

**“The lake is our office”:  
Fisheries resources in rural livelihoods  
and local governance on the Rufiji River  
floodplain, Tanzania**

Marie-Annick Moreau

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I, Marie-Annick Moreau, confirm that the work presented in this thesis is my own.  
Where information has been derived from other sources, I confirm that this has been  
indicated in the thesis.

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# **A Note on Terminology**

Throughout the thesis I use the term 'fisherman' or 'fishermen' to refer to individual(s) in the study area who fish, rather than the more gender neutral 'fisher' or 'fisherfolk'. This is a conscious decision reflecting the near total dominance of men in local subsistence and commercial fisheries, but does not negate the facts that women in Rufiji fish on occasion as well as playing an important role in the processing and sale of fried fish.

# Abstract

This thesis provides an analysis of the livelihood role of aquatic resources on an African floodplain, examining the economic, social and historical dimensions of local freshwater fisheries amid growing uncertainty over land and water tenure. The aim is to document who depends most on the resource and how. The contribution is both practical—in demonstrating the value of the current livelihood system to rural inhabitants—and theoretical, in putting forward a more ethnographically informed analysis of livelihoods by examining the social relations and cultural values structuring access to the fishery and market, and management efforts.

Fieldwork focused on three villages sharing access to a permanent lake and adjacent wetlands. A structured questionnaire confirmed that half of all households in the area relied on the sector as a key income source. Individuals' and households' asset holdings, demographic characteristics, and wealth ranks had limited influence on these participation and reliance patterns, reflecting the ubiquity of fisheries in local livelihoods. A household survey of aquatic resource use across one year showed that people depended on a variety local freshwater fish species as their main animal protein source, with poor households consuming the least. Fishermen surveyed at the fishing camps could be distinguished by their gear choice, with the decision to participate in commercial fishing related more to lifestyle factors than asset holdings.

Although a handful of individuals owned the largest commercial nets in the area, they did not monopolise supply, with a commodity chain analysis revealing the regional fish trade to be an equitable and accessible livelihood option. Through interviews and observations at village meetings, the performance of local institutions in managing the lake fishery was revealed to be hampered by unclear borders, petty corruption, and leaders' limited accountability, the latter due in part to cultural notions of equity and forgiveness.

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# Acronyms

AR	Aquatic resource
AME	Adult Male Equivalent
CBNRM	Community-based natural resource management
CCM	<i>Chama cha Mapinduzi</i>
CUF	Civic United Front, <i>Chama cha Wananchi</i>
CPR	Common property resource
DAS	Daily Activity Sheets
DHS	Tanzania Demographic and Health Survey
FAO	Food and Agriculture Organisation
FCS	Fishing Camp Survey
GDP	Gross Domestic Product
HARS	Household aquatic use survey
HSES	Household socio-economic survey
IPCC	Intergovernmental Panel on Climate Change
MKS	Market survey
NGO	Non-governmental organisation
OAA	Other aquatic animals
REMP	Rufiji Environment Management Project
TANU	Tanganyika African National Union
TZS	Tanzanian shilling
SD	Standard deviation
SLA	Sustainable livelihoods approach
SSF	Small-scale fisheries
VEC	Village Environment Committee
VEO	Village Executive Officer
UN	United Nations
USD	US Dollar
WHO	World Health Organisation



# Glossary

<i>Bondeni</i>	‘valley’, refers to the river floodplain
<i>Chai</i>	‘tea’, refers to small cash payments
<i>Dungu</i>	field house on stilts
<i>Fungu</i>	a pile or group, unit of sale in local markets
<i>Juu</i>	‘on top’, refers to land on levees or river terrace
<i>Juya</i>	a seine net worked by four men in two canoes (active gear)
<i>Kimea</i>	a cast net (active gear)
<i>Kisi/Kifaba</i>	a traditional basket-shaped fish trap
<i>Kitoweo</i>	see <i>mboga</i>
<i>Kuchokoa</i>	see <i>mkogero</i>
<i>Kutega</i>	a gill net, set in the water (passive gear)
<i>Masagala</i>	a brush pile, used to attract fishes
<i>Masika</i>	the long rains
<i>Matajiri</i>	rich men ( <i>tajiri</i> , sing.)
<i>Mboga</i>	side-dish (relish) eaten with main starch at meals
<i>Mkogero</i>	an encircling gill net (active gear)
<i>Mkoko</i>	a seine net worked from shore or from canoes, by two or four fishers
<i>Mlao</i>	planting on the flood recession to take advantage of drawdown
<i>Msingi</i>	‘base’, refers to money used as starting capital in business
<i>Mtendaji</i>	the Village Executive Officer
<i>Mwenyekiti</i>	a chairperson, e.g., the elected village chairperson
<i>Mzee</i>	an elder (male)
<i>Nyando</i>	a reed fence (fishing weir)
<i>Nyavu</i>	net
<i>Shamba</i>	a cultivated field
<i>Vuli</i>	the short rains
<i>Ujamaa</i>	‘Togetherness’, Nyerere’s African model of socialism
<i>Ukoo</i>	The clan or lineage group

# Chapter 1. Introduction

## 1.1 Overview

This thesis provides an analysis of the livelihood role of aquatic resources on an African floodplain, examining the economic, social and historical dimensions of local freshwater fisheries. The aim is to document who depends most on the resource and how, in an effort to understand how changes to the resource base—whether through increased exploitation, climate change, or dispossession—might affect the most vulnerable. The contribution is both practical—in demonstrating the value of the current livelihood system to rural inhabitants—and theoretical, in putting forward a more ethnographically informed analysis of livelihoods by examining the power relations and cultural values structuring fisheries access and management. The research took place on the Rufiji River floodplain, Tanzania, a location long in the sights of major hydropower developers and of increasing interest to large-scale commercial agriculture investors, including for biofuels (Hamerlynck et al. 2010, Hoag and Ohman 2008).

In this chapter, I place my research in the context of growing global demand for African land and water resources, and the accompanying uncertainty around securing ownership and rights to these. I then describe the theoretical framework that guided my research questions, drawing on the sustainable livelihoods approach and ideas from the access and common-property literatures. A third section reviews the available literature on the socio-economic and management aspects of African small-scale fisheries, leading to a final section setting out my research questions.

## 1.2 Research context: Uncertainty over land and water

Radical changes in land-ownership and land use are taking place across the global South which will result in dispossession of land and resources from local users

and increasing social inequality (Peters 2013, Benjaminsen and Bryceson 2012, Zoomers 2010). Characterised as a land grab, the rush to lease or purchase large tracts of land across national borders is driven primarily by food-importing nations wanting to secure cheap food crops, galvanised by the global food price crisis of 2007-2008, as well as a push towards biofuels (De Schutter 2011, Zoomers 2010). Zoomers (2010) places the land grab in a wider context of increasing globalisation, the liberalisation of land markets, and the worldwide boom in foreign direct investment. Largely ignored in the debate however is the fact that acts to secure land for agriculture are fundamentally about water (Rulli et al. 2013, Allouche 2011). In Africa, shortfalls in rainfall make investments in irrigation critical to proposed large-scale farming, yet few deals explicitly mention water requirements (Woodhouse 2012). Nonetheless, of the large tracts acquired by foreigners in the past decade in poor, developing countries, all have been watered land (Peters 2013).

Wetlands in Africa, with their rich, seasonally inundated soils, have become targets in the current drive for commercial agro-development, and represent a new agricultural frontier (Maconachie et al. 2009). Wetland areas have historically been perceived as wastelands by outsiders and national governments, more suited to agricultural conversion or large-scale hydrological developments than existing multiple use systems (Leauthaud et al. 2013, Adger and Luttrell 2000). Overlooked in these mega-projects is the critical role played by wetlands in supporting food, water and livelihood security for rural communities (Maltby and Acreman 2011, Richter et al. 2010, MA 2005), and the disproportionate contribution these areas make to Africa's national economies by virtue of being wet places on a dry continent (Woodhouse et al. 2000, Adams 1992). The fact that Africa is the continent "most vulnerable" to climate change according to the UN IPCC, with rainfall predicted to become even scarcer and more unreliable, will only increase surface waters' importance (Pottinger 2006, see also Junk et al. 2013).

African wetlands were traditionally used for communal purposes (Ansoms et al. 2014), such as fishing, grazing and hunting, and lack of official recognition of prevailing customary rights are proposed to contribute to the loss of these valuable zones (Adger and Luttrell 2000). The appropriation of land and resources, particularly those held under customary tenure, is not a new phenomenon but the continuation of a longer process begun under colonialism (Peters 2013, 2009). Nor is appropriation for agricultural purposes the only engine behind the current land grab, with Zoomers

(2010) including the expansion of conservation and ecotourism areas among seven processes contributing to the “foreignisation of space”. In Tanzania, where at least 40% of the country’s total land area is conserved in some form, the promotion of community-based conservation projects has provided the key mechanism for more powerful actors to gain access to village lands and natural resources, dispossessing local users while allowing the winners to accumulate capital (Benjaminsen and Bryceson 2012). As these authors demonstrate, dispossession occurs not only through the loss of land but also in restrictions on the nature of locals’ resource use, such as regulations on fishing gear.

The mounting evidence of major deficiencies in community-based natural resource management (CBNRM), revolving primarily around the ability of more powerful actors to co-opt devolved approaches to their own ends, has contributed to a crisis of identity and purpose in the field, challenging a model that has dominated conservation circles for the past thirty years (Dressler et al. 2010; see also Blaikie 2006, Campbell et al. 2001, Alexander and McGregor 2000). The push towards community-based conservation coincided with efforts to put in place legal reforms across Africa and the global South aiming to decentralise and democratise natural resource management (Smoke 2003, Batterbury and Fernando 2006). By devolving significant powers—including the ability to raise and keep tax revenues—to democratically elected local governments, decentralisation could theoretically result in new financially secure and socially acceptable institutions even while contributing to poverty reduction through more sustainable resource use (Ribot 2002, 2004). However, expected benefits are rarely realised because true democratic decentralisation rarely occurs, whether in forestry (Ribot et al. 2010), wildlife management (Benjaminsen et al. 2013), or fisheries (Lawrence and Watkins 2012, Béné et al. 2009a).

In fisheries, the logic of CBNRM and decentralisation reappears as co-management, a type of power-sharing partnership that aims to strengthen customary management while improving the legitimacy of state involvement in fisheries management through more inclusive decision-making processes (Evans et al. 2011). As with other forms of devolved natural resource management, critics identify co-management approaches as facilitating the impoverishment of communities by introducing governance structures that empower dominant social classes (Davis and Ruddle 2012, Bromley 2009). Davis and Ruddle (2012) excoriate practitioners and

researchers for assuming that the state is a benevolent force and failing to take into account power relationships among all players.

Instead, questions must be asked about who wins and who loses in new resource ownership and governance arrangements, as part of a greater recognition of the wider political economy in which contestation over resources takes place (Peters 2013, Davis and Ruddle 2012, Dressler et al. 2010). For Fairhead et al. (2012), concerned that the emerging trend in appropriating land for environmental ends (“green-grabbing”) is only beginning, reflecting on winners and losers is fundamental in ensuring social equity and justice for agrarian societies. For Campling et al. (2012), it is essential to extend such analyses away from a near-exclusive focus on land to encompass aquatic systems and capture fisheries.

### **1.3 Theoretical framework**

The manner in which rural communities, households and individuals use and rely on natural resources—and in this thesis, specifically on fisheries resources—to build their livelihoods will affect their degree of vulnerability to any changes in access to these, and in turn their identification as potential winners and losers in the process.

In this thesis, I use the theoretical framework provided by the sustainable livelihoods approach (SLA) to structure my examination of the role of natural resources in rural livelihoods (Chambers and Conway 1992, Scoones 1998, Carney 1998, Ellis 2000). Although widely adopted by the development and research communities, including in the analysis of small-scale fisheries, livelihoods approaches have been criticised for *inter alia* ignoring issues of politics and power (Scoones 2009). In recognition of this, I also draw on ideas from political ecology, and in particular, access theory, to structure my examination of people’s ability to participate in fishing and the fish trade. For the poorest and most vulnerable groups in society, the challenge of building sustainable livelihoods often comes down to the problem of gaining and maintaining access to common pool resources (Garaway 2006, Beck and Nesmith 2001). As such, I also consider ideas from the field of common property management and collective action, with the caveat that these have been criticised for taking overly economic, often ahistorical and politically naïve perspectives.

### ***1.3.1 The sustainable livelihoods approach***

An asset-based approach to understanding households' activity choices and welfare outcomes is widespread in the rural livelihoods literature, and stems from attempts to provide a more realistic picture of how "people get by and get things done" (Bebbington 1999, see also Homewood 2005). Drawing heavily on geography, farm household economics, and development studies, combined with insights from anthropology, numerous authors put forward analytical frameworks and empirical analyses re-thinking the relationship between rural resource use, environmental change, and poverty from the 1990s onwards (Bebbington 1999, Leach et al. 1999, Reardon and Vosti 1995, Dercon and Krishnan 1996). However, the framework that has the most "brand recognition" and that continues to dominate in development circles is the sustainable livelihoods approach (SLA) (Scoones 2009, de Haan and Zoomers 2005).

Under this approach, livelihoods are conceived of as:

"not just what people do in order to make a living, but [also] the resources that provide them with the capability to build a satisfactory living, the risk factors that they must consider in managing their resources, and the institutional and policy context that either helps or hinders them in their pursuit of a viable or improving living." (Ellis and Freeman 2005:4)

The resources available to members of a household are generally divided into five categories: natural capital (land, water, trees, etc.), physical capital (production equipment and infrastructure), financial capital (money, savings, credit access), human capital (skills, education, health) and social capital (networks, associations) (Ellis and Freeman 2005:4; Carney 1998:7). The ability to access and use these resources depends in turn on prevailing social relations (e.g., gender, class, age, ethnicity), institutions (e.g., rules and customs, land tenure, markets) and organisations (e.g., associations, NGOs, local administration) (Ellis 2000). A critical point about rural livelihoods is that they are dynamic: assets can be built up, eroded or catastrophically destroyed; access norms and economic opportunities can change (Ellis 2000:10).

A central concern in SLA is presenting livelihood diversification (in terms of diverse activities and assets) as a viable strategy for the rural poor, and explaining its varied and often contradictory causes (e.g., risk avoidance vs. wealth accumulation). Empirical work has shown that such diversification could have complex effects on

rural inequality, increasing income for the poorest households in some cases but also advantaging the wealthiest, who can make better use of economic opportunities (Ellis 2000, Ellis 1998). In applying SLA to fisheries research and policy, the emphasis has shifted since first deployed from considering assets and activities towards addressing governance issues (i.e., policies and institutions) and supporting fishing communities' human rights and well-being (Allison et al. 2012, Allison and Horemans 2006, Coulthard et al. 2011).

With the ascendance of the livelihoods approach, anthropologists wary of overly materialist, actor-centered and ahistorical notions of livelihoods and poverty have called for more ethnographically informed research inputs (Arce and Long 2000). For de Haan and Zoomers (2005), a deeper understanding of rural livelihoods will come from a more complete conceptualisation of access issues, and from recognising structural aspects of individual decision-making. In the first case, the authors consider that the livelihoods approach must go beyond simply identifying social and institutional structures governing access, and examine the power relations within these. In the second case, individuals are constrained in their decision-making by structural factors related to geography, demography, and socio-cultural understandings of what are appropriate choices to make.

### ***1.3.2 Political ecology: Access to resources***

Conflict over access to resources, whether violent or non-violent, obvious or subtle, is a major analytical focus of political ecology (Turner 2004). By highlighting the power relations involved in defining and using natural resources, researchers working from this perspective have provided a crucial alternative to dominant, neo-Malthusian explanations of environmental change (Blaikie and Brookfield 1987; Peet and Watts 1996).

Investigations of people's competing claims to resources have revealed struggles both across and within households, and structured along age, gender, ethnic, religious and class lines, among others (Carney 1993; Peluso 1992; Rocheleau et al. 1996; Turner 2004; Walker 2001). This is in line with earlier ethnographic work examining rights to resources (particularly land) across Africa. Anthropologists there documented a diversity of overlapping forms of tenure, captured in the ideas of "bundles of rights" and nested "hierarchies of estate", whereby a variety of actors may

hold rights to a resource for one purpose but not another, at some times but not others (Shipton 1994). Exercising these rights often required negotiation, with successful outcomes dependent on people's social standing and additional investment in social relations (Peters 2009, Guyer 1995, Berry 1989, 1993).

Social relations is just one set of mechanisms amongst several posited by Ribot and Peluso (2003) to constrain or enable people's ability (or power) to benefit from resource use. Others are legal rights and numerous extra-legal mechanisms, structures and relations, including: social identity or status, coercion and trickery, material wealth (i.e., financial and capital assets), or physical circumstances (Ribot 1998). In developing a theory of access, the researchers aim to "facilitate grounded analyses of who actually benefits from things and through what processes they are able to do so", making a careful distinction between holding rights to a resource and the ability to derive benefits from those rights (or even from the rights of others). In practical terms, these authors advocate mapping benefit flows for a particular resource of interest; identifying all of the mechanisms by which different actors gain, control and maintain the benefit flow and distribution; and considering the power relations involved at each stage (Ribot and Peluso 2003), as put in practice in Ribot's (1998) analysis of a charcoal commodity chain in Senegal.

### ***1.3.3 Common-pool resources and collective action***

Common pool resources are resource systems whose size, mobility and complexity make it difficult to prevent individuals from using them and whose use can deplete the scale and quality of benefits the resource provides (Ostrom 1990). Fisheries represent such a resource, because fish live in water and are mobile, and are both a renewable but exhaustible resource (Campling et al. 2012). Managing common-pool resources can present a collective action problem, defined as any situation in which the interests of the individual diverge from what is optimal for the group. Hardin (1968) famously described how shared benefits would encourage individuals to avoid costs and free-ride on the sacrifices of others, leading inevitably to a "tragedy of the commons". However, an entire scholarship arose in the wake of his essay to document how people have put in place varied systems of rules, rights and duties meant to avoid just such a scenario, drawing in many cases on empirical examples from maritime



anthropology, where various forms of common property regimes dominate (reviewed in Acheson 1981, Acheson 2006).

Defining, allocating, owning or managing rights to extract fish species is made even more complex in seasonally flooded wetlands, where the borders of waterbodies themselves shift in space and time (Adger and Luttrell 2000). There is evidence for a mix of open-access, communal and private tenure in African inland fisheries, although commons institutions prevail (Coulthard et al. 2011). On floodplains, the type of regime in place is closely related to the form, distribution and value the resource takes on as water levels rise and fall (Thomas 1996). Prevailing property regimes can also be related to goals of social equality, whereby the catch and/or proceeds obtained from waterbodies under common-property arrangements are distributed to the community (Thomas 1996; see also McDaniel 1997 for Amazonia). Similarly, private ownership of all fisheries resources would threaten the survival strategy of people living in a chaotic and risky environment by undermining traditions of mobility and livelihood diversification (Thomas 1996, Gallais 1984).

Common property systems (in contrast to private property or government control) tend to be the governance structures preferred by social scientists for management of natural resources, yet many newly designed communal institutions have failed to achieve conservation and sustainability objectives, as discussed in Section 1.2. Even though common property theory sets out the conditions under which success should arise (Ostrom 1990), few if any communities achieve the degree of social homogeneity (Agrawal and Gibson 1999; Singleton and Taylor 1992) or isolation from wider political and economic forces (Smith and Wishnie 2000) required by the models. At a more fundamental level, dominant models of common property management have been criticised as overly economic, ahistorical and apolitical (Johnson 2004, Agrawal 2003, Mosse 2003). From a political perspective, both Johnson (2004) and Agrawal (2003) consider that theorists of the commons have privileged resource conservation and sustainability over issues of equity, overlooking how marginal and less powerful groups can be disadvantaged within common property regimes. These criticisms are also reflected in recent calls for a re-focusing of CBNRM on issues of social justice, and that such interventions pay greater attention to wider political economic dynamics (Dressler et al. 2010).

### **1.3.4 Summary**

The theoretical frameworks reviewed here are tied together by calls to pay more attention to issues of access and power. Access consists not only in access to the resource itself, but to the assets and institutions required for realising benefits from its use. Power differentials among the various stakeholders will affect individuals' ability to exercise their rights to the resource, and are themselves the outcomes of economic, social and historical processes. As a result, there is a need for livelihood studies that look more at equity outcomes from common property resource systems (rather than simply conservation results), that disaggregate resource use and reliance patterns among different resource users (paying particular attention to marginal groups as well as the most powerful), and that place resource use decisions within a wider historical and cultural context.

## **1.4 Literature review: Small-scale fisheries in African rural livelihoods**

Fish production is a basic element in the economy of many African wetlands (Adams 1992: 93), with inland fisheries supporting food security, employment, and cash income to millions of the rural poor (Béné and Friend 2011). In this section, I review available literature on the role of small-scale fisheries in rural livelihoods and on their governance. The aim is to link ideas developed in the preceding section on livelihood assets, access and common property arrangements with available empirical evidence in order to identify areas for further research.

### **1.4.1 The state of inland small-scale fisheries**

The term “small-scale fisheries” (SSF) is a broad one, but fundamentally describes fishing activities in which households or communities are the focus of social organisation, where there are relatively low levels of capitalisation, and where activities are dynamic in space, time and technology (Mills et al. 2011). Inland fisheries in developing countries differ fundamentally from coastal fisheries in typically being integrated into complex and diversified livelihood strategies (Welcomme et al. 2010), and also involve more people (Béné and Friend 2011). Participation in inland SSF is high, and while most of the catch is consumed locally supplies are also traded up to urban and coastal areas (Welcomme et al. 2010). Despite

the widespread view that inland fisheries are in crisis—influenced by perceptions from marine fisheries and similarly blamed on over-fishing—global catches are actually rising, and are likely underestimated (Welcomme et al. 2010). As these authors explain, assessing the state of exploitation of inland fisheries is complicated because of the diffuse and small-scale nature of fishing makes collecting data on landings difficult, but also because most fisheries are multi-species and multi-gear and so not amenable to standard fishery assessment models (see next section).

Despite their importance to rural livelihoods, remarkably little has been written on the socio-economic aspects of these systems (Welcomme et al. 2010, Béné 2003, Geheb and Binns 1997). In Africa, much of the available research is restricted to a few geographic areas, including work carried out under the Sustainable Fisheries Livelihoods Programme in West and Central Africa, and cited below. Fisheries policy in developing countries continues to prioritise economic growth rather than welfare goals, promulgating the concentration of fishing rights into fewer hands (Campling et al. 2012, Ratner and Allison 2012, Allison et al. 2011, Béné et al. 2010). The need to demonstrate the full weight of SSF's contribution to food security, livelihood provision and poverty alleviation is particularly important given the exclusion of the sector from debates on water management, or rural development and poverty alleviation more broadly (Béné and Friend 2011, Mills et al. 2011).

#### ***1.4.2 The ecology of floodplain fisheries***

There are some 12.8 million km of rivers in Africa (Welcomme 2003), with most rivers having fringing floodplains along their channels (Howard-Williams & Thompson 1985). Seasonal floods deliver nutrients to river floodplains, with inundated areas providing food and shelter to many larvae and juvenile fish species, as well as feeding and breeding grounds for adult fish (Welcomme et al. 2010). Floodplain-associated fish fauna are extremely diverse, together showing a wide range of morphological and behavioural adaptations to their complex and temporally dynamic habitats (Welcomme 2003). Fish in these systems can be classified generally as whitefish (i.e., fish that migrate long distances between their feeding and breeding sites, primarily within the main river channel but sometimes on to the floodplain) or blackfish (i.e., fish that spend most of their life in permanent waterbodies on the floodplain, leaving these during the floods to reproduce and feed) (Welcomme 2003).

In the Rufiji River, some 40 fish species occur, with most migrating from the main river channel to the floodplain and major lakes as waters are rising in order to spawn and feed (Hopson 1979).

Floodplain fisheries across the tropics are organised to exploit fishes' seasonal movement patterns, with people using a wide variety of fishing gears and methods to target the great variety of species making use of seasonally variable habitats (Allan et al. 2005). In general, fishing activity intensifies when fish become confined to smaller waterbodies (during the dry season and period of falling water) or as fish are migrating (the rising water period). As flood waters peak, fish disperse over wide areas of the floodplain and take shelter in submerged vegetation, making fishing difficult and driving fishing activity to a minimum (Welcomme 1975). Such high-water periods thus serve as a type of closed season.

Small individuals and species tend to far outnumber large fish in inland waters, with implications for productivity (Allan et al. 2005). Many smaller fish species exhibit r-selected life history strategies (i.e., rapid growth, early maturity and high reproductive rates), with high floods and consequent high nutrient levels contributing to rapid growth (de Graaf 2003). Indeed, where examined, floodplain fishery productivity is closely correlated with the intensity of flooding in preceding seasons (Welcomme et al. 2010). Climate-driven fluctuations in fishery productivity are such that conventional fisheries management measures centered on limiting fishing effort locally have relatively little impact on stocks (Sarch and Allison 2000, Hamerlynck et al. 2011).

In fact, given the multiple species and gears involved in inland fisheries the classic concept of overfishing—whereby increases in fishing effort beyond a maximum sustainable yield lead to declining catches and possible stock collapse—is inappropriate for inland fisheries (Abbott and Campbell 2009, Welcomme et al. 2010, Kolding and van Zwieten 2011). Rather than exhausting a single stock, inland fishers simply shift their effort to other members of the fish assemblage. This process, characterised as “fishing down the food web” may lead to the largest individuals and species in the assemblage being successively reduced and even lost from the fishery until only the smaller species remain, without necessarily leading to declining catches overall (Allan et al. 2005). This is because smaller species are more biologically productive, and larger species are often fish-eating predators. The main indicator of increasing fishing pressure in these ecosystems thus becomes a reduction in the mean

size (and age) of fish landed, not reductions in total catch (Welcomme et al. 2010). However such a result is not inevitable: Garcia et al. (2012) note that in several African inland SSF the fish size spectrum has been maintained under intense and diverse fishing activity, so that fishing spread over more species and sizes is less likely to lead to population extirpations or biomass depletion.

While overfishing in inland fisheries of certain target species can occur (Allan et al. 2005), the greatest threats to these resource systems lie outside the fishery sector and the immediate watershed (Sneddon and Fox 2006, Béné and Friend 2011). Modification of flow regimes by water abstractions and hydroelectric developments are among the greatest threats, compounded by climate change (Welcomme et al. 2010). The dependence of floodplain fishery productivity on broader ecosystem-level processes, combined with a limited understanding of floodplain ecology at the local level, suggest to Abbott et al. (2007a) the need for new management approaches combining transboundary and community-based approaches.

#### ***1.4.3 Livelihood role: Contribution to food security and nutrition***

Fisheries make a major contribution to human food supply, with fish furthermore recognised as one of the world's most nutritious food sources (Tacon and Metian 2013). People in developing countries tend to depend on fish in their diet as a source of animal protein more than is the case for developed nations (Kent 1998), with aquatic animal products (primarily fish) representing over 18.5% of total animal protein supply within Africa in 2009, second only to Asia at 23% (Tacon and Metian 2013). The true contribution of fish to protein supply is undoubtedly higher, given that available statistics are based on national-level estimates of fishery production and consumption which regularly overlook fish supplied by small-scale coastal and inland fisheries (Mills et al. 2011).

Protein derived from fish provide multiple advantages over other sources. Animal protein is more easily digested than plant protein and fish, in comparison with most terrestrial meats, have a higher protein content on an edible fresh weight basis (Tacon and Metian 2013). Adding fish to a plant-based diet can also increase a person's total protein intake, as levels of lysine in fish help to counteract shortages in this essential amino acid in plant foods, which remain the main sources of protein in low-income food-deficit countries (Kawarazuka and Béné 2010). Of increasing interest however is the contribution that fish could make beyond protein, helping to combat the

‘hidden hunger’ arising from micronutrient deficiencies in human diets. More than two billion people worldwide, with a large proportion in Africa, are estimated to be deficient in essential vitamins and minerals, especially in vitamin A, iron and zinc (WHO 2007). Micronutrient deficiencies occurring at specific stages of human life can severely affect health and development, sometimes with irreversible effects (Kawarazuka and Béné 2011). Food-based approaches to combat micronutrient deficiency, in which interventions rely on locally-available nutritious foods rather than supplements, are increasingly incorporating fish, particularly small fish species (Toledo and Burlingame 2006, Kawarazuka and Béné 2010, Roos et al. 2007).

Besides their direct contribution to human diets, fish may improve food security indirectly by increasing households’ cash income. That fish sales generate much-needed cash for rural households is well-documented in small-scale fisheries, with poor households using income from fish sales to purchase other foods, including lower cost staple foods (Kawarazuka and Béné 2010). Such cash income might also be spent on the daily necessities that rural Africans would feel “hard-pressed” without, such as soap, kerosene, cloth and cooking oil (Bryceson 1989).

#### ***1.4.4 Livelihood role: Poverty in SSF***

SSF communities are often characterised as being amongst the “poorest of the poor” in the fisheries literature, with impoverishment seen as the inevitable Malthusian consequence of unlimited users entering and over-exploiting putatively ‘open-access’ fisheries (Béné 2003). The reality is more complex and not well understood, with poverty among fishermen related not only to their income earnings from the sector, but also to earnings from other livelihood activities, holdings of land and other physical assets, and access to health, education and the political process (Béné and Friend 2011). Fishermen are not invariably among the poorest community members, in income terms, in any case (Béné et al. 2009b). Also central to an understanding of poverty in fishing communities are concepts of vulnerability—people’s exposure and sensitivity to risks and ability to cope with external shocks—and marginalisation—through exclusion from institutional or market processes, for example (Béné and Friend 2011, Allison and Horemans 2006). Marginalisation, through its effect on access, is dealt with in the next section.

A key contribution of livelihood studies in African inland fisheries has been to establish the dynamic role of fishing in rural livelihoods: fishing is more often a complement to diversified livelihoods than the sole source of fishing households' income (Neiland et al. 2005, Béné et al. 2003a, Neiland et al. 2000a, Sarch and Allison 2000, Geheb and Binns 1997). For this reason, understanding how and when fishing contributes to overall livelihood strategies is more important than counting up the number of 'full-time' fishermen in an area (Béné and Friend 2011). The ability of individuals to move flexibly in and out of fishing is of particular importance in reducing people's vulnerability to shocks and disasters (Allison and Ellis 2001, Sarch and Allison 2000). In this welfare role, SSF have been characterised as a "labour buffer" or "safety-valve", absorbing rural, unskilled, surplus labour and also as "safety-nets" providing additional income-earning opportunities after unexpected shocks such as floods or illness (Béné et al. 2010a, see also Coomes et al. 2010).

The proportion of income derived from fishing by any one household varies widely, and even farmers might use fishing as their primary source of cash (Béné et al. 2009b, Allison and Mvula 2002). This is because fishing can usually be conducted year-round (though subject to seasonal effects), as opposed to the one-off sales generated by most agricultural activities (Béné and Friend 2011). In addition to contributing to the daily household expenses (see above), earnings from fishing can be used on services such as education (Paul et al. 2011, Béné et al. 2009,) and on productive assets including fishing nets and farming inputs (Sarch 1996). Sarch (1996) at Lake Chad describes how households that cycle cash and labour between fishing and farming activities produced more agricultural output than did strictly farming households. However, at Lake Victoria, Geheb & Binns (1997) describe a negative correspondence between fishing and farming: people needed to both farm and fish more in order to make up for declining productivity in both sectors. Higher earnings from fishing do not necessarily equate to more secure livelihoods in any case, with migrant fishermen in the Congo found to be more vulnerable than residents with lower incomes (Béné 2009).

Fishermen are not necessarily asset-poor. Around Lake Chad, richer households hold more, larger and a greater variety of fishing gear than do poorer households, enabling exploitation of the most productive fisheries (Béné et al. 2003b). An examination of the floodplain fisheries on Namibia's Caprivi River found a similar process of differentiation occurring, with "richer" households able to allocate more

labour and resources—most importantly, large, modern gears—to making their fishing more effective (Tvedten 2002). In other situations, land holdings can matter: on the Yaéré floodplains land is a scarce and unequally distributed asset, conferring high economic and possibly social benefits to land-holders, further driving the wealth differentiation that enables richer households to better exploit local fisheries (Béné et al. 2003a). While differences in gear types and availability of capital are commonly taken into account in SSF livelihoods research, other assets, particularly those related to a household's social or political position within their communities, are less often considered (Coulthard et al. 2011).

#### ***1.4.5 Access to fishery resources and benefits***

Access to fisheries resources are typically mediated by the state, existing local institutions, relationships of power and influence between stakeholders, and gender relations (Nunan 2006). The ability to benefit from the resource also depends crucially on access to fishing opportunities and to the market, so that analysing relationships between fishermen, fish processors, boat and gear owners and traders becomes critical to understanding individuals' livelihood strategies (Campling et al. 2012).

##### *Access to markets*

The economic opportunities for local people, pressures on local food security, and impact of fisheries exploitation on social relations among fishermen and wider communities are key themes in studies of fish trade and markets in Africa (for marine fisheries: Crona et al. 2010, Övera 2001, Walker 2001, Gibbon 1997; for major inland lakes: Geheb et al. 2008, Allison and Mvula 2002, Gordon 2005, Chirwa 1996). Intermediaries in SSF typically provide fishermen with gear or credit, entering into patron-client relationships in order to guarantee their own supplies while off-setting risks to fishermen (Platteau 1989). The role of smaller, less commercially-important floodplain fisheries in African rural livelihoods remains relatively understudied, leaving open questions as to whether small-scale fish trading represents a marginal livelihood activity, and how intermediaries influence resource users' access to market (Abbott et al. 2007b).



### *Fisheries governance*

In the current context of decentralisation, and building on a long history of the appropriation of resources held under common property arrangements, relations between the state and local institutions are fundamental in structuring people's access to fisheries resources. For the most part, African fisheries remain under the influence of local traditional leaders (Russell and Dobson 2011, Béné et al. 2003, Neiland et al. 2005, Thomas 1996). However, in some cases decentralisation has contributed to the dismantling of existing local institutions without offering an effective alternative. In Zambia, the granting of equal access rights to fisheries to all citizens without concomitant support to statutory regulations contributing to a *de facto* open-access situation (Haller and Chabwela 2009, Haller and Merten 2008). For Haller and Merten (2008), a critical question lies in asking why local people are not acting collectively to fill the governance vacuum, and they suggest that the answer depends on understanding the historical context of institutional change and the different actors' bargaining power in maintaining their own interests.

Elsewhere, the retreat of the state can serve to strengthen actors within local institutions without necessarily benefitting fishing communities. In a review of fisheries-related reforms in five sub-Saharan nations, Béné et al. (2009a) found that decentralisation tended to modify rather than improve governance, allowing local elites greater freedom to pursue their own agendas while the poorest fisherfolk generally lost out (see also Njaya et al. 2012, Thomas 1996). Although the role of traditional authorities is not always negative—with influential individuals able to facilitate community-state interactions (Russell and Dobson 2011, Aarnink 1999) or resolve conflicts among fishermen (Olomola 2008)—those local leaders excluded or undermined from reform processes can become highly disruptive (Béné et al. 2009a). Other elites, including government staff and their agents, can also seek to establish control over resources, hijacking newly devolved powers to extend their own political, social or economic status (Béné et al. 2009a, Njaya et al. 2012).

### *Power and marginality*

Marginal groups within inland fisheries can include women and migrant fishers, who might be less able to influence decision-making processes or access opportunities which underpin their livelihoods (Allison and Ellis 2001).

Although research attention has tended to focus on the male-dominated catching sector, women typically dominate the fish processing and marketing sectors in SSF (Harper et al. 2013, Bennett 2005). In reviewing studies on the significance of small-scale fish trading to women's livelihoods, Abbott et al. (2007b) indicate that no clear trends emerge: in some places fish trading is a prestigious livelihood among women, in others only socially marginal women are involved despite opportunities for wealth accumulation. Obtaining fish supplies can entail engaging in fish-for-sex transactions, a practice that carries social stigma for women trading in fish from Zambia's Kafue Flats but that is increasingly common as women lose their traditional (but informal) access to tributaries to commercial fishermen (Merten and Haller 2007).

Although mobility is a key feature of SSF livelihoods in Africa, its role in fisheries governance has received little attention (Nunan 2010, 2006). The primary incentive for fisherfolk's movements remains the need to follow fish, but people also move in search of better opportunities in the fishery sector (e.g., better markets, higher prices, and cheaper fishing gear) or in society more widely (e.g., better schools), or as a means to escape family obligations (Njock and Westlund 2010, Beuving 2010, Randall 2005). On arrival to a new area, the means by which outsider fisherfolk gain access to fishery resources are influenced by local institutions in which they might not have a voice (Geheb and Crean 2003, Olomola 1998). Where examined, frequent movements were found to hamper fishermen's participation in decision-making at Lake Victoria, allowing boat owners to dominate management arrangements (Nunan et al. 2012).

Exclusion from the political process is one sign of the marginal status often occupied by migrant fishermen, and contributes to their vulnerable position in rural society. Integration into local communities, even where outsiders share their hosts' ethnicity and language, is complicated if the two groups are competing for employment and resources (Njock and Westlund 2010). Often, outsiders are considered threats to sustainable resource exploitation, both by increasing activity directly and by disruptions to existing management regimes (Curran and Agardy 2002, Smith and Wishnie 2000, Ostrom et al. 1999). In the latter case, migration into an area is presumed to weaken reciprocity and trust in the host community, where such social bonds are required for effective collective action.

For African inland waters, the issue of over-exploitation may be moot in any case: Sarch and Allison (2000) argue that the widespread acceptance of migrant fishers

in these ecosystems and the persistence of reciprocal access rights among fishing communities speaks to people's recognition that fisheries resources fluctuate widely over space and time, with fish numbers primarily driven by climatic factors rather than exploitation levels. How individuals in fishing communities respond to outsiders might have more to do with their perceptions of their own security of access to the resource and expected losses or benefits from outsiders' presence than the biological state of the resource itself (Geheb and Crean 2003).

## **1.5 Research questions**

This section presents my main research questions, set up as responses to identified gaps in knowledge in the available literature on African SSF and organised by chapter heading. An aim throughout the thesis is to identify differences among individuals and households in their reliance on the fishery, in order to better understand who the potential winners and losers might be if access to these resources change.

Theme: Differential participation and reliance on local fisheries
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*Chapter 4:* Which households participate in local fisheries and rely the most on the resource, and how are these participation and reliance patterns related to asset holdings?

*Chapter 5:* What role do fish and other aquatic resources play in local food security (through direct consumption and indirect cash earnings) for local households, and how does this vary by wealth group?

*Chapter 6:* How do differences among fishermen in their gear choice affect their earnings from the fishery, and how are these differences related to other household characteristics?

Theme: Access to markets

*Chapter 7:* Who are the main actors and major beneficiaries in local fish commodity chains, and what are the opportunities for individuals to enter the trade?

Theme: Access to fisheries resources

*Chapter 8:* Has decentralisation improved fisheries management on the Rufiji floodplain and, if not, what historical and social processes have contributed to observed failures?

*Chapter 9:* Do migrant fishermen feature in local fisheries, and if so, how do they differ from resident fishermen and what impact do they have on local fisheries management?

Before presenting my research results, I introduce the study area and main study villages in the next chapter, followed in Chapter 3 by a description of my research methods. In the final chapter, I revisit my main research themes and consider how this thesis has contributed to current knowledge in these areas, and what conclusions can be drawn as to who stands to win or lose as incipient struggles over land and water in Rufiji District take material form.

## Chapter 2. Study Area

### 2.1 The national context: Tanzania

The United Republic of Tanzania is located in eastern Africa, just south of the Equator, on the Indian Ocean. It borders on Kenya, Uganda, Rwanda, Burundi, the Democratic Republic of Congo, Zambia, Malawi and Mozambique (Figure 2.1). Dodoma is the national capital, but Dar es Salaam is the largest city and commercial centre. Kiswahili is the national language, spoken by nearly all citizens, while English is the language of higher education. Another 128 minority languages or so are spoken in the country (Petzell 2012).

The modern nation of Tanzania was founded in 1964 through the union of mainland Tanganyika and the archipelago of Zanzibar. The islands and coastal areas were integrated into the commercial system of the Indian Ocean as early as 200BC, giving rise to the Swahili civilisation (Sheriff 1987). The area that was to become Tanganyika came under German rule in the 1880s, passing to Britain after World War I under a League of Nations mandate (Iiffe 1969). The colony achieved independence under Julius Nyerere's leadership in December 1961. Nyerere's party (TANU, and later CCM, *Chama cha Mapinduzi*) has remained in power ever since, winning every national election since a multi-party system was introduced in 1992.

The population of Tanzania in 2007 stood at 34.4 million people, with 33.6% of the population considered to be under the basic needs poverty line. By 2012, the population had increased at the rate of 3% *p.a.* to 44.9 million people, with a life expectancy at birth of 56 years (NBS 2013). The country scored 'low' on the UN Human Development Index for 2012, ranking 152<sup>nd</sup> out of 187 countries and territories (HDR 2013). Gross national income per capita in that year was estimated at 570USD (World Bank 2013). Despite rising unemployment, frequent power outages and growing calls for political reform, projected major investments by China in coal, iron ore and gas projects have led to optimistic forecasts for GDP growth into 2013 (AEO 2013).



Cartography: M. Irving (UCL)

**Figure 2.1** Map showing the position of Rufiji District within Tanzania

However, agriculture (with forestry, fisheries and hunting) remains the major employer of three-quarters of Tanzanians and the primary economic sector, representing 28% of GDP in 2010. Foreign loans and grants continued to supply one third of the budget in 2010/11, with the government called upon to *inter alia* reform taxation and spur private-sector growth to curb aid dependence (AEO 2013).

## **2.2 Study site location: Rufiji District**

My study site was located in Rufiji District, one of six districts within the Pwani (Coast) Region (Figure 2.2). The district is sited approximately 180km south of Dar es Salaam, between latitudes 7.47° and 8.03°S and longitudes 38.62° and 39.17°E (Mwageni et al., *n.d.*). The Coast region is one of Tanzania's poorest, with 46% of households classed below the basic needs poverty line (URT 2002). Educational attainment in the region is the second-lowest in the country, with 25% of males and 56% of females living in the rural areas having no primary schooling (URT 2002).

In 2002, Rufiji District had a population of 202,001, the majority of whom (76%) were classified as living in rural areas (URT 2004). The intercensal growth rate (1998 – 2002) was 1.9%, and from the 2002 to 2012 census had slowed to 0.76% p.a.. The district covers an area of 13 339km<sup>2</sup>, of which 38% is held in registered Forest Reserves and the Selous Game Reserve (Durand 2003). Excluding reserve land, the average population density for the district in 2012 was 43 people/km<sup>2</sup>, compared to a national average of 51 people/km<sup>2</sup>. The district council headquarters are located at Utete, but Ikwiriri and Kibiti (with the district's only bank) are the main commercial centres.

Transport in the district improved greatly in 2003 with construction of the Mkapa Bridge over the Rufiji River at Ikwiriri, linking Dar es Salaam to Mozambique and replacing a highly unreliable ferry service. In tandem with this project, paving of the main road has cut travel times from Ikwiriri to Dar es Salaam from one or more days to a few hours. Roads in the rest of the district remain unsurfaced and impassable in the wet season (Richmond et al. 2002). The Rufiji River is not easily navigable because of sandbars, debris, and crocodiles and hippos.

## **2.3 Physical characteristics**

### **2.3.1 Geography and climate**

The Rufiji River is the defining physical feature of Rufiji District. It is the longest river in Tanzania, draining some 20% of the country's land area through its major tributaries, the Great Ruaha, the Kilombero and the Luwegu (Duvail 2004). At the western edge of the district the Rufiji River passes through Stiegler's Gorge in the Selous Game Reserve, runs eastwards for some 150 km through a broad river valley, and then branches out to form the Rufiji Delta, the largest mangrove wetland in East

Africa (Hamerlynck et al. 2010). A vast floodplain (roughly 1450km<sup>2</sup> in size) occupies the valley bottom, gradually widening as the river approaches the delta, from 7km at Utete to 30km at the delta (Hamerlynck et al. 2010). The floodplain is characterised by a mosaic of former river channels, levees and shallow depressions, as well as eight major permanent lakes, the shallow remnants of former tributaries to the Rufiji River (Hamerlynck et al. 2011). From the edges of the floodplain, river terraces lead up to forested hill areas which are entirely out of reach of floods. The main agro-ecological zones of the district follow this delta/ floodplain/ hills zonation (Havnevik 1993). However, zones are also distinguished along the length of the floodplain, divided into western, central, and eastern portions (Hamerlynck et al. 2010; Figure 2.1).

The study area has a tropical, semi-arid climate with little monthly variation in day length or temperature. Rainfall across the district is highly variable in space and time, but generally display two peaks with the short rains (*vuli*) in October-November and the long rains (*masika*) from March to May (Hamerlynck et al. 2010). The coincidence of heavy rains and high flood waters marks the ‘wet season’ in the district. The Rufiji River has an annual flooding pattern, generally beginning in December and reaching peak water levels in April, although the timing, duration and level of flooding is highly variable (see next section).

When water levels exceed a certain threshold (known locally as *kingo*), riverine water flows into the permanent lakes of the district, mixing with water contributed by tributaries on the opposite side of the connecting channel (Hamerlynck et al. 2010). The connection can extend for several weeks, allowing exchange of water, suspended matter and biological material, including fishes. At flood recession, excess water (i.e., above the threshold level) flows back to the river until the connection is severed and the water level in the lake evolves independently from the level in the Rufiji River until the next connection.

Agricultural potential in the district is mainly determined by soil quality and water supply (Hamerlynck et al. 2010). The floods deposit fertile silt over the clay soils which dominate the river valley floor. Where this accumulates on elevated ground behind the low river levees rich *mbaragilwa* soils are formed, relatively easy to work and suitable to a variety of crops but typically dominated by maize (Havnevik 1993, Hamerlynck et al. 2010). On the slightly-lower lying depressions with heavy clay soil (*mfinyanzi*) farmers grow mainly rice.



### 2.3.2 *Risks and benefits of the flood*

The Rufiji River overflows its banks and impacts floodplain agriculture on average in five years out of ten, leaving periods of several years in which no floods occur (Duvail and Hamerlynck 2007). Flooding patterns are notoriously difficult to predict: multiple tributaries contribute to water flow, rainfall across catchment areas is highly variable, and few monitoring stations exist (Duvail and Hamerlynck 2007). Flood damage depends on the height, duration and speed of the rising waters (Bantje 1980). High floods can destroy crops and homes, and even kill people, while early floods can disrupt the planting cycle (Hoag and Ohman 2008). At the same time, the floods are crucial to the region's agricultural productivity, regularly renewing the rich *mbaragilwa* soils. An individual plot may be cultivated continuously for 5 to over 30 years depending on the flooding frequency, with yields decreasing by half if there have been no floods for three years (Hamerlynck et al. 2010).

For government officials and outside experts, the unpredictability of local floods has long been viewed as a threat to human life and economic development, blamed in particular for causing crop loss and recurrent famines. Local people, however, are more likely to describe floods in positive terms, as “a blessing” (Duvail and Hamerlynck 2007; Hoag 2003). In fact, examination of the historical record shows that famines in the district can more often be blamed on drought, war and social conditions as on high waters (Bantje 1980).

Indeed, floods play a crucial role in mitigating *against* drought conditions, both compensating for shortfalls in rainfall, in particular through the *miao* flood recession crop, and supporting alternative safety-net activities, including fisheries and forest product gathering, when crops fail (Duvail and Hamerlynck 2007). The floods support riparian groundwater forests from which locals collect timber, fuel and non-timber forest products such as fruits and honey for home use and sale. The lakes, recharged by high floods, are also the major sources of domestic and drinking water for local villagers, and these as well as temporary waterbodies on the floodplain attract wildlife in the dry season (Duvail et al. 2014). As a result, the worst case scenario for local people is not one of high floods, but one in which both the rains and floods fail (Duvail and Hamerlynck 2007).

## **2.4 Biological characteristics**

Vegetation in Rufiji District includes miombo and open woodlands, coastal forests and, in the delta, tidal forests and mangroves (Durand 2003). The floodplain supports an intensive, integrated rice-maize agricultural system, scattered tree crops, tall grasslands (dominated by *Hyparrhenia rufa*, or ‘*upanje*’) interspersed with acacia (*Acacia sieberana*) and palms (*Borassus*, *Hyphaene* and *Phoenix* spp.; Doody and Hamerlynck 2003; IUCN 2004). Riparian and/or groundwater forests are established on the higher riverbanks and edges of lakes that connect to the river during the annual floods. Almost all of the forests in the district were considered to be overharvested, with some valuable species commercially extinct (Durand 2003). A study of the timber trade found that the woodlands of northern Rufiji District, given their relative accessibility, accounted for 85% of the total harvest in southern Tanzania, with pressure expected to increase throughout the region following completion of the Mkapa bridge (Milledge and Kaale 2005).

A review of available information on biodiversity in the district suggested a minimum of 1354 species in the area (including plants, invertebrates and vertebrates), of which 125 were endemic and 59 considered threatened under IUCN and/or CITES criteria (Doody and Hamerlynck 2003). Of the 117 mammal species, two were considered endangered—the wild dog (*Lycaon pictus*) and elephant (*Loxodonta africana*)—and one critically so (the black rhinoceros, *Diceros bicornis*). There has been no systematic investigation of fish diversity in the district, but the authors list 46 freshwater species from 15 families known from local waterways, none of which are endemic nor under threat.

## **2.5 History of the human population**

### ***2.5.1 The pre-colonial period***

The Rufiji valley is a historical cross-roads, sheltering various groups during the pre-colonial period and onwards (Sandberg 1974). Archaeological evidence suggests that early farmers and iron-using people were present in the area from around the 1st to 5th century AD. A port linked to Mediterranean and Middle Eastern trade routes might have been established in the delta as early as AD 40 – 70 (Chami 1999). By the middle ages, the floodplain and especially delta area were important to East African trade networks, supplying Shirazi (from around AD 1200) and later Omani

merchants (from 1730) with mangrove poles and agricultural produce for export (Havnevik 1993:67). Ivory, wax, and gum-copal were also traded out of the area by caravans (Bantje et al. n.d.). The prosperity of Rufiji was such that in the late 19th century European explorers characterised the area as a “land of plenty” (Elton 1898 in Hoag 2003) and as “Little Calcutta” (because of the scale of rice exports to Zanzibar; Kjekshus 1977a:32 in Havnevik 1993).

Oral histories collected by British colonial officers to explain the origins of the Matumbi, Ndengereko, Kichi and Nyagatwa tribes in the area, though of doubtful accuracy, suggest that people first moved into the largely “uninhabited” district around 1500, arriving from the coast (Kilwa) and interior (Uhehe, Uzaramo) (Rufiji District Book, TNA). Successive waves of migrants from other tribes in the south and west—Ngindo, Pogoro, Makonde, and others—followed, settling primarily in the upstream areas (Lockwood 1998: 59). Once within the district, people continued to move periodically: in search of wives (Lockwood 1998); between the floodplain and hills in times of high floods (Bantje 1980); and in response to domestic slaving raids and conflict, hiding for instance in the reedy islands on the river (Sunseri 2003, Beardall 1881).

### **2.5.2 German and British colonisation**

Social and economic transformation in the district was brutally accelerated by European colonisation (Lockwood 1998). The German East Africa Company acquired a colony in Tanganyika from 1885 through dubious treaties with headmen, with administration passing to the German state in 1891 (Iliffe 1969). In addition to extracting taxes, the Germans forced men (and eventually women and children) to work on road construction or the plots of European settlers (Iliffe 1969:21). Unremunerated, harshly enforced cotton cultivation schemes throughout the southern coast were particularly resented, especially as labour timing clashed with local agricultural timetables (Lockwood 1998:65). In 1905, emboldened by a prophet claiming to have found in the southern hills of Rufiji district a medicine (water, or *maji*) that protected against European bullets, a group of Matumbi people attacked the headquarters of a German-appointed overseer, sparking the MajiMaji rebellion (Iliffe 1969). The war spread across southeastern Tanzania and was only definitively put down in 1907 after much loss of life, the Germans employing a scorched earth policy to bring about widespread famine (Gwasse and Iliffe 1967).

In the aftermath of the rebellion, German administrators expanded their control over forest areas that had served as places of refuge during the fighting, and of spirit worship (Sunseri 2003). Sunseri notes that the declaration of forest reserves as “ownerless, uninhabited, and off-limits to peasant use” set a pattern of social control continued by the British after assuming control of Tanganyika in 1919. Most notably, gazetted in 1905 and expanded by the British in 1922, the Selous Game Reserve drove people out of an area of approximately 45,000 km<sup>2</sup>, and remains one of the largest protected areas in the world.

A series of famines and epidemics, the two world wars (in which only 3000 of 15 000 men drafted as porters in WWI reportedly returned to Rufiji), and consequent disruptions to local marriage patterns and agricultural production contributed to the ongoing demographic and economic decline of the district into the British colonial period (Lockwood 1998:26). In the 1930s, the people of Rufiji began migrating to nearby Dar es Salaam in search of employment, preferring this to supervised agricultural labour promoted by the British (Bantje et al n.d.). The ‘Rufiji’ ethnic group was the second most numerous in the 1931 Dar es Salaam census, though Burton (2005) notes that they displayed a high degree of mobility. Rufiji migrants tended to work as unskilled labourers in the city, and primarily as dockworkers from the 1950s onwards (Lockwood 1998:77, Burton 2005:237).

### **2.5.3 Independence and villagisation**

After Independence, president Julius Nyerere put forward the Arusha Declaration (1967), promoting an African model of socialism or ‘family togetherness’ (*ujamaa*) by which Tanzania would achieve economic self-reliance in part through accelerated rural development. Central to the model was the concept of co-operative villages, where people would volunteer to live and farm communally in order to improve agricultural production and facilitate the provision of centralised socio-economic services. Growth of *ujamaa* villages was slow, however, soon leading the government to take a more active interest in their development (Briggs 1979). Rufiji was the first district in the country to experience the new, heavy-handed villagisation policy, and it was to be a model for resettlement elsewhere in the country (Hoag 2003:152).

Following a high and prolonged flood in 1968 the government ordered all people living on the Rufiji floodplain to move to new villages on the river terraces

north and south of the river before June 1969, under “Operation Rufiji” (Bantje 1976, 1980; Hoag 2003).<sup>1</sup> Food aid and other necessities were only made available on the terraces, and government agents provided transportation. Although most people went willingly, they did not necessarily know that the move was permanent (Hoag 2003:151). Those who refused to move were threatened, put in jail, and in some cases had their houses burnt down. Each family received a half-acre plot within the village for their house and kitchen garden, as well as 3 acres of agricultural land nearby.

The terrace fields were not suited to agriculture, however, as soils were poor and rainfall unpredictable. On the western floodplain, access to former fields was now cut off by the river itself and chronic food shortages became the norm (Bantje 1976). On the central and eastern floodplain, villagers soon returned to the floodplain to farm though not necessarily to their pre-settlement locations which were now too far away and/or overrun by wild animals. The increased travel time led to serious labour management problems and substantial declines in rice and cotton cultivation (Bantje 1976). The disruption to agricultural systems instigated massive migration of males to urban areas together with increased reliance on fisheries and wildlife, and increased deforestation through destructive logging and charcoal-making (Bantje 1976, Hoag 2003, Duvail and Hamerlynck 2007). Far from accelerating the district’s development, villagisation had failed, making residents even more heavily reliant on urban remittances and natural resources (Hoag 2003:167).

## **2.6 Social and political organisation**

### **2.6.1 Ethnicity**

Some eight ‘tribes’ represent the main inhabitants of the Rufiji floodplain and delta: the Ndengereko, considered the original settlers and in the majority; the Rwingo, a sub-group of the Ndengereko; the Matumbi, in the southern hills; the Nyagatwa, concentrated at the delta; and the Makonde, Ngindo, Ngoni, Pogoro, and Zaramo, with populations concentrated outside the district (Mwageni et al. *n.d.*, Mbiha and Senkondo 2001). Although no ethnography exists specifically for the Rufiji valley, Lockwood (1998:59) considers that the people “fall geographically and culturally at the interstices of two or possibly three major identified systems” (citing the works of Biedelman 1967 and Wembah-Rashid 1975 on the matrilineal peoples of Eastern

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<sup>1</sup> A flood in 1974 led to a second resettlement (Operation Pwani) near and at the delta.

Tanzania, and of Prins 1967 on the Kiswahili-speaking people of the East African coast).

The Ndengereko were the main ethnic group in my study area, and claimed descent from a Hehe chief who had come from Morogoro to marry a local Rufiji woman. By this account, their twelve sons were the founding ancestors of twelve local clans.<sup>2</sup> As described to me, the Ndengereko in the pre-villagisation period usually married other Ndengereko (from the floodplain or northern high terrace) or Rwingo (from upstream), but marriages with Hehe, Ngindo, Pogoro and Zaramo people also took place. To this day, these tribes are considered the joking partners of the Ndengereko.<sup>3</sup> The practice of marrying across ethnic groups established in Rufiji and neighbouring areas led one British colonial official to describe the locals as “belonging to one endogamous ring” (Rufiji District Books Vol 1, ‘Notes by A.V. Hartnoll’).

As noted by Lockwood (1998:60), ethnicity in Rufiji is malleable, and can be claimed from the narrow level of clan groups (*ukoo*), to ‘tribal’ identities, up to the broad level of the district. Many residents refer to the local population as the Warufiji, meaning all people living in areas affected by the river (Hoag and Ohman 2008). When pressed on differences between ethnic groups in the area, several informants told me that “everything is one big mix” (*mchanganyiko*). There were few obvious outward differences in the appearance of different ethnic groups. Indeed, tribal differences were said to be a thing of the past (“from our grandfather’s time”).<sup>4</sup> I was also repeatedly told that everyone who lived here now was Ndengereko, just as the original Hehe settlers had become Ndengereko through living in Rufiji. In the words of one woman: “If your family has come here, you are Ndengereko, and you yourself have perhaps never been to the place of your ancestors”.

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<sup>2</sup> The British colonial archives describe the emigration of the twelve sons of a Hehe chief, Wambanguru, from Mahenge District (Morogoro Region) to the western and central area of the Rufiji valley, along with the emigration of two other chiefs, Mbonde and Rwambo, to the region. Successive officials listed present-day clans and attempted to trace their descent from these chiefs and other key ancestors, but admitted that their proliferation prevented any reliable classification.

<sup>3</sup> Joking relationships (*utani*) linking members of distantly-related lineage groups are a common feature of African societies. Locals explained that when kinship relationships extended far into the past, over five or six generations, the modern-day ties became ones of *utani*. As described by Radcliffe-Brown (1940) joking partners are permitted to tease and make fun of the one another, without either taking offense. In Rufiji, partners could behave outrageously with one another, regardless of age or gender differences, and also played an important role in funeral rites.

<sup>4</sup> The Makonde in particular, passing through Rufiji on their way to sisal plantations in the colonial period, tended not to marry locally and were once feared: they ate strange animals, dressed differently, and a man-eating lion that had terrorised the area in the 1940s was said to have been a Makonde wizard.

Despite this welcoming attitude, ethnic origins were not entirely forgotten. Outsiders who moved to the village without marrying locally were accepted and given land, but necessarily remained outside the clan system structuring much of social life (see below).<sup>5</sup> There was also an expectation that new arrivals might move on quickly, with one man telling us that the Ngindo in particular were very unstable, sometimes leaving without notice, and so were assigned house plots on the periphery of the village and farmland on the edge of field areas. In any case, an open attitude to strangers did not extend to displaced Barabaig and Sukuma pastoralists recently arrived to the district (e.g., Makoye 2012). It may also be the case that people simply preferred not to delve too deeply into issues of ethnicity with me, in line with a wider reluctance to discussing villagisation (of which ethnic mixing was a clear consequence) and conflict in general.

### **2.6.2 Language**

Linguists recognise Kimatumbi as a main language in Rufiji, together with its child sub-group languages, Kindengereko, Kingindo and Kirufiji (MultiTree 2013). These are Bantu languages, in the Niger-Congo family. All are mutually intelligible, whereas their speakers would not easily understand languages spoken by the Makonde, Pogoro or Zaramo, for example. In the study villages, people born prior to villagisation spoke their “home language” (*kinyumbani*) fluently and continued to use it daily. Overall, however, Kiswahili dominated, with only the oldest women in the village not able to speak the national language.

### **2.6.3 Clan and lineage groups**

Concepts of ethnicity, through inter-tribal marriage practices, were closely tied up with the organisation of lineage and clan groupings in Rufiji. Although informants (male and female alike) insisted that their society was patrilineal, they also described features consistent with a matrilineal society.

In late pre-colonial Rufiji, people lived in settlements consisting of “a loose cluster of up to a dozen agnates [relatives on the father’s side] along with their families and dependants” (Cross-Upcott 1956:26 discussing the Ngindo, though Lockwood

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<sup>5</sup> For instance, my research assistants, who appeared to know everyone in the village, were unable to tell me who was getting married as we walked past a wedding celebration one day, because “they’re all Makonde around here”, i.e., on this street. Similarly, when a man in Mbunju-Mvuleini was attacked by a crocodile, my neighbours couldn’t specify who it was beyond “one of those Ngindo”.

1998:61 applies this social organisation to the Hehe and others). Above these lineage cells were the clan groupings, related through a common ancestor, although (rather confusingly) both levels were referred to as one's *ukoo*. Lineage cells were knit together by marriage ties, with the Ngindo for instance preferentially seeking wives from outside their home settlement, flinging a "complex web of kinship across Ngindoland" (Cross-Upcott 1956:119 in Lockwood 1998). My informants, largely Ndengereko, described a similar pattern of settlement centered on the patriarch, with men and women expected to marry outside their lineage cell to this day.

On marrying, a woman might move to her husband's settlement, with the children inheriting his clan name. However, a man who came from far away to marry would typically take up residence with his wife's kin, receiving land from his father-in-law and often adopting that clan's name (see Section 2.8.2).<sup>6</sup> Maternal ties remained particularly important in the case of separation, illness or death: a woman or her orphaned children would then be taken in by her male relatives (often her brother), and her husband's land would revert to the clan.

Informants regularly explained that through local marriage practices everyone in the area (i.e., the north shore of the lower Rufiji river valley, or "from Rwingo to Ikwiriri" in the words of one elder) was related to one another: "*Watu wote wamoja*" (All people are one). "*Wanazaa, wanazaa*", they would say, people give birth, and so knit the families together. For Lockwood (1998:61) affinal ties (i.e., those contracted by marriage) played a role similar to that of blood ties in promoting resource sharing among people in Rufiji, helping them to deal with famine, illness or political crisis. He also makes the point that people used ethnic and cultural identity to meet specific social and political ends, something I also observed.

Some of the men and women who married locally had arrived as children from the northern terrace, sold into slavery by their parents for a few measures of rice, with the practice continuing up into the British colonial period.<sup>7</sup> Their descendants were apparently marked out as 'unclean', but these secret lineage histories remained

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<sup>6</sup> The archives similarly describe the matrilineal nature of land rights when an outsider marries a local woman, and note the large number of landholders related to local clans through the mother (where such relations were referred to collectively as "*wipwa*", from *mpwa*, a cross-nephew or niece) (Rufiji District Book Vol 1).

<sup>7</sup> As adults, slaves were given a piece of land to clear but half the harvest belonged to their master, and they remained his property, though referred to as a servant (*mtumishi*) rather than a slave (*mtumwa*). At times of famine, local people could also abandon their children in the bush, in the expectation that they would be taken in as slaves at another settlement.



unknown to me, and I could not say what consequences, if any, this had for present-day descendants.<sup>8</sup>

#### **2.6.4 Religion**

The Rufiji people converted to Islam beginning in the mid-nineteenth century, and the district is the most uniformly Islamic part of Tanzania today (Lockwood 1998: 74). As he describes, local Islamic practice is “deeply syncretic... [and] also heterodox, with strong Sufic tendencies”. As I observed in my host village, attendance at the mosque and religious celebrations was more common among the older generation, with younger people said (by themselves and their elders) to be neglecting their religion.<sup>9</sup>

The practice of Islam co-existed in the area with spirit worship and witchcraft. Although it was generally agreed that the spirits were much less powerful than when people had lived on the floodplain, neither was there any question as to their existence.<sup>10</sup> People built shrines to the spirits (in the form of miniature houses on raised platforms) in certain locations. Witchcraft was a constant feature of daily life, from accusations of wizardry among neighbours, the setting of curses to attack or protect oneself from enemies, and visits to witchdoctors to treat all manner of physical and mental illness. Again, the importance of witchcraft was said to have diminished since villagisation, but primarily in the sense that it was no longer as effective a tool for controlling the young. Several informants explained that elders no longer had a monopoly on witchcraft, with young people now able to protect themselves by visiting witchdoctors themselves.

#### **2.6.5 Political organisation**

Rufiji society in the pre-colonial period was essentially egalitarian (Lockwood 1998:61). The oldest male in the settlement, the elder (*mzee*), was accepted as its head. For serious disagreements among individuals or major problems (e.g., pest animals,

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<sup>8</sup> I became aware of the status of slave descendants only when my host family told a tale of a tortoise-like creature with the face of a cat (the *ngake*) that would come from the woods into your house. The *ngake* would tell the future after being danced to and offered gifts, but only allowed itself to be seen after those with slave ancestors had left the premises.

<sup>9</sup> There, and presumably in other villages of the district, each hamlet had a primary sheikh (*shehe kuu*) and one or two female helpers, the *shawishi*, who would co-ordinate religious activities. Many children attended Koranic school in the evenings, a few to the exclusion of formal education.

<sup>10</sup> As reflected by one middle-aged man who told me that many people no longer believed in spirits, but explained this by saying that perhaps it was because the spirits had moved away.

drought, disease) elders from the affected lineage groups would meet to discuss the situation together. Several informants also spoke of the *mhenga* (literally, an elder who can be trusted to provide good advice), as an important person (*mkubwa*), an ancestor, the first to settle in an area and superior to all those who came after him. Like the lineage elder, but at a the higher clan-level, the *mhenga* was responsible for distributing land to newcomers, for brokering marriages, and resolving disputes. In this the role was likely equivalent to that of the *mpindo*, or clan head, described for southern Rufiji, and in no sense like that of a chief or headman (Lockwood 1998:61).

Over this local structure the Arabs introduced the Akida system, carried on by the Germans and modified by the British after 1927 (Lockwood 1998). The later system established 18 tribal authorities along clan lines, each under a sub-division *jumbe*, and each with its own court presided over by its own chief known as the Mtawala. The *jumbe*'s role changed little from what it had been under the Germans, consisting primarily of communicating announcements, arbitrating disputes, and facilitating collection of the head tax.

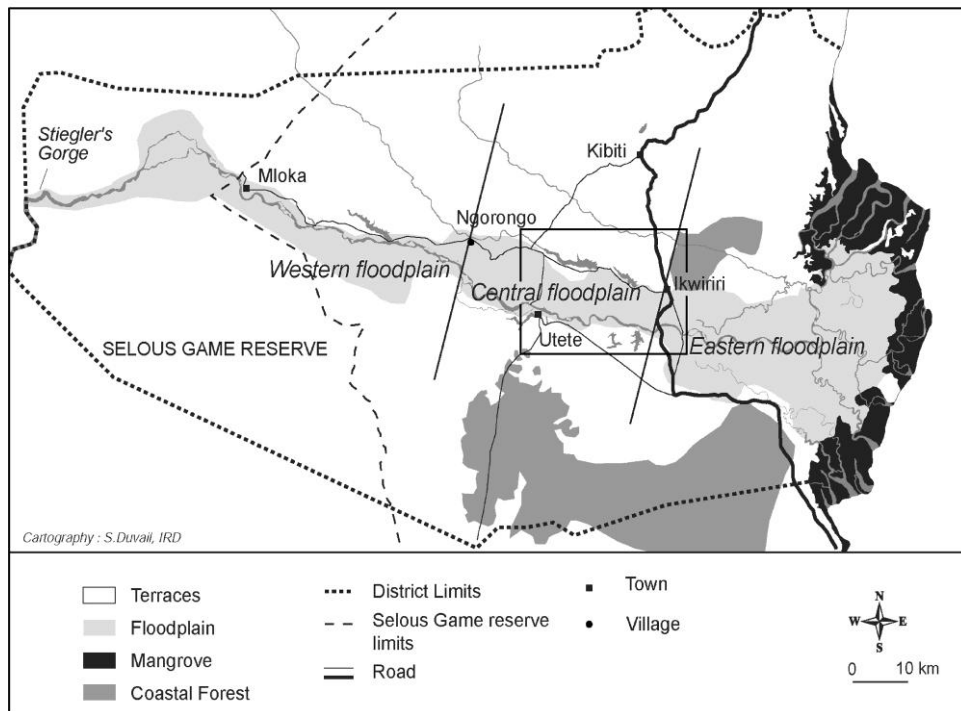
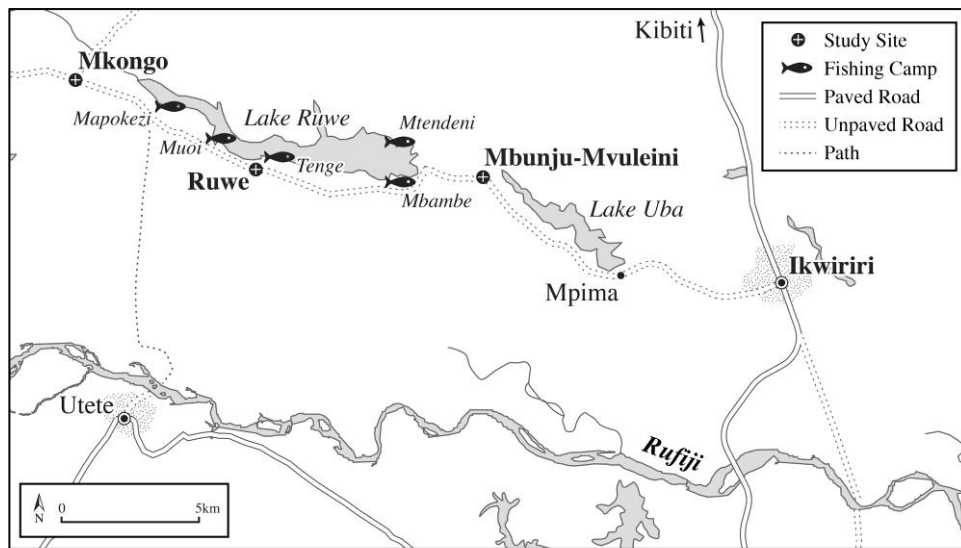
The current local government framework is the result of a reform process officially endorsed with the 1998 Local Government Reform Programme (URT 1998), and is described in more detail in Chapter 8 in relation to fisheries management.

## **2.7 Lake Ruwe and the study villages**

I conducted my research primarily around the villages and fishing camps bordering Lake Ruwe, located on the north shore of the lower Rufiji River valley, in the central floodplain zone, and the largest of the major lakes in the district (Figure 2.2). The three study villages that shared access to Lake Ruwe—from east to west, Mbunju-Mvuleini, Ruwe and Mkongo—made up Mkongo Ward, one of 19 wards in the district (Table 2.1).

### **2.7.1 Choice of study site**

My choice of study location was influenced by conversations with researchers very familiar with Rufiji District through their association with the Rufiji Environment Management Project (REMP, see below) and ongoing projects in the area. Like other district lakes, Lake Ruwe supported an active commercial fishery, but was closer than most to the regional and Dar es Salaam markets. The fact that the lake was shared



Cartography: Top map - M. Irving (UCL); Bottom map – S. Duvail (IRD)

**Figure 2.2** Map of study area showing study villages and fishing camps around Lake Ruwe and Lake Uba (above), and location of the study area within Rufiji District and the Rufiji River floodplain (below).

among three villages, one of which had been involved in REMP activities, gave scope for comparing institutional arrangements. Finally, no focused research had taken place there, whereas anthropologists had worked or were working at Lakes Uba (Meroka 2010) and Zumbi (Paul et al. 2011).

**Table 2.1 Hamlets and population data for the three study villages, Rufiji District, Tanzania, 1972-2012**

Village	Hamlets	Population		
		2012	2002	1972
Mbunju-Mvuleini	Mbunju, Mvuleini		593	692
Mkongo			2510	3867
Kaskazini (North)	Nyipara, Rusende, Karakana		1457	
Kusini (South)	Kitundu, Kiwili, Mkunga, Makoge		1053	
Ruwe	Beta, Kipela, Nyalingwe		1925	2893
Mkongo Ward TOTAL		4619	5028	7452
Annual rate of population growth (since previous census)		-0.81%	-1.08	-

Source: NBS 2012, 2002 and Hoag 2003:168.

I based myself in Ruwe village and carried out the bulk of my research there because of its intermediate location and size between the two other villages, and stronger claim to the lake (with most landing sites located within its borders). There was also the advantage of being a novelty in Ruwe, whereas locals in Mbunju-Mvuleini had experience working with foreign researchers.

### **2.7.2 The local aquatic environment**

Lake Ruwe is the largest of eight major permanent floodplain lakes in the district by surface area (8.76km<sup>2</sup>) and the second largest by volume (20.6Mm<sup>3</sup>) (Hamerlynck et al. 2011). Lake Uba is much smaller than Lake Ruwe (3.18km<sup>2</sup> by surface area,

7.2Mm<sup>3</sup> by volume), and therefore more sensitive to flooding conditions. The flood peak in 2008, the year of this field study, was the highest since 2002, allowing Lake Ruwe, but not Lake Uba, to reconnect briefly to the river for the first time in six years (Hamerlynck et al. 2011). For Lake Uba, which has not reconnected since 1997, the lake was in danger of drying out completely, and is the only floodplain lake found to be heavily overfished based on 2008-2009 data (Hamerlynck et al. 2011). Although the river connection at Lake Ruwe was brief in 2008 (approximately three days) local informants considered this sufficient for recharging fish supplies, as confirmed by Hamerlynck et al. (2011).

Besides the major permanent lakes, there are myriad smaller waterbodies located on the floodplain proper that swell with the floods, and channels through which floodwaters from the Rufiji River flow across the landscape and (in some years) up to the permanent lakes, and back again.

### **2.7.3 The study villages: Setting and foundation**

All three study villages were founded in 1968, although parts of Mbunju were inhabited prior to villagisation. A dirt road linking Ikwiriri to the Selous Game Reserve—impassable at high water—passes through the villages, with a second road branching off to link Mkongo to Kibiti on the northern high terrace. Between the current villages on the terrace and the river, to the south of the road, lies the floodplain, referred to as the valley (*bondeni*).<sup>11</sup> This is where the main cultivation areas are located, with some a mere 15 minute walk from the villages, and others, close to the river, up to 2h away. On the high levees of the floodplain are the old settlements, marked by massive mango trees, adjacent to field areas and laid out like a ribbon along the former colonial road running parallel to the river. Woodland and mixed forest patches lie on the far side of Lake Ruwe. The villages lie in a wildlife corridor, with large mammals moving through to and from the Selous in the dry season.

