Who benefits and who loses?

Evaluating the impacts of community-based marine protected areas on ecosystem services and human wellbeing

From top left, clockwise © Kazungu Samson, Bahati Kenga, Hamisi Fundi

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Abstract

Coral reef ecosystems are some of the most biologically diverse systems in the world, and provide a number of ecosystem services that humans depend on for their wellbeing. Marine protected areas (MPAs) are a social-ecological intervention that while conserving these ecosystems, also have significant impacts on the communities that depend on them for their wellbeing. Community-based MPAs are growing in popularity with the assumption that by putting communities at the forefront of their planning and management, more participation will occur, ensuring positive social and ecological impacts. This study, through mixed qualitative and quantitative methods, examines two community-based MPAs in coastal Kenya (called tengefu) to understand how each tengefu was incepted, and how resource users perceive the impacts of the tengefu on ecosystem services and human wellbeing. Participation in and donor support for the tengefu were found to influence how resource users perceived impacts. Individuals who were more engaged in the project or held some type of leadership position perceived more positive impacts on ecosystem services and human wellbeing compared to those not involved. In the two cases, tangible benefits (e.g. fisheries spillover and ecotourism) from the marine enclosure itself are too few to benefit the community as a whole. For tengefu to be social successes, more attention should be given to engaging all resource-dependent community members in their planning, implementation and management, and to understanding the multifaceted role of donor funding in supporting these initiatives.
Acronyms
BMU: Beach management unit
CBMPA: Community based marine protected area
ES: Ecosystem services
HWB: Human wellbeing
KSH: Kenyan Shilling
KWS: Kenyan Wildlife Service
KWCA: Kuruwito Conservation and Welfare Association
MPA: Marine protected area
MA: Millennium Ecosystem Assessment
NGO: Non-governmental organization
USD: United States dollar
WCS: Wildlife Conservation Society

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1. Introduction

Coral reef ecosystems are some of the most biologically diverse systems in the world, and provide a vast number of ecosystem services (ES) that humans depend on for their wellbeing (Moberg and Folke, 1999; MA, 2005). However, these ecosystems are increasingly threatened by human activities (Connell, 1978; Maragos et al., 1996; Halpern et al., 2008). Overfishing and changes in atmospheric carbon dioxide levels are dramatically changing the marine ecosystem processes and functions that underpin these vital ecosystem services (Hughes, 2003, Hoegh-Guldberg et al., 2007; McClanahan, 2002). These changes in turn, have had consequences on humans, especially poorer populations who depend on ecosystem services to sustain their livelihoods (TEEB, 2010; Cinner et al., 2012).

To cope with these changes, new management strategies have been tried and tested over the last several decades. Marine protected areas (MPAs) have emerged as one of the most popular tools for both conservation (Agardy, 1994) and fisheries management (Dugan and Davis, 1993). MPAs are defined as “...any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein" (US Presidential Executive Order 13158, 26 May, 2000).

MPAs are argued to have positive effects on the dynamics of ecological systems (Dugan and Davis, 1993; Halpern, 2003; Babcock et al., 2010) yet it has been recognized that the social implications of MPAs are often ignored (Christe et al., 2003; Mascia and Claus, 2009) with consequences on the long-term success of MPAs (Agardy et al., 2003). To address this gap, there has been an increasing amount of social science research addressing the social dynamics surrounding MPAs, discussed in detail in the following sections. However, despite this increase in interest, there is still a notable gap in the understanding of the impacts of MPAs on resource-dependent human populations (Fox et al., 2012).
1.1. Research aim
This research will examine the social impacts of community-based MPAs (in Kenya, called *tengefu*) through the lens of ecosystem services and human wellbeing (HWB). This study will explore both the inception and evolution of two *tengefu*, trace the flow of ecosystem services from the *tengefu* to different groups of people within the surrounding communities, and explore how these services impact human wellbeing. This study will examine these questions through perceptions: How community members perceive both the *tengefu* itself, and its impact on ecosystem services and human wellbeing. Recent MPA literature has shown perceptions play a significant role in determining fisher’s actions towards MPAs (e.g. Pollnac et al., 2010; Fabinyi et al., 2014). As such, understanding how communities perceive *tengefu* initiatives and their impact on ES and HWB will likely influence the future sustainability of these initiatives. This study aims to provide an in-depth look into the complex social-ecological interactions that surround community-based MPAs, while also contributing to the theoretical discourse on linking ecosystem services to human wellbeing.

1.2 Research question

What impact do community-based MPAs have on the wellbeing of surrounding communities?

*Sub-questions*

1. How has the history and evolution of each *tengefu* had an impact on the flow of ecosystem services to human wellbeing?

2. How do marine ecosystem services contribute to human wellbeing?

3. How has the *tengefu* influenced the community members’ perception of ecosystem services and human wellbeing?
2. Conceptual background

2.1 Ecosystem services and human wellbeing

The ecosystem service concept first emerged to represent human dependence on nature (Daily, 1997) and has since grown in popularity in a number of disciplines including ecology, economics, and development studies (e.g. de Groot et al., 2002; Tallis et al., 2008). The Millennium Ecosystem Assessment (MA) defined ES to be the benefits people receive from nature, with the underlying assumption that ES contribute to human wellbeing (MA, 2005). The MA stated that ecosystem services impact five different constituents of human wellbeing: security, basic material for a good life, health, good social relations, which are all supported by freedoms and choice (MA, 2003).

However since the MA, it has been recognized that the empirical linkages between ES and human wellbeing are still poorly understood (Carpenter et al., 2006) and that there is a need for science that transcends typical disciplinary boundaries to uncover the dynamic relationship between humans and nature (Carpenter et al., 2009). Efforts have been made to address the inequalities associated with ES distribution to poor populations (e.g. Brown et al., 2008). It has also been recognized that different resource user groups may receive different benefits from different ES, supporting the need to disaggregate wellbeing within the context of ecosystems (Daw et al., 2011). In light of these findings, many different approaches and frameworks to link ES to wellbeing are emerging (e.g. MA, 2005; Ringold et al., 2013). There is also a growing body of literature that explicitly links wellbeing to marine ecosystems (Abunge et al., 2013, Charles et al., 2012, Weeratunge et al., 2013).

The wellbeing concept is argued to be useful in that it reaches beyond material and economic wellbeing (Smith, 2010), allowing for a much more holistic view on wellbeing that can be understood in relation to ecosystem services. For the purpose of this study, I will draw upon the concept of social wellbeing presented by Gough and McGregor (2007) where wellbeing is defined to be a state of being with others, where human needs are met, where one can act meaningfully to pursue one's goals, and where one enjoys a satisfactory quality of life (McGregor, 2008). This definition forms the base for the ‘three dimensional’ approach, which includes material, relational, and subjective wellbeing:
Material wellbeing refers to what people have and whether or not their needs are met; relational wellbeing considers how social relationships enable an individual to pursue wellbeing, and subjective wellbeing refers to how individuals feel about what they have. Recently, this definition has been discussed and empirically applied to understand the global fisheries crisis (Coulthard et al., 2011; Britton and Coulthard, 2013).

2.2. Marine protected areas: A social-ecological intervention

A marine protected area is an example of a social-ecological intervention that while attempting to safeguard ecosystem services, has lasting impacts on the social systems that depend on marine resources for their wellbeing (Mangi and Hattam, 2009; Mascia et al., 2010; Samonte et al., 2010).

MPAs are widely recognized in the literature as successful tools that protect marine ecosystem processes, functions and services (Dugan, 1993; McClanahan et al., 1999; Halpern, 2003; Babcock et al., 2010). While MPAs have a long informal history, the first inception of the MPA concept as we know it today occurred in 1962 at the World Congress on National Parks (Gubbay, 1995). Today, 9.7% of territorial waters have protected status (WDPA) and as of 2010, approximately 5880 parks have been gazetted (Toropova et al., 2010) with many unofficial reserves likely in existence or in development phases. The number of MPAs is likely to increase in the coming years, with the Convention on Biological Diversity Aichi target 11 aiming for 10% of the world’s oceans to be protected by 2020 (UNEP, 2010).

MPAs take on a variety of different forms, ranging from strict no-take zones to regions allowing restricted extraction (Gubbay, 1995). MPAs are also incited for a variety of different goals and objectives, impacting the way in which they are created, implemented, and managed (Laffoley, 2008).

MPAs have become one of the most popular tools for marine conservation for a number of reasons: They are argued to be the most tangible part of marine conservation programmes, and for conservationist, they are an opportunity to target protection efforts (Gubbay, 1995). More recently, they have been viewed as an opportunity to align
conservation and development goals, resulting in potential ‘win-win’ scenarios within sustainable development (Gjertsen, 2005), as MPAs are often cited as providing benefits to humans via fisheries spillover (McClanahan and Mangi, 2000) contributing to tourism, improved governance, health, and even empowerment of women (Leisher et al., 2007).

On the other hand, some of the biggest critiques of marine protected areas are that social dynamics are ignored, leading to failures in both the social, and ultimately, the ecological system (Christie, 2004). It is increasingly recognized that MPAs exist within the context of complex social-ecological systems (Pollnac et al., 2010), and consequently, their ecological goals have lasting impacts on people who dependent on marine resources.

2.3 Community based marine protected areas

Community-based marine protected areas (CBMPAs) refer to a MPA that has the community at the forefront of the planning, implementation and management of the area. Community-based conservation initiatives have emerged out of the recognition that top-down conservation strategies fail to account for local populations (Wells and Brandon, 1993 cited in Campbell and Vainio-Mattila, 2003). In reaction, a community-based strategy “in theory….places the community’s involvement at the center of conservation, rather than the mechanism for achieving it.” (Cambpell and Vainio-Mattila, 2003:421). Community-based conservation has thus been conceptualized as a valuable strategy that has the power to not only protect vulnerable ecosystems, but also engage and support communities who depend on these resources for their wellbeing. However achieving such ‘win-win’ scenario where both conservation and development goals are met is not without substantial challenges. Noted challenges in these types of initiatives include improper implementation of projects, conflicting objectives in conservation and development and weak definitions of either conservation or development goals; all of which can lead to the failure of meeting set social and/or ecological goals (Berkes, 2004; Tallis et al., 2008; McShane et al., 2011).

Much of the literature on CBMPAs centers on initiatives in the Philippines dating back to the mid 1980s (Crawford et al., 2000; Christie et al., 2002; Indab and Suarez-Aspill, 2004). The popularity of these initiatives has since spread to other parts of the world,
with more and more initiatives appearing across East Africa. While there have been studies evaluating the social and ecological factors that determine the success of CBMPAs (Pollnac, 2001) little empirical research has been carried out on the impacts these CBMPAs have on marine resource users.

2.4 What do we know about the social dynamics surrounding MPAs?
It is increasingly evident that a MPA can have a significant impact on the social dynamics of a particular area, and conversely, the social conditions surrounding a MPA play a vital role in determining its ecological success (Pollnac et al., 2010). A variety of social science lenses have addressed this complexity: MPAs have been discussed as interventions that reallocate property rights, creating winners and losers from MPAs (Mascia and Claus, 2009) and also as interventions that impact human welfare (Mascia et al., 2010). Jentoft (2007) emphasized the role of governance, and examined how power dynamics play out in fisheries management. More recently, Gustavsson et al. (2014) examined the distribution of costs of benefits from MPAs through a lens of participation and found that limited participation by communities contributed to local power asymmetries and conflict.

Other literature focuses more heavily on perceptions and attitudes, and what these might mean for the long-term success of MPAs. A recent review found that a majority of the literature on commercial fishers’ attitudes towards MPAs center around issues of governance, conservation, and the impact of MPAs on fishing (Pita et al., 2011). More recently, Fabinyi et al. (2014) recognized perceived inequalities between resource users in who benefits, who contributes to degradation, and who should bear these costs overrides the desire to act on sustainability issues. Chaigneau (2013) found that a variety of factors, such as design and management factors, feelings and emotions, influence community support from MPAs. Furthermore, a study within the same geographic region as this research has noted that people’s experience of and perceived benefits from marine reserves can depend heavily on the socioeconomic status of fishers (Cinner et al., in press).

Recent literature has also argued that the planning and inception of a MPA can have a great influence on its long-term success. Chuenpagdee and Jentoft (2007) developed the
‘step-zero’ concept, which starts with the assumption that success of fisheries co-
management relies not only on its implementation, but on the way in which the idea was
conceived. This concept was further developed by Chuenpagdee et al. (2013) to
recognize the importance of the conditions, drivers and processes that exist prior to the
inception of the MPA. One example they give is that initial communication confined to
personal networks can raise suspicion with those not involved and that the ‘leaders’ of the
project have hidden agendas. They also argue the importance of local perceptions about
both the problem requiring a MPA, and the decision regarding the solution. They later
emphasize the fact that MPAs are situated within complex socio-political arenas, and that
local circumstances involving politics and power struggles can play a substantial role in
the implementation process. However, this concept has only been applied in a select
number of case studies, indicating a need for further exploration.

2.5. Integrating ES, HWB, and MPAs: A framework for analysis
The wide number of approaches discussed above illustrates the complicated social
dynamics that surround MPA conception, implementation, and governance. This thesis
will incorporate many of the conceptual constructs discussed above in a framework for
analysis. To understand how the tengefu was incepted and implemented, each case will
be examined within the ‘step zero’ concept, examining the different dynamics that were
present or not during the early stages of the MPA.

The ecosystem service and human wellbeing approach will be used to understand how
MPAs are perceived by communities. Only recently has the ES concept been applied
within the context of MPAs (Potts et al., 2014) in which it is argued that MPAs protect
the features necessary for the provision of ES that contribute to human welfare. The ES
and HWB framework, with its multidimensional focus, provides a unique way to better
understand the multifunctional nature of MPAs, as well as examine the different types of
associated benefits and costs. The ES and HWB framework also has mechanisms for
addressing complexities and feedbacks in both the social and natural systems, especially
relevant for MPAs where these dynamics are evolving and co-dependent.
3. The Kenyan context

Settlements along the coast of Southern Kenya have a long history of dependence on marine resources (McClanahan, 1997) and are still in recent years, heavily dependent on fisheries for supporting livelihoods (Cinner and Bodin, 2010). However, overfishing and climate change have led to a general decline in the health of the marine ecosystem over the last several decades (McClanahan, 1997; Hoorweg et al., 2009) contributing to social-ecological vulnerability, especially in overfished areas (Cinner et al., 2012b).

To combat this challenge, stakeholders on all levels have been working towards developing solutions that will help alleviate pressure on marine resources while simultaneously supporting local communities. After years of top-down management and increasing conflict between government departments and local stakeholders, a movement towards co-management started with the creation of Beach Management Units (BMUs). In the 1990s, BMUs were created and implemented in the Lake Victoria region as an attempt to de-centralize management responsibility for fisheries. The model was later applied to marine fisheries, and in 2007 the BMUs were legally mandated by the Kenyan government.

