DEALING WITH UNCERTAINTY IN GOVERNANCE OUTCOMES: ILLEGAL FISHING AND CONSERVATION IN THE SOUTHEAST ARM FISHERY OF LAKE MALAWI

ANDREW MOONSEOK SONG

Dealing with Uncertainty in Governance Outcomes: Illegal Fishing and Conservation in the Southeast Arm Fishery of Lake Malawi

By

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Abstract

This thesis employs a multi-level governability approach to explore ways of alleviating uncertainty in fisheries governance outcomes, with particular attention to conservation measures. A *system* perspective that provides a holistic and comprehensive view of a fisheries system is accompanied by an analysis situated at the *people*-level which accounts for individual viewpoints. At the system-level, the governability assessment was undertaken to investigate system complexity that confounds governance outcomes. At the individual-level, the study uncovered conservation awareness and inclination of fishery stakeholders to discuss how their conservation principle relates to illegal fishing practices. The results highlight several areas of governance challenges in the Southeast Arm fishery of Lake Malawi that may limit the success of governance measures, including those aimed at mitigating illegal fishing. Hence, acknowledging and navigating around the limitations would be a step towards achieving a more reliable governance function. Further, potential for achieving fisheries conservation among stakeholders was shown, suggesting individual principle's relevance in achieving conservation governance outcomes.

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Chapter 1 Introduction

Plate 1.1 An early morning scene at one of Kadango's beaches

Plate 1.2 A large beach in Kadango in the dry season harbouring unused boats

This chapter introduces the study by describing the challenges faced in the fisheries and considering them as a governance issue. Through this approach, two stand-alone, but related, study aims are brought forward. The case study location, the Southeast Arm of Lake Malawi, is then briefly mentioned, followed by the research questions and specific objectives. Finally, the organization of the thesis gives a reader an overview of what lays ahead.

1.1 Describing the problem

1.1.1 Challenges in fisheries

Fishery resources have been in decline in terms of abundance, size and diversity in the last several decades (Pauly *et al.* 1998; Worm *et al.* 2006; Stobutzki *et al.* 2006; FAO 2007). Large, high-value fisheries targeted under single-species management regime are prime examples of species being driven to extinction (Jackson *et al.* 2001; Myers and Worm 2003). It is estimated that more than 75% of world fish stocks have been either fully- or over-exploited with possibility of depletion (FAO 2007). Accordingly, in the last few years the production level of marine capture fisheries has plateaued fuelling the suspicion that maximum potential of capture fisheries has hit a ceiling (FAO 2007). Meanwhile, aquaculture production continues to expand at a rapid rate accounting for most of the increase in the fish production but not without significant environmental and social concerns (Primavera 1997; Páez-Osuna 2001).

The decline of fishery resources is faced with a horde of other inter-linked challenges, three of which are degradation of ecosystem health, social and economic hardship of fishing communities and resource-dependent populace, and the issue of social justice (Chuenpagdee *et al.* 2005). Aquatic ecosystems around the world have been exposed to a varying degree of anthropogenic disturbances resulting in pollution, eutrophication, physical destruction of habitats and invasion of alien species among others. Affected ecosystems are wide-ranging, which include near-shore environments such as estuaries (Nixon 1995), coral reefs (Hughes 1994; Pandolfi *et al.* 2003) and seagrass beds (Hall *et al.* 1999), offshore environments such as benthic bottoms of continental shelf and slope (Chuenpagdee *et al.* 2003; Edinger *et al.* 2007), deep-sea environment (Hall-Spencer *et al.* 2002; Roberts 2002) and inland lakes and river system (Allan *et al.* 2005; Ogutu-Ohwayo and Balirwa 2006). In addition, social and industrial restructuring of fishing sector brought on by the widening reaches of globalization have frequently been attributed to creating negative social and economic impacts and hardship to fishers and fishing communities, many of whom are in developing countries that depend on fish for their livelihoods and as a source of income (Sinclair and Ommer 2006; Ommer *et al.* 2007; OECD 2007). Further, the ensuing integration into the global fisheries "value-chain" have produced a compounding effect in the marginalization of generally poor and less-powerful fishing populace with an implication on social justice (Chuenpagdee *et al.* 2005; Primavera 1997). The issue of social justice in fishery delves into the imbalance of power among various actors involved in the governance (Jentoft 2007). Also, regulations that bring about unfair access rights to resources as well as the North-South inequality in terms of fish consumption and food safety are all matters deeply connected to social

justice. As a result, despite decades worth of governing effort, well-managed fisheries that are both biologically, economically and socially viable are still rare. Disappointment, dissatisfaction, finger-pointing, resentment and outcry have been the mainstay of fisheries realities.

1.1.2 Difficulty of governing fisheries

Evidently, governing the fisheries has not been easy, and such difficulty has been a pervasive theme in the natural resource governance discourse (Ludwig *et al.* 1993; Cochrane 2000; Pauly *et al.* 2002; Dietz *et al.* 2003). Several explanations have been put forward, each offering its own piece of the puzzle to promote a deeper understanding of the issue. For example, uncertainty of science and the policy-science divide (Ludwig *et al.* 1993, Bradshaw and Borchers 2000; Kinzig *et al.* 2003) have been two related themes that highlight this governance tribulation. Other perspectives point to an inability to reconcile multiple objectives that exist in fisheries (Charles 1992; Cochrane 2000), a blanket approach to management solutions relying on disciplinary technical fixes (Degnbol *et al.* 2006), faulty paradigms that incorrectly describe the relationship between humans and natural resource base (Bundy *et al.* 2008), and failure to recognize and embrace natural and human non-linearity and uncertainties surrounding natural resources (Folke *et al.* 2002). In a more fundamental sense, the management/planning problem such as fisheries resource governance is inadequately conjured up and treated as a 'tame' problem (Rittel and Webber 1973; Jentoft and Chuenpagdee 2009). Letting alone the fuzzy socio-political and normative aspect and considering only the natural system side, controversies that add to the ongoing difficulty still prevail. While a general consensus on

the depleting trend of fisheries resources worldwide exists (FAO 2007; Worm *et al.* 2006; Hilborn *et al.* 2003), the extent of the decline and the degree of urgency relating to the depletion is greatly debatable (Essington *et al.* 2006; Hilborn 2007). In addition, the characteristics of complexity, diversity, dynamics and scale issues are deep-rooted in fisheries, and this condition renders fisheries governance an inherently difficult task (Kooiman *et al.* 2005a).

1.1.3 Uncertainty in governance outcomes

The high difficulty of managing and governing fisheries is reflected in the uncertain nature of governance outcomes. For instance, marine protected areas (MPAs) is a widely advocated and practiced form of fisheries management set up to tackle the difficulty of governing a certain spatial range of fisheries system, whether to manage the diversity of fish stocks, to protect sensitive habitats or to bring up stakeholder involvement. Yet, despite the elevated degree of knowledge and experience in conjunction with careful planning and design, MPAs outcomes are nothing but uncertain, owing to the complex variables involved, such as oceanographic, socio-economic and institutional factors (Allison *et al.* 1998; Le Quesne 2009; Charles and Wilson 2009). Also, where and under what conditions co- or community-based management of fisheries resources works and where it does not has intrigued many practitioners and academics, generating much interest and scholarly speculations (cf. Wilson *et al.* 2003; Nielsen *et al.* 2004; Blaikie 2006; Chuenpagdee and Jentoft 2007). A varying degree of success and failure experienced in different co-management initiatives under diverse circumstances was seen

unintended and surprising to the governing authorities around the world. Only in hindsight, challenges were diagnosed and lessons were learned.

Generally speaking, governors can be awash with confidence and optimism about implementing a certain policy measure because of its high rate of success elsewhere or its popularity with resource users, and therefore feel optimistic that the intended effect will occur. As seen in numerous cases, however, governing outcomes cannot be simply guaranteed given the various challenging and complex parameters involved in the governance of natural resources. All the emerging perspectives on natural resource governance such as adaptive (co-) management (Folke *et al.* 2002; Armitage *et al.* 2007) and interactive governance (Kooiman *et al.* 2005a; Bavinck *et al.* 2005) are grounded upon the recognition that a cautious and sensitive approach to governance is almost mandatory and that it should be enabled via learning, adaptation, and open and principle-based interaction.

1.2 Study aim

Much uncertainty in governing outcomes transpires because system knowledge is mostly limited and imperfect and understanding about fishery stakeholders and their values is poor. For instance, achieving conservation may be an overambitious goal when little information exists about system complexity or if fishers' values do not align with the tenets of conservation measures. The outcome of any governance effort can never be predicted with sheer certainty. However, it can be made more reliable if key unknowns

are addressed and taken into consideration for governance decisions in a reasonable and responsible manner. One way of reducing uncertainty in governance outcomes, therefore lessening the difficulty of governing, is to explore the following two stand-alone, but related, questions: (1) whether the governing system is capable of delivering intended outcomes from a proposed governance measure in light of system complexity; (2) and whether governance measures correspond to the understanding and the worldview of those being governed. These two questions are not randomly drawn. Instead, they are prompted and become substantiated through the use of the concept, 'governability', an expression of how governable a human-in-nature system is (Kooiman 2003). In this sense, they represent two governability questions at two different scales; the first one aims at learning about the system-wide perspective, while the second one focuses on the people-level. The concept of governability will be discussed in-depth as the thesis progresses.

Using a Lake Malawi fishery as an illustration, this study employs a multi-level approach (i.e. system and individual), corresponding to the two threads of the study aim proposed above, in alleviating some of the uncertainties when delivering conservation measures. At the system-level, the governability assessment matrix is used as a tool to gauge the capacity of the governing system in addressing broad governing needs and demands present in the fisheries system. In doing so, a better understanding about system complexity and the challenges faced in fisheries governance can be obtained. At the individual-level, as with the narrowed scope of looking at individuals rather than the whole system, a specific issue of illegal fishing and conservation is taken as the main

focus. Illegal fishing and non-compliance widely occur in Lake Malawi impeding conservation goals. Hence, the damage schedule approach is applied to learn about stakeholders' internal obligation towards fisheries conservation (Chuenpagdee *et al.* 2001, 2003). Specifically, the study aims at examining the extent to which conservation measures strike a chord with the resource users and community members. This can also be viewed as a governability issue, since the degree to which people comply with conservation measures greatly hinges on the deep-rooted support of target groups, and also because the governability of the wider system in turn influences the underlying support of target groups towards those measures. On the whole, the study intends to show that the utilization of the multi-level governability approach focusing on a system perspective as well as accounting for an individual viewpoint can help mitigating uncertainty in governance outcomes by revealing useful insights about a fisheries system, which may not emerge from conventional governance assessments.

1.2.1 First approach: governability assessment at the system-level

Despite the ongoing difficulty, fisheries worldwide have been managed and governed at various capacities, which are not necessarily at the level by which governing actors can effectively deal with the identified governance needs and demands. What happens if a governing system is expected to handle a governance issue that is beyond its capacity? Such attempt would likely lead to unfulfilled or undesirable governing outcomes, which would bring more realism into the governance process, adapting expectation to actual experience. At the same time, a growing friction, conflicts and dissatisfaction would also likely persist. Moreover, there can also be occasions where capacity is not well-known in

governance situations but instead it is merely assumed without much deliberation. In this instance, underestimated or overblown capacity would be unfit to properly deal with the governance problem at hand, cultivating uncertainty about the outcomes, leading to a likely failure and in the end further increasing the aura of *difficulty* associated with fisheries governance.

It is argued here that the difficulty facing fisheries governance is connected to the usual tendency to misjudge the capacities of the governing systems, or to undervalue the inherent and constructed complexity of the natural systems and of people that are being governed, and to under-appreciate the intricate interactions among these systems. For example, fisheries management authorities in many places are mandated to do more than what is possibly allowed by the available financial and human resources. Similarly, the capacity of a fishing community in becoming a productive partner in a co-management regime is often exaggerated. Also, instead of being guided by the precautionary principle, the fisheries ecosystem is routinely approached with unwarranted confidence, which emits a false faith that the inherent unpredictability associated with the ecosystem will play an agreeable hand to human governing efforts. This tendency of overestimated governance capacities on the part of governing system and underestimated governance needs on what are being governed (in this case, fish and fishers) would likely lead to the setting up of unrealistic goals and the inappropriate design of governing institutions. Whether such tendency stems from unchecked optimism or socio-political pressure to deliver an ideal result, the message is clear: inaccurately-assessed or hurriedly-assumed

governance capacities and needs would pose an added uncertainty and difficulty to the process of governing fisheries.

What is needed is a candid assessment of governance capacity and needs so that fisheries governance can be approached with more realistic measures and goals. One such framework is offered by the concept of governability (Kooiman 1993; Kooiman and Chuenpagdee 2005). It rests on the idea of a perpetual balancing process between governing needs and demands on the one hand and governing capacities on the other (Kooiman 1993). Hence, governability is proposed as the measure of the overall capacity of a particular fisheries system with regard to achieving realistic governing goals. The assumption is that there are limits to how governable fisheries systems are and what level of governance capacity they can achieve in terms of meeting the needs and the demands of a fishery (Jentoft 2007). For instance, governing challenges may be seen as too great for the limited capacity of a governing system. This case would make the particular fisheries system less governable. On the contrary, high governability may be inferred for a fisheries system where a given governing capacity is faced with relatively low needs and demands of those being governed. Further deliberations on this concept have led to the development of a systematic scheme of assessing governability (Chuenpagdee *et al.* 2008; Chuenpagdee and Jentoft 2009; Mahon 2008). This study aims to refine and operationalize the conceptual framework through an application to a real-world fishery.

1.2.2 Second approach: individual's underlying principle concerning illegal fishing and fisheries conservation

Illegal fishing and non-compliance of regulations poses a serious problem to fisheries around the world. It is a governance issue that has a wide implication to all scales of fishery. From an inland artisanal fishery in a developing country to a large industrial-scale one in the high seas, this is a common concern for those who are involved in the governing of fisheries. In this sense, it can perhaps be considered as one of the key factors influencing a fisheries' governability. Manifested through various means such as poaching, use of destructive fishing methods, discarding, high-grading of species, zoning violation and illegal, unreported and unregulated (IUU) fishing, its overall effect threatens the integrity and the health of the ecosystem as well as the socio-economic basis of those who depend on the very resources. Over the years, a range of fisheries management practices and studies have reported its widespread nature and deliberated on ways to improve the situation (FAO 2001; Flewwelling *et al.* 2002; Crawford *et al.* 2004; Sumaila *et al.* 2006; Hauck and Kroese 2006; Agnew *et al.* 2009).

The overarching policy response to this issue has been the promotion of deterrence by heightening enforcement and posing threats of severe sanctions thereby increasing the expected monetary costs of violation, in order to raise the level of compliance among fishers (Hatcher *et al.* 2000). This measure has its theoretical basis on the neoclassical thinking which underpins the economic models of criminal behaviour (Becker 1968). It assumes that fishers are utility maximizing individuals driven by self-interest whose

decision to whether or not engage in illegal fishing is primarily determined by expected payoffs and penalties (cf. Sutinen and Gauvin 1989; Sutinen *et al.* 1990; Furlong 1991).

However, this kind of policy measure has proven to be extremely expensive and difficult to implement. It demands a large quantity of financial and human resources to ensure its effectiveness, and when such demand cannot be easily met, as commonly observed in a resource-stretched developing world fishery, implementation often suffers and consequently so do the ecosystem and the conservation efforts. Even the advanced fishing nations equipped with higher enforcement capability and stringent regulatory sanctions are not always successful in deterring illegal fishing in their own Exclusive Economic Zone (EEZ) or in the shared regional waters. Moreover, much empirical evidence in fisheries has shown that this economic perspective alone cannot adequately explain the whole non-compliance behaviour (Sutinen *et al.* 1990). Examples found outside of the fisheries sector which illustrate high compliance despite characteristically low enforcement and sanctions, such as the low rate of tax evasion (Elster 1990), further supports the notion that achieving the optimal level of compliance should involve much more than regulatory compliance based on the deterrence model.

Inspired by the seminal work of Young (1979) and Tyler (1990) who have highlighted the importance of normative factors such as legitimacy, social norm and morality on the issue of compliance in the public policy domain, fisheries studies have also begun to identify normative factors as playing a crucial role in influencing compliance behaviour among fishers (Kuperan and Sutinen 1998; Sutinen and Kuperan 1999; Charles *et al.* 1999;

Hønneland 1999, 2000; Hatcher *et al.* 2000; Jentoft 2000; Nielsen and Mathiesen 2003; Gezelius 2004). Co- or participatory management concept popular in the fisheries management literature and in practice is precisely an attempt to advance this normative aspect through raising legitimacy and fostering social norms (Jentoft 1989; Jentoft and McCay 1995). The arising consensus is that policy intervention should be shifted towards paying greater attention to these normative factors.

In line with this thinking, the second part of this research considers the underlying moral aspect embedded in conservation to connect with individuals involved in a real-world fishery. It attempts to gain a better understanding of the individuals' inclination towards conservation measures, widen our appreciation of the link between illegal fishing/non-compliance and governability, and at the same time to add to the current policy discourse on illegal fishing. Although frequently mentioned in the literature as one of the important normative factors, a fisheries study that focuses on the moral aspect is rare. This rarity potentially arises from the slippery nature of studying such topic from both the conceptual point of view as well as the methodological one. In this study, individual principle relating to fisheries conservation was chosen to represent the moral dimension involved in illegal fishing. Principle is central to governance theory as it is one of the fundamental notions forming a normative dimension of governance (Kooiman *et al.* 2005). A detailed conceptual elaboration on 'responsibility to conserve' principle (or shortly conservation principle) is supplied in Chapter 3.

No established quantitative methodology for examining one's moral principle is readily available. Although the field of cognitive psychology has developed tests that measure the stages of moral development in an individual, they have a different focus and a broader scope than what is intended here. In order to provide an indication of the conservation principle held by various stakeholders, this study relies on the damage schedule approach (Chuenpagdee *et al.* 2001), which has been shown to reliably elicit stakeholders' judgments on environmentally damaging activities and resource losses. This approach is deemed suitable for assessing something as intangible as one's underlying principle, and the relative simplicity in its methods also presents an advantage. The inferred conservation principle of the stakeholders would show how their internal tendency is oriented towards fisheries conservation in the context of illegal fishing. Further, the revealed insights can suggest policy direction towards improving the likelihood of realizing conservation goals – a way to increase governability in this important governance outcome.

1.3 Southeast Arm of Lake Malawi fishery as a case study

A Lake Malawi fishery situated in the southeast end of the water body called the Southeast Arm (SEA) was chosen as an appropriate case location for this research for the following reasons: (1) illegal fishing is observed to be rampant and it is contributing to the decline of fisheries resources (Bulirani 2005; Banda *et al.* 2005a), (2) historically, a policy response to deal with the illegal fishing issue has been through the enforcement of regulations and the threat of sanctions (Hara 2006), (3) participatory management has

been attempted in the last 10 years but with limited success (Njaya 2007, 2008), and (4) due to the limited availability of financial and human resources in managing the fisheries, an alternative policy exploration is urgently needed. This largely small-scale fishery provides an important source of livelihoods, income generation and animal protein for many Malawians. However, the changes in species composition and catch size coupled with depleting inshore stocks in recent decades have intensified concerns among the governing authority and fishing communities.

The SEA as the study area offered major advantages in terms of logistical and expert support due to the connection established with the Sustainable Fisheries for Food Security (SFFS) project administered by the Marine Institute in St. John's, Newfoundland. The SFFS project is an Association of Universities and Colleges of Canada (AUCC) – Canadian International Development Agency (CIDA) funded capacity-building project aimed to strengthen the fisheries officer training curriculum in Malawi as well as to reach out to selected fishing communities on urgent issues such as fish spoilage. Therefore, this study greatly benefited from the existing network of partnership and working relationships with key institutions in Malawi such as the Department of Fisheries (DoF) at the national level, the Malawi College of Fisheries at the regional level, and the Beach Village Committees (BVC) at the community level.

1.4 Research questions

The fundamental aspiration of this study is to explore a way to deal with uncertainty in the outcomes of governance measures, which are required to alleviate the challenges facing the fisheries. A conceptual direction I take in this thesis is towards investigating governability of a fisheries system; in other words, by learning to which degree and in which areas a fisheries system is governable and, if possible, how it can be made more governable. This was to be facilitated by the two broad objectives of the study: to reveal inherent and constructed needs and demands of the fishery as governing limitations and highlight the capacity of the governing system as potentials for addressing those challenges; and to uncover stakeholder's internal tendency towards conservation in relation to illegal fishing activities through an examination of one's underlying principle. In promoting these broad objectives, two research questions were formulated,

1. Where and to what extent do governing capacity and governing challenges exist in the fisheries system of the SEA viewed through the application of the governability assessment framework?
2. Can any plausible linkages between individual conservation principle and illegal gear use be uncovered to provide empirical support to the view that one's conservation principle has potential to influence one's fishing choice and behaviour?

Answering the first question would give us a general, system-wide account of the knotted aspects of the system that lend the fisheries less governable. It would also provide some clues about the illegal fishing situation and conservation efforts taking place in the SEA

fishery, as any governance issue (including illegal fishing) is in many ways dependent on the inherent and constructed system characteristics. Answering the second question would generate more direct findings that can be specifically linked to the governability and uncertainty of conservation measures in the fishery.

1.5 Research objectives

Following the research questions, six specific research objectives were pursued. They were:

1. To identify aspect(s) of the SEA fishery that are more governable, or less governable, based on the assessment scheme of governability;
2. To assess the level of awareness about the damaging impact of fishing activities among stakeholders and deduce about their conservation understanding;
3. To gauge the level of inclination towards conservation among stakeholders;
4. To identify the level of agreement between various stakeholder groups on the topic of Question 2 and 3;
5. To explore any plausible linkages that may exist between individual conservation principle and illegal gear use, through the development and application of "conservation principle category"; and
6. To make policy inferences based on the examination of the conservation principle in regard to addressing the concerns of illegal fishing

1.6 Organization of the thesis

This thesis is organized into eight chapters. Chapter 1 provides an overall picture of the fisheries issue under consideration and introduces the aims, research questions and specific objectives. Chapter 2 gives a brief overview of the SEA fishery, including its geography, history, main target fish species and illegal fishing practice, in order to provide a place-based context with which the discussion of the subsequent chapters can be conceived. A review of theoretical foundations is presented in Chapter 3 delving into a range of literature from governance, governability to fisheries compliance. This chapter is intended to provide a theoretical context for the research as well as to explain the conceptual thinking that sets the basis for the design of the method used to examine the conservation principle in this research. Chapter 4 describes the mixed methods research utilizing both qualitative and quantitative data collection methods. The governability assessment framework forms the major qualitative data method along with informal interviews and field observation. Quantitative data was collected following the damage schedule approach via the use of paired comparison questionnaire survey. Secondary data of various sources, such as journal articles, government reports and theses, was also consulted.

The next two chapters present the analyses and the results. Chapter 5 reports the findings of the system-level governability assessment applied to the SEA fishery. It provides a holistic description of the research site and the fisheries system according to the governability assessment matrix in order to answer the first research question. Also, the

ways in which the various levels of the system-level governabilities determined through system properties may affect the illegal fishing situation is discussed. Chapter 6 delves into the issue-specific investigation of the governability of illegal fishing and conservation principle by analyzing questionnaire survey data and displaying the results.

The final two chapters bring together the results of the research to reflect upon the findings and make policy inferences. Chapter 7 is dedicated to the interpretation and discussion of the questionnaire survey results with the aid of supplementary information gathered from other forms of data collection methods. The chapter also puts forward several policy suggestions that may provide a direction as to how to move forward with the governance options regarding fisheries conservation in the SEA. Moreover, it attempts to weave together the two levels of governability measurement in order to generate an integrated discourse about the overall governability of conservation measures and illegal fishing in the SEA. Chapter 8 recaps the research objectives and discusses the lessons learned from examining the two research questions. In addition, the central theoretical objective of dealing with uncertainty of governance options, with particular attention to conservation measures, is re-traced reflecting on the theory, study results and discussions presented in the thesis. Finally, several recommendations are made to point towards future research needs.

Chapter 2 Southeast Arm Fishery of Lake Malawi

Plate 2.1 A fisher in a dug-out canoe (Photo credit: Nigel Allen)

Plate 2.2 An *mbuna* feeding on a rocky substrate

2.1 Geography

Malawi is a land-locked country bordering Mozambique, Zambia and Tanzania (Figure 2.1). With over one-fifth of its surface covered with water, Malawi is blessed with a great range of fishing grounds contained within. The major water bodies are Lake Malawi, Lake Malombe and Upper Shire River, Lower Shire River, Lake Chilwa and Lake Chiuta. The biggest and the most important is Lake Malawi, which is the third largest lake in Africa with the surface area of about 28,800 km^2. Lake Malawi can be further divided into seven sections largely coinciding with the district administrative boundaries, which are, from north to south, Karonga, Nkhata Bay, Likoma, Nkhotakota, Salima, Mangochi (Southwest Arm) and Mangochi (Southeast Arm) (Banda *et al.* 2006). The Southeast Arm (SEA) is a semi-opened water body located at the southern end of the lake (Figure 2.1). The surface area of the SEA is estimated to be 2,000 km^2 or about 8.3% of the entire lake (Hara 2001).

As part of the Great African Rift Valley, shorelines of Lake Malawi are typically rocky and extend steeply down to water depths of over 200 m very quickly (FAO 1993). In contrast, the SEA exhibits relatively shallow water depth of less than 100 metres, with predominant presence of sandy and muddy bottoms (Crul 1997). Furthermore, the blowing of seasonal south-easterly trade winds in winter (May to August) causes upwelling and the mixing of entire water column, which help bring up the nutrient-rich bottom waters to the euphotic zone. Enabled by the favourable limnological

characteristics, the SEA enjoys high biological productivity making the SEA one of the primary sources of fish in the country for generations.

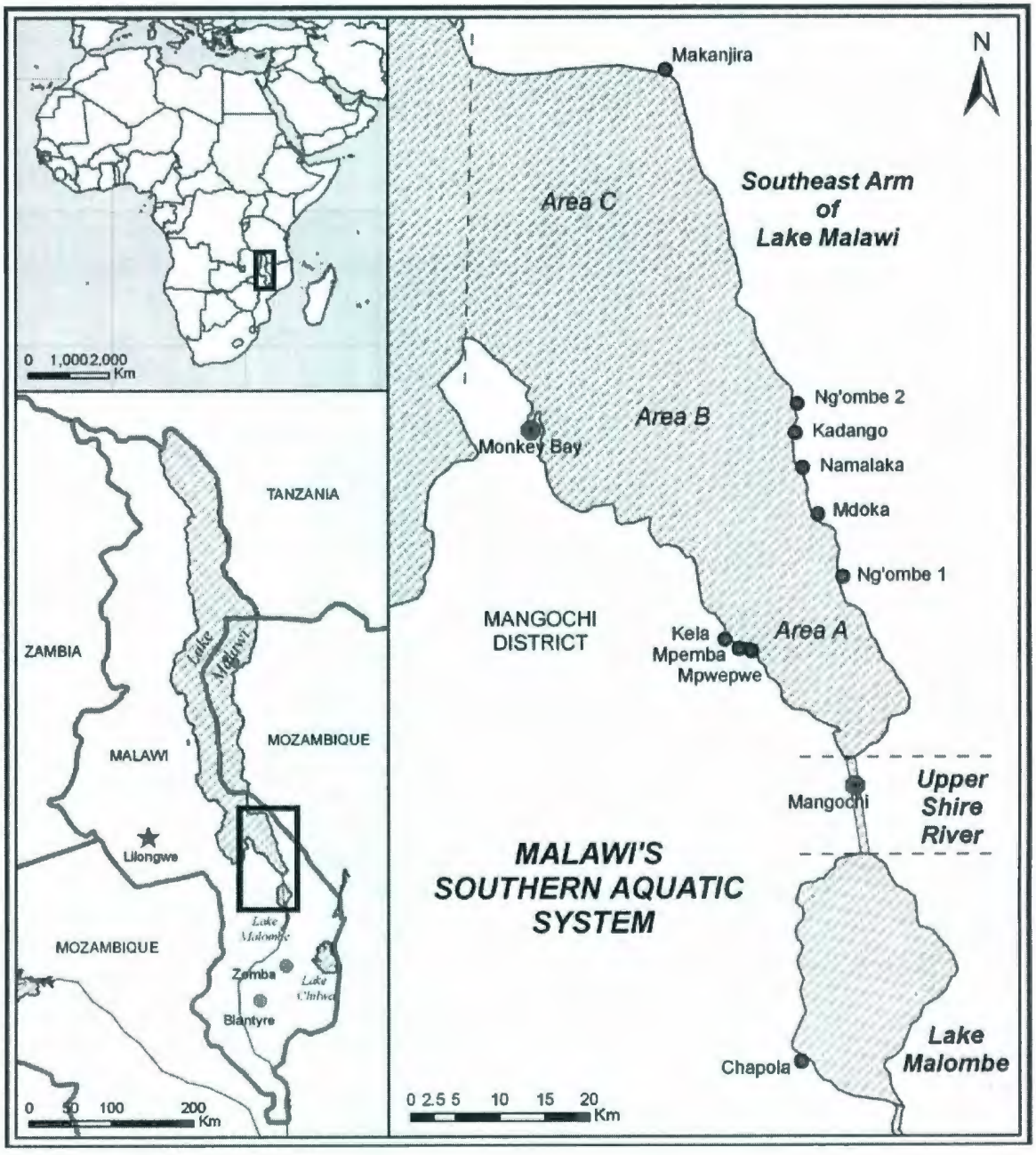


Figure 2.1 Map of the Southeast Arm of Lake Malawi. Also shown are the Upper Shire River and Lake Malombe to represent Malawi's southern aquatic system.

2.2 A brief history of the fishery

In the 19th century and before the end of the First World War, the fishery in the SEA, and most likely everywhere else, was regarded under the common-property regime regulated by family heads, village heads and chiefs, although no exclusive property or tenurial rights were established (Chirwa 1996; Kasulo and Perrings 2006). The communities along the shore enjoyed nearly unlimited rights and access to the lake resources. The 1920s saw the beginning of a transformation in fisheries from being a subsistence endeavour to a commercial activity, as fishers were observed taking a large quantity of fish using traps and lines near the southern end of the SEA and taking it to the markets in major towns such as Zomba and Blantyre. The fishery shifting into a commercial venture was echoed by the development of large-scale commercial/industrial fishing enterprise in the area. The SEA is one of the few areas in Malawi which has seen a viable large-scale commercial fishing, which was begun in the 1930s by European entrepreneurs and has flourished for nearly half a century (McCracken 1987; Chirwa 1996). The 1940s saw two major developments in the fisheries governance of the SEA. First, 'indirect rule' was introduced by the British colonial government which established the Traditional Authority structure and handed the traditional leaders (e.g. chiefs) the responsibility of handling all government activities at the local levels, such as settling civil disputes and collecting taxes and fees. This system continued even after the independence in 1964, with the traditional authority structures still standing (Njaya 2007). Secondly, in 1946, the Department of Fisheries was instituted by the colonial government, and the first fisheries regulation in Malawi – Fisheries Ordinance – was published in 1949 (Hara 2006). Up

until then, the colonial intervention in fisheries matters was marked with ambivalence and ineffectiveness. McCracken (1987, p.429) notes of the governing situation during the colonial era by saying:

> Particularly striking was the relative lack of colonial intervention in fishing despite the fact that in other areas of the economy elaborate controls were constructed over marketing and production. Pre-colonial rulers often associated themselves intimately with the fate of the fishing industry, preparing charms to ensure good yields and prohibiting fishing at certain times of the year.

In 1950s, a large contingent of Malawian capitalist fishers set up fishing businesses in the area upon their return from South Africa or South Rhodesia (McCracken 1987). In addition, a close proximity to major town centres such as Zomba and Blantyre has also helped fish trading and marketing activities to blossom. By this time, even the small-scale fishing already held a strong commercial nature, rather than the one of subsistence.

In the period following the independence in 1964, the fisheries sector was under the spell of the development/modernization agenda, led by Dr. Hastings Kamuzu Banda who ruled the country for 30 years until 1994 in a one-party political system. The Banda regime's high degree of central government intervention also reached the fisheries sector jumpstarting various development initiatives such as production-oriented modernization policies, moving fisheries offshore, centralized fish marketing system, and fish culture. However, many of these top-down initiatives supported by donor assistance were seen as

problematic due to the neglect of small-scale fishing and fishers, who in fact make up a large majority of the SEA fishery (Allison *et al.* 2002). Some externally-driven technologies were successful, however. Plank boats promoted by the Department of Fisheries began to replace dugout canoes. Also, the introduction of nylon gillnets improved the efficiency in fishing, while smoking kilns from West Africa improved fuel-efficient in fish processing. Overall, the fishing industry in Malawi expanded substantially during the second half of the twentieth century (McCracken 1987).

Today domestic fish production in Malawi comprises over 70% of the national animal protein intake. It also provides employment to more than 300,000 people and supports the livelihoods of 10% of the population[1]. In addition, the fisheries sector contributes 4% to the total Gross Domestic Product (GoM 2007). Figure 2.2 displays the catch trend of the entire Lake Malawi and the SEA from the period of 1976 to 2000 comparing to the national yield. Despite its small size to the entire lake, contributions from the SEA have always been high. As can be judged from Figure 2.2, from 1976 to 2000, the SEA contributed to the yearly average of 42% of the total production from Lake Malawi and 25% of the national production (Weyl 2005). The importance of fishing in the SEA and how it can be sustained are systematically uncovered as part of the governability assessment detailed in Chapter 5.

[1] The population of Malawi is estimated to be 12.3 million in 2005 (GoM 2007). Given that Mangochi district which entirely encompasses the SEA had a projected population of 796,272 for the year 2000 (Hara 2001), the author cautiously approximates the number of people inhabiting in the SEA area to be around 500,000.

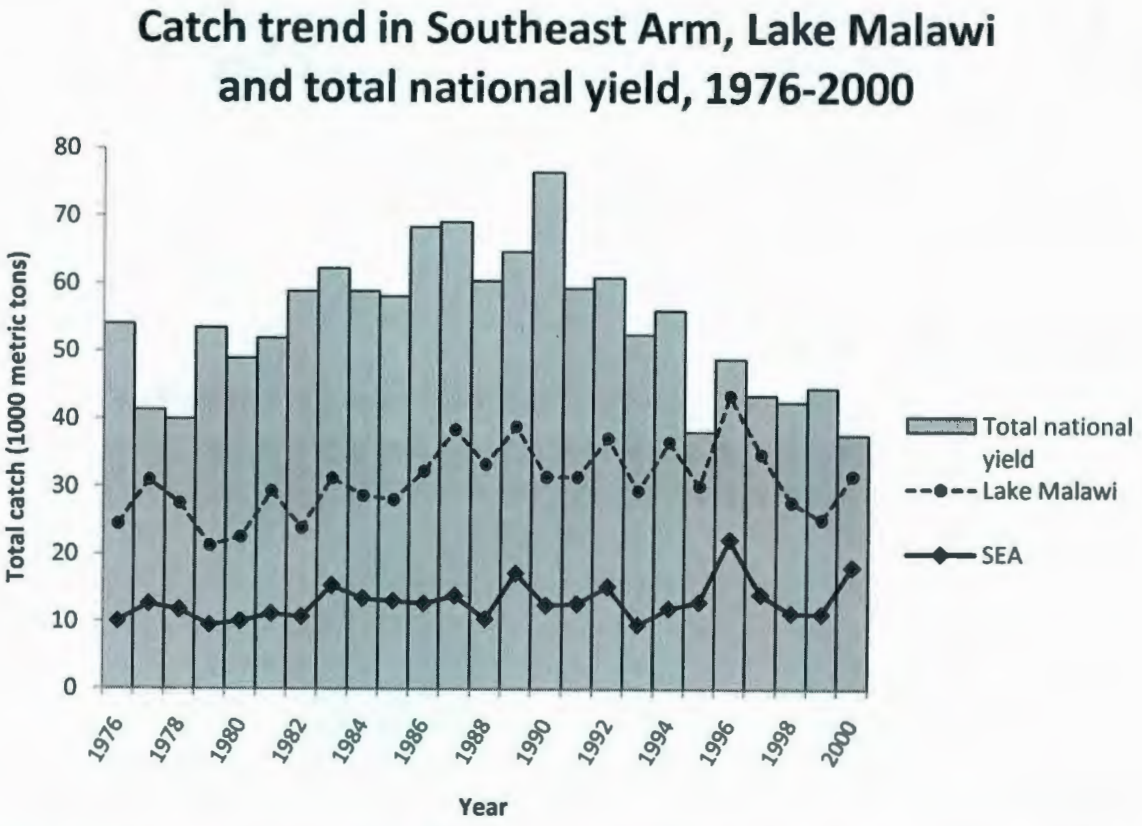


Figure 2.2 Catch trend in Lake Malawi and in the Southeast Arm from1976 to 2000 *(Source: Weyl 2005)*

2.3 Target fish species

There are several major fish species targeted in the SEA. While some species have gained importance in more recent years, one species has garnered utmost popularity and fetched high value for many decades, thereby immensely influencing management interventions in the process. *Oreochromis* spp. is a genus of large tilapiine cichlids with a local name of *chambo*. This genus has 47 species (Froese and Pauly 2009), but the three endemic species that make up the *chambo* stock in Lake Malawi are *Oreochromis squamipinnis*,

O. karongae and *O. lidole* as shown in Plate 2.3. They are demersal species found in shallow waters of less than 50 m deep (Banda *et al.* 2005a). *Chambo* primarily feed on phytoplankton, although zooplankton is also present in their diet. They exhibit a unique breeding pattern, uncommon in other 'tilapia', by being maternal mouthbrooders in collective nesting grounds at depths of 5 to 40 m. After release from the mouth of the female parent, juveniles migrate to nursery grounds in shallow waters. They remain in this area until they are large enough to join the main stock in deeper water. Sexual maturity happens at about 24 cm and takes about 3 years (FAO 1993; Banda *et al.* 2005b). It is speculated that, once the stock becomes depleted, such biological characteristics of *chambo* may pose a greater difficulty for the quick recovery of the stock, especially compared to other popular tilapiine species such as *O. niloticus* (Banda *et al.* 2005b).

A large variety of fishing gears has been employed to target *chambo*. Small-scale fisheries mainly use gill net, beach seine net and open-water seine net called *chilimira*, and large-scale fisheries use mainly trawls and purse seine (Banda *et al.* 2005a). The shape and operation of beach seine and *chilimira* is illustrated in Appendix A. The *chambo* are the most preferred and valuable food fishes in Malawi and have directly and indirectly supported livelihoods of many local people. Also, a number of technical studies carried out over the years reflects a concentrated attention on the *chambo* stock including Lowe's two-year study on the biology of *chambo* in as early as 1945 (Lowe 1952) and Food and Agriculture Organization-led study on further biological and socioeconomic knowledge on the management of *chambo*, which ran from 1988 to 1992 (FAO 1993). In

the 1990s, however, the suspected consequence of perennial over-fishing appeared true (Figure 2.3) and the population collapsed causing widespread concern and urgent management interventions in order to induce the recovery of the *chambo* stock. Yet, little sign of recovery has been observed to date

Plate 2.3 Comparison of *Oreochromis squamipinnis*, *O. karongae*, and *O. Lidole* (top to bottom) (*Source: http://malawicichlids.com/turn001_oreo_sq_ka_li.jpg photo credit: George F. Turner*)

In the meantime, fishers have intensified the catching of smaller, less-valuable species to sustain their fishing-related ways of living, which has emerged as the major fishery resources of the area that are increasingly being marketed and consumed (Figure 2.3). They are anchovy-like small pelagic species called *usipa* (*Engraulicypris sardella*), various species belonging to haplochromine cichlids such as *kambuzi* (*Lethrinops* spp., and *Otopharynx* spp. among others) and *utaka* (*Copadichromis* spp.) (FAO 1993). These

three fish groups currently make up much of the total biomass of the fishery resources in the area. Another fish group that is of significance is colourful, rock-dwelling ornamental fishes, locally called *mbuna*. They are part of an extremely diverse family of haplochromine cichlids, and hold particular importance in the aquarium fish trade as well as the tourism sector. Plate 2.4 displays the appearance of each of the fishery resources identified above.

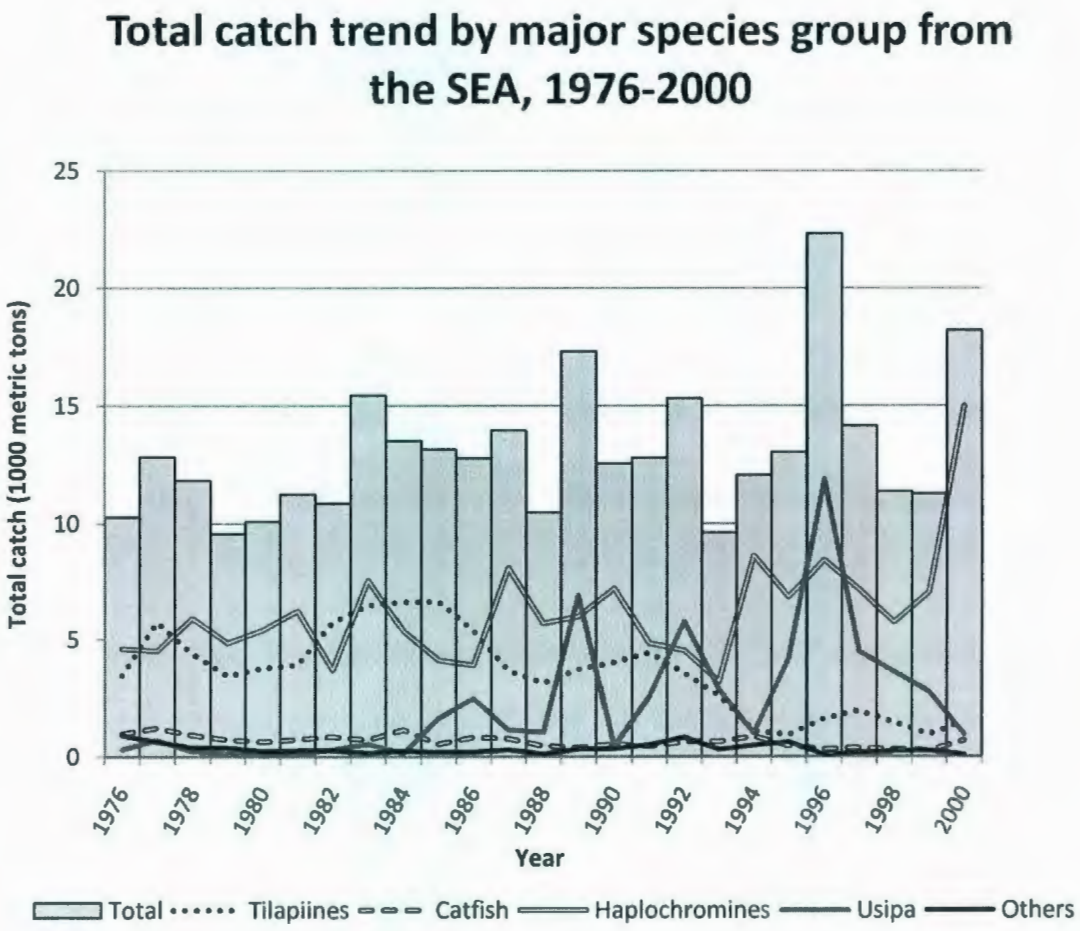


Figure 2.3 Total catch by major species group in the SEA, 1976-2000 *(Source: Weyl 2005)*

Plate 2.4 (a) *Engraulicypris sardella, usipa*; (b) *Copadichromis virginalis*, one of the many species that make up *utaka* stock; (c) *Otopharynx tetrastigma*, one of the species that are referred to as *kambuzi*; (d) *Pseudotropheus tropheops*, one of the many species that are referred to as *mbuna* (*Source: a http:// http://www.akvastranky.unas.cz/malawi.html*)
(*b: http://research.yale.edu/peabody/CICHLID/CK/copadsp1.jpg*)
(*c: http://research.yale.edu/peabody/CICHLID/QZ/tetrastg.jpg*)
(*d: http://www.fishbase.org/images/species/Pstro_u0.jpg*)

2.4 Illegal fishing practice

Historically, regulations governing the SEA fishery have been largely based on the findings of biological and ecological investigations, which have led to the enactment of provisions that emphasize biological concerns such as breeding habits and size limits (Hara 2006). As follows, prior to the early 1990s, conservation or preservation was the main paradigm with which the regulations were aligned (Donda 2005), and this condition has set the basis for defining recommended fishing practices versus illegal fishing. Thus, in principle, abiding by such regulations (i.e. practicing only the legally-allowed fishing operation) can be, in fact, seen as promoting conservation. Despite the intent, illegal

fishing was widely practiced, and the insufficient regard to the socio-economic or cultural dimension of fishing in the formulation and implementation of the regulations wan begun to be perceived as a major reason why the efforts to curb illegal fishing have proved to be ineffective (Hara 2006). In the 1990s, co-management regime was introduced to bring up the involvement of resource users in management and enforcement of fisheries regulations. However, to this date, for various reasons, some of which will be systematically explored in this thesis, effective means to minimize the extent of illegal fishing have failed to take hold.

In the SEA fishery, the most common forms of illegal fishing are use of destructive gear, gear modification[2], fishing without proper license and fishing season/zoning violation (Bulirani 2005; pers. observation). One form of gear that has been a major contention in the SEA fishery is an open-water seine called *nkacha*, whose shape and operation is illustrated in Figure 2.4. Originally devised and used in nearby Lake Malombe, there has been unprecedented increase in the use of this gear in Lake Malawi since the mid-1990s, particularly in the SEA, as *nkacha* fishers would migrate to the SEA following a closed season in Lake Malombe or simply seeking a better catch elsewhere (Manase 2001). This poses a serious concern since the operation of this gear in Lake Malawi is prohibited according to the regulations on account that the gear destroys nursery grounds for important fish stocks, including *chambo* (GoM 2000). Currently in the SEA, there are certain beaches where *nkacha* operation is harboured and concentrated. In these beaches,

[2] This can take several forms: smaller mesh size; enlarging the length or width of the gear; or alternative design of the gear such as attaching a small trawl net at the end of a beach seine to catch non-selectively, locally called *kandwindwi*.

there appears to be weak political will to comply with the regulations as well as a lack of formal enforcement capabilities. As the case of *nkacha* succinctly exemplifies, illegal fishing is a multi-dimensioned issue that intricately involves both the natural, social and governance aspects. Combined with its wide-ranging nature in type and occurrence, it remains a major topic that needs to be duly addressed in promotion of conservation goals. An in-depth examination of illegal fishing in the SEA from a governance perspective will follow in the subsequent chapters.