Each village was divided into hamlets based on their location in the colonial-era administrative divisions (e.g., people living in the Beta sub-division were assigned to the Beta hamlet, and so on; Table 2.1). However, beyond that little attention was paid to people's previous settlement patterns, and lineage group members who had lived together on the floodplain struggled to secure neighbouring plots. Even those that

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<sup>11</sup> When referring to pre-villagisation settlements, people will say "Bondeni-Beta", for example, to distinguish from the current Beta hamlet.

did so could not always find homes nearby for their male children once these grew up and married. Many people left the hamlets entirely, moving to neighbouring villages or further afield. Nonetheless, certain clans tended to dominate certain hamlets, in an echo of traditional settlement patterns.<sup>12</sup>

In addition to a home in the village, most families also maintained a fieldhouse (*dungu*), made of thatch and palm, and consisting of a sleeping platform elevated on stilts about six feet above the ground. During high water and up until the rice harvest, some family members would live more or less permanently at their *dungu* to guard the crop from wild animals. An unknown number of families had moved back permanently to the floodplain, usually building more substantial mud-and-pole houses on levees, and no longer maintained a home in the village proper. This was technically against government policy, but village and district officials turned a blind eye to it.<sup>13</sup>

### *Mbunju-Mvuleini*

The smallest of the study villages, Mbunju-Mvuleini had one primary school but no other facilities. The village had access to a second permanent lake, Lake Uba, although ownership was disputed with the neighbouring village of Mpima. Mbunju-Mvuleini was one of four villages selected by the Rufiji Environment Management Project (1997-2003) to receive assistance in promoting sustainable livelihoods. Through this project, it had gazetted its forests north of the river, developed a Village Environment Management Plan, and had supporting by-laws approved by the district (see Chapter 8).

### *Mkongo*

Mkongo was the administrative center of Mkongo ward, hosting the ward offices, police station, local court and CCM office, as well as a health clinic, secondary school, two primary schools and a cell-phone tower. In addition to three mosques it also had the only church (Pentecostal) and bar in the ward, reflecting the presence of Christian government officials and teachers. A large cotton farm run by a family of Indian

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<sup>12</sup> As an indication of the social relevance of hamlets, participants in wealth-ranking exercises in two separate groups were indignant at having people not from their hamlet mistakenly included on the list under consideration, and insisted they could not be expected to know anything about these households.

<sup>13</sup> “*Tumefumba macho*”, We close our eyes, one village chairperson told me, “They do not hide themselves, and we do not deny they are there”. He explained that the district did as much, because while they might deny that anyone lived on the floodplain, they issued evacuation warnings during large floods.

origin, founded in 2006, provided permanent employment only to eight locals (working as guards) but had not yet planted a crop. Mkongo was a large village, split into two divisions, and different in atmosphere from the other two study villages: fewer households lived in cooperative clusters (see Chapter 3) and extreme poverty was more obvious (in that a small number of beggars gathered at the marketplace).

### *Ruwe*

Ruwe, located between Mkongo and Mbunju-Mvuleini and intermediate in size, had a health clinic, primary school and mosque.

## 2.8 Local livelihoods

### 2.8.1 *A flood-adapted way of life*

Local livelihood strategies were dominated by farming and fishing, and adapted to the flood-cycle (Turpie 2000). The timing of fish availability dovetailed nicely with agricultural labour demands, and was held up by several informants as proof of God’s good planning (Table 2.2).

**Table 2.2 Agricultural calendar on the Rufiji floodplain, with peaks in fisheries production.**

Activity	Season Flood	Month											
		Short rains					Long rains						
		O	N	D	J	F	M	A	M	J	J	A	S
Agriculture													
Preparation of fields													
Maize – <i>mvuli</i> crop			Plant			Harvest							
Rice					Plant					Harv.			
<i>Mlao</i> crops – maize, pumpkins, pulses									Plant			Harvest	
Market vegetables									Plant			Harvest	
Cashews			H.								Weed		
Fisheries													
Productivity				High: Low-water				No fishing			High: Post-flood		

Source: Own material, also Hamerlynck et al. 2010, Bantje 1980.

The agricultural year begins with field preparation for maize, planted to take advantage of the short rains (the *mvuli* crop). This is generally harvested around February or March, as the wet season sets in. Rice planted in January or February, intercropped with the maize, is typically ready for harvest by June or July, with farmers spending much of their time in the two months up to the harvest living at the fields. Fish enter the floodplain on the rising flood and breed there (between March and May), offering good opportunities to trap fish as they move through water channels. However, most people are soon kept busy guarding their fields, and fish for subsistence only, if at all. Fishing around peak flood (a period of approximately two months) is nearly impossible, as fish disperse widely across the landscape and nets become choked with vegetation (Paul et al. 2011). As flood waters recede, people take the opportunity to catch fish as they leave the floodplain or become stranded in shrinking water bodies, with a peak in fishery production occurring between July and September (Hamerlynck et al. 2011).

If farmers experience a poor harvest (e.g., a drought affects the *mvuli* crop, or excessive flooding destroys their rice), they can plant dry season *mlao* crops (maize, pumpkins, pulses) to draw on sinking ground water as flood waters recede, often achieving bumper crops (Havnevik 1993:95; Hamerlynck et al. 2010). Others might grow water-intensive market vegetables (e.g. tomatoes, okra). However, if harvests were sufficient (as seemed to be the case in Ruwe in 2008), people enjoyed taking August as a period to market their rice and rest (Bantje 1976), with far-flung family arriving to share in the harvest and join in the weddings, coming out (*unyago*) and spirit possession (*ngoma*) ceremonies scheduled then. By September, many men turned to fishing, joining in the commercial lake fisheries until it was time to prepare the fields again. More dedicated fishermen might have begun fishing earlier (in July, shortly after the permanent lakes connect, or not, to the floodplain), and would continue for longer. A second peak in fishery production occurred around December-January, when the lakes had drawn down and the juvenile fishes of the year had reached a more marketable size (Hamerlynck et al. 2011). The latter period also corresponded to peak exports of fish from the villages, as road conditions were relatively good then (Richmond et al. 2002).



### 2.8.2 *Agriculture and access to land*

Households typically cultivated a number of small, often widely-dispersed plots on the floodplain, inter-cropping maize with rice on the slopes of depressions and using different varieties planted at different times in order to hedge against uncertain rainfall and flooding patterns (Duvail and Hamerlynck 2007). Local farmers also grew tree crops (mango, cashew, plantain) and some annual rainfed crops (sorghum, sesame) on the high levees of the floodplain (Duvail and Hamerlynck 2007). No cotton was grown in my study area, though this was once an important *mlao* crop in the area, second to rice in cash importance (Bantje 1976). In the villages, people had small rainfed home gardens (planting cassava, pigeon peas and cowpeas) and sometimes cashew orchards, planted at the time of villagisation, though these were rarely maintained. Close to the villages, people grew rice on *njacha* land, grassy, seasonally waterlogged areas, though this tended to be older people who could no longer travel into the floodplain.

Through their sophisticated responses to the riverine environment, farmers were likely to achieve sustenance under a variety of rainfall and flood conditions, and produce considerable surplus in good years (Hamerlynck et al. 2010). The main food crops in Rufiji are also the main cash crops, and locals have long exported cereals from the region (Bantje 1976, Hamerlynck et al. 2010). Although highly efficient, and requiring little capital input, farming in Rufiji is very labour intensive, with clearing and hoeing the most demanding tasks, together with scaring away pests including warthogs, wild pigs and baboons (Hamerlynck et al. 2010). There was only one private tractor available for hire in Ruwe, and several at Mkongo, and those that could afford to pay and access the machines used them to prepare their fields at a cost of 24-28USD/ha.<sup>14</sup>

By customary practice, land was held in usufruct, and once cleared was usually marked by planting tree crops such as plantains, papaya, cashews or mango. Villagers and district officials alike agreed that land as a general category was in abundant supply locally. Nonetheless, access to land suitable for agriculture was limited by the need to farm close to other people (in order to see off pest animals) and mediated through social relations.

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<sup>14</sup> Attempts to mechanise cultivation have failed in the past due to problems with maintenance and field access (Hamerlynck et al. 2010, Bantje 1979). In Ruwe, people complained that well-connected people monopolised the machines, and only certain field areas were visited by the tractor.

Today, as in the time prior to villagisation, the most common way to acquire land locally was as a gift or inheritance from one's father or lineage elder. People could also open up new field areas, working as a group to cut grasses and clear out pest animals. Yet for elders, there was no such thing as entirely 'new' land (bush, or *pori*) on the floodplain, with one informant stating that: "Every piece of land and tree is owned, by the father, grandfather or clan [*ukoo*], and everyone, even the youth [*vijana*], knows who the owners are".<sup>15</sup> People could also acquire land on loan, or through purchase (though this seemed rare), without necessarily having blood or marriage ties to clan elders. Low-lying rice fields seemed to be the most often lent out, perhaps because few trees grew there and by keeping the paddy under cultivation owners could maintain their claim on the site.

Women had their own fields, but could not sell or give away land received from her father without consulting him or her brothers first.<sup>16</sup> Outsiders who had married local women were given land by their wife's kin, but this reverted to the family in the case of separation.

### 2.8.3 Fisheries

Fishing occurs year round, but with strong seasonal changes in effort corresponding to flooding patterns (Richmond et al. 2002; see above). Fisheries were generally unselective, and most fishes are caught as juveniles or adults well below their maximum size (Turpie 2000). Most commercial fishing by "professionals" took place in the shallow, permanent lakes of the district, while smaller and/or temporary water bodies and channels were primarily exploited for subsistence by "occasional" or "part-time" fishermen (Hopson 1979, Richmond et al. 2002). Very little fishing occurred in the river itself because of treacherous waters and dangerous wildlife (Richmond et al. 2002). There were no formal limitations on people's access to waterbodies (but see Chapter 8).

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<sup>15</sup> The two new field areas I visited near Ruwe had been opened by local men returning to land once farmed by their own parents and grandparents. Their current fields were not receiving enough flood water, and they were moving to depressions that would be wetter. Outsiders to the area could request to join these 'pioneer' groups, as was the case for a man from an upstream village who had married locally and farmed his father-in-law's land for several years; this new field would be the first he could properly call his own in the area.

<sup>16</sup> Women also reported receiving land from their mother or grandmothers more often than was the case for men. They also had the right to keep any land they had cleared with their husbands in the case of divorce, but could struggle to enforce this.

The most widely-used gear in the district were simple, single-filament nylon set gill-nets referred to as *nyavu ya kutega* (“nets for trapping”), a passive gear (Cavalier 2003). These were set vertically in the water column, with floats on a rope running through the top of the net keeping the top floating near the surface, and weights on the lower rope.<sup>17</sup> Fish were caught by the gills or entangled as they tried to swim through the net, with the size of fish caught directly dependent on the size of the mesh (FAO 2012). Depending on their means, people invested in *kutega* nets of varying height, length and mesh size, buying individual pieces to sew together in various configurations. In general, pieces did not last more than one or two fishing seasons, and had to be sewn up regularly due to rips by crocodiles, large fish, or submerged logs. Most fishermen set their *kutega* net in the evening, checking the net each morning before getting on with their tasks for the day. Sometimes hooks were added to the nets, requiring fishermen to check the nets regularly to remove captured catfish before these ripped the net.

The major commercial gear in the district was a boat seine net known as the *juya*, worked by four men from two dugout canoes in deep waters. The gear consisted of a very long net with a bag or slack central area in which to retain captured fish, and two long ropes fixed to either end for use in handling and hauling in the net. The upper rope of the net floats at the surface, but the lower rope is weighted in order to prevent fish from escaping from the net as it is hauled in (FAO 2012). The *juya* is most often used at night, when the water is cooler and fish move up in the water column. The crew can set and haul in the net from 8 to 15 times a night, with a day shift added during times of high production. The work leaves most fishermen too exhausted to work more than two nights in a row. The net was considered illegal by district authorities.

Besides the *juya*, locals used other active gears. Nets set by two fishermen in a single canoe were used to encircle fish out on the water (referred to as *kuchokoa* or *mkogero* nets) or, working with up to four men, dragging a heavier seine net from canoes or the shore (referred to then as the *mkoko* net). To frighten fish into the net, fishermen would beat the water with sticks. A small number of fishermen used cast nets (*kimea*), made up of two to four pieces of netting anchored by lead weights. This

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<sup>17</sup> Fishermen used buoyant wood, old flip-flop sandals or empty water bottles as floats, and stones as weights.

is a falling gear, requiring a skilled fisherman to throw the net out over shoals of fish swimming near the water's surface while his partner manoeuvres the canoe.

Fishermen made use of traditional fishing gear as well as modern nets. Most of these were made of *upanje* reeds, including conical baskets (*kifaba* or *kisi*) and fish fences or weirs (*nyando*). Locals also built brush traps, referred to as *masagala*.

In general, passive gear is used when the water level is high and the fishery is productive, with active gear coming into use as water levels drop or when fish are more difficult to catch (Hamerlynck et al. 2011).

#### **2.8.4 Other livelihood activities**

Besides farming and fishing, local people were involved in a wide variety of livelihood activities, centered on natural resource extraction and petty trade. Formal employment within the study villages was nearly non-existent. Those commodities that could be sold in the regional or urban markets were among the best options for earning cash, and included (besides agricultural crops and fish), timber, charcoal, and wild mangos. Most lucrative of all was big-game hunting, but the risks involved were high, including a 30-year jail sentence if caught hunting without a license (or trading illegal ivory). Fishing, charcoal-making and timber harvesting and any trade also required a license, but the expense and bureaucratic hassle involved meant that few villagers bothered to obtain them (Meroka 2010). Timber was organised around pit-sawing, involving pairs of villagers working independently, and larger-scale logging operations with outside overseers. Other sources of cash income included food and alcohol sales within the village, and providing services such as bicycle transport or repairs, tailoring, or showing videos. Many households kept chickens, but disease levels were high. Nearly all households harvested *milala* palm leaves (*Hyphaene coriacea*) to make mats, baskets, bed coir, and other household items, and to thatch roofs, but cash sales were rare.

#### **2.8.5 Gender and livelihoods**

There was strong segregation of livelihood activities by gender, with men expected to be the main providers of cash income through activities such as fishing, logging, and collecting forest products (palm thatch, honey, building poles, etc.). This ceaseless activity was referred to as "*kuhangaika*", defined variously as roaming about, suffering, worrying, and being busy. Paul et al. (2011), in tracking the budgets of nine

households, found husbands to be responsible for 70% of expenditures on average, against 20% for their wives. Lockwood (1998:91) comments on men needing to be near centres of marketing, transport and communications to support their cash-earning activities, largely leaving to women the job of living in the fields and guarding the rice crop. As one local put it, “To have a *shamba* a man first needs a wife and a bicycle”: the first to run the farm, and the second to move between the farm, lake, forest, village and town in pursuit of income-earning opportunities.

Women’s cash earning opportunities were restricted in comparison to men’s, and consisted mainly of selling cooked food, whether from their homes or dedicated stands (*hotelini*). In line with this, women dominated the processing and sale of fried fish. They also sold alcohol, worked as day labourers, and sometimes made charcoal (often organising work parties to this end). Cash crops such as cashews and simsim (oil seed) were men’s crops, but women (and men) grew market vegetables.

## **2.9 Outside threats**

### **2.9.1 Dams, commercial agriculture and land-grabbing**

In Nyerere’s economic development strategy, concurrent with the push towards socialist agriculture, was a focus on industrial development supported by hydroelectricity (Hoag and Ohman 2008). As these authors describe, beginning in the 1960s, planners (primarily foreign consultants) studied the feasibility of damming the Rufiji River at Stiegler’s Gorge, basing their recommendations to proceed on aerial surveys and limited hydrological data and ignoring both the geographic complexity of the basin or the interests of its residents. By 1984, financial constraints and growing unease over the negative ecological and social consequences halted the planning.<sup>18</sup> Nonetheless, proposals to build a dam at Stiegler’s Gorge, premised on the same inadequate data, are re-emerging with the country’s current electricity crisis (Hoag and Ohman 2008, see next section).

The waters of the Rufiji River are of growing interest not only to energy planners but to commercial agriculture investors as well, for growing food crops but also palm oil and biofuels (e.g., sugarcane) (Hamerlynck et al. 2010). These authors consider such projects largely hypothetical given the unfeasibility of large-scale

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<sup>18</sup> These potentially negative consequences were identified through careful field studies by a team of inter-disciplinary researchers, both Tanzanian and foreign, based at the University of Dar es Salaam’s Bureau of Resource Management and Land Use Planning (BRALUP) (Hoag and Ohman 2008).

irrigation in the region. Nonetheless, once a village's rights in land are passed to a corporation these are extinguished forever, even if the project never comes to pass (Nelson et al. 2012).

Investigating proposals for biofuel plantations in Rufiji District, Neville and Dauvergne (2012) considered that, rather than a land-grab being underway, local uncertainty over land (and water) was creating an unpredictable negotiating context whereby companies could not easily acquire land even while locals could not effectively resist attempts to do so. They pointed to unclear or missing maps and landmark-based rather than quantified notions of space as underlying uncertainty over tenure, made worse by the tangle of current land-related legislation overlaid on colonial and post-colonial tenurial arrangements (see also Duvail et al. 2006).

Insecurity around land tenure is compounded by the fact that the state (in the person of the President) owns all land in Tanzania in trust, and can dispossess customary owners for the public interest (Beymar-Farris and Bassett 2012). In addition, there is a drive currently underway across Tanzania to formally register customary rights, a process of land titling to which both villagers and non-villagers may apply, but which will undoubtedly increase uncertainty by favouring more well-connected players (Benjaminsen et al. 2009, Sundet 2005).

Congruent with the push for "green" biofuels on the floodplain, and indicative of the threat to local communities, are plans to evict people from the Rufiji Delta as mangrove forests there are made REDD-ready, i.e., made more valuable on the carbon market in line with the Reduced Emissions from Deforestation and Degradation initiative (Beymar-Farris and Bassett 2012).

### ***2.9.2 Impacts of hydropower schemes in the Rufiji Basin***

Tanzania has six hydropower stations, all operated by the parastatal agency TANESCO (Tanzania Electricity Supply Company). Three of these are situated within the Rufiji Basin: the Mtera and Kidatu stations on the Great Ruaha River, and the Kihansi station on a tributary of the Kilombero (or Ulanga River) (Figure 2.1). A large hydropower/multipurpose dam on the Rufiji River itself, at Stiegler's Gorge, has been planned for decades, as mentioned above. This is in addition to further smaller dams, reservoirs and irrigation schemes envisioned as part of the Southern Agricultural Growth Corridor of Tanzania (Tanzania Ministry for Water 2012). In this section I

briefly review the existing and potential impacts of hydropower projects in the basin, in terms of both ecological change and livelihood disruption.

The Great Ruaha Power Project represents over half of Tanzania's total installed generating capacity. The Mtera dam, completed in 1980, was originally built to provide reservoir storage for the downstream Kidatu station, with a hydropower plant of 80MW capacity added in 1989. The Kidatu station itself, completed in 1976, has a capacity of 204MW (Walsh 2012). Although designed to meet over 75% of the country's hydroelectric needs, low water levels in the reservoirs have led to frequent national power shortages since the mid-1990s, with serious consequences for industry (Walsh 2012). These shortages were blamed on decreased water flow arriving from the Great Ruaha River, which at that time had begun to dry out towards the end of the dry season, and has continued to do so for increasing periods of time every year since (Lankford et al. 2004). However, research by the SMUWC project (Sustainable Management of the Usangu Wetland and its Catchment, 1998-2002) found no significant connection between changes in upstream river flow and water levels in the Mtera Reservoir (Walsh 2012). Instead, dam managers were releasing too much water from the reservoir in order to generate more hydroelectric power, and failing to refill it (Yawson et al. 2003). The implications of TANESCO itself causing power shortages through mismanagement and flawed operational policy made blaming upstream users politically expedient, and as Walsh (2012) describes, contributed to an environmental panic that saw fishers and pastoralists evicted from wetland areas. These evictions occurred despite evidence that observed hydrological changes resulted mainly from water abstraction for irrigation rather than land degradation or climate change (Lankford et al. 2004).

The third hydropower scheme operating in the Rufiji Basin—the Lower Kihansi Hydropower Project (180MW capacity)—has had dramatic negative ecological impacts since its completion in 1999. Located in the biodiversity hotspot of the Eastern Arc forest, the dam destroyed an 800m-high waterfall at Kihansi Gorge. The consequent reduction in water spray onto adjoining wetlands led to major changes in riparian vegetation and poses significant threats to the endemic Kihansi Spray Toad and other plant species (Lovett et al. 1997, Quinn et al. 2005). Project authorities have resisted efforts to increase downstream flows despite having no official water rights to the Kihansi River (International Rivers 2014).

The impacts of upstream dams on water flow within the Rufiji River appear to be minimal, as measured on the basis of expected versus observed annual maximum flood peaks at Stiegler's Gorge (Yawson et al. 2006). However, construction of a dam at the gorge itself would fundamentally alter the downstream flooding regime and livelihood activities. As currently designed, the Stiegler's Gorge Dam would allow for a reduced flood release of up to 2500 m<sup>3</sup>/s, compared to the mean annual flow of some 800 m<sup>3</sup>/s (Duvail et al. 2014). However, as these authors demonstrate, the designed flood would likely be insufficient to exceed the threshold water level necessary for most lakes to reconnect to the river. The resulting declines in fishery production (see Section 2.7.2), together with the loss of many other benefits provided by the floods (see Section 2.3.2), are likely to drive floodplain inhabitants towards unsustainable livelihood activities and consequent reductions in local biodiversity (Duvail et al. 2014).



# Chapter 3. Methods

## 3.1 Overview of research timing and methods

Fieldwork was conducted between February 2008 and March 2009, with a pilot study in June-July 2007 (Table 3.1). During the pilot study I selected my study site and completed a village-wide census and map of Ruwe for use in sampling. Research activities in the main fieldwork period tended to overlap, with the most extended being a year-long monthly survey of household aquatic resource use (HARS), a repeat survey of stall holders in the two regional market towns between March and November (MKS), and biweekly collection of daily activity sheets from selected fishermen from July to January (Table 3.2; see Section 3.4.3). From mid-June, as fishing activity picked up, I began visiting the lakeside fishing camps regularly, and ran a survey of fishermen working there from mid-October. Other time was spent in qualitative interviews, visits to dry season fishing weirs, several informant-led walks, and participant observation, primarily in Ruwe village. In the last two months of fieldwork I conducted a household-level socio-economic survey (HSES) across the three villages.

I provide a description of each structured questionnaire and interview formats in the 'Methods' section of the relevant chapters (Table 3.2). The questionnaire forms themselves are available under the 'Resources' tab at the website:

[http://www.ucl.ac.uk/anthropology/research/research\\_reading\\_groups/herg](http://www.ucl.ac.uk/anthropology/research/research_reading_groups/herg)

The above research tools provide the bulk of the material presented in this thesis, although I did draw in limited instances on existing records. Officials at Jaribu checkpoint, on the border with Rufiji and Mkulanga districts (on the road north to Dar es Salaam) allowed me to copy their records of fish exports from the area. In Ruwe and Mbunju-Mvuleini I consulted records of village income and expenditures, as well as minutes from meetings. In Mkongo, I spent two days reading through court records, looking for examples of conflict around fisheries or land.

**Table 3.1 Work timetable**

<b>Dates</b>	<b>Phase</b>
Sept 2006 – Apr 2007	Developing a research proposal and grant writing
May – July 2007	Pilot study and beginner Kiswahili course
Aug – Dec 2007	Developing field methods and upgrading
Jan 2008	Intermediate Kiswahili course
Feb 2008 – Mar 2009	Main fieldwork period
Apr 2009 – Jan 2010	Data analysis and write-up I
Feb 2010 – Feb 2012	Maternity leave
Mar 2012 – Jan 2014 ( <i>part-time</i> )	Data analysis and write-up II

Finally, for background to the area, I consulted the Rufiji District Books (Vol I. and II.) prepared by British colonial officials and kept in the National Archives at Dar es Salaam. In addition, although not part of my own research project, in March 2009 I conducted in-depth interviews with 20 purposively selected households in Ruwe exploring people’s perceptions of their household membership, which helped further my own understanding in this area.<sup>19</sup>

### **3.2 Defining the household**

The use of the household as a unit for social research is long-standing, as is the recognition, particularly among anthropologists, of the difficulty of capturing the complexity and changing nature of such domestic groupings in a formal category. Guyer (1981) sets out the attraction of the household unit for studying decision-making—with its apparent locus, resources, and labour force—but then demonstrates how such a model is inaccurate for Africa. There might be a residence to survey, but the people in it come and go and have different rights and obligations according to age and gender, so that households are neither discretely-bounded groups, internally

<sup>19</sup> I was hired to do this work by Prof. Sara Randall (UCL) and Dr. Ernestina Coast (LSE) and used their prepared interview guide.

**Table 3.2 Overview of primary research methods used in research and the chapter each relates to, with an indication of frequency and timing, and research assistant used.**

Chapter	Theme	Research method	Frequency	Location	2008												2009		Assistant
					F	M	A	M	J	J	A	S	O	N	D*	J*	F	M	
4	Participation and reliance	Household socio-economic survey (HSES)	One-off	R, Mbj, Mk															MB (KT)
5	Aquatic resource use	Household 24h recall survey (HARS)	Monthly	R															KT and IU
6	Fishermen's earnings	Activity sheets	Daily <sup>1</sup>	R															MB
7	Regional trade	Market survey (MKS)	Every 6-8 weeks	Kibiti, Ikwiriri															MB
6 and 9	Gear choice and Mobility	Fishing camp survey (FCS)	One-off	Various camps															MB (KT)
8	Resource management	Interviews and participant observation	n/a	R, Mbj, (Mk)															MB, KT (IU)

Notes: Interviews and participant observation form the basis of Chapter 8 but inform all other chapters as well. R = Ruwe, Mbj = Mbunju-Mvuleini, Mk = Mkongo; MB = Moshi Bora, KT = Karim Tenge, IU = Idaya Ungando. I was back in the UK from 20 Nov 2008 – 20 Jan 2009, but my assistants carried on with research. <sup>1</sup>Filled in by fishermen daily, collected biweekly.

homogeneous, nor fixed in time (Guyer 1981, Guyer and Peters 1987). This is certainly the case in Rufiji, as explored in detail by Lockwood (1998) working in a hill community. In this section, I describe the nature of domestic groups in my study area, and the methodological steps taken to reflect local complexities.

### **3.2.1 Observations on local domestic groups**

The Tanzania Demographic and Health Survey (DHS) defines a household as “a person or group of persons, related or unrelated, who live together and share a common source of food”. Yet even by this flexible definition, Randall et al. (2012) found that the DHS enumerators, if presented with the 20 self-defined households I surveyed in Ruwe, would classify these as 31 separate households. The challenges for outsiders in defining household membership are multiple, with complexities surrounding residency patterns, reproduction, organisation of production and consumption (Lockwood 1998: 142).

Ideally, each adult or adult couple has their own home in the village (*nyumba*), while elderly relatives or young men attached to the group might live nearby in individual huts (*kibanda*). Men in polygamous marriages do not necessarily keep co-wives in the same house or even same village, and share their time between wives’ houses. In addition, nearly all domestic groups maintain a field house (*dungu*). At times of peak labour demand, the wife is stationed there with the youngest children, while older children stay behind in the village to attend school, moving back and forth bringing necessities from the village. The elderly might live at the *dungu* year-round, taking care of grandchildren who do chores for them, and receiving food from the parents.

Movement patterns extend beyond the floodplain, so that husbands might send their wife and young children, or elderly parents, to stay a month or more with relatives in Dar es Salaam in the dry season, to stretch food supplies at home. In many cases, these same relatives would have come to visit the village earlier to eat their fill following the rice harvest; if visiting at other times of the year villagers would expect them to bring gifts of food (as also observed by Bantje 1982). Other relatives or friends (joking partners) from the hill terraces might come to stay late in the dry season, intent on catching and smoking fish to trade back home (Lockwood 1998: see Chapter 8). The end result is much coming and going of family members and non-kin alike across geographically dispersed residences.

The changing membership of domestic groups is compounded by the high divorce rate in Rufiji, with divorce culturally acceptable, easy to achieve under *sharia*, and made more likely by the common occurrence of extramarital affairs by both sexes (Lockwood 1998: 148). Long periods of separation were given as the main reason for such affairs. On divorcing, a woman usually returns to live with her family with her youngest children, while the eldest might stay with her ex-husband's family. Upon remarriage, children from previous marriages might be sent to live at another house, with grandparents or the parents' siblings. Even children from 'stable' unions were shared out thus, sometimes sleeping at one house but eating at another.<sup>20</sup> Illegitimate children stay with the mother, and the father has no formal obligation to contribute to their upbringing.

Production groups can be larger or smaller than residential groups (Lockwood 1998: 143). Each adult typically has his or her own field, but subgroups within the residential group might take turns working on each other's plots (or a shared family plot), or band together in communal work parties (*komalio*) with people from other residential groups to perform labour-intensive activities such as rice harvesting and threshing or charcoal production. In conversation with villagers, husbands and wives usually reported keeping the harvest from their own field in their own granary (*kiengele* or a larger *sheke*), which could not be accessed without the owner's permission.<sup>21</sup> In practice, husbands and wives negotiated which store to access (with some pooling stores together, particularly if they had farmed the same field), and even where a woman's store might be earmarked for feeding the family and the husband's for cash sale, women could still secretly sell their rice.

The same rationale as for food stores extends to cash-earnings, whereby proceeds from one's own economic activity (such as sales of prepared food, alcohol, woven items, timber, or charcoal) cannot legitimately be claimed by any other. At the same time, men are expected to provide cash for store-bought necessities (e.g., cooking oil, salt), food items (e.g., dried beans, vegetables and fish) and major expenses such as school fees. Failing to meet this responsibility is grounds for divorce. Women are expected to contribute to the food budget through their labour, growing the family's food crop (Lockwood 1998: 124). Nonetheless, demands on people to share their cash

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<sup>20</sup> Referred to as "children in the middle" (*watoto wa kati*).

<sup>21</sup> Based on 26 short, semi-structured interviews with villagers in Ruwe in March 2008 on issues of farm labour and food and cash sharing, and casual conversations.

income (both from the domestic group and larger family) meant that accumulating savings was considered near impossible by both men and women in the study village. Only young, unmarried men (i.e., without land of their own) are free to keep their cash earnings, although still expected to contribute labour to the domestic group (see also Lockwood 1998: 145).

Strategies for coping with food shortages added a further temporal dimension to domestic groups. These might merge together when hungry (sharing both food stores and cooked meals) but separate again when circumstances had improved. Other households in Ruwe were adamant that they would not share resources in this way—and indeed, that times of hardship made them *less* likely to help their relatives—making a distinction between themselves and those that still lived in the traditional manner (*kwa ukoo*). Discussing siblings, Bantje (1982) notes that mutual assistance is not automatic but depends on personal relationships. In some cases, more traditional households had maintained physical proximity, building their houses facing one another across the same village street. One such compound in Ruwe, which I will refer to as the Kwele compound, was made up of an elderly patriarch and his three married sons, one of whom had two wives living in separate houses, a *kibanda* belonging to a teenage grandchild and an empty house left by a fourth, unmarried brother who had moved to Dar es Salaam.<sup>22</sup> In this compound, each wife cooked daily but any member could eat at any house. Such sharing of meals happened more widely throughout the village, but only in the case of small children, elderly parents, or the infirm. Adults on the Kwele compound also shared cash and took turns working each others' fields.

### **3.2.2 Working definitions of the household**

My formal definition of the household changed as I gained field experience. In my initial census, I simply asked informants to list the members of their household, including all people presently living *in the house* and of any children of the household head's living elsewhere, with the latter category proving unwieldy. In defining the household for the aquatic resource use survey, I was more careful to trace relationships outside the immediate residence, asking informants to list:

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<sup>22</sup> One brother's daughter from a previous marriage lived at the patriarch's house, while another grandchild lived with her own parents but had her school fees paid by her paternal uncle.

1. all the family members in the home (*ndani*) who cooked and ate together;
2. any other people who ate elsewhere but slept here; or
3. who slept here but ate elsewhere.

We asked this same set of questions at the start of each survey every month, in order to capture people's movements. These repeat visits revealed extensive food sharing between certain domestic groups, as well as a case of two 'households' physically merging temporarily into one, leading me to again revise my criteria for defining the household. On the socio-economic survey, I added a fourth question to my list, asking informants:

4. Do you live in the traditional manner (i.e., "*kwa ukoo*"), that is, do you share food and/or cooked meals (plates of food, *sahani*) regularly with other households?

If they said yes, we would discuss the nature of this cooperation with them in more depth, including whether they shared farm labour and cash. We would then visit the named households to confirm whether they viewed the association in the same light. Where all respondents agreed on the matter we surveyed these additional domestic groups as part of a larger economic unit (or 'cluster'), usually on a later date and always separate from the original domestic group (see Section 3.2.4).

Of the 14 clusters identified, all but one (the Kwele family compound) consisted of two sub-groups. These typically consisted of one sub-group headed by a younger married man and a second headed by his elderly birth parent(s) (N=7), paternal uncle (N=2) or wife's parents (N=2). Such domestic arrangements were basically equivalent to domestic groups in which elderly relatives were directly reported as living with a married couple. The remaining two clusters consisted in one case of sub-groups headed by a birth brother and sister, and in the other of two female-headed households, with one elderly widow the sister-in-law of another. During analysis, I rejected as proposed clusters five instances where children (more often than adults) ate together and adults did not cooperate on farmwork, but retained the surveys done with sub-groups not in my original sample (N = 3) nonetheless.

### 3.2.3 *Sampling frame*

Before I could define the household for myself, I needed to find some. In Tanzania, the very word ‘household’ (*kaya*) was invented by the National Bureau of Statistics in the 1970s, and often bears little resemblance to local reality (Randall et al. 2011).<sup>23</sup> Nonetheless, the concept remains influential as the *kaya* was the building block of the local administration structure put in place after villagisation, whereby ten households made up a ten-cell unit under a local leader, with several ten-cell units comprising a hamlet. Individuals or households not included under the ten-cell structure are likely to be omitted from lists of village households (Randall et al. 2011). Nonetheless, their easy availability means that such lists remain the basis for many household-level surveys, including in Rufiji (Lockwood 1998, Turpie 2000, Parker 2010).<sup>24</sup>

My village map in Ruwe was an attempt to develop a more accurate list of household heads than that available from the village. I assigned a number to each house in the village, keyed to the name of the household head as recalled by my research assistants. In the course of using this list (for my initial census, wealth ranking exercises, and aquatic resource use survey) and through growing familiarity with local social organisation, I realised that it was hardly an improvement on available information.<sup>25</sup> I did not have time to map the other two villages in any case, so ended up relying on information provided by village leaders there. In Mbunju-Mvuleini, the most up to date information consisted of a ‘Farmers’ Register’ listing all villagers (male and female) with fields, compiled by village leaders in 2007/08 for the district.<sup>26</sup> We interviewed leaders in each hamlet to add to the list anyone who did not have a field that year or had otherwise been left off the list. In Mkongo, I used the village registers compiled in 2003 and reportedly updated whenever a person moved into or out of the village, or died.

The time taken to identify household clusters at the start of each socio-economic survey was in part to compensate for my inadequate sampling frames. Often, the sub-

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<sup>23</sup> By one official definition, the *kaya* is “a person or group of persons, related or unrelated who live together and share a common source of food”.

<sup>24</sup> An additional challenge to working with village lists in the study area was the proliferation of clan names and nicknames in use. People joked that it was to make it difficult for strangers to find them, and likely reflected the long history of resistance in the area to colonial controls.

<sup>25</sup> A combination of my own ignorance and my research assistants’ internalisation of the ‘*kaya*’ mindset meant that we had missed some domestic groups entirely, or split others apart.

<sup>26</sup> The actual village register had gone missing when the former chairman died.



groups named as part of a cluster were not found on my village lists, which suggests that village leaders recognised that such households were subsumed within another and so did not bother to list them separately. Lockwood (1998: 144) makes reference to the dominance of the concept of family over that of the household (or *kaya*), even as the *kaya* continues to dominate village administration. Nonetheless, very recent arrivals not yet added to village lists and/or those solitary individuals or domestic groups without close ties to any others would not have been picked up by this method, and remain under-represented to an unknown degree.

I excluded from my research any households where a member was a government worker (e.g., teachers, health clinic staff), on the basis that they were unlike most residents in not depending on the natural environment for their livelihood. In most cases, they came from outside the district as well, and kept largely to themselves. I also focused nearly exclusively on households with a home in the study villages, ignoring the unknown number of households established (unofficially) on the floodplain proper.

#### ***3.2.4 Weaknesses in household-level data***

Identifying household clusters was important in reflecting the social reality of domestic group organisation, but conducting the surveys separately meant I could not be sure that I had accurately documented lands, assets and income sources. Instead, I combined the information from related sub-units into one form during data entry, possibly leading to double-counting. Typically, the larger household had a middle wealth ranking and the smaller a poor-ranking, but in combining the two I always assigned the cluster a middle-rank.

Aggregating sub-units' assets and activities together under one cluster obscures differences just as collecting household-level information obscures individual differences. In Rufiji men and women, the aged and young, married and unmarried women, have very different access to resources and claims on their labour and earnings (Lockwood 1998). The position of the person being interviewed could be expected to have a strong influence on answers given, particularly in reporting the relative importance of various economic activities, and should be kept in mind.

To simplify data analysis, I always scored the married man in the house as the head, if one was present. This meant ignoring cases where the wife was reported to be the head (because her husband was from away) or the elderly father (or mother).

### **3.3 Wealth Ranking**

#### ***3.3.1 Participatory wealth ranking exercises***

I carried out participatory wealth ranking exercises (Grandin 1998) with groups of villagers in each hamlet of Ruwe and Mbunju-Mvuleini and four of seven wards in Mkongo (see Chapter 4 for justification of hamlet selection). Wealth ranks were used in proportional sampling design for the aquatic resource use survey and the socio-economic survey.

For the ranking exercises, I used cards listing the names of household heads living in each hamlet (see Section 3.3). To select participants, I used a mixture of haphazard and formal methods. In Ruwe, where I conducted the wealth ranking exercises early in my fieldwork period (March 2008), I walked around the village with my research assistant on the lookout for groups of people already sitting together. In this way we set up one all male and one all female group in each of two hamlets, consisting of about five main participants joined by varying numbers of onlookers. In Beta hamlet, where my research assistants lived, I relied on their own sort and a separate sort done by the hamlet's chairman. In the other two villages, I asked the village chairmen to set up groups of three people from each hamlet of interest that would include at least one village council member and one woman. In Mbunju-Mvuleini this approach worked out well, likely reflecting leaders' experience with REMP and its participatory methods. In Mkongo, the leaders recruited only men for one of the hamlets, so that we had to organise an additional women's only group.

In the exercise, my research assistant would first ask informants how they would recognise someone in the village as wealthy ("having means"), poor or in between, and then had them sort the cards into corresponding piles. Criteria used by participants are presented in Table 3.3. The middle-rank group invariably contained the majority of households in every exercise. Where groups agreed to re-sort the middle category, participants considered that those with "a bit more" were again those who could find money a little more easily than others, with physical asset holdings said to have little part to play in this. Although we encouraged people to think widely of different physical assets that might correspond to wealth (e.g., quality of housing, bicycle ownership), the over-riding consideration had to do with the ability to work and move around in pursuit of income-earning opportunities: if one had youth and/or energy, one was doing alright by local standards.

**Table 3.3 Criteria put forward by participants in wealth ranking exercises for sorting households into poor, middle and rich categories, all three study villages combined.**

Rank	Poor	Middle	Rich
Access to food	Often hungry: Might eat only once a day	Avoid hunger: If food runs low, can find means to get more	Never hungry
Health	Very old, ill or disabled; unable to farm	Have energy, vitality	
Farm labour	All farming by hand	Might hire tractor	Hire tractor
Support networks	Have no children <i>or</i> children do not help		
Assets			Own a shop, goats, house in Dar es Salaam, milling machine, motorcycle or other expensive asset
Non-farm income	Negligible	Trade, such as selling fish or vegetables	Salary

### 3.3.2 Wealth rank correlates

In comparing wealth ranks as determined in the group exercises with data from the socio-economic survey, older households and those with female heads were more likely to be ranked as ‘poor’ (Table 3.4). Education levels were low overall but particularly among poor households and negatively correlated with age (-0.54, N=130,  $p < 0.001$ ). Only 49% of male household heads and 36% of female heads had completed primary school and just two individuals (one ‘rich’, one ‘poor’) had any secondary education.

Households ranked as ‘rich’ in the ranking exercises were found to hold substantially more value in non-land assets than did middle- and poor-ranked households (Table 3.4). Differences between wealth groups in total land holdings were less pronounced than for non-land assets but followed the same trend (Table 3.4). Overall, rich and middle-ranked households kept comparable absolute amounts of land under active cultivation, but rich households farmed relatively less of their total holdings than did others, though this was highly variable. Rich households had more trees on average than did middle or poor-ranked households (Table 3.4).

**Table 3.4 Age and gender of household head, and land and non-land asset holdings among poor, middle and rich households in the three study villages, HSES.**

Wealth Rank	Household head			Non-land assets <sup>1</sup>			Land			Trees	N	
	Age	> 70y old	Female	Educ'n	In Top Quartile	Total value	In Top Quartile	Total holdings	Area under active cultivation	Prop. of total land under cultivation		No.
		(% of HH)		(years)	(% of HH)	(USD)	(% of HH)		(ha)	(%)		
Poor	56.3 ± 16.8 (55)	33	29	3.6 ± 3.1 (4)	9	147 ± 225 (110)	19	7 ± 5.5 (5)	2.7 ± 2.5 (2)	0.47 ± 0.32 (0.4)	8.7 ± 17.4 (2)	42
Middle	47.5 ± 16 (43)	12.5	2.8	4.7 ± 2.9 (7)	19	204 ± 205 (163)	27	9.9 ± 7.6 (8.25)	4.1 ± 3 (3.5)	0.49 ± 0.24 (0.43)	21 ± 29 (10)	72
Rich	47.8 ± 18.7 (38)	17.6	0	5.4 ± 2.4 (7)	88	865 ± 712 (652)	35	10.8 ± 7.9 (10)	3.7 ± 3 (3.25)	0.39 ± 0.25 (0.35)	49 ± 90 (10)	17
TOTAL											131	

Notes: All descriptive statistics presented as mean ± SD (median). <sup>1</sup>Non-land assets includes livestock and physical assets; for a complete list with estimated values see Appendix A.

Cashews were the most commonly-held trees overall (held by 52% of households, and representing 74% of the 2736 trees reported), followed by mangos (44% of households, and 25% of all trees).

Rich households held a greater proportion of their assets in commercial items such as milling machines and shops, and owned relatively little in fishing gear compared to others (Figure 3.1). They also tended to live in better-quality houses in the village and to own houses elsewhere (Table 3.5). Households in all wealth categories held most of their land in low-lying depressions on the floodplain proper (“*bonden*”), with poor-ranked households overall and in each village holding the least proportion of their total land holdings on the high levees and river terrace (“*juu*”) (Figure 3.2).

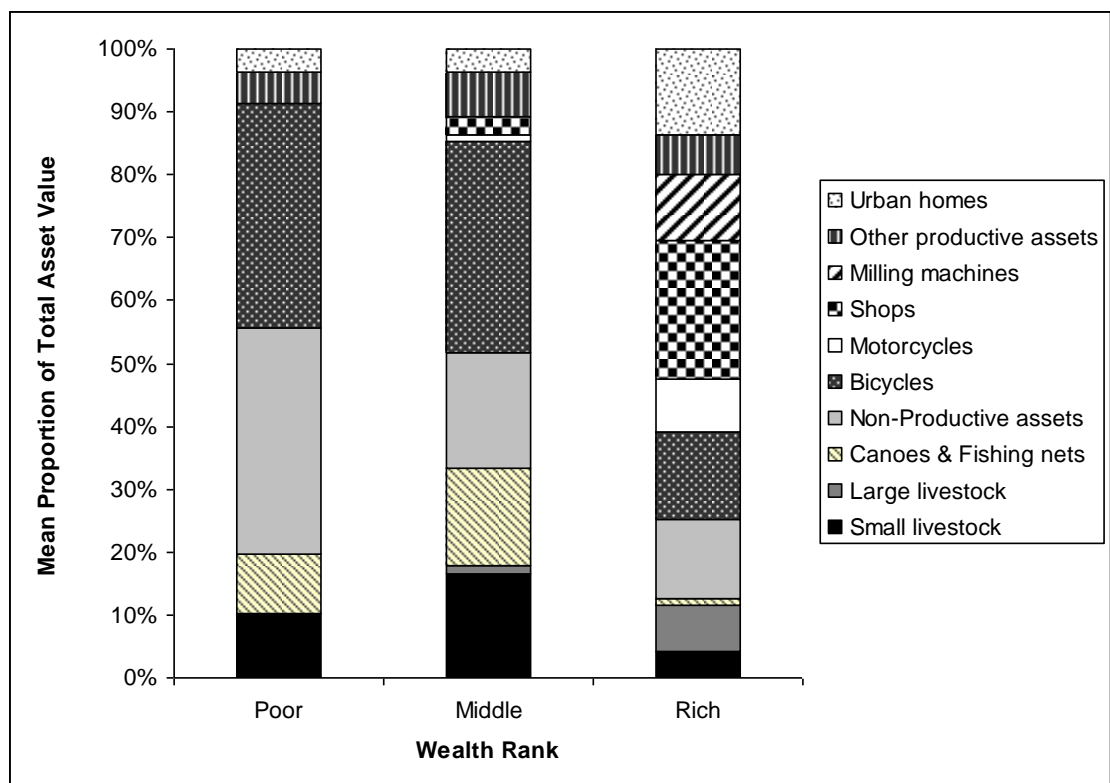
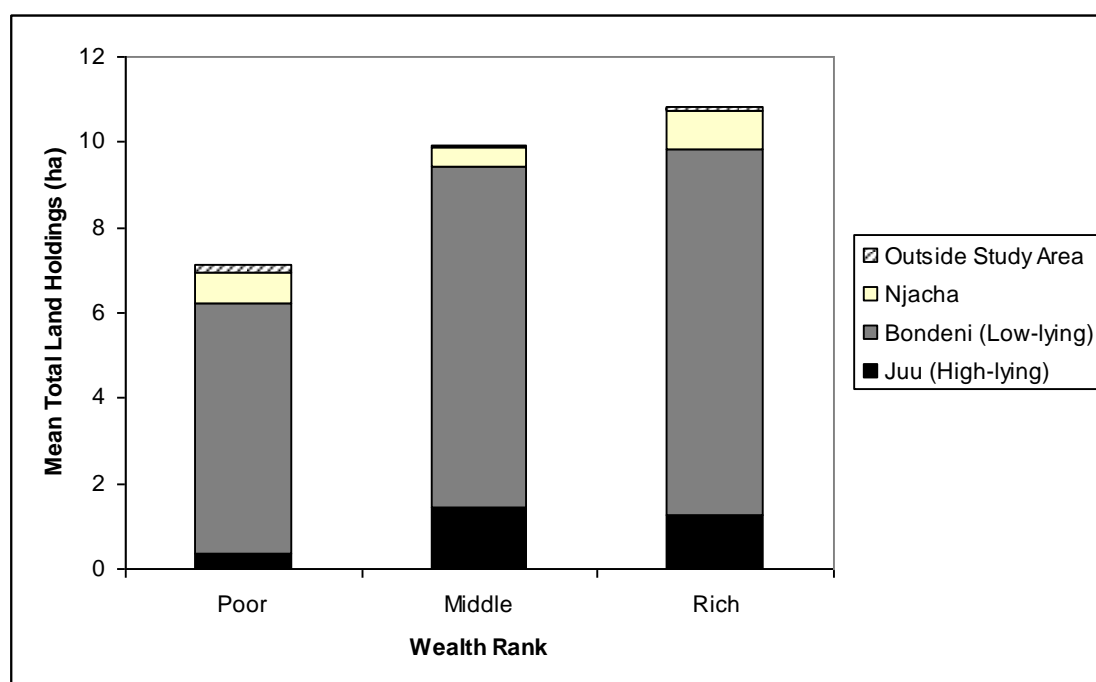


Figure 3.1 Mean proportion of total non-land asset value held in different asset categories, by wealth rank, HSES.

**Table 3.5 Quality of village housing and house ownership outside the study villages, by wealth rank, HSES.**

Wealth Rank	Village House Materials			Own home outside village		N
	Cement floor	Brick or Cement walls	Tin Roof	In DSM	In Ikw/ Kib	
	(% of HH)					
Poor	2.4	14.3	23.8	4.8	0	42
Middle	2.8	4.2	20.8	1.4	5.6	72
Rich	35.3	23.6	59	17.6	11.8	17
TOTAL						131

Notes: Those with houses outside the village owned one house, with the exception of one 'rich' individual with two houses in Kibiti (Kib), one 'middle' individual who owned a house in Dar es Salaam (DSM) and a second in Ikwiriri (Ikw), and one 'poor' individual, a retired construction worker, with three houses in DSM occupied by his children.



**Figure 3.2 Mean amount of total land (ha), actively farmed and fallow fields combined, held in each agro-ecological zone, by wealth rank, HSES.**

There was a significant but low correlation between households' wealth ranks as determined in ranking exercises and their self-assessment ( $p = 0.245$ ,  $p < 0.01$ ,  $N = 127$ ). About half of rich and middle-ranked households self-assessed as "doing alright/average" while only a third of poor-ranked households did. Almost a quarter of rich households considered that they were "doing well", but so did a tenth of middle and poor households.

### 3.3.3 *Wealth and accumulation in Rufiji*

The picture that emerged from both the wealth ranking exercises and statistical analyses of wealth-rank correlates is that of villages with relatively little economic differentiation. The vast majority of people lived like their neighbours, with only a handful of villagers having accumulated major non-land assets. Land was plentiful and administered under the *ukoo* system, making it difficult for individuals to acquire large concentrated areas (as observed by Lockwood 1998: 132). Trees mattered (as evidenced by conflict over inheritance) but were apparently not accumulated to the same degree as on the hill terraces, where trees represented a major productive investment for men (Lockwood 1998: 133). Coconuts, a key resource in the Coast region, did not grow locally, cashew orchards required investment in maintenance, and any trees on the floodplain could be damaged easily by prolonged floods. Mango trees were nominally under the control of the *ukoo*, with any profits from fruit sales to be shared among members.<sup>27</sup>

It may be that Rufiji floodplain dwellers more generally have tended to invest in prestige rather than material assets which could be washed away by floods or destroyed by rats (Sandberg 1974). The giving of larger and more costly *ngomas* or prayer readings (*maulid*) were traditionally the primary means of acquiring social prestige, with associated feasts serving to redistribute wealth within the community. More generally, generous spending and sharing was considered to be the hallmark of a successful man (Bantje 1982). Nonetheless, ritual ceremonies occurred in my study area on a much reduced scale compared to when people lived on the floodplain, according to informants.<sup>28</sup> Already by the early 1970s, Sandberg (1974) observed that

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<sup>27</sup> Elders complained that they could not realise their trees' value in any case as hiring trucks to bring the fruit to market was too expensive and unscrupulous individuals stole the ripe fruit.

<sup>28</sup> For instance, whereas the female rites around puberty and marriage (*kinyago*) remained vital, the male equivalent had largely disappeared since villagization, ascribed in part to the introduction of formal education but also to the expense involved.

wealthier individuals were finding it easier to escape such social obligations in part by hiding their wealth (e.g., investing in a house in Dar es Salaam). Risk of property loss remained high today, though through theft rather than floods. Any wealth accumulation in my study area was regarded with suspicion, and invariably attracted jealousy, accusations of witchcraft and curses (see also Sandberg 1974, Lockwood 1998).<sup>29</sup>

My wealth analyses did not encompass clan membership, although land, trees, labour (e.g., through *komalio* organised on patrilineal lines) and other valuable resources were controlled through the *ukoo* to an unknown degree. There were certainly concrete political advantages to being a member of certain clans. For example, many of the village officials in Ruwe were from the largest local clan (Minge) and it was common knowledge that in any court case the Minge party was sure to win.<sup>30</sup> Other clans were marked out as ‘unclean’ for having a slave ancestor, but these secret lineage histories remained unfamiliar to me, and I could not say what consequences, if any, this had for present-day descendants.<sup>31</sup>

### **3.4 Implementing research**

#### **3.4.1 Research permissions**

I obtained research clearance from the Tanzania Commission for Science and Technology (COSTECH) to conduct fieldwork from June 2007 to June 2009 under research permit numbers 2007-170-NA-2007-54 and 2008-142-ER-2007-54. Dr. Pius Yanda, Director of the Institute of Resource Assessment (IRA) at the University of Dar es Salaam, was my COSTECH-assigned local contact and together with IRA staff provided invaluable advice on entering the field.

During a one-week reconnaissance trip to Rufiji District in June 2007, accompanied by an IRA Master’s student, I introduced myself to the Village Executive

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<sup>29</sup> For instance, one young man in Ruwe was said to have murdered his father by offering him to the spirits, his father having died the same year he acquired a motorcycle. Anyone with wealth was said to have either murdered their father or child, or sworn off women (i.e., killed sexual desire), in order to gain the spirits’ help.

<sup>30</sup> A Minge elder who died in 2006 had been the village’s last rainmaker. The most powerful local witchdoctors were apparently of the Minge clan as well, and so could not be relied on by other clans for setting curses against or gaining protection from Minge enemies. For this reason, one informant told us, he had travelled to a neighbouring district to find an ‘unbiased’ witchdoctor.

<sup>31</sup> I became aware of the status of slave descendants only when my host family told a tale of a tortoise-like creature with the face of a cat (the *ngake*) that would come from the woods into your house. The *ngake* would tell the future after being danced to and offered gifts, but only allowed itself to be seen after those with slave ancestors had left the premises.



Officer (VEO) in each of my three future study villages. On my return several weeks later Ruwe's VEO granted his 'official' permission for me to live and work there. Shortly thereafter, he introduced me at a well-attended Village Assembly meeting.<sup>32</sup> A clan patriarch also invited me to his home for a meeting with the *wazee wakubwa* (important elders, an unofficial council) who questioned me closely on my research and motivations before welcoming me to stay. I was assigned to a host family by the VEO, in one of the nicest houses in the village (concrete, with a tin roof). The family consisted of an elderly man (who had worked for many years in Dar es Salaam as a dockworker), his dynamic younger wife (also a village councillor and midwife), and their two pre-teen sons still at home. The father had no family left in the village, but my host mother shared the care of her elderly father with her brother, and had many other relatives among our neighbours. I paid rent on two rooms, and also hired my host mother's sister (divorced, with a young daughter) to cook, collect water, and wash my clothes. My own food supplies were shared with the family.

Despite initial acceptance obtained from village leaders, gaining villagers' trust took longer. My decision to begin with a census gave me the opportunity to meet many villagers early on, but was viewed with suspicion by some who thought I was a land investor or a government spy.<sup>33</sup> Being fastidious in my greetings (in Kiswahili and Kindengereko), switching to local dress (a *kanga* skirt, though rarely the veil), regularly visiting the floodplain fields on foot and attending funeral services helped me gain acceptance. My host mother was an invaluable ally, shepherding me on visits to neighbours, coaching me on how to act, and bragging about all the types of local food I ate. My good standing in my host village served me well when conducting research in neighbouring communities, as villagers there had either met me at ritual ceremonies in Ruwe or heard about me from their family and friends.

For the market survey, I introduced myself to the town officials prior to beginning research and explained my interest in the fish trade. In Kibiti, the VEO brought us to meet the chairman of the market, a dry-goods stall holder whom we always stopped off to see first on successive visits to the market. In Ikwiriri, the VEO was away so a village councillor introduced me to the district fisheries officer based in

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<sup>32</sup> This turned out to be the meeting at which he effectively lost his position as VEO via the intercession of the ward councillor (Diwani), responding to villagers' anger at an unauthorised land transfer (see Chapter 8).

<sup>33</sup> People thought I was compiling information for taxation purposes, or on illegal hunting. A few of the very old people thought I might be intent on murder, as I learnt later.

the town. This man gave us a tour of the market, but otherwise had no involvement in my research.

I continued to request permission of informants throughout my time in the field, requesting consent before undertaking any surveys or interviews. People were generally open to speaking with me and comfortable with the idea that I was “studying to become a teacher”, with no direct benefits foreseen from my work. Nonetheless, many people (including my research assistants) remained convinced that I would one day return to the village with a large-scale investment project.

### **3.4.2 *Research assistants***

I hired two local men as my research assistants, Moshi Bora and Karim Tenge, and worked occasionally with a third, female assistant, Idaya Ungando. Mr. Bora and Mr. Tenge were both around 30 years old, had some high school education and were the only English-speakers (besides the head teacher and a former secondary school teacher) living in the village. I decided to share the work between the two men not only to avoid bad feelings—they had been presented to me together by the VEO as potential employees—but also to ensure that I always had a worker available given each man’s obligations to his farm and family. I hired Ms. Ungando on the recommendation of my two male assistants, telling them I needed an outgoing, intelligent, well-respected village woman to help in administering the aquatic resource use survey, since our respondents were usually the female household head.

None of my assistants had previous research experience and consequently we spent significant amounts of time talking through the research instruments and testing them on their family or friends before beginning any new research phase. This preparation was also important to overcome communication difficulties. Mr. Bora’s and Mr. Tenge’s English, though better than my Kiswahili, was far from fluent, and Ms. Ungando didn’t speak any English at all (see below).

I attempted to divide the work so that each research task was carried out all or mainly by one assistant, as shown in Table 3.2. The main exception was the aquatic resource use survey, where I used Mr. Tenge as a go-between to communicate with Ms. Ungando, with the two of them administering the survey together. As my Kiswahili improved, I kept the arrangement since the two of them could check each

other's work and I did not wish to reduce Mr. Tenge's work hours.<sup>34</sup> I conducted most of my interviews with the help of either male research assistant, but tried to match their personalities to the interview subject or task. For example, one assistant was very chatty and enjoyed gathering gossip, while the other was more adept at dealing with local officials. My female-research assistant helped me with women's discussion groups and interviews with local women selling fried fish. In administering surveys, my research assistant always asked the survey questions and wrote down responses while I observed and sought clarification as necessary.

I am confident that working with local research assistants provided me with a better research experience than would have been the case if I had chosen to work with an outsider, despite the important language difficulties. The advantages included greater acceptance from the community, as I was providing employment to two of their own, expert guiding around a complicated local geography, and access to insider knowledge of villagers' personal histories and relationships. I do not think I would have achieved close to 100% response rates on my various surveys and interviews without my assistants' ability to easily approach and reassure local people as to my motives. However, with their powerful help also came powerful biases to fight against: both men tended to favour their own neighbours or friends whenever the choice of interview subject was not up to random sampling, and to reject certain lines of questioning as too obvious or uninteresting. They also adopted a proprietary air whenever strolling around the village with me, so that I felt that people were sometimes unwilling to approach me, particularly women. To counter this, and as a means to practice Kiswahili, I dedicated much time to walking around on my own, sitting down to chat wherever I felt welcomed to do so.

I paid my assistants 1.60USD for each day worked.

### ***3.4.3 Strategies for co-ordinating multiple surveys***

It was my intention in this project to provide a holistic analysis of the local fishery sector, from the level of domestic fish catches and consumption, through to management at the village and district level, and up to the commercial sale of fishes in the regional markets. The differing nature and scale of the data necessary to provide

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<sup>34</sup> People in the village were very attuned to my assistants' work schedules, and would immediately joke or comment if I was seen to be favouring one over the other. On one occasion I was upbraided by an elder of one of the two men for not giving him enough work.

such an overview meant that some surveys required repeated rounds (e.g., the HARS monthly survey, or the fishermen’s activity sheets collected biweekly) while others took me outside the village entirely (i.e., the market survey). Interviews had to be scheduled around survey schedules and informants’ own time commitments. As a result, I had multiple research tools in play at the same time. This, combined with trips away from the field site (see below), meant that I could not be present at all instances of data collection (Table 3.6).

**Table 3.6 Presence of main researcher and assistants on quantitative surveys**

Research tool	Location	Total No. of Surveys (Research Days)	% of Surveys (% of Days) on which present			
			MAM	MB	KT	IU
HARS	R	463 (98)	31 (25)	3 (3)	85 (87)	98 (100)
HSES	R, Mbj, Mk	147 (34)	57 (74)	83 (85)	25 (47)	-
FCS	Lake Ruwe	137 (26)	38 (46)	77 (73)	23 (19)	-
DAS	R	1474 (201)	73 (79)	100 (100)	-	-
MKS	Kibiti, Ikwiriri	244 (14)	100 (100)	100 (100)	-	-
<b>OVERALL</b>		<b>2465 (373)</b>	<b>65 (63)</b>	<b>79 (71)</b>	<b>19 (28)</b>	<b>18 (26)</b>

Notes: For key to abbreviations see Table 3.2

I made regular trips away from the field for research and personal reasons. I did not have a computer in the village, and so returned to Dar es Salaam for a few days every three weeks or so in order to type up my field notes, e-mail my supervisors, prepare and photocopy any new survey instruments, buy necessary supplies, and meet with my translator. I also met up with my husband on several occasions, in the UK and in Tanzania. Each break had the added value of providing an opportunity to reflect on the fieldwork from a distance, allowing for a re-focusing of my research if I felt I was drifting off course or had come across a new angle worth pursuing. However, it also meant that my research assistants had to carry on with the surveys without daily supervision, and that I had to manage my relationships with villagers to compensate for repeated absences. The remainder of this section concentrates on these two issues.

In setting up my research program, I invested much time in designing easy-to-follow survey tools, training my research assistants, and checking up on their work. I also had an excellent rapport with both Moshi and Karim, working with them from my pilot study onwards and getting to know their extended families and close friends. As their employer, I was also flexible with payments (providing advances on request) and generous with favours (e.g., lending them my motorcycle, bringing gifts for their wives), which they appreciated. I treated them as partners in the research with valuable insights to share, and in return found that they took their work very seriously.

My approach on introducing a new research tool was for Moshi, Karim and I to go through the draft survey form or interview guide in detail, incorporating their suggestions for modifying questions and using local terms. Each assistant would then practice the survey on each other, and then on selected practice informants (such as my host family or their relatives) while I observed in order to prepare a final version. On the HARS, the same training process was followed but involved Idaya as well.

On the HARS, I accompanied Karim and Idaya on the two first survey rounds, when it became apparent that I would not be able to sit in on all surveys given the time involved in finding respondents at home.<sup>35</sup> I was away from the field for the third round, but after checking through the completed forms and accompanying the research assistants on the entire fourth round, I decided they were capable of carrying out the work on their own. To check that Karim and Idaya remained consistent in their use of the form across the study year, I periodically accompanied them on subsequent survey rounds, although there were five rounds when I did not. Occasionally a respondent would be put out that I had not come on the survey myself; in those cases I would make an effort to visit them independently. For all the surveys I was not present on, I read over the completed forms and discussed any unclear entries with one or both assistants on the same day or (if I was away from the village) immediately upon my return. For those forms reviewed on the day where problems arose, I would send the assistant(s) to clear up any discrepancies with the respondent the following day. Working alone, Karim and Idaya often forgot to probe for information on breakfast items (not an important meal, and one at which aquatic resources were not usually eaten), but on the other hand were more likely to receive truthful answers about meat consumption.

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<sup>35</sup> Each survey round required on average nine days to complete each month.

On the HSES, I split the work involved between myself, Moshi and Karim in order to ensure that we reached my sampling target within the allocated time period. It could take up to five visits to a sample household's village or field house before finding respondents at home, and I had other fieldwork to complete, precluding my participation on every survey. To control for potential interviewer effects, besides the usual practice period, all three of us conducted the survey together on the first day (taking turns with one assistant observing the other). I then took turns accompanying one or the other assistant on most days in order to correct any drift from the standard format. Each assistant also worked with me for the first three days they spent on the official survey and worked together (without me) over five days. I used the same verification process as with the HARS for any surveys on which I was not present, sending the assistant back to the respondent if any answer was unclear.

Moshi was the main assistant for all work relating to fishermen, to ensure consistency in data collection. I was present on all surveys and fishing site visits for six weeks prior to my trip to the UK over Christmas 2008, with Moshi subsequently working alone (see Chapter 6). The form was straightforward, with the main discrepancy between surveys done with or without me being in whether a fisherman was recorded as participating in the fish trade versus in 'business' more generally (see Chapter 6). Similarly, Moshi had worked for five months with me in collecting fishermen's daily activity sheets before I entrusted the task solely to him. In both cases, I went through all the forms with him upon my return, asking for clarifications where necessary. Minor problems encountered in using his forms are discussed in Chapter 6. The MKS, because of the detail involved in recording vendors' stock and sale prices, always involved both me and Moshi.

Although I could trust my research assistants to fill in the survey forms consistently, those surveys I sat in on were necessarily much more informative for my research. I usually would ask additional questions of respondents or have unexpected insights from listening to their answers. For example, in attending the HARS over many months, I realized the degree of fluidity in household membership, something that came through in the data but could be better explored in conversation with respondents. In essence, there is a balance to be struck between using assistants to collect large amounts of data, and scaling back the research effort to maximize your own opportunity to discover the nuances of local life. In retrospect, some research areas might have been better addressed through interviews rather than quantitative

surveys, in particular my work on the regional fish trade and on the users and operation of local fishing camps.

In terms of the effect my regular absences had on the quality of my relationships with villagers, I felt that it was on balance positive, building rather than eroding trust. My frequent movements were easily accepted, as villagers often had personal experience of cycling between the rural areas and Dar es Salaam for work or visits, and of hosting family members who did the same. The common assumption was that I went to the city to pick up my pay cheque, and people seemed to consider that holidays to see my husband were entirely normal if he was not to divorce me. My return was always commented upon, with people often saying they were happy to see me back.<sup>36</sup> My absences from the field also spurred me on to be more fully involved in village life when present. If I was not directly working, I forced myself to leave my rented rooms and socialize with my host family, neighbours, or villagers on other streets and hamlets. When setting out away from home, my usual technique was to pick an end destination (a shop or marketplace, or a friendly person's house) and on the way there to greet everyone I saw, accepting any (sincere) invitations to stay and chat. Whereas the results were sometimes discouraging—including one man berating me for pestering his elderly mother—overall people seemed to appreciate my efforts. Indeed, sometimes it felt as if I had learnt more from lying under a mango tree all afternoon with neighbours than chasing down formal interviews or surveys.

#### ***3.4.4 Transport and geographic bias***

In Ruwe, my research assistants and I would usually get about on foot, and hire bicycles to travel to the floodplain fields. In April I purchased a small motorcycle to make it easier to travel to the neighbouring villages, although travel was slow because of the deep sand covering much of the road. At Ikwiriri, I would use local buses to get up to Kibiti and back and forth to Dar es Salaam.

Reaching people on the floodplain proper was the major logistic challenge of this project, and meant that research focused on more accessible village households. I included a handful of 'floodplain' households in the aquatic resource use survey, but not in large enough numbers or across a wide enough area to be representative of that

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<sup>36</sup> My major frustration at leaving was when people told me that I had missed some interesting occasion (such as a spirit drumming ceremony or fishing trip) and that if only I had been around I could have attended. However, I also suspect that such tantalising invitations were only made precisely because I had *not* been around and so not at risk of taking up the offer.

environment. In the dry season, my assistants and I could travel to the fields by bicycle or on my small motorcycle, but the distances between field areas meant that we could rarely visit more than four or five fieldhouses in a day. In the wet season the only access to the floodplain was by foot, often walking through water that (in May) was up to chest deep. I went into the floodplain fields only three times in these conditions, as I was afraid of crocodiles.

#### **3.4.5 *Gender bias***

Given my focus on fisheries, my research necessarily focused on men. However, operating in a Muslim society and having male research assistants reinforced this tendency, so that men were constantly put forward as local experts. When I tried to interview women with either of my male assistants, or in a group with other men, the results were lacklustre. Using a female research assistant and speaking to women on my own, which I could do later in fieldwork, was more rewarding, and confirmed Hoag's (2006) observation that local women possess detailed knowledge of the complex riverine environment.

#### **3.4.6 *Language***

I reached a good conversational level in Kiswahili by the final months of research through a combination of coursework and practice. Nonetheless, I relied on my research assistants for translation in all formal research situations. This worked well in surveys, where I could follow the discussions easily and flag inconsistencies in questions asked or answers received, with my research assistant always administering the survey while I wrote down responses. However, for lengthy interviews where I needed to capture detail I used a digital voice recorder and had the audio recordings transcribed and translated by an English-speaking Tanzanian master's student at the University of Dar es Salaam, Mr. Albert Williams (Appendix B). Mr. Williams also translated my survey forms into Kiswahili, which I would then go through with my research assistants to adjust to local parlance.

In situations where audio recording was not practicable (e.g., at open-air village meetings, on walks), I would talk through my jottings with my research assistant(s) immediately after the event, and sometimes have them take notes as well. We also spent a lot of time together between interviews or surveys, or at the end of the day, clarifying gaps in my (or their) understanding with the help of a dictionary.



### 3.4.7 *Informant payments*

I compensated people for their time in most formal research situations, but tried to avoid cash payments where possible, particularly within the villages. In my initial village census, I offered to take photographs of family members and distributed the pictures on my return the following year. On the aquatic resource use survey, participants received a gift worth 0.50USD every other month. This was usually sugar with tea bags, but I distributed salt packs on one occasion and laundry soap on another. On the socio-economic survey and for lengthy interviews, I also compensated each participating household with 0.50USD worth of sugar and tea. The elders who gave us a tour of the former village settlements received lunch and also an assistant's daily wage (1.60USD each), as did the women who gave me a guided tour of aquatic food plants.

In my interactions with fishermen, traders and village officials, I generally paid for information in cash as this was their preference. The fishermen completing daily activity sheets received 1.20USD/week each. I paid each village official 0.80USD for participating in group interviews, as per local practice.<sup>37</sup> On the market survey, I paid 0.40USD per survey, about twice the daily market stall fee and district tax, presented as compensation for any disruption to their sales.<sup>38</sup> For fishermen and traders participating in my fish camp survey, I gave a choice of a gift of sugar and tea or of a few cigarettes, equivalent to 0.12USD/survey.

Deciding on whether and how to compensate people for their participation in my research project was one of the more difficult issues I confronted in the field, and one I did not resolve to my satisfaction. I agreed in principle that people should be compensated for the time spent helping out with research (Bernard 2006), but was uncomfortable with the result that nearly every interaction, even the most casual conversation, then carried the expectation of payment. Other villagers chastised me for paying people to speak with me. Eventually, I learnt to let people know up front whether or not a particular interaction would involve a gift, and not to pull out my notebook unless I was prepared to offer compensation. I also learnt to choose the form

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<sup>37</sup> This is standard local practice, whereby village officials expected a cash payment (or sitting fee, literally, "tea", *chai*) in return for attending meetings, to be paid for by the outsider requesting the meeting or, in the case of an internal meeting, by village funds.

<sup>38</sup> Fresh fish traders often received new stock throughout the trading period, and although most would allow me to re-survey their wares 'for free' one or two on each survey round (always in Ikwiriri) would insist on more money, which I refused to pay.

of payment more carefully, noting that certain gifts (cash in particular, but also laundry soap used publicly down by the lake) caused greater resentment within the village than others. I also would not give cigarettes again or soap, as the negative health and ecological consequences were repeatedly pointed out to me by recipients. The constant requests for photographs also made me wish I had been less free with distributing copies.

With time I became more skilled at casually interacting with people, and more comfortable with the local gift-giving culture. I made efforts to give gifts not just in formal research situations but rather in my role as a wealthy inhabitant of the village: cash gifts at funerals and weddings, medicine for the sick and elderly, fruit or sodas when hanging out with younger people. I also realised that while everyone would constantly ask me for money or gifts, offense was rarely taken if I politely or jokingly refused; the prevailing attitude was that all gifts came from Allah, and sometimes you were lucky and sometimes not. On leaving Ruwe I presented each hamlet (through the *shawishi*, female office holders in the village's Sufi religious society) with a large cooking pot for use in preparing ritual feasts.

#### **3.4.8 Positionality**

Considering one's positionality is essentially asking: How does who you are shape what you know about the world? (Takacs 2003). My position within the field was related both to my inherent or culturally-ascribed characteristics (gender, age, race, religion, etc.) but also to my personal history (married, without children, etc.). Although I could not transcend my otherness altogether adopting local dress combined with my long stay in the community greatly increased my acceptance there. With time, I was told that I had become "one of us" (*mwenyeje*), that people were "used to me", that I was a local (*mwanainchi*) or like a grandchild. However, entire areas of local experience remained unknown to me which, while not essential for an understanding of fishing practices and management, restricted my ability to place this activity within a wider economic and cultural context.

The most glaring differences between myself and local people related to me being a white female with apparently limitless financial resources. Being 'European' (*mzungu*) often brought me unearned deference, particularly in my interactions with the older generation who had experienced British colonialism or even worked as domestic servants. This contributed towards making elder informants easier to

approach and as a result I gravitated towards historical interviews with them rather than the more arduous task of approaching younger men. The latter group usually wanted to talk to me about life in Europe so that steering conversations towards my own research interests often proved difficult. Such interactions also cast me as a conduit to a better life, despite my insistence that I could not access investment funds nor travel visas. The view that I might one day bring investment to the district might have led some people in conversation and on surveys to emphasize their poverty in the expectation of later handouts.

My being a white outsider meant most people were wary of sharing sensitive information with me (such as participation in hunting) given the risk that I might be associated with the district government. Indeed, nearly every district official I met pressed me for information on 'illegal' activities taking place in the village, but accepted my naïve pretence of knowing nothing. In Mbunju-Mvuleini, where villagers had experience working with REMP, I was more often perceived as an NGO worker than a district official, and occasionally treated to long discourses on environmental degradation and management, the benefits of bee-keeping, the importance of tree-planting, etc. Though fluently expressed, it is difficult to know how sincere people were in echoing REMP's philosophy so exactly. Hoag (2003) reports that she had to abandon group interviews and participatory rural appraisal exercises in REMP-associated villages and focus on individual interviews (as I did) in an attempt to deal with counterfeit enthusiasm.

An additional layer of discomfort in my fieldwork came from the fact that as a woman (supposedly married but too far from home for it to really count, in locals' view), younger men often wanted to talk and joke about sex and relationships with me. At no time did I feel threatened, and with greater language skills I could have navigated these conversations better, but it did make me more hesitant in approaching some men. Fishermen in particular were often drunk or stoned and so more uninhibited, and this contributed to me limiting the time I spent at the fishing camps. On the other hand, I had better access to the female domain than a male researcher would have had, and spent many hours with women as they carried out their domestic tasks, hearing local gossip and gaining insight into women's lives. However, being childless also meant that my own life experience was vastly different from that of most women, and likely marked me out as immature in their eyes.

