Management of small-scale fisheries in developing countries : The case of Elephant Marsh in Malawi

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1

General Introduction

Women are involved in fish trade at Chisamba Fishing Village of the Elephant Marsh Wetland

1.1. Introduction

Despite the provision of many ecosystem goods and services such as fisheries, agriculture, (eco) tourism, water supply, transport, carbon sequestration, biodiversity as well as water purification, the management of wetlands across the globe continues to face many challenges. The competing and sometimes conflicting interests of various stakeholders often result in management paradigms that only focus on the few ecosystem goods and services for which direct local interest is high such as cash crop production (McCartney & Houghton–Carr, 2009). The result is often unsustainable resource exploitation which is costly to both humans and nature and the ecological systems which support them.

The lack of certainty on sustainable wetland management frameworks is particularly common in most developing countries; more so in sub-Saharan Africa. These are also the very geographical locations where socio-economic indicators of human development are

poor (United Nations Development Programme, 2014; Neumayer, 2001; Bowen & Riley, 2003; Gutiérrez et al., 2011). The ever-increasing exploitation pressures mainly emanating from socio-economic drivers such as high population growth, market growth, rural poverty and unstable political systems continue to challenge natural resource managers with problems that require urgent but adaptive solutions.

In the 1970s, deficiencies in the management of natural resources were attributed to lack of stewardship among resource users; a situation that led to either the transfer of property rights to 'state command and control' or privatization (Kellert et al., 2000; Hardin, 1968). In Africa, the evolution of natural resources management systems can be related to three identifiable sets of theories namely: the classical (state control) approach (Biot et al., 1995; Grimble & Chan, 1995; Blaikie, 1996), neo-liberal (deregulation) approach (Blaikie et al., 1997; Adger et al., 2001; Béné & Neiland, 2006; Lockwood & Davidson, 2010), and populist approach (Ostrom, 1990; Olsson et al., 2004). The state-based classical approach was supported by most early scholars (Cheung, 1970; Johnson, 1972; Campbell, 1981; Smith, 1981) who based their school of thought on the "Tragedy of Commons" (Hardin, 1968). However, in later years (2000s) a review of state-centric systems of natural resources management revealed that the approach has become less popular because, among many other reasons, it leads to loss of property rights for the local people and incites abuse, non-compliance and competition (Persoon & van Est, 2003; Berkes et al., 2003; Ribot et al., 2006; Seixas & Davy, 2008). These contestations on the effectiveness of state control over natural resources laid a foundation for populist typologies of natural resources management which have come with different labels such as community based natural resources management (CBNRM); integrated conservation and development projects (ICDPs); joint management (Berkes et al., 2008; Flaherty et al., 1999, Cheong, 2004); and co-management (Ostrom, 1990; Berkes, 2010; Pomeroy, 2003; Agrawal, 2001; Ostrom, 2005). Out of these management styles, the most commonly used approach has been 'co-management' (Pomeroy, 2016; Cundill & Fabricius, 2010). Despite its non-universality, the co-management model has generally been accepted as an inclusionary power-sharing strategy between the state and resource users whose basis is a consensus of all the actors involved (Berkes, 2010; Ostrom, 2005; Gutiérrez, et al., 2011). Nevertheless, recent studies have argued that the success of any system for managing natural resources depends on a clear understanding of the social networks of the actors involved and the institutions within which they operate (Pahl-Wostl & Hare, 2004; Bodin et al., 2006; Ostrom, 2009). Since the dynamics that underlie social and ecological systems are known to be very complex (Evans et al., 2011; Mahonge, 2010), it is critical to give careful thought when downscaling globally popular natural resources management frameworks such as co-management (Ostrom,

1990; Cox et al., 2010). In many cases, a tentative, flexible and learning-based approach grounded in local potentials may work out better than theory-based designs. In fact, Kolding and van Zwieten (2006) note that the theoretical and hypothetical relationships from which most universal models for institutional design are developed usually use very limited empirical evidence. Along the learning-based pathway, new or less known but adaptive institutions may be built that protect long-term sustainability of natural resources.