The responsibilities of the BMU includes law enforcement, developing sanitation facilities and onshore infrastructure for the landing, buying, and selling of fish, collecting fisheries data, conflict resolution and welfare matters, and handling emergencies (Fisheries Department). On paper, membership in the BMU should include anyone involved in the use of the marine resource (e.g. fishers, fish traders, beach vendors, tour boat operators). Yet in practice, BMUs are still new and often lack the capacity needed to carry out all their mandated activities, including recruiting membership. In theory, anyone who wants to fish in a given region must first register with the BMU, however this has not been established in all sites. BMU leadership positions are voluntary (unpaid), and are voted in by members.

In the region, significant scientific attention has been given to the relationship between humans and nature through the study of fisheries. For example, research has addressed human impacts on ecological dynamics (McClanahan et al., 2009; McClanahan et al., 2011), different management strategies and their impacts on the ecosystem, including
marine reserves (Hicks et al., 2009, McClanahan et al., 1997, Cinner et al., 2012a,c), and socioeconomic processes in relation to the fishery (Cinner et al., 2009a,b; McClanahan et al., 2010). More recently the wellbeing lens has been applied to this system (Daw et al., 2011; Abunge et al., 2013; Cinner et al., in press) highlighting the unequal distribution of ecosystem benefits that exist within current management strategies. Non-governmental organizations (NGOs) have also played an important role in addressing both social and ecological issues related to fisheries on the coast. A number of international and regional non-profits operate programs in the area with a wide variety of objectives such as conducting scientific research, program work and providing financial support for conservation projects.

3.1 Status of marine protected areas in Kenya

The implementation of MPAs has a history of controversy in Kenya (McClanahan, 2005; Evans, 2009, 2010). The first MPAs in Kenya were ‘top-down’ initiatives, in which the government implemented a marine closure without much consultation with the community. While in the long run, most have been ecologically successful, these MPAs contributed to high levels of mistrust in the government within fishing communities, and in several cases, led to conflict (McClanahan et al., 2005; Evans, 2009). The most contested case example in Kenya was the Diane-Chale Management Area, designated as an MPA by KWS in 1995. Local communities were strongly opposed to the idea, leading to intense conflict. The local government supported the community’s stance, and as a result, KWS was forced to pull out within a week of the MPA’s establishment (Evans, 2009). Given the turbulent history, the Kenyan government is increasingly embracing more participatory methods of resource management (e.g. the BMU concept) with the same mentality increasingly applied to the implementation of MPAs.

Within the last decade, a number of community-initiated MPAs have been created that have been considered successful social-ecological interventions; simultaneously reducing resource exploitation while engaging local communities (Cinner et al., 2012a; Maina et al., 2011; WCS, 2012). These community-based MPAs (*tengefus*), follow a co-management model in that both the establishment and enforcement are the responsibility of the communities themselves, with support from NGOs and various government
departments. The first tenefu was implemented in 2005, and now roughly 18 are in various stages of development. Each tenefu has a unique history and reason for inception, and consequently local perception varies greatly between sites (WCS, 2012).

Recent research within several tenefu sites has illustrated the complex nature of the benefits received from such closures: For example, Cinner et al. (in press) found that while more poor fishers are displaced from these community closures, they still perceive a positive effect on their catch from the closure. Additionally, Hicks at al. (2009) found less total economic and direct use value but higher levels of social capital in a tenefu site compared with top-down MPA and co-managed areas. However, little is still known about the social dynamics surrounding these initiatives; a gap this research aims to fill.
4. Study sites and methodology

4.1 Methodological approach

When I initially developed this study, I followed a deductive approach, through which I developed a set of research questions, and came up with a research design and a set of hypotheses. Afterwards, I began to explore the questions and hypotheses through my field methods. However, while carrying out fieldwork I realized that many of the informal interactions and general observations I made played just as important of a role in contributing to understanding the system as did the formal methodology initially selected for this research. I also realized that the methods I had initially selected were not addressing many of the social dynamics present in the field, and consequently I shifted to a more inductive approach. Given that few empirical studies have been carried out on tenganfs, this shift to a more “exploratory” approach seemed justified (Yin, 2003:29) and also allowed for the most important data relevant to the topics of inquiry to emerge.

This study draws on elements of grounded theory (Mills et al., 2006) in which the experience of fieldwork has guided the theory and methods adopted. Campbell et al. (2006), within the context of human geography, discusses the concept of “being human” and what this means for data collected during fieldwork. Drawing on examples from a 2001 special issue of Geographical Review, the authors highlight how personal experiences from the field have the power to shape all aspects of the research process, from the initial conception of research all the way to the analysis and presentation (DeLyser and Starrs, 2001). Additionally, as a female ‘mzungu,’ a white or non-African in Kenya, I was perceived in a certain way that likely dictated how both respondents and other community members responded to me; an issue addressed in previous ethnographic research in the region (Kawarazuka, 2013) Consequently, I will describe my personal experiences of the data collection process along with the scientific methods I followed in the methodology.
4.2 Study sites

A multiple case-study approach was chosen for this study. Yin argues (2003:9) that a case study method is ideal when a “how” or “why” question is being asked about a contemporary set of events over which the investigator had little or no control. Additionally, evidence resulting from multiple case studies is often argued as being more compelling, as findings have a stronger basis for support (Herriott and Firestone, 1983 as cited in Yin, 2003:45). As I was interested in gaining a more holistic insight into the social dynamics surrounding teneffus, I chose to explore several sites in a more qualitative way. Originally I selected three sites for the study in order to follow the “replication logic” idea for multiple case study design (Yin, 2003:45), however given time constraints, the third site was dropped to allow for further inquiry in the first two sites.

The two sites selected for the study (Kuruwito and Kanami) are located in Kilifi County, in the Coast province of Kenya just north of Mombasa. Both sites have been deemed as “successfully implemented” by the Wildlife Conservation Society (WCS, 2012), meaning the no-take zone has been established and marked, and has a certain level of compliance. Selecting sites from this category ensured that MPAs were actual closures with compliance, rather than just MPAs ‘on paper’, allowing for a proper assessment of the impacts of the MPA on the surrounding community. Table 1 gives a short description of each site. Sites are described in further detail in the results (section 6.2).
Figure 1. Map of study sites. *Inset maps show each BMU region, with the tengefu marked as a black rectangle and landing sites as red points.*

### Table 1. Description of study sites

<table>
<thead>
<tr>
<th></th>
<th>Kuruwito</th>
<th>Kanami</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tengefu Established</td>
<td>2005</td>
<td>2010</td>
</tr>
<tr>
<td>Tengefu Size</td>
<td>29 ha</td>
<td>22 ha</td>
</tr>
<tr>
<td>Number of landing sites</td>
<td>Six</td>
<td>Four</td>
</tr>
<tr>
<td>Participation</td>
<td>High percentage of BMU membership</td>
<td>Lower percentage of BMU membership</td>
</tr>
<tr>
<td>Proximity to urban areas</td>
<td>~20 km to Mtwapa, ~35 km to Mombasa</td>
<td>~5 km to Mtwapa, ~20 km to Mombasa</td>
</tr>
</tbody>
</table>
4.3 Unit of study
Yin refers to the existence of multiple units of analysis within a case study as being an ‘embedded’ case study (Yin, 2003), which is the case for this research. The overarching unit of analysis is the ‘tengefu project,’ referred to as the tengefu for the purpose of this study. The ‘tengefu project’ includes not only the marine closure itself, but also all the supporting initiatives (e.g. NGO support, financial investment, alternative livelihood projects) that have started as a direct result of the conservation agenda. The embedded unit of study will be the tengefu itself, referring the physical ecological closure.

4.4 Methodology
My initial research design involved collecting a mix of quantitative data via surveys, and qualitative data via participatory photography and focus groups. These diverse methods were selected to obtain a rich perspective on the relationship between ecosystem services and human wellbeing within the context of tengefs, and how the tengefs may have altered this relationship. This research was carried out in partnership with the Wildlife Conservation Society, a science-based non-profit organization that has been operating in the Mombasa region for over 25 years. Therefore, initial contact was made with the research sites with the help of the organization. These initial contacts were individuals engaged with the tengefu and members or leaders of the local governing organizations (the Kuruwito Conservation and Welfare Association in Kuruwito and the Beach Management Unit in Kanami). These people became the ‘gatekeepers,’ referring to individuals who, in a sense, control which individuals the researcher has access to when carrying out social field research (Campbell et al., 2006), as they shaped whom I had access to in the community (see section 5.4).

An initial meeting was held in each site with key individuals involved in the tengefu formation process, including the gatekeepers, as well individuals identified by the leaders as being key actors in the tengefu project. These meetings provided background information about the fishing community, the tengefu formation, and who was involved in the process. During this initial meeting, a timeline exercise was carried out (see Bunce et al., 2000) during which focus group participants identified key events that led to the
formation of the tengefu, and any key events that have happened since the formation. Tengefu committee members were asked to help identify different types of resource user groups. Discussions were held separately in each site to identify which were the most important groups to consider. First in Kanami, committee members identified spear gun fishers, gill net fishers, and fish traders. In Kuruwito the same groups were identified, as well as a group representing those who work in the ecotourism sector. I also requested a group to represent a random selection of individuals from the community, to try and capture the perspective of those not as close to the fishery or the project. Tengefu committee members were then also asked to help identify different participants for the various groups. Once participants were identified, a short introductory meeting was held in each site during which the study and the photovoice methodology were explained in more detail to the participants. Photovoice, a process that helps people reflect on their community’s strengths and concerns using photography (Wang and Burris, 1997), has been recognized as an underutilized tool that can help incorporate diverse stakeholder knowledge when linking ecosystem services to human wellbeing (Berbés-Blázquez, 2012). Given the limited nature of the study, this tool was selected as it was hypothesized that it would give a more in-depth view of the community in the short period of time allotted for fieldwork.

Participants were given both written and verbal instructions in Kiswahili explaining what was meant by wellbeing in this context, and the procedures for the photovoice exercise (see appendix E). Since most of the participants had never taken photos before, I showed example photographs that I took myself that represented how I connected to nature. The goal of this was to provide an example on how different emotions and thoughts can be captured through photography. Each participant was given a 27-exposure disposable camera, and asked to return the camera within 3-5 days. In both sites, not all participants were present at this introductory meeting, and therefore some individuals from the group were asked to deliver the cameras and written instructions to those missing.

Focus group discussions were held with each resource user group during which photos were redistributed to participants and discussed. Discussions were facilitated by two field

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1 In Kuruwito, a greater number of people were absent for this introductory meeting, possibly reflecting the research fatigue issue addressed in the ethics section.
assistants, conducted in Kiswahili, and were later translated and transcribed. The focus group started with the facilitators asking what participants thought about wellbeing, followed by presenting how we defined wellbeing, simply put as ‘having a good life.’ This was to ensure that everyone had the same definition in mind when discussing wellbeing. Discussion then led to how the marine ecosystem contributes to wellbeing, using the photographs taken. Each participant presented three of their photographs that best represented what the marine ecosystem meant for their wellbeing, and provided a verbal or written caption for each image. Discussion continued on to what other ways the marine ecosystem contributes to their wellbeing, and how the tengefu may or may not have altered this. At the end of the meeting, participants were asked to rank out of the key wellbeing categories they identified, which were the most important to them and discussed why.

The focus groups were carried out first in Kanami, followed by Kuruwito. Focus group discussions and interviews from Kanami were transcribed first, and coded for emerging themes. This, along with observations and informal conversations, helped to identify the role of membership in the Beach Management Unit (BMU). Both within and outside of the focus groups, many participants cited conflict between BMU members and non-BMU members. Reviewing the data revealed that all participants up until this point were BMU members.

With the help of local contacts, additional participants were identified that represented ‘non-BMU’ fishers and traders. With the first group of non-BMU fishermen in Kanami, we held an initial meeting where the photovoice methodology was explained. However upon returning to carry out the focus group, we learned non-participants associated the cameras with the BMU, and believed I was a spy for the BMU. This conflict between research participants and non-participants nearly led to the termination of the focus group. After assuring participants the neutrality of the research, the meeting was able to continue. Yet because of this conflict, I decided to drop the photovoice methodology for the remainder of the study.

Informal individual and group interviews were carried out rather than photovoice focus groups, to capture the perspective held by non-BMU fishers and traders. Participants
were identified both by snowball sampling, as well as random sampling by visiting fish landing sites within each study area. These interviews followed a similar format at the focus groups, inquiring about general wellbeing in relation to the marine ecosystem and if the tengefu has had any impact on wellbeing (see appendix E). When possible, the same ranking exercise was carried out during which participants ranked what from the marine ecosystem contributes to wellbeing. Interviews were carried out in Kiswahili, many were recorded, and later were transcribed to English. Those not recorded because of logistical reasons were carried out in Kiswahili, and detailed notes were taken in English. When possible, individual interviews were carried out with those from group interviews and focus groups to triangulate results.

Follow-up interviews were conducted with all research participants in which an abridged version of the Resource and Needs Questionnaire was carried out, using indicators developed in the P-Mowtick project (ESPA) that answer whether or not an individual’s basic needs are being met. This survey aims to measure the ‘material’ dimension of wellbeing, and uses a mix of objective and subjective indicators for evaluate the following 10 basic needs: the need for economic security, food security, clean drinking water, sanitation, shelter, education, health, physical security, emotional relationships, and participation and respect. The goal of the survey was to provide a quantitative snapshot of the ‘poverty context’ of participants in the study and to observe if there were any differences in material wellbeing between resource user groups.

Fishers wives were also interviewed (n=17) to see if women were aware of the tengefu projects, and if they perceived any changes in their households as a result of the tengefu. Questions started broad, inquiring where respondents were from, how long they had been in the area, what they did for work, and if they have perceived any changes in their lives over the past years before asking specifically about the tengefu project. Interviews were short, lasting 5 – 10 minutes, as many women knew very little about the project. These interviews were not recorded and were carried out in Kiswahili by the research assistant.

Additional individual interviews with key stakeholders involved in the early stages of the tengefus in Kenya provide supplementary information about the context of the tengefus.
Individuals were identified during the research process via snowball sampling; were carried out in English by the researcher, recorded, and later transcribed.