Strictures placed on local women in an Islamic society did not really apply to me, giving me unusual freedom compared to other women. I was free to sit at the marketplace or other places men gathered, for instance, although once night fell people urged me to get home quickly. People practiced a moderate and welcoming form of Islam in any case, and my Christian background was not an issue for the vast majority (although I did not admit to my agnosticism). Nonetheless, as a non-Muslim, I had little understanding of my hosts' religious beliefs or appreciation for the ritual aspects of local life, including the social importance of religious networks. Similarly, the central importance of witchcraft and traditional rituals was alien to me, and I limited my exploration of these areas due to my own ignorance of these topics and people's reticence in discussing them.<sup>39</sup>

### 3.5 Analysis

I entered all survey data into Microsoft Access databases on return from the field, and used SPSS for statistical analyses (IBM Corp. 2012). I typed up my fieldnotes and interview notes in Microsoft Word, and codified these using either NVIVO or coloured pens on print-outs.

All means are presented  $\pm$  standard deviations. Prior to running statistical analyses, I used exploratory techniques (e.g., box plots, scatterplots) to look for outliers or obvious patterns in the raw data. I used non-parametric statistical tests in analysing data collected through the HARS as this involved repeated measures on a set of households, i.e., data were not independent from one month to the next. In developing binary logistic regression models, I first added variables of interest one at a time, removing those that were non-significant at the  $p < 0.1$  level. Once I had several candidate models, I entered all retained variables in a forward stepwise regression model and took the result as the final model (Stevens 2002). I removed the constant from the model only if it was non-significant and had little effect on the fit of the overall model. I transformed variables only where this improved the final result.

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<sup>39</sup> For instance, although I was invited to a number of girls' coming out ceremonies, I was always asked to leave once the dancing (and gift-giving) was done and more serious ritual matters began. At times, my ignorance of local beliefs also put me in danger, as my research assistants were convinced that, as a white person and therefore immune to witchcraft, I would never be attacked by a crocodile. Before I figured this out, I walked through a number of flooded areas on their assurance that it was safe.

### **3.6 Notes on conventions used in the text**

The national currency is the Tanzanian Shilling (TZS). All prices are given in US dollars throughout the thesis, using the average interbank exchange rate for the main study period, from 31 January 2008 to 31 March 2009 (0.0008 TZS to 1 USD; [www.oanda.com](http://www.oanda.com)). Fish species names are based on the correspondence of locally used common names with species names as determined by Dr. Olivier Hamerlynck and colleagues in their ongoing study of Rufiji fisheries, and have not been independently verified. Unless otherwise specified as Kindengereko (Kind.), local terms used in the text are given in Kiswahili.

I use aliases to refer to local people named in the text, choosing common first names and made-up names for lineages, a necessary precaution given district officials' intimidation tactics (Paul et al. 2011).

I use "aquatic resources" to refer to animal aquatic resources only, not aquatic plants. I refer to "local" fisheries meaning those operating in Lake Ruwe and in the nearby floodplain, i.e., in waterbodies located within the floodplain area where most villagers in the study area had their fields. Roughly speaking, this includes all waterbodies within a two to three hour walk of the river terrace, and includes Lake Uba only when I am discussing resource use in Mbunju-Mvuleini.

# **Chapter 4. Geographic and wealth-related differences in participation and reliance on local floodplain fisheries**

## **4.1 Introduction**

Research on the livelihood role of SSF in Africa has demonstrated that fishing is part of diverse livelihoods, that fishing households are not necessarily the poorest of the poor, and that asset holdings matter to participation patterns (see Chapter 1). However, relationships between asset holdings and participation in fishing can be complex and are likely site-specific. Physical assets are more often taken into account than social and political assets in livelihoods analyses of SSF, and understanding exactly how and when (in a year but also over a lifetime) fisheries contribute to overall livelihood strategies is still lacking. This chapter does not address these gaps specifically, as it is based on a quantitative survey focused on tangible assets and administered at a single point in time. Rather, it provides a baseline for analyses presented in subsequent chapters by demonstrating the widespread importance of fishing and the fish trade to a range of local actors at different stages in their livelihood trajectories.

In this chapter, I first establish the level of participation and reliance on fishing by households relative to other livelihood activities. I then explore differences in levels of participation and reliance on local fisheries by considering households' ownership of fishing gear, geographic location, wealth ranking and gender. To draw these descriptive findings together, I use binary logistic regression models incorporating key variables to predict the likelihood of households' and individuals' participating in local fisheries. I begin by describing the methods used to collect and analyse information on local households' demographic and socio-economic characteristics. Relevant

background information, on the study villages and my definition of the household are presented in Chapters 2 and 3 respectively.

## **4.2 Methods: Household socio-economic survey**

### **4.2.1 Sampling design**

I used a stratified sampling design to proportionally represent households in different wealth categories across all village wards in Ruwe and Mbunju-Mvuleini (three and two wards respectively) and four of seven wards in Mkongo. I randomly selected two wards in Mkongo North and one in Mkongo South for inclusion in the sample, but purposively choose a fourth hamlet—Makoge in Mkongo South—after determining through conversations with villagers that this is where most of the village's fishermen lived. This choice was made because I did not have the time nor resources to survey across the entire village but did not want to miss out on collecting information on fishermen's households for comparison with those in the other two villages.

In selecting households for inclusion in my stratified sample I used a random numbers table and household lists derived either from my own village map (in Ruwe) or official village records supplemented by conversations with village officials and further revised during wealth ranking exercises (see Chapter 3). Despite corrections to available household lists, on carrying out the survey we sometimes found that a selected household no longer existed because its members had left the village, been absorbed into another household, or was mis-classified and located outside the hamlet of interest (N=6 cases). In those cases, I randomly selected another household in that hamlet/wealth category for sampling. Where household heads were not available on the first visit, we returned between three and five times to their village and if necessary their field house to secure an interview. For those still not available, or who were away for an extended period (in the city or field areas more than two hours away), I selected replacements as before (N=3). Only one household we approached refused to participate in our survey.

Local domestic arrangements could be complicated and in recognition of this we began each survey by assessing whether the sample household was closely linked to any others, as described in Chapter 3. Linked households are referred to here as units in a household cluster.

#### 4.2.2 Survey design and administration

I designed the survey towards the end of my fieldwork period, drawing on background knowledge of household structure and local livelihoods accumulated through informal conversations and focused thematic interviews (see Chapter 3). We administered the survey from 4 February – 20 March 2009, as the first maize harvest of the current agricultural year was coming in. The survey took approximately one hour to complete.

Karim found alternate employment in early 2009, so Moshi carried out most of the surveys, limiting my initial plans for a larger sample (i.e., across all wards in Mkongo) and a second round (to collect absolute income information from selected households). To control for potential interviewer effects, besides the usual practice period, all three of us conducted the survey together for one day (taking turns with one assistant observing the other). I would take turns accompanying one or the other assistant, and correct any drift from the standard format. Each assistant also worked with me for the first three days they spent on the official survey and worked together (without me) over five days.

On the questionnaire form, we collected demographic information on all household members (as defined in Chapter 3), and asked for their three primary livelihood activities, if any. For the household head only, we asked for his or her birthplace (if not born in the village), their first language, and that of their parents (as a proxy for ethnicity). We asked about last year's land holdings (i.e., those farmed in the previous year, providing the 2008 maize and rice harvests) and "inactive" land lying fallow or lent out to others, probing in each case by ecological zone. For each field, we asked who the owner was, the size of the field, and the number and type of any trees established there. For the previous year's land holdings we verified the size of the actively farmed area (the *shamba*) with respect to the larger land holding (the *eneo*). For physical assets, we asked how many of a set list of livestock, fishing gear, and other goods were owned by members of the household.<sup>40</sup>

The third section of the survey collected information on household members' livelihood activities in the past year (i.e., from the 2008 maize harvest to now), with respondents asked to identify which of a set list of activities members had participated

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<sup>40</sup> The items were (1) Livestock: chicken, ducks, goats, cattle (2) Fishing gear: canoe, kutega net, juya net, kimea net, other nets, hooks, basket trap (3) Goods: Kerosene lantern, torch, radio, TV/VCR, mobile phone, generator, sewing machine, saw, chemical sprayer, gun, bicycle, motorcycle, shop or stand, bank account, second home, other.



in, and to rank the five most important (whether for food and/or cash). For those households reporting fishing activity, we asked who had fished, where they usually fished, and what was their usual gear. A final section provided a check on my own wealth-ranking by asking respondents to self-assess their economic standing.

### 4.2.3 Analysis

In preparing data for analysis, I made several assumptions and simplifications. For calculating household size, I excluded those people who had been away for over a year (35 of 1026 individuals). I considered as dependents children aged 0 – 14 and adults 65 and over, in line with the definition used in the Tanzanian census. Married women sometimes identified themselves as the household head because their husbands were outsiders to the area, but I coded the husband as the head to not confuse these households with those headed by single women. I did not assign any cash value to home-made fishing gear (i.e., reed fences, traps or spears) nor to fishing hooks. The most expensive fishing nets might have been co-owned but I assumed full ownership in all cases.

In terms of categories used, “fishing” includes fishing with any type of gear, from nets, to hook and line, to traditional reed traps. The “fish trade” refers to bringing fish outside the village to sell, rather than selling locally. Income always refers to subsistence and cash income combined. If a household ranked fishing (or any activity) among its top-five most important income sources for the past year I refer to that activity as “important” and consider the household “reliant” upon it. More specifically, I consider a household to “**specialise**” in fishing (or any other activity) if it listed it as a primary or secondary income source, to be “**dependent**” on fishing if it featured as the 3<sup>rd</sup>, 4<sup>th</sup> or 5<sup>th</sup>-ranked source, and to be a “**casual**” fishing household if the activity did not feature among its top five income-earning activities. I calculated households’ rate of livelihood diversification based on the number of different livelihood activities they reported gaining income from in the past year, out of a maximum of 37 (or 32 for comparisons between fishing and non-fishing households, to exclude fishery-related activities).

I used logistic regression models to test which factors might explain patterns in households’ and individuals’ participation in the fishery. For household-level analyses, variables tested in the model were residence, demographic characteristics of the head (age, gender, marital status, and/or education level), household composition (size,

number of adult men, and/or number of dependents), and wealth measures, namely wealth ranks, land holdings (previous year's *shamba* or *eneo*, inactive land, total land), tree holdings (number of trees), and/or non-land asset values (total value, fishing gear value, total value excluding fishing nets). For models predicting individual-level participation in the fishery, I included measures related to the individual fisherman (age, gender, marital status, education level, land holdings). To build the models, I added explanatory variables one at a time, removing those found to be non-significant at the  $p < 0.05$  level. I tested for interactions among the variables retained, and kept as the best model that with the fewest variables and highest chi-square test statistic.

### **4.3 Results**

#### **4.3.1 Description of sample**

We surveyed 127 households that were part of our original sample and another 20 identified as part of larger clusters. In all, 117 units were considered to be self-contained households, and 30 units to be part of 14 clusters, for a final sample size of 131 households. Of the 147 surveys, Moshi conducted 110 and Karim 25, with me present on 60% and 70% of their surveys respectively. The two assistants worked together without me on the remaining 12 surveys. On most surveys where respondents were noted (N=127) we spoke with the household head (N=95), or the male head's wife alone (N=24).<sup>41</sup> In the remaining cases, we spoke with an adult child, grandchild or younger sibling of the head.

As part of the survey, we collected information on the main gear and fishing locations of 103 individual members who had fished in the past year, from 79 of 80 fishing households.

Household heads in our sample overwhelmingly identified themselves as Ndengereko (64% with both parents identified as Ndengereko, and a further 18% with one parent of that group). The remaining household heads together represented seven other ethnic groups, with numbers in each group too small to detect ethnicity-based differences in livelihood activities or asset holdings.

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<sup>41</sup> We only recorded interviewing husbands and wives together on 25 surveys, but this is in part an artefact of failing to record all respondents on the survey form.

### **4.3.2 *Widespread participation in fishing***

Most households (69%) reported gaining income from fishery-related activities in the past year. The most common of these was fishing (practiced by 61% of all households), followed by selling fried fish (19%), trading fish outside of the village (17%) and working as a fish smoker (2.3%). Half of all economically active males in our sample were reported to have fished in the past year (53% of 194 males reporting at least one livelihood activity).<sup>42</sup> In most fishing households (80% of 80) only one member was reported to fish, with most fishermen being male household heads (66% of 103 fishermen).

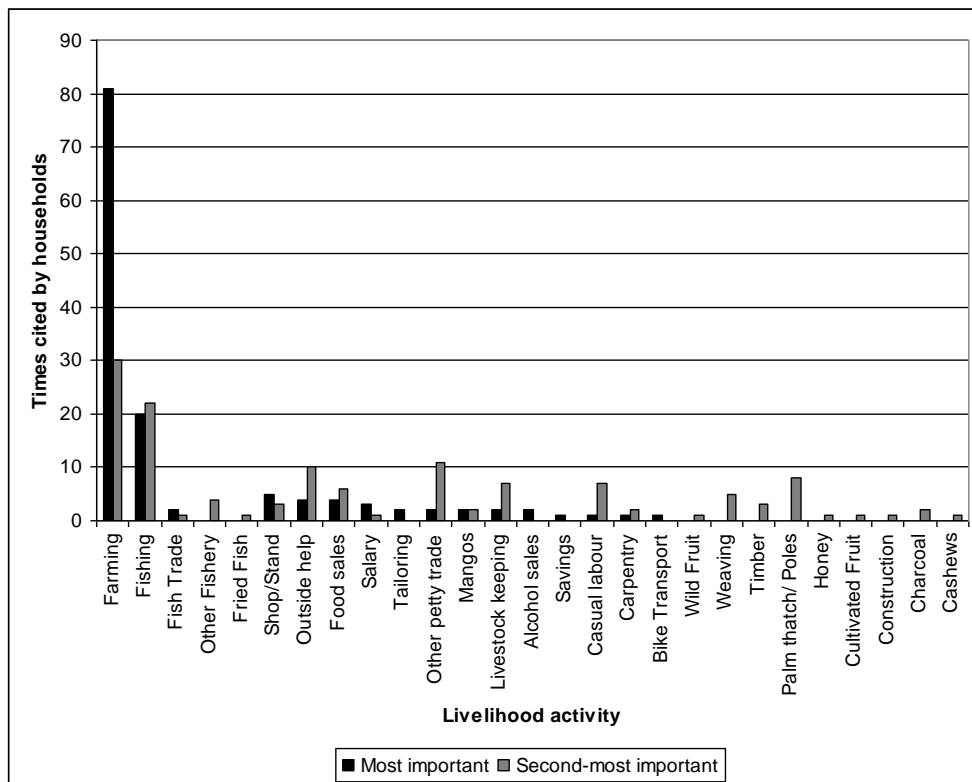
### **4.3.3 *Only farming is more widely relied upon than fishing***

Over half of all households (54%) ranked fishery-related activities among their five most important sources of income in the past year. Although farming income was much more often cited as a household's primary income source, the second-most cited was fishing, together cited by 15% of households (Figure 4.1). The next most-relied upon primary income sources were running a store or a tea stand, cited by just 3% of households in each case. A further 14.5% of households named fishing as their second-most important economic activity, comparable to farming as a secondary income source (at 22%) and ahead of other forms of petty trade (8%) or receiving assistance from outside the household (6%). Only a few households relied on fish trade or fried fish as primary or secondary income sources (see below).

If a household was involved fishing at all, this activity usually figured among its five most important income sources (76% of 80 households), and often in its top three (54%). Households that did not list fishing as among their five most important fishing activities described farming as their primary activity more often than those that did (66 vs. 57% of 56 and 77 households respectively). The next most cited primary income sources for these non-reliant households were receiving a salary, running a tea stand, or receiving outside help (at 5.4% of households each), with only one fishing-reliant household citing any of these activities as their primary income source.

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<sup>42</sup> These 194 individuals represented 85% of the men over the age of 14 in our sample (who were not away or disabled).



**Figure 4.1 Livelihood activities most often cited by sample households as their primary or secondary income source (cash and subsistence importance combined), HSES.**

Fishing-reliant households had a higher rate of livelihood diversification on average than those that did not rely on the activity, as measured by the number of activities involved in out of a possible 32 (after excluding fishery-related activities), but the difference was non-significant by one-way ANOVA testing:  $13.5 \pm 4.5$  activities vs  $9.9 \pm 4.9$  activities,  $N=69$  and  $62$  households respectively.

#### **4.3.4 Fishing households own more fishing gear**

Together, households owned a variety of fishing gears, with *kutega* nets the most commonly owned (Figure 4.2). Households specialised in fishing were more likely to own nets of more different types than were those dependent on the activity, which in turn owned nets more often than those for which fishing was a minor income source (Figure 4.2).

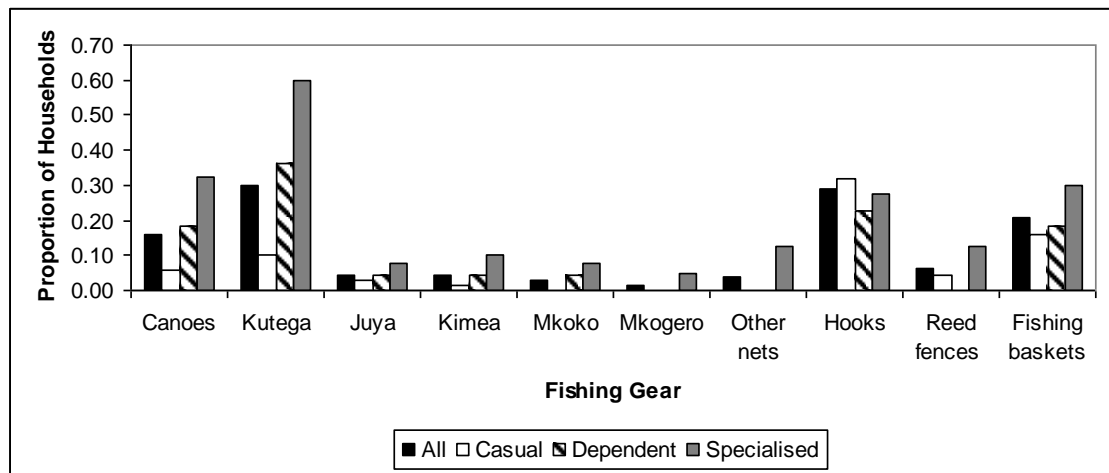


Figure 4.2 Gear ownership among sample households, HSES

Households' value held in nets differed significantly among the three groups by a one-way ANOVA test,  $F(2,79)=3.82$ ,  $p=0.03$ . Tukey post-hoc comparisons showed that specialised households (mean: 23USD 95% CI [15-32USD]) held significantly more value in fishing gear than did casual households (5USD, 95% CI [-0.1 – 11USD],  $p=0.01$ ) but not more than dependent households (13USD, 95% CI [2.50-24USD],  $p=0.02$ ). The difference in the value held between dependent and casual groups was non-significant.

Nearly half of fishing households did not own any nets of their own (40%, or 32 households). Instead, the main gear reported for members of these households were often fish hooks or traditional reed traps (37% of 43 individuals in 31 households). The majority, however, worked as crew on others' nets, as did a number of men who came from households that owned smaller, cheaper nets than the ones they reported as their main gear. Overall, a third of men who fished (35% of 103 individuals) worked as crew rather than for themselves, most often on *juya* or *mkogero* nets.

#### 4.3.5 Net ownership and involvement in the fish trade

Households did not necessarily have to own the largest commercial gears to participate in the fish trade, nor did those who owned these gears necessarily trade fish. Only twelve households owned the largest nets (six owned a *juya*, four owned an *mkoko* and two owned an *mkogero* net, one each). Value held in fishing nets, looking

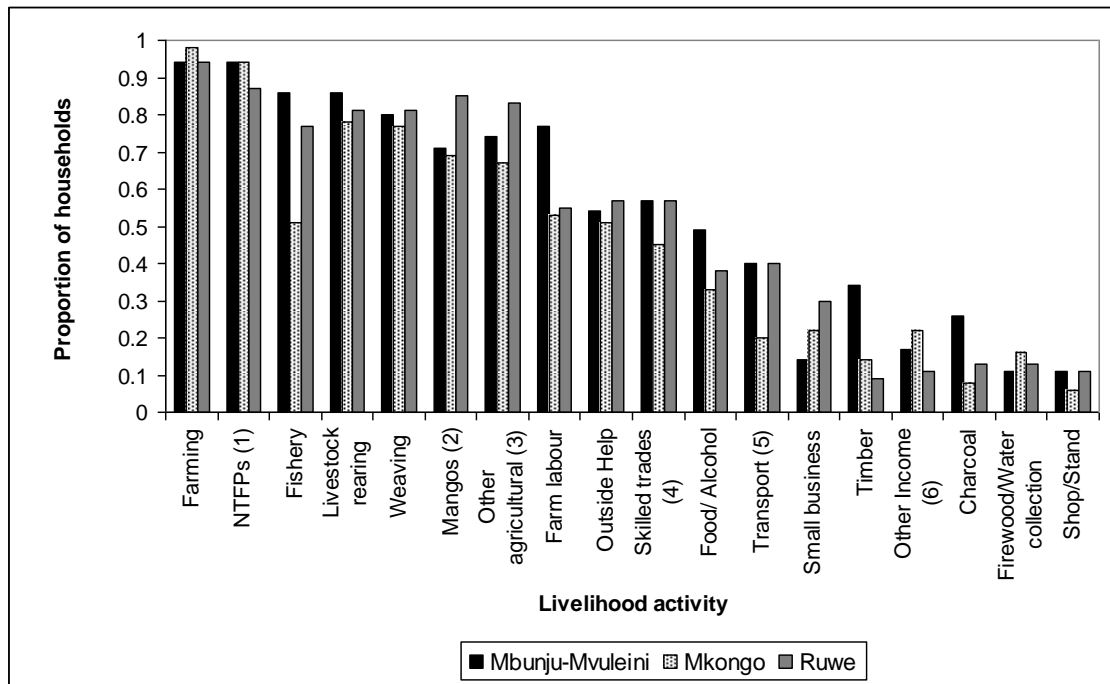
at all types of nets for fishing households only, was not significantly related to a households' wealth rank, by one-way ANOVA testing. Nine of the 12 households owning the largest nets were in the middle-wealth rank, and only one was ranked as 'rich'. Five of these households earned income from the fish trade, including four of six *juya* net owners. Among these were *juya* net owners were Kassim and Ashiru, with details on their businesses given in Chapter 7. Households with more limited investment in fishing gear could also trade fish (N=17), with most fishing with their own *kutega* nets.

Net owners who fished without trading their catch presumably lacked the working capital to do so (see Chapter 7). This was definitely the case for the two *juya* net owners in our sample who did not trade fish: one was saving up money to begin trading shortly while the second worked his family's communal net and sold to an outside buyer (Omari in Chapter 7).

Overall, gear ownership rates were higher among fish trading households than others (77% vs 37%), but bike ownership rates—useful for bringing fish to regional markets—were similar (77% vs 69%, N=22 and 109 households respectively). Among fish trading households, only nine ranked the activity among their top five income sources (41%), although two households considered it their primary income source (to the near exclusion of all others) and a third their second-most important income source. The one 'rich' net owner, Kassim, considered income from the fish trade to be in third place after earnings from his shop and two milling machines, assets in very short supply locally.

#### **4.3.6 Geographic differences in participation**

Households across the three survey villages had broadly similar rates of participation in livelihood activities listed on the survey (Figure 4.3). Participation in the fishery, however, was considerably higher in Mbunju-Mvuleini and Ruwe than in Mkongo, as might be expected given each village's position relative to local lakes. Mbunju-Mvuleini was also set apart from the other study village by households' notably higher participation rates in charcoal-making, timber cutting, food service, and casual farm labour (Figure 4.3).

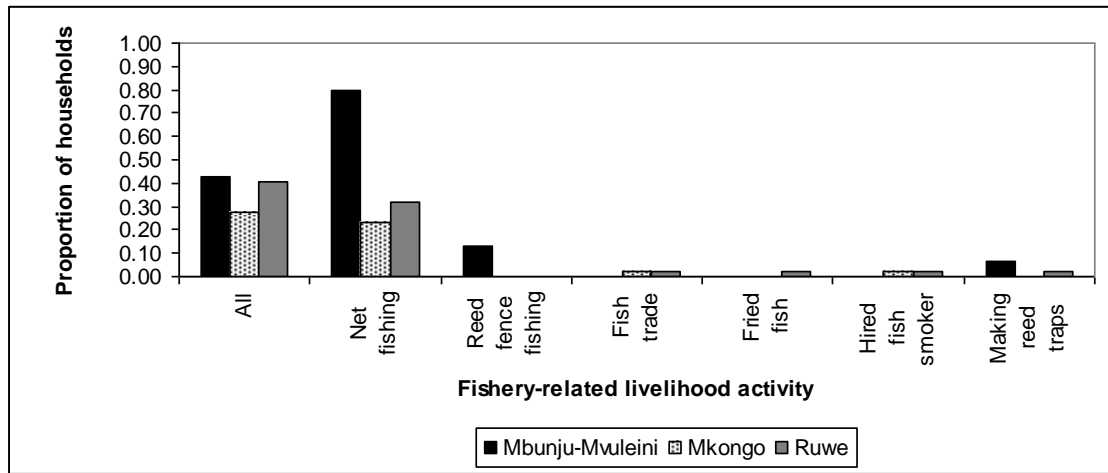


Notes: <sup>1</sup>Palms (*makuti, milala*), wild fruit, wild vegetables, house construction poles (*pagao*), honey (though some might come from managed hives). <sup>2</sup>Crop and wild harvest combined <sup>3</sup>Cashews, fruit crops (besides mangos), garden vegetables. <sup>4</sup>Pottery, carpentry, construction, sewing, repairs, witchcraft, traditional drumming. <sup>5</sup>By bicycle, motorcycle. <sup>6</sup>Salary, pension, savings, government assistance.

**Figure 4.3 Household participation in different livelihood activities, by village, HSES.**

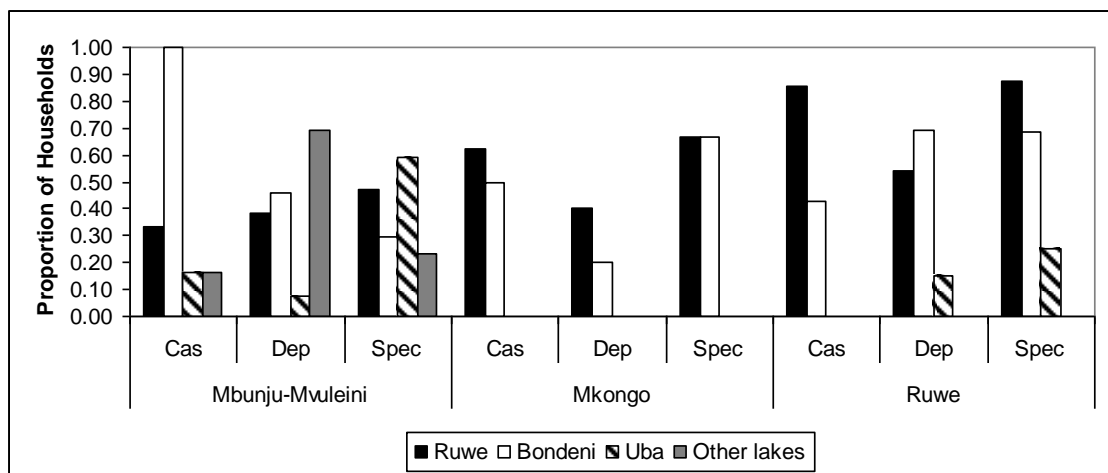
Households differed significantly across the three villages in their rate of livelihood diversification by one-way ANOVA testing,  $F(2,130)=7.14$ ,  $p=0.01$ . Tukey post-hoc comparisons showed that households in Mbunju-Mvuleini (15.6 activities, 95% CI[13.3 – 17.9]) had more diversified livelihoods than did those in both Mkongo (11 activities, 95% CI[9.5 – 12.5]) and Ruwe (12.6 activities 95% CI [11.1 – 14.1]), while the rates among the latter two villages did not differ significantly.

In terms of reliance on the fishery, proportionally more households in Mbunju-Mvuleini specialised in fishing than did so in the other villages (Figure 4.4). Exactly how villagers made use of fisheries resources also depended on their location: only households in Mbunju-Mvuleini specialised in traditional reed fence fishing, exploiting nearby floodplain channels.



**Figure 4.4** Proportion of households specialised in various fishery-related activities, by village, HSES.

Individuals in Mbungu-Mvuleini also had access to Lake Uba, whereas few individuals from Ruwe and none from Mkongo were reported as fishing there in the past year (Figure 4.5). Lake Uba was drying out however (see Chapter 2), and this might partly explain why more fishermen in Mbungu-Mvuleini, and mainly those from households specialised in fishing, travelled to other district lakes to fish. In contrast, no fishermen in the other two villages were reported to have travelled elsewhere, focusing their fishing at Lake Ruwe or the adjacent floodplain (Figure 4.5).



**Figure 4.5** Locations fished in the past year by individuals (N = 103) from casual, dependent and specialised fishing households in each of the three study villages, HSES.



Of the largest nets in our sample only one (a *juya* net) was held by a household in Mbunju-Mvuleini, perhaps another reason why fishermen there had to travel further to access fishing opportunities.

Within each village, levels of participation in the fishery could differ greatly among wards. In Mkongo, participation rates in and reliance on fishing by households in Makoge—described to us as the hamlet where most of the village’s fishermen lived—were up to twice as high as those in other surveyed wards, and comparable to those in the other two study villages overall. In Ruwe, where Kipela was the reputed home of fishermen, more households traded fish or sold fried fish there than in any other hamlet in our survey.

#### 4.3.7 Differences in participation across wealth categories

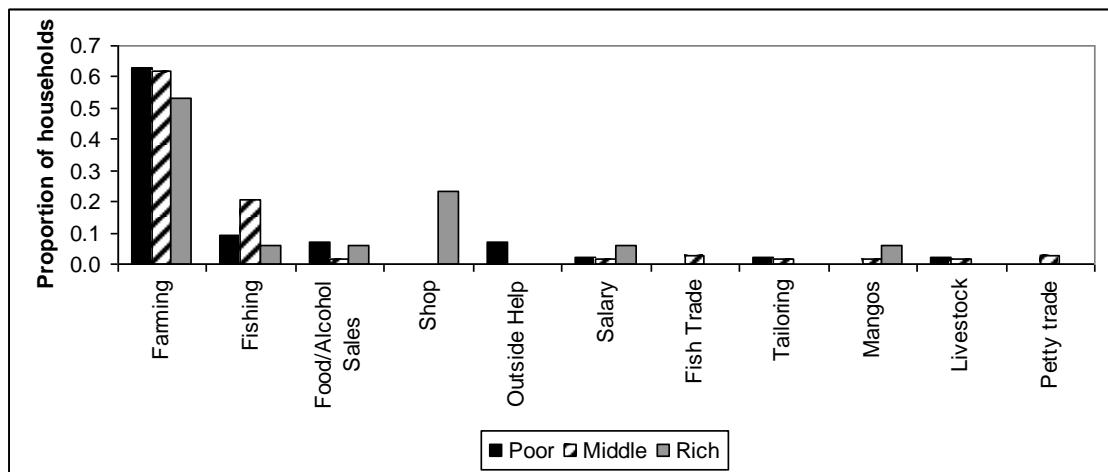
Participation rates in and reliance on the fishery were highest among middle-ranked households in our sample, followed by poor and rich households, a trend which held in each of the three villages (Table 4.1).

**Table 4.1 Wealth-related differences in household participation rates in the fishery and (in parentheses) reliance, as the proportion of households ranking fishery-related activities among their top 2 income sources, HSES.**

Wealth Rank	All villages	N	Mbunju-Mvuleini	N	Mkongo	N	Ruwe	N
Poor	63 (23)	43	80 (30)	10	45 (20)	20	77 (23)	13
Middle	81 (47)	73	100 (60)	20	64 (36)	25	82 (46)	28
Rich	35 (6)	17	40 (-)	5	17 (17)	6	6 (-)	6
Total		133		35		51		47

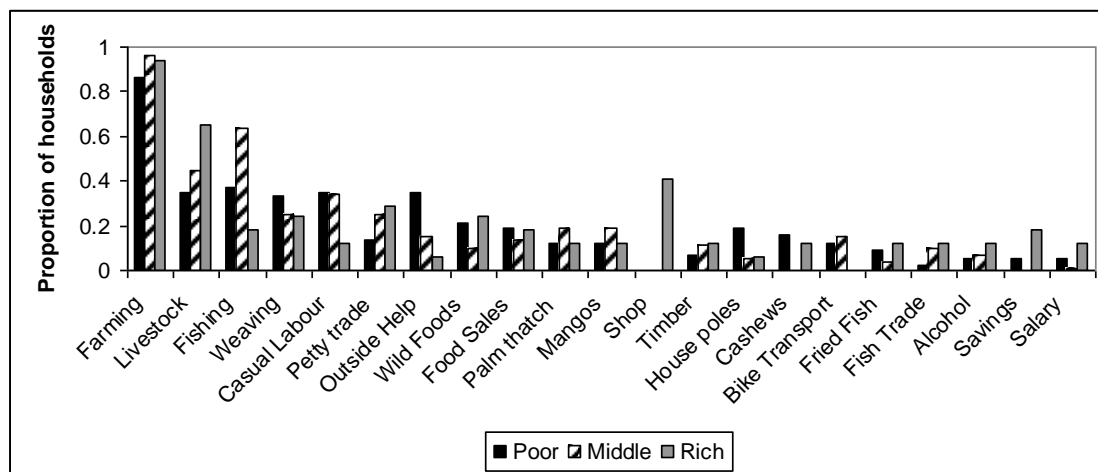
Notes: <sup>1</sup>Palms (makuti, milala), wild fruit, wild vegetables, house construction poles (pagao), honey (though some might come from managed hives). <sup>2</sup>Crop and wild harvest combined. <sup>3</sup>Cashews, fruit crops (besides mangos), garden vegetables. <sup>4</sup>Pottery, carpentry, construction, sewing, repairs, witchcraft, traditional drumming. <sup>5</sup>By bicycle, motorcycle. <sup>6</sup>Salary, pension, savings, government assistance.

For poor and middle-ranked households, fishing was the second-most often relied upon income source, after farming (Figure 4.6). Only one rich household (in Mkongo) considered the activity similarly important. Fish trading and selling fried fish were ranked among the households' top five income sources by only three middle-ranked and one poor-ranked household. For both poor and middle-ranked households, those that specialised in the fishery had similar rates of livelihood diversification to those that did not, on average. However, in their choice of activities poor households were less likely to participate in potentially high-earning opportunities outside the fishery such as petty trade, livestock-rearing and timber, magnifying the importance of fishing as a source of cash (Figure 4.7).



Note: Only those activities mentioned by more than one household are displayed.

**Figure 4.6 Proportion of households citing different livelihood activities as their most important income source in the past year, by wealth group, HSES.**



Note: Only those activities ranked among the top ten most-cited in any one wealth group are displayed.

**Figure 4.7** Proportion of households citing different activities among their top five most important income sources for the past year, by wealth group, HSES.

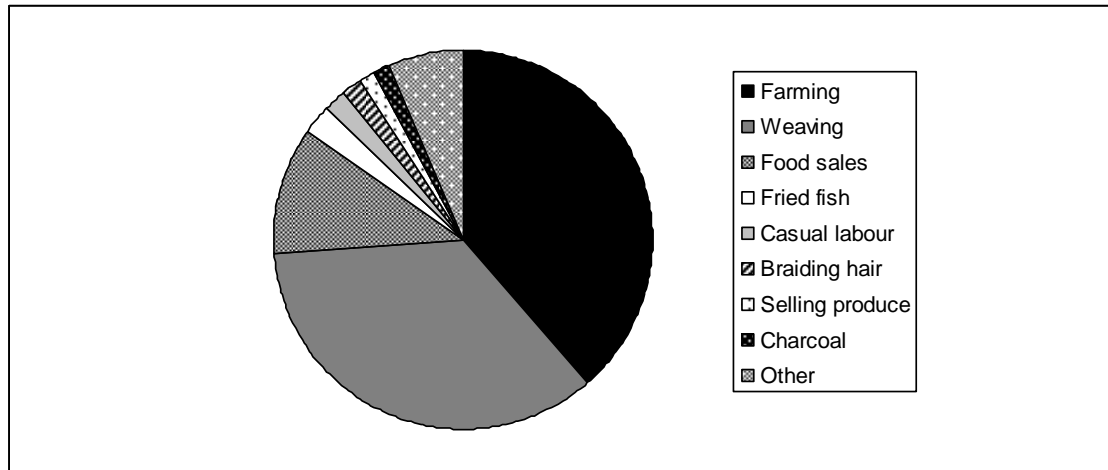
#### 4.3.8 Role of women in the fishery

Women in the study villages were excluded from the commercial net fisheries, with none reported to fish and only one reported to trade in fish. Although not picked up in this survey, women did fish for home use, but only sporadically and with simple gear, such as cloth or mosquito nets (see Chapter 5).

The only fishery sector dominated by women was in the processing and sale of fried fish, both within the study villages and at the regional markets (see Chapter 7). Of those eight individuals in our sample for whom selling fried fish was reported as a livelihood activity, the sole male was a teenager working with his sister. Overall, female-headed households were slightly more likely to participate in the activity than those headed by men (29% vs 18% of 14 and 117 households respectively, for a total of 25 households). Day labour, food and alcohol sales, collection of wild fruit, palm leaf (*milala/makuti*) collection, and weaving were the only other activities in which the same trend applied.

Income from fried fish sales was considered important by one-third of households participating, with female-headed households more likely to rank it so (75% of 4 households vs. 29% of 21 male-headed households). Both groups were about equally likely to report income from fishing entering the household. Although

relied upon by relatively few households in our sample, the importance of fried fish sales is magnified if one considers the limited, and relatively lowly remunerated cash-earning activities in which individual women were reported to participate (Figure 4.8).



Note: (N = 235 women together citing 598 livelihood activities).

**Figure 4.8** Proportion of total citations represented by different livelihood activities in which women were reported to have participated in in the past year (i.e., named as one of up to three activities), HSES

Overall, households that fished in our sample were more likely to participate in selling fried fish (26% of fishing households vs. 8% of non-fishing households) but only slightly more likely to trade fish (19% vs. 14%, N = 80 and 51 respectively). This suggests that it was harder for women outside fishing households to gain access to fishery products than it was for men, in line with accounts from our fried fish seller informants (see Chapter 7).

#### 4.3.9 Factors in households' participation in and reliance on fishing

A household's location, wealth rank, gender of the household head and land and non-land asset holdings were found to significantly affect the likelihood of its participation in fishing of any kind, coded as 1 if the household gained income from fishing, and 0 if it did not (Table 4.2). Most influential by far was a household's wealth

rank, with poor households 75 times more likely to fish than rich households when other factors were constant, and middle-ranked households 45 times more likely to do so. Increases in total land holdings (active and inactive field areas combined) increased the likelihood of fishing (by 1.14 times), as did increased holdings of fishing gear (by 1.04 times). Households with female household heads were less likely to fish, as were those based in Mkongo (with the odds decreasing 0.15 times and 0.27 times respectively).

**Table 4.2 Logistic regression model predicting a household's likelihood of participating in the fishery, HSES.**

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Female household head	-1.871	0.903	4.289	1	0.038	0.154
Village: Mbunju-Mvuleini	1.241	.744	2.782	1	.095	3.460
Village: Mkongo	-1.324	.564	5.508	1	.019	.266
Wealth Rank: Middle	3.821	.976	15.321	1	.000	45.633
Wealth Rank: Poor	4.307	1.109	15.083	1	.000	74.210
Total land holdings (ha)	.133	.051	6.754	1	.009	1.142
Fishing Nets and Canoe Value (USD)	.048	.017	8.293	1	.004	1.049
Constant	-4.146	1.179	12.370	1	.000	.016
Model $\chi^2$	69.35		% Correct Classification			
-2LL	105.780		Overall			80.9
df	7		Non-fishing household			72.5
p	<0.001		Fishing household			86.3
No. of observations	131					

However, in considering the likelihood of a household participating in local net fisheries (coded as 1 if it gained income from the activity, and 0 if it fished with traditional means, hook and line, or not at all), neither wealth rank, residence, land holdings, nor gender of the household head were significant (Table 4.3). Instead, households with more dependents and more value held in fishing gear were more likely to fish with nets, while those with more value in alternative (i.e., non-fishing) non-land assets and older household heads were slightly less likely to do so.

**Table 4.3 Logistic regression model predicting a household's likelihood of participating in the net fisheries, HSES.**

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	
Age of household head	-.030	.008	13.638	1	.000	.971	
No. of dependents	.283	.086	10.743	1	.001	1.327	
Fishing Nets and Canoe Value (USD)	.085	.020	18.237	1	.000	1.089	
Total Value of Non-Fishing Assets (USD)	-.003	.001	11.214	1	.001	.997	
Model $\chi^2$	60.71		% Correct Classification				
-2LL	120.894		Overall				80.9
df	4		Non-participating household				85.3
p	<0.001		Participating household				76.2
No. of observations	131						

To better understand reliance patterns, I ran a third logistic regression predicting, for those households that had fished in the past year, whether a household relied heavily on the activity (ranking it among their top three most important income sources, coded as 1) or did not (ranking it fourth, fifth or not at all). None of the factors that mattered for participation significantly predicted the reliance outcome except for the household's value held in fishing gear (nets and canoes). Those owning more value in gear were slightly more likely to rely on the activity (1.02 times), though the overall model was weak, with an overall accuracy of 62.5% (Table 4.4).

**Table 4.4 Logistic regression model predicting the likelihood of a fishing household relying heavily or not on fishing of any kind, HSES.**

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	
Fishing Nets and Canoe Value (USD)	.020	.010	4.433	1	.035	1.020	
Constant	-.267	.291	.842	1	.359	.765	
Model $\chi^2$	5.397		% Correct Classification				
-2LL	105.06		Overall				62.5
df	1		Non-reliant household				64.9
p	0.02		Reliant household				60.5
No. of observations	80						

#### 4.3.10 Factors explaining individuals' participation in fishing

In this section I look only at the factors that might explain an individual's decision to fish with nets. For economically active males (i.e., those for whom at least one livelihood activity was reported, N=194), those who reported using a net as their main gear were coded as 1 on the dependent variable, and those who used other gear or did not fish at all were coded as 0. By logistic regression, it appeared that an individual's decision to participate in the net fisheries was significantly related to their residence, age, marital status and non-land asset holdings (Table 4.5). Specifically, men living in Mkongo were less likely to fish with nets (0.38 times), as were older individuals (0.96 times less likely), while being married increased the likelihood of doing so by 3 times. Furthermore, as found at the household-level, individuals from households with more value held in fishing gear (i.e., nets and canoes) were more likely to fish with nets (1.05 times), whereas increased holdings of non-fishing physical assets (i.e., livestock and all other consumer and productive goods) decreased the likelihood of participating in the net fisheries (by 0.997 times).

**Table 4.5 Logistic regression model predicting an individual's likelihood of participating in the net fisheries, HSES.**

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Age	-.039	.012	10.173	1	.001	.962
Married (Yes = 1)	1.103	.434	6.443	1	.011	3.012
Village: Mbunju-Mvuleini	-.090	.430	.044	1	.835	.914
Village: Mkongo	-.963	.462	4.335	1	.037	.382
Fishing Nets and Canoe Value (USD)	-.003	.001	14.703	1	.000	.997
Total Value of Non-Fishing Assets (USD)	.049	.010	22.358	1	.000	1.050
Constant	.749	.548	1.869	1	.172	2.114
Model $\chi^2$	70.735					% Correct Classification
-2LL	185.260					Overall
df	6					Did not fish with nets
p	<0.001					Fished with nets
No. of observations	194					

#### 4.4 Discussion

Local fisheries were a fundamental resource for people living in our study area. Not only did the majority of households gain income (in food and cash) from the fishery, but most of those that did so ranked fishery-related activities among their households' five most important income sources. Half of all economically-active men were reported to fish as one of their three main livelihood activities, while others (including children and occasionally women) would have fished on occasion. Only farming was more widely practiced than fishing, in line with people's view of themselves as farmers first. Trading in fish outside the village or selling fried fish locally offered additional livelihood opportunities, with no other entrepreneurial activities as widely practiced by households in our sample as these.

The widespread reliance on fishing observed in this study is not new. In his survey of the fisheries of the lower Rufiji River valley, Hopson (1979) writes that nearly every inhabitant fishes, contrasting "occasional" fishers using improvised gear to capture fishes at certain times of the year with "part-time" fishers who own one or two gill-nets, a dugout canoe, and integrate their farming activities with fishing on floodplain water bodies. Bantje (1982) describes how villagisation, and consequent disruptions to farming, pushed more people into fishing and petty trade as a source of cash. In a household-level survey conducted for REMP, Hogan et al. (2000) found that fishing was practiced by almost half of households (45%, N=1612). In that study, 6.5% of households (N=1590) reported fishing as their most important economic activity but 45.2% (N=1143) reported it as their second-most important income source, compared to 15% and 14.5% here, respectively.

The relative lack of comparably accessible and dependable sources of cash income in the area magnifies the importance of the fishery to local people. Rufiji villagers operated in a cash-poor society. As a result, products that were easy to acquire oneself (such as palm thatch or wild foods), make at home (such as woven mats) or go without were infrequently sold. Those commodities that could be sold outside the village—fish, chickens, charcoal, timber, large mangos, agricultural crops—therefore provided the best opportunities for earning cash, along with running local shops and food stands. Most lucrative of all was big-game hunting, but the risks involved were very high. Rice sales were a key means for gaining cash, but harvests



were unpredictable and any profits quickly spent, requiring households to seek alternatives, of which fishing was the most attractive (see also Paul et al. 2011).

The investment required to participate in many alternative cash-earning activities were unfeasibly high for most villagers. Mangos had to be transported to Dar es Salaam (requiring a car hire), livestock needed to be purchased and cared for, timber felling entailed specialised tools and knowledge in an over-exploited forest, running a shop required inventory and the ability to advance credit. More accessible activities, such as charcoal-making, involved back-breaking labour and delayed returns (of up to one month). In contrast, with approximately 10USD (or a loan) a man could buy a small *kutega* net and begin fishing with relatively little discomfort and immediate results. As described in Chapter 6, fishermen could usually rely on a small catch from their net every day, providing a meal, enough cash for the daily food budget, and possibly surplus fish to smoke for later sale. This is the “bank in the water” effect described by Béné et al. (2009b).

In its combination of relatively low investment and regular returns, fishing occupied a similar position to food sales as a cash-generating livelihood activity within the study villages, with the difference that increasing investment in fishing gear or time spent fishing could increase economic returns, whereas earnings to those providing food services were limited by the number of customers coming through their doors. The accessibility and attractiveness of fishing is apparent in the fact that poor households in our sample participated in fewer other cash-earning opportunities than did middle or rich-ranked households.

Nonetheless, participation in the fishery in itself, even specialisation in the sector, did not reduce households’ need to pursue multiple other activities as part of their livelihood strategy. Diversification rates for fishing reliant households in fact were higher than for those that did not fish. This probably reflected the reality that participation in the fishery was facilitated by having able-bodied members in the household (particularly in the case of the net fisheries), thereby making fishing-reliant households more likely to participate in other areas of economic life as well. In fact, there was no single economic activity that seemed to excuse households from pursuing many other options, with households in all three wealth-groups having similar livelihood diversification rates. Even households known to us to be involved in commercial hunting usually fished (eight of ten households), despite their presumably more profitable economic alternative. Of course, in the absence of information on the

absolute income gained from livelihood activities, it is difficult to know where this diversification was critical for households (i.e., fishing provided the bulk of income) or tangential.

As hypothesised, there were differences both within and across villages in people's use of the fishery, although these patterns were easier to discern for participation rates than for reliance levels given the lack of absolute income data. Not surprisingly, given that male heads of household were the usual fishermen, all else being equal having a female head of household reduced the likelihood of fishing. Geography mattered too, with those households and individuals further away from fisheries resources (namely, those established in Mkongo) least likely to fish. With access to both Lake Ruwe and Lake Uba, as well as active *nyando* fisheries on nearby Mbambe channel, one might expect living in Mbunju-Mvuleini to increase the odds of a household fishing, but this was not the case in our models. In fact, fishermen in that village were the most likely to travel to other district lakes to fish, and ownership of the largest commercial nets was concentrated in the other two study villages.

The reality was that Lake Uba represented a resource in decline. Not only was it considered hardly worth fishing, but locals could face harassment from outsiders fishing there. Members of the Village Environment Committee recounted being threatened by Ikwiriri youth bearing machetes at the lakeshore, and I overheard villagers saying to one elderly man who was headed there to fish: "What are you doing over there? Do you want to get beaten up by the kids from Ikwiriri? Do you want to have your bike stolen?". It is striking that more fishermen in Mbunju-Mvuleini did not simply shift their fishing activity to Lake Ruwe, and difficult to know why. There was no obvious exclusion of fishermen from elsewhere operating at the Lake Ruwe landing sites, as discussed in Chapter 9. Nonetheless, perhaps individuals from Mbunju-Mvuleini found it difficult to compete for crew positions with the kin and neighbours of net owners based in Ruwe and Mkongo, and with possibly more experienced, full-time Ikwiriri-based fishermen (see Chapter 6).

The influence of wealth on households' and individuals' participation in the fishery was ambiguous. On the one hand, relatively more middle-ranked households in our sample fished than poor and rich households, but by logistic regression models, once other variables were held constant, poor-ranked households were much more likely to participate in fishing of any kind, while wealth-ranks had no effect on households likelihood to fish with nets. Furthermore, wealth was not found to matter

for predicting a household's reliance on fishing income, nor individuals' decision to participate in the net fishery.

It could be that our wealth ranks were a crude measure for determining households' relative economic standings, as illustrated by one problematic case. In our original sample were two households that listed one full-time *juya* fisherman, Juma, among its members. He and his child lived at his aunt's house in Ruwe, but he had a girlfriend in Mbunju-Mvuleini. The aunt considered that he contributed no income to her (poor) household, while the girlfriend ranked his fishing income as her (middle-ranked) household's second-most important income source. Surveying Juma himself, he lived with another girlfriend, and depended primarily on fishing. Although dropped from the analysis, this situation illustrates how a fishing household could be ranked either reliant or not reliant, and ranked in the poor or middle group, depending on the respondent's perspective.

Looking at wealth in terms of asset holdings rather than ranks suggested that these could have a significant but relatively slight influence on participation and reliance patterns. Households with greater total land holdings were more likely to fish, as were those with more value in fishing gear and more dependents. While the usefulness of more fishing gear for deciding to fish is clear, the influence of greater land holdings is less so. Perhaps households with more land holdings were better able to invest in fishing gear (from increased agricultural profits, as reported by Sarch 2000) but this was not specifically investigated. Land holdings had no significant effect on households' or individuals' participation in the net fisheries nor on households' reliance on the fishery by the models presented here. This makes sense given people's insistence that land was in abundant supply, with even dedicated fishermen we met insisting they could find land to farm if and when they decided to do so.

Few other characteristics examined here were found to have a significant bearing on fishing participation or reliance patterns. Households with more dependents were more likely to participate in the net fisheries, but household size and composition had no apparent import on household reliance nor individuals' participation in the net fisheries. Being a married man increased one's likelihood to participate in the net fisheries, with likelihood decreasing with age. This could reflect a situation in which men marry and begin to fish in their role of cash provider, regardless of the number of other adults or dependents in the family. Alternatively, our sample might have

underrepresented unmarried men who fished; even where these individuals were listed as household members, respondents might not have considered their fishing income as relevant to the household and so not reported it. Certainly, fishermen we spoke with at the landing sites did not necessarily share all of their income with their household back home (see Juma's example above), nor were they necessarily expected to (see Chapter 6).

In any case, the logistic regression models obtained, although significant, explained a relatively small proportion of observed variation, and were only moderately successful at accurately classifying observed cases into their predicted categories. Using income ranks rather than absolute values reduced my ability to distinguish between households in their degree of reliance on the fishery, although collecting absolute income information brings its own challenges (Campbell and Luckert 2002). It would have been useful to distinguish between subsistence income (for home use only) and cash income, as I had no means to separate subsistence fishermen from commercial fishermen in my analysis. The division of households or individuals fishing with nets from those fishing with other gear is not equivalent, as many subsistence fishermen used nets. Even with simple ranks, whether an income source was considered important or not might have depended greatly on the respondent, with individuals likely to emphasise the relative contribution of their own activities to the overall household.

The limited accuracy of the logistic regression models further suggests that important factors in households' and individuals' decisions to fish were overlooked. Key among these might be social capital, for which I did not have a satisfactory measure. A household could fish, and even specialise in fishing, without owning any gear of its own, with connections to gear owners and traders presumably influencing the likelihood of working as crew on others' nets. The fact that there were hamlet-related differences in participation and reliance levels suggest a social influence, given the association of particular clan groups with particular wards (see Chapter 2). Certainly, the *juya* nets operating out of Kipela were manned by close relatives (see Chapter 6), as was at least one *mkogero* net in Makoge, with both wards home to their village's dominant fishing clan.

Lake fisheries were the main target of commercial fisheries, with the floodplain exploited primarily for subsistence use, although this is based more on observation and conversations with fishermen and traders than the survey results. Previous researchers

have come to the same conclusion (Richmond et al. 2002, Hopson 1979). From the survey, I found that fishermen who used higher-efficiency gears (i.e., commercial gears) fished most often on Lake Ruwe or other permanent lakes in the district, rather than on the floodplain. Furthermore, those individuals from households specialised in fishing fished at more different places (i.e., at more lakes), than did those from non-specialised households, who fished more often at temporary floodplain waterbodies.

As expected, ownership of the most expensive, high-efficiency fishing gear was concentrated in a few hands, but it did not necessarily follow that these individuals controlled the trade, nor by extension that they earned the most from the fishery. None of the commercial gear-owning households was ranked as 'rich', with one exception, and only five appeared to have the necessary working capital to engage in fish trading. Although one of these traders owned a motorcycle, none of the other four motorcycle owners were involved in the fishery, suggesting that improved access to market was not enough to draw people into the trade. In the absence of absolute income information I cannot say whether fish traders earned substantially more from the fishery than those who sold fish locally; much would depend on how often fish traders brought their wares to market (see Chapter 7). In any case, nearly half of households involved considered the fish trade an important income source, and two households were able to depend on it as their primary livelihood activity.

Finally, the processing and sale of fried fish was one of the few cash-earning opportunities available to and dominated by women in our study area. Female-headed households appeared to rely more heavily on this activity than did others, further underlining its importance to women's livelihoods. In addition, although not captured in the survey, women controlled their earnings from fried fish sales (even if married), providing a degree of economic independence.

In this chapter, I have demonstrated the fundamental role of floodplain fisheries in local livelihoods across the study villages. Results from the survey—although hampered by difficulties in measuring income, wealth and social capital—clearly demonstrate the central importance of fishing to local people and the valuable opportunity provided to men and women alike to engage in entrepreneurship through fish sales. Findings on the relationship between wealth and participation and reliance patterns were ambiguous, with even owners of the largest gears not necessarily rich nor dominant in the fish trade, and wealth rankings not related to reliance. Identifying exactly who depends most on local fisheries, how and why, requires closer

investigation of the nature of this use. In the next chapter, I focus in on the food security role of local fisheries, considering how fish and other aquatic resources provide food and cash to households in different wealth categories across the year.

# **Chapter 5. Contribution of fish and other aquatic resources to local livelihoods in Ruwe village**

## **5.1 Introduction**

Wild foods make a vital contribution to the diets, livelihoods and food security of poor rural households across the tropics, with fish taking on particular importance as a superior and relatively cheap protein source for the most vulnerable among these (Tacon and Metian 2013, Penafiel et al. 2011, Dugan et al. 2006; see Chapter 1). From a diet quality perspective, smaller fish species are often particularly high in micronutrients and also tend to be those most consumed by the poor (Kawarazuka and Béné 2010). Small fish cost less than large specimens, can be purchased in smaller quantities, are easier to share out among family members, and can be more easily processed and stored for long periods (Thilsted et al. 1997).

Fisheries contribute further to food security by providing an important, and often the key, source of cash income to rural households in many rural areas (see Chapter 1). The effect of fishery-related income on food security may not be straightforward, however: the poorest households may feel compelled to sell more of their catch than they keep, for instance, undermining nutritional well-being (Kawarazuka and Béné 2010; Béné et al. 2009b).

Fish are not the only aquatic animals to offer alternative protein sources and cash-earning opportunities to the rural poor. In South East Asia, freshwater frogs, molluscs, and snails are eaten regularly by almost all people (Garaway et al. 2013, Meusch et al. 2003). Trade in other freshwater aquatic species such as snakes, crocodiles and ornamental fishes may involve some of the poorest rural households across the developing world in multi-million dollar export industries (Brooks 2008, Roe 2008).

Yet, quantitative evidence of the use of aquatic resources globally remain rare, and tend to overlook diversity in species used and geographic and seasonal variations (Garaway et al. 2013).

Having established that the majority of households in the study area are involved in local fisheries (Chapter 4), this chapter focuses in on the nature of this use, exploring household-level catches, consumption and sales of fish and other aquatic animals (OAA) across an entire year. The focus is on animals rather than plants, given the known value of fish and OAAs to food security. The analysis is based on a household-level aquatic resource use survey (HARS) in one Rufiji village, with additional observations made on local aquatic resource use and food culture. I first provide an overview of the type and quantities of fish and OAA used by all households in all seasons combined, and then disaggregate use patterns by wealth rank and seasons to explore if aquatic resources matter more to some households than others and when. I briefly consider which other factors besides household wealth which might influence use patterns. A final results section touches on additional aquatic animal and plant species used for food, medicine and commercial sale in the area which did not necessarily turn up on the survey. I begin by describing the local food culture and methods used.

## **5.2 Setting: Food culture**

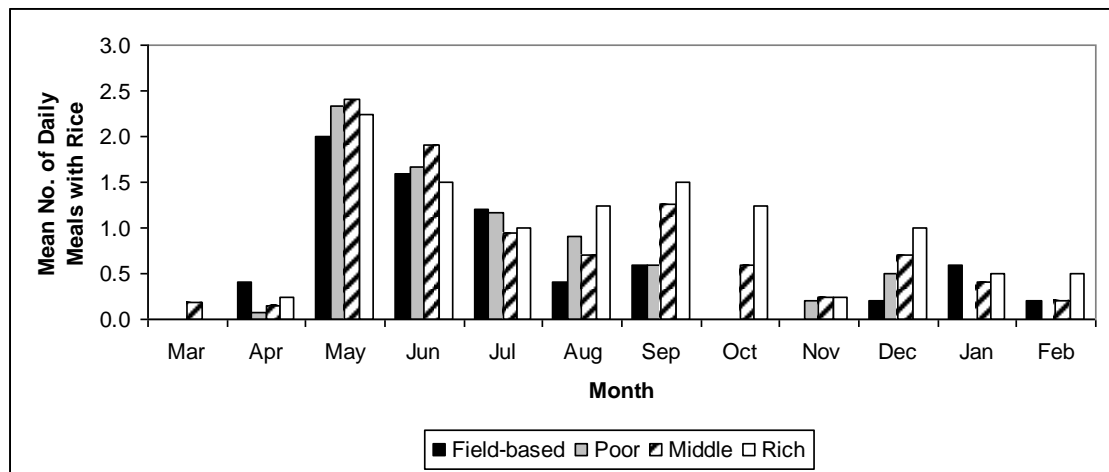
### **5.2.1 *The food year***

Although maize (eaten as *ugali*, a stiff porridge) is the mainstay of local diets, rice is by far the preferred food. Use of the very word ‘food’ (*chakula*) was only grudgingly extended to the cassava, plantain, millet or other starches eaten when these two staple crops were unavailable (Bantje 1982).

The agricultural year yields a first (short rains) maize harvest in February-March, and a rice harvest in May-June, with corresponding seasonal movements between the village and floodplain fields (see Chapter 2). Villagers delight in the rice harvest, noting the sweet smell that pervades the village as women pound the grain, and complimenting each other on how fat they and their children have become on their rice diet. Rice is also an important cash crop, a valued gift, and central to ritual meals, with weddings and girls’ coming out ceremonies scheduled for after the harvest.



As a result of such heavy demand, most families depleted their rice stores quickly (Bantje 1982). As stores dwindled, people adopted food saving strategies such as eating rice only for the evening meal, and drawing on relatives outside the village for help, either soliciting gifts of food and cash or sending family members to live with them for periods of weeks or months. As food stores dwindled further, people might buy maize flour in cash or on credit from village shops and/or switched to cheaper starches, primarily cassava flour. As a last resort, some people dipped into their seed stores. In our HARS sample, households in all wealth groups had reduced their rice consumption from an average of two meals per day to one within two months of the harvest, with the poorest households already not reporting any rice at meals during the October survey (Figure 5.1).



**Figure 5.1 Mean number of meals at which rice was eaten by household members in each survey month, by wealth group, HARS.**

Before the harvest of the first maize crop, from December or so, villagers experienced the seasonal hunger typical of African farming communities (Bryceson 1989). As this was the hottest time of the year, fewer wild plant foods were available, but mangos came into season then. People gorged themselves on the fruit until, as one woman put it, “our blood turns to juice”.

### 5.2.2 *Daily meals*

The midday and evening meal consisted of a starch with an accompaniment or 'relish' (referred to as *mboga* or *kitoweo*) of vegetables, fish or meat. A person was not considered to have eaten if her meal did not include *chakula*, and would tell you she was hungry if *mboga* was consumed on its own. All cooked meals were prepared on hearth fires.

Meals were generally taken away from public view, either in the corridor running down the center of the home, or in the back courtyard. In my host family and for most meals I happened to observe in the village, family members ate off one shared platter, with the exception of elderly men who tended to receive their own small plate. When guests were present or at ritual meals, men and older boys ate separately from women and small children. In eating from a communal platter, the men took priority, choosing the best of the *mboga* and eating more than others.

People generally ate three meals a day, but better-off households often ate a fuller breakfast. All households aimed to take sugary tea in the morning, often eaten depending on the season with boiled plantain, papaya, cassava or maize, or with last night's rice (*kipolo/upolo*). Better-off households took tea with some variety of fried dough (e.g., rice donuts, chapatis), usually purchased from village women. When means were limited, people contented themselves with nothing but a drink of *uji*, a watered-down maize porridge. Differences were also apparent at lunch and dinner in the type and number of *mboga* people consumed and cooking method. *Mboga* was best prepared with a little oil or coconut milk, salt, and chopped onions, tomatoes and sometimes chili, but many families were constrained to using only water and salt.

Eating times were flexible given the varying activities of family members. Breakfast was usually taken around 10 in the morning, when children returned home from school for their morning recess. However, men who needed to eat very early because of farm or other work often ate breakfast at the village tea stands. Parents and young children might eat lunch together in the fields while school-age children cooked for themselves in the village home, and reunited for dinner after sunset. During periods of heavy agricultural work, people might forego either breakfast or lunch entirely because they were too busy to cook.

Snacking was highly individual and opportunistic. Around the maize and rice harvests, people snacked on roasted maize and kernels (*bici*) and dried new rice (*pepeta*). There were sudden snack fads in the village as well, with children devoting

entire days to collecting and selling cashews, mangos and various wild fruits as these came into season. It was not unusual to see a large group of children sharing a single fruit in the village, but quantities consumed 'at the source' might have been greater.

At Ramadan, people who fasted typically ate two times during the night. The *futari* meal taken shortly after sunset generally consisted first of a drink of *uji* followed by a stew of cassava, papaya, sweet potatoes and/or green bananas cooked, where means allowed, with coconut milk. A heavier meal, *daku*, consisting typically of rice and *mboga*, was eaten around 10-11pm. Some people additionally took a third, light meal around 3-4am. Most children, pregnant and breastfeeding women, and the ill did not fast in Ruwe, nor did a number of adults who explained that farmwork was too physically demanding to allow it.

### **5.2.3 Access to meat**

Few households kept any livestock besides a few chickens. A handful kept ducks and even fewer raised goats, but no one in Ruwe owned cattle. Domestic animals were often considered too valuable to eat, except in the case of fowl stricken by disease and otherwise unsaleable. Special occasions such as weddings and funerals however required that meat, ideally goat, be served to guests. Pastoralists in the area would occasionally sell milk and meat to villagers, but the cost was prohibitive for most.

The licenses required for owning a gun and hunting game in Tanzania, and the threat of a jail sentence for any infraction, meant that acquiring wild meat was problematic. In Ruwe, the three dedicated (illegal) hunters sold meat primarily to the Dar es Salaam market. Nonetheless, game was available through gift and exchange networks or discreet purchases, particularly in the dry season when villagers were flushing out animals while burning their fields. People visited sellers at home, or bought game in the backstreets from sellers on bicycles. While in the village, I saw evidence of elephant, hippopotamus, waterbuck, bushbuck, zebra, hare and porcupine kills, and many other game animals were mentioned as good eating by local people, although discussion of hunting as an activity was difficult. Most villagers did not eat wild pigs, baboons or monkeys, citing Islamic food prohibitions. Some also avoid

eating hippopotamus and elephant as well given their debated status under dietary laws.<sup>43</sup>

The Ndengereko do not eat insects, although other Rufiji people (the Rwingo, the Pogoro) do, according to Ruwe villagers.

#### **5.2.4 Non-staple plant food, fruits and nuts**

People in Ruwe cultivated vegetables and also collected wild vegetables and tree leaves from the bush and wetlands. The leaves (*majani*) of cultivated vegetables were often eaten as well as the vegetable itself, in particular *kisamvu* (cassava leaves), *matembele* (sweet potato leaves) and pumpkin, cowpeas and pigeon peas. Locally-grown market vegetables such as tomatoes and okra were sometimes available to buy.

The main cultivated fruits were papaya and bananas (*ndizi sukari*). A small number of families cultivated other fruit for market sale, including oranges, guava, jackfruit and passionfruit. Many varieties of mangos were available, either from village trees or the more numerous and productive river valley trees planted in German colonial times, and cashews were harvested from village orchards. Other fruit eaten in the village included limes, baobab fruit, custard apple (*matopetope*), plum (*zambarau*), tamarind (*mkwaju*), *furu* (*Vitex doniana*), *mabungo* (*Landolphia kirkii*), *mpelepele kumbwani* (*Sorindea* sp.), *ndaba*, and palm fruit (*makoche*, *Hyphaene coriacea*). However, a systematic study of plant foods would undoubtedly reveal many more (e.g., Kasthala et al. 2008).

### **5.3 Methods**

#### **5.3.1 Household aquatic resource use survey (HARS)**

A questionnaire survey eliciting information on all aquatic resources brought into the home in the previous 24h was conducted once a month from March 2008 to February 2009, with 25 households beginning in March and 15 added in April. I based the survey form on one developed by Dr. Caroline Garaway (UCL) for use in South East Asia (Garaway et al. 2013). I discuss my sampling method below, followed by the design and administration of the survey.

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<sup>43</sup> The Makonde people (who are generally Christian) living in the area reportedly hunted and ate baboons and monkeys, however. There was also a market for wild pig meat among the Christians and Chinese road workers living in the larger towns of Rufiji district.

### *Sampling method*

I purposively selected households for inclusion in the survey, expanding the sample from 25 to 40 households on the second round in order to have a larger sample and include households based permanently in the field areas for comparison to those based in the village. Village-based households were selected by location (across the three village wards) and wealth category (proportionally across three wealth categories; see Chapter 3). Within these parameters, I purposefully selected units with contrasting domestic arrangements. The most common was a married couple and their dependents living in a single home, but I also selected households headed by single men (N=1) and women (N=5), and households consisting of a man and his two wives (N=4), who in all but one case lived under the same roof. I also included a family compound in its entirety, the Kwele compound described in Chapter 3, on the basis that family members shared food and cooked meals.

Field-based households were selected in the absence of information on total number of households on the village-associated floodplain, or on their relative wealth (see Chapter 3). I chose field areas that were a manageable distance from the village for regular research visits (up to one hour's walking time) and that were at some distance one from the other, with five households located across three field areas in a series of depressions immediately south of the village (~1 – 2km from the central marketplace), and two more in two field areas situated on the floodplain proper (~3 – 4km). It was generally understood that only the poorest households lived permanently in the fields, particularly on the floodplain proper, with villagers disapproving of families that lived too far away to send their children to the village school.

The final sample size was restricted by the time required to find respondents each month, with each survey round taking between seven and 12 days ( $9 \pm 1.5$  days; mean  $\pm$  s.d.) to complete. For village households, people's trips to their fields and to visit friends and relatives elsewhere meant that locating a respondent typically required multiple visits to their village home or fieldhouse. Survey rounds conducted during the flood season and busy agricultural periods (when many village households moved to the floodplain) took the most time.

### *Questionnaire survey design and administration*

On the first survey held with a household, we collected basic information on current household members (name, age, gender and relationship to the household

head), updating the list at each round as necessary (see Chapter 3). On every round, we recorded which household members were present at each meal for the day preceding our visit, and the number of guests present that day. Respondents were then asked to list any aquatic animal resources members of the household had caught, bought or received as gifts on the previous day, with the interviewer probing specifically for fish, shrimp, turtles, crocodiles and other “insects or animals that live in the water”. Where aquatic resources were reported, detailed information on type, origin, number, size (see Section 5.3.3) and use (i.e., percentage eaten, sold, preserved and gifted) was collected. Finally, respondents were asked which of a set list of food items the household had eaten on the previous day, and whether these were consumed at breakfast, lunch and/or dinner. The survey was modified slightly for the September round, coinciding with Ramadan (2 September – 1 October 2008) to ask which household members were fasting, and what they ate for their night-time meals.

The female household head was the usual respondent as the person preparing the meals but also because men tended to be away from home more often. On occasions when the respondent had eaten apart from other members of the household (e.g., she had gone to the fields while the children remained in the village) and was unsure what the others had eaten, we would ‘follow’ the respondent’s meals, i.e., marking as ‘absent’ those who had eaten apart from her. If, however, she had prepared in advance the meal others ate without her, all were recorded as having eaten together since she could report on their meal.

I trained two research assistants to administer the survey as a team. Idaya Ungando, a woman, asked the questions while Karim Tenge, a man and one of my two English-speaking assistants, filled in the survey sheet (see Chapter 3). For surveys I was not present on, I reviewed the forms and discussed any discrepancies with my assistants during or shortly following the survey period. The survey had the advantage of being straightforward and relatively quick to administer, especially as respondents gained practice. However, weaknesses in the data collected became apparent over time, and are highlighted in the discussion. Survey households received regular gifts as compensation for their time (see Chapter 3).

### **5.3.2 *Qualitative methods***

In order to elicit additional information on local uses of aquatic resources, and to corroborate seasonal trends that might be suggested by the recall questionnaire, I

organised three discussion groups and a resource walk with village women. If time had allowed and if my focus had been on documenting local aquatic biodiversity in full I would have organised more such activities, and specifically sought out witchdoctors and traditional midwives for their expert knowledge.

The discussions involved 19 women from my HARS sample and two who spontaneously joined in, separated into groups based on hamlet membership, with one discussion held in each hamlet over one day in September 2008. We invited all of the wives and unmarried female household heads in our sample to attend by letter (taking a cue from the village council's way of organising meetings), and followed up with a reminder in person, which contributed to the respectable participation level.

My female research assistant led the discussions while I took notes and asked the occasional question. We asked the women in our first group to name fish, aquatic animals, insects and plants used in the village for food or medicine (*dawa*, which includes both traditional medicines and witchcraft uses), and I wrote these down on a large piece of paper. We then used this list as a starting point for discussions in the other two groups. In all three groups, women were asked whether the fish species named were good to eat, all right, or not well liked, with me writing a preference score (from best to worst, 1 to 3) based on their discussions.

The second exercise, conducted with our second and third group only, was to draw a resource calendar starting with a blank piece of paper, with women first asked to indicate rain and flooding patterns and agricultural labour demands, focusing on the past agricultural year (i.e., starting from preparation of fields in October 2007 to the present). We then handed around cut-out drawings of fish so that the women could place more or less fish on the sheet to indicate availability across the past year. In the third discussion group we also handed out drawings of skinny, normal and fat stick figures, for indicating food availability more generally from month to month. The calendars produced should be read as a loose description of a typical year, and not a documentation of the past one, as the women themselves noted. They also emphasised that it was impossible to predict from one year to the next when the rains would start, if and when the flood would rise and how high, and how this would influence the number of fish available.

Following from the free-listing of aquatic plants, I asked Idaya to select two women with good knowledge of plants to accompany us on a resource walk to photograph species named. She chose the wife of the village chairman, whose fields

were alongside the channel at Mbambe, and the wife of a local fisherman who herself often collected aquatic plants for sale. We spent an afternoon in October walking on the chairman and his wife and neighbours' fields, discussing the plants found there. The women considered that the same plants were generally found here as on the floodplain, with specific locations depending on the water level at any one place and time. Quentin Luke (National Museums of Kenya/KENWEB) identified plant species from my photographs.

Participants in the focus group discussions were not compensated for their time, as I presented the activity as a voluntary add-on to the HARS for which they already received regular gifts, but I paid the guides on our resource walk (Chapter 3).

### **5.3.3 Data analysis**

#### *Estimating fish size and weight*

Respondents were asked to estimate the size of fish reported on the survey with the use of a visual aid (Garaway et al., in prep). For each species of fish named, respondents chose from a bundle of six sticks laid side by side on the ground that which most closely approximated the total length of the fish (i.e., TL: from tip of tail to tip of snout). For fish acquired already smoked (2.7% of 370 records) or fried (8.1%), we asked people to estimate length prior to processing.

The stick sizes used were A – F, or 10, 15, 20, 30, 45 and 60 cm respectively. Where people reported a range of sizes (e.g., a bunch of 10 and 15cm long fishes), I took the midpoint as the size of all fishes in that bunch. If they said a fish was “smaller than” a particular stick, I revised estimates downwards as follows: <A - <F, or 7, 14, 17, 25, 40, 55). I classified the very smallest fishes as 4cm in length. I chose the stick sizes in consultation with my research assistants to reflect usual fish sizes caught in the area, and added the largest stick in April (with the appearance of large catfish on the survey).

It was my intention to convert fish length estimates to weights based on my own independently collected length-weight data. From July 2008, me and/or my research assistant measured fish lengths and weights in Ruwe (at the lakeside landing sites or the village market) and fish markets in Ikwiriri and Kibiti.<sup>44</sup> All fish were measured for TL with a rigid ruler (if less than 30cm) or measuring tape. Weights were

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<sup>44</sup> I only began data collection then because I broke one mechanical scale *en route* from DSM early in fieldwork, and had the other one stolen.



taken with a mechanical kitchen scale, accurate to 10g. The smallest fish were weighed in groups and an average individual weight and length recorded. I only had enough data points to develop length-weight relationships for two species, and for all others used relationships available on Fishbase, as set out in Appendix C. Using species-specific length-weight relationships rather than an average one reflected the varying shapes of different fish in the area (e.g., long catfish vs. rounded tilapia).