One of the widely studied wetland services whose management has stimulated a lot of institutional science debate (Kolding & van Zwieten, 2014) and which forms the basis for this PhD thesis is small-scale fisheries (SSF). According to Carvalho et al. (2011) defining scale in fisheries has been difficult among scholars. The substitutability of SSF associated terms such as “artisanal”, “local”, “traditional”, “small”, “subsistence”, “non-industrial”, “low-tech”, “poor” etc., is symptomatic of the complexity of the characteristics that underpin their definition (Natale et al., 2015). In this PhD thesis, SSF is defined purely on the spatial distribution of the fishing unit (small scale) and refers to traditional fisheries involving fishing households (as opposed to commercial companies), using a relatively small amount of capital and energy, making short fishing trips close to the shore, and mainly for local consumption (either subsistence or market -oriented). In philosophical terms, the main advantage of studying artisanal, small-scale fisheries is that if it is accompanied by adequate institutions, SSF expresses the idea ecosystem-based management (De Groot and van den Born, 2003) very well. Additionally, if compared to such ecosystem good and services as tourism, fisheries can be studied at the level of a wetland in its actuality. The management of SSF is also particularly perceived as important because 15% of the world population depends on fish as the main source of animal protein (Béné et al., 2015). Although most developed countries have been successful in designing sustainable management systems at the SSF scale (Isaacs, 2012), developing countries such as Malawi where this study was conducted are still struggling. The widely adopted mode of management is where governments are in regulatory position (Ward & Weeks, 1994; Carswell, 2003) but many SSFs are gradually moving towards imposed co-management arrangements (Hara & Nielsen, 2003; Nunan et al., 2015). For instance, having studied a decreasing trend in fish catches at the 4 metre-deep Lake Malombe in Malawi (Van den Bossche and Bernascek, 1990), Jul-Larsen et al. (2003) recommended putting in place co-management arrangements.

The focus of this PhD thesis is the fishery at Elephant Marsh wetland in Southern Malawi (figure 1.1) which supports the livelihoods of about 1500 households. In 1897, the wetland was mandated as one of the first two protected game reserves in Malawi. The aim was to

protect large game animals, including elephants, which are reported to have been common in the area (Hughes & Hughes, 1992). Field work observations revealed that there is no recent data. Moreover, the enforcement of wetland management regulations at the Elephant Marsh has never been very effective (Turpie et al., 1999) and was largely interrupted by the two world wars (Inter-agency Working Group on Protected Areas, 1997). The final loss of statutory protection of the Elephant Marsh seems to have occurred during the transition from colonial rule to the then newly independent government (Mvula & Haller, 2009) that lacked a well-coordinated legal and institutional setup. Since then the Elephant Marsh Fishery relies on local management arrangements which stem from a blend of customary law and some elements of state regulation. The emphasis of these arrangements is on input controls (gear restriction, closed fishing season etc.), and not output controls (e.g. catch limits) (Njaya et al., 2012; Soliman, 2014).

The question of whether individual fishermen will really comply to the regulatory controls has always been difficult (Sutien et al., 1990; Young, 2013) due to intricate social links that usually exist in small-scale fishing communities (Beuving, 2013) but as Jentoft (1989) observes, when fishermen are persuaded to advance local collective interests (e.g. at the fishing community level) at the expense of personal interests, it becomes easier to achieve success in fisheries management. Based on this complexity of motivation to fisheries management success, the issue that motivates this PhD thesis is whether the current management arrangements may be adequate to sustain the fishery at the Elephant Marsh in the longer run and to explore options of management strengthening if needed.

In fisheries science, the traditional way of determining sustainable exploitation of fish stocks is by the use of maximum sustainable yield (MSY) which is related to fishing effort (Bousquet et al., 2008; Froese and Proelß, 2010). MSY sees sustainability purely through the maintenance of a fish stock population and excludes the effects of competition, symbiotic or commensal relationships with other species, trophic relationships or changings in carrying capacity due to other human influences such as pollution (Bell and Morse, 2008; Legović, et al., 2010; Larkin, 1977; Garcia et al., 2012). The limited ability of MSY to guide the environmental and social dimensions of fisheries management and its limited application in multi-gear and multi-species fisheries (Kolding and van Zwieten, 2006) has led to the birth of ecosystem-based approaches which seek to alleviate the classical extremes of MSY (Pikitch, et al., 2004; Zhou, et al., 2010; Berghöfer, et al., 2008; Berkes and Folke, 1998). For the Elephant Marsh Fishery, the MSY is not yet definitive. Instead, sustainability attributes in this PhD thesis are based four indicators (*i*) stability of catch (abundance overfishing); (*ii*) quality of catch (non-juveniles for the late maturing *Oreochromis* and *Tilapia*

species); (*iii*) trends in the catch per unit effort (CPUE); and (*iv*) the ability to keep non-community members (immigrants) out of the resource.