![Timeline of data collection (2013)](image)

**Figure 2. Timeline of data collection (2013)**

**Table 2. Summary of data collected**

<table>
<thead>
<tr>
<th>Data collection technique</th>
<th>Sample</th>
<th>Data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeline focus group</td>
<td>2 groups (One per site) Representing tengefu committee members from each site</td>
<td>Historical background of tengefu from the point of view of the tengefu leadership and involved community members</td>
</tr>
<tr>
<td>Photovoice focus groups</td>
<td>Kuruwito: 5 Kanami: 4 Groups of 2-4 individuals</td>
<td>Qualitative data and visual representations on perceptions on HWB in relation to ES, tengefu Ranking of what from the marine ecosystem is important for wellbeing</td>
</tr>
<tr>
<td>Group Interviews – Members from the community</td>
<td>Kuruwito = 5 groups Kanami = 3 groups</td>
<td>Qualitative data on perceptions of HWB in relation to ES, tengefu Ranking of what from the marine ecosystem is important for wellbeing (3 groups)</td>
</tr>
<tr>
<td>Individual Interviews – Members from the community</td>
<td>Kuruwito: 2 fishermen, 5 traders, 10 fishers wives Kanami: 1 fisherman, 8 traders, 1 beach boy, 7 fishers wives</td>
<td>Individual perceptions of the tengefu project Triangulating against photovoice focus groups and group interviews</td>
</tr>
<tr>
<td>Individual Interview – Non-community members involved with tengefu</td>
<td>3 semi-structured interviews (resident, consultant, fisheries officer)</td>
<td>Qualitative data on historical background of tengefu project from the point of view of non-community stakeholders</td>
</tr>
<tr>
<td>RANQ Survey</td>
<td>N = 41 (Kuruwito) N = 26 (Kanami)</td>
<td>Quantitative measures of basic needs being met</td>
</tr>
</tbody>
</table>
5. Reflections on Methodology and Ethics

The diverse set of methods used in this study had both strengths and weaknesses. Overall reflections on the methods and data collected are discussed, followed by specific ethical concerns and challenges encountered in the field.

While changing the approach in the midst of the study may not have been ideal from a practical view, I found that the transition from a more deductive to an inductive approach provided me with a new perspective on how to approach the theoretical concepts that are the focus of the study, and also helped me become more reflexive on both the ethical and methodological issues surrounding this study. This adaptability in the field allowed a range of experiences, both within the interview context and informal interactions, to help answer the research questions. At the start of the research, resource user groups were identified with the assumption that there may be differences between, for example, types of fishers or traders. However, the flexible nature of the study allowed a shift in focus to account for what actually impacted perceptions of ES and HWB.

Using a mix of group and individual interview had many advantages. The photovoice focus groups and group interviews provided the means to capture ‘collective’ thoughts and allowed for the inclusion of a greater number of stakeholders in the research. The photovoice methodology provided a broad view on the community itself that helped better inform decisions made later in the data collection process. The visual technique also helped show subtle differences between individuals in focus groups, and presented context-specific data that most likely would not have been discussed without the photographs. Supplementing group data with individual interviews provided rich, in-depth knowledge of individual experiences with the tengefu, and also allowed for contrasting narratives to emerge. And lastly, working with gatekeepers in the early stages of the research allowed me to respect the norms of local community while building trust. This allowed me the freedom later to carry out more interviews at random to capture the perspective of individuals not associated with the tengefu leadership.

However, this approach was not without challenges. Photovoice as a method was time consuming, and required a commitment from participants that was difficult to ensure at
times. Photovoice also stirred up conflict between certain individuals, mentioned in methods. Group dynamics in focus groups and group interviews often overshadowed sensitive topics related to the tengefu, such as conflict and perceptions of doubt. And lastly, as the gatekeepers in each site influenced who I had access to in a number of ways (see section 5.4), the perspective of those not involved with the tengefu is limited.

5.1 Ethics
This study followed the usual ethical review required for research of this nature, in which an ethical assessment was made and reviewed by an ethics committee prior to the start of the research (see appendix C). Despite these procedures, a number of ethical dilemmas arose during fieldwork, contributing to the change in methodology discussed. This contrast between “procedural ethics” and “ethics in practice” is a phenomena recognized in qualitative research (Guillemin and Gillam, 2004). There have been many case examples in which such ethical dilemmas, such as power relations, positionality, and conflict, have an influence on all actors involved in the research process, supporting the need for reflexivity in this type of research (Campbell, et al. 2006; Sultana, 2007). As such, ethical dilemmas and their implications for the research process are discussed below.

5.1.1 Financial compensation for research
The social and ecological dynamics in coastal Kenya have been heavily researched the past several decades. This has led to significant research fatigue in many sites along the coast and consequently, there is a growing dilemma about financial compensation for participation in research projects.

In accordance with the ethics assessment made for this study, I was not planning to offer any financial compensation for participants. I began the research in Kanami, a site where research fatigue was not prevalent. I continued several weeks later in Kuruwito. Kuruwito has a few important differences from Kanami: Kuruwito consists of six landing sites, much more spread out than Kanami, with more fishers/traders. I also realized once research was underway, that one village in the region had been the site for many studies over the last decade, contributing to high levels of research fatigue. I presented the project and idea in the same manner as in the first site, and at first the community leaders
were accepting of the fact that no financial compensation would be offered. However the next time I came to meet with the group, they informed me that they had changed their mind about financial compensation and requested that each participant be paid 500 KSH (~5.70 USD) for participating, and an additional 200 KSH (~2.30 USD) per meeting to cover transport.

After much debate and negotiation between the research team, the community, and the partner organization, the community agreed to accept only the transport reimbursement. This compromise also followed the procedures usually followed by the partner organization for field research. However this solution was not without significant ethical dilemmas: It became evident that many individuals did not use the allotted sum for transport, meaning that in essence, I was paying individuals for research and masking the payment a ‘transport reimbursement.’ Second, the focus groups in Kanami were completed with no financial compensation of participants, creating an ethical dilemma on if retroactive reimbursement should be given to participants in Kanami. After much consultation with my field assistant, a local with experience in field research in that region, I decided that retroactively reimbursing participants from the first site would be more likely to stir up conflict. Additionally, retroactive payments would further encourage the idea of payments for research, a controversial ethical issue in research (Erlen et al., 1999; Grant and Sugarman, 2004).

5.1.2 Enhancing conflict
As discussed in the methods, a conflict arose when interviewing a group of fishermen who were not involved (non-core) in the tengefu project. These fishers also became in conflict with a female fish trader who came from their same village, yet had joined the BMU. A conflict already existed between the supporters and non-supporters of the project (discussed further in results) however, despite the conflict, this trader still seemed to be on good terms with her neighbors who were not involved in the project. Yet after the research was complete, she informed me that since she brought me to the community to ask questions about the tengefu, the fishers did not want to sell fish to her anymore because they associated her even more with tengefu. While it was clear that a conflict
was already building between her and the non-core fishermen, my presence and asking questions about the tengefu, seemed to have enhanced the conflict.

### 5.1.3 Research fatigue and dissemination of results

Several participants made comments about how researchers come to conduct research, but never send back or present any results to the community. As a result of these sentiments, I wanted to find the best way to provide results back to the community in a form they can use and understand. As I was working with a local conservation organization, the results from this study are meant to help inform project work on co-management of tengefu. Yet despite this, it is highly likely that most community members will not perceive any direct benefit from the time they put into the study, further contributing to issues of research fatigue.

However, this study uncovered information that might be controversial if presented back to the community its current form. As a result, it has become increasingly evident that presenting the results in a traditional form is more likely to induce conflict than to help. As a result I decided instead of providing the scientific results of the study, to put together more of an artistic representation of the findings using the results from photovoice. This way, the results will hopefully provide a tangible result that can be experienced by all community members that could be used towards supporting their conservation initiative.

### 5.2 Methodological challenge: Gatekeepers

The role of ‘gatekeepers’ has been discussed in the human geography literature, and recognizes that there are often a few individuals that in a sense ‘control’ who the researcher can access when carrying out social field research (Campbell et al., 2006). In both sites, gatekeepers influenced what data was collected and how. Given the limited nature of this study, I was reliant on the connections that pre-existed between the partner organization and the local communities, and consequently, the leaders of the tengefu in each site became the gatekeepers. These gatekeepers played a significant role in determining who I was associated with, who I interviewed, and consequently influenced the data I gathered.
5.2.1 The “community” group

In both sites, I wanted one of the focus groups to represent a random selection of individuals from each community. The aim of this group was to capture the view of those not directly involved in fishing or trading, and understand how those individuals perceived the tengefu project. In each site, I provided the same request to those helping me to identify research participants. Despite this, in both sites the ‘community’ group consisted of individuals within the core group: In Kanami, all were BMU members while in Kuruwito, the group consisted of mostly tengefu committee members. Once I recognized this, I addressed it in a meeting with the committee in one site, emphasizing that I was looking for more of an ‘outside’ perspective to capture varying views within the community. The response to my concern was that they were all members of the community, so they felt themselves fit to represent community’s view. This incident also provided an important indication of the perceptions held by the leadership group: that the leadership viewed themselves as fit to speak on behalf for the rest of the community.

5.2.3 Field assistants a gatekeeper

I worked predominantly with two different translators/field assistants during this project. Both translators were identified by the partner organization, so both individuals were experienced with this type of field research, and also had some personal connections to organizations or individuals working in the area. The first translator was male, from the coast province, and had about 20+ years of experiencing working on issues related to the environment and community development in coastal Kenya. As a result of his experience, it became evident after time that his personal interest in community development shaped how he interacted with research participants. Furthermore, one of his friends was a committee member in one site, influencing our interactions in that site. The second field assistant I worked with for the remainder of the study was female, not originally from the area, and had not worked in the study sites before, helping to avoid any bias that might have been introduced by the first field assistant.
5.2.4 Gatekeepers and conflict in Kanami
In Kanami, the initial group I made contact with was the tengefu committee and members of the beach management unit. After completing the first round of photovoice focus group, I realized that residents from two of the four landing sites in the region had not been represented. As a result, I tried to find fishers and traders from the other landing sites to interview. I was helped by a BMU member who lived in the village where most of the non-supporters from one landing site lived. However, since it was a BMU member who led us to this group, we were at first assumed to be supporters of tengefu project. Previous studies have shown that the nature of the research itself—inquiring about a conservation project—can lead to researchers being labeled as conservationists, impacting how participants interact and share knowledge with researchers (Campbell et al. 2006). As a result, this association made it difficult to be accepted in the community. We were able to overcome this barrier only with a few individuals who were willing to sit for an interview with us, consequently interview data reflecting this view is limited.

5.2.5 Gatekeepers in Kuruwito
In Kuruwito, the gatekeepers were also the tengefu committee members. Additionally, one of the tengefu committee members was also employed by the partner organization, so in many ways this individual played a significant role in determining who I had access to in this community. This individual was present at many of the meetings, and often times when he wasn’t present, interviewees would ask for him, saying he had to be present in order for them to speak with researchers. To try and avoid the bias that could be introduced by the presence of members of the core group, we spend time at the landing site to randomly identify other individuals for interviews, who through snowball sampling, helped identify additional people to interview.

5.2.6 Interviewing women
Fishers wives were interviewed in each site to try and capture another perspective in the community. Fishers wives were chosen because most community members not working in the fishing sector either were not interested in the conservation project or did not know about it. Additionally, women were interviewed to try and see if the ‘benefits’ that many of the fishers discussed from the tengefu actually made it back to the household.
However, while useful in providing a broader perspective on the tengefu project, this process involved a series of challenges, influencing the usefulness of the data.

In both sites, it was necessary to go first through a male member of the community in order to speak to women. As a result of this, the women I spoke with were chosen by the male community member who guided me around the village. Gender issues are prevalent in the region that have influenced how research is carried out in this region. Issues similar to the example described here are well addressed in the PhD work By Nozomi Kawarazuka, who discusses her experience with gender conducing ethnographic research in Vipingo village (Kawarazuka, 2013).

In Kanami, the tengefu leader was the male community member who introduced me to a number of fishers wives. As a result, these individuals were only from Mdengo, the village where the tengefu leader came from, and also where most of the BMU members are found. Attempts to talk to women from the neighboring village were thwarted by an increase in the conflict between the core and the non-core group. As a result, the female perspective from Kanami reflect only the views of the ‘core group,’ and were possibly influenced by the presence of the tengefu leader.

In Kuruwito, a fisherman who had been identified as a ‘non-BMU’ member, and thus outside of the core group of leaders, was the guide who led us around the Vipingo village. As a result, this sample was likely more diverse, including the wives of fishermen who could have been more or less involved in the tengefu project. We attempted to contact women in the in the village of Kuruwito through a female fish trader that was interviewed, however the husbands of women from Kuruwito insisted that if their wives were to speak to the researcher, they would have to be paid. Given the ongoing ethical dilemma around paying for research in this case, I decided against interviewing women in Kuruwito. This outcome is a likely indication of research fatigue in Kuruwito, the village closest to the tengefu site.
6. Analysis and Results

6.1 Analysis

Focus groups and interviews that were recorded were transcribed from Swahili to English, and all focus group and interview data was coded using Dedoose version 4.9.2 for emerging themes to address the perceptions of ecosystem services and human wellbeing. The history of each case study was assembled by triangulating interview and focus group data, with additional input from grey and scientific literature. Quantitative results for the wellbeing ranking and RANQ questionnaire were assembled and analyzed using descriptive statistics.

6.2.1 History: Kuruwito tengefu

Kuruwito was the first tengefu formed in Kenya. History on its formation was assembled based on a timeline exercise carried out with tengefu leadership (Ku FG1) triangulated against photovoice focus groups and group interviews (KuFG 2,4,6,8), interviews with non-community stakeholders involved in the formation of the tengefu (Ku I 1,2), and available scientific (Kawarazuka, 2013) and grey literature (Harrison, 2005; Griffin, 2013).

Discussion on the tengefu project began around 2003. Community members and a wealthy plot-owning resident\(^2\) cited overfishing, the use of destructive gear by migrant fishers, and overexploitation and destruction by foreign aquarium fish traders as reasons for the inception of the MPA concept. According to the tengefu leadership and the resident, the conflict with aquarium fish traders was a trigger that lead a small group of community members and the resident to approach Kenya Wildlife Service in 2002. While different actors claim responsibility for coming up with the idea (Ku 1,2, Ku FG1, 8) it was decided a community-based marine protected area was the solution to these problems, to keep out both aquarium traders and migrant fishers using illegal gears and to help restore the degraded ecosystem.

\(^2\) Plot-owning residents refer to those who own land along the coast; a mix of wealthy white Kenyans, Africans and Asians. This particular individual will be referred to as ‘the resident’
In partnership with an honorary warden from KWS, starting in 2003 a series of meetings were held in the chief’s office in Kuruwito where the idea was presented and discussed with members from the community. Engagement with more plot-owing residents, as well as a conservation NGO pushed the process further and discussions eventually led to the creation of a constitution, the opening of a bank account, and engagement with potential sponsors (KuFG1, KuI 1,2).