I did not test how well respondents were able to estimate fish lengths, but in examining scatter plots the reported lengths for each species were found to be largely consistent across households each survey month and also with length data obtained from measurements at landing sites and markets. Also, the fact that people would often qualify their choice of stick, explaining that the fish was a bit smaller or larger, suggests that they were paying attention to actual size, as does the appearance of monthly trends in reported average fish sizes for selected species.

Weights are live weights of the whole, fresh animal, prior to any pre-processing (e.g., gutting, beheading, deboning). I did not collect data on the proportion of weight discarded in pre-processing, but observed that this varied depending on species. Larger fishes had larger bones to be discarded, while smaller, fried fishes tended to be eaten in their entirety, as frying softened their bones. I used conversion factors established by FAO for converting estimated live fish weights to weights for smoked (0.43) and sun dried fish (0.28), and a conversion factor of 0.61 for fried weights (Burger 2004).

Where fish length was missing (4.6% of 370 freshwater fish records,  $N = 17$ ), I inputted data based on the mean reported size for that species for the month in question (matched to state—fresh, smoked, fried—where possible). Where respondents had reported acquiring a mixed-species bunch of fish, precluding the use of species-based length-weight relationships, I estimated weight on the basis of the average weight per *fungu* of fish as reported that month by other sample households.

### *Estimating weights of OAA*

For OAAs we asked respondents to estimate weight in kg, but found that this only worked if the product had been bought at the regional market (i.e., dagaa or delta prawns) or in the case of a large turtle. In the remaining cases, informants would tell us how many bunches they had bought at what price, and I estimated weight based on available price/kg information drawn from other households' surveys or (in the absence of village-based data) my trade survey.

### *Estimating daily aquatic animal resource consumption rates*

Consumption is calculated on an adult male equivalent (AME) basis rather than per capita in order to reflect the different demographic composition of households (Deaton 1997). Based on the observation that people of different age and gender require different numbers of calories to maintain “normal” activity levels, the conversion is as follows: males  $\geq 10$  years old = 1 AME; females  $\geq 20$  years old = 0.72; females between 10 and 19 years old = 0.84; and children  $< 10$  years old = 0.60 (Ministry of Agriculture/Michigan State University/USAid Research Team 1992:5). This approach, with the same conversion factors, is commonly adopted in studies of bushmeat consumption (e.g., Albrechtson et al. 2006, Fa et al. 2009, de Merode et al. 2004).

The number of household members and guests present at meals could vary across the survey day. I therefore calculated the g of AR/AME consumed on a meal-by-meal basis, and added these together to obtain the daily consumption of AR in each household (i.e., g/d/AME). If the fish was entirely consumed at one meal, calculating the weight consumed per AME per meal was a straightforward summing up of the individual AME values for all household members and guests present at that meal.<sup>45</sup> If the AR was consumed over two or three meals, I divided the total weight by the average AME value for the meals over which it was consumed. Because we did not consistently record information on guests’ gender and age, I assumed all guests to be adult males (AME = 1).

### *Describing consumption patterns for all foods*

Although on most surveys I have information for three meals a day, on others information on a meal is missing either because this meal was not eaten or interviewers forgot to probe specifically about food items besides aquatic animal resources consumed. The latter situation happened much more often for breakfast than for other meals. For this reason, I score food items as present/absent on the survey day rather than at each meal.

To overcome the problem of patchy data on breakfast (with information on 71% of breakfast meals vs. 98% and 99% of lunch and dinner meals respectively,

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<sup>45</sup> For the surveys during Ramadan on which certain household members were fasting (n = 24 surveys) for ease of calculation of total AME per meal I counted those individuals fasting as present at dinner because they ate the dinner leftovers for *daku*. This was not an issue for *iftar*, as no AR consumption was ever reported at that meal.

N=463 surveys) respectively), and because starch was often the sole component of breakfast and the mainstay of every other meal as well, I do not consider starch in the analysis of overall consumption patterns, i.e.: maize (as *ugali*, *uji* or cobs), rice, cassava, plantains, or the various fried breads and cakes eaten at breakfast (chapatis, donuts, etc.). Nor do I consider the various snack foods such as sugarcane, corn kernels (*bici*), and dried rice (*pepeteta*) consumed throughout the day but not easily recalled by respondents during surveys nor consistently probed for by interviewers.

Remaining food items were grouped into categories for ease of analysis: aquatic resources (local freshwater and all other), cultivated vegetables including pulses, wild vegetables, domestic meat, wild meat, eggs, and fruit. Fruit are further divided into fruit eaten as an *mboga* (42 of 261 meals featuring fruit) and fruit eaten as a snack. I made the distinction by considering that papaya eaten with rice (in a dish known a *dengu*) was a main course (34 of 42 fruit *mboga*), as was any other fruit eaten when no other *mboga* was consumed (mango in 7 of 42 cases, *bungo* in 1).

#### *Coding mode of acquisition*

If households reported using more than one aquatic resource per survey, these were almost always acquired by the same means (e.g., all purchased). This allowed me to compare households on the basis of the mode of acquisition of aquatic resources reported on the survey. For the eight cases (1.7% of 463 surveys) where mode of acquisition was mixed, I coded the mode of acquisition as whichever mode had contributed the greatest amount of food (weight of fish eaten) to the household that day. These households had either combined purchased fishes with captured ones, to supplement leftovers for example, or had received fish as gifts in addition to those already caught or bought.

#### *Missing information*

The frequency of fish sales and amounts sold are underestimated given that female respondents often could not tell us whether her partner had sold fish in addition to those brought home. In such cases, we would try to track down the partner in the village on the survey day or the next, but were not always successful. The alternative, to conduct the survey only when both husband and wife were present, was not practicable given the difficulty of finding even one of these individuals at home.

## 5.4 Results

### 5.4.1 Description of HARS sample

In all, 463 consumption surveys were conducted among 41 houses (and 40 households) over the study period, totalling 1295 meals, including the *daku* and *iftar* meals of Ramadan.<sup>46</sup> I was present on 31% of surveys, sitting in on all of the two first survey rounds and on certain days during the remaining rounds. Idaya was present on 98% of surveys, and Karim on 85%. My presence during the survey had no significant effect on whether or not respondents reported aquatic resource use ( $\chi^2 = 0.271$ ,  $p > 0.05$ ,  $df = 1$ ), but reported instances of meat consumption were too rare to test for a similar effect.<sup>47</sup>

The membership of individual households tended to vary on a monthly basis as people came and went. For this reason, no average demographic characteristics are given here. In total, 295 individuals were reported as living within the sample households over the course of the survey as members of the household, with just over half (56.6%) present for the entire duration (i.e., 11 or 12 months) and 16.8% for two months or less. Only four households reported no change in membership over the survey period. Two households dissolved entirely by August and September respectively, dropping the overall sample to 38 households.<sup>48</sup>

Guests were present on 137 surveys, with 86% of these involving just one or two individuals eating with the household at any one meal and never more than five, with one exception (13 guests for lunch and 17 for dinner).

### 5.4.2 Overview of aquatic resource use by sample households

#### *All aquatic resources*

Aquatic resource use—that is any instance of catching, buying or receiving as a gift fish or OAA—was reported in 60% of all surveys (N=463). Of the 396 separate records of aquatic resource use (where each different species reported on a single survey is counted as a separate record), 370 (93.4%) were for local freshwater fish and

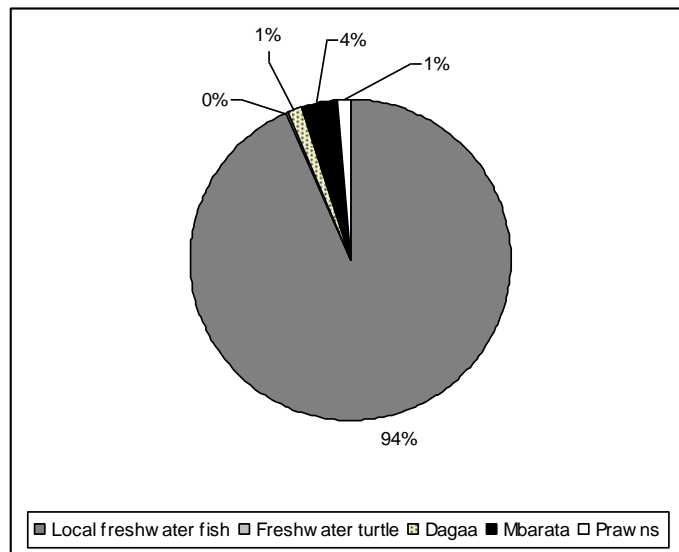
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<sup>46</sup> One household, in the Kwele compound, was made up of a man and his two wives. Each co-wife had her own house and refused to be interviewed with the other. We were rarely able to survey them on the same date, precluding merging of survey data for this household, although the husband and children would have been able to eat at either house on any day.

<sup>47</sup> I was present on three of the ten occasions respondents reported domestic meat consumption, and none of the five occasions on which households reported eating wild meat.

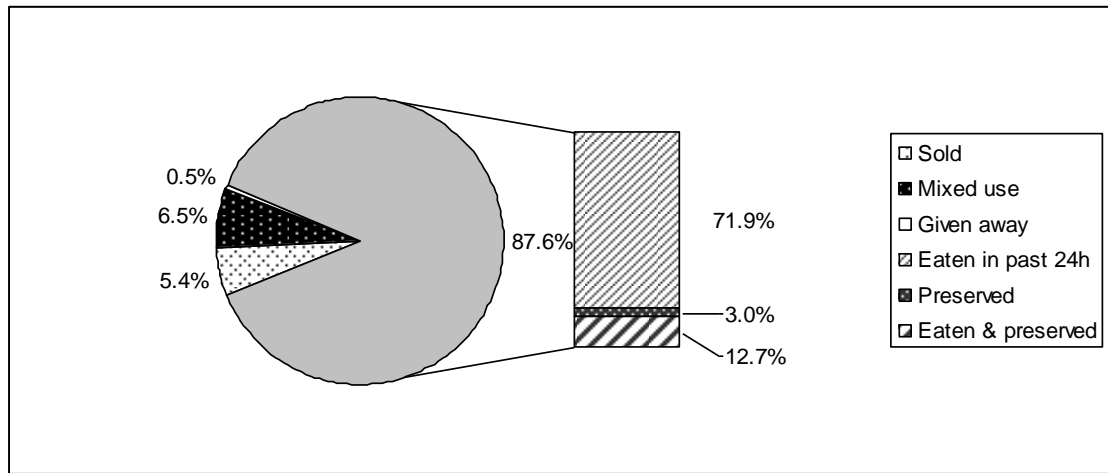
<sup>48</sup> The first household, consisting of a single female and her two daughters, moved to the nearest town. The second dissolved when a man's two widows returned to live with their respective families.

one was for a freshwater turtle (*ndasi*, species unknown) (Figure 5.2). The remaining records were for OAA sourced from outside the local area, namely *dagaa* (small, dried herrings typically caught in Lake Victoria and a common food across Tanzania), the sundried marine fish *mbarata* (*Hilsa kelee*) and prawns from the Rufiji delta (Figure 5.2).



**Figure 5.2** Frequency of different types of aquatic resources reported by survey households, HARS (N = 396 records).

The primary reported use of freshwater fishes by households was for direct consumption in the home, usually eaten in entirety within the past 24h (87.6% of 370 records, Figure 5.3).



**Figure 5.3** Uses of local freshwater fishes brought into the home, and of fish kept for home consumption, HARS (N = 370 records).

Although we did not record any instances of households re-selling purchased fish, several women in our sample did on occasion buy fresh fish to fry and sell locally. Most freshwater fish recorded in the surveys were acquired through purchase (57.3% of 370 records), and most were bought fresh (82.5%). The remainder were caught by a member of the household (36.5%) or received as gifts (6.2%, always fresh, with one exception). All other aquatic resources were purchased, with the exception of the freshwater turtle received as a gift.

Village-based households purchased most of their fish in Ruwe itself (87%, N=163 records with origin reported), at the market, lakeside, or from fishermen peddling their catch along village streets. Field-based households purchased only a third of their fish in Ruwe (31% of 13 records), with more bought in Utete across the river (38%). The remainder of fishes, for both village and field-based households, were purchased on the floodplain.

Captured freshwater fish were mainly taken from Lake Ruwe (83.7%, N=135 records), and the remainder from a variety of small waterbodies on the nearby floodplain.

### *By freshwater fish species*

Three species made up the bulk of freshwater fish records: ‘kumba’ (the tilapia *Oreochromis urolepis*), ‘pele’ (*Citharinus congicus*) and a squeaker catfish called ‘kogo’ (*Synodontis rukwaensis*) (Table 5.1). Apart from ‘ngocho’ (a carp, *Labeo congoro*) and ‘kambale’ (the catfish *Clarias gariepinus*), other freshwater fish species were infrequently reported. *Pele* were by far the most important species by weight due primarily to two large catches by two households. Certain freshwater fish species were more often purchased than caught directly by household members, in particular *ngocho* and *pele*. These species, along with *kumba*, were the main targets of commercial fisheries and among the most popular in the regional markets (see Chapter 7). *Kogo*, *kambale* and *mbufu* were among the species more often caught than bought.

### **5.4.3 Food fish preferences**

Locals had definite views on what made a fish good eating, with preference scores from women’s discussion groups given in Table 5.1. Of primary importance was size and overall boniness: a fresh fish was prized if it could be cut into large fillets or steaks, and dismissed as *ukonge* (Kind., ‘like a frayed rope’) if full of little bones.

In terms of taste, people preferred fattier, oily fishes (especially as this saved money on cooking oil) and fish that produced a tasty broth (*mchuzi*) when boiled with water, the most common cooking method. Despite such preferences, however, people were clear that any fish was good enough to eat. The large catfish, *kambale*, and white-fleshed tilapia, *kumba*, were overall favorites and considered the best fish to serve to visitors or give as gifts. Smoked *kambale* was said to taste like Cape buffalo meat and could last for weeks, while *kumba* could be kept fresh longer than most other fish. The catfish ‘mbufu’ was also prized for its meaty taste after smoking, but was quick to rot if not processed. Locals liked and ate many *kogo*, but outsiders generally scorned this small catfish, and it was rarely seen in the town markets. The innards of *kogo* caught just before dawn (i.e., when the stomachs and intestines were empty) were considered a delicacy by locals, and fishermen kept them for personal consumption or gave them as gifts. Similarly, the small elephantfish ‘zozo’ (*Marcusenius livingstonii*) was nicknamed ‘the fish that never makes it to higher ground’ because fishermen said it was too delicious to sell. Women we spoke with did not like to eat ‘mkonga’ (a freshwater eel, *Anguilla* spp.) but said it was popular with men.

**Table 5.1** Frequency of occurrence, number, estimated total weight, proportion purchased fresh, fried or smoked, and preference score for fresh water fishes reported by households, HARS.

Fish Local name	% of freshwater fish records <sup>1</sup>	No. of specimens	Est. total weight (kg)	% of records acquired by purchase	Proportion of fish purchased			Of captured fish, proportion sold	Food Preference Score <sup>3</sup>
					Fresh (%)	Smoked (%)	Fried (%)		
Kumba	25.4	588	35.5	58.5	92.7	1.8	5.5	25	1
Pele	25.1	3893	183.5	74.2	84.1	2.9	13	35	2
Kogo	16.2	831	27	38.3	100			27	1
Ngocho	8.4	169	5.9	77.4	62.5	4.2	33.3	29	3
Kambale	8.1	110	38.7	43.3	69.2	30.8		13	1
Mbufu	3.5	24	17.7	46.2	83.3	16.7		57	2
Tungu	2.7	45	3.9	40	75		25	80	3
Bubu	2.2	21	.1	62.5	60		40	0	3
Kasa	1.9	32	2.9	57.1	25		75	0	1
Beme	.8	170	1.4	33.3			100	50	3
Ndundundundu	.8	?	.3	66.7	100			0	3
Sasile	.8	55	.1	33.3	100			0	-
Zozo	.8	9	.2	-				0	1
Viliampunga	.5	3	.3	-				0	2
Kokoto	.3	5	.01	-				0	3
Mkunga	.3	1	.5	-				0	-
'Mixed'*	2.2	162	4.8	62.5	80		20	67	
TOTAL	100%	6118	323						
N	370								

Notes: Scientific name given in text and Appendix D. <sup>1</sup>Each mention of a separate aquatic resource on a survey counts as one record <sup>2</sup>Preferred food fishes as ranked by women in our discussion groups, where 1 is most preferred and 3 least. \* 'Mixed' are mixed-species *fungu* of fish.



Even the most unpopular fishes could be rescued by a good fry-up: frying not only preserved fish for two or three days, but also softened tiny bones so that ukonge fish became palatable and tasty. These included tetras ('beme' and 'kasa', *Brycinus* spp.) and gobies ('bubu', *Glossogobius giuris*), as well as smaller specimens of preferred species (primarily *pele* and *ngocho*).

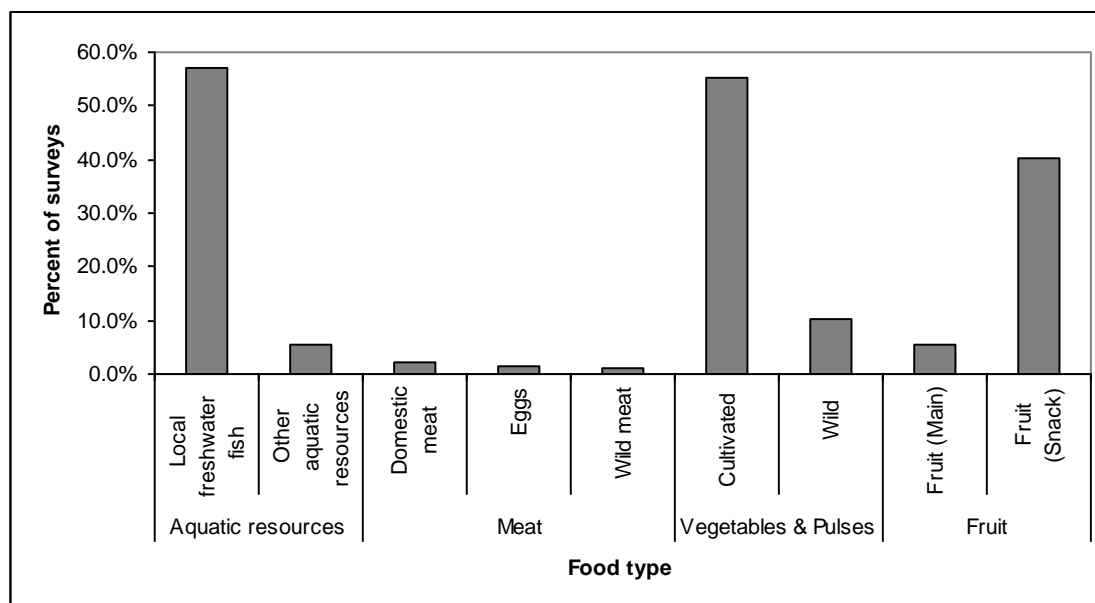
#### **5.4.4 Local prices for freshwater fishes**

Reported prices for freshwater fish were highly variable, a reflection of seasonal trends (see Section 5.4.9) but also small sample sizes, and should be treated with caution. Prices in district markets are given in the next chapter.

For freshwater fishes where the purchase price was reported, the mean price across the survey year was  $2.34 \pm 1.79$ USD/kg for fresh fish ( $n = 103$ ), and considerably more for fried ( $9.00 \pm 9.61$ USD/kg,  $n = 17$ ) and smoked fish ( $9.93 \pm 13.50$ USD/kg,  $n = 4$ ). In comparison to prices for fresh fish recorded independently in the village between July and November 2008, those reported by households in that period were considerably higher:  $2.37 \pm 1.42$  vs  $1.06 \pm 0.45$ USD/kg,  $N = 44$  and  $38$  respectively. In practice, locals bought fish not by weight but by the bunch, paying 300TZS/fungu (or 0.24USD/bunch) in 86% of such cases ( $N=29$ ). Vendors adjusted the species composition, size and number of fish in a bunch in order to maintain a fixed price.

#### **5.4.5 Contribution of animal aquatic resources to local diets**

Local freshwater fishes were by far the most important source of animal protein for our household sample, eaten on 57% of surveys vs. 5.6% for all other aquatic resources (i.e., dried marine fish, dagaa, shrimp, turtle) and 3.3% for meat (Figure 5.4). Respondents reported eating bushmeat (Cape Buffalo, cane rat and one unspecified game animal) on just five consumption days, and domestic meat (beef, goat or chicken) on 10 days. Eggs were rarely eaten. In terms of an accompaniment to meals (i.e., as an *mboga*), only vegetables (cultivated and wild combined) were eaten more often than fish (Figure 5.4).



Note: Fruit are split to reflect whether they were eaten as a main course (*mboga*) or as a snack; snacks are likely under-reported, see Methods.

**Figure 5.4** Frequency of consumption of different food types by sample households, HARS (n=463), March 2008 – February 2009, Ruwe, Tanzania.

On average, people in our sample ate  $48.9 \pm 115$  g/d/AME of freshwater fish per day (range: 0 – 1254g/day/AME, median = 13g/d/AME, N= 463 surveys;). Considering only those surveys where freshwater fish consumption was reported, people ate, on average,  $86.3 \pm 142.3$  g/AME of freshwater fish (N = 262 surveys). The mean consumption rate of OAA, not including the turtle, was just  $5.4 \pm 11.5$  g/d/AME (range: 0.6 – 55g/day/AME, median = 3.2g/d/AME, N=21). Those people eating the turtle consumed 215g/AME of OAA that day.

#### 5.4.6 *Wealth-related differences fish consumption*

While wealth had an effect on households' patterns of aquatic resource use, as will be explored in this section, having a fisherman in the household or access to someone who could otherwise provide you with fish also influenced consumption levels, and is addressed in Section 5.4.10.

### *Frequency and amount consumed*

All households reported at least one instance of consuming freshwater fish across the survey period. Nonetheless, rich and middle-ranked households ate freshwater fish nearly twice as often as did poor and field-based households (Table 5.2). Individuals in rich and middle-ranked households also ate more freshwater fish per day by weight on average than did individuals in poor and field-based households (Table 5.2). The results of a Kruskal-Wallis test were significant ( $H = 38.1$ ,  $df=3$ ,  $p<0.001$ ), with the mean ranks of quantity of fish consumed per day per AME significantly different among the four groups.

**Table 5.2 Frequency and quantity of consumption of local freshwater fish and frequency of consumption of other aquatic animal resources by households across wealth groups, HARS.**

Wealth Group	No. of HH	Freshwater fish		OAA	N
		Frequency (% of surveys)	Mean amount consumed per AME (g/day)	Frequency (% of surveys)	
Rich	4	71	58.4 ± 14.5	9	48
Middle	20	70	57.8 ± 8	6	230
Poor	12	40	39.7 ± 11	4	128
Field	5	30	25.5 ± 8.5	2	57
TOTAL	41	-	-	-	463

### *Differences in fish size, species and state*

On average, wealthier households ate larger fishes (based on estimated lengths) than did middle and poor village households, with field-based households eating the largest fish, although observed differences were not significant (by a Kruskal-Wallis test; Table 5.3). The consumption of the largest catfishes, *mbufu* by the rich households and *kambale* by the field-based households, had much to do with this pattern. Excluding both catfishes, average length of fish consumed varied little among the groups ( $15 \pm 6$ cm,  $N=277$ ).

**Table 5.3 For fresh fish only, differences across household wealth categories in average fish size (eaten or preserved all or in part) and in the frequency of preserving fish and the proportion kept, HARS.**

Wealth Group	Mean fish length (all species)	N (no. of fish)	Frequency of preserving fish (% of surveys)	N	Mean proportion of fish kept for later consumption (%)	N
Rich	19 ± 13	35	26	48	14 ± 29	35
Middle	17 ± 9	208	19	230	11 ± 25	226
Poor	16 ± 7	49	12	128	4 ± 11	49
Field	23 ± 19	16	15	57	10 ± 25	20

Notes: Fish length is TL as estimated by respondents. Proportion kept is based on respondent's estimates of the number or portions of a fish acquired on the survey day set aside for later consumption.

There were not enough cases to test for significant differences in the frequency of consumption or amount eaten of individual species across wealth groups, except for *pele*, where no difference in mean ranks was found (Kruskal-Wallis test). *Kumba*, *kogo*, *kambale*, and *pele* were the only species eaten across all wealth groups. No poor or field-based households ate any of the 13 *mbufu* specimens reported on our surveys. Similarly, only one rich household (but also only one shamba household) ate any of the 21 unpopular 'bony' fish specimens recorded on 23 surveys.<sup>49</sup>

Households in all wealth groups consumed some fried and smoked fish, although field-based households reported many fewer instances of eating fried fish (1.7% of 57 surveys vs.  $7.4 \pm 1.2\%$  for other groups combined), likely due to their distance from fried-fish sellers in the village. Richer households were more likely to report preserving fish for later consumption, and to save a greater proportion of the item (Table 5.3).

#### *Uses of bought vs captured fishes*

All wealth groups purchased fish more often than they fished, although the difference was less for the middle-ranked group (Table 5.4). When households caught fish, most were kept for home consumption ( $74 \pm 41\%$  of fish, N = 135).

<sup>49</sup> Grouped together as beme, bubu, kasa, kokoto, ndundundu and viliampunga.

**Table 5.4** Frequency (% of surveys) with which households in different wealth categories purchased, caught or received gifts of freshwater fish, and median amount of fish consumed per individual (g/day/AME) depending on mode of acquisition, HARS, (N = 292 surveys).

Acquired by	Wealth Group							
	Rich		Middle		Poor		Field	
	Freq	Amount	Freq	Amount	Freq	Amount	Freq	Amount
Purchase	90.9	35	57.8	33	72.5	41	82.4	41
Capture	9.1	52	34.8	64	25.5	98	17.6	101
Gift	-	-	7.5	48.5	2	14	-	-
N	33		161		51		17	

Households that had caught their own fish, as a group, ate more fish on the survey day than those that had purchased or received fish as gifts, achieving median daily consumption rates of 64g/day/AME vs 35 g/day/AME for the latter group. The distributions in the two groups were significantly different (Mann-Whitney  $U = 8744$ ,  $n_1 = 75$ ,  $n_2 = 174$ ,  $p < 0.0001$ , two-tailed). This trend was particularly notable for households in the poor and shamba groups, who more than doubled their median consumption compared to days on which fish were purchased (Table 5.4). On days when fish were purchased, households differed relatively little across wealth groups in their median daily consumption, with values ranging from 33 to 41g/day/AME (Table 5.4).

Respondents as a group reported catching larger fishes ( $19.4 \pm 11.7$ cm, N=135) than those they purchased ( $16.3 \pm 10.5$ , N=212) or received as gifts ( $14.4 \pm 6.9$ , N=23), with the mean ranks of length significantly different depending on the mode of acquisition (Kruskal-Wallis  $H = 13.67$ ,  $df = 2$ ,  $p < 0.01$ ).

#### **5.4.7 Wealth-related differences in the consumption of other animal foods**

Differences across the village wealth ranks in the frequency of consumption of OAA were found to be non-significant by chi-square testing, although rich households consumed such products most often, on 9% of surveys (Table 5.2). The rich and middle-ranked households were more likely to eat meat, with seven wealthier households consuming domestic or wild meat on 13 survey days (4.7% of 278 surveys)

vs. one poor village and one shamba household eating domestic meat on one survey day each (1.1% of 185 surveys).

#### 5.4.8 Contribution of fish to local incomes

Eight different households together reported selling fish on 22 days (4.8% of all surveys), or 29% of days on which households reported members fishing (N = 77 days).

Although a similar proportion of poor and middle-ranked households caught fish at least once (58 vs. 65%), middle-ranked households caught fish more often and were much more likely than poor households to sell a portion of their catch (Table 5.5). There was no difference in the size (i.e., average length) of captured fish on days that the catch was sold (all or in part) and those when it was consumed entirely at home, suggesting that households were not preferentially consuming smaller (or larger) fishes. However, it may be that on any one day, the catch was split so that fish sold were smaller (or larger) than those consumed at home.

**Table 5.5 Uses of fishes caught by households, across wealth groups, HARS.**

<b>Wealth Group</b>	<b>No. of HH (surveys)</b>	<b>HH that caught (sold) fishes (%)</b>	<b>No. (%) of surveys on which fish were caught</b>	<b>Frequency of HH selling their catch (% of surveys on which fish were caught)</b>	<b>If fish sold, mean proportion sold (% of fish)</b>
Rich	4 (48)	25 (0)	3 (6%)	0	-
Middle	20 (230)	65 (30)	109 (47%)	29	84 ± 21
Poor	12 (128)	58 (8)	16 (12%)	6	33
Field	5 (57)	20 (20)	7 (12%)	71	100
<b>TOTAL</b>	<b>41 (463)</b>				

The survey did not directly collect information on the revenues made from fish sales, and available data on fish prices were too patchy to reliably estimate earnings from reported numbers sold, or to determine which share of the profits went to the

individual in question in cases where he might have fished with a partner. However, estimates of selected villagers' daily and seasonal income from fishing are presented in Chapter 6.

#### 5.4.9 Seasonal trends in households' freshwater fish use

Frequency of consumption of freshwater fish on the survey day was highest from September to November for all households combined. Freshwater fish were the most commonly eaten mboga in two other months as well (June and August), otherwise coming second to agricultural produce (Figure 5.5). Amounts of freshwater fish consumed varied widely across months, with households together achieving their highest mean level of consumption in November (157g/day/AME), roughly three times the median level achieved in the next-highest months of September and October (51 - 55g/day/AME) (Figure 5.6).

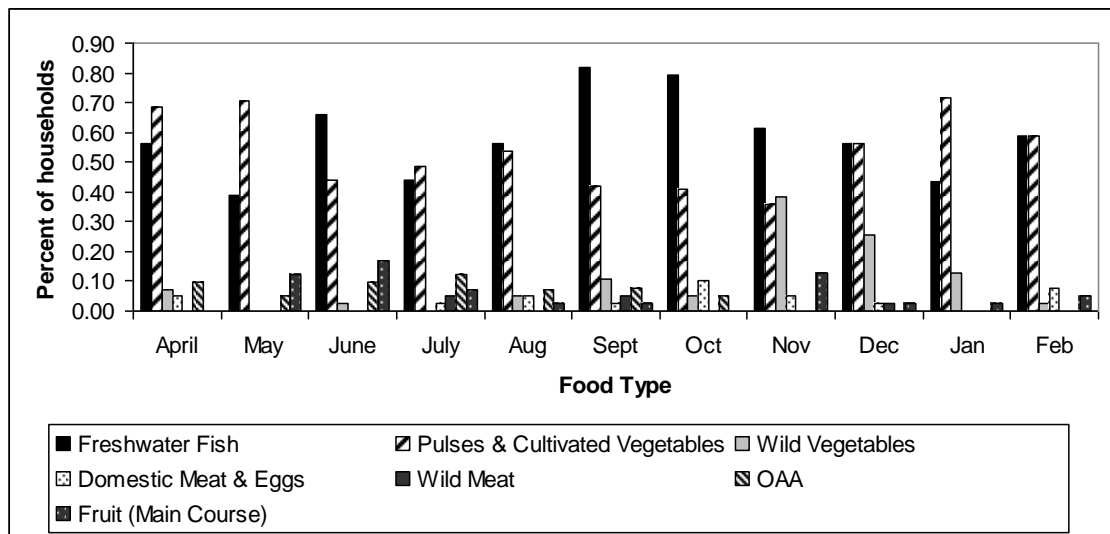
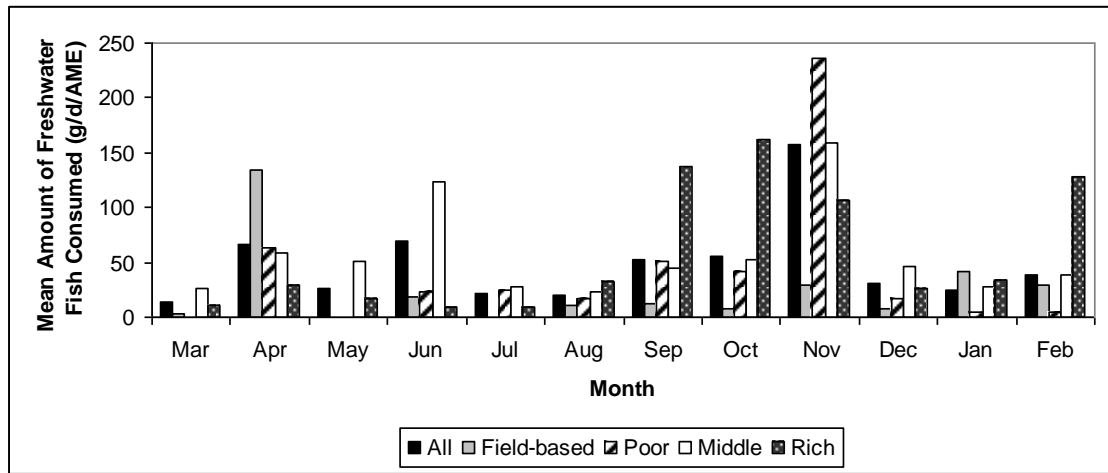


Figure 5.5 Seasonal patterns in the frequency of consumption of different food types by sample households, HARS (N=438).

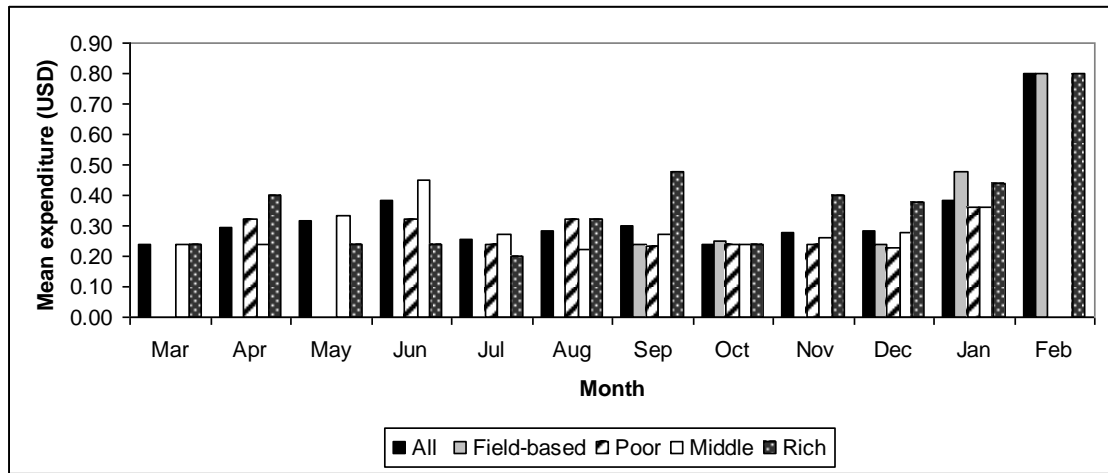


**Figure 5.6 Mean amount of freshwater fish consumed (g/day/AME) each survey month, by all households combined and by wealth group, HARS.**

Whereas some middle-ranked and all or most rich households ate fish on every survey month, no poor households ate fish on the May survey, and field-based households did not report any fish consumption on either the May or July surveys. However, rich households had quite restricted mean fish intake (on a g/day/AME basis) compared to the other wealth groups during most wet-season months, reversing the trend from August onwards in most months (Figure 5.6). In contrast, field-based households consumed more fish on average during the wet season than the dry. Rich households tended to spend more on fish purchases on average than most other households, particularly in the dry season (Figure 5.7). However, overall the mean amount spent per household was relatively constant throughout the year at approximately 300TZS/survey (0.24USD/survey).

The picture of fish availability drawn for us by women in our focus groups helps make sense of the survey findings, and is coherent with the agricultural/fishing year described in Chapter 2. The groups identified September to November as typically the period with the greatest availability of fish in the village, as men turned to fishing after the rice harvest, but noted that there was a second peak in March and April but only for those households living on the floodplain. During this period, men (and some women) would be catching fish on their flooded fields but not making the trip into the village to sell any—hence the difficulty for rich households to buy supplies.





**Figure 5.7 Mean amount spent on daily freshwater fish purchases across survey months, for all households and by wealth category, HARS.**

Similarly, in the period directly following the rice harvest they noted that fish were hard to come by in the village (because men had not yet turned to fishing on the lake) but could be caught in small numbers on the floodplain, enough for *mboga*, using traditional methods such as basket traps (*kisi*, primarily by men) and seining with clothing (*kutanda* fishing by women). As more people turned to fishing in the dry season, rich households could buy fish more easily, and continue to do so until the wet season set in again and supplies on the market dwindled.

#### **5.4.10 Other factors influencing households' freshwater fish use**

##### *Characteristics of fishing vs non-fishing households*

In total, 22 households reported catching fish, caught by 25 different individuals. Most of the time, the person who had caught the fish was the male head of the household (83% of surveys), or a son, male grandchild, or in one instance the brother of the female household head. Only three women were found to have caught fish: two wives (from separate households) fishing with a mosquito net on the floodplain in June (known as *kutanda* fishing), and a ten-year old grandchild using hook and line in July at Lake Ruwe; in all cases the fish were entirely consumed at home.

Most heads of household had caught fish three times or less across the survey year (median = 2 surveys, N = 9 individuals), but others seemed quite dedicated to the task, catching fish between five and 13 times (median = 8 surveys, N = 6). All six of these dedicated fishermen were among the eight households that ever reported selling a portion of their catch, and most were known to me as fishermen. Dedicated fishing households were all ranked in the middle-wealth group and headed by a married man who tended to be slightly younger than male heads of other households (median age of 41 vs 43.5, N= 6 and 30 respectively), with similar adult gender ratios and dependency ratios as other households.

Those households which never reported catching fishes included the wealthiest households, those headed by the sick and/or elderly (i.e., over 60 years old), and female-headed households, although there were exceptions. The one wealthy household that consumed captured fishes obtained them as part of a larger business enterprise, from a reed-fence fishing trap established on the male head's fields (the Tenge *nyando* in Chapter 6). One 'elderly' 60-year old household head fished regularly until his *kutega* net was stolen, and the oldest dedicated fisherman in our group was also 60, so age was not an absolute constraint to fishing. However, when elderly or female-headed households had consumed captured fish it was usually because younger people living in their home had gone fishing or they had received a gift.

#### *Effect of husband's presence on fish consumption*

Married women often told us that there was no fish in the house because their husband had been away recently, and so were not around to fish nor to provide money to buy fish. Nonetheless, looking only at households with a male household head, a chi-square test found no significant difference in the probability of purchasing fish between surveys when the male head was present in the 24h recall period and those when he was absent.

#### *Gifts*

Our survey captured relatively few instances of households receiving fish as gifts or making gifts (N= 16 and 10 surveys respectively), but such contributions were nonetheless important. Female-headed households were about as likely to consume freshwater fishes as were male-headed households (58.8% of 51 surveys vs. 60.2%)

only because they received fish as gifts more frequently (7.8 vs 2.2% of 51 and 412 surveys respectively).

Of the ten households which received fish as gifts, seven were in the middle-income group and headed by men, and the remainder consisted of one middle and two poor female-headed household. Most households (N=7) reported gifts only once. For two others, gifts were regular contributions from family members who were fishermen, both of whom fished *juya* at Lake Ruwe but didn't have homes of their own in the village: one was the male household head's brother and the other the nephew of the female head. A third household received fish twice as a thank you from a fisherman for the husband having lent him his fishing net.

Of the five households that ever gave fish away, four were dedicated fishing households who gave fish that they had caught to their "mama" (biological mother or maternal aunt) or to their fishing partner (the same man who lent out his fishing net), where specified. Fishermen were sometimes reluctant to reveal who they had given fish to however, as such gifts often went to lovers. Prized *ngocho* and *mbufu* were among the species given away, along with more run-of-the-mill *kogo*, *kumba*, *ngocho* and *pele*.

#### **5.4.11 Additional uses of aquatic biodiversity**

##### *Other animal aquatic resources*

Discussions with people throughout the study period revealed a number of aquatic and semi-aquatic freshwater animal species used locally besides those appearing in the survey data (Table 5.6). An additional three fish species were mentioned—*kange* (*Hydrocynus* sp., given a food preference score of '2'), *mbata* (*Schilbe moebiusii*, scored '2') and *mbimbisilo* (unidentified species)—bringing the total of freshwater fish species consumed locally to 19. Also eaten were turtle eggs, juvenile shrimp (probably *Machrobrachium*), clams, various birds and hippopotamus. Hippo meat and oil (for use in cooking) were highly prized by some and widely shared when available, while hippo ivory and hide were taken for commercial sale. Crocodiles were associated with witchcraft (McGregor 2005), and hunted for their skin and teeth only, with locals supplying an outside license-holder.

**Table 5.6 Freshwater aquatic resources (other than fish) named by informants as used for food, medicine and/or other purposes, Ruwe, Tanzania**

Local name	Scientific name / English name	Food	Medicine/ Witchcraft	Other
<i>Animals</i>				
Boko	<i>Hippopotamus amphibius</i> / Hippopotamus	X		X: cooking oil
Sato	Snake (Unidentified)	X		
Ndasi	Turtle (Unidentified)	X		
Kamba = Ngamba	Shrimp (Unidentified)	X	X	
Mamba	<i>Crocodylus niloticus</i> / Crocodile		X	X: sell skin and teeth
Luba	Leeches (Unidentified)		X	
Lukorombe / Ukarasa	Clams (Unidentified)	X*		X: spoons
Konokono	Snails (Unidentified)			X: fish bait
<i>Birds</i>				
Ngolongolupanje	?	X		
Kyobebele	?	X		
Kitipa	?	X		
Bata maji	?	X		
<i>Plants</i>				
Mwaage	<i>Aeschynomene</i> sp.	X		
Ngandalongo	<i>Ipomoea aquatica</i> Forssk.	X		
Nyampioko (or likolomasi)	<i>Achyranthes sessiliflora</i> ?	X		
Makangasa	<i>Nymphaea lotus</i> L./ Water lily	X	X	
Kiyungiyungi	<i>Pistia stratiotes</i> L./ Nile cabbage	X	X	
Nyalanyala	<i>Mimosa pigra</i> L.		X	
Kikolo	<i>Echinochloa cf stagnina</i> (Retz.) P. Beauv.		X	
Mtomondo	<i>Barringtonia racemosa</i> (L.) Spreng.		X	
Mabua	<i>Phragmites australis</i> / Reeds		X	X: fences, containers, etc.
Magugumaji	<i>Neptunia oleracea</i> Lour.		X	

\* *Not commonly eaten.* Source: Women's discussion groups, informal interviews.

Crocodiles, with their association with witchcraft, were considered fit to eat only in a revenge scenario, where people might kill and eat the animal in retaliation for it killing humans.<sup>50</sup> Locals were also adamant that no one would eat the freshwater crabs, frogs or snails commonly observed in the area, even in times of hunger. Snails caught in fishing nets and traps were used as fishing bait only. Women reported

<sup>50</sup> The informant likened this to the way people will kill and eat man-eating lions, such as the one that had recently terrorised the region (see Baldus 2004).

additional uses for *kambale* and hippo oil (used as rubbing or drinking medicine), shrimp (shells used to treat warts), clams (medicinal uses, but also keeping shells as spoons) and leeches and crocodile parts (for witchcraft).

### *Aquatic plants*

A minimum indication of the number of aquatic plants used as food and traditional medicine in the village is given in Table 5.6. Certain aquatic plants featured prominently in local diets and served as cultural markers, with *mwaage* (*Aeschynomene* sp.), *nyampioko* (possibly *Achyranthes sessiliflora*) and *ngandalongo* (*Ipomoea aquatica* Forssk.) described to me as “Rufiji’s own relish” (*mboga wa Rufiji*), although only the first of these ever appeared in our consumption survey.

*Mwaage* was eaten more often than any other green vegetable except for cassava leaves (9.7% of surveys vs. 14.7%), and appeared across all wealth groups and survey months, although half of all consumption was recorded in November and December. Demand for *mwaage* was such that locals transplanted wild plants close to field paths to facilitate its collection, and sold it in the village market whereas most other wild aquatic plants were only for home use. *Mwaage* was tasty and cheap to cook, requiring no oil and only a little salt, and is also considered to be a tonic for the blood. Women compared the taste of *ngandalongo* leaves to cultivated spinach or sweet potato leaves, and *nyampioko* to cowpea leaves. *Ngandalongo* became available during the rice harvest, when few other *mboga* were available. Women also mentioned eating wild rice (*kicheche*), *kibange* and *kiambe*, but I did not manage to find examples of these for identification. Water lily (*makangasa*, *Nymphaea lotus* L.) roots, flowers and, less importantly, leaves can be eaten in times of hunger, but only elderly informants had any direct experience of this.

Of the medicinal plants named, women focused on their uses in childbirth and childrearing. The aquatic plants *kiyungiyungi* (Nile cabbage, *Pistia* spp.) and *nyalanyala* (*Mimosa pigra* L.), for example, were boiled together with other plants to make a wash for newborns, to protect their health but also to guard against evil spirits.

Reeds (*mabua*, *Phragmites australis*) were important for building traditional fish traps and fences, and were also used to build grain storage containers (*kilenge*) and in other construction projects (e.g., chicken coops, fences). The plant with the most household uses by far however was the milala palm (*Hyphaene* sp.), with its leaves used to make baskets, mats, sleeping bags, threshing mats, bed ropes, ropes for fishing,

brooms, grain silos, and other products. It is not strictly speaking an aquatic plant, but as it prefers to grow in alluvial sands and tolerates inundation on the floodplain, can be considered an integral part of Rufiji's aquatic environment. The ubiquitous use of *milala* may help to explain the reduced use of grasses, reeds and sedges in Rufiji compared to other African wetland areas, itself perhaps a result of the notable paucity of aquatic macrophytic vegetation in the region (Turpie 2000).

## 5.5 Discussion

Freshwater fish were an essential part of local diets in Ruwe village, representing by far the most important source of animal protein in sample households' diets and consumed on more than half of survey days. The sale of captured fish also represented a regular source of income for a number of sample households, although more complete information on this cash role is provided in the next chapter. How households obtained and made use of freshwater fish resources varied over the year, but also with household wealth and the age and gender of household heads. Villagers used at least 50 aquatic and semi-aquatic plants and animals, including 19 freshwater fish species, for food, traditional medicine, commercial sale, building materials and other purposes, illustrating the importance of biodiverse wetlands to local livelihoods.

The mean daily amount of freshwater fish consumption reported here ( $48.9 \pm 115$  g/day/AME overall, or  $86.3 \pm 142.3$  g/AME on days fish were consumed) is towards the low end of the range observed across studies of African populations (Table 5.7). It may be that other researchers overestimated fish consumption levels, or that I underestimated mine. Garaway (unpublished data) found that using fish sticks as aids to length estimation improved accuracy (in comparison to asking informants to estimate weight directly) but tended to bias results downwards. The average dry season price/kg I recorded for fish sold in the village was nearly half that reported by households, suggesting that households were either underestimating fish size and/or the relationships I used to convert fish length to weight were inappropriate. I also assumed that all guests at meals were adult males, increasing household AME values (and so decreasing AR consumption levels per AME). Conversion factors used to estimate the FWAE of smoked and sundried products were generic values developed in other regions, so that quantities of processed fish consumed might have been either under or over-estimated.

**Table 5.7 Mean amounts of fish consumed per day as reported in various studies of African populations.**

Population	Fish (g/day)	Consumption unit	Source
Mvae hunter/farmers Cameroon	41	Per capita	Koppert et al. 1993 <i>in</i> Hodgkinson 2009
Farmer/fishermen, Rufiji, Tanzania	49	Per AME	This study
Non-Aka, hunter/farmers, CAR	53.6	Per AME	Hodgkinson 2009
Agricultural community, DRC	60	Per capita	de Merode et al. 2004
Mixed urban, Equatorial Guinea	116.3	Per AME	Albrechtsen et al. 2005
Niger State, Nigeria	217	Per capita	Gomna and Rana 2007 <i>in</i> Hodgkinson 2009
Mixed urban, rural, coastal, forest, Equatorial Guinea	228.6	Per capita	Fa et al. 2009

Most of the studies cited in Table 5.7 have found that individuals ate more bushmeat than fish, which would suggest that animal protein consumption levels in Ruwe were particularly low. The frequency of meat consumption is likely higher than that reported here, given villagers' reluctance to admit to the (illegal) consumption of game. However, my use of local research assistants (who knew when game was available in the village) helped correct for this in part, and meat was clearly less available and affordable than local fishes. In August, when wild game was most available, meat sold for between 1.20 - 2.00USD/kg compared to the average price for fish of 0.96USD/kg. In fact, villagers typically did not buy meat, finding it too expensive, but instead solicited gifts through their relationships with village hunters or those equipping hunting expeditions.<sup>51</sup> Villagers frequently complained of meat scarcity, with elders remarking that people used to eat much more meat. Concurrent research in a nearby village at Lake Zumbi similarly found fish to be much more often eaten than meat, present in 40% of daily meals vs. 1.4% (Hamerlynck et al. 2011).

<sup>51</sup> Portions received were small, shown to me as two cupped hands' worth.

Domestic meat consumption was low as expected, given villagers' limited involvement in livestock keeping.

Historically, fish on the Rufiji floodplain had a critical role to play in food security, traded for cassava flour and other foodstuffs produced on the high terrace in the hungry season or in the case of failed harvests (see Chapter 8). In this way, “fish rescued us from hunger nearly every year”, as one respondent told us. The most devastating famines seem to have occurred when the fish unusually failed to appear, such as during the drought years of 1944-46.<sup>52</sup> Even so, death from starvation in the area is considered to have been extremely rare (Bantje 1980). The widespread availability of fish is perhaps one reason why so few other local aquatic species were part of the food culture, in contrast to the consumption of freshwater snails, molluscs, frogs or snakes in other parts of the world (Garaway et al. 2013, Brooks 2008, Roos et al. 2007, Meusch et al. 2003). Any suggestion I made that local people might eat such creatures, if only in times of famine, was dismissed with the phrase: “Only fish!” (*Samaki tu!*). Consumption of non-local aquatic resources—namely *dagaa*, *mbarata* and prawns—was limited as well, and more common among the richest households. However, the monthly timing of the survey might have meant that we missed concentrated peaks in the consumption of juvenile shrimp (and fishes) as waters entered or left the floodplain, caught in large numbers by women and children using mosquito nets (Hamerlynck et al. 2011).

The near total reliance on local fish species in Ruwe villagers' diets aligns with evidence from elsewhere on the importance of indigenous fish species to food security in developing countries. As reviewed by Kawarazuka and Béné (2011) smaller fish are particularly important, combining typically high levels of micronutrients with features that make them attractive to poorer households. For one, smaller fish tend to be more affordable, which was the case in Ruwe. Larger, fleshier fish were preferred by consumers, with smaller, bonier species perceived as inferior, with some made palatable only through frying. Despite the lower status of smaller fishes in local diets, these tend to be eaten whole, potentially increasing their nutritional benefits (Kawarazuka and Béné 2010). In Rufiji, people ate the bones of fried fish (increasing calcium intake) and the innards of fresh fish such as *kogo*.

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<sup>52</sup> Approximate dates. Named the *yangeyange* famine after John Young, the district commissioner (1946-1947 and 1950-1961) administering the distribution of maize flour at times of food shortage (Hoag and Ohman 2008).



Smaller fish have a second advantage for the poor in being sold in small quantities—hence the dominance of the *fungu*, or bunch, as a local sale unit—fitting in to households' limited daily budget for food. Only the wealthiest villagers and teachers generally had cash available to spend more than the usual 0.24USD/day on fish, and even then sometimes bought fish on credit. Village fishermen explained that while they could sell small fish almost immediately (often selling all of their catch on their walk to the village market stand from the landing site), they struggled to sell large, expensive fish in the village, preferring to smoke these for later sale in the regional markets. The general trend for all fish species was for specimens reported in surveys to be smaller than those I measured in the regional markets, which could reflect a bias in respondents' estimations but is also congruent with a system in which larger fish tended to be sold on to the regional markets.

A third pro-poor aspect of smaller fish is that they are easier to share out among household members (Thilsted et al. 1997). My own observations suggest that this was also the common practice in Ruwe, with small fish parcelled out to individual household members, although adult males could still expect a larger share (see below). Fourth, small fish species are often processed and stored for long periods, increasing household fish consumption over time (Thilsted et al. 1997). However, this situation was reversed in Ruwe, where the largest species (*kambale* and *mbufu*) obtained by our sample households were the most likely to be smoked for later consumption, and wealthier households the most likely to preserve fish.

Wealth differences mattered to household members' immediate fish consumption as well. Rich and middle households ate fish on survey days nearly twice as often as poor and field-based households, and ate significantly more on average. The richest households also ate the largest fishes on average and rarely consumed the least preferred species found in middle and poor-households' meals. In fact, all households appeared to be eating less fish than they would like, given that consumption levels on days that households had caught their own fish were considerably higher than on days fish were purchased. The difference in amount of fish consumed between fishing and non-fishing households is one rarely tested in the literature (Kawarazuka and Béné 2010).

Presence of a fisherman in the household was likely related to a household's wealth rank. Local conceptions of wealth included a household's ability to sustain itself through work, so that those households with able-bodied men were generally

considered better-off than those whose members were less active (see Chapter 3). Able-bodied men, in turn, usually did some fishing unless they had alternative sources of cash income. For the rich households this included hunting, commodities trading and transport (by motorcycle) and/or running milling machines. For the six middle-wealth households headed by able-bodied men who never reported fishing, at least two had alternative cash income sources, with one serving as a village councillor and tax collector and the other running a small stand in the village which sold, among other things, dried fish products which regularly appeared in that home's consumption survey.

It was a constant struggle to acquire cash in the village, as observed elsewhere in the district (Paul et al. 2011). In line with this, villagers mentioned the cash role of fish in conversation nearly as often as its food role. A number of fishermen explained how a good catch would supply enough fish for the day's *mboga* and a surplus to sell for the purchase of flour, accompaniments (e.g., tomatoes, onions) and some necessities (e.g., soap, salt, oil). For a number of villagers we spoke with, these food savings were the express purpose for buying a *kutega* net, either on one's own, with a friend, or on loan from a buyer, to be re-paid in fish.

The use of fishing as a reliable source of cash for meeting daily needs is described at nearby Lake Zumbi (Paul et al. 2011) and matches the description by Béné et al. (2009) of a fishery serving as a "bank in the water". Nonetheless, captured fish in our sample were most often reported as consumed at home, as also found among households in Lao PDR (Garaway 2006) but in contrast to fish caught by households in the DRC (de Merode et al. 2004) or bushmeat caught by the rural poor across Africa (Brashares et al. 2011). The poorest households in our sample were the least likely to sell fish they had caught, perhaps a reflection of their unmet need for fish as a food. Although frequency of fish sales was likely underreported, this bias would presumably have been the same across wealth ranks, suggesting the difference was real. In the study by Béné and others (2009b) the poorest households also kept a larger share of their catch than those better-off, even while fish sales represented the main source of cash income for most households.

Women and children's consumption of fish in this study is likely compromised relative to that of men given constraints on their access to fishing opportunities, fish and food more generally. Women described reduced opportunities to fish compared to when people lived permanently on the floodplain. Then, a woman could combine

fishing (e.g., seining with cloth, but also using basket traps, spears or hook and line) with the rest of her daily chores at those times of the year when fish were easiest to catch. Now, as one older woman told us, “fishing is a project” (*mradi*): one needs to organise a time to go with family or friends on to the floodplain, by which time the fish spotted earlier might have moved on. Where women did report fishing in our survey, in both cases the catch went to home consumption, contributing to household food security as found for women fishing in Zambia (Merten and Haller 2008) and the Congo (Béné et al. 2009b).

Besides fishing less, women had to compete with commercial traders to buy fish. In the dry season months women described watching fresh fish being loaded on to motorcycles for sale in the regional markets with none left over for local sale. Husbands were also able to sell more of their catch when more buyers were around, perhaps bringing fewer fish home, as observed on Lake Victoria (Geheb et al. 2008). Whereas men tend to spend cash on themselves, studies find that women tend to be more attentive to the household’s nutritional needs, especially those of children (Bryceson 1989). At the same time, increased presence of traders could bring economic benefits to women, as discussed in Chapter 9.

Together with reduced control over the amount of fish or fishery earnings entering the home, women had to contend with the cultural practice of men serving themselves first at meals, and taking the greater share of fish. In my host family, for instance, the two young boys often ate little more than the leftover broth poured over rice or *ugali* when fish was served (see also Bantje 1982). On nearby Mafia Island, Caplan (2003) similarly documents the food deficits experienced by women and children compared to adult men. How much fish or other food people, and especially children, were actually eating was complicated by food sharing practices, with small children floating among relatives’ houses at mealtimes, and elderly parents sometimes shared among several households.

In conclusion, this chapter has shown that local freshwater fish species are a cornerstone of local diets, depended on as the main source of animal protein in the area, and provides a clear example of the value of aquatic biodiversity to human well-being. Although households undoubtedly experienced food stress, and many were unsatisfied with their level of fish consumption at certain time of the year, the fact that most preferred species were consumed across all wealth ranks, and that locally available non-fish aquatic species were scorned as food, illustrates the adequacy of the

floodplain fisheries for meeting local food needs and the value of guaranteeing continued access to this resource. However, the analysis also revealed that wealth mattered to use patterns, with poor households eating less fish than wealthier ones and prioritising home consumption over cash sales of any captured fishes. As such, the poor could be expected to be particularly hard hit by decreased access to local fisheries, as would be those households that made a regular income from fishing.

In the next chapter, I turn more fully to the issue of cash earnings from local fisheries as these were not well captured in the HARS yet clearly represent a key contribution to the local livelihoods. My aim is to explore the physical and demographic assets required to participate in the fishery as well as the social relations involved in order to better understand why some households and individuals dedicate themselves more to commercial fishing than do others.

# Chapter 6. Making a living from fishing: Gear choice and the fishing brotherhood

## 6.1 Introduction

The majority of men in our study villages fished, but the degree to which this income mattered to the household could vary widely (Chapter 4), as did the nature of this reliance. As demonstrated through the household aquatic resource use survey (Chapter 5), certain fishermen were dedicated to fishing as a commercial activity, always selling a portion of their catch as well as consuming a portion at home while others prioritised subsistence use. Other commercial fishermen may not have maintained households at all, working full-time and living at fishing camps around the district. This was the case at nearby Lake Zumbi, where the only full-time fishermen were young, unmarried men, many of whom worked illegal boat seine nets, or *juya* (Hamerlynck et al. 2011).

Catches and earnings on the *juya* can be considerably higher than on other fishing gears (Paul et al. 2011). The nets are also more expensive to acquire and run than other nets used in the local fishery, and *juya* fishermen rarely own the nets they work on. Instead, net owners hire workers as part of a four-man crew, and may move their net and crew around the district lakes in search of good fish catches. Crew members often miss their assigned spot on fishing trips, giving more people opportunities to fish than just the nominal teams. The high efficiency of the gear, its illegal status, and the particular labour arrangements around it can be expected to have implications for local livelihood strategies as well as for fisheries management.

In this chapter, I look more closely at the cash role of local fisheries, surveying fishermen at the fishing camps to better reflect participation in commercial fisheries. The objective is to explore who earns the most from local fisheries, and how they gain

opportunities to do so. I first go through the potential earnings that can be made from the three main types of modern gear in the local fisheries (passive *kutega* nets, active *juya* nets and other active gears) as well as from traditional dry-season fishing weirs (*nyando ya kutega*). This serves to establish the different labour requirements and economic outcomes available to fishermen working the various gears and sets the scene for analysing why different individuals might choose to fish with different gears. To that end, I consider patterns of gear ownership and the social relations governing labour arrangements, focusing in the latter case on the *juya* net as the gear which provides the highest potential earnings. I develop a binary logistic regression model to predict which demographic and economic factors might explain an individual's decision to fish with *juya* before moving to a wider consideration of what it might be about the *juya* fishing lifestyle that makes it attractive to some men but not others.

A key feature of *juya* fishing, namely crewmembers' mobility and the consequent involvement of 'outsiders' in local lake fisheries, is explored separately (in Chapter 9) because of its relevance to fisheries management issues (the subject of Chapter 8). Here, I begin with an introduction to the landing sites and an overview of my research methods.

## **6.2 Study Area: Landing sites**

During the study period, there were four fishing camps set up on Lake Ruwe: Mapokezi outside Mkongo, Tenge outside Ruwe, Mtendeni outside Mbambe and (for a short time) Muoi between Mkongo and Ruwe (Figure 2.2). There was no fishing camp at Lake Uba, with many fishermen travelling back to Ikwiriri to sleep, but fishermen could be found during the day in Mpima sewing up their nets and socialising.

Each camp, with the exception of Muoi, was located about a 20-30 min walk outside the closest village. All were extremely basic, consisting of a few simple triangular shelters (*banda*), made up of two rectangular pieces of palm-thatch leaning against one other in length and open at both ends. A table kiln usually ran along one side of the shelter, used for smoking fish, with room for two or three people to sleep on dirt or woven mats on the ground. The person who built the shelter, typically a smoked fish buyer, owned it, but anyone could sleep there if it was unoccupied. Fishermen did not have mosquito nets, there were no latrines, and drinking water came from the lake.

Many more people used the camps than slept there: only people without homes or contacts in the villages tended to sleep in the shelters, and outsiders said they were afraid of staying there overnight unless several shelters were occupied. At the same time, the relatively high flood in the study year had allowed most district lakes to reconnect to the Rufiji river, recharging fish supplies and—according to informants—reducing the need for fishermen to leave their home villages in search of fishing opportunities. As a result, the number of shelters at Lake Ruwe was limited in 2008/09, consisting of just three shelters at most camps (Table 6.1).<sup>53</sup> The exception was Mtendeni with ten shelters. Located on the far side of the lake it was known as the “old person’s camp” as it attracted older fishermen using *kutega* nets to supply smoked fish wholesalers established there, in contrast to the younger crews on more active gears supplying the fresh fish trade out of camps closer to the roads.

Besides the fishing camps, fish were landed at lakeside sites used by residents to draw drinking water and bathe. Local rather than outsider fishermen were the usual users of these sites, in line with villagers’ preference for keeping outsiders away from the village proper. In addition, fishing took place away from the lake, across the channels, ponds and even flooded fields on the floodplain, depending on the water level. Again, fishermen here tended to be local, given the difficulty of access and detailed knowledge of local geography required to navigate the area. The diffuse nature of fishing and difficulty of access prevented me from surveying the floodplain fisheries, apart from the occasional visit to particular ponds.

### **6.3 Methods**

Here I describe our visits to the fishing camps and research tools used with fishermen: a fishing camp survey and daily fishing activity sheets kept by selected informants. For a description of the methods used in surveying reed fence (*nyando ya kutega*) fishing teams, see Chapter 8.

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<sup>53</sup> If shelters were not maintained they did not last more than one fishing season. At Tenge, users neglected to build a firebreak and the five shelters left over from the previous year burnt down in August 2008 in a fire set in a neighbouring cashew orchard.

**Table 6.1 Overview of visits to fishing camps and number of fishermen surveyed, FCS.**

Location <sup>1</sup>	No. of shelters	Residents (% of fishermen surveyed)	No. of fishermen surveyed	No. of camp visits (No. of visits by RA only) <sup>2</sup>	
				Survey Period <sup>3</sup>	Pre-Survey period
Lake Ruwe					
Mkongo					
<b>Mapokezi camp</b>	3	56	25	6 (2)	2
Mkongo village	n/a	100	4	-	-
Ruwe					
<b>Tenge camp</b>	3	20	35	13 (5)	7
Ruwe village	n/a	100	18	-	-
Muoi camp <sup>4</sup>	3	-	-	-	3
Ruwe/Mbunju-Mv.					
<b>Mtendeni camp</b>	10	39	13	4 (1)	0
Mbambe site	n/a	100	6	2 (1)	0
Lake Uba					
Mpima village	n/a	64	36	4 (4)	2
<b>Total</b>			137	29 (13)	14

Notes: <sup>1</sup> Main fishing camps indicated in bold. <sup>2</sup> RA = Research assistant. <sup>3</sup> Survey period, 10 October 2008 – 8 January 2009. <sup>4</sup> Muoi camp had disbanded by late September.

### **6.3.1 Visits to Fishing Camps**

From mid-June to the end of November 2008, my research assistant (usually Moshi Bora) and I regularly visited the three main fishing camps and a landing site at Mbambe, as well as the village of Mpima on Lake Uba, with Moshi making further visits to these sites on his own from 25 November to 8 January 2009 (Table 6.1).<sup>54</sup> My objectives in visiting the camps were to observe levels of fishing activity and, beginning from 10 October when the number of fishermen had noticeably increased, to survey fishermen on their characteristics, fishing activity, and movements. We often weighed and measured fish when at the camps as well, and engaged in participant

<sup>54</sup> We also visited Muoi camp until it disbanded in late September, with the trader and fishermen established there moving to Mapokezi camp.



observation, including sharing fishermen's meals, going out to check *kutega* nets, watching *juya* fishing from shore, and sewing up ripped nets.

When on his own, Moshi followed a schedule I had drawn up in advance showing which camps to visit on which days, with two "free choice" days for him to select the camp at which he felt there was most activity at that time. Besides administering the fishing camp survey he also had an additional form to complete at each visit, providing an overview of the number of shelters, buyers and number of nets of each type at the camp. We paid a final visit to Tenge camp and the Mbambe landing site in March 2009. Both sites were busy (comparable to January-levels), but while Moshi had already surveyed 12 of the 17 fishermen present at Tenge, he had only surveyed one of 16 fishermen at the Mbambe landing site, since most had only recently arrived to the site from other lakes.

### **6.3.2 Fishing Camp Survey**

#### *Survey administration and design*

We used opportunistic sampling to recruit respondents to the fishing camp survey, surveying any fisherman present on our visits who was willing to speak with us. We focused on fishermen using active gear (i.e., *juya* and *mkoko/mkogero/mkwanga/kimea* nets) because these tended to be non-residents, and I expected to capture the passive (i.e., *kutega*) net users (most of whom were resident farmer-fishermen) in my socio-economic survey. If we missed resident *juya* crew members at the landing site, we sought them out in the village later.

Fishermen at the camps were often in a hurry after landing their catch to go to the village to sell fish, to eat, sleep or relax, or to head out to the fields or other work. Our approach was to arrive at the camps as early as feasible, although this usually meant after 8am for the landing sites away from Ruwe, and no earlier than 6am at the Ruwe sites. The *juya* crews would sometimes have already landed their catch by then and gone to the village or to sleep, although the *kutega* fishermen were usually still out checking their nets. Only one fisherman directly refused to participate in the survey, but others may have avoided us. Our sample is therefore biased—given our unequal number of visits to the different camps, focus on active gear users and missing respondents—and cannot be taken as representative of fishermen across the study area. However, it does provide insight into the scale of activity and type of people using Lakes Ruwe and Uba at the time of my fieldwork.

The fishing camp questionnaire was relatively short in recognition of fishermen's desire to get on with their day, taking about twenty minutes to complete. It gathered information on the fisherman's: identity (name, birthplace, residence, language); marital status and number of children; household members (relationship, and whether that person contributed any income to the household); fishing activity; land owned together with his wife if married, and assets owned by himself or other household members; household livelihood activities (whether he or any member of his household had participated in a set list of activities, with the three most important ranked); and movements. We explained the concept of a household to respondents as those people who were part of his family, who cooked together and ate together.

### *Strengths and Weaknesses*

The survey form provided a reason for me to approach sometimes wary fishermen, and helped explain my repeated visits to the camps. As time went on I felt more welcome at the camps, and administering the survey became auxiliary to hanging out there. We could administer the survey quickly, but as a result of shortcuts taken in collecting data (particularly on household size and land holdings) it is not directly comparable to the village-based socio-economic survey.

Apart from the problem of sample bias, discussed above, we also had some issues with uneven data collection. Although Moshi and I administered the survey together for six weeks prior to his taking on the project, in entering the data it became apparent that we had asked certain questions differently. Most crucially, Moshi rarely recorded the nature of people's business activities when asking about income sources, when these likely involved fish trade in nearly all cases.

### **6.3.3 Daily fishing activity forms**

I recruited several village men to fill out a one-page form daily detailing their fishing activity. The aims of the daily fishing activity sheet (DAS) were to gain insight into the variability of daily fishing catches and returns, and to provide a starting point for building relationships with fishermen, recalling McGregor's (2005) technique of having fishermen keep diaries for her. I based the form, with minor modifications, on one developed by Dr. Jean-Luc Paul, an anthropologist working on Lake Zumbi at the time of my fieldwork.

### *Design, sample selection and administration*

The DAS collected information on: where, how long and with whom the recorder fished; gear used and any canoe and net rental fees paid; number of fish caught, smoked, sold, and kept for home consumption or as gifts; buyer's name and destination; and fishing-related earnings and expenses. If the man had not fished that day, he recorded what he had done instead (e.g., fixing nets, farming). There was also a section inviting the recorder to describe any notable events, such as storms or crocodile encounters.

In all, ten Ruwe-based fishermen filled out the activity forms for varying lengths of time between mid-June 2008 and early January 2009 (Table 6.2). I began by recruiting men who were actively fishing early in the season, and then expanded the number of recorders to reflect the growing number of villagers entering the fishery in September. The ten fish recorders together used nine different fishing gears over the recording period, but each tended to specialise in one (Table 6.2). Four of the five recorders recruited early on in the process were primarily *juya* fishermen, while the fifth fished with *kimea* and *kutega* nets. The later recruits all fished primarily with *kutega* nets except for one exclusive *kimea* fisherman.

I was guided by my research assistants and own interactions in the village in selecting recorders. The fishermen were chosen from across the three village wards, and represented the range of types of fishermen, in terms of intensity of activity and gear type, operating in the village. They were also chosen for their ability to read and write, and their good character. This tended to exclude the younger, unmarried fishermen in the village, many of whom had left school early to pursue fishing, or were considered by my assistants to be untrustworthy. As the fishermen were paid for their work, there were likely additional considerations of friendship and patronage influencing my research assistants' recommendations (Chapter 3).

My research assistant Moshi Bora and I met with each recorder individually every two weeks or so to collect and discuss their forms, and give them a set of new blank forms. Moshi continued to collect and review the sheets with the fishermen when I was away from the village.

### *Strengths and weaknesses*

The forms did improve my understanding of the organisation of the village fishery, both from the data collected but primarily because my links with the recorders facilitated my acceptance by others at the landing sites.

I was impressed by the meticulousness with which some of the recorders filled out their forms, but the data were uneven. There were often inconsistencies that had to be sorted out through discussions, especially at the start of the recording period for each individual fisherman. Usually these were simple arithmetic mistakes or misunderstandings of the form, but discussing these seemed to make the recorders anxious. The bi-weekly collection of the forms thus became more of a chore for all involved than a starting point for wide-ranging conversations.

Overall, I trust that the fishermen were recording their work honestly though perhaps not always precisely. Apart from reviewing the forms closely, I also noted days that I saw recorders at the landing site or selling fish in the village, and compared that with information on their forms. In only one case did the recorder clearly make-up his entries on early forms, thinking that we expected him to be fishing every day. The larger issue, in terms of data reliability, is that recorders might have presented a simplified version of a messy reality, never recording loan payments or fees/taxes paid for instance. It also happened that recorders would sometimes miss filling out a daily form entirely, either because they had forgotten, or had travelled far away from Ruwe and run out of blank forms.

#### **6.3.4 Data Analysis**

##### *Analysing the fishing camp survey*

The key decisions I made in analysing the fishing camp survey were in assigning respondents to residency and gear categories. I considered as ‘resident’ any person living in a lakeside village (Mkongo, Ruwe, Mbunju-Mvuleini or Mbambe) who was surveyed fishing at any site on Lake Ruwe, as well as any person from Mbunju-Mvuleini and Mpima surveyed fishing at Lake Uba. A number of non-residents had been born in a lakeside village (18% vs. 79% of residents), which clearly made them more “local” than those born elsewhere. However, I retained the resident/non-resident definition of an “outsider” as the economic opportunities available to fishermen would depend more on their present location than birthplace.

**Table 6.2 Overview of fishing activity reported by the 10 recorders fishing locally (L: in Lake Ruwe and nearby floodplain) and away (A) from the village, DAS.**

ID	Loc'n	M?	Start Date	No. of records	Gear Type										Days spent fishing	Days prep	% days involved	Total Earnings (USD)	
					Juya		Kutega		Kutega + Hooks		Kimea		Other active gear						Hook and Line
					L	A	L	A	L	A	L	A	L	A					L
4	K	Y	18-Jun	145	<b>51</b>											51	38	.61	77
1	B	N	19-Jun	193	<b>60</b>	<b>33</b>					1				2	96	9	.54	355
9	K	N	20-Jun	199			34			<b>18</b>	<b>46</b>			1	99	41	.70	389	
2	N	N	7-Jul	201	<b>74</b>	<b>17</b>				17	1	18			127	11	.69	623	
7	B	Y	13-Jul	179	<b>61</b>	<b>6</b>				1		2			70	21	.51	246	
6	B	N	19-Sep	105			<b>33</b>	<b>7</b>	1			9	2	5	57	3	.57	321	
10	S	Y	19-Sep	100			<b>21</b>		23			1		3	48	21	.69	60	
3	B	Y	20-Sep	103			<b>50</b>						13		63	4	.65	279	
5	N	Y	20-Sep	104						<b>51</b>					51	3	.52	128	
8	N	Y	6-Oct	88			<b>87</b>								87	0	.99	141	
4A	K	-		57	<b>57</b>										57	-	-		
Total				1474	303	56	225	7	24	-	88	47	43	2	11	806	151		2619

Notes: Bolded numbers indicate the gear used most often by that recorder. Loc'n = Hamlets: B = Beta, N = Nyalingwe, K = Kipela, S = Shamba. M? = Married (Yes/No). Preparation days includes interrupted fishing trips and days when a recorder was making preparations to fish. 'Percent days involved' refers to the percentage of days in the total recording period that the individual either fished or prepared to fish. Total Earnings are total personal earnings for the recorder, including estimated earnings from smoked fish sale (see Table 6.4). Sample sizes do not always match those reported in the text because information might have been missing from forms.

I split fishing gear into three categories, namely: passive nets (i.e., *kutega*), *juya* nets, and other active gear (*mkoko*, *mkogero* (or *kuchokoa*) and cast nets, *kimea*). I assigned respondents to gear categories based on the gear they were using at the time of the survey, even though individuals might use different types of gear over a fishing season. My reasoning was that (1) most fishermen owned no other gear besides the one they were currently fishing on, (2) *juya* fishermen typically reported working on *juya* nets from the start of the season and (when asked) in previous years as well, and (3) my fish recorders, where data on gear use were available over a long period, were highly specialised in one gear type (Table 6.2). Nonetheless, the categories are somewhat blurred, particularly for *juya* users who sometimes used other active gears as well. Analyzing differences among gear categories was also made more difficult by the unequal sample sizes for each group.

