was a lack of knowledge about boundaries, regulations, the rationale for NMP establishment, and even their existence. A third management shortcoming is a lack of capacity to manage the area, in terms of finances, infrastructure, skills, knowledge, and leadership. A final management shortcoming is acrimonious relationships due to minimal community *participation in protected area decision-making* and management, despite the presence of guarantees for community

participation in natural resource management since the 1997 implementation of the Thai Constitution (Government of Thailand, 2007a; Knight, Watson, Dill, Moore, & Miller, 2010). In terms of governance, interview participants from all groups (government agencies, NGOs, ENGOs, academia, and communities) felt that the DNP was neither transparent nor adaptable and that it enabled corruption. These factors led to a lack of trust in the agency and NMPs, and widespread unwillingness to participate in or support DNP-led marine conservation.

Finally, though many NGOs and fisheries organizations in Thailand are contending that communities should have the right to manage their own resources (e.g., IUCN, 2012), effective local environmental management would require both a conservation ethic (*norms*) as well as the presence of *local institutions*. We considered a conservation ethic to be strong if there were strong and consistent expressions of support for conservation actions by interview participants in communities. There appeared to be a strong conservation ethic in Lions, Tapae Yoi, Tha Khao, and Koh Chang, which resulted from either the ongoing presence of outside conservation organizations, strong local leadership, or local spiritual leaders who encouraged moderation. These four communities had local community- based conservation groups that were mainly focused on the terrestrial environment or mangroves. In Koh Panyee, there were mixed expressions of support for conservation. There seemed to be less of a conservation ethic in both Baan Moken and Koh Sin Hi. This may have been due to limited *access to assets* – for example, lower *financial status* or a lack of Thai citizenship and thus *rights* to the resource and sense of ownership - in these communities. Several (non-Moken) participants conjectured that the Moken were traditionally nomadic and would move when resources were scarce or over-utilized, so culturally there had been no need to develop a conservation ethic or management practices prior to becoming settled.

Though some communities appeared to have stronger conservation ethics than others, there was still a paucity of locally developed *environmental institutions* – including formalized regulations, processes, mechanisms, and organizations - that would allow for the conservation of marine resources. In all of the communities, key informants were asked about the presence of the following institutions: gear restrictions, spatial restrictions, community mangrove forests, species restrictions, catch restrictions,

temporal restrictions, resource monitoring mechanisms, enforcement of rules, and formalized spaces for sharing (Table 13). There were no species restrictions, catch restrictions, temporal restrictions, or resource monitoring mechanisms in any of the sites. In Thao Khao, Tapae Yoi, and Lions, there were what was perceived to be "locally created" gear restrictions on bay closing nets and boat-towed shell dredges, but these restrictions were consistent with national regulations. There were several small seagrass MPAs (for conch and sea cucumbers) that had been recently created in Baan Lions and Baan Tapae Yoi but it appeared that few of the pre-requisites for functioning local MPAs - e.g., adequate consultation, community consensus, means for enforcement, exclusion rights (Bennett & Dearden, 2012a; White, Aliño, & Meneses, 2006) were in place to ensure their long-term sustainability. There was a small coral reef MPA in Baan Tha Khao that had been abandoned, but the community did have a community mangrove forest that appeared to be functioning.

Local enforcement of rules was only done in two communities. In Tha Khao, it was done through public shaming and confiscation of gears – which by all accounts was deemed effective. In Baan Lions, the chief suggested that he arrested people in a public meeting but others said that he had no right to do this. None of the communities had functioning small-scale fisheries associations or organizations, or other *spaces for learning* specifically dedicated to sharing and discussing actions for fisheries management or marine conservation. However, conservation actions and fisheries rules were sometimes discussed during other community meetings and there was an outside NGO on Koh Phrathong (Lions and Tapae Yoi) that was facilitating conversations about conservation in the area.

Interview participants suggested that three factors – 1) the lack of legislation or policies to allow communities to conserve or manage their own resources, 2) a history of top-down natural resource management in Thailand, and 3) the open access regime - are all *environmental policies* that are somewhat responsible for preventing locals from developing their own institutions. Ongoing and unresolved conflicts – e.g., between small-scale fishers and with commercial fishers - were also disenfranchising local communities. Finally, all of these communities had short histories (less than 100 years)

and our analysis suggests that Traditional Ecological Knowledge (*diversity of knowledges for NRM*) was limited and focused primarily on accessing resources to increase harvests.

Table 13 - Presence or absence of local institutions to support conservation across the research sites

Type of Institution	Community						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Gear Restrictions	–	✗	–	–	✗	✗	✗
Spatial Restrictions (MPA)	–	✗	✔	✔	✗	✗	✗
Community Mangrove Forest	✔	–	✗	✗	✗	✗	✗
Species Restrictions*	✗	✗	✗	✗	✗	✗	✗
Catch Restrictions	✗	✗	✗	✗	✗	✗	✗
Temporal Restrictions	✗	✗	✗	✗	✗	✗	✗
Size Restrictions	✗	✗	✗	✗	✗	✗	✗
Resource Monitoring	✗	✗	✗	✗	✗	✗	✗
Enforcement of Rules	–	✗	–	✗	✗	✗	✗
Formalized Spaces for Sharing	✔	✗	✔	✗	✗	✗	✗

Notes: ✗=not present, ✔=present, –=marginal presence; *None other than those already required by national law

Adapting to Economic Opportunity?

The following section briefly examines the current livelihood situation – *diversity, resource dependence, mobility, and financial status* - of households and participants and then discusses the components of adaptive capacity that were helping or hindering communities or households to engage with new economic and livelihood opportunities and move away from fisheries.

Occupational multiplicity and livelihood diversity and levels of *dependence on marine resources* in the sampled communities were quite different (Table 14). Interview participants in all of the communities noted a general decline in fisheries-based livelihoods and in fisheries yields. Yet, fishing for income or subsistence still maintained an important place in most households. Overall, 35.4% of households across all sites (range=6.7%-81.8%) listed fisheries livelihoods as most important in terms of income. Sampled communities were becoming increasingly dependent on other livelihoods

including tourism (22.8%), agriculture and plantations (11.8%), and other livelihoods (19.8%) as the primary source of income. However, a portfolio of livelihoods made up the overall income of most households. Even in households where fisheries were not the most significant source of income, there were often individuals whose primary (55% of households) or secondary occupation (47% of households) was fisheries. Many households relied heavily on the marine environment for subsistence use (47% of households) with 72.1% of households eating seafood 5 or more nights per week.

In some communities, interviewees suggested that high demand and favorable market prices meant that tourism and rubber plantations were largely responsible for raising both the average incomes of households and the overall wealth of communities, though this wealth was often highly concentrated among a few individuals who owned lots of land or tourism businesses (*equity*). The majority of livelihood opportunities were also highly *seasonal* and income was lower in the rainy season (mean = 14001 Thai baht) than in dry season (mean = 23037 Thai baht). Males (all in household >18 years) had almost double the mean annual income of women (all in household >18 years) higher income than women on average (Male mean annual salary = 63657 Thai baht; Female mean annual salary = 34393 Thai baht). However, women made important contributions to households through subsistence activities including gleaning, household gardening, raising livestock, and selling food and desserts. Interview participants in most of the communities felt that their income (*financial status)* was improving (the exception was Baan Ko Sin Hi) but livelihood and household costs were also increasing along with household debt. This meant that 38% of households felt that household income was less that expenses (38% income equal to expenses; 24% income greater than expenses). Many survey participants believed that there were plenty of opportunities for *occupational mobility* if they could not make a living, indicating they would choose to migrate elsewhere for work temporarily (32.1%) or permanently (8.9%). Of all households sampled, 19.8% (range 9.1%-45.5%) received remittances from family members working elsewhere with average monthly remittances contributing significantly to household income (mean = 3361 Thai baht/month).

Table 14 - Importance of fisheries-based livelihoods to households (hh) for income, employment, and subsistence

Indicator	Community								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value
% of households for which fisheries is most important livelihood for income	10	9	7	68	10	82	73	35	<.0001~*
All households mean income from fisheries in Thai baht*** (median)	36726 (0)	15943 (0)	31120 (0)	62004 (58000)	17290 (0)	77401 (61520)	57271 (42800)	38964 (7600)	0.0003#**
All households mean income from all sources in Thai baht*** (median)	237893 (216400)	314611 (240000)	150781 (157600)	200183 (122100)	237955 (200000)	92750 (76800)	107757 (78600)	204165 (152000)	<.0001#**
% of households with 1 or more person with fishing as primary livelihood	63	21	40	78	16	82	88	55	<.0001~*
% of households with 1 or more person with fishing as secondary livelihood	29	23	67	82	61	91	50	47	<.0001~*
% of households that gather seafood for subsistence	44	17	67	86	55	82	47	47	<.0001~*
% of households that eat seafood 5 or more nights per week	88	93	47	45	58	64	69	72	<.0001~*

Note: *Chi-square; **ANOVA; ***1 Thai baht =approx. 0.031USD

The extent to which communities were engaging with alternative livelihoods appeared to be largely dependent on three main factors: 1) suitability of the site for tourism (*natural capital*), 2) access to land and local ownership of land for livelihood purposes (*natural capital/material assets*), and 3) hiring of locals versus outside laborers (*bonding social capital*). Many of the communities surveyed – Tha Khao, Koh Panyee, Lions, Tapae Yoi, Koh Chang – are situated near areas that are attractive to tourists or are themselves the home of an important tourist attraction that allowed for tourism to flourish. However, many fishing villages on the Andaman coast are situated in mangrove forests with no access to beaches and as such are less attractive to tourists.

Land access and ownership in some communities has allowed local people to establish plantations or build bungalows. Two communities – Koh Panyee and Baan Moken – did not have easy access to land for geographical reasons and therefore could not diversify their livelihoods by establishing agricultural areas or plantations. More than half (52.3%) of all households in all communities owned land for livelihood purposes but it was not evenly distributed (Table 15). Local ownership was strongest in Koh Chang and Tha Khao where the majority of plantations and tourism businesses were locally

owned. In all sites, but particularly in Lions, Tapae Yoi, and Koh Sin Hi, land ownership was complicated by citizenship rights (or lack thereof) of community members, clarity of land title, sales of land to outside investors, illegal encroachment and corruption.

Finally, the hiring of labor – both Burmese and Thais -- for plantations, tourism, and even to operate small-scale fishing boats from outside the community reduced the number of opportunities available to locals and lowered wages. This problem was particularly apparent in Tha Khao but was on the increase in Koh Panyee, Tapae Yoi, and Koh Chang. Low tourism suitability, little access or local ownership, and outside hiring all placed locals in a position where either fisheries or outmigration were the most likely options when livelihoods faltered.

Table 15 - Do people in your household own land suitable for agriculture or tourism livelihoods (% of households)

Response	Community								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value
Yes	68.3	41.5	53.3	54.5	87.1	36.4	35.9	52.3	0.0005~
No	31.7	58.5	46.7	45.5	9.7	63.6	62.5	46.8	
# of rai* owned - mean (median)**	11.7 (8.5)	4.3 (1.0)	39.5 (18.5)	21.9 (10.0)	51.1 (48.0)	4.0 (4.0)	9.2 (7.0)	20.9 (10.0)	<.0001#

Note:*1 thai rai = 0.4 acres or 0.16 hectares; **houses indicating “yes” only

In addition to demand and markets, a number of factors were acting as bridges or barriers to the ability of these communities and households to adapt. Several bridging factors were consistently supporting adaptation of livelihoods across our research sites, including access to various *sources of credit*, the presence of benevolent middlemen (*bonding social capital*) who gave loans and supported people during difficult periods, and positive perceptions of *equity* within the community. Participants felt that *levels of education* were increasing significantly from the previous generation and many households had members that were attending school elsewhere. Educated youth were starting to return to work in and help their communities. The expansion of tourism and plantations was increasing the *livelihood and income diversity* for women. Households also exhibited *livelihood diversity* and individuals demonstrated *flexibility*. For example,

survey participants had held an average of 2.3 occupations during the past 10 years and households had an average of 5.9 different livelihoods (out of a list of 30).

Community perceptions of the quality of *leadership and governance* were quite varied from community to community, as were the processes used to make decisions and the *equitable* consideration of different socio-economic and racial groups and genders within the community. Governance structures in some communities were inclusive of women, while in others they were either poorly represented or not represented at all. *Gender relations* appeared to contribute to the amount of consideration given to women's livelihoods. The quality of *bridging social capital* was quite mixed, with several communities having good relationships with outside private sector organizations and only one community having an ongoing partnership with outside researchers. Many researchers had come to these communities but never returned with results. *Bonding social capital*, or the quality of relationships within the community, varied among sites and may have been related to levels of equity. When it was too strong, *bonding social capital* had the potential to undermine the flexibility of individuals and households within the community, as was discussed by participants in Koh Panyee. Neither *rights* nor *infrastructure* were evenly distributed between the communities. The absence of individual citizenship and thus *rights* – i.e., no Thai ID card or Thai ID card with 0 – for many community members in Baan Moken and Baan Koh Sin Hi undermined flexibility. The level and quality of *infrastructure* also varied substantially by community.

Institutional supports – e.g., government livelihood workshops, NGO development programs – were more likely to be found in communities that were easier to access or that were more pleasant to visit than in those communities most in need of these programs. More marginalized (by poverty, power, or ethnicity) interview participants discussed how assistance was often captured by powerful or wealthy members of the community (*equity*) and that *corruption* often interfered with the distribution of development aid or programs. A frequently-discussed example was the distribution of post-tsunami aid. Finally, the success of externally sponsored projects depended on the longevity of project support (e.g., Community-based tourism in Ban Lions) as well as ongoing support by local leaders (e.g., women's cooperative in Baan Tha Khao). During the previous decade, a significant number of diverse community savings and community development funds

had been promoted and developed in this region and in Thailand (e.g., One Tambon One Million, DoF Fishing Development Fund, Post-tsunami development funds). These had the potential to support households in adapting their livelihoods. However, the results of these funds varied between communities, depending on the local *leadership*'s capacity to manage the fund and on the impacts of *bonding social capital* on their success.

The sampled communities were highly heterogeneous and there were quite varied capacities to adapt to alternative non-fisheries livelihoods. This produced mixed levels of livelihood diversity among households and communities. Levels of reliance on marine resources for livelihoods or subsistence were related to an array of factors primarily associated with access to assets – *natural capital, material assets (especially land), financial status and sources of credit, education, infrastructure, social capital, and equity* - and also with the capacity to organize – *governance and leadership, corruption, gender relations, and bonding social capital*. Results also suggest that the following factors may have been interfering with the ability to adapt to non-fisheries livelihood opportunities across all of the sites: perceived or real *corruption* in mid-level *governance* structures (especially Tambon Administration Offices), inequitable distribution of wealth and land within communities (*equity*), rising economic costs for livelihood and household expenses, and increasing levels of debt (*financial status*). We found declining *livelihood diversity* in several communities, which were tending to focus on one resource and to abandon all other livelihood opportunities (e.g., only rubber plantations or tourism).

Adapting to Climate Change?

Community, household and individual adaptation to climate change is facilitated by the extent to which local people are *experiencing climate change*, are *knowledgeable about climate change*, and are able to change their behavior to *actively manage risks*. Climate change adaptation can also be supported by broader-scale *institutional supports* from national, international governmental and non- governmental organizations.

Communities and households were clearly *experiencing climate change* on a daily basis. According to interview and survey results, the types of climate change events most communities were experiencing were more powerful and frequent weather events, changing seasons and rainfall patterns, flooding, rising sea levels, and erosion. To a lesser degree communities were also noticing increased saltwater intrusion, increased freshwater in mangrove areas, as well as coral bleaching. Some survey participants discussed how these perceived changes would have an impact on tourism visitation, the ability to take fishing boats out, human health, and agricultural productivity.

Though local people were experiencing the effects of climate change, *knowledge of climate change* – including what it is, why it is happening and its impacts - was very limited among both interview and survey participants. A general lack of knowledge of climate change, as well as economic factors, situational factors, and individual values meant that individuals and households were most likely to be reacting to, rather than *actively managing risks* or even proactively planning for, climate change. For example, of 286 houses in Koh Panyee only 10 houses do not flood during particularly high tides in recent years, yet few houses have raised their floors. The low probability of adaptation is likely partially due to limitations placed on households and individuals by economic factors (e.g., rising costs, persistent debts, poverty), situational factors (e.g., need to watch boats, rights), and cultural and individual values (e.g., enjoying life near the ocean, quality of life, not wanting debt). Some of these factors may interact and cause additional stress for individuals and households and may mean that they take additional risks (Ommer & Team, 2007; Tuler et al., 2008). For example, one interviewee explained how economic stressors caused fishers to take risks: “In Koh Sin Hi, due to poverty, even though there is a lot of change and storms, we have to go out [fishing] every day even with a big storm” and, “Normally, one boat has to go out, 3 fishermen together. The boat owner usually hired 2 laborers to work on the boat but now they cannot afford to hire laborers.” Interview participants also suggested that some groups, for example the Moken in Ban Moken or Tapae Yoi or less educated fishermen on Koh Sin Hi, are less able or accustomed to thinking about and planning for the future: “these problems seem far off, uncontrollable...In Tapae Yoi, people live day to day.”

Overall, interviews and surveys revealed limited *knowledge of the impacts of CC* or ocean acidification on habitats, species or fisheries – although there were some interesting observations about the potential impacts of storms, sea temperatures, and degraded reefs on fish abundance. This lack of awareness is concerning as climate change and acidification are predicted to have increasingly deleterious impacts on habitats, particularly coral reefs, and on fish distribution, interactions, abundance, and size and to interfere with the growth of marine species with exoskeletons or shells made of calcium carbonate (Brierley & Kingsford, 2009; Guinotte & Fabry, 2008; Harley et al., 2006; O. Hoegh-Guldberg et al., 2007; Parry & IPCC, 2007). These long-term outcomes will have serious consequences for local fisheries livelihoods. Yet very few of these communities take a collective approach or proactive stance in planning for changes in livelihoods – particularly as they might be impacted by climate change or ocean acidification. There are, however, several smaller community-based organizations that facilitate livelihoods, including the community-based tourism initiative in Lions, a tourism association on Koh Chang, a small chicken farm on Koh Sin Hi, and a women's cooperative in Tha Khao

While most households do not seem to plan specifically for climate change impacts, households employ other *risk management* strategies including saving money, contributing to community savings funds, purchasing health insurance, moving to more lucrative livelihoods, supporting the education of young family members, diversifying livelihoods, participating in subsistence activities, and participating in activities of the sufficiency economy (e.g., planting household gardens, raising livestock) as proposed by the King of Thailand (Suthawan Sathirathai & Piboolsravut, 2004). Yet overall levels of participation in many of these activities varied significantly between households and communities.

At the community level, the main areas of focus for adaptation planning for climate change would be a) planning community infrastructure, particularly for extreme weather events, erosion, flooding and to ensure a supply of freshwater, b) adapting for impacts on livelihoods, and c) preparing for disasters. At this level too, responses to climate change trends and events tended to be reactive rather than proactive (*active risk management*). For example, erosion is a significant problem in all communities. Yet there is ongoing

removal of natural barriers - e.g., mangroves in front of communities - that has increased erosion and led a few communities to discuss creating concrete walls to stop erosion.

A first challenge at the community level is a lack of *knowledge of climate change* and an ignorance of its potential future impacts among leaders in communities and regional Tambon Administration Offices. There have been several brief disaster preparedness workshops and programs organized by NGOs (Thai Red Cross in Koh Chang and Koh Sin Hi and Raks Thai in Koh Panyee) in some communities during which climate change was discussed (*institutional supports*). As a result of these workshops, post-disaster evacuation plans are in place in three communities but not in the others. Generally speaking there is almost a complete lack of government or civil society organizations that work with these communities on climate change education or adaptation. Current *infrastructure* is built in an uncoordinated fashion by various organizations - including government agencies, local governments, Royal Foundations, and NGOs - without consideration of current or future impacts of climate change. For example, piers in Baan Lions, Tapae Yoi, and Baan Tha Khao have been rendered almost useless by erosion, and rising seawater washes over the walkways in Koh Panyee and Koh Sin Hi, whereas it did not when they were built. The effective planning and building of infrastructure in these communities is significantly limited by several factors: lack of coordination between community leaders and other organizations to ensure structures are appropriately designed and local knowledge is considered (*bridging social capital* and *participation in decision making*), the potential for corrupt officials and businesspeople or certain community factions to siphon off financing (*corruption* and *equity)*, and limited access to financing to support locally developed infrastructure adaptation projects (*institutional supports*).

At the national level, an increasing number of structures and policies are in place to support adaptation but coordination and implementation are weak (*institutional supports*). The Office of Climate Change Coordination (OCCC; est. 2007) - situated within the Office of Natural Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment (MNRE) - is responsible for coordinating climate change mitigation and adaptation in Thailand (Limsoontorn, 2010;

Pipitsombat, 2011). A "National Strategic Plan on Climate Change Management B.E. 2551-2555 (2008-2012)" (Government of Thailand, 2008) and the more recent "10-Year Master Plan on Climate Change (2010-2019)" both focus on adaptation and mitigation measures (Government of Thailand, 2010). The adaptation focus in the documents mentioned above is on agriculture, water, and disaster relief, with limited attention to the marine environment. Though 30 agencies and ministries participate in the central Climate Change Coordinator under the OCCC, Lebel (2010) suggests that adaptation to climate change is still a recent policy initiative that has seen limited uptake by government departments. Our interviews with representatives of various government agencies (i.e., DNP, DoF, Department of Marine and Coastal Resources, Community Development Office, Ministry of Agriculture and Cooperatives, Navy) showed that there was a complete lack of *knowledge* at the lower level about any policy initiatives or programs focused on climate change adaptation or even knowledge *of climate change*. Even representatives of the recently (2002) established Department of Disaster Prevention and Mitigation (DDPM), which is mandated to plan for and implement community-based disaster mitigation strategies, seemed unclear about what the implications of climate change were for their department and about how they were planning for it. The DDPM has, however, established a network of early warning towers (*infrastructure*) and communication systems for alerting communities of impending disasters.

Many climate change adaptation efforts in Thailand, Lebel (2010) suggests, are still limited to small, localized or regional projects run by civil society groups. More recently several larger and longer-term (5-year) coastal-focused climate change adaptation projects have emerged that bridge international donors with Thai civil society organizations and government agencies. These projects include the Rockefeller Foundation's Asian Cities Climate Change Resilience Network (ACCCRN), the Increase National Capacity for Climate Change Adaptation for Coastal Communities (INCA) program of the UNDP and Thai Red Cross Society, the Building Coastal Resilience to Reduce the Impact of Climate Change (BCR) initiative by Sustainable Development Foundation (SDF) and the International Union for the Conservation of Nature (IUCN), and the Building Coastal Community Resilience to Reduce Climate Impact (BCRCC) run

by Raks Thai with CARE Deutschland (Tepa, BCRCC, & Raks Thai, 2011).
These projects all focus on understanding climate change impacts and using participatory processes to adapt coastal cities and communities. Yet they are still somewhat limited in scale and none of them were, at the time of the study, actively engaged in work in the region under discussion.

Discussion

In our conceptual framework, we distinguish between adapting, reacting and coping. Adapting refers to proactive planning of actions based on knowledge or experience of past or anticipated future changes, whereas reacting signifies an unplanned response to an event or change. Coping, on the other hand, denotes passively accepting the consequences of a change or event. Our findings suggest that the study communities on the Andaman coast of Thailand are merely coping with social-ecological decline and change such that many interview and survey participants did not know or felt that nothing could be done about fisheries declines. They are adapting inconsistently and unevenly to economic opportunity as evidenced by the differential dependencies on fisheries and other livelihoods such as tourism and agriculture. And, they are being seriously buffeted by climate change but have limited knowledge of its causes or consequences, and little has been done to reduce its impacts, suggesting they are largely in reactive mode. What do these findings tell us about marine management and conservation, local development, and climate change adaptation policies, programs, and localized actions in Thailand, this region, and these communities? This analysis of adaptive capacity points to a number of leverage points at various scales for addressing shortfalls in adaptive capacity in these communities and perhaps elsewhere on the Andaman coast.

First, moving communities beyond coping with environmental decline towards active rebuilding of depleted resources and eroded livelihoods and towards reducing or mitigating the effects of climate change and acidification requires a multi-faceted approach to the conservation of marine resources and management of fisheries and local development that addresses the issues at multiple scales – from local to national to regional - simultaneously (BOBLME, 2012; Pomeroy, 2012). At the national level, this

would require specific attention to the *environmental policies and agencies,* particularly on the part of the DoF and DNP, *participation in NRM and protected area decision making*, and *corruption* components of the adaptive capacity framework. Several actions are required by the DoF to increase the perceived legitimacy of the agency and its regulations and to improve compliance. An important initial step would be to ensure that regulations are appropriate to the ecological and social context and to monitor and adapt pre-existing legislations that are not functioning adequately. Improved participation in the development of regulations would ensure that they are contextually appropriate and more acceptable (Panjarat & Bennett, 2012). Effective and equitable enforcement of regulations is a necessity that would require increased monitoring, control and surveillance, improved coordination among government agencies, increased physical and personnel capacity, and means to overcome industry-government corruption. Programs of outreach and education would increase fishers' knowledge about regulations and their ecological rationale. Establishing mechanisms to decrease fisheries conflicts could reduce the current "race to fish" (Grafton, 2005). Moving from an open access regime towards a limited access common property regime might empower locals to develop environmental institutions through allowing for exclusion rights (Ostrom, 1992). Adopting an integrated approach to coastal management could improve the overall health of the marine environment (BOBLME, 2012; MFF, 2008).

Significant improvements to the governance and management of NMPs are required to improve their acceptability and increase their effectiveness. Improving the perceived legitimacy of NMP and DNP governance structures would require increasing the transparency, accountability, inclusiveness, fairness, and adaptability of the system (Graham et al., 2003; Lockwood, 2010) as well as reconsidering whether or not national park superintendents should be political appointments or hired because of their knowledge, experience, and skills (Prasertcharoensuk et al., 2010). Management capacity could be enhanced through addressing shortfalls in financing, infrastructure, skills, and leadership (Pomeroy et al., 2004). Initial planning processes could better incorporate the social and economic values of local communities (Sobel & Dahlgren, 2004). Zoning of MPAs could reduce conflicts through providing multiple use areas for communities (Lunn & Dearden, 2006). Outreach and education would improve knowledge of

boundaries, regulations, the purpose of MPAs, and even the existence of MPAs (Leisher et al., 2012). Participation and relationships could be improved through establishing co-management institutions. Consideration should be given to local development through establishing processes and capacity building programs to hire local people into management positions and supporting the development of alternative livelihoods (Bennett, 2010; Cattermoul et al., 2008).

At the local level, attention needs to be paid to the development of local environmental institutions and social norms, resource monitoring, feedback, and adaptation mechanisms, and spaces for learning. There are important roles for environmental policies and agencies and institutional support from ENGOs in the growth and maturation of these institutions (Sudtongkong & Webb, 2008). Legislation and policies are needed to support local management and conservation initiatives (Johnson, 1998) – for example, the Draft Community Forest Act (Government of Thailand, 2007b) or the proposed Marine and Coastal Resource Management Act (DMCR, 2012a, 2012b). Environmental education and outreach by ENGOs could focus on effective means for conserving local resources, development of "conservation ethics", and documentation of local knowledge. Knowledge is lacking among ENGOs and local communities about the necessary inputs to create effective local MPAs (Bennett & Dearden, 2012a). Support is also needed for the (re)development (see Jones, Gray, & Umponstira, 2010) of local fisheries associations and cooperatives or other spaces for sharing and mechanisms for resource monitoring and the development of adaptive responses (Folke et al., 2003).

While the factors aiding or interfering with livelihood adaptation were context-specific, meaning generalized solutions are not possible and different things would need to be addressed in each community to facilitate adaptation to new livelihoods, some insights can be offered. There are several ways to improve the adaptability of households and individuals to economic and livelihood opportunities: build *flexibility and diversity*, increase *access to assets*, and improve *governance and leadership*. Communities and households should be encouraged to maintain diverse livelihood portfolios, including the development of subsistence activities (Ellis & Allison, 2004). Issues with land ownership, title, encroachment, or sales to outsiders have undermined diversification in many communities. Mechanisms need to be created to ensure locals are hired by

businesspeople and community elites. The quality of local *leadership and governance* structures could be addressed through capacity-building programs and networking between communities. The following assets also need to be considered: levels of *education*, *relationships* with other communities, *partnerships* with outside academics and private sector organizations, *rights*, *gender inequities*, *sources of credit*, *financial status* and debts, and community *infrastructure*. There are important roles for NGOs and government agencies in facilitating and funding livelihood projects, advocating for local people's rights, and creating necessary policies to support local development. However, for outside *institutional supports* (NGOs, governments, community funds) to be more effective, development programs need to consider the local context, be long-term, address the needs of vulnerable groups, and engender local leadership.

Finally, improved adaptation to climate change would benefit from widespread programs of *knowledge* mobilization and expanded *institutional supports*. Improved *knowledge of climate change* is needed in national, regional, and local governments and at community and household levels. Effective adaptation will require rapid and coordinated expansion of policies and programs for adaptation among Thai government agencies, both in terms of scope, with a renewed focus on the marine environment and coastal communities, and in terms of scale. New projects should build on current coastal climate adaptation projects (INCA, BCR, BCRCC), focus on proactive adaptations, and encourage low-cost and nature-based adaptations over costly infrastructure projects. Where necessary, infrastructure development would benefit from community decision-making processes facilitated by outsiders, incorporation of local knowledge, coordination between local and outside organizations, and accountability mechanisms. Disaster preparedness programs should be continued and expanded. Outside groups can facilitate participatory discussions about how to adapt communities, livelihoods, and households to the reality of climate change (Marshall et al., 2010). Adaptation projects should consider the multiple stressors (e.g., economic, technical, social and cultural factors) that may be hindering adaptation and encourage the adoption of as many *risk management* strategies as possible. At the household level, for example, this includes diversifying livelihoods, limiting debt and saving money, participating in subsistence activities (e.g., household gardening, gleaning), reducing household costs, increasing levels of education, migrating

for work and sending remittances, relying on more than one species, or planting more than one crop.

Conclusion

Coastal communities worldwide are experiencing a broad array of environmental, climatic, and economic changes to which they must constantly adapt. This paper offers a distinctive integrative perspective on these issues through analyzing the adaptive capacity of 7 island communities on the Andaman coast of Thailand to multiple stressors. We recommend different leverage points within the system for addressing the adaptive capacity gaps that communities may possess in relation to the various environmental, economic, and climatic changes that are occurring as follows. First, increasing adaptive capacity to stem environmental declines necessitates that attention be given to ameliorating governance and management deficiencies of *environmental policies and agencies,* increasing *participation in NRM and protected area decision-making*, addressing issues with *corruption* and developing local conservation *norms and institutions* and *resource monitoring, feedback and adaption mechanisms*. Second, enhancing the ability of communities to adapt to climate change requires improving *knowledge of climate change* at all scales from the national to local level, augmenting *institutional supports* for community climate change adaptation, and increasing *risk management* planning and behaviours at community and household levels. Finally, increasing *flexibility and diversity*, facilitating *access to assets*, and improving *governance and leadership* will increase the ability of communities to adapt to alternative livelihoods. Faciliation of *spaces for sharing and learning* at the community, regional and national levels might be instrumental for augmenting adaptive capacity to all types of change.

Yet it is important to recognize that there are significant limitations placed on the adaptive capacity of communities by their connectedness to complex and uncertain environmental, economic and socio-political systems at macro-scales. Significant changes in the structure and functioning of communities may be inevitable, but might be tempered or moved towards more desirable outcomes through proactive and mindful

actions taken at multiple scales from the national to the local. It is with this in mind that we suggest that the King of Thailand's philosophy of the Sufficiency Economy – with the three pillars of reasonableness, moderation, and immunity (also translated as risk management) and grounded by knowledge and morality – may be a particularly relevant concept and a culturally appropriate place to continue discussions about adaptation policy and practice in Thailand (Sathirathai & Piboolsravut, 2004).

Chapter 6
Conclusion

Synthesis

Several critical issues facing coastal communities include climatic and anthropogenic threats to the marine environment on which local people rely for subsistence and survival, the social and economic impacts of marine conservation initiatives, the stresses caused by climatic, environmental, and social changes occurring at multiple scales, and the maintenance of meaningful livelihoods. This dissertation presents the results of a research project that focused on how community livelihoods and adaptive capacity and conservation outcomes can be enhanced in communities near MPAs on the Andaman Coast of Thailand in consideration of a changing climate. The four manuscripts included herein have focused on local perceptions on the nature and severity of socio-economic and environmental changes and stressors that communities are experiencing, community opinions on the livelihood impacts and governance and management process of National Marine Parks in Thailand, and an examination of the adaptive capacity of coastal communities to environmental, climatic, and economic changes. Though this multiple case study has focused on the particulars of seven communities near three MPAs on the Andaman Coast of Thailand, the results offer insights into the complex social-ecological changes and challenges being experienced by other coastal communities in Thailand and the lessons learned are instructive for policies and programs in other contexts. In conclusion, this chapter summarizes the methodological and theoretical insights and policy and practical implications of the research and reflects on the research process, limitations, areas or future research, and contributions.

Insights and Implications

Methodological and Theoretical Insights

A number of methodological and theoretical insights were gained from this study. First, Photovoice is a valuable method for participatory examinations of social, ecological

and social-ecological change, providing insights into broader scale trends and local particularities and the way that changes are experienced by local communities. With a more robust sampling strategy, more generalizable results could also be achieved. It is also a helpful tool for facilitating discussions and building local capacity around these types of issues, thus leading to community empowerment. Photovoice processes focusing on change could provide useful input into natural resource management, conservation, and climate change adaptation policies, programs, and projects particularly if facilitated by or conducted in conjunction with local community-based organizations, non-governmental organizations or governments. Conducting a multi-sited Photovoice in conjunction with an array of other methods proved challenging, and the resultant time-lapse between stages may have ultimately led to the ineffectiveness of the final workshop. Since community-based and participatory methodologies are highly time consuming, I would recommend using Photovoice in singular case studies and dedicating more time to the whole process.

Second, this study confirms the importance of triangulation of methods and analysis to achieve the most complete picture (Neuman, 2000). The results of this study suggest that it is useful when exploring perceptions of change because different methods, often employing different sampling strategies, can produce differing accounts or even conflicting results. For example, each of the three research methods utilized focused on stressors occurring at different scales, which might lead a researcher using only one method to attach more importance to different changes or events. Photovoice yielded the most place-based and local scale insights regarding changes and discussions of climate change did not emerge often in the Photovoice results. Qualitative interview results tended to bridge across scales – with results focusing on local, regional, and national changes. Yet survey results showed that global and uncontrollable stressors – economics and climate change - were the most impactful overall for communities. A question that demands further attention is why these highly quantitatively rated stressors were not as prominent in qualitative results.

A third and related point is to reiterate the importance of empirical and case-based studies in providing insights into the ways that communities are experiencing change and the implications of multiple stressors and exposures for quality of life, adaptive capacity,

and also conservation (Brklacich et al., 2010; Bunce, Rosendo, et al., 2010; O'Brien & Leichenko, 2000; Zou & Wei, 2010). Qualitative results demonstrated that there are clearly multiple stressors occurring at different scales that are impacting communities on the Andaman coast. Quantitative results showed that climate change and economics were perceived to be the most impactful, which is confirmatory of a double exposure scenario (Leichenko & O'Brien, 2008; O'Brien & Leichenko, 2000). Yet modeled impacts of individual and household characteristics - such as gender, age, livelihoods, levels of social capital, and socio-economic status - on perceived impact of stressors showed few apparent patterns. This suggests that different groups may not be impacted in a differential manner by the different stressors to produce "winners and losers" (O'Brien & Leichenko, 2003) - perhaps signifying that at the community level it is the collective that wins or loses. Livelihood and community were the most consistently significant predictors of the perceived impact of stressors, which was not particularly surprising. Some stressors from our list were livelihood specific. Community is a proxy for history, location, geography, and ecology, which are perhaps the most important determinants of the perceived impact of stressors rather than individual or household factors (see also Zou & Wei, 2010). It is important to recognize here that this study only focuses on perceived impact of stressors, not actual impacts, so we cannot determine whether some groups or households are definitively more or less vulnerable to the stressors.

Fourth, it is both challenging but also necessary to engage in comprehensive assessments of adaptive capacity prior to the design of adaptation policies and programs *but* efficiency, effectiveness, participation and co-learning also need to be taken into account. There are a number of reasons why the insights of complex assessments of adaptive capacity are indispensible: 1) each community as well as regional and national context is exceedingly different making comparison and scaling up challenging or impossible; 2) proactive and purposeful adaptation is a complex and layered process wherein various aspects of adaptive capacity can support or undermine successful actions and outcomes; 3) social, situational and economic factors as well as cultural values can influence choices and undermine adaptation behaviours (Adger et al., 2009; Moser & Ekstrom, 2010); 4) governance at various scales from the local to national to international

can be instrumental in supporting local adaptation planning and processes (Armitage & Plummer, 2011); and 5) incomplete understandings of the broader context could lead to ineffective, counterproductive or expensive adaptation plans or policies.

More comprehensive analysis requires moving beyond overly simplified metrics of adaptive capacity (McClanahan et al., 2008; Vincent, 2007; Wongbusarakum & Loper, 2011) and engaging in mixed-methods and multi-scalar research and analysis that recognizes multiple stressors and accounts for the inherent complexity of local social-ecological contexts (see also Armitage & Plummer, 2011; Brklacich et al., 2010; Bunce, Brown, et al., 2010; Silva et al., 2010; Tuler et al., 2008). Complex frameworks with multiple qualitative and quantitative indicators drawn from previous studies and literatures are also an essential part of the tool-kit for exploring adaptive capacity. Conversely, while the extensive programs of research on adaptive capacity engaged in by this author and encouraged by others (e.g., Cinner et al., 2009; Marshall et al., 2010) are insightful, they have drawbacks: they are time-consuming, complicated, expensive and may lead to limited co-learning. From a practitioner's standpoint, they may be impractical, inefficient and ineffective. For communities, they may be seen to be of limited utility. These critical weaknesses suggest that effective, efficient, deliberative and participatory research processes on adaptive capacity – such as those advocated by NGOs and aid organizations (CARE, 2009; IISD, 2012; UNDP, 2010) - but that also allow for consideration of complexity and multiple interacting stressors, non-linearity and unpredictability, multiple actors at multiples scales, heterogeneity and that lead to co-learning (e.g., Marschke & Berkes, 2006; Wesche & Armitage, 2011; Wesche, 2009) are crucial. Thus research projects focusing on adaptive capacity should also engage the wide array of participatory techniques available (e.g., Chevalier & Buckles, 2013; Kindon, Pain, & Kesby, 2007; Mukherjee, 1998) in conjunction with non-technocratic future oriented planning methods - such as participatory scenario planning, visioning or backcasting (see Daconto & Sherpa, 2010; Evans et al., 2006; Evans, de Jong, & Cronkleton, 2008; Robinson, Burch, Talwar, O'Shea, & Walsh, 2011; Sheppard et al., 2011; Walker et al., 2002; Wiggins, 2012). The focus of these activities should be on striving towards desirable and sustainable futures while proactively responding to multiple climatic, environmental, social, and economic eventualities.

Practical and Policy Implications

The study also generated a number of practical and policy insights. First, the empirical account of the nature, severity and impact of multiple stressors being experienced by coastal communities (Chapter 2 & 3) confirms that practitioners need to take multiple stressors into account in tandem with climate change adaptation efforts. Environmental declines, governance issues and/or economic stressors may undermine climate change adaptation efforts at an individual, household or community level. For example, declining resources combined with increasing costs and debts may inhibit the ability of fishers and households to reduce risk by making less hazardous decisions. Indebted or poor fishers may continue to fish in inclement weather, which could lead to loss of life or physical assets. Climate change adaptation efforts are likely to fail if development practitioners and communities are unable to address more pressing existential issues. The prevalence of economic stressors along with environmental stressors means that external organizations – governments, NGOs, donors, and inter-governmental organizations – have an important role in funding and facilitating adaptation efforts if local households and communities are to escape from poverty traps (Eakin, 2005). At the same time, climate change may further exacerbate economic stressors (costs, debts) by causing loss of, or damage to, assets or inhibiting alternative livelihoods such as tourism or agriculture. The relative importance of climate change in the ratings and the predicted worsening of climate change events and impacts (Parry & IPCC, 2007; Solomon & IPCC, 2007; START, 2010) endorses the notion that climate change adaptation needs to be planned for now, not at some distant point in the future (Leary, Adejuwon, et al., 2009). The multi-scalar, unpredictable and uncontrollable nature of stressors and drivers that emerged from this research also confirms that mitigation and adaptation needs to occur at multiple scales (Adger, Arnell, & Tompkins, 2005; Ostrom, 2010).

Second, the generally negative local perceptions of MPA livelihood outcomes as well as management and governance processes indicates the need for significant improvements to DNP and NMP policies, institutions, and processes to increase the

likelihood of conservation success (Chapter 4). Required improvements to governance include policies and processes to increase transparency, accountability, participation, legitimacy, adaptability, equity and coordination (Graham et al., 2003; Lockwood, 2010). It is particularly important to ensure that previous issues with corruption, lack of accountability and ineffective mechanisms for participation do not undermine current and future efforts – such as the previous JoMPA and ongoing SAMPAN projects - to improve NMPs in Thailand. NMP management will need to address shortcomings in the following areas: communication of rules and regulations, programs of outreach and education, processes for participation in management, incorporation of local values and knowledge, conflict resolution and trust building activities (Bennett & Dearden, 2012a; Lunn & Dearden, 2006; Pomeroy et al., 2004). The capacity of managers to accomplish these tasks will need to be improved. Explicit recognition that local fisheries, subsistence and agricultural livelihoods will be impacted by the presence of NMPs and that trade-offs are necessary for conservation justifies the need to invest in alternative means to achieve local economic and livelihoods benefits. Specific attention needs to be given to the development of alternative livelihoods in part through building local human, social, physical, cultural, political, and financial assets (Bennett et al., 2012; Cattermoul et al., 2008). Specific actions that the DNP could adopt to support more beneficial livelihood outcomes include NMP policies that support local tourism development, hiring of locals into management positions and programs for building local capabilities. Successful local development will likely necessitate that DNP partners with government agencies, NGOs, and/or the private sector (e.g., benefit sharing arrangements with private companies).

Finally, there are numerous actions that could be taken at different scales to address shortcomings in community adaptive capacities to different types of change. Results show that communities are reacting to climate change, coping with environmental declines in fisheries, and inconsistently adapting to economic opportunities (Chapter 5). To improve the capacity of communities to adapt to climate change, particular attention needs to be given to improving institutional and policy supports for adaptation, increasing knowledge of climate change at all levels through outreach and education, and addressing governance issues. Governance issues, particularly corruption, localized decision-making

processes and capacity, may undermine the potential of targeted adaptation funding and processes. Corruption and nepotism could undermine the ability of local communities to make strategic and proactive adaptation decisions, as it did during the reconstruction efforts after the tsunami. Existing modes of engagement, particularly lack of participation or consideration of the most vulnerable, may mean that some groups are further marginalized. As such, adaptation policies and programs should be designed to ensure the inclusion of the most vulnerable (CARE, 2009; Leary, Adejuwon, et al., 2009). These issues need to be addressed - through supporting capacity building programs for local leadership, facilitating decision-making processes with communities, and designing accountability mechanisms - if climate change adaptation funding and programs are to be successful. While local scale actions are clearly required, many essential functions will need to be filled by bridging with external organizations. Important roles for outside academic, NGO and governmental organizations include contributing funding, strengthening national institutions and policies on adaptation and rural development, improving community infrastructures, providing climate change education, facilitating contextualized adaptation programs, and assisting with the diversification of livelihoods.