The key actors in the Malawian fisheries sectors are the government officers, fishers, leaders of fishing community user groups (known as Beach Village Committees) and traditional chiefs. Several authors (Donda, 2001; Hara et al.,2014; Hara, 2001;2002; Njaya et al., 2012; Ganter et al., 2001) have highlighted some of the challenges in the interactions among these key players. It is therefore important that before devising any governance options for sustenance of the Elephant Marsh Fishery, a proper understanding has to be achieved about the various roles of each of the key players and the relationships amongst them at the local level.

1.2. Objective

Against this background, the major drive behind this dissertation has been to design more empirically grounded institutions for the management of small-scale inland fisheries in developing countries. This drive can be found back in research questions *iii* (empirical basis) and *iv* (designs). But before arriving there on a proper quality level, it was logical to first get to know the region (research question *i*) and to study how comparable fisheries are managed (research question *ii*).

Thus, the main objective of this study is to determine sustainable institutional arrangements for themanagement of small-scale fisheries resources in developing countires; and how they relate to local needs as well as national and international interests in the conservation of these resources. The research questions were as follows:

i. What are the socio-ecological and land use setting and potentials of the Elephant Marsh wetland in Malawi?
ii. What are the key actors and institutions in the management of small-scale inland fisheries in developing countries compared to situation at Elephant Marsh fishery?
iii. What are the key socio-causal dynamics of the management system at the Elephant Marsh Fishery?
iv. How can these socio-causal dynamics at the Elephant Marsh Fishery, if and insofar needed in the near future, be translated into strengthened institutions for sustainability of small-scale inland fisheries in developing countries?

1.3. Study Area

Location and ecology

The Elephant Marsh is located on the East African Rift Valley floor in the southern part of Malawi (14°25′–17°50′S and 35°15′–35°15′E), see Figure 1.1. It covers an average area of about 600 km^2, although actual size varies from about 2700 km^2 in the wet season to 500 km^2 in the dry season. The variation creates seasonal pressure on the ecosystem goods and services that communities can draw from the wetland. The Elephant Marsh straddles the administrative districts of Chikhwawa and Nsanje, which fortunately follow similar institutional arrangements so that for this study, no major trans-district complications arose. The region has an average altitude of 500 m above sea level and an annual precipitation range of 560 to 960 mm. Four hydro-climatic seasons are identified, comprising (1) hot, dry weather with low river levels from July to September, (2) hot, windy, wet weather from October to December, (3) hot, humid, wet weather from January to March, and (4) humid, cool weather from April to June. The marsh is fed by the Shire River, the only outlet of Lake Malawi, which flows through it in a southerly direction before joining the Zambezi River in Mozambique. It extends from the south eastern part of Illovo sugar estate to just above the confluence of Shire River and Ruo River at Chiromo. Since the Ruo River has a less buffered flow regime than the Shire, its peak flow levels can rise above those of the Shire's, causing backflow into the marsh, sometimes (1950, 1991, 2001, 2011, 2012 and 2015) with substantial flood damage.