Earnings are reported after costs. To value shared fishing assets, I assigned each owner their part of the value (e.g., half the net's value for a net shared among two people).

#### *Analysing fishing activity forms*

Fishermen often left blanks on their activity forms. Where I neglected to fill in the missing information in the field, I added in figures during data entry if the missing value was obvious. I did not calculate numbers of fish caught based on revenues reported, or vice versa, but left those columns blank, given the changing composition and value of the catch from day to day. If the fishermen reported numbers of fish caught and sold that was discrepant with the number they reported as leftover for their home use (i.e., for *mboga* or *kitoweo*), I did not try to square those values, but left as is (see below). In general, results provided from the fishing forms should be seen as indicative of the levels of fish caught and income earned, but not a precise accounting of these.

Wherever fishers reported their catch in bunches (*fungu*), I assumed there were five fish per *fungu* unless otherwise specified. I did the same for *fungu* kept as *kitoweo*, although a fisherman's *fungu* could sometimes have many more fish in it than one destined for sale (15 vs. 5 fish in one case; see below). I avoid calculating a catch per unit effort and report a catch per day (or per night) instead. This is because recorders differed in how they reported time spent fishing.

Most caught fish were sold on fresh. Individual earnings are presented as reported by the recorder, and are after costs of gear hire and canoes (if applicable). Fishermen working the *kimea* net with a partner generally split the profits in half. For *juya* fishermen, individual earnings were generally reported as a quarter of the total net earnings (after costs), but were sometimes off by tens or hundreds of shillings.<sup>55</sup> Fishermen would stockpile smoked fish for later sale, either bringing their product to a regional market or selling the fish in the village to a visiting buyer. It is difficult to work out total earnings from smoked fish sales as recorders sometimes reported earnings from smoked and fresh fish together, recorded the number of smoked fish sold but not the value, or reported smoking more fish than they reported selling. In the first case, I estimated smoked fish earnings as the balance remaining after subtracting the number of fish sold fresh at the average monthly fresh fish price from the day's total reported earnings. Where I knew the number of fish sold, or the number of fish smoked remaining after the reported sales, I worked out the value of the product by multiplying by the average smoked fish price received by fishers over the reporting period.

Recorders likely took home a portion of the catch more often than they reported. One reason for this under-reporting of the *kitoweo* is that the take-home catch was often composed of commercially overlooked species, such as *kogo*, *bubu* or *ngocho*, or very small fishes. These would be fishes “left in the bottom of the canoe,” as one fisher put it, and unlikely to be counted up. On the other hand, fishermen did sometimes keep particularly fine fish for themselves, taken out of the saleable catch, such as large *kumba* or *kambale*. For *juya* fishermen, the leftover fish were often used as *mboga ya kambu*, cooked up to feed the team and others at the camp. Nevertheless, to allow for comparisons across recorders and gears, I assigned a value to the take-home catch of each fisher calculated as the number of fish kept multiplied by the average price of the fish sold that day.

Two of the fish recorders often fished on the same *juya* team. Although their individual earnings could vary, the same (or nearly) catches and total earnings were

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<sup>55</sup> Two *juya* recorders once and twice respectively noted that their individual earnings were lower than would be expected because of loan repayments to the net owner, but any such advances received or repaid were otherwise recorded without comment. Nor does payment of village taxes appear directly on the forms, but may also be reflected in lower than expected take-home earnings.

reported on 31 days, and only counted once in analyses combining recorders' data.<sup>56</sup> A third *juya* recorder also filled in the fishing activity form every time another shift used the *juya* net he co-owned (N = 57 days), providing additional information on daily earnings and sometimes on total catch (N = 39). Every recorder did most of their fishing in Lake Ruwe (73.4% of 830 records) or in the nearby floodplain (13%). Analyses presented here are restricted to these local fishing instances, given the focus in this thesis on Lake Ruwe and adjacent floodplain.

## 6.4 Results

### 6.4.1 *Fishing camp survey sample*

We surveyed 137 fishermen and four traders, with the data on traders used to inform our account of the regional trade (Chapter 7). I was present on 37% of the surveys and 55% of visits to fishing sites during the survey period (Table 6.1). Most surveys (94%) took place at fishing camps or Mpima village, in the case of Lake Uba, with a small number conducted at fishermen's homes or gathering places (Table 6.1).

Keeping in mind our bias towards interviewing active gear users and non-residents at the camps, Tenge camp had the lowest proportion of resident users (Table 6.1), as well as the most people fishing with *juya* nets (Figure 6.1). Fishermen using *juya* preferred to fish the deepest parts of the lake (the holes, *mashimo*) where fish congregated, with these most accessible from Tenge. At Lake Uba, where the waters were shallower, fishermen had to resort to a range of other fishing methods (Figure 6.1).

### 6.4.2 *Fishermen's earnings*

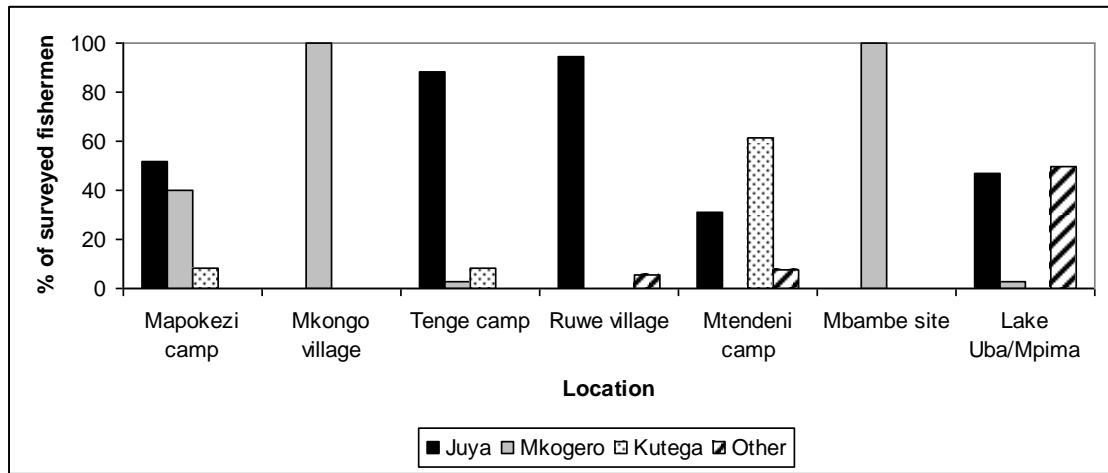
#### *Going fishing: seasonal and daily patterns in participation*

The majority of fishermen entered the lake fishery only once the rice harvest was in. Most of our surveyed fishermen began fishing in July (50% of 114 fishermen for which we had this information) or later. Of the 14 fishermen who started earlier in the year (from March), ten were *juya* fishermen.

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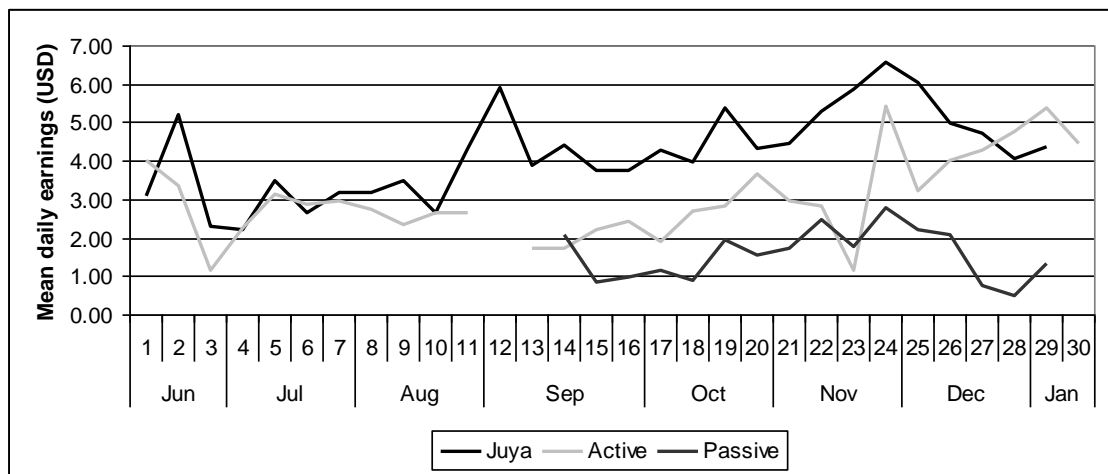
<sup>56</sup> I always retained the information from the same recorder for consistency. On the one occasion when the two forms were vastly different from one another, I excluded both.





**Figure 6.1** Main gear in use by fishermen surveyed at each fishing camp

In general, informants considered that while professional *juya* fishermen were prepared to fish as soon as daily earnings reached 4USD/day, other individuals only entered the fishery once earnings had reached 8USD/day, with even farmers abandoning their field preparations to fish under those conditions. However, based on our fish recorders' results, daily earnings reached the first tipping point in late August, but only for *juya* nets, and never surpassed 7USD/day (Figure 6.2). These figures do not take into account *kutega* net owners' delayed sales of smoked fish, however (see below).



**Figure 6.2** Mean daily earnings (from fresh fish sales only) on different fishing gear types, averaged by week across survey months, DAS.

Once engaged in fishing, fishermen were unlikely to fish every day, with only 51% of individuals surveyed having fished in the previous 24h. Those fishing with *juya* on our survey fished less often than those on other gears, on average (Table 6.3).

Based on daily activity forms, those individuals fishing *juya* had to spend many more days in preparing to fish (e.g., sewing up nets), and also encountered more problems in setting out to fish, citing issues with gear (e.g., the need to replace paddles and ropes, or repair nets) and labour (e.g., team members not showing up to work, giving up one's spot to a friend). In addition, *juya* fishing trips often ended prematurely because of issues such as high winds, crocodiles ripping the net and broken paddles or ropes.

In contrast, the *kutega* net seemed to guarantee a small but reliable supply of food and income. Unsuccessful fishing outings, where the net did not stay in the water all night or the catch was otherwise lost, were uncommon among our recorders. Importantly, it was possible to combine setting and checking the *kutega* net for a couple of hours in the early morning or late evening with a day's work, so that even on days that recorders fished *kutega* they could still pursue other activities. The demanding nature of overnight *juya* fishing trips and the time required for *kimea* fishing trips however generally prevented fishermen from undertaking any other work that day.

When not fishing, nor making preparations to fish, our recorders were most often working in the fields or elsewhere (35% and 7% of 436 records) or resting (29%), although many days were also taken up with social obligations or illness.

#### *Daily and annual earnings on fishing nets*

Fishermen experienced great variability in their earnings across days they did go out fishing, and estimating earnings over the longer term is complicated by the uneven nature of participation. As well, daily earnings on *kutega* nets are difficult to compare directly with those made on other gears because *kutega* fishermen often smoked all or part of their catch, foregoing income on the fishing day for payment (not always reported) at a later date (see Section 6.3.4).

**Table 6.3 Demographic and socio-economic characteristics, movements and earnings on the survey day of fishermen using *juya* nets versus other active and passive gear types, FCS.**

	<i>Juya</i>	Fishermen using Other active gear <sup>1</sup>	Passive gear ( <i>Kutega</i> )
<b>Demographic characteristics</b>			
Age (median)	32.5	29	44.5
<b>Education</b>			
Years of education (median)	6	4.5	6.5
No formal education (%)	24	27	21
Some primary education (%)	27	29	29
Completed primary (%)	46	41.5	50
Some secondary education (%)	2.4	2.4	0
No Ndengereko heritage (%)	16	37	14
Married (%)	54	63	64
Household adult sex ratio	1.1 ± 0.8	1.3 ± 0.8	0.9 ± 0.4
Household size	5.8 ± 2.9	6.8 ± 2.6	6.6 ± 2.8
<b>Land Assets</b>			
Farm their own field (%)	52	78	57
Total land area (median)	2 acres	2.5 acres	2.5 acres
Cultivated land area (median)	0.5 acres	1 acre	1.4 acres
<b>Non-land Assets</b>			
Own current (other) gear (%)	13 (34)	48 (61)	79 (86)
For owners, value of nets (USD)	38 ± 35	56 ± 38	27 ± 22
Total value, all non-land assets (USD)	118 ± 173	137 ± 74	112 ± 63
<b>Income sources</b>			
Fishing as 1 <sup>o</sup> income source (%)	45	37	14
Fishing as sole or one of two income sources (%)	22	2.4	14
<b>Movements</b>			
Living at camp (%)	55	5	86
Of those at camp, % non-resident	84	50	58
Median (range) length of stay (days) <sup>2</sup>	4 (1 – 17)	4 (1 – 7)	5 (2 – 14)
Had fished at least one other location in current season (%)	84	76	50
For those who moved, number of previous locations fished at <sup>3</sup>	2.2 ± 1.6	1.6 ± 1.2	1.7 ± 0.9
<b>Earnings</b>			
Fished (and sold catch fresh) in past 24h (%)	41 (41)	56 (56)	93 (21)
No. of fish caught	636 ± 691 (40 – 2600)	542 ± 423 (100 – 1500)	36 ± 39 (8 – 80)
Personal earnings from sale of fresh fish (USD)	4.49 ± 2.65 (0.80 – 9.60)	4.32 ± 2.19 (0.56 – 8.00)	3.33 ± 3.00 (0.40 – 6.40)
N	82	41	14

Notes: <sup>1</sup>Namely, *mkoko*, *mkogero*, *mkwanga*, *kuchokoa*, *kimea* <sup>2</sup> Does not include the *juya* fisherman who had been at Mapokezi camp for about 50 days, or the *kutega* fisherman who lived year-round at Mtendeni camp. <sup>3</sup>Our counts are underestimates for nine fishermen who reported fishing “on the floodplain” without us eliciting definite locations.

In terms of fresh fish sales, the daily personal earnings of fishermen on our fishing camp survey ranged widely, with insufficient data to discern monthly trends (Figure 6.3) Fishermen using *juya* nets tended to catch slightly more fish, of higher value, than those using active gear, and consequently earned slightly more per fishing day on average (Table 6.3). These figures aligned with those reported by our fish recorders (Figure 6.4).

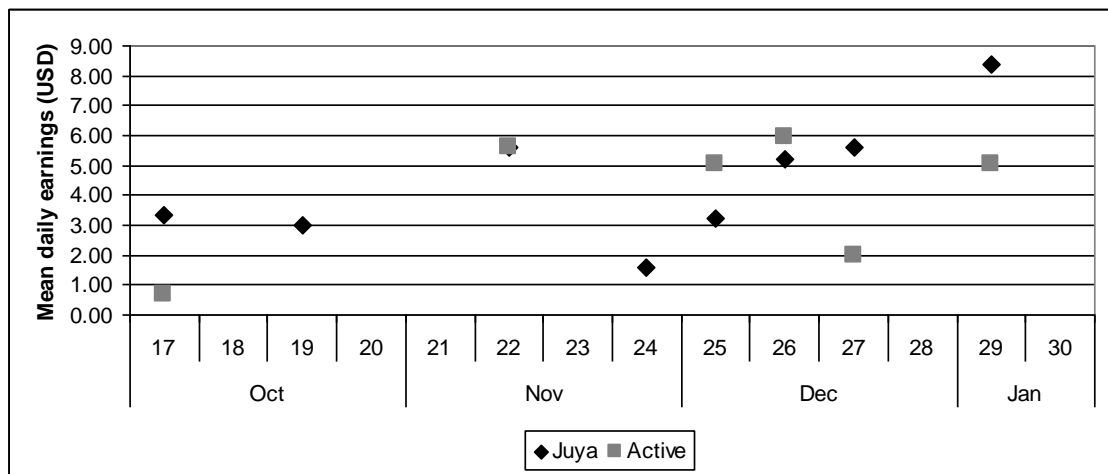


Figure 6.3 Mean daily earnings reported by fishermen on *juya* and all other active gears combined, averaged by week, FCS.

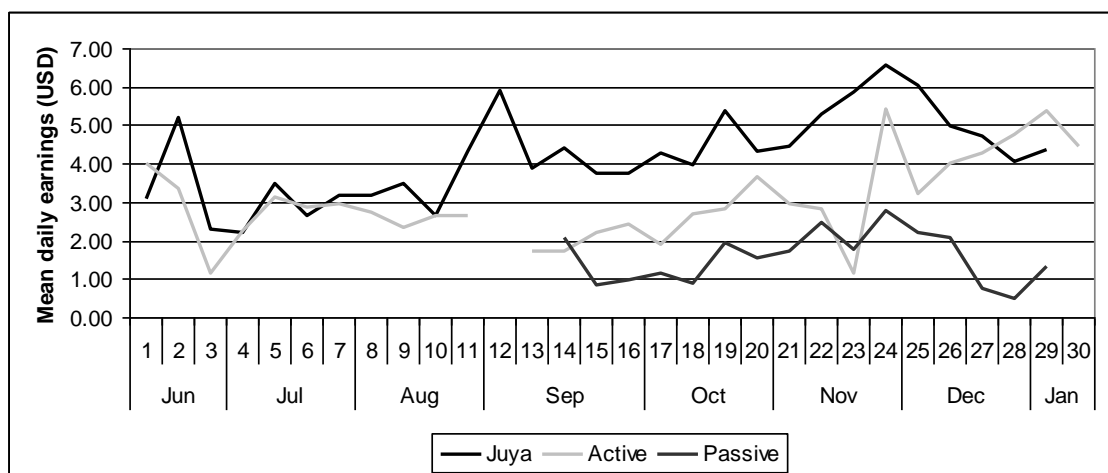


Figure 6.4 Daily earnings of fish recorders working different gear types, averaged by week, DAS.

Estimated earnings from smoked fish sales were substantial for some of our fish recorders (Table 6.4).

**Table 6.4 Reported (R) and estimated (E) numbers sold and earnings from smoked fish by recorders fishing locally with various gear types, DAS.**

Key to calculations <sup>1</sup>		A	B	C	D
Recorder	Gear	Total number of fish smoked (Reported)	Number of Smoked Fish Sold	Smoked Fish Income (USD)	Total Smoked Fish Income (Estimated) <sup>2</sup> (USD)
3	Kutega	989	509 (R)	53 (E)	101
6	Kutega	540	48 (R)	10 (R)	126
			456	34 (E)	
	Kuchokoa	550	41 (E)		
8	Kutega	166	160 (R)	5 (R)	5.17
			6	0.17 (E)	
9	Kutega	693	226 (R)	29 (R)	89
			467	60 (E)	

Notes: <sup>1</sup>Key to calculations: Column C is the earnings reported for the sale of the fish listed in Column B. Column D takes the average fish price (C/B) times the total number of fish smoked (Column A) to calculate total earnings.

Fishermen selling smoked fish appeared to follow two distinct strategies, either accumulating stock for later sale (with two recorders selling fresh fish on only 61 and 53% of fishing days) or selling fresh fish nearly exclusively (on 85 – 100% of fishing days for the three remaining recorders). Smoked fish represented about 64% of estimated total fishing earnings from the *kutega* net over the recording period for the two dedicated fish smokers, and 36% for a third.<sup>57</sup>

<sup>57</sup> This last recorder consistently reported among the highest catches and daily fresh fish sale earnings across all months, which could reflect the fact that he had the largest net of all of the recorders (60 vs 51 to 20 pieces for other recorders).

The total earnings garnered by our fish recorders over the study period ranged over an order of magnitude, even among fishermen using the same gear, likely reflecting differences in gear efficiency (e.g., size of *kutega* nets) and frequency of fishing (Table 6.2). As a rough approximation of annual earnings, I assumed that *juya* fishermen continued to fish at their observed rate and for the same average daily earnings over eight months (July – February), and all other fishermen over four months (September – December), finding that by this scenario *juya* fishermen among our recorders earned 1.4 times more than *kimea* fishermen on average in a year (325 vs 258USD), and 1.8 times more than *kutega* fishermen (200USD). These estimates ignore potential earnings over the wet season (March – June), when fishing with nets is much reduced and usually impracticable for at least two months in any case (see Chapter 2).

#### *Earnings from fishing weirs: nyando ya kutega*

Although rare compared to fishing nets, some villagers continued to use traditional reed fence fishing traps to catch fish for sale and home consumption, as described in Chapter 8. At the dry season *nyando ya kutega* traps we observed, daily catches were hit and miss, but on a good day, delivered many large, valuable fish (from cheap *kogo* early in the run, moving to mature *kumba* and large *kambale* when the channel was almost dry) at a time of the year when fishermen were struggling to catch fish on Lake Ruwe.<sup>58</sup>

Team members would meet every evening at the *nyando* (and every morning as well in productive periods) to check the trap chambers and divvy up the catch. The entire process could take as long as 3.5h for the fences located furthest from people's homes. Each team had set up a "bank" to accumulate savings from their daily sale of fresh fish, for distribution at the end of the cycle. Some teams put all of their money in the bank, drawing out small advances if required, while others paid themselves half of their earnings and banked the other half each day.

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<sup>58</sup> For comparison, one *nyando* user compared his catch to that taken with a 3.5 or 4 inch mesh-size net while lake fishermen were resorting to illegal 1.5-2 inch nets in that period.

**Table 6.5 Characteristics of dry-season weir (reed fence) fishing teams, *nyando ya kutega*, and estimated seasonal earnings, Mbambe field area, Nyando survey.**

Team	No. of members	Rights to site?	Team composition	Elder present?	Fence size (no. of pieces)	Length of season	Total Seasonal Earnings	Survey Dates
<b>Tembo</b>	3	Own field	Two neighbours and an invited 'expert' elder	Yes, Mzee Manga	6	Mid-June - late Sept	492USD total (after 20USD in costs)	6/05; 9/05; 6/08; 9/08; 3/11
<b>Jenge</b>	7	Own field	Field owner and his 3 son-in-laws, 1 brother-in-law, 1 sister's son, 1 unknown	Yes, brother-in-law	10	July - late Sept	Estimated ~360USD (bank: 153USD + daily earnings)	24/08; 4/11
<b>Manga</b>	2	Own field	Field owner and his sister's son	Yes, field owner	4	Jul - ?	?	21/08
<b>Ndege</b>	5	Common land – field path	Team leader and his sister's son, brother-in-law, friend and friend's father	Yes (2): brother-in-law and friend's father	16	Jul - late Aug	Estimated ~200USD (bank: 80USD + daily earnings)	24/08; 28/10
<b>Mpango</b>	4	Own field	Parallel cousins	No	8	May - Sept	480USD total	16/09; 28/10
<b>Ndula*</b>	3	?	Cousins	Yes, leader	?	Jul - Oct	192USD total	21/09; 28/10
<b>Ng'ombe*</b>	1	Asked permission of field owner	Occasional help from his "grandson" through <i>mtani</i> , joking relationship	Yes, himself	14	Mid June - ongoing	1 <sup>st</sup> location: 0.80USD 2 <sup>nd</sup> location: ?	11/08; 31/10

Notes: All names are aliases. \*Considered main experts. Mzee Manga also a partner on the Tembo *nyando*. Survey Dates: The last date was a quick visit to obtain seasonal earnings. Where total earnings are estimated I assumed daily income of 0.40USD/person/day. With the exception of the Tembo *nyando*, fences were prepared by team members and I assumed zero costs. Paying others for the work, based on Omari Bumbo's account, costs between 2.80-3.20USD per section of fencing (1.60USD for the reeds, 0.40USD for the *milala* palm fronds used to make the rope, and 0.8-1.20USD in labour) plus an additional 3.20USD for fixing the entire fence in place (1.60USD for the trees used as support stakes and 1.60USD for labour).

Although total earnings had to be estimated in some cases, and at least one *nyando* failed to produce significant cash earnings, overall members of profitable *nyando ya kutega* teams individually earned between 40 and 171USD before costs over about a three month period (mean:  $89 \pm 55$ USD, N = 5 teams), or between 0.44 and 1.90USD/day, not including the contribution to their food budget of free fish for their *mboga* (Table 6.5).<sup>59</sup> With the exception of the Tembo *nyando*, team members collected the materials for and built their own fences, so I have assumed zero costs for those teams. Although the materials can be collected for free, collection and weaving is time-consuming, involving up to five days for each fencing piece.

### 6.4.3 Direct contribution to household food supplies

When recorders reported whether they had brought extra fish home from their catch for their daily meal, the mean value kept each day was at least as much as other non-fishing households generally budgeted for their daily meals, namely one *fungu* of fish worth 300TZS (0.24USD) (Figure 6.5; see Chapter 5). *Juya* fishermen reported keeping the greatest value of fish for home use, nearly double that of *kutega* fishermen.

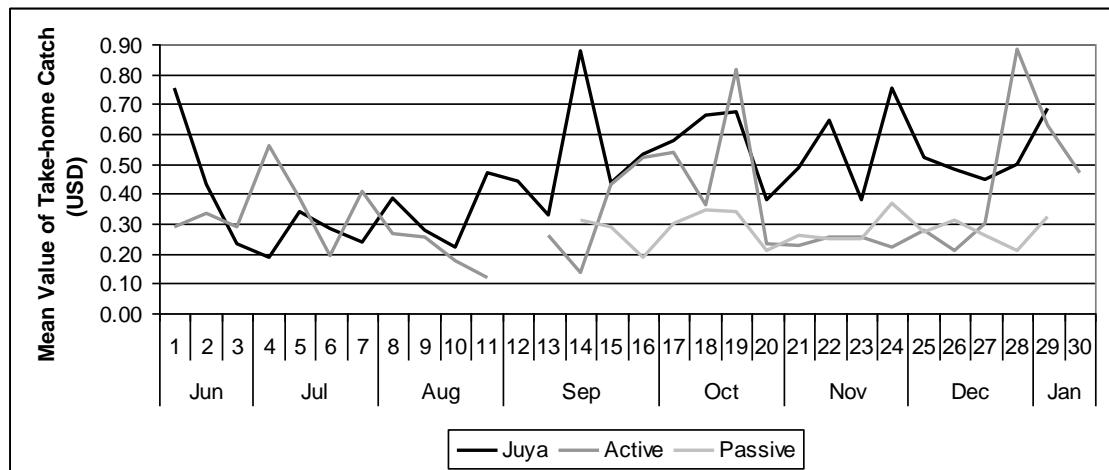


Figure 6.5 Mean value of take-home catch kept by fish recorders on different gear types, averaged by week, DAS.

<sup>59</sup> Just as earnings were variable across the different fishing teams in the season observed, earnings also varied across years. One *nyando* team leader joked that his team was so large this year (7 people) because his fence had earned each member 152USD last year, and 110USD the year before last, but just 51USD this year. Rainy season reed fences in wet years were apparently even more profitable than dry season fences, but I did not collect any information on these.



#### **6.4.4 Importance of fisheries earnings to fishermen's households**

Fishermen and their household members together engaged in a variety of income-earning activities besides fishing. Overall, *juya* fishermen were more likely to report fishing as their household's sole income source, or to name fishing as one of only two important income sources (Table 6.3). Households that had not farmed at all were rare (N = 11 *juya* and 3 *kutega* fishermen), both resident and outsider (6 vs 8 individuals respectively) and dependent in all but one case on fishing/fish trade as their most important income source.

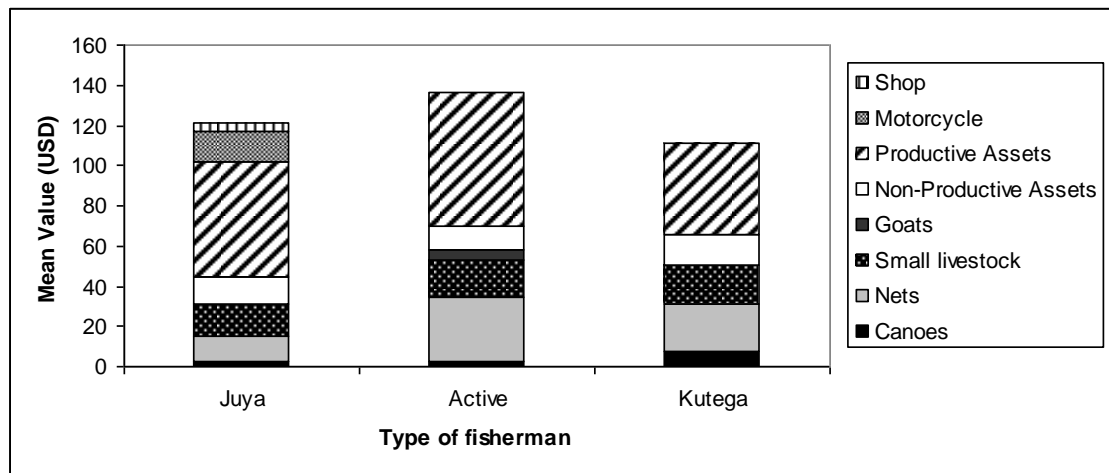
Disentangling the importance of earnings from fishing versus those earned from the fish trade is difficult with our data (see Section 6.3.2). Among fishermen surveyed, fifteen mentioned fish trading as an economic activity, and another 38 reported unspecified "business" activities, which most likely related to selling fish. Of the five fishermen who ranked fish trading as their household's primary activity, four owned gear: Ashiru, a *juya* net owner, and three *kutega* net owners smoking fish out of Mtendeni. The fifth was a member of Mkongo's main fishing clan.

#### **6.4.5 Gaining access to fishing opportunities**

##### *Net ownership among fishermen*

About a third of fishermen surveyed (31%) owned (or part-owned) the net they were working on at the time of the survey, and only 14% owned any part in canoes. (For costs of gear, see Appendix A). An additional 23 fishermen had inactive nets at home (*kutega* nets in 74% of cases), for an overall gear ownership rate of 47% (N = 137 fishermen). *Juya* fishermen were the least likely to own any gear of the three groups (Table 6.3). Fishermen using other active gear held the most value in fishing nets on average, as well in non-land assets overall and in most asset categories (Figure 6.6).

Despite the fact that large nets were outside the budget of most fishermen, several told me that co-ownership was impractical. Each person invariably had his own plans and opinions of where to fish, with disagreements usually ending in the owners cutting up the net and going their separate ways (but see Box 6.1).



**Figure 6.6** Mean value of non-land assets held by different types of fishermen (based on current gear), across different asset categories, FCS.

#### *Labour opportunities on others' nets*

Nine *juya* nets worked Lake Ruwe over the study period, counting only those that made five or more appearances in our fish recorders' records. Three nets dominated the scene, however, being in constant operation from late August. These were owned by: Ashiru, a Mbunju-Mvuleini native living in Mpima; Kassim, born in Ruwe, living in Utete, and running shops in both places; and the Ruwe-based Tembo family, whose communal net-owning arrangement is described in Box 6.1. Both Ashiru and Kassim bought fish off their own nets, while the Tembo family sold to Omari, a resident of Ikwiriri (see Chapter 7). In October, two more *juya* nets were put into regular operation on Lake Ruwe. Each was owned by a Ruwe resident, but neither man had the capital to buy the fish produced, so that Ashiru bought off one and Omari, through his agent, off the other. By March, only the Tembo net remained, joined by three other new *juya* nets, one of which was owned by a Ruwe resident. Of other crewed nets, the survey recorded fishermen working on *mkogero* nets under ten different owners, five *mkoko* net owners, and up to eleven *mkwanga* net owners.

#### *Getting a spot on the juya crew: Social relationships*

Fishing crews were typically assembled by the net owner, who might fish on the net himself or assign a crewmember to lead the group. Net owners we spoke with

*Box 6.1 Sharing net ownership: a clan-based co-operative*

The only co-owned *juya* net we came across in our study was owned by members of the same Ruwe family, a practice started in the 1980s. This year's net and two canoes were owned by at least five clan members, and possibly more. We observed up to eight people at a time sewing up the clan's net, consisting of one of our fish recorders, his two older and one younger brother, a parallel cousin, his sister's son, his "son-in-law" (the husband of a woman with Tembo ancestry through her paternal grandmother) and a neighbour. Some of these people would have been only crew however, with one man telling us he had already put in two days' work sewing in the hope of earning a spot on the next fishing shift. Workers and owners of the Tembo net would come together in the late afternoon to the "office", as they referred to the open area in front of the eldest brother's house, to methodically sew up the net. While sewing the group would discuss who should go fishing that night. They would also receive visits from their buyer and his agent here, preferring to discuss money matters away from the landing site where others might overhear.

Catches and earnings from the net were managed to meet team members' social obligations and protect their investment. To the latter end, the team set aside 1.60USD from each day's earnings towards maintenance of the current net and savings for next year's ("*fungu ya nyavu*", the net's share)—a common practice among all gear owners. The amount of fish the Tembo team kept from their net as *kitoweo* was notably greater than that taken by other *juya* teams however, as revealed through the daily activity forms. The important social function of the net was also evident when one of the brothers was preparing to host his daughter's coming of age ceremony. As guests began to arrive to his home (up to one week before the event) he was allowed to take home many more fish than his crew mates.

insisted that they had no particular requirements in selecting crew for their net, apart from trustworthiness. In fact, one owner considered it a disadvantage to work with a permanent crew since he could not afford to let the net sit idle while a worker left to

deal with the farm or family emergencies. Another buyer told us that crew would invariably disappear once paid (as likely as not on a drinking spree), and not be seen again until the money had run out.

Despite net owners maintaining that they had no special criteria for selecting crew, family connections clearly played some role. One villager preparing a *juya* net for later in the season told me that part of the reason for the investment was to be able to offer work to his family and friends. Among our four *juya* fish recorders, the two with no strong family connections to net owners worked between six and eight nets as these appeared on the lake, each spending no more than 24% of their fishing days on any one net. In contrast, a third recorder spent 65% of his fishing days on Lake Ruwe on his kinsman Kassim's net while the fourth, a Tembo, co-owned and fished exclusively on his own clan's net, and preferentially staffed his net with relatives (Box 6.1). At the fishing camps, Ashiru had assigned his parallel cousin to be the leader on his *juya* net at Lake Ruwe, and his nephew to run his net at Lake Uba, and two other crew members on two different nets told us they were each working for their maternal uncle.

#### *Conflict with net owners*

The day-to-day operations of *juya* nets working out of Ruwe are described in Chapter 7. Here, I focus on the relationships between crew members and their *matajiri* (i.e., holders of capital, the net owners and fish buyers) to argue that, although dependent on the latter for access to fishing opportunities, by banding together fishermen had various means of resisting exploitative practices.

To counter fishermen's tendency to squander their earnings, and at fishermen's own request, buyers did not usually pay the crew for their catch every day. Instead, the buyer would bank the money, giving fishermen a small daily advance, as explained in Chapter 7. However, managing fishermen's requests for loans and their late repayments was a delicate business, one Kassim, as a novice net-owner/buyer, had not yet perfected. His fishermen were expected to pay Kassim for the use of the net (1.60USD) and canoes (0.24USD each), the village tax if collected that day (0.80USD) and to repay the daily advance (0.80USD each) at every fishing trip, for a total of up to 5.84USD deducted from the proceeds of the fish sale regardless of the size of the catch. His inflexibility caused increasing resentment among the crew as the fishing

season proceeded, particularly as a “good boss” would have waived all fees if the catch was below 12USD.

Together with this rigid approach, fishermen noted that Kassim had failed to assign a single overseer for the net, so that his crew sewed up the net without method and did not fold it properly after use.<sup>60</sup> As frustrations grew, crew members no longer showed up to sew the net at all, leaving the task to two of Kassim’s relatives. In response, Kassim took his net to another lake but soon returned. By then, some of his crew had switched to another *juya* net. When we spoke with them, they were considering whether to go out fishing once more on Kassim’s net but only in order to sell the fish to another buyer and then rip his net on submerged logs as a way to explain the poor catch.

The problem of moral hazard, namely that net owners, if not present on a fishing trip, could not monitor whether fishermen were taking care of the gear, was an issue for other *matajiri* as well. One of our interviewed buyers, Omari, had recently decided to sell his own *juya* net and two canoes because of “poor communication” with his crew, explaining that without a personal stake in the net the fishermen had failed to take care of it. In future, he planned to buy gear for his crew and have them pay off the amount gradually, deducting the advance from their fish sales. Even then, fishermen might abscond with the net before paying off their debt, given the lack of an effective legal framework to develop or enforce agreements among crew and *matajiri*.<sup>61</sup>

Despite a degree of independence ensured by mobility, lack of oversight on the fishing grounds, and a non-existent legal framework, fishermen could only continue to work if nets were available. In that sense, the *matajiri* retained the upper hand over fishermen, sometimes frustratingly so. One fisherman complained to us that, although many fish remained at the lake he had been fishing at previously, his net owner had moved locations “because he was following women, not fish”.

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<sup>60</sup> We met a *juya* fisherman who had been working another net who left for the very reason that there was no overseer, explaining that the net’s condition deteriorated to the point that it was bringing in very small catches.

<sup>61</sup> In examining all available court records held at Mkongo, we came across only one case dealing with fisheries, of a net owner suing for the return of an advance to two fishermen.

#### 6.4.6 Who fishes with *juya*?: A binary logistic regression model

Given the higher earnings that could be made on the *juya* net, and its status (at least at Lake Ruwe) as the main gear for supplying the fresh fish trade, I used a binary logistic regression model to explore which demographic characteristics and physical asset holdings might correspond to an individual's decision to fish with *juya* (scored as 1) or not (scored as 0) in the study period (Table 6.6).

**Table 6.6** Logistic regression model predicting an individual's likelihood of fishing on the *juya* nets, FCS.

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Tenge Camp (1=Yes)	2.742	.555	24.434	1	.000	15.518
Resident (1=Yes)	-1.369	.461	8.826	1	.003	.254
Household size	-.215	.081	7.070	1	.008	.807
Constant	1.756	.660	7.076	1	.008	5.789
Model $\chi^2$	51.16				% Correct Classification	
-2LL	145.258				Overall	80
df	3				Did not fish with <i>juya</i>	79.6
p	<0.001				Fished with <i>juya</i>	80.2
No. of observations	137					
Variables not retained in model:			Age, Marital status, Total land holdings, Total Non-land asset value			

The control variable coded for whether or not an individual was surveyed at camp Tenge, the main landing site for *juya* nets on Lake Ruwe. I chose as an explanatory variable whether or not the individual was resident to the area, given that *juya* fishermen tend to move around the district more in search of fishing opportunities. Residency could also serve as a proxy for one's social connection to local *juya* net owners, in the absence of better social capital measures. Young, unmarried men without lands of their own tend to be the only source of casual labour in Rufiji District (Lockwood 1998: 129), and as such I included age, marital status and

land holdings as additional explanatory variables, together with an indication of household size. In terms of land holdings, those individuals with less access to land might be more reliant on fishing, and seek out work on more efficient gears. Finally, wealth level, as reflected in holdings of non-land assets, might also correspond to the likelihood of individuals' fishing with *juya* nets.

Results from our model indicate that fishermen working out of Camp Tenge were nearly 16 times more likely to fish with *juya* than those fishing elsewhere. Few other explanatory variables were significant, although resident fishermen were 0.25 times less likely to fish with *juya* than were non-residents and likelihood of fishing with *juya* decreased with increasing household size (0.8 times less likely with each additional household member). The model was significant, but only 80% correct in its overall classification of fishermen.

Although not found to be significant in our model, fishermen using *juya* nets and other active gears tended to be younger than those using *kutega* nets and less likely to be married (Table 6.3). Among landless fishermen (defined as neither the individual nor his wife having land of their own, N=30, or 22% of all fishermen), most were *juya* fishermen (60%), and two-thirds (N=20 fishermen) had household members that did farm. Of the ten fishermen with no agricultural land or income, all were heavily invested in fishing, with two owning *juya* nets and the others reporting fishing or fish trading as their main income source. Although, as a group, *juya* fishermen held the least value in non-land assets, the two individuals with the greatest holdings overall were both *juya* fishermen, with one (Ashiru) also an important buyer and net owner.

#### **6.4.7 *An occupation apart: The fishing brotherhood***

There is clearly something about *juya* fishermen that sets them apart from others, although our analysis of fishermen's demographic and socio-economic characteristics could not draw these differences out with confidence. As a group *juya* fishermen tend to depend more on fishing for their livelihoods than other fishermen, earn relatively more (despite the unpredictable nature of their work), hold less value in fishing gear, and—as explored in Chapter 9—move around more in pursuit of fishing opportunities. In a society where people identify first and foremost as farmers, their chosen way of life is unusual.

Professional fishermen emphasised the camaraderie that existed amongst themselves, with one stating that fishermen were guided in their relations “by cooperation and togetherness” (*ushirikiano na ujamaa*). Others referred to “the company” of fishermen, or more often their fishermen comrades (*wavuvi wenzake*). An explicit component of this good-fellowship, as fishermen often told me, was allowing your colleagues to fish at your local waterbody, just as you would wish to be allowed to fish at theirs. Furthermore, they explained that one could show up at any camp in Rufiji District and receive food and shelter from those staying there.

Crews on the *juya* net were bound together by their shared experience of physically exhausting and dangerous work. The teams can set and haul the *juya* net up to twenty times per night, although more usually 8 to 15 times. Encounters with crocodiles, snakes, and occasionally hippos were common, and fishermen spoke often of their fear of falling out of their canoes.<sup>62</sup> Mosquitos made the work particularly uncomfortable and increased exposure to malaria. Finding replacement crew members at short notice was difficult, with working *juya* fishermen and net owners explaining that few people were able and even fewer willing to do this kind of work. Although fishermen insisted that a novice could get the hang of *juya* fishing after just a few outings, several villagers who had tried it told us they would rather be at home sleeping than on the lake hauling heavy nets through the mud.

When not fishing or sleeping, many *juya* fishermen were busy drinking or getting stoned together, contributing to their poor reputation. One team of unmarried non-resident *juya* fishermen we spoke with told us that they spent all their money on alcohol, laughingly describing their need to look like big men, “the boss”, whenever women were also present. They claimed to spend as much as 80 – 160USD on such drinking sessions. Other young *juya* fishermen feigned panic when I tried to work out their spending on marijuana, telling me they did not want to count it up.<sup>63</sup> These men said they smoked pot to make fishing easier, claiming that it made the work go by faster and took away their fear of crocodiles. Too much drinking and fights over women were cited as reasons for frequent conflict at fishing camps, which were often blamed on outsiders (see Chapter 9).

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<sup>62</sup> Our fish recorders reported two run-ins with hippos and 20 instances of nets ripped by crocodiles, which for the four occurrences reported by *juya* fishermen involved enclosing the animals in the net.

<sup>63</sup> It was about 100TZS/day/person, or a third of the daily household budget for fish.



The younger, pot-smoking fishermen (but also some of the older, outsider *juya* fishermen) stood out in their dress and attitude from other men in the village, looking more like tough urban dwellers than rural farmers. They wore jeans rather than cotton trousers, cool ‘import’ T-shirts bearing English words and bold graphics, and often a wool tuque and/or sunglasses. Some went shirtless even when far from the landing sites, something that was never done by respectable villagers. A walkman or mobile phone was the ultimate accessory, although phones were coveted by all villagers. Many of these youths lived in Kipela, or came from Ikwiriri, and would roam Ruwe village in small groups stopping at the houses where alcohol or pot were sold. The young fishermen we spoke with often had aspirations of moving to Dar es Salaam, but those that had done so and returned reported that finding work there was difficult. At least in the village, one returnee explained, there were opportunities to earn money by selling mangos or cashews (often stolen) or by fishing.

Finally, *juya* fishermen were alike in their general distaste for farming, but recognised that full-time fishing was not compatible with married life. *Juya* fishermen typically explained that they preferred fishing to farming because of the speed at which one could earn money. People contrasted the immediate earnings from the *juya* and other active gears with the long wait between preparing one’s field and reaping the harvest. In contrast to more dedicated fishermen, part-time fishermen prioritised farming over fishing for both practical and cultural reasons. Chief among these was the need to avert hunger, with farming viewed as the best means of putting food “*ndani*” (“inside” the house or granary). The association of rice-eating with the good life and local belonging was also strong. One local smoked fish buyer said that he would never give up farming no matter how well he did in business because he would not want his children getting teased for not eating freshly-harvested rice. Villagers also considered full-time fishermen averse to the sustained hard work involved in farming, although this view was often conflated with contempt for the young: “Farming hurts your back, the young just want to fish,” in the words of one informant. Another man despaired that: “All [young people] want to do is fish. They refuse even to help you carry bags of rice from your field”.

## 6.5 Discussion

The very different lifestyles associated with gear choice—including around earnings, ability to pursue other activities while fishing, labour arrangements and (as explored in Chapter 9) higher mobility—contributed to the development of an occupation-based social identity among *juya* fishermen which set them somewhat apart from other fishermen and their wider society. Fishermen themselves referred to this brotherhood or “company” of dedicated fishermen, and to the support offered by their fishermen comrades, including information on fish availability and prices, shelter and food, and spots on fishing crews. The ability of *juya* crewmembers to walk away from a net in the knowledge that they would be welcome at the next fishing camp (provided nets were available) also gave them some measure of bargaining power vis à vis net owners, and likely contributed to owners and buyers characterising fishermen as stubborn and troublesome (*wabishi, wakorofi*).

That dedicated fishermen (most often using *juya*) could earn relatively high sums compared to other gears was widely acknowledged and confirmed by our survey and fish recorders. *Juya* fishermen were also the most likely to begin fishing early in the season, as soon as practicable after peak flood, and to report fishing as their household’s sole income source, or one of only two sources. In these respects, the group conformed to the general assumption in the fisheries literature that full-time fishermen are highly productive, though at the cost of higher risk, and farmer-fishermen, with their diversified activity base, are at lower risk but less efficient (Béné 2009). Risk to *juya* fishermen came in multiple forms. The high cost of the *juya* net meant that very few fishermen owned their own gear, making them dependent on net owners for opportunities to fish, contributing to livelihood uncertainty. The need to fish as a team exposed them to further risk if a crewmember did not show up, while broken or stolen gear, bad weather and encounters with animals could also cause them to miss a night of fishing.

Relying on fishing as one’s primary livelihood activity brought potentially higher rates of fatigue and illness due to difficult work and social conditions. Rates of HIV/AIDS for one tend to be higher among fishermen living apart from their wives and usual social milieu (Allison and Seeley 2004). Local women told me that men could attract lovers with gifts, including of money, fish and clothes, and identified fishermen as among the men most likely to provide these, as well as telling cautionary

tales of outsiders spreading infection. Living at camps with no clean water and the threat of violence further increased fishermen's vulnerability, and while they always had something to eat, it may be a reflection of their hard existence that lunches we shared with them included rotten and worm-eaten fish.

The relatively high cost of food in Rufiji further exposed any would-be full-time fisherman to risk, as few people in Rufiji could afford *not* to farm (J.L. Paul, pers. comm.). This could help explain why every fisherman on our survey maintained ties to larger households even if unmarried and/or an outsider, and nearly all had access to farm income from their own and/or household members' land. In this way, most fishermen in Rufiji district appeared to be engaged in a "multi-active" strategy (as per deHaan 1999), working together with other household members to build diversified, more secure livelihoods. I did not explore how such support networks worked in practice, beyond hearing fishermen's frequent reports of returning home to help out with agricultural tasks. There appeared to be an expectation that young, unmarried men could keep their fishing earnings for themselves, however, with several mentioning that they might contribute small amounts to their household occasionally but were not obliged to do so.

Those fishermen who owned their own gear could fish at will, with *kutega* nets almost guaranteed to bring in a daily catch during the fishing season. A strategy among focused *kutega* fishermen was to invest money made through *kutega* fishing into buying better nets (larger gill nets or *mkoko* nets), with estimated annual earnings approaching those made by *juya* fishermen. The key difference was that while *juya* fishermen earned money every day, those selling smoked fish had to wait for their pay-offs. Similarly, individuals running reed fence traps waited patiently to receive the bulk of their earnings at the end of the fishing season. Far from being a marginal and low-value activity, earnings from the traps could be quite high for minimal investment, and seemed to represent a particularly important source of income for vulnerable elderly men. While the latter did not necessarily have the strength to set up or run the fences themselves, they held a near monopoly on the traditional knowledge necessary for siting the fences and seeing off (through witchcraft) dangerous animals and competitors' curses. Members of *nyando* teams typically were proud of their hauls, and considered that few did this work only because they did not have the necessary knowledge.

The use of other active gear besides *juya* nets was not well captured in the fishing camp sample, or my research more generally, but seemed to lie somewhere between the two extremes of slow and steady *kutega* fishing by farmer-fishermen and fast-paced *juya* fishing by dedicated fishermen. On the one hand, *mkoko* nets were the main gear of several older, resident fishermen living at Mkongo and fishing only at Lake Ruwe. On the other hand, alternative active gears such as *mkogero* nets also attracted young, mobile, unattached fishermen as suggested by the appearance at Mbambe towards the end of our survey of six fishermen who had been working these nets at other district lakes up until then. Part of the problem was in lumping different nets together (due to my small sample size) when the work involved could be quite different: younger fishermen were prepared to take more risks while fishing, getting in the water to scare fish into *mkogero* nets while those with *mkoko* nets stayed safely in their canoes.

Many young, unmarried fishermen might have been fishing in order to accumulate savings to be able to marry, despite their flashy expenditures on clothes and accessories. Although never specifically mentioned in our study as a reason to fish, the bride price did represent a relatively high expense in a society where cash-earning opportunities were limited.<sup>64</sup> If this were the case, it would mean that membership in the fishing brotherhood was a temporary phase in life for many, reflecting one's position in the life cycle rather than a fixed occupational choice. At Lake Zumbi, for instance, *juya* nets were manned almost exclusively by fit, unmarried young men with no other responsibilities (Paul et al. 2011). Although I did not find the same sharp division by life stage in our survey, with nearly half of *juya* fishermen married, they did tend to be younger and more often single than those using passive gear. Furthermore, fishermen (single and married alike) admitted that once married, a man could no longer follow the best fishing opportunities (or carry on drinking) but needed to be at home with his wife to meet his responsibilities (see Chapter 2).

Nonetheless, I had the impression that some of the older, unmarried (sometimes divorced), *juya* fishermen were in no way looking for or fit for marriage, deriding farming as back-breaking labour and/or with reputations as inveterate

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<sup>64</sup> In the examples I heard, two grooms paid 80USD and a third 104USD in bride price, in addition to a smaller fee of 8USD referred to as a "letter fee" (*pesa za barua*) enclosed with the initial written proposal to the bride's father. The groom must also provide gifts on the wedding day, consisting of new clothes (at least two wraps or *kangas*, one dress or *kitenge* fabric, underwear, headscarf, and a pair of shoes), at an estimated cost of at least 16USD.

drinkers. For them, full-time fishing was indeed a career, if perhaps a marginal one. The importance of marriage as a mark of adulthood is long-standing in Rufiji, as shown by the fact that only adults, i.e., those men with a wife and family to support, were allowed to participate in communal *nyando* fishing expeditions (see Chapter 8). Similarly, having a *shamba* and being a farmer also seemed to be important to people's sense of self. Whenever I asked a young, single man whether he had his own field, the usual answer was negative, quickly followed by the claim that he would be clearing land this year to start farming. Villagers of all ages, men and women, puzzled at my focus on fishing, would emphasise that local people were farmers first, and fished only to get extra food and money.

Fishermen could have been fishing to accumulate savings for reasons besides marriage, including for investment and as a safety net. Clearly, some fishermen, such as Ashiru, had managed to build up stakes in large nets and transport (i.e., motorcycles) to establish thriving fish trading businesses. Others were less lucky, with one villager friend of mine spending all the money he'd painstakingly amassed over six months on his child's emergency medical expenses, losing savings he'd garnered first by pit-sawing, then by investing in a fishing net, and finally by running a small smoked fish trading enterprise. This difficulty of not only making but holding on to savings was described by several fishermen, who regularly cited school fees as a major and devastating expense. Paul et al. (2011) eloquently describes the struggle faced by Rufiji fishermen who have no choice but to risk their lives fishing illegally in the Selous Game Reserve to pay for their children's education.

The overall picture that emerges, though not always evident from my survey results, is of the youngest fishermen working on active gears besides *juya* (many of which require little skill but much foolhardiness) in search of fast cash for a short time in life, while those men who remain in the fishery longer-term develop more specialised skills and connections (i.e., facilitating their hiring as crew on the *juya* nets), eschewing farming for as long as they are physically capable because of life circumstances (e.g., divorce) or character. More stable adults turn to farming combined with *kutega* fishing on marriage, possibly parlaying savings into better nets, with the most focused (and lucky) among them establishing themselves in the fish trading business.

This chapter has shown that, while fishermen using *juya* nets might be able to earn the highest annual incomes from the fishery, they were exposed to higher risk

than fishermen using other gears. A fisherman's physical asset holdings were not found to predict participation in *juya* fishing, and wealth likely has less of a role to play in the decision than other factors related to lifestyle: youth, lack of alternate demands on labour (through marriage and farming) and the attraction of living with one's peers away from home.

Livelihood strategies based on commercial fishing depend fundamentally on the market. In the next chapter, I trace the movement of fish out of floodplain villages to the regional markets, and consider how benefits from the trade are distributed among suppliers, intermediaries and market vendors along the commodity chain.

# Chapter 7. The Rufiji freshwater fish trade: Opportunities for rural economic development

## 7.1 Introduction

In Africa, markets for commodities are characterised by the activity of numerous small traders, with many more transactions involved in delivering a product to the final consumer than would typically be the case in developed economies, where large firms dominate (Fafchamps 2001). In this sense, Fafchamps argues that markets are of paramount importance in Africa, and yet little is known of how these operate in practice, in line with Polly Hill’s argument made two decades earlier that researchers had neglected “indigenous economics” (1970, p.4). In getting to grips with the South African maize industry, Bernstein (1996) championed combining a *filière* approach—following a commodity at each stage of its journey from production to consumption—with an analysis of the social relations and institutions affecting how markets work in practice. As Ribot (1998) demonstrated in his study of the charcoal commodity chain in Senegal, such analyses provide a tool for “understanding who benefits from natural resources, how they benefit, and how those patterns [...] might be changed”.

Markets for African floodplain fisheries remain little studied in comparison to other coastal or lake fisheries (see Chapter 1). Abbott et al. (2007b) suggest that floodplain fisheries, by their inherent variability—due not only to changing availability of fisheries resources but also to changing labour demands on participants—are less likely have fixed landing sites, and therefore less likely to be linked to outside systems of production and consumption, or to involve complex trading arrangements between fishermen and buyers. However, a technical report on the Rufiji delta and floodplain fisheries trade, prepared for REMP on the basis of a 10-day field visit, noted that

certain traders dominated certain routes and products in the freshwater fish trade, and at times capitalised fishermen through loans and equipment-based bonds (Richmond et al. 2002).

In this chapter, I ask who are the main actors and beneficiaries in the freshwater fish trade in Rufiji District, and how do individuals come to enter the trade. The overarching objective is to gain a better sense of the main players in commercial fisheries, as such individuals might play a disproportionate role in shaping resource exploitation levels, local livelihood opportunities, and the success of fisheries management. The analysis starts with an overview of the regional trade, in terms of product availability, seasonality and geographic extent. I then describe the regulatory context, as the ability to pay or avoid required licenses and fees fundamentally affects how people participate in the trade. Next follows a description of the fresh and smoked fish commodity chains in turn, identifying the various actors, supply arrangements and costs and revenues at each level, with the ultimate aim of justifying estimated profit margins used to estimate who earns the most from the trade. The penultimate section discusses fish trading as a livelihood, asking who exactly is participating, how reliant they are upon the trade, and how they managed to access this economic opportunity. A final brief section on the fried fish trade follows a similar structure to the one just described. To begin, I introduce the regional market towns and my research methods.

## **7.2 Setting: Regional market towns**

### **7.2.1 *Geography and economy of Ikwiriri and Kibiti***

Kibiti (urban population: 11 395; URT 2002) and Ikwiriri (urban pop. 10 029) are the two largest towns in Rufiji District, both located on the main road linking Dar es Salaam to Mozambique, with Kibiti sited on the high terrace approximately 28km north of Ikwiriri in the river valley below (Figure 2.2). Traders, fishermen and district fisheries officers all confirmed that the two towns were the primary markets for freshwater fish in the district, with smaller markets located on the main road towards the north, at Bungu, Kimanzichana and Jaribu.

People in Kibiti grow cassava, coconuts and oranges, and the main salaried jobs are as workers at the bank, hospital or as schoolteachers. Ikwiriri is the commercial centre of the district, supporting the headquarters of the major Chinese-led road construction project at the time of my fieldwork as well as several saw-mills



capitalising on the illegal timber trade (Milledge and Kaale 2005). The town was formed following a major flood in 1974, but locals retained their original fields post-villagisation (Bantje 1976). Today, locals grow rice and maize on the floodplain, and fish at a number of permanent lakes nearby, including Rungora, Iru, Weme and Uba, as well as at the many seasonal waterbodies, and in the Rufiji River itself.

Both towns have only one main market, but vendors hawk all kinds of goods, including fish, from stands scattered around the back streets.

### **7.2.2 Transport links**

The completion of the Mkapa bridge at Ikwiriri (in 2003) and paving of the road up to Dar es Salaam (nearly completed in 2008) has greatly improved travel times. As well as long-haul buses travelling along the Mtwara--Lindi--Dar es Salaam route there are numerous minibuses (*dala-dalas*) that run frequently between Ikwiriri and Kibiti and onwards to the city. The two towns are also linked in a triangular route by a dirt road that runs southwest from Kibiti to Mkongo and a second sand/dirt road running along the southern edge of the lake between Ikwiriri in the east and the village of Mloka, on the edge of the Selous Game Reserve, in the west. Two buses run along these roads, travelling one day up to Dar es Salaam and back the next: a large bus that terminates at Mloka, and a minibus that runs from Kilimani (a village just west of Mkongo). If the weather is good and the road is not flooded, both buses follow the lower road to Ikwiriri; otherwise both take the junction at Mkongo up to Kibiti. Neither bus is particularly reliable, and neither can use the lower road in the wet season. Instead, people, bicycles and motorcycles are ferried across flooded sections in dugout canoes.

### **7.2.3 Market set-up and size**

Ikwiriri market is located off the main highway, reached by walking down a side street lined with a dozen small, freestanding shops. Most shops sell dry goods (e.g., maize flour, rice, beans and *dagaa*) and home necessities (e.g., soap, kerosene) but others sell meat, fabric or hardware, or offer services such as mobile phone charging. The lane delivers shoppers into an open area where fresh fish are sold from trestle tables arranged on either side of the path leading into the market proper. On walking straight into the market, you enter an airy covered space where the smoked and dried fish and prawn traders are set up on tables arranged in a grid pattern. Three

lanes lead away from this welcoming space back towards the main road. The first is crowded with vegetable sellers working from tiny stalls. The second runs between two rows of mud huts housing the businesses of the *mama lishe* (“Nutrition mothers”), women who run small restaurants there during the day, moving to the roadside after dark. The third lane leads to an open area where the women who sell fried fish display their wares in small, moveable table-top cabinets. These are lined with newspaper and covered with wire mesh to keep off the flies. A few small shops sell charcoal on the far side of this space. This grouping of traders by produce sold is one commonly observed in African markets (Mendelson et al. 2006, Geertz 1978).

Kibiti’s market has a more straightforward organisation than Ikwiriri’s, as all the stalls are contained under a rectangular roof, with the *mama lishe* located on one side, the vegetable and dry goods stalls in the middle, and the smoked and dried fish vendors concentrated on stalls along the far side. The fresh fish vendors operate a short distance outside the market in an open area where traders also gather to auction bags of clothes, and others to run lotto games. There was no dedicated space for fried fish sellers (see next section). As in Ikwiriri, the market is located close to the main road, but separated from it by a row of small shops and the bus stand.

In all, we mapped 72 stalls in Ikwiriri within the covered market, about a third of which were in the zone dominated by smoked/dried fish and prawn traders, around ten fried fish cabinets (but this number was highly changeable), and 25 *mama lishe* restaurants. We mapped 76 stalls in the Kibiti market, with about 30 in the area used by smoked/dried fish and prawn traders, and 22 *mama lishe* restaurants. Fresh fish were sold from ten tables in Ikwiriri and four in Kibiti, but traders would also lay their fish out on crop sacks on the ground, or share tables.

#### **7.2.4 *Fish trading sites outside the marketplace***

Women buying fish for frying in Ikwiriri intercept fishermen and traders before they reach the main market, stationing themselves near the bridge at the junction where the bicycle paths from the floodplain landing sites join up with the paved road into town. They gather there under the mango trees from about 7:30 in the morning—once their morning chores are done—with plastic buckets or wash basins, and generally buy up all of the small-size fishes on offer. In Kibiti, women who fry fish buy them at the market, but disperse across the backstreets of the village to sell their wares. Many fried fish sellers operate in the streets of Ikwiriri as well, and the women we spoke to at the

buying site noted that sellers at the market stands tend to carry large fish, while street sellers focus on smaller specimens.

### **7.2.5 Daily trading activity patterns**

In Ikwiriri, although some fresh fish may arrive to market around 10am, most appear closer to 4pm, with sales winding down by nightfall. Some traders apparently keep fish landed in the morning at home on ice in order to target evening shoppers, although most local fishermen reportedly land fish during the day. Fresh fish arrive at Kibiti market around 8am and are usually gone by noon. This timing would allow traders to sell fresh fish at both markets on the same day, but only one individual on our survey did so. Smoked fish traders in both towns tend to be at their stalls by 9am, but may arrive much later in the day. They will remain until evening, but may temporarily leave their stalls to go eat, transact business or pray, asking a neighbouring vendor to man their stall. Fried fish vendors bring their product to Ikwiriri market in the late afternoon, around the same time that fresh fish arrive on the stalls.

Vendors reported that there were no differences between the days of the week in the supply of fish available at the market, but that this simply depended on how many fishermen had gone out fishing on any particular day.

## **7.3 Methods**

### **7.3.1 Market Survey**

#### *Administration and design*

I conducted a market survey at the two main regional fishing markets (Kibiti and Ikwiriri) with the aim of characterising fish vendors and obtaining a picture of seasonal trends in fish supply, prices and market participation. I carried out the survey on six occasions at roughly 6 to 9 week intervals between March and November 2008, assisted by Moshi Bora.

We began each survey round by arriving early to the market to prepare our sampling frame. We would map out where the various smoked freshwater fish, dried fish, prawn and *dagaa* sellers were located, using a prepared, numbered drawing of all the market stalls, and add any late-arrivals to the map throughout the day. We aimed to survey all smoked and fresh freshwater fish sellers on each survey day. To reflect the availability of alternative aquatic resources in the market, we also surveyed half of

fried fish sellers, a third of *dagaa* sellers, and (because there were so few) all dried prawn and marine fish sellers. We used a print-out of random numbers and our map to select which stalls to survey. Where we missed surveying smoked or fresh fish sellers it was usually because the vendor was absent or had very little stock, and occasionally because they were too busy to speak with us. For fried fish sellers, if the stall holder was a young child (<10 years old or so) we would randomly choose another individual to survey.

The first part of the survey collected information on traders' backgrounds, involvement in the trade and its livelihood importance. All fish sellers (i.e., smoked, fresh, sundried and fried stock) were asked basic demographic information—name, age, birthplace, current residence, first language (in lieu of ethnicity)—and questions about their business: whether they were the owner of the business or a worker, what other markets they sold at, which months were best for business (with each month scored from 0 to 2), what other livelihood activities they were involved in, and which of these was the most important. On subsequent survey rounds, if we found we had already interviewed the respondent (because we recognised them or they told us we had), we skipped this first part of the survey and asked only for their opinion of how business this month compared to the previous month.

The second part of the survey collected data on the trader's stock, in order to develop a picture of seasonal trends in species availability, origins, demand (via stock turnover) and prices. For each species and size grade sold, we asked: the selling price, day brought to market, purchase price, amount purchased (number of fish or total cost), location caught, location purchased and from whom, and for processed fish, whether the fish had been bought fresh or processed. Often there was no clear correspondence between the sale price of a fish and its purchase price, because the vendors might have bought all their fish in bulk and then sorted them out for sale, or they might have bought fish of three different size grades, for example, and re-sorted them into four or more grades for sale. For fried fish sales, we abandoned the species/size grade approach entirely as too confusing, and simply asked how many buckets of fresh fish the respondent had purchased, at what price, when she expected to sell all, and what profit she expected.

For surveys with dried shrimp and *dagaa* vendors, I did not collect any demographic information, but asked only if the respondent was the owner of the business or a worker, if we had interviewed him before, and what the best months for

his business were. For each product sold (i.e., different types of *dagaa*, or different size grades or types of shrimp) we asked the sale price (by *fungu* and weight), the purchase price, the amount purchased and amount remaining for sale (by weight), and the date and location purchased. See Chapter 3 for information on informant payments.

### *Price information*

It was my intention to measure the total length and weigh a sample of the fish sold by every smoked and fresh vendor from the April survey onwards in order to develop a price/kg measure. This was particularly important given seasonal trends in supply and vendors' common practice of keeping prices fixed year-round (e.g., 0.24USD per *fungu*) while changing the number and size of fish (a practice described by Geertz 1978). However the scale I brought out for the April round and its replacement for July both broke in transit, so weights were only taken on the last four survey rounds. Even then, I measured and weighed only one or two fish of each species sold fresh usually in each size grade, but sometimes only in the largest and smallest grades, and not for all vendors. I was loath to disturb the fresh fish sellers who had to sell their fish quickly, and found the smoked fish difficult to weigh accurately. These were often jumbled in mixed species piles, sometimes had parts broken off, and tended to be very light, so that I needed to weigh several piles together and take an average.

Given the small sample sizes involved, it is difficult to make any statements relating to price with confidence. Prices for fresh fish were especially dynamic, changing in response to conditions in the market (see also Richmond et al. 2002), but there was also much variation in the price/kg recorded for smoked fishes. As a result, I do not present price/kg information except to make general comparisons between market conditions in Kibiti and Ikwiriri. Where the purchase and sale price of a product was known (i.e., for fishes not bought in bulk), markups on the purchase price of fishes also varied widely across market traders and across size grades of fish of the same species sold by a single vendor. To control for effect of trader I used the price markup averaged across all size grades of species sold on a single survey for analysis here.

### *Weaknesses of the market survey*

Given my primary purpose was to understand the organisation of the regional trade and benefit flows along the supply chain, I should have focused more energy on interviews with traders rather than collecting information on fish quantity and prices through the market survey. The survey was administered too irregularly to accurately reflect market trends, I did not consistently measure and weigh fish in any case, and I covered only a portion of the year, limiting my descriptions of seasonal trends.

I am missing information on the demographic characteristics and livelihoods of a quarter of traders surveyed because I relied on informants to tell me whether or not we had surveyed them before, and only administered that part of the survey if we had not. People who told us we had interviewed them when we had not perhaps did not want to cause offense or were afraid of missing out on the payment to informants. Also, given that the false positives happened more often with the fresh fish vendors (12 of the 19 traders), and that these vendors often work in teams, it may be that a team member would tell me I had interviewed “them” before, meaning the team and not himself specifically.<sup>65</sup>

In terms of the fried fish trade, I did not devote the time necessary to obtain information suitable for in-depth analysis. In Ikwiriri market, we were hampered by the overlap in trading activities between fresh and fried fish sellers. Surveying both groups of vendors thoroughly would have required spending an extra day in the town, particularly as fried fish sellers in Kibiti were spread out throughout the back streets.

### ***7.3.2 Interviews and observation among trade participants***

I conducted 20 semi-structured interviews with 33 fresh and smoked fish trade participants throughout the fieldwork period (not including fishermen), working from a different list of questions depending on the informant’s position in the commodity chain (Appendix B). These interviews were in addition to informal conversations with fishermen and traders held over the course of the market survey, and also during more than 40 visits to fishing camps on Lake Ruwe, and in the time spent in the study villages (see Chapter 6 for details). We didn’t interview but instead conducted our ‘fish camp survey’ (see Chapter 8) with three additional buyers encountered at Lake Ruwe,

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<sup>65</sup> Even though I had a list of former respondents with me on each round, the proliferation of nicknames in use meant I rarely consulted it. For example, a major fresh fish buyer was referred to by himself and other people by four different names over the course of my fieldwork.

and I learned much about a fourth buyer who lived in Ruwe whom I didn't manage to interview but who bought from fishermen we spoke with often.

At the landing sites, we asked the twelve fish buyers interviewed about: who and where they bought from and sold to, supply arrangements (e.g., renting out gear), scale of their business (capital invested, frequency of sales), costs and expected earnings, other livelihood activities, and how they had gotten started in the trade. Most buyers were reluctant to discuss the financial aspects of their business given the proximity of fishermen at the camps. Two of these buyers sold fish into the fresh trade, six sold smoked fish onwards, and one sold smoked fish if he couldn't sell his fresh fish quickly enough. We had similar questions for the net-owners interviewed (two individual villagers, and a group of Ruwe clansmen), but asked also about how they chose workers for the net, and how payment was arranged.

We interviewed two fresh and three smoked fish market traders individually in Ikwiriri and conducted a group interview with ten others on the October 2008 survey round. The group discussion addressed the costs and profits involved in the trade, regulations, and how the business had changed over time. The individual interviews focused on how traders had entered the trade, the structure of their current business, and observed changes in the trade.

### ***7.3.3 Additional work on the fried fish trade***

We observed fish-buying transactions by women in the fried fish trade one morning in November (from 6:30 to 9am) in Kibiti, and one morning in October (from 7 to 9:30am) at the site down near the river where Ikwiriri women purchase fish (see Section 7.4.13). On both occasions we recorded the number of women and traders involved to gain a sense of scale. In Ruwe village, I also interviewed eight women known to sell fried fish locally and at other markets in six separate semi-structured interviews conducted in November 2008, assisted by Idaya Ungando. We asked women about: supply arrangements, where they sold to and how often, costs and profits, and how they had obtained their starting capital. Idaya did not speak English, but was able to translate my Kiswahili for informants, and explain their answers to me where necessary. I also recorded the interviews for later review.

### **7.3.4 District Fisheries Information**

I met with three fisheries officials employed at the district government headquarters in Utete in September 2008, accompanied by Moshi Bora. During the group interview officials described village and district-level fisheries regulations and enforcement challenges. They also set up a meeting for us with the district official working at Jaribu Mpakani, the checkpoint on the highway towards Dar es Salaam, at the border of Rufiji and Mkulanga districts. Buses stop at the checkpoint and traders carrying taxable goods, including fish, prawns and marine crabs, are expected to report to the office and either show a valid receipt (obtainable from the fisheries district official stationed at Kibiti or the one at Ikwiriri) or pay the required tax before travelling onwards.

On our visit to the office in October 2008 we were allowed to copy data from the ledger books spanning from 1 April 2007 to 22 October 2008, although no data were available for March, April and May 2008. Over that period various record systems were used, with marine and freshwater fish considered together or apart, with place of origin listed or not, and with value of the tax paid on the load recorded and/or the number of baskets. Where marine and freshwater fish were considered together I could only disaggregate the records if place of origin was recorded. It should be noted that place of origin referred to the residence of the trader or the starting point of the bus route (e.g., Mloka) and not the exact source of the fish (e.g., Lake Ruwe). I used an average tax value of 2.25USD per basket to impute missing data on tax paid where number of baskets was known. As discussed in Section 7.4.5 these official data are highly suspect, but can provide some indication of the scale of the export of fish out of the district.

## **7.4 Results**

### **7.4.1 Final market survey sample**

In total, we conducted 144 surveys with market traders selling fresh and smoked freshwater fish in the Ikwiriri and Kibiti markets (Table 7.1). Every species sold on each survey was recorded as a separate product entry, for a total of 147 freshwater fish products and 223 smoked products recorded. We carried out an additional 100 surveys with vendors selling fried fish, prawns, dagaa and/or sundried marine fish in the two market towns (Table 7.1).



**Table 7.1 Market survey sample by product type and location**

Survey Type	No. of Surveys		
	Ikwiriri	Kibiti	Total
Fresh Freshwater Fish	42	27	69
Smoked Freshwater Fish	39	36	75
Fried Fish	27	5	32
Prawns	15	8	23
Dagaa	18	18	36
Dried (Marine) Fish	2	7	9
<b>TOTAL</b>	<b>143</b>	<b>101</b>	<b>244</b>

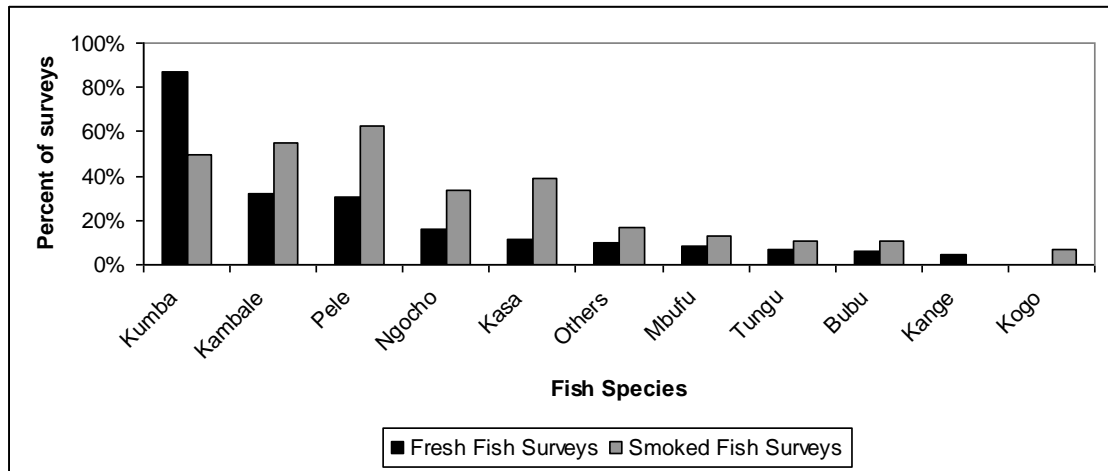
We collected demographic information for 61 of the 80 fresh and/or smoked fish vendors surveyed (see below), and for all 27 fried fish sellers surveyed. However, for fried fish sellers we restrict our descriptive statistics to the 22 surveyed in Ikwiriri, because we only surveyed five such sellers in Kibiti.

#### **7.4.2 Fishery products in the market**

Fresh fish were by far the preferred fishery product in the regional markets. Vendors explained that people liked to eat fish every day and would purchase smoked fish only if they could not afford to buy fresh fish.<sup>66</sup> Alternative fishery products such as fried fish, dried marine fish, *dagaa*, prawns, or *uduvi* (a small brown marine shrimp) were described as occasional purchases made to save money or for a change from the usual.<sup>67</sup> Thirteen species of freshwater fish were recorded on our surveys. Three species dominated the fresh trade in both towns—*kumba*, *kambale* and *pele*—and to a lesser degree the smoked trade (Figure 7.1). The fried fish trade was primarily based on freshwater fishes in Ikwiriri market and marine fish in Kibiti’s market. Three freshwater species—*pele*, *kumba* and *ngocho*—together represented two thirds of those recorded (N = 59 products).

<sup>66</sup> From this point forward, the use of ‘fish’ in the text refers to freshwater fish.

<sup>67</sup> In Ruwe village, women who sold fried fish explained that some people preferred to buy fish already processed because it saved them money: 150TZS (0.12USD) of fried fish could serve as a complete mboga versus spending 300TZS for fresh fish alone before adding the cost of cooking oil and sauce ingredients (e.g., tomatoes, onions).