Addressing the ability and willingness of communities to adapt to fisheries declines, in such a manner as to increase ecosystem functioning and productivity, will require attention to the quality and functioning of institutions and policies at both local and national levels. Though the types of rules and regulations promoted by the Department of Fisheries are often recognized as potentially effective by local fishers, the agency's legitimacy is questioned leading to unwillingness of locals to participate in these policy initiatives (Sampan & Bennett, 2012). Improving legitimacy and effectiveness of DoF management would require addressing issues and shortcomings in the following areas: enforcement of existing regulations – particularly for commercial fisheries, monitoring, control and surveillance, physical and personnel capacity, industry-government corruption, conflict resolution, outreach and education, inter-agency coordination, and local participation in the creation of policies. As discussed previously, significant improvements are also needed to the Department of National Parks (DNP) governance and the management of National Marine Parks (NMPs) if these institutions are to fulfill

their conservation and fisheries potentials. These advancements should be matched with cross-scalar actions to improve coordination of coastal zone management along the Andaman coast in consideration of multiple threats to the marine environment (BOBLME, 2012).

Though there is interest in conservation, at the local level, conservation and management institutions and processes are not well developed – perhaps due to the short histories of these communities, the complexity of the socio-economic context, or a history of top-down institutions (Ostrom, 2009). Attention needs to be paid to further developing local environmental institutions and social norms, creating resource monitoring, feedback, and adaptation mechanisms, and promoting spaces for learning (Berkes et al., 2003; Marschke & Berkes, 2006). NGOs and government organizations could facilitate improvements in these areas through aligning community interests with conservation through outreach and education (Leisher et al., 2012), promoting spaces for sharing (e.g., networks, intercommunity meetings, fisheries associations, etc) and documenting local knowledge. There is a void of government legislation and policies that support local management and MPAs, which (optimistically) will be filled by the Draft Community Forest Act (Government of Thailand, 2007b) or the proposed Marine and Coastal Resource Management Act (DMCR, 2012a, 2012b).

Alternative means of income generation are also required to reduce fisheries dependencies and pressures and to ensure that locals are benefitting from conservation. Household dependencies on fisheries in most small rural Andaman coastal communities are much higher than in those sampled for this study (Plathong & Hirinshinan, unpublished data). Increasing the ability of these communities to adapt to alternative livelihoods and development will require context specific actions as the strengths, barriers and resources available are very different in each community context. In particular, this research suggests that attention needs to be paid to building flexibility and diversity, increasing access to assets, and improving local governance and leadership (Cattermoul et al., 2008; see Chapter 5).

Though there are a numerous complex recommendations above, that some changes or actions are slow to mature should not be seen as a reason for inaction by policy-makers or practitioners at any place or scale within the process. Different actions for increasing

adaptive capacity are all means towards improving community adaptive capacity for environmental degradation, climate change and local development (Figure 15). These are not separate but overlapping initiatives.

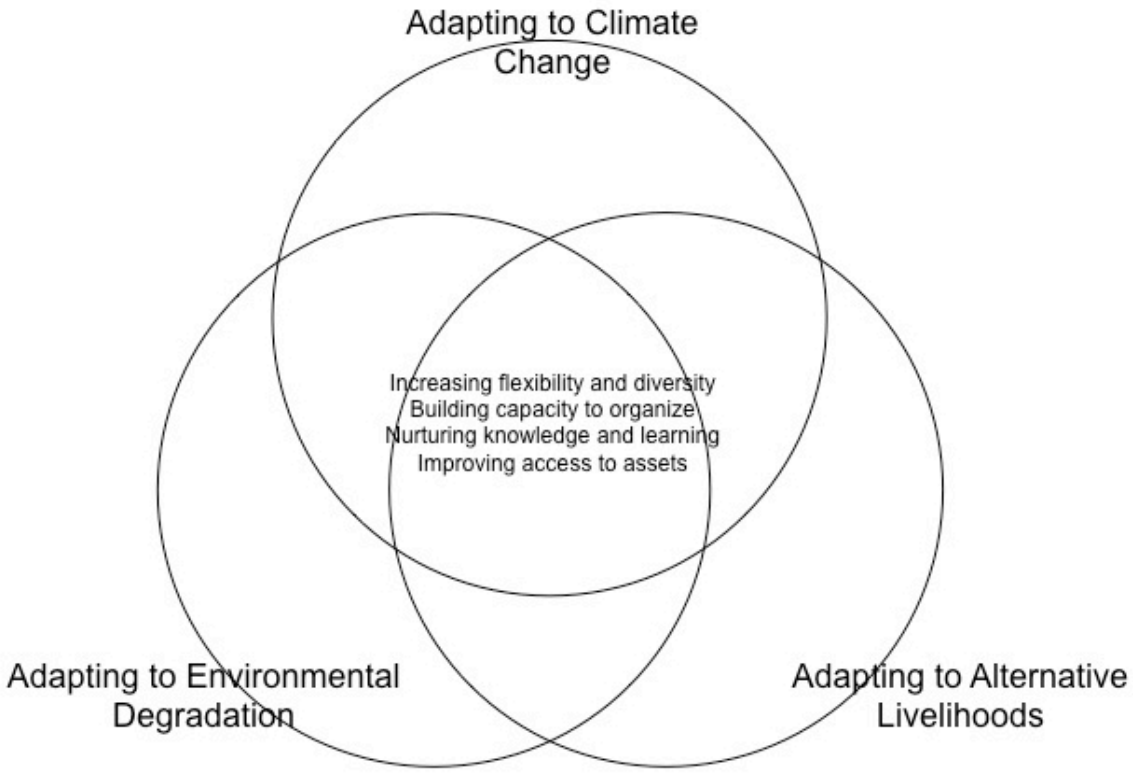


Figure 15 – Simultaneously addressing adaptive capacity to climate change, environmental degradation and development

Reflections, Limitations, and Future Research

An Adaptive Learning Process

Although the essence of the project undertaken in Thailand remained much the same as originally proposed, there were changes at all stages of the research process and I learned many lessons that I would apply in future projects. A select few of these changes and lessons are discussed below. First, based on feedback from my committee, an early change to the research was to engage more fully with the multiple changes and stressors

that were occurring in the region prior to exploring adaptive capacity. Indeed, the insights of others provided guidance throughout my dissertation research. I am excited to move towards more collaborative research and publication endeavors in the future.

Second, I had initially planned to do four stages of research - relationship building, exploratory, probing, and prospective – and incorporate 5 research processes. I intended to do participatory focus groups at the exploratory stage and to use scenario planning processes (see Daconto & Sherpa, 2010; Palomo, Martín-López, López-Santiago, & Montes, 2011; Sheppard et al., 2011; Walker et al., 2002) during the prospective stage to explore recommended actions and policy changes to address issues that were identified in early phases of the research. Several factors led to the adaptation of these plans. Each of the research methods took much longer than originally planned, particularly the Photovoice process. Several researchers have contacted me by email to inquire about Photovoice logistics suggesting that there is a need for more published information about the minutiae (e.g., timing, samples, logistics) of the Photovoice method. In truth, almost everything took longer than originally planned due to logistical – travel times between sites, researcher or team illness or fatigue - and contextual – Thai holidays, efficiency of processes, unexpected community events - barriers. I also came to question the ethics of asking participants to do a "planning" process without being deeply integrated with a local or external group who would carry the results of the research forward. The need to create stronger community and external partnerships is a lesson that I will carry forward to future research processes that I hope will inspire action or policy change. Note that I returned to Thailand in June-July for a month 2013 to do workshops and a modified scenario planning process with selected communities.

Third, it was challenging to integrate all of the different methods and phases of the research process as they were often occurring simultaneously. This meant that analysis from one part of the research were not finished in time to fully integrate insights into the next phase. It became clear to me that there are inherent trade-offs in fieldwork and research between efficiency and effectiveness. This means that researchers are always doing the best with the resources and the time that they are given. Nonetheless our practice can always be improved and I learned valuable insights into how to be both more efficient and effective.

Fourth, I learned that there is definite value in using different methods - participatory, qualitative and quantitative - and processes - community-based versus larger scale and multi-sited research processes. Each method and process can lead to distinctive results and narratives, which have somewhat different implications for policy and action. Additionally, I learned the importance of having clarity in the goals of the research and the problems that I am trying to address when choosing methods. This is something that I could do better in the future.

Fifth, throughout this project I have attempted to mobilize knowledge in a variety of different ways: reports, working papers, policy briefs, community workshops, a national workshop, conference presentations, academic publications, and a website. In part this has been because each type of research necessitates that results are communicated at different scales – for example, the results of Photovoice need to be returned to participants and communities though the narratives that emerge are equally important for broader audiences to hear – but it is also in an effort to leverage the most amount of impact from the research. The maintenance of a project research website (http://projectimpaact.asia) in English and Thai has been especially valuable for promoting the project, maintaining connections with the team, and mobilizing results from the research. I have been contacted a number of times by academics and practitioners from around the world as a result of the website. According to Wordpress statistics the website has been viewed 9,669 times with approximately half of all views coming from Thailand (Figure 16), which is probably more attention overall and regionally than the project's academic publications and reports will receive. This does not necessarily mean that the website will have greater impact on policy and practice than other forms of knowledge mobilization, but it does imply that research websites and blogs are important means of transmitting research results and their implications.

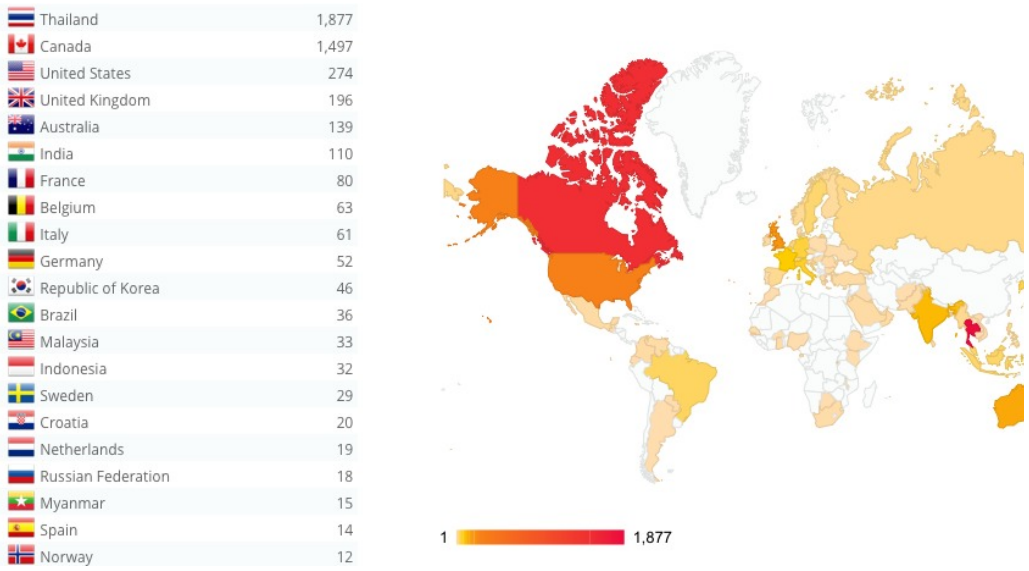


Figure 16 - Density map and website viewing statistics since February 25, 2012 (Source: wordpress.com)

Finally, the writing of a manuscript-based dissertation means that this document does not contain as rich of a narrative or complete of an account as it might have done if I had chosen to do a book-length dissertation. Focusing on manuscripts has, on the other hand, challenged and developed my ability to write shorter and more succinct pieces of academic writing.

Limitations

Several overall limitations of this study were the scope, the timeframe, and the limited sample sizes. Since the goal of the study was insight, the sampling strategies employed mean that the results have limited generalizability. The multiple case-study approach to sampling communities means that this study offers important and more in-depth insights; however, results are not generalizable to all communities in the region. Selecting communities for heterogeneity – i.e., of livelihoods, of ecosystems, of size, of ethnicity – may have also lead to more of a focus on site specific outcomes and application than to more broadly applicable recommendations. The purposive and snowball sampling procedures employed for the Photovoice process and interviews meant that the samples were not representative (Neuman, 2000). Efforts were made,

particularly for community interviews, to select individuals of various genders, ethnicities, and socio-economic classes. Interview and Photovoice samples were biased towards males and the survey samples were biased towards females. The quality and type of information that local people are willing to share might have been influenced by the different racial, cultural and language background of the researcher (Ryen, 2002). Conducting research in another language and through translators may have interfered with the complete understanding of concepts and cultural nuances (Ryen, 2002). Efforts were made to mitigate this limitation through training and working alongside competent and bi-lingual Thai research assistants. A significant limitation of the Photovoice process was the ineffectiveness of the final workshops, which was due partially to timing (i.e., dry season and Songkran festival) but probably also the time lapse between when the research was conducted and when the workshops were scheduled. The accuracy of some responses were questioned by survey administrators – for example, survey administrators felt that the personal nature and financial focus of some of the survey questions may have interfered with the accuracy of results.

Areas for Future Research

The current project has offered insights into numerous areas for future research. First, there are still a number of additional ways that the data from this study can be parsed and explored and additional papers stemming from this project will be written in the coming months and years. Second, this research identified a number of potential additional avenues of inquiry that would be particularly relevant on the Andaman Coast. There is a salient need to explore solutions to some of the problems that were identified here through future- and solution-oriented research processes at all levels from the local to national. Clarification is needed as to what are the best mechanisms to ensure that livelihood trade-offs are taken into account by the DNP when MPAs are created and that support is given to create alternative livelihoods options. Two related questions are how to effectively redirect the benefits from MPA related tourism towards local communities and what balance between small-scale fisheries and tourism will lead to the most socio-economic and ecological benefits for local communities. Participatory and non-

participatory spatial mapping of uses and zones could serve to reduce fisheries and other use conflicts both within and beyond MPA boundaries (see Lunn & Dearden, 2006). This could also lead to a better understanding of the types and extent of inter- and intra-fisheries conflicts in the region. Further clarification of the relationship between migrant laborers and local labour pools, community well-being, and environmental outcomes is needed. Since migrant labourers were also geographically or ideologically situated outside the communities that we studied (and thus they were notably absent from the samples), a study that examines the vulnerability and adaptive capacity of Burmese migrant labourers is also recommended as is a longitudinal study of remittances and their contribution to community adaptive capacity. A more complete and multi-scalar analysis of governance of the whole system of MPAs in Thailand is a necessity, using for example a modified framework such as that proposed by Lockwood (2010). The Andaman coast would also make a useful case study for examining the implications of governability (i.e., Chuenpagdee & Jentoft, 2009, 2013), particularly how the social and political complexity of the region may place limits on local adaptive capacity and on MPA governance and management. Finally, since the use of so-called "trash fish" for feed for fish-cage and pond-based aquaculture was used to justify both illegal methods (e.g., pongpang nets, push nets, fine mesh) by local fishers and destructive commercial fishing methods (e.g., trawlers), an important area of research is to clarify the ecosystem impacts of removing forage fish for aquaculture feed in this region and how to ensure that aquaculture does not subsidize perverse actions and outcomes.

There are several additional theoretical or methodological topics that deserve further exploration. One area is to seek a more nuanced understanding of the psycho-social impacts – e.g., quality of individual and community life, social structures, cultural activities, civic engagement, financial status and working requirements - of individual and multiple stressors in this context. More attention could also be paid to local perceptions of the drivers of stressors and the outcomes of the interactions between stressors. Further empirical work is required to clarify the role of various social, cultural, institutional, economic, and political factors in mediating the impact of and response to climate change and to multiple stressors (Adger et al., 2009). In future research initiatives, the Photovoice method might also be used to more fully explore adaptive

responses – either those strategies currently being employed or potential future adaptations - to the changes identified. Finally, there appears to be a void of effective and simple research protocols to measure the social and economic livelihood impacts and trade-offs of MPAs and to rectify the imbalances that are created.

Contribution and Conclusion

This dissertation has elucidated the many changes that are occurring for coastal communities on the Andaman coast of Thailand and the trials that they are experiencing in adapting, conserving, and thriving in this challenging context. In doing so, it has made a number of contributions to knowledge. This is one of the first studies that we are aware of to use of Photovoice to explore social and ecological change; however, from personal communications that I have received from others, it appears that there are a plethora of exciting emerging studies in this area. This dissertation contributes an empirical study of local perceptions of multiple stressors to the growing body of work in this area and examines differential impacts between different communities and groups. It also presents results of a fairly comprehensive, mixed-methods, and multi-scalar examination of adaptive capacity of communities to concurrent changes including environmental decline, climate change, and alternative livelihoods. Finally, it offers a nuanced perspective on local perceptions of MPA impacts, governance and management within a particular geographical context through focusing on national marine parks on the Andaman coast of Thailand.

Exploring and illuminating social and ecological changes and multiple stressors from the local perspective, interrogating the current level of adaptive capacity of communities, and critically scrutinizing National Marine Parks from the local perspective provides useful insights into policy changes and actions that could improve outcomes for communities and conservation in Thailand. The complexity of the social-ecological context and the heterogeneity of communities means that that simple, one-off or band-aid solutions will not suffice. Coastal communities and ecosystems in Thailand are experiencing constant and intensifying change. To be effective, policies and actions to address the issues related to conservation, local development and climate change will need to be multi-faceted, coordinated and integrated across scales and be focused on

"win-win" or "no-regrets" solutions for both communities and ecosystems. MPAs can be part of the solution rather than an additional problem for local communities. Ameliorating the relationship between the DNP and NMPs and local communities will require improved governance, management, and that specific consideration is given to local needs and aspirations. Finally, there is extensive policy-level and on-the-ground work to be done to move households and communities beyond coping with or reacting to stressors towards actively planning for and responding to change in a manner that supports positive social-ecological outcomes. The resources and work required to improve community adaptive capacity will become increasingly important to coastal communities in Thailand and elsewhere as climate change and other stressors increasingly impact upon marine ecosystems and marine dependent communities.

Post-Script

In June-July of 2013, I returned to Thailand to communicate the results of the research to several of the participating communities and to lead two scenario planning processes as suggested earlier in this dissertation. Returning the results to communities through workshops allowed for valuable capacity building at the community level and lead to fruitful discussions about building local adaptive capacities for change. Workshop participants expressed their appreciation that I had revisited the communities to discuss research results, as I was the first academic that had done so. The ethical act of returning to communities to present the results of research requires researcher commitment and sufficient financial support but also a humility of intellect to present and discuss results with research participants and a willingness to engage in the challenging work of translating results into a communicable format. The orientation and structure of the academy discourages this act of bringing results back to communities through not actively encouraging, supporting, recognizing or rewarding it.

I also conducted a two-day long participatory scenario planning processes with two communities based on the following four steps: 1) problem identification and purpose of scenario planning; 2) exploration of system and drivers of change; 3) generation of possible scenarios; and 4) suggestion of policy and actions (adapted from Daconto &

Sherpa, 2010; Evans et al., 2006; Evans, de Jong, & Cronkleton, 2008; Walker et al., 2002). Prior to conducting the scenario planning workshops, I partnered with a local organization that worked closely with the two communities so that there would be follow-up afterwards. Though a discussion of the results of this process is beyond the scope of this dissertation, a few important insights emerged from the processes. Importantly, according to community participants and leaders, the scenario planning processes were very useful, informative, and enjoyable and they hoped that researchers would conduct research in a participatory manner in the future. Scenario planning appeared to be an important co-learning tool when used at the local level – allowing for an open dialogue about social and environmental change and future directions for community development. It was a useful method for examining multiple interacting change events and stressors and the perceived level of controllability of these changes and stressors. The perceived controllability of different categories of changes differed markedly between communities suggesting that local factors are extremely important in determining a community's perception of their collective capacity to adapt. During the second stage of the workshop, I incorporated a lesson about the causes, outcomes and consequences of climate change. For participants, this information appeared to confirm changes had already been noted earlier in the workshop and the general feeling that climate change was not something that could be controlled locally. Yet, policies and actions proposed later in the workshop suggest a limited ability at a local scale to engage with the concept of climate change, let alone to adapt to it. Though the scenario planning workshop allowed for a coming together of people and a convergence of ideas, I am not convinced that the process was particularly effective at producing novel or ingenius solutions that were not already being entertained by at least some individuals within the group. Finally, I am still left wondering whether it would be more effective to conduct a regional scale (e.g., six provinces of the Andaman coast of Thailand) scenario planning process - with representatives from government, universities, NGOs, and communities - that would incorporate the results of a broader program of research on vulnerability and adaptive capacity (e.g., such as the research presented in this dissertation) in order to seek broader policy level interventions. An effective scenario planning workshop at this larger scale would require skilled facilitation of both process and power-dynamics to ensure that

the opinions and ideas of all actors and groups were represented. Further discussion of the results and more reflections on the scenario-planning processes will be published in forthcoming reports and academic articles.

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Appendices

Appendix A – Indicators and Methods Used to Measure Adaptive Capacity

Table 16 - Indicators and methods used to analyze different measures of adaptive capacity (Methods: I=Interview, S=Survey, KI=Key Informant, SD=Secondary Documents)

Aspect	Measure	Indicator	Method
Flexibility and Diversity	Occupational mobility Attachment to occupation	Level of occupational diversity throughout the year	S, I, KI
		Number of employment changes in last 10 years	S
		Response to hypothetical change in primary livelihood – What would you do if unable to make a living?	S
		Livelihood narratives and values	I
	Occupational multiplicity Livelihood and income diversity	Number of different types of marine resource utilized for income purposes	S
		Number of different gear types utilized	S
		Number of different livelihoods in a household.	S
		Diversity of livelihood opportunities throughout the year (seasonality)	KI
		Diversity of livelihood opportunities available to men versus women	S, I
		Average income in rainy versus dry season	S
		Average income in rainy versus dry season (by Gender)	S
	Dependence on natural resources (fisheries)	Percentage of primary livelihoods in community that are fisheries related	S, I
		Relative importance of fisheries as a secondary livelihood	S
		Relative importance of subsistence marine livelihood activities (# of items used)	S
		Contribution (%) of fisheries livelihoods to household income	S
		Number of nights a week that house eats seafood (food security)	S
		Relative importance of tourism to community and of natural resources to tourism	I
	Perception of risk	Perception of how much of a risk climate change poses to the community or to livelihoods (1-5 ordinal ranking)	I, S
		Ranking the order of a number of different changes in terms of risks to community – How much impact do change events have on your household or livelihoods (1-5 ordinal ranking)	S
	Place attachment	Willingness to re-locate for livelihood purposes	S
		Length of time living in the area	S
		Origin of interviewee	S
		Family members living away from area	S
Capacity to Organize	Bonding social capital and networks	Level of participation in community organizations	S, I
		Level of support from family and friends (inside and outside community)	S
		Ranking and rating of importance of community organizations	S
		Local hiring practices	I
		Relationships with local middlemen in the community (benevolence)	I
		History of collective action	I
	Gender relations	Proportion of women in leadership roles	I
		Women have equal access to and control over critical livelihood resources	S
	Participation in community, regional, and protected area decision making	How are people involved with community organizations? – number ways and nature of involvement	S
		How involved people are in community decision making (ordinal score ranking 1-5)	S
		How involved people are in regional decision making (ordinal score ranking 1-5)	S
		How involved are people in the community in protected area management (ordinal score ranking 1-5)	S, I
		How involved are people in management of natural resources in the	S

Aspect	Measure	Indicator	Method
		area? (ordinal score ranking 1-5)	
		DNP policies for participation and presence of active programs of outreach and engagement to communities and groups	I, SD
	Local environmental institutions and social norms	Qualitative exploration of rules, practices, and norms that the community uses to conserve natural resources (e.g., habitats protected, 5 types of restrictions, qualitative exploration of rules and regs)	KI, I, S
		Presence of conservation ethic – qualitative judgement	I
		Qualitative exploration of relative community knowledge of the rules and norms	I, KI
		Qualitative exploration of how and whether regulations are enforced	I, KI
		Community trust and perceptions of justness and fairness in resource allocation	S, I
	Environmental policies and agencies	Knowledge of national park – existence, names, rules and regulations, purpose	S, I
		Perceptions of national park management and governance	S, I
		Following of rules created by the DNP	I
		Perceptions of fisheries management and agencies	I
		Following of rules created by fisheries	I
		Perceptions of DMCR management and agencies	I
		Enforcement of rules and regulations	I
		Cooperation and trust between various government agencies – fisheries department, national parks department, DMCR, marine police, etc	I, SD
		Legislation to support local management	I, SD
		Harmonization of policies with actions at various scales	I, SD
	Governance and leadership	Perceptions of local leaderships role in overcoming problems	S
		Qualitative descriptions of the community leadership and governance processes	I, KI
		Perceptions of local leadership and governance	I, S
	Levels of corruption	Perceptions of level of corruption in community, protected area and regional governments	I, SD
		Ranking of impact of corruption as change event on household livelihoods	S
		National corruption index	SD
	Active risk management	Are people managing risk by planning for and investing in the future (Do people have reserves of food, savings, or protect assets from hazards?)	KI, S
		How community plans for adaptation and plans for risks	KI, I
	Migration	Whether born in the community or region	S
		Number of years living in the community (-AC)	S
		Children living and working away from the community (+AC)	S
Learning and Knowledge	Resource monitoring, feedback, and adaptation mechanisms	Qualitative exploration of rules, practices, and norms that the community uses to conserve natural resources	I, KI
		Exploration of how rules have changed in the past in response to perceived environmental changes (flexibility)	I, KI
		Qualitative exploration of engagement with knowledge from past change events into current thinking and practice	I, KI
		Presence or absence of adaptive management in MPA management	I, SD
	Knowledge and experience of climate change	Experience of climate change related changes (e.g., storms, etc…)	I, PV, S
		Understanding and knowledge of the present and potential future impacts of climate change	S
		Number of sources of climate change information	S
		Regional-community extension workers and government understand climate risks	I
		Access to climate change information at regional and local level	I, S
	Spaces for learning	Presence of active programs of outreach, education, and engagement with communities	S, KI
		Qualitative discussion of formal and informal spaces for anticipatory learning and action	I, KI
		Involvement of communities in NRM – national parks and fisheries	S, I
	Diversity of knowledges for NRM	Level of incorporation of diverse knowledges in NRM and conservation	I, SD
		Presence and strength of traditional knowledge	I, SD
		Past or active programs of documentation of Traditional Knowledge	I, SD
	Capacity to anticipate change	Identification of factors that cause change to number of fish in the	S, I

Aspect	Measure	Indicator	Method
	and develop response strategies	sea	
		Identification of actions that could help to conserve resources or increase the number of fish in the sea	S, I
	Recognition of causality and human agency	Naming of factors that cause declines in marine resources.	S, I
		Naming of human factors that cause declines in marine resources	S, I
		Naming of interventions for conserving resources	S, I
Access to Assets	Material assets	Household construction materials	S
		Proximity of house to beach	S
		Number and quality of household appliances	S
		Number of boats	S
		Number of land vehicles	S
		Diversity of fishing gears	S
		Ownership of house and land for house	S
		Ownership of land and number of rai – suitability of land	S
	Infrastructure	Presence of 20 infrastructure items in community (see $)	KI
		Presence of infrastructure for disaster prevention	I
		Presence of tourism related infrastructures	I, KI
	Levels of education	Levels of formal education	S
		Family members attending school away from the area	S
	Financial status and access to sources of credit	Relative income-poverty level	S
		Perception of income versus household expenses	S
		Qualitative exploration of economic costs - household and livelihood	I
		Balance of debt to income	S
		Presence or absence of financial savings	S
		Balance of debt to savings	S
		Access to sources of credit – number of items	S
		Remittances from family members – amount, remittance to household income ratio	S
		Comprehensive wealth ranking	S
		Number of laborers	S
		Number of dependents in the household	S
	Bridging social capital	Partnerships with outside academic organizations or NGOs on local development projects	KI
		Levels of participation in organizations from outside the community	S
		Relative importance of organizations from outside the community in overcoming challenges	S
		Qualitative explorations of conflict between communities and groups	I
		Presence of social and economic “safety nets” in case of disaster	I, KI
	Institutional support	Presence of local and regional institutions that are involved in facilitating adaptation	I, SD
		Government organizations with mandates to incorporate climate change considerations	I, SD
		Presence of policies, programs, and plans for climate change adaptation	SD
		Involvement of civil society in planning and implementation of CC adaptation	I, SD
		Financial support for adaptation programs for building AC (community and industry)	I, SD
	Natural capital	Relative diversity of natural resource base and habitats (utilized)	I, S
		Health of the marine ecosystem - fish in the sea	S, I
		Suitability of the site for tourism	KI
		Access to and control over critical livelihood resources (rules, perceptions, actual?)	I, S
	Equity and rights	Perceptions of equity in access to resources	S
		Equity in sharing of benefits from livelihoods	S
		Equitable distribution of wealth among various groups	S
		Participation of most vulnerable in planning processes	I, S
		Perceptions of equity for women in access to resources	S
		Thai ID numbers and the rights associated with these	I
		Comprehensive equity ranking	S
		Relative equity in wealth within the community (comprehensive ranking)	S

Appendix B – University of Victoria Ethics Approval

University of Victoria

Human Research Ethics Board
Office of Research Services
Administrative Services Building
PO Box 1700 STN CSC
Victoria British Columbia V8W 2Y2 Canada
Tel 250-472-4545, Fax 250-721-8960
Email ethics@uvic.ca Web www.research.uvic.ca

Certificate of Approval

PRINCIPAL INVESTIGATOR:	**Nathan Bennett**	**ETHICS PROTOCOL NUMBER:**	**11-212**
UVic STATUS:	**Ph.D. Student**	ORIGINAL APPROVAL DATE:	16-May-11
UVic DEPARTMENT:	**GEOG**	APPROVED ON:	16-May-11
SUPERVISOR:	**Phil Dearden**	APPROVAL EXPIRY DATE:	15-May-12

PROJECT TITLE: **Conservation, Livelihoods and Climate Change in Marine Protected Areas on the Andaman Coast of Thailand**

RESEARCH TEAM MEMBERS: Niphon Phongsuwan, Advisorial - Office Space (Phuket Marine Biological Centre)

DECLARED PROJECT FUNDING: **SSHRC (Research Grant - Phil Dearden); Trudeau Foundation (Scholarship and Research Stipend - Nathan Bennett)**

CONDITIONS OF APPROVAL

This Certificate of Approval is valid for the above term provided there is no change in the protocol.

Modifications
To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.

Renewals
Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.

Project Closures
When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

Signature Obscured

Dr. Rachael Scarth
Acting Associate Vice-President, Research

Certificate Issued On: 16-May-11

11-212 Bennett, Nathan

Appendix C - Thai Research License

สำนักงานคณะกรรมการวิจัยแห่งชาติ
รับที่ ๒๐๐๕
วันที่ ๑ ๘ เม.ย. ๒๕๕๕

ที่ ทส ๐๙๐๗.๔/ ๖ ๓ ๙ ๓

กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช
๖๑ ถนนพหลโยธิน แขวงลาดยาว เขตจตุจักร
กรุงเทพมหานคร ๑๐๙๐๐

รับที่ 1824
วันที่ 18 เม.ย. 55
เวลา 16.11 น.

๑๒ เมษายน ๒๕๕๕

เรื่อง ขออนุญาตเข้าไปทำการศึกษาหรือวิจัยทางวิชาการในพื้นที่ป่าอนุรักษ์ (Dr. Philip Dearden : University of Victoria ประเทศแคนาดา)

เรียน เลขาธิการคณะกรรมการวิจัยแห่งชาติ

อ้างถึง หนังสือสำนักงานคณะกรรมการวิจัยแห่งชาติ ที่ วช ๐๐๐๒/๑๔๓๘ ลงวันที่ ๒๑ กุมภาพันธ์ ๒๕๕๕

สิ่งที่ส่งมาด้วย เงื่อนไขประกอบการเข้าไปทำการศึกษาหรือวิจัยทางวิชาการในพื้นที่ป่าอนุรักษ์

ตามหนังสือที่อ้างถึง ส่งคำขออนุญาตเข้าไปทำการศึกษาหรือวิจัยทางวิชาการในพื้นที่ป่าอนุรักษ์ เรื่อง "โครงการศึกษาวิจัยเพื่อปรับปรุงการจัดการอนุรักษ์พื้นที่คุ้มครองทางทะเลในฝั่งอันดามันภายใต้การเปลี่ยนแปลงสภาพภูมิอากาศ" ณ อุทยานแห่งชาติ ๑๒ แห่ง คือ อุทยานแห่งชาติลำน้ำกระบุรี อุทยานแห่งชาติแหลมสน อุทยานแห่งชาติหมู่เกาะระนอง อุทยานแห่งชาติหมู่เกาะสุรินทร์ อุทยานแห่งชาติหมู่เกาะสิมิลัน อุทยานแห่งชาติเขาหลัก-ลำรู่ อุทยานแห่งชาติอ่าวพังงา อุทยานแห่งชาติธารโบกขรณี อุทยานแห่งชาติหาดนพรัตน์ธารา-หมู่เกาะพีพี อุทยานแห่งชาติหมู่เกาะเภตรา อุทยานแห่งชาติตะรุเตา และอุทยานแห่งชาติทะเลบัน โดยมี Dr. Philip Dearden เป็นหัวหน้าโครงการวิจัย ระยะเวลาศึกษาวิจัยตั้งแต่วันที่ ๑ พฤษภาคม ๒๕๕๔ ถึงวันที่ ๓๑ พฤษภาคม ๒๕๕๖ เพื่อให้กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช พิจารณา นั้น

กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช พิจารณาแล้ว ขอเรียนว่าโครงการวิจัยดังกล่าวเป็นโครงการเพื่อประโยชน์ในการศึกษาหรือวิจัยทางวิชาการ ซึ่งต้องปฏิบัติการโดยพนักงานเจ้าหน้าที่ ดังนั้น จึงอนุมัติให้หัวหน้าอุทยานแห่งชาติทั้ง ๑๒ แห่งดังกล่าวข้างต้น และนางสาวศิริพร จันทร์สว่าง นักวิชาการป่าไม้ปฏิบัติการ อุทยานแห่งชาติหาดนพรัตน์ธารา-หมู่เกาะพีพี พร้อมทั้งมอบหมายให้หัวหน้าศูนย์ศึกษาและวิจัยอุทยานแห่งชาติทางทะเล จังหวัดภูเก็ต และหัวหน้าศูนย์ศึกษาและวิจัยอุทยานแห่งชาติทางทะเล จังหวัดตรัง ในฐานะพนักงานเจ้าหน้าที่เป็นผู้ปฏิบัติการ โดยมีหน้าที่ควบคุม กำกับ ดูแล การดำเนินการใดๆ ตามระเบียบซึ่งออกตามพระราชบัญญัติอุทยานแห่งชาติ พ.ศ. ๒๕๐๔ อย่างเคร่งครัด ภายใต้การสนับสนุนการดำเนินการศึกษาวิจัยของสถาบันวิจัยและพัฒนาทรัพยากรทางทะเลชายฝั่ง และป่าชายเลน โดย Dr. Philip Dearden หัวหน้าโครงการฯ และให้ปฏิบัติตามเงื่อนไขประกอบการเข้าไปทำการศึกษาหรือวิจัยทางวิชาการในพื้นที่ป่าอนุรักษ์ รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ตั้งแต่บัดนี้ ถึงวันที่ ๓๑ พฤษภาคม ๒๕๕๖ และก่อนคณะนักวิจัยเข้าไปดำเนินการศึกษาวิจัยในพื้นที่ โปรดแจ้งเป็นหนังสือต่ออธิบดีกรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช ให้ทราบก่อนเข้าไปดำเนินการในพื้นที่อย่างน้อย ๑๕ วัน พร้อมทั้งแจ้งพนักงานเจ้าหน้าที่ในพื้นที่ทราบก่อนทุกครั้งจึงเข้าไปดำเนินการได้ และเมื่อสิ้นสุดโครงการวิจัยแล้ว ให้ส่งรายงานผลการวิจัยฉบับสมบูรณ์ จำนวน ๕ เล่ม พร้อมแผ่นบันทึกข้อมูล จำนวน ๑ แผ่น ให้กรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช ด้วย

จึงเรียนมาเพื่อโปรดทราบและพิจารณาแจ้งผู้วิจัยทราบและปฏิบัติต่อไป

ขอแสดงความนับถือ

Signature Obscured

(นายธีรภัทร ประยูรสิทธิ)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมอุทยานแห่งชาติ สัตว์ป่า และพันธุ์พืช

☐ ทปส. ☐ ทปว. ☐ สง. ☐ กช. ☐ นค. ☐ กผ. ☐ ก.พ.ร. ☐ ผสน. ☐ กภ. ☐ ภค. ☐ กม

18 เม.ย. 2555

สำนักวิจัยการอนุรักษ์ป่าไม้และพันธุ์พืช
โทร. ๐ ๒๕๖๑ ๐๗๗๗ ต่อ ๑๔๖๐
โทรสาร ๐ ๒๕๗๙ ๘๗๗๕ , ๐ ๒๕๗๙ ๙๕๗๖

สำนักงานคณะกรรมการวิจัยแห่งชาติ
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No. 0002/ 3134

24 April B.E. 2555 (2012)

Dear Dr. Dearden,

We are pleased to inform you that the Office of the National Research Council of Thailand (NRCT) has permitted you and your colleagues (Mr. Nathan Bennett and Ms. Jessica Augustine) to conduct the research on "Project IMPAACT: Improving Marine Protected Areas on the Andaman Coast of Thailand under a Climate Change Regime" from May 2012 - May 2013.

Carrying out this research, you have to accord with the following conditions:

1. Inform the Director-General of Department of National Park, Wildlife and Plant Conservation (DNP) by letter, and officials in the site before commencing research.

2. Send three copies of progress report, copy of raw data every six months and summary of the project to DNP.

3. In regard to each specimen collection, you have to offer one set of species and/or culture of isolates to DNP in case the specimens exist more than one. Contrarily, if only one sample is collected, DNP reserves the right to be co-owner of that sample.

4. At the completion of the project, you have to submit five copies of complete report including research documents publicized in diverse journals to DNP.

5. Follow the objectives, work plan, methodology, terms and conditions specified in research proposal.

6. Accord strictly to forestry law and other concerned laws.

7. In the event that you do not accord with the law, regulations, terms, or have any conduct deemed to be detrimental to society, security of Thailand, environment, plant and animal genetics and other natural resources, the Director-General of DNP may cancel its permission for your research, then enforce the law.

8. Should you intend to extend a period of research time, kindly propose the letter applying for prolonging the project period to the Director-General of DNP at least 30 days

before the termination of the research period by informing reasons/necessity for extension, together with five copies of recent progress report in Thai version.

9. In case if you do not conform to these conditions, Thai institutions/organiztions endorsing or taking part in your project are in charge of getting you to act on these conditions.

10. In case you desire to take research results and/or samples to apply for copy right, patent, intellectual property right, trade mark, etc. for commercial advantages, you must get permission from DNP before doing that. Please note that the copy right, patent, intellectual property right, trade mark will become co-assets between you and DNP. Agreement (s) on the benefit sharing of the above commercial use must be made, and returned to DNP case by case in future.

According to our current immigration law, you and your colleagues are advised to apply for non – immigrant visa prior to your leaving for Thailand. Moreover, you and your colleagues are required to report to the Office of International Affairs, NRCT within seven days after your arrival in Thailand in order to pay a deposit of 10,000 Baht guaranteeing submission of the complete report to NRCT, then obtain concerned documents.

We look forward to welcoming you.

Yours sincerely,

Signature Obscured

(Ms. Jintanapa Sobhon)
Senior Advisor for Social Sciences Research
For Secretary - General

Dr. Philip Dearden
Department of Geography
University of Victoria, PO Box 3060
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No. 0002/ 3135

24 April B.E. 2555 (2012)

Dear Mr. Bennett,

We are pleased to inform you that the Office of the National Research Council of Thailand (NRCT) has permitted you to participate in Dr. Philip Dearden's research project on "Project IMPAACT: Improving Marine Protected Areas on the Andaman Coast of Thailand under a Climate Change Regime" from May 2012 - May 2013.

In this connection, you and your family (Mrs. Elizabeth Nethery, Mr. Kai Dylan Nethery Bennett and Miss Sage Ilah Nethery Bennett) are advised to apply for non – immigrant visa prior to your leaving for Thailand. Moreover, you are required to report to the Office of International Affairs, NRCT within seven days after your arrival in Thailand in order to obtain concerned documents.

We look forward to welcoming you.

Yours sincerely,

Signature Obscured

(Ms. Jintanapa Sobhon)
Senior Advisor for Social Sciences Research
For Secretary - General

Mr. Nathan Bennett
Department of Geography
University of Victoria, PO Box 3060
Stn CSC, Victoria, BC, V8W3R4
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Appendix D – Sampled Community Information

Table 17 – General community information and statistics

Community (Baan)	Province/ District/ Subdistrict	National Marine Park	Habitats	Livelihoods (listed by importance)	Ethnic Groups	Population #	Households #
Baan Tha Khao	Phang Nga/ Kuraburi/ Koh Yao Noi	Ao Phang Nga and Than Bhok Khorani	Coral reefs, mangroves	Rubber plantations, tourism, fishing, gleaning	Thai Muslim	486	142
Baan Koh Panyee	Phang Nga/ Muang/ Ko Panyee	Ao Phang Nga	Mangroves	Tourism, fishing	Thai Muslim	1440	286
Baan Lions	Phang Nga/ Kuraburi/ Koh Phrathong	Mu Koh Rah-Koh Phrathong	Seagrass, mangroves, coral reefs	Tourism, mixed plantations, fishing, gleaning	Thai Buddhist, Moken	57	44
Baan Tapae Yoi	Phang Nga/ Kuraburi/ Koh Phrathong	Mu Koh Rah-Koh Phrathong	Mangroves, seagrass	Fishing, plantations, tourism, gleaning	Thai Buddhist, Moken	119	63
Baan Koh Chang	Ranong/ Muang/ Koh Phayam	Mu Koh Ranong	Mangroves, coral reefs	Rubber and cashew plantations, tourism, fishing	Thai Buddhist	300	126
Baan Moken		Mu Koh Ranong	Coral reefs, mangroves	Fishing, gleaning	Moken	175	36
Baan Koh Sin Hi	Ranong/ Muang/ Paknam	Mu Koh Ranong	Mangroves, seagrass, coral reefs	Fishing, migration for work, gleaning, rubber plantations	Malay Muslim, Burmese	1775	290

Appendix E - Photovoice Workshop and Questionnaire (in English and Thai)

Photovoice Process and Interview Questions
ขั้นตอนการทำเสียงจากภาพและคำถามในการสัมภาษณ์

Photovoice Process:
ขั้นตอนการทำเสียงจากภาพ

The Photovoice workshop schedule will be as follows:

- Introduction:
  - Nathan in Thai
  - Nathan, Por, Aey (self introductions)
- Schedule of Workshop (Por)
- About Project IMPAACT (Nathan)
- About Photovoice
  - Research Brainstorm (Por)
  - Photovoice Process (Nathan)
- The Photovoice Questions (Nathan)
- The Polite Photographer
  - Brainstorm of Things That it is Not Appropriate to Take Photos Of (Por)
  - Suggestions of Ethical Behaviour - Explain Project, Ask Permission (Nathan)
- How to Use the Camera
  - Intro to Cameras
    - Hand Out and Go Over Parts (Nathan)
    - Quick Practice (Nathan)
    - Collect Cameras (Por)
  - Tips on Taking Photos (Aey)
  - Sign Out Cameras (Por)
  - Practice - Something Good About Living on Phrathong (Nathan)
  - Sharing (Nathan)
- Review of Photovoice (Nathan)
  - Photovoice Process (Poster 4)
  - Photovoice Questions (Poster 5)
- Closure - Thank you and have fun!