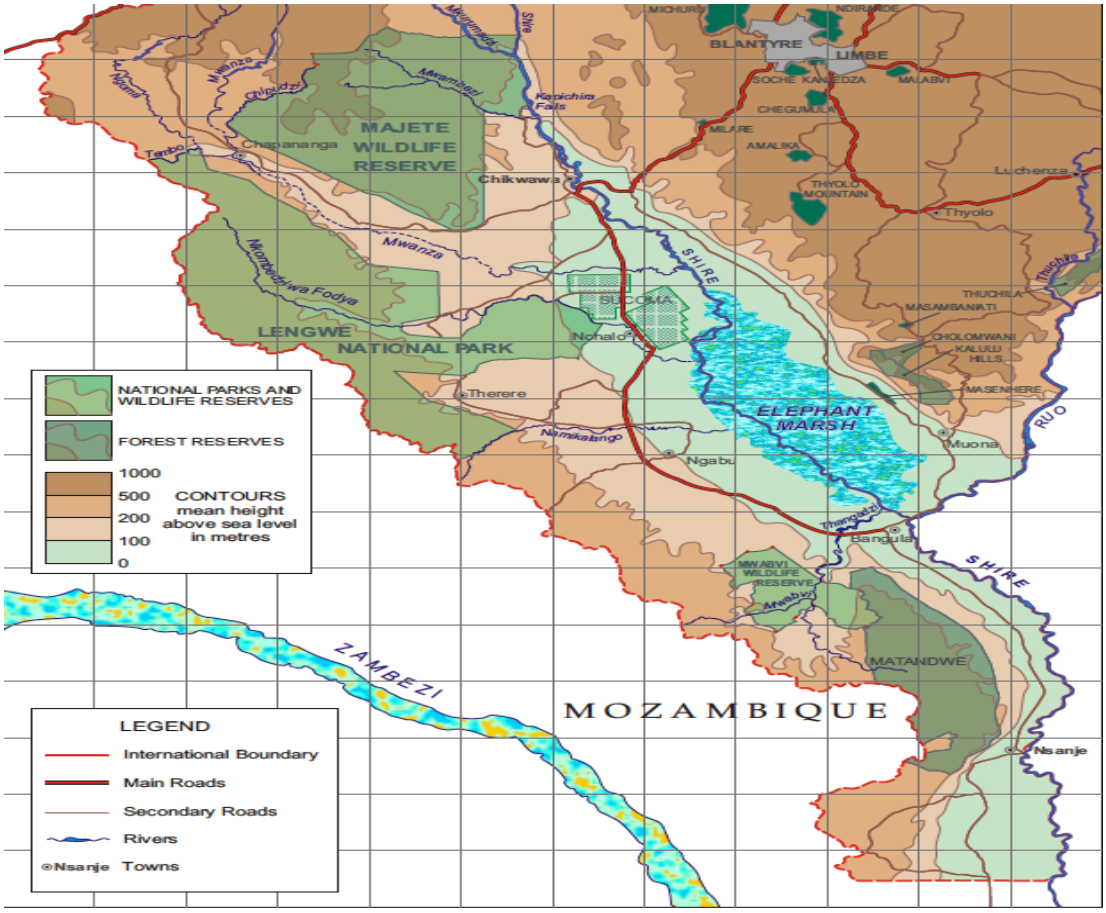

Figure 1.1 Map of southern Malawi showing the position of Elephant Marsh

The marsh has relatively grassy margins but the bulk of its surface is formed by a mosaic of rooted swamp vegetation (sudd) floating vegetation and open water. In the southern part, this pattern is interspersed with islands with saline soils and palm trees (Hughes & Hughes, 1992). The floating vegetation includes *Nymphaea odorata* (water lily), *Eichhornia crassipes* (water hyacinth), *Pistia stratiotes* (water lettuce), and *Azolla nilotica* and *Salvinia molesta* (floating ferns). Other common flora in the wetland include *Phragmites australis* (common reed), *Vossia cuspidata* (hippo grass), *Typha domingensis* (cattail), *Cyperus papyrus* (papyrus), *Cyperus procerus* (sedge), *Lonchocarpus capassa* (apple-leaf),*Utricularia inflexa* (bladderwort), and *Hyphaene benguellensis (vegetable-ivory palm),* from which palm wine (locally known as *uchema*) is produced.