In 2003, the Kuruwito Conservation and Welfare Association was formed to lead the tengefu initiative, with the objectives of reducing unsustainable inshore fishing practices and enhancing the understanding of marine conservation in the community (KCWA). In 2004, a donor funded a trip for members of the community to visit a conservation project in Tanzania so they could see first-hand how community-based conservation works in practice. Representatives from each of the six landing sites were invited on the trip, and for most of them, it was the first time that had traveled to a new country (Kal 1). After the trip, a series of meetings were held at each landing site to share the knowledge learned (KuI 1,2; KuFG1, Griffin, 2013).

A NGO-funded Alternative Livelihood Survey (Harrison, 2005) was carried out, which later informed the development of alternative livelihood projects such as poultry farming and ecotourism. The tengefu was implemented in 2005, first as a six-month trial period. Marine resource users directly affected by the closure were given monetary compensation by an environmental NGO, with the most affected receiving the most and those less affected receiving less (KuFG1). After the trial period passed, it was decided by the leadership to keep the tengefu in place. However, one ‘dissenter’ stated that some community members were not in support of the closure continuing longer than 6 months, and accused the leadership of going against their word (KuI 3). The leadership group also stated that only a select group of individuals really supported the initiative in the beginning. They said by 2008 that most of the community was on board with the idea (KuFG1).

3 This initial group consisted of mostly community elders
Since the closure has been in place, a variety of international organizations have offered financial support the tengefu initiative in Kuruwito used for example, towards purchasing equipment for ecotourism and deep-sea fishing (KuI 1). Both the consultant and resident involved in the project spoke about efforts they made on an individual level recruiting potential donors and project partners, including engaging local hotels and businesses to hire community members or to send visitors to the ecotourism site (KuI 1,2). Several of the plot-owning residents also offered financial support for the project, put towards paying guards and other initiatives by the KWCA (KuI 2). The KWCA has worked with donors and supporters to form a curio shop for women and developed poultry farming activities per the recommendation by Harrison (2005) (KuI 1).

Challenges still exist with the tengefu, as many residents feel they aren’t benefitting enough from the project (Kul 6). As a result, there are still instances of poaching and ongoing conflicts with the leadership group, discussed in further detail in the next sections (KuI 1, KuFG 1,3). The leadership group estimated that about 70% of the community was on board with the tengefu at present, and expressed hope that more will support it in the future. However, they also recognized that there will likely always be dissenters of the project:

“Anywhere with such projects, there has to be people who oppose it, in our case we had people who did not like the idea but we tried to make them see the long term benefits of the project by having regular dialogues and discussions.”

(KuFG1)

6.2.2 Kanami tengefu

The history of the Kanami tengefu was assembled from the timeline exercise with the tengefu leadership (Ka FG1), triangulated against photovoice focus groups and group interviews (KaFG2-8), interviews with outside individuals knowledgeable about the Kanami case and personal observations (KaI 8,9).

The area now considered under the jurisdiction of the Kanami BMU was once part of the management area for the neighboring city of Mtwapa (see map in Figure 1). Around 2007, a fisheries officer introduced the BMU concept to a group of fishers from the
The Kanami BMU was then formed in 2007, and officially separated the area from management in Mtwapa. This group of people consisting of mostly fishers from the *Mvuvi*\(^4\) and *Jumba Ruins* landing sites (referred to as the ‘core group’) formed the BMU with the intention of forming a tengefu. The new concept of the BMUs, combined with local success stories about the tengefu in Kuruwito, made for opportune timing for a tengefu in Kanami. This group also cited contact with an elder from Mtwapa who originally brought the idea to the region around 1999, but said that the idea ‘wasn’t quite ripe’ at that time (KaFG1).

Members from the leadership group cited an increase in fishers and the use of destructive gear, breaking of corals by ‘beach boys,’ and cowrie shell collection dating back to 2000 as reasons for the tengefu. Migrant fishers from Pemba (Tanzania), as well as fishers from local communities such as Mtwapa and Shanzu were blamed for the destructive practices. A series of meetings between 2007 and 2010 built the foundation for creating the tengefu. Meetings involved community members, who later became tengefu committee members, representatives from the fisheries department, and members from the Kuruwito conservation committee who came to share their experience. The tengefu was implemented in 2010, yet still faces a number of challenges, such as getting the rest of the community on board and keeping out poachers. The leadership group said the tengefu was a point of conflict in the community, and that some of those who opposed the initiative did so because they believed it was the government in disguise (KaFG1).

However, fishers not part of the core group (from Kanami and Sun n Sands landing sites) shared a different narrative on the formation of the tengefu. When asked respondents from Kanami said:

"*After the formation of the tengefu, there was a big separation. They used their personal emails to communicate and made decisions to benefit themselves alone. If they were sure the project would benefit all of us in the future, they would involve us and we would work as a team...*" (Ka FG 6)

\(^4\) Also called *Mwendo wa panya*
Another adds:

“I believe if we could work as a team, we could see the long-term benefits of the project and that would be great.” (Ka FG 6)

And last, fishers from the Sun n Sands landing site didn’t know anything about the project, despite the fact their fishing grounds fall within the jurisdiction of the Kanami BMU:

“In this area there is no BMU or even any fisheries at all, we have not interacted with the members of these projects.” (Ka FG 7)

6.3 Linking marine ecosystem services to human wellbeing

When asked how the marine ecosystem contributed to human wellbeing, participants spoke about a range of things, such as having the ability to buy food, clothing, and to save income. A few examples:

“The fish we catch earns us some income it is food for our families and also a source of income....for food, school fees.” (Ku FG 7)

“We get food, clothes and shelter for our families here, it provides for our basic needs.” (Ku FG7)

“The fish we got from the sea we used as food to feed our families, we also sold the fish and made money, which of course improves our lives.” (Ka FG6)

These qualitative results show that participants perceive benefits from the marine ecosystem beyond income alone. However, when asked to rank what were the most important aspects of wellbeing from the marine ecosystem, there was overwhelming consensus that income was the most important. Table 3 provides a summary of the ranking exercise showing the importance participants placed on income; the category with the highest number of times mentioned and mean rank. These results suggest that while resource users perceive that there is more to wellbeing than income alone, income may serve as a mechanism to achieve other attributes of wellbeing.
Table 3. Summary of ranking exercise. Participants were asked to list and rank what from the marine ecosystem is the most important for contributing to human wellbeing. The number of times each category was mentioned is listed first, followed by the mean rank each category received during the exercise. Categories that were mentioned at least twice are included.

<table>
<thead>
<tr>
<th>Category</th>
<th>Times mentioned</th>
<th>Mean rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>12</td>
<td>0.803</td>
</tr>
<tr>
<td>Food</td>
<td>8</td>
<td>0.587</td>
</tr>
<tr>
<td>Ecotourism</td>
<td>8</td>
<td>0.587</td>
</tr>
<tr>
<td>Education</td>
<td>6</td>
<td>0.767</td>
</tr>
<tr>
<td>Conservation</td>
<td>5</td>
<td>0.789</td>
</tr>
<tr>
<td>Recreation</td>
<td>5</td>
<td>0.212</td>
</tr>
<tr>
<td>Employment</td>
<td>3</td>
<td>0.744</td>
</tr>
<tr>
<td>Collaboration</td>
<td>3</td>
<td>0.495</td>
</tr>
<tr>
<td>Landing site</td>
<td>3</td>
<td>0.687</td>
</tr>
<tr>
<td>Leadership</td>
<td>2</td>
<td>0.369</td>
</tr>
<tr>
<td>Health</td>
<td>2</td>
<td>0.267</td>
</tr>
<tr>
<td>Transport</td>
<td>2</td>
<td>0.243</td>
</tr>
</tbody>
</table>

6.4 Tengefus and the perceptions of ecosystem services and human wellbeing

6.4.1 Participation determines perception of ES/HWB

Perceptions of ES and HWB impacts from the tengefu varied according to the level of participation individuals had in the project. Individuals who led, who were involved in the planning and implementation of the project, and those directly employed by the project in the case of Kuruwito, tended to have the most positive view of the tengefu and its impact on current (and in the case of Kanami, future) wellbeing. These individuals are hereafter referred to as ‘core’\(^5\), and those less involved with the project as ‘non-core.’ In general, Kuruwito had higher levels of participation in the project compared with Kanami, where only two of the four landing sites were actively involved in the planning and implementation of both the tengefu and the BMU.

\(^5\) In the methods, membership in the BMU was discussed as being a distinguishing factor between those who participated and those who did not. While this was true in Kanami, in Kuruwito the BMU was more established and consequently, even those who weren’t involved in the tengefu project were members of the BMU, as membership is required by law in order to fish in the region. Consequently, to be consistent across sites, participation groups are labeled as ‘core’ and ‘non-core’
In Table 4, perceived ES and HWB impacts are listed per ‘user group,’ delineated first by their level of involvement of the project and between different types of resource users (described in table 5 and 6). These tables describe the characteristics of these groups based on the data collected in this study, and also describe the sample of individuals represented. Further written descriptions of resource user groups and their perceptions of ES and HWB can be found in appendix B.

Table 7 describes the findings from the Resource and Needs Questionnaire (RANQ), divided by core and non-core resource users. The results show that there are low levels across sites for several basic needs: Food security, shelter, and education; all categories mentioned in focus groups as being important for wellbeing. The results also show that for the average of all basic needs, the core individuals in both sites had a higher percentage of needs met. The analysis was also run without female fish traders, to remove any bias gender may play, and still found the core individuals to have a higher percentage of needs met (see appendix A, table 2).
Table 4. Beneficiary groups per site, perceived ES and impacts on human wellbeing.
Data based on focus group and interview data. Detailed description of perceptions from each user group can be found in appendix B

<table>
<thead>
<tr>
<th>Site</th>
<th>ES perceived</th>
<th>HWB impacts perceived</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanami: Core, mostly fishers, few traders</td>
<td><strong>Regulating, Provisioning, Cultural, Indirect</strong></td>
<td>+ Income: Contributes to other constitutes of material wellbeing (health, education, housing, food)</td>
</tr>
<tr>
<td></td>
<td>• Habitat provisioning</td>
<td>+ Sense of pride and ownership</td>
</tr>
<tr>
<td></td>
<td>• Support for aquatic life cycles</td>
<td>+ Secure future wellbeing</td>
</tr>
<tr>
<td></td>
<td>• Spillover effect – Fish catch</td>
<td>+ Benefits to the whole community</td>
</tr>
<tr>
<td></td>
<td>• Spillover effect – Aquarium fish</td>
<td>+ Collaboration*</td>
</tr>
<tr>
<td></td>
<td>• Knowledge and education</td>
<td>- Conflict*</td>
</tr>
<tr>
<td></td>
<td>• Ecotourism</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• (Future) Donor funding and support</td>
<td></td>
</tr>
<tr>
<td>Kanami: Non-core fishers</td>
<td>none</td>
<td>- Income: Contributes to other constitutes of material wellbeing (health, education, housing, food)</td>
</tr>
<tr>
<td>Kanami: Non-core, (Majority) of female fish traders</td>
<td>none</td>
<td>- Exclusion*</td>
</tr>
<tr>
<td>Kuruwito: Core, Leadership, mostly fishers</td>
<td>• Habitat provisioning</td>
<td>- Conflict*</td>
</tr>
<tr>
<td></td>
<td>• Support for aquatic life cycles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spillover effect – Fish catch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Knowledge and education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ecotourism</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Donor funding and support</td>
<td></td>
</tr>
<tr>
<td>Kuruwito: Core, fishermen</td>
<td>• Habitat provisioning</td>
<td>+ Income: Contributes to other constitutes of material wellbeing (health, education, housing, food)</td>
</tr>
<tr>
<td></td>
<td>• Support for aquatic life cycles</td>
<td>+ Sense of pride and ownership</td>
</tr>
<tr>
<td></td>
<td>• Spillover effect – Fish catch</td>
<td>+ Secure future wellbeing</td>
</tr>
<tr>
<td></td>
<td>• Knowledge and education</td>
<td>+ Benefits to the whole community</td>
</tr>
<tr>
<td></td>
<td>• Donor funding and support</td>
<td>- Conflict (poachers, leadership)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Perceptions of inequality between community members*</td>
</tr>
<tr>
<td>Kuruwito: Core, ecotourism</td>
<td>• Habitat provisioning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Support for aquatic life cycles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spillover effect – Fish catch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Knowledge and education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ecotourism</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Therapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Donor funding and support</td>
<td></td>
</tr>
<tr>
<td>Kuruwito: Non-core, fishers</td>
<td>• Habitat provisioning</td>
<td>+ Income: Contributes to other constitutes of material wellbeing (health, education, housing, food)</td>
</tr>
<tr>
<td></td>
<td>• Support for aquatic life cycles</td>
<td>+ Sense of pride and ownership</td>
</tr>
<tr>
<td></td>
<td>• Donor funding and support</td>
<td>+ Sense of security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Benefits to the whole community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Conflict (poachers, leadership)*</td>
</tr>
<tr>
<td>Kuruwito: Non-core, Female fish traders</td>
<td>• Donor funding and support</td>
<td>- Income: Contributes to other constitutes of material wellbeing (health, education, housing, food) (via increased pressure on further landing sites)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Benefits to the whole community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Conflict (migrant fishers)*</td>
</tr>
</tbody>
</table>
Table 5. Description of beneficiary groups from Kuruwito

<table>
<thead>
<tr>
<th></th>
<th>Core Group</th>
<th>Non-Core Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leadership</td>
<td>Ecotourism (Non-fishery employment)</td>
</tr>
<tr>
<td>Sample</td>
<td>1 Group interview (GI), 1 Photovoice focus group (PV), 1 individual interview (II)</td>
<td>2 PV, 1 GI interview, 1 II</td>
</tr>
<tr>
<td>Community: Estimated numbers</td>
<td>10+</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Representatives from all</td>
<td>Greater % from Kuruwito, Vipingo, Kinuni</td>
</tr>
<tr>
<td></td>
<td>Additional comments</td>
<td>Leadership is elected by community members. There are roughly 10+ individuals on the KWCA committee, mostly male fishers with one female and one male trader. Subcommittees exist in each landing site, including a greater percentage of male fishers.</td>
</tr>
<tr>
<td>Landing sites</td>
<td>Representatives from all</td>
<td>Greater % from Kuruwito, Vipingo, Kinuni</td>
</tr>
<tr>
<td></td>
<td>Kuruwito, Vipingo, Mwanamia,</td>
<td>Mwanamia</td>
</tr>
</tbody>
</table>

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### Table 6. Description of beneficiary groups from Kanami.