Photovoice Questions:
In and effort to explore the changes that are being experienced by the communities, the process of photo taking will be structured around two questions:
เพื่อที่จะสำรวจความเปลี่ยนแปลงต่างๆที่ชุมชนพบเจอ
คำถามสองข้อนี้จะหัวข้อหลักในกระบวนการถ่ายภาพ

1. What changes do you see in the natural environment?
   มีความเปลี่ยนแปลงอะไรบ้างในธรรมชาติที่คุณสังเกตเห็น?

2. What changes do you see in your community?

มีความเปลี่ยนแปลงอะไรบ้างในชุมชนที่คุณสังเกตเห็น?

—

Participants will be asked to focus on
ขอให้ผู้ทำการถ่ายภาพเน้นเรื่องต่างๆ ดังนี้

1. both positive and negative changes
   ผลกระทบจากความเปลี่ยนแปลงทั้งในด้านที่ดีและไม่ดี

2. changes that are caused both by natural events and changes that are directly caused by humans
   ความเปลี่ยนแปลงที่มีสาเหตุจากธรรมชาติและมีสาเหตุโดยตรงจากมนุษย์

3. changes in the natural environment and their communities that are or might be caused by climate change.
   ความเปลี่ยนแปลงในธรรมชาติและในชุมชนที่อาจมีสาเหตุมาจากสภาพภูมิอากาศเปลี่ยนแปลง (โลกร้อน)

4. Participants will also be asked to focus their efforts on the marine or near-shore environment.
   ขอให้ผู้ทำการถ่ายภาพเน้นในเรื่องสิ่งแวดล้อมทางทะเลและชายฝั่งด้วย

Photovoice Interview Questions:
คำถามในการสัมภาษณ์
In the interviews that follow the photo-voice process, the participants will participate in an interview to explore their photos. Interviews will be recorded and field notes of translations will also be taken. The photovoice interview process will be structured as follows:

- Review of photovoice questions from workshop.
- Participants will be asked to separate the photographs into 2 piles: 1) Pictures related to the questions; and, 2) Pictures that are not related to the questions.
- Participants will be asked to separate the remaining *related* photographs onto a chart paper labelled environmental changes and social changes:

Environmental Changes	Social Changes

- Have participants introduce broadly their photos using the following

  prompt: “Tell us a little bit about the changes that are shown in these photos.” “ช่วยเล่าให้เราฟังเกี่ยวกับความเปลี่ยนแปลงที่ปรากฏในภาพเหล่านี้หน่อย”

- Then have participants select the photos that represent the 5 most signficant changes in each of the two categories.
- Use the interview script shown below to explore the selected photos.
- Ask them if there are any others that they think are important that they want to tell us more about.
- Ask participants to reflect on the photovoice process.

Interview questions:

Interviewees will be asked the following questions:
จะมีการถามคำถามกับผู้เข้าร่วมในขั้นตอนการสัมภาษณ์ ซึ่งจะเกิดขึ้นหลังจากการถ่ายภาพดังนี้

1. What does this photo show? What changes does it represent?
   ภาพนี้แสดงให้เห็นถึงอะไร? ความเปลี่ยนแปลงเหล่านี้หมายถึงอะไร?

2. What should we call this picture?
   เราควรจะตั้งชื่อภาพนี้ว่าอะไร?

3. What is a story behind this picture?
   มีเรื่องอะไรอยู่เบื้องหลังภาพนี้?

4. When did this change happen?
   ความเปลี่ยนแปลงนี้เกิดขึ้นเมื่อไหร่?

5. What causes these changes? Is the change caused by human or natural factors?
   อะไรเป็นสาเหตุของความเปลี่ยนแปลงเหล่านี้?
   ความเปลี่ยนแปลงนี้เกิดโดยธรรมชาติหรือมนุษย์?

6. What impacts do these changes have on the community?
   ความเปลี่ยนแปลงเหล่านี้มีผลกระทบอะไรกับชุมชน?

7. How can the community respond most effectively to this change?
   ชุมชนรับมืออย่างมีประสิทธิภาพที่สุดอย่างไรกับความเปลี่ยนแปลงนี้?

8. What other factors might help the community to overcome or fully take advantage of this change?

ปัจจัยอื่นใดที่ช่วยให้ชุมชนสามารถผ่านพ้นหรือปรับความเปลี่ยนแปลงนี้ให้เป็นโอกาสได้?

9. What things might make it so that the community is not able to overcome or fully take advantage of this change?
อะไรเป็นส่วนที่ทำให้ชุมชนไม่สามารถผ่านพ้นหรือปรับความเปลี่ยนแปลงนี้ให้เป็นโอกาสได้?

Participants will also be asked to give feedback on the photovoice process using the following questions:

1. What do you think about the photovoice process?
คุณคิดอย่างไรเกี่ยวกับกระบวนการเสียงจากภาพ?
    a. What did you like about it? Not like about it?
    คุณชอบอะไรเกี่ยวกับเสียงจากภาพ? ไม่ชอบอะไร?
    b. What do you think about taking photographs?
    คุณคิดอย่างไรเกี่ยวกับการถ่ายภาพ?
2. Did the photovoice process change your way of thinking or seeing? How?
เสียงจากภาพเปลี่ยนความคิดหรือมุมมองของคุณหรือไม่? อย่างไร?
3. What do you think about using Photovoice to explore changes? Social changes? Environmental changes? Is there a better way?
คุณคิดอย่างไรเกี่ยวกับการใช้กระบวนการเสียงจากภาพในการสำรวจความเปลี่ยนแปลง? ความเปลี่ยนแปลงด้านสังคม? ความเปลี่ยนแปลงด้านสิ่งแวดล้อม? มีวิธีที่ดีกว่านี้หรือไม่?
4. Do you have any recommendations for us on how to do it better next time?
คุณมีข้อแนะนำสำหรับเราในการปรับปรุงกระบวนการเสียงจากภาพให้ดีขึ้นในครั้งหน้าหรือไม่?

Appendix F - Photovoice Sample and Statistics

Table 18 - Participant and descriptive statistics for photovoice processes in both sites

Participant # and Nickname	Community	Gender	Age	Primary Livelihood	# of Photos	Length of Interview
Photovoice Process 1 – Baan Tapae Yoi and Baan Lions						
1 – Pa Son	Baan Lions	F	60+	Subsistence Gathering, Homestay	79	1h03m
2 – Pui	Baan Lions	F	20-30	Shop and Gathering	106	2h56m
3 – Toom	Baan Lions	M	20-30	Tourism, Fishing, Labour	96	1h48m
4 – Tam	Baan Lions	M	20-30	Tourism, Fishing, Labour	174	1h06m
5 – Lung Kit	Tapae Yoi	M	50-60	Fishing and Gathering	51	1h20m
6 – Pa Pan	Tapae Yoi	F	40-50	Subsistence Gathering and Gardening	55	1h34m
7 – P'Sao and Go Ud	Tapae Yoi	F/M	40-50	Fishing, Middleman, Rubber, Aquaculture, Bungalow	43	1h59m
8 – P'Noon	Tapae Yoi	M	30-40	Fishing, Labour	119	1h49m
9 – P'Ying	Tapae Yoi	F	30-40	Tourism, Fishing, Gathering	55	1h36m
Photovoice Process 2 – Baan Tha Khao						
10 – Chief	Baan Tha Khao	M	40-50	Leadership, Tourism, Fishing, Rubber	145	4h27m
11 – Bung Red	Baan Tha Khao	M	50-60	Rubber and Fishing	84	3h52m
12 – Bung Opat	Baan Tha Khao	M	50-60	Fishing	16	0h26m
13 – Bung Sompong	Baan Tha Khao	M	40-50	Fishing	22	1h37m
14 – Ja Ah	Baan Tha Khao	F/M	50-60	Subsistence Fishing and Gathering	79	1h43m
15 – Ja Ran	Baan Tha Khao	F	50-60	Rubber and Gathering	70	1h27m
16 – Ja Kor and Bung Nan	Baan Tha Khao	F/M	40-50	Fishing	42	1h18m
17 – Bung Meed	Baan Tha Khao	M	50-60	Fishing and Rubber	37	1h01m
18 – Bung Hed	Baan Tha Khao	M	40-50	Tourism Boat	123	3h47m
19 – Bung Bao	Baan Tha Khao	M	40-50	Tourism Boat	156	1h28m
20 – Ja Bidah	Baan Tha Khao	F	30-40	Fishing	20	1h54m

Appendix G - Interview Questionnaire (in English and Thai)

Interview Questionnaire
แบบสอบถามสำหรับการสัมภาษณ์

This is a composite list of questions designed to guide a semi-structured interview process with various individuals – community key informants, governmental representatives, NGO representatives, and members of various community groups. This questionnaire is designed to explore various aspects of the livelihoods, resilience, and adaptive capacity theories that are central to this research. Please note that not all questions will be used with any individual participant.
ข้อมูลนี้เป็นการรวบรวมคำถามต่างๆที่ออกแบบมาเพื่อเป็นแนวทางสำหรับขั้นตอนการสัมภาษณ์แบบอิงโครงสร้างส่วนหนึ่ง (semi-structured interview process) โดยจะนำไปกับบุคคลหลากหลายประเภท ซึ่งได้แก่ ผู้ให้ข้อมูลหลัก ตัวแทนจากภาครัฐ เจ้าหน้าที่องค์กรพัฒนาเอกชน และสมาชิกจากกลุ่มต่างๆในชุมชน แบบสอบถามนี้ออกแบบมาเพื่อสำรวจแง่มุมที่หลากหลายในทฤษฎีเรื่องการประกอบอาชีพ ความสามารถในการฟื้นตัว (resilience) และความสามารถในการปรับตัว ซึ่งทั้งหมดเป็นหัวข้อหลักของงานวิจัยครั้งนี้ อย่างไรก็ดี โปรดรับทราบว่าจะไม่มีการใช้คำถามทั้งหมดกับผู้ถูกสัมภาษณ์คนใดคนหนึ่ง

1. Livelihoods Strategies
   กลยุทธ์ในการประกอบอาชีพ

   1. What are the major livelihood strategies that the community engages in?
      อะไรคืออาชีพหลักของชุมชน?

   2. What livelihood strategies are done in the area around the park (island, subdistrict, district, and province)?
      อะไรคืออาชีพหลักในพื้นที่แถบนี้ (เกาะ ตำบล อำเภอ จังหวัด)?

   3. What livelihoods did people participate in the past? How have people's livelihoods changed over time?
      ในอดีตคนที่นี่เคยมีอาชีพใดบ้าง
      และที่ผ่านมาอาชีพเหล่านั้นเปลี่ยนแปลงไปอย่างไร?

   4. What percentage of people in the community participate in each of the following livelihoods?
      ในชุมชน มีคนกี่เปอร์เซ็นต์ที่ประกอบอาชีพดังต่อไปนี้?

   5. What percentage of the community's livelihoods rely on natural resources?
      อาชีพต่างๆในชุมชนต้องพึ่งพิงทรัพยากรธรรมชาติเป็นจำนวน กี่เปอร์เซ็นต์?

6. At what times of the year do the different livelihoods occur?
   ในแต่ละช่วงของปี มีการประกอบอาชีพอะไรบ้าง?

7. Do people in the community migrate to other places to work?
   มีคนในชุมชนที่ย้ายไปทำงานทีอื่นบ้างหรือไม่?

8. Do family members make remittances to people who are still located in the community?
   คนที่ย้ายไปทำงานที่อื่นส่งเงินกลับมาให้สมาชิกครอบครัวที่ยังอยู่ที่นี่หรือไม่?

9. What types of fisheries and marine resources are utilized by the community?
   ชุมชนนี้ทำประมงแบบไหนและจับ(สัตว์)อะไรบ้าง?

10. What types of gears are used in the community?
    ที่นี่ใช้เครื่องมือประมงแบบไหนบ้าง?

11. How do women and men's livelihoods differ in the community?
    ในผู้หญิงและผู้ชายชุมชนทำงานเหมือนหรือต่างกันอย่างไร?

2. <u>Livelihood Outcomes</u>
   <u>ผลที่ได้จากการประกอบอาชีพ</u>

   1. How is the community impacted by each these livelihoods?
      อาชีพเหล่านี้ส่งผลอย่างไรกับชุนชน?

   2. What benefits does the community get from these livelihoods? What negative outcomes does the community experience as a result of these livelihoods?
      ชุมชนได้ประโยชน์อะไรบ้างจากอาชีพเหล่านี้?
      และอาชีพเหล่านี้ก่อให้เกิดผลเสียใดบ้างต่อชุมชน?

   3. What contributions do women's livelihoods make to the household and the community?
      งานของผู้หญิงช่วยอะไรกับครอบครัวและชุมชน?

4. How much benefit does each livelihood bring to the community in terms of income?
แต่ละอาชีพสร้างรายได้ให้กับชุมชนเท่าไร?

5. What are the community's preferred livelihoods? Why? What are the benefits of that livelihood to individuals and to the community over the other options? Why are the other options not preferred?
คนในชุมชนนิยมทำอาชีพอะไร? เพราะอะไร?
อาชีพนั้นๆดีต่อบุคคลและชุมชนกว่าอาชีพอื่นอย่างไร?
ทำไมจึงไม่นิยมอาชีพอื่น?

6. How is the natural environment or local resources impacted by these livelihood strategies? In the short term and in the long term? How has this changed over time?
อาชีพต่างๆในชุมชนส่งผลอย่างไรต่อสิ่งแวดล้อมและทรัพยากรธรรมชาติ?
ในระยะสั้นและระยะยาว? และสิ่งแวดล้อมเหล่านี้เปลี่ยนแปลงไปอย่างไร?

7. How do members of different groups (e.g., livelihood, ethnic, gender) benefit differently from MPA-related and regional livelihoods?
คนในแต่ละกลุ่ม (เช่น กลุ่มอาชีพ ชาติพันธุ์ เพศ)
ได้รับประโยชน์จากอาชีพที่เกี่ยวข้องกับอุทยาน/พื้นที่คุ้มครองทางทะเล
และอาชีพในพื้นที่แถบนี้แตกต่างกันอย่างไรอย่างไร?

3. <u>Factors Impacting Livelihood and Conservation Outcomes</u>
<u>ปัจจัยต่างๆที่ส่งผลต่อการประกอบอาชีพและการอนุรักษ์ทรัพยากร</u>

1. What internal (inside the community or subdistrict) and external (outside the community) factors impact livelihood outcomes (from each livelihood strategy)? (positive and negative)
อะไรคือปัจจัยภายใน(จากในชุมชนและในพื้นที่/ตำบล)
และปัจจัยภายนอก(จากนอกชุมชน)ที่มีผลต่อการประกอบอาชีพ(ในแต่ละอาชีพ)?
(ทั้งแง่ดีและไม่ดี)

2. What factors influence the levels of benefit that the community receives from each livelihood? (For example, can you think of a time when your income changed drastically as a result of factors beyond your control?)

อะไรเป็นปัจจัยที่มีผลต่อระดับผลประโยชน์ที่ชุมชนได้รับจากแต่ละอาชีพ?
(เช่น ช่วงเวลาที่รายได้เพิ่มหรือลดลงอย่างชัดเจน
และเป็นผลมากจากสิ่งที่อยู่เหนือการควบคุม)

3. What policies, laws, legislations, or regulations facilitate or constrain resource use? How? For which groups?
นโยบาย กฎหมาย บทบัญญัติ หรือข้อบังคับใดที่เอื้อหรือจำกัดการใช้ทรัพยากร?
อย่างไร? สำหรับกลุ่มใด?

4. What organizations (government or/and non-government) work with the community?
มีองค์กรใดบ้างที่ทำงานกับชุมชนแห่งนี้ (ทั้งภาครัฐ และ/หรือ
องค์กรพัฒนาเอกชน)?

5. How do NGOs, governments, and other organizations at various levels interact with the community? Influence livelihood outcomes? Interact with the protected area? (cross-scale linkages)
องค์กรพัฒนาเอกชน ภาครัฐ และองค์กรอื่นๆ
ในแต่ละระดับทำงานกับชุมชนอย่างไร? มีผลต่อการประกอบอาชีพอย่างไร?
ทำอะไรบ้างกับพื้นที่คุ้มครองฯ/อุทยานฯ? (การเชื่อมโยงข้ามระดับ)

6. How do relationships with other communities effect on livelihood outcomes? (cross-scale linkages)
ชุมชนอื่นๆมีผลอย่างไรต่อการประกอบอาชีพ? (การเชื่อมโยงข้ามระดับ)

7. How does the private sector and businesses influence both livelihood and conservation outcomes?
ภาคเอกชนและธุรกิจมีผลอย่างไรต่อการประกอบอาชีพและการอนุรักษ์?

8. How do local governments influence livelihood and conservation outcomes?
หน่วยงานภาครัฐในท้องถิ่นมีอิทธิพลต่อการประกอบอาชีพและการอนุรักษ์อย่างไร
?

9. What infrastructure or physical assets do to community possess that facilitates beneficial livelihood outcomes? How do these assets help?
การที่ชุมชนมีโครงสร้างพื้นฐาน (เช่น ไฟฟ้า น้ำประปา ถนนคอนกรีต

ท่าเรือ โรงเรียน อนามัย) ให้ประโยชน์อะไรบ้างต่อการประกอบอาชีพ? สิ่งพื้นฐานเหล่านี้ช่วยอย่างไร?

10. How do factors inside the local community impact on livelihood outcomes? (culture, norms, social relations, corruption)
ปัจจัยภายในชุมชนมีผลต่อการประกอบอาชีพอย่างไร? (วัฒนธรรม บรรทัดฐาน ความเชื่อมโยงด้านสังคม คอร์รัปชั่น)

11. What factors effect the natural environment or natural resources? (For example, fish abundance, coral reefs, mangrove habitats)
ปัจจัยใดบ้างที่มีผลต่อสิ่งแวดล้อมหรือทรัพยากรทางธรรมชาติ? (เช่น ความอุดมสมบูรณ์ของปลา ปะการัง ป่าชายเลน)

12. What things does the community do to conserve natural resources? How does the community ensure that rules and regulations are being followed?
ชุมชนอนุรักษ์ทรัพยากรธรรมชาติอย่างไร?
ชุมชนแน่ใจได้อย่างไรว่าคนทำตามกฎและข้อบังคับนั้นๆ?

13. How does the community monitor changes in the environment? What mechanisms does the community use to adapt to any change in the environment?
ชุมชนติดตามความเปลี่ยนแปลงต่างๆที่เกิดขึ้นในสภาพแวดล้อมอย่างไร? ชุมชนใช้วิธีใดในการปรับตัวต่อความเปลี่ยนแปลงในสภาพแวดล้อม?

14. What role does scientific knowledge and traditional knowledge play in community NRM? MPA management?
ความรู้ทางวิทยาศาสตร์และภูมิปัญญาท้องถิ่นมีบทบาทอย่างไรต่อชุมชนในการจัดการทรัพยากรธรรมชาติ? การจัดการพื้นที่คุ้มครองทางทะเล/อุทยานฯ?

15. What are the previous or potential future impacts of climate change on the natural resources? On livelihoods? On community?
สภาพภูมิอากาศเปลี่ยนแปลงส่งผลกระทบอย่างไรต่อทรัพยากรธรรมชาติ? ทั้งที่ผ่านมาและที่อาจเกิดขึ้นในอนาคต? ต่อการประกอบอาชีพ? ต่อชุมชน?

4. <u>Impact of MPA on Community</u>
<u>ผลกระทบของพื้นที่คุ้มครองทางทะเล/อุทยานฯต่อชุมชน</u>

1. How has the MPA effected the community? Your livelihood? Both positive and

negative impacts?
พื้นที่คุ้มครองฯ/อุทยานฯมีผลอย่างไรต่อชุมชน? อาชีพของคุณ?

2. How do you feel about the MPA? Why do you feel that way?
คุณรู้สึก/มีความคิดเห็นอย่างไรกับพื้นที่คุ้มครองฯ/อุทยานฯ? ทำไมจึงรู้สึก/คิดเช่นนั้น?

3. What interactions does the MPA management have with the community?
พื้นที่คุ้มครองฯ/อุทยานฯทำอะไรกับชุมชนบ้าง?

4. How have previous interactions with the MPA impacted on the community?
ที่ผ่านมาสิ่งที่พื้นที่คุ้มครองฯ/อุทยานฯทำมีผลกระทบอย่างไรต่อชุมชน?

5. What is the relationship between MPA related processes, institutions, and organizations and community livelihoods?
การประกอบอาชีพของชุมชนเกี่ยวข้องอย่างไรกับขั้นตอน สถาบัน และองค์กรต่างๆที่เกี่ยวกับพื้นที่คุ้มครองฯ/อุทยานฯ

6. How have various governmental or non-governmental organizations related to the MPA helped or hindered community progress?
ที่ผ่านมา
องค์กรภาครัฐหรือองค์กรพัฒนาเอกชนต่างๆที่เกี่ยวข้องกับพื้นที่คุ้มครองฯ/อุทยานฯมีส่วนช่วยหรือเป็นอุปสรรคต่อความก้าวหน้าของชุมชนอย่างไร?

7. How was the MPA created?
พื้นที่คุ้มครองฯ/อุทยานฯแห่งนี้เกิดขึ้นได้อย่างไร?

8. What is the level involvement of community members in MPA management? Do community members have input into MPA management?
สมาชิกในชุมชนมีส่วนร่วมในการจัดการอุทยานฯมากน้อยแค่ไหน?
สมาชิกในชุมชนมีส่วนสนับสนุน/ให้ข้อมูลกับการจัดการพื้นที่คุ้มครองฯ/อุทยานฯหรือไม่?

9. How does a small local MPA differ from the Marine National Park proposal?
พื้นที่คุ้มครองฯขนาดย่อมที่ดูแลโดยชุมชนต่างจากอุทยานแห่งชาติอย่างไร?

5. Drivers of Change and Change Events
   สิ่งกระตุ้นของความเปลี่ยนแปลงและเหตุการณ์ของการเปลี่ยนแปลง

   1. Historically, what things and events have had the most significant impact on community livelihoods? When did these events happen?
      ในอดีต สิ่งและ/
      หรือเหตุการณ์ใดที่มีผลกระทบมากที่สุดต่อการประกอบอาชีพของชุมชน?
      เหตุการณ์เหล่านั้นเกิดขึ้นเมื่อใด? (ตอบได้หลายสิ่งและหลายเหตุการณ์)

   2. What factors have caused major changes for communities on the Andaman coast? When did these events happen?
      อะไรเป็นปัจจัย/
      สาเหตุที่ก่อให้เกิดความเปลี่ยนแปลงครั้งใหญ่ในชุมชนต่างๆบนชายฝั่งอันดามัน?
      เหตุการณ์เหล่านี้เกิดขึ้นเมื่อใด?

   3. What factors are currently driving ecological changes? Community factors? Outside factors?
      ในปัจจุบัน อะไรเป็นตัวกระตุ้นให้เกิดความเปลี่ยนแปลงทางนิเวศน์?
      ปัจจัยจากในชุมชน? ปัจจัยจากภายนอก?

   4. What factors are currently driving socio-economic changes? Community factors? Outside factors?
      ในปัจจุบัน อะไรเป็นตัวกระตุ้นให้เกิดความเปลี่ยนแปลงทางเศรษฐกิจและสังคม?
      ปัจจัยจากในชุมชน? ปัจจัยจากภายนอก?

   5. What factors do you think will cause the most change for communities and livelihoods in the future?
      คุณคิดว่าอะไรจะสร้างความเปลี่ยนแปลงต่อชุมชนและการประกอบอาชีพมากที่สุดในอนาคต?

   6. In the past, what factors have changed people's livelihoods in the community? In the region?
      ในอดีต สิ่งใดที่เปลี่ยนอาชีพของคนในชุมชน? ในพื้นที่แถบนี้?

6. Exploring Resilience/Adaptive Capacity

สำรวจความสามารถในการฟื้นตัว(resilience)/ความสามารถในการปรับตัว

1. What things helped the community to overcome some the negative impacts caused by previous change events? What things hindered?
   อะไรช่วยให้ชุมชนผ่านพ้นสิ่งที่ไม่ดีจากเหตุการณ์ความเปลี่ยนแปลงที่ผ่านมา?
   อะไรคืออุปสรรค?

2. What strategies has the community employed to help them overcome strong shocks? What things have interfered? What "safety nets" are available to help community after hazards?
   ชุมชนทำอย่างไรเพื่อช่วยให้สมาชิกผ่านพ้นสิ่งสะเทือนใจเหล่านั้น?
   อะไรที่เป็นอุปสรรค?
   ในชุมชนมีสิ่งรองรับ/"โครงข่ายคุ้มครอง"ใดบ้างที่คอยช่วยเหลือชุมชนหลังวิกฤต?

3. What factors influenced the community's ability to take advantage of these changes or turn a crisis into an opportunity? Inside the community? Outside the community?
   อะไรเป็นปัจจัยที่ช่วยให้ชุมชนสามารถหยิบสิ่งที่ดีจากความเปลี่ยนแปลงเหล่านี้
   หรือปรับวิกฤตให้เป็นโอกาสได้? ปัจจัยจากภายในชุมชน?
   ปัจจัยจากภายนอกชุมชน?

4. What things allowed the community to resist unwanted changes?
   อะไรคือสิ่งที่ช่วยชุมชนต้านทานความเปลี่ยนแปลงที่ไม่อยากให้เกิดขึ้นเหล่านั้น?

5. What factors allow the community to participate in current livelihoods opportunities? What hinders them from taking full advantage of current or new opportunities?
   ปัจจัยใดช่วยให้ชุมชนมีโอกาสมาประกอบอาชีพที่ทำอยู่ในปัจจุบัน?
   อะไรคืออุปสรรคที่ทำให้ไม่สามารถเปิดรับโอกาสในปัจจุบันหรือโอกาสใหม่ๆ?

6. What factors would allow the community to expand their repertoire of livelihoods? What hinders?
   ปัจจัยใดที่จะช่วยให้ชุมชนประกอบอาชีพที่หลากหลายขึ้น? อะไรเป็นอุปสรรค?

7. What sources of credit are available to the community? In the past, when loans are taken, are community members able to repay these loans? How much debt do people have in the community?
   ชุมชนมีแหล่งให้กู้ยืมเงินได้ที่ใดบ้าง? ในอดีต เวลาทำการกู้เงิน

สมาชิกในชุมชนสามารถใช้คืนได้หรือไม่? คนในชุมชนเป็นหนี้เท่าไหร่?

8. What organizations and institutions help to facilitate adaptation? To climate change? What have these organizations done during past change events? What could these organizations do better?
องค์กรหรือสถาบันใดที่ช่วยสนับสนุนในเรื่องการปรับตัว?
เรื่องสภาพภูมิอากาศเปลี่ยนแปลง?
องค์กรเหล่านี้ทำอะไรบ้างในช่วงที่เกิดเหตุเปลี่ยนแปลงที่ผ่านมา?
มีอะไรบ้างที่องค์กรเหล่านี้ควรปรับปรุง?

9. What policies, programs, and plans are there for facilitating adaptation to climate change?
มีนโยบาย โครงการ
และแผนงานอะไรบ้างที่สนับสนุนเรื่องการปรับตัวต่อสภาพภูมิอากาศเปลี่ยนแปลง?

10. How well does the community adopt or implement external plans or programs? (plans created within the community)
ชุมชนนำแผนหรือโครงการจากภายนอกมาปรับใช้ได้มากน้อยแค่ไหน?

11. What role do community organizations play in helping the community and households in times of need? Which organizations? Who participates in these organizations?
องค์กรท้องถิ่นมีบทบาทอย่างไรในการช่วยชุมชนและแต่ครัวเรือนเมื่อเกิดเหตุจำเป็น? องค์กรใด? ใครทำงานร่วมกับองค์กรเหล่านั้น?

12. What role do family and friends play in helping the community and households in times of need?
ครอบครัวและเพื่อนมีบทบาทอะไรในการช่วยชุมชนและแต่ครัวเรือนเมื่อเกิดเหตุจำเป็น?

13. What things do people in the community do to protect themselves against unexpected events (e.g., storms, floods)?
คนในชุมชนทำอย่างไรเพื่อปกป้องตัวเองจากเหตุการณ์ที่ไม่คาดคิด (เช่น พายุ น้ำท่วม)?

14. How does the community plan for any unexpected events or circumstances? What processes are used?

ชุมชนวางแผนอย่างไรกับเหตุการณ์หรือสถานการณ์ที่ไม่คาดคิด? มีขั้นตอนอะไรบ้าง?

15. How does the community consider or plan for slow gradual changes? How does the community plan for the impacts of climate change?
ชุมชนพิจารณาหรือวางแผนอย่างไรกับความเปลี่ยนแปลงที่ค่อยๆเกิดขึ้น? ชุมชนวางแผนอย่างไรเรื่องผลกระทบจากสภาวะภูมิอากาศเปลี่ยนแปลง?

7. Community Profile
ข้อมูลชุมชน

1. What previous research has happened in the community?
เคยมีการทำสำรวจหรือวิจัยอะไรบ้างในชุมชนแห่งนี้?

2. What research still needs to be done?
มีการสำรวจวิจัยอะไรบ้างที่ควรจะต้องทำเพิ่มเติม?

3. Which organizations – community-based or non-governmental – work in the community?
องค์กรใด (องค์ท้องถิ่น หรือ องค์กรพัฒนาเอกชน) ที่ทำงานในชุมชนแห่งนี้

4. Checklist of community infrastructure items
รายการโครงสร้างพื้นฐานที่มีในชุมชน
- Hospitals โรงพยาบาล
- medical clinics คลินิก/สถานีอนามัย
- doctors หมอ
- dentists หมอฟัน
- elementary school โรงเรียนประถม ๑-๖
- middle school โรงเรียนมัธยมต้น
- high school โรงเรียนมัธยมปลาย
- piped water น้ำประปา
- sewer pipes/ canals ท่อน้ำทิ้ง
- sewage treatment facilities เครื่องมือบำบัดน้ำเสีย
- electric service ไฟฟ้า
- telephone service โทรศัพท์ (รวมถึงโทรศัพท์มือถือ)
- food markets ตลาดสด
- pharmacies ร้านขายยา

- hotels or guest houses โรงแรมหรือบ้านพักแขก (guesthouses)
- restaurants ร้านอาหาร
- gas stations ปั๊มน้ำมัน
- public transportation การขนส่งสาธารณะ
- hard-top road access ถนนคอนกรีตหรือยางมะตอย
- banking facilities ธนาคาร
- pier ท่าเรือ

(Knowledge of MPA boundary)

Appendix H – Key Informant Interview Questionnaire (in English and Thai)

Community Profile – Key Informant Interview ข้อมูลชุมชน – การสัมภาษณ์ผู้ให้ข้อมูลหลัก

Interview Date (YYMMDD) วันที่สัมภาษณ์: _____

National Park Name ชื่ออุทยานแห่งชาติ: _____

Community Name ชื่อชุมชน: _____ District อำเภอ: _____

Province จังหวัด: _____

Which of the following organizations have worked in the community in the past or does the community have an ongoing relationship with? องค์กรใดบ้างต่อไปนี้ ได้เคยทำงานในชุมชนหรือยังคงมีความเกี่ยวข้องกับชุมชนอยู่ในปัจจุบัน

Type of Organization ประเภทขององค์กร	**Past Work** ผลงานในอดีต	**Ongoing Relationship** ความเกี่ยวข้องกับชุมชน	**Names of Organizations and Details** ชื่อองค์กรและรายละเอียด
Government organizations – development focused หน่วยงานรัฐบาล – มุ่งเน้นเรื่องการพัฒนา			
Government organizations – environment focused หน่วยงานรัฐบาล – มุ่งเน้นเรื่องสิ่งแวดล้อม			
Non-Governmental Organizations – Thai องค์กรพัฒนาเอกชน/มูลนิธิของไทย			
Non-Governmental Organizations – International องค์กรพัฒนาเอกชน/มูลนิธิระหว่างประเทศ			
Environmental Organizations – Thai องค์กรด้านสิ่งแวดล้อมของไทย			
Environmental Organizations – International องค์กรด้านสิ่งแวดล้อมของต่างชาติ			
Academics and Researchers – Thai นักวิชาการและนักวิจัยของไทย			
Academics and Researchers – International นักวิชาการและนักวิจัยของต่างชาติ			
International Foundations มูลนิธิของต่างชาติ			

Thai National Foundations มูลนิธิของไทย			
Royal Foundations and Projects มูลนิธิและโครงการหลวง			
Outside Religious Organizations องค์กรด้านศาสนาจากภายนอก			
Private Sector Bodies – Business Organizations องค์กรเอกชน – ภาคธุรกิจ			
Local Community Based Organizations องค์กรชุมชนในท้องถิ่น			
Local Environmental Organizations in the Community องค์กรสิ่งแวดล้อมท้องถิ่นภายในชุมชน			
Other? อื่นๆ			

Which of the following infrastructure items are available in the community? รายการโครงสร้างพื้นฐานที่มีในชุมชน

- ☐ Hospitals โรงพยาบาล
- ☐ medical clinics คลินิก/สถานีอนามัย
- ☐ elementary school โรงเรียนประถม 1-6
- ☐ middle school โรงเรียนมัธยมต้น
- ☐ high school โรงเรียนมัธยมปลาย
- ☐ piped water น้ำประปา
- ☐ sewer pipes/ canals ท่อน้ำทิ้ง/คลอง
- ☐ sewage treatment facilities เครื่องมือ/อุปกรณ์บำบัดน้ำเสีย
- ☐ evening electricity service with generator บริการไฟฟ้าด้วยเครื่องปั่นไฟ ในช่วงค่ำ
- ☐ 24 hour electric service with generator บริการไฟฟ้าด้วยเครื่องปั่นไฟ ตลอด 24 ชั่วโมง
- ☐ 24 hour electric service from outside source มีแหล่งจ่ายไฟฟ้าจากภายนอก ตลอด 24 ชั่วโมง
- ☐ telephone service บริการโทรศัพท์
- ☐ food shops or markets ร้านอาหารหรือตลาด
- ☐ pharmacies ร้านขายยา
- ☐ hotels or guest houses โรงแรมหรือเกสต์เฮ้าส์
- ☐ Community-based tourism program or homestay กลุ่มท่องเที่ยวโดยชุมชนหรือโฮมสเตย์

- ☐ restaurants ร้านอาหาร
- ☐ gas stations ปั๊มน้ำมัน
- ☐ public transportation – bus บริการขนส่งสาธารณะ รถโดยสาร รถเมล์
- ☐ public transportation – ferry บริการขนส่งสาธารณะ เรือข้ามฟาก
- ☐ hard-top road access ถนนคอนกรีตหรือยางมะตอย
- ☐ banking facilities สิ่งอำนวยความสะดวกเกี่ยวกับธนาคาร
- ☐ pier ท่าเรือ
- ☐ Sheltered harbor ท่าเรือมีหลังคา
- ☐ Mosque, temple, or church มัสยิด,วัด,โบสถ์
- ☐ TAO Office ที่ทำการ อบต.
- ☐ Community hall or meeting place ศาลากลางของชุมชนหรือจุดนัดพับ
- ☐ Infrastructure for managing waste? Details โครงสร้างพื้นฐานสำหรับการจัดการขยะ? รายละเอียด:
  _____
- ☐ Other important infrastructure โครงสร้างพื้นฐานสำคัญอื่นๆ:
  _____
  _____

What past changes has the community undergone that have changed livelihoods in the community? ความเปลี่ยนแปลงใดในอดีตที่เปลี่ยนอาชีพต่างๆของคนในชุมชน?

How did the community adapt to these changes? ชุมชนปรับตัวต่อความเปลี่ยนแปลงเหล่านั้นอย่างไร?

In what ways does the community plan for potential future changes in livelihoods? For example, changes in the amount that people can make from fishing, tourism, or agriculture. ชุมชนวางแผนสำหรับความเปลี่ยนแปลงด้านอาชีพที่อาจเกิดขึ้นในอนาคตในด้านใด? ตัวอย่างเช่น การเปลี่ยนแปลงของปริมาณปลาที่หาได้, การท่องเที่ยว, หรือการเกษตร

In what ways does the community plan for potential disasters, such as storms or floods? ชุมชนได้วางแผนรับมือกับภัยพิบัติที่อาจจะเกิดขึ้นได้ เช่น พายุ หรือน้ำท่วม อย่างไรบ้าง?

What things do households do to protect themselves from risks (eg, potential negative impacts to household livelihoods, personal health, or to household assets)? ครอบครัวของคุณมีวิธีการรับมือความเสี่ยงต่างๆ อย่างไรบ้าง (เช่น ผลกระทบที่ไม่ดีซึ่งอาจเกิดขึ้นได้ต่อการประกอบอาชีพ, ปัญหาสุขภาพ หรือ ปัญหาทรัพย์สินของครอบครัว)?

What do you think are the major impacts of the community's main livelihoods on the marine environment? คุณคิดว่าอะไรคือผลกระทบที่สำคัญของอาชีพหลักของชุมชนต่อสิ่งแวดล้อมทางทะเล?

What rules or regulations does the community have to protect the environment? ชุมชนมีกฎหรือข้อบังคับอะไรบ้างในเพื่อที่จะดูแลรักษาสิ่งแวดล้อม?

What conservation actions does the community currently do in the marine or the terrestrial environment? ปัจจุบันชุมชนทำอะไรบ้าง เพื่ออนุรักษ์ทรัพยากรทางทะเลและบนบก?

Does the community do anything specific to protect coral reefs, mangroves, seagrass areas, seashells, crabs, fish or other things related to the marine environment? Please describe.
ชุมชนได้ทำอะไรเป็นพิเศษเพื่อรักษาปะการัง ป่าโกงกาง บริเวณหญ้าทะเล หอย ปู ปลา หรือสิ่งอื่นๆที่เกี่ยวข้องกับสิ่งแวดล้อมทางทะเลหรือไม่? กรุณาอธิบาย

Does the community take any of the following specific conservation actions? Please describe. ชุมชนได้มีการทำสิ่งต่างๆต่อไปนี้ เพื่อการอนุรักษ์บ้างหรือไม่? กรุณาอธิบาย

- ☐ Area closures or spatial restrictions การปิดพื้นที่หรือข้อกำหนดเรื่องบริเวณ
- ☐ Seasonal or temporal closures การปิดพื้นที่ตามฤดูกาลหรือชั่วคราว
- ☐ Species restrictions ข้อกำหนดเรื่องชนิดพันธุ์
- ☐ Catch restrictions (Limits on the amount you can catch) ข้อกำหนดในการจับ (จำกัดปริมาณที่คุณจับได้)
- ☐ Gear restrictions (Limits on certain types of gears) ข้อกำหนดการใช้เครื่องมือประมง (จำกัดเครื่องมือประมงบางประเภท)

What do people in the community do when people do not follow the rules? คนในชุมชนทำอย่างไรเมื่อมีคนไม่ปฏิบัติตามกฎระเบียบ?

How does the community monitor the health of the environment? (For example, fish, seashells, mangroves, seagrass, corals, wildlife, forests) ชุมชนติดตามความเปลี่ยนแปลงในสภาพของสิ่งแวดล้อมอย่างไร? (เช่น ปลา หอย ป่าโกงกาง หญ้าทะเล ปะการัง สัตว์ป่า ป่าไม้)

How have rules changed in the past in response to perceived changes in the health of the environment? กฎข้อบังคับต่างๆในอดีตเปลี่ยนไปอย่างไรบ้าง เพื่อให้สอดคล้องกับความเปลี่ยนแปลงในสภาพของสิ่งแวดล้อม?

In what ways does the community plan for adaptation to climate change? For example, how does the community plan for rising sea levels, erosion, storms, changing rainfall, decreasing salt in mangrove areas, flooding, landslides, or coral bleaching. Please go through each. ชุมชนได้วางแผนในการปรับตัวต่อสภาพอากาศเปลี่ยนแปลงอย่างไรบ้าง? ยกตัวอย่างเช่น ชุมชนวางแผนรับมืออย่างไรสำหรับระดับน้ำทะเลที่สูงขึ้น, การกัดเซาะชายหาด, พายุ, ฝนตกไม่ตรงฤดู, ความเค็มในป่าโกงกางลดลง, น้ำท่วม, ดินถล่ม, หรือ ปะการังฟอกขาว กรุณาตอบไล่ที่ละอย่าง

Please tell me about the governance structure in the community? กรุณาเล่าถึงโครงสร้างการปกครองของชุมชนนี้

How are important or difficult decisions made in the community? Please describe the process.
ชุมชนนี้ตัดสินใจเรื่องที่สำคัญหรือยากอย่างไรบ้าง? กรุณาอธิบายกระบวนการ

Series of Y/N Questions – If yes, please ask for more information about where, who, what, and when.
คำถามแบบใช่/ไม่ ถ้าตอบว่าใช่ ให้ผู้ถูกสัมภาษณ์ให้ข้อมูลว่าที่ไหน ใคร ทำอะไร และเมื่อไหร่

____ Have there been programs of education or outreach on climate change in the community? Describe. ชุมชนนี้เคยมีกิจกรรมหรือการให้ความรู้เกี่ยวกับเรื่องสภาพอากาศเปลี่ยนแปลงหรือไม่? กรุณาอธิบาย

____ Have there been programs related to disaster preparedness in the community? Describe. ชุมชนนี้เคยมีโครงการการเตรียมพร้อมด้านภัยพิบัติบ้างหรือไม่? กรุณาอธิบาย

____ How does the local community council or Tambon consider climate change adaptation when planning infrastructure? Describe. คณะกรรมการหมู่บ้านหรือตำบลได้คำนึงถึงเรื่องการปรับตัวต่อสภาพอากาศเปลี่ยนแปลงเมื่อวางแผนโครงสร้างพื้นฐานในชุมชนหรือไม่? กรุณาอธิบาย

____ Have there ever been programs or workshops related to conservation or natural resource management in the community? Describe. เคยมีโครงการหรือ workshop เกี่ยวกับการจัดการหรือการอนุรักษ์ทรัพยากรธรรมชาติในชุมชนบ้างหรือไม่? กรุณาอธิบาย

____ Have there ever been programs or workshops related to livelihoods in the community? Describe. เคยมีโครงการหรือ workshop เกี่ยวกับอาชีพ จัดขึ้นในชุมชนบ้างหรือไม่? กรุณาอธิบาย

What livelihoods are available to community members during the following months of the year? คนในชุมชนสามารถทำอาชีพอะไรได้บ้างในแต่ละเดือนต่อไปนี้ ในช่วงปี

Jan ม.ค.	Feb ก.พ.	Mar มี.ค.	Apr เม.ย.	May พ.ค.	Jun มิ.ย.
July ก.ค.	Aug ส.ค.	Sept ก.ย.	Oct ต.ค.	Nov พ.ย.	Dec ธ.ค.

What marine resources are fished and collected either for subsistence or commercial purposes by community members during the following months of the year? ทรัพยากรทางทะเลอะไรบ้างที่คนในชุมชนจับและเก็บไปกิน/ใช้ หรือนำไปขาย ในแต่ละเดือนต่อไปนี้บ้าง?