The Elephant Marsh supports a diverse population of birds with more than 60 species. These include *Ardea purpurea* (purple heron), *Butorides striata* (green-backed heron), *Nettapus auritus* (African pygmy goose), *Ardea goliath* (goliath heron), *Anas undulate (yellow-billed duck), Erythrocercus livingstonei* (Livingstone's flycatcher), *Scotopelia peli* (Pel's fishing-owl), *Telecanthura ussheri* (mottled spinetail), *Phalacrocorax lucidus* (white-

breasted cormorant), *Haliaeetus vocifer* (African fish eagle), *Alcedo atthis* (common kingfisher), *Alcedo cristata* (malachite kingfisher), *Anaplectes rubriceps* (red-headed weaver), *Ploceus cucullatus* (village weaver), *Tringa totanus* (common redshank),*Tringa nebularia* (common greenshank), *Bubulcus ibis* (cattle egret), *Merops boehmi* (Boehm's bee-eater) *Tchagra minuta* (marsh Tchagra)*, Estrilda astrild* (common waxbill), *Actophilornis africanus* (African lily-trotter), *Actitis hypoleucos* (common sandpiper), Tringa stagnatilis (marsh sandpiper)*, Rostratula benghalensis* (greater painted snipe), *Philomachus pugnax* (ruff), *Macronyx croceus* (yellow-throated longclaw)*, Glareola pratincola* (collared pratincole)*, Acrocephalus palustris* (marsh warbler), *Mycteria ibis* (yellow-billed stork), *Ardeola ralloides* (squacco heron), *Asio capensis* (marsh owl) and *Rynchops flavirostris* (African skimmer) (Dowsett-Lemaire & Dowsett, 2006).

The Elephant Marsh is also home to many fish species mainly comprising cyprinids (*Hydrocynus vittatus, Lebo altivelis, Barbus species, Lebeo mesopsand Labeo Congoro*), Cichlids (*Oreochromis mossambicus, Oreochromis placidus, Eutropius sepressirotris* and *Tilapia rendaii*) and Clarids (*Clarius geriepinus, Clarius ngnamensis and Protopteus annectus*). Out of these fish species *Clarias gariepinus* (locally known as mlamba), *Oreochromis mossambicus, Oreochromis placidus* (makumba) *Sarotherodon mossambicus* (chambo) and *Barbus ssp*. (matemba) comprise over 90 percent of the commercial catch (Government of Malawi, 2010). The wetland also acts as an ecological barrier between *Barbus johnstonii* (Cyprinidae family) of Lake Malawi and Upper Shire, and *Barbus marequensis* of the Lower Shire and Zambezi.

The Elephant Marsh is also a very important habitat for *Crocodylus niloticus* (Nile crocodile) and *Hippopotamus amphibius* (hippopotamus). The 2015 International Union for Conservation of Nature (IUCN) red list identifies *Rynchops flavirostris* (African skimmer) and *Oreochromis mossambicus* (chambo) in its natural range as species which are ‘Near Threatened’ while Appendix 1 of the Convention on International Trade in Endangered Species (CITES) list includes *Crocodylus niloticus* (Nile crocodile) and *Hippopotamus amphibius* (hippopotamus).

Human Environment

There are about 24 fishing villages at the Elephant Marsh namely: Chambalo, Ntchenyela, Chisamba, Bulawayo, Pindani, Alumenda, Mchesi, Nyaulombo, Nyalugwe, Thedzi, Mitawi, Nthenda, Nyangu, Nsambokulira, Chuluchamkango, Bwemba, Mchachajemusi, Twaya, Mpandeni, Namathongo, Njale, Chigwamafumu, Mwala, and Nkolimbo. These villages are

located on two distinctive geographical sections of the wetland which are locally referred to as the ‘East Bank’ and the ‘West Bank’. Most of the fishing villages (~70%) are situated on the East Bank while the remaining 30% are situated on the West Bank. A map (figure 4.1) showing the spatial distribution of the fishing villages at the Elephant Marsh is presented in Chapter 4 of this thesis.

The indigenous people at the Elephant Marsh are the Mang‘anja but many other ethnic groups have migrated to the area, most notably the Sena (Schoffeleers 1968). Other ethnic groups in the area include: Lomwe, Yao, Chewa, Ngoni, Tonga and Tumbuka. The Man’ganja are usually specialized farmers (wetland cultivation of maize, rice , sorghum, millet, beans, cassava and sweet potatoes) while the Sena tend to engage more in livestock keeping (goats, cattle, sheep and poultry) and small-scale fishing with a relatively business-oriented outlook. Fishing involves the use a variety of gear that include gill nets, fish traps, hooks, cast nets, scoop nets, seine nets and fish spears. Fish spears are usually used in the wet season when fish are all over in the flood plains.