**Figure 7.1** Percentage of surveys on which different fish species were recorded, for the fresh and smoked freshwater fish trade, MKS.

In Ikwiriri, the main clients of market traders are townspeople buying their daily *mboga*, the side-dish to the ubiquitous starch eaten at every lunch and dinner. Most clients tend to buy the smaller fresh fishes, usually sold by the bunch. The largest fresh fish—the most expensive products—are generally bought by those people earning a salary, by those expecting important guests, or by larger restaurants and boarding-house owners catering to the foreign work crews stationed in the town. People travelling to Dar es Salaam or elsewhere also buy fish in the market to bring with them as gifts, putting fresh fish on ice in buckets. In Kibiti, market traders reported that the women selling fried fish are their main clients, buying up bucketfuls of small fish as soon as these are unloaded at the marketplace. The remainder of fish go to a similar set of clients as in Ikwiriri, though with fewer salaried employees traders said it is difficult to sell the largest fresh fishes.

#### **7.4.3 Seasonality in the trade**

There are two phases in the local fish market, a slower period in the wet season (from about January to May) and a period of greater trading activity as water levels fall and the dry season sets in. This pattern was apparent in the number of vendors observed at the market (Figure 7.2), and vendors' own assessments of levels of trading activity (Figure 7.3). In both towns, vendors selling alternative fishery products were

more common when vendors of freshwater fish were fewer, basically across the flood and immediate post-flood season (March to July).

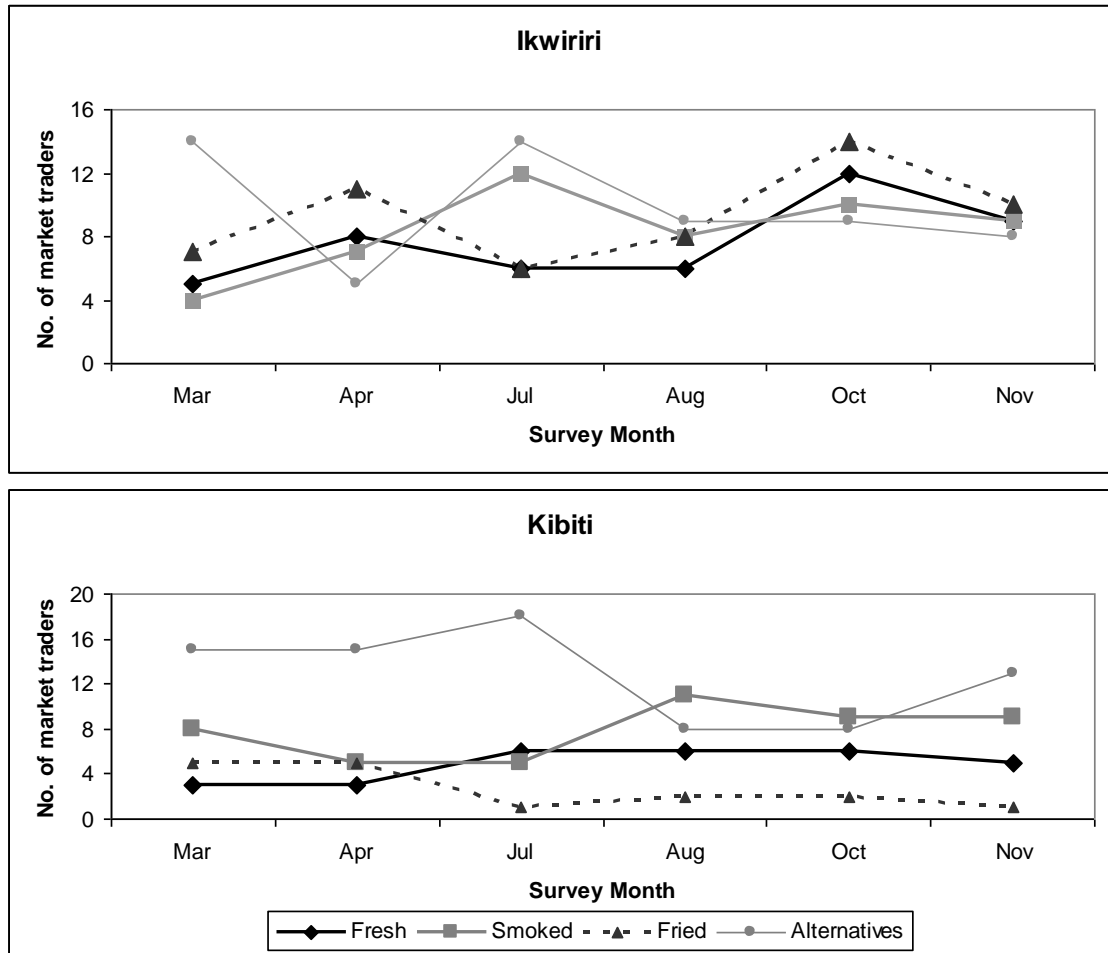
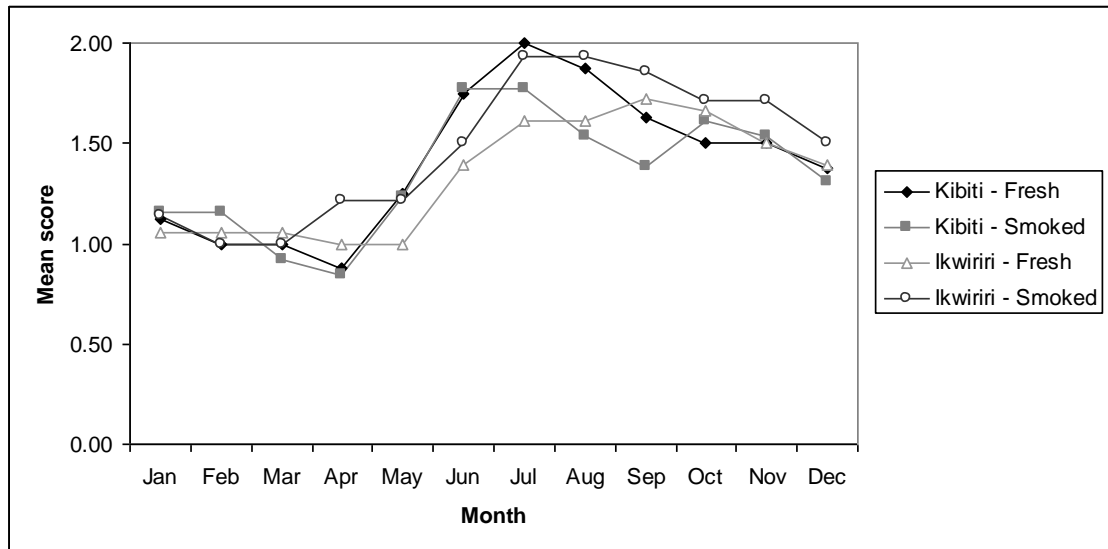
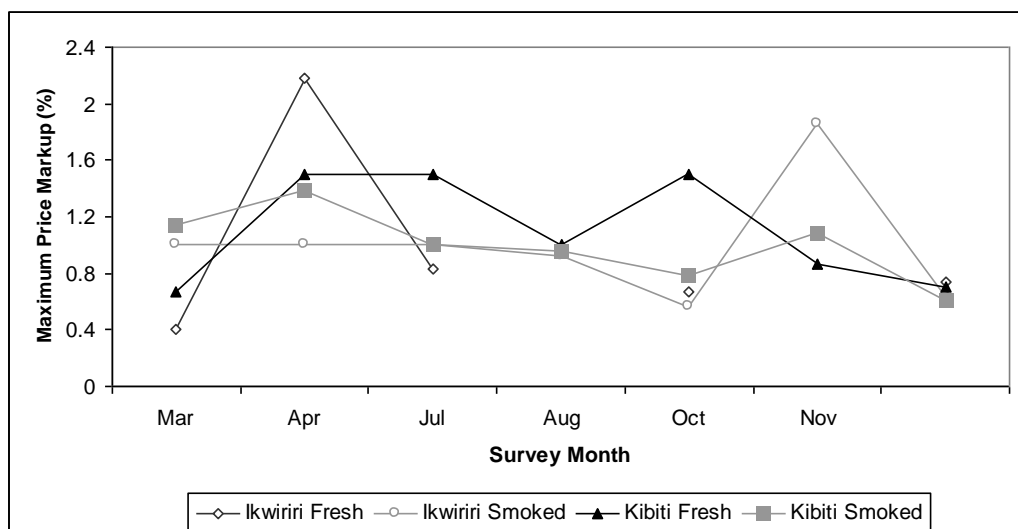


Figure 7.2 Number of market traders of fresh, smoked, fried and alternative fishery products (*dagaa*, prawns, *udufi* and *mbarata*) observed in (A) Ikwiriri and (B) Kibiti markets, MKS.



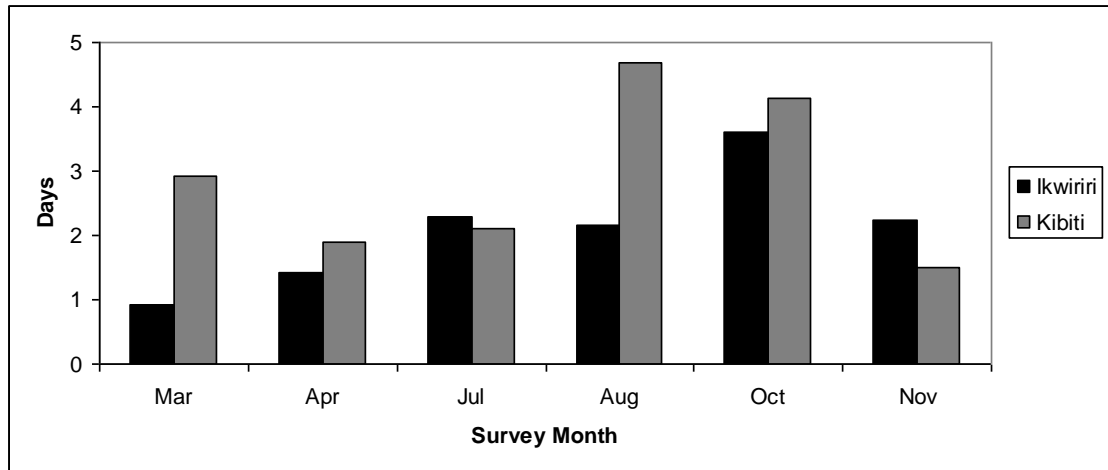
**Figure 7.3 Vendors' own assessment of levels of monthly trading activity across the year, based on mean scores (0 for lowest activity levels, 1 for usual, 2 for highest), MKS.**

The maximum markup on fresh fish prices were recorded at peak flood (April) in Ikwiriri, at twice the purchase price, but remained relatively constant in Kibiti across survey rounds (Figure 7.4). Maximum price markups on smoked fish were at least 100% in both towns in March, April and July, but highest in Ikwiriri in November.



**Figure 7.4 Maximum price markup on fresh and smoked freshwater fish sold in Ikwiriri and Kibiti markets across survey months, MKS (N=129 surveys).**

Turnover in the smoked fish trade—measured as the number of days since a smoked fish product had first been brought to market—was slower in Kibiti than in Ikwiriri in most months, with the slowest sales in August and October, in line with greater availability of fresh fish (Figure 7.5).



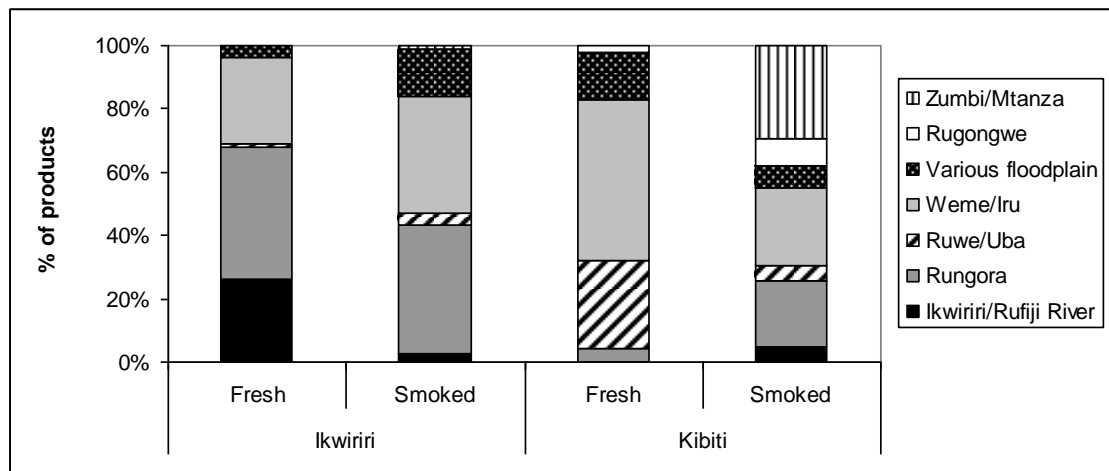
**Figure 7.5** Stock turnover (days since product first brought to market) in Ikwiriri and Kibiti markets across survey months, MKS.

Market vendors more often cited demand-side issues (i.e., purchasing power and number of clients) than supply issues (i.e., availability of fish) when asked to explain differences between the state of their business now and in the previous month. There was general consensus that from March to May, when water levels were high and fish difficult to catch, prices for fish might be high but there were few clients around: people in Ikwiriri were living at their farms (guarding rice and fishing for themselves), and those in Kibiti were low on cash (blamed on the recent district-wide ban on charcoal collection, the usual wet season activity). By July, fish remained somewhat difficult to catch but farmers had returned to town and were buying fish with proceeds from their crop sales. Traders in both towns complained that most of that cash had dried up by August, and that business remained slow throughout September because clients were fasting for Ramadan and saving money to buy gifts for

Eid. In October, they explained, fish were easier to catch as waterbodies dried out, more fishermen were working, and the cashew harvest was in, with people spending more on fish, a situation that did not carry on into November. Presumably, as fish became easier to catch in December/January but local cash availability decreased even further, the regional trade would shift towards more distant markets, in line with the statement by Richmond et al. (2002) that this is the major period for exports.

#### 7.4.4 Geographic extent

All freshwater fishes sold on our surveys were sourced within the district, making the regional trade entirely dependent on local supply. Fresh fish tended to be sourced from the nearest waterbodies to the market town (Figure 7.6).



**Figure 7.6 Geographic origin of fresh and smoked fish sold in Ikwiriri and Kibiti markets, MKS (N=303 products).**

There was no significant export of fresh fish outside of the district, despite recent improvements in transportation to the city.<sup>68</sup> However, local fish, once smoked, were exported far beyond the district. Together, 31 market vendors named 22 places

<sup>68</sup> Vendors reported that a few individuals occasionally travelled from Dar es Salaam by car with ice to buy fresh fish, possibly hotel owners or their employees, but only two such buyers had come to the market by early October of the survey year, and only one in the previous year.

other than Ikwiriri and Kibiti at which they had sold smoked fishes, concentrated primarily in Dar es Salaam (40 mentions of at least eight different markets) and the Pwani region (15 mentions of six market towns), but also ranging as far as Lindi, Mtwara and Zanzibar (N = 76 places mentioned). Smoked fish traders delivered to wholesalers in Dar es Salaam who would purchase their entire stock on delivery to the city. Richmond et al. (2002) noted that both male and female wholesalers for Rufiji finfish operated at Kariakoo, the main Dar es Salaam market.

#### **7.4.5 The regulatory context**

##### *Legislation and enforcement*

Fisheries and fish trade regulations in Rufiji district are set at the village and national level, with district officials acting to enforce national legislation only. The latter is laid out in the Fisheries Act No. 6 of 1970 (amended to Act No. 22 of 2003), the Fisheries Policy of 1997 and the Principal Fisheries Regulations, 2004. Villages on Lake Ruwe and elsewhere in the district had bylaws at different stages of adoption, including rules on fishing methods, user fees, and taxes on fish leaving the landing sites, but these were unevenly applied, and are discussed in Chapter 8.

In the district, fisheries officials' activities centered on preventing the use of illegal nets (mesh size below 2mm) and monitoring licensing and taxation (with all fees shown in Table 7.2). Fishermen are required to obtain an annual fishing license from the district which, besides authorising them to fish, allows them to transport their catch anywhere in the district. Fishermen are also meant to register fishing vessels below 11m in length—including dugout canoes—for a one-off fee and renew the vessel license each year. To transport fish outside the district, individuals must hold an annual license (*Leseni za Ukusanyaji*), plus pay for the four ID pictures required. The trading license is issued by the fisheries officer in Ikwiriri or Jaribu, while the fishing license can additionally be obtained in Utete.

District fisheries officials noted that very few fishermen voluntarily obtained any licenses, only purchasing these when forced to by a patrol. Even then, district officials told me that monitoring of the inland fisheries was infrequent due to limited resources: no gas money for transport and only six full-time staff.

**Table 7.2 Amounts due in fees and taxes by participants in the Rufiji District freshwater fisheries, 2008**

Requirement	Amount (USD)	Type	Requirement	Amount (USD)
<i>District-issued Licenses</i>			<i>District Export Taxes</i>	
Fishing license	3.02	Annual	Small basket	0.80/basket
Vessel license (< 11m)	4.03	One-off	Medium basket	1.20/basket
Vessel license renewal	3.02	Annual	Large basket	2.40/basket
Trading license + required photographs	7.02 (4.62 + 2.40)	Annual		
<i>Market Fees</i>				
Stall Fee	0.16	Daily		
Market Tax	0.08	Daily		
Cleaning charge	0.01	Daily		

Furthermore, their superiors preferred that officials focus their efforts on the more lucrative prawn fishery at the delta, where there was a better chance of recouping the cost of patrols from fining (or extorting bribes from) fishermen.<sup>69</sup> Transporting fish any distance without a license was risky however. If caught, the person faced a fine between 8USD and 240USD, depending on the size of the basket, or confiscation of the fish. As a result, unlicensed fishermen we spoke with who brought their smoked fish to sell outside the village travelled by bicycle on footpaths through the backcountry. Other people without licenses would pass off their fish as the property of a travelling companion who did have one, with the bus driver on the Mloka to Dar es Salaam route holding a fish trading license for this very purpose.

All people trading fish must also pay a tax (*ushuru*) on each basket (*tenga*) of fish transported. The tax due is set by the size of the basket, but amounts paid vary at the discretion of the official, and can depend on how full the basket is. Checkpoints are located at Mohoro, Nyamwage, Ikwiriri, Kibiti, and Jaribu. The official we spoke with

<sup>69</sup> No district officials came by Lake Ruwe during my time in the field. Richmond et al. (2002) similarly note the lack of patrols for freshwater fisheries, while Gibbon (1997) never encountered district officials at the delta in his time there.



at Jaribu checkpoint said that the larger traders invariably held a license and stopped at the office to pay their tax en route to the city. There would seem to be ample opportunity for traders to under-report the size of their baskets, however, given that we did not observe any officials inspecting buses' cargo.<sup>70</sup> We also witnessed a number of traders asking the person on desk duty to "help them" (i.e., to waive or lower the amount owed), and can assume that bribery is practiced, as is common at all levels of interaction with officials in Tanzania (Fjeldstad 2003).

Stationary market vendors do not need a license to operate, but do pay a daily tax to the district as well as a daily stall rental fee (Table 7.2). In Ikwiriri, the fees are meant to pay for a new market, though the building is still in the planning stages. In Kibiti, a new covered market adjacent to the current one had been completed by the end of our fieldwork, but remained empty.<sup>71</sup> Traders also pay an additional small fee for keeping the market area swept and clean. Market vendors in Kibiti had an official chairperson, a dry-goods seller, while in Ikwiriri an older, successful smoked fish trader was referred to unofficially as "our leader".

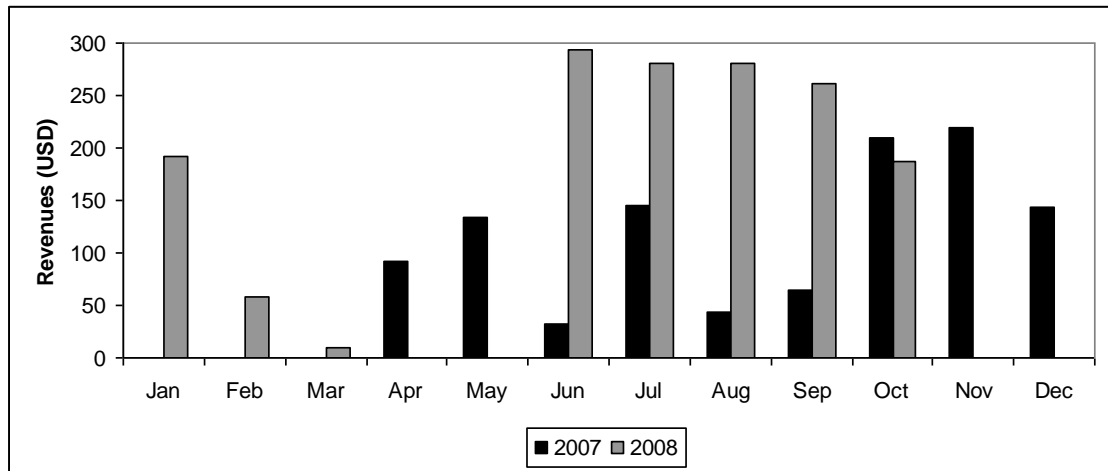
#### *Revenues to the district*

Based on available information, the district collected a minimum of just 1082USD from taxes on freshwater fish exports (N = 188 entries) in 2007, and 1564USD in 2008 (N = 427). Total revenue collected and number of entries varied widely from month to month and showed contradicting seasonal patterns between the two years, though in general revenues were lowest in the wet season and higher in the dry (Figure 7.7). I replaced missing values for months in one year with those available for the other and averaged the total revenues collected in the two years for each of the remaining months to arrive at potential annual revenues for an imaginary, composite 2007/08 year of 1878USD. For comparison, Durand (2003) notes that 60% (146 000USD) of the district's revenues came from the forest sector, dwarfing amounts contributed by the inland fishery.

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<sup>70</sup> The same official noted that traders might theoretically pay the tax on their basket at an earlier checkpoint, top up the basket with more fish, and show the receipt for the smaller load at Jaribu, but then stated that such tricks did not work.

<sup>71</sup> Traders variously explained that the building was not quite finished, or complained that the new space was too small to accommodate everyone.



**Figure 7.7** Total monthly revenues collected from taxes on freshwater fish exports from Rufiji District at Jaribu border checkpoint, District Record Books.

#### **7.4.6** *Actors in the freshwater fish commodity chains*

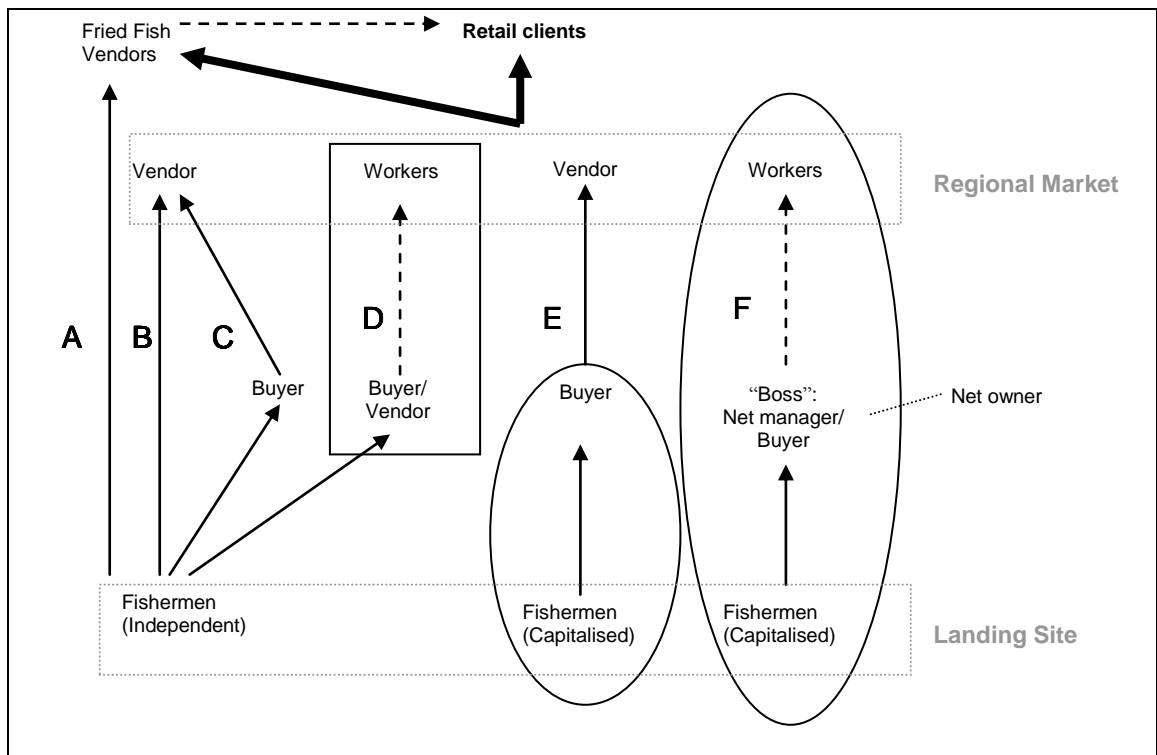
Fresh and smoked fish arrive at the regional markets along more or less separate commodity chains although the same fishermen can supply both. The supply chains are typically short (especially for the fresh trade), but come in multiple forms, offering income-earning opportunities to a variety of local people. There are six main types of actors who participate in the freshwater fish trade within Rufiji district: fishermen, net owners, fish buyers (i.e., intermediaries), market vendors, fried fish sellers and clients. Other people derive income directly from the trade as fish smokers, suppliers of firewood, bicycle transporters, porters for lifting loads on and off the buses, and helpers at the market stalls. In addition, urban wholesalers operate in Dar es Salaam, as well as market vendors established there and likely in larger towns of neighbouring districts. The actor categories identified are not mutually exclusive, so that a net-owner may also be a fish buyer for example, or a fish buyer may himself be a market vendor, depending on the funds available to that individual at the moment. The fried fish trade is dealt with in a separate section.

#### **7.4.7** *The fresh fish trade*

For participants in the fresh fish trade, the driving imperative is to sell fish as quickly as possible. There is no ice at the landing sites, and the hot weather ensures

that most fish will be past selling fresh within 12 hours (Richmond et al. 2002). The result is a fast-paced, competitive environment in which participants stand to earn more than in the smoked trade on any one day, but face a much higher risk of losing their investment if transport breaks down, prices drop from over-supply, or buyers fail to appear. For these reasons, informants repeatedly likened the fresh fish business to a lottery.

There is an opportunity for intermediaries to enter the fresh fish trade because fishermen are usually too tired immediately after fishing to bring their surplus catch to market (Figure 7.8; letters in parentheses in this section refer to the figure). In addition, fishermen may have limited cash for spending on licenses and transport, limited connections within the marketplace, high risk aversion, and competing demands on their time from farming. The exception is fishermen who live in or near Ikwiriri (B), who sell fresh fish directly to women fried fish sellers (A) or at the market (B). Otherwise (based on observations at Lake Ruwe), most of the fresh fish destined for



**Figure 7.8 Structure of the commodity chains for freshwater fish traded fresh, Rufiji District, 2008**

the regional markets are caught by fishermen working at the major lakes for sale to intermediate buyers waiting onshore. These fishermen tend to work the large *juya* nets and are capitalised by the buyers (E, F), receiving advances in cash and in kind, as described in Box 7.1.

Those buyers without special supply arrangements with fishermen (C and D) noted that it was sometimes difficult to obtain fish as a result, as there was no guarantee of enough people going out to fish each day to supply the trade. In addition, these buyers were often obliged to purchase fishes in bulk, whereas ‘patron’ buyers had the privilege of buying fish on a retail basis, that is agreeing on a price for each size grade of fishes, and counting the number in each grade. With bulk purchases, buyers often lost money on the smallest fishes and tried to make this up on the larger fish.

All of the 13 buyers we interviewed and/or surveyed were male, and most were natives of Rufiji, with the exception of three smoked fish traders born and residing in neighbouring districts. The buyers worked year-round though not necessarily full-time, switching between one or two weeks spent at the fishing camps and a similar period back with their families, usually to farm. Most of the buyers encountered at the landing sites travelled around the different lakes of the district following fish availability, though one worked primarily on the coast and came inland only during the monsoon season, and another (the owner of two *juya* nets) focused his activity on and near Lake Ruwe.

#### **7.4.8            *Smoked fish trade structure***

There is nowhere near the same amount of pressure on participants in the smoked trade as there is on those in the fresh trade. Intermediary buyers or vendors can take days or weeks to sell their product with little change in selling price. As explained by Richmond et al. (2002) most processing losses occur at the smoking stage, with buyers distinguishing between fish that have been poorly and well-smoked, and paying a lower price accordingly.<sup>72</sup> In general, fish sold for about 20-40% of their fresh weight value once smoked, with the smallest losses made on smoking *kambale*.

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<sup>72</sup> Once in the hands of traders, post-processing losses occur through moisture and infestation (rendering fish unfit for human consumption) and fragmentation. Traders interviewed by Richmond et al. (2002) reported that less than 3% of their stock was affected by such losses, and invariably sold damaged fish, though at 50-30% of their purchase value.

**Box 7.1 Fresh fish buyers: A race to market**

At Lake Ruwe, three major fresh fish buyers—I will call them Ashiru, Kassim and Omari—worked the landing sites during the 2008/09 fishing season. All three had motorcycles, and Ashiru and Kassim each owned a *juya* net off which they bought the daily catch. Ashiru also had a second *juya* net at Lake Uba run by his sister's son. Omari bought off two other people's *juya* nets, stationing his agent at one landing site while he waited at another each morning. Kassim also employed an agent when he was away from the village, usually his younger brother.

The *juya* buyers all gave small advances in cash or in kind to their fishermen for food, cigarettes or expenses at home, and deducted these loans from the amount owed to fishermen for their catch. Fishing teams on the *juya* nets also had to pay net owners a rental fee each time the net was in the water. Where the buyer owned the net, the fee was deducted from the value of the catch, with the expectation that the fee would be waived if catches were low. If another person owned the net, the buyer collected the rental fee from the fishing team (or advanced the amount to them), but had to pay an additional fee himself to the owner for the privilege of buying off the net.

Every morning each buyer (or his agent) would meet the returning fishermen, observe the team grading and counting the fish, pack the fish into *tenga* (large bamboo baskets) between layers of freshly-cut grass, and load them onto the motorcycle for delivery to the regional market. Ashiru had his own workers stationed at Kibiti to whom he would turn the fish over for sale, explaining that clients liked to buy from a familiar and trusted local person (pictured in Figure 7.8 as commodity chain F). Workers were paid according to the earnings made that day after costs, whereas helpers on the stall might only receive fish in payment on a slow trading day. The other two buyers usually sold to market traders in Kibiti, though they would sometimes stop by Ikwiriri and sell to traders there if prices were good (E).

On lakes closer to Ikwiriri, buyers used bicycles and public transport to travel between the landing sites and market. This was the case for Juma, who would ride his bicycle down from Kibiti to the Ikwiriri landing sites early in the morning, hire one or more bicycle transporters to help him carry his *tenga* back to the main road and load them onto the minibus for delivery to Kibiti, where he and his workers would sell them at the market (D). The main buyer established at the fishing camp on Lake Ruwe closest to Mkongo village—where no *juya* nets operated—also used a bicycle, selling fresh fish in the village or to buyers smoking fish at the camp, and otherwise smoking fish for sale at regional markets.

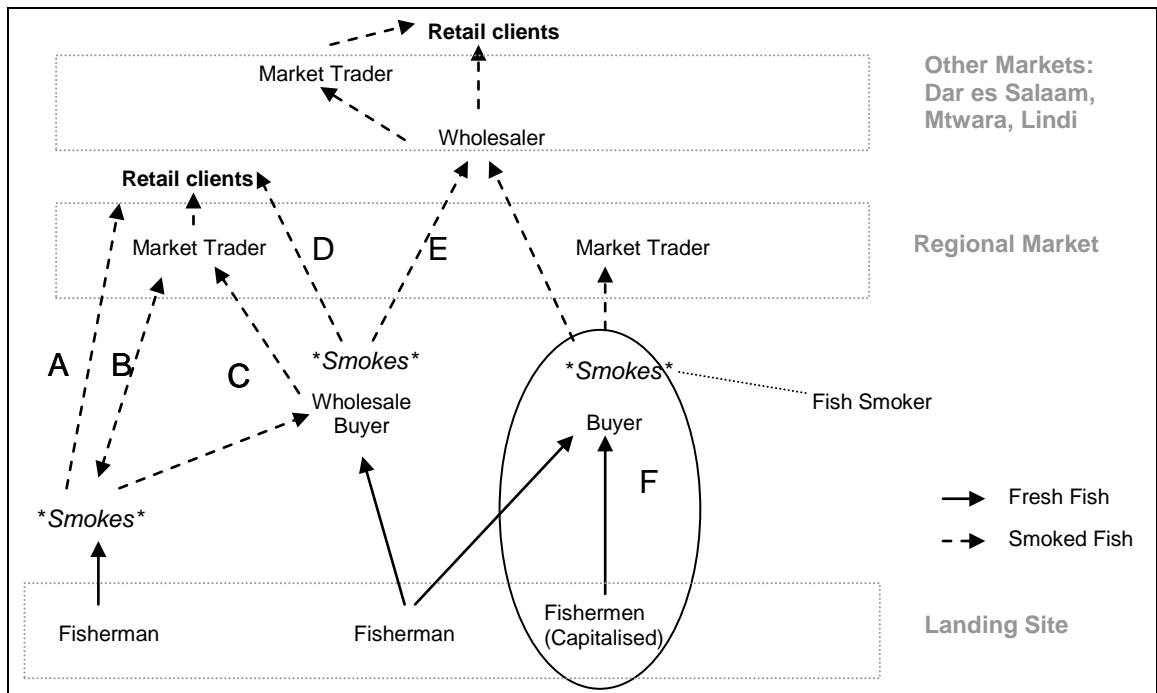
After racing fish to market, vendors there continued to hustle to keep fish looking fresh, employing helpers to throw water over the fish and shoo clouds of flies away. When fresher fish arrived to market they resorted to other strategies to trick clients into thinking their

**Box 7.1 cont'd**

fish were best, such as moving the older fish on to a new stall or next to the new stock to mimic a fresh delivery, messing up the piles of older fish to suggest no one has had time to sort them yet, and/or rinsing them surreptitiously on a different stall to the one they were sold on. As a last resort, vendors would drop their prices. Any fish left unsold were usually smoked for sale the next day, fried or put on ice for sale that evening in the backstreets.

Although potential profits are lower than for fresh fish, and turnover much slower, smoked fish vendors told us they preferred the guaranteed income to the high-risk business of fresh fish selling. Unlike in the fresh trade, fishermen were much more likely to take charge of selling their own catch after processing it (Figure 7.9). Fishermen we spoke with in Ruwe village travelled to regional markets to sell smoked fish directly to clients (A) or market vendors (B), but usually did not choose to go to Kibiti or Ikwiriri (Letters in parentheses here refer to the various chains as illustrated in Figure 7.9). Instead they went by bicycle to more distant markets located north along the road to Dar es Salaam in order to obtain better prices. Fishermen could also receive buyers to their homes, often by pre-arrangement, to organise the sale of fish stockpiled there (B). Other smoked fish buyers established themselves at fishing camps, acting as wholesalers, purchasing fresh fish which they would either smoke themselves or, at times of high production, hire someone else to smoke (an *mchomaji*). Of the buyers we interviewed, all of whom were established at fishing camps, four brought fish to Dar es Salaam markets for sale to urban wholesalers (E), two (who worked primarily in the marine and fresh fish trade respectively) sold to vendors at markets on the road north to the city (e.g., at Bungu, Marusembe) (C), and one retailed his wares on the backstreets of Ikwiriri (D).

Most of the camp wholesalers we spoke with had specific supply arrangements with “special” fishermen (*wavuvi maalum*) in addition to buying fish from those working independently and/or fishing themselves (F; see Box 7.2). These included fishermen working on one *juya* net owned by someone other than the buyer, but also fishermen using *kimea* (cast nets) and *kutega* nets. If their sponsoring buyer was absent, the fishermen were free to sell to others that day.



**Figure 7.9 Structure of the commodity chains for freshwater fishes traded smoked in Rufiji District and up to urban markets, 2008**

As in the fresh trade, not having dedicated supply arrangements could lead to problems acquiring fish: an outside buyer (from Mkulanga district who spent most of the year buying marine fish on the coast) had given up dealing with local fishermen and bought instead through a local buyer who had more success obtaining supplies. Most dedicated smoked fish buyers did not fish themselves, although a couple of local buyers did in the wet season when few fishermen were around. Similarly, buyers tended to smoke fish themselves when supplies were low, but would hire fish smokers (sing., *mchomaji*) as quantities increased.

Ikwiriri market vendors tended to source smoked fish from nearby waterbodies and to purchase these directly from fishermen, as in the fresh trade. In Kibiti, in contrast, traders bought their smoked fish mainly from intermediaries travelling to the market from as far afield as Mloka, on the border with the Selous Game Reserve, reflecting the town's position on the regional road network.

**Box 7.2. The smoked fish trade: A buyer's camp on the Rufiji floodplain**

Athumani, a farmer from Ruwe village, worked as a wholesale smoked fish buyer about six months of the year, beginning around September and stopping when water levels rose too high. At the start of the 2008 fishing season he and another villager had agreed to pool their cash and work as equal partners. In November we found them set up in a shelter beside a temporary floodplain pond about 3km from Ruwe. There, they were buying fish from independent fishermen living in nearby villages and field areas, but had specific supply arrangements with at least two others, partners from Ruwe village who fished with a cast net (*kimea*).

Athumani had met with the fishermen at the start of the season in order to “prepare” (*kuandaa*) them, deciding with the men where they would fish and advancing to each fisherman a *posho*, or maintenance allowance for use by the family in his absence. At the end of a fishing cycle, about five to seven days for *kimea* fishing, the buyers tallied up the value of the fish supplied, and deducted the *posho* and camp expenses. These included cigarettes, marijuana, and daily canoe rental, which the fishermen had to repay in full, and food which was split equally among the two fishermen and two buyers (see Appendix E). The remainder was owed to the fishermen and was meant to be paid in two parts, half immediately and half once the fish had been sold. Athumani considered that there was no cost to the fish smoking, since he and his partner did the work with firewood they collected themselves.

From the camp, Athumani and his partner would bicycle home with their smoked fish and spend a day carefully grading the fish into price categories before travelling to Dar es Salaam. Athumani emphasised the importance of arriving to the wholesaler's with a well-organised parcel (*mzigo*) in order to maximise profits. Through re-investment of a substantial part of these profits, Athumani and his partner sought to steadily build up their working capital across the fishing season, as described in Section 7.4.10.

**7.4.9 Costs and revenues**

The highest profit margins in the trade were made by fresh fish buyers running vertically-integrated enterprises, that is controlling the supply chain from point of purchase at the landing site to sale at the regional market. Costs and revenues for buyers and vendors for one business cycle (i.e., one sale) in the fresh and smoked trades are presented in Appendix E, and resulting estimated profit margins in Table 7.3.



**Table 7.3 Estimated profit margins made by traders in the fresh and smoked fish trades.**

Position	Buys from	Sells to	Alias	Profit Margin
<b>Fresh Trade</b>				
Buyer/vendor – Vertically integrated enterprise	Independent fishers	Retail clients	Juma	57%
Buyer	Own fishers	Market vendors	Omari	45%
<b>Smoked Trade</b>				
Wholesale Buyer – Large scale	Any supplier	Dar es Salaam	-	43%
Wholesale buyer – Small scale	Any supplier	Dar es Salaam	-	38%

Notes: Developed on the basis of estimated costs and revenues presented in Appendix E.

Fresh and smoked fish buyers faced four main sets of costs: those related to any special supply arrangements with fishermen, the cost of purchasing (and processing, if applicable) fish, transport, and fees. Buyers generally deducted the cost of any loans to fishermen from payment owed for fishes supplied, but it was understood that some portion of the advance would take a long time to be repaid, if at all (see Chapter 6). The amount vendors spent daily on fresh and smoked fish stock ranged widely, as did the amount spent by landing site buyers (Table 7.4).

**Table 7.4 Value of stock held by traders in Ikwiriri and Kibiti markets, average price and mark-ups on fresh and smoked fish sold, in USD, MKS.**

Location	Product	Median Value of Stock Purchased (Range) (USD)	N (no. of surveys)	Sale Price per kg (USD)	N No. of products (No. of surveys)	Median Price markup (%)	N No. of products
Ikwiriri	Fresh	17 (3.20 – 60)	36	3.03 ± 1.26	72 (21)	0.54	8
	Smoked	45 (11 – 211)	31	3.98 ± 1.99	19 (5)	.5	28
Kibiti	Fresh	23 (6 – 112)	24	4.05 ± 2.56	50 (18)	.67	36
	Smoked	94 (5 – 616)	27	5.20 ± 1.70	11 (4)	.56	57

There was little difference on our surveys in average price markup whether traders had purchased from intermediary buyers or directly from fishermen, which contradicts information gained through interviews. From August onwards we sometimes asked traders to tell us their target profit on a known purchase amount: these were similar on average for fresh and smoked fish traders (around 20% above the value of the initial investment) but higher in both cases for vendors buying directly from fishermen rather than intermediaries. Across all surveys, not differentiating between fishes purchased directly from fishermen and those obtained through intermediaries, median price markup on smoked fish was around 50% in Ikwiriri and Kibiti, and highest for fresh fish in Kibiti at 67% (Table 7.4).

All of the traders we asked said they were active year-round, but increased their activity in certain months. Based on reported costs, price markups and turnover, and making a number of assumptions of traders' level of involvement in the activity across the year, we provide very rough estimates of traders' annual income in Table 7.5. These estimates are best taken as an indication of the relative earnings made by participants at different positions in the trade rather than absolute amounts.

#### ***7.4.10 Capital investment***

##### *Starting capital and business growth*

The amount of money available to invest in business was a recurring topic in our discussions with trade participants. Referred to as the *msingi* (defined variously in Kiswahili as the base, the essence of a thing, the key) this was the fund individuals had to build up before they could enter the trade, and that they risked losing if business went sour. This fund was seen as quite separate from money to be spent on living expenses, although traders mentioned drawing on their *msingi* in family emergencies or to meet major obligations (e.g., medical costs, school fees). The concept is similar to that of the *agbadoho*, described as the "money that is set aside for business" by West African fishermen (Hill 1970:41).

Market vendors considered 5.60USD the minimum investment to begin trading in fish locally (fresh or smoked), moving from street sales to the market once your *msingi* had built up to 16USD. Bringing fish outside the district required considerably more investment, with a trader needing at least 80USD starting capital just to break even on a selling trip to Dar es Salaam. Smoked fish buyers we spoke with at

**Table 7.5 Estimated annual earnings (USD) of participants in the Rufiji District regional fresh fish trade, 2008.**

Participant Selling to	Smoked			Fresh	Fried	
	Market vendor	Buyer	Buyer/Vendor	Buyer only	Vendor only	Vendor
	Retail clients, District	Wholesalers, DSM	Retail clients, District	Traders, District	Retail clients, District	Retail clients, District
Starting capital (USD)	80	120	64	64	16	16
High Season						
Length of cycle (d)	7	10	2	2	2	2
Number of cycles	21	15	74	74	74	74
Earnings (USD)/cycle	30	80	36	28	3.50	4.50
Low Season						
Length of cycle (days)	14	21	4	4	4	6
Number of cycles	8	5	27	27	27	18
Earnings (USD)/cycle	15	41	18	14	9.60	1.84
Total annual earnings (USD)	750	1405	3150	2450	518	366

Notes: This table is built on a number of assumptions and values should be treated with caution. I set the high season at 5 months long, with trade participants working full-time (so 148 work days). I set the low season at 7 months, with participants working half-time, given other obligations on the farm and lower potential earnings (so 106 work days). I increased turnover in the low season even for fresh fish sellers, who in fact may continue to work every day, and halved the earnings/cycle for all. It is difficult to take into account cycles on which trade participants made losses, but assumed lower earnings in the low season will help to counter this.

landing sites in October/November were working with *msingi* between 120USD and 160USD (N = 3), and one buyer we encountered at the market place during that period had invested 400USD in fish he was preparing to transport to the city by car.

Profit, in contrast to the *msingi*, was at constant risk of being eroded through demands on cash. Traders frequently explained that the longer it took to sell fish, the more profit was reduced by daily expenditures on food and necessities. As a result, to preserve any profit, trade participants needed a quick turnover and re-investment in their stock, over and above the original starting capital amount.<sup>73</sup> Such re-investment could improve profit margins (by increasing the number of fish brought to market while other costs remained relatively fixed) and was a central strategy for many traders, described to us in detail by the smoked fish buyer Athumani (Box 7.2).

By re-investing about 60% of profits made on one sale back into the fund used to purchase fishes for the next, Athumani explained that he and his partner could double their initial investment of 120USD by the end of the season. Taking this capital gain together with earnings and benefits (i.e., expenses covered while living at the camp), Athumani makes an estimated total income of 738USD in a season (Appendix E, Table E-4). This may appear to be not much more than a fisherman could make in the same period (estimated at 592USD; Appendix E), but in practice it is highly unlikely that a fisherman would work non-stop throughout the fishing season (see Chapter 6 for further discussion of fishermen's work patterns and incomes). The buyer also has the added benefit of growing his capital and keeping it safe within his business. Traders explained that you could build up your capital more quickly in the fresh trade, given better profit margins, but lose it overnight if unlucky.

None of the landing site buyers or market traders we spoke with had received loans from buyers up the commodity chain, and our group informants at Ikwiriri market were categorical in stating that none were to be had. In fact, informants explained that wholesale buyers in Dar es Salaam did not even necessarily pay the full amount due on purchase of the fish, increasing the cost for traders who had to cover accommodation and meals in the city while they awaited payment. Nonetheless, providers of capital, or rich men ("*matajiri*") were crucial to the operation of the fish trade at lower levels of the commodity chain. The role of the *mtajiri* is to finance

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<sup>73</sup> For instance, In our group interview, informants estimated that fresh fish traders made about 15 – 50% profit on daily investments of 16USD, but considered profits on a similar value of smoked fish to be nil if it took more than five days to sell them.

fishing outings, providing capital (nets, canoes, or paying the necessary rental fees), food and petty cash, with the amount owed deducted from payments due to the fishermen for fish supplied. Crucially, the *mtajiri* in the fresh fish trade must have enough working capital to purchase all the fish produced by his crew every day.

#### **7.4.11 Market trading as a livelihood**

##### *A local activity segregated by gender and age*

Market trade was dominated by male vendors and natives of Rufiji. Only two smoked fish traders on our survey were female.<sup>74</sup> Nearly all vendors lived in the town they traded in, and many had been born there as well, particularly in the case of Ikwiriri fresh fish traders (Table 7.6).<sup>75</sup> Most were of the major Rufiji ethnic groups of the Ndengereko (67%) and/or Matumbi (10%), with the remainder identified as Ngindo (7%), Pogoro, Zaramo, Yao and/or Swahili. Fresh fish vendors tended to be younger than smoked fish vendors ( $30 \pm 9$  vs.  $44 \pm 16$  years old,  $N = 25$  and  $30$  respectively).<sup>76</sup> No one over the age of 45 in our sample was seen to sell fresh fish, whereas a number of smoked fish sellers were in their seventies.

The age division observed between fresh and smoked fish vendors corresponded with informants' descriptions of the fresh fish trade as a young man's game. It was unusual for vendors to switch between the two trades on our survey: only four of 44 individuals who sold fresh fish were also observed on another occasion selling smoked fish.<sup>77</sup> However, fresh fish vendors told us that they traded in smoked fish when travelling further afield, and those who failed to sell their fresh fish by the end of the day could smoke them for sale the next. Smoked fish traders, if they diversified their business, tended to go towards selling marine products.

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<sup>74</sup> One of whom was in business with her brother.

<sup>75</sup> The exceptions lived in the neighbouring towns: Jaribu, Nyamisati and for two traders surveyed in Ikwiriri, Kibiti. Those not born in the two market towns or in Rufiji District included three men born in Dar es Salaam and one woman born in Mtwara.

<sup>76</sup> To simplify presentation of results in this section I include in the "fresh fish" vendor group those three vendors who sold fresh and smoked fish, and in the "smoked" group those four vendors who sold both freshwater and marine smoked fishes, after ensuring that this did not contradict the overall trend reported.

<sup>77</sup> Three of these vendors were only surveyed twice, but one was known to us as a major fresh fish buyer at Ruwe, and the fourth vendor was seen to sell fresh fish on three other survey rounds.

**Table 7.6 Characteristics of fresh and smoked fish traders in Ikwiriri and Kibiti, and of fried fish market traders in Ikwiriri, MKS.**

Product	Location	Male	Lives in town	Born in town	Sells at other markets	Has a shamba	N	Trading as main/equal occupation	N
% of vendors									
Fresh									
	Ikwiriri	100	100	81	52	71	21	52	17
	Kibiti	100	66.7	44	44	44	9	67	8
Smoked									
	Ikwiriri	93	93	43	64	100	14	47	13
	Kibiti	94	100	59	41	71	17	64	13
Fried									
	Ikwiriri	100	91	38	43	67	21*	57	21*

\*excludes the schoolgirl helping her mother in Ikwiriri

Most vendors were encountered only once or twice on our survey (N = 50 and 17 vendors respectively); only one was present on all six survey rounds, and one on five rounds.<sup>78</sup> This low rate of re-encounters suggests that vendors did not go to the market everyday, in line with the fact that many travelled to other locations to sell fish and were also farmers with other demands on their time (see below). Vendors themselves considered that there were ten established, regular fresh fish vendors in Ikwiriri and six in Kibiti, with the remainder bringing fish to market only now and again. In Ikwiriri, vendors estimated there were forty regular smoked fish sellers, working at the market but also in the back streets of the town; we did not obtain estimates for Kibiti but the number was likely comparable.

#### *A livelihood complement to farming*

Market vendors were entrepreneurs for the most part, all owning their business with the exception of two smoked fish traders working for their relatives and two workers employed by two different fresh fish buyers. Most vendors traded more or less year-round, only half of vendors had their own shamba (55% of 82 vendors), and over

<sup>78</sup> These were both fresh fish buyers/market traders operating in Kibiti, referred to here as Juma and Ashiru.

a third considered the fish trade to be their household's main income source (38%). Among the respondents who reported no livelihood activities other than trading fish and farming, most (60%) considered the fish trade most important, and another 5% that it was as important as farming (N = 50 traders who answered the question). Traders in the latter group explained that earnings from the fish trade could be invested in farming (hiring labour or a tractor), or compensate when floods had affected their crop. If harvests were good, fish trading allowed you to maintain your crop stores for longer. Those who considered the fish trade most important usually explained that business provided a predictable, regular income whereas success in farming was never assured, depending on the weather and floods. Those who prioritised farming emphasised that it was important to have food in the house, and only then to embark on any fish trading.

Vendors who did not farm were less likely to report additional sources of income besides the fish business than those who did have a field (11% of 37 traders versus 15% of 45). Those eleven individuals with other income sources were typically involved in only one other activity, citing: selling food (tea, *uji*), trading rice, raising chickens, making charcoal, selling roast corn, building houses, braiding palm rope (*kamba*), taking photographs and being a driver. In most cases (7 of 11) respondents considered fish trading to be the most important income source for their household.

Earnings from trading could certainly improve market vendors' long-term economic prospects, although we did not specifically explore this. One elderly man had saved enough in three years to build a second home in Ikwiriri (as had his daughter through the fried fish trade). Other local vendors had made enough money in the fish trade to move their family to Dar es Salaam and "live a good life", according to our group of informants. The fish trade could also serve as an emergency activity to generate cash, as was the case for an elderly 'retired' vendor who had returned briefly to selling smoked fish to pay for a family member's medical fees.

#### *An accessible livelihood option*

The barriers to entry to the regional fish trade were relatively low at both the market vendor and buyer level, providing an attractive livelihood option for entrepreneurial types. When asked how they had gotten started in the fish trade, participants generally described how they had worked to gather the *msingi* necessary, with none receiving loans and only a few entering already established businesses. The

market vendors we spoke with entered the business more often using savings from farming than by fishing. One had joined his father's fish-selling business, originally started up with proceeds from the family's cashew nut harvest. Another way into the business was to work for a vendor, saving your daily wage while learning how to buy and sell at the right prices. One trader had entered the fish trade on his retirement from professional football.

Most intermediary buyers pulled together their *msingi* by fishing themselves and/or were from families that fished. Omari for instance, had started by purchasing fish off his fisherman brother, keeping the profit for himself. Ashiru had bought his first *juya* net from the proceeds of fishing with his family. Kassim, in contrast, had recently entered the trade on the basis of his earnings from shops in Ruwe and Utete.<sup>79</sup> Three smoked fish buyers working at Mtendeni camp were brothers and had fished together in their youth, moving into the fish trade with their savings from fishing and from one brother's job as a soldier. Two other buyers, born in the area, had never fished but started in the trade with capital accumulated in the local timber industry. A third buyer, from outside the district and primarily a marine fish trader, had worked at the fish market in Dar es Salaam in the 1980s and then sold charcoal in order to accumulate his *msingi* to enter the trade. His son recently had joined him in the business.

Trade participants cooperated with others at the same level in the commodity chain to increase their *msingi*. Several buyers in the smoked fish trade (such as Athumani) were known to cooperate with a regular partner, as did several market vendors in Kibiti. In the latter partnerships, one individual was charged with selling fish at the market while the other sourced fish in the hinterland. Cooperation in the fresh fish trade was less evident but also took place. Although the three fresh buyers on the *juya* nets we interviewed worked independently (to our knowledge), the major buyer in Kibiti (Juma) had a regular partner (whom we never saw). Fresh fish vendors at the marketplace were observed agreeing on the spur of the moment to purchase fishes together if a large delivery arrived at the market, sometimes repeating the exercise several times with different partners during a single evening.

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<sup>79</sup> His father was a relatively well-off *sheikh* in Ruwe who owned a milling machine, and Kassim was rumored to have bought his motorcycle with a gift from his mother of her entire rice harvest one year.



#### ***7.4.12 Differences between Ikwiriri and Kibiti trade organisation***

Despite their physical proximity to one another, the markets for freshwater fish in Ikwiriri and Kibiti operated quite differently, a reflection of their respective locations on the floodplain and the high terrace. Freshwater fish dominated the Ikwiriri market, with those vendors together outnumbering vendors selling ‘alternative’ fishery products in all months but March in Ikwiriri, but only in August for Kibiti (Figure 7.2). Given the longer distances Kibiti traders needed to travel to source fishes, both fresh and smoked fish cost more by weight in Kibiti than in Ikwiriri on average for all species and survey rounds combined (Table 7.4). In Kibiti, fresh fish market traders bought directly from fishermen as often as did those in Ikwiriri, but with the difference of running more organised businesses, often with dedicated supply arrangements, buying fish themselves or through an agent at the landing sites, transporting them to market (by motorcycle or bike/minibus), and having workers sell their fish on the stalls. Smoked fish buyers in Kibiti bought primarily from intermediaries coming to the market, and traders in general disliked travelling too far themselves.<sup>80</sup>

In addition, Ikwiriri was a more dynamic market than Kibiti, with more clients and higher turnover. Most smoked fish vendors in Ikwiriri had bought fish within the past two days (80% of surveys, N = 39), but only 52% had done so in Kibiti, with most having bought within the past week (90%, N = 31 surveys). The longest period traders reported holding stock was 23 days in Ikwiriri and 30 days in Kibiti, with most tending to buy fish only once their current stock was nearly depleted. Traders in Ikwiriri reported trading at other markets more often than did those in Kibiti (42 vs 57% of 26 and 35 vendors respectively), with smoked fish traders in Ikwiriri the most likely to report travelling (Table 7.6).

Despite the greater activity in Ikwiriri, and the better access to fisheries supplies, market vendors in Kibiti were more likely to say that the trade was their primary income-earning activity, and were less likely to farm (Table 7.6).

#### ***7.4.13 The fried fish trade***

Unlike the trade in fresh and smoked fish, the processing and sale of fried fish was a female-dominated activity in Rufiji District, as was the sale of most other

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<sup>80</sup> “We go to Mloka [a village at the entrance to the Selous Game Reserve] to find a wife, not fish!” one joked.

cooked items (see Study Area).<sup>81</sup> Fresh fish traders in Kibiti market considered fried fish sellers to be their most important clients, and this group purchased enough fish in Ikwiriri as well to be considered to affect market price. Despite proscriptions on women's movements in an Islamic society, women traders sometimes travelled long distances to source and market their fish. The pace of the trade was moderate, with fried fish lasting longer than fresh but not as long as smoked. According to sellers in Ruwe, fried fish lost about a quarter of their value by the third day of sale, and rotted quickly thereafter. Sellers we asked at the market similarly planned to sell their fish within two days of processing, and none held fish more than three days old.

All of the women we surveyed in Ikwiriri (N = 22) described themselves as owners of their business, except for a 14-year old (who was helping out her mother during the school holidays) and two other women helping their female relatives. The women we surveyed were between 14 and 55 years old ( $32.5 \pm 9$ ), but we also occasionally observed younger girls and once a young boy working the cabinets alone. Of the women we asked (N = 16), half were unmarried, and six of these had one child or more. Nearly all of the women lived in Ikwiriri, and most were of the main Rufiji ethnic groups (52% identified as Ndengereko, and 13% as Matumbi). However, unlike male market vendors, few had been born in the town itself and likely drew on family connections back home to source fishes (Table 7.6).<sup>82</sup> Six of the eight women who sold marine fishes on our survey were born in coastal towns of the Lindi and Mtwara regions, and two lived there still.

Freshwater fried fish sold in Ikwiriri—the main product on offer in most months—were sourced from waterbodies adjacent to the town. Women would typically meet intermediary buyers near the Mkapa bridge, where they would buy up the smallest, cheapest fishes available. On the morning we were there, the first women arrived on foot to the site around 7:30, with some prepared to stay until 10 or 11am. As each intermediary arrived on his bicycle and laid his fish out on a sack on the ground, the women descended and price negotiations begin. Thirteen traders bicycled through the site while we were there, with one refusing to stop and two with larger fishes bundling up their wares when prices offered were too low. The remaining ten traders sold all of their stock of tiny fishes, suggesting there is specialisation among

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<sup>81</sup> The lone male market trader observed, at the market in Kibiti, had purchased his stock, already fried, from a woman and usually sold tomatoes.

<sup>82</sup> My married neighbour in Ruwe returned regularly to her birth village near Lake Zumbi, for instance, staying with her mother while she bought and fried fish, and returning to Ruwe to sell her stock.

intermediaries at Ikwiriri between those who supply the market vendors and those who sell to the fried fish sellers. There was no such specialisation in Kibiti, where the buyers selling fish to the women on the day we observed these transactions the same three individuals who regularly supplied the market trade.

Women might avoid competition at the trading site by paying fishermen in advance to deliver fish to their homes (but risked losing these advances if the man was untrustworthy), or they might travel directly to the landing sites in order to bypass intermediaries. Three women we spoke with at a fishing camp on Lake Ruwe—the *mchumba* (Kiswahili: lover) of an important fish buyer, her sister and sister-in-law—each had their separate fish frying business, and planned to bring fish by bicycle transport to Ikwiriri and then by minibus to markets in Dar es Salaam. Although I did not explore this aspect of the business, having a relationship with a fisherman or buyer would greatly increase a woman's access to supplies.

Women were prepared to travel to other markets in search of better prices for their fish, primarily within the district (Jaribu, Kimazichana) where fresh fish were less available but also to the southern suburbs of Dar es Salaam. This paralleled women surveyed in the Ikwiriri market who had either travelled to or from the southern coastal regions to bring marine fishes to market when freshwater supplies were low (at the peak of the wet season). In Ruwe, only three village women had sold fried fish at other markets (Kibiti, Bungu), but two had failed to sell fish quickly enough and lost all of their startup capital in the process, and the third had decided the costs involved were too high.

Women surveyed at the market in Ikwiriri had spent between 1 and 52USD on their stock, and the median capital investment at 20USD/buyer (N = 26) was slightly higher than for male fresh fish traders in that town (Table 7.4). To fry about 16USD worth of fish, a seller in Ikwiriri would buy four bundles of firewood (at 0.12USD each), two packages of salt (at 0.12USD each) and cooking oil (two 1L bottles at 1.28USD/L), for a total processing cost of 3.28USD. Women could save on processing by frying larger batches of fishes, buying cooking oil in larger containers, and collecting their own firewood. Overall, women expected to make on average a  $28 \pm 11\%$  return on the purchase price of their fishes (N = 20). The highest values of stock held in fried fish were recorded in March and April, for women who had travelled the furthest in order to deliver marine fish to Ikwiriri.

Most fried fish sellers in Ikwiriri (86% of 21, excluding the schoolgirl) cited the trade as their only occupation, although 72% of these women also farmed. In the latter group, as many women considered farming to be their most important income source as did those who named the fish trade (N = 5 in each case), with the remaining two respondents considering the two activities equally important, depending on circumstances at any one time. Four women listed additional income-earning activities: two sold breakfast food (*uji, maandazi*) but considered the fish trade more important; a third earned most of her income from selling vegetables; and a fourth sold charcoal but depended primarily on her farm income. Like smoked and fresh fish traders, the women reported trading in fried fish year-round, but reducing visits to the market in the wet season.

#### 7.4.14 Alternative fishery products

Market traders purchased *dagaa* in Dar es Salaam markets, but the remaining products considered here tended to be bought by traders from intermediaries coming to Ikwiriri and Kibiti from the delta. Markups were lower on all products in Kibiti, perhaps reflecting closer connections with the coast. Prawns were more expensive than other alternative products, on average, in both markets and their price per kg varied little from month to month (Table 7.7).<sup>83</sup>

**Table 7.7 Mean  $\pm$  SD (Minimum - Maximum) monthly prices (USD/kg) for alternative fishery products sold in Ikwiriri and Kibiti markets, MKS.**

Product	Ikwiriri	N	Kibiti	N
Dagaa	1.78 $\pm$ 1.14 (1.20 – 6.40)	20	1.74 $\pm$ 1.18 (0.96 – 5.60)	25
Prawns	3.53 $\pm$ 0.57 (2.40 – 4.80)	14	2.67 $\pm$ 0.46 (2.40 – 3.20)	3
Udufi	2.58 $\pm$ 0.50 (2.00 – 3.20)	6	2.00	1
Mbarata	-	-	1.60	2

Notes: N = number of products

<sup>83</sup> In reality, prawn traders obtained better prices than those shown here because they rarely sold their product by weight but rather by *fungu* fixed at 100 or 300TZS (0.08 – 0.24USD), giving them leeway to subtract shrimp from the pile (or add more, if they were having trouble attracting clients).

## 7.5 Discussion

The trade in freshwater fishes from Rufiji district provides relatively little (officially declared) revenue to the state but makes a key contribution to the food and livelihood security of its inhabitants. Fresh, local fish are the preferred fishery product in regional markets, purchased every day by those clients who can afford it, while smoked fish are traded up to Dar es Salaam and across the southern districts, providing animal protein to communities where fishery resources may be limited. Although certain buyers dominated certain supply chains (particularly in the fresh fish trade) there were ample opportunities for individuals to enter the trade on a smaller-scale, from fishermen bringing their smoked catch to market themselves to villagers building their own seasonal smoked fish exporting businesses. In nearly all cases trade participants were local to the district, and even major buyers had been able to amass the necessary starting capital through their own labour rather than loans or patronage arrangements. Fish trading was, for most people, a useful complement to farming, providing security when crops failed and a useful means to protect and grow their savings.

The links described here between a thriving local production system and urban markets could not be more different from the ‘involuting market’ described for a floodplain fishery in Namibia, where consumption was nearly entirely local (Abbott et al. 2007b). Indeed, Richmond et al. (2002) considered that most fish caught in Rufiji inland waters were exported from the district. Abbot et al. (2007) ascribed the lack of intermediaries and regional markets for fishery products in their system in part to the nature of the floodplain, where—unlike in lake or marine environments—landing sites are frequently changing as water levels rise and fall, as is the portfolio of alternative economic activities available to local people. This makes it difficult for traders to know when and where fish will be landed. Rufiji District, by combining an environment of large permanent lakes with temporary waterbodies, presented opportunities for developing both geographically stable, year-round trading routes and seasonally shifting ones. The proliferation of mobile phones also made finding where fish and fishermen were located much easier than in the past, as reported by informants.

It is also the case that the people of Rufiji have a long history of engaging in commercial trade, honed through centuries of interaction with the Arab world (Bantje

et al. n.d). These authors consider that, despite the collapse of this economic system, local people retain an orientation towards enterprise, as shown by their sensitivity to market incentives and talent for avoiding official controls (referring in the 1970s context to marketing cooperatives but equally applicable today to avoiding trade licensing and taxation measures). The orientation of the freshwater fishery in particular towards urban markets is long-standing, with Bantje (1982) describing the daily export of smoked fish up to the city by bus. It may be for this reason that informants did not consider the recent improvements in the road network to have had much effect on their business. The time saved with the new road to Dar es Salaam was still not enough to ensure fresh fish arriving in good condition to the city by local transport, whereas it made little difference to smoked fish traders whether they arrived there in half a day or (as in the past) two.

In keeping with the entrepreneurial nature of Rufiji people, the regional trade was dominated by locals, rather than outsiders. I would venture that urban wholesalers were predominantly Rufiji natives as well, on the basis of informants' anecdotes of local traders who had made good and moved to the city, and wider patterns of Rufiji men's migration to Dar es Salaam (Bantje 1976). Control of the supply chain and trade benefits by locals is unlike the situation described for charcoal in Senegal (Ribot 1998), and even less like the situation in the nearby Rufiji Delta, where international actors and their agents (often from other parts of Tanzania) were key players in the export-driven prawn fishery (Gibbons 1997).

It would appear that fresh fish buyers had the highest margins and greatest annual earnings among trade participants in the district, with those running vertically-integrated enterprises (i.e., bringing fish from the landing sites through to retail sale from their own market stall) doing best of all. As discussed, income estimates were based on a number of assumptions and may not have adequately factored in losses, and could only be taken as indicative of potential earnings. However, on the only available point of direct comparison my estimated annual income for a smoked fish market trader (520USD) did come close to that provided by Richmond et al. (2002; 454USD). The fact that fresh fish buyers could potentially earn substantially more than market vendors or smoked fish buyers would suggest an unequalitarian trade structure, in which some people were able to extract much more surplus from the fishery than others. However, a longer-term study might reveal the risky nature of investing in the fresh fish business, and serve to rebalance relative earnings among participants.

The barriers to entering the trade were relatively low, with buyers and vendors able to accumulate the necessary starting capital through their own efforts, and few standing out as particularly wealthy. Informants considered that there were few *matajiri* among themselves, and as a result little opportunity to secure loans for nets or for investing in one's business. As found also by Richmond et al. (2002) most buyers were small-scale traders who visited lakeside fishing camps and landing sites every few days, with a few wholesalers who spent longer periods in fishing camps amassing larger quantities of smoked fish for transport to market, and a few major fresh fish buyers.

The major fresh fish buyers we came across were different from most other trade participants in having access to greater fixed capital, owning a motorcycle in three cases, and a *juya* net in two others. However, capital holdings alone did not seem to explain how people reached their position as major intermediary buyers. One of the most successful fresh fish buyers (Juma), observed on every survey round and with the highest (estimated) profit margins, had neither nets nor a motorcycle. Similarly, we met several *juya* net owners (local villagers) who were unable to effectively monetise their investment, lacking the cash to buy fish produced every day from their nets. Furthermore, some of the smoked fish buyers we encountered, with *msingi* of 240USD or more, could have theoretically invested that money in the fresh fish trade but chose not to.

One reason for people with the economic means to do so not moving into the fresh fish trade could be that it was a young man's game: it was high-risk and fast-paced, "a lottery" as repeatedly told to us by traders. Indeed, several market traders had given up selling fresh fish to concentrate on smoked fish in their older age. The fresh fish trade also required excellent negotiation skills in obtaining the best prices from buyers and clients who knew full well of sellers' need to sell quickly. Fresh fish buyers also required a deft touch in managing relationships with fishermen in order to secure supplies. It may be for this last reason that, although several smoked fish buyers at the landing sites came from outside the district, fresh fish buyers we encountered were all Rufiji natives. Indeed, one 'outsider' buyer at a landing site had given up trying to purchase fresh fish directly from fishermen for smoking and paid a higher price to the camp's local fresh fish buyer instead. The latter told us that while fishermen also tried to renege on agreements with him, it was easier for him to find them in the village (and

presumably draw on kinship and other social ties) and persuade them to deliver promised supplies than it was for the outside buyer.

Although a relatively small number of fresh fish buyers worked at the markets and the landing sites on Lake Ruwe, and therefore dominated that commodity chain, they appeared to maintain this position primarily through economic wherewithal and business acumen rather than coercion or open conflict. It may be that I missed observing more obvious power plays among male traders because of the timing of my fieldwork, outside the height of the trading season. It may also be that such competition played itself out even before buyers had arrived at the market and landing sites where I had opportunity to observe transactions. For instance, a potential buyer may know that there will be no way for him to obtain fish from a certain landing site, because the few *juya* nets there are already assigned to a buyer, and so simply not appear there. Certainly, in economic terms, buyers with more money (and who could therefore absorb smaller margins) could afford to pay more for fishes and acquire supplies faster, thereby squeezing out smaller players. This could explain why Athumani, a village-based smoked fish buyer, was operating from the floodplain rather than from Lake Ruwe when we visited him in November, but had moved to Lake Ruwe later in the season when his capital had increased. Buyers could also potentially exclude others by outperforming them as managers, dealing with fishermen with more skill and thereby ensuring better supply (see Chapter 6). With the absence of overt competition came obvious instances of cooperation as well, with buyers seen to transport each other's catch to market if they had extra room on the motorcycle, or to lend each other gas.

As a group, men derived more direct benefits from the freshwater fish trade than did women, whose participation was restricted almost exclusively to the processing and sale of fried fish. The fried fish traders were relegated to the physical margins of the marketplace in Ikwiriri, and entirely absent from the Kibiti marketplace, with most women in both towns selling their wares on the streets. Even the act of purchasing fish was kept separate, in space or time, from the main business of the market, with women in Ikwiriri travelling outside of town to buy fresh fish, and those in Kibiti completing their purchases at the market before most clients and many traders had arrived. One elderly smoked fish trader blamed the women for driving up fish prices through ignorance and inexperience, overpaying buyers for tiny fish. No other



traders displayed hostile attitudes towards the women, but neither did we explore the issue.

As far as I know, women did not own any fishing gear in the local fishery nor provide credit, but some did have supply arrangements with specific fishermen, paying them in advance for their catch. Women were at a particular disadvantage in gaining access to fish supplies, telling us that they sometimes had to physically fight with one another to get fish from buyers. There was certainly much jostling among those women trying to fill their buckets on the mornings we observed women's fish buying. Those few women we met who were living at the fishing camps likely secured supplies through the kind of sex-for-fish transactions described elsewhere in Africa (Béné and Merten 2008, Merten and Haller 2007). Fishermen said as much, and village women passed comment on the female visitors established there, though such economic transactions were not necessarily shameful. In Rufiji, the association of fish with sex appeared to be long-standing, judging from reports of men from the high terrace 'lending' their wife to visiting fishermen from the valley (see Chapter 8; see also Bantje 1982, Lockwood 1998:67 on transactional sex in Rufiji District).

The restricted role of Rufiji women in the fish trade is in stark contrast to other parts of Africa and the world, where women can hold dominant marketing positions (Harper et al. 2013, Hapke 2001). Most notable are the Fante fishtraders of Ghana, where female relatives of a fisherman is charged with selling his catch, and in many cases parlays these stakes into capital accumulation and hiring labour (Walker 2001). Rural women with limited access to farmland or spousal salaries in Zambia in the 1980s established a new, low-input fishery for *chinense* fish, giving rise to a class of female rural-urban fish traders and eventually gear owners (Gordon 2005). In Uganda, Dolan (2002) records fish trading as a prestigious livelihood among women and their most important income generating activities, while Abbott et al. (2007b) found nearly all fish vendors to be female, with all ranking fish trade as their most important livelihood activity. Rufiji women, unlike their counterparts in the above cases, are Muslim and operate in a deeply ambiguous context, at once allowed independence of movement and control over their own earnings, but also confronting men's desire to maintain control over them. Their ability to trade likely relates to the status of fried fish as a cooked item and therefore a product firmly in the female domain (see Chapter

2).<sup>84</sup> Despite the challenges involved, the fried fish trade was clearly important to the livelihoods of those women participating, considered by many market traders surveyed to be as important as farming.

Earnings from the freshwater fish trade generated a cash surplus which participants variously described as investing in their business or farming, using to buy houses, and serving to pay for family emergencies. There was little concern as to the sustainability of the trade, although informants agreed that it no longer provided as good a livelihood as it once had. This was blamed on the fact that many more people were fishing and trading now than twenty years ago, driving down profit margins even while capital to invest in one's business remained hard to come by. Several vendors described their failed attempts to secure bank loans, and were upset at the lack of support for local businesses. District officials told us that traders had resisted their efforts to increase cooperation among them, but if so this was likely a response to bitter memories of failed cotton cooperatives in the district (Bantje 1982). The market vendors we met were not against cooperation: several worked in long-standing partnerships and as a group vendors in both towns had chosen a market leader. District officials themselves could hardly be relied upon to improve livelihood outcomes from the trade, given their near total absence from the management landscape. Only those regulations that extracted rents from fishermen and traders were regularly enforced, with the licensing system on fishermen in particular serving to criminalise a long-standing livelihood activity (i.e., the transport of one's fishes for sale in the highlands) (see Chapter 8). Problems of administrative apathy and corruption in fisheries departments, compounded by lack of staff, funds and expertise, are not unique to Rufiji District (Geheb and Crean 2003) nor to Tanzania (Haller and Merten 2008).

In this chapter, a picture has emerged of a freshwater fish trade that is thriving, dependable as an income source (particularly for smoked fish traders), and relatively equitable (although men had more opportunities to participate than women). Whereas a few individuals did dominate certain routes, there were ample opportunities for smaller traders to buy supplies from non-contracted fishermen or away from the main landing sites. Furthermore, the starting capital required to trade was not exorbitant, likely contributing to the fact that most trade participants were local. Differences in annual earnings at different trade levels, though substantial, were not necessarily exploitative,

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<sup>84</sup> Perhaps a similar status applies to *uduvi*, a small brown shrimp collected by women in the Rufiji delta who live at women's fishing camps during neap tides (Gibbon 1997).

given the costs and risks incurred by traders relative to fishermen. Fishermen retained the ability to walk away from buyers in any case, as explored in Chapter 6. As such, it is difficult to speak of winners and losers in the fish trade itself (again, ignoring gender imbalances), as in its current form it provides a viable livelihood opportunity to a large segment of the district population. However, commercial fishing for an external market necessarily sets up tensions between those local people who depend on fishing for subsistence use and those intent on extracting as much income from the resource as they can. The next chapter turns to issues of governance, in which the historical commercialisation of local fisheries has served to overwhelm traditional communal, benefit-sharing arrangements and where present-day commercial fishermen and savvy traders undermine what limited management arrangements.