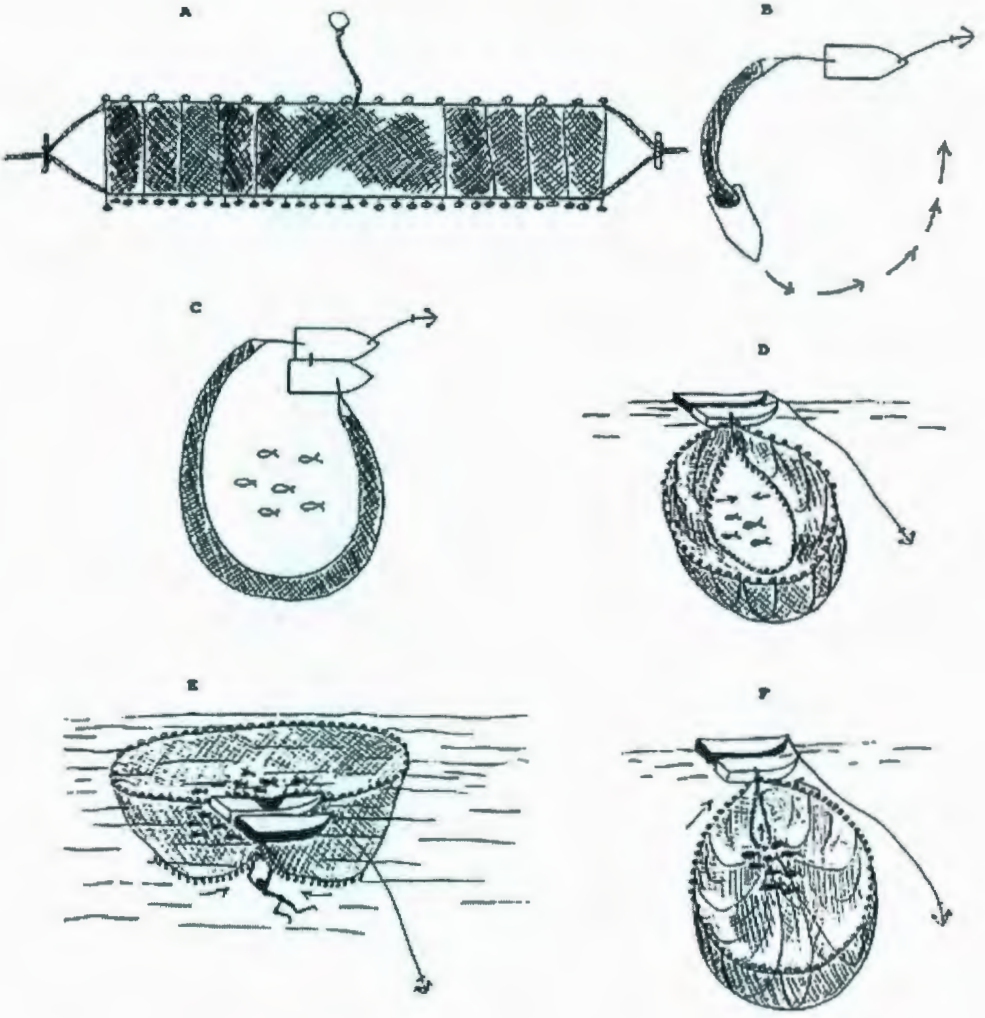


Figure 2.4 Shape (a) and operation (b-f) of *nkacha* net (*Source FAO 1993*)

Chapter 3 Theory and Conceptual Background

Plate 3.1 Fish caught by its gill in a beach seine

Plate 3.2 *Chambo* harvested from an experimental cage culture in the SEA

The theoretical background for this thesis is presented in six components throughout this chapter. First, I start out with the introduction of the emerging idea in fisheries governance called interactive governance, which forms the theoretical backbone for the entire study. This is where the research ideas and motivation find their origins. Following that, two key concepts of interactive governance, governability and meta-governance, are examined in detail. Fisheries literature are reviewed in the next two sections focusing especially on the moral dimension and compliance. In the last section, I offer a model that conceptualizes how conservation principle is developed and used in this research.

3.1 Interactive governance

Governance is a concept that has been around for a long time. From its origin in the Greek medieval time with the verb *kubernân* (to pilot or steer), it has branched into several discourses such as public policy and administration, international relations, comparative politics whose focus lies on how to bring about economic development and democratization into parts of the world, and more recently corporate governance (Kjær 2004). Although no single, unifying definition of governance exists, some common ideas emerged in the last few decades to give it a reasonably coherent meaning. Governance is seen as something more than government and beyond management (Rhodes 1996; Stoker 1998). In other words, it includes other actors and processes that are placed outside the narrow realm of government and the daily management routine. In this sense, private actors such as the market and civil society as well as non-governmental organizations have a crucial role to play. Governance is also conceived as an interactive process which

involves various forms of partnership because no single actor has the knowledge and resource capacity to tackle problems unilaterally (Kooiman 1993). The mode of interaction captured in the above stipulation is often manifested in the form of a network involving multiple interdependent actors with capability to self-organize. For this reason, Rhodes (1996) posits that governance is about managing networks.

The interactive governance for fisheries captures these key notions and provides a unique perspective on how fisheries governance can be viewed and tackled under the given challenges facing the fisheries (Kooiman *et al.* 2005a; Bavinck *et al.* 2005). Its premise lies in the belief that ecological-socio-political systems imply interactions, and interactions are the fundamental conditions for the existence of those systems (Kooiman 2008). In this sense, any fisheries or human-in-nature system can be characterized and evaluated by the concept of interaction whether through the presence or the absence of interactions, or the types and the nature of interactions, or the actors involved in interactions, or finally the speed at which interactions happen and hindrances that exist to impede its vigour. The conceptual exploration of this perspective has come to the fore in recent years through collaboration by the FISHGOVNET members (www.fishgovnet.org), which is composed of academics and practitioners around the world, whose interdisciplinary deliberation was grounded in Kooiman's concept of governance (Kooiman 1993; Kooiman 2003). The interactive governance is defined as:

> the whole of public as well as private interactions taken to solve societal problems and create societal opportunities. It includes the formulation and application of principles

> guiding those interactions and care for institutions that enable them (Kooiman *et al.* 2005a, p.17).

Stemming from this definition, interactive governance, first of all, recognizes that fisheries are characteristically diverse, complex, dynamic and operative at various scales. Hence, diversity, complexity, dynamics and scale issues of fishery systems become fundamental building blocks of a governance structure, and therefore must be carefully scrutinized in assessing governance potential (Jentoft 2007). Interactive governance employs the terminology of 'system' and applies it to a fishery. Shown in Figure 3.1, a fishery system is distinguished into three sub-systems, which are 'system-to-be-governed', 'governing system' and a web of interactions between the two systems called 'governing interactions' (Jentoft *et al.* 2007). System-to-be-governed refers not only to the natural and the socio-economic systems, but also to the governing system itself as an object of governance. Governing system entails those who are involved in the governing of fisheries and their sphere of actions – be it the state, the market or civil society, but more likely a combination of the various actors. Governing interactions are a pattern and process of interactions between the governing system and the systems-to-be-governed that constitute the push and pull of certain governing forces such as power and consent that shape how fisheries governance materializes.

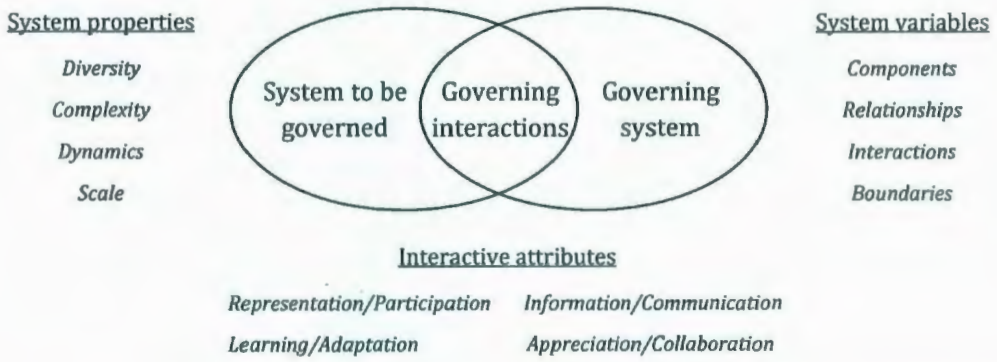


Figure 3.1 Fishery system made up of governing system, system-to-be-governed and governing interactions; system properties, system variables and interactive attributes are also presented *(Adapted from Chuenpagdee and Jentoft 2009).*

Interactive governance adopts the perspective that governance is multi-dimensional and both analytic and normative. Figure 3.2 displays the three sets of governance attributes. First, elements are the images, instruments and actions used in governance. For example, 'Malthusian overfishing' (Pauly 1997) is an image of a problem in fishery, which may lead to the use of *instruments* such as marine protected areas (MPAs) or individual transferable quotas (ITQs), and subsequent actions. Secondly, modes of governance concern the structural form of a governance undertaking such as self, hierarchical and co-governance. Self-governance is characterized by the minimal intervention of central governing authority and enabled by the capacity of the governed to self-organize. Hierarchical governance, on the other hand, is about central planning and rigidity, while co-governance attempts to share the role of governing between the governors and the governed. Thirdly, the layer at which the governing elements take place and the modes constructed is presented as the three orders of governance. The first order deals with day-to-day fisheries management activities required to solve societal problems and create

societal opportunities. The second order refers to the institutional design and set-up that enables the first order processes. The third, or meta-, order stipulates that fisheries governance should be grounded on certain values, norms and principles. In other words, activities involved in the first and second order governing as well as the governing interactions should be guided and directed by the underlying principles and values that are held by the governing players. This is where governance can have its normative appeal, and in fact, the interactive governance proposes that normative principles guiding the governance process should be made explicit so that they can be explained, defended, discussed and evaluated as part of the governing interactions (Kooiman and Jentoft in press).

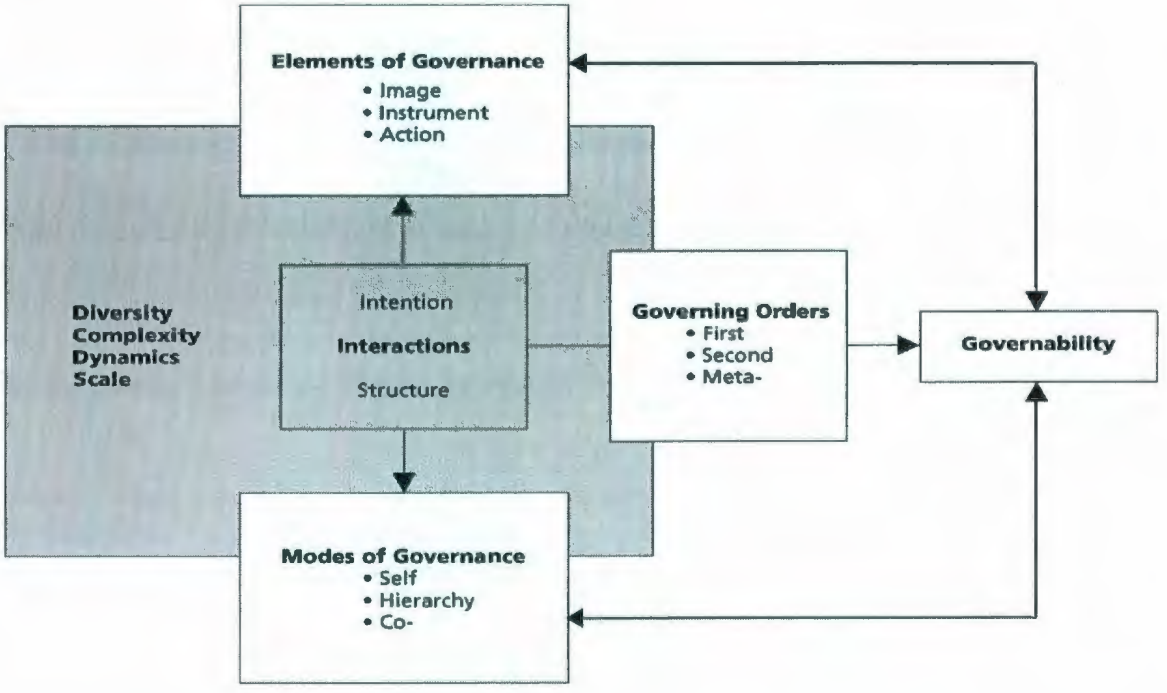


Figure 3.2 Schematics of interactive governance showing attributes that are involved in governing of a fisheries system (*Source: Kooiman and Chuenpagdee 2005, p.325*)

So far, the interactive governance approach has been largely discussed in a conceptual manner and in the broad context of world's fisheries. While Mahon (2008) has applied it to examine three fisheries in the Caribbean, and Chuenpagdee and Jentoft (2009) borrowed the case of the Gulf of Thailand fishery in their governability analysis, being formally put together only in recent years with the publication of *Fish for Life*, interactive fisheries governance has not been extensively supported through empirical studies thus far. As a result, the practicality of the interactive governance approach has been cautiously undermined by some, claiming that this approach is only of interest and use to an academic circle (Symes 2006; Annala 2007). Future empirical studies that test and push the boundaries of the theoretical base are expected to improve its applicability and acceptance.

3.2 Governability

Figure 3.2 displays governability as a stand-alone, yet interconnected, entity that both feeds into and is fed by the governance attributes. The concept of governability was first articulated in Kooiman (1993) succinctly summed up as the adjustment and balancing process between governing needs and governing capacities. The needs roughly represent social-political problems that arise in a society, while the capacities are viewed as 'solutions' that are acted upon to satisfy those needs. He proposed that needs are not solely the domain of society, that is, needs also arise in the realm of government. Similarly, capacities are not only held by the government, but they are also found in the society, for example, in the fishing communities and in nature. He put an emphasis on an

interactive communication and decision-making process, through which needs and capacities can be integrated and matched with each other.

Amidst a series of further deliberation, the governability concept has begun to gain maturity and develop into something that can be more systematically approached, as shown in Kooiman (2003). Governability is posed as an overarching (composite) quality of a social-political entity. By this, he meant that it can be a starting or culminating point of the discussion on governance of a certain society or a fishery because, in a sense, all features involved in governance ultimately influence governability and *vice versa*. In other words, system properties such as diversity, complexity, dynamics and scale issues exhibited in a system as well as those aspects that make up the system such as governing modes and elements all play a role in shaping the level of governability (i.e. they all interact with and influence the level of 'fit' between needs and capacities). Assessing this level of fit in a manner that is practical in a real governance setting would provide a strategic viewpoint from which to analyze a certain governance situation and therefore may prove advantageous in improving its governance.

An initial attempt to move the concept of governability from theory to practice is enclosed in Kooiman *et al.* (2005a) as the interactive governance was given a more specific (yet still fairly broad) context – fisheries. A chapter by Kooiman and Chuenpagdee (2005) presents a crude measurement scheme that assesses a 'northern' fishery, a 'southern' fishery and aquaculture enterprises, as shown in Table 3.1. While this assessment relied on high degree of generalization which does not hold much weight

in influencing real-life policy *per se*, it was an important characterization that paved the way for future studies. Jentoft *et al.* (2007) in examining MPAs and their relation to governance under the light of governability, Chuenpagdee *et al.* (2008) in assessing the governability in capture fisheries, aquaculture and coastal zone, Mahon (2008) of three fisheries in the Wider Caribbean, Bavinck and Salagrama (2008) of captures fisheries in the Bay of Bengal, and Chuenpagdee and Jentoft (2009) of the Gulf of Thailand fisheries are all recent important extensions in advancing this research issue while producing alternative insights into their respective fisheries which may not emerge from conventional fishery assessments. Nonetheless, governability assessments thus far are still largely rooted in theory, and conducted based on authors' expertise and knowledge about the studied fishery rather than being set up as a more structured empirical study that is rigorously researched.

Table 3.1 Scoring governability for hypothetical examples of northern and southern fisheries and aquaculture enterprises (*Source: Kooiman and Chuenpagdee 2005, p.348)*

Criteria	*A 'Northern' fishery*	*A 'Southern' fishery*	*Aquacultural enterprises*
Representation of DCD*/scale	L	H	M
Rationality of fits of elements	M	L	H
Responsiveness of modes	M	H	L
Performance of orders	L	M	M
Overall	L	H	M

*DCD = Diversity, complexity, dynamics; H, M, L = High, Medium and Low

The need to make the governability framework more applicable for assessment and comparison purpose is underscored in the latest refinement of the governability concept

(Kooiman 2008). Many predict that this will be a long-term research task that is likely arduous and requires a high degree of collaboration and interaction between various thinkers and practitioners. The governability assessment conducted as part of this thesis research is a step in the direction of operationalizing the concept. What is unique this time is that governability assessment was conducted as a (quasi-) empirical study that involved literature review, informal interviews and field observation. The governability assessment of the SEA fishery adds value to the continuing discourse through encouraging further research on the subject and providing some practical insights on the fisheries governance in the study area.

3.3 Meta-governance

The articulation of the third order of governance, 'meta-governance', or *governing of governance*, is where it has been identified as the most distinguishing and innovative, yet also potentially controversial, facet about the interactive governance (Symes 2006; McGoodwin 2007). Symes (2006), in reviewing *Fish for Life* notes that the "firm foundations in ethical values and carefully articulated governing principles" (Symes 2006, p.116) on which interactive governance bases its focus is a pioneering notion that could lead fisheries governance to a new height. Meanwhile, McGoodwin (2007) cautions that the utmost focus on ethically-grounded, humanistic-minded governing principles may be criticized by skeptics as overly ideal and therefore the meta-governance concept may face resistance from certain participants in the fishery.

The explicit attention on meta-governance stems from the acknowledgement that governance is value-ridden from top to bottom (Kooiman 2003). It rests on the idea that while governing and governance may be seen largely as an analytical concept, what *governs* the governing is highly normative. Hence, this implies that one cannot escape nor should not ignore the normative aspect involved in governance since it lays a foundation for all governing activities whether they are day-to-day management tasks, policy formulation or institutional restructuring. To facilitate the connection to this meta-perspective, interactive governance offers a set of norms or criteria to judge governance with. *Rationality* is a norm for evaluating the three governing elements, image, instrument and action. *Responsiveness* is a criterion for reviewing the governance modes, while *performance* is the yard-stick to judge the orders of governance. However, Kooiman (2003) notes that these meta-principles are his personal choice as a 'meta-governor', and the essence of interactive governance follows that other suitable normative notions of meta-principles conceived by others should come forward and be made explicit so that they can be discussed and negotiated as part of regular governing interactions.

Looking at the meta-principles in fisheries context as detailed in Kooiman *et al.* (2005b), interactive governance stipulate that *sustainability* should be the guiding principle for image formation, although sustainability can be a weary concept that is open to varying degrees of interpretation. *Efficiency* should be the main criterion for choosing an instrument. Whether it is economic, environmental or social efficiency that governors are most interested in, instruments that maximizes the desired benefits and minimize the cost should receive high penchant for governing use. Action component should be guided by

precautionary principle to safely deal with uncertainties intrinsic to any fisheries and to reduce the occurrence of unacceptable or undesirable situations.

For modes of governance, *respect* is suggested as a meta-principle for self-governance. Respect for the autonomy of collections of individuals and their institutions can go a long way to ensure that self-governing capacity of groups is upheld. In the context of fisheries, a local management regime by resource users requires respect from government officers and other user groups to achieve the advantages of self-governance such as lesser cost and utilization of local ecological knowledge. Such respect, however, should come with reciprocity as "autonomy is not a principle people can claim, without also taking the autonomy of others into consideration (Kooiman *et al.* 2005b, p.273)". *Inclusiveness* is a meta-principle for co-governance. Co-governance is about sharing governance responsibilities between the fishing community and the government. Inclusion of different stakeholders to the decision-making table would mean raising legitimacy and participation by having diverse views represented and fostering the spirit of collaboration. However, mere inclusion that is shrouded in power imbalance or subject to an unfair process should be guarded against. Instead, co-governance regime must try to ensure meaningful inclusion of various stakeholders. Lastly for the mode, *equity* is particularly well-suited to guide hierarchical governance. Through both procedural equity and outcome equity which promote fair procedures and equitable distribution of costs, benefits, hardships and burden-sharing, hierarchical governing interventions could garner adequate legitimacy to ensure effective functioning.

With the premise that performance is a concept that binds the three governing orders, *effectiveness* is first conjured up as the meta-principle for first-order governing, by which day-to-day management tasks geared towards problem-solving and opportunity-creation are appropriately evaluated. Second-order governing which entails institutional framework and structural aspects of governing interactions should be approached with *legitimacy* in mind, since it is generally assumed that a high degree of legitimacy towards the governance structure will have a greater chance of achieving its goals. Finally, *moral responsibility* is called in to guide the process of third-order (meta-) governing. There will inevitably be moral dilemmas and hard-choices in the way of governors. How they decide to deal with the moral conflicts and inconsistencies is often a critical issue that has substantial consequences to governance situation, in turn affecting the rest of governance actors. In this sense, *taking responsibility for* the specific governing interactions and how governance subsequently unfolds appears to be the most fundamental normative principle that will set the standard for governing of governance. Overall, the vital role that meta-governance occupies in the whole interactive governance perspective is succinctly summed as such: "ethical and moral questions are the essence of the governance domain. They are not only part of meta-socio-political interactions, but in a final sense, they are also the foundations of these interactions (Kooiman *et al.* 2005b, p.281). This view serves as the initial motivation for taking an interest in the moral dimension in this research.

A further elaboration provided by Kooiman and Jentoft (in press) distinguishes four variables relevant in the meta- or normative discourse, which are values, norms, principles and choices. The distinction is not clear-cut, as one can imagine. However, it

may still be a useful exercise to make sense of the meta-governance scheme by breaking down into components. It is conceptualized that values give rise to norms, which in turn establish principles, which then shape choices and therefore behaviours (Figure 3.3). In this scheme, values are the most fundamental notions, while choices/behaviours represent the most applied and specific. Principles are conceived as an intermediate position that is still founded in the general notions of what is right or wrong, but applied in the sense that it has a direct association with the choices and behaviours that the governance actors make. Norms hold a hint of practical overtone derived from values while linking to principles. Here, a relevant example would be seeing sustainability as a value, natured-centred environmental ethics[3] as a norm, conservation as a principle and compliance of regulations as a choice/behaviour.

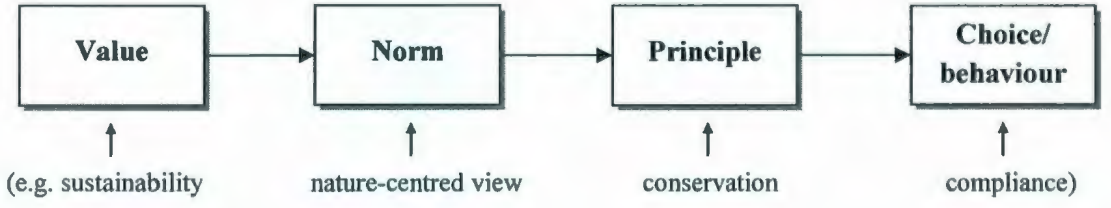


Figure 3.3 Schematics of normative ideas in meta-governance process (*Adapted from Kooiman and Jentoft in press*)

Hard choices that frequently turn up in fisheries are value-ridden (Bailey and Jentoft 1990). More specifically, it is the incompatibility and incomparability of the values at

[3] In this nature-centred ethics, all living organisms are seen as deserving moral recognition, as opposed to human-centred environmental ethics which is solely focused on human happiness (Kooiman *et al.* 2005b: 267). Another norm which could be deduced from sustainability is 'sustainable *development*' (cf. Sachs 1999).

stake that make the choices so hard. The examples of having to make difficult choices are plentiful in fisheries. What should the governors choose (or prefer more) between small-scale and large-scale fisheries, between short-term development and long-term development, between innovation and precaution, between aquaculture development and capture fishery restoration, or between centralization and decentralization (Bavinck *et al.* 2005)? These inevitably necessitate moral and political considerations (Bailey and Jentoft 1990), for these choices can often produce winners and losers, leaving equity and sustainability and other hordes of values on the line. Underlying and implicit values, norms and principles are always involved in these tough choices, but they are usually hidden from the speeches of the governors, from the voices of the citizens and from the decision-making table. 'Habermas argues that moral discourses are needed to solve interest- and value conflicts: values and norms have to be compared and tried out against each other before one can come to a decision' (Habermas as quoted by Søreng 2006, p.159).

3.4 Moral dimension in fisheries and in other sectors

Despite its fundamental position in governance, there have only been a limited number of studies that examines moral dimension in fisheries. Gezelius (2004) investigates the connection between morality and two commonly-distinguished scales of fishing, namely subsistence or small-scale operations, and large-scale commercial operations. Through a comparative study of two fishing villages from Norway and Newfoundland, the study highlights that illegal fishing activities, such as poaching, done for food fishery is morally

safe and acceptable by the surrounding members of the village, while illegal fishing associated with commercially-driven, large-scale operations is subject to a tougher standard of morality by others in the village, who could demand external sanctions to be imposed on such 'greedy' fishing practices. A corollary to this finding is that moral principles to abide by the rule of law for the sake of fisheries conservation can be forgone if illegal fishing is done for subsistence purpose, or as a dire income source, or as a desperate measure of basic survival. Søreng (2006) draws upon 'communicative rationality' theory[4] to explore the importance of moral discourse in the communication design of a co-management regime. Using a case study from Norway, she contends that moral discourses, through which various stakeholders can build a common understanding of the differences in values and interests, are necessary to infuse normative fundament to the decision-making and, in due course, to raise the legitimacy of a co-management regime among various stakeholder groups.

Nevertheless, looking at the wider fisheries sector, progress has been made in substantiating and codifying the moral dimension involved in fishing and fishing-related activities, with particular attention paid on the principle aspect. The best-publicized product is the Code of Conduct for Responsible Fisheries (FAO 1995). In the provision, it states that "The right to fish carries with it the *obligation* to do so in a *responsible* manner so as to ensure effective conservation and management of the living aquatic resources." (ibid. p.4, italics added). Mangel *et al.* (1996), Costanza *et al.* (1998) and FAO (2005) all

[4] Habermas (1990) Moral consciousness and communicative action, and Habermas (1996) Between facts and norms

make a similar assertion on the users' responsibility to use the resources in a manner that protects and conserves the ecosystem, as summarized in Table 3.2.

Table 3.2 Summary table of written provisions that emphasize the 'responsibility to conserve' principle and their sources

Provision	Source
"The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources."	FAO Code of Conduct for Responsible Fisheries, General Principle 6.1, FAO (1995)
"The concept of 'right to use the resources' must be changed to the 'privilege to use the resources.'...The intention of this principle is to make clear that demonstrating that resource use will not be damaging is the responsibility of those who want to use it."	Principles for the Conservation of Wild Living Resources, Principle III, Mangel *et al.* (1996)
"Access to environmental resources carries attendant responsibilities to use them in an ecologically sustainable, economically efficient, and socially fair manner."	Principles for Sustainable Governance of Oceans, Principle 1, Costanza *et al.* (1998)
"Responsibility for the biosphere, which concerns the interconnections of all life forms and the protection of biodiversity...This principle combines ethical reasoning based on rights and on consequences for human welfare, as well as on individual virtues and duties to respect the environment."	Fundamental principles of bioethics, FAO (2005)

Outside of the fisheries sector, the meaning of moral principles and how it shapes individual behaviour have been studied for a long time from various angles (e.g. economy, psychology and sociology, and political science), which provides substantial evidence that the moral dimension is an irrefutable and stand-alone element shaping one's choice and behaviour (Etzioni 1988; Goodin 1980; Mansbridge 1990).

There has been a substantial body of research that rejects the prevalent neoclassical notion that human economic behaviour is solely explained by self-interest. Instead, they present a more complex view of behaviour arguing that it should be more accurately viewed as quasi-rational, taking duty, commitment and affection into account (Sen 1977; Mansbridge 1990; Thaler 1991). Among them, highlighting how people's behaviour is systematically and significantly affected by moral factors is put forth by Etzioni (1988). He posits that people pursue (at least) two irreducible "utilities" or two sources of valuation: pleasure and morality. In his words, 'people do not seek to maximize their pleasure, but to balance the service of two major purposes – to advance their well-being and to act morally" (ibid. p.83). A simple model shown in Figure 3.4 succinctly illustrates his theory. Evidence of altruistic acts is readily available through the case of voting behaviour, voluntary work, and refusal to free ride, which are inconsistent and often incomprehensible with the basic premise of neoclassical thinking. How one's moral values can 'stand on its own' is based on the denial of pleasure in the name of principle(s) evoked, and in the process the values are internalized meaning 'individuals see the values as their own and not as external conditions to which they merely adapt' (ibid. p.46). This argument provides a strong theoretical support for the feasibility of relying on the moral dimension to curb illegal fishing, as Hoffman (as cited by Etzioni, 1988, p.46) states that 'once internalization has taken place, individuals pursue what they consider to be a moral line of behaviour even in the absence of external sanctions'. Etzioni's view on how moral commitments can influence behaviour, independent of economic factors, is consistent with Kooiman and Jentoft's meta-governance process conceptualized in Figure 3.3. Merging the two viewpoints seems to suggest that once one's values based on morality

become internalized, moral commitment is borne to elicit behaviour that is in harmony with evoked principles.

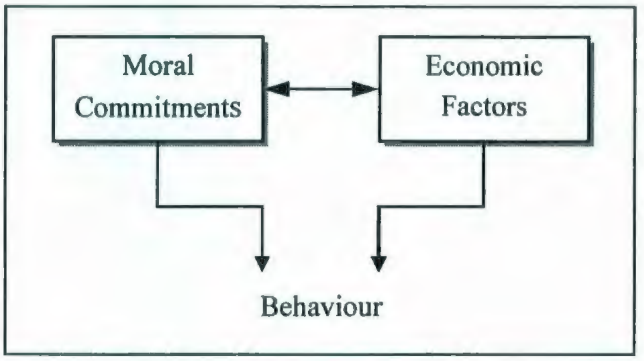


Figure 3.4 Two pillars of utilities affecting individual behaviour *(Source: Etzioni 1988, p. 64).*

Schwartz (1968a, 1968b, 1970), coming from the angle of sociology and psychology, posits that activation of moral norms in individuals to produce behaviour that is congruent with a given norm depends on the awareness of interpersonal consequences related to the welfare of others and ascription of responsibility for the actions and their consequences. First, being aware that particular actions have consequences for the welfare of others is the first step leading to a moral decision-making. Schwartz argues that without recognition of such consequences, one would not perceive him/herself to be facing a moral choice at all (Schwartz 1970). Secondly, once becoming aware of potential consequences, one must accept responsibility for the actions and their consequences. In a morally-relevant situation, one may ascribe responsibility to the self or may evade responsibility by ascribing it to others. Schwartz confirms in his studies that both these two 'tendencies' are necessary for enabling a positive correlation between subscribed

moral norms and actual behaviour, and therefore the presence of the tendencies do increase pressure to behave in accordance with the moral norms that the individual endorses. In his reasoning, major barriers to acting in conformity with the moral norms are also identified, which are, "the absence of the resources and opportunities needed to conform (e.g. interpersonal skills and spatial proximity) and various countervailing motives (e.g. selfish interest)' (Schwartz 1970, p.131). He adds that "the presence of countervailing motives renders the process of moral decision making more complex." (ibid. p.131).

Coming from a political science viewpoint, Goodin (1980) distinguishes three ways of formally representing moral principles in order to appeal to them to help enforce social policies. One views morality as simple prudence and enlightened self-interest, while another depicts it to be an internalized norm which typically tacks onto an ordinary utility function as another type of consumption good. According to the latter view, both egoistic and moralistic considerations are compared, juggled and substituted on a same plane, even if the latter is weighed more heavily in the equation. This viewpoint has been how the moral aspect and principles have been treated in the many past fisheries compliance studies (cf. Kuperan and Sutinen 1999, Sutinen *et al.* 1990, Charles *et al.* 1999; Furlong 1991; Hatcher *et al.* 2000). The third model takes morality very seriously meaning 'they may be formally set apart from more mundane objects of desire by repudiating the use of instrumental rationality in situations requiring a moral response' (Goodin 1980, p. 136). He argues that tapping into this strongest form of moral principles for social policies can produce a significant least-cost benefit in enforcing policy demands. However, he also

notes that they are extremely susceptible to becoming *polluted* by less pure motives such as material incentives, and therefore policies must be designed in such a way as to avoid the pollution. The present study opts to view the moral principle associated with conservation in this light, instead of applying it to the utility theory as other studies have done. In this context, assessing the presence and/or the relative strength of the conservation principle in the various stakeholders and learning about its relationship to other possible motives such as material incentives may lead to gaining a better understanding of the illegal fishing situation in Lake Malawi.

3.5 Fisheries compliance literature

3.5.1 Two perspectives on compliance – instrumental and normative

This section reviews the fisheries compliance literature that delves into the issue of individual illegal fishing or non-compliance of regulation. The study of compliance had an initial point of departure in the criminal behaviour of economic individuals. Inspired by the work of Adam Smith[5] and Jeremy Bentham[6] who reasoned that individuals in pursuit of economic self-interest could yield criminal behaviour necessitating the concept of deterrence to reduce crime, there followed numerous studies[7] that linked crime and economic circumstances (Hønneland 1999). In the 1960s, a formal theoretical framework that views criminals as any other individuals attempting to maximize personal utility was

[5] Smith (1759) The theory of moral sentiments, and Smith (1776) An inquiry into the nature and causes of the wealth of nations

[6] Bentham (1789) An introduction to the principles of morals and legislation

[7] Such as Bonger (1916) Criminality and economic conditions, and Fleischer (1966) The economics of delinquency

established by Becker's economic analysis (Becker 1968). Stemming from this neoclassical thinking that underpins the economic models of regulatory compliance, the prevailing framework has been to regard fishers as utility maximizing rational agents, and the calculation of relative gains and losses as the primary factor determining compliance. Some of the early fisheries compliance studies that follow this lineage are Sutinen and Gauvin (1989), Sutinen *et al.* (1990) and Furlong (1991). Therefore, heightened enforcement and the threat of sanctions have virtually been the only policy responses in deterring illegal fishing around the world (Hatcher *et al.* 2000).

Contrary to what the neoclassical deterrence model prescribes, in reality, the probability of getting caught is usually low, and the penalties generally are not large relative to the illegal gains (Kuperan and Sutinen 1998). In addition, high penalties are not always feasible because the judiciary and legislature may oppose excessively severe sanctions perceived to be too high for the committed crimes. Yet, much empirical evidence has shown that a high portion of fishers (50% to 90%) normally comply with regulations despite such shortcomings (Sutinen and Gauvin 1989; Sutinen *et al.* 1990). The examples of high compliance despite characteristically low enforcement and deterrence are also commonly found outside the fisheries sector, such as the low rate of tax evasion (Elster 1990). Realizing that the neoclassical perspective alone is not adequate to explain the whole compliance behaviour, several studies have embarked on accounting for this 'irrationality' by incorporating other factors into the compliance framework (Kuperan and Sutinen 1998; Sutinen and Kuperan 1999, Charles *et al.* 1999; Hatcher *et al.* 2000). These other factors – legitimacy, morality and socialization – are similar to some of the meta-

principles elaborated earlier (in section 3.3), and have appeared in, and much articulated by, disciplines such as psychology[8] and sociology.

Tyler (1990) introduces the terminology of 'instrumental perspective' and 'normative perspective' in distinguishing these two streams of arguments. Instrumental perspective is synonymous with the Becker's framework that assumes individuals as rational agents driven by self-interest and responding to payoffs and penalties. The key factors determining compliance are the severity and certainty of sanctions. The normative perspective, on the other hand, emphasizes that individuals are influenced by what is just, fair, appropriate and morally right. The arising consensus in the fisheries circle as well as elsewhere is that the normative perspective plays a crucial role in influencing compliance behaviour among fishers and therefore policy intervention should be shifted towards paying greater attention to this aspect.

3.5.2 Sources of (or factors affecting) compliance

Several versions of typology already exist drawing upon seminal works of Young (1979) and Tyler (1990), which identify moral dimension as one of the determinants of compliance (see Sutinen and Kuperan 1999; Hønneland 1999; Nielsen 2003). Depicted in Figure 3.5 is a simplified framework that outlines four different channels through which compliance with fisheries regulation can take shape. Also illustrated in Figure 3.5 is with which perspective, instrumental or normative, each of the four channels aligns. A review

[8] A large amount of literature exists. See Kohlberg (1969), Levine and Tapp (1977) for cognitive theory, and Akers (1985), Aronfreed (1968) for social learning theory

of fisheries compliance literature indicates that one's internal conviction driven by moral principle(s) is a legitimate source affecting fishers' compliance behaviour, and this finding corroborates with the assertions originating from the aforementioned discourses (section 3.3 and 3.4).

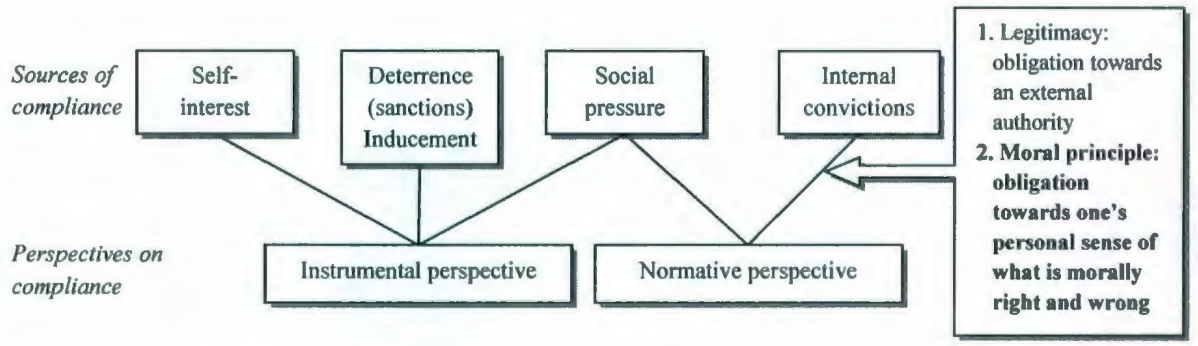


Figure 3.5 Simplified typology showing sources of compliance and perspectives guiding them

Self-interest as well as deterrence and inducement come from an economic approach elaborated in Becker (1968) viewing individuals as utility maximizing agents under the scarcity of resources. Individuals are likely to comply with the regulation if their self-interest happens to correspond with the aim of the regulation. In this case, obeying the regulation, in fact, furthers one's quest of maximizing personal gain. On the contrary, if one's self-interest is found inconsistent with the regulation, then deterrence through enforcement and threat of sanctions, and/or inducement using awards and incentives can be employed to channel the individual's utility-maximizing penchant into compliance. Next, social norm or pressure can both add to the instrumental and normative perspectives according to Tyler (1990). Social group's incentives and disincentives such as social approval or withdrawal of respect can function in the same manner as do public

inducement and sanctions representing the instrumental perspective, while group influence can be internalized in individuals' minds to produce an effect that is similar to voluntary compliance which is part of the normative perspective. Yet, in the disappearance of the group influence, it can be suspected that one may easily revert back to non-compliance.

The final component is voluntary or internalized obligation to comply. This normative source of compliance can be further drawn into two sub-components. One is the discussion of perceived legitimacy of the governing authority and appropriateness of the regulations, which translates into an individual's obligation towards an external authority (Jentoft 2000; Nielsen 2003). A question such as 'do you try to follow the regulations of federal fisheries authority even if you think that they are wrong?' is a relevant question in investigating the topic of legitimacy. The other is personal morality which is an internalized obligation to pursue one's personal sense of what is morally right or wrong. In this sense, voluntary compliance takes place despite inconvenience or lack of reward because one has internally converted constraints into preferences (Etzioni 1988).

While the current thinking is that more support and focus should be aimed at exploring the normative aspect as it has shown the potential to realize a high degree of compliance, both the instrumental and normative perspectives are seen needed to most effectively handle the issue of illegal fishing and non-compliance. Coercive enforcement, for example, is apt to deal with the chronic, flagrant violators, to whom moral obligation and social pressure have little effect on their behaviour. The presence of such a group of

fishers, if left unchallenged, is likely to be seen as unfairness and/or ineffectiveness in the compliance mechanism thereby undermining the normative basis of those who act according to their moral conviction and social norms (Kuperan and Sutinen 1998; Sutinen and Kuperan 1999). Therefore, notwithstanding the rising importance of boosting legitimacy and applying moral suasion, the instrumental perspective remains an essential feature in any compliance regime.

3.6 Conceptualization of conservation principle

Focusing on one specific source of fisheries compliance (i.e. moral principle), this step involves the development of a conceptual framework to enable an examination into the conservation principle of the stakeholders in the Southeast Arm. The conceptualization process can be viewed as a bridging element that connects between the theory and the methodology. Hence, it would provide a direction as to which methodology may be best suited to carry out the research.

How the conservation principle is being conceptualized in this study, in many ways, resembles how Schwartz has structured his model of moral decision-making (cf. Schwartz 1968a, 1968b, 1970). Coinciding with Schwartz, this study also proposes that two components are necessary in forming conservation principle in individuals – the adequate levels of conservation awareness/understanding and the inclination towards promoting conservation. The first component refers to an adequate level of awareness or understanding about conservation, as shown in Figure 3.6. The assumption is that the

internalization of the conservation principle can only take place if one has sufficient understanding of which activities promote conservation and which hinder it. Only after the fishers are aware of the potential consequences of various fishing activities, then they can internally determine whether a certain activity is the right thing to do or not. Without sufficient understanding, a fishing choice or behaviour would come about in a haphazard fashion driven by instincts or other innate motives, not as *a matter of principle*. This may explain why fisheries managers everywhere often strive to ensure that all stakeholders, especially fishers, achieve an adequate level of conservation knowledge through education and awareness raising. A relevant set of knowledge would include information on various fishing activities as well as on the aquatic ecosystem, but more importantly, the kind of impact those fishing activities can have on the ecosystem would be a crucial piece of knowledge that could enable attaining an overall understanding. From this conception, this study asks which fishing activities are judged to be more damaging to fisheries resources in the SEA in order to assess the awareness level of stakeholders in regard to fisheries conservation. This component bears great similarity to Schwartz's first attribute focusing on one's awareness of consequences, which his study statistically established the relationship that being aware of the consequences of one's action activates moral norms, thereby permitting them to influence action (Schwartz 1968a).

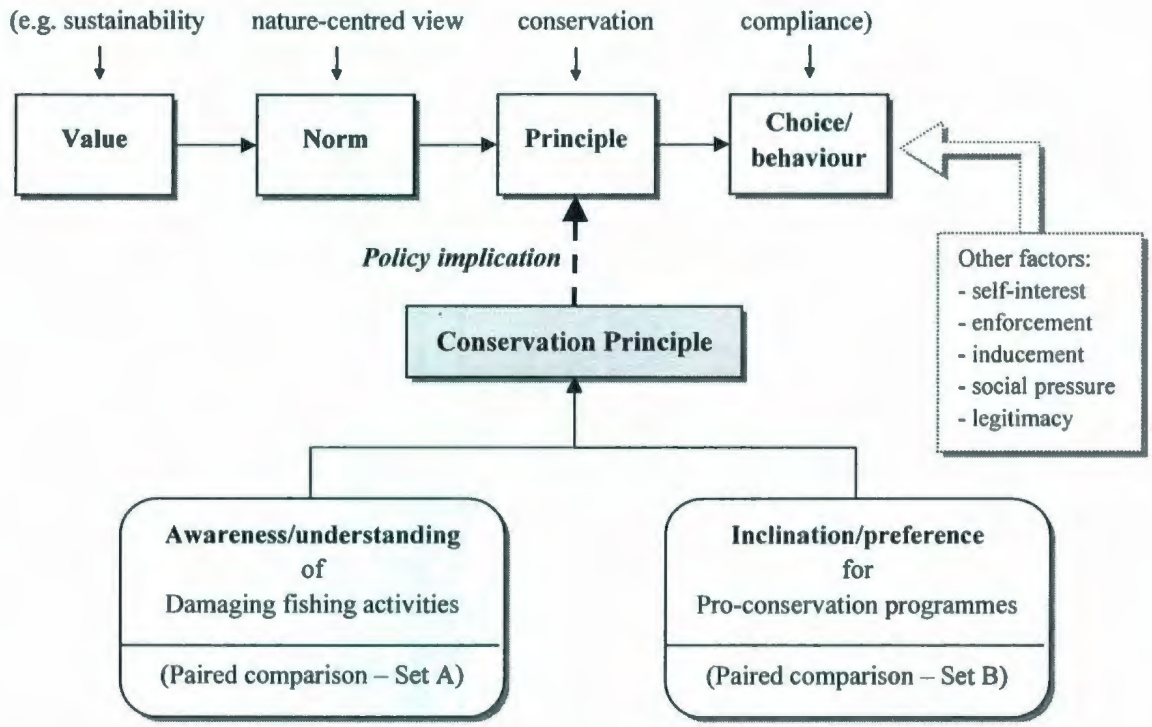


Figure 3.6 Conceptual diagram showing how the conservation principle is positioned in relation to theory and survey design. Theoretically, principle is straddled between value and choice/behaviour as an intermediate step. The operationalization of the concept occurs through two components that make up the conservation principle. Aside from principle, other factors also influence individual's choice and behaviour.

The second component is about the inclination towards fisheries conservation. Even if the stakeholders hold sufficient understanding on how to proceed with conservation, it is necessary to confirm that they do in fact value conservation. For example, if the industrial polluters are asked whether they understand the ecological consequences of discharging toxic effluents into a coastal system, many would perhaps say yes. Hence, it is generally not the lack of understanding about facts and knowledge but the lack of genuine inclination towards conservation that keeps the polluters from forming a strong

conservation principle. In this study, stakeholders' preferences towards conservation-oriented community programmes are assessed in order to find out how much importance they attach to conservation. This component is similar to the second attribute of Schwartz's model, ascription of responsibility, in the sense that both represent the next step in the internal processing of moral norms after one holds sufficient awareness of consequences of potential actions. However, the main difference lies in that 'ascription of responsibility' is already embodied in the meaning of conservation principle as was stipulated to signify 'responsibility to conserve' earlier in section 3.4 (also see Table 3.2). The conservation inclination is, therefore, about specifically how much individuals see this responsibility as something that is fulfilled out of anticipatory virtue, pride or personal satisfaction. In short, this study is under the proposition that when an individual acts *knowingly* and *willingly* despite inconveniences or the opportunities to do otherwise, an individual is said to be acting out of his/her principle. Hence, acting to protect fisheries ecosystem and resources knowingly and willingly to fulfill one's moral responsibility despite certain needs and inconveniences such as livelihood concerns or economic motives can be considered practising conservation as a matter of principle.

Detailed explanations of the design of the methods derived from this conceptual understanding are presented in Chapter 4. Chapter 5 describes and analyzes contextual information concerning fisheries conservation and illegal fishing in the SEA using the governability assessment matrix. In Chapter 6, the assessment results of the two components are viewed in relation to each other using a categorization scheme in order to obtain useful inferences about the conservation principle.