<table>
<thead>
<tr>
<th></th>
<th>Core</th>
<th>Non-core</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample</strong></td>
<td>4 photovoice focus groups, 3 individual interviews,</td>
<td>2 group interviews, 3 individual interviews</td>
</tr>
<tr>
<td><strong>Total: Estimated number of fishers</strong></td>
<td>Estimated 40-60. Mixed gear types</td>
<td>Estimated 50-250. Mixed gear types</td>
</tr>
<tr>
<td><strong>Total: Number of traders</strong></td>
<td>6 (2 male, 4 female)</td>
<td>Estimated 60, mostly female fish traders</td>
</tr>
<tr>
<td><strong>Landing sites</strong></td>
<td><em>Mvuvi</em> (also called <em>Mwendo wa panya</em>) and Jumba Ruins</td>
<td>Kanami and Sun n Sands</td>
</tr>
<tr>
<td><strong>BMU membership</strong></td>
<td>All members</td>
<td>No members</td>
</tr>
<tr>
<td><strong>Additional description</strong></td>
<td>This group includes leaders of the tengefu/BMU, and those who have been closely associated with the project.</td>
<td>Those that are aware of the project in this group are overwhelmingly against it, while others are completely unaware of the project</td>
</tr>
</tbody>
</table>

### Table 7. Results from RANQ questionnaire. *Figures describe the percentage of individuals surveyed whose needs are met.*

<table>
<thead>
<tr>
<th></th>
<th>Kuruwito</th>
<th>Kanami</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core (n=21)</td>
<td>Non-core (n=20)</td>
</tr>
<tr>
<td>Economic Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shamba</td>
<td>43%</td>
<td>20%</td>
</tr>
<tr>
<td>Livestock</td>
<td>57%</td>
<td>70%</td>
</tr>
<tr>
<td>Ability to borrow money</td>
<td>76%</td>
<td>60%</td>
</tr>
<tr>
<td>Average</td>
<td><strong>59%</strong></td>
<td><strong>50%</strong></td>
</tr>
<tr>
<td>Food security</td>
<td>62%</td>
<td>30%</td>
</tr>
<tr>
<td>Water security</td>
<td>85%</td>
<td>100%</td>
</tr>
<tr>
<td>Sanitation</td>
<td>95%</td>
<td>75%</td>
</tr>
<tr>
<td>Shelter</td>
<td>52%</td>
<td>25%</td>
</tr>
<tr>
<td>Health</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>Security</td>
<td>95%</td>
<td>90%</td>
</tr>
<tr>
<td>Education</td>
<td>35%</td>
<td>10%</td>
</tr>
<tr>
<td>Emotional Relationships</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Participation</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td><strong>AVERAGE % NEEDS MEET ACROSS ALL NEEDS</strong></td>
<td>78%</td>
<td>66%</td>
</tr>
</tbody>
</table>
In Kuruwito, individuals from the leadership group cited positive individual and collective wellbeing impacts:

“The entire community has benefited from the project, like school fees for their children. We help them get health services, we continue to assist where necessary” (KuFG1)

“In relation to the benefits I have received from the association, my wellbeing has really been able to improve in that, I have managed to take my children to school and take good care of them despite problems” (KuFG2)

In Kanami, there was an emphasis on benefits to the whole community, with a focus on the spillover effect from the tengefu:

“So now that we’ve started conserving the area, (fishers) started seeing the benefits. This shows that having decided on tengefu, we have realized its blessing will benefit our future wellbeing” (KaFG 2)

“The income we get after the tengefus is high....we now see the most benefit of the tengefus, as we get more fish” (KaFG3)

Benefits were also cited in relation to a foreign aquarium trader, in contrast to the role of the trader in Kuruwito (see Figure 3).
Figure 3. A core individual: Perceived impact on ES/HWB from tengefu
“That service really has contributed to creation of jobs for more than 200 youths and we can say they (the aquarium traders) are the ones who we normally do collaborate with...” (Ka FG4)

Figure 4. A core individual: Perceived impact on ES/HWB from tengefu
“She is my wife. It is because of the tengefu I had the chance to undergo some training such as for first aid, tour guiding, which has enable me to get some money for the work ... enabling me to buy the sewing machine for my wife, even some household goods. At least I have benefited from the tengefu for even if I fail to come to the beach my wife can as well contribute to family finances” (KuFG6)
Members of the ecotourism group from Kuruwito cited the highest number of benefits (10) from the marine ecosystem in the wellbeing ranking exercise. They also cited some of the indirect benefits from the tengefu, identified in figure 4.

Non-core individuals in Kuruwito had a more neutral attitude towards the tengefu:

“*It does not affect us negatively, the people that fish there are our brothers and neighbors therefore the entire community benefits in some way*” (KuFG 9)

However these individuals cited the increase in fishing pressure in their region from displacement of fishers, resulting in some conflict:

“*Since the area was restricted no fishing was allowed to take place and the fishers who were fishing in that area had to relocate to other landing sites. Some fishers moved to our territory and we were already overpopulated, about 50-60 fishers were fishing in that area.*” (Ku FG 10)

Non-core fishers in Kanami, who were not involved in the planning and implementation process had the most negative view on the tengefu:

“*Honestly we do not feel any connection with the project that positively affects us, with the start of the tengefu our fishing has been messed up, before we used to go fishing in the restricted area and our catch was plenty but now we really have to struggle.*” (Ka FG6)

### 6.4.2 Participation of female fish traders.

Female fish traders, known as *mama karanga*, are responsible for the processing and sale of smaller fish in the local markets, compared to male traders who buy and sell higher value fish (Matsue et al., *submitted*). The majority of the female fish traders – from landing sites both near and far from the tengefu - are considered part of the non-core group, as most of them cited little or no benefit from the tengefu:

“I have not experienced any change, as fishing is not done within tengefu. So the fishermen if they go fishing, if they get [fish] or not is just normal. If they get, we buy, if they don’t, we buy from other markets” (KuFG5) - Trader from Kuruwito
“No, we are not affected in any way. We do not see the benefits of Kuruvitu in any way, maybe the people from there benefit from the project” – Trader from Mwanamia

In Kuruwito only one female trader sits on the KWCA committee, and in Kanami, three to four female traders were said to be members of the BMU, with one serving as on the BMU committee. These women, in general, spoke in support of the project. However, the committee member from Kanami said while she supports the project, she doesn’t get any benefits in terms of fish from the tengefu, and said a male trader in Kanami benefits the most from fish from the tengefu (KaI 3). The remaining majority of women interviewed said the project didn’t affect them, or in Kanami, contributed to conflict.

Additionally, many traders said that getting fish now is harder than before. Some attribute this to the tengefu, while others point to the fact that, unrelated to the tengefu, the number of traders in the area has increased over the last years, leading to greater competition for less fish.

“The fishmongers now have to get alternative means of livelihoods because after restricting the area they do not easily get fish like before.” (Ku FG1)

“It is the traders numbers which has increased numbers leading to the competition amongst them on the quantity of fish one can ... buy, and not that the fish population has declined. While in the past, within the six landing sites there were less than twenty traders.” (KuFG2)

The wellbeing of female fish traders was shown to be heavily dependent on relationship with fishers, as the livelihood of traders depends on buying catch from fishermen:
The relationship between fishermen and fish traders was often discussed in focus groups and interviews. While co-dependent, the gendered relationship between female fish traders and fishermen lead to fishermen holding a significant amount of power over female traders (Matsue et al., submitted). A conflict in Kanami occurred when fishermen sold fish to traders according to their membership in the BMU: Fishers in the BMU were said to only sell to traders who were members of the BMU, while as non-BMU fishermen refused to sell fish to traders who were members of the BMU.

“There is segregation; the members of BMU are given first priority the fishers fill the members’ buckets first before giving fish to the non members. They arrange the buckets in a line.” (Ka I 1)

The conflict forced one fish trader to stop trading in her village, as fishermen refused to sell to her anymore given her affiliation with the tengefu (Ka I 3).
6.4.3 Perceptions of inequality

The level of participation in the tengefu also influenced how individuals viewed their fellow community members. Fishers from more distant landing sites in Kanami felt excluded from the process and felt that supporters of the project were purposely excluding others to keep benefits for themselves:

“They send invitation letters to members of the project only. That is when you are left wondering is this a government project or a project to benefit a few individuals? What will the community get from the project?” (KaFG6)
In Kuruwito, some fishers involved in the project cited conflict or problems with the leadership. Some perceived that leadership roles were concentrated on those who from closer landing sites to the tengefu, excluding those from further sites from making decisions, and that there is little transparency with regards to how money is spent by the leadership committee (KuFG 3,4, Kul 3). One dissenter stated the leadership committee was the only group who benefitted from the project (Kul 3). Finally, members from one focus group expressed their dissatisfaction with how the leadership communicated and organized my presence as a researcher (personal observation).

6.4.4 The role of donor support
A key difference between sites was the level of donor support, with Kuruwito having more support during the planning, implementation, and management, compared to Kanami. The importance of donor support was often mentioned in relation to wellbeing impacts from the tengefu, and in this thesis will be referred to as an ‘indirect ecosystem service.’

Because of the tengefu, a number of NGOs and donors took an interest in supporting Kuruwito over the 10+ years the project has been in place. As discussed in the history, forms of support included the reimbursement for fishers excluded from the tengefu in the initial six months of the project, financial backing for a visit to Tanzania to learn about conservation, and funding for deep sea fishing equipment and a range of trainings in being a guard, tour guiding, and support for alternative livelihood projects such as poultry farming. The KWCA lists 20 partner organizations on their website, including local and international governments and NGOs, who are either financial supporters or work collaborators (KWCA).

For individuals in Kanami, the Kuruwito case showed that creating a tengefu led to significant financial support from various social and environmental NGOs (Ka FG1, 2). While support from “sponsors,” or donors, was mentioned as important for contributing to ‘future wellbeing’ in Kanami (KaFG4, KaI5), it was also said no sponsors had shown interest yet (KaI 5, KaFG 6).
6.4.5 Perceptions of communal and future benefits

An emerging theme from the core focus groups was the emphasis on the benefits to ‘the community’ rather than to individuals. This was especially the case in Kanami within the core group, but also prevalent in Kuruwito across all resource users. Often times, different resource groups would discuss benefits to others, for example, fishermen talking about how fish traders are earning income from the tengefu, referring to jobs created for the community’s youth with the aquarium fish traders, and in focus groups, saying “we benefit” rather than “I benefit” (KaFG 2,4; KuFG 1,2,3). In Kuruwito, ‘non-core’ fishers from further landing sites still believed the tengefu was a good thing, even though it had no positive impact on them as individuals (KuFG9).

There was discussion about ‘future wellbeing’ in Kanami. Many community members in the core group believe the tengefu will help contribute to a future increase in income:

“The only important thing is to conserve the area as it is our only hope…it can enable us to improve our future wellbeing” (KaFG 2)

“The conservation of the area should continue to enable fishermen to improve their living standards as well as get support and donor funding just like the fishermen from Kuruwitu have managed to get.” (Kal 5)

While discussions on ‘future wellbeing’ prevailed, triangulation showed that some core fishers still doubt the project because of the lack of short-term benefits (Kal 6): Only two of the seven women interviewed in Kanami cited any change in income since the tengefu started (Kal 5).
7. Discussion

7.1 Step zero applied: A comparison of cases

The two sites provide contrasting examples in which the planning and inception, or the ‘step-zero,’ of each tengefu followed different paths resulting in different outcomes for perceptions of ES and HWB. In Kuruwito, the data reflects that a greater majority of the community shared a common narrative on the creation of the tengefu compared with Kanami, where a great divide exists between individuals involved in the project and those who are not. Figure 7 summarizes the key similarities and differences between each site.

![Comparison between two tengefu sites](image)

**Figure 7. Comparison between two tengefu sites.** Key similarities and differences in the step zero and development of each tengefu

Chuenpagdee et al. (2013) emphasize the role that power and politics play throughout the step-zero process, manifested in many ways within the tengefus. The most obvious example was that in both sites, there were individuals who were said to believe the tengefu was KWS in disguise, reflecting the general mistrust fishers on the Kenyan coast.
have towards the government resulting from past top-down management (McClanahan, 2005; Evans, 2009).

The relationships between community members and foreign aquarium traders manifested itself in different ways at each site. These relationships are laden with power dynamics, as aquarium fish traders in coastal Kenya often have higher social-economic status. In Kuruwito, the community unified against the trader because the trader was causing damage to the ecosystem and not helping the community in any way. In contrast, the core group in Kanami said the trader was a positive force in the community because he employed many of the local youth.

Another element argued for a successful step-zero is the recognition of the problem at the community level during the pre-implementation phase (Chuenpagdee and Jentoft, 2007). The unification against the aquarium trader and Pemba fishermen, coupled with significant stakeholder engagement the two years prior to the tengefu implementation, allowed for stakeholders in Kuruwito to get on board with the project in their own time. While a similar amount of time was spent on step-zero in Kanami, there was less widespread engagement of community members, breeding negative sentiments towards the tengefu during the early phases that are still felt today (Chuenpagdee et al., 2013; Cinner et al., *in press*). From the perception of the non-core individuals, the engagement in the planning process was limited to the select group of core individuals. Tengefu leaders were accused of only communicating about the project within their personal networks through email, increasing suspicion for those not involved in the project (Chuenpagdee and Jentoft, 2007).

Another important distinction between the two sites was the involvement of the wealthier resident in Kuruwito. This individual, who was involved with the inception of the project and cited conservation as a personal interest, provided a bridging function between the community and donors. He cited a close relationship to the community members dating back decades, and given his social-economic status, was more connected to the ‘donor’ community in Kenya. As a result, he played an instrumental role in bridging the two worlds by connecting donor support directly to the needs and wants of the community.
This bridging function is an important part of adaptive co-management, described in the next section.

7.2 Tengefu in complex social-ecological systems
As stated by Berkes “communities don’t conserve… at least, they do not act as simple, isolated agents. Rather, they are embedded in larger systems, and they respond to pressures and incentives” (2004:628). As such, it is important to recognize that community-based conservation initiatives exist within complex social-ecological system and are affected by dynamics on multiple scales (Berkes, 2007). It is also important to recognize that tengefu exist in a highly politicized context that also influences their impact on ES and HWB. This case showed how actors acting on multiple different scales beyond the community (e.g. donors, aquarium traders, government, research groups, NGOs) played an important role in shaping the community’s perception of the project, and ultimately its social and ecological success.

Fisheries governance in Kenya is moving more and more in the direction of co-management, embedding tengefu in this relatively new management structure. With BMUs gaining more power, and the increasing number of tengefu in Kenya, this period provides a window of opportunity to ensure this transition adopts elements of adaptive co-management. Adaptive co-management has been defined as flexible community-based systems of resource management that are tailored to specific places and situations, supported by, and working with, various organizations at different levels (Berkes, 2003; Olsson, 2004; Folke et al. 2005). Participation – a key factor in dictating perceptions of ES/HWB impacts in this case – is also recognized as a critical component of adaptive co-management (Schultz et al., 2011).