Jan ม.ค.	Feb ก.พ.	Mar มี.ค.	Apr เม.ย.	May พ.ค.	Jun มิ.ย.
July ก.ค.	Aug ส.ค.	Sept ก.ย.	Oct ต.ค.	Nov พ.ย.	Dec ธ.ค.

Appendix I - Interview and Group Interview Sample Statistics

Table 19 – Individual interview sample categorized by attribute

Attribute	Value	Number (Total N=85)	Percentage
Age	Under 20	2	2.4
	20-30	9	10.6
	30-40	31	36.5
	40-50	28	32.9
	50-60	10	11.8
	60+	5	5.9
Gender	Male	64	75.3
	Female	21	24.7
Community	Baan Koh Chang	7	8.2
	Baan Koh Panyee	16	18.8
	Baan Koh Sin Hi	6	7.1
	Baan Lions	14	16.5
	Baan Moken	4	4.7
	Baan Tapae Yoi	10	11.8
	Baan Tha Khao	8	9.4
	Other Community	11	12.9
	All Communities	8	9.4
	Not Applicable	1	1.2
Occupation by Sector	Fisheries	13	15.3
	Agriculture/Plantations	7	8.2
	Tourism	18	21.2
	Local Government	17	20
	Other	10	11.8
	Outside Government Agency	10	11.8
	Outside NGO	7	8.2
	Outside University	3	3.5
National Marine Park	Ao Phang Nga NMP	23	27.1
	Koh Rah-Phrathong NMP	28	32.9
	Mu Koh Ranong NMP	19	22.4
	Than Bhok Khorani NMP	5	5.9
	Other NMP	2	2.4
	All NMPs	8	9.4
Role in Community or Society	Community Member	37	43.5
	Community Group Leader	5	5.9
	Community Leader	20	23.5
	Government Employee	3	3.5
	Outside Academic	3	3.5
	Outside Government Rep	10	11.8
	Outside NGO Worker	7	8.2

Table 20 – Group interview statistics

Interview #	Age	Community	Gender	Number of People	Occupation by Sector	National Marine Park	Role in Community
20110629b	Mixed Age Group	Other Community	Mixed Genders	4	Mixed Livelihoods	Ao Phang Nga NMP	Community Members
20110629d3	20-30	Other Community	Female	2	Other	Ao Phang Nga NMP	Community Members
20110630a	40-50	Other Community	Mixed Genders	4	Local Government	Mu Koh Ranong NMP	Community Leaders
20110712a	Mixed Age Group	Baan Tapae Yoi	Mixed Genders	5+	Mixed Livelihoods	Koh Rah-Koh Phrathong NMP	Mixed Group
20110712b2	Mixed Age Group	Baan Tapae Yoi	Male	4	Fisheries	Koh Rah-Koh Phrathong NMP	Community Members
20110712b3	20-30	Baan Lions	Mixed Genders	2	Mixed Livelihoods	Koh Rah-Koh Phrathong NMP	Community Leaders
20110713	Mixed Age Group	Baan Tapae Yoi	Female	5+	Mixed Livelihoods	Koh Rah-Koh Phrathong NMP	Community Members
20110713a2	20-30	Baan Lions	Male	2	Tourism	Koh Rah-Koh Phrathong NMP	Community Members
20110721	Mixed Age Group	Other Community	Mixed Genders	5+	Mixed Livelihoods	Mu Koh Ranong NMP	Mixed Group
20110722b	Mixed Age Group	Baan Koh Chang	Mixed Genders	5+	Mixed Livelihoods	Mu Koh Ranong NMP	Mixed Group
20110723a	Mixed Age Group	Baan Koh Sin Hi	Male	5+	Fisheries	Mu Koh Ranong NMP	Community Leaders
20110724a	Mixed Age Group	Other Community	Mixed Genders	5+	Mixed Livelihoods	Mu Koh Ranong NMP	Mixed Group
20110804a	Mixed Age Group	Baan Tapae Yoi	Female	3	Fisheries	Koh Rah-Koh Phrathong NMP	Community Members
20110809	Mixed Age Group	Other Community	Mixed Genders	4	Mixed Livelihoods	Ao Phang Nga NMP	Mixed Group
20110823a	Mixed Age Group	Baan Koh Panyee	Mixed Genders	5+	Mixed Livelihoods	Ao Phang Nga NMP	Mixed Group
20110906	Mixed Age Group	Baan Thao Khao	Mixed Genders	4	Mixed Livelihoods	Than Bhok Khorani NMP	Mixed Group
20110913d	Mixed Age Group	Baan Koh Chang	Mixed Genders	5+	Mixed Livelihoods	Mu Koh Ranong NMP	Mixed Group
20110916d	20-30	Baan Koh Sin Hi	Female	4	Other	Mu Koh Ranong NMP	Community Members
20110920c	30-40	Baan Lions	Mixed Genders	2	Tourism	Koh Rah-Koh Phrathong NMP	Community Members
20110922b	Mixed Age Group	Baan Tapae Yoi	Mixed Genders	4	Fisheries	Koh Rah-Koh Phrathong NMP	Community Members
20110928a	Mixed Age Group	Baan Koh Panyee	Mixed Genders	4	Mixed Livelihoods	Ao Phang Nga NMP	Mixed Group
20110929	60+	Baan Koh Panyee	Mixed Genders	2	Other	Ao Phang Nga NMP	Community Members
20110929c2	40-50	Baan Koh Panyee	Mixed Genders	2	Fisheries	Ao Phang Nga NMP	Community Members

Appendix J – Survey in English

Household Survey

Interview Date (YYMMDD): _____ National Park Name: _____

Community Name: _____ District: _____ Province: _____

Interviewer Name: _____ Length of Interview (hh:mm): _____ Interview #: _____

Introduction

This is a reminder to survey administrators to 1) introduce yourselves, 2) introduce the project, and 3) discuss ethical considerations as per project requirements. Please refer to introduction script and ethics checklist.

Household Data

The first section of the survey will collect background information on your household, including the people who live in the house, livelihoods, levels of income and debt, your household assets, and use of marine resources.

General Household Information

Q1) How many years have you lived in this community? _____ years

Q2) Where are you from originally?

1) The community
2) The subdistrict
3) The province
4) Thailand
5) Other: _____

Q3) How many people live in the household? _____

Q4) How many dependent children under 18 years of age live in the household? _____

Q5) How many elders who do not work live in the household? _____

Q6) What is the nationality of the household?

1) Thai
2) Burmese
3) Mixed Thai & _____
4) Other: _____
5) Stateless

Q7) Which languages do people in the household speak? Check all that apply.

a) ____ Thai
b) ____ Burmese
c) ____ Malay - Yawi
d) ____ English
e) _____ Moken/Moklen
f) ___Other: _____

Q8) What is the religious affiliation of the household?

1) Muslim
2) Buddhist
3) Christian
4) Catholic
5) Other: _____
6) None

Q9) Do members of the household belong to one of the following Chao Lay (sea gypsy) groups?

1) Not Applicable
2) Moken
3) Moklen
4) Urak Lawoi

Q10) Fill out the following table for individuals who live in the household.

Household member*	I?	H?	Age	Sex (MFO)	Formal Education**	Occupation(s)*** (Circle main for each)	Avg. Monthly Income – Dry Season	Avg Monthly Income – Rainy Season	ID #
a.									
b.									
c.									
d.									
e.									
f.									
g.									
h.									
i.									

I? = Interviewee. Please check the box next to the person or persons that you are interviewing.
H? = Head of household. Please check the box next to the head of the household.
*Household Member. Identify by relationship to head of household: 1) husband or father – male head of household, 2) wife or mother – female head of household, 3) parents of heads of household, 5) children of head of household, 6) adult partner of children of head of household, 7) children of children of head of household, 4) adult relative, 8) children of relatives, 9) household help, 10) other
**Identify by category: 1) none, 2) 1-3, 3) 4-6, 4) middle school, 5) high school, 6) diploma or vocational certificate, 7) bachelors, 8) graduate program
***Occupations: List by number as listed in Appendix A for livelihoods. Please list all livelihoods for each person using the numbers. Circle the main livelihood for each person.
ID# - Please identify whether the household member has an ID card that starts with 1, 2, 3, 4, 5, 6, 7, 8, 0, or no card (9). Note to please ask this question at the end of the survey.

Livelihood Information

Q11) During rainy and dry season, approximately how many baht do each of the following livelihoods contribute to household income? Please include income from both ownership and from wage labour in each sector.

Livelihood (by sector)	Dry Season	Rainy Season
a. Fishing	Baht	Baht
b. Harvesting Seafoods	Baht	Baht
c. Aquaculture	Baht	Baht
d. Tourism	Baht	Baht
e. Agriculture	Baht	Baht
f. Rubber Plantations	Baht	Baht
g. Palm Plantations	Baht	Baht
h. Other Livelihoods	Baht	Baht

Q12) What is the household's most important livelihood in terms of income? _____

Q13) If you were unable to make a living from your main livelihood, would you:

1) Stay in the community to work
2) Move somewhere else permanently to work
3) Migrate somewhere else to work but come back to the community

Q14) If the interviewee answered 1 to the previous question, please ask: If you were unable to make a living and stayed in the community, what would you do to make a living?

_____
_____
_____

1) Stay doing the same thing and hope it gets better
2) Primarily a fisher, would move to another type of fisheries
3) Not primarily a fisher, would increase involvement with fisheries
4) Depend more on non-fisheries livelihood options. Please specify: _____
5) I don't know

Q15) How many different occupations have you had in the past 10 years? _____

Income and Debt

Q16) How many family members from this house are currently living and working away from the area? _____

Q17) Do family members who live elsewhere send money back home?
a) Yes
b) No

Q18) Approximately, how much money is sent home each month _____ baht

Q19) How many family members are currently attending secondary or post-secondary school away from the area? ____

Q20) How would you rate household income as compared to living expenses?
1) Income less than expenses – Usually not enough to make a living
2) Income equal to expenses – Usually, just enough to make a living
3) Income greater than expenses – Usually have some money left to save or spend

Q21) Do people in your household have access to sources of credit?
1) Yes
2) No

Q22) From which of the following sources can people in your household get loans or borrow money? Check all that apply.
a) _____ Middleman or boss
b) _____ Informal loans from local business person
c) _____ Community trust fund or revolving fund
d) _____ Vocational group or community savings group
e) _____ Banks loans
f) _____ Family members in the community
g) _____ Family members outside the community
h) _____ Credit card
i) _____ Other: _____

Q23) Approximately, how much debt do you have in the household? _____ baht

Q24) Approximately, how much savings to you have in the household? _____ baht

Household Assets

Q25) Please observe and estimate the proximity of house to the ocean (highest tide).
1) On wooden stilts above the ocean (highest tide)
2) On concrete stilts above the ocean (highest tide)
3) On the ocean but within a sheltered canal
4) Within 50 meters of the ocean (highest tide)
5) Within 100 meters of the ocean (highest tide)
6) Further than 100 meters from the ocean (highest tide)
7) On a hill farther away from the ocean

Q26) Please observe and assess under which of the following categories the house could most easily be classified
1) Made from thatch or bamboo
2) Made from other non-permanent materials
3) Wooden house
4) Made from a combination of concrete and wood
5) Made from cement
6) Other: _____

Q27) Which of the following items does the household possess. Check all that apply.

a) ____ Clay stove
b) ____ Gas stove
c) ____ Fridge
d) ____ Television
e) ____ Radio
f) ____ Cell phone
g) ____ Computer
h) ____ Air conditioner

Q28) How many of each type of boat are owned by your household? Please enter the number for each type of boat.

a) ____ longtail boat b) ____ leppid boat c) ____ flatbottom boat

Q29) Does your household own any of the following land-based vehicles? Please enter the number for each vehicle.

a) _____Car or truck b) _____Motorcycle c) _____Tractor

Q30) Do people in your household own the house?

1) Yes, the house belongs to people in the house
2) No, the house belongs to extended family
3) No, the house does not belong to people in the house or extended family

Q31) Do people in your household own the land that your house is on?

1) Yes, the land belongs to people in the house
2) No, the land belongs to extended family
3) No, the land does not belong to people in the house or extended family

Q32) Do people in your household own other land that is suitable for livelihood purposes – either agriculture, plantations, or tourism?

1) Yes 2) No

Q33) What is the land suitable for? Check all that apply.

a) ____ agriculture
b) ____ plantations
c) ____ tourism
d) ____ Other

Q34) If yes to 33a, please ask: Approximately how many rai of land do you own? _____

Q35) How many foreign migrant laborers do you have working for your household? ____

Q36) How many laborers from Thailand but outside the sub-district do you have working for your household? ____

Q37) How many local (within subdistrict) labourers do you have working for your household? ____

Q38) Please specify how many domestic and migrant labourers work in each of the following sectors. Ensure the numbers add up to the total from the previous question.

Sector	Local Labourers (#)	Domestic Migrant Labourers (#)	Foreign Migrant Labourers (#)
a. Fishing			
b. Agriculture or Plantations			
c. Tourism			
d. Other			

Q39) Which of the following fishing gears does your household own? Check all that apply.

☐ a) Not applicable - None
☐ b) Net for crab
☐ c) Net for shrimp
d) Net for fish – List types of fish:
_____
☐ e) Surrounding net for anchovy
☐ f) Trap for mud or mangrove trap
☐ g) Trap for swimming crab
☐ h) Trap for squid or cuttle fish
☐ i) Small fish traps – List types of fish:
_____
☐ j) Large fish traps – Type of fish: _____
☐ k) Set bag net or stow nets
☐ l) Push nets for shrimp
☐ m) Bottom trawl
☐ n) Bag net trawl
☐ o) Line and hooks
☐ p) Pole, line, and hook (hand-held)
☐ q) Hand held scoop net for jellyfish
☐ r) Hand Held Shell Dredge
☐ s) Boat Towed Shell Dredge
☐ t) Bamboo Stake Trap – large scale

- ☐ u) Bay closing net
- ☐ v) Casting net
- ☐ w) shrimp spear or basket trap
- ☐ x) mask and generator
- ☐ y) hand tools for collecting shells
- ☐ z) Other: _____

Use of Marine Resources

Q40) How many nights a week does your household eat fish or seafood for dinner (rather than pork, meat, chicken, or eggs)?

1) None
2) 1-2 nights a week
3) 3-4 nights a week
4) 5-6 nights a week
5) 7 nights a week

Q41) Which of the following marine resources does your household rely on for household use or for sale? Check all that apply.

Marine Resource	For Selling	For Household Use
a. Mangrove wood for building or making stuff (e.g., fish traps)		
b. Mangrove wood for charcoal or firewood		
c. Anchovies		
d. Mackerell		
e. Jack Fish		
f. Sardinellas		
g. Parrotfish, Rabbitfish, or Surgeonfish		
h. Butterfly Fish		
i. Grouper		
j. Snapper		
k. Reef shark		
l. Rays		
m. Krill		
n. Shrimp		
o. Squid		
p. Cuttle Fish		
q. Trash Fish		
r. Mud or Mangrove Crabs		
s. Deep Sea Crabs (e.g., Blue or Star Crab)		
t. Sea cucumbers		
u. Conch		
v. Shellfish from mangrove areas		
w. Shellfish from seagrass areas		
x. Shellfish from rocky or reef areas		
y. Shells or coral reef products for household decoration or tourists		
z. Coral reefs for recreation or tourism (snorkeling or scuba)		
aa. Sandy beaches or beach dunes for recreation or tourism		
bb. Rocky islands or formations for recreation or tourism		
cc. Island plant species for collecting for medicinal or decorative purposes		
dd. Island forests, island swamps or wetlands, or savannah areas for recreation or tourism		
ee. Island wildlife for eating or pets		
ff. Island wildlife for recreation or tourism		
gg. Other: _____		

Knowledge and Learning

This section is to explore your opinions about fisheries and knowledge of climate change.

Q42) In your opinion, are marine resources or the number of fish in the sea:
1) Increasing 2) Staying the same 3) Declining

Q43) In your opinion, what things do you think can cause declines in the number of fish in the sea? Anything else?

_____
_____
_____

Q44) In your opinion, what actions do you think would be effective to conserve or increase the number of fish in the sea? Anything else?

_____
_____
_____

Q45) Have you ever learned about climate change?
1) Yes 2) No

Q46) Have you learned about climate change from any of the following sources? Check all that apply.
a) ____ Newspapers
b) ____ Radio
c) ____ Television
d) ____ Internet
e) ____ Visiting Non-Governmental Organizations
f) ____ Going on a fieldtrip or to a workshop
g) ____ Community Leaders
h) ____ Schools-teachers
i) ____ Visiting climate scientists-experts
j) ____ Family or friends
k) ____ Government information
l) ____ Other: _____

Q47) What do you think are the current and potential future impacts of climate change on your community and on nature in this region?

_____
_____
_____
_____

Organizational Involvement and Participation

The next section will explore your involvement in community and outside organizations and your participation in decision-making processes.

Q48) What community organizations (For example, formal groups, committees, cooperatives, or associations) do you currently belong to? Please name the organizations:

_____
_____
_____

a) Number of organizations that are listed _____

Q49) In which of the following ways are you involved with community organizations? Check all that apply.
☐ a) Attend meetings and listen
☐ b) Attend meetings and express opinions
☐ c) Active membership in an organization
☐ d) Member of committee
☐ e) Elected member of leadership

Q50) What organizations (For example, formal groups, committees, cooperatives, or associations) outside the community do you currently belong to? Please name the organizations:

_____
_____
_____

a) Number of organizations that are listed _____

Q51) In your opinion, how involved are people in your household in decision making at the following levels:

	Not Involved At All	Very Little Involvement	Medium Level of Involvement	High Level of Involvement	Very High Level of Involvement	Don't Kn
A) Community Level Governance	1	2	3	4	5	6
B) Subdistrict Level Administration	1	2	3	4	5	6
C) District and Provincial Levels	1	2	3	4	5	6
D) Management of Natural Resources in the Community	1	2	3	4	5	6
D) Management of National Parks	1	2	3	4	5	6

Resilience - Risks and Supports

The next section of the survey will explore a number of different factors that might negatively impact household livelihoods. It will also look at supports to help your household overcome potential challenges or obstacles.

Q52) How much negative impact do the following factors have on household livelihoods? Please rank on a scale of 1 to 5.

	No Impact	Very Little Impact	Medium Level of Impact	High Level of Impact	Very High Level of Impact	Don't Know
A) Declines in the price that you can sell fish	1	2	3	4	5	6
B) Extreme weather events such as storms	1	2	3	4	5	6
C) Increasing of sediments in the waters	1	2	3	4	5	6
D) Overfishing	1	2	3	4	5	6
E) Commercial fishers coming into inshore waters (within 3000 meters)	1	2	3	4	5	6
F) Changes in rainy and dry seasons or changing rainfall patterns	1	2	3	4	5	6
G) Increased garbage in the ocean	1	2	3	4	5	6
H) Coral bleaching	1	2	3	4	5	6
I) Conflict with other small-scale fisheries or fishers	1	2	3	4	5	6
J) Increased freshwater in mangrove areas making water less salty	1	2	3	4	5	6
K) Exclusion from doing livelihoods in certain areas	1	2	3	4	5	6

because of the tourism industry						
L) Nobody wants to buy the product I am selling	1	2	3	4	5	6
M) Trawlers taking or destroying my gears	1	2	3	4	5	6
N) More people moving into the area	1	2	3	4	5	6
O) The price of rubber declining	1	2	3	4	5	6
P) Destructive and/or illegal fishing practices	1	2	3	4	5	6
Q) Getting arrested when traveling across the border to fish	1	2	3	4	5	6
R) The rising price of supplies needed to do my livelihoods	1	2	3	4	5	6
S) Increasing levels of household debt	1	2	3	4	5	6
T) National government policies	1	2	3	4	5	6
U) Land encroachment in the area	1	2	3	4	5	6
V) The national park	1	2	3	4	5	6
W) Gear or boat being taken when traveling across the border to fish	1	2	3	4	5	6
X) Rising sea levels compared to the past	1	2	3	4	5	6
Y) The increasing price of gas	1	2	3	4	5	6
AA) Conflict within the community	1	2	3	4	5	6
BB) Landslides	1	2	3	4	5	6
CC) Conflict with other communities	1	2	3	4	5	6
DD) The change of national governments	1	2	3	4	5	6
EE) Salt water coming up in drinking water or agricultural water sources	1	2	3	4	5	6
FF) Coastal or beach erosion	1	2	3	4	5	6
GG) Corruption in Thailand	1	2	3	4	5	6
HH) Rising cost of living	1	2	3	4	5	6
II) Flooding	1	2	3	4	5	6
JJ) More pollution in the ocean	1	2	3	4	5	6
KK) Health problems of members of your household	1	2	3	4	5	6
LL) Other: _____	1	2	3	4	5	6

Q53) How important do you think each of the following factors are in helping your household to overcome obstacles and challenges? Please rank on a scale of 1 to 5.

	Not at all important	**A Little Bit Important**	**Somewhat Important**	**Quite Important**	**Very Important**	**Don't Know**
A) Family and friends in the community	1	2	3	4	5	6
B) Family and friends from another community	1	2	3	4	5	6
C) Assistance from government agencies or government development programs (Fisheries, Agriculture, Rural Development)	1	2	3	4	5	6
D) Assistance from Thai Non-Governmental Organizations	1	2	3	4	5	6
E) Current employers in the community	1	2	3	4	5	6
F) Employers outside the community	1	2	3	4	5	6
G) Agriculture or rubber associations or cooperatives in the community	1	2	3	4	5	6
H) Agriculture or rubber association or cooperatives outside the community	1	2	3	4	5	6
I) Fishing associations or cooperatives in the community	1	2	3	4	5	6
J) Fishing associations or cooperatives outside the community	1	2	3	4	5	6
K) Middle-men within the community	1	2	3	4	5	6
L) Middle-men from outside the community	1	2	3	4	5	6
M) The navy or the army	1	2	3	4	5	6
N) Previous household savings	1	2	3	4	5	6
O) Personal assets – things that the household owns	1	2	3	4	5	6
P) Other employment opportunities outside the community	1	2	3	4	5	6
Q) Assistance from international foundations and NGOs	1	2	3	4	5	6
R) Royal foundation community development projects	1	2	3	4	5	6
S) State welfare programs	1	2	3	4	5	6
T) Environmental or conservation organizations who work in the community	1	2	3	4	5	6
U) Local women's cooperatives or vocational groups	1	2	3	4	5	6
V) Local chief and council	1	2	3	4	5	6
W) Tambon administration office and projects	1	2	3	4	5	6
X) Assistance from the Disaster Mitigation Unit	1	2	3	4	5	6
Y) Researchers or universities who come to work in the area	1	2	3	4	5	6
Z) Subsistence fishing and harvesting	1	2	3	4	5	6

AA) Insurance programs	1	2	3	4	5	6
BB) Community revolving fund or trust fund	1	2	3	4	5	6
CC) The local church, mosque, or temple	1	2	3	4	5	6
DD) The community health centre or hospital	1	2	3	4	5	6
EE) Cooperation with other communities	1	2	3	4	5	6
FF) Other skills that allow me to work in other occupations	1	2	3	4	5	6
GG) Other: _____	1	2	3	4	5	6

Access and Equity

The next section of the survey will explore your perceptions about levels of access to resources and equity in the community.

Q54) In your experience, are there any rules or regulations that restrict your access to resources that you need to make a living?

1) Yes 2) No 3) Not that I know about

Q55) If Yes to the previous question, in your opinion which rules or regulations restrict access to resources? Who makes these rules or regulations?

_____
_____
_____

Q56) Compared with other households in my community, my household has

1) More access to marine resources
2) The same level of access to marine resources
3) Less access to marine resources

Q57) Compared with other households in my community, my household receives

1) More benefits from outside development programs or government assistance programs
2) The same amount of benefit from outside development programs or government assistance programs
3) Less benefits from outside development programs or government assistance programs

Q58) Compared with other households in the community, I would rate my household's level of wealth as

1) Above average 2) Average 3) Below average

Q59) Compared with other households in the community, how well does community decision-makers listen to your opinion?

1) Listened to more than other households in community decision-making
2) Listened to at the same level as other households in community decision-making
3) Listened to less than other households in community decision-making

Q60) In your opinion, which of the following statements is most accurate?

1) Women have better access to livelihood opportunities and resources than men
2) Women have the same level of access to livelihood opportunities and resources as men
3) Women have less access to livelihood opportunities and resources than men

Perceptions of National Park

The final section of the survey will explore your perceptions of the impacts of the national park or national park proposal.

Q61) Did you know that there is a national park (proposal) near the community?

1) Yes 2) No

Q62) Do you know the name of the national park?

1) Knows the name of the national park
2) Does not know the name of the national park

Q63) The next question will explore how you feel that living near a national park has impacted or will impact on your community. Please indicate the extent to which you AGREE or DISAGREE with each of the following statements.

	Disagree	**Neutral**	**Agree**	**Don't Know**
A) The park (has/will) improve(d) conservation of the marine environment (For example, mangrove areas, seagrass areas, coral reefs, fish, and other marine species).	1	2	3	4
B) The park (has/will) improve(d) conservation of the terrestrial environment (For example, forests, wildlife, and savannah areas).	1	2	3	4
C) The park (has/will) decrease(d) levels of participation in management of natural resources	1	2	3	4
D) The park (has/will) increase(d) knowledge of nature and support for conservation in the community	1	2	3	4
E) The park (has/will) increase(d) tourism jobs and financial benefit for the local community	1	2	3	4
F) The park (has/will) decrease(d) access to natural resources for livelihoods or household use	1	2	3	4

Q64) Do you have any questions, comments, or concerns?

_____
_____
_____
_____
_____
_____

Q65) Notes on the interview.

_____
_____
_____
_____
_____
_____

Q66) Any additional information from the interview.

_____
_____
_____
_____
_____
_____

Appendix A – Livelihoods List for Survey

1) Fishing – Small Scale – Boat Owner
2) Fishing – Small Scale – Worker
3) Fishing – Commercial Fisheries - Worker
4) Middleman for Small Scale Fisheries
5) Collecting shells and marine products – For sale
6) Collecting shells and marine products – Household
7) Collecting wild foods for household use
8) Cooking, cleaning, and taking care of children
9) Making handicrafts, deserts, or other products for sale
10) Working as part of a women's vocational group
11) Raising livestock, poultry, or rabbits
12) Government employee – e.g., teacher, nurse
13) Local government officer – chief of community or tambon administration
14) Store or shop owner
15) Tourism – CBT or homestay program
16) Tourism – Guide
17) Tourism – Bungalow Owner
18) Tourism – Restaurant Owner
19) Tourism Industry – Employee
20) Construction Worker
21) Aquaculture – Employee
22) Aquaculture – Owner
23) Subsistence Gardening
24) Farming Food Crops for Sale
25) Plantation Owner – Rubber
26) Plantation Owner – Cashews or Coconut
27) Plantation Owner – Palm Oil
28) Plantation Worker - Rubber
29) Plantation Worker – Cashews or Coconut
30) Plantation Worker – Palm Oil
31) Informal Recycler
32) Student
33) Unemployed
34) Other: _____

Appendix K - Survey in Thai

1

การสำรวจข้อมูลครัวเรือน

วันที่สัมภาษณ์ (ป/ด/ว): _____ ชื่ออุทยาน: _____

ชื่อชุมชน: _____ อำเภอ: _____ จังหวัด: _____

ชื่อผู้สัมภาษณ์: _____ ระยะเวลาในการสัมภาษณ์ (ชม./นาที): _____

สัมภาษณ์ #: _____

แนะนำตัวเอง

คนสัมภาษณ์ อย่าลืม 1)แนะนำตัวเอง 2) แนะนำโครงการ 3) อธิบายเรื่องจริยธรรมที่สำคัญของโครงการ โดยกรุณาดูที่เอกสารต้นฉบับและหัวข้อที่เกี่ยวข้องกับจริยธรรม

ข้อมูลครัวเรือน

ข้อมูลส่วนแรกจะเป็นการเก็บข้อมูลพื้นฐานของครอบครัว ได้แก่จำนวนสมาชิกในครัวเรือน, อาชีพ, รายได้และหนี้, ทรัพย์สินครัวเรือน และทรัพยากรทางทะเล

ข้อมูลทั่วไปของครัวเรือน

Q1) คุณอยู่หมู่บ้านนี้มานานกี่ปีแล้ว?_____ปี

Q2) พื้นเพเป็นคนที่ไหน?

1) ชุมชน
2) ตำบล
3) จังหวัด
4) ประเทศไทย
5) อื่นๆ_____

Q3) บ้านอยู่กันกี่คน? _____

Q4) มีเด็กต่ำกว่า 18 ปีที่ต้องหาเงินเลี้ยงดูในบ้านนี้กี่คน?_____

Q5) มีผู้สูงอายุที่ไม่ได้ทำงานอยู่ในบ้านนี้กี่คน?_____

Q6) ครอบครัวนี้มีสัญชาติใด?

1) ไทย
2) พม่า
3) ไทยกับ _____
4) อื่นๆ_____
5) ไร้สัญชาติ

Q7) ครอบครัวนี้พูดภาษาอะไรได้บ้าง? (ขีดถูกหน้าข้อที่เกี่ยวข้อง)

a) ____ ไทย
b) ____ พม่า
c) ____ มาเลย์ – ยาวี
d) ____ อังกฤษ
e) ____ มอแกน/มอเกลิ่น
f) ____ อื่นๆ _____

Q8) ครอบครัวนี้นับถือศาสนาอะไร?

1) มุสลิม
2) พุทธ
3) คริสเตียน
4) คาทอลิก
5) อื่นๆ _____
6) ไม่มี

Q9) มีสมาชิกในครอบครัวเป็นชาวเล ตามที่ระบุหรือไม่?

1) ไม่มี
2) มอแกน
3) มอเกลิ่น
4) อุรัก ลาโว้ย

Q10) เติมข้อมูลของสมาชิกแต่ละคนในครอบครัว กรุณาถามคำถามโดยไม่ให้ตัวเลือกในการตอบ และใส่เลขรหัสให้ตรงกับภาคผนวก และคำอธิบายใต้ตารางนี้

สมาชิกในครอบครัว*	I?	H?	อายุ	เพศ (ช/ญ/3)	การศึกษา**	อาชีพ (วงกลมที่อาชีพหลัก)***	รายได้ต่อเดือนโดยประมาณ - หน้าแล้ง	รายได้ต่อเดือนโดยประมาณ - หน้าฝน	II
a)									
b)									
c)									
d)									
e)									
f)									

g)									
h)									
i)									

I? = กรุณาขีดถูกที่หน้าชื่อผู้ถูกสัมภาษณ์

H? = กรุณาขีดถูกที่หัวหน้าครอบครัว?

*ระบุความสัมพันธ์: ที่สัมพันธ์กับหัวหน้าครอบครัว 1) สามี หรือ พ่อ – หัวหน้าครอบครัวที่เป็นผู้ชาย 2) ภรรยา หรือ แม่ – หัวหน้าครอบครัวที่เป็นผู้หญิง 3) พ่อแม่ของหัวหน้าครอบครัว 4) ลูกของหัวหน้าครอบครัว 5) สะใภ้หรือเขยของหัวหน้าครอบครัว 6) หลานของหัวหน้าครอบครัว 7) ญาติผู้ใหญ่ 8) หลานญาติ 9) ผู้ช่วยในบ้าน 10) อื่นๆ

** ระบุประเภท: 1) ไม่ได้เรียน 2) ป.1 – 3 3) ป. 4-6 4) ม.3 5) ม.6 6) ปวช. ปวส. วิชาชีพ 7) ปริญญาตรี 8) สูงกว่า

***อาชีพ: ลงหมายเลขรายการอาชีพ ตามภาคผนวก ก. กรุณาเขียนหมายเลขอาชีพทุกอาชีพของแต่ละคน และวงกลมที่อาชีพหลักของแต่ละคน

กรุณาระบุว่าสมาชิกแต่ละคนมีบัตรประจำตัวประชาชนขึ้นต้นด้วยเลข 1, 2, 3, 4, 5, 6, 7, 8, 0, หรือ ไม่มีบัตร (9)

ถามคำถามเรื่องเลขหน้าบัตรประชาชนหลังทำแบบสอบถามนี้ครบแล้ว

ข้อมูลอาชีพ

Q11) ระหว่างหน้าฝนกับหน้าแล้ง โดยประมาณคุณทำรายได้ให้กับครอบครัวในแต่ละอาชีพเท่าไหร่ ทั้งรายได้จากการทำงานและกิจการตัวเอง

ประเภทของอาชีพ	หน้าแล้ง	หน้าฝน
a. ประมง	บาท	บาท
b. เก็บสัตว์น้ำ (เก็บหอย ดักปู แทงกุ้ง)	บาท	บาท
c. เพาะเลี้ยงสัตว์น้ำ (กระชังปลา บ่อกุ้ง บ่อปลา)	บาท	บาท
d. การท่องเที่ยว	บาท	บาท
e. พืชผลการเกษตร	บาท	บาท
f. สวนยาง	บาท	บาท
g. สวนปาล์ม	บาท	บาท
h. อาชีพอื่นๆ	บาท	บาท

Q12) อาชีพอะไรทำเงินให้ครอบครัวคุณมากที่สุด ? (ใส่เป็น code) _____

Q13) ถ้าคุณไม่สามารถทำอาชีพหลักได้ คุณจะ :

1) อยู่ในชุมชนเพื่อทำงาน 2) ย้ายออกนอกชุมชนอย่างถาวรเพื่อไปทำงาน 3) ย้ายไปทำงานข้างนอกชุมชนชั่วคราว

Q14) ถ้าผู้ถูกสัมภาษณ์ตอบข้อหนึ่ง ในข้อที่แล้วกรุณาถามว่า : ถ้าคุณไม่สามารถหาเงินได้แล้วคุณต้องอยู่ในชุมชน คุณจะทำอาชีพอะไร?_____

_____

_____

_____

_____

_____

(ให้ผู้ถูกสัมภาษณ์ตอบคำถาม แล้วผู้สัมภาษณ์เลือกคำตอบด้านล่างเอง)

1) ทำอาชีพเดิมแล้วหวังว่ามันจะดีขึ้น
2) ถ้าเดิมทำประมงจะเปลี่ยนไปทำประมงประเภทอื่น
3) ถ้าเดิมไม่ได้ทำประมงอาจจะหันมาทำประมงมากขึ้น
4) ขึ้นอยู่กับอาชีพอื่นๆที่ไม่ใช่ประมง โปรดระบุ _____
5) ไม่รู้

Q15) คุณทำอาชีพมากี่อาชีพใน 10 ปีที่ผ่านมา?_____

รายได้และหนี้

Q16) มีคนในบ้านนี้กี่คนที่ออกไปทำงานหรือออกไปอยู่นอกพื้นที่? _____

Q17) มีคนในบ้านนี้ที่ไปอยู่นอกพื้นที่ แล้วส่งเงินกลับมาบ้านหรือไม่?

a) มี b) ไม่มี

Q18) ส่งเงินกลับมาประมาณเดือนละเท่าไหร่? _____ บาท

Q19) ในปัจจุบัน มีสมาชิกที่เรียนชั้นมัธยม หรือสูงกว่า นอกพื้นที่กี่คน? _____

Q20) คุณจะเปรียบเทียบรายได้กับรายจ่ายในครอบครัวคุณอย่างไร?

1) รายได้น้อยกว่ารายจ่าย - ปกติใช้จ่ายไม่พอ
2) รายได้เท่ากับรายจ่าย – ปกติใช้จ่ายได้พอดี
3) รายได้มากกว่ารายจ่าย – ปกติมีเงินเหลือเพื่อเก็บออม หรือไว้ใช้จ่ายอย่างอื่น

Q21) ครอบครัวคุณสามารถเข้าถึงแหล่งกู้ยืมได้หรือไม่?

1) ได้ 2) ไม่ได้

5

Q22) ครอบครัวคุณสามารถกู้ยืมเงินจากที่ไหนได้บ้าง? (ขีดถูกในข้อที่สามารถกู้เงินได้)

a) _____ พ่อค้าคนกลาง หรือนายหัว
b) _____ กู้เงินนอกระบบ
c) _____ เงินกองทุนหมู่บ้าน หรือเงินหมุนเวียน เช่นกองทุนเงินล้าน, กองทุน SML
d) _____ เงินกู้จากกองทุนกลุ่มอาชีพหรือจากกลุ่มออมทรัพย์
e) _____ จากธนาคาร
f) _____ เงินกู้จากญาติที่อยู่ในชุมชน
g) _____ เงินกู้จากญาติที่อยู่นอกชุมชน
h) _____ บัตรเครดิต
i) _____ อื่นๆ_____

Q23) ครอบครัวคุณมีหนี้เท่าไหร่ในปัจจุบัน?
_____ บาท

Q24) ครอบครัวคุณมีเงินเก็บเท่าไหร่ในปัจจุบัน?
_____ บาท

ทรัพย์สินครัวเรือน

Q25) กรุณาสังเกต (ผู้สัมภาษณ์) ประมาณระยะห่างจากบ้านไปถึงบริเวณแนวน้ำขึ้นสูงสุด

1) บ้านเรือนน้ำเสาไม้
2) บ้านเรือนน้ำเสาปูน
3) บ้านเรือนน้ำอยู่ในคลอง
4) ห่างจากทะเลไม่เกิน 50 เมตรจากน้ำขึ้นสูงสุด
5) ห่างจากทะเลไม่เกิน 100 เมตรจากน้ำขึ้นสูงสุด
6) ห่างจากทะเลเกิน 100 เมตร จากน้ำขึ้นสูงสุด
7) อยู่บนเขา ห่างจากทะเล

Q26) กรุณาสังเกต(ผู้สัมภาษณ์) ประเมินว่าบ้านมีลักษณะแบบใด

1) หลังคามุงจาก หรือไม้ไผ่
2) ทำจากสิ่งก่อสร้างที่ไม่ถาวร
3) ทำจากไม้
4) ทำจากไม้และคอนกรีต
5) ทำจากซีเมนต์
6) อื่นๆ : _____

Q27) ครอบครัวคุณเป็นเจ้าของสิ่งเหล่านี้หรือไม่ (ขีดถูกในข้อที่มี)

a) ____ เตาถ่าน
b) ____ เตาแก๊ส
c) ____ตู้เย็น
d) ____ โทรทัศน์
e) ____ วิทยุ
f) ____ โทรศัพท์มือถือ
g) ____ คอมพิวเตอร์
h) ____เครื่องปรับอากาศ

Q28) บ้านคุณมีเรือแต่ละชนิดต่อไปนี้กี่ลำ?(เติมตัวเลข)

a) _____เรือหางยาว b) _____เรือพีท c) _____เรือท้องแบน

Q29) ครอบครัวคุณมีพาหนะทางบกหรือไม่ (เติมตัวเลข)

a) _____รถยนต์หรือรถบรรทุก
b) _____มอเตอร์ไซค์
c) _____รถแทรกเตอร์/รถอีแต๊ก

6

Q30) ครอบครัวคุณเป็นเจ้าของบ้านหรือไม่?

1) ใช่เป็นเจ้าของบ้านเอง 2) ไม่ใช่ ญาติเป็นเจ้าของ 3) ไม่ใช่ ไม่ได้เป็นของครอบครัวหรือของญาติ

Q31) ครอบครัวคุณเป็นเจ้าของที่ดินที่ปลูกบ้านหรือไม่

1) ใช่ เป็นเจ้าของที่ดินเอง
2) ไม่ใช่ ญาติเป็นเจ้าของ
3) ไม่ใช่ ไม่ได้เป็นของครอบครัวหรือของญาติ

Q32) ครอบครัวคุณเป็นเจ้าของที่ดินที่เหมาะกับการทำอาชีพ เช่นการเกษตร, การทำสวน หรือการท่องเที่ยว หรือไม่ ?

1) ใช่ 2) ไม่ใช่

Q33) ที่ดินเหล่านี้เหมาะกับการทำอาชีพอะไรบ้าง (ขีดถูกข้อที่ทำได้)

a) _____ทำการเกษตร เช่น ปลูกผัก ทำนา ปลูกมะพร้าว
b) _____ทำสวน เช่น สวนยาง สวนปาล์ม
c) _____ท่องเที่ยว
d) _____อื่นๆ

Q34) ครอบครัวคุณเป็นเจ้าของที่ดินใช้ประกอบอาชีพได้กี่ไร่ ? _____

Q35) มีแรงงานต่างด้าวที่ทำงานให้ครอบครัวคุณกี่คน?_____

Q36) มีแรงงานนอกตำบลที่เข้ามาทำงานให้ครอบครัวคุณกี่คน? _____

Q37) มีแรงงานในตำบลที่เข้ามาทำงานให้ครอบครัวคุณกี่คน? _____

Q38) แล้วแรงงานต่างจังหวัดหรือแรงงานต่างด้าวเข้ามาทำงานอะไรบ้าง (ต้องพยายามบวกให้ได้เท่ากับจำนวนข้อ 35-37 รวมกัน)

ประเภท	แรงงานในตำบล (คน)	แรงงานนอกตำบล(คน)	แรงงานต่างด้าว (คน)
a) ประมง			
b) เกษตรหรือทำสวน			
c) ท่องเที่ยว			
d) อื่นๆ			

Q39) อุปกรณ์ประมงใดบ้างที่ครอบครัวคุณเป็นเจ้าของ? โปรดระบุ

- ☐ a) ไม่เกี่ยวข้อง
- ☐ b) อวนปู
- ☐ c) อวนกุ้ง
- ☐ d) อวนปลา เขียนชนิดของปลาที่จับได้_____
- ☐ e) อวนล้อมปลากระตัก
- ☐ f) ลอบปูดำ / หยองปูดำ
- ☐ g) ลอบปูม้า/ไซปูม้า
- ☐ h) ลอบปลาหมึก
- ☐ i) ลอบปลาเล็ก เขียนชนิดของปลาที่จับได้

- ☐ j) ลอบปลาใหญ่ ชนิดของปลาที่จับได้ _____ _____
- ☐ k) โพงพาง
- ☐ l) อวนรุนกุ้ง/เคย
- ☐ m) อวนลากหน้าดิน
- ☐ n) อวนลากเดี่ยว
- ☐ o) เบ็ดที่ใช้เรือลาก
- ☐ p) เบ็ดมือ เบ็ดตวัด
- ☐ q) สวิงดักแมงกะพรุน
- ☐ r) คราดหอยใช้มือ
- ☐ s) คราดหอยใช้เรือ
- ☐ t) ไป๊ะ /โบ๊ะ
- ☐ u) อวนปิดอ่าว
- ☐ v) แห
- ☐ w) โล๊ะกุ้ง(แทงกุ้ง) / ครอบกุ้ง
- ☐ x) หน้ากากกับเครื่องทำออกซิเจน
- ☐ y) อุปกรณ์ต่อยหอย เจาะหอย
- ☐ z) อื่นๆ: _____

การพึ่งพิงทะเล

Q40) มีกี่คืนที่ครอบครัวคุณกินปลาหรืออาหารทะเลสำหรับมื้อเย็น (แทนการกินหมู, เนื้อ หรือไข่)?