Access to the Elephant Marsh is very good as there is a good network of peripheral roads and a railway line to Malawi’s commercial city of Blantyre. With a natural population growth of 2.8% and an influx of people from upland and other districts such as Blantyre, Thyolo and Mulanje (NSO, 2008) coupled with rising poverty in Malawi, where 51 per cent of the population is living below the income poverty line of US$1.9 a day (NSO, 2012a), pressure to convert the wetland to agricultural land is likely to increase. The 2008 Population and Housing Census report for Malawi indicates that about 100,000 people had immigrated to Chikhwawa and Nsanje districts between 1998 and 2008 (NSO, 2008).This represents about 14% of the original population thereby creating more pressure on the ecosystem goods and services of the Elephant Marsh. The human population is rapidly increasing and there is an accompanying resource utilization which has resulted in degradation of the wetland ecosystems. Apart from population growth at the local wetland ecosystem, influxes of people from uplands and other districts have exerted exploitation pressure on the Elephant Marsh. Many farmers, as a result, occupy and cultivate fragile marginal lands such as swamps and riverbanks. Lower water levels due to drought and river flow regulations by a barrage and dams have facilitated the settlement and utilization of marshes creating further stress on wetland ecosystems. Many farmers are killed or injured by crocodiles as they cultivate near the riverbanks, draw water to irrigate their crops or when crossing the river to gardens on the other side of the river.

There are five main traditional areas (commonly known as Traditional Authorities) around the Elephant Marsh, namely: Makhuwira, Mlolo, Lundu, N'gabu and Mbenje (NSO, 2008). Ownership of land at the Elephant Marsh is based on customary tenure and access to land is through kinship or marriage, depending on ethnic cultures and traditions (Schoffeleers, 2008). For example, the Man'ganja system of succession and inheritance is matrilineal while the Sena system is patrilineal whereby inheritance follows the male line and the wife moves to her husband's village for settlement. Many original traditions and norms have now been eroded by intermarriage, modernization and intermingling between the different tribes (Mandala, 1990). However, it remains in accordance with Malawi's National Land Policy of 2004 that land (including wetland) under customary tenure is communal and cannot be sold outside the community.

Management arrangements at Elephant Marsh are therefore guided by customary law. At village level and under guidance of a traditional chief, each development sector (education, health, natural resources management etc.) is represented in the form of a village-level executive committee that is responsible for coordination of specific activities. In the fisheries sector, the village level committee is called the Beach Village Committee (BVC), which also controls access to the Elephant Marsh through BVC leaders known as Beach Chairs. The social organisation (social capital) of the local community is therefore an important attribute for successful management of resources at Elephant Mrsch. In this thesis, social capital refers to the social networks and norms (behaviours) which individuals or groups of individuals can use to facilitate coordination and cooperation for their own or mutually beneficial collective outcomes (Gutie´rrez et al., 2011; Sekhar, 2007; Grafton, 2005).

1.4. Fieldwork Methodology

This study mostly relied on the primary information due to the scarcity of secondary data. Data collection was done using a mix of qualitative and quantitative techniques from multiple sources to improve the validity and reliability of the data (Yin, 1994). These included structured interviews with key informants, participatory observations, Geographic Information Systems (GIS), Focus Group Discussions, and informal talks with individuals. These various techniques targeted relevant actors in small-scale fisheries at the Elephant Marsh in Malawi. In addition, secondary data were collected from documents at relevant offices and through internet search. The study followed strict ethical guidelines and considerations as required by Leiden University. In that respect, participation in the study was based on voluntary consent of the participating parties. Data collection was done during three periods: May to December 2011, April to September 2012, and January to June, 2013.

Pilot (Reconnaissance) Survey

The fishing villages at the Elephant Marsh were initially surveyed prior to the actual data collection to enable the researcher to familiarize himself with the local conditions of the study site and therefore to establish the feasibility details of the study. This was an imperative step for making decisions on the approach for data collection. The pre-assessment provided a general overview which was important for identification of data sources and modifying the data collection tools to reflect the reality on the ground.

Primary data collection

For primary data collection, it was necessary at each stage to critically look at the best method to use in collecting factual information on fisheries management at the Elephant Marsh.