Plate 4.1 Capacity building session on post-harvest fish spoilage

Plate 4.2 Questionnaire survey being conducted with the help of a translator

This chapter begins by describing the general design of the mixed method data collection approach, focusing on the two levels of governability assessment. It then proceeds to explain the selection of the SEA as a case study location on the grounds of theoretical sampling. Next, the four methods used in this study are described one-by-one in subsequent sections. The details about how the questionnaire survey was designed and conducted are also presented.

4.1 Mixed method data collection

This research employed mixed data collection methods. It offers several advantages over the use of any single method. First, it affords opportunities to capitalize on the strengths of some methods to counterbalance the weaknesses of other methods. For example, 'combining survey methods with other less structured methods may lend the flexibility required to generate new insights into the people we study' (Axinn and Pearce 2006, p.13). Also, use of multiple methods can produce a more comprehensive empirical record about a topic than either quantitative or qualitative research alone and help reduce non-sampling error by providing redundant information from multiple sources (Creswell and Plano Clark 2007). More specific to this research, qualitative data was sought and analyzed in order to enrich and explain the quantitative results. Basic research design follows a process outlined in Figure 4.1. Also displayed is to which methods the two levels of governability assessments correspond. Four types of methods utilized in this study are review of secondary sources and archives, questionnaire survey, semi-structured/unstructured interviews and direct observation. As shown in Figure 4.1, results

from one method feed into the other, providing supplementary information and facilitating the interpretation of the findings. For instance, information gathered from informal interviews with key informants can help guide the formulation of contextually appropriate and sensitive survey questions. Similarly, the results of the damage schedule can suggest areas of focus for subsequent direct observation in order to fill in the knowledge gaps and aid the result interpretation process.

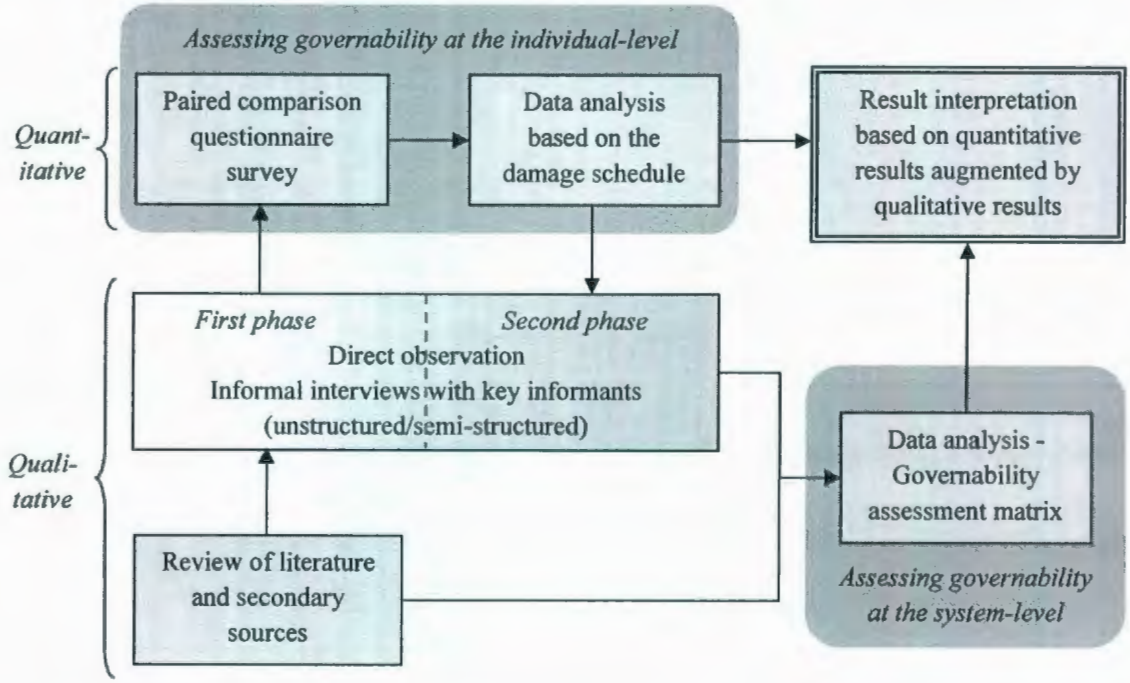


Figure 4.1 Research design used in this study involving mixed methods

4.2 Selection of case study

The selection of case study followed a theoretical sampling approach (also known as purposive sampling), which allows the researcher to choose a case because it illustrates

some feature or process in which he/she is interested in accordance with some theory the research subscribes to (Silverman 2005). Here, the assumption is that if a case is chosen in terms of what the theory stipulates, the case would be relevant to a wider population who shares the same theoretical base. The theoretical context for this study is the occurrence of illegal fishing amidst attempts to control it through enforcement and other measures.

Through contacts with the Sustainable Fisheries for Food Security (SFFS) project of the Marine Institute of Memorial University whose project scope involves working with the governmental bureau responsible for fisheries as well as two fishing communities in Malawi, the feasibility of choosing the Southeast Arm of Lake Malawi was raised. An extensive consultation with the two fisheries officers from the Department of Fisheries in Malawi, who were visiting the Marine Institute on a project mission in October 2007, revealed a complex picture of fisheries reality in the SEA. A co-management regime was tried with mixed success, illegal fishing is widespread, and the government possesses limited resources to effectively monitor and deter it. In addition, fishing villages are generally associated with poverty and low capacity to effectuate positive changes. Finally, alteration in catch composition and size coupled with a subsequent decline in catch value has had a compounding effect adding to the governance challenges in the region. Therefore, according to the criteria of theoretical sampling, the SEA of Lake Malawi provides an appropriate case study, the insights from which can likely be applicable to the wider universe. More specifically, assessing the governability of the SEA was anticipated to produce a fresh look at the governance situation by uncovering

governing needs and capacities in a systematic fashion, serving as a template for other future governability studies. For the second part of the thesis, frequently reported occurrence of illegal fishing amidst limited availability of enforcement resources sets the stage for the alternate exploration into the issue through the conservation principle. On the whole, the prevailing situation in the SEA is intriguing, and the tremendous support and encouragement of the project staff in both St. John's and Malawi made it feasible to conduct the study.

4.2.1 Study villages

Since 2005, the Sustainable Fisheries for Food Security (SFFS) project has been ongoing in this area with two beneficiary fishing villages, Kadango and Chapola, established as project sites as shown in Figure 2.1. The villages are located on the eastern side of the SEA and on the western side of Lake Malombe, respectively. The connection with the project provided a point of entry in terms of choosing a study village. After a consultation with the project coordinator, the local fisheries officials, and the review of preliminary information on the two villages, Kadango was chosen as the focal study site, and subsequently the SEA as the main water body for several reasons. First, fish stocks of Lake Malombe are in great decline while the fishing situation in the SEA is believed to be faring better (Weyl 2005). Subsequently, fishing activities are likely more active in Kadango in the SEA than Chapola in Lake Malombe. Njaya (2008) indeed notes that fishers and traders in the recent years have flocked to the eastern shore of the SEA since it is believed to yield better catches. Furthermore, the disparity in the liveliness of fishing activities was being reflected in the general socio-economic image of the two villages

through notable differences in areas like the tidiness in the children's clothing and cleanliness of the village streets, with Kadango appearing more orderly than Chapola (pers. comm. Moret). Based on these reasons, Kadango and the SEA were chosen as the main study area of the study.

It should be noted that while Kadango was the primary study site, Mpwepwe on the western side of the SEA was also selected as the secondary site, as it houses the Malawi College of Fisheries, a local partnering institution of the SFFS project. This facility is where I was based during the 4-month fieldwork period that span between April and July of 2008. Although Mpwepwe is not the centre of everyday fishing activity in the area[9], active fishing villages are nearby and easily reachable. Hence, those fishing villages on the western side of the SEA such as Kela, Mpemba, Maldeco and Namiasi were included as supplementary study sites in order to get a wider perspective on fisheries governance in the SEA.

4.3 Review of secondary sources and archives

Before and throughout fieldwork, I reviewed the available literature on Lake Malawi and especially on the Southeast Arm fishery. Lake Malawi is a relatively well-researched water body. Numerous studies have been conducted with a prevailing focus on natural

[9] For the most part, it is a village built around the college. Therefore, it is composed of campus buildings and housing for the lecturers and staff. It has a couple of beaches, however, as it sits by the shore. The beaches are used for sporadic fishing and landing activities as well as for other daily necessities such as washing and laundry.

science topics such as hydrology, limnology, fish biology and stock assessment. While there exists some amount of archival data that explores the social, economic, historical, cultural or institutional dimension of the area and the fishery, its availability and accessibility seems to be low. Hence, there has been a call for more emphasis on conducting and utilizing social science studies (Hara 2006). Aside from the published work such as book chapters and journal articles, grey literature and other hard-to-obtain materials such as government reports, proceedings of regional symposium, internal and contract reports were also consulted via contacts with the SFFS project team of Marine Institute in Canada and visits to the Department of Fisheries libraries in Malawi. The literature review included, in rough categorization:

- Limnology and hydrology (Crul 1997; Bootsma and Hecky 1993; Irvine and Waya 1999)
- Biology and stock assessment (Darwall and Allison 2002; Genner and Turner 2005; Lowe-McConnell 1993; Turner 1995; Turner *et al.* 1995; Banda *et al.* 1996; Weyl *et al.* 2005; Thompson *et al.* 1996; Kanyerere 2000; Phiri *et al.* 2001)
- Fisheries management (Jul-Larsen *et al.* 2003; Chisale 2006; Kasulo and Perrings 2006; FAO 2003; Ogutu-Ohwayo and Balirwa 2006; Lake Malawi Fisheries Management Symposium – Weyl and Weyl 2001; Chambo Restoration Strategic Plan – Banda *et al.* 2005b)
- Governance/institutional analysis (Hara 2001; Njaya 2007; Scholtz *et al.* 1998; GoM 2005)

- History of fisheries in and around the SEA (McCracken 1987; Chirwa 1996)
- Socio-economic analysis (Allison and Mvula 2002; Seeley and Allison 2005; GoM 2007; Munthali 1997)
- Government fisheries policy document (Annual frame survey – Banda *et al.* 2006; National – GoM 2001)

4.4 Governability assessment matrix (system-level)

As stipulated in the previous chapter, the governability concept was to be operationalized by applying the assessment framework to a case study. Governability assessment framework is regarded as a data analysis method that offers a systematic way to structure and analyze collected data. Its use serves two key purposes. First, it is used as a method to systematically describe the multi-faceted dimensions of the case study. Obtaining a comprehensive and systematic understanding of the natural, socio-economic and governing system, and the interactions and relationships among them, would help facilitate an effective investigation of the research in question. The framework could, thus, be a valuable way of capturing and making sense of the complexity embedded in the fisheries issues. Second, assessing governability is used as an analytical tool to reveal areas of bottlenecks in governance in terms of where the challenges might lie, where the governing limitations spring from and where governance capacity and potential could be found. The rest of this section illustrates what the framework entails and how it was carried out.

The governability assessment framework is a matrix for the evaluation of the three sub-systems – natural, socio-economic and governing system – based on sets of criteria (Table 4.1). The assessment of the natural and socio-economic systems reveals the needs and demands of what is being governed, while that of the governing system descriptively portrays the capacity held within the system. The governing interactions are the facilitating element between the two systems which works as a lubricant that ensures smooth functioning of governance mechanisms. If a governability assessment of a particular fishery indicates low governability, for instance, it may mean several things depending on the site-specific details revealed in the assessment. It may be that the management authority has low governing capacity to tackle the problems it must deal with. Alternately, the low governability may arise due to the highly complex and erratic nature of the ecosystem which cannot be easily controlled or predicted, or the prevailing dismal socio-economic condition of fishing communities that stalls much progress of the governing interventions. Likewise, low governability may stem from inadequate or little governing interactions that prevent governing capacity from properly engaging with the demands. In either case, the assessment result may point to suggestions in improving governance by adjusting or re-thinking various components such as governing goals and institutional framework.

Assessing governability involves asking specific questions to examine the particularities of the fisheries system under consideration. For example, an examination of inter-linkages between species, habitat and the system productivity forms a relevant inquiry which could reveal the complexity nested in the natural system. Here, a challenge is in

selecting what to examine in each cell because what we could consider as potentially relevant for governability is nearly limitless. Kooiman (2008) suggests that *interactions* should be the guiding focus of the inquiry. Asking specific questions in a systematic manner, by paying special attention to the intrinsic and constructed system properties and the interactions between them, is the beginning of the diagnosis of governing potentials and limitations. Having the information (answers to the questions) in the assessment matrix can be a useful step to document the information in a meaningful way, making it possible to trace and track governability. It is worth noting that governability is not a static quality, but rather it changes constantly subject to external as well as internal factors to a societal entity or system (Kooiman 2003). Likewise, governance capacity and needs assessed through this framework would also be subject to a perpetual change influenced by the governing interactions taking place in the overall system. For instance, governing capacities of a particular fisheries system assessed 10 years ago may differ from the current situation, and therefore may not be entirely relevant to the present-day governing deliberations. Alternatively, the framework can be applied to capture system features in two different time periods for a comparative analysis providing an opportunity to learn from past experiences. In dealing with this aspect, the framework relies on *dynamics*, one of the four system properties, to provide a platform for infusing trends and change drivers to the overall approach.

Table 4.1 Governability matrix of the Southeast Arm fisheries of Lake Malawi (*Source: adapted from Chuenpagdee and Jentoft 2009)*

System properties	System-to-be-governed		System properties	Governing system	Interactive attributes	Governing interactions
	Natural system	**Socio-economic system**				
Diversity	Types of habitat; level of biodiversity in fish species; cichlids	Different fishing sectors; fishing units and stakeholders; level of specialization in fishing villages	*Diversity*	Various formal and informal fisheries authorities; institutions; their roles and mandates	*Representation/ participation*	Extent of participation and representation, particularly by fishing villages
Complexity	Inter-linkages between species, habitats and the system productivity	Multiple livelihood strategies; subsistence agriculture; HIV/AIDS; kinship and community relationship; underlying principles and values	*Complexity*	Hierarchical structure; decentralization and devolution; relationship between BVC and other institutions; witchcraft	*Information/ Communication*	Means of communication; effectiveness of information flow
Dynamics	Physical and hydrological drivers such as seasonal winds; biological characteristics of cichlids; catch trends	Fluxes in fishing customs and activities; changes in the 'fish chain'; larger societal transformations	*Dynamics*	Changes in the governing institutions, initiatives and measures; past results; main drivers	*Learning/ adaptation*	Occurrence of learning and adaptation in SEA fisheries
Scale	Natural boundaries of the water body; well-bounded or open system in both spatial and temporal terms; spatial range of fish species in the SEA	Intra-, inter-community boundary; social and economic boundary; mobility of fishers; connection to regional events and globalization	*Scale*	Political and administrative boundaries; regional scale vs. finer scale in use; geographical scale of governing institutions	*Appreciation/ collaboration*	Level of collaboration; need for appreciation of diverse interests and underlying values

To further illustrate the system properties, diversity is about the heterogeneity of components and elements that constitute a system. Complexity is concerned with the relationship and interdependency between those components. Scale deals with the overlap and presence of multi-layered, interlinked boundaries. Scale matching within and across the natural, social and governing systems is believed to ease the governance process in that the magnitude of governing objectives and interventions are better fitted to the "true" features of the systems-to-be-governed. The governing interactions are assessed according to four pairs of interaction attributes. They are representation/participation, information/communication, learning/adaptation and appreciation/collaboration. Generally speaking, a high level of system properties present in the sub-systems (e.g. high diversity or high dynamics) would make the systems less governable, therefore giving rise to low governability. This is in recognition that the more diverse, complex, dynamic and complicated with scale issues they are, the more difficult it is to govern their functioning (Chuenpagdee and Jentoft 2009). However, governability is also affected by the level of governing interactions. Interactive governance theory argues that more spirited kind of governing interactions could raise governability by potentially navigating around these limitations. In other words, a system with high level system properties may still be governable if the level of interactions between the governing system and the system-to-be-governed is high and effective. Through this process, it is expected that the system can be made more governable.

4.5 Questionnaire survey (individual-level)

4.5.1 Measuring moral judgment

Although the moral dimension has been a much discussed topic from many disciplines, developing a valid and reliable measurement has been a challenging task. However, the field of cognitive psychology provides us with a major progress in quantitatively assessing an aspect of morality in individuals. Lawrence Kohlberg's Moral Judgment Interview method was the first breakthrough which relies on the presentation of moral dilemmas followed by open-ended, probing interviews to assess individual's cognitive stages of moral judgment (Kohlberg 1958; Colby and Kohlberg 1987). The Defining Issues Test by James Rest has originated from Kohlberg's model, but instead utilizes a written survey based on a Likert-scale rating and ranking of moral dilemmas to achieve a similar objective (Rest 1979). Although their work has seen a wide application to many fields of study, including a fisheries study which examined the moral development of Malaysian fishers as part of a bigger research focusing on the non-compliance fishing behaviour (Kuperan and Sutinen 1998), several limitations preclude the suitability of applying these methods to the current study.

First, both the Kohlberg's and Rest's method tests and measures the *degree* to which an individual is capable of applying moral principles to decision-making. In this scheme, one's higher moral judgment stage determined in the test implies higher developed capacity to engage in moral behaviour when faced with a moral dilemma (Lind 1989). To do so, their methods present multiple scenarios that describe different moral dilemmas. This is because the focus of their methods is an individual's composite cognitive capacity

in responding to various moral dilemmas. However, critics have raised the possibility that individuals react differently to different dilemmas depending on their familiarity and experience with a particular scenario (Elm and Weber 1994). In this study, a particular concern is the conservation principle in the context of illegal fishing. Hence, their methods may prove to be overly in-depth and detailed for the purpose of this study unless a significant methodological adaptation is made to isolate one principle. Furthermore, both Kohlberg and Rest qualify their concept of 'morality' as something that involves social interaction, and hence they exclude individual values that do not affect other people from the scope of their conceptualization. Rest (1979, p.20) admits that 'perhaps it would have been clearer if this research area had been labelled "fairness judgment" instead of "moral judgment"'. Elm and Weber (1994) explains that both their models heavily draw upon a concept of justice. On the other hand, the study contained in this thesis does not concern with the cognitive stages of moral judgment, nor one's reasoning about moral dilemmas. Instead, it is interested in revealing whether moral principle could be inferred from a choice situation, given specific contexts focused on the conservation principle. Also, it is mainly about individual environmental ethics, i.e. moral responsibility towards natural things, although it is believed that conservation has a far reaching consequence to the well-being of other human beings in the long run.

4.5.2 The damage schedule approach

The survey method used in this study draws upon the damage schedule approach (Chuenpagdee 1998; Chuenpagdee *et al.* 2001). A damage schedule is envisioned as a set of policy instruments similar to payments and sanctions that could be used to discourage

damaging activities and compensate for resource losses. It collects public judgments on the relative importance of resource losses or the relative harmfulness of certain activities causing the losses. The assessed preference or judgments is presented in the form of an interval ranking scale, which works as a non-monetary indicator of the severity of resource losses or the impacts of the damaging activities. The result can aid policy makers in developing appropriate policy strategies to prevent certain activities, create a compensation scheme for resource damage, and deter accidents such as oil spills and discharge pollution. Further, the developed damage schedule offers policy makers a platform to involve local communities in the management of resources and directly incorporate their inputs in policy design, since the schedules are based on the knowledge of resource users and on people's preferences and judgments about resources and their importance, as well as those of scientists and managers. Chuenpagdee *et al.* (2001, p.254) succinctly states that 'given the complex nature of coastal resources and the limitations of current monetary valuation methods, the use of a predetermined schedule of sanctions and incentives that reflect the community's sensitivity to the importance of different changes in resource conditions may offer a useful approach'.

The damage schedule approach has been applied to several fisheries and coastal related studies over the years. The original application was to examine coastal development issues surrounding shrimp farming and tourism in Southern Thailand (Chuenpagdee *et al.* 2001). Chuenpagdee *et al.* (2002) sought the opinions of community members in Mexico to reveal local judgments about the severity of damages to coastal habitats and the impact of activities that may cause the damages. A more elaborated set was developed to assess

the relative severity of collateral impacts of the fishing gears commonly used in the United States (Chuenpagdee *et al.* 2003). Environmental damages in the urban coastal setting of Singapore were the subject of the study by Quah *et al.* (2006), who then used the resulting scale to derive willingness-to-accept compensation amounts for relinquishing top environmental concerns. This quantitative valuation approach, developed to measure one's judgments and preferences on environmental damages and harmful activities, appears well-suited to the assessment of something as intangible as one's underlying moral principle, and therefore was chosen as the method of individual-level governability assessment.

4.5.3 Paired comparison

The damage schedule approach relies on the use of paired comparison survey, which is a simple method being frequently used to attain a ranking scale. Its basic unit is the comparison of two objects, *A* and *B*, and the comparison is presented to one or more judges. The term 'object' is used to cover what is being compared such as treatment or stimuli, while judges mean survey respondents (David 1988). This method has proven useful in situations where the objects to be compared can be judged only subjectively, such as in taste tasting, colour comparison, or personnel evaluation, particularly 'when it is impossible or impractical to make relevant measurements in order to decide which of the two objects is preferable' (David 1988, p.1). The method has been widely employed by psychometricians through studies like Thurstone (1927). In more recent time, fields of application have expanded to include acoustics, animal ecology, economics, epidemiology, food science, sports and others. Furthermore, its use in eliciting public

preferences and judgments in an environmental study setting has been justified by a number of studies which employed this method with a similar intention (Peterson and Brown 1998; Rutherford *et al.* 1998; Chuenpagdee *et al.* 2001; Rudd 2001; Wattage and Mardle 2005; Quah *et al.* 2006). The method begins with establishing a set of objects under the theme of a particular study, whether it is resource losses, damaging activities or community programmes. The objects are presented in pairs to each respondent who is asked to make a choice between them. This will continue one after the other until all possible pairs are exhausted. Standard notation denotes N as the total number of objects, while the total number of respondents are denoted as k. For each respondent, the total number of all possible pairs is $N(N\text{-}1)/2$. Under normal circumstances, each object has the same probability of being selected as all objects are paired an equal number of times.

There are at least three key advantages of using paired comparisons. A fine judgment can be better achieved in a binary setting especially when objects are deemed to have subtle differences. The usual difficulty that faces a simultaneous ordinal ranking of all N objects can be lessened, because there are only two objects in each choice pair, reducing the effect of confounding extraneous influences caused by the presence of other objects. Secondly, the paired comparison method produces an interval scale in which the numerical differences between the objects have an arithmetic meaning. It shows the spread of the objects in a scale, and is useful in explaining how much one object is more preferred than others in the numerical terms. The third advantage offered in the paired

comparison method is that it provides a way to check for intransitivity[10] in the respondent's choices by means of counting the number of circular triads (Dunn-Rankin 1983). A circular triad refers to an intransitive response where, in the paired comparison of three objects, x, y and z, x is preferred to y and y is preferred to z, but z is preferred to x. In this case, one circular triad (z being preferred to x) has occurred (David 1988). There are several causes of circular triads, one being systematic inconsistence, which can arise when respondents are faced with complex, multidimensional objects such that they focus on different dimensions for different pairs (Chuenpagdee *et al.* 2001). Other potential causes for intransitivity include indifference, guessing, incompetence or simple errors on the part of respondents. Beside the intransitivity, other issues need to be paid attention to in designing a paired comparison survey. If the differences between objects are not easily discernible or if N is too big, paired comparison can become very tiresome and prolonged leading to respondent exhaustion. Therefore, it is important to limit the number of questions in a survey (Rudd 2001).

4.5.4 Experimental design

In this study, two sets of paired comparisons were developed (Figure 3.6). One gauges the level of conservation awareness of respondents in relation to which fishing activities are more damaging to the fisheries resources in the SEA, while the second set assesses respondents' preferences towards conservation-oriented community fisheries programmes. There are seven objects included in each set, as listed in Table 4.2, giving

[10] Intransitivity refers to a relationship between three elements such that the relationship holds between the first and second elements and between the second and third elements, yet it fails to hold between the first and third elements.

the total number of 21 pairs for each set. They represent site-specific fishing activities and the community programmes that are relevant in the SEA. They were developed based on existing literature including the fisheries regulation, direct observations during field visits, informal interviews with key informants, and the results of several rounds of pre-tests. The lists were also verified with a group of fishery managers in the SEA to ensure that these activities and programmes indeed best reflect the concerns of the stakeholders in the region.

Table 4.2 Objects for each paired comparison set

Set A: Fishing activities
• Catching juvenile fish
• Fishing using mechanized gear
• Fishing using gears that disturb lake bottom
• Fishing in offshore deep water
• Fishing using non-selective gear
• Too many people fishing in one area
• Fishing in spawning area
Set B: Community programmes
• Protect fish habitat and fish species
• Promote scientific research on lake fisheries ecosystem
• Provide micro-credit loans to expand fishing-related work
• Help reduce fish spoilage during catching and processing
• Promote small-scale community fish cage culture
• Ensure fishing access for local fishers and communities
• Provide ownership of resources to local communities

Responses to the first set, Set A, produce a scale which identifies from the most damaging fishing activity to the least damaging one as respondents perceive it. It is an indication of their level of understanding about the fisheries and lake ecosystem, which may enable

voluntary engagement in conservation-oriented fishing practices. As shown in Table 4.2, the objects are void of any specific details. For example, there is no number indicating the degree of mechanization in 'fishing using mechanized gear', and any mention of a specific fishing gear is avoided. This was to minimize strategic voting of the respondents by basing the comparisons on the concept – or the *image* – of the fishing activities and not on the specifics that may conjure up certain attachment to their own fishing activities. One example of paired comparison used in the Set A is displayed in Figure 4.2(a).

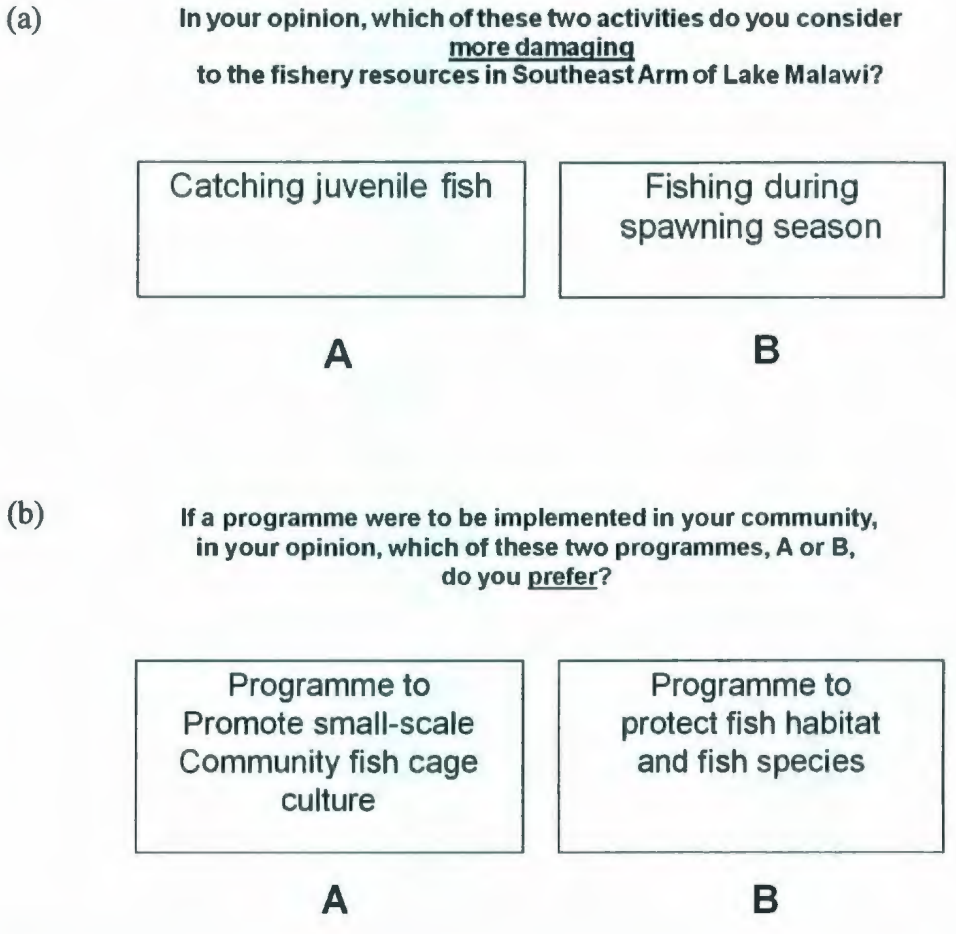


Figure 4.2 Sample paired comparison question drawn from (a) Set A and (b) Set B

The second set, Set B, results in a scale which reveals respondents' extent of inclination for fisheries conservation. The set was designed such that two community programmes that directly promote conservation, but at various levels, are included in the choice pairs. These programmes are presented to the respondents in a hypothetical sense as something that could be implemented but with no promise. This was to prevent immediate expectation from influencing their choices. An example of paired comparison used in the Set B is displayed in Figure 4.2(b).

4.5.5 Survey information

The survey was directed at seven groups of respondents involving multiple locations within the SEA. Active fishing villages on the eastern shore of the SEA (e.g. Kadango) were chosen to be the main location in surveying the *resource-dependent groups*, i.e. gear owners, crew members, fish processors/traders and community members. The villages on the eastern shore currently feature very lively fishing activities since it is generally believed that this side of the water body yields better catch than the depleted western shore (Njaya 2008). Also, with its relative remoteness, and the shortage of infrastructure and tourism development, fishing still remains a key activity that supports the livelihoods. To investigate any potential disparity that may arise from the east-west geographical distinction, gear owners and crew members found on the western shore were added to the survey. Thus, together with the managers/scientists group, seven respondent groups were formed. The villages visited, as shown in Figure 2.1, are Kadango, Ng'ombe 1, Ng'ombe 2, Namalaka and Mdoka (Machakwani beach) on the eastern side, and Kela, Mpemba and

Namiasi on the western shore. Upon entering each village, authorities of the village/area (e.g. village heads and/or BVC chairperson) were first visited to inform about the survey and seek their approval to carry out the research in their village. In all cases, they were supportive and gave their blessing.

The survey with the scientists/managers group also took place in various locations around and away from the lake. Site visits were conducted to solicit participation. Sites included lake-side locations such as Malawi College of Fisheries, Fisheries Research Unit in Monkey Bay and DoF Mangochi District Office as well as more distant locations like DoF Headquarter in Lilongwe and Worldfish Center in Zomba. Respondents in this group comprise various government officials such as planners, researchers, statisticians, enforcement officers, lecturers, and also scientists from several nongovernmental organizations working in the field of fisheries.

All 21 pairs from each set were included in the survey booklet making the total of 42 pairs. The sequential order of the pairs in the booklet and the left-right position of the two choices in each pair were both randomly generated to ensure the uniqueness of each booklet and therefore to avoid any possible bias relating to ordering. In addition, one-on-one survey setting was preferred, whenever possible, to minimize strategic bias that may arise out of social pressure or the fear of reprisal. Hence, most surveys were conducted in a quiet, sheltered environment in the absence of other community members. It was determined that random sampling using a defined list of respondents was not feasible due to concerns about the availability and reliability of a census database. Therefore, quota

sampling was employed to obtain the total number of 144 respondents with each group containing approximately 20 respondents. As per the process of quota sampling, each survey respondent was selected on the basis of convenience, accessibility and availability. An explanation about the survey was given to each potential respondent and consent to participate was solicited. Table 4.3 presents the demographic breakdown of the survey respondents. One may think that the small sample size of each group could reduce the reliability of the results of this study. However, as other studies of similar methodology and intent have shown (cf. Chuenpagdee *et al.* 2003; Quah *et al.* 2006; Bose and Crees-Morris 2009), the general guideline is to ask whether having additional respondents would contribute to adding new information to the study. If the answer is 'no', it can be argued that increasing the number of respondents would be of no pragmatic value from the criteria of both cost-effectiveness and time-efficiency (Bose and Crees-Morris 2009). As will be more thoroughly shown in Chapter 6, the result of this study also conformed to the tendency observed in the other studies that in-group consistency was quickly reached with the small number of respondents (cf. Table 6.1).

The survey was conducted during daytime at locations that are familiar and comfortable to the respondents, such as beaches, their houses and processing areas. The average time it took to complete each survey was approximately 20 minutes.

Table 4.3 Breakdown of the paired comparison survey respondents

	Gear owners (East)	Crew members (East)	Processors / Traders	Community members	Gear owners (West)	Crew members (West)	Managers/ Scientists	Total
Total number of respondents	**20**	**20**	**20**	**20**	**21**	**17**	**26**	**144**
Male	20	20	7	8	19	17	21	112
Female	0	0	13	12	2	0	5	32
Age*	38	30	37	34	38	34	40	
Years of fishery experience*	10	9	9	–	6	9	13	
Years in education*	1	5	6	3	3	3	13+	

* denotes average value
– not applicable

4.5.6 Additional questions in the survey

Aside from the two sets of paired comparison, 15 additional questions were included in the survey to gather information on mainly two fronts. First, basic personal, demographical information was acquired from each respondent. With the exception of respondent's name to retain the anonymity of the survey, facts regarding age, ethnic origin, formal education level, village of origin, the nature of fishing-related occupation, the type of fishing gear owned or operated, and years of experience in fishing-related occupation were collected. As specified earlier, all questions remained voluntary as respondents were free to opt out from any particular question if they wished to. The second theme of the supplementary questions involved a broad spectrum of fisheries governance, briefly delving into such aspects like resource status, means of communication, and participation in policy formulation. Notably, a question asked what the respondents perceived as the trend in the size of the fish population in the SEA

compared to a previous year. For those who thought that there were fewer fish, a further set of questions asked what were the causes of fewer amount of fish. The result of this question is presented and discussed in section 6.2.5. A governance-related question about the envisioned role of fishing community *vis-à-vis* the fisheries authority (i.e. government) in formulating fisheries regulation was posed, whose result is shown in the section 6.2.6. These supplementary questions were presented in various formats such as multiple choices, choose-all-that-apply, and naming a place or an organization. The complete copy of the questionnaire booklet is presented in Appendix B.

4.5.7 Translator and translation

The paired comparison surveys were intended to be a rigidly structured, self-administered questionnaire. However, given the reality of low literacy level, and especially little proficiency in English, among the community members, designing and conducting the survey relied on the assistance of translators. The initial design and the fine-tuning of the survey through rounds of pre-tests were aided by a senior lecturer at the Malawi College of Fisheries. He is of Yao origin, fluent in both Chiyao and Chichewa, two of the most widely spoken local languages, as well as English. English is one of the official languages in Malawi, and hence most official administrative and business proceedings are conducted in English. For the actual study in the villages, a native to Kadango with fluency in the local languages as well as being proficient in English assisted with the translation of the survey. This person has an extensive family kinship in the area with good language skills. He was also particularly well-versed in fishing matters as he had been a retired fisheries extension worker who held the position for over 15 years in

another part of Lake Malawi. The version of the paired comparison questionnaire used in the survey was written in both English and Chiyao, and the questions and the pairs were read out to each respondent by the translator. I travelled to all the survey locations (i.e. villages on the both sides of the water body) with the same translator who assisted in the enumeration of all questionnaires. This was to prevent any potential bias originating from using two different translators, and therefore to ensure an adequate level of consistency in the translation. With the managers and scientists, utilizing their high proficiency in English, surveys were self-administered without the help of a translator using the English version of the questionnaire.

4.6 Informal interviews with key informants

Informal interviews with key informants were carried out throughout the research period prior to as well as during the field visit. They were intended to provide qualitative, contextual information about the study area and the fisheries, aiding in the identification of key processes and issues, interpretation of data, and verification of survey results. Interviews were either unstructured or semi-structured done in an informal setting, thus allowing for greater flexibility and the breadth (Berg 2004). A total of eight individuals familiar with the SEA fishery and generally regarded to hold a high degree of expertise in a certain aspect pertaining to it were interviewed. Depending on the informants, different themes were focused on. Key informants and respective themes are listed in Table 4.4. All the interviews were conducted in English since their proficiency in the language was sufficiently high.

Table 4.4 Key informants for informal interviews; main theme(s) explored in each interview; and location held

Key informant	Theme	Interview location
Acting principal, Malawi College of Fisheries	General topics on fisheries	St. John's, Canada
Director, Department of Fisheries	General topics on fisheries	St. John's, Canada
Chief Planning Officer, Department of Fisheries	Participatory management; Mangochi fisheries by-law	Mangochi, Malawi
Acting head, Fisheries Research Unit	Fisheries research; stock assessment; fish biology and distribution	Monkey Bay, Malawi
Traditional Authority Chief	Changing role of traditional leaders in fisheries; hierarchical governance	Makanjira, Malawi
Former acting District Fisheries Officer (Mangochi district)	Mangochi fisheries by-law; governance structure; Beach Village Committee; local ownership of resources	Mangochi, Malawi
Outreach officer, Department of Fisheries	Micro-credit small loan programme available to members of fishing community	Mpwepwe, Malawi
Acting District Fisheries Officer (Mangochi district)	Large-scale fishing operation; fish cage culture; inland fish ponds	Mangochi, Malawi

4.7 Direct observation

The study relied partially on direct field observation to collect qualitative information necessary to complete the analysis and to fill in the information gaps left by the two main methods. Field observation (or participant observation) is an established research method where a researcher situates himself/herself in the local context and takes part in the daily activities to learn about socio-cultural processes, patterns, relationships among people, and the organization of institutions (DeWalt and DeWalt 2002; Jorgensen 1989). As part of this research, activities such as walking, participating in fishing activities, attending social events, interacting with village members, and simply 'hanging out' were the main

mediums enabling direct observation. Photographs were taken with full discretion cognizant of ethics involved in taking photographs of human subjects and potentially infringement of their dignity and privacy. Hence, taking photographs was withheld until the author felt that adequate rapport was established or explicit permission was granted by the human subject of the photograph.

By having myself (i.e. a foreign individual who is interested in collecting information) respectfully exposed to village members and fishers in the community, there is a greater chance that the familiarity and empathy towards me would grow. This was anticipated to help in soliciting interest during the questionnaire survey process. Staying at the village for weeks eating and moving about like villagers, in this case, had a positive effect on building trust and enhancing their acceptability of being part of the survey as respondents. Lastly, direct and participatory observation offers an added advantage of enhancing the quality of the interpretation of the survey data (DeWalt and DeWalt 2002). Therefore, it serves as both a data collection method and an analytical tool.

A total of three weeks was spent in Kadango and in the nearby villages completing the questionnaire survey and engaging in direct observation. In addition, several day trips were also made to a number of villages in the SEA including Kadango for the purpose of general scouting, pre-testing and communication of preliminary results. Much of the field visit in Malawi took place in Mpwepwe while designing survey instruments, transcribing field notes, preliminary result interpretation and conducting informal interviews with key

informants. The remainder of the time was spent at various locations in Malawi conducting site visits to carry out interviews, surveys and observation.

Plate 5.1 Crew members of a fishing unit

Plate 5.2 Crew members pulling in the net towards the shore

Chapter 5 presents the findings of the system-level governability assessment. Descriptively, it provides detailed information about the study site from wide-ranging angles that include the natural environment, socio-economic composition, governing structure and the relationship within and among these components. Diagnostically, the governability assessment offers a way to probe into the governance of fisheries in order to uncover the inherent and constructed limitations that exist in the system in terms of governing demands and capacity. It starts with a look into the natural, socio-economic and governing system in this sequence using the four system properties – diversity, complexity, dynamics and scale. This is followed by the examination of governing interactions according to the four interactive attributes. Next, a brief discussion that puts forward some practical suggestions is provided. Finally, the implications of the governability assessment results for the conservation principle are explored.

5.1 System-to-be-governed

5.1.1 Natural System

Diversity

Lake Malawi is part of the chain of the Great Rift Valley, making it deep and rocky in some parts and with little shoreline development. Limnological characteristics following this structure are that it is mostly oligotrophic, with a permanently stratified water layer and surface temperature of 23-25°C (Lowe-McConnell 1993). This condition generally limits the production of phytoplankton making it significantly less productive waters than

eutrophic lakes characterized by ample nutrient supply (FAO 1993). The southern end of the lake including the SEA, however, features an area with a comparatively shallow depth of less than 100 m and the presence of diatom ooze and muddy bottom to create a favourable condition for a productive tropical climate fishery (Crul 1997; Irvine and Waya 1999). In some pockets of the shoreline, reeds, macrophytes and other aquatic vegetation are present although a significant portion has been removed in recent decades for tourism infrastructure and development initiatives, affecting thus the survival of fry and juvenile fish (Bulirani 2005). In addition, an invasive aquatic weed, common water hyacinth (*Eichhornia crassipes*, Pontederiaceae) has been spreading to parts of the lake impeding boat navigation and depleting oxygen in the water column underneath (Phiri *et al.* 2001).

Lake Malawi contains fishes of eleven families, which include catfishes (Bagridae and Clariidae), minnows (Cyprinidae), elephant snout fish (Mormyridae), and eels (Anguillidae and Mastacembelidae). But by far the most dominating family is Cichlidae (Ngatunga 2001). About 450-700 species of cichlid fishes are estimated to be found in Lake Malawi, with a high concentration in and around the SEA (Konings 1990, Turner *et al.* 2001, Genner *et al.* 2004). A large portion of the cichlids are colourful, ornamental haplochromine species locally called *mbuna* (*Pseudotropheus* spp. and other genera, Cichlidae) which dominate the rocky shores. The number of species found in Lake Malawi is disproportionally high in relation to the surface area. For example, the North American Great Lakes have a vast surface area of 246,900 km^2 (or almost 10 times the size of Lake Malawi), yet contain only 173 fish species (Rohde 1998). Although Lake

Malawi boasts one of the highest species diversity among the freshwater ecosystems in the world, it still pales in comparison when put in the same rank with tropical coastal areas especially those containing coral reefs and seagrass patches. These latter ecosystems are said to contain, in global aggregate, at least 950,000 species (Reaka-Kudla 1997). On a whole the degree of diversity in the SEA is considered to be *medium*.

Complexity

The broad, shallow shelf of the SEA with its muddy bottom supports high demersal productivity much less common in other parts of the lake. In addition, the elongated shape of Lake Malawi that stretches north to south interacting with the seasonal southeast wind called *mwera* in the winter months (April to September) induces seasonal upwelling of nutrient-rich water to occur in the southern end, notably in the SEA. This effect causes mixing of nutrients and oxygen throughout the entire water column (Ngochera 2001; Crul 1997; McCracken 1987). Another hydrological factor affecting the productivity in the SEA is the annual variations of water level between the dry and the rainy season. A small volume of outflow through Upper Shire River results in a long flushing time equaling at 750 years (Bootsma and Hecky 1993). Coupled with its large surface area, Lake Malawi is hypersensitive to the precipitation-evaporation effect markedly raising the water level by about four feet following the rainy season (Crul 1997; McCracken 1987). Increased water levels generally result in enhanced inflows of nutrients, which normally act as a boost in the ecological productivity of the system. Such mechanism shows a marked effect in the shallow and small water body such as the SEA, and it can increase

productivity to a considerable degree and lead to booms in the fisheries of certain species (Jul-Larsen *et al.* 2003). Furthermore, differences in primary productivity of Lake Malawi under various hydrological and meteorological influences were extensively documented in Bootsma (1993). While there seems to be an adequate understanding of the limnological and hydrological factors influencing fisheries, there is currently a lack of sufficient biological and ecological knowledge with regard to the natural fluctuation of resource productivity, inter-species interactions, distribution and migration patterns and breeding habits of several key fish species. For example, despite being two of the primarily targeted species that help sustain the Lake Malawi fishery, the biology and lifecycle of a small pelagic cyprinid locally called *usipa (Engraulicypris sardella*, Cyprinidae), and *bombe* (*Bathyclarias* spp., Bagridae) are still poorly understood (Thompson *et al.* 1996).

According to Kooiman (2003), complexity does not simply mean that something is difficult to understand, or complicated to handle. Crucial concepts like interaction and interdependency amongst the parts and how the parts relate to the whole can be an important addition to the inquiry of complexity. Although many unknowns and uncertainties still exist in the SEA fishery, it is spared from possibly other sets of complexity-generating factors seen in fisheries systems elsewhere such as the occurrence of severe storms and damaging waves and the presence of large predatory species. Therefore, a *low-medium* level of complexity is suggested for the SEA natural system.

Dynamics

Propensity for a dynamic change in the natural system of the SEA seems to be high. Marked seasonal climatic variations in wind, temperature and precipitation set off a chain of environmental fluctuations which have a major impact on fisheries. Interacting with the climatic variations, seasonal upwelling and hypersensitive hydrologic budget are the two factors already discussed. Fish itself possesses several key characteristics that suggest a high potential for change. The most well-known evolutionary account of a dynamical change in Lake Malawi is the rapid speciation and adaptive radiation of *mbuna* (Turner *et al.* 2001; Genner and Turner 2005). It is estimated that the explosive speciation which resulted in over 200 *mbuna* species is a relatively recent development that has taken place in as recent as the last 300 years (Lowe-McConnell 1993). In terms of biological characteristics, Cichlidae, which is by far the most prevalent family in Lake Malawi, has low fecundity and is *K*-selected. This contributes to the low recovery rate in case of a stock collapse (Ngatunga 2001). Particularly among all the cichlids, the most prized fish of a tilapiine kind in Malawi, *chambo* (*Oreochromis* spp., Cichlidae) shows slow-maturing, mouth-brooding and habitat-dependent breeding traits (Banda *et al.* 2005a) which make it vulnerable to a stock collapse in case of over-exploitation. As shown in Figure 2.3, the catch data from 1976 to 2000 has shown that while the *chambo* fishery (tilapiines line) has, in fact, experienced a considerable decline in the SEA, catching of fast-growing and smaller haplochromine species and *usipa* has steadily grown to produce a stable level of total yield over the years (Turner 1995; Weyl 2005). The overall decline in the catches of larger fishes – tilapia, catfish and African carp (*Labeo mesops*,

Cyprinidae), combined with the increased yields of smaller species, suggest that catch trend is dynamic, not static, over a relatively short period of time. Similarly, the cases of subdued fishing pressure have also demonstrated the high propensity for change in stock size. For instance, low catches and illegal fishing practices triggered a one-year closed season for a pair-trawl fishery in 1992 in the area south of Boadzulu Island denominated as Area A. The closure of the fishery produced a marked impact on the stocks as, after the one-year ban, a rapid rebound in fish biomass was documented (Banda *et al.* 1996). On a separate occasion, the average fish sizes of certain cichlids locally called *mbaba* (*Lethrinops* spp., Cichlidae) increased dramatically shortly after a properly observed closed season (Hara *et al.* 2002).