1) ไม่มี
2) 1-2 คืน ต่ออาทิตย์
3) 3-4 คืน ต่ออาทิตย์
4) 5-6 คืน ต่ออาทิตย์
5) 7 คืน ต่ออาทิตย์

Q41) ทรัพยากรทางทะเลใดที่ครัวเรือนนำไปใช้ในครัวเรือนเองหรือนำไปขาย? กรุณาขีดถูกทุกข้อที่เกี่ยวข้อง

ทรัพยากรทางทะเล	ใช้ขาย	ใช้ในครัวเรือน/ใช้กิน
a. ไม้ในป่าโกงกางสำหรับก่อสร้างหรือสร้างสิ่งของ (ทำลอบปลา)		
b. ไม้ในป่าโกงกางสำหรับทำถ่าน		
c. ปลากะตัก		
d. ปลาทูหรือปลาลัง		
e. ปลามง		
f. ปลาหลังเขียว		
g. ปลานกแก้ว ปลาสลิด และปลาขี้ตัง		
h. ปลาผีเสื้อ		
i. ปลาเก๋า		
j. ปลากะพง		
k. ปลาฉลามในแนวปะการัง		
l. ปลากระเบน		
m. กุ้งเคย		
n. กุ้ง		
o. ปลาหมึกกล้วย / ปลาหมึกหอม		
p. ปลาหมึกกระดอง		
q. ปลาไก่ / ปลาเป็ด		
r. ปูดำ / ปูป่าโกงกาง		
s. ปูทะเลน้ำลึก เช่น ปูม้า ปูดาว		
t. ปลิงทะเล		

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u. หอยชักตีน		
v. หอยจากบริเวณป่าชายเลน		
w. หอยจากบริเวณหญ้าทะเล		
x. หอยจากบริเวณโขดหินหรือปะการัง		
y. หอยหรือผลิตภัณฑ์จากปะการังเพื่อตกแต่งบ้าน หรือการท่องเที่ยว		
z. ปะการังเพื่อการพักผ่อนหรือเพื่อท่องเที่ยว เช่น ดำน้ำ		
aa. หาดทราย หรือเนินทราย เพื่อการพักผ่อนหรือท่องเที่ยว		
bb. เกาะหินหรือหินกองเพื่อการพักผ่อนหรือท่องเที่ยว		
cc. พืชที่มาจากเกาะ สำหรับไว้กิน รักษาเป็นยา หรือตกแต่งบ้าน		
dd. ป่าในเกาะ พื้นที่ชุมน้ำหรือหนองน้ำ/พรุ หรือทุ่งหญ้าสาวันนา(ทุ่งหญ้าสีทอง) เพื่อพักผ่อนหรือท่องเที่ยว		
ee. สัตว์ป่าในเกาะเพื่อกิน หรือเลี้ยงดูเล่น		
ff. สัตว์ป่าในเกาะเพื่อพักผ่อน หรือท่องเที่ยว		
gg. อื่นๆ : _____		

การเรียนรู้ และความรู้

ส่วนนี้จะเน้นเรื่องความรู้เกี่ยวกับผลกระทบจากสภาวะการเปลี่ยนแปลงของภูมิอากาศโลก

Q42) ในความคิดเห็นของคุณ จำนวนปลาในทะเล:

1) เพิ่มขึ้น 2) เหมือนเดิม 3) ลดลง

Q43) ในความคิดเห็นของคุณ คุณคิดว่าอะไรทำให้ปลาลดจำนวนลง ? มีอย่างอื่นอีกไหม?

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Q44) ในความคิดเห็นของคุณ คุณคิดว่าการกระทำใดที่จะช่วยรักษาหรือเพิ่มจำนวนปลาในทะเลได้ อย่างมีประสิทธิภาพ? มีปัจจัยอื่นๆ อีกไหม?

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Q45) คุณเคยเรียนรู้เกี่ยวกับสภาพอากาศเปลี่ยนแปลงหรือไม่?

1) เคย 2) ไม่เคย

Q46) คุณเรียนเกี่ยวกับสภาพอากาศเปลี่ยนแปลงมาจากแหล่งใด? กรุณาขีดถูกทุกข้อที่เกี่ยวข้อง

a) ____ หนังสือพิมพ์
b) ____ วิทยุ
c) ____ โทรทัศน์
d) ____ อินเตอร์เน็ต
e) ____ องค์กรเอกชนเข้ามาเยี่ยม
f) ____ ไปดูงาน หรือไป workshop
g) ____ ผู้นำชุมชน
h) ____ โรงเรียน - ครู
i) ____ผู้เชี่ยวชาญทางด้านสภาพอากาศเปลี่ยนแปลงเข้ามาเยี่ยม
j) ____ เพื่อนและครอบครัว
k) ____ ข้อมูลจากรัฐบาล
l) ____ อื่นๆ:_____

Q47) คุณคิดว่าสภาพอากาศเปลี่ยนแปลงส่งผลอะไรในพื้นที่นี้ ในปัจจุบันและในอนาคต ต่อชุมชนและภูมิภาคของคุณ ?

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<u>การมีส่วนร่วมในองค์กร</u>

ส่วนนี้จะเน้นการมีส่วนร่วมในชุมชน และจากองค์กรภายนอกชุมชน และการเข้าไปมีส่วนร่วม ในกระบวนการการตัดสินใจ

Q48) คุณเป็นสมาชิกองค์กรในชุมชนใดบ้าง (เช่น กลุ่มอย่างเป็นทางการ, คณะกรรมการ, สหกรณ์ หรือ สมาคม) กรุณาบอกชื่อองค์กรในปัจจุบัน:

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_____ a) จำนวนองค์กร _____ องค์กร

Q49) คุณเข้าไปเกี่ยวข้องกับองค์กรอย่างไร? ขีดถูกทุกข้อที่เกี่ยวข้อง

- ☐ A)ร่วมประชุม และรับฟัง
- ☐ B)ร่วมประชุม และแสดงความคิดเห็น
- ☐ C)ร่วมกิจกรรมกับขององค์กร
- ☐ D))เป็นสมาชิกของคณะกรรมการ
- ☐ E)ได้รับการเลือกให้เป็นผู้นำ

Q50) คุณเป็นสมาชิกองค์กรจากนอกชุมชนใดบ้าง (เช่น กลุ่มอย่างเป็นทางการ, คณะกรรมการ, สหกรณ์ หรือ สมาคม) กรุณาบอกชื่อองค์กร:

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_____ a) จำนวนองค์กร_____ องค์กร

Q51) ในความคิดของคนในครอบครัวคุณ พวกคุณมีส่วนร่วมในการตัดสินใจด้านความปกครองด้านต่างๆมากน้อยแค่ไหน:

	ไม่มีส่วนร่วมเลย	มีส่วนร่วมเล็กน้อย	มีส่วนร่วมปานกลาง	มีส่วนร่วมค่อนข้างมาก	มีส่วนร่วมอย่างมาก	ไม่ทราบ
A) การปกครองระดับชุมชน	1	2	3	4	5	6
B) องค์การบริหารส่วนตำบล (อบต.)	1	2	3	4	5	6
C) ระดับอำเภอ และจังหวัด	1	2	3	4	5	6
D) การจัดการทรัพยากรธรรมชาติในชุมชน	1	2	3	4	5	6
E) การจัดการอุทยานแห่งชาติ	1	2	3	4	5	6

<u>ความยืดหยุ่น - ความเสี่ยงและการช่วยเหลือ</u>

ส่วนต่อไปจะสำรวจปัจจัยด้านต่างๆ ที่ส่งผลกระทบทางด้านลบกับอาชีพ และดูปัจจัยที่สนับสนุนให้ครอบครัว ผ่านอุปสรรคและความท้าทายไปได้

Q52) ครอบครัวของคุณได้รับผลกระทบจากปัจจัยต่างๆ ที่มีต่อการประกอบอาชีพมากน้อยอย่างไร? กรุณาจัดลำดับจาก 1 ถึง 5

	ไม่กระทบ	กระทบเล็กน้อย	กระทบปานกลาง	กระทบค่อนข้างมาก	กระทบอย่างมาก	ไม่ทราบ
A) ราคาที่ขายปลาได้ลดลง	1	2	3	4	5	6
B) สภาพอากาศที่รุนแรง เช่น พายุ	1	2	3	4	5	6
C) การเพิ่มขึ้นของตะกอน ในน้ำ	1	2	3	4	5	6
D) การจับปลาเกินปริมาณ	1	2	3	4	5	6
E) ประมงพาณิชย์เข้ามาจับปลาในน่านน้ำด้านใน (ภายใน 3000 ไมล์ทะเล)	1	2	3	4	5	6

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F) การเปลี่ยนแปลงของฤดูฝนและฤดูแล้ง, ฝนตกไม่ตรงฤดูกาล	1	2	3	4	5	6
G) ขยะเพิ่มขึ้น	1	2	3	4	5	6
H) สภาวะปะการังฟอกขาว	1	2	3	4	5	6
I) ความขัดแย้งกับชาวประมงขนาดเล็กคนอื่นๆ	1	2	3	4	5	6
J) การเพิ่มขึ้นของน้ำจืดในป่าโกงกาง ทำให้น้ำเค็มน้อยลง	1	2	3	4	5	6
K) การท่องเที่ยวกีดกันพื้นที่ในการทำอาชีพ	1	2	3	4	5	6
L) ขายของไม่ได้ เช่นขายปลาไม่ได้ ไม่มีนักท่องเที่ยวมาเที่ยว	1	2	3	4	5	6
M) เรือพาณิชย์ทำลายอุปกรณ์ประมง	1	2	3	4	5	6
N) มีคนข้างนอกอ้ายเข้ามาอยู่ในพื้นที่มากขึ้น	1	2	3	4	5	6
O) ราคายางลดลง	1	2	3	4	5	6
P) ประมงทำลายล้าง และ/หรือการทำประมงผิดกฎหมาย	1	2	3	4	5	6
Q) ถูกจับเนื่องจากการทำประมงนอกเขตชายแดน	1	2	3	4	5	6
R) ราคาสิ่งของที่ใช้ในการประกอบอาชีพเพิ่มสูงขึ้น	1	2	3	4	5	6
S) มีหนี้มากขึ้น	1	2	3	4	5	6
T) นโยบายของรัฐบาล	1	2	3	4	5	6
U) การบุกรุกพื้นที่	1	2	3	4	5	6
V) อุทยานแห่งชาติ	1	2	3	4	5	6

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W) อุปกรณ์ประมงถูกยึดเมื่อข้ามเขตน่านน้ำออกไป	1	2	3	4	5	6
X) ระดับน้ำทะเลสูงขึ้นเมื่อเปรียบเทียบกับสมัยก่อน	1	2	3	4	5	6
Y) ราคาน้ำมันเพิ่มขึ้น	1	2	3	4	5	6
AA) ความขัดแย้งภายในชุมชน	1	2	3	4	5	6
BB) ดินถล่ม	1	2	3	4	5	6
CC) ความขัดแย้งกับชุมชนอื่น	1	2	3	4	5	6
DD) การเปลี่ยนรัฐบาล	1	2	3	4	5	6
EE) น้ำเค็มขึ้นมาปนแหล่งน้ำดื่มหรือแหล่งน้ำที่ใช้ในการเกษตร	1	2	3	4	5	6
FF) การกัดเซาะของชายหาด หรือชายฝั่ง	1	2	3	4	5	6
GG) การคอร์รัปชั่นในประเทศไทย	1	2	3	4	5	6
HH) ค่าครองชีพสูงขึ้น	1	2	3	4	5	6
II) น้ำท่วม	1	2	3	4	5	6
JJ) น้ำเสียน้ำปนเปื้อนสารเคมีมากขึ้น	1	2	3	4	5	6
KK) ปัญหาสุขภาพหรือโรคภัยไข้เจ็บของคนในครอบครัว	1	2	3	4	5	6
LL) อื่นๆ_____	1	2	3	4	5	6

Q53) เมื่อเกิดปัญหาหรือเหตุการณ์อะไรขึ้น ปัจจัยเหล่านี้มีความสำคัญในการช่วยให้ครอบครัวคุณผ่านพ้นปัญหาไปได้มากน้อยเพียงใด

	ไม่สำคัญ	สำคัญเล็กน้อย	สำคัญปานกลาง	สำคัญค่อนข้างมาก	สำคัญอย่างมาก	ไม่ทราบ
A) ครอบครัว และเพื่อนในชุมชน	1	2	3	4	5	6
B) ครอบครัว และเพื่อนนอกชุมชน	1	2	3	4	5	6
C) การช่วยเหลือจากหน่วยงานรัฐบาล หรือโครงการด้านการพัฒนาของรัฐ เช่น พัฒนาชุมชน กรมประมง เกษตร	1	2	3	4	5	6
D) การช่วยเหลือจากองค์กรเอกชนของไทย	1	2	3	4	5	6
E) นายหัวคนปัจจุบันในชุมชน	1	2	3	4	5	6
F) นายหัวจากภายนอกชุมชน	1	2	3	4	5	6
G) สมาคมเกษตร หรือสมาคมสวนยาง หรือสหกรณ์เกษตรในชุมชน	1	2	3	4	5	6
H) สมาคมเกษตร หรือสมาคมสวนยาง หรือสหกรณ์เกษตรนอกชุมชน	1	2	3	4	5	6
I) สมาคมประมงหรือสหกรณ์ประมงในชุมชน	1	2	3	4	5	6
J) สมาคมประมงหรือสหกรณ์ประมงนอกชุมชน	1	2	3	4	5	6
K) พ่อค้าคนกลางจากในพื้นที่	1	2	3	4	5	6
L)พ่อค้าคนกลางจากนอกพื้นที่	1	2	3	4	5	6
M) ทหารเรือหรือทหารบก	1	2	3	4	5	6
N) เงินเก็บครัวเรือนในอดีต	1	2	3	4	5	6
O) ทรัพย์สินส่วนบุคคล – หรือสิ่งที่ครอบครัวเป็นเจ้าของ	1	2	3	4	5	6
P) โอกาสในการหางานนอกชุมชน	1	2	3	4	5	6
Q) การช่วยเหลือของมูลนิธิหรือองค์กรเอกชนระหว่างประเทศ	1	2	3	4	5	6
R) โครงการหลวง หรือโครงการพัฒนาต่างๆ	1	2	3	4	5	6

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S) สวัสดิการของรัฐ	1	2	3	4	5	6
T) องค์กรสิ่งแวดล้อมหรือองค์กรอนุรักษ์ที่ทำงานในพื้นที่	1	2	3	4	5	6
U) กลุ่มแม่บ้านหรือกลุ่มอาชีพผู้หญิง	1	2	3	4	5	6
V) ผู้ใหญ่บ้าน และคณะกรรมการหมู่บ้าน	1	2	3	4	5	6
W) องค์การบริหารส่วนตำบล และโครงการของ อบต.	1	2	3	4	5	6
X) ความช่วยเหลือจากหน่วยบรรเทาภัยพิบัติ และ อภปร.	1	2	3	4	5	6
Y) นักวิจัย หรือมหาวิทยาลัยที่เข้ามาทำงานในพื้นที่	1	2	3	4	5	6
Z) การออกไปหาอาหารมากินในครอบครัวเช่น จับปลา เก็บของป่าเก็บหอย	1	2	3	4	5	6
AA) ทำประกันภัย	1	2	3	4	5	6
BB) กองทุนหมุนเวียน หรือกองทุนในชุมชน	1	2	3	4	5	6
CC) โบสถ์, มัสยิด หรือวัดในพื้นที่	1	2	3	4	5	6
DD) สถานีอนามัยหรือโรงพยาบาล	1	2	3	4	5	6
EE) การร่วมมือกับชุมชนอื่นๆ	1	2	3	4	5	6
FF) ทักษะอื่นๆของฉันที่สามารถทำให้ฉันประกอบอาชีพอื่นๆได้	1	2	3	4	5	6
GG) อื่นๆ: _____	1	2	3	4	5	6

<u>การเข้าถึงและความเท่าเทียม</u>

ส่วนนี้จะเน้นสำรวจดูการรับรู้ของระดับการเข้าถึงทรัพยากรและความเท่าเทียมกันในชุมชน

Q54) จากประสบการณ์ของคุณ มีกฎระเบียบข้อบังคับที่ห้ามไม่ให้คุณเข้าไปใช้ทรัพยากรเพื่อทำอาชีพหรือไม่?

1) ใช่ 2) ไม่ใช่ 3) ไม่ทราบ

Q55) ถ้าคุณตอบว่า 'ใช่' มีกฎหรือข้อบังคับใดบ้าง? มาจากหน่วยงานใด

Q56) เปรียบเทียบกับครัวเรือนอื่นๆในชุมชน ครอบครัวของฉัน...

1) สามารถเข้าถึงทรัพยากรทางทะเลได้มากกว่าครอบครัวอื่นๆ
2) สามารถเข้าถึงทรัพยากรทางทะเลได้เท่ากับครอบครัวอื่นๆ
3) สามารถเข้าถึงทรัพยากรทางทะเลได้น้อยกว่าครอบครัวอื่นๆ

Q57) เปรียบเทียบกับครอบครัวอื่นๆในชุมชน

1) ได้รับประโยชน์จากโครงการพัฒนาต่างๆหรือความช่วยเหลือจากรัฐบาลมากกว่าครอบครัวอื่น
2) ได้รับประโยชน์จากโครงการพัฒนาต่างๆหรือความช่วยเหลือจากรัฐบาลเท่ากันกับครอบครัวอื่น
3) ได้รับประโยชน์จากโครงการพัฒนาต่างๆหรือความช่วยเหลือจากรัฐบาลน้อยกว่าครอบครัวอื่น

Q58) เปรียบเทียบกับครอบครัวอื่นๆในชุมชน ครอบครัวของฉันมีฐานะ...

1) ดีกว่าคนอื่น
2) เท่ากัน
3) น้อยกว่าคนอื่น

Q59) เปรียบเทียบกับครอบครัวอื่นๆในชุมชน ฉันคิดว่า ความคิดเห็นของฉัน..

1) ได้รับการรับฟังมากกว่าครอบครัวอื่นๆในเรื่องกระบวนการวางแผนชุมชน
2) ได้รับการรับฟังเท่ากับครอบครัวอื่นๆในเรื่องกระบวนการวางแผนชุมชน
3) ได้รับการรับฟังน้อยกว่าครอบครัวอื่นๆในเรื่องกระบวนการวางแผนชุมชน

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Q60) ในความคิดเห็นของคุณ คำกล่าวใดตรงกับความเป็นจริงมากที่สุด?

1) ผู้หญิงในชุมชนมีโอกาสในการเข้าถึงทรัพยากรและการประกอบอาชีพมากกว่าผู้ชาย
2) ผู้หญิงในชุมชนมีโอกาสในการเข้าถึงทรัพยากรและการประกอบอาชีพเท่ากับผู้ชาย
3) ผู้หญิงในชุมชนมีโอกาสในการเข้าถึงทรัพยากรและการประกอบอาชีพน้อยกว่าผู้ชาย

<u>การรับรู้เกี่ยวกับอุทยานแห่งชาติ</u>

ส่วนสุดท้าย จะสำรวจการรับรู้ของคุณต่อผลกระทบของอุทยานแห่งชาติ หรือแผนร่างอุทยานแห่งชาติ

Q61) คุณรู้หรือไม่ว่ามีอุทยานแห่งชาติในบริเวณนี้

1) รู้ 2) ไม่รู้

Q62) อุทยานแห่งชาติชื่ออะไร

1) รู้ชื่ออุทยาน 2) ไม่รู้ชื่ออุทยาน

Q63) คำถามต่อไปตั้งใจที่จะประเมินว่าผู้ถูกสัมภาษณ์คิดอย่างไรที่อาศัยอยู่ใกล้อุทยานแห่งชาติ หรืออาจจะได้รับผลกระทบต่อชุมชน กรุณาชี้แจงว่าคุณเห็นด้วยหรือไม่เห็นด้วยอย่างไร

		ไม่เห็นด้วย	เป็นกลาง	เห็นด้วย	ไม่รู้
A)	อุทยานจะทำ / ทำให้การอนุรักษ์ทรัพยากรทางทะเลดีขึ้น เช่น ป่าโกงกาง, หญ้าทะเล, ปะการัง ปลา, และสัตว์น้ำอื่นๆ	**1**	**2**	**3**	**4**
B)	อุทยานจะทำ / ทำให้ให้การอนุรักษ์ทรัพยากรทางบกดีขึ้น เช่น ป่า, สัตว์ป่า และทุ่งหญ้าสาวันนา	**1**	**2**	**3**	**4**
C)	อุทยานจะทำ / ทำให้การมีส่วนร่วมในการจัดการทรัพยากรธรรมชาติลดลง	**1**	**2**	**3**	**4**
D)	อุทยานจะเพิ่ม / เพิ่มความรู้เกี่ยวกับธรรมชาติและส่งเสริมการอนุรักษ์ในชุมชน	**1**	**2**	**3**	**4**
E)	อุทยานจะทำ / ทำให้มีการจ้างงานและมีเงินเข้าสู่ชุมชนจากการท่องเที่ยว	**1**	**2**	**3**	**4**
F)	อุทยานจะทำ / ทำให้การเข้าไปใช้ของในเขตอุทยานยากขึ้น เช่น เพื่อประกอบอาชีพ, ไปหาของกิน, ตัดไม้ป่าโกงกาง	**1**	**2**	**3**	**4**

Q64) คุณมีคำถาม, ข้อคิดเห็น, หรือข้อสงสัยใดๆหรือไม่?

_____

_____

_____

_____

Q66) Notes on interview

Q67) Any additional information that come out from interview

ภาคผนวก ก. - อาชีพในการสำรวจ

1) ประมงขนาดเล็ก - เป็นเจ้าของเรือ
2) ประมงขนาดเล็ก - ลูกจ้าง
3) ประมง - ประมงพานิชย์ - ลูกจ้าง
4) พ่อค้าคนกลางสำหรับประมงขนาดเล็ก
5) เก็บหอยหรือผลิตภัณฑ์จากทะเล - เพื่อขาย
6) เก็บหอยหรือผลิตภัณฑ์จากทะเล - เพื่อใช้ในครัวเรือน
7) เก็บของป่าเพื่อบริโภคในครัวเรือน
8) ทำอาหาร, ทำความสะอาด, และดูแลเด็ก
9) ทำงานประดิษฐ์, ทำขนม หรือทำสินค้าเพื่อขาย
10) ทำงานในกลุ่มอาชีพ/แม่บ้าน
11) เลี้ยงปศุสัตว์, สัตว์ปีก หรือกระต่าย
12) รับราชการ เช่น ครู
13) รับราชการในการบริหารส่วนท้องถิ่น – ผู้ใหญ่บ้าน, คณะกรรมการหมู่บ้าน, อบต
14) เปิดร้าน หรือเป็นเจ้าของร้าน
15) ท่องเที่ยว - การท่องเที่ยงโดยชุมชน หรือ โฮมสเตย์
16) ท่องเที่ยว - นำเที่ยว
17) ท่องเที่ยว - เจ้าของบังกะโล
18) ท่องเที่ยว - เจ้าของร้านอาหาร
19) ธุรกิจท่องเที่ยว - ลูกจ้าง
20) ทำก่อสร้าง
21) เพาะเลี้ยงสัตว์น้ำ – ลูกจ้าง
22) เพาะเลี้ยงสัตว์น้ำ – เจ้าของ
23) ปลูกผักสวนครัว
24) ปลูกพืชเพื่อส่งขาย
25) เจ้าของสวน - ยาง
26) เจ้าของสวน - มะม่วงหิมพานต์ หรือมะพร้าว
27) เจ้าของสวน - ปาล์ม
28) ลูกจ้างทำสวน - ยาง
29) ลูกจ้างทำสวน - มะม่วงหิมพานต์ หรือมะพร้าว
30) ลูกจ้างทำสวน - ปาล์ม
31) เก็บขยะขาย
32) นักเรียน
33) ว่างงาน
34) อื่นๆ:_____

Appendix L - Survey Sample Statistics

Table 21 - Survey sample and statistics by community

Community (Baan)	Population	Households #	Sampled Households # (% of HH in village)	Completed Surveys # (% of HH in village)	Non-sample (% of sample)	Mean # of People in HH	Interviewee Mean Age	Gender = Female N (%)
Baan Tha Khao	486	142	47 (33.1)	41 (28.9)	6 (12.8)	4.2	43.9	27 (65.9)
Baan Koh Panyee	1440	286	60 (21)	53 (18.5)	7 (11.7)	5.2	42.5	34 (64.2)
Baan Lions	57	44	21 (47.7)	15 (34.1)	6 (28.6)	1.9	46.3	6 (40.0)
Baan Tapae Yoi	119	63	22 (34.9)	22 (34.9)	0 (0)	3.7	43.8	13 (59.1)
Baan Koh Chang	~300	126	39 (31)	31 (24.6)	8 (20.5)	2.9	44.3	15 (48.4)
Baan Moken	~175	36	12 (33.3)	11 (30.6)	1 (8.3)	4.8	31.9	8 (72.7)
Baan Koh Sin Hi	1775	290	78 (26.9)	64 (22.1)	14 (17.9)	4.7	39.6	37 (57.8)
Total	4352	987	280 (28.4)	237 (24)	42 (15)	4.2	42.1	140 (59.1)
p-value	-	-	-	<0.001~	-	<0.001#	0.059#	0.753~

Table 22 - Non-sample reasons for not participating statistics

Reason for not participating	Baan Tha Khao	Baan Ko Panyee	Baan Lions	Baan Tapae Yoi	Baan Ko Chang	Baan Moken	Baan Ko Sin Hi	All
Not want to participate	2	2			2			6
Relocated	1				1		1	3
No time		1						1
Health, age	1		1				1	3
Mainland house			1		1			2
Already sampled	1	1					1	3
Away fishing			1				2	3
Away for work		3	3				7	13
House rented to foreigners					2			2
away - unknown	1				2	1	2	6
Total	6	7	6	0	8	1	14	42

Appendix M – Recruitment script

Hello (Sawat dee krap)

My name is Nathan Bennett and I am a university student from the University of Victoria in Canada. I am in Thailand working on a collaborative research project with the Phuket Marine Biological Centre.

The study that were are currently conducting is titled "Conservation, Livelihoods, and Climate Change in Marine Protected Areas on the Andaman Coast of Thailand." The purpose of the research is to look at how marine protected areas and climate change impact on local communities and livelihoods. The study will also explore solutions for how to ensure that community livelihoods are improved and that the marine environment is protected. Your participation in this research will be extremely beneficial as it will help us to better understand these issues and to explore solutions.

I would like to request your participation in a ___(research process; e.g., interview, survey, focus group)___ to explore your thoughts on these issues. The process will take ___(amount of time; e.g., between 30-90 minutes)___ and it will occur at ____(location; e.g., can happen at a time and location of your convenience)___.

If you are willing, the next step will be to set up an ___(research process; e.g., interview time)___ that will work for both of us.

Or

If you are interested and willing, the ___(research process; e.g., focus group, photo-voice workshop, etc…)___ will be taking place at ___(location)___ on ___(date)___.

Appendix N - Consent script

Instructions: The following verbal consent form is to be used to inform study participants about the study. The form will be utilized like a check-list for each participant and checkmarks will be put in the box next to each point as it is covered. At the end of the form, the participant will be asked whether they are willing to participate and this will be recorded.

Participant Point-form Verbal Consent Form

Project Title: Conservation, Livelihoods, and Climate Change in Marine Protected Areas on the Andaman Coast of Thailand

Funded by: The Social Science and Human Research Council of Canada and the Pierre Elliot Trudeau Foundation.

Researcher(s): Nathan Bennett, Graduate Student, Department of Geography, University of Victoria, 250-472-5926, njbennet@uvic.ca

Supervisor: Dr Phil Dearden, Department of Geography, University of Victoria, 250-721-7325, pdearden@office.geog.uvic.ca

Purpose(s) and Objective(s) of the Research:

- ☐ This study will examine communities in three MPAs on the Andaman Coast of Thailand in order to explore how conservation outcomes and community livelihoods and adaptive capacity can be enhanced in consideration of a changing climate. This study will focus on three objectives: 1) An exploration of the relationship between climate change, MPAs, and local livelihoods; 2) An examination of the current level of adaptive capacity of the MPA communities; and, 3) An exploration of policy mechanisms and on-the-ground actions to achieve future scenarios that will uphold conservation objectives and community socio-economic outcomes.

This Research is Important because:

- ☐ …the creation of MPAs can have significant impact on local communities and climate change also has significant implications for both marine conservation and local communities. For local people on the Andaman Coast, both conservation and community development are important issues. As a result, communities, conservationists, and governments need to consider the potential problems associated with climate change and MPAs and plan for how to adapt to these changes.

Participation:

- ☐ You have been chosen to participate because we felt that you will have particular insights into these issues as well as potential solutions.
- ☐ Your participation in this project is entirely voluntary.
- ☐ Whether you choose to participate or not will have no effect on your position [e.g. employment, class standing] or how you will be treated.

Procedures:

**Please note that this section of the document will be adapted for each of the research processes (as laid out in the ethics application). The following description is for the interview process:

- ☐ Describe procedures, research activities, method of recording participant
- ☐ **Duration:** The interview will take approximately 30-90 minutes.
- ☐ **Location:** The interview will take place at a time and location of your choosing and convenience, such as your house ot the beach while you are mending nets.

Benefits:

- ☐ The potential benefits of this research include:

1. Facilitation of dialogue and planning processes within MPA communities
2. Building greater knowledge of climate change and other changes within local communities
3. Advocating for greater consideration of local communities in broader policies and processes
4. Providing a better understanding of relationships between Climate Change, MPAs and Livelihoods
5. Identification of local to national level on-the-ground actions and policy implications for supporting conservation and local development
6. Contribution of climate change perspective to current conservation and development planning process in the region

Risks:

- ☐ There are no known or anticipated risks to you by participating in this research
- ☐ We will be consulting with your community throughout the process to make sure that we are conducting research and sharing results in an appropriate manner.

Withdrawal of Participation:

- ☐ You may withdraw at any time without explanation or consequence.
- ☐ Should you withdraw, if you would like to remove your data from the study, your data will be destroyed immediately (and in the case of photographs from the photovoice process, these will be returned to you as soon as possible).

Continued or On-going Consent:

- ☐ In the case that you participate in another research activity, I explain the research again and restate the main points regarding your participation.

Anonymity and Confidentiality:

- ☐ For survey and interview - During and after your participation, your participation will be anonymous
- ☐ For photovoice, focus groups, and scenario planning processes – Due to the group nature of the research process, you will not be anonymous during participation in this research. Also, your answers may not be completely confidential since other people will be present during the research.
- ☐ During dissemination of results, your name will not be used and any results will be anonymized.

- ☐ For Photovoice – During dissemination of results, your name can be attached to your photographs and explanations if you wish or your photographs and explanations can be anonymized (see below)
- ☐ All data and results will be kept confidential and stored in a secure location, such as a locked car or office, at all stages of this research process and for 4 years afterwards.

Research Results will [may] be Used/Disseminated in the Following Ways:

- ☐ Results from this research may be used to write newsletters, reports, articles, book chapters, and my PhD dissertation. Results will also be shared in presentations to communities, to governments, and at conferences.

Questions or Concerns:

- ☐ If you should have any questions or concerns, please contact the researcher(s) using the information provided above and on the business card that we will give you;
- ☐ You may also contact the Human Research Ethics Office, University of Victoria, (250) 472-4545 ethics@uvic.ca

Consent:

A name and checkmark below indicates that the participant has been read the consent form and understands the above conditions of participation in this study and that he or she has had the opportunity to have his or her questions answered by the researchers.

_____	_____	_____
Name of Participant	*Agrees to Participate in Research*	*Date*

A copy of this consent form will be left with you and a copy will be taken by the researcher.

Visually Recorded Images/Data: Participant or parent/guardian to provide initials:

- ☐ Photos may be taken of me for: Analysis _____ Dissemination _____

For the photo-voice process only, participants will be asked whether they would like to waive confidentiality.

- ☐ Photos taken by me during the photovoice may be utilized for: Analysis _____ Dissemination _____

- ☐ Does the participant agree to have his or her photographs and responses attributed to him or her by name in the results: Yes _____ No _____

Appendix O - Consent Script for Photovoice Participants (English and Thai)

Verbal Consent for Photovoice Subjects
คำขอความยินยอมในกระบวนการเสียงจากภาพ

AS SUGGESTED BY THE RESEARCH ETHICS BOARD, PHOTOVOICE PARTICIPANTS OR "CO-RESEARCHERS" WILL BE REQUIRED TO ASK FOR PERMISSION TO TAKE PHOTOGRAPHS OF SUBJECTS AFTER VERBALLY EXPLAINING THE PURPOSES OF THE RESEARCH AND THE PHOTOGRAPHS. THEY WILL ALSO EXPLAIN THAT THESE PHOTOGRAPHS MIGHT BE USED IN DISSEMINATION OF RESULTS
จากคำแนะนำของคณะกรรมการด้านจริยธรรมในงานวิจัย ผู้เข้าร่วมในกระบวนการเสียงจากภาพ หรือ "ผู้ร่วมวิจัย" จะต้องทำการขออนุญาตถ่ายภาพ(เป้าหมาย) หลังจากอธิบายวัตถุประสงค์ของงานวิจัยและภาพถ่าย ผู้เข้าร่วมจะต้องอธิบายด้วยว่ารูปภาพเหล่านี้จะถูกนำไปใช้ประกอบในการเผยแพร่ผลงานวิจัย

SCRIPT:

I AM TAKING PHOTOGRAPHS AS PART OF A RESEARCH PROJECT THAT IS FOCUSING ON THE MARINE PROTECTED AREA, OUR COMMUNITY, AND CLIMATE CHANGE. THE GOAL OF THE PROJECT IS TO FIND SOLUTIONS FOR BALANCING MARINE CONSERVATION WITH LOCAL COMMUNITY DEVELOPMENT. THE RESEARCH IS BEING CONDUCTED BY A CANADIAN RESEARCHER IN COLLABORATION WITH THE PHUKET MARINE BIOLOGICAL RESEARCH CENTRE. THIS PART OF THE PROJECT IS LOOKING AT THE CHANGES THAT ARE AFFECTING OUR COMMUNITY. PHOTOGRAPHS THAT I AM TAKING WILL BE USED TO EXPLORE THIS QUESTION IN AN INTERVIEW AND MIGHT BE USED FOR REPORTS OR OTHER DOCUMENTS. I WOULD LIKE TO TAKE YOUR PHOTOGRAPH IF THAT IS OKAY. YOUR PARTICIPATION IS VOLUNTARY AND YOU CAN SAY NO IF YOU WANT TO. WOULD IT BE ALRIGHT IF I TAKE YOUR PHOTOGRAPH?

บทพูด:
ผม/ดิฉันกำลังถ่ายภาพ ซึ่งเป็นส่วนหนึ่งของโครงการวิจัยที่เน้นในเรื่องพื้นที่คุ้มครองทางทะเล/อุทยานฯ ชุมชนของเรา และเรื่องสภาพภูมิอากาศเปลี่ยนแปลง/โลกร้อน โครงการนี้มีเป้าหมายในการหาบทสรุปของการสร้างความสมดุลระหว่างการอนุรักษ์ทรัพยากรทางทะเลและการพัฒนาชุมชนท้องถิ่น โครงการนี้เป็นการร่วมงานระหว่างนักวิจัยชาวแคนาดาและศูนย์ชีวฯ ภูเก็ต (สถาบันวิจัยและพัฒนาทรัพยากรทางทะเล ชายฝั่งทะเล และป่าชายเลน) งานส่วนนี้ของโครงการเน้นในเรื่องความเปลี่ยนแปลงต่างๆที่ส่งผลต่อชุมชนของเรา ภาพที่ผม/ดิฉันกำลังจะถ่าย จะถูกนำไปใช้ในการตอบคำถามการสัมภาษณ์ และอาจถูกนำไปใช้ประกอบในรายงานหรือเอกสารอื่นๆ ผม/ดิฉันอยากจะถ่ายภาพของคุณหากคุณไม่มีปัญหาอะไร คุณจะให้ความร่วมมือในการถ่ายภาพนี้หรือไม่ก็ได้ จะเป็นอะไรหรือไม่หากผม/ดิฉันจะขอถ่ายภาพคุณ?

Appendix P – Aggregate Survey Results

Table 23 - Survey Header.General survey information

Attribute	Value	Number (N=237)	Percentage (%)	p-value (Chi^2)
Community	Baan Tha Khao	41	28.9	<0.001~
	Baan Koh Panyee	53	18.5	
	Baan Lions	15	34.1	
	Baan Tapae Yoi	22	34.9	
	Baan Koh Chang	31	24.6	
	Baan Moken	11	30.6	
	Baan Koh Sin Hi	64	22.1	
National Marine Park	Ao Phang Nga NMP	94	39.7	<0.001~
	Koh Rah-Phrathong NMP	37	15.6	
	Mu Koh Ranong NMP	106	44.7	
Province	Ranong	106	44.7	<0.001~
	Phang Nga	131	55.3	
Interviewer	Por	73	30.8	0.756~
	Alin	85	35.9	
	Aice	79	33.3	

Table 24 - Survey Header.Mean survey length (hours)

Indicator	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Mean interview length (hours)	1.0	0.9	1.1	1.2	1.1	0.8	0.7	0.9	<0.001#

Table 25 – Survey Q1.How many years have you (interviewee) lived in this community?

Indicator	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Mean years lived in the community	33.5	33.8	12.8	26.9	23.7	4.8	27.2	27.3	<0.001#

Table 26 – Survey Q2.Where are you (interviewee) from originally?

Location # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
the community	27 (65.9)	35 (66.0)	5 (33.3)	9 (40.9)	8 (25.8)	1 (9.1)	32 (50.0)	117 (49.4)	<0.001~
the subdistrict	5 (12.2)	2 (3.8)	1 (6.7)	4 (18.2)	0 (0.0)	4 (36.4)	1 (1.6)	17 (7.2)	
the province	2 (4.9)	11 (20.8)	4 (26.7)	3 (13.6)	8 (25.8)	5 (45.5)	4 (6.3)	37 (15.6)	
Thailand	7 (17.1)	5 (9.4)	5 (33.3)	3 (13.6)	15 (48.4)	1 (9.1)	4 (6.3)	40 (16.9)	
Other*	0 (0.0)	0 (0.0)	0 (0.0)	3 (13.6)	0 (0.0)	0 (0.0)	23 (35.9)	26 (11.0)	

Notes: *All cases indicating "other" were from Burma

Table 27 – Survey Q3.How many people live in the household?

Number of people in household (% of hh)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
1-3	14 (34)	6 (11)	15 (100)	8 (36)	23 (74)	3 (27)	15 (23)	84 (35)	<.0001~
4-6	25 (61)	38 (72)	0 (0)	12 (55)	7 (23)	7 (64)	39 (61)	128 (54)	
7 to 9	1 (2)	6 (11)	0 (0)	2 (9)	1 (3)	1 (9)	9 (14)	20 (8)	
10 or more	1 (2)	3 (6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	5 (2)	
Mean # of people living in households	4.2	5.2	1.9	3.7	2.9	4.8	4.7	4.2	<0.001#*

Note:*ANOVA

Table 28 – Survey Q4.How many dependent children under 18 years of age live in the household?

Mean number (% of hh) of dependent children (<18)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
none	12 (29)	13 (25)	11 (73)	5 (23)	16 (52)	2 (18)	14 (22)	73 (31)	<.0001~
1	13 (32)	11 (21)	4 (27)	7 (32)	12 (39)	0 (0)	21 (33)	68 (29)	
2	14 (34)	16 (30)	0 (0)	8 (36)	2 (6)	4 (36)	14 (22)	58 (24)	
3	1 (2)	10 (19)	0 (0)	2 (9)	0 (0)	1 (9)	7 (11)	21 (9)	
4	0 (0)	2 (4)	0 (0)	0 (0)	0 (0)	4 (36)	6 (9)	12 (5)	
5 or more	1 (2)	1 (2)	0 (0)	0 (0)	1 (3)	0 (0)	2 (3)	5 (2)	
Mean # of dependent children <18 in households	1.2	1.8	0.3	1.3	1.1	2.5	1.6	1.5	0.023#*

Note:*ANOVA

Table 29 – Survey Q5.How many elders who do not work live in the household?

Number of non-working elders (% of hh)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
none	31 (76)	39 (74)	14 (93)	18 (82)	30 (97)	10 (91)	49 (77)	191 (81)	0.6438~
1	9 (22)	10 (19)	1 (7)	4 (18)	0 (0)	1 (9)	13 (20)	38 (16)	
2	1 (2)	2 (4)	0 (0)	0 (0)	1 (3)	0 (0)	2 (3)	6 (3)	
3	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	
Mean # of non-working elders who live in households	0.3	0.3	0.1	0.2	0.1	0.1	0.3	0.2	0.204#

Note:*ANOVA

Table 30 – Survey Q6.What is the nationality of the household?

Nationality # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Thai	41 (100.0)	53 (100.0)	14 (93.3)	19 (86.4)	30 (96.8)	2 (18.2)	32 (50.0)	191 (80.6)	<0.001~
Burmese*	0 (0.0)	0 (0.0)	0 (0.0)	3 (13.6)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.3)	
Mixed Thai & Other	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	1 (3.2)	1 (9.1)	18 (28.1)	21 (8.9)	
Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	2 (3.1)	3 (1.3)	
Stateless	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (63.6)	12 (18.8)	19 (8.0)	

Note: *In most communities, Burmese migrant workers households were often situated away from the villages and not considered part of the "community". There was also a language barrier. These households were not included in the survey.

Table 31 – Survey Q7.Which languages are spoken in the household? Check all that apply.

Languages spoken - # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Thai	41 (100.0)	53 (100.0)	15 (100.0)	22 (100.0)	31 (100.0)	10 (90.9)	63 (98.4)	235 (99.2)	0.098~
Burmese	0 (0.0)	1 (1.9)	1 (6.7)	5 (22.7)	5 (16.1)	0 (0.0)	15 (23.4)	27 (11.4)	<0.001~
Malay	2 (4.9)	6 (11.3)	1 (6.7)	1 (4.5)	1 (3.2)	0 (0.0)	58 (90.6)	69 (29.1)	<0.001~
English	19 (46.3)	33 (62.3)	8 (53.3)	5 (22.7)	20 (64.5)	0 (0.0)	2 (3.1)	87 (36.7)	<0.001~
Moken or Moklen	0 (0.0)	0 (0.0)	2 (13.3)	14 (63.6)	1 (3.2)	11 (100.0)	0 (0.0)	28 (11.8)	<0.001~
Other	0 (0.0)	2 (3.8)	2 (13.3)	1 (4.5)	2 (6.5)	0 (0.0)	0 (0.0)	7 (3.0)	0.094~
Mean # of languages spoken in households	1.5	1.8	1.9	2.2	1.9	1.9	2.2	1.9	<0.001#

Table 32 – Survey Q8.What is the religious affiliation of the household?

Religion - # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Muslim	40 (97.6)	53 (100.0)	1 (6.7)	0 (0.0)	2 (6.5)	0 (0.0)	63 (98.4)	159 (67.1)	<0.001~
Buddhist	1 (2.4)	0 (0.0)	13 (86.7)	22 (100.0)	28 (90.3)	0 (0.0)	1 (1.6)	65 (27.4)	
Christian	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	1 (3.2)	10 (90.9)	0 (0.0)	12 (5.1)	
None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	0 (0.0)	1 (0.4)	

Table 33 – Survey Q9. Do members of the household belong to a Chao Lay (sea gypsy/indigenous) group? Which group?