The Kuruwito case also highlighted the importance of the bridging function, discussed above. The adaptive governance literature frames this function as being carried out by “bridging organizations,” which are groups that facilitate collaboration and knowledge co-production amongst various actor groups, such as researchers, resource managers, and resource users (Crona and Parker, 2012). In this case, it was an individual who played this role, and through his networks helped create incentives for ecosystem management (Folke et al., 2005).
7.3 Participation and equity

One of the main goals of community-based conservation is to empower individuals who depend on ecosystems for their livelihoods to actively participate in the management of natural resources. As a result, it is often assumed that community-based projects always have equitable participation of stakeholders. This study argues this may not always true, and highlights the crucial role participation plays in dictating the perceptions of the tengefu and the consequential impacts on ecosystem services and human wellbeing. In Kanami, there was a clear divide between landing sites that coincided with how individuals were engaged with and participated in the tengefu. In Kuruwito, where all landing sites had been engaged on some level with the project, the data indicates that a greater majority of community members supported the tengefu.

The leadership groups in both sites participated the most in the project, and consequently had the most contact with outside NGOs and donors that support the conservation initiative. This, and the similarity of perceived ES/HWB impacts between leadership groups in both sites (see table 3), could also indicate the role played by environmental education from outside actors, such as conservation NGOs and researchers, in influencing perceived impact (Christie, 2005). While participation has been recognized as important for MPA governance and success (e.g. Elliot et al., 2001; Mascia, 2003; Gustavsson et al., 2014), little attention has been given to the multifaceted role participation plays in CBMPAs, as its role is generally assumed.

Perceived inequalities about distribution of benefits may have also played a role in the various conflicts surrounding each MPA. In Kuruwito, the conflict between the leadership and the rest of the community stemmed from the belief that the leadership was benefitting more than the rest of the community. In Kanami, those from the non-core group perceived the core group was carrying out conservation for their own benefit rather than for the benefit of the whole community. Perceptions of inequalities have been recently argued to play a significant role in successful fisheries governance (Fabyini et al., 2014). Research on income has suggested that relative income disparity actually has a greater consequence on happiness (Ball and Chernova, 2007) and health (Wilkinson,
than actual income inequality, further supporting the importance of considering perceptions in this context.

The results from the RANQ questionnaire also indicate that there may be an actual difference in wealth between core and non-core individuals, as a greater percentage of core individuals had their basic needs met compared with non-core. These findings relate to two different hypotheses discussed in previous literature: That those who participate more in the tengefu are actually benefitting more, supported by arguments by Kellert (2000) and Berkes (2004) in that conservation-development projects may in fact result in less equitable distribution of benefits, or that wealthier individuals use conservation initiatives to promote and maintain their own interests at the cost of others (Christe, 2004; Béné et al., 2009). Further support for these hypotheses is found in Cinner et al. (2012c) who found that co-management tends to benefit wealthier individuals more.

7.4 Participation of female fish traders
The lack of participation of female fish traders in tengefu implementation and management exemplifies an issue too rarely addressed: the role of gender in fisheries management. Women account for nearly half of the fishing industry globally (WorldFish Report, 2010), yet social impacts on women are rarely discussed in fisheries governance literature (Bennett, 2005). In recent years, gender issues in fisheries have started to gain some attention (e.g. Resurreccion, 2006; Kambewa et al., 2009; Yang, 2013; Matsue et al., submitted), raising awareness of the need to address these challenges both in research and policy.

This study found that while a majority of traders in each site were women, very few had any say in decision-making regarding the BMU or the tengefu. In each sites, only one female trader held a leadership position while a majority of the others said they were not involved with the project. Female fish traders in Kenya have been shown to be in a disadvantaged position, as they have low socioeconomic status, and limited education, capital or opportunities (Matsue et al, submitted). A recent study also found that female fish traders in the same region work longer hours while earning less than half the income of male fish traders (Yang, 2013).
Power dynamics between fishers and traders were also found to influence perceptions of the tengefu. While the relationship between fishers has been argued as being co-dependent (Bennett, 2005) women were often found to be in a vulnerable position compared with the fishers. Power dynamics between fishers and traders have gained recent attention, with the concept ‘fish-for-sex’ recognized as a phenomenon that is increasingly reported in Kenya and other African countries, in which women are often forced to offer sex as a means to secure fish from fishermen due to lack of economic alternatives (Béné and Merten, 2008). A key example reflecting power dynamics between fishers and traders from this case was in Kanami, when fishers controlled which traders had access to fish depending on their support for the tengefu project.

With the implementation of co-management schemes that devolve power to the local level, the risk of reinforcing the cultural contexts that perpetuate these gender inequalities is high. Consequently, developing the means to better include female traders in all aspects of tengefu implementation and management holds great significance at this stage of the transition.

7.5 Money Matters

Two findings from this study emphasize the need to bring money into the discussion on ecosystem services, human wellbeing, and MPAs: The importance placed on income for contributing to wellbeing by resource users, and the role donor support plays in the implementation phases of an MPA and the perceptions of its benefits.

Sen (1999) argues that resources and assets are not the end goals of wellbeing; they are simply the means of achieving “something else.” While other components of wellbeing were discussed, the ranking results showed that most resource users saw income as being the most important for wellbeing. As suggested in the results, this could indicate income serves as a means to achieve other aspects considered important for wellbeing, such as food, shelter, children’s education, and access to healthcare. Previous studies in the East African context support this argument by emphasizing the importance of income in relation to ecosystem services: Brown et al. (2008) emphasize the importance of cash and employment, further supported by Daw et al. (2011) who argue that in systems of greater inequality, marginal utility of income plays a major role.
Donor support played a diverse role in influencing how community members perceived the tengefu project. Tangible benefits were felt by individuals in Kuruwito, ranging from the immediate reimbursements after the fisheries closure or more indirect benefits associated with alternative livelihood trainings. In Kanami, the example of Kuruwito showed that the tengefu provided an opportunity to solicit support from the outside, potentially indicating a growing expectation within communities that tenefus equate to donor support.

Little scientific attention has been given to the role that donor support may have in dictating the outcome of conservation projects (Ferraro and Pattanayak, 2006). However in this case, donor support was found to underpin functions that have been recognized as being important for successful fisheries governance. For example, by supporting alternative livelihood development: A study in the same geographical region found that fishers with more diversified livelihoods were more willing to exit a declining fishery (Daw et al., 2012). Donor funding also played a significant role in supporting the participation process during the early stages of the tengefu, a key component for adaptive co-management (Schultz et al., 2011) and ensuring an inclusive step-zero for the MPA (Chuenpagdee and Jentoft, 2007).

7.6 Theoretical conclusions: Linking ecosystem services, human wellbeing, and marine protected areas

This thesis has shown how the ecosystem service and human wellbeing approach can help make sense of the complex social-ecological dynamics surrounding CBMPAs. This approach allowed for the inclusion of the greater social-political mechanisms influencing the ecosystem services that people can access and transfer into individual and collective benefits. This approach also provided the means to disaggregate wellbeing, highly relevant in the poverty context of this case (Daw et al., 2011). This disaggregation also allowed for the identification of ‘winners and losers’ from the MPAs (Mascia and Claus, 2009; Cinner et al., in press). The qualitative view on ES/HWB gave the flexibility needed to account for the ‘indirect’ service from the tengefu (donor support), what this and other services mean for wellbeing, and helped identify groups of people who perceived ecosystem services and wellbeing impacts in different ways. By examining
wellbeing, a more in-depth understanding is gained on who are the different actors affected by fisheries governance, and how their decisions and actions may in turn, affect fisheries governance (Coulthard et al., 2011).

This study also found support for the notion that the three dimensions of wellbeing – material, relation and subjective – are interlinked and connected (Britton and Coulthard, 2011). For example, in Kanami, the relations between the non-core and core group of fishers determined who was able to access the material benefit (e.g. spillover, revenue from ecotourism), which in turn had an impact on how individuals felt about the tengefu. In Kuruwito, the relationships with the bridging individual, who helped link the community with outsiders, helped create a sense of pride for the project while simultaneously bringing monetary benefits to the community.

The perceived importance of communal benefits also connects to the relational dimension of wellbeing. While the tengefu created ‘bad blood’ between some community members, it also was a mechanism that brought other community members together to work towards a common cause. Additionally, those involved in the tengefu project became more connected to actors on different scales. For example, in Kuruwito, more connections were made with plot-owning residents, donors, NGOs, and in Kanami, fewer connections to NGOs and to the Fisheries Department.

The perceived lack of short-term benefits coupled with the emphasis on future and communal benefits in Kanami also may also indicate that tangible benefits – fish spillover - often used an argument for MPAs (McClanahan, 2010) can only be felt by a few individuals. Community members from the closest landing sites to the tengefu spoke about spillover effect benefitting them, while those from the further landing site talked about exclusion from the fishery. In Kuruwito, while fish spillover was discussed, many of the benefits identified by community members were resulting from donor support (e.g. trainings, equipment) or more subjective benefits such as pride and ownership. This argument is supported by previous studies, which show that while the spillover effect is perceived, it does not compensate for displacement from fisheries (Pita et al., 2011; Cinner et al., in press).
8. Conclusions

Tengefu initiatives on the Kenyan coast are growing in number, with some succeeding and others failing. While from an ecological perspective, Kanami and Kuruwito have both been considered successful, it is evident that the social dynamics between the two vary greatly, with implications that may influence their future success. The findings from this study and others have shown that issues surrounding CBMPAs are highly complex and context-dependent (Pollnac et al., 2010; Cinner et al., in press). Despite this complexity, the results indicate that there may be key elements in the inception and management process that lead to more positive results in the social systems that could be considered in future CBMPA initiatives. Consequently, the following recommendations are suggested to encourage equitable distribution of benefits from tengefus, with the ultimate goal of contributing to greater social and ecological success:

1. Provide a transparent step-zero phase with sufficient time to engage with all community members and potential donors, to ensure that all stakeholders share the same vision of the CBMPA by the time the project is initiated.

2. Ensure participation is not just limited to ‘local elite’ and is inclusive of all, especially vulnerable stakeholders.

3. From the start, consider the role of donor support. For example, the expectations the community has for donor support and the actual needs to make the project sustainable into the future.

4. Ensure investment in alternative livelihoods initiatives suitable for the local context.

It is also important to recognize that a number of challenges continue to face communities dependent on small-scale fisheries in coastal Kenya. These challenges - such as the presence of migrant fishers, the use of destructive fishing gears and the massive decline in tourism due to increasing social-political unrest – will continue to influence the social and ecological success of tengefus. However, despite these challenges, the findings from this study provide concrete steps that can be taken to help contribute to more inclusive management, contributing to the social and ecological resilience of these initiatives in an uncertain future.
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## Appendix A. Additional tables

### Table 1. Interview and focus group codes

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<td>KaFG3</td>
</tr>
<tr>
<td>Kanami: Gill (photovoice)</td>
<td>KaFG4</td>
</tr>
<tr>
<td>Kanami: Traders (photovoice)</td>
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</tr>
<tr>
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</tr>
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<td>Kanami: Jumba Ruins</td>
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Table 2. RANQ questionnaire results, excluding female fish traders

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<td>Non-core n=8</td>
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Appendix B. Distribution and contribution of ecosystem services to human wellbeing

The following sections discusses the perceptions held by each group regarding the flows of ES and their implications for human wellbeing. This sections serves as a qualitative supplement to table 2 in the results section.

ES to Wellbeing: Kuruwito
1. Core: Leadership

The leadership group discussed the tengefu in a very positive light, emphasizing their perception in that that the whole community benefits from the project.

“The entire community has benefited from the project, like school fees for their children. We help them get health services, we continue to assist where necessary.” (KuFG1)

They discussed a range of benefits, including job creation, increase in tourism, the ability to purchase deep-sea fishing gear, the improved state of the ecosystem and fish spillover, as well as the loans available to community members in need due to the revenue from ecotourism and donor support. On an individual level, members of the leadership group also cited the fact they were able to benefit by earning more income through alternative livelihood projects, contributing to different aspects of wellbeing:

“In relation to the benefits I have received from the association, my wellbeing has really been able to improve in that, I have managed to take my children to school and take good care of them and despite problems” (KuFG2)

The same member cited the fact she was able to build her own house and access a small loan through another outside organization as a result of the tengefu.

A strong sense of pride and ownership of the project was also evident in interviews with the leadership group. Despite the significant support from outsiders, members of the community discuss the project as being their own, and only rarely mention the non-community supporters behind the project, such as the NGOs or residents who have
contributed financially to the project (KuFG1, KuFG2, KuI 2). They discuss how they have been able to build an office, and how they knowledge with other communities interested in conservation:

“We have mentored other fishing communities who have also started conserving their environments after seeing the benefits of Kuruwitu” (KuFG1)

An observation made in this study was that a majority of the leadership group nominated themselves to be participants in the study, despite requests to find individuals from outside their immediate group to participate. This could have been attributed to a number of reasons: Individuals could have seen the research as an opportunity to obtain another monetary benefit from the tengefu, as they often spoke about how the tengefu brought in foreign researchers who would pay fees to conduct their research. Alternatively, it could reflect some of the sentiments discussed below by the core fishers in that some conflict exists between the leadership group and the rest of the community. Or simply, since the leadership holds a significant amount of pride in the project, they could be interested in the opportunity to talk more about the project. The core group also discusses conflicts that arise as a result of the project, including instances of poaching.

2. Core: Fishers
This group had very similar perceptions to the leadership group regarding benefits to the community as a whole, perceptions of spillover from the tengefu, and how an increase in income has allowed for other wellbeing contributions:

“I have managed to meet my basic needs, built my residential house, buy clothing, and food, as well as take care of my parents” (Ku FG 3)
Figure 1. “As you can see there is fish here, this is what contributes to improvement of my wellbeing as I fish them, sell to get money while use some for food” (KuFG 4)

However the key distinguishing factor from the core to the leadership is that members in this group often cited conflict and problems with the leadership. Complaints ranged from leadership not addressing important issues, such as the land grabbing issues at the Bureni site, perceptions that leadership roles are concentrated on those who are from closer landing sites to the tengefu, and last, that there is little transparency with regards to how money is spent (KuFG 3,4, KuI 3). One individual also claimed people were withdrawing membership from the KWCA as a result of this poor leadership (KuI3).

However despite these complaints, many of these fishers still discussed the tengefu in a positive way. One individual in the focus group stressed the importance of participating in my research, saying it was important to share the knowledge about the tengefu (KuFG4), also reflecting a sense of pride in the project.