Welcomme (2001) asserts that inland aquatic ecosystems are among the most vulnerable natural systems as the effects of all natural and anthropogenic activities are eventually collected and reflected in the quality of the water and what is contained within. The SEA is no exception to the pressure and stresses that include coastal erosion, removal of aquatic vegetation, disturbance of lake bottom and deforestation in the catchment area. Such anthropogenic interactions as well as the naturally-induced changes all add to the *high* dynamics of the natural system in SEA.

Scale

Functions and interactions associated with a natural system are rarely contained in a single, clearly demarcated scale. Misidentification of or failure to recognize the

appropriate scale could result in inappropriate governing actions which may amplify the severity of the problem that the natural system is under rather than resolving it as intended (Cumming *et al.* 2006). Delineating the boundaries of natural system is relatively straightforward for lakes because structural/physical and functional boundaries naturally tend to align with each other (Post *et al.* 2007). Similarly, where there is a strong association between resource flow, community membership and physical boundaries, it creates systems that are well-bounded. Thus, suitable scales for well-bounded systems are generally conceived with less difficulty. In contrast, open systems are exemplified by such water bodies with more amorphous boundaries in the likes of rivers and estuaries. In this case, scale matching is a more convoluted task.

Aside from having clear boundaries as being part of a lake, the steeply shelving rocky shores at the northern extreme end of the SEA, which is where it connects to the rest of the lake, may act as a barrier to the movements of all fish species, perhaps with the exception of those found in the extreme deep waters or in the pelagic zone (Turner *et al.* 1995). In terms of hydrology and nutrient-cycling, the SEA displays distinct characteristics from the rest of the lake as discussed earlier. Furthermore, distribution of some commercially important fish species exhibits a prevalence of localized stocks that are contained and appeared to be shifting within the SEA (Turner *et al.* 1995; Kanyerere 2000). Also, there is no conclusive evidence suggesting the existence of migration patterns of fish species through the Upper Shire River (FAO 1993).

Another dimension of scale that is of high importance to the issue of well-boundedness is temporal scale. At relatively long temporal scales, all ecosystems can be regarded as open systems as external inputs and outputs overshadow the internal mechanisms in the long run (Post *et al.* 2007). Lake ecosystems are considered well-bounded at temporal scales shorter than the residence time but open at temporal scales longer than the residence time. Residence time refers to an average time a substance resides within a system before draining out. Lake Malawi's residence time is estimated to be 140 years (Bootsma and Hecky 1993), which is a period of considerable length from a governance perspective. If one considers the temporal scale of typical human governing interventions where planning for one next generation is a near-absolute rarity, it appears safe to regard Lake Malawi as a well-bounded system according to this criterion.

The examination of scale indicates that the natural system of Lake Malawi, and of the SEA in particular, has relatively well-defined boundaries. Despite the SEA's physical and functional linkages to the rest of the lake, it is reasonable to set the natural scale of the SEA at the current physical delineation which traditionally and commonly denotes the SEA as a pseudo-isolated body of water. Therefore, the scale issue involved in the natural system appears to be *low*.

5.1.2 Socio-economic system

Diversity

The small-scale fishery in the SEA involves multi-gear and targets multi-species. It uses small vessels such as planked boats and dug-out canoes, while it can also be done without boat as in the case of beach seining. In the 2005 annual frame survey (Banda *et al.* 2006), 10 types of gear were recognized as widely used. However, each gear can be easily modified in its design, size and operation depending on the targeted species and weather conditions. Hence, an existence of a large variation of improvised fishing gear is reasonably suspected. A fishing unit is typically comprised of a gear owner and crewmembers hired to provide man-power in the actual fishing operation. The fishing units that dot the SEA waters may be residents of the surrounding area or they may come from other locations as part of the usual temporary migration pattern of 'following a good catch'. In either case, gear owners often do not engage in fishing operations. Rather, they oversee the landings, the sale of the catch and the distribution of cash income with crewmembers. They are essentially the 'boss' figure to the hired crewmembers and should be more accurately viewed as investors or managers, not fishers.

Two types of large-scale commercial fishing are observed in the SEA. The first involves individually owned and operated pair-trawls, whose numbers in operation range between 10 and 15 at any one time in recent years. The characteristics of this large-scale fishing unit are not unlike the small-scale counterparts except that the catch amount is bigger, investment at stake is higher, and that the 'investor-labourer' relationship is more pronounced. The second type is the large-scale industrial fishing by a company named Maldeco. It utilizes several stern trawlers to target multiple types of species available in the SEA and beyond, while the catch is mainly iced and transported to regional

distribution offices located in major town centres across the country in a centrally-coordinated fashion. With the exception of the industrial-level fishing, all fish processing and trading is a greatly dispersed individual activity with few centralized mechanisms of channeling and distributing fish (Seymour 2001; Allison *et al.* 2002).

A clear distinction between various fishing-related occupations is not easy to draw in the SEA. Fishers and villagers alike seem to display a low level of specialization which inhibits the creation of a more diverse socio-economic make-up in a fishing village. Jul-Larsen *et al.* (2003) explains that fishing is often a part-time endeavour, and also mobility within fisheries as well as in and out of the fishing sector seems to be rife and fluid. For example, any non-fishing community member can intermittently enter into fish trading by buying from fishers on the beach and selling them at another place. Likewise, a gear owner can go fishing himself or alternately become a temporary crewmember of another gear owner, thereby blurring the distinction between owners and crew. Post-harvest arrangements also show a low degree of diversity in which two forms constitute the main processing activities – sun-drying and smoking. The extent of distribution of the processed fish is nation-wide eventually reaching all corners of the country, while the sale of fresh fish is limited to more immediate areas by bicycle or bus and to major markets by a small number of faster vehicles. In terms of demographic traits, although there are an increasing number of people of various ethnic origins and religions in the SEA, the Yao ethnic group associated with Islam religion is the large majority inhabiting the area. Subsequently, their language Chiyao is still spoken widely among people. Reflecting on the low socio-economic diversity in fishing activities and customs, which include labour

relationship and post-harvest practices, as well as in major demographic characteristics, a *low to medium* level of socio-economic diversity seems appropriate.

Complexity

The socio-economic dimension of the fisheries system in the SEA is complicated with external factors such as poor living standards, the importance of subsistence agriculture, multiple livelihood strategies, gender disparity and the insidious effect of HIV/AIDS. Malawi is considered a developing nation by most conventional measures such as the Human Development Index[11] and the World Bank classification by income[12]. Set in a rural setting, fishing communities surrounding the SEA have long been deficient in proper education and health facilities, accessibility to safe drinking water, sound infrastructure, as well as in reliable and affordable energy sources. In a fishing village, although fishing is often a leading economic activity, it may not be the most crucial livelihood activity. Nearly every household grows maize or other staple crops in their plot of land for subsistence consumption throughout the year. Simply put, maize is the staple food that eradicates daily hunger while fish is a condiment, a source of animal protein. Therefore, in view of food security, the importance of staple food farming cannot be overlooked.

[11] The HDI for Malawi is 0.437, which gives the country a rank of 164th out of 177 countries with data (UNDP 2007).

[12] Malawi is classified as one of the 49 low-income economies (WorldBank 2009).

Income earned from fishing is often supplemented by other small-scale activities and trades carried out by family members including young children of age below 10 years. Remittances sent back from overseas employment in the region like South Africa also form a rather lucrative source of income for many villagers including fishers. In general, there is a high degree of interdependence among villagers as they rely on each other for a smooth socio-economic functioning through extensive kinship and community-oriented relationship as well as through activities like petty trades, informal loans between individuals and provision of moral support and social order.

At present, the socio-economic picture is further complicated by another harsh factor – the HIV/AIDS pandemic. Malawi's HIV prevalence rate among 15 to 49 year olds continued to hover around 14% in 2006. In many African countries, however, fishing communities experience the prevalence rate nearly 4 to 5 times higher than the general population putting them among the most vulnerable and the highest-risk group (Allison and Seeley 2004; GoM 2007). Factors such as geographic mobility and migration, availability of large sums of cash, a generally low level of education, coupled with the usually subordinate socio-economic status of women are all present in the SEA fisheries adding to the increasing vulnerability of fishing communities. It produces a detrimental effect on livelihoods at the household level as well as on the larger economy regionally and at the national scale. The combined loss of labour, income and productivity could easily lead to food insecurity and undermine household resilience. HIV/AIDS could also have a severe bearing on governance as it would reduce the capacity and the will of those who are affected in participating and committing in a long-term sustainable resource use

initiative (GoM 2007). Linked to HIV/AIDS, "fish-for-sex" transactions between female fish traders and male fishers arranged to secure a supply of fish for processing and sale in exchange of sex (Béné and Merten 2008) are a phenomenon that also exists in the SEA, further illuminating the complexity of the socio-economic relationships present in fishing communities.

The internal mechanisms that influence socio-economic circumstances also deserve consideration. Normative concerns such as one's values, norms, principles and interests affect their socio-economic choices as profoundly as the external drivers discussed above (Kooiman and Jentoft 2005; Etzioni 1988). Not only that both the internal and external drivers affect the socio-economic reality, they also affect one another. Therefore, making sense of the internal complexity that resides within individuals in a responsible manner would also form an important step towards understanding the governance picture. For example, the issue of illegal fishing, one of the major ecological and socio-economic concerns confounding the SEA fisheries, could benefit from a careful examination of fishers' values and moral principles regarding fisheries conservation, therefore providing alternate insights into this urgent governance challenge. Hara (2006, p. 429) argues that "in an area such as the Southeast Arm with multiple gear types, a variety of ethnic groups and different sectors, assumptions of shared norms and coincidence of interests need to be validated before any practical attempts to decentralize resource management".

In summary, the socio-economic system contains several sub-components that give rise to *high* complexity. It is not simply 'poverty' that is at the heart of it all (Béné and Friend

2009), but the interaction of the many underlying intricacies, which must be understood and dealt with in order to properly address the challenges faced in the socio-economic domain of SEA's fisheries system.

Dynamics

The pace of conventional *development* can perhaps be a crude starting point to gauge the degree of socio-economic dynamics. Generally, the 'progress' has been lagging. For instance, a large segment of the villages surrounding the shoreline of the SEA are not yet a beneficiary of the regular electricity supply. Rechargeable car-batteries, portable generators and solar cells are sources of electricity that only a small portion of households can afford. Along with the slow-coming of the electricity, other change-inducing drivers have also been rather sluggish to permeate into the area.

In the fishing sector, however, past evidence suggests that the fishing system holds relatively higher dynamic tendency. This can be seen from fishers' responses to the changes occurred in the volume and composition of their catch. The prevailing form of gear has gone through a drastic transformation in the 1990s responding to the declining *chambo* fishery and instead targeting more abundant smaller species. This resulted in a large increase in the construction of an open-water seine called *chilimira* at the expense of decommissioning beach seines that target either *chambo* or small haplochromine species called *kambuzi* (*haplochromis* spp., Cichlidae) (Ngochera 2001; Hara 2006). Figure 5.1 illustrates the shift in the number of the two gears, *chilimira* and chambo seine net, which

has taken place in the SEA. In addition, over the years, the number of fishers themselves has also fluctuated depending on the profitability of their catch or the availability of more favourable income prospects outside of the fishing sector (Jul-Larsen *et al.* 2003). A fluctuation in the number of gear owners in the SEA displayed in Figure 5.2 supports this view. Furthermore, another important dynamic factor is the widespread and near-unobstructed movement of fishers to other villages or parts of the lake (Allison *et al.* 2001). It is a common practice for fishers, fish processors and traders to move away from their original home for days, weeks or even months in order to make a better income from fishing work. These characteristics seem to indicate high potential for dynamic transformations within the fisheries sector.

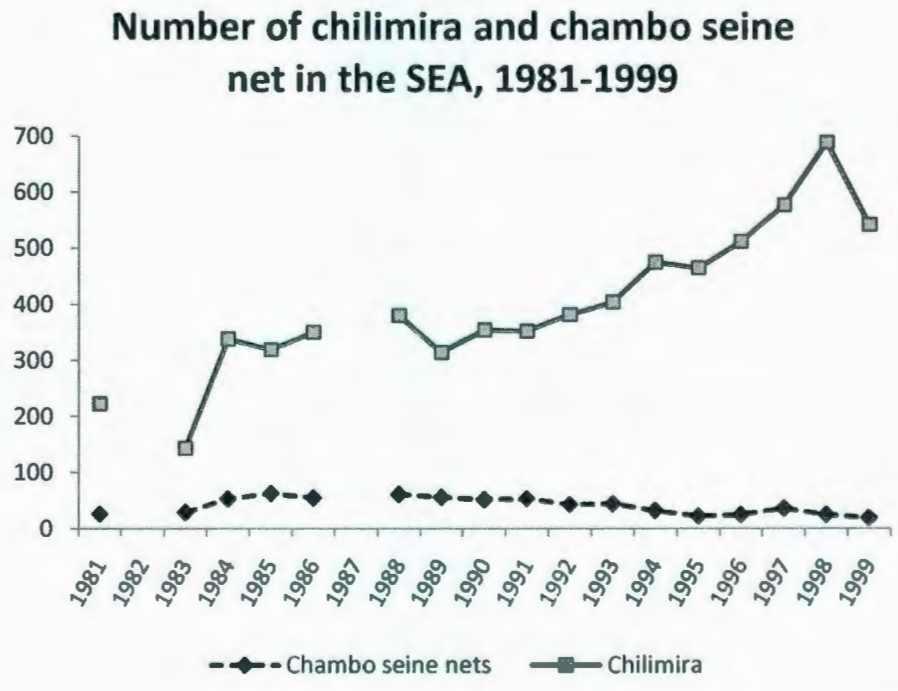


Figure 5.1 Number of chilimira and chambo seine net in the SEA from 1981 and 1999 (data for 1982 and 1987 are missing) *(Source: Weyl 2005)*

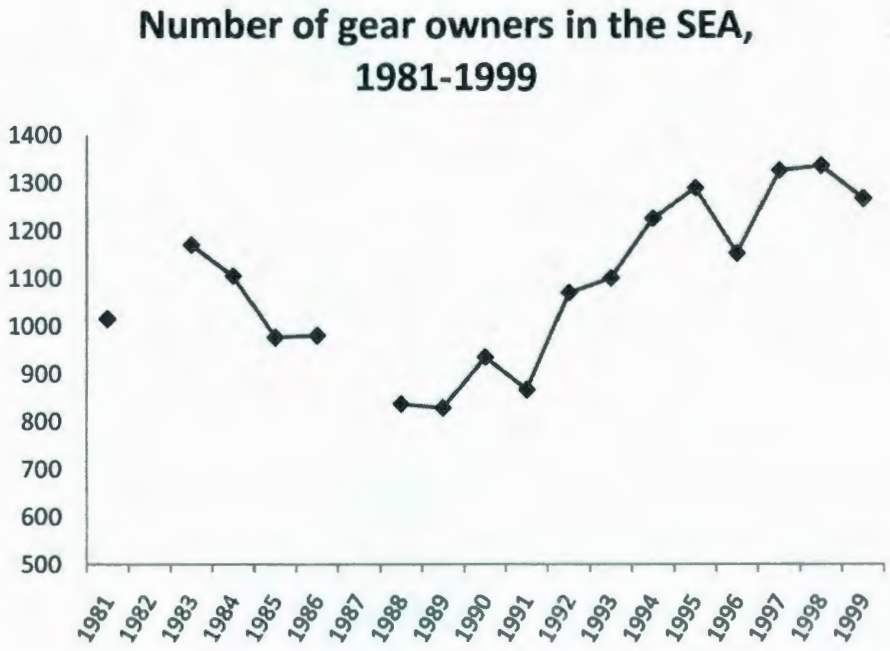


Figure 5.2 Number of gear owners in the SEA (data for 1982 and 1987 are missing) (*Source: Weyl 2005*)

Despite these dynamics, the nature and *modus operandi* of fishing are essentially the same as a century ago. Similar style of small-scale fishery still dominates with only a handful of technical innovations taking root over the decades (Allison *et al.* 2002). In addition, the socio-economic relationships and the level of organization among fishers, the model of fish processing and trading, and the pattern of labour migration to outside sectors are not entirely different from what would have been observed in the colonial period (McCracken 1987; Chirwa 1996). The anticipated arrival of the regular supply of electricity to the rest of the villages in the SEA through road-side cables in the future and the continuing migration of young men to overseas bringing remittances and noticeable household wealth are seen as two of the main short-term drivers that could shift the pace

of societal dynamics. A more long-term dynamics will depend upon the macroeconomic changes induced by the general level of development happening in the country. Overall, the dynamics of the socio-economic system of the SEA fisheries is at a *medium* level.

Scale

In the fishing villages surrounding the SEA, a long chain and extensive network of family kinship and community association are common. For instance, when there is a funeral in the village, as a gesture of respect, all business undertakings including shops and fishing activities are suspended following the decree of the village head. This kind of socio-economic relationship also traverses the village boundaries into the nearby villages through extensive kinship and social institutions like school and church. Hence, defining community and social boundary may be a tricky issue which requires a careful examination of social structure and relationship, as Agrawal and Gibson (1999) have elaborated.

The fishers in Lake Malawi move easily from one beach to another with little jurisdictional and social constraints. The flux of fishers and fish processors is most often driven by the economic opportunities within fishing, but it is also sometimes linked to, and even somewhat regulated by, the prosperity and downturn of external sectors taking place outside the social and geographical boundaries of the SEA as well as the environmental variations (McCracken 1987; Jul-Larsen *et al.* 2003). Historically, major events in other parts of the country, such as a boom in tea plantation in the Shire

Highlands and the rise of the First World War, have produced a significant demand for the production of fish and the growth of fish trading. Nowadays, as mentioned earlier, many young men migrate overseas and their remittances are channeled back to the SEA. This is another mechanism that has a broadening effect in the socio-economic scale, since the volatility of global market would also find its way to many households in the fishing villages through fluctuating remittances and return labour. That being said, the effect of globalization has not fully infiltrated into the SEA yet, particularly in many of the fishing villages. With the advent of more development activities and the growth of tourism in the area, it is anticipated that the socio-economic scale will likely expand.

Although most day-to-day social and economic activities of the actors take place in the vicinity of the lake, seen in a larger context it may be misleading to limit the socio-economic scale to the immediate boundary congruent to that of the natural system. Caution must be exercised in conceiving the socio-economic scale, incorporating, for example, external factors and developments in the greater region as well as intra-/inter-community relationship. Therefore, the scale issue in the socio-economic system of the SEA is considered to be *medium*.

5.2 Governing system

Diversity

The Department of Fisheries (DoF) was established in 1946 by the colonial government effectively shifting the mode of governing from the common property regime of the pre-colonial time into that of centralized and top-down (Kasulo and Perrings 2006). Since then, the control of the fisheries resources was widely assumed to be held by the government. However, severe limitations of the central-state management of fisheries have been observed, which include weak legitimacy towards regulations, costly implementation and subsequently widespread illegal fishing. Hence, rather than being regulated as was the intention, the fishery has approximated an open-access system with little control over who can fish when, what and where. Realizing the limits, the DoF attempted to include wider and more meaningful participation of user communities in the governing of lake resources, as the potential benefits of participatory- or co-management were being recognized in and outside of the country. Enabled by a series of donor support, Participatory Fisheries Management was initiated in the SEA of Lake Malawi in 1997 (Njaya 2008). From this, a formal institution, named Beach Village Committee (BVC), was created in each fishing village to fill the institutional void at the community level and facilitate the participation of resource users. The legally-mandated BVC's duties include management and monitoring of activities in the beach, prohibition of illegal gears, managing migrating fishers, and involvement in other pertinent local fishing issues (GoM 1997; GoM 2000). The executive members of the BVCs are elected by fishers and community members. They are normally influential or well-liked individuals in the village who may or may not have participated in fishing-related work in the past. While the names of the committee members are registered with the DoF, they receive little official governmental acknowledgement and support, and therefore essentially remain as

volunteers. Furthermore, relevant training opportunities are rare, and operating funds are virtually non-existent. Overall, there appears to be a general lack of aptitude and capacity to lead the BVCs, and inadequate incentives to fulfill their mandated duties.

The DoF established District Fisheries Offices in all districts with natural fish resources, including Mangochi district. Reporting to the District Fisheries Officer, fisheries extension workers perform extension and catch data recording services at the village level. Each of them normally oversees several villages and works with multiple BVCs in his/her assigned area.

Along with the devolution of authority envisioned in the establishment of BVCs, another governance reform has been underway which aims to decentralize the governing authority to districts through the creation of District Assemblies. Each District Assembly would consist of elected councilors from each ward and integrate various ministries and departmental agencies at the district level into one administrative unit (GoM 1998). Furthermore, Area Development Committees (ADCs) and Village Development Committees (VDCs) were to be set up to govern sub-district and village affairs under the leadership of the Traditional Authority leaders. However, since proposed in 1998, the recurring delays in the election of councilors have prevented the District Assemblies or the sub-district structures from being functional, with most of the governing authority still concentrated at the government ministries and departmental agencies (Hara 2008). Nevertheless, the Mangochi District has been preparing for its wider involvement in the fishery sector by drafting fisheries by-laws (GoM 2005). With the seating of councilors

and the approval of the by-laws in the future, the Mangochi District Assembly is expected to play a greater role in the SEA's fisheries governance.

Traditional governing institution in Malawi is denoted as the Traditional Authority (TA) administration. It is upheld by the three hierarchical levels of traditional leaders – village heads (-man or -woman), group village heads and chiefs. The land surrounding the SEA is split between five TA areas, named Mponda, Chowe, Nankumba, Namavi and Makanjira, each of which is governed by a hereditary chief. Aside from having an authoritative control over the village affairs such as land partitioning and settlement of civil cases, a village head also wields considerable power over fishing matters. Notably, granting permission to visiting fishers in exchange of a weekly tribute called *mawe*, and determining which fishing gears are allowed to operate from the village are two of the many relevant decisions rested on the village head. Village heads, along with all TA leaders, are viewed and approached with utmost respect. To say that 'a village head rules his/her village' is not entirely incorrect. This implies that aspirations of village heads, whatever it may be regarding the fisheries, is in many cases freely expressed and extended to the fisheries governance at the village level.

Other governing institutions include Members of Parliament representing the area at the national level, and the Commercial Fishermen's Association, which exists to represent the opinions of a handful of powerful, large-scale fishing owners and operators. There are also non-governmental organizations promoting causes such as HIV/AIDS prevention, micro-finance and civic education. However, their influence in the governing of fisheries

appears to be limited. In the governing system, a diverse set of governing institutions exists at varying levels whose positions and interests do not necessarily complement each other. As a result, *high* diversity characterizes the fisheries governing system of the SEA.

Complexity

With such a wide array of actors and institutions involved in the governing of fisheries, it is perhaps no surprise that the SEA's governing system displays a complex picture of governance structure. Fisheries governance in the SEA presents a unique form of a hierarchical system, which attempts to link the formal governing institutions with the traditional ones as shown in Figure 5.3. The proposed decentralization scheme would install the TA chiefs in the District Assembly as non-voting, ex-officio members. Also, the set up of the ADCs and VDCs would formally involve the village heads and group village heads in the governance process. Already, all three levels of the TA leaders are receiving monthly allowances from the central government for the positions they hold and the duties they must fulfill under the command of the Ministry of Local Government and Rural Development. As the uncertain nature of their current linkages to the formal institutional framework persists, the level of accountability in the hierarchy also remains in doubt. The TA leaders follow the hereditary pattern of succession where each leader is appointed by his/her clan members, rather than democratically elected by the villagers. Moreover, the leaders' clan and associated senior elders resembles something of a 'royal family' who may pose to be authoritarian by wielding their power and influence, therefore further raising the issue of accountability as a major concern.

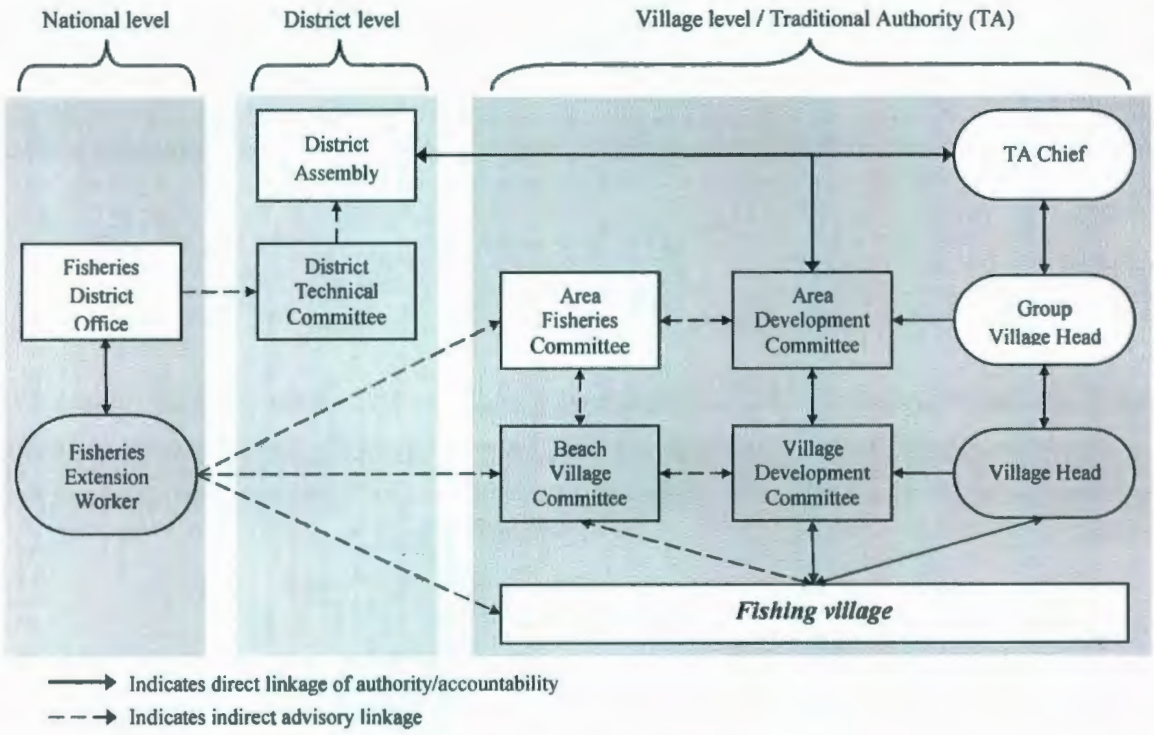


Figure 5.3 A possible institutional structure in the SEA with decentralization and devolution of authority. Shown are institutions (rectangle) and actors (rounded rectangle) as well as the nature of linkages. Currently, accountability linkages amongst traditional leaders as well as between them and the district- or national-level governing authority appear weak (*adapted from Hara 2008*)

Hara (2008) states that a high sense of ambiguity exists concerning how decentralization of political and administrative authority is to be proceeded vis-à-vis devolution of sectoral management responsibilities. For example, in terms of handling fisheries issues at the village level, it is unclear how the BVCs (a sectoral co-management institution) and VDCs (a decentralization institution) should be related to each other. Vague legal basis and lack of a shared vision for decentralization have opened the door for various speculations as to how to move forward, that is, either the BVCs are to be disbanded and absorbed into the VDCs to allow for a more integrated management approach, or the

BVCs can be nested within the decentralization structure to become an advisory sub-committee of the VDCs (Hara 2008).

A further set of complex governance challenges are observed in the BVC's relationship with other existing institutions. The BVC is a concept initiated by the DoF and international donors, not something that is locally brought up (Njaya 2002). Hence, it tends to align itself with the government's position through basing their actions on the fisheries regulations and utilizing assistance from fisheries extension workers. However, as they are not employed by the government, they are neither directly connected to nor entitled to receive a regular and tangible support from the DoF. At the same time, as villagers themselves, they must rely on the village head for support to be seen as legitimate and to produce any tangible result. Hence, the BVC's influence and effectiveness in the management and monitoring of beach/fishing activities can be greatly undermined by a failure to secure a true commitment of the village head. This is not the way the BVCs were envisioned to operate in the first place. They were designed to be situated in the middle ground balancing the powers of both the DoF and the village head while working to assist local fishers (Hara *et al.* 2002; Njaya 2007). The apparent disconnect from the DoF who propped up the BVCs in the beginning, has forced the BVCs in a position where their clout is weakened and their efficacy hangs on the cooperation of the village head. As a result, their independence and discretionary powers are diminished, and likely their legitimacy challenged by the fishers and the local community (Hara 2008).

Finally, witchcraft is an informal belief custom widely held by many Malawians including rural villagers, urban dwellers and even the highly educated and sophisticated social elites. This is likely another complexity-raising feature in the governing system, as it is believed to interact with the governance effort of the formal institutions as well as the TA administration. For example, many villagers believe that traditional leaders possess witchcraft, which could be used to inflict harm on ordinary villagers like themselves. Therefore, the mysterious aura of witchcraft power contributes to the upholding of the 'untouchable' status of traditional leaders. It is also noted that decision-making capacity of some formal government personnel and even some of the traditional leaders themselves can be compromised in fear of retribution and vengeance. Shadowy power of witchcraft appears to be rooted strongly in the minds of 'governors' and 'the-governed' alike, and it is sure to play a role in the governing of the village-level fisheries. This partial understanding gives us enough evidence to grasp the *high* complexity embedded in the SEA's fisheries governing system.

Dynamics

The BVCs were set up in the SEA as a vehicle for encouraging the participation of resource users and to distribute the responsibilities for managing and conserving the fisheries resources (Njaya 2008). Through such co-governing mechanisms, it intended to produce an added effect of curbing illegal fishing activities and raising the level of compliance among the fishers. The idealistic conceptual design of the BVCs and the legal mandate given to ensure that the BVCs work as designed, however, have not been able to

guarantee lasting success in the implementation of the BVC as a governing institution. As stated earlier, the village head's lack of support in the activities of the BVCs would deprive the political backing necessary to raise the legitimacy of their actions in the eyes of fishers. Also, the DoF is too far removed from the reaches of an individual BVC to offer tangible support due to the sporadic line of communication and limited availability of resources. Although the creation of the BVCs in the SEA was a welcome gesture that holds great potential in its intention, the actual efficacy to bring about the changes necessary to improve fisheries governance seems to be deficient.

One potential change that could reshape how fisheries are governed in the SEA is the implementation of the Mangochi District Fisheries By-laws. Through an iterative formulation process and an extended period of consultations with wide-ranging stakeholders including traditional leaders and fishers, the by-laws, at the time of writing, stand ready to be presented to the future-elected councilors for approval and implementation. This will provide a legal and operational basis for the Mangochi District Assembly to have a greater participation in the fisheries governance, and therefore offer an opportunity to cautiously experiment with a decentralized mode of governing in the SEA (GoM 2005; Njaya 2008).

There have been few major initiatives that attempted to institute changes to the fisheries decision-making and management process in the SEA. Even for those that have been promoted, the inertia of the system exists to impede much of the progress. Thus, a *low* dynamic characterizes the governing system. Although the predictability offered by the

low dynamics would make the governing system relatively more governable, attaining a certain level of dynamics may prove to be beneficial in bringing about the desired socio-political changes to the system. To do so, more spirited interactions in the governing process may be urgently needed to lift the current state away from the socio-economic and natural issues that confound the fisheries.

Scale

Two broad perspectives can be applied to aid the understanding of the governing scale. One involves the multi-layered institutional structure, while the other is spatial based on the physical/structural and biological characteristics of the water body. First, a complex picture of multi-layered scales of governing institutions is identified in the SEA fishery. The largest scale is the domain of the DoF at the national level whose mandate encompasses all fishing activities in all water bodies in the country including inland fish culture using dug-up ponds. Historically it is the most powerful player with the most resources available to them, and they have maintained the perception as the governing body that is ultimately responsible for the fate of fisheries resources. At the regional scale is the District Assembly, who has been without a meaningful role in fisheries governance despite having the entire length of the SEA under its jurisdiction. With the decentralization taking full effect and the implementation of the fisheries by-laws in the future, the involvement of the District Assembly in the governance of the SEA fisheries is expected to increase. Three levels of the Traditional Authority operate at the village-level

scale. They are officially recognized by the central government as the local-level governing bodies who work directly within the communities.

Alternately, governing scales can be explored through the lens of the physical and biological characteristics of the water body itself. Here, three levels of scale operating in the SEA are identified. The first governance viewpoint sees the SEA nested in the southern aquatic system (Figure 2.1), comprising Lake Malombe and Upper Shire River. Corresponding with the main *chambo* harvesting areas, this regional view has been solidified over the years as the scale of consideration for managing the *chambo* fishery (FAO 1993; Banda *et al.* 2005b). This larger scale may also prove to be particularly advantageous when the Mangochi District Assembly increases its role in exercising governing authority, because the SEA, Lake Malombe and Upper Shire River all fall under the complete jurisdiction of Mangochi district. In addition, the whole inclusion of the SEA in one single district avoids potential inter-jurisdictional pitfalls often experienced by a water body shared by or split between multiple political jurisdictions.

Secondly, the SEA itself is seen as one governing scale for the fisheries system, as the name itself already implies. It has an implicit connotation that the fishing activities taking place in this water body are aggregated and managed as a whole, and treated distinct from fishing matters of other parts of the lake. This level of scale has been applied in numerous occasions likely making it the most commonly used boundary. Lastly, a finer scale describing the SEA fisheries system has also been in use. Figure 5.4 shows the SEA divided into three sub-areas, Area A, B and C, as specified in the fisheries regulations of

2000 (GoM 2000). Area A is characterized with muddy/sandy lake bottom which slopes gently down to about 50 m near Boadzulu Island. Due to its high demersal productivity, this area has been intensely fished leading to the fully or over-exploited status (Weyl *et al.* 2005). Area B contains the water depth of less than 100 m in which offshore, deepwater species like *ndunduma (Diplotaxodon* spp., Cichlidae) begin to appear. Area C features deeper water depth that ranges over 100 m. In this deeper part of the water body, it is speculated that there is potential for sustaining high level of exploitation, or even expansion, by targeting pelagic and deep demersal fish stocks (Banda *et al.* 1996; Seymour 2001). This set of finer scales has been the spatial basis for various management purposes such as stock assessment, prohibition of fishing gears and zoning scheme for large-scale fishing operation.

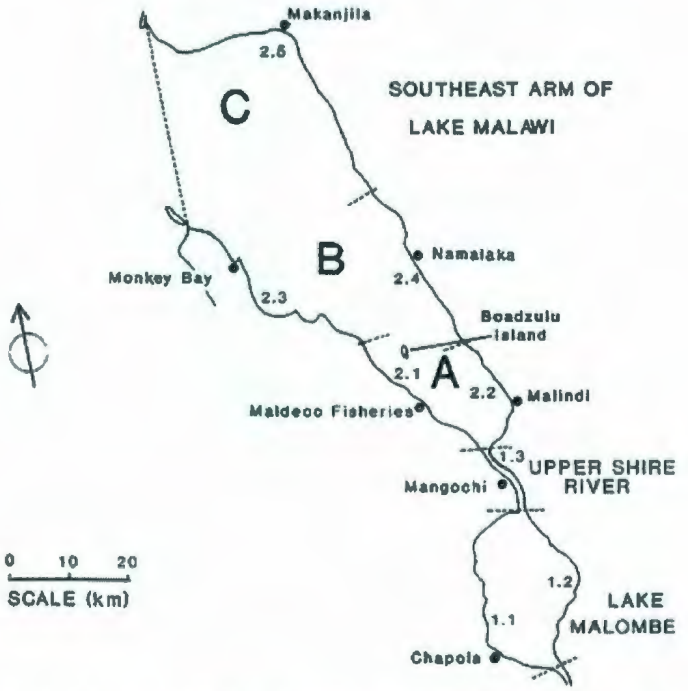


Figure 5.4 Area division in the Southeast Arm used for various fisheries management and research purposes *(Source: FAO 1993)*

These two broad categorizations of scale used in the governing system of the SEA are drawn up independently and used in disassociation with the other type of governing scale. The question is then whether there is a need to link these two scales together, either conceptually or in practice, such that governing scale issue is streamlined (Cumming *et al.* 2006) and therefore governability would be enhanced. If so, what would the end design look like and how should it be achieved? Does this necessarily imply that fishing areas are to be partitioned and matched with the jurisdiction of village-level governing institutions through the promotion of local ownership and limiting access, as done in other countries like the Philippines? Or a broader scale that takes a sweeping approach to management (e.g. coordinated from the district-level) would be a better fit? Quite likely, the design and implementation of an appropriate governing scale would be something of a thoughtful, lengthy experiment that requires a constant adjustment process. The scales of the natural and the socio-economic system will also need to be carefully consulted in formulating an appropriate governing scale. Overall, the scale issue involving the governing system appears to be *high*.

5.3 Governing Interactions

In the 1990s, Participatory Fisheries Management Program was aimed at bringing up the participation level of resource users in fishing communities by enabling the BVC (Njaya 2007, 2008). It was envisioned that through this process the needs and the demands of the system-to-be-governed can travel up and down the interaction chain in a more flowing fashion, raising the responsiveness of the system and having the views of the system-to-

be-governed more systematically and reliably represented. Such process of wider participation and greater collaboration would enhance the capacity to govern, since no single actor has the knowledge and resource capacity to tackle problems unilaterally (Kooiman 1993). After a decade-long implementation, however, active participation of resource users in the governance of SEA fisheries remains low, and consequently their concerns inconsistently represented. Instead, facing the frail status of BVCs, communication between resource users and the government seems to center around fisheries extension workers. The messages of the DoF are disseminated to resources users via fisheries meetings and other extension activities organized by them, and in return the opinions of the fishers are passed back up to the fisheries offices. Overall, the nature of the interactions in the SEA remains ad-hoc, haphazard and predominantly one-way from the governments directed towards fishing communities.

Learning and adaptation is another important governing interaction. When the governing system takes the lessons of previous letdowns and breakdowns seriously, governing capacity in satisfying the existing demands can be expected to increase. An ongoing example from the SEA (and the whole lake) is averting the introduction of non-native species, such as Lake Tanganyika sardine (*Limnothrissa miodon*, Clupeidae), to Lake Malawi by the Malawian Government, after observing severe ecological alterations in other neighbouring lakes such as Lake Victoria (Allison *et al.* 2002; Kaufman 1992; Ogutu-Ohwayo and Balirwa 2006). The recognition of the potential pitfall and adaptation of its governing accordingly has ensured that the high diversity of fish species in Lake Malawi is maintained to the benefit of the systems-to-be governed.

There are also times when governing interactions involve dealing with those needs and demands that cannot be easily reconciled or satisfied, such as livelihood concerns and value judgments. In such instances, sincere appreciation of each other's standpoints and interests that fosters collaboration and compromises can be seen as a kind of interaction that could ensure smooth functioning governance. As an example, governing instruments employed in the SEA fishery have had a strong 'technical' flavor whose basis lies in scientific studies. The prevailing measures, thus, include gear controls, licensing and closed areas among others. Although such technical instruments are usually seen to be compatible with the hierarchical governing structure present in the area, decades of widespread non-compliance of regulations by fishers (Bulirani 2005; Hara 2006) raise a concern as to whether they are indeed appropriate to meet the real demands of resource users. In this light, the enduring situation of non-compliance in the SEA can be seen to have resulted from the lack of meaningful collaboration between the socio-economic system-to-be-governed and the governing system. For both sub-systems to work together effectively in the governing of the fisheries, a genuine appreciation and understanding of the interests, motivations and values held by various stakeholders is deemed necessary to enable a true collaborative process that can reconcile the underlying differences.

So far globalization has shown limited reach in the fisheries system of the SEA. As a result, the lengthening of interaction chains and multiplication of interaction nodes often associated with the changes brought on by globalizing fisheries have largely been absent in the governing interactions in the SEA. The premise of governing interactions is that

governability can be compensated or made more difficult depending on the nature and details of the interactions (Chuenpagdee and Jentoft 2009). Examining the governing interactions happening for the SEA fisheries system gives an indication that their current set-up is not greatly conducive to aiding governance. In other words, they leave much to be desired in terms of facilitating effective and smooth-functioning governing. Hence, *low to medium* governing interactions are suggested.

5.4 Discussion

The summary of the assessment findings is presented in Table 5.1. Both the degree of system properties observed in each sub-system and the inferred level of governability are shown. For the systems-to-be-governed and the governing system, high system properties (e.g. high complexity) are generally considered to be linked to low governability, whereas low properties would indicate that a system is generally rather more governable. The relationship between the level of system properties and the level of governability is seen to be reversed in the case of the governing interactions, since high governing interactions would induce high governability in the system. It must be noted that the ratings given in the assessment represent a relative scale and therefore should not be taken in an absolute sense. For the systems-to-be-governed, complexity and dynamics are generally high, while diversity and scale issues display less demanding characteristics. Looking at each sub-system on its own, the socio-economic system exhibits high or medium level of system properties. The natural system appears to be a less demanding sub-system in terms of the inherently-held properties, thereby making it relatively more governable. Overall,

the high *dynamics* of the natural ecosystem and the high *complexity* embedded in the socio-economic actors deserve the most acute attention as they represent the most challenging aspect of governing the needs and demands present in the SEA fisheries system.

Table 5.1 Summary of the assessment findings (system properties are shown in parentheses)

System properties	**System-to-be-governed**		**Governing system**	**Governing interactions**
	Natural system	Socio-economic system		
Diversity	*(Medium)* Moderate governability	*(Low-Medium)* Moderate-High governability	*(High)* Low governability	*(Low-medium)* Low-Moderate governability
Complexity	*(Low-Medium)* Moderate-High governability	*(High)* Low governability	*(High)* Low governability	
Dynamics	*(High)* Low governability	*(Medium)* Moderate governability	*(Low)* High governability	
Scale	*(Low)* High governability	*(Medium)* Moderate governability	*(High)* Low governability	

Having assessed the system properties and identified the bottlenecks contained in each system-to-be-governed, governing goals can be carefully crafted to correspond with the realities of the particular fisheries. To do so, governor's action in dealing with those high difficulties and ultimately improving governability of the systems can be broadly classified into two main types. Governors can act consciously to reduce the difficulties associated with the system properties of a system-to-be-governed. While there are properties that cannot be readily altered by human governing actions such as the complexity of the natural system, for certain properties, like the scale of the socio-

economic system, for example, a governing intervention could be set in motion to reduce the scale mismatches that typically confound management efforts. Alternately, governors can recognize the low governability embedded in the systems-to-be-governed and work around them by setting realistic governing goals permitted by the inherent difficulties faced in the fisheries. For instance, a recommendation put forth by Jul-Larsen *et al.* (2003) to let the dynamic environmental variations of the lake be the guiding rules in regulating access to fishery instead of instituting a governance mechanism that officially abolishes the open-access fishery can be considered a latter type of governing action that fully respects the limits of the high dynamics in the natural system.

Socio-economic complexity is identified as another major demand of the system-to-be-governed in the SEA. Multiple drivers and factors are at play with potentially intricate relationships and interdependency behind them. Interactions with the natural system further complicate the socio-economic details, in the case of illegal fishing, for instance, as the resource-dependent communities strive to cope with their livelihood challenges. Overall, it results in the complicated socio-economic picture that is tricky to understand. To properly deal with the complex situation, a blanket approach that sees it as a straightforward 'poverty' issue or within the purely economic terms should be avoided. Instead, respecting the high degree of complexity through taking the demands seriously would be the first step in demystifying the complexity. To do that, governance arrangements will have to be better tuned to the various factors involved. In particular, a meaningful consideration of the internal mechanisms, such as underlying values and

principles of the fishing community members, which have been mostly neglected, could prove to be beneficial in lessening the difficulties posed in the socio-economic system.

Reviewing the assessment summary for the governing system (Table 5.1), generally low governability is observed with the exception of the dynamics aspect. This low governability associated with the governing system is a reflection of the low capacity on the part of the governing system, which, in a broader sense, includes the resource-dependent community as well as the various levels of government. Limited availability or scarcity of financial and human resources appear to be the main cause of the low capacity in general. In addition, prevailing socio-economic conditions that disfavour the fishing communities is another well-cited reason that hinders the build-up of governing capacity. Given this reality, governing goals and actions must better reflect the level of governability experienced in the system. For instance, an adoption of internationally-driven governance aspirations should be cautiously approached to avoid any overblown governing ambitions unsuitable and unrealistic for the SEA fisheries system. At the same time, it is crucial that international donors and funding partners be better aware of the limitations present in the system and play a more supportive role in the governance initiatives or reforms taking place in the SEA (cf. Bailey and Jentoft 1990). Such prescription would discourage the governors from making overpromises in the delivery of governing outcomes. Overall, an original and site-specific ingenuity that takes account of the governability of governing system should be widely encouraged.

One example of governing intervention aimed to improve governability of the governing system would involve strengthening accountability in the institutional structure (refer to Figure 5.2). In the hierarchical structure, the question of accountability comes into focus from two viewpoints – whether the existing governing mode can respond effectively to the governing challenges identified at the resource user level and be held accountable for the actions taken, and secondly, whether it bears accountability to the governing directives coming from the higher government level. Currently, neither of the two channels appears to be particularly effective in the SEA, as weak linkages are found in the governing structure chain. For example, village heads are sometimes regarded as ungovernable because they may not heed the opinions of the villagers, and at the same time harsh penalties for any malpractices are rarely imposed to village heads by the higher chain of command for various reasons that cite bribery, corruption, lack of financial and human resources, physical threat and witchcraft. Such situation appears to be common, bringing down the overall accountability in the governing system. Therefore, efforts to strengthen accountability by employing locally-feasible measures[13] could be one way of responding to the governing difficulty identified in the assessment. In the process, governing capacity is expected to rise, positively affecting the governability of the whole fisheries system as well.

[13] One example suggested was the strict adherence to the practice of note-taking at each official meeting at the village level, such as BVC or VDC meetings (pers. comm. Kachala). Once the practice becomes firmly established through legislations and appropriate incentives, the notes detailing the proceedings of each meeting would be kept for record for audit and other governing purposes. This process could prove to be beneficial in improving the accountability and transparency of the governing hierarchy in the SEA.

The low-to-moderate governability observed in the governing interactions is another important dimension of governance that must be carefully dealt with. Interactive governance theory posits that enhancing the quantity and quality of governing interactions could contribute to making the system more governable. Governing interactions could take various shapes, but in the SEA the issue of compliance and the communication/information flow emerge as two major factors that have a significant bearing on governability. As was said earlier, from the perspective of interactive governance, non-compliance and illegal fishing can be viewed as a manifestation of dissent or indifference on the part of the being-governed, or the lack of care on the part of the governing, resulting from inadequate governing interactions. When the regulations are well-received and commonly observed, a fisheries system is likely to be more governable. As inferred from this particular interaction, fisheries regulations themselves do not seem very governable in the SEA at the current time. Hence, divergent views and values concerning the regulations should be subject to a sincere forum of understanding, negotiation and compromises in order to bridge those differences and arrive at a more productive form of interaction that facilitates the overall governance process.