# Chapter 8. “We are hungry”: Challenges to decentralised resource management at Lake Ruwe

## 8.1 Introduction

In this chapter I consider past and recent ways that local people have managed the floodplain fishery, paying particular attention to how historic patterns of resource access and use under the now-dismantled customary regimes echo down to influence today’s (limited) management efforts. The introduction of nylon fishing nets, increasing commercialisation and social change brought about through villagisation set the stage for today’s essentially open-access regime. Local fisheries are formally under-regulated, in the formulation of Geheb and Crean (2003). Fishery-related legislation exists, but the state, rather than supporting villagers’ efforts to gain more benefits from the resource, takes no part in local enforcement or education activities for freshwater fisheries. Villagers’ own ideas and plans for better managing the fishery—even where developed through inclusive, participatory methods and supported by well-designed local institutions—are undermined by the rent-seeking behaviour of their leaders and people’s own ambiguous notions of whether and how it should be dealt with.

Understanding the practical functioning of village government is all the more important in the context of an increasing drive towards devolving responsibilities for natural resource management to local authorities in Tanzania and across the continent (see Chapter 1). For true democratic change to occur, however, observers have emphasised the need for improved downward accountability to guard against the misuse of devolved powers (Béné et al. 2012a, Agrawal and Ribot 1999).

As argued by Brockington (2008), however:

“[W]ell-designed power structures alone cannot make for muscular decentralisation. It is the *performance* of these structures, the way they actually operate, which will determine how well decentralised local democracies work” (emphasis in original).

Accordingly, the author calls for “rich ethnographic descriptions of local governments in action” in order to better understand the challenges facing participatory democracy and their broader implications for community conservation.

In this chapter, I first describe the structure of local government in order to orient readers in the later discussion of how leaders operate within this framework, and briefly introduce the Rufiji Environmental Management Project (REMP), a district-administered and donor-supported project which facilitated environmental management planning in Mbunju-Mvuleini. I then turn to a description of traditional fishing methods and the customary tenure regime governing access to floodplain fishing sites, before discussing the impact of both modern fishing methods and villagisation on traditional fishery-related rules and institutions. From this historical basis, I move on to explore the current status and major challenges to present-day fisheries management, focusing on the manifestations of poor governance at the local level. I contrast the case of Mbunju-Mvuleini, where participation in REMP created a strong platform for resource management, and that of Ruwe, where no such support was available, to highlight the fact that better institutional design cannot guarantee better performance.<sup>85</sup> In the discussion, I pull out how traditional attitudes to fisheries management compound wider issues of poor governance, making decentralisation difficult but all the more necessary.

## **8.2 Study Area: Local government and REMP**

### **8.2.1 Current structure of rural local government**

In rural areas, most important decisions (such as planning and budgeting) are carried out at the district level, overseeing constituent wards and villages (Venugopal and Yilmaz 2010). The “village” (*kijiji*) in Tanzania is a very specific socio-

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<sup>85</sup> I did not spend enough time in Mkongo to evaluate local governance there, with the situation made more complicated by the fact that local offices for the ward council and state ruling party (CCM) were also located in the village.

institutional entity, constructed on the basis of having a fully-identifiable membership and a clear demarcation of the land area occupied and/or used by villagers, a concept first embedded in law in the 1975 Villages Act (Wily 1997). Member households are listed and established as the supreme authority of the community (the Village Assembly), and adult members in turn elect a representative government (the Village Council) with wide-ranging legal functions and responsibilities. As Wily (1997) goes on to describe, these include the ability to make village by-laws which once drafted and approved by the local district council become law and up-holdable in any court. Importantly, a village government may fine anyone in breach of its by-laws and retain all monies generated through the by-laws, following the passing of the Local Government (District Authorities) Act No. 7 of 1982, and supporting legislation such as the 2002 Forest Act (Wily 1997, Lund 2007).

The Village Council consists of 15-25 members elected for a five-year period, of which at least one fourth must be women, and an elected chairperson (the *mwenyekiti*). Larger villages are split into hamlets (sing., *kitongoji*), each of which has an elected chairperson included on the village council. Also on the council, as a non-voting secretary, is the Village Executive Officer (VEO, or *mtendaji*), nominated by the Village Council but appointed by the District Executive Director (DED), himself appointed by the Minister of Local Government. Collections of villages are grouped into administrative wards, overseen by a centrally-hired Ward Executive Officer (WEO). Each ward in turn elects its own councillor to the District Council to serve alongside the DED, members of parliament (MPs) and other centrally-appointed members (Venugopal and Yilmaz 2010). These authors argue that the intrusive role of centrally-appointed administrators results in elected representatives having a limited impact on decision-making and implementation in rural government. Furthermore, even though Tanzania moved to multi-party democracy in 1992, candidates of the ruling party, CCM, are rarely effectively opposed (Brockington 2008).

People's opinion of local government is justifiably low: taxpayers see few benefits for the taxes they pay, with public services non-existent in some cases. Nonetheless, the elimination of the development levy (a head tax) in 2004-2006 has only intensified local authorities' pursuit of tax revenue (Venugopal and Yilmaz 2010, Fjeldstad 2002).

### **8.2.2 *The Rufiji Environment Management Project***

The Rufiji Environmental Management Project (REMP, known in Kiswahili by the acronym MUMaRu) operated in four pilot villages in the district, including Mbunju-Mvuleini, from 1997 to 2003. Its stated goal was to promote sustainable use of natural resources while enhancing local livelihoods (e.g., Ochieng 2002). The project was spearheaded by the International Union for the Conservation of Nature (IUCN), in partnership with the Tanzanian and Dutch governments (IUCN 2004), and was meant to build capacity for and facilitate decentralisation of natural resource management (O. Hamerlynck, pers. comm). REMP representatives engaged villagers in the pilot sites in a highly inclusive multi-stage process, from resource mapping to designing a village environment management plan and developing supporting legislation in the form of village by-laws (IUCN 2004). Despite the premature end of the project due to institutional changes within the Dutch government (Parker 2010), the Village Environmental Committee formed during the participatory process in Mbunju-Mvuleini was still very much active at the time of my fieldwork, with its ten elected officers overseeing the activities of ten village scouts. The scouts' primary duty was to patrol the village forest, giving out fines to or confiscating materials from any users who had not first paid the required fees to the village office. The village had shared in the prestigious awarding of a cash prize from the United Nations Development Programme's Equator Initiative, using the funds to build a village office much envied by neighbouring villagers.<sup>86</sup>

### **8.3 Methods**

Over the fieldwork period I conducted several sets of interviews organised around various themes (see Appendix B for detailed list). The first set (N = 30 interviews) focused on people's recollections of life up to and just after villagisation, with particular attention to traditional fisheries and water tenure on the floodplain. I usually interviewed people alone or in pairs, with elderly men living in Ruwe, occasionally joined by their wives, as my main informants (19 interviews, and one group interview). I conducted group interviews with elders in Mkongo (two groups)

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<sup>86</sup> "It makes our own office look like a chicken coop," was the most incisive comment I heard on this topic. Informants in Ruwe blamed themselves for missing out on the REMP project, saying locals had been overly suspicious of the project's motivations during a visit from representatives early on in the site selection process.

and Mbunju-Mvuleini (one group), as well as seven individual interviews (only one with a woman alone) in the latter village. The Ruwe group organised themselves and invited me to speak with them early on in my fieldwork, whereas in the two other villages I asked the village chairperson to select three or four knowledgeable informants to meet with, including one woman in each group. In selecting individual informants I began by re-visiting several of the participants met through the early group interviews, and continued to identify people to speak with through my interactions in daily life or on other research surveys, or through the recommendations of my research assistants. Five informants with particularly relevant experience and enthusiasm were interviewed at least twice, sometimes for a different interview series.

In support of these interviews, and as a means to better understand the geography of the pre-villagisation settlements and map traditional borders (see below), I organised two walks onto the floodplain with elders from two of the three village wards in October 2008.<sup>87</sup> Each group consisted of three men from the hamlet of interest, myself, and one or both research assistants. On both walks we bicycled to the edge of the original settlement (Bondeni-Kipela for the first group, Bondeni-Beta for the second), and walked along the former road (now a path) where homesteads had been sited, discussing which families had lived there, daily life, and access to nearby waterbodies. I also took GPS readings at key sites. I selected informants for the walks based on previous interviews, and their physical ability to make the trip.

A second set of interviews (N = 9) explored present-day resource management efforts for the Lake Ruwe fishery, with particular attention to actions taken in Ruwe and Mbunju-Mvuleini (Appendix B). These consisted of group interviews with members of the village council (in Ruwe, Mbunju-Mvuleini, Mkongo North and Mkongo South, and Mpima), members of the Village Environment Committee in Mbunju-Mvuleini, and resource guards in Ruwe, as well as individual interviews with the chairman of Mbunju-Mvuleini and VEO of Ruwe. I gained additional insights into struggles over resource management by attending one village assembly meeting in Ruwe (over two days) and two in Mbunju-Mvuleini and copying from the village

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<sup>87</sup> I chose the wards on the western and eastern edges of the village because I was interested in conflict over borders with neighbouring villages and did not have time to conduct a third walk with elders from the central section.



books in both villages.<sup>88</sup> As well, work among fishermen and traders at the fishing camps on Lake Ruwe provided direct examples of how attempts to manage the fishery worked in practice. I also spent two days reading through court records at Mkongo but found only one case dealing with conflict in the local fisheries, and very few relating to other natural resources.

Having learnt that uncertainty over borders contributed to problems in managing local resources, I held six interviews specifically on that topic (in addition to three earlier 'local history' interviews which also explored the issue), with four elders in Ruwe and three in Mbunju-Mvuleini, in addition to the resource walk with elders from Kipela. I elicited five maps from these informants, usually by asking them to draw in the sand which I would then recopy on paper, and visiting key features to obtain GPS coordinates. I selected informants for these interviews based on village records of who had been involved in setting the most recent (disputed) border point, and recommendations of those people with the best grasp of the issues.

Finally, to round out my consideration of access to fisheries resources, I conducted a survey of fishermen currently fishing with reed fences on floodplain water channels (15 interviews with seven teams between May and November 2008). I focused on fishermen working the channels at Mbambe, between Ruwe and Mbunju-Mvuleini, eliciting invitations to visit every *nyando* in the area. At each visit, I would ask about the composition of the team, who owned the land the *nyando* was sited on and the history of that site, whether there was any conflict around sites, and typical catches and earnings. On my last visit I asked when the *nyando* had stopped producing and what their total earnings had been for the season.

In all my interviews I used interview guides to remind myself of topics to cover, but otherwise encouraged informants to share additional information by asking open-ended questions. All group interviews were held in the village offices except for the elder group interview in Ruwe, which was in the home of one of the participants. Individual interviews took place variously at the informant's home in the village, at their field house, or at their fishing spot, in the case of the *nyando* survey. Interviews usually lasted no more than one hour. I conducted all formal interviews with one or the

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<sup>88</sup> During my pilot study, in July 2007, I happened to be present for another Village Assembly meeting in Ruwe, at which the VEO was formally accused of corruption in the presence of a District official, leading to his later dismissal, discussed in this chapter.

other of my research assistants, and compensated informants for their time (see Chapter 3).

## 8.4 Results

### 8.4.1 *Fishing on the floodplain: customary patterns of resource use*

Living on the floodplain, where land would be submerged for at least three months of nearly every year, and countless water channels and ponds would swell and shrink with the floods, made fishing an essential feature of the Ndengereko's world. A variety of different fishing gears and techniques were deployed to catch fish at different stages of the flood's annual cycle, but none was more central to fishing culture than the practice of harvesting fishes with reed fences (i.e., fishing weirs), the *nyando* (pl. *wando*, Kind.: *ndanga*). There are two types of *nyando* fishing—*nyando ya kutega* (to trap, also referred to as *ya kuzuia*, to obstruct) and *ya kukwega* (to pull). The first, *ya kutega*, involves blocking off narrow water channels as fish move on and off the floodplain at the start and end of the rainy season, and is still commonly practiced (see Box 8.1). The other, *ya kukwega*, is more labour-intensive, lands a greater amount of fish, and is practiced in larger waterbodies (semi-permanent ponds, sing. *bwawa*) during the dry season. It will be the focus of this section because, although now largely absent from Rufiji life, it once played a critical role in people's food security, taking place at the height of the hungry season.

#### *Reed fence fishing technique and social organisation*

In *nyando ya kukwega* fishing, the reed fence is very long, covering the pond from one shore to the other, with a trap in the centre (the *kijumba*, a hut or little house) into which fish are driven as the men slowly move the fence across the length of the pond. Moving the fence could take from one week up to two months, depending on the size of the waterbody, and involved strenuous effort. The men working the fence (Kind.: the *wandanga*) came each morning, with one set working to push and pull the fence while another worked as divers, making sure the fence stayed upright, clear from the mud and flush with the bottom, so that no large fish escaped. When the fence had crossed nearly the entire length of the pond, the fish remaining trapped at the far end were harvested in bulk by the men moving two smaller reed fences towards one

**Box 8.1 Persisting fishing traditions: Present-day reed fence traps, *nyando ya kutega***

In our survey of dry-season *nyando* established at Mbambe in the study year, we observed water tenure rules, witchcraft practices and features of social organisation similar to those described by elders as having all but disappeared with the arrival of net fisheries and villagisation. (See Chapter 6 for a consideration of economic aspects)

Stationary dry-season fences (*nyando ya kuinzia*, as opposed to wet-season fences, *nyando ya libue*, which are moved after each rainfall to follow the fish) need to be spaced far enough apart so that each catches enough fish to make the effort worthwhile, raising the potential for conflict.<sup>89</sup> Initially, informants claimed that *nyando* could be erected anywhere on any water channel as long as the field owner(s) on whose land the fence was set agreed to it. In line with this, four of the seven *nyandos* we surveyed were set on one of the team members' fields, and one on common land. However, informants also reported that certain spots were recognised as belonging to specific fishermen and, even if unoccupied, could not be used without their permission. One expert elder whom I will call Musa (who at our first interview denied the existence of any such tenure arrangements) told us that he returned to his own spot near Lake Uba every year. Musa specified that his children would not have rights to the spot after his death, stating that fishing locations were not heritable in that way, but others told us spots were passed from father to son.

Although active conflict over *nyando* sites was strongly denied, disagreements that did occur appeared to play themselves out through witchcraft. Musa, for instance, was accused by another *nyando* team of cursing their chamber which became filled with frogs. Informants described the need for medicine (*dawa*) from a witchdoctor to protect against such curses, as well as against crocodiles and other dangerous animals. The best fishing results required spending the night by the *nyando* to remove *kambale* as they entered the trap (otherwise these catfish were strong enough to break through), but without lighting a fire, which would scare off the targeted fish but also exposed

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<sup>89</sup> *Nyando ya kuinzia* started more or less after May 15, the date referred to locally as the end of the wet season (*masika*), marked by the Pleiades constellation (Kiswahili: *kilimia*) dropping from the heavens, so that it is on the horizon in the early night sky. As explained to us by an expert fisherman, the stars' falling was a signal for the fish to leave the fields and return back to the ponds through the water channels. In the Swahili calendar, the appearance of the Pleiades marks the onset of the agricultural season, with the name of the constellation reflecting the Bantu root of the word *-lima*, to dig or to cultivate (Gray 1955).

**Box 8.1 cont'd**

the fishermen to attacks by wild animals. Several informants explained that this reliance on witchcraft meant that *nyando* fishing had to involve the participation of older people who knew the traditional ways. In fact, most of the teams surveyed included a mix of ages, providing a livelihood activity to some quite elderly men. Those elders who worked mainly alone (with occasional helpers) were recognised as the most expert, describing themselves as having vast knowledge of the ways of fish and crocodiles, and secret expertise to ensure good catches.<sup>90</sup> The single team with no elders on board, and who claimed not to use witchcraft, had shut down their fence early compared to others in the area, and were accused of inexperience by Musa. The custom of offering fish to any visitor of the *nyando* who happened to be present when fish were landed still occurred. One elder referred to this practice as *kujoga* in Kindengereko, explaining that this is simply what fishermen do, in order to help people who cannot fish themselves.<sup>91</sup> However, most people could only take advantage of this generosity once; repeat visits were frowned upon. Although there was no formal obligation to give fish to the owner of the field on which a *nyando* was sited (if he wasn't already a team member), occasional gifts of fish were still expected, and sometimes even a cash gift at the end of the season. Patterns of social organisation in *nyando* fishing persisted as well, with teams typically made up of family members who also farmed near one another (Table 6.5).

another, squeezing the fish into an even smaller space and scooping them out of the water. Smaller, more frequent harvests might occur throughout the period the *nyando* was in the water, with fishermen retrieving fish caught in the *kijumba* and also diving for fish in the fenced-in section of the water, pinning them to the bottom with a

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<sup>90</sup> One of these elders, Mzee Ndanga (literally, Elder Nyando in Kindengereko) had inherited his name from his father, famous in German colonial times for organizing *nyando* expeditions which helped up to fifteen men at a time pay the head tax.

<sup>91</sup> My research assistant and myself received fish on every *nyando* survey where we observed fishermen collecting fish from the trap.

traditional net and scooping them up (the *ngubale*). At the final mass harvest the fence was dismantled, with useable sections saved for incorporation in the next.

The teams involved in *nyando* fishing could involve from as few as five people up to 70 or more, as described for expeditions on Lake Uba, a large, permanent waterbody. Only married men with children were allowed to fish on the *nyando*, and only after obtaining their father's consent. Each *nyando* expedition worked under a leader (the *fundi*, an expert or master), who would plan the enterprise and invite men to join his group. Typically, a team would involve members of a lineage group and their neighbours (related also by intermarriage). Each participant contributed one or two sections of fencing, made of split, sun-dried reeds (*upanje*) tied with *milala* palm leaf fibers. The leader would summon a witchdoctor (*mganga*) who had the task of communicating with the underwater spirits (*mashetani*) guarding the pond and making the necessary offerings to ensure fishermen's safety and a good catch. The leader and witchdoctor camped at the pond until the expedition was over, together with the *njoshi* (the man responsible for dividing up the catch) and the *mwalang'ombe* (the man charged with checking on the state of the *nyando* every night). The four men were referred to collectively as the "children of the camp". The *njoshi*, while the other man was charged. Women had no direct role in fishing, but did help to smoke the catch. The wives of the *fundi* and witchdoctor also had to follow certain taboos, such as leaving their hair unbraided for the duration of the *nyando* cycle.

At the final harvest, the catch from the *nyando* was divided among the men involved in each cycle after first meeting certain obligations. The cost of any offerings was covered by setting aside an equivalent amount of fish for the person who had provided the goat, chicken or other item. The elder of the clan based at the pond would also receive a gift of fish at the harvest, as would men who had lent canoes to the team. In some cases, the gift to the clan elder was limited to a few prize fish, in tribute, but in others he was assigned a full share of the final harvest. The *fundi* would then take his share and give a portion to his witchdoctor, selecting the largest and best fish. Of the remaining catch, each fisherman would be allowed to choose two fish for himself. The *njoshi* would then proceed with distributing the remainder. The fishing team was divided into pairs, with each pair receiving a share of fish to split between them, and any odd-man out (called the *mbinja*) getting half that amount. Divers were meant to receive more than those workers who had simply pulled the nets. Any helpers who had worked on the *nyando* on any given day were also given a share of the final catch.

Other people besides the *nyando* participants benefitted from the final harvest as well, as described below.

### *Gaining access to ponds*

People living on the northern floodplain in the colonial period built their houses in clusters strung out along the main road, forming ribbon-like settlements. A cluster could have as few as two but up to ten houses within it (see Chapter 2). Each lineage-based cluster (*ukoo*) abutted against another's, and several clusters would share access to the nearest pond from which drinking water would be drawn. Like unworked land, a pond was considered by informants to be a gift from God, and could not be owned. Nonetheless, specific clans had particular responsibility for each pond, with a clan's claim on the waterbody arising from their ancestor having been the first to live near it. Alternatively, a clan with no claim on a waterbody could suddenly acquire one, as large floods could transform a group's water hole into a deep pond. The element of luck involved in their appearance reinforced the local view that ponds were a divine gift.

Clans with claims on their local pond were said "to control" the ponds by interceding with the water spirits residing there, acting as guardians. They would maintain the spirit shrines by the pond, praying to the spirits and offering gifts, but also undertake prosaic tasks like clearing out aquatic vegetation. Usually one clan had responsibility for one pond, but sometimes one clan could control more than one pond, or two clans could share responsibility for the same pond, though different sections of it. Guardianship of the pond was described as the entire clan's responsibility, although the senior-most male, as the key authority figure in all matters relating to the group, was the central figure. It was this man, known simply as the *mzee* (the elder) who would decide when to fish *nyando* on the pond, and convene his family and neighbours to the task. If someone from outside the clan wished to fish the pond, the *nyando* expedition leader or his emissary would first approach a local clan member to solicit an opportunity to speak with the *mzee*.

Informants were categorical in stating that the *nyando* leader did not *ask* for permission to fish, but simply *informed* the clan elder of his intention, noting that consent was almost always forthcoming. First, the person asking was generally related to the clan in question (and indeed was selected as emissary for that reason), with informants emphasising that it would be extremely difficult for anyone to deny a

kinsman's request. Second, *nyando* expeditions were organised in the hungry season, and it was unheard of to deny a hungry man food. Third, the clan stood to gain directly from the expedition, with members invited to join the team. Indeed, the clan elder could in some cases receive a full share of the catch whether he participated or not, with our informants wryly noting that he might be at his fields for the entire cycle.<sup>92</sup> The only reasons an elder might refuse the asker would be if the clan had their own plans to set up a *nyando* in the pond (in which case they would usually invite the asker's team to join them) or if it had been just recently fished

Fishermen could use other methods without any formalities, such as brush traps (*masagala*), conical baskets (*kisi*), spears, hook and line, and traditional nets (e.g., *ngubale*, clapped against the bottom, or *tindi*, a scoop net) on floodplain ponds and water channels, although it was considered good manners to inform people living nearby of your activities. Informants further noted that at high water, when the floodplain was "like an ocean," all claims on ponds ceased until their edges re-emerged. However, fixed reed fences on water channels (*nyando ya kutega*) were the private property of those who had built the fence, with access to the site every year thereafter reserved for the individual who had first fished it (see Box 8.1).<sup>93</sup>

#### *Enforcing access rights: water spirits and ritual*

A *nyando* expedition could not go ahead without the consent of the water spirits residing at a pond, hence the need to work through the pond's guardians. Clan elders and witchdoctors were able to pray to and appease the spirits living at the floodplain ponds, although those associated with the larger lakes were beyond their control. One informant told us that at Lake Ruwe and all large lakes the fish belonged to the spirits, were their children, and viewed the spirits as their kings. Informants described a spirit world overlaid on the local geography, with spirit villages mirroring real villages, and spirits moving freely between locations, leaving Lake Ruwe to attend Friday prayers at Lake Rugongwe, near Utete, for instance. Shrines (resembling tiny houses on stilts) were established at places where spirits gathered (*tambizi*) and still remain dotted throughout the landscape (although the number has decreased). Many

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<sup>92</sup> Although not confirmed, given people's repeated emphasis on the share of the catch accorded to the *mbinja*, the term likely refers to the man who is part of the team in name only.

<sup>93</sup> Fishermen still used basket traps on small water channels as well, such as the funnel trap called *dema*, that I would expect conformed to the same private property regime that *nyando ya kutega* did, although I did not specifically confirm this. (See Thomas 1996).

fishermen continue to leave offerings to the principal shrine at Lake Ruwe and follow rules of ‘proper behaviour’ by the lakeshore (see Chapter 9).

The *mzee* of the guardian clan (or the clan’s witchdoctor, if not the same person) would take the offerings (of white, yellow or red cloth, myrrh, cinnamon and nutmeg) provided by the person wishing to fish the pond to the shrine and inform the spirits that the clan had accepted the request of “a poor and hungry man” but needed their consent. The *mzee* would stay overnight by the pond to learn if the spirits required further gifts (such as a chicken or goat) before fishing could begin. The spirits might also impose conditions, stating that all fishing had to be finished within a month, for example.

To go against the spirits placed fishermen in danger of attack from wild animals and of possession by the spirits themselves. As noted, the *nyando* team had their own witchdoctor on site once fishing began (not necessarily the clan’s witchdoctor, as I understood it) who asked the spirits to release the fish and also “closed the pond” (*kufunga bwawa*) or “closed the crocodile”, a reference to shutting the jaws of wild animals. Besides crocodiles, these included hippos and pythons but also *kange*, a fish with terrible teeth that could rip your insides open, and *kogo*, a fish with poisonous spines. The animals were still present, but rendered harmless, with one former diver recalling the terrifying sensation of crocodiles rushing past him as they chased fish near the *nyando*.

One group of elders told us that they placed all their faith in the witchdoctor, and obeyed him in all things. If he revealed that the spirits had requested a human sacrifice, however, the fishermen would immediately desist from fishing the pond. Nonetheless, two other elders told us that some witchdoctors were more secretive, and would allow a human sacrifice to take place in order to guarantee a good result on the *nyando*. Fathers passed the knowledge of how to deal with the water spirits on to their sons, with two of our informants being at least third generation witchdoctors.

#### *Livelihood role: a communal safety net*

Fishing with *nyando ya kukwega* took place in the dry season when food (i.e., grain) was locally scarce, beginning around October. Preparations for a *nyando* cycle would begin up to a month in advance so that fish would be harvested before grain stores ran too low. Men smoked their surplus catch and carried the fish to Kibiti and other villages on the northern high terrace (Magongo) to exchange for cassava, millet,



sorghum, maize and other foodstuff. For people on the high terrace, the dry season brought a lack of relish (*mboga*), with their usual plant foods dried out (in particular, *kisamvu*, cassava leaves), which made them keen to trade grain for fish. The fishermen often had relatives and close friends (*ndugu*) on the high terrace, such as brothers who had married local women, and with whom they could stay.<sup>94</sup> They might also travel further north into Zaramoland, towards Dar es Salaam. Men could also sell their catch and use the cash earnings to, for example, buy food and clothes or a bicycle, or to pay the colonial head tax or the bride price for a new wife.

It was not only the direct participants in *nyando* fishing who benefitted from the fish harvest. A fisherman might share his portion of the catch with a wide circle of kin, providing *mboga* first of all to his father, but also to his wife and children, in-laws, unmarried sisters, brothers, uncles, grandparents and lovers. However, even those with no relatives on the *nyando* team could obtain fish simply by being present at the final harvest (or indeed any time fish were landed throughout the cycle). Visitors to the *nyando* at a harvest obligatorily received a gift from the *njoshi*, under the leader's direction, even if they came from distant settlements. When the catch was good at a final harvest, fishermen would call people down to the pond so they could help themselves to the smaller fishes left on the ground.<sup>95</sup> Fishermen might even bring fish directly to elderly people unable to displace themselves, or even a gift of cassava acquired on the high terrace from their fish exchange, with first priority going to helping your own kin. Another strategy used by the elderly was to walk the path to Magongo, knowing that each fisherman they passed on his way home would gift them with a couple of pieces of cassava. In these ways, elders explained, the *nyando* was "a blessing" to the entire community.

Informants considered that the amount of fish acquired through *nyando* fishing was nearly always sufficient to meet people's food needs, except under extreme

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<sup>94</sup> Informants contrasted their welcome at Magongo with that received in the southern hills where the "bad" Matumbi people lived. The locals there preferred cash to exchange transactions, but would not sell to you unless their chickens deigned to peck at your money laid out on the ground. In contrast, at Magongo, one informant told us that there a man would leave his house and wife to his visiting fisherman friend for the night, announcing his return in the morning with a song to allow the pair time to get out of bed. He noted that the courtesy was not reciprocated, perhaps because the valley inhabitants were "more jealous" of their wives, but also reminiscent of current practices of women exchanging sex for fish (see Chapter 8).

<sup>95</sup> In Kindengereko, the fishermen would call out "Baboi!", to mean we have so many fish, they are rotting, come and take them for free. The people would answer "Twike!", meaning we are coming to take them.

conditions of no rains and no flooding.<sup>96</sup> Even in a very dry year, informants stated that there would always be two or three ponds in the vicinity with fish. If a high flood had destroyed the rice crop in a wet year, the fishing would at least be very good. If fish were particularly abundant in a pond, or if few fish had been caught the first time around, *nyando* might be performed there twice in a fishing season, but it could also occur that two or more years went by before a pond was fished again.

Most people would only fish as much as they needed to keep food in the house, returning to fish *nyando* when their bag of maize or cassava flour ran out. A family might experience hunger in the time required for the fisherman to go and return from the terrace, but this was measured in days not weeks. The fish caught were very large, with informants considering that the fish consumed today would not have been caught by the *nyando* at all (escaping through gaps in the fence), and if they had, would have been thrown back in the water as too small to bother with. A single large fish was enough to feed your household for several days, with people recalling fish as thick as your thigh, or the size of a small child, fish which had to be carried home singly on your back.

#### ***8.4.2 Decline of the nyando: fishing nets and social change***

It was the Nyasa people from around Lake Malawi who first brought nylon filament nets to Rufiji District, fundamentally altering how local people fished, who fished, and where. One elder, surveying the history of his community since German times, considered that: “Nothing much has changed here, besides the arrival of fishing nets”. The decline in *nyando* fishing followed quickly thereafter, but it was the move out of the floodplain that dealt the final blow, with villagisation disrupting patterns of communal life.

##### *Outsiders bringing nets: Two very different welcomes*

Elders in Mbunju-Mvuleini variously stated that the Nyasa arrived to the district and Lake Uba in the late 1930s or early 1940s, and from there moved on to Lake Ruwe.<sup>97</sup> The Nyasa would sew up gill nets with commercial nylon thread or with thread pulled from car tires, up to 100 yards long and with 3.5 – 4 inch mesh sizes.

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<sup>96</sup> As occurred in 1944-46, for instance, a famine referred to locally as *njaa ya yange*.

<sup>97</sup> Meroka (2006) reports that the use of boats and nets were first brought to Rufiji in the early 1970s by the Nyanza from Malawi (an alternate spelling of the Nyasa), perhaps referencing *juya* fishing and ignoring the earlier introduction of commercial gill nets.

With these nets they used active fishing techniques, setting the gillnets close to shore (with the technique referred to locally as *kuchokoa*) or encircling fish further out in the water (*mkogero* and later *juya*), and presumably set passive nets as well.

The arrival of the Nyasa was fiercely opposed by the Mtolia clan, the first settlers to the area around Lake Uba and the acknowledged guardians and in this particular case, owners, of the waterbody. Their claim to ownership reflected Lake Uba's man-made status: an extremely large flood, occurring before the arrival of the Germans, left a water-filled depression on the clan's land, spurring members to redirect a nearby river channel in order to bring more water into the hole. The Mtolia clan continued to dig year on year, deepening the channel to the floodplain and creating the present lake. Elders at Mbunju-Mvuleini recounted that local people had been able to fish *nyando* at Lake Uba every year, rarely having to move locations. The new fishing nets caught many more fish more quickly than possible with *nyando*, which reportedly worried local people. The Mtolia tore up the outsiders' fishing nets and threatened them with violence, eventually bringing their case for excluding the Nyasa to the district commissioner at Utete. He ruled however that the lake was to be shared, and advised the villagers to learn the new fishing methods, which they soon did.

In contrast, people in Ruwe reported that the Nyasa asked and easily obtained consent to fish at neighbouring Lake Ruwe. Men alive at the time recalled that far from wanting the visitors to leave, they envied them and wished to learn their methods, learning to sew up nets for the chance to be taken out fishing with them. Not least among the methods locals wanted to learn, as explicitly stated to us, was the magic the Nyasa had used to subdue the spirits living at Lake Ruwe. Prior to villagisation, Lake Ruwe was far from any settlements, deep in the forest and overrun with wild animals. Strange sights and events were common, such as burning fires on the water, walking maize stalks, or canoes that would sink or freeze motionless if set on the water. Some local people fished there anyway, building brush piles (*masagala*) to attract fish, and then encircling them with a reed fence, but many were taken by crocodiles in the process. In the words of one elder, going to Lake Ruwe was akin to selling yourself to Death. The spirits inhabiting its waters were extremely fierce and powerful and rejected any offerings and prayers by local witchdoctors. The integration of the Nyasa into local life is discussed further in Chapter 9.

The Nyasa were not the only outsiders to have had a major impact on Lake Ruwe's fishery. Later, a group of Nyamwezi people, from west-central Tanzania, came to trap crocodiles on the lake in huge numbers. In the early 1980s, white hunters decimated the lake's hippo population, killing up to twenty a day. The near disappearance of these two species was recognised locally as having made the lake a much safer place for people, but also to have contributed to more intense fishing activity.

#### *Differences between net and nyando fishing*

Nylon nets provided an enormous degree of freedom and independence to fishermen used to participating in collective *nyando* enterprises. There was no need for the careful planning central to *nyando* fishing. Fishermen owned their nets alone or with only one partner, such as a brother or child, so fishing trips could be organised on the spur of the moment. Nets were smaller than today (a 50-yard set gill net catching more than today's 500-yard net, by one account), and relatively inexpensive to acquire and quick to sew up. The nets were easy to carry, so that fishermen could travel much further in search of fish than before, and could be used in very large waterbodies. The catches obtained were also more than an individual would have made from his share of the *nyando* catch, at least in the early years of net fishing. Crucially, the results were immediate, with fish landed the same day one went fishing, rather than days or even weeks after beginning a *nyando* cycle. Furthermore, the catch belonged to the fisherman (and his partner) alone, with no obligations to share the proceeds of one's work with a team leader, witchdoctor, host clan or visitors to the landing site.

Net-fishing soon acquired a higher status than the *nyando*, seen as "more professional" partly through its association with modern dress. Men fished *nyando* wearing only loincloths, whereas net fishermen wore clothes and stayed dry in their canoes. One elder told us that with net-fishing one "went to work like a *mzungu* (a white person)", with another stating you could even "wear a tie" while fishing. Net fishermen today still refer to the lake as their office. Nets, perhaps by virtue of their outside provenance, were also said to be beyond the control of local witchdoctors, so that rivals could not limit the amount of fish your net caught to the extent they could do with *nyando*. Members of one well-known fishing clan considered that wizardry was involved in "90%" of *nyando* fishing expeditions, still to this day, but just "30%" of net fishing. Fishing with nets from a canoe was also much less dangerous than

entering the water to set and move the *nyando*, and would have made protection from evil spirits and wild animals less important. At the same time, we were told that those men who had special knowledge of how to control the water spirits were dying out, with the younger generation not interested in learning their ways.

Younger men began teasing those who continued to fish with *nyando*, laughing at them for diving underwater and “going after crocodiles”. As described by one informant, fear overtook the remaining *nyando* fishermen and they began to stay in their canoes too, fishing with nets from the safety of the water’s surface.

#### *Decline of access rules and communal way of life*

The watershed year in which net fishing overtook collective *nyando* fishing seems to be around 1965, a year often cited by informants, and just prior to villagisation. Informants described how the emphasis shifted from fishing for obtaining food to fishing for cash, and from investing the time required for a *nyando* cycle to getting quick results. Bantje (1982) describes how the disruption to agricultural activities caused by villagisation pushed many more people into the fishery.

Many more people were fishing, and fishing over a longer period of the year, than had ever been the case with *nyando*. Younger, unmarried men who had once been excluded from participation in *nyando* cycles could now fish at will, and without consideration of customary access rules on the floodplain. The divorcing of net fishing from *nyando*-associated magic was one reason fishermen could enter ponds without the consent of guardian clans or fear of reprisal. Another was that net fishermen were so mobile, with one elder considering that these men behaved like thieves, coming in the night to the pond and leaving by morning. In any case, fishing was increasingly taking place at Lake Ruwe and other large permanent lakes in the district, where no clan guardianship was established.

While people continued to live next to the floodplain ponds it was still possible to monitor fishing activity there, but with villagisation informants explained that claims to the floodplain waterbodies became unenforceable. Physical loss of control over the ponds was compounded by political change, whereby the Arusha Declaration of 1967 asserted that “all citizens together possess all the natural resources of the country”. In an echo of that statement forty years later, an elder told us that the floodplain ponds had become “places for all people”.

Traditional patterns of authority were also changing. Fathers had controlled their children's labour, decided on their marriage partners, and assigned them farmland, enforcing their decisions where necessary through beatings and witchcraft. Fathers commanded respect, with one elder who had briefly struggled against parental authority explaining that to disobey your parents would be to disobey God, and you "would not have light in your life". However, the same freedom of movement that brought outsiders to Rufiji in search of a better life, following the Arusha Declaration, inspired young people to leave the district as well. Villagisation, one patriarch recalled, was "the key that opened a door for everyone to go and live where they wanted to".

Elders were adamant that the time for *nyando* fishing had passed because the most important factor in its practice, unity with one's family and neighbours ("*ushirikiano*"), had disappeared following re-settlement. Decisions of when and where to fish and of how to cooperate with neighbouring clans were once arrived at through discussion, but elders considered that the underlying trust required was no longer there. People now, they said, were more independent, less reliant on their family, and motivated by money more than communal spirit. They drew parallels with the decline in agricultural work parties (*komalio*) whereby family and neighbours would once help you at your field all day in return for a meal and a few measures of rice, but now would work only for cash. In addition, whereas the practice of sharing fish from the *nyando* harvest had been done willingly, today it would be unthinkable. Fish, once free for all, "had become property", with several informants complaining that a fisherman today would not gift you with even a single fish.

The transformation of fish resources from communal goods to private ones was a process elderly people were still coming to terms with for another important resource, with the privatisation of the mango harvest held up as yet another example of the breakdown of social cohesion.<sup>98</sup> Planted in German colonial times, the most productive mango trees on the floodplain gave forth valuable fruit much in demand in the Dar es Salaam markets. Under customary rules, a mango tree and any fruit on its branches belonged to the descendants of the original planter (led by the senior-most male of the family), but mangos that fell to the ground were a common good, free to any passer-by. However, young people had taken to shaking fruit out of the trees without owners' permission and selling the fruit to outside traders, depriving owners of

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<sup>98</sup> One elder described in the same breath how fishermen using nets damaged the pond fisheries by catching the smallest fishes, just as thieves collecting mango fruit by breaking branches hurt the trees.

a source of income while also threatening an important hungry-season food source (see Chapter 5). Elderly men pointed out that (as in the case of floodplain ponds) they now lived too far from the trees to keep watch, and that without support from their younger relatives were unable to defend the trees from aggressive youths in any case. Mangos, like fish, “had become property”, with privatisation reducing the resource’s safety net function for the most vulnerable in the village.

In ecological terms, several elders considered that *nyando* fishing would no longer deliver good results in any case as fish have become too small to trap in reed fences, and the large floods that used to deliver large numbers of fishes into the ponds no longer occur.

### **8.4.3 Present-day fisheries management on Lake Ruwe**

#### *Intensification of local fisheries*

The Nyasa people continued to bring fishing innovations to Rufiji District in the decades that followed the introduction of nylon fishing nets. According to one man who had fished with them, the Nyasa first taught locals to use boat seine nets in the early 1960s, and *juya* fishing (as it is known locally) remains the most intensive fishing method used on Lake Ruwe and across the district.

Fishermen on Lake Ruwe considered that *juya* fishing had really taken off there in the early 1980s, in line with similar local stories of resource-use intensification traceable to Tanzania’s 1978 economic crisis and facilitated by the killing-off of crocodiles and hippos. The number of *juya* nets reportedly increased again after the 1998 El Niño episode, when flooding devastated harvests but recharged the lake’s fisheries (see also Hamerlynck et al. 2011). Informants together described tremendous increases in fishing effort on Lake Ruwe since the 1980s, with nets becoming larger and mesh sizes smaller. In those early days one setting of the *juya* was enough to fill your net with large fish, according to older villagers, but today you could fish for twelve hours and catch comparatively little. Certain fish species had all but disappeared from the lake, and overall fish size was greatly reduced, observations made in relation to their own lifetime by both older and younger (30-40 years old) generations of villagers alike.<sup>99</sup>

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<sup>99</sup> Informants said that *kasa*, *kange*, *mbata*, *mbufu* and *zozo* were now difficult to find, and a fish I could not identify, called variously *potwa* or *pokwe*.

However, different informants had different explanations for how this situation had come about, often related to their own economic involvement in the fishery. Older fishermen who now used passive nets primarily for subsistence fishing, or retired fishermen, argued that fish were not being left long enough in the lake to grow large. Younger fishermen, typically using more intensive gears, considered that the problem was not one of fishing effort but rather one of changing flooding patterns. Such men explained that the large floods necessary for delivering fresh supplies of adult and juvenile fishes to the lake had become less frequent, and only a large flood could improve the health of the fishery.<sup>100</sup> Fishermen using intensive gears were also less likely to cite the number of people fishing as a concern than were older and non-fishermen. Among the latter group, informants complained that everyone was a fisherman now, even youths who should be in school.

#### *Legal and institutional framework for fisheries*

Fisheries regulations in Tanzania are set at the national and village level (see Chapter 7). In the study villages, draft fisheries-related by-laws were awaiting approval by the district (for Mkongo) and by the village assembly (in Ruwe), while updated bylaws were awaiting assembly approval in Mbunju-Mvuleini. Legislation was unevenly enforced in the meantime, with the main focus on revenue collection (Table 8.1). In Mkongo and Ruwe, the village government had appointed a few revenue collectors to make daily visits to the main landing sites in each village during the high season (i.e., starting around October), with collectors paid a small percentage of the amount collected.<sup>101</sup> In Mbunju-Mvuleini, however, revenue collection from the lake fisheries (at Ruwe and Uba) had lapsed in favour of concentrating on the more lucrative forestry sector. Members of the Environment Committee explained that the Lake Uba fishery was essentially moribund, with the lake slowly drying out and fish too small to attract outside traders. Members were keen to enact a seasonal closure on Lake Uba in order to revitalise the fishery, as laid out in their bylaws, but conflict with other lake users prevented this (see below).

Village leaders in all three locations were aware of national legislation on licensing and illegal mesh sizes but admitted that there was limited implementation

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<sup>100</sup> The last very large flood had happened in 1998, and prior to that in 1974, with the current stock of fish in the lake considered to be “the children” of the 1998 cohort.

<sup>101</sup> 10% in Mkongo, usually 40% in Ruwe.



and no support from district fisheries officials either in enforcing the law or educating citizens on its value (see Chapter 7). Nonetheless, in each village, we were told that anyone found to be contravening fisheries or other legislation could be reported to the village office and asked to pay a fine. If the person refused to admit wrongdoing, he might be chased away from the village (if a non-resident), or reported to the police station (based in Mkongo) and eventually the district court. In practice, as explored in the next section, how a person is dealt with depends on his local status and the perceived seriousness of his crime.

**Table 8.1 Fisheries-related legislation (approved or drafted) and enforcement status in the study villages, Rufiji District, Tanzania, 2008/09.**

Legislation	Mbunju-Mvuleini	Mkongo	Ruwe	Enforced locally?
<i>National level</i>	x	x	x	
Minimum gill net mesh size 3”				Rarely
No use of “ <i>katuli</i> ”, i.e. scaring fish into nets				No
Fishing license and vessel registration/license				No
<i>Village level</i>				
Visiting fishermen to register at village office		x	x	No
Entrance fee: right to fish (Amount) <sup>1</sup>			x (1.20 – 2.00USD)	No
Daily user fee (Amount) <sup>2</sup>			x (0.40 – 1.60USD)	Yes
Tax on basket of fish leaving village (amount) <sup>3</sup>	x	x (0.40USD)	x (0.16 – 0.80USD)	Yes, except in Mbunju
No cutting of near shore grasses			x	No
No destructive fishing gear or methods	x			No
Seasonal closure of Lake Uba (April – June)	x			No

Notes: <sup>1</sup> For a *mkoko* net: 0.40USD, for a *juya* net, 0.80USD, with fees rising later in season. <sup>2</sup> Depending on the number of fishing nets in use <sup>3</sup> Depending on size of basket.

#### **8.4.4 Challenges to fisheries management**

##### *Unclear borders*

Even the limited rules villages had in place for extracting value from the local fishery were difficult to implement, primarily because of the lack of a coherent management framework across all of Lake Ruwe. Fishermen and traders used the fact that each village held and applied different by-laws to argue that these were invalid, with people at one camp going so far as to write a letter to the village government in Mbunju-Mvuleini stating as much.<sup>102</sup> Together with village leaders, fishermen recognised that any efforts by one village to enforce regulations would simply result in people moving their activity to the next. Although leaders of all three villages on Lake Ruwe spoke of coordinating their efforts, cooperation was hampered by a festering border dispute.

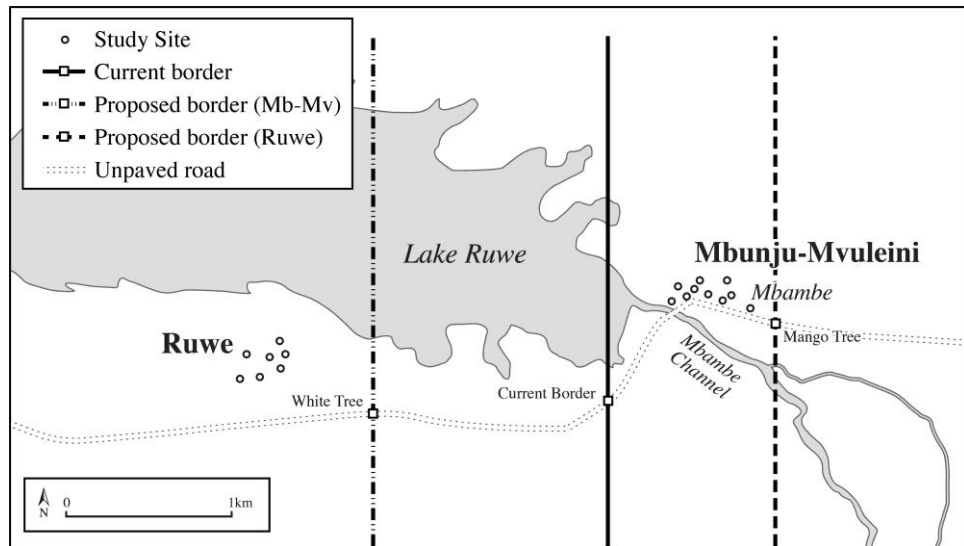
The dispute centered around Mbambe, a strip of low-lying farmland located between Ruwe and Mbunju-Mvuleini and split down the middle by a channel running into Lake Ruwe (Figure 2.2). People with permanent houses on the adjoining eastern ridge were registered as members of Mbunju-Mvuleini village, but they shared the field area with people officially registered at Ruwe, Mkongo and other nearby villages. In 2006, an outside venture obtained permission from Mbunju-Mvuleini to operate a short-lived sunflower farm at Mbambe, which is when the disagreement with Ruwe began. The two villages could not agree on the actual border marker, with Ruwe claiming a point far to the east (which would bring Mbambe into its jurisdiction and cut off Mbunju-Mvuleini's access to Lake Ruwe in the dry season), and Mbunju-Mvuleini claiming one well to the west (Figure 8.1). A committee of five representatives from each village met with the district authorities to resolve the dispute and settled on a compromise position between the two points, only to have the agreement angrily rejected by a number of elders at Mbunju-Mvuleini. These men had the most direct stake in the border decision because their ancestral lands on the floodplain (and valuable mango trees established there) stood to be officially transferred to Ruwe.

The dispute was particularly acrimonious because at villagisation people living in the former settlement (known as Kipela) had split, with some settling in Mbunju-Mvuleini and others in the Kipela hamlet of Ruwe village. The two factions were in

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<sup>102</sup> The chairman and secretary of the camp were the brothers of Ruwe's village chairman, and so particularly well-apprised of the border dispute.

essence struggling against their former neighbours and in some cases kinsmen, each accusing the other of evil-mindedness (*wa korofi*).<sup>103</sup>



Cartography: M. Irving (UCL). Source: Interviews with selected elders, 2008 (Appendix B)

**Figure 8.1** Map indicating official disputed border and alternative borders proposed by Ruwe and Mbunju-Mvuleini (Mb-Mv).

Those less directly involved in the dispute nonetheless considered it important, not because of access to land but because of access to water. Many informants in Ruwe told us the conflict was over the lake, and nothing else, with one explaining:

“Fish are as they were in the past, anyone can come and take the fish, there is no problem at all. But the lake is still ours, because today the lake is like an office, just like the forest is like an office. Someone can come here and want to rent our woods, or rent our water, and if this happens, who will get the money [if the border is unclear]?”

<sup>103</sup> The conflict over borders stemming from re-settlement was not unique to Ruwe and Mbunju-Mvuleini, but neither was it inevitable. Elders from Ruwe and Mkongo described how, at villagization, people had come to an agreement among themselves as to where their shared border would lie. Basing themselves on the original border marker (a tree) between the Beta and Makoge settlements (now wards in the new Ruwe and Mkongo villages respectively) they had drawn a line upwards with a jag to the west, to ensure that the people of Mkongo retained access to Lake Ruwe. This concession to Mkongo was described as only fair, otherwise the village would have no access to water, whereas informants noted that Mbunju-Mvuleini had Lake Uba and didn't need a further claim on Lake Ruwe.

Lake Ruwe mattered to informants in Mbunju-Mvuleini as well, with one elder saying that, as a native son of Kipela, Lake Ruwe was truly his, and Lake Uba only his because of villagisation.

To bolster their respective claims to the lake, elders on either side of the dispute made reference to the first people to live at Lake Ruwe—around 1930 when it was still a forbidding wilderness—who were variously associated with the present-day villages. The first was a hunter and witchdoctor named Pindi who had arrived from the interior, fleeing a battle, and lived alone on the western shore. He had associations with the floodplain settlements now incorporated into Ruwe and Mkongo, not least by helping villagers to denounce a corrupt headman to the British authorities by protecting those who spoke out against him from the headman's wizardry. The second was a solitary woman who farmed on the eastern shore, visited by people living at Mbunju and said to have later moved west to be with her lover, Mchembezi (the Nyasa leader and master fisherman). Ruwe elders dismissed this claim entirely saying that the woman had been a leper and an outcast, and presumably therefore unworthy of original settler status.

The need for coordination among the villages was especially obvious given the failed attempts by Mbunju-Mvuleini to enact a seasonal closure of Lake Uba despite past success. The village had once amicably shared access to the lake with Mpima village to the east, managing to enforce a six-month closure in 1972 which led to large subsequent catches.<sup>104</sup> Unresolved border disputes had since frustrated further cooperation, although informants in Mpima also noted that unfair distribution of the proceeds from the original closure had contributed to their reluctance to repeat the attempt. In 1974, under villagisation, Mpima was designated as part of the Ikwiriri Ward, and Mbunju-Mvuleini placed within Mkongo Ward. For villagers in Mbunju-Mvuleini today this administrative change invalidated Mpima's claim to the lake even while leaders in Mpima struggled to restrict the large number of young men coming from the town of Ikwiriri to fish in "their" lake at Uba. With REMP's support, representatives of both villages had travelled to the district headquarters in 2002 but had not managed to resolve the dispute, and were still awaiting a visit from the District Commissioner to decide the matter. People we spoke with on both sides regretted the

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<sup>104</sup> The year of the first closure was also given as 1974 and 1979. Also, Mbunju-Mvuleini informants spoke of a second closure in 2002, but those in Mpima said there had been none since the first.

ongoing quarrel, and had abandoned talks of closing the lake in order to avoid aggravating the situation.

### *Corruption in village government*

Local fishermen asked to pay user fees on the lake frequently expressed anger at paying out money that never made it to the village coffers. In Ruwe, villagers (often those who did not fish themselves) were frustrated that the village did not extract more revenue from the fishery, with many seeing outsiders as particularly stubborn and devious in avoiding fees. Fishermen from away on the other hand noted that local fishermen could get away with not paying fees at all, or paying the revenue collector in fish (i.e., giving him *mboga*), a practice that clearly benefitted him personally and not the village. Several fishermen independently gave the example of village officials embezzling user fees collected at nearby Lake Weme (reportedly 1040USD) as justification for not attempting similar measures on Lake Ruwe. Certainly, one resident fisherman captured the general sentiment when he characterised the village fees as just another form of bribery.

The VEO, as an employee of the district, is the only village official who receives a salary. Elected officials, from the village and hamlet chairpersons to the councillors, received a small fee (*chai*, literally ‘tea’), or sitting allowance, for attending meetings, paid from the village coffers or by any outsider convening a gathering. In Mbunju-Mvuleini, in our observation, any adult villager attending a village assembly expected *chai* as well, perhaps reflecting the village’s healthier financial situation (see below). One female councillor in Ruwe told us she would sometimes hide in order to avoid attending lengthy meetings which took her away from her work in the fields and at home. Other officials, all male, had devised various means to turn their government position to advantage, from embezzling village revenue to accepting bribes.<sup>105</sup>

Entire revenue streams, where villagers and outside traders alike were known to have paid taxes on exports from the village of fish, charcoal, and agricultural produce, or user fees on fishing nets, had gone missing from Ruwe’s books in the study year. The village chairman, with important tomato fields and many papaya trees, had circumvented the tax on produce entirely. These actions had occurred despite

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<sup>105</sup> This is by no means restricted to the village level, with several unsubstantiated accounts of corruption at the district level collected over the fieldwork period.

officials' claims that the recent dismissal of the former VEO (early in 2008) had ushered in a new era of accountability (see below). The fact that the replacement VEO, a district-appointee from the Ruvuma region, had wasted little time in embezzling 103USD saved up for constructing a new market building did not inspire confidence, although villagers seemed satisfied with his promise to pay it back to the village coffers.

Taxes on timber were the main source of village revenue in both Ruwe and Mbunju-Mvuleini based on village account books I saw. Although data for comparison are limited (given the appalling state of Ruwe's books and refusal by the VEO to share the most recent accounts), reported monthly revenues for Ruwe in 2007 were on average higher than, and expenditures similar to, those collected by Mbunju-Mvuleini in 2008 (Table 8.2).

**Table 8.2 Village revenues and expenditures in Ruwe (Apr – Dec 2007) and Mbunju-Mvuleini (Aug 2007 and 16 Dec 2007 – 15 Sep 2008), Rufiji District, Tanzania.**

Village	Reporting Period	No of months	Income (USD)	Expenses (USD)	Balance (USD)	Averaged Monthly Income (USD)	Averaged Monthly Expenses (USD)
Ruwe	4 Apr - 1 Dec 2007	8	413	228	185	52	28
Mbunju-Mvuleini	4 - 29 Aug 2007	1	128	68	60	128*	68
	16 Dec 2007 - 24 Mar 2008	3	192	80	112	64	27
	25 Mar - 3 Jun 2008	2	50	41	9	25	21
	25 Jun - 6 Aug 2008	1	72	-	-	72	-
	17 Jun - 15 Sep 2008	3	-	162	-	-	54

Notes: \*Includes income from fines totalling 102USD. No fines were reported for other reporting periods. Sources: For Ruwe: Village account book and oral report at village assembly meeting on 26/09/08; For Mbunju-Mvuleini: Account books held by the Village Environment Committee.

The similarity in the two villages' financial records is surprising given the seemingly stronger institutions in place in the latter village for forest management, and suggests recorded figures should be treated with extreme caution. In any case, much of

this money was being diverted in both villages into officials' pockets. In Ruwe, one councillor was paying off a debt owed to local police after a misjudged attempt to blackmail pastoralists in the area (See Box 8.2). His ally, the official revenue collector for forest resources, was rumoured to hand the money over to the councillor, who would then give him back a larger percentage than he would have received for reporting the money directly to the village office. In Mbunju-Mvuleini, the VEO had been caught and forgiven three times in five years for stealing the collected funds. He had recently been accused of taking another 208USD, disguising the theft in made-up expenditures, such as building latrines which never materialised.<sup>106</sup>

Corruption occurred at the ward and district levels as well, and is a feature at all levels of government in Tanzania (Fjeldstad 2003). For instance, a women's micro-credit group in Ruwe was barely operational because district officials had misappropriated most of the earmarked funds, while an irrigation project for the village budgeted at 2400USD failed after higher-up officials embezzled money required to buy a powerful water pump. Rumours of criminality, such as district officials' involvement in the ivory trade, were also rampant.

#### *Accountability and forgiveness*

Villagers were able to hold their leaders to some account through the mechanism of the village assembly with support (not always forthcoming) from the district. However, villagers also exhibited contradictory and fluid views of what constituted inappropriate behaviour, and drew on a similar vocabulary to excuse both their own and their leaders' actions except in the most egregious cases.

In Mbunju-Mvuleini, following the repeated theft of village funds by the VEO, members of the VEC had reported the problem to the District Executive Officer, who advised them to audit the village books and hold the VEO to account at the next village assembly. However, over the years the expenditure books kept by the VEO had, according to the VEO himself, been stolen, eaten by rats, and most recently burnt in a fire.<sup>107</sup>

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<sup>106</sup> Inflating expense claims (though on a much more restrained level) was common practice, and people I knew in both villages with access to village funds occasionally joked about their own very expensive stationery purchases and trips into town.

<sup>107</sup> "I'd believe him if the rest of his house had burnt down," said one informant.

***Box 8.2. The treatment of pastoralists: A money-making project***

Farmers' interactions with recently-arrived pastoralists in the study area illuminates the insecure position of the rural poor relative to local authorities, both at the village and district level, and highlights many of the same problems of unclear borders, corruption and distrust undermining better resource management more generally. At the same time I recognise that presenting these conflicts as a story of farmers vs. herders risks over-simplifying a more complex political reality, one which I did not specifically explore during my fieldwork (see Turner 2004).

Displaced Barabaig pastoralists (referred to locally as the Mang'ati tribe and from the northern Manyara Region) had permission to graze their cattle on land near Ikwiriri but had strayed further west over the contested Mpima/Mbunju-Mvuleini border. There was growing anger at their presence, with the pastoralists said to knowingly allow their livestock into farmers' fields and not compensate them for any damage to crops. Many local people were also visibly nervous around cattle, and said as much, and resented having to wait for herds to pass on the field paths before struggling through the mud churned up by the animals. A group of local men had torched the pastoralists' shelters the previous year in an unsuccessful bid to chase them away. Villagers contrasted the Barabaig—whom many disparaged as pests and less than human—with the Sukuma, agro-pastoralists who asked and obtained permission from Ruwe for village land in the study year. The Sukuma were “farmers like us” and were sharing their much-appreciated knowledge of vegetable farming, as well as providing opportunities to buy milk and meat. The Sukuma also reportedly always came to pay and ask for forgiveness for any damage caused by their livestock.

Intimidation of the Barabaig had become “a money-making project” for local leaders in the words of one villager, with sometimes unintended consequences. In Ruwe, a village councillor and several associates had threatened to bring the Mang'ati to the police if they did not pay them a large bribe (280USD). The pastoralists had agreed, but before paying went to the district to report the attempted blackmail, with officials sending in the police from Ikwiriri. The police arrested all five villagers as well as several of the Mang'ati, releasing them only after demanding large bribes of their own from both groups. In another case, village youths had been stealing cows and selling the meat in Ikwiriri when a hamlet chairman informed on them. The Ikwiriri police duly confiscated the meat, but then sold it themselves and gave a pay-off to the



***Box 8.2 cont'd***

informer. The leader was run out of the village, stripped of his elected position (on the basis that he had switched political allegiance from CCM to CUF since his election) but nonetheless returned often to meddle in local affairs. He benefitted again from a run-in with pastoralists when cattle invaded a field area farmed by many people from his hamlet. Following an official valuation of the damage by the district agricultural officer, the ex-leader convinced the fifty or so affected farmers that only a few representatives needed to make the journey to Ikwiriri to lodge the claim against the Barabaig. As a result, only his father and two kinspeople went to the police and received full compensation, with the police then declaring the matter closed despite the payments outstanding to the other claimants.

A small contingent of women from Ruwe travelled to Ikwiriri to discover what had happened with their claim, but one of them explained that they did not have the time or resources to pursue the issue further, beyond opening a court case against the pastoralists. Their neighbours in Mbunju-Mvuleini did manage to win a similar case in the same period but it had involved numerous visits to Ikwiriri over three months, subsidised by revenues collected by the Village Environment Committee. Women appeared to gain the least from the arrival of the pastoralists in other ways as well. The Sukuma paid for the right to use Ruwe land by purchasing a soccer ball and jerseys for the (all-male) village team and giving the elder men a cow. The men sold the cow and divided the money amongst themselves, ignoring women's calls for the animal to be slaughtered so that everyone could eat the meat.

In 2012, relations between pastoralists, farmers and police in nearby Ikwiriri had deteriorated to the point that confrontations over crop damage led to pastoralists (identified as Sukuma) murdering one farmer and local people torching the homes of police officers accused of being in the pastoralists' pay (Anon. 2012).

Village assembly meetings, the date of which is set by the village government, are meant to be held at least four times a year but in practice are endlessly postponed by leaders seeking to avoid questions. Once scheduled, decisions of the assembly are

only binding if quorum is reached (i.e., two-thirds attendance of registered adults) or, failing that, on the third convening.

In both meetings we attended at Mbunju, ostensibly to discuss the border with Ruwe and the need to deal with agricultural pest animals, discussions focused mainly on the actions of the VEO.<sup>108</sup> It was acknowledged by speakers that he had stolen money and wrongly agreed to the new border with Ruwe, but people were divided on how to deal with him. Several called for his dismissal, while his staunchest defender, a respected elder and former village chairman, reminded people that he was not a bad person, had already been forgiven, and that in any case quorum would be needed to take such a decision. Although unconfirmed, we heard rumours from members of the VEC that the VEO was ill (likely with HIV/AIDS) which could help explain villagers' leniency. The principal fishery revenue collector at Ruwe similarly suffered from tuberculosis (a coded reference to HIV/AIDS), and had been given his position because he was unfit for farm work.

In Ruwe, there was much build-up to the village assembly held on the third attempt and in two parts (26 September and 3 October), and only the second assembly of the year. In relation to this study, leaders had repeatedly told me that the new fisheries bylaws would be presented to villagers for adoption at the assembly, and fishermen had talked often of confronting officials with receipts for fees paid to the village. Neither event took place (with the main agitator among the fishermen claiming to have lost the collected receipts), although confrontations over missing revenue were the main feature of the assembly. The focus was on having one councillor in particular own up to wrongdoing, the same known to be diverting funds from forest revenue collection, but this time accused of taking for himself a sheep confiscated by the village from pastoralists. The back-and-forth lasted for two hours, until an elder finally stated that the case was clearcut, and the councillor agreed to pay for the animal. When the report on the budget was finally presented (on the second day of the meeting), the VEO rushed through a reading of every incoming revenue and outgoing expenditure item over the past nine months, making it difficult to consider or contest the numbers presented beyond the most glaring discrepancies. As mentioned previously, villagers protested at the omission of entire revenue categories from the report. However, they focused their ire on the fact that the village chairman had avoided paying tax on his

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<sup>108</sup> My research assistant and I both attended the first convening of the meeting, and he attended the second alone. Both failed to reach quorum.

own tomatoes and papayas rather than the larger issue of missing funds, demanding that he report back to them on his own produce exports. Indeed, far from questioning the obvious embezzlement of funds across numerous revenue categories, villagers voted on giving the forest guards a gift of 8USD to show appreciation for their excellent work.<sup>109</sup>

Expressions of wrongdoing and justifications for such behaviour often revolved around concepts of food. Leaders involved in embezzling funds were said to be “eating money” (*kula pesa*). In explaining why villagers forgave officials their stealing, informants would say that the leaders “were hungry”, that they lacked means as did everyone else in the area. This was a common refrain among fishermen as well, who countered most suggestions (from myself or among themselves) for controlling the fishery with the claim that people would not obey such rules because of hunger. Alongside this willingness to accept hunger as an excuse for questionable behaviour came a local privileging of admission of guilt over the resolution of underlying issues. In the case of the sheep-stealing councillor, for instance, villagers harangued him until he admitted to the theft, yet when he failed to pay back the money by the second half of the assembly, as agreed, a number of supporters (first his female neighbours, seconded by many men) urged everyone to consider the matter past. Similarly, an elder woman involved with many other villagers in a court case involving another dishonest village official urged the assembly to move on to other matters (See Box 8.2).

Conciliation and forgiveness were themes at all of the village meetings we attended, with people frequently saying things such as “Let us not go backwards” (*Haturudi nyuma*) and “We are all human here” (*Sisi ni binadamu*), and making jokes alongside more aggressive interventions. This reflected the local practice of shunning open quarrel in favour of talking disagreement through, with people placing much emphasis on living peacefully with one another. I observed several occasions on which people sat down together with senior family members on the *baraza* (the front porch or yard) to resolve disputes. In one case, a man accused his elderly neighbour of being a witch and stealing from him, but was persuaded by an older relative and the local sheikh to forgive her. In another, my host father was reconciled with his wife after a visit from her senior uncle and brother, following a disagreement over having her orphaned adult nephew stay over. The careful avoidance of open conflict was

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<sup>109</sup> The main timber revenue collector ended up keeping the entire amount of the gift for himself, rather than sharing it with his colleagues as villagers had intended.

perhaps because its consequences ranged from the unpleasant (in a small place, the unavoidable daily contact with your opponent and their kin) to the potentially dangerous (if your opponent resorted to witchcraft against you).

There were limits to villagers' acceptance of bad behaviour within their own community. In Ruwe, the former VEO had engaged for years in the same kind of revenue embezzlement typical of other leaders. Locals explained that, as a native of the village, he had been protected by family connections, with relatives unwilling to report him. However, he crossed a line in accepting a bribe from an outsider to allow for the purchase of 200 hectares of forest land without consulting the village assembly, as required by law.<sup>110</sup> A group of men—relatively young (30 to 50), well-educated, politically astute but not directly involved in village government (including a former district councillor dismissed himself for misappropriating funds)—reported him to the district commissioner, who then attended the village assembly at which the VEO was forced out of office. One of the men who reported the event to the district (and had the agreement voided) noted that villagers were not against selling land *per se*, but wanted any proceeds to go to the village. The VEO was re-assigned to another village in the district, perceived locally as a suitable punishment since he would no longer be among his own people.

#### *Buy-in, enforcement and sanctions*

If a coherent fisheries management plan and supporting by-laws could be put in place across the lake, the cooperation of fishermen would still be needed to ensure success. As discussed, fishermen already perceived current attempts to raise revenue from the fishery as unfair because of the theft of collected funds. There was also the feeling among many that village officials did not understand their situation because these leaders were, almost without exception, primarily involved in agricultural work. Whereas resident fishermen could theoretically participate in village government, those from elsewhere (often full-time fishermen) had no official voice in rule-making. Each fishing camp had an elected chairman and secretary, resident to the area, but their role was to communicate the decisions of the village government and deal with any conflicts, not to relay fishermen's own concerns. Even in Mbunju-Mvuleini, where

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<sup>110</sup> Under modern legislation (the Village Land Act No. 5 of 1999) all village land is vested in the Village Assembly, and administered through the Village Council. Villagers can agree to requests for areas below 250ha, with approval from the District Council, while transferring land in excess of that area requires ministerial approval in addition (Neville and Dauvergne 2012).

village by-laws had been developed in close consultation with the population, members of the VEC noted that people, once directly affected by a law they had helped write, came to perceive it as a bad thing and sought to circumvent it. In Ruwe, village men generally took the view that regulations were well and good, but that no one could tell them what to do with their own fish on their own lake.

As a result of fishermen's resistance to fishery controls, the need for effective monitoring of any future management efforts was widely recognised, but considered unlikely. Lake Ruwe is large, and villages do not have the resources for motorised patrol boats.<sup>111</sup> If caught, sanctions against rule-breakers would also need to be better developed, as at the moment these are unevenly applied. Many people fished with small-mesh nets early in the fishing season for instance, yet I was aware of only one person being punished for it: Ruwe's recently-arrived VEO, a Christian from a neighbouring district, took the man's catch from the village market stall and threw it in a pit latrine. Villagers were appalled at the VEO for wasting fish and for punishing a well-liked local.<sup>112</sup> In Mbunju-Mvuleini, VEC members told us that those caught using illegal nets were asked to apologise, and usually let go without a fine. District officials were stricter, reportedly burning illegal nets if found, but were never seen in the area over the study period.

Daily life in rural Tanzania is rife with the danger of committing a crime, often carrying the possibility of extremely harsh sentences. Hunting without a license, for instance, even the killing of a bush pig, is punishable by up to 30 years in jail.<sup>113</sup> Setting fire to one's fields, as locals regularly do to clear grasses in the dry season, is illegal. Failure to maintain your home (by digging a garbage pit and latrine, building a dish-drying stand, and clearing grasses) could result in fines and jailtime. Fathers whose school-age daughters become pregnant could be jailed along with the perpetrator. Preparing charcoal, a crucial livelihood activity for many of the poorest in the community, was subject to a district-wide wet-season ban in the study year. Prohibitions were accompanied by edicts such as ordering all farmers to plant 20 trees on their land (in order to meet a district-wide target of 2 million new trees) when locals

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<sup>111</sup> Boat motors, entirely absent from Lake Ruwe but very much wanted by local *juya* fishermen, would likely be too valuable to be devoted to patrolling duties in any case, and be used for fishing.

<sup>112</sup> Apart from many men denouncing the VEO's actions, a respected elder (on the village council of elders, the *wazee wakubwa*) warned the VEO that "blood finds its course", explaining this to us to mean that local people will stick together.

<sup>113</sup> Locals were clearly afraid of ending up in jail for even short periods, with one man who had served time describing filthy conditions, with prisoners dependent on family members bringing them food.

were already struggling to farm enough food. Such instructions were likely most used as rent-seeking opportunities for officials, providing opportunities to fine extensively or demand payment in return for not fining (see Brockington 2008).

As a result of this repressive environment, people are accustomed to living outside the law, and understandably show reluctance in reporting anyone for so-called offenses, given the disproportionate punishments involved. In addition, because of the pervasive labelling of many common activities as criminal, no person is entirely innocent themselves, and so cannot easily take the risk of accusing others. Among my neighbours, for instance, several of whom were forest guards, the men would tease each other about reporting one for this offense if the other told on him about another. This net of complicity overlay a complicated web of kinship and friendship obligations to one another, preventing any straightforward accusations of guilt.

## **8.5 Discussion**

The narrative I have presented here, of a traditional riverine fishery relied on primarily for food transformed through more efficient gear and social change into an essentially open-access market-oriented resource sector, has its parallels across the globe (Scudder and Conelly 1985; see also Gordon 2005). In Scudder and Conelly's review, the authors find that the management strategies for such traditional systems tended to be inadvertent rather than intentional, with rules regulating access to fishing waters (although understudied) the most significant among these. Such access rules, as documented by Thomas (1996) in his study of a Nigerian floodplain fishery, can change at a particular location with the status of the flood, shifting from open through to communal to private access as fish resources become more predictable and concentrated.

In Rufiji, a similar mix of water tenure regimes once existed across space and time, with open-access regimes prevailing at high water and on the large permanent lakes, communal access governing floodplain ponds as these became disconnected from the floodplain, and individual rights associated with weir sites on smaller water channels. The notion of private rights to weir sites (*nyando ya kutega*) persists to this day, but the reluctance of weir owners to discuss this suggests underlying tension. Indeed, I surveyed weir sites only in one area of the floodplain, entirely under cultivation, with weirs typically sited on a team member's field. It may be that current

land holders (many of whom came from outside the immediate area) had usurped earlier residents' traditional weir sites by virtue of occupying the land, but this would need further investigation, including comparison to tenure arrangements for weir sites on fallow or unclaimed floodplain land.

Under traditional common property arrangements in the study area, discrete ponds fell under the guardianship of the clan associated with the territory on which it was located, with all descendants of the first person to have occupied that land having equal rights to fish there. Outsiders, however, were required to obtain permission from the guardian (the clan elder) and pay him a tribute (a portion of the catch). Although Scudder and Conelly (1985) make a distinction between descent-based rights—such as those described here and observed for example among riverine communities of southwest Nigeria (Olomola 1998)—and territorial-based rights, where access to fish is granted by a territorial leader (Haller and Merten 2008, Hurault 1961 in Scudder and Conelly 1985), the difference seems to be chiefly one of scale given intertwined notions of kinship and locality. The idea of guardianship described in the study area, where a clan's claim on the resource was mediated through their relationship with local spirits, coincides with Haller and Merten's (2008) description of "spiritual ownership" of communally-fished water bodies. They describe the importance of a ritual master to oversee fishing events, a role fulfilled in Rufiji by the witchdoctor responsible for ensuring a productive and safe *nyando* cycle, and a function performed in other African fisheries as well (e.g., McGregor 2003, Neiland et al. 2000b, Olomola 1998, White 1956).

Although centralised under a single guardian and kinship-based, the communal management system described here appears to have been far from exclusionary. Informants emphasised the ease with which they could access fishing opportunities at other clans' ponds, either through invitations or by request. Fortes (1945 in Scudder and Conelly 1985) describes owners of fishing pools, a status usually obtained on acquiring a chieftainship, organising communal fishing parties in Ghana as a means to maintain and extend their prestige. Traditional Rufiji society, in contrast, has been described as essentially egalitarian (Lockwood 1998:61). I would argue that the organisation of fishing parties here had more to do with people's belief that fish belonged to everyone and that the benefits from the fishery should therefore be shared, combined with the practical necessity of mobilising extra-clan labour in order to successfully carry out a *nyando* cycle.

Equally important was the need to ensure one's own ability to find fish in an unpredictable and risky environment: allowing others to access your pond made it easier for your kinsmen to obtain permission to fish in theirs another year. One elder likened *nyando* fishermen to hunters, always moving in pursuit of fish. However, this mobility was curbed by the difficulty of transporting heavy reed fences any far distance, and the fact that access was mediated through kinship connections. A true 'outsider' could only be invited to fish, I was told, if he had lived among the locals for some time and learned their ways. In Nigeria, Thomas (1996) describes the extension of reciprocal access rights even beyond neighbouring communities to transients from outside the floodplain, arguing that people's survival strategies depended on the mobility such arrangements made possible, an argument taken up by other authors in describing the livelihood function of African small-scale fisheries (Allison and Sarch 2000, Geheb and Crean 2003).