Member of Chao Lay group - # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
yes	0 (0.0)	0 (0.0)	2 (13.3)	9 (40.9)	0 (0.0)	10 (90.9)	0 (0.0)	21 (8.9)	<0.001~
Moken	0 (0.0)	0 (0.0)	0 (0.0)	6 (27.3)	0 (0.0)	10 (90.9)	0 (0.0)	16 (6.8)	
Moklen	0 (0.0)	0 (0.0)	2 (13.3)	3 (13.6)	0 (0.0)	0 (0.0)	0 (0.0)	5 (2.1)	

Table 34 – SurveyQ10.Household composition by relationship to head of household (all individuals in all households)

Relationship to head of household - # (%)	Community (Baan)								
	Tha Khao (N=167)	Koh Panyee (N=275)	Lions (N=28)	Tapae Yoi (N=80)	Koh Chang (N=90)	Moken (N=51)	Koh Sin Hi (N=299)	All Sites (N=990)	p-value (Chi^2)
husband or father and male head of house	36 (22)	44 (16)	12 (43)	21 (26)	22 (24)	10 (20)	57 (19)	202 (20)	0.0050~
wife or mother and female head of house	41 (25)	52 (19)	10 (36)	18 (23)	26 (29)	10 (20)	63 (21)	220 (22)	
parents of head of house	7 (4)	9 (3)	0 (0)	2 (3)	2 (2)	1 (2)	7 (2)	28 (3)	
adult relative	50 (30)	108 (39)	4 (14)	28 (35)	24 (27)	29 (57)	138 (46)	381 (38)	
children of head of house	9 (5)	13 (5)	0 (0)	0 (0)	3 (3)	0 (0)	9 (3)	34 (3)	
adult partner of children of head of house	18 (11)	38 (14)	1 (4)	7 (9)	10 (11)	0 (0)	18 (6)	92 (9)	
children of children of head of house	4 (2)	10 (4)	1 (4)	3 (4)	2 (2)	1 (2)	4 (1)	25 (3)	
children of relatives	2 (1)	1 (0)	0 (0)	1 (1)	0 (0)	0 (0)	2 (1)	6 (1)	
household help	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	1 (0)	
other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	1 (0)	

Table 35 - Survey Q10.Number of people and each gender living in households.

Gender	Community (Baan)									
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
All	1-3	15 (37)	6 (11)	15 (100)	9 (41)	23 (74)	3 (27)	17 (27)	88 (37)	<.0001~
	4-6	24 (59)	39 (74)	0 (0)	11 (50)	7 (23)	7 (64)	37 (58)	125 (53)	
	7 to 9	1 (2)	6 (11)	0 (0)	2 (9)	1 (3)	1 (9)	8 (13)	19 (8)	
	10 or more	1 (2)	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)	2 (3)	5 (2)	
	Mean	4.1	5.2	1.9	3.6	2.9	4.6	4.7	4.2	<0.001#
Males	Mean	2.0	2.5	1.0	2.0	1.3	1.9	2.4	2.1	<0.001#
Females	Mean	2.0	2.6	0.9	1.6	1.6	2.6	2.3	2.1	<0.001#

Table 36 - Survey Q10.Number of people and each gender of working age in household

Gender	Community (Baan)									
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Both genders	Mean	2.4	2.9	1.6	2.5	2.2	2.3	2.8	2.6	0.016#
	Max	5.0	7.0	2.0	4.0	5.0	3.0	8.0	8.0	
males	Mean	1.3	1.4	1.0	1.4	1.0	0.9	1.4	1.3	0.146#
	Max	3.0	4.0	2.0	3.0	3.0	1.0	6.0	6.0	
females	Mean	1.2	1.4	0.6	1.1	1.2	1.3	1.4	1.3	0.015#
	Max	3.0	4.0	1.0	2.0	3.0	2.0	4.0	4.0	

Table 37 - Survey Q10.Number of people and of each gender who are of working age and unemployed in households

Gender		Community (Baan)								
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Both genders	Mean	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.2783#
	none	32 (78)	44 (83)	11 (73)	18 (82)	25 (81)	10 (91)	60 (94)	200 (84)	0.2554~
	1-3	9 (22)	9 (17)	4 (27)	4 (18)	6 (19)	1 (9)	4 (6)	37 (16)	
males	Mean	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.404#
	none	37 (90)	49 (92)	11 (73)	20 (91)	25 (81)	10 (91)	62 (97)	214 (90)	0.3985~
	1	1 (2)	3 (6)	0 (0)	0 (0)	1 (3)	1 (9)	0 (0)	6 (3)	
	NR	3	1	4	2	5	0	2	17	
females	Mean	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.386#
	none	33 (80)	47 (89)	11 (73)	18 (82)	25 (81)	11 (100)	60 (94)	205 (86)	0.6497~
	1	5 (12)	4 (8)	0 (0)	2 (9)	1 (3)	0 (0)	2 (3)	14 (6)	
	2	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	
	NR	3	1	4	2	5	0	2	17	

Table 38 - Survey Q10.Mean age of all people and each gender in all households

Gender		Community (Baan)								
	#	Tha Khao (N=167)	Koh Panyee (N=275)	Lions (N=28)	Tapae Yoi (N=80)	Koh Chang (N=90)	Moken (N=51)	Koh Sin Hi (N=299)	All Sites (N=990)	p-value (ANOVA)
Both genders	mean	32.8	31.4	36.6	28.8	34.0	21.6	26.0	29.7	<.0001#
	median	33.0	30.0	35.5	29.5	33.5	19.0	22.0	28.0	
	max	85.0	84.0	75.0	85.0	74.0	60.0	86.0	86.0	
males	mean	34.4	32.0	40.5	28.8	36.7	24.0	28.6	31.8	0.007#
females	Mean	38.5	32.6	39.0	33.9	37.9	22.2	28.3	32.9	<0.001#

Table 39 - Survey Q10.Mean number of children, unemployed and all dependents in households

Dependents (Mean #)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value*
Children	0.6	1.0	0.2	0.7	0.2	1.0	1.0	0.7	<0.001#
Unemployed adults	0.6	0.6	0.1	0.5	0.3	1.0	0.7	0.6	0.051#
All Dependents	1.3	1.6	0.3	1.2	0.5	2.0	1.7	1.3	<0.001#

Note: *ANOVA

Table 40 - Survey Q10.Number of children and unemployed dependents in households

Dependents - # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value*
none	16 (39)	9 (17)	11 (73)	6 (27)	20 (65)	2 (18)	17 (27)	81 (34)	0.0073~
1	8 (20)	17 (32)	4 (27)	9 (41)	8 (26)	2 (18)	15 (23)	63 (27)	
2	11 (27)	15 (28)	0 (0)	4 (18)	2 (6)	3 (27)	17 (27)	52 (22)	
3	3 (7)	9 (17)	0 (0)	2 (9)	1 (3)	2 (18)	7 (11)	24 (10)	
4	2 (5)	3 (6)	0 (0)	1 (5)	0 (0)	2 (18)	6 (9)	14 (6)	
5 or more	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (3)	3 (1)	

Table 41 – Survey Q10.Participation in each livelihood by all individuals of working age

Livelihood - # (%) of people	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
Fishing – Small Scale – Boat Owner	18 (16)	17 (9)	4 (17)	19 (37)	7 (10)	5 (21)	57 (33)	127 (20)	<.0001~
Fishing – Small Scale – Worker	7 (6)	2 (1)	2 (9)	4 (8)	3 (4)	5 (21)	27 (15)	50 (8)	<.0001~
Fishing – Commercial Fisheries - Worker	1 (1)	0 (0)	0 (0)	2 (4)	0 (0)	0 (0)	0 (0)	3 (0)	0.0159~
Middleman for Small Scale Fisheries	2 (2)	1 (1)	0 (0)	1 (2)	1 (1)	1 (4)	2 (1)	8 (1)	0.7899~
Collecting shells and marine products – For sale	5 (4)	4 (2)	7 (30)	15 (29)	1 (1)	10 (42)	24 (14)	66 (10)	<.0001~
Collecting shells and marine products – Household	24 (21)	11 (6)	11 (48)	27 (53)	34 (49)	13 (54)	43 (25)	163 (26)	<.0001~
Collecting wild foods for household use	19 (17)	0 (0)	7 (30)	12 (24)	12 (17)	4 (17)	12 (7)	66 (10)	<.0001~
Cooking, cleaning, and taking care of children	29 (26)	32 (18)	14 (61)	20 (39)	41 (59)	9 (38)	68 (39)	213 (33)	<.0001~
Making handicrafts, deserts, or other products for sale	7 (6)	5 (3)	4 (17)	3 (6)	1 (1)	1 (4)	4 (2)	25 (4)	0.0126~
Working as part of a women's vocational group	4 (4)	2 (1)	3 (13)	1 (2)	3 (4)	0 (0)	1 (1)	14 (2)	0.0047~
Raising livestock, poultry, or rabbits	7 (6)	2 (1)	2 (9)	9 (18)	6 (9)	0 (0)	18 (10)	44 (7)	0.0005~
Government employee – e.g., teacher, nurse	0 (0)	0 (0)	0 (0)	1 (2)	1 (1)	0 (0)	2 (1)	4 (1)	0.5331~
Local government officer – chief of community or tambon administration	3 (3)	1 (1)	2 (9)	1 (2)	1 (1)	0 (0)	0 (0)	8 (1)	0.0163~
Store or shop owner	9 (8)	63 (35)	3 (13)	4 (8)	13 (19)	2 (8)	15 (9)	109 (17)	<.0001~
Tourism – CBT or homestay program	3 (3)	5 (3)	8 (35)	2 (4)	2 (3)	0 (0)	0 (0)	20 (3)	<.0001~
Tourism – Guide	10 (9)	5 (3)	1 (4)	1 (2)	2 (3)	0 (0)	0 (0)	19 (3)	0.0028~
Tourism – Bungalow Owner	4 (4)	1 (1)	2 (9)	1 (2)	22 (31)	0 (0)	0 (0)	30 (5)	<.0001~
Tourism – Restaurant Owner	3 (3)	5 (3)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	9 (1)	0.1425~
Tourism Industry – Employee	17 (15)	49 (27)	2 (9)	9 (18)	8 (11)	0 (0)	1 (1)	86 (13)	<.0001~
Construction Worker	5 (4)	9 (5)	6 (26)	4 (8)	3 (4)	3 (13)	22 (13)	52 (8)	0.0018~
Aquaculture – Employee	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1 (0)	0.8513~
Aquaculture – Owner	2 (2)	13 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (2)	0.0002~
Subsistence Gardening	18 (16)	0 (0)	7 (30)	10 (20)	28 (40)	4 (17)	15 (9)	82 (13)	<.0001~
Farming Food Crops for Sale	2 (2)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	3 (0)	0.2687~
Plantation Owner – Rubber	37 (33)	8 (4)	1 (4)	2 (4)	28 (40)	0 (0)	25 (14)	101 (16)	<.0001~
Plantation Owner – Cashews or Coconut	1 (1)	0 (0)	2 (9)	5 (10)	27 (39)	0 (0)	8 (5)	43 (7)	<.0001~
Plantation Owner – Palm Oil	0 (0)	2 (1)	2 (9)	2 (4)	0 (0)	0 (0)	0 (0)	6 (1)	0.0007~
Plantation Worker - Rubber	9 (8)	1 (1)	1 (4)	3 (6)	3 (4)	0 (0)	1 (1)	18 (3)	0.0020~
Plantation Worker – Cashews or Coconut	0 (0)	0 (0)	1 (4)	3 (6)	3 (4)	0 (0)	3 (2)	10 (2)	0.0151~
Plantation Worker – Palm Oil	0 (0)	1 (1)	1 (4)	2 (4)	0 (0)	0 (0)	0 (0)	4 (1)	0.0117~
Informal Recycler	7 (6)	0 (0)	6 (26)	5 (10)	4 (6)	0 (0)	10 (6)	32 (5)	<.0001~
Student	0 (0)	10 (5)	0 (0)	1 (2)	1 (1)	0 (0)	1 (1)	13 (2)	0.0125~
Unemployed	13 (12)	18 (10)	0 (0)	3 (6)	1 (1)	1 (4)	10 (6)	46 (7)	0.0766~
Other	16 (14)	12 (7)	7 (30)	13 (25)	6 (9)	0 (0)	20 (11)	74 (12)	0.0002~

Table 42 – Survey Q10.Level of education of all individuals who are of working age

Relationship to head of household - # (%)	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
None	10 (9)	2 (1)	3 (13)	5 (10)	2 (3)	16 (67)	54 (31)	92 (14)	<.0001~
Year 1-3	1 (1)	6 (3)	1 (4)	4 (8)	2 (3)	4 (17)	1 (1)	19 (3)	
Year 4-6	60 (53)	73 (40)	10 (43)	30 (59)	35 (50)	1 (4)	59 (34)	268 (42)	
Middle school	14 (12)	34 (19)	5 (22)	5 (10)	12 (17)	2 (8)	21 (12)	93 (15)	
High school	17 (15)	29 (16)	1 (4)	1 (2)	7 (10)	0 (0)	19 (11)	74 (12)	
Diploma or vocational cert	4 (4)	16 (9)	1 (4)	3 (6)	4 (6)	0 (0)	4 (2)	32 (5)	
Bachelors	4 (4)	17 (9)	1 (4)	2 (4)	7 (10)	0 (0)	1 (1)	32 (5)	
Graduate program	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0)	
Not specified	3 (3)	3 (2)	1 (4)	1 (2)	1 (1)	1 (4)	16 (9)	26 (4)	

Table 43 – Survey Q10.Level of participation in each livelihood category by all individuals of working age

Livelihood Category* - # (%) of people	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
Fisheries	31 (27)	26 (14)	9 (39)	28 (55)	9 (13)	16 (67)	95 (54)	214 (34)	<.0001~
Tourism	33 (29)	63 (35)	13 (57)	12 (24)	34 (49)	0 (0)	1 (1)	156 (24)	<.0001~
Agriculture and Plantations	47 (42)	8 (4)	6 (26)	10 (20)	45 (64)	0 (0)	36 (21)	152 (24)	<.0001~
Other	40 (35)	82 (45)	16 (70)	23 (45)	25 (36)	5 (21)	63 (36)	254 (40)	0.0084~
Subsistence	41 (36)	42 (23)	19 (83)	39 (76)	59 (84)	19 (79)	94 (54)	313 (49)	<.0001~
Student or Unemployed	29 (26)	40 (22)	7 (30)	17 (33)	8 (11)	1 (4)	30 (17)	132 (21)	0.0086~

Note: *Livelihood categories are based on the following categorization of livelihoods from last page of survey - Fisheries = 1, 2, 3, 4, 5, 21, 22; Tourism = 9, 10, 15, 16, 17, 18, 19; Plantations & Agriculture = 24, 25, 26, 27, 28, 29, 30; Other = 12, 13, 20, 31, 34; Subsistence livelihoods = 6, 7, 11, 23; Student or Unemployed = 32, 33

Table 44 – Survey Q10.Mean number of livelihood categories participated in by all individuals of working age

# of categories	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
mean	2.0	1.4	3.0	2.5	2.6	1.7	1.8	1.9	<.0001#
median	2.0	1.0	3.0	2.0	2.0	2.0	2.0	2.0	

Note: Livelihood categories = fisheries, tourism, plantations and agriculture, other, and subsistence

Table 45 - Survey Q10.Mean number of unique, income-based, and subsistence livelihoods of all individuals of working age by gender

Gender	Community (Baan)								
	Livelihood Type	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
All	All	2.5	1.5	4.7	3.6	3.8	2.4	2.2	2.5	<.0001#
	All inc/sub	2.2	1.5	4.1	3.4	3.6	2.4	2.0	2.3	<.0001#
	Income-based	1.5	1.1	2.9	2.0	2.0	1.1	1.3	1.5	<.0001#
	Subsistence	0.6	0.1	1.2	1.1	1.1	0.9	0.5	0.6	<.0001#
	Household	0.4	0.3	0.6	0.5	0.6	0.4	0.5	0.4	0.0020#
All males	All	2.3	1.6	4.5	3.5	4.1	2.5	2.1	2.4	<.0001#
	All inc/sub	2.2	1.5	4.1	3.4	3.6	2.4	2.0	2.3	<.0001#
	Income-based	1.9	1.4	3.2	2.3	2.3	1.5	1.7	1.8	<.0001#
	Subsistence	0.4	0.1	0.9	1.1	1.3	0.9	0.3	0.5	<.0001#
	Household	0.1	0.1	0.4	0.1	0.5	0.1	0.1	0.2	<.0001#
All females	All	2.7	1.5	4.9	3.8	3.5	2.5	2.4	2.5	<.0001#
	All inc/sub	2.1	1.0	4.0	2.9	2.8	1.8	1.6	1.8	<.0001#
	Income-based	1.2	0.9	2.5	1.8	1.8	0.8	0.9	1.2	<.0001#
	Subsistence	0.8	0.0	1.5	1.1	1.0	0.9	0.7	0.6	<.0001#
	Household	0.6	0.5	0.9	0.9	0.7	0.7	0.8	0.7	<.0001#

Note: All – All livelihoods = list from last page of survey; All inc/sub = all excluding 8, 32, 33; Subsistence livelihoods = 6, 7, 11, 23; Income-based livelihoods = 1, 2, 3, 4, 5, 21, 22 (Fisheries), 9, 10, 15, 16, 17, 18, 19 (Tourism), 24, 25, 26, 27, 28, 29, 30 (Plantations & Agriculture), 12, 13, 20, 31, 34 (Other); Household=8

Table 46 – SurveyQ10.Participation of individuals of working age in fishing and subsistence harvesting

Nature of participation in fishing and harvesting - # (%) of people	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
Primary occupation is fishing related	36 (32)	15 (8)	7 (30)	28 (55)	10 (14)	12 (50)	87 (50)	195 (31)	<.0001~
Secondary occupation is fishing related	17 (15)	16 (9)	11 (48)	26 (51)	32 (46)	14 (58)	45 (26)	161 (25)	<.0001~
Participation in subsistence gathering of marine resources	24 (21)	11 (6)	11 (48)	27 (53)	34 (49)	13 (54)	43 (25)	163 (26)	<.0001~

Table 47 – SurveyQ10.Participation of males of working age in fishing and subsistence harvesting

Nature of participation in fishing and harvesting - # (%) of people	Community (Baan)								
	Tha Khao (N=54)	Koh Panyee (N=88)	Lions (N=13)	Tapae Yoi (N=27)	Koh Chang (N=31)	Moken (N=10)	Koh Sin Hi (N=88)	All Sites (N=311)	p-value (Chi^2)
Primary occupation is fishing related	19 (35)	13 (15)	3 (23)	21 (78)	7 (23)	8 (80)	74 (84)	145 (47)	<.0001~
Secondary occupation is fishing related	10 (19)	13 (15)	7 (54)	15 (56)	18 (58)	6 (60)	23 (26)	92 (30)	<.0001~
Participation in subsistence gathering of marine resources	8 (15)	9 (10)	5 (38)	14 (52)	18 (58)	5 (50)	17 (19)	76 (24)	<.0001~

Table 48 – SurveyQ10.Participation of females of working age in fishing and subsistence harvesting

Nature of participation in fishing and harvesting - # (%) of people	Community (Baan)								
	Tha Khao (N=59)	Koh Panyee (N=92)	Lions (N=10)	Tapae Yoi (N=24)	Koh Chang (N=39)	Moken (N=13)	Koh Sin Hi (N=86)	All Sites (N=323)	p-value (Chi^2)
Primary occupation is fishing related	17 (29)	2 (2)	4 (40)	7 (29)	3 (8)	4 (31)	13 (15)	50 (15)	<.0001~
Secondary occupation is fishing related	7 (12)	3 (3)	4 (40)	11 (46)	14 (36)	8 (62)	22 (26)	69 (21)	<.0001~
Participation in subsistence gathering of marine resources	16 (27)	2 (2)	6 (60)	13 (54)	16 (41)	8 (62)	26 (30)	87 (27)	<.0001~

Table 49 – SurveyQ10.Livelihood roles of all individuals of working age

Livelihood Role * - # (%) of people	Community (Baan)								
	Tha Khao (N=113)	Koh Panyee (N=182)	Lions (N=23)	Tapae Yoi (N=51)	Koh Chang (N=70)	Moken (N=24)	Koh Sin Hi (N=175)	All Sites (N=638)	p-value (Chi^2)
Labourer	43 (38)	66 (36)	10 (43)	21 (41)	21 (30)	6 (25)	53 (30)	220 (34)	0.4611~
Owner	66 (58)	92 (51)	15 (65)	32 (63)	58 (83)	14 (58)	101 (58)	378 (59)	0.0009~
Household	41 (36)	40 (22)	18 (78)	39 (76)	59 (84)	18 (75)	94 (54)	309 (48)	<.0001~
Cooperative	7 (6)	7 (4)	9 (39)	3 (6)	5 (7)	0 (0)	1 (1)	32 (5)	<.0001~
Not applicable	29 (26)	40 (22)	7 (30)	17 (33)	8 (11)	1 (4)	30 (17)	132 (21)	0.0086~

Note: *Livelihood roles are based on the following categorization of livelihoods from last page of survey - Labourer = 2, 3, 12, 13, 16, 19, 20, 21, 28, 29, 30; Owner = 1, 4, 5, 9, 14, 17, 18, 22, 24, 25, 26, 27, 31; Household = 6, 7, 8, 11, 23; Cooperative = 10, 15; Not Applicable = 32, 33, 34

Table 50 – SurveyQ10.Seasonal and annual incomes of all males, females and individuals of working age in Thai baht

Gender	Community (Baan)										
	Season	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
males	N		(N=54)	(N=88)	(N=13)	(N=27)	(N=31)	(N=10)	(N=88)	(N=311)	(N=54)
	Dry	mean	10908.3	9721.3	13322.5	24106.5	19077.1	11611.5	5709.5	11189.7	0.0304#
		median	8450.0	7000.0	11000.0	8500.0	10000.0	6570.0	4000.0	7000.0	
	Wet	mean	8112.0	8617.8	8215.8	4575.9	8845.0	3945.0	3969.9	6713.4	0.0006#
		median	8000.0	6500.0	9000.0	3500.0	3000.0	2550.0	3000.0	5000.0	
	Annual	mean	108530	106616	119016	133033	147068	78006.0	54597.3	98153.2	0.0102#
		median	96000.0	75000.0	132000	60000.0	102500	58280.0	44000.0	70000.0	
females	N		(N=59)	(N=92)	(N=10)	(N=24)	(N=39)	(N=13)	(N=86)	(N=323)	
	Dry	mean	6570.3	7316.7	8114.2	3554.6	12613.6	1510.8	1475.4	5766.5	<.0001#
		median	5000.0	6000.0	8300.0	2750.0	6500.0	500.0	0.0	3000.0	
	Wet	mean	4436.4	6014.4	4874.2	2054.6	2627.4	969.2	1432.2	3549.4	<.0001#
		median	2500.0	5000.0	4271.0	1575.0	1000.0	400.0	0.0	1500.0	
	Annual	mean	61772.9	75725.8	71450.4	30655.0	71473.8	13796.9	17359.3	51149.7	<.0001#
		median	42000.0	64000.0	75852.0	25960.0	43300.0	6000.0	500.0	29920.0	
All	N	(N=113)	(N=182)	(N=23)	(N=51)	(N=70)	(N=24)	(N=175)	(N=638)	(N=113)	
	Dry	mean	8643.4	8507.0	11058.0	14435.0	15476.0	5719.0	3596.1	8409.2	0.0002#
		median	8000.0	6000.0	10000.0	5500.0	9700.0	1750.0	2200.0	5000.0	
	Wet	mean	6192.9	7275.7	6762.9	3389.4	5380.9	2231.3	2700.1	5091.8	<.0001#
		median	4800.0	6000.0	7000.0	2400.0	2375.0	1500.0	1500.0	3000.0	
	Annual	mean	84116.8	90732.8	98335.3	84855.3	104951	40725.8	35985.5	74027.2	<.0001#
		median	72000.0	72000.0	96000.0	45600.0	60000.0	19000.0	24000.0	48000.0	

Table 51 - Survey Q10.Mean number of unique, income-based, and subsistence livelihoods of all members, all males, and all females in the households

Gender	Community (Baan)									
	Livelihood Type	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
All	All	6.3	4.3	6.4	8.1	7.3	5.4	5.5	5.9	0.003#
	Income-based	4.4	4.0	4.5	5.1	4.6	3.2	4.0	4.2	0.460#
	Subsistence	1.8	0.3	1.9	3.0	2.7	2.2	1.5	1.6	<0.001#
All males	All	3.1	2.5	4.6	5.0	4.6	2.5	3.4	3.4	0.001#
	Income-based	2.6	2.3	3.6	3.2	3.0	1.6	2.8	2.7	0.111#
	Subsistence	0.5	0.2	1.0	1.7	1.6	0.9	0.6	0.7	<0.001#
All females	All	3.1	1.7	4.1	3.9	4.3	2.7	2.3	2.8	<0.001#
	Income-based	1.9	1.6	2.5	2.3	2.7	1.5	1.3	1.8	0.001#
	Subsistence	1.3	0.1	1.6	1.6	1.6	1.3	1.0	1.0	<0.001#

Note: All – All livelihoods = list from last page of survey excluding 8, 32, 33; Subsistence livelihoods = 6, 7, 11, 23; Income-based livelihoods = 1, 2, 3, 4, 5, 21, 22 (Fisheries), 9, 10, 15, 16, 17, 18, 19 (Tourism), 24, 25, 26, 27, 28, 29, 30 (Plantations & Agriculture), 12, 13, 20, 31, 34 (Other)

Table 52 - Survey Q10.Total number of income and subsistence based livelihoods in which households participate

Livelihood Type	Community (Baan)									
	Number	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
All	1-2	9 (22)	14 (26)	2 (13)	3 (14)	3 (10)	1 (9)	9 (14)	41 (17)	0.0441~
	3-4	9 (22)	20 (38)	4 (27)	2 (9)	10 (32)	4 (36)	24 (38)	73 (31)	
	5-6	6 (15)	10 (19)	5 (33)	2 (9)	5 (16)	2 (18)	13 (20)	43 (18)	
	7 or more	17 (41)	9 (17)	4 (27)	15 (68)	13 (42)	4 (36)	18 (28)	80 (34)	
Income	none	0 (0)	0 (0)	0 (0)	1 (5)	0 (0)	0 (0)	1 (2)	2 (1)	0.7790~
	1-2	10 (24)	17 (32)	5 (33)	2 (9)	9 (29)	4 (36)	22 (34)	69 (29)	
	3-4	17 (41)	21 (40)	4 (27)	8 (36)	11 (35)	4 (36)	18 (28)	83 (35)	
	5-6	7 (17)	9 (17)	4 (27)	6 (27)	4 (13)	3 (27)	14 (22)	47 (20)	
	7 or more	7 (17)	6 (11)	2 (13)	5 (23)	7 (23)	0 (0)	9 (14)	36 (15)	
Subsistence	none	19 (46)	44 (83)	5 (33)	2 (9)	6 (19)	1 (9)	23 (36)	100 (42)	<.0001~
	1-2	8 (20)	8 (15)	6 (40)	7 (32)	13 (42)	6 (55)	31 (48)	79 (33)	
	3-4	9 (22)	1 (2)	2 (13)	8 (36)	6 (19)	4 (36)	5 (8)	35 (15)	
	5-6	4 (10)	0 (0)	1 (7)	4 (18)	4 (13)	0 (0)	4 (6)	17 (7)	
	7 or more	1 (2)	0 (0)	1 (7)	1 (5)	2 (6)	0 (0)	1 (2)	6 (3)	

Note: All – All livelihoods = list from last page of survey excluding 8, 32, 33; Subsistence livelihoods = 6, 7, 11, 23; Income-based livelihoods = 1, 2, 3, 4, 5, 21, 22 (Fisheries), 9, 10, 15, 16, 17, 18, 19 (Tourism), 24, 25, 26, 27, 28, 29, 30 (Plantations & Agriculture), 12, 13, 20, 31, 34 (Other); Total number of livelihoods are summed across individuals in the household. Therefore livelihood counts may be counted twice and overlap.

Table 53 - Survey Q10.Number and percentage of households with any person, males and females gathering marine resources for subsistence

Gender	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Any person	18 (43.9)	9 (17.0)	10 (66.7)	19 (86.4)	17 (54.8)	9 (81.8)	30 (46.9)	112 (47.3)	<0.001~
Any males	9 (22.0)	9 (17.0)	5 (33.3)	13 (59.1)	15 (48.4)	5 (45.5)	15 (23.4)	71 (30.0)	<0.001~
Any females	17 (41.5)	2 (3.8)	6 (40.0)	14 (63.6)	12 (38.7)	9 (81.8)	25 (39.1)	85 (35.9)	<0.001~

Table 54 - Survey Q10.Number and percentage of households with individuals with primary or secondary livelihoods that are fishing related.

Importance	Community (Baan)									
	# in household	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Primary	none	15 (37)	42 (79)	9 (60)	5 (23)	26 (84)	2 (18)	8 (13)	107 (45)	<.0001~
	1-3	25 (61)	11 (21)	6 (40)	16 (73)	5 (16)	9 (82)	51 (80)	123 (52)	
	4-6	1 (2)	0 (0)	0 (0)	1 (5)	0 (0)	0 (0)	5 (8)	7 (3)	
Secondary	none	29 (71)	41 (77)	5 (33)	4 (18)	12 (39)	1 (9)	32 (50)	124 (52)	<.0001~
	1-3	12 (29)	12 (23)	10 (67)	15 (68)	17 (55)	9 (82)	30 (47)	105 (44)	
	4-6	0 (0)	0 (0)	0 (0)	3 (14)	2 (6)	1 (9)	2 (3)	8 (3)	

Table 55 - Survey Q10.Mean seasonal and annual incomes (in Thai baht) for all males, all females and households

Gender	Community (Baan)										
	Season	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
All males in household	Dry	mean	14793.9	16051.9	11546.1	30030.7	19319.0	10694.1	8484.6	14981.9	0.1486#
		median	14000.0	10000.0	11000.0	10000.0	12000.0	4000.0	5000.0	9140.0	
	Wet	mean	11107.3	14202.8	7120.3	5820.5	8845.0	3724.5	5828.5	8992.4	<.0001#
		median	10000.0	9000.0	8563.0	5000.0	5000.0	3000.0	4000.0	6400.0	
	Annual	mean	148034	177830	103147	166686	148036	72572.7	80566.6	131867	0.0300#
		median	140000	120000	132000	86700.0	100000	56000.0	57830.0	92000.0	
All females in household	Dry	mean	9586.6	12614.2	5409.5	3882.3	15868.7	1971.8	2304.5	7971.6	<.0001#
		median	8000.0	10000.0	5000.0	3580.0	6500.0	500.0	506.0	5000.0	
	Wet	mean	6439.0	10402.8	3249.5	2245.9	3305.5	1331.8	2246.5	4955.3	<.0001#
		median	4000.0	8000.0	1000.0	1075.0	1500.0	400.0	225.0	2600.0	
	Annual	mean	89858.5	133679	47633.6	33496.4	89918.7	18541.8	27190.1	71528.4	<.0001#
		median	72000.0	104000	28000.0	29960.0	60000.0	6000.0	7320.0	45600.0	
Household	Dry	mean	24380.5	29015.1	16955.6	33913.0	35187.7	12802.3	10789.0	23037.8	0.0064#
		median	20000.0	23900.0	12100.0	15300.0	30000.0	6000.0	7000.0	15000.0	
	Wet	mean	17546.3	24818.9	10369.8	8066.4	12150.5	5192.7	8075.1	14001.7	<.0001#
		median	17100.0	17500.0	11700.0	6800.0	8610.0	4500.0	6800.0	10000.0	
	Annual	mean	237893	314611	150781	200183	237955	92750.9	107757	204165	<.0001#
		median	216400	240000	157600	122100	200000	76800.0	78600.0	152000	

Note: Incomes are in Thai baht

Table 56 - Survey Q10.Interviewee information – gender, education, role in household, primary occupation, and whether head of household

Attribute	Value	Number (N=237)	Percentage (%)	p-value (Chi^2)
Gender	Male	95	40.1	0.753~
	Female	140	59.1	
	Other	1	0.4	
	Unspecified	1	0.4	
Education	None	30	12.7	<0.001~
	Year 1-3	11	4.6	
	Year 4-6	113	47.7	
	Middle school	38	16.0	
	High school	17	7.2	
	Diploma or vocational cert	13	5.5	
	Bachelors	9	3.8	
	Graduate program	0	0.0	
	Not specified	6	2.5	
Role in the household	husband or father and male head of house	84	35.4	0.555~
	wife or mother and female head of house	118	49.8	
	parents of head of house	4	1.7	
	adult relative	23	9.7	
	children of head of house	4	1.7	
	children of children of head of house	4	1.7	
Primary Occupation	Fisheries	47	19.8	<0.001~
	Tourism	35	14.8	
	Agriculture & Plantations	32	13.5	
	Other (govt, store, recyc, voc., constr)	59	24.9	
	Subsistence	42	17.7	
	Student or unemployed	21	8.9	
	missing or not specified	1	0.4	
Head of Household	Yes	109	46.0	0.013~
	No	128	54.0	

Table 57 - Survey Q10.Interviewee mean age and income

Attribute	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Mean age (years)	43.9	42.5	46.3	43.8	44.3	31.9	39.6	42.1	0.059#
Mean annual income (Thai baht)	74073.2	116894	97273.6	138369	147892	52478.2	34740.7	89117.8	0.0022#

Table 58 - Survey Q10.Head of household mean age

Age (years)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
min	29.0	29.0	22.0	23.0	25.0	23.0	22.0	22.0	
mean	47.9	50.0	47.3	43.4	47.2	38.8	42.1	45.8	0.010#
max	77.0	84.0	75.0	72.0	74.0	60.0	75.0	84.0	

Table 59 - Survey Q10.Head of household gender

Gender # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Male	36 (87.8)	43 (81.1)	11 (73.3)	19 (86.4)	21 (67.7)	9 (81.8)	55 (85.9)	194 (81.9)	0.571~
Female	5 (12.2)	9 (17.0)	4 (26.7)	3 (13.6)	10 (32.3)	2 (18.2)	9 (14.1)	42 (17.7)	
Other	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	

Table 60 - Survey Q10.Head of household income (in Thai baht) by season and annually

Income by season (Thai baht)	Community (Baan)								
	Number	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value ANOVA
Annual	Mean	129468	128404	117974	156568	132937	73532.7	56802.6	109253	0.0372#
	Median	108000	86000.0	132000	84000.0	102500	56000.0	48000.0	72800.0	
Dry Season Month	Mean	12940.2	11729.2	13412.8	28446.6	20913.2	10774.1	5842.0	13164.3	0.0576#
	Median	9000.0	9000.0	12000.0	9262.5	15625.0	4000.0	4000.0	8000.0	
Wet Season Month	Mean	9713.4	10185.8	8040.3	5347.7	6160.5	3804.5	4179.3	7074.5	0.0011#
	Median	8000.0	7500.0	9000.0	5000.0	3000.0	2100.0	3000.0	5000.0	

Table 61 - Survey Q11.Mean monthly household incomes (in Thai baht) by occupation and season

Livelihood	Community (Baan)									
	Season	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Fishing	Dry	2784	1150	5120	7746	554	5852	7143	4055	<.0001#
	Wet	3122	1141	1233	3472	271	3427	3409	2311	0.0002#
Harvesting seafoods	Dry	19.5	0.0	73.3	409.1	0.0	5807	179.7	364.1	<0.001#
	Wet	19.5	0.0	60.0	200.0	0.0	418.2	53.1	59.5	<0.001#
Aquaculture	Dry	31.7	184.0	0.0	0.0	0.0	0.0	23.4	53.0	0.336#
	Wet	31.7	184.0	0.0	0.0	1613	0.0	23.4	263.9	0.407#
Tourism	Dry	9807	19375	4800	22241	14032	0.0	0.0	10233	0.012#
	Wet	6802	15857	2393	1291	1097	568.2	0.0	5164	<0.001#
Agriculture	Dry	7.3	0.0	400.0	334.1	3471	0.0	25.4	518.5	<0.001#
	Wet	14.6	0.0	450.0	113.6	712.9	0.0	7.8	136.9	0.024#
Rubber plantations	Dry	6483	132.1	300.0	0.0	9808	0.0	54.7	2468	<0.001#
	Wet	2651	113.2	300.0	68.2	5531	0.0	54.7	1248	<0.001#
Palm plantations	Dry	0.0	0.0	500.0	0.0	161.3	0.0	0.0	52.7	0.008#
	Wet	0.0	0.0	420.9	68.2	64.5	0.0	0.0	41.4	0.002#
Other livelihoods	Dry	5248	8173	5762	3182	7161	1143	3363	5293	0.187#
	Wet	4905	7524	5512	2853	2861	779.1	4527	4778	0.267#
All livelihoods	Dry	24380	29015	16955	33913	35187	12802	10789	23037	0.0064#
	Wet	17546	24818	10369	8066	12150	5192	8075	14001	<.0001#
Mean Ratio of Monthly Incomes in Wet vs Dry Season		0.8	0.9	0.8	0.6	0.5	0.7	0.8	0.8	0.010#

Table 62 - Survey Q11.Mean total household annual income (in Thai baht) by sector (all houses)

Sector		Community (Baan)								
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value*
All fisheries**	Mean	36726.8	15943.4	31120.0	62004.5	17290.3	77401.8	57271.9	38964.2	0.0003#
	Median	0.0	0.0	0.0	58000.0	0.0	61520.0	42800.0	7600.0	
	Min	0.0	0.0	0.0	0.0	0.0	4800.0	0.0	0.0	
	Max	240000	148000	288800	160000	400000	223500	330000	400000	
Tourism	Mean	93648.8	204355	38346.7	99290.9	64903.2	4545.5	0.0	82244.7	<.0001#
	Median	64000.0	152000	8000.0	0.0	16000.0	0.0	0.0	0.0	
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Max	448000	1560000	176000	1760000	280000	40000.0	0.0	1760000	
Agriculture	Mean	47287.8	1434.0	14166.9	3336.4	104227	0.0	820.3	23562.2	<.0001#
	Median	18400.0	0.0	0.0	0.0	50400.0	0.0	0.0	0.0	
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Max	280000	72000.0	108000	24000.0	600000	0.0	30000.0	600000	
Other	Mean	60229.3	92879.2	67147.2	35550.9	51534.2	10803.6	49664.5	59393.5	0.2959#
	Median	24000.0	600.0	36000.0	6300.0	9000.0	0.0	19400.0	14520.0	
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Max	660000	1296000	168000	180000	320000	76600.0	512000	1296000	
All livelihoods	Mean	237893	314611	150781	200183	237955	92750.9	107757	204165	<.0001#
	Median	216400	240000	157600	122100	200000	76800.0	78600.0	152000	
	Min	15600.0	44000.0	0.0	0.0	0.0	4800.0	10200.0	0.0	
	Max	1108000	1560000	441304	1760000	760000	241500	528000	1760000	

Note:*ANOVA, **Includes fisheries, harvesting, and aquaculture

Table 63 - Survey Q11.Mean total household annual income (in Thai baht) by sector (only households participating in sector)

Sector		Community (Baan)								
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value*
All fisheries	Mean	79252.6	84500.0	77800.0	75783.3	89333.3	77401.8	65453.6	73289.8	0.9582#
	Median	60000.0	87500.0	30000.0	79200.0	24000.0	61520.0	44000.0	48000.0	
	Min	1600.0	16000.0	800.0	2400.0	4000.0	4800.0	10400.0	800.0	
	Max	240000	148000	288800	160000	400000	223500	330000	400000	
	n(missing)	19(22)	10(43)	6(9)	18(4)	6(25)	11(0)	56(8)	126(111)	
Tourism	Mean	147677	251879	63911.1	312057	125750	25000.0	.	189243	0.0894#
	Median	142400	200000	28000.0	60000.0	130000	25000.0	.	140000	
	Min	28000.0	12000.0	1200.0	3600.0	16000.0	10000.0	.	1200.0	
	Max	448000	1560000	176000	1760000	280000	40000.0	.	1760000	
	n(missing)	26(15)	43(10)	9(6)	7(15)	16(15)	2(9)	0(64)	103(134)	
Agriculture	Mean	77552.0	38000.0	70834.7	10485.7	146865	.	10500.0	87253.8	0.0190#
	Median	68000.0	38000.0	96000.0	10000.0	90000.0	.	6000.0	51000.0	
	Min	1200.0	4000.0	8504.0	2000.0	6000.0	.	1500.0	1200.0	
	Max	280000	72000.0	108000	24000.0	600000	.	30000.0	600000	
	n(missing)	25(16)	2(51)	3(12)	7(15)	22(9)	0(11)	5(59)	64(173)	
Other	Mean	94976.9	182319	91564.4	52141.3	93974.1	29710.0	72239.3	97751.8	0.0343#
	Median	72000.0	120000	97008.0	30000.0	60000.0	21000.0	48000.0	59120.0	
	Min	1200.0	600.0	22200.0	720.0	3600.0	240.0	288.0	240.0	
	Max	660000	1296000	168000	180000	320000	76600.0	512000	1296000	
	n(missing)	26(15)	27(26)	11(4)	15(7)	17(14)	4(7)	44(20)	144(93)	
All livelihoods	Mean	237893	314611	161551	209715	245887	92750.9	107757	206782	<.0001#
	Median	216400	240000	158800	131000	202500	76800.0	78600.0	153600	
	Min	15600.0	44000.0	22200.0	48800.0	12000.0	4800.0	10200.0	4800.0	
	Max	1108000	1560000	441304	1760000	760000	241500	528000	1760000	
	n(missing)	41(0)	53(0)	14(1)	21(1)	30(1)	11(0)	64(0)	234(3)	

Note:*ANOVA, **Includes fisheries, harvesting, and aquaculture

Table 64 – Survey Q12.What is the household's most important livelihood in terms of income?

Livelihood Sector # (%) of interviewees	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Fisheries	4 (9.8)	5 (9.4)	1 (6.7)	15 (68.2)	3 (9.7)	9 (81.8)	47 (73.4)	84 (35.4)	<0.001~
Tourism	14 (34.1)	21 (39.6)	6 (40.0)	3 (13.6)	10 (32.3)	0 (0.0)	0 (0.0)	54 (22.8)	
Agriculture & Plantations	15 (36.6)	0 (0.0)	1 (6.7)	0 (0.0)	12 (38.7)	0 (0.0)	0 (0.0)	28 (11.8)	
Other (govt, store, recylcing,vocational, constr)	4 (9.8)	23 (43.4)	4 (26.7)	2 (9.1)	5 (16.1)	2 (18.2)	7 (10.9)	47 (19.8)	
Subsistence	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.1)	2 (0.8)	
Student or unemployed	2 (4.9)	4 (7.5)	3 (20.0)	1 (4.5)	1 (3.2)	0 (0.0)	6 (9.4)	17 (7.2)	
missing or not specified	2 (4.9)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	2 (3.1)	5 (2.1)	

Note: Livelihoods from survey list were reclassified into the above categories.

Table 65 – Survey Q13.If you were unable to make a living from main livelihood what would you do?

Options # (%) of interviewees	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Stay in the community to work	36 (87.8)	33 (62.3)	10 (66.7)	12 (54.5)	18 (58.1)	6 (54.5)	24 (37.5)	139 (58.6)	<0.001~
Move somewhere else permanently to work	1 (2.4)	5 (9.4)	1 (6.7)	5 (22.7)	6 (19.4)	0 (0.0)	3 (4.7)	21 (8.9)	
Migrate somewhere else to work but come back to the community	3 (7.3)	15 (28.3)	4 (26.7)	5 (22.7)	7 (22.6)	5 (45.5)	37 (57.8)	76 (32.1)	
No response (99)	1 (2.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	

Table 66 – Survey Q14.If you were unable to make a living and stayed in the community, what would you do to make a living?