Perhaps more easily conceived as a kind of governing interactions is how the governing system and the system-to-be-governed interact through communication and information flow. A discussion earlier in section 5.3 briefly assessed how the interaction has veered off from utilizing the BVCs as was designed and instead it is happening in a more haphazard fashion via fisheries extension workers. In this case, the interaction is somewhat governable through the position of the extension worker, but whether it is

robust enough to overcome the low capacity faced in the fishing community and eventually allow more open and fair information exchange is something to be considered by governance actors. To bring up the level of governing interactions, the existing modes of communication will need to be strengthened. This may require a more active mobilization of the Community Outreach Unit, committed support towards fisheries extension workers, and a continuation of a fisheries radio broadcast called '*Usodzi-wa-lero*'. Other forms of meaningful communication opportunities and information exchange are to be promoted. In doing so, however, attention must be paid to the appropriately-judged governing capacity and the true needs of the system. This would ensure that communication and information flow genuinely engages the stakeholders' views and demands into the equation, and work as a facilitating element that enhances the quality of governing interactions.

5.5 System-level governability and conservation principle

For any governance measure being planned and implemented in the SEA fishery, inherent and constructed limitations affecting governability would need to be given due consideration. In this thesis, conservation measures are of particular concern. Recognizing that any specific issue is inherently linked to, and depends on, the system on which it is based, the governability of the SEA fishery assessed at the system-level also offers several implications to the issue of illegal fishing and conservation principle relevant in fishing communities. For example, the high complexity in the socio-economic relationship among the many involved actors can lead to condoning illegal fishing

activities rather than deterring it. Fishers and community members have multiple fisheries authorities with varying cultural and legal significance to negotiate when engaging in fishing practices. The village heads, BVCs, local fisheries extension officers and other government fisheries personnel can all be present in a fishing community with uncoordinated roles and vague responsibilities. The power dynamics and disagreement among the authorities could create confusion to fishers and may produce an environment where illegal fishing and disregard for conservation can be harboured and overlooked. Furthermore, the low governability stemming from the high dynamics in the natural system can render certain inflexible and stagnant conservation measures and regulations ineffective against deterring illegal fishing. For instance, high fish stock variability or unpredictable weather/climate conditions may be an important natural factor influencing fishers' circumstances for relinquishing their conservation principle. The generally low governability of the governing system in the SEA must also be duly acknowledged with regard to this issue. Resource-demanding, data-intensive and coercive measures would quickly have their limits in bringing up the conservation principle or minimizing illegal fishing. Similarly, overestimated enforcement capability and under-delivered enforcement action could engender poor conservation practices among resource-users. Also, the high complexity and ambiguity in the governance structure that exists in the system could create loopholes through which fishing takes place with no effective rules, whether formal or informal. Finally, the un-streamlined use of multiple institutional scales would confound the governors as much as the fishers.

Given this thinking on how the areas of low governability at the system-level would influence this particular issue of illegal fishing and conservation, the following chapter aims to investigate the issue from an empirical angle and actually find out to what extent the people in the communities hold regard for the conservation principle. The findings of this empirical analysis would complement the ongoing discussion of the governability of conservation measures in the SEA.

Plate 6.1 Villagers gathering around a fishing boat returning with catch

Plate 6.2 Smoked fish being sun-dried

Plate 6.3 Fresh catch being sun-dried on a rack

This chapter is firstly about answering research question 2 posed in section 1.4, which seeks to ascertain individual's normative principle's relevance in influencing actual fishing practice. It utilizes a questionnaire survey and the conservation principle category to assess the degree of conservation awareness and inclination among people, generate understanding about individual's conservation principle, and reveal a linkage between the conservation principle and the practice of illegal fishing. This chapter is also about assessing governability, albeit quantitatively this time, as opposed to the qualitative one conducted in the previous chapter. The damage schedule approach is a pragmatic methodological tool of choice for facilitating the study of the conservation principle and measuring the governability of conservation measures at the individual-level, that is, whether people agree with conservation from their internally-driven set of convictions.

6.1 Data analysis using nonparametric statistical tests

The paired comparison questionnaire survey result was analyzed using nonparametric statistical tests. Nonparametric tests were deemed suitable for two main reasons: data are inherently in ranks, and the tests allow the analysis of small sample sizes when the population distribution is not known (Siegel and Castellan 1988). The tests used here are Kendall T rank-order correlation coefficient, Kendall coefficient of agreement u and Kruskal-Wallis one-way analysis of variance by ranks. They are explained in fuller detail in the following sections.

6.1.1 Aggregate preference scores and rankings

The first step taken in analyzing the paired comparison data was to compute the individual preference scores for each object, i.e. the number of times a single respondent prefers one object over others in the choice pairs (Peterson and Brown 1998). In each set with N as the total number of objects, each object has a maximum individual score of N-1. Next, the individual preference scores were aggregated across all respondents in each of the seven groups. For simplicity, the aggregated preference scores were then normalized to a scale of 0 to 100 using a proportional procedure (Dunn-Rankin 1983). These scores are referred to as aggregated preference scores or scale values. A ranking was assigned to these values in order to test for an agreement between the respondent groups using Kendall rank-order correlation coefficient T (Siegel and Castellan 1988). Table 6.1 shows the normalized score values and the rankings for both the paired comparison sets, and Table 6.4 has the result of the Kendall T.

Table 6.1 Aggregated preference scores for (a) the damaging fishing activities and (b) preferred community programmes – all groups (rankings are shown in parentheses)

	Gear owners (East)	Crew members (East)	Processors/ Traders	Community members	Gear owners (West)	Crew members (West)	Managers/ Scientists
(a) Damaging fishing activities							
Fishing in spawning area	82 (1)	78 (1)	87 (1)	93 (1)	84 (1)	85 (1)	71 (1)
Fishing using gears that disturb lake bottom	68 (2)	76 (2)	72 (2)	70 (2)	50 (5)	55 (4)	62 (3)
Fishing using non-selective gear	55 (4)	65 (3)	64 (3)	66 (3)	65 (2)	72 (2)	68 (2)
Catching juvenile fish	58 (3)	58 (4)	63 (4)	57 (4)	58 (3)	57 (3)	60 (4)
Too many people fishing in one area	38 (6)	34 (5)	36 (5)	29 (5)	28 (6)	25 (6)	56 (5)
Fishing using mechanized gear	40 (5)	30 (6)	23 (6)	25 (6)	55 (4)	52 (5)	28 (6)
Fishing in offshore deep water	8 (7)	8 (7)	6 (7)	11 (7)	10 (7)	5 (7)	6 (7)
Number of respondents k	20	20	20	20	21	17	26
Kendall coefficient of agreement u	0.359	0.431	0.523	0.521	0.378	0.440	0.342
Chi-square[a]	164.2	192.8	229.8	228.8	179.7	168.8	200.6

[a]Significant agreement at $p < 0.001$.

	Gear owners (East)	Crew members (East)	Processors/ Traders	Community members	Gear owners (West)	Crew members (West)	Managers/ Scientists
(b) Preferred community programmes							
Provide micro-credit loans to expand fishing-related work	85 (1)	90 (1)	91 (1)	95 (1)	85 (1)	86 (1)	24 (6)
Protect fish habitat and fish species	68 (2)	62 (3)	69 (2)	63 (2)	71 (2)	62 (2)	72 (1)
Promote scientific research on lake fisheries ecosystem	50 (4)	68 (2)	64 (3)	51 (5)	54 (3)	56 (4)	54 (4)
Promote small-scale community fish cage culture	44 (5)	59 (4)	58 (4)	59 (3)	37 (6)	59 (3)	59 (3)
Provide ownership of resources to local communities	54 (3)	38 (5)	43 (5)	57 (4)	43 (5)	44 (5)	70 (2)
Ensure fishing access for local fishers and communities	40 (6)	25 (6)	18 (6)	22 (6)	45 (4)	41 (6)	22 (7)
Help reduce fish spoilage during catching and processing	8 (7)	8 (7)	6 (7)	3 (7)	14 (7)	2 (7)	50 (5)
Number of respondents k	20	20	20	20	21	17	26
Kendall coefficient of agreement u	0.370	0.469	0.551	0.567	0.314	0.394	0.224
Chi-square[a]	168.8	208.0	240.8	247.2	153	153.2	138.6

[a]Significant agreement at $p < 0.001$.

6.1.2 Kendall coefficient of agreement u

Kendall coefficient of agreement u measures the degree of similarity of rank ordering produced by k judges within a single respondent group. Unlike Kendall coefficient of concordance W, this test is suitable for ranking orderings specifically derived from paired comparison data (Siegel and Castellan 1988). Therefore, in this study, the level of agreement among individuals in a group was determined using the Kendall coefficient of agreement u, which is calculated using Eq. (6.1):

$$u = \frac{8(\sum a_{ij}^2 - k\sum a_{ij})}{k(k-1)N(N-1)} + 1 \tag{6.1}$$

where a_{ij} is the number of times that the object associated with column i is preferred to the object associated with row j, based on a sample preference matrix set up shown in Table 6.2. The computed value of u for each respondent group is listed in Table 6.1. It should be worth noting that the value of u is one when there is a complete agreement among the respondents in a group.

Table 6.2 Sample preference table set up to aid the calculation of coefficients of agreement u for 3 judges (*Source: Siegel and Castellan 1998, p.274)*

objects	a	b	c	d	e	f
a	–	2	2	2	2	2
b	1	–	1	1	1	0
c	1	2	–	1	2	1
d	1	2	2	–	1	1
e	1	2	1	2	–	1
f	1	3	2	2	2	–

Testing the significance of u, the test statistics below, Eq. (6.2), can be used, which is closely related to the chi-square goodness-of-fit test:

(6.2) $$X^2 = \frac{N(N-1)[1+u(k-1)]}{2}$$

The null hypothesis is that there is no agreement among respondents, while the alternative supposes that the level of agreement is greater than what would occur by chance or at random (Siegel and Castellan 1988). Using chi-square to test the null hypothesis, the observed chi-square values were greater than critical values at the 0.001 level for both damaging fishing activity and community programme scenarios (Table 6.1). Thus, rejecting the null hypothesis signified that there exists significant agreement among respondents in each group, and this justifies the number of respondents surveyed in each group.

6.1.3 Kendall T rank-order correlation coefficient

Kendall *T* rank-order correlation coefficient expresses the degree of association between two or more variables (i.e. respondent groups) measured in, or transformed to, ranks (Siegel and Castellan 1998). It is measured by Eq. (6.3):

(6.3) $$T = \frac{2S}{N(N-1)}$$

where *S* is denoted as the observed sum of the +1 scores and -1 scores for all pairs. How the +1 scores and -1 scores are computed is illustrated using the information in Table 6.3. First, the ranks of both judges are rearranged so that the ranks of judge X is displayed in natural order (i.e.1, 2,..., N). Focusing on the Judge Y's ranks, the first pair (c – a: 2 – 3) represents a 'natural' order, so +1 score is assigned. The next pair (c – b: 2 – 1), however, represents an 'unnatural' order hence garnering -1 score. In a similar manner, the final

pair (a – b: 3 – 1), also receives -1 score. The sum (S) of these scores is then -1, calculated as (+1) + (-1) + (-1). From using Eq. (6.3), Kendall T for this example is -0.333.

Table 6.3 A sample ranking information for the purpose of illustrating how Kendall T is calculated

Obtained ranking			
	a	*b*	*c*
Judge X	2	3	1
Judge Y	3	1	2
After rearranging the objects so that Judge X shows a 'natural' order			
	c	*a*	*b*
Judge X	1	2	3
Judge Y	2	3	1

Kendall T coefficient ranges from 1 meaning perfect agreement to -1 indicating perfect disagreement. As shown in Table 6.4, for damaging fishing activities, the Kendall T coefficients obtained between any two pairs of the seven respondent groups are close to the value of 1, indicating close-to-perfect correlation. The ranking of non-fishers (i.e. processors/traders and community members) significantly correlates to that of fishers (i.e. gear owners and crew members) at the 95% confidence level. In addition, what managers and scientists regard as damaging fishing activities significantly correlates with what the resource-dependent groups say as damaging activities. Therefore, the scale values of all groups were combined to form a single scale, as done in Table 6.5. With respect to fisheries-related community programmes, all resource-dependent groups show a similar-looking set of preference rankings (Table 6.1), which is also reflected in the significant levels of the correlation (Table 6.4). Therefore, the scale values were aggregated to create a single scale for all resource-dependent groups. On the other hand, the

managers/scientists group displays a divergent set of preferences echoed by the coefficients that show little correlation to the rankings of any of the six resource-dependent groups. Hence, we present the managers/scientists group separately in Table 6.5.

In testing the significance of Kendall T, the null hypothesis, H_0, is that there is no correlation between the respondent groups (i.e. an observed value of T has occurred at random). For a set of objects greater than 10 ($N > 10$), the sampling distribution of T may be approximated by the normal distribution. In this case, the normal approximation of the sampling distribution of T using Eq. (6.4) followed by consulting a table of normal distribution is deemed an appropriate way to test the hypothesis (Siegel and Castellan 1998). In this study, however, where $N = 7$, determining the significance of observed correlations between the ranks of the respondent groups involves looking up a special table provided in the books such as Siegel and Castellan (1998) and Kendall (1970). Instead, for convenience of analysis, a statistical software package called SPSS 16.0 was used to perform this test[14].

(6.4) $$z = \frac{3T\sqrt{N(N-1)}}{\sqrt{2(2N+5)}}$$

.

[14] A specific function used here is bivariate correlations using Kendall's tau-b coefficients with one-tailed test of significance

Table 6.4 Kendall *T* rank-order correlation coefficients

	Gear owners (East)	Crew members (East)	Processors/ Traders	Community members	Gear owners (West)	Crew members (West)	Managers/ Scientists
Damaging fishing activities							
Gear owners (East)	–						
Crew members (East)	0.810**	–					
Processor/ Traders (East)	0.810**	1.000**	–				
Community members (East)	0.810**	1.000**	1.000**	–			
Gear owners (West)	0.619*	0.619*	0.619*	0.619*	–		
Crew members (West)	0.714*	0.714*	0.714*	0.714*	0.905**	–	
Managers/ Scientists	0.714*	0.905**	0.905**	0.905**	0.714*	0.810**	–
Preferred community programmes							
Gear owners (East)	–						
Crew members (East)	0.714*	–					
Processor/ Traders (East)	0.810**	0.905**	–				
Community members (East)	0.810**	0.714*	0.810**	–			
Gear owners (West)	0.714*	0.619*	0.714*	0.524*	–		
Crew members (West)	0.714*	0.810**	0.905**	0.905**	0.619*	–	
Managers/ Scientists	0.333	0.048	0.143	0.333	0.048	0.238	–

**Denotes significant correlation at $p = 0.01$

* Denotes significant correlation at $p = 0.05$

Table 6.5 Combined aggregated preference scores for the damaging fishing activities and preferred community programmes based on significant correlations determined by Kendall T (rankings are shown in parentheses)

Set A: Damaging fishing activities	All respondents
Fishing in spawning area	82 (1)
Fishing using gears that disturb lake bottom	65 (2)
Fishing using non-selective gear	65 (2)
Catching juvenile fish	59 (4)
Too many people fishing in one area	36 (5)
Fishing using mechanized gear	36 (5)
Fishing in offshore deep water	8 (7)
Number of respondents	144

Set B: Preferred community programmes	Resource-dependent group	Manager/ Scientists
Provide micro-credit loans to expand fishing-related work	89 (1)	24 (6)
Protect fish habitat and fish species	66 (2)	72 (1)
Promote scientific research on lake fisheries ecosystem	57 (3)	54 (4)
Promote small-scale community fish cage culture	53 (4)	59 (3)
Provide ownership of resources to local communities	47 (5)	70 (2)
Ensure fishing access for local fishers and communities	32 (6)	22 (7)
Help reduce fish spoilage during catching and processing	7 (7)	50 (5)
Number of respondents	118	26

6.1.4 Circular triads

With seven objects used in each paired comparison set ($N = 7$), a maximum of 14 circular triads is possible in an individual's response (see David 1988). To check for the inconsistency of answers given by each respondent, the number of circular triads was calculated according to Eq. (6.5), which is:

(6.5) $$c = \frac{N}{24}(N^2 - 1) - \frac{1}{2}T$$

where $T = \sum(a_i - \bar{a})^2$, $\bar{a} = \frac{1}{2}(N-1)$ and a_i refers to individual preference score.

As shown in Table 6.6, a majority (52%) of the respondents produced either zero or only one circular triad in their choices for damaging fishing activities, while 50% did so in selecting preferred community programmes. A quick comparison with the results obtained in another study[15] of similar methodological nature, Chuenpagdee *et al.* (2001), suggests that this study has achieved an adequate percentage of respondents who produced either zero or only one circular triad. This is one indication of reasonable consistency in the result. More specifically, the responses of the managers/scientists, fish processor/traders and community members were noticeably more consistent. On the other hand, fisher groups consisting of gear owners and crewmembers displayed lower consistency reflected by a slightly larger number of observed circular triads. This difference could be due to the fact that the survey and the paired comparison objects are mainly about fishing activities and programmes which are most directly related to the fishers' livelihoods. Fishers presumably have more stakes in the matters presented in the survey, and it is possible that they perceived the choices to be more difficult.

[15] Chuenpagdee *et al.* (2001) also conducted two sets of paired comparison in which 31% and 43% of the respondents had either zero or one circular triad in their responses.

Table 6.6 Percentage of respondents who had zero or one circular triad in their answers (out of 14 possible maximum circular triads)

	Damaging fishing activities	Preferred community programmes
All respondents combined	52	50
Gear owners (east)	25	50
Crew members (east)	45	45
Processors/traders	70	65
Community members	70	55
Gear owners (west)	33	43
Crew members (west)	35	41
Managers/scientists	77	50

Another test for checking intransitivity in the responses involved removing those responses that have a high degree of intransitivity from the sample and then comparing the resulting ranking to the original one obtained from having all responses in the sample. To do so, the responses of those individuals who produced 5 to 14 circular triads in their choices were excluded, which means the responses now contain only 0 to 4 circular triads. The comparison for each set is displayed in Table 6.7 and Table 6.8. Both the preference scores and the rankings for damaging fishing activities and for preferred community programmes largely remain unchanged with only minor variations. Overall, it was deemed that the level of inconsistency caused by adding the highly intransitive responses into the sample is not enough to markedly alter the scale values and the rankings. Therefore, all respondents were included in the analysis despite the occurrence of circular triads.

Table 6.7 Comparison of preference scores and rankings for the damaging fishing activities after removing highly intransitive responses (rankings are shown in parentheses)

Damaging fishing activities	All respondents	
	Adding all intransitive responses	Excluding responses with 5- 14 circular triads
Fishing in spawning area	82 (1)	84 (1)
Fishing using gears that disturb lake bottom	65 (2)	65 (3)
Fishing using non-selective gear	65 (2)	66 (2)
Catching juvenile fish	59 (4)	60 (4)
Too many people fishing in one area	36 (5)	37 (5)
Fishing using mechanized gear	36 (5)	33 (6)
Fishing in offshore deep water	8 (7)	5 (7)
Number of respondents	144	122

Table 6.8 Comparison of preference scores and rankings for the preferred community programmes after removing highly intransitive responses (rankings are shown in parentheses)

Preferred community programmes	Resource-dependent group		Manager/ Scientists	
	Adding all intransitive responses	Excluding responses with 5- 14 circular triads	Adding all intransitive responses	Excluding responses with 5- 14 circular triads
Provide micro-credit loans to expand fishing-related work	89 (1)	91 (1)	24 (6)	20 (7)
Protect fish habitat and fish species	66 (2)	67 (2)	72 (1)	72 (1)
Promote scientific research on lake fisheries ecosystem	57 (3)	58 (3)	54 (4)	56 (4)
Promote small-scale community fish cage culture	53 (4)	53 (4)	59 (3)	59 (3)
Provide ownership of resources to local communities	47 (5)	46 (5)	70 (2)	72 (1)
Ensure fishing access for local fishers and communities	32 (6)	30 (6)	22 (7)	22 (6)
Help reduce fish spoilage during catching and processing	7 (7)	5 (7)	50 (5)	50 (5)
Number of respondents	118	102	26	24

6.1.5 Kruskal-Wallis one-way analysis of variance by ranks

The Kruskal-Wallis one-way analysis of variance by ranks is a useful test for deciding whether l independent samples represent different populations (Siegel and Castellan 1988). In this study, it was used to determine whether the respondent groups agree or differ with respect to the objects included in the two paired comparison sets. Since the degree of difference among the groups can be tested with respect to only one object at a time, 14 independent Kruskal-Wallis tests were performed. The computation of the test first involves arranging the preference scores in a matrix which has l columns representing groups, and the preference scores of the respondents belonging in each group forming rows underneath. Next, all the scores belonging to all respondent groups were ranked in a single series with the smallest score given rank 1 and the largest score given rank m, where m is the total number of scores from all l groups. With the rankings assigned, the sum (R_j) and the average ($\bar{R}_j$) of the ranks for j^{th} column are calculated. Finally, KW is calculated using Eq. (6.6), which is:

$$KW = \left[\frac{12}{m(m+1)}\sum_{j=1}^{l} n_j \bar{R}_j^2\right] - 3(N+1) \tag{6.6}$$

where n_j is the number of cases in the j^{th} sample. Testing of KW values can be performed using the chi-square test. Siegel and Castellan (1998) states that when the number of groups (l) is greater than 3 and the number of observations (j) in each group exceeds 5, the sampling distribution of KW is well-approximated by the χ^2 distribution with $df = l - 1$. The obtained KW values and the test of significance are listed in Table 6.9.

Table 6.9 Kruskal-Wallis test result and significant difference

Set A: Damaging fishing activities	*KW*
Fishing in spawning area	17.679*
Fishing using gears that disturb lake bottom	20.145*
Fishing using non-selective gear	8.867
Catching juvenile fish	1.511
Too many people fishing in one area	27.767*
Fishing using mechanized gear	34.824*
Fishing in offshore deep water	8.219
Set B: Preferred community programmes	
Provide micro-credit loans to expand fishing-related work	65.501*
Protect fish habitat and fish species	8.318
Promote scientific research on lake fisheries ecosystem	9.976
Promote small-scale community fish cage culture	16.246*
Provide ownership of resources to local communities	28.912*
Ensure fishing access for local fishers and communities	25.262*
Help reduce fish spoilage during catching and processing	71.051*

* denotes significant difference among the groups at $p < 0.05$ with chi-square value of 12.59

For Set A, the groups do not differ with respect to three fishing activities – fishing using non-selective gear, catching juvenile fish, and fishing in offshore deep water, while they significantly differ with respect to the other four fishing activities. For Set B, only two programmes have resulted in strong agreement among all the groups – programme to protect fish habitat and fish species and programme to promote scientific research on lake fisheries ecosystem, while according to the other five, the groups differ significantly. The result shows that although the comparison of relative rankings of the groups produced widespread correlation (see Table 6.4), when each object is compared individually and independently of others, the groups tend to differ in a greater degree. The notable findings

from this test will be discussed in the following sections in connection with the results of other tests.

6.2 Result interpretation

6.2.1 Damaging fishing activities

According to all respondent groups, fishing in spawning area was identified to be the most damaging practice with the scale value of 82 out of 100 (Table 6.5). This was followed by fishing using gears that disturb the lake bottom and using non-selective gear, which shared the identical scale value of 65. Catching juvenile fish was rated the next most damaging activity at 59. As for the comparably less damaging activities, too many fishers in one area was tied with fishing using mechanized gear at 36. With the scale value of 8, fishing in offshore deep water was judged to be by far the least damaging form of fishing activity.

Understanding the ecological impact of pertinent fishing activities forms an essential part of realizing fisheries conservation. Here, not only is the result agreed by all surveyed groups in the SEA fishery, it is also consistent with the widely-held knowledge about fishing gears and their impacts in other fisheries worldwide. For instance, utmost attention on fishing in spawning area observed in the SEA corresponds with the high emphasis put on the role of marine reserves in enhancing spawning stocks and protecting juvenile production (Murawski *et al.* 2000; Manríquez and Castilla 2001). Also, relatively severe damage from disturbing the lake bottom perceived by the respondents in the SEA

is also a contentious issue globally with special regard given to bottom-trawling (Watling and Norse 1998; Chuenpagdee *et al.* 2003). Furthermore, the effect of gear selectivity and bycatch poses a concern to the health of ecosystem and resources (Crowder and Murawski 1998; McClanahan and Mangi 2004; Fuller *et al.* 2008). Hence, the general correspondence of the survey result with the prevailing ecological issues in global fisheries adds to suggest that the stakeholder groups in the SEA hold a moderately high level of fisheries conservation understanding.

This shared understanding could be largely attributed to the effective one-way communication in transmitting knowledge from the managers/scientists group (i.e. governors) to fishing communities via fisheries extension workers. Over the years, the top-down style of restricting and controlling harmful fishing activities has been the main form of conservation measures (Hara 2001). For instance, the Fisheries Conservation and Management Regulations of 2000, which currently provides the governing rules for the fishing matters in the SEA, are featured with conservation provisions that predominantly attempt to control and manage the sort of fishing activities included in the Set A (GoM 2000). In the fishing community, too, measures such as minimum mesh size, closed season, size limits of fish and prohibition of bottom-disturbing gears are upheld as the main fishing restrictions to be abided by (pers. observation; pers. comm. Masiye). In addition, a previous study by Hara (2001) also reports fishers' strong acquaintance with the fisheries regulation applicable to their day-to-day fishing exercises. Therefore, it appears that the fishing community has, for the most part, understood and accepted the conservation measures of the governing body.

In this light, popular claims such as "fishers must be taught conservation" as a way to promote conservation-oriented fishing practices does not fully hold truth, since the finding above suggests that the resource-dependent group, by and large, is cognizant of what is generally considered right or wrong, or good or bad, in terms of fisheries conservation for them to engage in prudent fishing practices. It appears that fruitful knowledge dissemination done in a top-down fashion has produced little effect in curbing the extent of illegal fishing on the ground. Hence, this finding calls for a re-examination of 'teaching conservation' to go beyond mere knowledge dissemination and routine awareness raising initiatives. Instead, engaging in frank exchanges of ideas on other essential aspects such as conservation attitude, preference and habits to foster conservation practices could be one useful way of translating 'conservation lessons' into action, and therefore should be encouraged.

6.2.2 Preferred community programmes

A significant divergence of opinion existed between the resource-dependent group and the manager/scientists group when it comes to the preference ranking of fisheries-related community programmes (Table 6.5). While the resource-dependent group unequivocally preferred the programme to provide micro-credit loans for the expansion of their fishing-related work, the same inclination was not found within the managers/scientists who ranked the programme near the bottom. The two programmes that have direct relevance to conservation, protecting fish habitat and species and promoting scientific research on lake ecosystem, were both ranked high by the two groups. The promotion of small-scale

community fish cage culture occupied the middle position at 3rd and 4th for both the manager/scientists group and the resource user group. The second notable difference between the two groups lies in the programme to provide ownership of resources to local communities which was ranked low for the resources-dependent group contrary to being the second most preferred programme for the managers/scientists. The third disagreement concerns the programme to help reduce fish spoilage during catching and processing. This was, by far the least preferred programme by the resource-dependent group with the scale value of 7. It contrasts with the scale value of 50 for the managers/scientists who ranked it at the 5th place. Finally, the programme to ensure fishing access to local fishers and communities was generally the least preferred one by both groups compared to the other six hypothetical programmes.

As Table 6.5 displays, the two conservation-oriented programmes are positioned at the mid-to-high level in both groups' rankings. Choosing either of the two and ranking them above the other five programmes, which may be driven by other interests and motivations that, for the most part, show little compatibility with the conservation objective, can be interpreted as a fair indication of their genuine inclination towards conservation. Hence, all groups seem to care about conservation to some degree. In addition, they are the only two programmes that have resulted in strong agreement among all the respondent groups according to the Kruskal-Wallis result (Table 6.9), while according to the other five, the groups differ significantly. Together with the shared understanding about the damaging fishing activities observed from the Set A, moderate potential in advancing conservation goals in the SEA fishery is suggested. In other words, it appears possible that all

stakeholders including fishing communities would be able to act in unison in favour of conservation. An important challenge is noted, however, when looking at the top inclination of the two groups. While the managers/scientists group preferred the programme to protect fish habitats and species, the resource-dependent group showed a clear liking for the provision of loans that would enable the expansion of one's fishing work. This difference must be recognized and reconciled before realizing the conservation potential. A compromising solution is likely to be required, since fisheries governance is not so much about exercising authority from the top-down as about isolated grassroots movement from below. As suggested by Chuenpagdee and Jentoft (2009), it is a process of constant interaction and negotiation where operating goals and strategies are at best imperfect compromises.

6.2.3 Damage schedule

A damage schedule is developed in Figure 6.1 to illustrate the rankings of conservation awareness and conservation inclination based on the results of the two paired comparison sets. The conservation awareness ranking corresponds with the list of damaging fishing activities in Table 6.5. Similarly, the conservation inclination ranking shown here is taken from the result of preferences for the community programmes in Table 6.5, with two groups showing a divergent set of conservation inclination. The damage schedule presented in Figure 6.1 can be regarded as a graphical form of Table 6.5. Aside from the displayed rankings of relative damage or importance, a 'true' damage schedule, as it has been conceived and used in the past, is accompanied by a set of policy decisions/recommendations specifically tied to the result of each ranking. Such policy

decisions/recommendations can take shape of a compensation scheme for potential damage occurring to the resources, severe restrictions on the most damaging activities, or even establishing MPAs in the case of threatened coastal resources. In this study, however, specific policy implications were not drawn from the result of the ranking. Instead, a categorization scheme that closely looks into the conservation principle was further applied to the data, and its result, in conjunction with the damage schedule developed here, formed the basis of policy inferences. The details of the categorization principle category are presented in section 6.3.

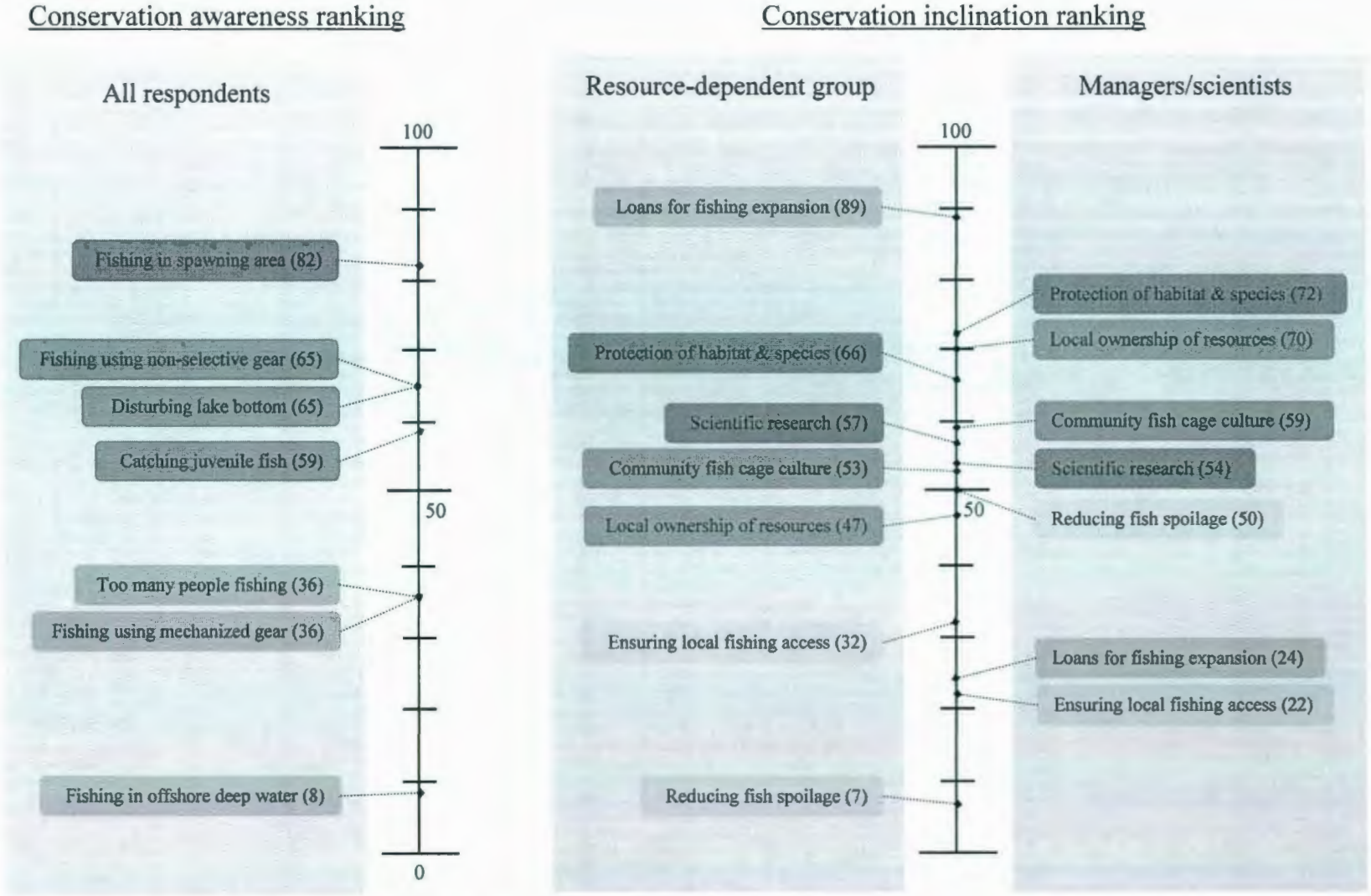


Figure 6.1 Damage schedule of conservation awareness and conservation inclination

6.2.4 Sensitivity analysis based on 'loans for fishing expansion'

As seen in the damage schedule of conservation inclination (Figure 6.1), 'the programme to provide micro-credit loans to expand fishing-related work' displays the most severe discrepancy between the two groups. A sensitivity analysis was performed to find out whether the low overall correlation between what the two groups judge as more preferable or less preferable to fishing communities[16], is in fact attributed to the large difference observed in this object, 'provision of loans for expansion of fishing-related work'. The sensitivity analysis removed this object from the individual responses, and the analysis procedures were re-applied to obtain a new set of rankings. Subsequently, Kendall *T* rank-order correlation was performed, with Table 6.10 comparing the two sets of rankings. The comparison reveals that the rankings between the two groups are noticeably better correlated when the object is removed. All correlation coefficients are improved, and in particular it produced significant correlations with two resource-dependent groups. Therefore, the result of this sensitivity analysis helps validate the observed divergence in judgment between the two groups regarding which community programme is more preferred or less preferred, which holds an implication towards conservation inclination.

[16] as shown in the correlation results (Table 6.4) and the rankings of the resource-dependent group and the managers/scientists group (Table 6.5)

Table 6.10 Kendall *T* correlation coefficients comparing the difference in the ranking of community preference based on inclusion of the 'loans for fishing expansion' object

	Managers/scientists with 'loans for fishing expansion' included ($N = 7$)	Managers/scientists without 'loans for fishing expansion' ($N = 6$)
Gear owners (East)	0.333	0.690*
Crew members (East)	0.048	0.276
Processors/traders	0.143	0.414
Community members	0.333	0.690*
Gear owners (West)	0.048	0.276
Crew members (West)	0.238	0.552

* denotes significant correlation at $p = 0.05$

6.2.5 Reasons for the fewer amount of fish

Figure 6.2 displays the result of an opinion question which asked respondents to directly select reason(s) they think are contributing to the decline of fish stocks in the SEA. Also, each respondent was allowed to select multiple reasons. In the figure, each bar denotes the percentage of respondents who believed that the specified reason is a contributing factor to the decline of fish stocks. As evident from the result, fishing using illegal gears is the most contentious issue relating to the decline of fish stocks among all respondents. Fishing during spawning season and catching juvenile fish are the two other popular claims identified to have caused negative implications to the health of the fish stocks. The following three reasons also deserve some attention as over half of the respondents have indicated their connections to fish decline; these are overfishing due to too many fishers/gears, fish habitat degradation and overfishing due to large-scale commercial boats. It is observed that what is identified in this question as the main reasons for causing

the decline of fish stocks holds general resemblance to the result obtained in the ranking of damaging fishing activities. High damaging fishing activities concerning juvenile fish, spawning season and area, disturbance of lake bottom all appear near the top of the graph in Figure 6.1. Similarly, low damaging fishing activities relating to the high number of fishers and the mechanization of fishing gear are also recognized in the graph as the less significant reasons affecting the fisheries resources. This correspondence supports the established ranking of the damaging fishing activities, and further it may be regarded as a basic validation process that cross-examines the result of the paired comparison method. More subtle findings contained in the result (Figure 6.2) will be brought out in the later chapter to aid the discussion of policy inference.

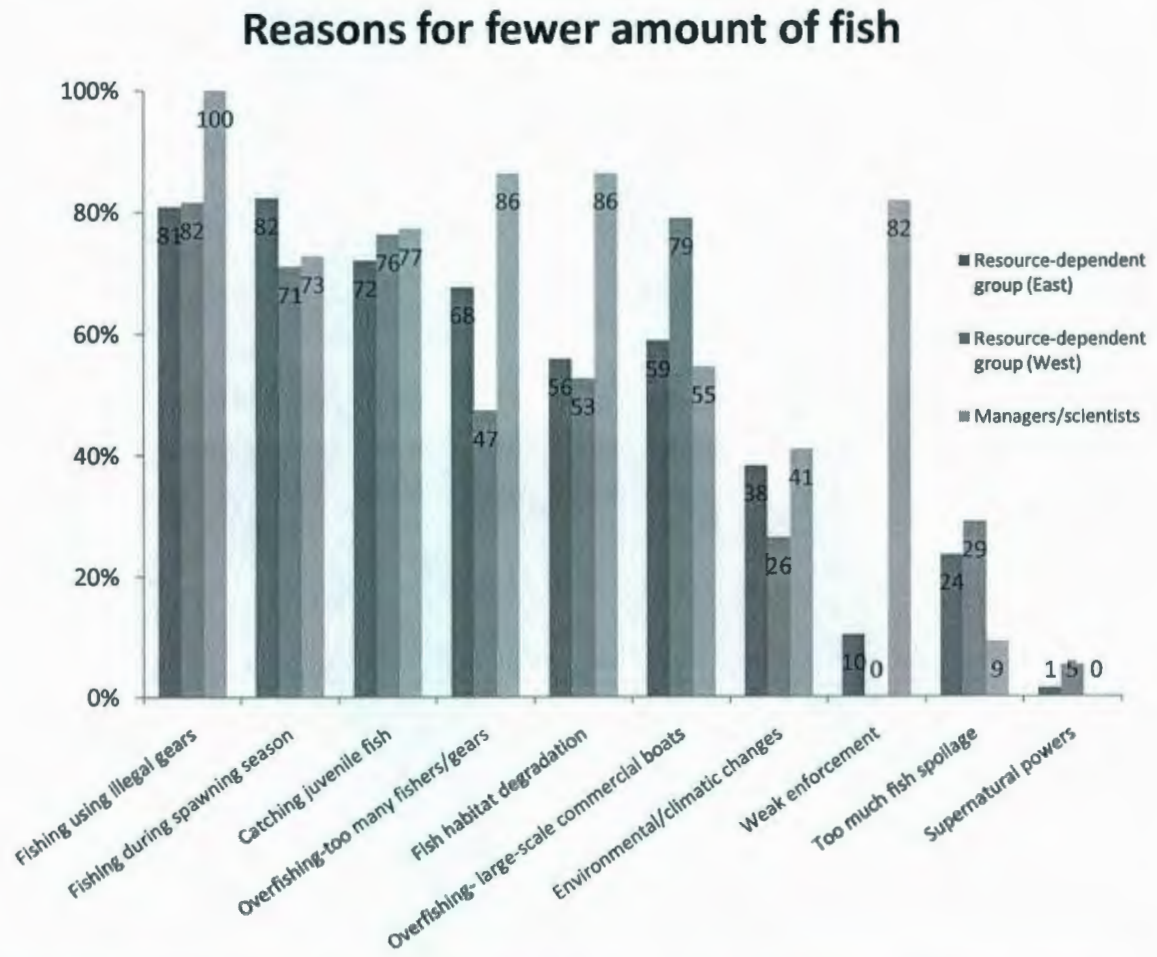


Figure 6.2 Percentages of respondents in each group indicating the specified reasons to be the cause of the decline of fish stocks in the SEA

6.2.6 Participation of fishing community in the formulation of fisheries regulation

One question in the survey aimed to gather the thoughts of respondents regarding the role of fishing community in the formulation of fisheries regulation vis-à-vis fishing authority (i.e. government). As shown in Figure 6.3, all seven groups overwhelmingly indicated that government and fishing community should work together to formulate the regulations. Especially, the managers/scientists group was in strong favour of having

fishing community jointly involved in the rule-making process, as 95% of them held this view. In addition, the five groups representing fishing-related occupations at the village level, namely, gear owners and crew members on both sides of the shore and processors/traders, displayed a high percentage of people who indicated that the joint participation of fishing community in rule-making is a desirable option, ranging between 65% and 75%. Interestingly, the community member group, who are not directly involved in any fishing-related occupation by definition, had only 45% of the respondents choosing the joint formulation. Instead, 25% opted for regulation-making as the sole and full responsibility of the government, while another 20% indicated that the government should still be in charge despite incorporating inputs of the fishing community. As someone who does not hold intimate connection to the fishing-related activities, hence not likely possessing great fishing-related knowledge and know-how, it is interesting to see that a higher percentage of community members favoured the government as the responsible body in rule-making than the fishing-related groups did. In general, both the fishing community and the fisheries managers/scientists seem to share the same vision of achieving a governance environment in which fishing communities and the government fishing authority can work in collaboration in fisheries regulation-making.

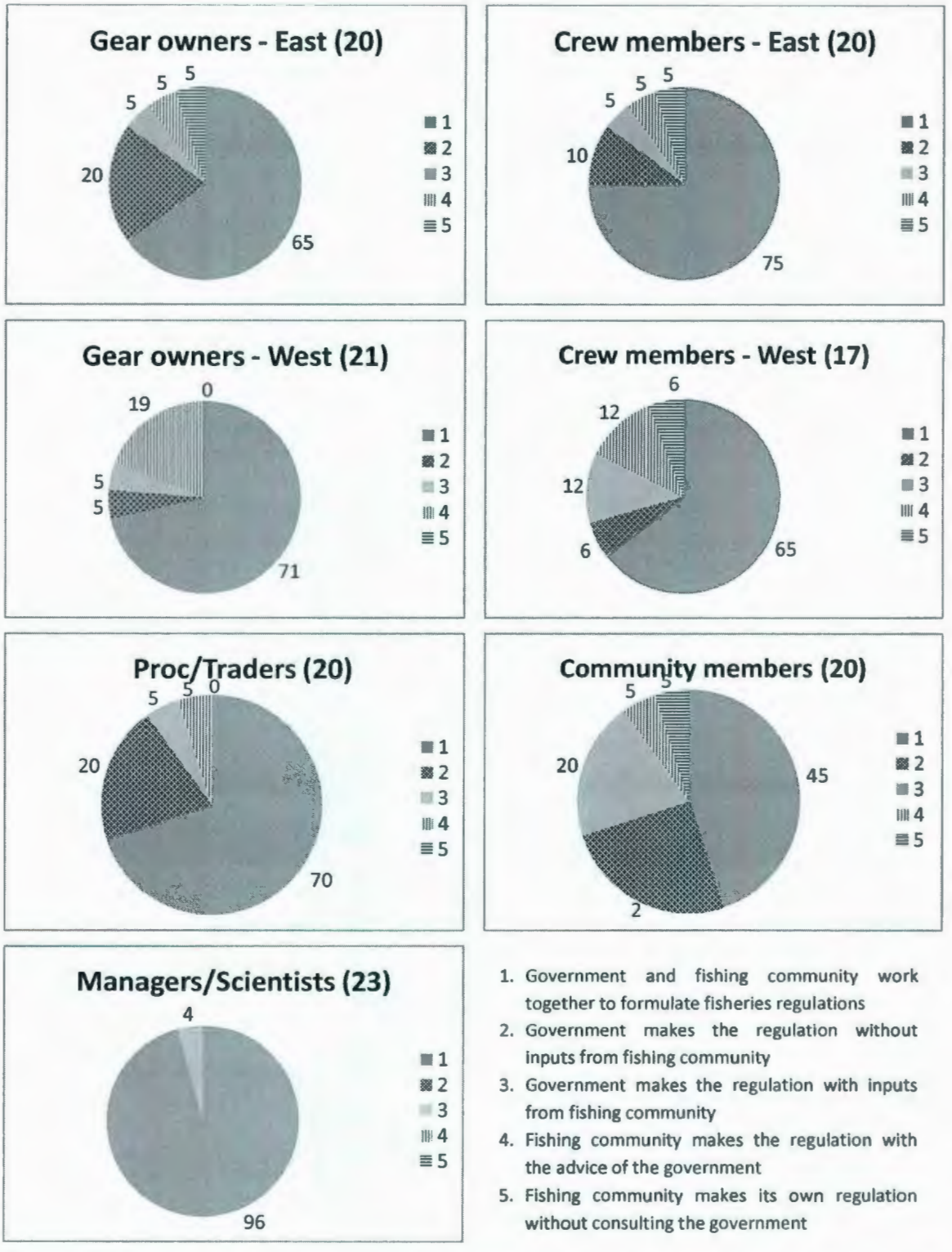


Figure 6.3 Percentages of respondents indicating their view on what level of participation a fishing community should play in the formulation of fisheries regulation (the number of respondents in each group is in parenthesis)

6.3 Conservation principle category

6.3.1 Description of categorization scheme

In this section, I examine whether any plausible linkages between individual conservation principle and illegal gear use can be established. To accomplish this, the results of the two paired comparison sets are viewed in relation to each other using a simple categorization scheme. This step allows observing the relationship between the understanding and inclination component, which is an important tenet of the conservation principle that was postulated earlier. Revisiting the relationship, the inquiry is about how understanding is important but not sufficient alone in securing conservation principle, and how inclination together with understanding can be linked to the conservation principle.

The remainder of this section briefly outlines the process taken in the categorization scheme. First, it starts with an establishment of weighting factors for each component (i.e. paired comparison set). For Set A, the more damaging the fishing activities are judged to be, the higher the weighting factor. For Set B, a higher weighting factor implies a higher degree of direct conservation benefit offered by a community programme. The weighting factors were multiplied with the individual preference scores of the paired comparison sets and aggregated across the objects to produce two weighed sums for each respondent, each of the two sums respectively corresponding to Set A and B. A high weighted sum from Set A would mean that an individual is equipped with apt awareness or understanding of conservation knowledge, while a high score from Set B would indicate higher inclination towards achieving conservation. Next, the weighted sums were

averaged for all respondents resulting in a mean value for each set. Based on the mean, each individual's weighted sums for the two sets are categorized to be either L, if lower than the mean value, or H, if it is higher than the mean value. This scheme results in four different combinations into which an individual respondent could be categorized, i.e. HH, HL, LH and LL. For example, HH would signify that a respondent has not only high conservation awareness, but also relatively strong sense of inclination towards conservation. Similarly, HL would denote a case where despite having high conservation awareness, a respondent is equipped with relatively low penchant for conservation.