3. Core: Non-fishery employment (ecotourism workers)

Those working with ecotourism cite the highest number of benefits from the tengefu: This group was the only group to mention therapy, security, and cultural services from the tengefu in addition to many of the services cited by the other groups (e.g. spillover effect, knowledge, ecotourism, employment, donor support) (KuFG6).
This group also talked more about the individual benefits to the project compared to the community as a whole. This could be resulting from the fact that their employment is a direct result of the tengefu project, so as a result the monetary benefit they receive is a distinct benefit from the project from an individual perspective. This increase in income in turn, has a chain reaction for contributing to wellbeing, exemplified in figure 3. However, there still were a few ‘dissenters’ whose views were similar to those in the core-group. Similar complaints were made about the leadership, specifically regarding lack of communication between the leaders and the rest of the community (KuFG6).

4. Non-core: Fishers

The sample representing the non-core fishermen came from the Mwanamia landing site (see map in figure 1), the landing site furthest to the north within the Kuruwito BMU region. Fishers from this site did not have strong opinions either for or against the tengefu. Some individuals discussed the project as something that was very far removed from their lives, with individual emphasizing that only those fishing near the tengefu can access the benefits via the spillover effect. This group also heavily discussed the need for deep-sea fishing gear, however also cited the fact they had access to the boats purchased KWCA (KuI 7).

Many in the group also voiced positive views on the tengefu, emphasizing its ability to contribute to the wellbeing of the community as a whole:

“It does not affect us negatively, the people that fish there are our brothers and neighbors therefore the entire community benefits in some way.” (KuFG 9)

It was also recognized that fishing pressure increased in their region from displacement of fishers, resulting in some conflict:

“Since the area was restricted no fishing was allowed to take place and the fishers who were fishing in that area had to relocate to other landing sites some fishers moved to our territory and we were already overpopulated, about 50-60 fishers were fishing in that area.” (Ku FG 10)
5. Non-core: Female fish traders

The majority of the *mama karanga*, or female fish traders – from landing sites both near and far from the tengefu - are considered part of the ‘non-core’ group, as most of them cited little or no benefit from the tengefu project:

“I have not experienced any change, as fishing is not done within tengefu. So the fishermen if they go fishing, if they get [fish] or not is just normal. If they get, we buy, if they don’t, we buy from other markets” (KuFG5)

“No; we are not affected in any way we do not see the benefits of Kuruwitu in any way, maybe the people from there benefit from the project” (KuFG11)

Many of the traders said that getting fish these days is harder than before. Some attribute this to the tengefu, while others point to the fact that the number of traders in the area has increased significantly over the last years, leading to greater competition for less available fish.

“The fishmongers now have to get alternative means of livelihoods because after restricting the area they do not easily get fish like before.” (Ku FG1)

The perceptions of the *mama karanga* in Kuruwito were very similar to those in Kanami, and are discussed in further detail in the following section.

**ES to Wellbeing: Kanami**

1. Core: Fishers and a few traders

The material (income) benefits from the tengefu via the spillover effect were cited as important for allowing fishers to enhance their wellbeing by buying food and medications, educating their children, and supporting families.

One of the biggest themes in the core focus groups was the emphasis on the benefits to ‘the community’ rather than to individuals, similar to what was found in Kuruwito. Often times, different resource groups would refer to benefits received by others in their community, for example, fishermen talking about how fish traders are making more money, and the jobs created for the community’s youth with the aquarium fish traders. As
such, the tengefu itself contributed directly to wellbeing by fostering this sense of collaboration and community amongst the core individuals.

Counter to what was discussed in the previous section, some within the core group say that there has not been an increase in income from ecotourism (KaI 6). Given these varying perceptions, actual increase in income likely varies between individuals and seasons. However, there seems to be a strong belief that even if income hasn’t increased presently, the tengefu will help contribute to a future increase in income. The same sentiment holds true to the idea of donor funding; even though the community hasn’t seen much outside support, because of the tengefu, the potential exists to get funding in the future.

Participants also cited negative impacts to wellbeing from the tengefu, with the main one being the presence of conflict. Almost all participants referred to the conflict that exists between the core group and the non-core group, as well as migrant fishers and fishers from neighboring cities such as Mtwapa and Shanzu. A variety of attitudes towards the non-core people exist, with some emphasizing how poaching is de-motivating for the project, while others discuss more how the others don’t understand why the project is in place, which is why they aren’t interested in joining (KaFG4).

A conflict also exists between old and new knowledge (figure 2). The presence of traditional management tied to cultural beliefs has been documented in the literature, highlighting the conflict between new and old ways of thinking (McClanahan 1997). These ‘older’ views were also briefly mentioned in Kuruwito, but not discussed to the same extent as they were in Kanami (KuFG6). While this conflict likely pre-existed before the tengefu, more knowledge about marine conservation and ecology were brought in with the tengefu, likely in opposition to the traditional views held by some individuals, in which the gods needed to be appeased to receive good catches. While some who supported the tengefu project expressed belief in these practices (through images of the shrine for cultural practice) others deemed the practice as “witchcraft” and untrue.
**Figure 2. Conflict between old and new knowledge.** “The standing man in the photo tried to tell me how, in the past, we used to come to this shrine to appease the gods to increase the fish catch. I was trying to tell him that was not the case; it is because of the fishing method we are now using” Participant 13, KaFG4

In general, the focus groups and interviews with core people (including fishers wives) reflect significant optimism about the future wellbeing of the community. Many see the tenefu project as a means to secure their future by attracting support from donors, and some recognize the importance of conservation for long-term sustainability. Despite this optimism, triangulated interviews revealed that some members are skeptical about the project and believe that the efforts necessary to keep the project going (e.g. time spent guarding the tenefu) are not worth it, especially when they struggle to make ends meet on a day-to-day basis.

“The only important thing is to conserve the area, as it is our only hope——it can enable us to improve our future wellbeing” (KaFG2)
2. Non-core: Fishers

The non-core individuals mostly talked about negative impacts on wellbeing as a result of the tengefu project. The most prominent theme in the discussion was exclusion from the continuous development of the project:

“What is the point of us leaving work to attend meetings everyday, and when we are present they do not discuss relevant information of the project but after we have left they start discussing about the project.”

Also, an increased difficulty in making a living from fishing due to exclusion from using the marine resource:

“Honestly we do not feel any connection with the project that positively affects us, with the start of Tengefu our fishing has been messed up, before we used to go fishing in the restricted area and our catch was plenty but now we really have to struggle.” (Ka FG6)

It is likely that these individuals are in fact not getting access to spillover effect because their fishing area has now been restricted the part of the sea that is closest to their landing site. This area adjacent to their landing site is also much more shallow and has typically not been an ideal area for fishing even before the tengefu was in place (personal communication).

These individuals also make references to the government, believing that the tengefu project should attract government support, or the belief that the project is actually a government project that won’t benefit the local people. This group also made a reference to lack of ‘sponsors’ for the project which contributes to the fact the project doesn’t benefit the community as a whole, but only a few (KaFG6). Other issues such as weather are discussed in conjunction with the tengefu project, indicating that other problems may also be contributed to the challenges faced by these individuals, yet are projected on the tengefu given their negative experience with the project. This is also supported by the fact these individuals say that before the tengefu, they were doing well and getting good catches (KaFG6) while other individuals from the same region cite that before the tengefu, overfishing was rampant and fish catch was declining (KaFG1).
Fishers in this group from the furthest landing site from the tengefu (Sun n Sands) had not heard of the tengefu project at all (KaFG 7). When carrying out the group interview with these individuals, they were fearful at first that we were trying to implement a tengefu in their area, in line with observations made by core fishers in that many fishers are still very skeptical about marine protected areas.

3. Non-core: Female fish traders

A majority of the female fish traders in this region are not involved in the tengefu. Interviews uncovered that only one female fish trader sat on the BMU committee, and three to four others were members of the BMU. Traders in Kanami cited the same problem that with an increase in fish traders over the years, there is less and less fish available for purchase at Kanami. Consequently, many of the female fish traders found in the region actually purchase fish at larger markets rather than at Kanami. Most of the female fish traders interviewed either knew nothing or very little about the tengefu project, or what it would mean to be involved in the project. A conflict in Kanami occurred when fishermen sold fish to traders according to their membership in the BMU: Fishers in the BMU were said to only sell to traders who were members of the BMU, while as non-BMU fishermen refused to sell fish to traders who were members of the BMU.
Appendix C. Ethics assessment form

ESPA Ethics Assessment Form

(Edited for the purpose of teaching at SRC)

This assessment form must be completed by the Principal Investigator. The assessment addresses many of the procedural issues (e.g. obtaining consent and managing data) that are a part of ethical research. It does not, however, include the broad spectrum of research practices that are also involved in research.

Title of project: Ecosystem services and human well-being: Who benefits and who loses? Identifying trade-offs in coral reef ecosystems

Duration: September 2013 – June 2014

Principal Investigator: Shauna L. Mahajan

Check List:

- I have read the appropriate Guidance Notes
- X I have completed all relevant check boxes
- X I have included a research abstract
- X I have completed the Additional Statement box (where appropriate)
- X I have appended all relevant documents
- X I have appended a Permission Letter (where appropriate)

Signature of Principal Investigator*: Shauna L Mahajan  Date: May 3, 2013

The completed form (along with additional documents) should be sent to the ESPA Ethics Committee Administrator at [email address].
* Electronic signatures/ typed names are accepted
Research Abstract/Summary

Please include a 250-500 word research abstract/summary. This statement should include a summary of the research methods and techniques.

Coral reef ecosystems are some of the most biologically diverse systems in the world, and are increasingly threatened by human activities (Connell, 1978; Maragos et al., 1996). Coral reef ecosystems are also known to provide a number of vital ecosystem services (ES) (Moberg and Folke, 1999), defined as the benefits people receive from ecosystems (MA, 2005). ES are assumed to contribute to human well-being (MA, 2005), however the empirical linkages between ES and human well-being are recognized as being poorly understood (Carpenter et al., 2006). This study attempts to contribute to this knowledge gap by evaluating the link between ecosystem services and human well being using a case study of a community-initiated marine protected area (MPA), and will specifically look at the equitable distribution of benefits from ecosystems to people, as well as the trade-offs that exist between different types of well-being and ecosystem services. MPAs are an example of a social-ecological intervention that attempts to safeguard ecosystem services, but also greatly affects the well-being of communities within and around MPAs (Mangi and Hattam, 2009; Samonte et al., 2010), MPAs thus provide a relevant setting in which to explore the following questions:

1. What ecosystem services are present in the study site?
2. What are the mechanisms that determine access to the benefits from ecosystem services?
3. How do stakeholders derive well-being from ecosystem services?
4. How have these relationships between ecosystem services and well-being changed over time?

Semi-structured interviews will be the dominant method for collecting data in this study, combined with a few broader surveys. To supplement data obtained from interviews, statistical data on related ecosystem services and socio-economic metrics will be obtained from available sources (e.g. government sources, scientific publications, NGO reports). First, ecosystem services will be identified by surveying relevant literature and from preliminary survey data. Second, via interviews, different mechanisms of access will be identified, specifically the presence of economic and social capital, technology, and institutions. Third, using both survey and interview data, I will evaluate three types of well-being: material, relational and subjective. Metrics will be based on elements from the human well-being toolkit, developed by the WeD research project (WeD toolkit website). The results from this study will uncover the dynamic mechanisms that determine who can actually derive benefits from ecosystems and illustrate the trade-offs (both now and before the establishment of the MPA) communities are faced with regarding questions of natural resource management.

1. Legal, and Moral Responsibilities, and Codes of Conduct

This box must be completed for all research projects.

a) Do any special conflicts of interest arise between the researchers, funding bodies, the institution, and/or research subjects/environments? YES □ NO X
d) Separate from any legal obligations, is there a moral responsibility to provide feedback or results to the research participants?
   YES X NO □

e) Are you aware of codes of conduct from professional associations that should guide your research?    YES X NO □

f) Will the research be, or has the research been, ethically reviewed in the host country?
   N/A

Guidance relating to legal and moral responsibilities and a sample list of relevant Codes of Conduct can be found in the Ethics Self-Assessment Guidance Notes. If applicable, include a statement on how conflicts of interest will be addressed in the Additional Statement box at the end of the form. If the research will abide by a data protection law other than the UK Data Protection Act (1998) please provide details in the Additional Statement box at the end of the form. If applicable, include a statement on why the research will not be ethically reviewed in the host country in the Additional Statement box at the end of the form.

2. Rights of human subjects

Complete this box only if the research involves living human subjects, or if your work requires extensive interaction with land users or other people in the course of your research. If you answer NO to any of these questions a Full Ethics Assessment is required.

a) Is confidentiality adequately handled by normal tenets of ethical academic research?    YES X
   NO □ N/A □

b) Are the research subjects capable of understanding their rights and of providing informed consent?    YES X
   NO □ N/A □

c) Are the research subjects over 18 years of age?    YES X NO □
   N/A □
### 3. Potential harm, discomfort or stress for living human subjects or non-humans

This box must be completed for all research projects. If you answer YES to any of these questions a Full Ethics Assessment is required.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<tbody>
<tr>
<td>a) Is there significant foreseeable potential for psychological harm or stress for those involved in your research?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>b) Is there significant foreseeable potential for physical harm or discomfort for those involved in your research?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
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<tr>
<td>c) Is there significant foreseeable potential for violation of cultural or social norms/practices?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>d) Is there foreseeable potential for conflict or discomfort for any humans or non-humans your research will impact upon?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>e) Is there significant foreseeable potential for psychological harm or stress to the researcher or other members of the research team (including those recruited locally)?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>
f) Is there significant foreseeable potential for physical harm or discomfort to the researcher or other members of the research team (including those recruited locally)?

| YES □ | NO X | N/A □ |

*Guidance relating to the minimisation of harm, discomfort, or stress can be found in the Ethics Self-Assessment Guidance Notes. If applicable, include a statement on procedures to minimise harm or stress or to reduce the potential for violation of cultural norms and practices in the Additional Statement box at the end of the form.*

### 4. Effect on the environment

Complete this box only if your research involves environmental fieldwork that involves sampling or directly monitoring a site, or if your research will involve movement in sensitive environments. If you answer YES to a, e, f, g or h a Full Ethics Assessment is required.

a) Will the fieldwork be conducted in an environmentally sensitive area

| YES □ | NO X | N/A X |

*b) Have the appropriate steps been taken to gain permission to access field sites?*

| YES □ | NO X | N/A X |

c) Does your field site require crossing sensitive or privately held land?

| YES □ | NO □ | N/A X |

d) Have you made an arrangement with the landowner?

| YES □ | NO □ | N/A X |

e) Will samples be collected and removed in sufficient quantities to have a negative physical/environmental impact on the site and/or its ecosystem?

| YES □ | NO □ | N/A X |

f) Will the conduct of the fieldwork significantly disrupt the site and/or its environment?