Key Informant Interviews (KII)

Key informant interviews included such personnel as local leaders, fishers, fish traders, fisheries extension workers, government officials, and chairpersons of village fisheries committees. Due to reminiscence problems among the elderly, it was necessary to cross-check some information by asking several people the same questions and also asking the younger generations.

Focus Group Discussions

This method was used to collect information from local leaders (village chiefs), fishers, fisheries committee, and community members of fishing village. Whyte (1977) classified it as “public hearing”. These focus group discussions provided information about fisheries management at the Elephant Marsh. This information complemented and clarified some of the data collected through Key informant interviews. Focus group discussions were generally open but checklists were used to guide discussions. In some cases, the discussions were followed by more probing questions on specific issues of interest in order to get more detailed information.

Informal Discussions

Informal but articulated discussions were used to confirm and complement information collected using other methods. Sometimes, when people are formally questioned, they tend to give answers which sieve information they think may lead them to risk in one way or

another. During data collection, informal talks were useful in generating more information which may not have been obtained during formal discussions.

Geographic Information Systems (GIS) and Participatory Observations

Landsat Thematic Mapper (TM) images obtained from Malawi's Department of Land Conservation in the Ministry of Agriculture and Water Development were used to produce maps of the study area. The classes of interest were cultivated land, grazed land, built-up land, freshwater, grassland, marshes and forest land. Classification employing the Gaussian Maximum Likelihood Classifier algorithm was used to create land use maps from the satellite imagery. This was done using ArcGIS 9 software. The green (0.52-0.60µm), red (0.63-0.69µm), near-infrared (0.76-0.90µm) and two mid-infrared (0.76-0.90µm and 2.08-2.35µm) bands were used in the classification. A range of wavebands was selected to improve the delineation accuracy of land use. A handheld global positioning System (GPS) was used to identify the physical location of the fishing villages which helped in generating the land use map of the area. Participatory observations were also used to supplement and/or confirm the data collected using other approaches.

Review of Secondary Data

Existing secondary data were extracted from relevant documents such as, policies and laws, books, reports, publications, journals and internet articles. The relevant documents were accessed, perused and the relevant information/text sorted and photocopied for further analysis. In some cases, there was either no electricity or photocopying services. In such cases, a digital camera was used to capture relevant documents which were later downloaded to a computer, printed out, and sorted, and analyzed based on the objectives of the study. In addition, a literature study of the existing research reports and some official statistics was done.

Limitations of the study

This PhD study achieved its intended goals despite some limitations which future research in small-scale fisheries management at the Elephant Marsh in Malawi may improve on. One clear shortfall was the scarcity of data on fish stock assessments which, without necessarily affecting the results of the study, limited the width and depth of the institutional design recommendations that have been proposed in this thesis. The scarcity of secondary data (some very old) also resulted in the researcher spending a lot of time to generate primary data to inform the study. Although there is no reason to believe that the fisher-informants should somehow be systematically biased, but still, the fish catch data has not been counted

systematically. Another thing to note is that being a case study, the scaling up of the findings from the Elephant Marsh Fishery to similar small-scale fisheries in other parts of Malawi or elsewhere should be done with caution. The reason for this is that socio-causal dynamics at the Elephant Marsh might be locally unique. The diversity and complexity of socio-ecological systems for small-scale fisheries across the globe therefore requires that wholesome generalities for sustainable small-scale fisheries management options should be subjected to further research.

1.5. Thesis Outline

The thesis comprises six chapters. The present chapter gives a general overview of the topic of study and presents the research questions. Chapter 2 presents the management arrangements as well as the ecosystem-based development potentials that exist at the Elephant Marsh in Malawi. Chapter 3 unveils the conditions that are necessary for small scale fisheries in developing countries. Based on lessons from the preceding chapters, Chapter 4 uses empirical data from the Elephant Marsh Fishery to establish conditions that are necessary for its sustainability. Chapter 5 analyses the socio-causal linkages among various key actors in order to devise a sustainable management plan that can achieve long-term sustainability of the Elephant Marsh Fishery. Finally in Chapter 6, the thesis presents the major conclusions and an outlook to further institutional development.

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