6.3.2 Weighting factors

Suitable weighting factors were developed for each paired comparison set, as shown in Table 6.11. For Set A, the agreed ranking provided by the respondents (see Figure 6.1) were used as a guide to establish the weighting factors, which reflect the severity of damages the different fishing activities inflict on fisheries resources. They range from 1 to 4, 1 and 4 denoting the least and the most damaging form of fishing activities, respectively. The weighting factors for the Set B were established based on the elicited judgment of local fisheries experts in the SEA in conjunction with the obtained ranking data. Several key fisheries experts were asked to give a rating to the seven community programmes included in the survey according to their potential contribution to fisheries conservation in the SEA. Combining the data, two programmes that directly promote conservation were given the top weighting, 3, which are 'protection of fish habitat and species' and 'promotion of scientific research on the lake ecosystem'. Next, the weighting of 2 was assigned to two programmes that are anticipated to hold modest potential in

advancing conservation, as listed in Table 6.11. Lastly, three programmes that are associated with low or even negative conservation benefits were allotted the weighting of 1.

Table 6.11 Weighting factors derived for conservation principle category

	Weighting factor	Description
Set A: Damaging fishing activities		
Fishing in spawning area	4	Most damaging
Fishing using gears that disturb lake bottom	3	Generally accepted to be very damaging
Fishing using non-selective gear	3	
Catching juvenile fish	3	
Too many people fishing in one area	2	High potential to be damaging
Fishing using mechanized gear	2	
Fishing in offshore deep water	1	Least damaging
Set B: Preferred community programmes		
Protect fish habitat and fish species	3	Direct promotion of conservation
Promote scientific research on lake fisheries ecosystem	3	
Provide ownership of resources to local communities	2	Modest potential in advancing conservation
Promote small-scale community fish cage culture	2	
Ensure fishing access for local fishers and communities	1	Low or even potentially adverse effect on conservation
Help reduce fish spoilage during catching and processing	1	
Provide micro-credit loans to expand fishing-related work	1	

6.3.3 Categorization results

The individual preference scores (i.e. the number of times a respondent has chosen specific objects over others) were multiplied by the weighting factors. A set of equations specifying the algorithm are provided through Equations 6.7, 6.8 and 6.9. A sample

calculation is also provided in Table 6.11 to illustrate the process. If we assume that a particular respondent has individual preference scores as shown in Table 6.11 for Set A, then the multiplied values are aggregated to produce a weighted sum, 60. This process is replicated for all remaining respondents, and the mean of the weighted sums is computed. The same procedure is undertaken to produce weighted sums and a mean value for Set B. The possible minimum and maximum weighted sum values for Set A are determined to be 42 and 66 by trial-and-error, and the respective values for Set B are 28 and 50. Appendix C provides a detailed calculation of the maximum and minimum weighted sum values for each set.

(6.7) $$W_j = \sum_{i=1}^{N} a_i w_i$$

(6.8) $$Avg = \frac{\sum_{j=1}^{k} W_j}{k}$$

(6.9) $$\begin{cases} \text{If } W_j \geq Avg, & \text{assign } \mathbf{H} \\ \text{otherwise,} & \text{assign } \mathbf{L} \end{cases}$$

where W_j is a weighted sum for j^{th} respondent, a_i refers to individual preference score for i^{th} object; N refers to the number of objects; w_i refers to weighting factor for i^{th} object, j refers to j^{th} respondent; and k refers to the total number of respondents (judges).

Table 6.11 Table illustrating the process of acquiring a weighted sum for an individual respondent

	Fishing in spawning area	Fishing using gears that disturb lake bottom	Fishing using non-selective gear	Catching juvenile fish	Too many people fishing in one area	Fishing using mechanized gear	Fishing in offshore deep water
Individual preference score	5	6	3	3	0	1	2
			×				
Weighting factor	4	3	3	3	2	2	1
			=				
Multiplied value	20	18	9	9	0	2	2
Weighted sum	$20 + 18 + 9 + 9 + 0 + 2 + 2 = \mathbf{60}$						

Figure 6.4 displays the histograms of the weighted sums for all 144 respondents. To reiterate the meaning of the weighted sum, given how the weighting factors are set up, a high weighted sum implies more apt conservation understanding obtained from the ranking of damaging fishing activities (Set A), and high inclination towards conservation obtained from the ranking of preferred community programmes (Set B). The 'conservation awareness' histogram shown in Figure 6.4(a) indicates that the frequency distribution is skewed to the left (i.e. negative skew), meaning many respondents are located in the range of high conservation understanding. This trend of overall high conservation understanding is not very surprising considering (1) the significant agreement reached by all seven respondent groups, and (2) consistency of the ranking results with the commonly-held knowledge about fishing gears and their impacts in other fisheries worldwide (see section 6.2.1). The 'conservation inclination' histogram displays

a more symmetrical frequency distribution, though it is still left-skewed (Figure 6.4b). The positive skew observed here is also a plausible outcome as we already have seen the two conservation-oriented programmes being ranked in the upper half by both the resource-dependent group and the managers/scientists group as shown in Figure 6.1. The weighted sum means for the conservation awareness set and the conservation inclination set are 62.7 and 42.1, respectively.

The next step involved categorizing the weighted sums of the respondents using the mean value. Simply, H was given if a weighted sum is bigger than the mean value, and L was assigned if it is lower. Repeating this step for both sets, each respondent was categorized to be one of the four possible combinations – HH, HL, LH and LL. This step categorized 144 respondents into 41 HHs, 46 HLs, 24 LHs and 33 LLs. As more respondents were classified as HL than any other category, this result indicates that most commonly the respondents have relatively high conservation awareness, but relatively low inclination towards conservation. In other words, having a good understanding about what conservation is and how to promote it may not be necessarily accompanied by keen interest in promoting conservation among the resource-dependent group. Hence, it should not be readily assumed that knowing about it guarantees conservation in the SEA.

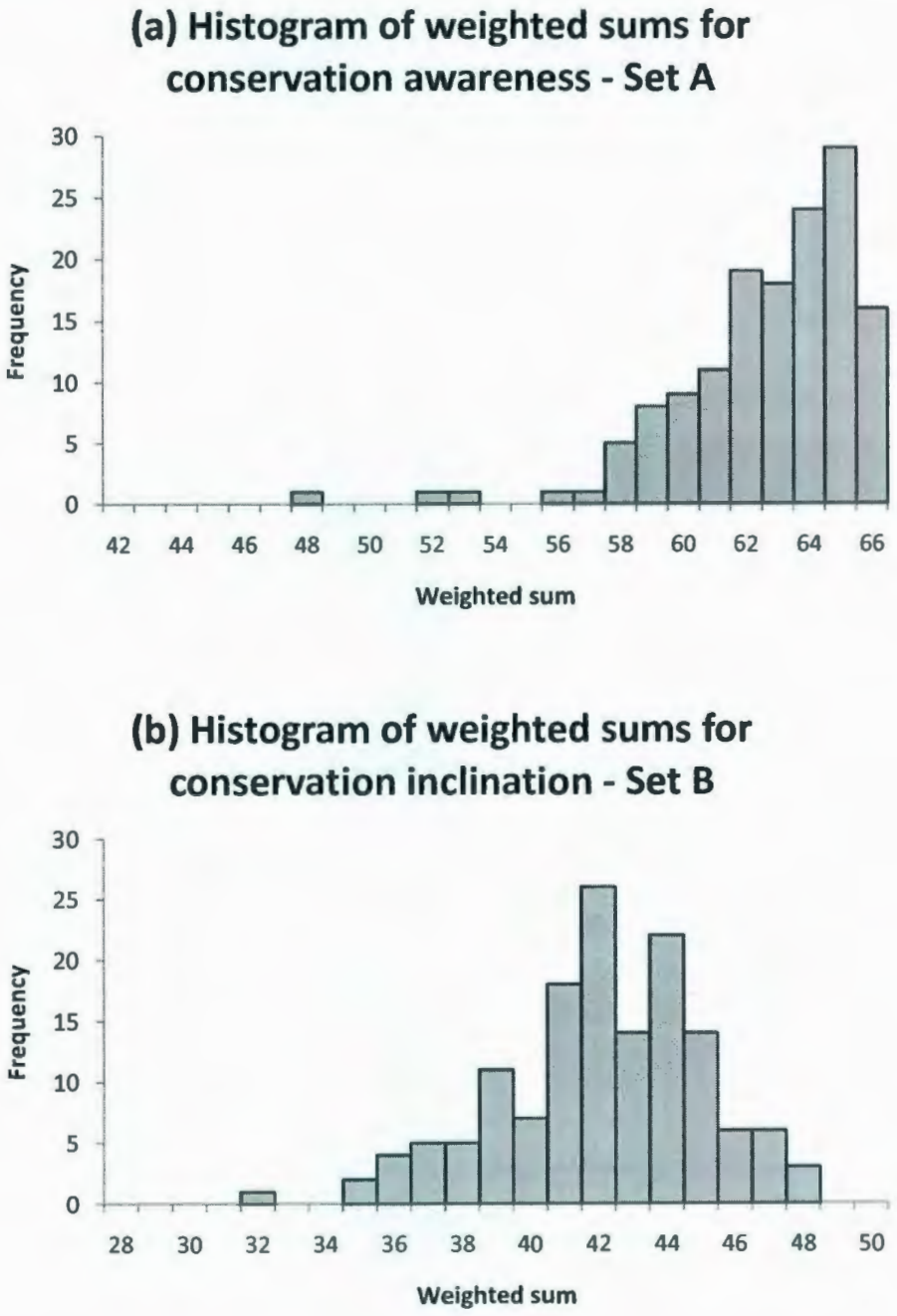


Figure 6.4 Histograms of (a) conservation awareness (Set A), and (b) conservation inclination (Set B) showing the frequency distribution of weighted sums (total frequency = 144, Set A mean = 62.69, and Set B mean = 42.10)

Another useful observation relates to the proportion of the occupations making up each category, as displayed in Figure 6.5. It can be noted that each of the four categories have all five groups represented, albeit with a varying degree of proportion. This suggests that no clear categorical pattern emerges from occupational information alone. For example, even some of the fisheries scientists and managers are considered to hold less adequate conservation understanding and/or inclination than some of the direct resource users. Given the rather effective one-way communication of conservation knowledge from fisheries managers to fishing communities as discussed earlier (section 6.2.1), this may be a surprising finding to some. However, the diverse fisheries backgrounds and expertise of the managers and scientists included in the survey are likely to contribute to the divergence of conservation-related opinions explaining why some of them are shown to hold relatively low conservation attributes. Another important observation is noted in Figure 6.5. Focusing on the LL category, which denotes both relatively low conservation awareness and inclination, the fisher group, composed of gear owners and crew members from both sides of the SEA, forms the clear majority of the LL category. Out of the 33 LL-category respondents, 26 of them belong to fishers. Probing further by examining the categorical make-up of each occupational group (Table 6.13), a considerably large portion of the two fisher groups are assigned into LL with 41% of the gear owners and 24% of the crew members, compared to 10%, 10% and 11.5% of the other three groups. This suggests that the fisher group should continue to be the primary partner and recipient of any future conservation initiatives. However, given the open-access nature of the SEA fishery with an easy entry allowed to any one, community members and other resource-dependent groups should not be excluded from the scope of such programmes.

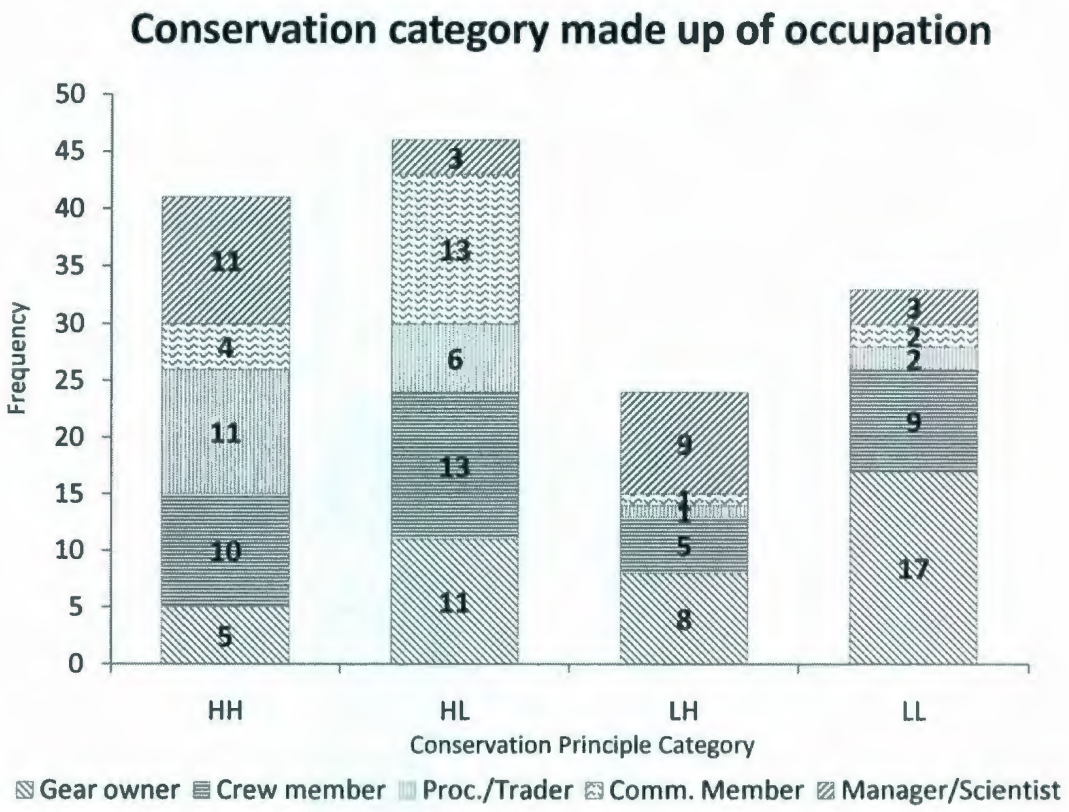


Figure 6.5 Cumulative composition of each conservation principle category based on occupation

Table 6.13 Percentages of respondent groups making up each conservation principle category

	HH	HL	LH	LL	Total
Gear owners	12	27	20	41	100
Crew members	27	35	14	24	100
Processors/Traders	55	30	5	10	100
Comm. members	20	65	5	10	100
Managers/Scientists	42	11.5	35	11.5	100

6.3.4 Conservation principle category by legal/illegal gear use

Minimizing illegal fishing, or more specifically the use of illegal gears, can be attempted by numerous policy means, including enforcement and sanctions. One of the approaches that this study is interested in examining is to rely on the individual moral principle to conserve fisheries resources and encourage a voluntary ban on damaging fishing activities. Whether and how it can be relied upon to minimize the use of illegal gear depends first on establishing a linkage between the strength of the parameters that constitute conservation principle and the observed case of illegal gear use. Hence, this step focuses on the fisher group to uncover any relationship between the use of illegal gear (a bona-fide form of illegal fishing) and the presence of low or high conservation awareness and inclination (Figure 6.6). Out of the 78 fishers included in the survey, 25 fishers indicated owning or operating illegal form of fishing gear, when asked to list all gears used or owned. Using the information listed in the Fisheries Conservation and Management Regulation of 2000 (GoM 2000), recommended gears (i.e. legally allowed) were differentiated from non-recommend gears (i.e. illegal gears). As shown in Figure 6.6, the result indicates that fishers who use illegal gear are most frequently found in the LL category (12 fishers out of 26 in LL). On the other hand, most fishers who are categorized as HH are legal gear fishers (14 fishers out of 15), with only a tiny fraction of illegal gear fishers sharing the category. Based on this, a relationship between the conservation principle and the illegal gear use can be reasonably established. HH is predominantly associated with the use of legal gears, while illegal gear use is most dominantly associated with LL. In other words, it is reasonable to suspect that moving from LL to HH could induce the reduction of illegal gear use. This correlation serves as a

plausible sign that raising conservation awareness and persuading them to favour conservation may in fact help decrease the number of fishers who admittedly own or operate illegal gears. Therefore, elevating individual conservation principle through raising the two components may indeed be an important governance option for mitigating the illegal fishing situation in the SEA. Aside from the legal/illegal gear use, the breakdowns of the conservation principle category by other pertinent criteria, such as the education level and gender of the respondents, are provided in Appendix C.

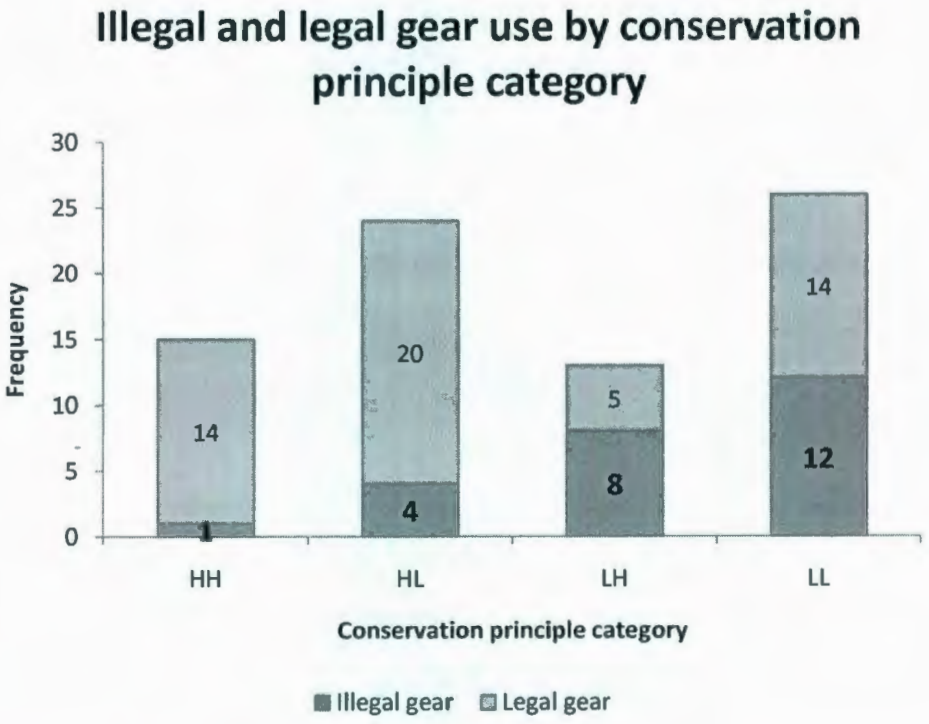


Figure 6.6 The number of fishers using illegal or legal gear displayed according to conservation principle category

6.4 Individual-level governability and conservation principle

The general findings of this chapter reveal several key points about the governability of the measures intended for fisheries conservation and discouraging illegal fishing. First, relatively high degree of conservation understanding was observed among the survey respondents. This result includes respondents from both sides of the water body, and is shared by both the managers/scientists group (i.e. governors in the typical sense) and the resource-dependent group in communities (i.e. part of the system-to-be-governed). It thus highlights a potential for all groups to be able to, at least, agree on urgent conservation issues and damaging fishing activities, if not more, and therefore carries a positive note that conservation measures can be made more governable through capitalizing the shared understanding. Another encouraging empirical finding confirms the linkage between the conservation principle and the extent of illegal gear use, where 'stronger' conservation principles in individuals correspond to a lesser ownership/usage of illegal fishing gears. Thus, fostering conservation principle can be suggested as a reasonable governance option to improve the governability of conservation measures and subsequently reducing outcome uncertainties. In terms of inclination toward conservation, while a moderately high level of penchant for the direct promotion of conservation was noted by all respondent groups, a significant divergence in viewpoint between the managers/scientists group and the resource-dependent group poses a governability challenge requiring extra care and sensitivity.

This chapter has revealed several important empirical findings on the individuals' general aptitude and regard for fisheries conservation, cast in the lens of governability. Here, the conservation principle was approached as something internally-held by individuals, independent from and uninfluenced by the system characteristics. In the governability assessment presented in Chapter 5, however, the conservation principle was approached as something that depends upon the overall governance picture shaped by high or low levels of the system properties. The connection between the system-level governability and the individual-level governability is left for more conceptual exploration and will be further elaborated in the next chapter.

Chapter 7 Discussion and Policy Recommendations

Plate 7.1 Inland view of Kadango

Plate 7.2 Kela beach in the morning

The aim of this chapter is two-fold. First, it discusses and advances some key policy recommendations aimed at addressing the illegal fishing issue in the SEA. The inference made here and suggestions proposed are based on the obtained results of the questionnaire survey as well as the insights gathered from other methods such as informal interviews and field observation. Secondly, it attempts to weave together the two levels of governability measurement in order to generate an integrated discourse about the overall governability of conservation measures and illegal fishing in the SEA, and this will be done based on the assessed system properties and individuals' conservation principle.

7.1 Economic/development incentive

First, targeting the group of respondents with relatively high conservation understanding but relatively low inclination (HL), the policy response would logically focus on bringing up the inclination towards conserving fisheries resources. In Figure 6.1, the resource-dependent group's leading preference was shown to be the expansion of one's fishing work by acquiring a capital through loans. In other words, resource-dependent group's preference to economic expansion and development seems to clearly outpace other inclinations including conservation. This empirical finding is, in fact, in line with the general, prevailing line of thinking in Malawi, in fisheries or elsewhere, which revolves around the development agenda. Poverty alleviation and raising the standard of living through development, modernization and rapid economic growth are the main theme that reverberates in all sectors of government affair (GoM 2009). In fisheries, according to the 2001 National Fisheries and Aquaculture policy, the major policy goals are aimed at

'maximizing the sustainable yield..., to improve the efficiency of exploitation, processing and marketing..., to promote investment in the fishing industry, rural fish farming units and exploit all opportunities to expand existing and develop new aquatic resources (GoM 2001 p.5)'. Furthermore, the persistent attempt to expand fisheries further offshore, a production-oriented modernization agenda and examples of policy support for the industrial sector exemplify the government's pro-development position in steering the fisheries sector, although some inconsistencies and ambivalence had been observed in the fisheries development policy over the years (Chirwa 1996; Allison *et al.* 2002). The theme of poverty alleviation and development is also prominent in rural fishing villages at the community level as well as among resource users at the individual level (pers. observation; pers. comm. Masiye). Therefore, the economic motive involving the expansion of one's fishing work appears to be an important factor hindering a more resilient expression of conservation principle in the SEA fisheries.

The findings indicate that the short-term enhancement of standard-of-living is one of the resource-dependent group's main motivations, if not the strongest, that competes with the inclination towards conservation. From the perspective of policy-makers and governors, when promoting conservation, a compromising solution is likely required in responding to this real demand of resource-users. Simply, a policy recommendation that does not lead to enhanced standard-of-living would not be well-received. Therefore, management initiatives that supply the resource-dependent group with an economic incentive to conserve are strongly recommended. In the process, conservation will be cast in a positive light raising the level of inclination towards conservation over time. Such initiatives could

come in various forms such as conservation subsidies or a reward scheme. Milazzo (1998) defines conservation subsidies as 'programs that are designed to enhance the resource base, reduce fishing operations and capacity, and foster "cleaner" harvesting technologies' (p.64). Several common types of conservation subsidies are provided, which include: vessel and fishing permit buybacks, refitting of vessels to operate in less stressed fisheries, stock enhancement, re-training of fishers, and innovations in clean harvesting gear (Milazzo 1998). Given the specificities of the SEA fishery set in a developing world with an open-access character, certain types of conservation subsidies are regarded as more appropriate than others. For example, refitting of vessels to operate in the deeper part of the lake to relieve the heavy pressure put on the nearshore stocks and to target less-exploited offshore species has been, in fact, undertaking since 2003 as part of the Lake Malawi Artisanal Fisheries Development Project funded by the African Development Bank Group. Also, re-training of fishers, fish processors and traders have also been one of the foci of various donor-funded initiatives that indirectly aim to steer economic incentives towards meeting the conservation objectives.

Alternately, a more direct approach to compensate people for their role in looking after fisheries resources can take place via direct conservation payments (or conservation performance payments) (Simpson and Sedjo 1996; Ferraro 2001; Ferraro and Simpson 2002). Conventional development interventions attempt to reduce pressures on ecosystem by steering the economic development process towards the path that is compatible with ecosystem protection, through initiatives such as eco-tourism and aquaculture. However, this indirect way of encouraging conservation is often observed to be ill-suited for

properly aligning the economic incentives with the conservation goals. This is mainly due to the complexity of development interventions vis-à-vis the temporal and spatial scales at which conservation objectives must be achieved. This difficulty often creates little effect on conservation-related household behaviour (Ferraro 2001). The premise of the payment scheme is to offer a much more cost-effective way of ensuring conservation results than the conventional development projects by directly linking explicit payments to conservation progress. Although the direct payment system is not without its own set of shortcomings, which necessitate careful program design and implementation, past and ongoing examples can be found in several developing countries in the tropics, where they have been employed to protect ecosystems and promote stewardship of forest resources (Ferraro and Simpson 2002). For instance, Ferraro and Simpson (2002) reports that Guatemala's example delivers direct payments to forest stewards through the Forest Incentives Program (World Bank 2000), while, in Costa Rica, institutional mechanisms were established to allow local, national, and international beneficiaries of ecosystem services to compensate those who protect ecosystems (Castro *et al.* 2000). As with these examples, such programmes can be made feasible through financial support garnered from national and international donors, NGOs and various interest groups around the world who share a keen interest in protecting particular ecosystems.

Various forms of conservation subsidies and direct payments schemes should garner meaningful attention in meeting the economic/development demand of the resource-dependent group in the SEA. This would be an important policy addition aimed to raise the level of inclination towards fisheries conservation, particularly of those categorized as

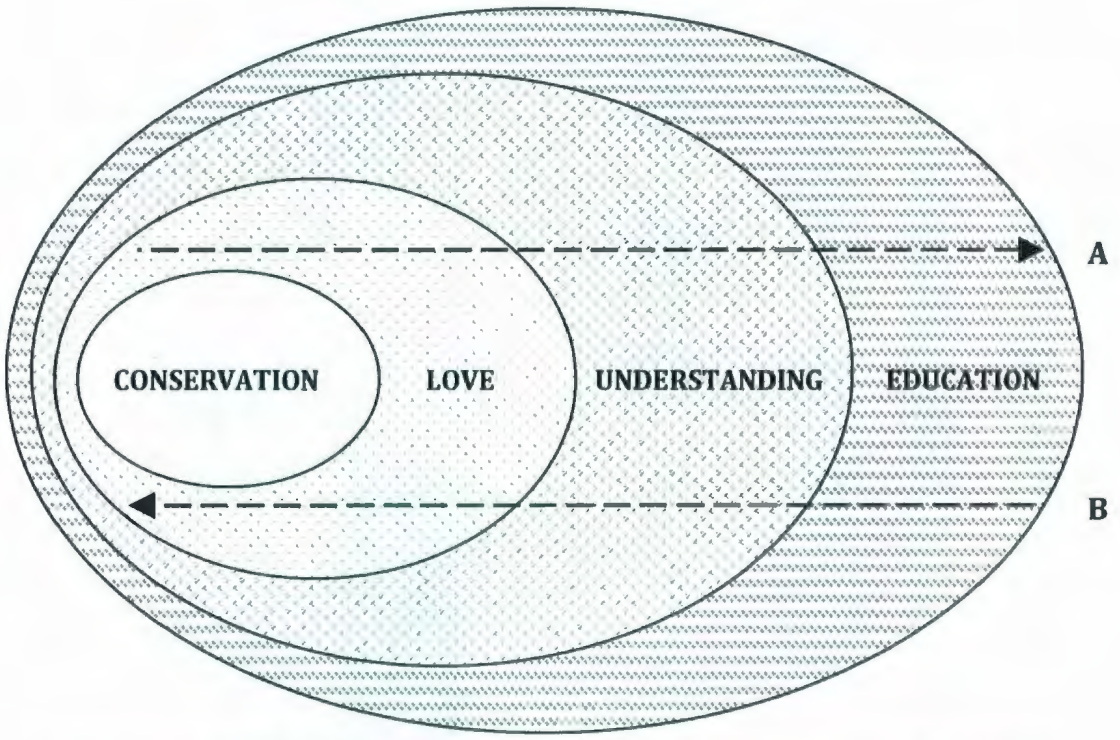
HL. As a result, activities that negate conservation (e.g. illegal fishing) are hoped to be discouraged out of their own conservation principle.

7.2 Conservation education, understanding and 'love'

Secondly, sustained focus on education and awareness raising is still needed to increase the level of conservation understanding of mainly those who are categorized to be LH and LL, despite the overall moderately high degree of knowledge suggested by the result of the Set A where various fishing activities were suitably differentiated according to the severity of impacts inflicted on the resources. The need is more acutely illustrated via Figure 6.6. Only 5 of 39 fishers in the higher awareness level (i.e. HH and HL) were reported to be using illegal gears compared to 20 out of 39 fishers in the lower half (i.e. LH or LL). This amounts to a large difference depending on the level of conservation understanding, as over half of the fishers (51%) with relatively lower conservation understanding are using illegal gears as opposed to a considerably smaller fraction (13%) by those equipped with relatively higher understanding. The result seems to suggest that reaching adequately high conservation awareness among fishers and other resource-dependent members can create a tangible impact on reducing the extent of illegal gear use. The effort to elevate the conservation understanding could be implemented through various accessible means such as formal education, outreach and extension programmes, community-based projects and the work of fisheries field officers. As mentioned in the previous chapter, emphasis should be shifted from one-way knowledge dissemination to a more open form of dialogue that allows a two-way exchange of conservation-related

attitude and habits between various stakeholder groups. This shift can perhaps help the translation of an understanding into a genuine inclination, such that knowledge on conservation can induce creating passion and belief and furthermore spilling into the moral domain such as principles and norms.

In a 1968 speech made to the general assembly of International Union for Conservation of Nature (IUCN) in New Delhi, a well-respected Senegalese environmentalist, Baba Dioum, is quoted saying: *"In the end we will conserve only what we love. We love only what we understand. We will understand only what we are taught"*. His statement speaks volumes about the importance of educating people about conservation, since education is at the foundation of understanding and fostering love for conservation (Figure 7.1). As was shown in this study, however, apparently everything we understand is not what we love, and everything we love is not in the best interest of conservation. The common prevalence of HL category suggests that while people have knowledge about conservation and are aware of what promotes or hurts conservation, it does not necessarily translate into passion towards it. In addition, high penchant for the enhancement of short-term well-being clearly shown in the result has low or even potentially adverse effect on conservation (i.e. what people love may be incompatible with conservation). However, tapping into the conservation principle as a governance option, as potential was shown in this study (section 6.3), can be a promising way of realizing conservation such that what we understand and what we incline to do would in the end coincide more with conservation.



A: Direction in which Baba Dioum views and relates the four attributes in his statement
B: Direction in which this study views and relates the four attributes

Figure 7.1 How conservation, love (i.e. inclination), understanding and education are related and overlap with each other. Seen this way, enlarging the circle of 'conservation' to match the size of 'education' would be the ultimate goal of conservation education

7.3 Differences in the preferred fisheries-related community programmes

7.3.1 Expansion of fishing work

It is interesting to note that the resource-dependent groups' penchant for the programme to provide micro-credit loans to expand fishing-related work is contrasted with the low preference by the manager/scientists group (see Figure 6.1). This contrast is likely to explain the greatly significant difference observed among the groups in the result of the

Kruskal-Wallis test (Table 6.9). The divergence in opinion seems reasonable considering the widely-held view of the manager/scientists about the fully- or over-exploited status of fisheries resources and their concern for overfishing due to a large number of fishers and gears (also shown in Figure 6.2). Also, in the case of fisheries expansion to deeper waters, there is no effective way of making sure that fishers will not use the upgraded boats and gears to remain in the near shore and catch inshore stocks instead of targeting deepwater species as the loan intended to (pers. comm. Kachala). Hence, while still being an advocate of fisheries expansion and development, managers/scientists seem to prefer alternative initiatives that put less pressure on the issues of overfishing, such as experimental fish cage culture and advancing fish processing technology.

In recent years, a private company, named Maldeco Aquaculture, has established a net cage system in the SEA with the intent of producing 1,200 metric tons of *chambo* per year (PressCorp. 2009). With potential shown for successful farming and harvest, the DoF has followed suit by constructing a cage culture system in the SEA in technical liaison with the Maldeco Aquaculture. The community-based model, as opposed to a private venture, is the main vision for the government-initiated cage culture. However, an experimental harvest that took place in April 2008 revealed a high mortality rate as well as generated a suspicion for the theft of fish, potentially perpetrated by nearby small-scale fishers out of jealousy or misunderstanding (pers. comm. Banda). Fish cage culture in the SEA is still at an early developmental stage. In order to achieve commercial viability and community benefits, several issues will need to be addressed, including the development of suitable technologies and garnering the support of fishing communities in the area.

As for deepwater fishing, despite the voiced concern of having no installed mechanism to ensure that deepwater fishing vessels do not target near-shore species, the currently ongoing Lake Malawi Artisanal Fisheries Development Project supported by the African Development Bank, intends to provide loans to more than 400 groups of fishers for upgrading of fishing boats and nets to enable them to fish in deep waters (pers. comm. Msukwa).

7.3.2 Instituting local resource ownership

Another interesting disagreement between the resource-dependent group and the managers/scientists group, as observed in the Kruskal-Wallis result (Table 6.9), occurs in the programme to promote local ownership of fisheries resources. Manager/scientists' high preference is thought to spring from having knowledge of the widely discussed potential benefits of local involvement and participation in the management of resources. Conferring a certain degree of resource ownership, privilege and responsibility to local communities by seeking active participation of resource-dependent groups has been a popular scheme among practitioners as well as in the academic circle around the world (Wilson *et al.* 2003; Béné and Neiland 2006). However, the efficacy and merit of the Participatory Fisheries Management Program, which was initiated in the SEA in 1997, is currently being reassessed as the program has not lived up to the expectation yielding little success and marginal achievements. (pers. comm. Bulirani; Njaya 2007). Nevertheless, it is shown in this study that managers and scientists still highly value the local community ownership of fisheries resources.

On the other hand, this study reveals that fishers and community members hold relatively low regard for the idea of local ownership even despite a decade long implementation of the participatory management initiative. The BVCs, which were established to facilitate the transition, though recognized at every major fishing beach, lack meaningful operation. In addition, several anecdotal evidences point to the similar conclusion. Many resource users see fisheries resources as something that belongs to the government, and they are just in it to take advantage of the resources that the government manages without sharing the ultimate responsibility (pers. comm. Masiye). Also, the high mobility of fishers and fish traders as a cultural norm in fishing casts a doubt as to whether rather static and permanent concept of local ownership would work (per. comm. Makanjira). Lastly, the notion of dividing a water body and conferring exclusive management and use rights to particular fishing communities, as one way of instituting local resource ownership, appeared to be an utterly foreign idea to many fishing villagers (per. comm. Nyungwa). Therefore, it is perhaps no surprise to find that the concept of local ownership has not taken a firm hold in the communities.

Here, it must be noted that participation in fisheries governance by resource users is one thing, but the institution of local ownership of resources and instilling the sense of ownership and stewardship among the resource-dependent group is another. Drawing upon the interactive governance theory, participation falls in the domain of the first as well as the second order of governance, where the first order refers to human governing activities involving day-to-day management undertakings, and the second order deals

with the maintenance and design of institutions that enable the first order governing. In other words, it is about raising the level of participation among various stakeholders and creating an institutional arrangement that will facilitate the higher level of participation. On the other hand, instilling the sense of resource ownership and stewardship is likely part of the third order of governance, that is, being intervened and handled by the underlying principles and normative values that guide and underpin the processes of the first and the second order. Hence, promoting local ownership of resources would require a foremost attention on the normative aspect of governance. The interactive governance framework also provides an analytical tool with which this distinction can be better recognized and acted upon.

As shown in Figure 6.3, respondents in this study have clearly expressed that fishing communities should be an equal partner in the rule-making process. However, how exactly this envisioned joint collaborative form of participation can be achieved using what type of governance mechanism remains a challenge. A greater challenge may lie in how to bring about the local ownership of resources so that the resource-dependent group would not only simply participate but have a greater role in governing the resources as legitimate owners. One conceptual point of departure for action could be putting a great commitment to enabling inputs in the words of Mahon *et al.* (2008, p.107). 'Enabling inputs are those that seek to make it possible for the system to self-organize and adapt to change through internal interactions and activities'. Somewhat similar to the concept of empowering, they are likely to require relinquishing or re-distributing of power and governing authority. They are also seen complementary to regulatory inputs, a more

conventional kind implemented by the government. Suggestions that would facilitate the transition from a largely regulatory to an enabled environment include stakeholder analysis, use of traditional/local ecological knowledge, setting up of appropriate indicators, a shift of emphasis from technical to 'people' skills, and earning the trust of stakeholders (Mahon *et al.* 2008).

7.3.3 Reducing fish spoilage

The third major difference between the resource-dependent group and the managers/scientists group, indicated by both the result of Kruskal-Wallis (Table 6.9) and rankings (Figure 6.1), involves fish spoilage. This issue highlights a possibility of communication gap in a programme that is being implemented. A partial aim of the AUCC-CIDA sponsored project is to reduce post-harvest losses through improved processing technology of small-scale fishers and processors. It is noteworthy to see that the manager/scientists' medium preference on this programme is contrasted with a very low preference by the resource user group. The explanation for this can go both ways. It could be that for fish processors and traders, this is not an important issue as little or almost no fish spoilage occurs throughout much of the year. Only during a rainy season, fish spoilage can be a problem that results in both economic and nutritional value loss. Fish has become such a valuable commodity nowadays that processing work is conducted with utmost care (pers. comm. Masiye). Hence, resource users may not see an urgent need for a programme that helps to reduce fish spoilage. Alternately, there may be potential in making a substantial value addition, in the form of profit gain or enhanced nutritional value, from reducing fish spoilage that is recognized by the managers and scientists, but

goes unnoticed by the resource users. In this case, the communication of the expected benefits from manager/scientists to resource user community would need to be strengthened. Overall, the success of one-way communication effort seen in the transmitting of the damaging impact of fishing activities is not apparent when it comes to the programmes and initiatives.

7.4 Direct conservation measures

Heightened promotion of direct conservation measures, such as protection of breeding sites and greater size limits of protected species, should be fully considered, given the finding that fishers and other resource-dependent groups do have a certain regard for conservation (see section 6.2.2). There is already recognition among various fisheries stakeholder groups in the SEA that direct conservation measures are imperative in sustaining the benefits of lake resources into the future. Extensive stakeholder consultations held in 2005 as part of the Mangochi Fisheries By-law formulation process have indicated that strict conservation objectives are being advocated and promoted. The importance of protecting breeding grounds and spawning fish stocks through restrictions on when and where to fish, prohibiting the catch of endangered fish species through gear control, and controlling access to fisheries through compliance with gear licensing and registration were some of the key points that were widely acknowledged as necessary. When other motives such as the short-term enhancement of standard-of-living are firmly ingrained in people's lives, a persistent push towards implementing direct conservation

measures could act as a necessary reminder to effectively uphold the existing care for conservation.

7.5 Debates about large-scale commercial fishing

A part of the fishing picture in the SEA not directly targeted in the survey portion is the large-scale commercial fishing sector, which currently involves one private company who operates 2 to 3 trawlers (90-385 hp), and 10 to 15 pair trawlers (20-40 hp, inboard engine) operated by individual owners. A history of large-scale commercial fishing reaches back to the colonial era in the 1930s when a group of European entrepreneurs began commercial fishing using seines and trawls (Banda 2001; McCracken 1987). In the mid 1960s, a pair trawl fishery was established to target the demersal species in the shallow part of the SEA. The 1970s saw the introduction of stern trawlers for both bottom and mid-water trawling. More recently, the bottom trawling has expanded to deeper water up to 100 m by two boats with 380 hp. After a sustained growth throughout the decades, the yield from the pair trawl fishery has been in general decline since early 1990s producing less than 200 tons in subsequent years 1999 and 2000. The stern bottom trawl fishery has stabilized to yield around 5,600 tons per annum in the second half of the 1990s, while the stern mid-water trawling has produced about 1,000 tons in the same temporal period (Banda 2001).

There is a noticeable geographical distinction observed in the large-scale fishing operation in the SEA. Most large-scale fishing units dock and land on the beaches on the

western side, and more specifically they base their operation out of the beaches located on the south-western end of the waterbody due to a larger human population and the proximity to the main market in Mangochi town. The survey result between the western-side fishers and those found on the eastern side seems to capture this areal difference. First, both gear owners and crew members surveyed on the western shore judged 'fishing using mechanized gear' to be more damaging than the fishers interviewed in the eastern villages (Table 6.1). The ranks and the normalized scores are both higher with the score values of 55 and 52 out of 100 produced by the fishers on the western side compared to 40 and 30 from the fishers found on the eastern shore. This pattern is perhaps more acutely presented in the survey result asking for the reasons of fisheries decline (Figure 6.2). 79% of the fishers on the western shore attributed the fewer amounts of fish in the lake to the overfishing of large-scale commercial units, compared to 59% of the respondents surveyed in the eastern side. The divergence in the opinion as to how they view the large-scale fishing units is probably why 'fishing using mechanized gear' showed such a large degree of statistical difference between the groups according to the Kruskal-Wallis result (Table 6.9).

The existence and operation of large-scale fishing in the SEA is a fairly contentious issue. Animosity towards large-scale fishing units is suspected to arise because they are perceived to compete with the small-scale fishers in many ways. They target the same species of fish and fish of similar size structure (Weyl *et al.* 2005) and also use the same beaches for landing. Moreover, some of the conservation regulations such as closed seasons have not been applied to the large-scale operations allowing them to fish freely

while small-scale fishers are subject to restrictions (GoM 2005). In addition, there have been occurrences of gill nets being destroyed by large boats fishing in the near shore despite the regulation provisions in place that separate the two fleets spatially and temporally (Banda 2001). Pair trawlers' non-compliance with the area restriction by fishing in the shallowest part of the SEA (designated as Area A) is being sighted frequently raising resentment among small-scale fishers (pers. comm. Usen). Hence, small-scale fishers tend to perceive the large-scale units as taking an unfairly large quantity of catch while benefit is accumulated to only a small number of owners and managers of the fishing operation. Perceived unfairness extends into the leniency of fisheries regulations applied towards the large-scale fishing units, which may act to discourage small-scale fishers from abstaining from their own set of illegal fishing.

Is the concern of small-scale fishers on the large-scale fishing partly attributed to envy and bitterness towards someone who is more powerful and prosperous? Are they simply placing blame on 'the other guys' for the problems that they are facing? Either scenario is indeed possible. Or are they genuinely worried about the extent of damage large-scale gear could cause to the ecosystem by disturbing the lake bottom and inflicting non-selectivity? Many of the fishers have clearly expressed this ecologically-based reason as why they feel that large-scale fishing should be discouraged (pers. observation). Whatever the main origin of the sentiment may be, the point is that their concern about the damaging effect of the large-scale fishery should be given sincere consideration in the management of SEA fishery. Numerous studies already point at the potentially hazardous effect of future over-development in the large-scale fishery. Turner *et al.* (1995) advises

against the expansion of trawl fishery in the northern portion of the SEA (i.e. Area B and C) to the levels of exploitation seen to the southern portion (i.e. Area A). Likewise, Weyl *et al.* (2005) leaves two crucial recommendations that renewed investment and increased effort in pair trawl fishery should be avoided in the SEA, and that the pair trawl fishery should not be managed in isolation of the small-scale fishery. In addition, studied in a bigger context that included other major African lakes, the findings of Jul-Larsen *et al.* (2003) warn that the high gear efficiency brought on by investment-driven growth is likely to result in serious bio-ecological problems for the lake. Furthermore, Mathew and Koshy (2008) has summarized a regional workshop discussion on the rights of small-scale fishers in eastern and southern Africa in which Malawi is a part of, and offers a shared caution against heedless management and development of large-scale industrial fishing in recognition of the rights and responsibilities of often marginalized and less powerful small-scale fishers. In this respect, the voice of the fishers reflected in this study adds and complements the rising scientific and managerial recommendations that advocate prudent development of the large-scale fishing operation.

Antagonism towards the large-scale fishery is a normative governance issue that inevitably involves underlying values and principles of governance actors. Given the prevalence of the modernization/development agenda guiding the SEA fisheries in the past, the 'hard choices' often evident in fisheries, such as innovation versus precaution or short-term gain versus long-term benefit, would have likely been resolved in favour of the large-scale fishery. Interactive governance theory urges that such underpinning values driving the policy decisions are to be made explicit so that the diverse views and the

opposing concerns of fishers and fishing communities can be heard and negotiated in a more transparent, legitimate and power-neutral governing environment.

7.6 Other policy suggestions

In the SEA, a pressing issue is the corruption of some traditional leaders who may permit illegal gears to operate in their villages in return for a weekly gift from fishers in the form of money or fish (GoM 2005; Njaya 2007; pers. comm. Masiye). This custom of giving gifts (or *mawe*) to traditional leaders as a token of appreciation and respect has long been in existence. However, when the power is being abused this way, illegal fishing can be condoned, encouraged and even protected, and the conservation principle of fishers naturally breaks down. Such situation would create a socio-political context in which illegal fishing persists and conservation does not prevail. Dealing with this issue is a governance problem. Njaya (2007) has recommended the formulation of clear management plans and by-laws as institutional mechanisms to guard against such malpractices. Furthermore, delving into the normative aspect (i.e. the third-order of governance or meta-governance as per Kooiman *et al.* 2005) would not only be a beneficial, but also an essential exercise, since how one views such subject that is intricately linked with politics and power dynamics is fundamentally value-ridden. In this sense, amid the long-running custom of giving and receiving *mawe* and the enduring village leadership structure, what constitutes a corruption (as opposed to a tradition) is in the eye of the beholder, based on one's biased perception. Some traditional leaders, or even fishers for that matter, may feel that the traditional leaders have the right and

authority to impose certain gifts on fishers, even for the illegal forms of fishing gear, because more value may be put on the preserving cultural traditions rather than complying with the laws of the government. Therefore, in the design and implementation of appropriate institutional measures, governing interactions based on mutual respect, acknowledgment and appreciation of divergent worldviews must be accompanied to set rules that people can together agree on. Also, wide representation and inclusion of all fishing village leaders in the SEA into the discussion of corruption should be encouraged, given the mobility of fishers which allows them to easily fish under different village headship. Overall, raising the accountability and transparency of the governance structure would aid fostering a conservation-friendly environment.

Aside from the fisheries-specific recommendations, policy options that have an implication to a wider society should also be continued to be explored. Fisheries in the SEA have always been closely connected to the events happening in the outside sectors and distant geographic locations. Through an economic and social feedback loop, fisheries and conservation issues are affected by dynamical mechanisms such as an influx of fishers and a sudden rise of demand for fish. Seen in this light, the development of alternative livelihood or income-generating options is a well-recognized strategy that could bring indirect benefits to fisheries conservation by potentially dissipating fishing effort into other sectors. Several initiatives that are currently underway in various stages of development include tourism operation and fish cage culture.