<p>| YES □ | NO □ | N/A X |</p>
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<tr>
<td>g) Does the fieldwork involve sampling rare/endangered or harmful taxa/species?</td>
<td>YES ☑</td>
<td>NO ☐</td>
<td>N/A ☒</td>
</tr>
<tr>
<td>h) Will the research involve transporting samples/specimens/soil between countries?</td>
<td>YES ☑</td>
<td>NO ☐</td>
<td>N/A ☒</td>
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</table>

*Guidance relating to environmental fieldwork can be found in the Ethics Self-Assessment Guidance Notes. If applicable, include a statement on how you will attempt to gain permission in the Additional Statement box at the end of the form. If applicable, append any written agreement with the land owner to the end of the form.*

## 5. Institutional/agency consent

This box must be completed for all research projects.

*a) Have permissions for research been obtained from national authorities in partner countries (as required)*

| YES ☑ | NO ☐ | N/A ☒ |

b) Will all researchers have appropriate permission to work in other countries, including the correct entry visas

| YES X | NO ☐ | N/A ☒ |

c) Where data are, or have been, obtained from another agency, archive or source, is it clear that the intended usage adheres to their terms of supply?

| YES X | NO ☐ | N/A ☒ |

d) Where other researchers’ data are being used, is it clear that the intended usage adheres to their terms of supply?

| YES X | NO ☐ | N/A ☒ |
e) Are issues of data handling and consent dealt with adequately and following procedures agreed with agencies, archive, and/or land managers?

<table>
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<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
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*Guidance relating to data protection and consent can be found in the Ethics Self-Assessment Guidance Notes.*

### 6. Collaborative working

This box must be completed for all research projects.

a) Will the research be undertaken in academic collaboration with representatives of the host country?

<table>
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<tr>
<th></th>
<th>YES</th>
<th>NO</th>
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b) Will the research involve collaborating with an NGO or other non-academic organisation/group?

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<th></th>
<th>YES</th>
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<th>N/A</th>
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c) Have you a written agreement pertaining to the collaborative relationship?

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<th></th>
<th>YES</th>
<th>NO</th>
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d) Will the research involve employing local field assistants (including guides and translators)?

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<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
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e) Has the local community been involved in the preparation of the research proposal?

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<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
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</table>

*Guidance relating collaborative working and the employment of local field assistants can be found in the Ethics Self-Assessment Guidance Notes.*

### 7. Dissemination

This box must be completed for all research projects.
a) Will the findings be reported accurately, honestly and within a reasonable time frame?

YES X

NO □

b) Have you reached agreements relating to intellectual property, publication and authorship?

YES □ NO X N/A □

c) Will the research findings, associated publications and, where feasible, data be made available in the country where the research took place?

YES X

NO □

d) Are publications for a wider audience planned as well as scientific papers in national and international journals?

YES X

NO □

e) Have plans been made for the dissemination of results to the study participants and local people?

YES □ NO X

Guidance relating to dissemination and intellectual property rights can be found in the Ethics Self-Assessment Guidance Notes.

8. Benefit sharing

This box must be completed for all research projects.

b) Has the benefit been linked to the participants and/or local communities (directly or indirectly)?

YES X

NO □

Guidance relating to benefit sharing can be found in the Ethics Self-Assessment Guidance Notes.

9. Health and safety

This box must be completed for all research projects.

Are there any health and safety risks associated with this project?

YES □ NO X

Have you completed a risk assessment for this project?

YES □ NO X

Guidance relating to health and safety and risk assessment can be found in the Ethics Self-Assessment Guidance Notes.
10. Additional Statement

Please add an explanation of how you will address the ethical issues identified above (500 words maximum).

1d/7c/7c – As this study examines relationships between livelihoods and ecosystems, results will be given back to communities in the form of a research summary written in a style intended for a more general audience. A copy of the thesis itself will also be provided. Plans have not been finalized for this step but the methodology that will lead to this step will be co-planned during the research process.

1e – Codes of conduct from relevant professional associations will be reviewed and followed before the start of the research.

1f/5a – Research in Kenya does not require ethical review by host country or approval from host country.

3a – Questions focusing on individual well-being will likely bring up very sensitive issues for participating subjects, potentially causing feelings of shame, offence, uncertainty. The researcher is well aware of these potential issues and will take all precautions necessary to be sensitive to the situations that may arise during the research process. Additionally when recruiting participants, great care will be taken to ensure participants do not feel pressured to take part in the research (see attached consent form).

3c – Research methods of interviews, surveys of stakeholders may cross social norms relating to gender. Appropriate steps will be taken to fully understand the research context and any norms before starting fieldwork.

3d – Given the research is getting at questions of ‘well-being,’ information about income, sense of well-being, etc., could potentially cause conflict between stakeholders. As a result, interview and survey data will be completely anonymous to avoid any conflict or discomfort that may arise.

3e – To conduct interviews, surveys, the services of a translator will be required which could potentially be a challenging job. Care will be taken in selecting a translator to avoid any sort of discomfort between community members and the translator, as well as ensuring the translator is well aware of all the ethical issues associated with the research questions (see 3a).

4b – Fieldwork will be conducted in a site adjacent to a marine protected area. The appropriate steps will be taken to ensure access to places where interviews, focus groups will be carried out.

5c,d,e – For data (written documentation) obtained from government sources on metrics such as fish catch, etc., the appropriate measures will be taken to inform those providing the data the intentions of the study and how the data will be used. A data agreement form will be created to be used in both these scenarios, as well as use of other researcher’s data.
6a – Contact will be made at least four months in advance of starting the project with local research groups and organizations (i.e., Wildlife Conservation Society) to start a dialogue about our research plans and explore any space for aligning research goals, work, data, etc.

7b – Agreements regarding property, publication, and authorship have yet to be reached but will be discussed with the research team and affiliated partners closer to the start of the research project.

8b – The aim of this study is to better understand how stakeholders derive well-being from ecosystems, thus the overall goal is to better understand the dynamics that can enhance well-being.

Additional points:
- Procedures regarding for participant recruitment, informed consent, incentives for participation, data storage and sharing (especially regarding clear agreements on data obtained from other sources such as NGOs and other researchers), anonymity of participants will continue to be revisited as methodology is developed in the months prior to the start of the research project.

- ESPA’s Full ethics assessment will be consulted to ensure that all measures are taken to ensure all issues related to working with human subjects are resolved.
Appendix D. Consent forms

Consent form 1 – General consent form:
Would you like to help me with my research?

My name is Shauna Mahajan and I am a Master’s student from the Stockholm Resilience Centre, in Stockholm, Sweden. My research is attempting to better understand how and if the formation of the tengefu in your community has changed the way people obtain benefit from ecosystems.

The best way to answer this question is by talking to people in the community surrounding the tengefu, and who also depend on nature to help sustain their way of life. My study will take place over the next 2.5 months, and during this time, I would like to talk with you about your relationship with the ecosystem, your experience of the tengefu, and how you perceive your wellbeing in relation to both of these.

You are free to decide if you want to take part in my study. The research will consist of group discussions where collective perceptions of the tengefu and ecosystem benefits will be discussed. Additionally, individual surveys will be carried out to obtain information on if your basic needs are being met, with questions relating to your employment, economic status, housing, etc.

When we meet, there will also be my research assistants present who will assist in translating. You also may choose at any point whether or not to answer a question if for any reason you feel uncomfortable. You are also free to leave the meeting at any time if you wish. Please remember that there are no right or wrong answers – I am most interested in just understanding your relationship with nature and to get a sense as to how you perceive your well-being.

The group discussions will be audio recorded, transcribed and then translated to English. This is to give me the ability to go back and review the answers you provided, to make sure that I accurately interpret the answers you provide. You are free to answer no to this question.

Further questions and contact information

If you have any further questions about this study, please don’t hesitate to contact me. I can be reached by phone at (+254716242859) or email (shauna.mahajan@gmail.com)
PARTICIPANT COPY: Agreement of participation
The research information was presented in written form and read by/to me. Anything I did not understand was explained and all my questions were answered.

I, ........................................ agree/disagree to participate in the study and agree/disagree to have the meetings digitally recorded.

☐ I certify that I am over 18 years of age

Signature/Mark of Respondent:
Date:

Signature of Researcher:

and Research Assistant:

Date:

________________________________________________________________

RESEARCHER COPY: Agreement of participation
The research information was presented in written form and read by/to me. Anything I did not understand was explained and all my questions were answered.

I, ........................................ agree/disagree to participate in the study and agree/disagree to have the meetings digitally recorded.

☐ I certify that I am over 18 years of age

Signature/Mark of Respondent:
Date:

Signature of Researcher:

and Research Assistant:

Date:
Consent form two: Photovoice activity consent form

Participatory Photography: Participant Release Form

1. Copyright

I, __________________________________________ agree to take part in the photovoice workshops as part of Shauna Mahajan’s MSc Research. I understand that as part of the project I will produce photographs and captions (my “work”). I understand that I will share copyright of my work and give permission for Shauna Mahajan and the Stockholm Resilience Centre to retain copies of my work for use as agreed below. I understand that my work will be credited as shown below when used.

© <Participant name>/<Shauna Mahajan>/<date>6

I want these photographs to be credited with my real name

I would like to be credited with the following pseudonym:

2. Consent

<table>
<thead>
<tr>
<th>I am happy for Shauna Mahajan to use my photographs and text in the following ways:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the Stockholm Resilience Centre website (<a href="http://www.stockholresilience.org">www.stockholresilience.org</a>) and other related websites.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In academic publications, reports and promotional material</td>
<td></td>
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<td>At public exhibitions</td>
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<tr>
<td>In the printed and online press</td>
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</tbody>
</table>

I also give permission for Shauna Mahajan and the Stockholm Resilience Centre to store copies of my work and to combine my work with other images and text and to crop, or alter my work, in line with their ethical standards.

3. Model Release

I am happy for Shauna Mahajan and the Stockholm Resilience Centre to retain copies of photos by fellow participants or project staff, that feature me, for usage as consented to in the list above.

6 For the purpose of this thesis, the copyright names have been made an
Please fill in your full contact details below:

Photographer’s full name: ________________________________

Photographer’s address: ________________________________

______________________________________________________

______________________________________________________

Date of birth: ___________________________________________

Telephone number: _______________________________________

Email: _________________________________________________

Signed

__________________________________

Date: ___________________________

IF THE RESPONDENT IS UNCOMFORTABLE WITH WRITING, PLEASE OBTAIN VERBAL CONSENT, FILL IN THE FORM ACCORDINGLY AND SIGN ON THEIR BEHALF BELOW.

I, ____________ (name of interviewer), certify that I have explained the information sheet to the research participant, ________________ (participant) who has given verbal approval to participate in the study.

Signed: ___________________________  Date: ___________________________

If you have any questions or would like to withdraw from this agreement please contact Shauna Mahajan on +254716242859 (Kenya) or +46728350375 (Sweden) or email her at shauna.mahajan@gmail.com.
Appendix E. Interview guides

1. Guidelines for Photovoice exercise.
The following instructions were provided in both written and spoken form to participants.

Guidelines for Photovoice exercise
The goal of this exercise is to help me understand how the formation of the tengefu has affected your wellbeing. For this exercise, I will provide you with a camera and ask you to take some photos that answer a few questions, listed below. The photos you take in this exercise will help show me how you perceive your wellbeing and how your wellbeing relates to the creation of the tengefu. I will be giving you a single-use camera that has the ability to take 27 photographs, and will ask that you take a certain number of photos per question. You will also receive a small journal that you can use to document any reflections you have while taking your photos.

Questions to answer through your photos
When taking your photos, please keep the following two questions in mind:

1. Can you photograph what in nature/the marine ecosystem contributes to your wellbeing? (about 13 photos)
   For example, this can be a material benefit such as fish or benefits from tourism, or an emotional feeling attached to the marine environment.

2. Can you show through your photographs how/if your wellbeing has changed as a result of the implementation of the tengefu? (about 13 photos)
   For example, this can be material benefit from tourism, increased fish catch or losses associated with loss of access, feelings of inclusion or exclusion.

So be creative! Think about how you can best represent these feelings you have about the marine ecosystem through photography. In the follow up discussion group, you’ll have a chance to discuss the reasons why you photographed what you did.

Photography basics

1. Important parts of the camera:

   *Viewer:* The ‘window’ you look through to frame your photograph. When you look through the viewer, you see the image that will be recorded as your photo when you press the shutter
   *Lens:* The lens is where the light is let into the camera, creating the image that you see in the viewer
   *Shutter release:* The button you press to record your photo
   *Film advance gear:* After taking a photo, you use the advance gear to prepare the camera to take the next photo
   *Film counter:* Shows how many photos you have left/have taken.
2. Camera care

Cameras are very sensitive objects!!! These cameras are NOT waterproof, so take care to keep them away from the water!!! If you bring them out on your boat, I would suggest keeping them in a plastic bag at all times unless taking a photo.

3. To take a photo

Close one eye, and look through the viewfinder with the open eye. What you see through the viewfinder will be what your photo will look like. To take the photo, press the button on the top of the camera. When finished, wind the film advance gear to prepare for the next photo.

4. Important things to keep in mind when taking photos

- Make sure your finger isn’t covering the lens. This will block the photo you are trying to take!
- Don’t try and capture too much into one photo. Think about the message you want to convey with your photo, and try and focus on one or two things that represent your message.
- Try and have your subject centered in your image.
- When taking photos of other people, it’s very important that you obtain verbal consent from your subject, as the photographs you take will become part of the research project. When taking photos of other individuals, please make sure to explain to them why you are taking their photo, and how it will be used, and obtain their permission to take the photo.
- And most important…. Be creative, and have fun!!

2. Interview guide for informal individual and group interviews

**Interview guide for fishermen**

Where are you from?
How long have you been fishing in this area?
Where do you usually fish? Do you fish at other landing sites?
Were you around when the BMU and tengefu were established?
What do you think about the BMU/tengefu?
Has the tengefu had any affect on your life?
(on your wellbeing)

**Interview guide for traders**

Where are you from?
How long have you been working in this area?
Where do you usually buy your fish from?
Were you around when the BMU and tengefu were established?
What do you think about the BMU/tengefu?
Has the tengefu had any affect on your life?
(on your wellbeing)

**Interview guide for fishermen wives**
Where are you from?
How long have you been living in this area?
What do you do for a living?
Have there been any changes in your household over the last (3 in Kanami, 7-8 in Kuruwito) years?
Do you know anything about the tengefu?
Have you perceived any changes in your life as a result of the tengefu?