Responses # (%) of interviewees	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Stay doing the same thing and hope it gets better	6 (14.6)	7 (13.2)	3 (20.0)	2 (9.1)	7 (22.6)	3 (27.3)	15 (23.4)	43 (18.1)	<0.001~
Primarily a fisher, would move to another type of work	2 (4.9)	1 (1.9)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	0 (0.0)	5 (2.1)	
Not primarily a fisher, would increase involvement with fisheries	4 (9.8)	6 (11.3)	1 (6.7)	2 (9.1)	0 (0.0)	0 (0.0)	1 (1.6)	14 (5.9)	
Depend more on non-fisheries livelihood options. Please specify	17 (41.5)	25 (47.2)	4 (26.7)	3 (13.6)	9 (29.0)	1 (9.1)	6 (9.4)	65 (27.4)	
I do not know	8 (19.5)	2 (3.8)	0 (0.0)	2 (9.1)	1 (3.2)	1 (9.1)	1 (1.6)	15 (6.3)	
No response (99)*	4 (9.8)	12 (22.6)	7 (46.7)	12 (54.5)	14 (45.2)	5 (45.5)	41 (64.1)	95 (40.1)	

Note:*Participants who indicated they would move elsewhere in Survey Q13 were not asked to respond to this question.

Table 67 – Survey Q15.How many different occupations have you (interviewee) had in the past 10 years?

Indicator # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
none	1 (2)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	4 (6)	6 (3)	0.0057~
1-2	21 (51)	34 (64)	4 (27)	13 (59)	14 (45)	8 (73)	48 (75)	142 (60)	
3 or more	19 (46)	18 (34)	11 (73)	9 (41)	17 (55)	3 (27)	12 (19)	89 (38)	
Mean # of different occupations in past 10 years	2.5	2.2	3.2	2.5	2.8	2.0	1.7	2.3	<0.001#*

Note:*ANOVA

Table 68 – Survey Q16.How many family members from this house are currently living and working away from the area?

Indicator # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
none	30 (73)	33 (62)	8 (53)	17 (77)	20 (65)	4 (36)	42 (66)	154 (65)	0.5187~
1	9 (22)	11 (21)	4 (27)	3 (14)	5 (16)	6 (55)	14 (22)	52 (22)	
2	1 (2)	3 (6)	2 (13)	2 (9)	4 (13)	1 (9)	5 (8)	18 (8)	
3	1 (2)	3 (6)	1 (7)	0 (0)	1 (3)	0 (0)	3 (5)	9 (4)	
4	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	1 (0)	
5 or more	0 (0)	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	

Table 69 – Survey Q17.Do family members who live elsewhere send money back home? (ie, remittances)

Responses # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Yes	8 (19.5)	8 (15.1)	4 (26.7)	2 (9.1)	3 (9.7)	5 (45.5)	17 (26.6)	47 (19.8)	0.090~
No	33 (80.5)	45 (84.9)	11 (73.3)	19 (86.4)	28 (90.3)	6 (54.5)	47 (73.4)	189 (79.7)	
No response (99)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	

Table 70 – Survey Q18.Approximately how much money is sent home each month in baht?

Remittances (Thai baht)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Mean*	5871.4	3000.0	5900.0	1336.7	2333.3	2300.0	2558.8	3361.1	0.2999#
n	7	6	5	3	3	5	17	46	
missing	34	47	10	19	28	6	47	191	

Note: *Households that indicated yes to previous question.

Table 71 – Survey Q19.How many family members are currently attending secondary or post-secondary school away from the area?

Indicator	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
none	36 (88)	33 (62)	12 (80)	21 (95)	24 (77)	10 (91)	59 (92)	195 (82)	0.0170~
1	4 (10)	9 (17)	0 (0)	1 (5)	6 (19)	0 (0)	3 (5)	23 (10)	
2	1 (2)	7 (13)	2 (13)	0 (0)	1 (3)	1 (9)	2 (3)	14 (6)	
3	0 (0)	2 (4)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	
NR	0	2	0	0	0	0	0	2	

Table 72 – Survey Q20.How would you rate household income as compared to living expenses?

Responses # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
income less than expenses-usually not enough to make a living	17 (41.5)	19 (35.8)	4 (26.7)	11 (50.0)	10 (32.3)	5 (45.5)	23 (35.9)	89 (37.6)	0.643~
income equal to expenses-usually, just enough to make a living	14 (34.1)	21 (39.6)	5 (33.3)	5 (22.7)	11 (35.5)	3 (27.3)	32 (50.0)	91 (38.4)	
income greater than expenses-usually have some money left to save or spend	10 (24.4)	12 (22.6)	6 (40.0)	6 (27.3)	10 (32.3)	3 (27.3)	9 (14.1)	56 (23.6)	
No response (99)	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	

Table 73 - Survey Q21 & Q22.Access to sources of credit, which sources, and total sources of credit

Responses # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Yes	35 (85.4)	49 (92.5)	11 (73.3)	22 (100.0)	31 (100.0)	8 (72.7)	52 (81.3)	208 (87.8)	0.008~
Middleman or boss	12 (29.3)	14 (26.4)	3 (20.0)	13 (59.1)	3 (9.7)	3 (27.3)	26 (40.6)	74 (31.2)	<0.001~
Informal loans from business person	13 (31.7)	18 (34.0)	1 (6.7)	5 (22.7)	8 (25.8)	0 (0.0)	4 (6.3)	49 (20.7)	0.001~
Community trust or revolving fund	21 (51.2)	15 (28.3)	7 (46.7)	12 (54.5)	22 (71.0)	0 (0.0)	17 (26.6)	94 (39.7)	<0.001~
Vocational group or community savings group	20 (48.8)	13 (24.5)	1 (6.7)	4 (18.2)	20 (64.5)	0 (0.0)	12 (18.8)	70 (29.5)	<0.001~
Bank loans	28 (68.3)	41 (77.4)	5 (33.3)	3 (13.6)	19 (61.3)	0 (0.0)	7 (10.9)	103 (43.5)	<0.001~
Family members in community	23 (56.1)	36 (67.9)	3 (20.0)	11 (50.0)	13 (41.9)	8 (72.7)	39 (60.9)	133 (56.1)	<0.001~
Family members outside community	11 (26.8)	15 (28.3)	8 (53.3)	9 (40.9)	13 (41.9)	3 (27.3)	9 (14.1)	68 (28.7)	0.003~
Credit card	4 (9.8)	7 (13.2)	0 (0.0)	0 (0.0)	2 (6.5)	0 (0.0)	0 (0.0)	13 (5.5)	0.006~
Other	6 (14.6)	3 (5.7)	0 (0.0)	3 (13.6)	1 (3.2)	0 (0.0)	1 (1.6)	14 (5.9)	0.010~
Mean # of sources of credit for households	3.4	3.1	1.9	2.7	3.3	1.3	1.8	2.6	<0.001#*

Note: *ANOVA

Table 74 - Survey Q23 &24.Mean household debt, savings, and ratio of debt/savings/income

Indicator		Community (Baan)								
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Household debt in Thai baht	Mean	98413.3	149552	130600	41727.3	229707	2018.2	3858.6	93499.5	0.0169#
	Median	50000.0	45000.0	0.0	9000.0	30000.0	0.0	0.0	6000.0	
Household savings in Thai baht	Mean	44516.1	32340.9	37785.7	20388.9	126296	1654.5	4718.2	36147.8	<.0001#
	Median	0.0	0.0	5000.0	0.0	30000.0	200.0	0.0	0.0	
Debt to savings ratio	mean	1.5	2.1	0.8	0.1	2.3	0.7	9.8	3.0	0.7305#
	median	0.6	1.7	0.0	0.0	0.4	0.0	0.0	0.2	
Income to debt ratio	mean	8.8	5.7	3.6	6.7	7.9	287.6	15.0	15.2	<.0001#
	median	2.5	3.1	2.8	5.2	3.6	120.8	9.9	4.6	
Income to savings ratio	mean	6.1	10.6	8.2	9.1	2.9	99.3	105.8	31.8	0.2435#
	median	4.6	4.2	4.1	4.4	1.3	54.5	10.8	4.8	

Table 75 – Survey Q25.Observed and estimated proximity of house to the ocean (high tide)

Distance from ocean # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
On wooden stilts above the ocean (highest tide)	0 (0.0)	23 (43.4)	0 (0.0)	3 (13.6)	2 (6.5)	3 (27.3)	23 (35.9)	54 (22.8)	<0.001~
On concrete stilts above the ocean (highest tide)	0 (0.0)	29 (54.7)	0 (0.0)	0 (0.0)	0 (0.0)	3 (27.3)	8 (12.5)	40 (16.9)	
On the ocean but within a sheltered canal	1 (2.4)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.8)	
Within 50 meters of the ocean (highest tide)	3 (7.3)	0 (0.0)	0 (0.0)	7 (31.8)	8 (25.8)	4 (36.4)	13 (20.3)	35 (14.8)	
Within 100 meters of the ocean (highest tide)	4 (9.8)	0 (0.0)	0 (0.0)	6 (27.3)	5 (16.1)	1 (9.1)	15 (23.4)	31 (13.1)	
Further than 100 meters from the ocean (highest tide)	25 (61.0)	0 (0.0)	15 (100.0)	6 (27.3)	15 (48.4)	0 (0.0)	5 (7.8)	66 (27.8)	
On a hill farther away from the ocean	8 (19.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.2)	0 (0.0)	0 (0.0)	9 (3.8)	

Table 76 – Survey Q26.Observed classification of the house

Classification # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Made from thatch or bamboo	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	5 (7.8)	6 (2.5)	<0.001~
Made from other non-permanent materials	0 (0.0)	0 (0.0)	0 (0.0)	2 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.8)	
Wooden house	17 (41.5)	28 (52.8)	0 (0.0)	5 (22.7)	4 (12.9)	5 (45.5)	39 (60.9)	98 (41.4)	
Made from a combination of concrete and wood	8 (19.5)	19 (35.8)	5 (33.3)	5 (22.7)	22 (71.0)	6 (54.5)	10 (15.6)	75 (31.6)	
Made from cement	16 (39.0)	6 (11.3)	10 (66.7)	9 (40.9)	5 (16.1)	0 (0.0)	10 (15.6)	56 (23.6)	

Table 77 - Survey Q27.Which of the following appliances does the household possess?

Appliances # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Clay stove	21 (51.2)	32 (60.4)	11 (73.3)	18 (81.8)	25 (80.6)	10 (90.9)	57 (89.1)	174 (73.4)	0.001~
Gas stove	41 (100.0)	53 (100.0)	15 (100.0)	21 (95.5)	24 (77.4)	2 (18.2)	36 (56.3)	192 (81.0)	<0.001~
Fridge	41 (100.0)	37 (69.8)	1 (6.7)	3 (13.6)	8 (25.8)	0 (0.0)	0 (0.0)	90 (38.0)	<0.001~
Television	41 (100.0)	52 (98.1)	10 (66.7)	18 (81.8)	21 (67.7)	8 (72.7)	46 (71.9)	196 (82.7)	<0.001~
Radio	18 (43.9)	19 (35.8)	11 (73.3)	16 (72.7)	25 (80.6)	4 (36.4)	27 (42.2)	120 (50.6)	0.002~
Cell phone	40 (97.6)	52 (98.1)	13 (86.7)	21 (95.5)	28 (90.3)	8 (72.7)	60 (93.8)	222 (93.7)	0.122~
Computer	11 (26.8)	14 (26.4)	1 (6.7)	4 (18.2)	9 (29.0)	0 (0.0)	1 (1.6)	40 (16.9)	0.007~
Air conditioner	2 (4.9)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.3)	0.622~
Mean # of household assets	5.2	4.9	4.1	4.6	4.5	2.9	3.5	4.4	<0.001#*

Note:*ANOVA

Table 78 – Survey Q28 & 29. Mean number of boats and land-based vehicles owned by households

Question		Community (Baan)								
	#	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
# of boats owned by household	mean	0.7	0.7	0.5	1.2	0.8	0.5	0.8	0.8	0.1254#
	median	1.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	
# of land vehicles owned by household	mean	2.9	0.9	0.9	1.4	1.8	0.0	0.2	1.2	<.0001#
	median	3.0	0.0	1.0	1.0	2.0	0.0	0.0	1.0	
# of motorcycles owned by household	mean	2.4	0.5	0.7	1.0	1.4	0.0	0.2	0.9	<.0001#
	median	2.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	

Table 79 - Survey Q30 & Q31.Ownership of house and land by people in the household or extended family?

House Ownership # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Own house and land	40 (97.6)	51 (96.2)	0 (0.0)	9 (40.9)	28 (90.3)	2 (18.2)	30 (46.9)	160 (67.5)	<0.001~
Own house but not land	0 (0.0)	0 (0.0)	14 (93.3)	10 (45.5)	2 (6.5)	9 (81.8)	32 (50.0)	67 (28.3)	
Own neither	0 (0.0)	2 (3.8)	1 (6.7)	3 (13.6)	1 (3.2)	0 (0.0)	2 (3.1)	9 (3.8)	

Table 80 - Survey Q32 & Q33.Household ownership of land for livelihoods

Land Ownership # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Yes	28 (68.3)	22 (41.5)	8 (53.3)	12 (54.5)	27 (87.1)	4 (36.4)	23 (35.9)	124 (52.3)	<0.001~
Land suitable for agriculture	19 (46.3)	2 (3.8)	7 (46.7)	6 (27.3)	19 (61.3)	4 (36.4)	16 (25.0)	73 (30.8)	<0.001~
Land suitable for plantations	27 (65.9)	9 (17.0)	3 (20.0)	9 (40.9)	26 (83.9)	1 (9.1)	19 (29.7)	94 (39.7)	<0.001~
Land suitable for tourism	10 (24.4)	9 (17.0)	7 (46.7)	3 (13.6)	20 (64.5)	0 (0.0)	4 (6.3)	53 (22.4)	<0.001~
Land suitable for other	0 (0.0)	3 (5.7)	1 (6.7)	0 (0.0)	4 (12.9)	0 (0.0)	0 (0.0)	8 (3.4)	<0.001~

Table 81 – Survey Q34.If own agricultural land, how many rai* do you own?

Number of rai*	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
mean	11.7	4.3	39.5	21.9	51.1	4.0	9.2	20.9	<.0001#
median	8.5	1.0	18.5	10.0	48.0	4.0	7.0	10.0	
min-max	0.3-70.0	0.1-20.0	1.8-109.0	0.8-90.0	1.0-150.0	3.0-5.0	0.0-27.0	0.0-150.0	
n	32	25	8	14	29	2	25	135	
missing	9	28	7	8	2	9	39	102	

Note:*1 thai rai = 0.4 acres or 0.16 hectares; only houses indicating that they owned agricultural land

Table 82 – Survey Q35 & Q36 & Q37.Mean total number of local, national, and foreign migrant laborers working for household

Number of laborers	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
mean	0.7	2.6	0.1	0.8	2.5	0.0	0.5	1.2	0.566#
median	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	
Min-max	0.0-6.0	0.0-104.0	0.0-1.0	0.0-8.0	0.0-10.0	0.0-0.0	0.0-20.0	0.0-104.0	
none	29 (71)	38 (72)	14 (93)	16 (73)	9 (29)	11 (100)	59 (92)	176 (74)	<.0001~*
1-3	9 (22)	12 (23)	1 (7)	5 (23)	10 (32)	0 (0)	3 (5)	40 (17)	
4-6	3 (7)	0 (0)	0 (0)	0 (0)	10 (32)	0 (0)	1 (2)	14 (6)	
7 to 9	0 (0)	2 (4)	0 (0)	1 (5)	1 (3)	0 (0)	0 (0)	4 (2)	
10 or more	0 (0)	1 (2)	0 (0)	0 (0)	1 (3)	0 (0)	1 (2)	3 (1)	

Note:*Chi-square

Table 83 – Survey Q38.Please specify how many domestic and migrant labourers work in each of the following sectors.

Sector		Source of Labour			
	# of Laborers	Local	Thailand	Migrants	All
Fishing	Mean	0.1	0.0	0.0	0.1
	Max	20*	0	2	20*
Agriculture	Mean	0.1	0.0	0.3	0.4
	Max	4	2	10**	10**
Tourism	Mean	0.4	0.1	0.1	0.6
	Max	80***	10***	14***	104***
Other	Mean	0.1	0.0	0.0	0.0
	Max	6.0	0	2.0	6.0
All	Mean	-	-	-	1.2
	Max	80	10	14	104

Notes: *Koh Sin Hi, **Koh Chang, ***Koh Panyee

Table 84 – Survey Q39. Which of the following fishing gears does your household own?

Gear type # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
None	10 (24.4)	20 (37.7)	3 (20.0)	1 (4.5)	7 (22.6)	0 (0.0)	11 (17.2)	52 (21.9)	0.016~
Crab net	8 (19.5)	11 (20.8)	2 (13.3)	6 (27.3)	3 (9.7)	5 (45.5)	8 (12.5)	43 (18.1)	0.060~
Shrimp net	12 (29.3)	6 (11.3)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	21 (32.8)	40 (16.9)	<0.001~
Fish net	12 (29.3)	9 (17.0)	5 (33.3)	11 (50.0)	8 (25.8)	3 (27.3)	37 (57.8)	85 (35.9)	<0.001~
Surrounding net for anchovy	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0.345~
Mud or mangrove crab trap	1 (2.4)	4 (7.5)	2 (13.3)	1 (4.5)	1 (3.2)	0 (0.0)	0 (0.0)	9 (3.8)	0.099~
Swimming crab trap	4 (9.8)	4 (7.5)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	9 (3.8)	0.060~
Squid trap	2 (4.9)	0 (0.0)	0 (0.0)	6 (27.3)	1 (3.2)	0 (0.0)	0 (0.0)	9 (3.8)	<0.001~
Small fish traps	1 (2.4)	10 (18.9)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	13 (5.5)	<0.001~
Large fish traps	6 (14.6)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	8 (3.4)	0.003~
Set bag or stow net*	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0.345~
Push nets for shrimp	0 (0.0)	1 (1.9)	2 (13.3)	5 (22.7)	0 (0.0)	0 (0.0)	1 (1.6)	9 (3.8)	<0.001~
Bottom trawl*	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.130~
Bag net trawl	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	3 (4.7)	5 (2.1)	0.319~
Line and hooks	0 (0.0)	2 (3.8)	1 (6.7)	2 (9.1)	0 (0.0)	0 (0.0)	3 (4.7)	8 (3.4)	0.197~
Pole line and hooks	20 (48.8)	22 (41.5)	9 (60.0)	10 (45.5)	20 (64.5)	1 (9.1)	21 (32.8)	103 (43.5)	0.021~
Hand held scoop net for jellyfish	2 (4.9)	5 (9.4)	2 (13.3)	13 (59.1)	5 (16.1)	5 (45.5)	35 (54.7)	67 (28.3)	<0.001~
Hand held shell dredge*	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	1 (3.2)	1 (9.1)	3 (4.7)	6 (2.5)	0.168~
Boat towed shell dredge*	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.130~
Bamboo stake trap*	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0.345~
Bay closing net*	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	0.345~
Casting net	5 (12.2)	5 (9.4)	1 (6.7)	1 (4.5)	5 (16.1)	1 (9.1)	1 (1.6)	19 (8.0)	0.135~
Shrimp spear	5 (12.2)	3 (5.7)	5 (33.3)	8 (36.4)	0 (0.0)	1 (9.1)	2 (3.1)	24 (10.1)	<0.001~
Mask and generator	0 (0.0)	1 (1.9)	0 (0.0)	2 (9.1)	1 (3.2)	2 (18.2)	0 (0.0)	6 (2.5)	0.005~
Hand tools for shells	16 (39.0)	6 (11.3)	3 (20.0)	8 (36.4)	7 (22.6)	9 (81.8)	18 (28.1)	67 (28.3)	<0.001~
Other	3 (7.3)	0 (0.0)	4 (26.7)	4 (18.2)	1 (3.2)	3 (27.3)	1 (1.6)	16 (6.8)	<0.001~
Total number of gears	97	95	37	80	53	34	156	552	

Note: *these fishing gears are illegal

Table 85 - Survey Q39.Household mean number of fishing gears possessed

Numbers of gears possessed	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
mean	2.9	1.9	2.9	4.1	1.8	2.8	2.7	2.6	0.0059#
median	2.0	1.0	2.0	4.0	2.0	2.0	3.0	2.0	
min-max	0.0-12.0	0.0-12.0	0.0-11.0	0.0-8.0	0.0-6.0	1.0-5.0	0.0-6.0	0.0-12.0	
none	9 (22)	20 (38)	2 (13)	1 (5)	7 (23)	0 (0)	10 (16)	49 (21)	0.0005~
1-3	17 (41)	22 (42)	8 (53)	8 (36)	21 (68)	7 (64)	33 (52)	116 (49)	
4-6	12 (29)	6 (11)	3 (20)	9 (41)	3 (10)	4 (36)	21 (33)	58 (24)	
7 to 9	1 (2)	4 (8)	1 (7)	4 (18)	0 (0)	0 (0)	0 (0)	10 (4)	
10 or more	2 (5)	1 (2)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	4 (2)	

Table 86 – Survey Q40.How many nights a week does your household eat fish or seafood for dinner?

# of nights per week eating seafood (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
None	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	<0.001~
1-2 nights a week	0 (0.0)	1 (1.9)	3 (20.0)	1 (4.5)	2 (6.5)	1 (9.1)	1 (1.6)	9 (3.8)	
3-4 nights a week	4 (9.8)	3 (5.7)	3 (20.0)	9 (40.9)	10 (32.3)	3 (27.3)	16 (25.0)	48 (20.3)	
5-6 nights a week	4 (9.8)	3 (5.7)	2 (13.3)	5 (22.7)	6 (19.4)	1 (9.1)	7 (10.9)	28 (11.8)	
7 nights a week	32 (78.0)	46 (86.8)	5 (33.3)	5 (22.7)	12 (38.7)	6 (54.5)	37 (57.8)	143 (60.3)	
No response (99)	1 (2.4)	0 (0.0)	1 (6.7)	2 (9.1)	1 (3.2)	0 (0.0)	3 (4.7)	8 (3.4)	

Table 87 – Survey Q41.Which of the following marine resources does your household rely on for household use or for sale?

Marine Resource # (%)	Community								
	Use	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites
Mangrove wood for building or making stuff (e.g., fish traps)	Sale	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)
	HH	6 (14.6)	14 (26.4)	3 (20.0)	10 (45.5)	5 (16.1)	2 (18.2)	8 (12.5)	48 (20.3)
Mangrove wood for charcoal or firewood	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	0 (0.0)	0 (0.0)	0 (0.0)	2 (9.1)	0 (0.0)	1 (9.1)	2 (3.1)	5 (2.1)
Anchovies	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	5 (12.2)	1 (1.9)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	2 (3.1)	10 (4.2)
Mackerel	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	1 (0.4)
	HH	12 (29.3)	7 (13.2)	1 (6.7)	5 (22.7)	9 (29.0)	5 (45.5)	34 (53.1)	73 (30.8)
Jack Fish	Sale	0 (0.0)	1 (1.9)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.1)	4 (1.7)
	HH	13 (31.7)	4 (7.5)	3 (20.0)	13 (59.1)	15 (48.4)	2 (18.2)	17 (26.6)	67 (28.3)
Sardinellas	Sale	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	2 (0.8)
	HH	11 (26.8)	4 (7.5)	1 (6.7)	4 (18.2)	13 (41.9)	3 (27.3)	25 (39.1)	61 (25.7)
Parrotfish, Rabbitfish, or Surgeonfish	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	1 (0.4)
	HH	10 (24.4)	9 (17.0)	4 (26.7)	14 (63.6)	8 (25.8)	2 (18.2)	9 (14.1)	56 (23.6)
Butterfly Fish	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	1 (2.4)	1 (1.9)	1 (6.7)	2 (9.1)	1 (3.2)	1 (9.1)	1 (1.6)	8 (3.4)
Grouper	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (7.8)	5 (2.1)
	HH	22 (53.7)	18 (34.0)	5 (33.3)	14 (63.6)	21 (67.7)	8 (72.7)	17 (26.6)	105 (44.3)
Snapper	Sale	0 (0.0)	1 (1.9)	1 (6.7)	0 (0.0)	1 (3.2)	0 (0.0)	4 (6.3)	7 (3.0)
	HH	13 (31.7)	18 (34.0)	5 (33.3)	10 (45.5)	13 (41.9)	3 (27.3)	15 (23.4)	77 (32.5)
Reef shark	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	8 (12.5)	9 (3.8)
	HH	2 (4.9)	2 (3.8)	3 (20.0)	2 (9.1)	8 (25.8)	2 (18.2)	3 (4.7)	22 (9.3)
Rays	Sale	2 (4.9)	1 (1.9)	1 (6.7)	0 (0.0)	1 (3.2)	0 (0.0)	5 (7.8)	10 (4.2)
	HH	8 (19.5)	9 (17.0)	3 (20.0)	7 (31.8)	15 (48.4)	6 (54.5)	15 (23.4)	63 (26.6)
Krill	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	7 (17.1)	2 (3.8)	2 (13.3)	9 (40.9)	0 (0.0)	0 (0.0)	5 (7.8)	25

Marine Resource # (%)	Use	Community							
		Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites
									(10.5)
Shrimp	Sale	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	4 (6.3)	5 (2.1)
	HH	10 (24.4)	12 (22.6)	3 (20.0)	6 (27.3)	9 (29.0)	5 (45.5)	32 (50.0)	77 (32.5)
Squid	Sale	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	2 (0.8)
	HH	9 (22.0)	3 (5.7)	1 (6.7)	9 (40.9)	14 (45.2)	0 (0.0)	26 (40.6)	62 (26.2)
Cuttle Fish	Sale	0 (0.0)	0 (0.0)	1 (6.7)	1 (4.5)	1 (3.2)	1 (9.1)	1 (1.6)	5 (2.1)
	HH	10 (24.4)	4 (7.5)	2 (13.3)	13 (59.1)	6 (19.4)	5 (45.5)	17 (26.6)	57 (24.1)
Trash Fish	Sale	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (12.5)	9 (3.8)
	HH	4 (9.8)	5 (9.4)	0 (0.0)	2 (9.1)	1 (3.2)	2 (18.2)	9 (14.1)	23 (9.7)
Mud or Mangrove Crabs	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	8 (19.5)	7 (13.2)	7 (46.7)	10 (45.5)	2 (6.5)	1 (9.1)	2 (3.1)	37 (15.6)
Deep Sea Crabs (e.g., Blue or Star Crab)	Sale	0 (0.0)	1 (1.9)	1 (6.7)	1 (4.5)	0 (0.0)	0 (0.0)	1 (1.6)	4 (1.7)
	HH	12 (29.3)	10 (18.9)	2 (13.3)	9 (40.9)	7 (22.6)	7 (63.6)	30 (46.9)	77 (32.5)
Sea cucumbers	Sale	0 (0.0)	1 (1.9)	1 (6.7)	1 (4.5)	0 (0.0)	4 (36.4)	0 (0.0)	7 (3.0)
	HH	2 (4.9)	0 (0.0)	1 (6.7)	6 (27.3)	0 (0.0)	2 (18.2)	1 (1.6)	12 (5.1)
Conch	Sale	0 (0.0)	0 (0.0)	2 (13.3)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.7)	5 (2.1)
	HH	6 (14.6)	2 (3.8)	7 (46.7)	19 (86.4)	2 (6.5)	7 (63.6)	23 (35.9)	66 (27.8)
Shellfish from mangrove areas	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	11 (26.8)	13 (24.5)	8 (53.3)	11 (50.0)	17 (54.8)	7 (63.6)	23 (35.9)	90 (38.0)
Shellfish from seagrass areas	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.1)	2 (0.8)
	HH	8 (19.5)	0 (0.0)	6 (40.0)	9 (40.9)	2 (6.5)	1 (9.1)	15 (23.4)	41 (17.3)
Shellfish from rocky or reef areas	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.1)	2 (0.8)
	HH	23 (56.1)	12 (22.6)	3 (20.0)	8 (36.4)	14 (45.2)	10 (90.9)	33 (51.6)	103 (43.5)
Shells or coral reef products for household decoration or tourists	Sale	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	2 (0.8)
	HH	2 (4.9)	2 (3.8)	2 (13.3)	2 (9.1)	8 (25.8)	0 (0.0)	1 (1.6)	17 (7.2)
Coral reefs for recreation or tourism (snorkeling or scuba)	Sale	4 (9.8)	0 (0.0)	1 (6.7)	0 (0.0)	1 (3.2)	0 (0.0)	0 (0.0)	6 (2.5)
	HH	5 (12.2)	4 (7.5)	4 (26.7)	4 (18.2)	7 (22.6)	1 (9.1)	5 (7.8)	30 (12.7)
Sandy beaches or beach dunes for recreation or tourism	Sale	1 (2.4)	5 (9.4)	2 (13.3)	0 (0.0)	2 (6.5)	0 (0.0)	0 (0.0)	10 (4.2)
	HH	23 (56.1)	19 (35.8)	8 (53.3)	9 (40.9)	21 (67.7)	4 (36.4)	30 (46.9)	114 (48.1)
Rocky islands or formations for recreation or tourism	Sale	3 (7.3)	5 (9.4)	2 (13.3)	0 (0.0)	1 (3.2)	0 (0.0)	0 (0.0)	11 (4.6)
	HH	15 (36.6)	20 (37.7)	7 (46.7)	10 (45.5)	18 (58.1)	4 (36.4)	21 (32.8)	95 (40.1)
Island plant species for collecting for medicinal or decorative purposes	Sale	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)
	HH	19 (46.3)	7 (13.2)	11 (73.3)	12 (54.5)	18 (58.1)	4 (36.4)	32 (50.0)	103 (43.5)
Island forests, island swamps or wetlands, or savannah areas for recreation or tourism	Sale	2 (4.9)	0 (0.0)	2 (13.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.7)
	HH	5 (12.2)	4 (7.5)	8 (53.3)	12 (54.5)	14 (45.2)	3 (27.3)	9 (14.1)	55 (23.2)
Island wildlife for eating or pets	Sale	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	HH	1 (2.4)	3 (5.7)	4 (26.7)	7 (31.8)	0 (0.0)	0 (0.0)	0 (0.0)	15 (6.3)
Island wildlife for recreation or tourism	Sale	2 (4.9)	0 (0.0)	3 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (2.1)
	HH	7 (17.1)	3 (5.7)	3 (20.0)	5 (22.7)	11 (35.5)	0 (0.0)	5 (7.8)	34 (14.3)

Note: Silago (Thai - "pla sai") should have been included in this list

Table 88 - Survey Q41.Reliance on corals, mangroves, seagrass, islands, species, and tourism resources for economic (sale) or subsistence (household) use

Category of Marine Resource** (# in category)	Community (Baan)										
	Use*	# Used	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value
Coral resources (8)	Sale	Mean	0.1	0.0	0.1	0.0	0.1	0.1	0.3	0.1	0.001#
		Max	1.0	1.0	1.0	0.0	1.0	1.0	3.0	3.0	
	HH	Mean	1.9	1.2	1.8	2.5	2.6	2.5	1.3	1.8	<0.001#
		Max	5.0	4.0	7.0	6.0	7.0	5.0	5.0	7.0	
Mangrove resources (4)	Sale	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.133#
		Max	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	
	HH	Mean	0.6	0.6	1.2	1.5	0.8	1.0	0.5	0.8	<0.001#
		Max	3.0	3.0	3.0	4.0	2.0	3.0	2.0	4.0	
Seagrass resources (3)	Sale	Mean	0.0	0.0	0.3	0.0	0.0	0.4	0.0	0.1	<0.001#
		Max	0.0	1.0	2.0	1.0	0.0	1.0	1.0	2.0	
	HH	Mean	0.4	0.0	0.9	1.5	0.1	0.9	0.6	0.5	<0.001#
		Max	3.0	1.0	3.0	3.0	1.0	2.0	2.0	3.0	
Island resources (6)	Sale	Mean	0.2	0.2	0.6	0.0	0.1	0.0	0.0	0.1	<0.001#
		Max	2.0	2.0	3.0	0.0	2.0	0.0	0.0	3.0	
	HH	Mean	1.7	1.1	2.7	2.5	2.6	1.4	1.5	1.8	<0.001#
		Max	5.0	6.0	5.0	5.0	5.0	4.0	5.0	6.0	
Total species (out of 22)	Sale	Mean	0.0	0.1	0.7	0.2	0.1	0.5	0.8	0.3	<0.001#
		Max	1.0	2.0	7.0	2.0	2.0	2.0	6.0	7.0	
	HH	Mean	5.2	2.8	5.0	9.0	6.0	7.5	6.0	5.4	<0.001#
		Max	19.0	14.0	15.0	17.0	13.0	16.0	15.0	19.0	
Tourism and recreation resources (6)	Sale	Mean	0.3	0.2	0.7	0.0	0.1	0.0	0.0	0.2	0.001#
		Max	2.0	2.0	4.0	0.0	3.0	0.0	1.0	4.0	
	HH	Mean	1.4	1.0	2.1	1.9	2.5	1.1	1.1	1.5	<0.001#
		Max	5.0	5.0	4.0	6.0	6.0	4.0	4.0	6.0	
All resources (32)	Sale	Mean	0.3	0.4	1.4	0.3	0.2	0.5	0.8	0.5	0.004#
		Max	2.0	2.0	7.0	2.0	3.0	2.0	6.0	7.0	
	HH	Mean	7.3	4.3	8.5	12.8	9.5	9.5	8.0	7.8	<0.001#
		Max	24.0	19.0	20.0	23.0	19.0	21.0	20.0	24.0	

Notes: *Uses=For Sale (Sale) or Household Use (HH); **Resource categories refer to resources (letters) listed in Survey Q41 - Corals (g, h, I, j, k, x, y, z = 8), Mangroves (a, b, r, v = 4), Seagrass (t, u, w = 3), Islands (aa, bb, cc, dd, ee, ff = 6), Fish or Shellfish Species (c-x inclusive (= 22) and number listed in gg), Tourism and Recreation (y, z, aa, bb, dd, ff = 6), Total Number of Marine Resources (=32)

Table 89 – Survey Q42.In your opinion, are marine resources or the number of fish in the sea:

Responses # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Increasing	1 (2.4)	2 (3.8)	0 (0.0)	1 (4.5)	2 (6.5)	1 (9.1)	0 (0.0)	7 (3.0)	0.016~
Staying the same	2 (4.9)	4 (7.5)	1 (6.7)	5 (22.7)	0 (0.0)	4 (36.4)	4 (6.3)	20 (8.4)	
Declining	38 (92.7)	46 (86.8)	14 (93.3)	15 (68.2)	29 (93.5)	6 (54.5)	60 (93.8)	208 (87.8)	
No response (99)	0 (0.0)	1 (1.9)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.8)	

Table 90 – Survey Q43.In your opinion, what things do you think can cause declines in the number of fish in the sea?

Natural causes	# of mentions*	Anthropogenic causes	# of mentions*
changing weather and storms	20	too many fishers	56
the tsunami	18	commercial boats and trawlers	40
dirty (sediment) water	16	illegal gears – push-nets, set bag nets, small mesh sizes, poison	32
degraded habitats – reefs	11	polluted water	24
sea temperature	10	more population	20
storms	8	fishers taking small and juvenile fish	19
fish go somewhere else	8	advanced/modern gears	16
climate change	4	fishing during spawning season	14
jellyfish	2	anchovy boats	11
more freshwater	1	garbage	9
Degraded habitats - mangroves	1	advanced technology – sonar	6
		increased tourism	6
		open access/outsiders	6
		taking too many fish	5
		taking everything/bycatch	4
		lack of enforcement	2
		bad regulations	1
		spotlight fishers	1
		coastal development	1
Total	**99**	**Total**	**273**

Note: *Answers from open-ended question were coded qualitatively and number of times each theme emerged was counted; total surveys=237

Table 91 – Survey Q44.In your opinion, what actions do you think would be effective to conserve or increase the number of fish in the sea? Anything else?

Action to increase resources	Number of mentions*
Do not know	76
Close area to restrict fishing during spawning season	35
Artificial reefs	25
Can't do anything	21
Restrict commercial boats in inshore waters	20
Better of enforcement of rules (by Department of Fisheries)	17
Protect and/or plant mangroves	15
Size restrictions	13
Area closures (MPAs)	12
Stop using illegal gears	10
Raise and release juveniles	10
Use larger mesh sizes	9
Not collect and eat pregnant ones	8
Manage waste and reduce garbage	7
Protect and stop destroying corals	7
Catch restrictions	5
Restrict anchovy boats	5
Restrict outsiders from fishing in area	5
Fishing gear restrictions	4
Crab banks	4

Action to increase resources	Number of mentions*
Increasing government capacity to manage	4
Reducing oil pollution	3
Temporal closures	3
Up to local leadership	3
Restrict commercial fishing gears - trawlers	3
Government should set rules	2
Protect seagrass areas	2
National parks	2
Increase alternative livelihoods	2
Reduce the number of fishers	2
Limit number of commercial boats	1
Protect against commercial fisheries corruption	1
Fishers should follow rules	1
Preserve marine mammals	1
Reduce sedimentation in the water	1
Manage environmental impacts of tourism	1
Limit anchovy boats	1
Raise awareness of rules	1
Total	**245****

Note: Note: *Answers from open-ended question were coded qualitatively and number of times each theme emerged was counted; **Total number does not include 'don't know' or 'can't do anything' categories; total surveys=237

Table 92 - Survey Q45 & Q46 – Learned about climate change (Y/N) and sources of information about climate change

Sources of climate change information - # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Yes	33 (80.5)	44 (83.0)	13 (86.7)	17 (77.3)	27 (87.1)	6 (54.5)	47 (73.4)	187 (78.9)	0.408~
Newspapers	6 (14.6)	7 (13.2)	2 (13.3)	0 (0.0)	9 (29.0)	0 (0.0)	2 (3.1)	26 (11.0)	0.009~
Radio	10 (24.4)	4 (7.5)	8 (53.3)	9 (40.9)	18 (58.1)	1 (9.1)	31 (48.4)	81 (34.2)	<0.001~
Television	33 (80.5)	41 (77.4)	9 (60.0)	16 (72.7)	22 (71.0)	5 (45.5)	35 (54.7)	161 (67.9)	0.019~
Internet	3 (7.3)	5 (9.4)	1 (6.7)	0 (0.0)	4 (12.9)	0 (0.0)	4 (6.3)	17 (7.2)	0.346~
Visiting NGOs	2 (4.9)	2 (3.8)	0 (0.0)	1 (4.5)	1 (3.2)	0 (0.0)	6 (9.4)	12 (5.1)	0.264~
Fieldtrip or workshop	2 (4.9)	2 (3.8)	1 (6.7)	0 (0.0)	1 (3.2)	0 (0.0)	1 (1.6)	7 (3.0)	0.434~
Community Leaders	7 (17.1)	7 (13.2)	1 (6.7)	3 (13.6)	2 (6.5)	0 (0.0)	7 (10.9)	27 (11.4)	0.323~
Schools and Teachers	2 (4.9)	2 (3.8)	0 (0.0)	0 (0.0)	2 (6.5)	0 (0.0)	5 (7.8)	11 (4.6)	0.298~
Visiting scientists-experts	1 (2.4)	4 (7.5)	1 (6.7)	0 (0.0)	2 (6.5)	0 (0.0)	5 (7.8)	13 (5.5)	0.345~
Friends or family	7 (17.1)	7 (13.2)	4 (26.7)	4 (18.2)	8 (25.8)	0 (0.0)	6 (9.4)	36 (15.2)	0.201~
Government Info	4 (9.8)	4 (7.5)	1 (6.7)	0 (0.0)	3 (9.7)	0 (0.0)	7 (10.9)	19 (8.0)	0.325~
Other	5 (12.2)	13 (24.5)	7 (46.7)	7 (31.8)	9 (29.0)	2 (18.2)	11 (17.2)	54 (22.8)	0.089~
Mean # of sources of climate change information	2.0	1.8	2.3	1.8	2.6	0.7	1.9	2.0	0.083#*

Note: *ANOVA

Table 93 – Survey Q47.What do you think are the current and potential future impacts of climate change on your community and on nature in the region?

Impacts on nature	# of mentions*	Impacts on community	# of mentions*
Changes in rainy and dry season	42	Impacts tourism – less tourism and sales	27
Hotter	25	Cannot take boats out fishing	22
Weather is less predictable	14	Human health, illness and diseases	19
Flooding	12	Hard to work and make a living	16
More rainy	12	More diseases and problems for rubber trees	12
More windy	9	Harder to fish and less fishers	12
Rising sea level	9	Less seafood to catch and eat	11
More storms	8	Impacts on houses – have to fix or move them	9
Higher tides and storm surges	5	Agricultural crops do not grow well	6
Too much rain	5	Impacts on incomes and economics	5
Storms in different seasons	4	Water over pier or boardwalks	5
Tsunamis	4	Cannot tap rubber trees	4
Less fish	3	Less water for agriculture or drinking	
More and bigger waves	3	Increased risk to community	3
Erosion	3	Loss of boats and lives	2
Extreme hot and cold weather	2	Impacts transportation to mainland	2
Losing mangroves	2	Impacts mental health	2
Stronger storms	2	Storms destroy trees in plantations	1
Fish move somewhere else	2	Saltwater in wells	1
Animals migrate somewhere else	2	People lose their land	1
Natural disasters	1	Cannot plan ahead	1
Dead corals	1	Landslides	1
Total	**170**	**Total**	**113**

Note: *Answers from open-ended question were coded qualitatively and number of times each response emerged was counted; total surveys=237; No effect or impact=39 mentions, Don't know=36 mentions

Table 94 - Survey Q48 & Q49.Level and nature of involvement in community organizations

Level and nature of involvement in community organizations	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value*
Mean # of community orgs interviewee belongs to	0.4	0.5	0.5	0.5	1.5	0.2	0.4	0.6	<0.001#
none	25 (61)	40 (75)	10 (67)	15 (68)	13 (42)	9 (82)	44 (69)	156 (66)	0.0284~
1	15 (37)	5 (9)	3 (20)	5 (23)	7 (23)	2 (18)	18 (28)	55 (23)	
2	1 (2)	3 (6)	1 (7)	1 (5)	2 (6)	0 (0)	1 (2)	9 (4)	
3	0 (0)	2 (4)	1 (7)	1 (5)	6 (19)	0 (0)	1 (2)	11 (5)	
4	0 (0)	1 (2)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	2 (1)	
5 or more	0 (0)	1 (2)	0 (0)	0 (0)	2 (6)	0 (0)	0 (0)	3 (1)	
Involvement - Attend meetings and listen	25 (61.0)	30 (56.6)	12 (80.0)	11 (50.0)	24 (77.4)	5 (45.5)	46 (71.9)	153 (64.6)	0.176~
Involvement - Attend meetings and express opinions	9 (22.0)	14 (26.4)	10 (66.7)	5 (22.7)	16 (51.6)	1 (9.1)	27 (42.2)	82 (34.6)	0.017~
Involvement - Active member	10 (24.4)	16 (30.2)	9 (60.0)	7 (31.8)	21 (67.7)	2 (18.2)	30 (46.9)	95 (40.1)	0.006~
Involvement - Member of committee	1 (2.4)	6 (11.3)	4 (26.7)	3 (13.6)	8 (25.8)	0 (0.0)	6 (9.4)	28 (11.8)	0.036~
Involvement -Elected member of leadership	1 (2.4)	4 (7.5)	2 (13.3)	0 (0.0)	5 (16.1)	0 (0.0)	2 (3.1)	14 (5.9)	0.083~
Mean # of ways involved in community orgs	1.1	1.3	2.5	1.2	2.4	0.7	1.7	1.6	<0.001#

Note:*ANOVA and Chi^2 were used as appropriate

Table 95 – Survey Q50.How many organizations outside the community do you belong to?