7.7 Integrating the two levels of governability

Conservation measures would be more governable, and therefore more reliable in generating intended outcomes, if the people involved in and affected by those measures (i.e. fishing communities) hold conservation in high esteem or if the system properties characterizing the fisheries are conducive to the realization of conservation goals. In this thesis, these two inquiries were framed as a multi-level endeavour, enabled via the concept of governability. The system-level assessment of the fisheries focusing on the system properties and interactive attributes examined what the inherent and constructed limitations are in the system and how they may influence the occurrence of conservation principle and illegal fishing in the SEA. At the individual-level, an empirical study that quantitatively estimates individual's conservation principle was conducted to build a direct linkage to the governability of the conservation measures. The issue of particular concern here, namely illegal fishing, holds close linkage to conservation, and corresponding to the set up of this research, the prevalence of illegal fishing can be viewed as a dependent variable that is contingent upon how the system is set up and operates as well as an independent variable that is single-handedly controlled by one's robust or inadequate conservation principle.

Both viewpoints of analyzing illegal fishing as the dependent and independent variables have been examined and discussed in this thesis so far with several notable findings that reveal the complexity of the issue (cf. section 5.5 and 6.4). The insights gathered from both perspectives point to the conclusion that dealing with illegal fishing in the SEA

would require multi-thronged approach taking various levels of governability problems into account. It is not reasonable to solely rely on one's internal moral conservation principle to enforce sustainable fishing activities while fishers are struggling to meet their basic living necessities, for example, or when everyone else in the community is openly disregarding conservation ethics. In a similar manner, the conditions of the fisheries and the wider society may be highly conducive to realizing conservation practices afforded by effective governance mechanisms, yet if individuals' value system does not appreciate conservation, illegal fishing may still persist. Hence, this is a two-sided coin – two integrated parts of the same issue.

The next chapter binds the various strands of discussions presented in this chapter to reach a coherent train of thought about dealing with uncertainty of governing outcomes in fisheries and highlight the lessons learned.

Chapter 8 Conclusion

Plate 8.1 Children playing in the vegetated shore area

Plate 8.2 A baobab tree in Kadango and a view towards the lake at dusk

In bringing this study to a close, this chapter summarizes the research findings and provides responses to the research objectives posed in section 1.5. Also, key policy suggestions are reiterated in order to highlight the implications of this study. Next, the central theoretical objective of dealing with uncertainty in governance options, with particular attention to conservation measures, is re-traced reflecting on the theory, study results and discussions presented in this thesis thus far. Answers to the two main research questions are also recapped. Finally, future research needs are discussed to offer a linkage towards future work.

8.1 Revisiting research objectives

1. *To identify aspect(s) of the SEA fishery that are more, or less, governable based on the assessment scheme of governability*

This objective was primarily approached with the use of the governability assessment matrix. Governability is a concept that assesses how governable a certain aspect of fisheries is. High governability implies less demanding system properties[17] observed in a particular system – both the governing system and the system-to-be-governed, while low governability stems from interplay of high system properties. Any particular fisheries will likely be a mix of high and low governability. Identifying the aspect(s) in the fisheries that experience high or low governability would help gauge where and how much of the governing challenges are posed in the system as well as the governing capacity to deal with them. Based on extensive literature review, informal interviews with key informants

[17] Diversity, complexity, dynamics and scale

and field observation, a set of relevant questions were compiled for each assessment criterion, as displayed in Table 4.1. The assessment findings point to several areas that appear to be more governable and less governable in the fisheries system of the SEA. First, focusing on more governable parts, the natural system seen through diversity, complexity and scale exhibits moderate-to-high governability. For the socio-economic system, diversity, dynamics and scale component indicate moderate-to-high governability. Finally, only the dynamics of the governing system is regarded as highly governable. Looking at the less governable features of the SEA fisheries system, the dynamics happening in the natural system and the complexity of the socio-economic system appear to be the overwhelming characteristics leading to a low governability. The governing system on the whole is seen less governable with its system properties showing a high degree of diversity, complexity and scale issues. Lastly, governing interactions also display a low-to-moderate level of governability based on the interactive attributes such as representation/participation, information/communication, and appreciation/collaboration.

Based on the findings of system-level governability, several limitations emerge in the SEA fisheries. The dynamic nature of the natural system involving marked patterns of seasonal winds and rain, high variability in catch trend and rapid evolutionary speciation of *mbuna* cichlids is a force to be reckoned with in terms of its impact on the fisheries productivity and fluctuation in the fisheries sector. This can be appropriately seen as a governing limitation arising from the system-to-be-governed (more specifically, natural system) since what can be realistically affected by the human governing interventions is

likely contained by what is permitted by (or what cooperates with) the natural patterns and non-linear occurrences. For instance, governance measures for fisheries expansion should be planned with the full recognition of the dynamic character of the natural productivity, since it could affect the abundance of fish stocks abruptly and at any time, therefore limiting the success of the governance outcome. Likewise, the high socio-economic complexity observed in fishing communities where various multi-faceted and intricate relationships prevail is another limitation that may restrict the outcome of a community-based fisheries programme. In the governing system, scarcity of financial and human capital is already a well-known limitation that hinders the build-up of governing capacity. From this study, a governance structure involving a wide range of 'governors' at various levels (i.e. high diversity) and tricky relationships and hidden power struggles among them (i.e. high complexity) could also pose as a limitation that could deter the attainment of the desired governance outcomes.

2. *To assess the level of awareness about the damaging impact of fishing activities among stakeholders and deduce about their conservation understanding*

The level of awareness regarding the damaging impact of fishing activities was assessed to be moderately high among the respondent groups. This was inferred from a ranking data produced in the survey. First, the deduction that led to a moderately high level of awareness stems from the significant agreement observed in the groups' responses. The resource-dependent group and the fisheries managers/scientists group have both identified 'fishing in spawning area' as the most damaging one, and similarly 'fishing in offshore

deeper water' was judged to be the least damaging one. In addition, the relative positions of middle-ranged fishing activities featured in the survey were also similar in the groups' responses. Assuming that the managers/scientists are equipped with a high level of conservation knowledge derived from their expertise in fisheries, it is quite plausible to deduce that the similar responses obtained in the resource-dependent group reflect a similar level of understanding. The agreement in the conservation understanding is reaffirmed in the result of the question that asked reasons for the decline of fish stocks. As can be seen in Figure 6.2, both the resource-dependent group and the managers/scientists group have a similar pattern of reasons as to what is contributing to the fewer amount of fish in the SEA. Field observation and informal chats also add to the reasoning that fishers and community members alike are fairly cognizant of issues dealing with fisheries conservation.

Secondly, aside from the rank correlation, examining the ranking of fishing activities itself suggests that a certain level of awareness exists. The top damaging activities judged by the respondent groups in the SEA, such as the harvest of spawning stocks, non-selectivity, disruption of sea- or lake-bottom, and catching juvenile fish are consistent with the general ecological concerns echoed in the fisheries worldwide. Hence, a moderately high degree of conservation understanding among both fishers and managers can be reasonably inferred. This finding has an implication towards how knowledge dissemination and awareness raising should be approached and carried out. The widespread occurrence of illegal fishing, therefore, may not be wholly attributable to the lack or ineffectiveness of the knowledge transfer. Instead, intermittent and weak two-way

interactions between managers and fishing communities centering on conservation preference, attitude and habits may be a larger factor lending to illegal fishing practices. Thus, the collaboration-kind of governing interactions should be given more emphasis to help enable sincere exchanges and appreciation of diverse conservation outlooks among stakeholders. This could be one tangible way of improving the governability of conservation measures in the SEA.

3. To gauge the level of inclination towards conservation among stakeholders

The level of inclination towards conservation shows two divergent patterns in the surveyed groups, although there are some important similarities which must be highlighted. In terms of similarities, both the resource-dependent group and the managers/scientists group have indicated their moderate-to-high preference of the two pro-conservation programmes by placing them in the upper-half of the ranking above other fisheries-related community programmes, which are seen to hold less direct benefits towards conservation (Figure 6.1). This result indicates at least mild, if not medium-to-high, inclination for promoting fisheries conservation. This is especially plausible considering that each survey was normally carried out in an individual and familiar setting away from the crowd from which social/external pressure could originate to influence their responses. In addition, the survey remained voluntary and anonymous. Therefore, the result seems to suggest that both the resource-dependent groups and the managers/scientists group possess certain *care* for conservation. This similarity is, however, met with some divergent responses in the other programmes included in the survey. A major difference lies in the programme to provide loans for expansion of

fishing-related work. While the resource-dependent group unequivocally favoured the provision of the loan, even in a hypothetical sense as presented in the survey, the managers/scientists group regarded this as a considerably less preferred community programme. In addition, the managers/scientists group's mid-range preference towards reducing fish spoilage for fishing communities is contrasted with comparatively very little preference from the resource-dependent group.

Despite the general occurrence of illegal fishing, this study confirms that fishing communities do care about conservation to a moderate degree, particularly when conservation inclination is examined in relative isolation with other influencing factors[18]. Overall, moderate inclination towards conservation observed in the SEA is an encouraging finding that could be used to continue to promote conservation-oriented fisheries programmes in fishing communities. Expressed through the concept of governability, the moderate conservation inclination also implies a reasonable degree of governability towards securing stakeholders' genuine support for the conservation-promoting measures. A problem, however, lies in the sensitive and compassionate bridging of the divergent preferences and motivations that exist in the SEA. Enabling such governing interaction, which carefully integrates various viewpoints, is seen needed to build a momentum and lasting commitment for the conservation measures. This would be an important governability challenge.

[18] such as self-interest and social norm

4. *To identify the level of agreement between various stakeholder groups on the topic of Question 2 and 3*

A significant level of correlation among all respondent groups was observed in the conservation understanding. The level of significance was statistically established by applying the ranking data to a non-parametric test of Kendall *T* rank-correlation coefficient (Table 6.4). This significant agreement allowed the ranking of all groups to be combined into one set using procedures detailed in Dunn-Rankin (1983). The combined ranking is displayed in the damaged schedule (Figure 6.1). The agreed and shared understanding leaves a positive impression on the future governance efforts in the SEA, especially ones relating to conservation. Although there is no guarantee that the stakeholder groups will all agree on the nitty-gritty of the conservation measures or on the future processes involving decision-making, the general consensus on what aspects of conservation should be given more urgent consideration is a good foundation to initiate the processes on. Perhaps this shared understanding can help create a shared vision for the fisheries. Hence, their agreement on what are more, or less, damaging fishing activities suggests that conservation potential exists, which could be harnessed to facilitate an effective rule-formulation and implementation process.

As for the fisheries-related community programmes, some visible differences have already been observed from the damage schedule of conservation inclination (Figure 6.1). The result of the Kendall *T* rank-correlation coefficient confirms the divergence between the resource-dependent groups and the managers/scientists group (Table 6.4), which subsequently produces two sets of rankings, one for the resource-dependent group and the

other for the manager/scientists group as shown in Table 6.5. The governance implication of the obtained result can be explained as follows. The noted differences in preferences must be given adequate recognition and consideration by all parties when improving current conservation measures or devising new initiatives. As a pertinent example, if the demands of the resource-dependent group remain neglected or responded without sincerity, the issue of illegal fishing which negates conservation efforts may persist despite the best intention of the measures that attempt to control illegal fishing activities. Compromising solutions are likely required, which adequately reflect the key concerns and top preferences of the resource-dependent groups found in fishing communities in the SEA.

5. *To explore any plausible linkages that may exist between individual conservation principle and illegal gear use, through the development and application of conservation principle category*

The use of the conservation principle category revealed a relationship between individual conservation principle and a form of illegal fishing (i.e. illegal gear use). Illegal gear use was most commonly found in fishers who exhibit both relatively low conservation understanding and inclination. Contrastingly, fishers who hold higher than the average conservation understanding and inclination were most frequently associated with owning or operating legal gears (Figure 6.6). This relationship suggests that moving from low awareness and inclination to high awareness and inclination, in other words raising the conservation principle in individuals, can offer an alternative governance option in reducing the use of illegal fishing gear in the SEA. This linkage also presents a potential

for improving the governability of conservation measures by offering us a strategic policy avenue to reduce the extent of illegal fishing.

6. *To make policy inferences based on the examination of the conservation principle in regard to addressing the concerns of illegal fishing*

Several policy inferences were made in Chapter 7 to suggest how management initiatives can be devised such that conservation inclination could be better fostered in individuals and awareness-raising mean more than simple transfer of knowledge, but involves instilling of conservation values, attitudes and habits. In the SEA, for the most prevalent scenario of individuals holding relatively high conservation awareness and relatively low inclination, the provision of conservation measures that align with the resource-dependent group's economic/development motivation could be an effective means to raise the level of inclination towards conservation. Such measures could take the form of subsidies, reward schemes or direct payment schemes. In the short term, perhaps the economic incentives offered in such economically-driven conservation activities are the main agent that creates the inclination. However, in the long run, the practice could become habitual and ingrained in individuals' minds to trigger a long-lasting, deeply-rooted inclination, as seen in the case of voluntary recycling studied by Hopper and Nielsen (1991) and Werner *et al.* (1995). Other policy guidelines include awareness-raising which should go beyond a simple one-way knowledge transfer and a sustained focus on management measures that directly advance the protection of the lake ecosystem and fisheries resources. The direct promotion of conservation has reasonable hope for success since the resource-dependent group has already shown certain care for pro-conservation measures in this study as well

as in a recent proceeding of community consultations conducted for the Mangochi district fisheries by-laws formulation (GoM 2005). The continual push would, in a sense, help keep them reminded about conservation. Lastly, availability and accessibility of alternative livelihood and income options is expected to help discourage taking part in the illegal forms of fishing since some fishers would move out of fishing and also desperation for providing basic necessities is likely to be reduced if one has multiple options to derive their living from. However, provision of alternative livelihood strategies is inherently tied to the advances made in outside sectors. Therefore, viable opportunities would have to be sought in connection to the happenings of a wider society.

8.2 Dealing with uncertainty in governance outcomes

Many of the world's fisheries are experiencing difficulties in achieving satisfactory ecological, social and economic outcomes. This thesis has taken a view that the challenges facing fisheries are fundamentally tied to the issue of governance. More specifically, the uncertain nature of governance outcomes, aimed at alleviating some of the challenges, is approached here as a function of governability, taking place at multiple levels. The assumption is that high governability would help a governance measure achieve its desired outcomes in a more reliable fashion, whereas low governability would contribute to making governance outcomes less manageable. Furthermore, this thesis applies the view that any specific issue confounding governance measures, such as illegal fishing, is part of the governability function as both the dependent variable and the independent variable. Conservation measures are of particular concern in this thesis.

Given the general association that illegal fishing negates conservation measures while conservation principle promotes them, illegal fishing and conservation principle were, on one hand, approached as a dependent variable shaped by system characteristics, and in turn affecting the governability of conservation measures, and, on the other hand, framed as an independent variable having a direct linkage to the level of governability of conservation measures in the SEA. These two perspectives were facilitated with a set of complementing methodological tools – the governability assessment at the system-level and the damage schedule at the individual-level.

Governance is, in a systematic sense, composed of the governing system (i.e. subject of governance), the system-to-be-governed (i.e. object of governance) and the governing interactions (i.e. dynamical relationship between the two systems that actually facilitate the governance process). This systematic view allows the fisheries challenges to be considered in an alternative fashion which may shed some new insights on how to effectively manage the difficulties. In this perspective, how the challenges are diagnosed relies on the manner with which the governing system measures itself against the system-to-be-governed. The assumption is that the governing capacity of a particular governing system needs to be suitable enough to be able to match the challenges posed in the fisheries system. Of more crucial importance is, perhaps, not the adequate level of capacity necessarily, but the acknowledgement of the limits in the capacity of the governing system and the limits in the system-to-be-governed as to what can be realistically effectuated by the governing interventions. As a result, the misjudgement of or insufficient regard to the governing capacity and the governing needs and demands

placed in the system-to-be-governed is believed to be a major source or uncertainty in the outcome of governance interventions. Taking the uncertainty in governance outcomes as both the cause and effect of the difficulty of guiding fisheries into the realm of ecological, social and economic viability, mitigating uncertainty in governance outcome in a responsible manner is likely to help lessen the degree of difficulty.

Along with the system perspective, this thesis proposed another inquiry in negotiating the uncertainty in governance outcomes. This second approach, narrower in conceptual scale, concerns whether the intended governance options agree with the social actors who are being steered by the very policy measures. A particular focus is given to conservation measures, which would invariably affect the fishing practices of those who depend on the fisheries resources. For example, if the fishers' underlying values do not align with the tenets of the conservation initiatives, the intended conservation outcome may be met with resistance and therefore not be realized. Hence, inadequate consideration paid to the underlying motives of the involved stakeholders would lower the governability of, and subsequently add to the uncertainty of, governance outcomes. Learning about the resource-dependent group such as fishing community at the individual level can be a valuable addition complementing the system perspective.

The multi-level approach to mitigating the uncertainty and to deliberating how conservation measures can be better delivered with more certainty is proceeded in this thesis by means of two research questions as previously stated in section 1.4.

1. *Where and to what extent do governing capacity and governing challenges exist in the fisheries system of the SEA viewed through the application of the governability assessment framework?*
2. *Can any plausible linkages between individual conservation principle and illegal gear use be uncovered, which would provide empirical support to the view that one's underlying conservation principle has potential to influence one's fishing choice and behaviour?*

First, the governability assessment framework was applied to the fisheries situation in the SEA of Lake Malawi to identify areas that are more, and less, governable. System property in which low governability is observed can be inferred as where the governing needs and demands are most urgent, also indicating where the governing uncertainty and difficulty likely stems from. For instance, the high dynamic nature of the natural system in the SEA, such as seasonal wind patterns, fluctuations in fish stocks and the variations in lake water level, has been noted to play a major role influencing and regulating the environmental aspect of fisheries. Environmental changes subsequently create ramifications for the socio-economic system of the fisheries. Also, the high complexity observed in the socio-economic system in the SEA fishery is a feature in the fisheries that make fisheries governance a challenging endeavour. Both the external circumstances such as income and livelihood concerns, extensive kinship and close-knit community structure, and the individuals' internally-driven normative mechanisms such as one's underlying principles and motivation are factors that warrant a careful handling. Such factors complicate a future direction for governance options in pertinent issues like illegal

fishing, and could create conditions where illegal fishing is incited and conservation principle is neglected. Policy measures must take such intricacies into account when planning for an appropriate policy response.

Next, examining the governing capacity held by the governing system, the governability assessment (Table 5.1) shows that the attributes of the governing system concerning diversity, complexity and scale issues are associated with low governability making the governing system a less straight-forward entity to deal with. This finding calls into question as to how the governing system can effectively respond to the challenges and smooth out the bottlenecks present in the system-to-be-governed (i.e. natural and socio-economic system). A related crucial question would be whether the governing system's current set up and mechanism enables the fostering of adequate governing capacity needed to properly address the given challenges in the fishery. There are two ways to deal with the limitations in governing capacity. First, recognizing the less than satisfactory capacity of the governing system, policy goals should be set in a realistic flavour heeding the limits of what the governing system can realistically offer and also the limits of the system-to-be-governed in their propensity to be positively affected by governing actions. At the same time, raising the governing capacity should garner a sustained focus. At the institutional level, the ongoing AUCC-CIDA project aimed at increasing the capacity of the local fisheries officers and training institutions is an encouraging example. In terms of governance structure, accountability between the various levels of governors in the hierarchical structure must be improved to create a more responsive and responsible governing system.

An inquiry at the system level produces worthy insights, but the difficulty regarding the uncertainty in governing outcomes can be approached from an alternate angle, this time directing the focus to the 'people' level involving various stakeholders in the SEA fishery. The second research question was about a potential relationship between one's underlying principle towards conservation and the practice of illegal fishing, and to address this question, the damage schedule was used as the main method followed by the conservation principle category. Stemming from how the conservation principle was conceptualized made up of two components – awareness of conservation understanding and inclination towards conservation, a paired comparison survey was designed to facilitate the quantitative data collection of the two components. The obtained data was then applied to arithmetic procedures and statistical tests to produce scale values and rankings.

A general level of conservation understanding is shared by both fishers and managers/scientists, who identified spawning area, non-selectivity of gear, disturbing the lake bottom to be the key concerns that threaten the fisheries. Also, certain care for fisheries conservation was noted from the result of the preferred community programmes. The two separate findings were examined in relation to each other to reveal a plausible linkage between the conservation principle and the illegal gear using a simple algorithm and weighting factors devised to facilitate the process. The results uncovered a correlating relationship between the strength of the conservation principle and the usage of illegal gear with a higher degree of the conservation principle being associated with mostly legal

gear users whereas illegal gear users were mostly frequently found having a low degree of the conservation principle. This suggests that if a move from low conservation principle to high conservation principle can be achieved in fishers, it may also produce a shift in the gear use from illegal gears to legal forms. In other words, tapping into one's conservation principle by raising awareness and inclination towards fisheries conservation could contribute to the reduction in illegal gear use providing an alternate policy direction in addressing the illegal fishing issue in the SEA.

As this study attempted, bringing out the internal tendencies of the stakeholders to surface can offer tangible benefits in reducing uncertainty in the outcomes of governance interventions aimed at promoting conservation. Reasonable support for the direct conservation measures can be expected in the SEA, especially those measures that attempt to tackle the most damaging fishing activities judged by the stakeholder groups in this study. This would particularly hold more validity if the conservation measures are sensitive towards other pressing demands of the resource-dependent group such as livelihood concerns and their robust entrepreneurial spirit.

The two complementing governability inquiries, conducted at the system- and the individual-level, to examine the issue of illegal fishing and conservation principle have added to our understanding of the efficacy of conservation measures in the SEA fishery. The system-level assessment of governability has shown that the occurrence and prevalence of illegal fishing can be much dependent on the inherent and constructed characteristics of the fisheries. The capacity and the limitations that exist in the fisheries

system act to promote or weaken the level of compliance as well as the depth of conservation principle in individuals. On the other hand, the individual-level measurement of governability asserts that one's internal resolve about conservation referred to as the conservation principle can have an independent and direct effect in influencing the extent of illegal fishing, and therefore contributing to the efficacy of conservation measures. The two perspectives are two sides of the same coin, each imparting some useful insights about the common set of issues. Examined together, more complete and inclusive information about a fisheries system can be gathered to help lessen the uncertainty associated with governance outcomes, and therefore contributing to resolve some of the difficulties facing the fisheries.

8.3 Future research needs

8.3.1 System-level governability assessment

In closing, several research needs were identified for the system-level analysis. First, the concept of governability is still in the process of constant refinement. Particularly, more deliberations on how governing interactions can enhance governability in a concrete and pragmatic sense and on what role governing interactions precisely play in the conceptual scheme of governability are two areas that require heightened attention. Also, there is a discord within the interactive governance discourse in regard to how directly governability is affected by the intensity of system properties observed in a fisheries system (cf. Bavinck in review). For example, the question that diverges the view is 'does high system property (e.g. high diversity or high complexity) make a system inherently

less governable?' In the essence of this debate is two levels of assessing governability – one at a sub-system level assessing the governability of each sub-system without incorporating the effect of the governing system and governing interactions, the other at an overall system level speaking of governability as a composite value that takes account of interactions among the systems through augmenting, matching or cancelling out of various system properties to arrive at an overall level of governability for the whole system. The latter view on assessing governability, although very useful, however, requires an elaborate scheme of sizing up governabilities of sub-systems in relation to each other to come up with a composite value – surely an arduous conceptual as well as a methodological challenge. As such, the governability concept will be undoubtedly subject to further debates, discussions and theoretical tinkering to solidify its meaning in the coming years.

While governability is being presented with much promise as an alternate perspective to approach the issue of natural resource governance from, and also has garnered much scholarly interest over the years, whether its potential can be translated into usability and viability that connect with practitioners and policy makers in the practical realm remains to be seen. This study was one of the earlier attempts to operationalize the concept. The governability assessment matrix itself requires further refinement, and therefore it would benefit from additional empirical tests and a wider application to various fisheries systems around the world. Despite its crude edges, however, the operationalization of the concept, as done here, has yielded a few insights into the governance of the SEA fishery, which may give those who are interested in the SEA fishery something to mull over.

Although the system-level governability assessment was carried out via extensive literature review, personal interviews and field observation, it must be acknowledged that the findings and the suggestions presented in this paper are solely a result of the deliberation of the author as an independent entity that does not closely take part in the governing of any particular fisheries. The main practical aim of this study was to act as a working template for future studies in governability as much as trying to shed some practical insights on the SEA fishery using this approach. An assessment done and agreed by the various governance participants involved in their own fishery is imagined to hold more impetus in effectuating change. Therefore, such initiative is widely encouraged, and we hope that it will help making fisheries governance a less difficult proposition in the SEA and elsewhere.

8.3.2 Individual-level governability measurement: conservation principle category

The damage schedule has been applied in many studies in various settings over the years, successfully eliciting community preferences and judgment for important environmental concerns such as the severity of resource losses and the impacts of damaging activities. This study utilized the established methodology as a pragmatic governability tool to assess the general level of conservation understanding and conservation inclination of the pertinent stakeholder groups in the SEA, through eliciting their judgment on the damaging impact of fishing activities and community programme preferences. This procedure revealed interesting and valuable insights about stakeholders' internal orientation towards fisheries conservation in the SEA. Several encouraging findings that

are in-line with promotion of conservation were noted among both managers and fishers, which include a moderate high level of conservation awareness and moderate inclination for serving conservation needs. The conservation principle category is an extension of the damage schedule approach devised and fitted to meet the focus of this study. Using the developed algorithm and the weighting factors, the relationship between the conservation principle and illegal fishing ownership/usage was quantitatively inferred.

Several future research needs were identified concerning the individual-level governability measurement. First, sensitivity analysis of the result can help ascertain the robustness of the study. While the sensitivity analysis can be done in various ways, this study has performed one kind of sensitivity analysis by removing the 'loans for fishing expansion' object from the paired comparison data and seeing that the main divergence in community programme preference between the resource-dependent group and the manager/scientists group is indeed explainable (section 6.2.4). More analysis would be beneficial in validating the study results. Secondly, this particular study has focused on the principle aspect in independently looking at the issue of illegal fishing. Although other factors that could potentially have significant influence in the illegal fishing practice, such as self-interest, enforcement and social pressure, were acknowledged and incorporated in the study as part of the system-level governability assessment, they were not given the equal weighting as the principle aspect, as per the study aim. Future research that focuses on and directly examines other factors could generate important insights that may supplement the findings of this analysis. Hence, such research would be worth an investigation. Lastly, the conservation principle category has potential for a

wider application to other fisheries. Whether a similar or congruous result about the conservation principle (i.e. awareness and inclination) will be obtained in other fisheries settings will be an interesting inquiry that would help draw out stronger and widely-applicable implications about one's underlying principle regarding conservation. For example, whether different fisheries varying on the extent of illegal fishing, the level of reliance on the fisheries resources, the type of fisheries (e.g. capture fisheries vs. aquaculture) or the size/scale of the fisheries (e.g. large-scale vs. small-scale) have any bearing on individuals' conservation principle can perhaps be proceeded as a comparative study. In the process, the method and the algorithm would likely see a refinement, and more broadly, the normative aspect involved in fisheries governance will be subject to further attention that it deserves.

References

Agnew, D.J., Pearce, J., Ganapathiraju, P., Peatman, T., Watson, R., Beddington, J.R. and Pitcher, T.J. (2009) Estimating the worldwide extent of illegal fishing. *PLoS One* 4(2):e4570. doi:10.1371/journal.pone.0004570

Agrawal, A. and Gibson, C.C. (1999) Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* **27**, 629-649.

Akers, R.L. (1985) *Deviant Behavior: A Social Learning Approach*, 3rd edn. Wadsworth, Belmont, CA.

Allan, J.D., Abell, R., Hogan, Z., Revenga, C., Taylor, B.W., Welcomme, R.L. and Winemiller, K. (2005) Overfishing of inland waters. *BioScience* **55**, 1041-1051.

Allison, E.H. and Mvula, P. (2002) *Fishing Livelihoods and Fisheries Management in Malawi*. Overseas Development Group, LADDER Working Paper, No. 22. University of East Anglia. 32 pp. Available at: http://www.uea.ac.uk/polopoly_fs/1.1004!wp22.pdf. Accessed January 2009.

Allison, E.H. and Seeley, J.A. (2004) HIV and AIDS among fisherfolks: a threat to 'responsible fisheries'? *Fish and Fisheries* **5**, 215-234.

Allison, E.H., Mvula, P.M., and Ellis, F. (2002) Conflicting agendas in the development and management of fisheries on Lake Malawi. In: *Africa's Inland Fisheries: The Management Challenge* (eds K. Geheb and M.-T.Sarch). Fountain Publishers, Kampala, pp. 49-73.

Allison, E.H., Ellis, F., Mvula, P.M. and Mathieu, L.F. (2001) Fisheries management and uncertainty: the causes and consequences of variability in inland fisheries in Africa, with special reference to Malawi. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 66-79.

Allison, G.W., Lubchenco, J. and Carr, M.H. (1998) Marine reserves are necessary but not sufficient for marine conservation. *Ecological Applications* **8** Supplement, S79-S92.

Annala, J. (2007) Review of the book *Fish for Life: Interactive Governance for Fisheries*. *Fish and Fisheries* **8**, 164-165.

Armitage, D., Berkes, F. and Doubleday, N. (2007) *Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance*. UBC Press, Vancouver.

Aronfreed, J. (1968) *Conduct and Conscience*. Academic Press, New York, NY.

Axinn, W.G. and Pearce, L.D. (2006) *Mixed Method Data Collection Strategies*. Cambridge University Press, Cambridge.

Bailey, C. and Jentoft, S. (1990) Hard choices in fisheries development. *Marine Policy* **14**, 333-344.

Banda, M. (2001) The state of the large-scale commercial fisheries on Lake Malawi. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 163-172.

Banda, M., Tomasson, T. and Tweddle, D. (1996) Assessment of the deep water trawl fisheries of the South East Arm of Lake Malawi using exploratory surveys and commercial catch data. In: *Stock Assessment in Inland Fisheries* (ed I.G. Cowx). Fishing News Books, Oxford, pp. 53-75.

Banda, M. C., Kanyeree, G. Z., Rusuwa, B. B. (2005a) The status of the chambo in Malawi: fisheries and biology. In: *The Chambo Restoration Strategic Plan.* (Proceedings of the national workshop, Mangochi, Malawi, 13-16 May 2003). (eds M. Banda, D. Jamu, F. Njaya, M. Makuwila and A. Maluwa). WorldFish Center Conference Proceedings 71. WorldFish Center, Penang, Malaysia, pp. 1-7.

Banda, M., Jamu, D., Njaya, F., Makuwila, M. and Maluwa, A. (eds) (2005b) *The Chambo Restoration Strategic Plan.* (Proceedings of the national workshop, Mangochi, Malawi, 13-16 May 2003). WorldFish Center Conference Proceedings 71. WorldFish Center, Penang, Malaysia.

Banda, M.C., Manase, M.M., Kanyerere, G.Z., Nyasulu, T.E., Sungani, H.H., Mwakiyongo, K. and Ngochera, M.J. *et al.* (2006) *Annual Frame Survey September 2005*. Department of Fisheries, Government of Malawi. Government Printer, Lilongwe, Malawi, 78 pp.

Bavinck, M. Slippery as fish: how variations in capture fisheries affect opportunities for governance. *Fish and Fisheries* (in review).

Bavinck, M. and Salagrama, V. (2008) Assessing the governability of capture fisheries in the Bay of Bengal – a conceptual enquiry. *The Journal of Transdisciplinary Environmental Studies* **7**, issue 1, article 5.

Bavinck, M., Chuenpagdee, R., Diallo, M., van der Heijden, P., Kooiman, J., Mahon, R. and Williams, S. (2005) *Interactive Fisheries Governance: A Guide to Better Practice*. Eburon, Delft.

Becker, G.S. (1968) Crime and punishment: an economic approach. *Journal of Political Economy* **76**, 169-217.

Béné, C. and Neiland, A.E. (2006) From participation to governance: a critical review of the concepts of governance, co-management and participation, and their implementation in small-scale inland fisheries in developing countries. *WorldFish Center Studies and Reviews 29.* The WorldFish Center, Penang, Malaysia and the CGIAR Challenge Program on Water and Food, Colombo, Sri Lanka, 72 pp.

Béné, C. and Merten, S. (2008) Women and fish-for-sex: transactional sex, HIV/AIDS and gender in African Fisheries. *World Development* **5**, 875-899.

Béné, C. and Friend, R.M. (2009) Water, poverty and inland fisheries: lessons from African and Asia. *Water International* **34**, 47-61.

Berg, B.L. (2004) *Qualitative Research Methods*, 5th edn. Pearson Education, Boston.

Blaikie, P. (2006) Is small really beautiful? Community-based natural resource management in Malawi and Botswana. *World Development* **34**, 1942-1957.

Bootsma, H.A. (1993) *Algal dynamics in an African Great Lake, and their relation to hydrographic and meteteorological conditions*. PhD thesis, University of Manitoba, 311 pp.

Bootsma, H.A. and Hecky, R.E. (1993) Conservation of the African Great Lakes: a limnological perspective. *Conservation Biology* **7**, 644-656.

Bose, S. and Crees-Morris, A. (2009) Stakeholder's views on fisheries compliance: an Australian case study. *Marine Policy* **33**, 248-253.

Bradshaw, G.A. and Borchers, J.G. (2000) Uncertainty as information: narrowing the science-policy gap. *Ecology and Society* **4**, issue 1, article 7.

Bundy, A., Chuenpagdee, R., Jentoft, S. and Mahon, R. (2008) If science is not the answer, what is? an alternative governance model for the world's fisheries. *Frontiers in Ecology and the Environment* **6**, 152-155.

Bulirani, A. (2005) Observations on the factors behind the decline of the chambo in Lake Malawi and Lake Malombe. In: *The Chambo Restoration Strategic Plan.* (Proceedings of the national workshop, Mangochi, Malawi, 13-16 May 2003). (eds M. Banda, D. Jamu, F. Njaya, M. Makuwila and A. Maluwa). WorldFish Center Conference Proceedings 71. WorldFish Center, Penang, Malaysia, pp. 8-11.

Castro, R., Tattenbach, F., Gamez, L. and Olson, N. (2000) The Costa Rican experience with market instruments to mitigate climate change and conserve biodiversity. *Environmental Monitoring and Assessment* **61**, 75-92.

Charles, A.T. (1992) Fishery conflicts: a unified framework. *Marine Policy* **16**, 379-393.

Charles, A. and Wilson, L. (2009) Human dimensions of marine protected areas. *ICES Journal of Marine Science* **66**, 6-15.

Charles, A.T., Mazany, R.L. and Cross, M.L. (1999) The economics of illegal fishing: a behavioural model. *Marine Resource Economics* **14**, 95-110.

Chirwa, W.C. (1996) Fishing rights, ecology and conservation along southern Lake Malawi, 1920-1964. *African Affairs* **95**, 351-377.

Chisale, E. (2006) *Dwindling fish stocks in Lake Malawi and Lake Malombe: effect of environment or artisanal exploitation?* MSc thesis, University of Bergen, 58 pp.

Chuenpagdee, R. (1998) *Damage Schedules for Thai Coastal Areas: An Alternative Approach to Assessing Environmental Values*. EEPSEA Research Report Series, August 1998. Economy and Environment Program for Southeast Asia, Singapore.

Chuenpagdee, R. and Jentoft, S. (2007) Step-zero for fisheries co-management: what precedes implementation. *Marine Policy* **31**, 657-668.

Chuenpagdee, R. and Jentoft, S. (2009) Governance assessment for fisheries and coastal systems: a reality check. *Human Ecology* **37**, 109-120.

Chuenpagdee, R., Knetsch, J.L. and Brown, T.C. (2001) Coastal management using public judgments, importance scales, and predetermined schedule. *Coastal Management* **29**, 253-270.

Chuenpagdee, R., Fraga, J. and Euán-Avila, J.I. (2002) Community perspectives toward a marine reserve: a case study of San Felipe, Yucatán, México. *Coastal Management* **30**, 183-191.

Chuenpagdee, R., Morgan, L.E., Maxwell, S.M., Norse, E.A. and Pauly, D. (2003) Shifting gears: assessing collateral impacts of fishing methods in US waters. *Frontiers in Ecology and the Environment* **1**, 517-524.

Chuenpagdee, R., Kooiman, J. and Pullin, R.S.V. (2008) Assessing governability in capture fisheries, aquaculture and coastal zones. *Journal of Transdisciplinary Environmental Studies* **7**, issue 1, article 3.

Cochrane, K.L. (2000) Reconciling sustainability, economic efficiency and equity in fisheries: the one that got away? *Fish and Fisheries* **1**, 3-21.

Costanza, R., Andrade, F., Antunes, P., van den Belt, M., Boersma, D., Boesch, D.F. and Catarino, F. *et al.* (1998) Principles for sustainable governance of the oceans. *Science* **281**, 198-199.

Crawford, B.R., Siahainenia, A., Rotinsulu, C. and Sukmara, A. (2004) Compliance and enforcement community-based coastal resource management regulations in North Sulawesi, Indonesia. *Coastal Management* **32**, 39-50.

Creswell, J.W. and Plano Clark, V.L. (2007) *Designing and Conducting Mixed Methods Research*. Sage Publications, Thousand Oaks, California.

Colby, A. and Kohlberg, L. (1987) *The Measurement of Moral Judgment: Theoretical Foundations and Research Validations*, Volume 1. Cambridge University Press, Cambridge.

Crowder, L.B. and Murawski, S.A. (1998) Fisheries bycatch: implications for management. *Fisheries* **23**, issue 6, 8-17.

Crul, R.C.M. (1997) *Limnology and Hydrology of Lake Tanganyika and Malawi*. UNESCO Publishing, Paris.

Cumming, G.S., Cumming, D.H.M. and Redman, C.L. (2006) Scale mismatches in social-ecological systems: causes, consequences, and solutions. *Ecology and Society* **11**, issue 1, article14.

Darwall, W.R.T. and Allison, E.H. (2002) Monitoring, assessing, and managing fish stocks in Lake Malawi/Nyassa: current approaches and future possibilities. *Aquatic Ecosystem Health & Management Society* **5**, 293-305.

David, H.A. (1988) The *Method of Paired Comparions*. Charles Griffin & Company, London.

Degnbol, P., Gislason, H., Hanna, S., Jentoft, S., Nielsen, J.R., Sverdrup-Jensen, S. and Wilson, D.C. (2006) Painting the floor with a hammer: Technical fixes in fisheries management. *Marine Policy* **30,** 534-543.

DeWalt, K.M. and DeWalt, B.R. (2002) *Participant Observation: A Guide for Fieldworkers*. Altamira Press, Walnut Creek, California.

Dietz, T., Ostrom, E. and Stern, P.C. (2003) The struggle to govern the commons. *Science* **302,** 1907-1912.

Donda, S. (2005) A review of chambo fisheries management strategies. In: *The Chambo Restoration Strategic Plan.* (Proceedings of the national workshop, Mangochi, Malawi, 13-16 May 2003). (eds M. Banda, D. Jamu, F. Njaya, M. Makuwila and A. Maluwa). WorldFish Center Conference Proceedings 71. WorldFish Center, Penang, Malaysia, pp. 21-29.

Dunn-Rankin, P. (1983) *Scaling Methods.* Erlbaum, Hillsdale, NJ.

Edinger, E., Baker, K., Devillers, R. and Wareham, V. (2007) *Coldwater corals off Newfoundland and Labrador: distribution and fisheries impacts*. WWF-Canada, Toronto, 41 pp.

Elm, D.R. and Weber, J. (1994) Measuring moral judgment: the Moral Judgment Interview or the Defining Issues Test? *Journal of Business Ethics* **13,** 341-355.

Elster, J. (1990) Selfishness and altruism. In: *Beyond Self-Interest* (ed J.J. Mansbridge) The University of Chicago Press, Chicago and London, pp. 44-52.

Essington, T.E., Beaudreau, A.H. and Wiedenmann, J. (2006) Fishing through marine food webs. *Proceedings of the National Academy of Sciences of the USA* **103,** 3171-3175.

Etzioni, A. (1988) *The Moral Dimension: Toward a New Economics*. The Free Press, New York.

FAO. (1993) *Fisheries Management in South-east Lake Malawi, the Upper Shire River and Lake Malombe with Particular Reference to Chambo (Oreochromis spp.)*. CIFA Technical Paper, No. 21. Food and Agriculture Organization, Rome, 113 pp.

FAO. (1995) *Code of Conduct for Responsible Fisheries*. Food and Agriculture Organization, Rome.

FAO. (2001) *International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing*. Food and Agriculture Organization, Rome, 24 pp.

FAO. (2005) *Ethical Issues in Fisheries*. FAO Ethics Series 4. Food and Agriculture Organization, Rome, 31 pp.

FAO. (2007) *The State of World Fisheries and Aquaculture 2006*. FAO Fisheries and Aquaculture Department, Food and Agriculture Organization, Rome, 162 pp.

Ferraro, P.J. (2001) Global habitat protection: limitations of development interventions and a role for conservation performance payments. *Conservation Biology* **15,** 990-1000.

Ferraro, P.J. and Simpson, R.D. (2002) The cost-effectiveness of conservation payments. *Land Economics* **78,** 339-353.

Flewwelling, P., Cullinan, C., Balton, D., Sautter, R.P. and Reynolds, J.E. (2002) *Recent trends in monitoring, control and surveillance systems for capture fisheries.* FAO Fisheries Technical Paper, No. 415. FAO, Rome, 200 pp.

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C.S. and Walker B. (2002) Resilience and sustainable development: building adaptive capacity in a world of transformations. *Ambio: A Journal of the Human Environment* **31,** 437-440.

Froese, R. and Pauly, D. (eds) (2009) FishBase, version (04/2009). World Wide Web electronic publication. Available at: hppt://www.fishbase.org. (accessed 04/04/09).

Fuller, S.D., Picco, C., Ford, J., Tsao, C.-F., Morgan, L.E., Hangaard, D. and Chuenpagdee, R. (2008) *How we fish matters: addressing the ecological impacts of Canadian fishing gear.* Ecology Action Centre, Living Oceans Society, and Marine Conservation Biology Institute, Delta, British Columbia, 25 pp.

Furlong, W.J. (1991) The deterrent effect of regulatory enforcement in the fishery. *Land Economics* **67**, 116-129.

Genner, M.J. and Turner, G.F. (2005) The mbuna cichlids of Lake Malawi: a model for rapid speciation and adaptive radiation. *Fish and Fisheries* **6,** 1-34.

Genner, M.J., Seehausen, O., Cleary, D.F.R., Knight, M.E., Michel, E. and Turner, G.F. (2004) How does the taxonomic status of allopatric populations influence species richness within African cichlid fish assemblages? *Journal of Biogeography* **31,** 93-102.

Gezelius, S.S. (2004) Food, money and morals: compliance among natural resource harvesters. *Human Ecology* **32,** 615-634.

GoM (Government of Malawi) (1997) Fisheries Conservation and Management Act 1997. Government Printer, Lilongwe, Malawi, 38 pp.

GoM (Government of Malawi) (1998) Local Government Act No. 42 of 1998. Government Printer, Lilongwe, Malawi.

GoM (Government of Malawi) (2000) Fisheries Conservation and Management Regulations. Government Printer, Lilongwe, Malawi, 58 pp.

GoM (Government of Malawi) (2001) National Fisheries and Aquaculture Policy. Government Printer, Lilongwe, Malawi, 23 pp.

GoM (Government of Malawi) (2005) Mangochi District Assembly Fisheries By-law Formulation. Draft workshop Proceedings Report, Department of Fisheries. Government Printer, Mangochi, Malawi, 65 pp.

GoM (Government of Malawi) (2007) Fisheries HIV and AIDS Strategy 2007-2011. Department of Fisheries. Government Printer, Zomba, Malawi, 32 pp.

GoM (Government of Malawi) (2009) The Government of Malawi, Lilongwe, Malawi. Available at: http://www.malawi.gov.mw. (accessed 01/09/08).

Goodin, R.E. (1980) Making moral incentives pay. *Policy Sciences* **12**, 131-145.

Habermas, J. (1990) *Moral Consciousness and Communicative Action*. Polity Press, Cambridge.

Habermas, J. (1996) *Between Facts and Norms*. MIT Press, Cambridge.

Hall, M.O., Durako, M.J., Fourqurean, J.W. and Zieman, J.C. (1999) Decadal changes in seagrass distribution and abundance in Florida Bay. *Estuaries* **22**, 445-459.

Hall-Spencer, J., Allain, V. and Fossa, J.H. (2002) Trawling damage to Northeast Atlantic ancient coral reefs. *Proceedings of the Royal Society B* **269**, 507-511.

Hara, M.M. (2001) *Could Co-management Provide a Solution to the Problem of Artisanal Fisheries Management on the Southeast Arm of Lake Malawi?* PhD thesis, University of Western Cape, 413 pp.

Hara, M.M. (2006) Restoring the chambo in Southern Malawi: learning from the past or re-inventing the wheel? *Aquatic Ecosystem Health and Management* **9**, 419-432.

Hara, M.M. (2008) Dilemmas of democratic decentralisation in Mangochi district, Malawi: interest and mistrust in fisheries management. *Conservation and Society* **6**, 74-86.

Hara, M., Donda, S. and Njaya, F.J. (2002) Lessons from Malawi's experience with fisheries co-management initiatives. In: *Africa's Inland Fisheries: The Management Challenge* (eds K. Geheb and M.-T. Sarch). Fountain Publishers, Kampala, pp. 31-48.

Hatcher, A. Jaffry, S., Thébaud, O. and Bennett, E. (2000) Normative and social influences affecting compliance with fishery regulations. *Land Economics* **76**, 448-461.

Hauck, M. and Kroese, M. (2006) Fisheries compliance in South Africa: a decade of challenges and reform 1994-2004. *Marine Policy* **30**, 74-83.

Hilborn, R. (2007) Moving to sustainability by learning from successful fisheries. *Ambio* **36**, 296-303

Hilborn, R., Branch, T.A., Ernst, B., Magnusson, A., Minte-Vera, C.V., Scheuerell, M.D. and Valero, J.L. (2003) State of the world's fisheries. *Annual Review of Environment and Resources* **28**, 359-399.

Hønneland, G. (1999) A model of compliance in fisheries: theoretical foundations and practical application. *Ocean & Coastal Management* **42**, 699-716.

Hønneland, G. (2000) Compliance in the Barents Sea fisheries. How fishermen account for conformity with rules. *Marine Policy* **24**, 11-19.

Hopper, J.R. and Nielsen, J.M. (1991) Recycling as altruistic behaviour: normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior* **23**, 195-220.

Hughes, T.P. (1994) Catastrophes, phase shifts, and large-scale degradation of a Caribbean coral reef. *Science* **265**, 1547-1551.

Irvine, K. and Waya, R. (1999) Spatial and temporal patterns of zooplankton standing biomass and production in Lake Malawi. *Hydrobiologia* **407**, 191-205.

Jackson, J.B.C., Kirby, M.X., Berger, W.H., Bjorndal, K.A., Botsford, L.W., Bourque, B.J. and Bradbury, R.H. *et al.* (2001) Historical overfishing and the recent collapse of coastal ecosystems. *Science* **293**, 629-638.

Jentoft, S. (1989) Fisheries co-management: delegating government responsibility to fishermen's organizations. *Marine Policy* **13**, 137-154.

Jentoft, S. (2000) Legitimacy and disappointment in fisheries management. *Marine Policy* **24**, 141-148

Jentoft, S. (2007) In the power of power: the underestimated aspect of fisheries and coastal management. *Human Organization* **66**, 426-437.

Jentoft, S. (2007) Limits of governability: institutional implications for fisheries and coastal governance. *Marine Policy* **31**, 360-370.

Jentoft, S. and McCay, B.J. (1995) User participation in fisheries management: lessons drawn from international experiences. *Marine Policy* **19**, 227-246.

Jentoft, S. and Chuenpagdee, R. (2009) Fisheries and coastal governance as a wicked problem. *Marine Policy* (in press).

Jentoft, S., van Son, T.C. and Bjorkan, M. (2007) Marine protected areas: a governance system analysis. *Human Ecology* **35**, 611-622.

Jorgensen, D.L. (1989) *Participant Observation: A Methodology for Human Studies*. Applied Social Research Methods Series, Volume 15. Sage Publications, London.

Jul-Larsen, E., Kolding, J., Overå, R., Nielsen, J.R. and van Zwieten, P.A.M. (2003) *Management, Co-management, or No Management?: Major Dilemmas in Southern African Freshwater Fisheries.1. Synthesis Report*. FAO Fisheries Technical Paper, No. 426/1. Food and Agricultural Organization, Rome, 127 pp.

Kjær, A.M. (2004): *Governance*. Polity Press: Cambridge.

Kanyerere, G. Z. (2000) *Spatial and temporal distribution of some commercially important fish species in the Southeast and Southwest Arms of Lake Malawi: a geostatistical analysis*. BSc thesis, Rhodes University, 30 pp.

Kasulo, V. and Perrings, C. (2006) Fishing down the value chain: biodiversity and access regimes in freshwater fisheries – the case of Malawi. *Ecological Economics* **59**, 106-114.

Kaufman, L. (1992) Catastrophic changes in species-rich freshwater ecosystems. BioScience **42**, 846-858.

Kendall, M.G. (1970) *Rank Correlation Methods*, 4th edn. Griffin, London.

Kinzig, A. and Starrett, D. *et al.* (2003) Coping with uncertainty: a call for a new science-policy forum. *Ambio: A Journal of the Human Environment* **32**, 330-335.

Kohlberg, L. (1958) *The development of modes of moral thinking and choice in the years 10 to 16*. PhD thesis, University of Chicago.

Kohlberg, L. (1969) Stage and sequence: the cognitive-development approach to socialization. In: *Handbook of Socialization Theory and Research* (ed. D.A. Goslin). Rand McNally, New York, NY.

Konings, A. (1990) *Cichlids and All Other Fishes of Lake Malawi*. Tropical Fish Hobbyist Publications, Nepture, New Jersey.

Kooiman, J. (1993) *Modern Governance: New Government-Society Interactions*. Sage Publications, London.

Kooiman, J. (2003) *Governing as Governance*. Sage Publications, London.

Kooiman, J. (2008) Exploring the concept of governability. *Journal of Comparative Policy Analysis* **10**, 171-190.

Kooiman, J. and Chuenpagdee, R. (2005) Governance and governability. In: *Fish for Life: Interactive Governance for Fisheries* (eds J. Kooiman, M. Bavinck and R.S.V. Pullin). Amsterdam University Press, Amsterdam, pp. 325-350.

Kooiman, J. and Jentoft, S. (2005) Hard choices and values. In: *Fish for Life: Interactive Governance for Fisheries* (eds J. Kooiman, M. Bavinck and R.S.V. Pullin). Amsterdam University Press, Amsterdam, pp. 285-299.

Kooiman, J., Jentoft, S. (2009) Meta governance: values, norms and principles, and the making of hard choices. *Public Administration* (in press).

Kooiman, J., Bavinck, M., Jentoft, S. and Pullin, R.S.V. (eds) (2005a): *Fish for Life: Interactive Governance for Fisheries*. Amsterdam University Press, Amsterdam.

Kooiman, J., Jentoft, S., Bavinck, M., Chuenpagdee, R. and Sumaila, U.R. (2005b) Meta-principles. In: *Fish for Life: Interactive Governance for Fisheries* (eds J. Kooiman, M. Bavinck and R.S.V. Pullin). Amsterdam University Press, Amsterdam, pp. 265-283.

Kuperan, K. and Sutinen, J.G. (1998) Blue water crime: deterrence, legitimacy, and compliance in fisheries. *Law & Society Review* **32**, 309-338.

Le Quesne, W.J.F. (2009) Are flawed MPAs any good or just a new way of making old mistakes? *ICES Journal of Marine Science* **66**, 132-136.

Levine, F.J. and Tapp, J.L. (1977) The dialectic of legal socialization in community and school. In: *Law, Justice and the Individual in Society: Psychological and Legal Issues* (eds J.L. Tapp and F.J. Levine). Holt, Rinehart & Winston, New York, NY.

Lind, G. (1989) Measuring moral judgment: a review of 'The measurement of moral judgment' by Ann Colby and Lawrence Kohlberg. *Human Development* **32**, 388-397.

Lowe, R.H. (1952) Report on the tilapia and other fish and fisheries of Lake Nyasa 1945–47. Colonial Office Fishery Publications Vol. No.2. Colonial Office, London.

Lowe-McConnell, R.H. (1993) Fish faunas of the African Great Lakes: origins, diversity, and vulnerability. *Conservation Biology* **7**, 634-643.

Ludwig, D., Hilborn, R. and Walters, C. (1993) Uncertainty, resource exploitation, and conservation: lessons from history. *Science* **260**, 17-36.

Mahon, R. (2008) Assessing governability of fisheries using the interactive governance approach: preliminary examples from the Caribbean. *The Journal of Transdisciplinary Environmental Studies* **7**, issue 1, article 4.

Mahon, R., McConney, P. and Roy, R.N. (2008) Governing fisheries as complex adaptive systems. *Marine Policy* **32**, 104-112.

Manase, M.M. (2001) The nkacha fishery in Lake Malombe and the southeast arm of Lake Malawi. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 156-162.

Mangel, M., Talbot, L.M., Meffe, G.K., Agardy, M.T., Alverson, D.L., Barlow, J. and Botkin, D.B. *et al.* (1996) Principles for the conservation of wild living resources. *Ecological Applications* **6**, 338-362.

Manríquez, P.H. and Castilla, J.C. (2001) Significance of marine protected areas in central Chile and seeding grounds for the gastropod *Concholepas concholepas*. *Marine Ecology Progress Series* **215**, 201-211.

Mansbridge, J.J. (ed) (1990) *Beyond Self-Interest*. The University of Chicago Press, Chicago and London.

Mathew, S. and Koshy, N. (2008) Flagging rights, realizing responsibilities. *Samudra, Triannual Report of International Collective in Support of Fishworkers* **50**, 4-12.

McClanahan, T.R. and Mangi, S.C. (2004) Gear-based management of a tropical artisanal fishery based on species selectivity and capture size. *Fisheries Management and Ecology* **11**, 51-60.

McCracken, J. (1987) Fishing and the colonial economy: the case of Malawi. *The Journal of African History* **28**, 413-429.

McGoodwin, J.R. (2007) Review of the books *Fish for Life: Interactive Governance for Fisheries and Interactive Fisheries* and *Interactive Fisheries Governance: A Guide to Better Practice. Ocean and Coastal Management* **50**, 590-596.

Milazzo, M.J. (1998) *Subsidies in world fisheries: a re-examination*. World Bank Technical Paper, No. 406. World Bank, Washington DC.

Munthali, S.M. (1997) Dwindling food-fish species and fishers' preference: problems of conserving Lake Malawi's biodiversity. *Biodiversity and Conservation* **6**, 253-261.

Murawski, S.A., Brown, R., Lai, H.-L., Rago, P.J. and Hendrickson, L. (2000) Large-scale closed areas as a fishery-management tool in temperate marine systems: the Georges Bank experience. *Bulletin of Marine Science* **66**, 775-798.

Myers, R.A. and Worm, B. (2003) Rapid worldwide depletion of predatory fish communities. *Nature* **423**, 280-283.

Ngatunga, B.P. (2001) The need to maintain maximum biodiversity in Lake Nyasa. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 27-30.

Ngochera, M.J.R. (2001) Status of small scale fishery in Malawi. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 95-104.

Nielsen, J.R. (2003) An analytical framework for studying: compliance and legitimacy in fisheries management. *Marine Policy* **27**, 425-432.

Nielsen, J.R., Degnbol, P., Viswanathan, K.K., Ahmed, M., Hara, M. and Abdullah, N.M.R. (2004) Fisheries co-managment – an institutional innovation? Lessons from South East Asia and Southern Africa. *Marine Policy* **28**, 151-160.

Nielsen, J.R. and Mathiesen, C. (2003) Important factors influencing rule compliance in fisheries lessons from Denmark. *Marine Policy* **27**, 409-416.

Nixon, S.W. (1995) Coastal marine eutrophication: a definition, social causes, and future concerns. *Ophelia* **41**, 199-219.

Njaya, F.J. (2002) Fisheries co-management in Malawi: implementation arrangements for Lakes Malombe, Chilwa and Chiuta. In: *Africa's Inland Fisheries: The Management Challenge* (eds K. Geheb and M.-T. Sarch). Fountain Publishers, Kampala, pp. 9-30.

Njaya, F. (2007) Governance challenges for the implementations of fisheries co-management: experiences from Malawi. *International Journal of the Commons* **1**, 137-153.

Njaya, F. (2008) Participatory Fisheries Management revisited. *Samudra, Triannual Report of International Collective in Support of Fishworkers* **49**, 29-34.

OECD (Organisation for Economic Co-operation and Development) (2007) *Globalisation and Fisheries: Proceedings of an OECD-FAO Workshop.* (Proceedings of the workshop on the challenges and opportunities of fisheries globalisation, Paris, 16-17 April 2007). OECD, Paris, 345 pp.

Ogutu-Ohwayo, R. and Balirwa, J.S. (2006) Management challenges of freshwater fisheries in Africa. *Lakes & Reservoir: Research and Management* **11**, 215-226.

Ommer, R.E. and the *Coasts Under Stress* research project team. (2007) *Coasts Under Stress: Restructuring and Social-ecological Health.* McGill-Queen's University Press, Montreal.

Páez-Osuna, F. (2001) The environmental impact of shrimp aquaculture: causes, effects and mitigating alternatives. *Environmental Management* **28**, 131-140.

Pandolfi, J.M., Bradbury, R.H., Sala, E., Hughes, T.P., Bjorndal, K.A., Cooke, R.G. and McArdle, D. *et al.* (2003) Global trajectories of the long-term decline of coral reef ecosystems. *Science* **301**, 955-958.

Pauly, D. (1997) Small-scale fisheries in the tropics: marginality, marginalization, and some implications for fisheries management. In: *Global Trends: Fisheries Management* (eds E.K. Pikitich, D.D. Huppert and M. Sissenwine). American Fisheries Society 20, Bethesda, MD, pp. 40–49.

Pauly, D., Christensen, V., Dalsgaard, J., Froese, R. and Torres Jr., F. (1998) Fishing down marine food webs. *Science* **279**, 860-863.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila U.R., Walters, C.J. and Watson, R. *et al.* (2002) Towards sustainability in world fisheries. *Nature* **418**, 689-695.

Peterson, G.L. and Brown, T.C. (1998) Economic valuation by the method of paired comparison, with emphasis on tests of the transitivity axiom. *Land Economics* **74**, 240-261.

Phiri, P.M, Day, R.K., Chimatiro, S., Hill, M.P., Cock, M.J.W., Hill, M.G. and Nyando, E. (2001) Progress with biological control of water hyacinth in Malawi. In: *Biological and Integrated Control of Water Hyacinth, Eichhornia crassipes.* (Proceedings of the Second meeting of the global working group for the biological and integrated control of water hyacinth, Beijing, China, 9-12 October 2000). (eds M.H. Julien, M.P. Hill, T.D. Center and D. Jianqing). ACIAR Proceedings 102. Australian Centre for International Agricultural Research, Canberra, pp. 47-52.

Post, D.M., Doyle, M.W., Sabo, J.L. and Finlay, J.C. (2007) The problem of boundaries in defining ecosystems: a potential landmine for uniting geomorphology and ecology. *Geomorphology* **89**, 111-126.

PressCorp. (2009) Maldeco aquaculture. Available at: http://www.presscorp.com/index.php?module=htmlpages&func=display&pid=14. (accessed 05/05/09).

Primavera, J.H. (1997) Socio-economic impacts of shrimp culture. *Aquaculture Research* **28**, 815-827.

Quah, E., Choa, E. and Tan, K.C. (2006) Use of damage schedules in environmental valuation: the case of urban Singapore. *Applied Economics* **38**, 1501-1512.

Reaka-Kudla, M.L. (1997) The global biodiversity of coral reefs: a comparison with rain forests. In: *Biodiversity II: Understanding and Protecting Our Biological Resources* (eds M.L. Reaka-Kudla, D.E. Wilson and E.O. Wilson). Joseph Henry Press, Washington D. C., pp. 83-108.

Rest, J.R. (1979) *Development in Judging Moral Issues*. University of Minnesota Press, Minneapolis.

Rhodes, R.A.W. (1996) The new governance: governing without government. *Political Studies* **XLIV**, 652-667.

Rittel, H.W.J. and Webber, M.M. (1968) Dilemmas in a general theory of planning. *Policy Sciences* **4**, 155-169.

Roberts, C.M. (2002) Deep impact: the rising toll of fishing in the deep sea. *Trends in Ecology and Evolution* **17**, 242-245.

Rohde, K. (1998) Latitudinal gradients in species diversity. Area matters, but how much? *Oikos* **82**, 184-190.

Rudd, M.A. (2001) The non-extractive economic value of spiny lobster, *Panulirus argus*, in the Turks and Caicos Islands. *Environmental Conservation* **28**, 226-234.

Rutherford, M.B., Knetsch, J.L. and Brown, T.C. (1998) Assessing environmental losses: judgments of importance and damage schedules. *Harvard Environmental Law Review* **22**, 51-101.

Sachs, W. (1999) *Planet Dialectics: Explorations in Environment and Development*. Zed Book, London.

Scholtz, U., Njaya, F.J., Chimatiro, S., Hummel, M., Donda, S. and Mkoko, B.J. (1998) Status and prospects of Participatory Fisheries Management Programs in Malawi. In: *Inland Fishery Enhancements.* Fisheries Technical Paper 374. (ed T. Petr) FAO, Rome, pp. 407-425.

Schwartz, S.H. (1968a) Awareness of consequences and the influence of moral norms on interpersonal behaviour. *Sociometry* **31**, 355-369.

Schwartz, S.H. (1968b) Words, deeds, and the perception of consequences and responsibility in action situations. *Journal of Personality and Social Psychology* **10**, 232-242.

Schwartz, S.H. (1970) Moral decision making and behaviour. In: *Altruism and Helping Behavior: Social Psychological Studies of Some Antecendents and Consequences.* (eds J. Macaulay, and L. Berkowitz). Academic Press, New York, pp. 127-141.

Sen, A.K. (1977) Rational fools: a critique of the behavioural foundations of economic theory. *Philosophy and Public Affairs* **6**, 317-344.

Seymour, T. (2001) Fisheries development, management, and the role of government. In: *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001* (eds O.L.F. Weyl and M.V. Weyl). Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi, pp. 42-54.

Siegel, S. and Castellan, N.J. (1988) *Nonparametric Statistics for the Behavioral Sciences*, 2nd edn. McGraw-Hill, New York.

Silverman, D. (2005) *Doing Qualitative Research*, 2nd edn. Sage Publications, London.

Simpson, R.D. and Sedjo, R.A. (1996) Paying for the conservation of endangered ecosystems: a comparison of direct and indirect approaches. *Environment and Development Economics* **1**, 241-257.

Sinclair, P.R. and Ommer, R. E. (eds) (2006) *Power and Restructuring: Canada's Coastal Society and Environment*. ISER Books, St. John's, Canada.

Søreng, S.U. (2006) Moral discourse in fisheries co-management: a case study of the Senja fishery, northern Norway. *Ocean & Coastal Management* **49**, 147-163.

Stobutzki, I.C., Silvestre, G.T. and Garces, L.R. (2006) Key issues in coastal fisheries in South and Southeast Asia, outcomes of a regional initiative. *Fisheries Research* **78**, 109-118.

Stoker, G. (1998) Governance as theory: five propositions. *International Social Science Journal* **50**, 17-28.

Sumaila, U.R., Alder, J. and Keith, H. (2006) Global scope and economics of illegal fishing. *Marine Policy* **30**, 696-703.

Sutinen, J.G. and Gauvin, J.R. (1989) An economic study of regulatory enforcement and compliance in the commercial inshore lobster fishery of Massachusetts. In: *Rights based fishing* (eds P.A. Neher, R. Arnason and N. Mollet). Kluwer, Dordrecht, The Netherlands, pp.415-428.

Sutinen, J.G. and Kuperan, K. (1999) A socio-economic theory of regulatory compliance. *International Journal of Social Economics* **26**, 174-193.

Sutinen, J.G., Rieser, A. and Gauvin, J.R. (1990) Measuring and explaining non-compliance in federally managed fisheries. *Ocean Development and International Law* **21**, 335-72.

Symes, D. (2006) Fisheries governance: a coming of age for fisheries social science? *Fisheries Research* **81**, 113-117.

Thaler, R.H. (1991) *Quasi Rational Economics.* Russell Sage Foundation, New York.

Thompson, A.B., Allison, E.H. and Ngatunga, B.P. (1996) Distribution and breeding biology of offshore pelagic cyprinids and catfish in Lake Malawi/Niassa. *Environmental Biology of Fishes* **47**, 27-42.

Thurstone, L.L. (1927) The method of paired comparisons for social values. *The Journal of Abnormal & Social Psychology* **21**, 384-400.

Turner, G.F. (1995) Management, conservation and species changes of exploited fish stocks in Lake Malawi. In: *The Impact of Species Changes in African Lakes* (eds T.J. Pitcher and P.J.B. Hart). Chapman & Hall, London, pp. 365-395.

Turner, G.F., Tweddle, D. and Makwinja, D. (1995) Changes in demersal cichlid communities as a result of trawling in southern Lake Malawi. In: *The Impact of Species Changes in African Lakes* (eds T.J. Pitcher and P.J.B. Hart). Chapman & Hall, London, pp. 397-412.

Turner, G.F., Seehausen, O., Knight, M.E., Allender, C.J. and Robinson, R. (2001) How many species of cichlid fishes are there in African lakes? *Molecular Biology* **10**, 793-806.

Tyler, T. (1990) *Why People Obey the Law*. Yale University Press, New Haven and London.

UNDP (United Nations Development Programme) (2007) Fighting climate change: human solidarity in a divided world. *Human Development Report 2007/2008.* UNDP, New York.

Young, O.R. (1979) *Compliance and Public Authority*. Johns Hopkins University Press, Baltimore.

Watling, L. and Norse, E.A. (1998) Disturbance of the seabed by mobile fishing gear: a comparison to forest clearcutting. *Conservation Biology* **12**, 1180-1197.

Wattage, P. and Mardle, S. (2005) Stakeholder preferences towards conservation versus development for a wetland in Sri Lanka. *Journal of Environmental Management* **77**, 122-132.

Welcomme, R.L. (2001) *Inland Fisheries: Ecology and Management.* Blackwell Science, Oxford.

Werner, C.M., Turner, J., Shipman, K., Twitchell, F.S., Dickson, B.R., Bruschke, G.V. and von Bismarck, W.B. (1995) Commitment, behavior and attitude change: an analysis of voluntary recycling. *Journal of Environmental Psychology* **15**, 197-208.

Weyl, O.L.F. (2005) *Capture Fisheries in Malawi and Their Contribution to National Fish Supply*. Aquaculture Development in Malawi (ADiM) report. Enviro-Fish Africa (Pty) Ltd., Grahamstown, South Africa, 63 pp.

Weyl, O.L.F and Weyl, M.V (eds) (2001) *Proceedings of the Lake Malawi Fisheries Management Symposium, Lilongwe, 4-9 June 2001*. Organizing Committee of the Lake Malawi Fisheries Management Symposium, Lilongwe, Malawi.

Weyl, O.L.F., Nyasulu, T.E. and Rusuwa, B. (2005) Assessment of catch, effort and species changes in the pair-trawl fishery of southern Lake Malawi, Malawi, Africa. *Fisheries Management and Ecology* **12**, 395-402.

Wilson, D.C., Nielsen, J.R. and Degnbol, P. (eds) (2003) *The Fisheries Co-management Experience: Accomplishments, Challenges and Prospects.* Kluwer Academic Publishers, Dordrecht, The Netherlands.

World Bank (2000) Project proposal: Guatemala Western Altiplano natural resources management project. Project ID GTPE64883. Latin America and Caribbean Region.

World Bank (2009) Data – country groups, low income economies. Available at: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20421402~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html#Low_income. (accessed 05/05/09).

Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C., Halpern, B.S. and Jackson, J.B.C. *et al.* (2006) Impacts of biodiversity loss on ocean ecosystem services. *Science* **314**, 787-790.

Personal Communications

Banda, M. 2008. Personal Communication. Chief Fisheries Officer (research), DoF.

Bulirani, A. 2007. Personal Communication. Director, DoF.

Chief Makanjira. 2008. Personal Communication. Traditional Authority Chief, Makanjira.

Kachala, R. 2008. Personal Communication, Senior lecturer, DoF.

Masiye, A. 2008. Personal Communication. Fisheries extension officer, DoF.

Moret, K. 2007. Personal Communication. Project coordinator, Marine Institute.

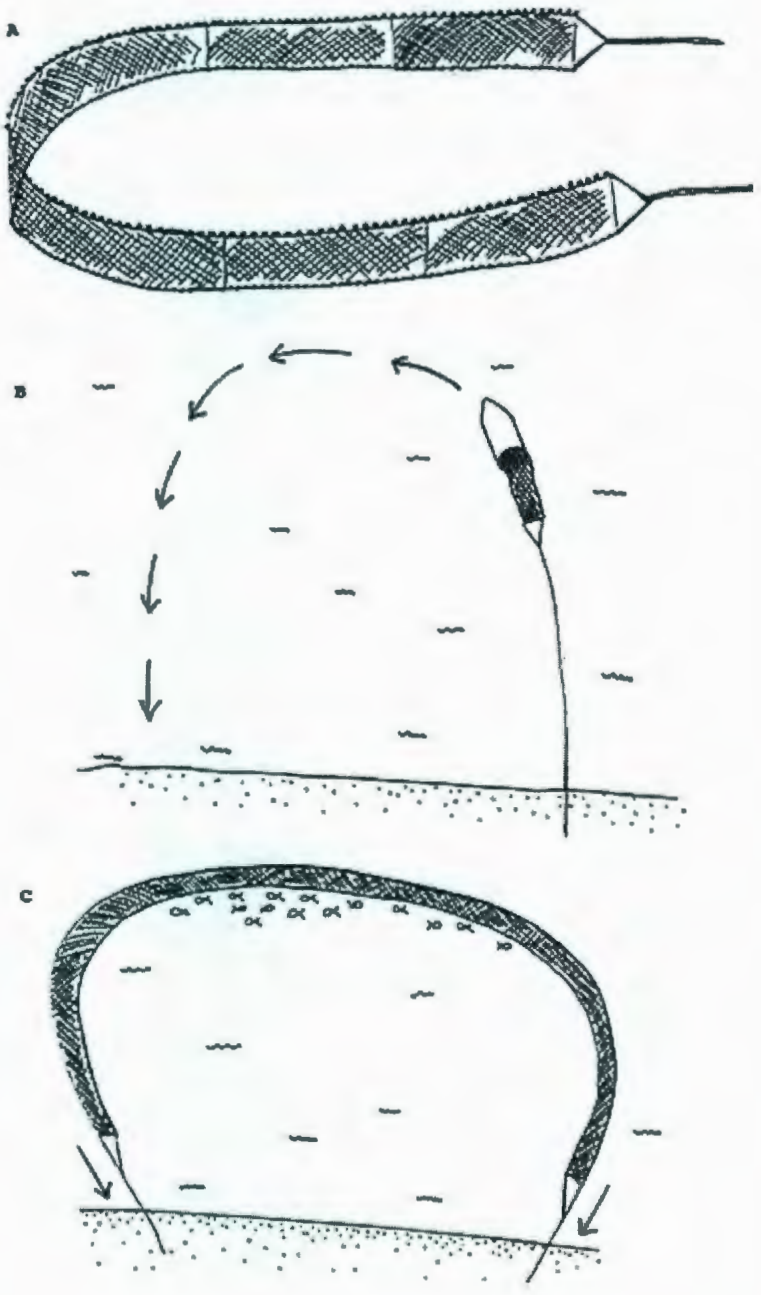
Msukwa, D. 2008. Personal Communication. Outreach Unit officer, DoF.

Nyungwa, J. 2008. Personal Communication. BVC chairman, Kadango.

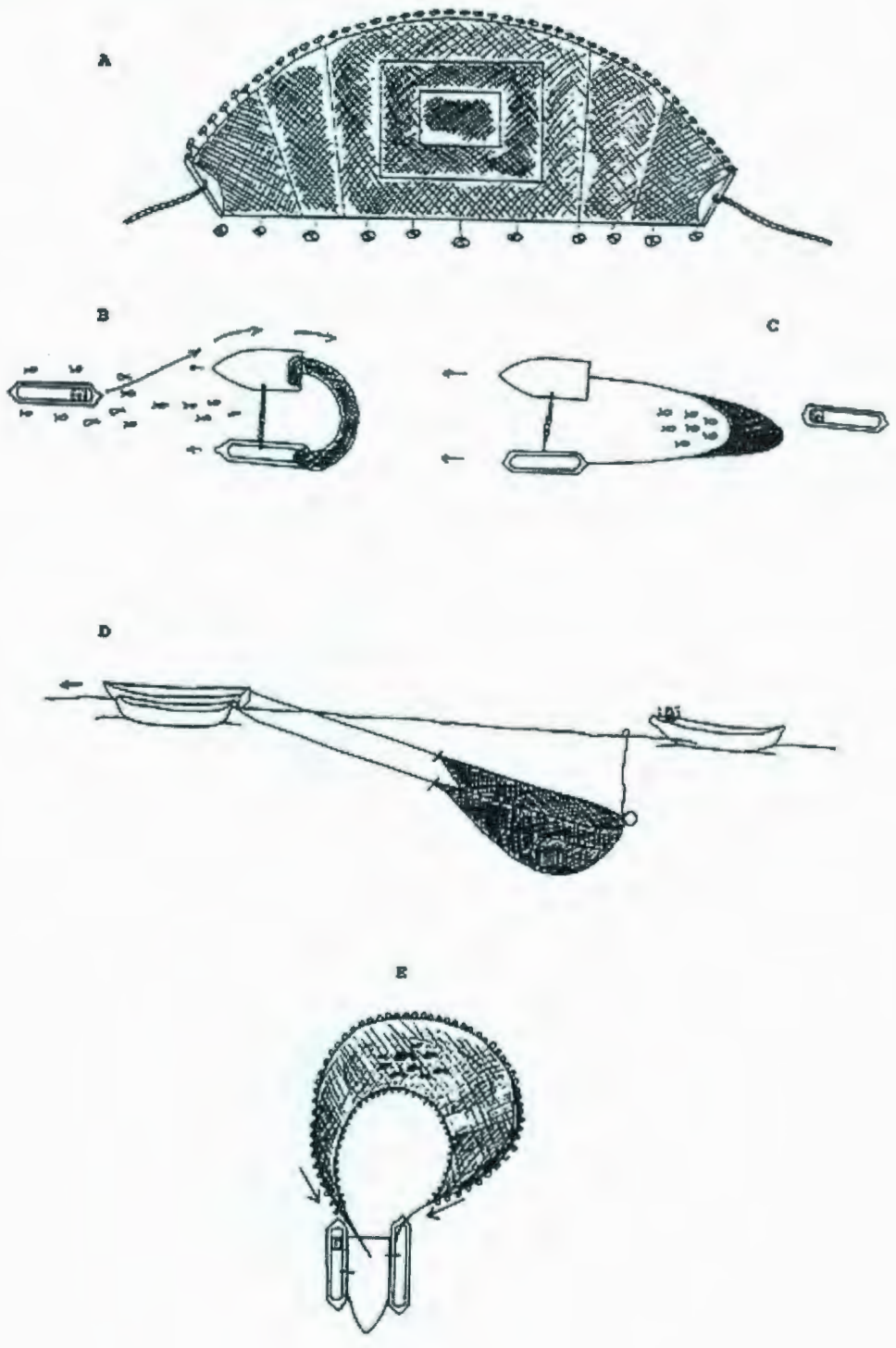
Usen. 2008. Personal Communication, Enforcement officer, DoF.

Appendix A Illustration of fishing gear

Beach seine: shape (a) and operation (b-c) (*Source: FAO 1993*)



Chilimira: shape (a) and operation (b-e) (*Source FAO 1993*)



Appendix B Questionnaire survey

INFORMATION FOR COMPLETING THE QUESTIONNAIRE
GANI JA MAUSYO JAKUTI AJAJE

This questionnaire is about your opinions! By conducting this survey, we wish to learn more about what you think about fishing activities in the Southeast Arm of Lake Malawi and your preferences for your communities. Please note that there is no right or wrong answers. We anticipate the questionnaire will require only about 30 minutes to complete. We would appreciate it if you could complete all questions. However, you are not obliged to and may choose to stop at any time.

Mausyoga gali nkusaka ganisyo syawo. Tukupita chiusya-usya, kuti tulijinganye kwajemaja mwakuganichisya ya itendo ya kulaga kwa somba kwiwanda kwa kono wagopochelo lyuwa lya nyasa ja Malawi ni yapakana aisache kumangwawo kuno. Tukwembecheya mawusyoga kujigale 30 minisi kuti tumalisye. Tukaliji wakondwa kuti ajanje mausyo gosope nambo naga gakombola ajanje muchaionele nipo komboleka kulechela petala

Your participation is completely voluntary and your responses will be kept <u>strictly confidential and anonymous</u>. By returning the questionnaire, it is understood that we have your permission to use the information for this study. The questionnaire contains four sections.

Ikutendekwayi ili yosope mwa kulipeleka kwawo nipo yosope ichitendekwe chiiwe yaasili nipo giyimanyika kuti ganiji jatyochele kwa munthu jati. Pa kwanga kwawo kwa mausyoga, tukumayirila kuti akutupa ukumu wakaja kamulichisya gani jatupereji pa majiganyo getu. Mausyoga gali mitundu mcheche.

We truly appreciate you participation and sincerely thank you for your kind assistance.

Tuli wakutogolela ligongo lya kunda ni kutama niwe nambo soni sikomo kwejinji ligogo lya chikamu chisyochi

THANK YOU!
Sikomo kwejinji

Section A

This brief section has a few questions about your occupation and your involvement in fishing activities.

Mundimeji mwana mawusyo ga yamasengo gawo ni itendo yasatenda pa kulaga somba

1. What is your occupation? – please tick all that apply

   Asatenda masengochi? – alembe chimanyisyo cha x mwibokosi pasipa malingana ni masengo gosope ga stendaga

☐ Gear owner *Asyene likoka*	☐ Crewmember *Mlovi*	☐ Fish processor *Kwanika/kuwamba somba*	☐ Fish trader *Kusumisya somba*
☐ Farmer *Wakulima*	☐ Housewife *Mama wapewasa*	☐ Shop owner *Asyene sitolo/okala*	☐ Teacher *Atichala*
☐ Fisheries manager *Wakwendesya ya Fisheries*	☐ Scientist *Wa ya sayasi*	☐ Other (please specify): _____ *Masengo gane galigonse (agasale)*	

   If you checked more than one box, which occupation represents you best?

   Naga alembire malo gakuposa gamo, asala masengo gasamanyika nago m'nope

   _____

2. Indicate which gear <u>you own</u> or <u>you use regularly to fish</u> – please tick all that apply

   (If you do not own or use any gear, please go to Question 3)

   Alajila likoka lyakwete kapena lyasakamulichisya masengo kawiri-kawiri- alembe x mwibokosimo kulajila kuti chawo kapena gamba kamulichisya masengo

Fishing gear		Own *Msyene*	Use *Kamulichisya*
Plank boat with engine *Liboti lya matambwa lyakwendela ingini*		☐	☐
Plank boat without engine *Liboti lya matambwa lyagali ingini*		☐	☐
Dug out canoe	*Wato*	☐	☐
Gill net	*Machela*	☐	☐
Chilimira net	*Chilimila*	☐	☐
Chambo seine	*Likoka lya chambo*	☐	☐
Kambuzi seine	*Likoka lya kumbuzi*	☐	☐
Usipa seine	*Likoka lya usipa*	☐	☐
Longline	*Isopo (kutega)*	☐	☐
Mosquito net	*Masikito*	☐	☐
Fish trap	*Misipu*	☐	☐

Nkacha seine *Nkacha*	☐	☐
Handline *Isopo (kulopochesya)*	☐	☐
Kandwindwi *Kandwindwi*	☐	☐
Other: _____ *Inepe*	☐	☐
Processing gear	**Own**	**Use**
Sun-drying rack *Irandala yakwanichila somba*	☐	☐
Smoking kiln *Yakochela somba*	☐	☐
Other: _____ *Inepe*	☐	☐

3. How long have you been engaged in your current occupation?
Atemi ndawi jelewu uli alikamula masengo gakamulana ni ya somba?

# of years: _____ (If less than one year, # of months: _____)
(Naga gakwana chaka, miesi jilingwa)

Section B

Each page contains two sets of **fishing activities, A and B**. Please indicate, based on your opinion, which activity you consider **MORE DAMAGING** to the fishery resources in the Southeast Arm of Lake Malawi.

Palisamba lilose lya chikalata pana itendo iwili-iwili yakuulajila somba, A ni B. chonde alosye, kutyochela muganisyo syawo , itendochi yakwiganichisya kuti yakonanga mnope sombasi munyasa ja Malawi jili mbali jakono wewanda wagopojelo lyuwa (jakwiwanda kwa mbwadzulu).

In your opinion, which of these two activities do you consider more damaging to the fisheries resources in the Southeast Arm of Lake Malawi?

Muganisyo syawo,muitendo iwili-iwili yiwapereyi, yapi yakwiganichisya kuti yakonaga mnope kuutsotsi uli kwiwanda kwangopochero lyuwa kwa nyasa ja Malawi?

1) Catching juvenile fish
   Kuulaga somba syawana-wana

2) Fishing during spawning season
   Kuulaga somba ndawi jakutajila mandanda kapena kola wanache

3) Fishing using mechanized gear
   Kuulaga somba pakamulichisya injini

4) Fishing using gears that disturb lake bottom
   Kuulaga somba pakuulajila indu yakusokonesya ndamilo japansi pa nyasa

5) Fishing in offshore deep water
   Kulaga somba kwakutalichila pa chiko, mnyasa, malo gesokoche mnope

6) Fishing using non-selective gear
   Ipangiso yagaasagula pakulaga somba (syosope)

7) Many people fishing in one area
   Wandu wajinji kuulajila somba pamalo gamo

8) Fishing in areas that have artificial reef
   Kuulajila somba malo gagali ilundu yakupaganya

Section C

Each page contains two sets of **hypothetical programmes** for your communities, **A** and **B**. Please indicate, based on your opinion, **if** a programme were to be implemented in your community, which one you **PREFER.**

Lisamba lililonse lya chikalata likwete mitundu jiwili ja pologalamu gagamba kuwanichisya , Ani B. Chonde muganisyo syawo alajile mapologalamu gapakana agatende mmusimagwawomu, ni pulogalamuchi japaka ajisache.

If a programme were to be implemented in your community, in your opinion, which of these two programmes do you prefer?

Ana muganisyo syawo pologalamu jatuli japakana ajitende kumangwawo kuno, mapologalamu gawiliga japi japakana ajisache?

1) Programme to protect fish habitat and fish species
   Pologalamu ja kusamala malo gakutama somba kapena mtundu wa somba

2) Programme to promote scientific research on lake fisheries ecosystem
   Pologalamu jakulola yakwesya lyunda lyapenani lyakusosa-sosa (lyasayasi) ya somba ni ndamilo syakwe munyasamu

3) Programme to set up a reward program to encourage compliance of fisheries regulations
   Pologalamu jakuti jiliganyeje yakupeleka mituka kwa wandu wakupikanila malamusi ga yasomba (ga fisheries)

4) Programme to provide micro-credit loans to upgrade fishing gear technology
   Pologalamu jakupeleka ngongole syawana-wana kuti jijausye penani yitendo yakulajila somba

5) Programme to develop technology to reduce post-harvest spoilage
   Pologalamu jakukwesya lunda lyakunondiya kuonasika kwa somba siulajidwe

6) Programme to promote small-scale community fish cage culture
   Pologalamu jakuti jikwesye kulanga kwa somba syagakwe (makeji) nyasamu

7) Programme to ensure beach access for local fishers and communities
   Pologalamu jakulola kuti wakulaga somba ni wandu osope akusimanikwa mikuli jamumbali mwa nyasa

8) Programme to provide *local* ownership and stewardship of fisheries resources
   Pologalamu ja kupeleka usyene ni kasamalidwe kosope kwa yasomba nimusisatamaga kwa wanthu

Section D

This section contains several simple questions that seek basic **information about yourself and about the fisheries by-law process.**
Likuga ali lyana mausyo gagasausya kakusaka kumanyila yawawo ni yasati pakupanganya malamulo gawana-wana ga Fesheries.

1. What is your age? _____
   Ana yaka yawo ilingwa?

2. What is your gender?
   Ana wachi?

   ☐ Male *walume* ☐ Female *wakongwe*

3. What is your ethnic origin?

   ☐ Chewa/Nyanja ☐ Yao ☐ Tonga
   ☐ Tumbuka ☐ Lomwe ☐ Ngoni
   ☐ Sena ☐ Other: _____ ☐ Do not know

4. What is the highest level of education you have completed?
   Ana sukulu jawo walijiganyisye ni kumalichisya papi?

   ☐ Primary Standard ____ *Pulayimale* *Sitandade*
   ☐ Secondary Form ____ *Sekondale* *Fomu*
   ☐ Tertiary *Ku Univesite*
   ☐ No schooling *Ginjaulaleje ku sukulu*

5. In which village (town) do you currently live? _____
   Musichi kapena tauni jasatamaga?

   How many years have you lived in that village (town)? _____
   Atemi yaka ilingwa m'musi muno

6. How many days in a year do you normally spend away from your village (town) for your work (e.g. fishing, trading, work trip etc)?
Ana masiku galingwa pa chaka gasatyokaga m'musi muno (tauni jino) kwaula kwine kukamula masengo (kulaga somba, kusumisa somba, kukamula masengo, ni ine-ine)

- ☐ Less than 30 days — *Gakwana massiku 30*
- ☐ 1 – 2 months — *Mwezi paka miyezi jiwiri*
- ☐ 3 – 6 months — *Meyezi jitatu paka m'sano ni umo*
- ☐ more than 6 months — *Kupelela meyezi m'sano ni umo*

7. In your opinion, what is the amount of fish in the Southeast Arm these days compared to last year?
Ana somba sipali syawinji watuli ku kono wewanda kungopochelo kwa nyasa ja Malawi, masiku agano pakuwanichisya ni chaka chipite

☐ Fewer fish	☐ Same amount	☐ More fish	☐ Do not know
Somba syanono	*somba sili muzyawelele*	*muzyawelele*	*gigumanyililа*

If you answered fewer fish,
Naga ajajile somba syanono

What are the reasons for the fewer number of fish? – please tick all that apply
Ana ligogochi somba sikunondipa?- alembe chimanyisyo cha x mwibokosi pasipa malingana ni masengo gosope ga stendaga

- ☐ Fish habitat degradation
  kupasuka kwa malo gatama somba
- ☐ Catching juvenile fish
  kamula somba syawana-wana
- ☐ Too much fish spoilage during catching and processing
- ☐ Fishing using illegal gears
  kulaga somba pakamulichisya ida yagasosekwa ni boma
- ☐ Environmental/climatic changes
  kusinda kwa ndawi ni indu pachilambo chino
- ☐ Overfishing due to too many fishers/gears
  Somba simasile ligogo lya kutupa kwa wakuulaga somba ni maboti gakulagila somba
- ☐ Overfishing due to large-scale commercial boats
  somba sikumala ligogo lya wakulaga somba wa waboti gamakulungwa
- ☐ Supernatural powers
  Yamasega
- ☐ Weak enforcement of regulations
  Kulepela kwatawa kapena kwalamula wanthu wakasa malamulo

☐ Fishing during spawning season
Kuulaga somba ndawi jakutajila mandanda kapena kola wanache

8. Are you a member of any fishing-related organizations such as BVC or Fishermen's Association (FA)?
Ana wawo ali gulu ja kwayana ni yakulaga somba mpela BVC kapena Fishameni Asosiyeshoni?

☐ Yes Please indicate: _____ *Chonde alembe apa*
☐ No

9. Do you know who to speak with if you wish to voice opinion on fisheries-related matters?
Ana kumanyila japaka awekete nanjo pa gani ja yakusana ni somba naga ali asachile kupeleka ganisyo syawo

☐ Yes ☐ No

If Yes, *Naga Ees!*
Please indicate the name of the committee or the position of the person:
Chonde alembe lina lya komintijo kapena mpando wa wamunthujo _____

10. What role do you think fishing community should play in the making of fisheries regulations?
muganisyo syawo ana wanthu wakulaga, kuwamba ni kusumisya somba paka atendechi pakupaganya malamulo ga fishalesi?

☐ Government make the regulations without inputs from fishing community
wanthuwa ampikanile bwana ja kufishalesi pa kuya malamulo

☐ Government make the regulations with inputs from fishing community
wanthuwa apelecheje ganisyo kwa bwana ja fishalesi nipo bwanajo apanganyeje malamulo

☐ Government and fishing community work together to formulate the regulations
wosope wene bwana ja fishalesi pamo ni wanthu apanganyenge malamuloga

☐ Fishing community make the regulations with the advice of the government
wanthuwa apaganye lilamulo nipo abwana wa fishalesi wa jogoleleje pa yakutenda

☐ Fishing community make its own regulations without consulting to the government
wanthuwa apaganye malamulo mwajika mwagausa abwana wa fishalesi

☐ Do not know *gigumanyilila*

11. How did you hear about the fisheries by-law consultation process?
Ana wapikene uli ya m'nda-nda-nda wupita chausa wanthu pa kupaganya malamulo gam'misi ga fishalesi

- ☐ Never heard of it — *Ginimbikanaje*
- ☐ Fisheries extension officer — *Alagisi wa fishalesi*
- ☐ BVC members — *Mamembala ga BVC*
- ☐ Village headman — *Kwa mwenye wa musi*
- ☐ Friend or family — *Kwa jawo kapena pewasa*
- ☐ Radio or newspaper — *Pawailesi kapena nyusipepala*
- ☐ Other _____ — *Matala gane agasale*

12. Do you think that the by-laws will help the fishing situation in the Southeast Arm of Lake Malawi?
Ana akuganisya malamulo gamisiga chigakamuchisye pa kulaga kwa somba mbali ja kono wewanda wagopochelo wa lyuwa lya Nyasa ja Malawi

- ☐ Not helpful at all — *yagagamuchisya kose*
- ☐ Mostly not helpful — *isagamuchisya panondi*
- ☐ Somewhat helpful — *isagamuchisya mbali siine nambo siine iyayi*
- ☐ Mostly helpful — *yasamuchisya kwejinji*
- ☐ Very helpful — *isagamuchisya kwejinji mnope-nope*
- ☐ Do not know — *gigumanyilila*

Appendix C Conservation principle category

Set A: Fishing activities

	Catching juvenile fish	Fishing using mechanized gear	Fishing using gears that disturb lake bottom	Fishing in offshore deep water	Fishing using non-selective gear	Too many people fishing in one area	Fishing in spawning area	Individual weighted sum
Weighting factors	3	2	3	1	3	2	4	
Highest score								
Possible individual preference score	3	1	5	0	4	2	6	
Weighted individual score	9	2	15	0	12	4	24	66
Lowest score								
Possible individual preference score	3	5	2	6	1	4	0	
Weighted individual score	9	10	6	6	3	8	0	42

Mean value = 62.69

Set B: Community programmes

	Protect fish habitat and fish species	Promote scientific research on lake fisheries ecosystem	Provide micro-credit loans to expand fishing-related work	Help reduce fish spoilage during catching and processing	Promote small-scale community fish cage culture	Ensure fishing access for local fishers and communities	Provide ownership of resources to local communities	Individual weighted sum
Weighting factors	3	3	1	1	2	1	2	
Highest score								
Possible individual preference score	6	5	2	1	4	0	3	
Weighted individual score	18	15	2	1	8	1	6	50
Lowest score								
Possible individual preference score	1	0	6	5	3	4	2	
Weighted individual score	3	0	6	5	6	4	4	28

Mean value = 42.10

Conservation principle category of respondents

	HH	HL	LH	LL	Total
Gear owners	5	11	8	17	41
Crew members	10	13	5	9	37
Processors/Traders	11	6	1	2	20
Community members	4	13	1	2	20
Managers/Scientists	11	3	9	3	26
Total	41	46	24	33	144

Conservation principle category by education level

	HH	HL	LH	LL	Total
No schooling	11	13	3	16	43
Primary 1-4	7	10	4	6	27
Primary 5-8	9	14	8	8	39
Secondary (9-12)	6	6	1	0	13
Tertiary	8	3	8	3	22
Total	41	46	24	33	

Conservation principle category by gender

	HH	HL	LH	LL	Total
Women	11	12	0	4	27
Men	30	34	24	29	117
Total	41	46	24	33	

Conservation principle category of fishers by use of legal/illegal gear

	HH	HL	LH	LL	Total
Legal gear					
Gear owners	5	10	4	10	29
Crew members	9	10	1	4	24
Illegal gear					
Gear owners	0	1	4	7	12
Crew members	1	3	4	5	13
Total	15	24	13	26	78

Conservation principle category of fishers by education

	HH	HL	LH	LL	Total
No schooling	5	8	3	15	31
Primary 1-4	3	5	4	6	18
Primary 5-8	6	7	6	5	24
Secondary (9-12)	1	4	0	0	5
Tertiary	0	0	0	0	0
Total	15	24	13	26	78