Number of outside organizations	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (ANOVA)
Mean	0.2	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.210#
none	31 (76)	43 (81)	13 (87)	18 (82)	29 (94)	11 (100)	59 (92)	204 (86)	0.1393~
1	9 (22)	8 (15)	1 (7)	4 (18)	2 (6)	0 (0)	5 (8)	29 (12)	
2	0 (0)	1 (2)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	
NR	1	1	0	0	0	0	0	2	

Table 96 - Q51.In your opinion, how involved are people in your household in decision making at the following levels? (Likert scale: 1-5*)

Governance process	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value ANOVA
Community level governance	3.1	2.8	3.1	3.3	3.1	3.0	3.6	3.2	0.014#
Subdistrict level administration	2.7	2.4	2.1	2.0	2.7	1.0	2.4	2.4	0.005#
District and provincial levels	2.4	2.1	1.7	1.2	2.1	1.4	2.1	2.0	0.024#
Management of natural resources in the community	2.8	3.2	3.3	3.3	3.5	1.4	3.0	3.0	0.002#
Management of national parks	2.2	1.8	1.5	2.1	2.9	1.9	1.8	2.0	0.008#

Note: *Likert scale where 1=Not involved at all; 2=very little involvement; 3=medium level of involvement; 4=high level of involvement; 5=very high level of involvement; 6=don't know (excluded from calculation of mean)

Table 97 – Survey Q52.How much negative impact do the following factors have on household livelihoods? (Likert scale: 1-5)**

Stressor	Community (Baan)							All Sites	p-value*
	Tha Khao	Koh Panyi	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi		
Declines in the price that you can sell fish	2.4	2.6	2.2	3.7	1.8	4.4	3.9	3.0	<0.001#
Extreme weather events such as storms	4.1	3.9	3.3	4.2	3.6	3.4	4.3	4.0	0.023#
Increasing of sediments in the waters	3.4	3.3	2.6	3.2	3.0	3.6	3.1	3.2	0.603#
Overfishing	2.9	2.3	2.4	2.9	2.6	3.9	3.5	2.9	<0.001#
Commercial fishers coming into inshore waters (within 3000 meters)	3.2	1.8	3.3	2.7	3.5	3.0	3.7	3.0	<0.001#
Changes in rainy and dry seasons or changing rainfall patterns	4.0	3.3	3.1	3.7	3.5	3.3	3.3	3.5	0.098#
Increased garbage in the ocean	3.5	4.0	2.9	3.4	3.4	3.4	3.8	3.6	0.054#
Coral bleaching	2.8	1.8	2.5	1.9	3.1	3.1	2.5	2.5	0.007#
Conflict with other small-scale fisheries or fishers	1.6	1.7	1.5	1.5	1.3	2.3	1.9	1.7	0.157#
Increased freshwater in mangrove areas making water less salty	1.7	2.2	2.0	3.0	2.1	2.4	2.5	2.3	0.022#
Exclusion from doing livelihoods in certain areas because of tourism industry	1.7	2.2	1.9	1.6	1.4	1.8	2.0	1.8	0.142#
Nobody wants to buy the product I am selling	3.2	4.4	3.5	3.5	3.1	3.2	2.8	3.4	<0.001#
Trawlers taking or destroying my gears	2.6	2.0	2.0	2.6	1.9	3.6	3.2	2.5	<0.001#
More people moving into the area	2.3	2.4	1.3	2.0	2.2	1.2	2.6	2.3	0.007#
The price of rubber declining	4.0	1.9	1.3	1.1	3.2	1.2	1.8	2.3	<0.001#
Destructive and or illegal fishing practices	2.4	2.1	2.9	2.4	2.4	2.0	2.6	2.4	0.658#
Getting arrested when traveling across the border to fish	1.1	1.1	1.1	1.0	1.3	3.4	2.6	1.6	<0.001#
The rising price of supplies needed to do my livelihoods	3.9	4.3	3.8	3.9	3.9	3.8	4.1	4.0	0.587#
Increasing levels of household debt	3.8	3.1	3.1	3.2	3.2	2.4	2.7	3.1	0.031#
National government policies	2.5	2.6	2.0	2.6	2.5	1.6	2.2	2.4	0.395#
Land encroachment in the area	2.0	2.2	1.7	1.7	1.6	1.3	2.0	1.9	0.346#
The national park	2.5	2.6	3.1	3.1	1.9	1.3	1.8	2.3	<0.001#
Gear or boat being taken when traveling across the border to fish	1.2	1.4	1.3	1.1	1.3	2.4	2.5	1.7	<0.001#
Rising sea levels compared to the past	2.1	2.8	2.4	2.1	2.5	2.4	3.5	2.7	<0.001#
The increasing price of gas	3.9	3.7	3.8	3.8	4.2	4.7	4.4	4.1	0.051#
Conflict within the community	2.0	2.0	1.9	1.7	1.9	1.2	1.8	1.9	0.701#
Landslides	2.2	1.4	1.1	1.0	1.5	1.6	1.8	1.6	0.002#
Conflict with other communities	1.2	1.6	1.3	1.2	1.3	1.4	1.5	1.4	0.432#
The change of national governments	2.4	2.1	2.5	1.8	2.2	1.5	2.2	2.2	0.526#
Salt water coming up in drinking water or agricultural water sources	1.8	1.5	2.3	2.5	2.4	2.1	2.8	2.2	<0.001#
Coastal or beach erosion	2.6	2.2	2.9	2.8	3.5	2.4	3.0	2.8	0.006#
Corruption in Thailand	3.1	2.5	2.6	2.2	2.8	1.6	2.5	2.6	0.175#
Rising cost of living	4.2	4.5	4.0	4.1	3.9	3.9	4.1	4.2	0.367#
Flooding	2.4	3.5	2.7	2.4	2.9	2.2	2.9	2.9	0.028#
More pollution in the ocean	2.9	3.3	2.5	2.9	2.2	2.9	3.0	2.9	0.084#
Health problems of members of your household	.	2.8	2.5	3.1	2.5	2.7	3.0	2.8	0.610#

Note:*ANOVA; **Likert scale where 1=no impact, 2=very little impact, 3=medium level of impact, 4=high level of impact, 5=very high level of impact, 6=don't know (6 excluded from calculation of means)

Table 98 – Survey Q53. How important do you think each of the following factors are in helping your household to overcome obstacles and challenges? (Likert scale: 1-5)**

Institutions and organizations	Community (Baan)							All Sites	p-value*
	Tha Khao	Koh Panyi	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi		
Family and friends in the community	4.0	3.8	4.0	3.8	3.8	3.4	3.7	3.8	0.804#
Family and friends from another community	2.7	2.9	3.3	2.8	2.9	2.3	3.0	2.9	0.566#
Assistance from government agencies or government development programs	3.2	2.8	2.8	2.6	3.0	2.6	2.8	2.9	0.680#
Assistance from Thai NGOs	2.2	2.5	2.8	2.9	1.8	3.9	2.8	2.5	0.004#
Current employers in the community	2.4	2.2	2.7	3.2	1.5	1.0	2.3	2.2	0.002#
Employers outside the community	1.2	1.4	1.5	2.0	1.4	1.8	1.8	1.5	0.074#
Agriculture or rubber associations or coops in the community	2.3	1.5	1.1	1.0	2.6	1.0	1.4	1.7	<0.001#
Agri or rubber associations outside the community	2.2	1.6	1.3	1.1	2.4	1.0	1.4	1.6	<0.001#
Fishing associations or coops in the community	2.7	1.7	1.4	2.0	1.5	1.9	1.6	1.8	<0.001#
Fishing associations or coops outside the community	1.8	1.5	1.6	1.7	1.4	1.4	2.1	1.7	0.109#
Middlemen within the community	2.4	2.0	1.7	2.6	2.1	1.4	2.4	2.2	0.127#
Middlemen from outside the community	1.8	2.1	2.1	2.0	2.3	2.3	1.8	2.0	0.626#
The navy or the army	1.5	2.2	2.4	2.0	3.9	2.5	3.0	2.6	<0.001#
Previous household savings	3.3	3.5	3.5	3.1	3.8	2.3	2.9	3.3	0.051#
Personal assets things that the household owns	3.9	3.3	3.3	4.0	4.1	3.4	3.6	3.7	0.194#
Other employment opportunities outside the community	2.2	2.9	2.8	2.9	2.4	3.3	3.4	2.8	0.006#
Assistance from international foundations and NGOs	2.4	2.4	3.7	3.0	1.6	3.4	2.2	2.4	<0.001#
Royal foundation community development projects	2.6	2.7	2.9	3.5	2.1	2.0	3.4	2.9	0.004#
State welfare program	4.1	3.8	3.6	4.4	3.7	4.0	4.0	3.9	0.376#
Environmental or conservation organizations who work in the community	3.1	2.6	3.5	3.4	2.9	1.0	2.6	2.8	0.007#
Local womens coops or vocational groups	3.1	2.3	2.6	2.3	2.4	1.6	2.6	2.5	0.129#
Local chief and council	3.7	3.4	3.5	3.7	3.5	3.3	3.8	3.6	0.745#
Tambon administration office and projects	3.7	3.5	3.3	3.3	3.2	2.0	3.0	3.3	0.043#
Assistance from the Disaster Mitigation Unit	3.0	4.2	1.8	2.3	3.2	2.5	2.8	3.1	<0.001#
Researchers or universities who come to work in the area	2.2	2.5	2.1	2.4	2.1	2.3	2.6	2.4	0.554#
Subsistence fishing and harvesting	3.4	3.1	3.5	4.4	3.5	3.7	3.6	3.5	0.057#
Insurance programs	2.9	3.0	2.4	2.0	2.7	1.4	1.7	2.4	<0.001#
Community revolving fund or trust fund	2.8	2.6	2.6	2.9	3.3	1.1	2.2	2.6	0.004#
The local church, mosque or temple	3.9	4.2	2.9	3.8	3.9	4.4	4.5	4.0	0.006#
The community health centre or hospital	4.3	4.1	4.1	4.3	4.3	4.4	4.5	4.3	0.572#
Cooperation with other communities	3.5	3.1	2.9	3.4	2.5	2.3	2.6	3.0	0.018#
Other skills that allow me to work in other occupations	2.0	3.9	3.6	4.0	3.4	3.6	3.4	3.6	0.068#

Note: *ANOVA; **Likert scale where 1=no impact; 2=very little impact; 3=medium level of impact; 4=high level of impact; 5=very high level of impact; 6=don't know (excluded from calculation of mean)

Table 99 – Survey Q54.In your experience, are there any rules and regulations that restrict your access to resources that you need to make a living?

Responses # (%) of respondents	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Yes	17 (41.5)	27 (50.9)	13 (86.7)	10 (45.5)	13 (41.9)	5 (45.5)	30 (46.9)	115 (48.5)	0.023~
No	21 (51.2)	21 (39.6)	2 (13.3)	10 (45.5)	18 (58.1)	3 (27.3)	34 (53.1)	109 (46.0)	
Not that I know about or do not know	2 (4.9)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	2 (18.2)	0 (0.0)	7 (3.0)	
No response (99)	1 (2.4)	3 (5.7)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	0 (0.0)	6 (2.5)	

Table 100 – Survey Q55. Which rules or regulations restrict access to resources? Who makes these rules or regulations?

Source of regulations	# of mentions*	Regulation or rule	# of mentions*
Department of National Parks	34	No fishing in area	10
		No collecting or destroying corals	1
		No collecting in the area	3
		No using destructive gears or illegal fishing	3
		No logging or cutting wood	8
		No selling shells, pearls, or corals	1
		Keep the environment clean – no garbage	2
		Do not cut mangroves	2
		Species restrictions	1
		No hunting wildlife or marine mammals	6
		Fishing gear prohibitions	1
		No harvesting birds	1
		Size restrictions	1
		No land encroachment	2
		No access to some areas	2
		No collecting pregnant fish	1
Chief or community	27	No logging or cutting wood	11
		Fishing gear prohibitions	1
		Size restrictions	1
		No collecting in the area	9
		No fishing in the area	4
		No cutting mangroves	5
		No hunting wildlife	4
		No land encroachment	1
		Quantity restrictions	1
		No destroying seagrass	1
		No destructive gears or illegal fishing	3
		No hunting birds	3
		Keep environment clean – no garbage	1
Department of Fisheries	20	Fishing gear prohibitions	5
		Restrictions on commercial boats in inshore waters	3
		Size restrictions	1
		No using destructive gears or illegal fishing	6
		Species restrictions	3
		Seasonal fishing closures	1
		No fishing in Burma	2
		No hunting marine mammals	1
Royal Forest Department	9	No logging or cutting wood	7
		No land encroachment	2
		No cutting mangroves	2
Government	6	No logging or cutting wood	3
		No hunting wildlfe	1
		No fishing in Burma	2
		Fishing gear prohibitions	1
		No destructive or illegal fishing	1
Tourism Companies	5	No fishing in the area	3
		No collecting in the area	2

Source of regulations	# of mentions*	Regulation or rule	# of mentions*
		No hunting birds and wildlife	1
Burmese Military	4	No fishing in Burma	4
District or TAO	3	Fishing gear prohibitions	1
		No destroying corals	2
		No destroying beaches	1
		No logging or cutting trees	1
		Species restrictions	1
Department of Marine and Coastal Resources/Mangrove Unit	2	No logging mangroves	2
Outside Land Owners	2	No collecting birds	1
		No fishing in the area	1
		No cutting trees	2
Collection of villages	1	No logging or cutting wood	1
Foreign NGO	1	No hunting turtles	1
Royal Family	1	No hunting wildlife	1
Unassigned	-	Fishing gear prohibitions	3
		No cutting mangroves	1
		No selling shells, pearls, or corals	2
		Seasonal fishing closures	1
		Species restrictions	1
		No using illegal gears	1
		No logging or cutting trees	3
		No fishing in some areas	1
		No collecting or destroying coral	1
		No collecting pregnant fish	1
Total	**115**	**Total**	**171**

Note: *Answers from open-ended question were coded qualitatively and number of times each response emerged was counted; total surveys=237; No rules=106, Don't know=3, No response=20

Table 101 - Survey Q55.Type of restrictive regulation stratified by community

Type of regulation	Number of mentions*							
	Community (Baan)							All Sites
	Tha Khao	Koh Panyi	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	
No logging or cutting wood	5	3	3	0	8	4	13	36
No fishing in area	3	3	3	4	0	2	5	20
Fishing gear prohibitions	5	9	0	0	0	0	3	17
No destructive gears or illegal fishing	3	2	0	3	0	0	5	13
No collecting in area	1	1	6	4	0	1	0	13
No cutting mangroves	0	2	1	3	2	0	3	11
No hunting wildlife or marine mammals	0	1	2	3	3	1	1	11
Species restrictions	0	3	2	2	0	0	1	8
No fishing in Burma	0	0	0	0	0	0	6	6
No collecting or destroying corals	2	0	1	0	0	0	1	4
No harvesting birds	1	0	0	1	2	0	0	4
No land encroachment	0	0	1	0	1	0	1	3
Restrictions on commercial boats	2	0	0	0	1	0	0	3
Size restrictions	1	1	0	1	0	0	0	3
No selling shells, pearls, or corals	0	3	0	0	0	0	0	3
Keep the environment clean – no garbage	0	1	1	0	1	0	0	3
Seasons fishing closures	0	2	0	0	0	0	0	2
No access to area	0	0	0	0	0	1	1	2
No collecting pregnant fish	0	0	0	0	0	0	2	2
Restrictions on amount caught	0	0	1	0	0	0	0	1
No destroying seagrass	0	0	1	0	0	0	0	1
No destroying beaches	1	0	0	0	0	0	0	1
Totals	**24**	**31**	**22**	**21**	**18**	**9**	**42**	**167**
Additional responses								
No rules	16	24	2	8	18	4	34	106
Don't know	1	1	1	0	0	0	0	3
No response	7	5	0	4	0	1	5	22

Note: *Answers from open-ended question were coded qualitatively and number of times each response emerged was counted; total surveys=237

Table 102 - Survey Q55.Type of restrictive regulation stratified by community

Source of regulations	Number of mentions*							
	Community (Baan)							All Sites
	Tha Khao	Koh Panyi	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	
Department of National Parks	6	7	3	2	6	2	8	34
Chief or village	2	1	7	5	5	3	4	27
Department of Fisheries	6	7	1	0	1	0	5	20
Royal Forest Department	0	2	1	0	2	0	4	9
Government	0	0	0	0	0	1	5	6
Tourism companies	0	1	1	0	1	1	1	5
Burmese Military	0	0	0	0	0	0	4	4
District or Tambon	1	0	1	0	0	0	1	3
Outside land owners	2	0	0	0	0	0	0	2
Department of Marine and Coastal Resources/Mangove Unit	0	0	0	2	0	0	0	2
Collection of villages	1	0	0	0	0	0	0	1
Foreign NGO	0	0	0	1	0	0	0	1
Royal Family	0	0	0	1	0	0	0	1
Total	**18**	**18**	**14**	**11**	**15**	**7**	**32**	**115**

Note: *Answers from open-ended question were coded qualitatively and number of times each response emerged was counted; total surveys=237

Table 103 – Survey Q56. Compared with other households in my community, my household has:

Responses # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
More access to marine resources	0 (0.0)	8 (15.1)	4 (26.7)	3 (13.6)	1 (3.2)	0 (0.0)	3 (4.7)	19 (8.0)	0.049~
The same level of access to marine resources	24 (58.5)	19 (35.8)	6 (40.0)	11 (50.0)	13 (41.9)	6 (54.5)	36 (56.3)	115 (48.5)	
Less access to marine resources	17 (41.5)	24 (45.3)	5 (33.3)	7 (31.8)	17 (54.8)	4 (36.4)	24 (37.5)	98 (41.4)	
No response (99)	0 (0.0)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	1 (1.6)	5 (2.1)	

Table 104 – Survey Q57.Compared with other households in my community, my household receives:

Responses # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
More benefits from outside development programs or govern asssit. progs	0 (0.0)	2 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.8)	0.144~
The same amount of benefit from outside development programs or govern assistance programs	30 (73.2)	33 (62.3)	12 (80.0)	14 (63.6)	20 (64.5)	9 (81.8)	35 (54.7)	153 (64.6)	
Less benefit from outside development programs or govern assist. progs.	11 (26.8)	16 (30.2)	3 (20.0)	7 (31.8)	11 (35.5)	1 (9.1)	29 (45.3)	78 (32.9)	
No response (99)	0 (0.0)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	0 (0.0)	4 (1.7)	

Table 105 – Survey Q58.Compared with other households in my community, I would rate my household's level of wealth as

Responses # (%) of households	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Above average	4 (9.8)	8 (15.1)	4 (26.7)	4 (18.2)	4 (12.9)	1 (9.1)	2 (3.1)	27 (11.4)	0.048~
Average	25 (61.0)	27 (50.9)	4 (26.7)	7 (31.8)	21 (67.7)	7 (63.6)	30 (46.9)	121 (51.1)	
Below average	12 (29.3)	16 (30.2)	7 (46.7)	10 (45.5)	6 (19.4)	2 (18.2)	31 (48.4)	84 (35.4)	
No response (99)	0 (0.0)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	1 (1.6)	5 (2.1)	

Table 106 – Survey Q59.Compared with other households in the community, how well do community decision makers listen to your opinion?

Responses # (%)	Community (Baan)								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Listened to more than other households in community decision-making	3 (7.3)	10 (18.9)	2 (13.3)	0 (0.0)	2 (6.5)	1 (9.1)	6 (9.4)	24 (10.1)	0.012~
Listened to at the same level as other households in community decision-making	29 (70.7)	33 (62.3)	11 (73.3)	15 (68.2)	24 (77.4)	6 (54.5)	32 (50.0)	150 (63.3)	
Listened to less than other households in community decision-making	9 (22.0)	8 (15.1)	2 (13.3)	6 (27.3)	5 (16.1)	2 (18.2)	25 (39.1)	57 (24.1)	
No response (99)	0 (0.0)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	2 (18.2)	1 (1.6)	6 (2.5)	

Table 107 – Survey Q60.In your opinion, which of the following statements is most accurate.

Responses # (%)	Community								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Women have better access to livelihood opportunities and resources than men	4 (9.8)	12 (22.6)	0 (0.0)	3 (13.6)	2 (6.5)	0 (0.0)	1 (1.6)	22 (9.3)	<0.001~
Women have the same level of access to livelihood opportunities and resources as men	21 (51.2)	17 (32.1)	9 (60.0)	7 (31.8)	13 (41.9)	2 (18.2)	8 (12.5)	77 (32.5)	
Women have less access to livelihood opportunities and resources than men	16 (39.0)	22 (41.5)	6 (40.0)	11 (50.0)	16 (51.6)	8 (72.7)	54 (84.4)	133 (56.1)	
No response (99)	0 (0.0)	2 (3.8)	0 (0.0)	1 (4.5)	0 (0.0)	1 (9.1)	1 (1.6)	5 (2.1)	

Table 108 - Survey Q 61 & Q62.Knowledge or presence of and name of national park near community

Responses # (%)	Community								
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites	p-value (Chi^2)
Knows about the NP and knows the name	6 (14.6)	32 (60.4)	6 (40.0)	5 (22.7)	11 (35.5)	1 (9.1)	7 (10.9)	68 (28.7)	<0.001~
Knows about the NP but does not know the name	27 (65.9)	17 (32.1)	7 (46.7)	10 (45.5)	18 (58.1)	8 (72.7)	29 (45.3)	116 (48.9)	
Does not know about the NP and does not know the name	6 (14.6)	1 (1.9)	2 (13.3)	5 (22.7)	2 (6.5)	1 (9.1)	24 (37.5)	41 (17.3)	
No response (99)	2 (4.9)	3 (5.7)	0 (0.0)	2 (9.1)	0 (0.0)	1 (9.1)	4 (6.3)	12 (5.1)	

Table 109 – Survey Q63.Please indicate the extent to which you agree or disagree with the following statements*

Mean agreement with following statements (Likert 1-3)*	Community (Baan)							All Sites	p-value ANOVA
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi		
The park has or will improve the conservation of the marine environment	2.6	2.4	1.7	2.0	2.4	2.5	2.3	2.3	0.011#
The park has or will improve conservation of the terrestrial environment	2.4	2.5	1.8	2.5	2.6	2.6	2.3	2.4	0.071#
The park has or will decrease levels of participation in management of natural resources	2.2	2.3	2.5	2.7	2.0	2.2	2.1	2.3	0.192#
The park has or will increase knowledge of nature and support for conservation	2.3	2.1	1.5	1.6	2.1	2.2	2.2	2.1	0.020#
The park has or will increase tourism jobs and financial benefit for the local community	2.1	2.3	1.6	1.7	1.8	1.7	1.9	2.0	0.048#
The park has or will decrease access to natural resources for livelihoods or household use	2.6	2.7	2.9	2.9	2.2	2.1	2.4	2.5	0.005#

Note: *Likert scale where 1=disagree, 2=neutral, 3=agree, 4=don't know (4 excluded from calculation of means)

Appendix Q – Community Statistics and Key Informant Interviews

Table 110 – Community infrastructure items

Infrastructure items	Community (Baan)							
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi	All Sites
hospitals	Y	-	-	-	-	-	-	1
medical clinics	Y	Y	Y	Y	Y	Y	Y	7
elementary school	Y	Y	-*	Y	Y	Y	Y	6
middle school	Y	Y	-	Y	-	-	Y	4
high school	Y	-	-	-	-	-	-	1
piped water	Y	Y	Y	Y	-	-	Y	5
sewer pipes/ canals	Y	-	Y	Y	-	-	-	3
sewage treatment facilities	-	-	-	-	-	-	-	0
evening electricity service with generator	-	-	Y	Y	Y***	Y	-	4
24 hour electric service with generator	-	Y	-	-	-	-	-	1
24 hour electric service from outside source	Y	-	-	-	-	-	-	1
telephone service	Y	Y	Y	Y	Y	Y	Y	7
food shops or markets	Y	Y	Y	Y	Y	Y	Y	7
pharmacies	Y	-	-	-	-	-	-	1
hotels or guest houses	Y	Y	-	Y	Y	-	-	4
community-based tourism program or homestay	Y	Y	Y	-	-	-	-	3
restaurants	Y	Y	-	-	Y	-	-	3
gas stations	Y	Y	-	-	-	-	-	2
public bus transportation	Y	-	-	-	-	-	-	1
Public ferry transportation	Y	Y	Y	Y	Y	-	-	5
hard-top road access	Y	-	Y	Y	Y	-	-	4
banking facilities	Y	Y	-	-	-	-	-	2
pier	Y	Y	Y	Y	Y	Y	Y	7
sheltered harbour	Y	-	Y	-	Y	-	-	4
mosque, temple, or church	Y	Y	-	Y	Y	Y	Y	6
TAO office	-	-	-	-**	-	-	-	0
community hall or meeting place	Y	Y	Y	Y	Y	-	Y	6
infrastructure for managing waste	-	-	-	-	-	-	-	0
other important infrastructure	-	-	-	-	-	-	Y*****	1
Total items	23	16	12	14	13	7	10	

Notes: *School building but not being utilized; **Recently relocated to mainland; ***Individual households; ****Utilize health centre and school Koh Chang though have no rights to do so; *****Public wells by municipality

Table 111 – Community livelihoods by month

Month	Community (Baan)						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
January	Tourism Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Cashew Tourist boat Tourism	Tourism Cashew Fishing Coconut	Fishing	Fishing
February	Tourism Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Cashew Tourist boat Tourism	Tourism Cashew Fishing Coconut	Fishing	Fishing
March	Tourism Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Cashew Tourist boat Tourism	Tourism Cashew Fishing Coconut	Fishing	Fishing
April	Tourism Rubber Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Cashew Tourist boat Tourism	Tourism Fishing Coconut	Fishing	Fishing
May	Rubber Fishing	Tourism	Construction	Fishing Coconut Tourist boat Tourism	Rubber Fishing Coconut Stink Bean	Fishing	Fishing
June	Rubber Fishing	Tourism	Construction	Fishing Coconut	Rubber Fishing Coconut Stink Bean	Fishing	Fishing
July	Rubber Fishing	Tourism	Construction	Fishing Coconut	Rubber Fishing Coconut Stink Bean	Fishing	Fishing
August	Rubber Fishing	Tourism	Construction	Fishing Coconut	Rubber Fishing Coconut	Fishing	Fishing
September	Rubber Fishing	Tourism	Construction	Fishing Coconut	Rubber Fishing Coconut	Fishing	Fishing
October	Rubber Fishing	Tourism	Tourist at GBB Fishing	Fishing Coconut Tourist boat Tourism	Tourism Rubber Fishing Coconut	Fishing	Fishing
November	Tourism Rubber Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Tourist boat Tourism	Tourism Rubber Fishing Coconut	Fishing	Fishing
December	Tourism Rubber Fishing	Tourism	Tourist at GBB Fishing Homestay	Fishing Coconut Tourist boat Tourism	Tourism Rubber Fishing Coconut	Fishing	Fishing

Table 112 – Marine resources harvested by month

Month	Community (Baan)						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
January	Crab Shrimp	Resting time	Squid Conch Sea cucumber Krill Shells	Fish Blue crab Squid Shells	Squid All fish Shells	Crab Shells Sea cucumber	Shrimp Squid Shells Silago Sardinella Trap fish
February	Crab Shrimp	Resting time	Squid Conch Sea cucumber Shells	Fish Blue crab Squid Shells	Squid All fish Shells	Crab Shells Sea cucumber	Shrimp Squid Shells Silago Sardinella Trap fish
March	Crab Jellyfish		Squid Conch Sea cucumber Shells	Fish Blue crab Squid Shells	Squid All fish Shells	Crab Shells Sea cucumber	Shrimp Squid Shells Silago Sardinella Trap fish
April	Crab Jellyfish	Crab Grouper	Squid Conch Sea cucumber Shells	Fish Blue crab Squid Shells	Squid All fish Shells	Crab Shells Sea cucumber	Shrimp Squid Shells Silago Sardinella Trap fish
May	Jellyfish	Shrimp	Squid Shells	Fish Blue crab Shells	All fish Shells	Crab Shells	Shrimp Shells Silago Sardinella Trap fish Snapper
June	Fish Shrimp	Shrimp	Squid Shells	Fish Blue crab Shells	All fish Crabs Shells	Crab Shells	Shrimp Shells Silago Sardinella Trap fish Snapper
July	Fish Shrimp	Crab Shrimp Fish (Grouper)	Squid Shells	Fish Blue crab Shells	All fish Crabs Shells	Crab Shells	Shrimp Shells Silago Sardinella Snapper
August	Fish Shrimp	Crab Shrimp Fish (Grouper)	Squid Shells	Fish Blue crab Shells	All fish Crabs Shells	Crab Shells	Shrimp Shells Silago Sardinella
September	Fish Shrimp	Crab Shrimp Fish (Grouper)	Squid Shells	Fish Blue crab Shells	All fish Crabs Shells	Crab Shells	Shrimp Shells Silago Sardinella
October	Fish Shrimp	Crab Shrimp Fish (Grouper) Cockle	Squid Conch Jelly fish Krill Shells	Fish Blue crab Shells	All fish Crabs Squid Shells	Crab Shells Jellyfish	Shrimp Squid Shells Silago Sardinella Trap fish Jellyfish
November	Crab Shrimp	Crab, Shrimp, Fish (Grouper)	Squid Conch Jelly fish Krill Shells	Fish Blue crab Jelly Fish Squid Shells	All fish Squid Shells	Shells Jellyfish	Shrimp Squid Shells Silago Sardinella Trap fish Jellyfish
December	Crab Shrimp	Crab Shrimp Fish (Grouper)	Squid Conch Jelly fish Krill Shells	Fish Blue crab Jelly Fish Squid Shells	All fish Crabs Squid Shells	Shells Jellyfish Sea cucumber	Shrimp Squid Shells Silago Sardinella Trap fish Jellyfish

Note: This analysis mainly focuses on species that are caught for economic livelihoods

Table 113 - Presence or absence of formalized local institutions to support management and conservation

Type of Institution	Community (Baan)						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Gear Restrictions	–	✗	–	–	✗	✗	✗
Spatial Restrictions (MPA)	–	✗	✔	✔	✗	✗	✗
Community Mangrove Forest	✔	–	✗	✗	✗	✗	✗
Species Restrictions*	✗	✗	✗	✗	✗	✗	✗
Catch Restrictions	✗	✗	✗	✗	✗	✗	✗
Temporal Restrictions	✗	✗	✗	✗	✗	✗	✗
Size Restrictions	✗	✗	✗	✗	✗	✗	✗
Resource Monitoring**	✗	✗	✗	✗	✗	✗	✗
Enforcement of Rules	–	✗	–	✗	✗	✗	✗
Formalized Spaces for Sharing	✔	✗	✔	✗	✗	✗	✗

Notes: ✗=not present, ✔=present, –=marginal presence; *None other than those already required by national law; **Individual observation and experience only

Table 114 – Conservation and management actions for habitats and species

Habitat or resource	Community (Baan)						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Coral reefs	-	-	-	-	-	-	Don't put traps on top of corals
Mangroves	Community mangrove forest, no cutting	Mangrove replanting	Locals harvest only what they need	Locals harvest only what they need	No mangrove logging	-	Mangrove planting
Seagrass	-	-	Local MPA	Local MPA	-	-	-
Seashells	-	-	Local MPA, conch - shell thickness, sea cucumber – length**	Local MPA, conch - shell thickness, sea cucumber – length**	-	-	-
Crabs	-	-	-	-	-	-	-
Fish	No illegal fishing, Closure of spawning area	No push net or pongpang net*	No illegal fishing	No illegal fishing	No illegal fishing	-	No illegal fishing
Other	Community forest	-	No turtle, deer, or lesser agitant harvesting, Agree to protect forest	No turtle, deer, or lesser agitant harvesting, Agree to protect forest	No hornbill harvesting	-	Artificial reefs

Note: *Though discussed these fishing methods were being used in the area in plain view, **Extent to which rules are followed was discussed by participants

Table 115 – Details of responses to questions regarding enforcement, monitoring, and adaptation of rules

Management and conservation actions	Community						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Enforcement and sanctions for not following rules	Confiscation of gears, call authorities**	-	Take gear and arrest* but no law to support	Cannot stop people only talk to them, confiscate gears and discuss punishment***	Call authorities**	-	Talk to trawlers, No punishments only warnings
Monitoring health of the environment	Experience	Individual Fishers	Observation	Individual observation	-	-	Individual fishers experience, no records
Past adaptations to rules based on perceived changes	Organize against trawlers, stop using destructive gears, creation of community (mangrove) forest	-	Creation of local MPA	Creation of local MPA	-	Migrate to another location	Do not understand root causes

Note: *This has not actually happened yet the chief suggests this as the necessary course of action.; **Though it was recognized that the authorities can do nothing due to a lack of capacity and will. ***This has not yet occurred and previous transgressions have been ignored.

Table 116 – Community planning for adaptation to climate change issues

Climate change related issues	Community (Baan)						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Sea level rise	-	-	-	-	Individual land and bungalow owners	-	Agreement to build houses 50cm higher
Erosion	-	-	-	-	Proposed to government for funding to build walls on beach	-	Discussed issue in meeting – no decisions
Storms	-	Disaster management plan facilitated by Rak Thai	-	-	-	-	-
Changing rainfall	-	-	-	-	-	-	-
Flooding	-	Individuals plan to raise floors of houses	-	-	n/a	n/a	-
Landslides	-	n/a	n/a	n/a	-	-	-
Coral bleaching	-	-	-	-	-	-	-
Saltwater intrusion	-	-	-	-	Enlarged reservoir with dam to prevent salt water entry	-	Large reservoir created by outside Foundation
Other	-	-	-	-	-	-	-

Table 117 – Details of responses to questions regarding active planning, adaptation and governance

Planning, adaptation, and governance	Community						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Past changes to livelihoods	Less fishers, more tourism, no rice farming, rubber plantations, women started cooperative	Declining fisheries, all tourism now	Declining fisheries, increasing tourism, increased costs	Declining fisheries	Move from growing food to rubber, more tourism, fishing always secondary	More sendentary, less work on trawlers, started crabbing	Declining fisheries, rubber fund and markets, regional construction opportunities, less subsistence activities
Individual livelihood adaptations	Bigger motors for tourism boats, more training and language skills	Some people buy land on the mainland, no other options	Sell boats and gears, move to wage labour, shift to tourist boat, move away	Changing fishing gears, smaller boats, cheaper fishing gear, fish closer to save gas, multiple livelihoods, move to mainland	Hiring Burmese labour, invest in rubber plantations, learn English, invest in tourism business	Fish in Burma, work for sea cucumber middlemen elsewhere in Thailand or Andaman/Nicobar Islands, move elsewhere	Use more gears, pay more attention to weather forecast, migrate elsewhere for construction work
Community planning for livelihood adaptations	Support workshops and training, stop encroachment and selling of land, local ownership, bring educated youth back	Livelihood groups to develop new products	Creating community-based tourism, women's tie-dye group	Shift focus towards tourism	Tourism association and agriculture association plan for sectors, no broader plan for uncertainty	Do not plan ahead	
Community planning for potential disasters	No group dealing with this, some first aid training	Disaster plan facilitated by Rak Thai, community rescue team, escape to mountain or boats to mainland, no budget allocation	None – Call rescue team from mainland	None	Evacuation zones for tsunami, navy unit ready to support	No plan	Two projects from Red Cross and World Vision, ask for relief money from municipality, use community prayer announcement system, cell phones
Community planning of infrastructure to adapt	Concrete to stop erosion of canal	Individuals plan to lift floors of houses	None	None	Enlarged reservoir with dam, build strong buildings	None	Erosion prevention (local), water reservoir (Red Cross)

Planning, adaptation, and governance	Community						
	Tha Khao	Koh Panyee	Lions	Tapae Yoi	Koh Chang	Moken	Koh Sin Hi
Household actions to protect against risk	Engage in mixture of livelihoods, women work also, buy health insurance, pay into community social security fund	Savings, fire extinguishers	Send kids to school on mainland	Depend on health centre	Insurance, houses on mainland	Do not plan ahead	Less day-to-day than before, save money, education of youth, youth move to mainland
Governance structure	Chief and 9 committee members (3 women), 4 deputy chief (1 woman)	Chief, assistant, 10 committee members, 2 TAO members 2 religious leaders, teacher, 12 committees	Chief and 5 person committee (2 women)	Chief and 15 representatives from different parts of community (8 women)	Chief and nine committee members (4 women)	Chief, 6 committee members (2 women), church people advise/make decisions	Chief is the representative for all ministries, many committees, religious leader addresses illegal actions
Governance processes for making difficult decisions	Committee meetings once a month, community meetings every 2 months, some decisions are made by voting	Meetings once a month, committee members discuss issue, community votes (sometimes public or secret), majority decides but those not in attendance have to sign agreement letter	Meetings are called once a month (less now), decisions are made by current chief or by public vote	Monthly meetings, not everyone knows/attends, often cancelled, vote on issues by show of hands	Meetings once a month, issues are raised, opinions and solutions are debated and discussed, majority vote, adhere to decision	Some meetings after church service, often church people call meetings, chief dictates decisions – no voting, community has to agree to allow new inhabitants	Meetings called 5-6 times per year, planning meeting once a year, not everyone informed, decisions made by majority vote

Table 118 - Community involvement with and support from local, national, and international organizations

Org	Community (Baan)													
	Tha Khao		Koh Panyee		Lions		Tapae Yoi		Koh Chang		Moken		Koh Sin Hi	
	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current
Government Organization – Development Focus	Rural Dev (MOI), Agriculture Dept, Dept of Fisheries, Land Dev.	Rural Dev (MOI), Agriculture Dept, Dept of Fisheries, Land Dev.	TAO, Health, Rural Dev. (MOI), Infrastructure	TAO, Health, Rural Dev. (MOI)	TAO	TAO	Agriculture	Agriculture	TAO, Agriculture, Dept of Fisheries, Navy, Health, Rural Dev.	TAO, Agriculture, Dept of Fisheries, Navy, Health, Rural Dev.	Health	Health	Municipality, Health, Non-school education office, Rural Dev (MOI), Dept of Fishieries	Municipality, Health, Non-school education office, Rural Dev (MOI), Dept of Fishieries
Government Organization – Environment Focus	n/a	n/a	n/a	n/a	DMCR	DMCR	DMCR	DMCR	DNP, RFD, DMCR	DNP, RFD, DMCR	n/a	n/a	DMCR (Mangrove Unit), RFD	DMCR (Mangrove Unit)
NGO - Thai	n/a	n/a	Rak Meung Thai, Rak Thai	n/a	n/a	n/a	Rak Thai	Rak Thai	n/a	n/a	Mirror Foundation, Baan Ton Mai Foundation	Mirror Foundation	Rak Thai, Mirror Foundation, Project Hope, Red Crescent	Mirror Foundation
NGO - International	n/a	n/a	Image Thailand, Red Cross Finland	Red Cross Finland	Lions, ADRA, Swiss Dev. Org, Andaman Discoveries, Mangrove Action Project	Lions, Andaman Discoveries, Mangrove Action Project	Plan International, Childline	n/a	Thai-American Red Cross	n/a	Merci Foundation	n/a	World Vision, Red Cross	n/a
ENGO – Thai	n/a	n/a	Rak Thai	n/a	n/a	n/a	Seub Nakasateen	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ENGO – International	CHARM Project	n/a	n/a	n/a	Mangrove Action Project, Naucrates	Mangrove Action Project, Naucrates	n/a	Mangrove Action Project	n/a	n/a	n/a	n/a	n/a	n/a
Academics and Researchers – Thai	Several	Several	Many	Many	n/a	n/a	5 students	n/a	One professor, several students	n/a	n/a	n/a	Several (Waste, Education)	n/a
Academic and Researchers - International	Two (Reefs, Coop)	n/a	Several	n/a	Several – Naucrates	Seagrass Watch, Naucrates	One (Moken)	n/a	One (Insects)	n/a	n/a	n/a	n/a	n/a
International Foundations	n/a	n/a	n/a	n/a	Lions	Lions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Org	Community (Baan)													
	Tha Khao		Koh Panyee		Lions		Tapae Yoi		Koh Chang		Moken		Koh Sin Hi	
	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current
Thai Foundations	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Royal Foundations and Projects	Sai Yai Rak	Sai Yai Rak	Sai Yai Rak	To Be Number 1	Sufficiency Economy, Mangrove Planting	n/a	Srilat Scholarships	Srilat Scholarships	n/a	n/a	n/a	n/a	Chaipattana	n/a
Outside Religious Organizations	Thamakai	Thamakai	Muslim Org.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Campus Crusade	Campus Crusade	n/a	n/a
Private Sector Bodies – Business Organizations	n/a	n/a	n/a	n/a	n/a	Blue Guru Diving	n/a	n/a	Tourism Authority of Thailand	n/a	n/a	n/a	n/a	n/a
Local Community-Based Organizations	Women's livelihood group, Fisher's group	Women's livelihood group, Fisher's group	Many groups (35)	Many groups (35)	Community Tourism Group	Community Tourism Group	n/a	n/a	Saving's Coop, Tourism Group	Saving's Coop, Tourism Group	n/a	n/a	n/a	n/a
Local Environmental Organizations	Reef Conservation Group, Community Forest Group	Community Forest Group	Environment Committee	Environment Committee	n/a	Local MPA	Local MPA (failed)	Local MPA	Hornbill Conservation Group	Hornbill Conservation Group	n/a	n/a	n/a	n/a
Other	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes: TAO-Tambon Administration Office; DMCR-Department of Marine and Coastal Resources; DNP-Department of National Parks; RFD-Royal Forest Department; MPA-Marine protected area; MOI-Ministry of Interior

Table 119 – Outreach and education programs on climate change, disasters, natural resource management and conservation, and livelihoods

Programs	Community (Baan)													
	Tha Khao		Koh Panyee		Lions		Tapae Yoi		Koh Chang		Moken		Koh Sin Hi	
	Y/N	Details	Y/N	Details	Y/N	Details	Y/N	Details	Y/N	Details	Y/N	Details	Y/N	Details
Programs on climate change	N	n/a	N	n/a	N	n/a	N	n/a	Y	Chief passes on info during meetings	N	n/a	N	n/a
Programs on disaster preparedness	N	n/a	Y	Rak Thai program and plan	N	n/a	Y	Tsunami preparedness	Y	Thai-American Red Cross ("Community Prepared for Disaster")	N	n/a	Y	Red cross and Raks Thai
Programs on natural resource management or conservation	Y	CHARM Project, Mangrove planting (Japanese org)	N	n/a	Y	MAP (Seagrass, mangroves), Naucrates (Turtles), and AD (Nature house, network)	Y	In the past - Seub Nakasatean Foundation	N	n/a	N	n/a	Y	Fishing gears (Dept of Fisheries)
Livelihoods programs or workshops	Y	Many – livelihoods, deserts, composting, gardening, crafts, tourism, etc…	Y	Several – tourism, deserts, crafts	Y	Community-based tourism, homestay, tye-dye group	Y	Sufficiency economy (Royal Foundation), Oyster farming (Agriculture), Desert making	Y	Making crafts, deserts (Non-school Education Office)	N	n/a	Y	Desert making, crafts, sufficiency (Army)

Notes: AD=Andaman Discoveries; MAP=Mangrove Action Project