The ideal of reciprocal access rights persists to this day, although largely stripped of the supporting institutions that mediated when and how visitors fished. Today's fishermen, with better gear and greater economic incentive, are more mobile than in the past, and defend their right to move freely among fishing waters. They reinforce this traditional attitude by drawing on the discourse of the modern state, whereby the Arusha Declaration guarantees people's freedom of movement but also states that "all citizens together possess all the natural resources of the country". In the words of Haller and Merten (2008) describing a Zambian floodplain fishery but also applicable to the situation in Rufiji, the state is "simultaneously present and absent": present in its dismantling of local institutions and support for notions of citizenship wielded by immigrant fishermen, but largely absent from enforcement activities to curb negative impacts. This is similar to the explanation given by Meroka (2010) for the *de facto* open-access situation governing natural resources in Rufiji district. Based on doctoral fieldwork conducted in Mbunju-Mvuleini and another village from 2002-2004, he concludes that incorporation into the market and villagisation eroded traditional resource management (including pre-colonial ethno-professional livelihood categories) with the state unable to fill the resulting void.<sup>114</sup>

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<sup>114</sup> Such ethno-professional categories did not feature in my own research. Ethnic identities in Rufiji are malleable (see Chapter 2), and it may be that because I did not probe this issue, rarely challenging people's self-identification as 'Ndengereko', I missed documenting similar categories as those identified by Meroka. However, I find it surprising that he excludes the Ndengereko from fishing livelihoods in the pre-colonial period and describes the Makonde (whom I was told arrived to the region in small



A second traditional attitude, that no person should be allowed to go hungry, is closely associated with that of reciprocal access and further complicates attempts to manage local resources. Activities that were widely viewed among fishermen and non-fishermen alike as detrimental to the fishery—in particular the use of small-mesh nets and cutting of nearshore vegetation—were simultaneously defended (often in the same conversation) as necessary if people were not to go hungry. A similar tension existed in people’s explanations of the state of the fishery, presented by some as being under threat from intensive fishing pressure (leading to catches of smaller-sized fish) and by others as only temporarily depressed until the next large flood could occur. Given the ecological complexity of floodplain fisheries, people’s differing economic reliance on these, the uncertainty introduced by a changing climate, philosophies of sustainable development promoted by REMP, and fisheries management directives issuing from district fisheries officials (predicated on inappropriate ideas of overfishing, see Chapter 1) it is of little surprise that no clear position emerged among local people as to the state of local fisheries and the need (or not) to manage these.

Despite competing environmental narratives as to its ecological effects, the prevailing view in the area was that fishing served to “remedy hunger” (*kuganga njaa*). In this conception of the role of the fishery, people prioritised equity goals over potential sustainability issues, harkening back to the traditional function of communal fisheries as safety nets in times of hunger, a function observed in many other societies (Thomas 1996, Olomola 1998, McDaniel 1997). The deep cultural significance attached to avoiding hunger is suggested by the fact that even in their prayers to the spirits people represented themselves as “poor and hungry” in order to gain permission to fish in guarded waters. The reluctance of leaders to intervene when people are hungry is also mentioned by Haller and Merten (2008) in discussing the difficulty of restricting entry to the Kafue Flats fishery.

Although similar in many respects to transformations described for other traditional African floodplain fisheries, the situation in Rufiji is particular in the dramatic upheaval to local institutions brought about by forced villagisation. What today’s elders particularly regretted, it seemed, was the loss of patriarchal authority

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numbers pre-villagisation, and tended to move on to work in more northerly sisal plantations) as the region’s main fishermen. The failure to mention collective reed fence fishing by the Ndengereko, a traditional fishing activity entwined with the communal management of floodplain ponds at Mbunju-Mvuleini and elsewhere in the district prior to villagization, is also puzzling. Other researchers familiar with the area have criticized Meroka’s work for numerous inaccuracies, misinterpretations and errors (O. Hamerlynck, pers. comm.).

and consequently, in the fishery context, the inability to tell younger men (i.e., the exploiters of the fishery) where, when and how to fish. This loss of authority was felt all the more keenly because of the failure of modern institutions to fill the resulting void. Villagers of all ages generally considered local leaders to be doing a poor job (without necessarily resenting them personally for it), with one elder's statement that "our own children are stealing from us" widely shared in Ruwe. This sentiment applied to lost revenues from mismanagement of the fishery and forest, but was particularly clear in elder-youth conflict over ancestral mango trees.

Challenges to good governance in the study villages are not limited to elder-youth conflict, and point to the difficulties involved in devolving responsibility for natural resources to the local level. Brockington (2008) in his ethnography of local government in a Tanzanian district outlines examples of limited and unwise government expenditure, lack of transparency and outright criminality which, albeit at the district level, overlaps in many respects with what I have described here. His aim in the paper is not least to counteract possibly over-enthusiastic advocacy for village democracies found in the literature on Tanzania's forest management, citing work by Liz Wily and colleagues. My description of the actual performance of village-based resource management institutions in Ruwe and especially Mbunju-Mvuleini, whereby funds dutifully recorded in village books disappeared into leaders' pockets, is a similar reminder not to rely on outward appearances of good governance. For instance, Lund (2007) takes figures presented in the account books of 15 village forest committees in Iringa district at face value to illustrate improved revenue collection, satisfied that dismissal of some committee members indicates that mechanisms of transparency and accountability are working. It may indeed be true, with the involvement of an outside donor no doubt contributing to such success, but the sometimes terrible consequences of identifying wrongdoing (as evidenced by the suicide of one accountant accused of embezzling funds, mentioned in a footnote) must influence people's willingness to hold leaders to account, and yet remains unexamined.

The lack of active opposition to corruption despite the fact that villagers constantly complained of it, and the inability of local elections to put a brake on it, suggests to Brockington (2008) not a failure of accountability, but its complete absence. I similarly found that villagers were angry about corruption, but they were more vocal in their opposition: haranguing village officials and even a visiting MP at assembly meetings and dismissing village leaders. It is tempting to view this

combativeness as a feature of local people's long history of resistance to outside influence (Beymer-Farris and Bassett 2012). However, it was exactly in response to *outside* pressures that villagers got most incensed (sale of land by the VEO to outsiders, betrayal of local youths stealing from pastoralists by the hamlet chairman). Villagers avoided dealing with the more everyday instances of leaders' corruption, preferring to forgive and forget their "mistakes". Forgiving bad behaviour was all the easier because of people's ambiguous notions of what it comprised of. Fishing with small mesh nets, for example, was accepted as wrong in a legal sense, but also entirely justifiable from the cultural standpoint (discussed above) of avoiding hunger at all costs. Stealing village funds to feed your family was similarly explained to me as a reasonable act. Lawson and Rakner (2005), exploring cultures of accountability in another Tanzanian district, similarly found that the same individuals could make use of different languages of accountability in competing and at times contradictory ways, drawing variously on ideas related to tradition, religion, *ujamaa* socialism or the market.

To be fair, villagers have few options for dealing with misdeeds. Mechanisms for downward accountability of leaders to local people exist but are weak and imperfect (Lawson and Rakner 2005). The Village Assembly is meant to meet four times a year, but it has no specific power to dismiss any village council member (Venugopal and Yilmaz 2010). Involving the authorities (i.e., the police, courts and district officials) can put both the accuser and accused in a vulnerable position, exposed to harsh punishments or shaken down for bribes. Instead, people often mentioned the need for "*busara*" in dealing with corrupt leaders, but also for addressing any contentious issue such as resolving border disputes and controlling access to the fishery. The term has multiple meanings but was most often translated for me by my local assistants as "wise ways". This approach encompassed consulting with elders and engaging in discussions but also using witchcraft to deal with your enemies, and was in explicit opposition to any involvement by the state.

Petty corruption as observed in the study villages undermined fisheries management in several ways. First, the direct theft of village revenue angered fishermen and others paying taxes and fees, and contributed to a general resistance to all rules. Second, officials' manoeuvrings in seeking to avoid accountability undermined village governance mechanisms, with the holding of village assembly meetings endlessly delayed and, once-held, side-tracked into games of cat-and-mouse

between leaders and their accusers. As a result, there was limited opportunity to discuss pressing issues and decide on real solutions. Third, the bad behaviour of village leaders fed into a wider atmosphere of suspicion and resentment, hampering the resolution of disputes such as that around village borders. For instance, the inhabitants of Mbambe, those most directly affected by the border dispute, boycotted the village assembly I attended in protest at the VEO's continued presence on the council.

Resolving the problem of village borders is not a simple matter, and yet is clearly of paramount importance for improving fisheries management. The blanket extinction of customary rights legislated under Act 22 (see Chapter 2) undermines customary land tenure while almost totally failing to provide a legitimate alternative (Shivji 1994). In the author's words regarding villagisation: "no thought was given to the tenurial system that would govern the 'new' settlements in villages", including, as he discusses, the problem of village boundaries. Conflict over local boundaries at the time of my study was taking place against a backdrop of rising tension over land-grabbing in Rufiji District driven by biofuels and REDD projects (see Chapter 2). It is important to realise that, although dealing with terrestrial borders, local people were particularly concerned with the loss of access to *water*, with Ruwe villagers repeatedly accusing those in Mbunju-Mvuleini of wanting not the fish but the lake. Land was considered to be in abundant supply locally (see Chapter 2) while offering access to water for irrigation was critical for attracting outside investors.

In Tanzania, the necessary underlying structures for democratic decentralisation are in place: the legislative ability to raise finances and set resource use plans and downward accountability of leaders through elections. The setbacks encountered in the actual practice of village-based resource management, as described here, could be seen as an essential part of the learning process by which locally democratic and long-term solutions will emerge (Brockington 2008, Lund 2007, Lawrence and Watkins 2012), an example of positive conflict (Bennett et al. 2001). In the particular case of Mbunju-Mvuleini, although it is easy to point at the misappropriation of funds as an indication of failure, the wider impact of REMP might still be positive on balance: the environmental committee leaders were sophisticated in their dealings with police and district officials, resource patrols were well-organised, villagers I spoke with (although a skewed sample) were strikingly well-informed on environmental issues, and the neighbouring village (Ruwe) was emulating its forest guarding practices in a bid to increase village revenues. However, given village

leaders' understandable propensity to use their position to their own advantage, and wider issues of elite capture (see Chapter 1), it would be politically naïve to assume that the improved design of institutional structures at the village level is enough to ensure the fair, equitable and sustainable management of valuable local resources, not least because of the lack of free and fair elections from the local level upwards (Brockington 2008). Furthermore, the existence of competing local narratives relating to the impacts of resource use and consequent differing views on how to address these add further complexity to the task of institution-building in the first place.

Management efforts can only be strengthened by paying better attention to the historical circumstances and cultural values shaping local resource use and actual governance practices, as I have attempted to do in this chapter. In this vein, the next and final results chapter focuses on the identity of outsiders operating within local fisheries, host communities' attitudes towards their presence, and implications for management.

# Chapter 9. Outsiders in the fisheries: Fishermen's mobility and implications for resource management

## 9.1 Introduction

Outsiders and residents alike participated in the district's lake fisheries, following a long tradition of moving across the floodplain in search of fish (Chapter 8). Fishermen also moved in search of better work conditions, following higher prices and work opportunities on commercial nets. Mobility is a key strategy for many fisherfolk in Africa, a normal and essential part of securing one's livelihood (Allison and Ellis 2001). In this, fishing households resemble many rural households around the world (deHaan 1999).

As will be shown in this chapter, outsiders coming to fish at Lake Ruwe were hardly outsiders at all, born almost without exception in Rufiji District and returning frequently to their homes in the area. As a result of their small-scale, temporary and short-term nature, fishermen's movements across Rufiji's freshwaters are less about migration than "circulation" in that these movements "[do] not alter the long-term distribution of the population" (Chapman and Prothero 1983 in Randall 2005). Nonetheless, the influx of outsiders into fishing zones necessarily increases activity there, and may increase the potential for over-exploitation in the destinations, both directly and by disruption to existing management regimes (see Chapter 1). In many cases, outsiders worked on *juya* nets and other active gears, so that issues relating to residency status were closely bound up with gear choice, itself the topic of Chapter 6.

In this chapter, I ask to what extent outsiders feature in local fisheries, how they differ from residents, and how host communities respond to their presence. The

aim is to better understand the degree of influence outside fishermen have on local resource use and management, and by extension on the pursuit of their own livelihood. To begin, I describe how outsiders coming to fish at Lake Ruwe and Lake Uba are different from resident fishermen who use the fishing camps in their demographic and socio-economic characteristics and short-term movement patterns, based on the fishing camp survey. I then consider how host communities viewed the presence of fishermen in the fishing camps, and villagers' cultural attitudes to outsiders more generally. The discussion develops the idea that, just as in dealing with local leaders, villagers' attitude towards outsider fishermen was ambiguous—at once quick to blame them for any perceived problem in the fishery but also unwilling to restrict access—and differentiated, depending on their own involvement in the fishery. I begin directly with a description of my methods; for information on the study area, see Chapters 2 and 6.

## **9.2 Methods**

The information on fishermen's movements, and demographic and socio-economic characteristics presented here are drawn from data collected through the fishing camp survey described in Chapter 6. The material on villagers' attitudes to outsiders was gathered through participant observation at the fishing camps and qualitative interviews with village leaders, elders, and others, as described in Chapter 8.

## **9.3 Results**

### ***9.3.1 Mobile but not necessarily outsiders***

Many more outsider fishermen in our sample used *juya* nets than did residents (75% of 60 individuals vs. 48% of 77; Figure 9.1). Outsiders on active gears, and to a lesser extent on *juya* nets, had fished at more different places on average than had residents in the current year (Figure 9.2). However, resident active gear users in our sample were the most likely to have moved at all (Figure 9.3).

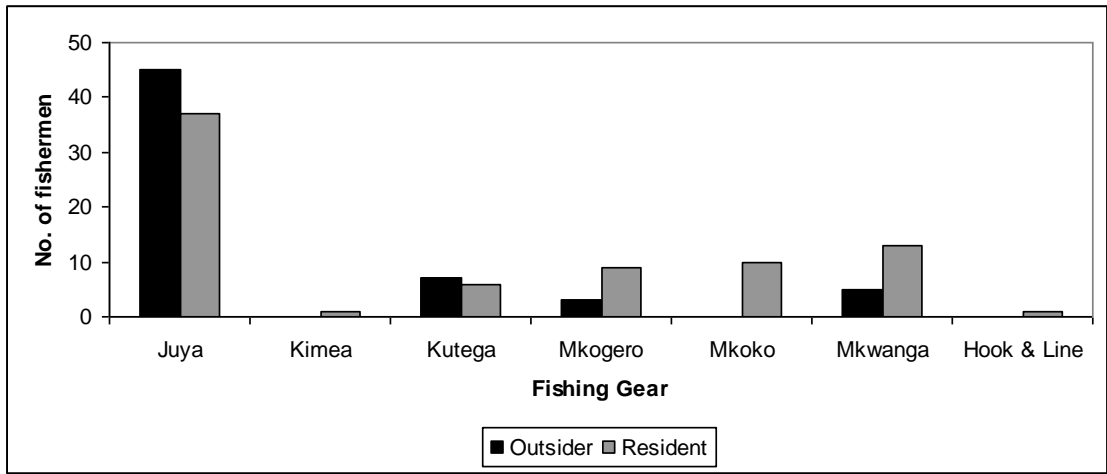


Figure 9.1 Number of outsider and resident fishermen surveyed using different gear types, FCS.

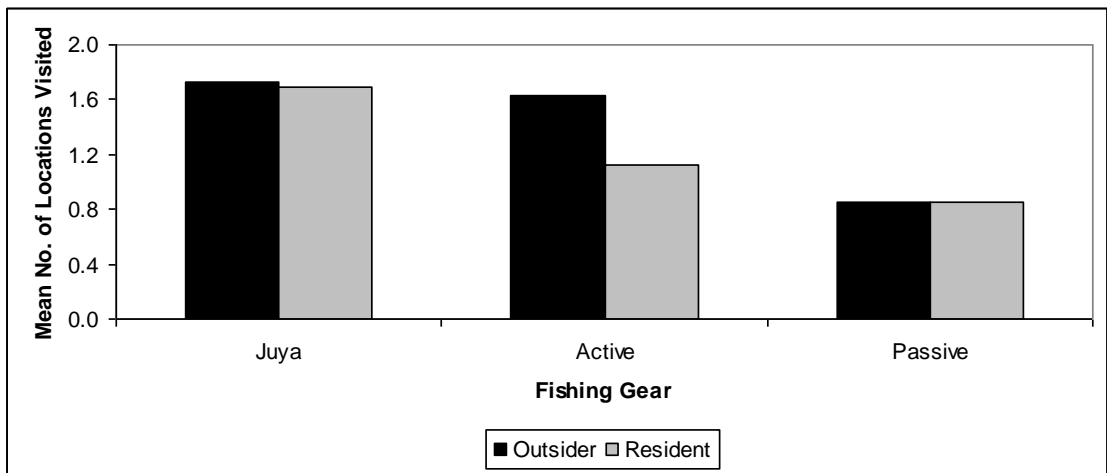
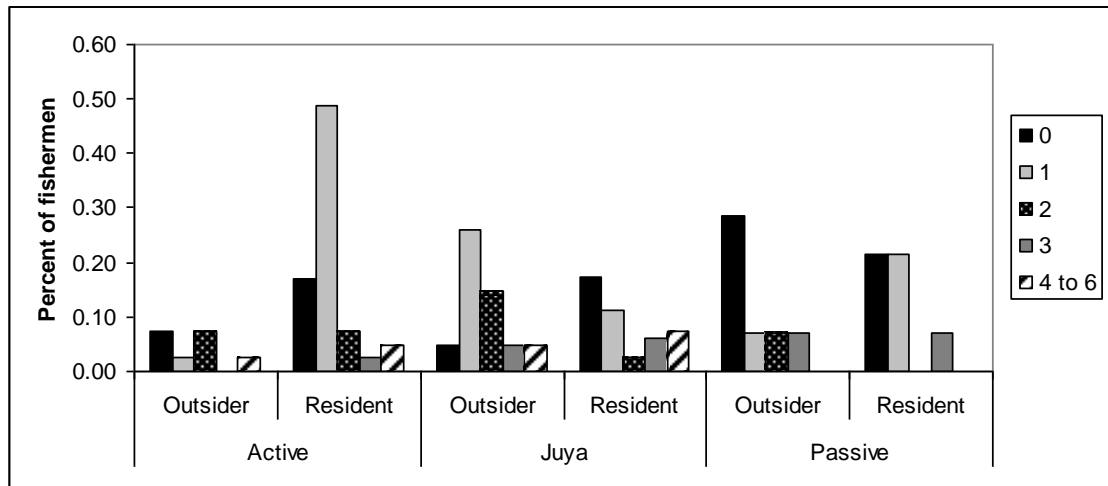


Figure 9.2 Mean number of locations visited previously by fishermen on different gear types in the current fishing season, FCS.





**Figure 9.3** Percent of fishermen in each gear category that had fished at none, or one to six previous locations in the current fishing season, FCS.

As a group, fishermen largely restricted their movements to the freshwater lakes and waterbodies located within the area spanning from Ikwiriri in the east to Lake Zumbi in the west (~40km apart). The most visited locations were major lakes, although several fishermen reported fishing on the smaller floodplain waterbodies. Visits to the delta or main Rufiji river channels, where entirely different fishing techniques were needed, were rarely reported.

Nearly every individual who had fished on the floodplain proper, that is away from the major lakes, lived locally (i.e., in the floodplain adjacent villages) and were often born in the study villages (70% of 26 fishermen, as compared to 52% of all 137 fishermen). The three exceptions were married to women born in the lakeside villages in two cases, and had a sister married to a local man in the other. I also met several villagers who travelled occasionally to neighbouring districts to fish on the Rufiji River's tributaries. None reported fishing in the Selous Game Reserve, in line with Paul et al.'s (2011) observation that only people in the western section of the district did so.

Over half of fishermen using *juya* had been at the fishing camps for periods ranging from one to 17 days when we surveyed them, with a median stay of four days for residents and outsiders alike. However, in our sample, proportionally more *kutega* fishermen than other gear users stayed overnight at camps on Lake Ruwe. This was an

effect of the older men living at Mtendeni nearly year-round, a behaviour not typical of *kutega* fishermen observed at other camps in the area.<sup>115</sup> During our study period, there was also an exodus of fishermen from Lake Weme when villages there imposed a seasonal closure, with several arriving to Lake Ruwe as a direct result.

We collected only crude information on how long an individual had fished at any one of their previous locations before moving on, but it seemed typically to be one month or less (64% of 242 visits). Even then, fishermen usually would not remain permanently at the site, but return home more or less frequently depending on how far they had to travel. Fishermen surveyed at Lake Uba from Ikwiriri commuted between their home and the lake each day. Mobile fishermen invariably returned home for the peak of the wet season, and once engaged in the fishing season even the most dedicated *juya* fishermen interrupted their fishing activity periodically, typically to work on their or family members' fields.

### **9.3.2 Characteristics of outsiders vs residents**

Apart from not residing in the lakeshore villages, outsider fishermen as a group were very similar to residents in most characteristics measured (Table 9.1). For one, 'outsiders' did not come from very far away and shared similar cultural backgrounds.

The majority of fishermen, both resident and outsiders to lakeside villages, were from Rufiji ethnic groups, predominantly the Ndengereko (78% of 136 individuals), as determined by the language spoken by themselves and/or their parent(s). Most outsiders were born in Ikwiriri (62% of 60 fishermen) and lived there (82%); 18% were born in one of the lakeside villages. Of the four men born outside the district, three lived locally: two were of the dominant local ethnic group, the Ndengereko, and the third was a Yao man born in Kilwa. The fourth man was a Ngindo born and living in Dar es Salaam, part of a *juya* team. Only two other fishermen besides the Ngindo *juya* fisherman lived outside the district, in Dar es Salaam. Both were in their sixties, born in Ikwiriri, working at Mtendeni and living primarily from the fish trade, fishing with *kutega* nets and selling smoked fish in the city. Outsiders did not tend to have marital ties to the lakeside fishing communities, with only two (6% of 35 married outsiders) married to a woman born in a lakeside village compared with 13 (29%) of 45 married resident fishermen.

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<sup>115</sup> Although I was told there was a similar "old person's" camp on nearby Lake Weme where the users farmed cassava alongside fishing.

**Table 9.1 Characteristics of resident versus outsider fishermen surveyed, all gears combined, FCS.**

	Resident	Non-Resident	All (Resident and Non)
Birthplace (%)			
Lakeside village <sup>1</sup>	79.2	18.3	52.5
Elsewhere in district	16.9	80	44.5
Outside Rufiji district	3.9	1.7	2.9
Ethnic Identity			
‘Ndengereko <sup>2</sup> (%)	80.5	75	78.1
No. of tribes represented	10	10	11
Age	34 ± 13	35 ± 10	34.5 ± 11.6
Education (%)			
No formal schooling	19	32	25
Some primary education (%)	31	23	28
Completed primary school	47	43	45
Some secondary education (%)	2.6	1.7	2.1
Married (%)	58	59	57.7
Household demographic characteristics			
Household size	5.9 ± 2.5	6.6 ± 3.1	6.2 ± 2.8
Dependency ratio	1.4 ± 1.1 (Median: 1)	1.3 ± 1 (Median: 1.4)	1.3 ± 1.1
No adult females (% of HH)	14.3	5	10.2
sex ratio (M:F)	1.1 ± 0.6 (N = 65)	1.2 ± 0.9 (N = 56)	1.1 ± 0.8 (N = 121)
Land holdings <sup>3</sup>			
Farms his own field (%)	68	52	61
Total land area (median)	2.5 acres	1.75 acres	2.4 acres
Area cultivated (median)	1 acre	0.5 acres	1 acre
Non-land asset values (USD)	114 ± 78	134 ± 194	123 ± 141
Fishing gear value (USD) <sup>4</sup>	16 ± 35	28 ± 38	23 ± 37
Gear in current use (%)			
<i>Juya</i>	48	75	60
<i>Mkoko/Mkogero</i>	24.7	5	16.1
<i>Mkwanga</i>	16.9	8.3	13.1
<i>Kutega</i>	7.8	11.7	9.5
Other	2.6	-	1.3
Income source (%)			
Primary: Fishing	44	33	39
Fishing sole income source or one of only two sources	8	25	15
N	77	60	137

Notes: <sup>1</sup>Namely: Mbambe, Mbunju-Mvuleini, Mkongo, Mpima and Ruwe, and includes locations in the floodplain (*bondeni*) incorporated into post-villagization settlements. <sup>2</sup> One or both parents spoke Ndengereko as a first language and/or the individual did. <sup>3</sup>Land holdings, as compiled under the survey, were for fields held by the fisherman and his wife (or wives) only, and not other members of the household. <sup>4</sup> Value of canoes and all fishing nets, combined.

There was little difference between resident and outsider fishermen overall in average age, marital status, and household demographic characteristics, although outsiders’ households had higher median dependency ratios (Table 9.1; see Chapter 4 for calculation of ratio). No fisherman lived alone, and together fishermen displayed an

array of household arrangements typical of other households encountered during fieldwork. Polygamous marriages were rare, with only five men having two wives, and one having three. However, outsider fishermen were less likely to have attended school than were residents. They also held less land on average, and more valuable non-land assets, although this latter finding was entirely due to two outsiders owning the only motorcycles in our sample. One of these fishermen was Ashiru, the fish trader and *juya* net owner described in Chapter 7. The other was a *juya* crew member who occasionally traded fish.

In fact, comparing fishermen on the basis of gear (as done in Chapter 6) revealed more consistent differences among categories, and similarities within categories, than did a division along residency lines.

### **9.3.3 Relations with host communities**

#### *Outsiders' reliance on local networks*

When outsiders were asked whether they had chosen to fish at Lakes Ruwe or Uba on the basis of existing ties to family or friends living in the lakeside villages, the most common response was negative. Instead, these informant said that they had heard news from other fishermen (often referred to as friends or colleagues, “*wenzake wavuvi*”) that the fishing was good there (N = 20 of 48 responses). A further nine fishermen said they had come to assess the situation for themselves. As one *juya* fisherman explained, his kind were always on the lookout for new fishing opportunities. Himself and eight other *juya* fishermen however had been recruited directly from their homes in Ikwiriri by various *matajiri*, net owners, to fish at Ruwe. The remaining fishermen, however, had decided to come fish on the advice of local friends or family (N = 9). External to the fishing camp survey, I met outsiders in the village who were staying temporarily with relatives, including a young man fishing *juya* (staying with his aunt) and three men fishing and buying fish to smoke for sale back home on the high terrace (staying with their nephew). The latter situation was part of long-standing fish exchange networks between the floodplain and high terrace (see Chapter 8).

#### *Fights, thefts, drugs and illegal fishing: The downside of fishing camps*

Although fishermen described an atmosphere of good-natured camaraderie at the fishing camps (see Chapter 6), conflict regularly flared up, causing some concern

among villagers, not least around the unwelcome prospect of involving district authorities. Each camp, apart from Muoi, had its own chairman and secretary, chosen from among the camp users without formal elections and responsible for maintaining peace in the camps. The leaders at Mapokezi and Tenge were also meant to play a role in revenue collection, reporting fishermen who refused to pay user fees or taxes to the village office.<sup>116</sup>

Camp leaders at Mapokezi and Tenge explained that fights were mainly over women or stolen property and could quickly escalate, aggravated by heavy drinking, with fishermen drawing knives. The leaders blamed outsiders for being too ready to resort to violence (although the one knife fight we witnessed was between two local men), and similarly considered that most thieves were outsiders as well. Thieves at the camps targeted nets (stolen on land and from the water), money, fish (smoked or from nets in the water), knives and other belongings. Petty thieves were said to live at the camps, with those taking larger hauls coming in the night. There was some tension between fishermen on the *juya* nets and those using passive gears as well, with the latter accusing the former of ripping *kutega* nets out of the way when fishing at night.

Leaders would deal with a troublesome fisherman by running him out of camp if an apology for his behaviour and/or the return of stolen property was not forthcoming. In the case of theft, if the person responsible could not be identified or would not admit to his crime, camp leaders might report them to the local police or resort to witchcraft, as had occurred at Mapokezi the previous year.<sup>117</sup> Theft occurred in the villages as well, but people blamed both local youths and outsiders for it there, with the latter category including fishermen but applying more to visitors from Dar es Salaam. In Ruwe, local youth involved in stealing were said to be the no-good pot-smoking fishermen living in Kipela (admittedly, I heard this most often from my neighbours in Beta hamlet). Locals associated pot-smoking with stealing not only because users needed to fund their habit, but also because instances of mental instability among them were ascribed to curses received from stealing witchcraft-protected property.

Like drug use, improper behaviour at the lakeshore was said to lead to mental illness, through spirit possession. Proper conduct meant being clean, sober, drug-free

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<sup>116</sup> Despite these semi-official roles, leaders at two camps told us that they deferred to the “true leaders”, their elders living at or working out of the camp.

<sup>117</sup> One thief had gone mad after stealing a cursed net, frightening the others and putting an end to the problem. Other thieves were said to have died of natural causes, by God’s will.

and not having sex the night before approaching the lake.<sup>118</sup> Fishermen also left gifts (of soda, cloth, or food) for the spirits at two shrines on the far shore of Lake Ruwe to ensure safe and successful fishing trips, and some would also seek the additional intercession of a witchdoctor to learn which further offerings might be needed to ensure their safety and good catches. Although younger fishermen were widely considered to have lost respect for the spirits, this was not true for everyone. Several young villagers told us they were always careful to smoke marijuana before reaching the lakeshore to avoid angering the spirits, whereas we observed older fishermen smoking by the lake, and flouting other proscriptions as well.<sup>119</sup>

Illegal fishing methods were widely practiced by locals and outsiders alike, in particular the use of small-mesh gill nets at times of the year when larger fish were not yet available. Men also resorted to cutting nearshore grasses to flush out fishes hiding there, which was less well regarded, but still within the realm of acceptability. The one method which was unequivocally condemned was the use of poison, most often agricultural chemicals tipped into floodplain waterbodies overnight, for collection before dawn of fish floating on the surface. Such events were blamed on outsiders but it was understood that no one could find their way around the floodplain without local guides. We witnessed one argument among Ruwe fishermen shaming a youth among them known to have been involved in poisoning a local pond. During the argument, the fishermen recounted the story of villagers elsewhere who had discovered a plan to poison a local pond and gone to the police in Ikwiriri, warning that villagers were prepared to fight to the death to prevent the use of poison.

#### *Better prices and more cash: the upside of fishing camps*

The proximity of troublesome fishermen put stress on the villages hosting the fishing camps. At the same time, villagers—both fishermen and non-fishermen alike, male and female, young and old—gained much-appreciated economic benefits from thriving fishing camps.

In general, villagers looked forward to the time when more fishermen would arrive to the fishing camps as this would attract outside buyers and *matajiri*, bringing

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<sup>118</sup> A woman similarly must abstain from sex the night before approaching the lake and not have her menstrual period.

<sup>119</sup> For instance, one local man set off in his canoe with his radio playing after laughing at those who told him it would bring out the evil spirits. Fishermen also joked about people stealing the offerings left at the shrines.

more nets and more opportunities for local men to fish even while driving up prices paid for fish. Larger camps also meant more business for those providing food and alcohol to fishermen, typically women. Village women but also those from elsewhere in the district would build small food stands (*hotelini*) at the camps (although not in my study year). Unlicensed alcohol sales were more discreet, with women serving home-brewed *pombe* in their village homes. Crew members' friends within the village could earn small sums helping to sew up new fishing nets or helping to clean fishes at the landing sites, for which men received "cigarette money" (*chai*, literally tea) or fish. Men supplying gear to the fishermen benefitted as well, with canoe-owners renting these out for up to 0.40USD a day, and people who braided the heavy ropes (*kamba*) used in hauling the nets (often elderly men) finding a ready market to hand.

In addition, the fishery provided opportunities to gain income and food to people one would not immediately associate with fishing. One elderly man had taken on the permanent role of camp helper at Mapokezi, making himself useful to the fishermen by cooking, untangling tiny fish from their nets, fetching firewood or watching over the fish-smoking kilns, as well as playing the jester. He told us he used to fish, but now was simply at the camp "following food" (*kitoweo*). Similarly, we regularly observed two elderly men at Tenge (one of whom was Mzee Tenge) separately landing pitiable catches with a decrepit fishing net but leaving the camps with large fish gifted to them by the returning *juya* fishermen. Even elderly women could benefit directly from the fishery, with one earning her daily meal of fish by lending *juya* fishermen a palm rope after theirs had broken.

Gift-giving away from the landing sites was an additional feature of the local fishery that brought direct advantages to villagers, but was also associated with the spread of HIV/AIDS. Fishermen would give fish to their relatives and friends in the village (see Chapter 5) but also to women they were sleeping with or hoping to seduce. Women told me that it was common, especially for younger girls (but also as I observed it, for single women with children), to sleep with men in exchange for a *fungu* of fish, or preferably money (see Chapter 6). I was given specific examples of two local women said to have contracted HIV/AIDS after taking a fisherman lover from Ikwiriri. From a health and cultural change standpoint, researchers have highlighted the role of highly mobile fishers in spreading HIV/AIDS in fishing communities, including through fish-for-sex transactions with local women (Appleton 2000, Merten and Haller 2007). Nonetheless, women were clear that fishermen were

not the only ones bringing the disease to the community, blaming visitors (*wageni*) more generally but also their own husbands.

Taxing the activity at fishing camps offered an opportunity for host communities to collect much-needed revenue, although villages faced multiple obstacles in realising this advantage. Camp leaders and villagers cited outsiders as the most stubborn tax avoiders, but these fishermen complained to us that local fishermen easily got out of paying fees, as we had opportunity to observe at the camps as well (see Chapter 7).

### **9.3.4 Traditions of acceptance**

In several different contexts and in examples spanning decades, local people described outsiders as bringing valuable knowledge and economic opportunity to the area, influencing how outsider fishermen were perceived in the present-day. The recent arrival of Sukuma agro-pastoralists was explicitly welcomed by some villagers because they were such fine farmers, and were sharing knowledge on how to grow market vegetables (although this did not extend to the Mang'yati, see Box 8.2). Local involvement in pit-sawing was credited to the presence in the village of an expert "headteacher", a Hehe man who had come to Ruwe in 1988 on a villager's invitation, after the two had befriended each other in a logging camp in Iringa. The visitor married a local woman, and shared his skills preferentially with kin and neighbours in his adopted hamlet of residence. Similarly, locals described learning how to make charcoal in the late 1970s from "experts" invited to the village from the northern terrace. New arrivals without particular skills who simply wanted to farm were welcomed to the floodplain as well, with informants explaining that more people farming meant more cleared land and safer conditions for residents. Finally, as described in Chapter 8, though violently confronted at Lake Uba, a waterbody under communal guardianship, the Nyasa were welcomed in the 1930s as master fishermen by others who were eager to learn how to fish at Lake Ruwe.

The peaceful integration of the Nyasa into local life, and the opportunity for locals to learn their fishing methods and magic, was eased by the relationship that developed between their leader and witchdoctor, Mchembezi, and his Ndengereko friend, Mzee Tenge, and provides an illustration of the formal bonds developed between guests and hosts. Mzee Tenge's now elderly son, our informant, explained that Mchembezi had wanted to have close relations with local people, and out of love



and respect for one another the two men had taken a blood oath. The children of Mchembezi upon his death became the children of his blood brother, and to this day continued “to live with and be loved by” Tenge’s son. Our informant explained that his own father was too old to fish when the Nyasa arrived, but he himself learnt from Mchembezi and his tribesmen. As an indication of how important this relationship was to the development of the local fishery, in my study year Mchembezi’s son was the chosen leader of the main fishing camp on Lake Ruwe, with the camp itself bearing Mzee Tenge’s name.

#### **9.4 Discussion**

Outsiders represent a significant proportion of fishery users, and dominate the use of the more commercial active gears on Lakes Ruwe and Uba. Fishermen’s movements occurred over relatively short distances, entirely within the Rufiji district, and over short time scales. Movements were by and large temporary, although there were instances of Nyasa migrants coming to the area to fish and remaining permanently. Surveyed fishermen were nearly all born and residing in the district, with most residents to the lakeside villages and non-residents alike identifying as Ndengereko. Resident and outsider fishermen on our fishing camp survey differed little in their demographic characteristics or asset holdings. Given a tradition of accepting outsiders, and the similar origins, cultural backgrounds and measured socio-economic characteristics of most visiting fishermen to their lakeside hosts, fishing technique rather than residency status appeared to be the more important marker of difference among fishermen (see Chapter 6). However, establishing a better sense of who moved and why in the Rufiji freshwater fishery would require a broader sample across more gear-types used by fishermen, greater attention to economic conditions in the communities of origin, a wider set of destination communities, and more attention to livelihood trajectories.

Whether fishermen moved at all, how far and how often, was closely related to their gear choice, with *juya* fishermen (particularly outsiders) moving frequently between more different waterbodies and *kutega* fishermen moving least often. The picture in our study was complicated by a messy underlying reality: some *juya* fishermen were resident and did not change location, others were resident but mobile (but we happened to capture them in our survey), and some outsiders used the passive

gear typical of farmer-fishermen (such as smoked fish fishermen/traders). In addition, users of other active gear besides *juya* nets occupied an intermediate position between the other two gear types: more often resident than not, and more mobile than *kutega* fishermen but not as much as those using *juya*.

Although seasonality played a role in fishermen's movements, with commercial fishing activity much higher in the dry season, on a smaller scale fisherfolk's movements varied unpredictably in duration and timing across different lakes in Rufiji district as fish availability and work conditions changed, similar to the situation described by Nunan (2010) between different areas of Lake Victoria. As explained to us by one *juya* fisherman, people would shift lakes if earnings dropped below 4USD/night.

Given the scarcity of true outsiders to the fishery, it is hard to gauge how ethnic identity as such mattered to accessing fishing opportunities, as it can in other African fisheries (see Chapter 1). Net owners insisted they had no criteria for choosing crew beyond trustworthiness, but kinship networks (related to but not perfectly congruous with ethnic identity) were clearly important in gaining opportunities to fish (see Chapter 6). The strongest hint that ethnicity might matter to accessing fishing opportunities is in the fact that proportionally fewer of the fishermen using other active gears were Ndengereko than in the other two gear categories. This catch-all category includes dangerous and relatively unskilled fishing techniques where fishermen stand in the water to scare fish into gill nets. Young men involved in such fishing told us they were frightened of crocodiles, and presumably would rather have been safe in *juya* canoes but perhaps could not gain access to crew spots. Similarly, Paul et al. (2011) consider that the use of the cast net is restricted to a few expert fishermen (as was the case in this study), usually outsiders to the district (which my sample was too small to confirm).

Nonetheless, it is difficult to imagine locals excluding fishermen from lake fisheries strictly on the basis of ethnic identity, itself a malleable category in Rufiji (see Chapter 2). Already, the existence of joking relationships among various tribes eased integration for some outsiders, with regular teasing observed at the landing sites. Easy acceptance of outsiders remains a common feature of East African societies (Kusimba and Kusimba 2013, Glaeser 2000), with Richard Waller (in deHaan 1999) describing the area prior to colonialism as:

“...a frontier region where society was fluid, highly adaptable, and capable of absorbing outsiders easily. Labour, rather than land, was the scarce resource...and the definitions of identity tended to be inclusive rather than exclusive”.

Local people shared this attitude, describing the ease with which men from elsewhere could arrive to the area and acquire land, a wife, and eventually belonging, from the colonial period until today.

The existence of a brotherhood of fishermen, and relationships with relatives and lovers in lakeside villages, necessarily complicated relations between those engaged in fishing and their hosts, dividing loyalties. Resident dedicated *juya* fishermen recognised the potentially destructive aspects of their fishing technique (in particular, the high catches of juvenile fishes) but at the same time defended the right of fishermen from elsewhere coming to fish at Lake Ruwe, in order to guarantee their own right to move as necessary (see Chapter 8). Non-fishermen were similarly divided: while many might well rail against the use of *juya* nets, a number of them would have had relatives engaged in that very activity. Local people’s ambiguous attitudes to problematic behaviour were explored in Chapter 8, and apply here as well, with locals seemingly easily forgiven for putatively illegal fishing activities, and the worst of these activities ascribed to outsiders “from Ikwiriri” in any case. Nunan (2010) observed a similar tendency to blame the use of illegal fishing methods on outsiders in the Lake Victoria fisheries without finding evidence that this was the case.

In the ease with which locals blamed outsiders for ‘illegal’ activities, residency status does come to matter again, as non-residents become more likely to be blamed for wider problems in the fishery and possibly punished if the offense is judged serious enough. This combination of severity and outside perpetrators occurred in the summer of 2013 at Ruwe, when village leaders decided to ban outsiders from using the lake in response to a spate of fish poisonings. According to my research assistant, people from Ikwiriri and Utete but also the village had been pouring pesticides into the lake, indiscriminately killing aquatic life in an effort to harvest hard-to-catch fishes. Those caught by the lakeshore faced a hefty 40USD fine, but it would be interesting to know the identity of those charged. Assuming non-residents are the most likely to engage in destructive fishing, this case echoes that described by Unruh et al. (2005) among the Gwembe Tonga, whereby migrants with insecure rights are the most likely to engage

in destructive resource use practices, even where socio-cultural, ethnic and land-use differences between migrants and hosts are small.

In this study, I did not systematically assess whether user fees and taxes were extracted more often from outsiders than residents, and there were few other aspects of enforcement to observe. That villages *can* manage to implement fishery by-laws is evident in the apparent success of councils at Lake Weme and Zumbi in closing their lake fisheries temporarily and collecting user fees otherwise. It may be that the difference lies in the composition of the village council in those places, as my respondents considered that only those councils without fishermen representatives could be ignorant enough of fishermen's difficulties to enforce such harsh measures. At Ruwe, several members of the village council were part of the Tembo fishing clan, including the village chairman himself, whose two brothers were important fish traders. Without sympathetic representatives it is hard to see how non-resident fishermen would influence political decisions in the village, having no right to participate in village meetings and little chance of being chosen as fishing camp officials. For Allison and Ellis (2001) such political exclusion threatens migrant fishermen's livelihoods.

Success in enforcing fisheries regulations on other Rufiji lakes might be the result of lesser fishing pressure there than on lakes closer to the main market towns and population centres of Kibiti and Ikwiriri. One leader at Mpima despaired of enforcing any seasonal closures on the Lake Uba fishery because youth from neighbouring Ikwiriri "would tunnel underground" to reach the lake. His explanation, and those of several Ikwiriri-based fishermen we spoke with, was that there were no economic opportunities for young men in town. These youth complained that villagers jealously guarded their timber resources, so that fishing remained the only viable option for them. For Paul et al. (2011), forests in Rufiji were over-exploited, and fishing remained the only reliable means of earning cash income from natural resource extraction.

Whether local communities allow or restrict outsiders' access may depend on how community members evaluate their own rights and facility of access to the resource, as observed around Lake Victoria (Geheb and Crean 2003). Although not satisfactorily explored here, the fact that villagers had access to an entire alternate fishing environment, namely the lower floodplain, likely influenced their propensity to allow outsiders on the main lakes. It was well accepted that only locals could easily

find their way among the smaller waterbodies on the floodplain, and perhaps local fishermen and traders could take refuge there if competition at the main landing sites became too intense. The resident smoked fish trader we spoke with at one floodplain pond (Athumani in Chapter 7) told us prices had gotten too high for him by the lake, prompting his move.

Furthermore, villagers were not uniformly or overly concerned about the state of the fisheries resource, even while recognising that fish size had decreased dramatically over time. It was accepted that people, whether local or not, “were hungry” and justified in earning income any way they could (see Chapter 8). As well, even though households sometimes had trouble acquiring fish, they were as likely to explain this as the result of not enough people fishing to supply the market as on there being too many people fishing. Furthermore, several resident fishermen (admittedly, those using the most efficient *juya* gear) argued that the availability of fish depended more on the flooding regime—that is whether the lake had re-connected to the floodplain—than on their own activities. In this, they echoed Sarch and Allison’s (2000) argument that fish numbers in floodplain ecosystems are primarily driven by climatic factors rather than exploitation levels, and that people’s recognition of this fact helps explain the widespread acceptance of outsiders and persistence of reciprocal access rights among fishing communities, just as observed at Lake Ruwe.

In conclusion, this chapter confirms the local nature of the Rufiji freshwater fishery, while demonstrating the difficulty of dividing fishermen into categories of local “us” vs. outsider “them”. In terms of the impact of outsiders on local fisheries management, the shared geographic origins and cultural similarities of non-resident fishermen with host communities, together with long-standing traditions of acceptance in the region, may reduce villagers’ motivation or ability to restrict access to the fishery, although clearly not in all places (e.g., seasonal lake closures at Zumbi, Weme) nor all circumstances (e.g., controlling the use of poison on Lake Ruwe).

# Chapter 10. Discussion

## 10.1 Overview

In this final chapter, I first revisit the context and structuring ideas of this thesis. I then set out the research themes these gave rise to, summarise the key findings of my study, and consider how these could be pushed forwards. I conclude with an assessment of who stands to gain or lose the most from future changes in the fishery sector and Rufiji agrarian society more generally.

## 10.2 Revisiting the starting point: Research themes

I placed this research within the context of growing uncertainty over rural Africans' access to the natural resources necessary for supporting their economic well-being and very way of life. Two fundamental shortcomings in pursuing large-scale investment and development of rural lands and waters are at play. First, proponents overlook the economic value of supporting existing livelihood systems, assuming that the employment, productivity or poverty reduction functions of interventions will be higher than increasing support to small-scale agriculture (de Schutter 2011, Woodhouse 2012), SSF and trade (Allison and Mvula 2002) or diversified local livelihoods more widely (Richter et al. 2011). In fact, wherever examined for rivers and wetlands, conversion for hydropower, agriculture, aquaculture, or otherwise has benefitted more powerful individuals at the expense of the food and livelihood security of others downstream (Leauthaud et al. 2013, Orr et al. 2012, Richter et al. 2011, Welcomme et al. 2010, Derman and Ferguson 1995). This raises the second important shortcoming in current policies favouring investment, in that proponents pay little attention to how such processes are creating winners and losers, leading to greater inequality in rural society (Peters 2013, Woodhouse 2012). Without strong political leadership and/or grassroots resistance to counter the capitalist tendency for primitive

accumulation, such tensions will continue to worsen (Fairhead et al. 2012, Woodhouse 2012, Benjaminsen and Bryceson 2012, Zoomers 2010).

A pervasive sense of crisis is central to the forces driving accumulation by dispossession, where nature must be sold off in order to be saved (Fairhead et al. 2012). Crisis narratives are a primary feature of the literature on global fisheries, but may not apply as neatly to inland fisheries (Welcomme et al. 2010). In Rufiji District, a sense of crisis certainly pervaded fisheries management, heightened since my time in the field with the district fisheries department increasing clampdown on illegal gear and enforcement of seasonal lake closures (Hamerlynck et al. 2011; see also Benjaminsen and Bryceson 2012). In fact, as these authors demonstrate, any perceived crisis in local fisheries soon resolves itself when even a minimal flood reaches the viable floodplain lakes. As is elsewhere the case, the risk to local fisheries comes not from within the sector itself, therefore, but from external drivers of change, including modification of water flow through hydropower and irrigation as well as climate change (Welcomme et al. 2010).

In the exposure of local SSF and livelihoods to potential dramatic change through renewed interest in damming the river and commercial agriculture investments (Hamerlynck et al. 2010), Rufiji District can be seen as on the brink of an “open moment”, defined by Lund (1998) as a “particularly intense period of rearrangement of the social order” during which local norms and power relations are reformulated (in Ansoms et al. 2014). The conditions for dispossession are there, but are not yet fully manifested on the ground (Fairhead et al. 2012), as observed in the incipient but unrealised attempts to grow biofuels in the area (Neville and Dauvergne 2012).

It is against this background of threats to local livelihoods (though only gathering on the horizon in Rufiji District during my time in the field) that I set out the main theoretical threads of the thesis. First, to assess the role of SSF in terms of food security and cash provision for villagers on the Rufiji floodplain through a sustainable livelihoods approach. This provided a means to justify the sectors’ importance and identify those households and individuals most dependent upon it. Second, to facilitate the identification of potential winners and losers in any future changes to the resource base, I drew on a theory of access to reveal the means by which individuals accessed fishing opportunities and the market. Third, I took a historically, culturally and politically-informed view of access to and governance of common-pool fishery resources, in order to consider how changes in prevailing common property tenure

regimes and resulting access to local fisheries might impact its livelihood role for different players. The aim throughout was to establish the various actors in the fishery, their positions, and their consequent ability to cope or not with changes in access to the resource. In the next section, I set out the specific research questions these ideas gave rise to, and the main findings obtained.

### **10.3 Contributions of this study**

#### *10.3.1 Differential participation and reliance on SSF in local livelihoods*

As found in other African inland SSF, household participation in Rufiji's fisheries was high, with fishing typically a part of diversified livelihood strategies (Béné et al. 2010a, Neiland et al. 2005, Allison and Mvula 2002). While many households participated in the fishery, the degree to which any one relied on the income source varied. Where researchers have attempted to explain such variation on the basis of household characteristics, results obtained tend to be site-specific and ambiguous. At Lake Chad, Neiland et al. (2000a) found that larger households were more dependent on fishing in the floodplain area, and smaller households on the lakeshore. Closer examination revealed that wealthier households invested more labour in fishing (hence the effect of household size), but otherwise there was no clear-cut relationship between household wealth and income sources (Béné et al 2003b).

My own findings similarly failed to locate a clear relationship between wealth and participation or reliance on fishing as a livelihood activity. As seen elsewhere (Béné et al. 2009b), fishermen in the study area were not necessarily among the poorest members of the community, with middle-ranked households representing the majority of fishing households. Only the value held in fishing gear consistently increased the likelihood of households in the study area participating or relying on fishing. Wealth ranks mattered in households' decision to fish at all (with poor households most likely to participate) but not in the decision to fish with nets, nor to whether households relied heavily on the activity. For individual fishermen, the decision to fish with *juya* bore no relation to wealth, as measured by physical asset holdings.

The ambiguous links of fishing as a livelihood to wealth reflects the facts that 1) land was not a limiting resource in the area and so likely not critical to present-day



livelihood decisions and 2) people could participate in fishing, particularly commercial fishing, without owning their own gear. Other assets thus become more important to understanding differential households participation and reliance, including human capital (e.g., one's physical strength, fishing knowledge and experience) and social capital (i.e., connection to owners or crewmembers of the largest commercial gears and the labour opportunities they provided). My examination of the social relations between crew, net owners and their buyers provides the fuller context missing from my quantitative models, but could be usefully extended to develop an explicit understanding of which of these intangible assets matter more, and how.

Cultural expectations were also crucial to shaping differential participation in fishing, whereby full-time participation in the commercial fisheries set professional fishermen apart from their farmer-fishermen neighbours, either for a time in life (prior to marriage) or more permanently. Attachment to the fishing lifestyle, rather than to the income provided by the activity itself, could help to explain the willingness of *juya* fishermen to forego the comforts of home to live in basic fishing camps and engage in dangerous, exhausting work. Beuving (2010) describes as much for men in the Lake Victoria Nile perch fishery who—despite little success in furthering their economic prospects—preferred the personal freedom and urban culture of landing sites to returning home. Exploring this lifestyle component for Rufiji fishermen in more detail, and placing the decision to fish within individual actors' livelihood trajectories, would likely provide a more satisfying answer to the question of who fishes, when, and why, than the more quantitative approach pursued here, and is one advocated for livelihood studies more generally (de Haan & Zoomers 2005).

The most fundamental contribution of SSF, to food security through fish consumption and cash sales, is one that is well-recognised but rarely examined in terms of species composition, seasonal variability (Garaway et al. 2013) or inter-household differences (Kawarazuka & Béne 2010). My findings show that a diversity of indigenous fish species provided the major source of animal protein to village households, with any future studies on the nutritional composition likely to lend support to the argument that local biodiversity is key to ensuring nutritional security (Toledo and Burlingame 2006). However, despite the local availability of small, cheap “pro-poor” fish (Thilsted et al. 1997) poor households had a more difficult time acquiring fish than others, unable to purchase fish as often as rich households, less likely to fish than middle-ranked households, and more likely to keep any catches for

home consumption than sale. This effect was dampened somewhat when fish became easy to catch (e.g., trapping fishes as these entered the floodplain on the rising flood) or prices dropped (e.g., at the height of the commercial fishing season), but only the rich had enough funds to regularly meet their fish consumption needs.

### *10.3.2 Access to markets*

That participation in the fishery was so overwhelmingly local to Rufiji District—from the suppliers up to market vendors and reportedly linked to Rufiji-born urban wholesalers as well—underscores the fishery’s positive contribution to rural livelihoods. Trading in fried fish was one of very limited cash-earning opportunities open to Rufiji women, and it would be useful to document the importance of this income to their and their childrens’ livelihoods (Harper et al. 2013, Geheb et al. 2008). Unlike Abbott et al. (2007b), this study finds evidence of formal, though flexible, arrangements between fishers and vendors in a floodplain fishery. Like these authors’ work on the Kafue Flats, I similarly found that, although market vendors’ investment in their business and consequent earnings could vary widely, the activity was more or as important than farming as a livelihood activity for the majority. Documenting the structure and livelihood role of the Rufiji trade adds to the weight of evidence on the importance of SSF trade to rural African economies (Béné et al. 2010).

Given the vitality of the regional fish trade—as evidenced by marketing chains that extended across the district and beyond, the lack of any monopolies, and the livelihood opportunities it presented to both men and women—the sector could be promoted as an engine for rural economic development, as argued by Allison and Mvula (2002) for the rural fish trade in Malawi. Doing so would require a more formal evaluation of food security concerns, but higher earnings could come from reducing waste in the trade through investment in better processing methods and transport infrastructure rather than simply increased exploitation (Richmond et al. 2002).

### *10.3.3 Access to fisheries resources*

Management of Lake Ruwe’s fishery would appear to provide yet another example of the failure of co-management in African SSF. As part of Rufiji District’s move towards decentralisation, villagers in Mbunju-Mvuleini had engaged directly and deeply with outside professionals to develop environmental management plans and

bylaws, yet the attention paid to fisheries there was even less than at Ruwe or Mkongo. I explored several reasons why local governance of the fisheries was inadequate in this study, including unclear borders, petty corruption and elite capture, and involvement of outsiders. Paying attention to the actual performance of village government, through long-term observation, was essential to discovering its failings (as demonstrated also by Brockington 2007, 2008), and is a key contribution of this study. Many of the challenges to good governance identified here are recast in Table 10.1 in relation to Elinor Ostrom's principles for the sustainable and equitable governance of the commons (1990).

However, additional, deeper reasons underlie the apparently poor governance of local fisheries, which I would relate first, to people's ecological understanding of the inherent variability of the resource (as argued by Sarch and Allison 2000, and demonstrated empirically by Hamerlynck et al. 2011) and second, to the cultural tradition of relying on fisheries for their social benefits. Despite increasing commercialisation in local fisheries, ideas of equity—in the sense that one could not let a person go hungry—trumped more ephemeral ecological concerns, apparently with good reason. In this sense, local people were resisting a crisis narrative imposed from the outside, in the form of district regulations and my own early lines of questioning. The acceptance of outsiders in the fishery built on principles of reciprocal access (i.e., equity), and was facilitated by the social and cultural similarities between them and residents (Curran and Agardy 2002).

The idea of trade-offs between sustainability and equity goals in fisheries management was recognised by Thomas (1996) in his study of Nigerian wetlands, but a review by Agrawal and Benson (2011) assessing the outcomes of various common property institutions finds few other examples of researchers addressing these different dimensions of resource use in relation to one another. A re-focusing on equity and social justice issues is however exactly what researchers are calling for in the design and application of SSF policy (Allison et al. 2012), CBNRM projects (Dressler et al. 2010), and governance of large-scale investments in land and water resources (Fairhead et al. 2012, Richter et al. 2011). This study, without evaluating such trade-offs, does demonstrate the value of understanding people's historical and cultural relationship to local resources as an explanation for perceived governance 'failures'. Only by recognising such local norms and values will new institutions for resource management achieve any kind of local legitimacy (Russell and Dobson 2011).

**Table 10.1 Summary of local fisheries management arrangements in place at Lake Ruwe in relation to Ostrom's (1990) principles for managing common-pool resource institutions**

Principle	Observed in this study
Define clear group boundaries	<p>Unclear in terms of resident/outsider fishermen (due to cultural similarities, and shared occupational identity among dedicated fishermen).</p> <p>Unclear in terms of type of fishermen (<i>kutega</i> vs more active gears vs. <i>juya</i>)</p> <p>Unclear in terms of the lake's physical borders: who 'owns' the lake?</p>
Match rules governing use of common goods to local needs and conditions	<p>Many rules set at the national level and not responsive to the particular ecological conditions of floodplain fisheries</p> <p>Local needs and conditions (i.e., cash and food availability) change seasonally and are not the same across all households.</p>
Ensure that those affected by the rules can participate in modifying the rules	<p>Unelected leaders within village councils carry disproportionate influence.</p> <p>Other well-connected individuals (e.g., fish buyer brothers of local village chairman) could have undue influence.</p> <p>Outsider fishermen, as non-residents, had no official status in Village Assembly meetings.</p>
Make sure the rule-making rights of community members are respected by outside authorities	<p>Yes, in theory. In practice, district officials have more status and authority than elected village leaders.</p>
Develop a system, carried out by community members, for monitoring members' behaviour	<p>None for fisheries. (Yes for timber resources, but resource guards able to divert funds/ accept bribes)</p>
Use graduated sanctions for rule violations	<p>Disproportionate punishments from district officials: burning/confiscation of gears, of fish, and/or heavy fines.</p>
Provide accessible, low-cost means for dispute resolution	<p>In general, disagreements resolved through discussions with respected members of the community, though this favours well-connected locals. The police and courts used as a last recourse.</p>
Build responsibility for governing the common resource from lowest level up to entire interconnected system	<p>Supported in Mbnju-Mvuleini only, through REMP (but no longer active).</p>

#### **10.4 Conclusion: Who wins, who loses?**

As life on the Rufiji floodplain now stands, fisheries make an essential contribution to the livelihoods of the majority of households. There are few comparably reliable and accessible sources of animal protein, or of cash income. Despite widespread participation and reliance on the fishery, there were marked differences in who could most effectively access the resource and bring fish to market. Chief among these was access to money: wealthier households could buy more fish to eat, those with more fishing gear were more likely to fish and rely on fishing, and individuals with greater savings could make better profit margins in the fish trade. The most vulnerable households—those headed by women and/or the elderly, or otherwise poor—were least likely to fish themselves (limiting fish consumption), and women's role in the trade was restricted to the sale of fried fish. The men who worked the large commercial nets might have the potential to earn more than those working on other gears, but at higher risk to their safety, health and livelihood security. Nonetheless, social differentiation in the fishery was limited. Owners of the largest gears were not necessarily rich, traders (especially in the fresh trade) recounted the ease with which all of their savings could be lost, and the sector was not lucrative enough to attract participants from outside the district.

As a result of its dominant role in local livelihoods, disruption to floodplain fisheries through water flow modification would find few local winners. Only in a scenario where outside investors were prepared to pay for (or otherwise acquire) access to floodplain land (and water) would substantial benefits accrue, and even then only to a few individuals. These would most likely be the village leaders with the authority to enter into discussions with outsiders and district officials, and who already use their position to better their financial prospects. Investments that would benefit rural society more widely would need to support and enhance existing livelihood activities, not least by providing access to credit, better infrastructure and public services (Béné and Friend 2011) but also support to small-scale agriculture (de Schutter 2011).

Supporting local people in their own efforts to attract or resist investment projects is key, and can build on their own sharp understanding of the threats facing local livelihoods (see also Beymar-Farris and Bassett 2012, Paul et al. 2011). As one

elder in Mbambe put it, deriding the latest land-related scheme in the district (to do with land-titling):

“When you're trying to catch fish, you use nets. When you don't catch anything, you put in your *nyando*. If there are still no fish, you use hooks. [...] They are trying every means to get our land”.

—Hamisi

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## Appendix A. Asset Values

Value of household assets used in analysis, not including fishing gear.

Asset	Value in TSH (Maximum)	Value Used in Analysis (USD)	Notes
<b>Livestock</b>			
Chicken	4000	3.20	
Duck	5000 (6000)	4.00	
Goat	25000 (30000)	20.00	
Cow	200000 (300000)	160	
<b>Non-Productive Assets</b>			
Torch	2000	1.60	
Kerosene lantern	6500	5.20	
Radio	10000 (15000)	8.00	
TV alone	100,000 est.	80	Buy TV/VCR second-hand in Ikwiriri; Buy generator second-hand in DSM (or steal)
Vidio alone	50,000 est.	40	
Mobile phone	15,000 (50000)	12	
<b>Productive assets</b>			
Generator	100,000	80	
Sewing machine	125,000	100	*internet price for second-hand in DSM
Backpack sprayer (Solo)	125,000	100	*internet price for sale in US
Saw ( <i>Msumeno</i> )	30,000	24	
Bicycle	80,000 (150,000)	64	
Motorcycle	800,000 (900000)	640	Buy second-hand
Milling machine	500,000	400	Small milling machine, new *internet price for sale in Tz
Shop inventory	400,000	320	Gussed!!
<b>House</b>			
Dar es Salaam	500,000 (2000000)	400	
Ikwiriri or Kibiti	400,000 (1000000)	320	
<b>Not included in analysis</b>			
Hunting rifle	200,000?	-	Many are very old; excluded from analysis as people did not admit to owning
Village House/Plot	40,000 (80,000)	-	

Source: Field interviews

## Value of Fishing Gear Used in Analysis

Net	Number of pieces	Price per piece	Value used in analysis (TSH)	Value used in analysis (USD)	Notes
Cast Net					
Kimea	3	3000	20 000	16.00	Total includes cost of lead weights
Set Gill Nets					
Kutega	10	1200	12000	9.60	2 plug.
Mkogero	20 - 30	1200	24000	11.60	Like kutega nets, but two rows
Seine nets					
Juya	40 - 50	1200 - 3000	84,000	67.20	2 or 3 plug. Typically lasts one year, although can be longer.
				64	9 plug net. Lasts 3 years. Can also make with 18 plug net at 9000TSH/piece but too expensive for area
Mkoko	20	4500	80,000		
Canoes					
Small		25 - 30000	25000	20	
Large		40 - 50000	-	-	Lasts three years
Hardwood		50 - 100000+	-	-	"
					Canoes made of mkongo wood can last over 30 years; mgama [mtanga?] wood

Source: Field interviews. NB. The cost of a piece of netting increases throughout the fishing season, so a piece of kutega netting may cost 1000TSH (0.80USD) in June, and increase to 1200TSH (0.96USD) (in Ikwiriri) by December. Also, net sizes and value of the same type can vary widely. The cost of a canoe includes the cost of transport from the carving site in the forest. For a large canoe, the cost can break down to 16USD (for the actual canoe), and 24USD for the transport (by car or by a team of porters).

## Appendix B. List of formal interviews

Theme	Topic	Location	Date (2008)	Informant(s)	Recorded
Set 1: Local history	Borders/Fishing	Mbj-Mv	5/5	Group interview: elders	Y
	Borders/Fishing	Mbj-Mv	19/8	Rajabu S. M.	Y
	Borders/Fishing	Mbj-Mv	22/8	Mapua S.	Y
	Fishing/ Floodplain life	Mbambe	9/07	Musa N.	Y
		Mbj-Mv	19/08	Arua S.	Y
	Fishing/ Floodplain life	Mbj-Mv	19/08	Saidi N.	Y
	Fishing/ Floodplain life	Mbj-Mv	19/08	Former chairman, Mbunju-Mvuleini	Y
	Fishing/ Floodplain life	Mbj-Mv	22/8	Seifu N.	Y
	Fishing	Mkongo	21/8	Group: Mkongo elders (3)	Y
	Fishing/ Floodplain life	Mkongo	21/8	Group: Mkongo elders (4)	Y
		Ruwe	16/4	Twahili M.	Y
	Post-villagization	Ruwe	16/4	Group interview, incl. dismissed Ruwe VEO	Y
	Fishing/ My presence	Ruwe	21/4	Group: Ruwe elders (10)	Y
	Fishing/ Floodplain life	Ruwe	2/5	Juma K.	Y
	Fishing	Ruwe	2/5	Abdallah T.	Y
	Floodplain Life	Ruwe	7/7	Seif S. O.	Y
	Fishing	Ruwe	7/7	Saidi T.	Y
	Floodplain Life	Ruwe	7/7	Twahili M.	Y
	Fishing/ Floodplain life	Ruwe	8/7	Seif U and Mkb.	Y
	Fishing	Ruwe	9/7	Nga. and Seif S.O.	Y
	Floodplain Life	Ruwe	9/7	Juma K. M. and Mwajuba	Y
	Floodplain Life	Ruwe	10/7	Mng.	Y
	Fishing/ Floodplain life	Ruwe	10/7	Salum O. R.	Y
	Fishing	Ruwe	10/7	Idi M, Mat., Ukw.	Y
	Fishing/ Floodplain life	Ruwe	11/7	Salum A. M.	Y
	Floodplain Life	Ruwe	11/7	Shamte S.	Y
	Fishing/ Floodplain life	Ruwe	12/7	Idi M.	Y
	Floodplain Life	Ruwe	13/7	Juma K.	Y
	Fishing	Ruwe	13/11	Kin.	Y
	Floodplain life	Ruwe	19/08	Salum A. M.	Y

Set 2: Resource Management					
		Mbambe	11/8	Chairman, Mbunju-Mvuleini	Y
	Fishing	Mbambe	11/8	Group: Village councillors (4)	Y
	Environment	Mbj-Mv	22/8	Group: Village environment committee (4)	Y
		Mkongo North	18/8	Group: Village councillors (4)	Y
		Mkongo South	18/8	Group: Village councillors (3)	Y
	Lake Uba fishery	Mpima	12/11	Group: Village leaders	Y
		Ruwe	12/7	Group: Village councillors (6)	Y
		Ruwe	11/8	Current (new) VEO	
		Ruwe		Group: Village Scouts (3)	
Walks: Borders, Fishing, Floodplain life					
		Pre-villagisation settlements (Ruwe)	14/10	Kondoo, Bosco, S. A. M.	
			1/11	Ali R., Mar., Juma K.	Y
			31/10	Ali R., Mar., Juma K.	
Set 3: Border disputes					
		Mbj-Mv	23/09	Seifu N.	Y
		Mbj-Mv	23/09	Seifu N. and Mgb.	Y
		Ruwe	19/08	Chairman, Nyalingwe hamlet	
		Ruwe	19/09	Salum A. M.	
		Ruwe	19/09	Athumani K	Y
		Ruwe	25/09	Juma K	Y
Set 4: Nyando survey Land access					
		Mbambe		See List Table 6.5	
	Field histories	Ruwe field areas	19, 20, 22/06 and 14/07	Various: owners of 15 fields	
	RUDIDEA etc	Utete	18/8	District official	
Trade					
	Market vendors	Ikwiriri	6/10	Market traders, Group of 10	
		Ikwiriri	6/10	Fresh fish seller, young	
		Ikwiriri	6/10	Fresh/Smoked seller	
		Ikwiriri	6/10	Smoked seller, old man, Stall 2	
		Ikwiriri	6/10	Smoked seller, stall 3	
		Ikwiriri	6/10	Fresh retail trader	
	Buyers	Floodplain	15/11	Smoked wholesaler	
		Kambi	26/6	Buyer fresh and smoked	
		Kambi Mapokezi	20/10	Smoked and Marine Wholesaler/Retailer	
		Kambi Mtendeni	9/11	Smoked wholesaler	

Trade (cont'd)					
		Kambi Mtendeni	9/11	Smoked wholesaler	
		Kambi Tenge	25/06	Smoked fisher/buyer	
		Kambi Tenge	18/10	Buyer smoked	
		Kambi Tenge	18/10	Fresh buyer	
		Ruwe	11/11	Fresh buyer	
		Kambi Tenge	17/3/2009	Smoked fish buyer and partner	
		Kambi Tenge	27/10	Fresh buyer and <i>juya</i> net owner	
		Kambi Tenge	21/10	<i>Juya</i> Net owner	
		Ruwe	13/11	Communal Tembo <i>juya</i> net owners/fishermen (5)	
	Leaders	Tenge	16/06	Camp leaders x2	
Regulations		Utete	22/09	District Fisheries Officials (3)	
Fried Fish		Ruwe	5/11	Young woman	Y
		Ruwe	5/11	Two young women	
		Ruwe	5/11	Two women	Y
		Ruwe	5/11	One woman	
		Ruwe	5/11	One young woman	Y
		Ruwe	5/11	One older woman	Y
Witchcraft		Ruwe	11/7	Main local witchdoctor (female) and daughter	Y

Notes: Does not include exploratory interviews/conversations I had with villagers in Ruwe on themes of domestic group arrangements, on earnings from various livelihood activities (e.g., charcoal, timber, pottery, bike transport, palm collection, etc.), or genealogies, nor informal 'hanging-out', e.g., at fishing camps.



## Appendix C. Estimating fish weights

### To convert estimated lengths to weights:

Used the equation:  $\text{Log Weight} = a + b \cdot \text{Log length}$

#### 1. Length-weight relationships derived from my own data

Local name	df	a ± s.e.	b ± s.e.	Significance	Rationale
Kumba	213*	-2.805 ± 0.126	3.673 ± 0.093	F = 1550.8 p < 0.000 R <sup>2</sup> = 0.879	Also used for kokoto (n=1) b/c no data on Fishbase and is a small cichlid
Pele	63**	-2.147 ± 0.418	3.151 ± 0.325	F = 93.76 p < 0.000 R <sup>2</sup> = 0.602	No data for this species on Fishbase

Notes: Length and weight measures for fresh fish only, collected in Ruwe (landing sites or village market) and at regional markets in Ikwiriri and Kibiti between August and November 2008. \* Sample includes only those fish measured and weighed individually. \*\* Sample includes average fish lengths and weights. Because my scale was not sensitive enough to detect weights below 10g, smaller fish were weighed in the bunches in which they were sold.

#### 2. Length-weight relationships taken from Fishbase, with justification for choice of data used

Local name	Species used	Same?	N	a	b	Notes	Justification
Kogo	<i>Synodontis victoriae</i>	No	296	0.0187	2.973	Based on FL, where FL = TL/1.12	Only 3 Tanzanian Synodontis species with L-W data; this one a large species like local kogo
Kambale	<i>Clarias gariepinus</i>	Yes	194	0.0054	3.092		Took the value for the sole Tanzanian sample
Ngocho	<i>Labeo congoro</i>	Yes	?	0.0299	3.008	SL = TL/1.259	Only data available
Mbufu	<i>Bagrus meridionalis</i>	Yes	883	0.0037	3.151		Median value
Tungu	<i>Distichodus schenga</i>	No		0.0136	3.252	SL = TL/1.266	None for <i>D. petersii</i> , so of 4 <i>Distichodus</i> species with data, chose median 'b', from Zambia.
Bubu	<i>Glossogobius girius</i>	Yes	43	0.0116	3.068	SL= TL/1.317	
Beme, Kasa and Viliampunga	<i>Brycinus imberi</i>	Partial		0.0360	2.790		<i>B. imberi</i> is found in Rufiji area
Ndundundu	<i>Mormyrus longirostris</i>	Maybe		0.013	2.94		Known from Rufiji
Mkungu	<i>Anguilla mossambica</i>	Maybe		0.0007	3.3		One of 3 possible species matches
Zozo	<i>Marcusenius macrolepidotus macrolepidotus</i>	Maybe	?	0.005	3.202		Species found in Tanzania (Ruaha)
Mbarata	<i>Hilsa kelee</i>	Yes	127	0.0061	3.248	SL = TL/1.191	<i>H. kelee</i> South Africa

**To estimate fresh fish numbers and/or size where only price paid was known:**

(i.e., for 'mixed' multi-species bunches of fish, or for tiny sasile (n=3).

I tried using the relationship derived from all the fresh fish in the survey:  $\log \text{ price} = 1.193 + 0.441 * \log \text{ weight}$ ,  $R^2 = 0.455$ ,  $F = 72.54$ ,  $p = 0.000$ ,  $df = 87$ . However, this seemed to give very large weights, so instead, I used the mean price/weight for each survey period (month) to impute weight value where price was known.

**Where no number of fish was given, and no price either, but I knew it was a 'fungu':**

I assumed the weight was the mean weight for that month for a 'fungu' (300sh) of fish. In one case I didn't have the mean price/g for Feb, so used the Jan value.

In some cases, it was not possible to impute a value, as not enough information was collected, and the field was left blank.

**Conversions from estimated fresh fish weight to processed weight:**

For smoked fish – calculated fresh weight, then multiplied by FAO conversion factor (0.43)

For sundried fish – calculated fresh weight then multiplied by FAO conversion factor (0.28).

For fried fish: Deep frying fish (fillets) without batter resulted in a weight loss of 39% (Burger 2004). So, using 0.61 for conversion.

Where information was missing on number/size of fried fish, I used the price to estimate weight, but because I had fewer data, I had to use the mean price/weight for the months immediately preceding and following the survey period (n=2 cases).

**For weights of dagaa and shrimp:**

I took the lowest weight/fungu value seen in the market towns for that survey month (April, July) as the probable weight of fungu sold in the village.

## Appendix D. Local and scientific names of freshwater fishes in study area

Local and scientific names of freshwater fishes encountered or mentioned by local people during fieldwork. Scientific names are assigned based on matching local names reported by informants with the taxonomic work carried out by Olivier Hamerlynck and colleagues (pers. comm.)

Family	Local Name	Scientific Name	Market?
ANGUILLIDAE	Mkunga or Mkonga	<i>Anguilla mossambica</i> , A. <i>bengalensis</i> , A. <i>bicolor</i>	
BAGRIDAE	Mbufu (used interchangeably with Kitoga locally)	<i>Bagrus meridionalis</i> (Kitoga is <i>Bagrus orientalis</i> )	X
CHARACIDAE	Beme or Bembe	<i>Brycinus</i> sp. with green fins	X
CHARACIDAE	Kasa or Ngacha	<i>Brycinus affinis</i>	X
CHARACIDAE	Kiliampunga or Viliampunga	<i>Brycinus</i> sp. with red fins	
CHARACIDAE	Kange	<i>Hydrocynus vittatus</i>	X
CICHLIDAE	Kikokoto	<i>Astatotilapia bloyeti</i>	
CICHLIDAE	Kumba	<i>Oreochromis urolepis</i>	X
CITHARINIDAE	Pele or Pelege	<i>Citharinus congicus</i>	X
CLARIIDAE	Kambale	<i>Clarias gariepinus</i>	X
CYPRINIDAE	Ngocho or Nguchu	<i>Labeo congoro</i>	X
DISTICHODONTIDAE	Tungu	<i>Distichodus petersii</i>	X
GOBIIDAE	Bubu	<i>Glossogobius giuris</i>	X
MOCHOKIDAE	Kogo	<i>Synodontis rukwaensis</i>	X
MORMYRIDAE	Ndundundundu	<i>Mormyrus</i> sp.	
MORMYRIDAE	Zozo	<i>Marcusenius livingstonii</i>	X
SCHILBEIDAE	Mbata	<i>Schilbe moebiusii</i>	X
?	Mbimbisilo	?	
POECILIIDAE	Kisasile	<i>Pantanodon stuhlmanni</i>	

Note: Market? = Observed at least once in the market survey

## Appendix E. Costs and revenues in the Rufiji freshwater fish trade

**Table E-1. Costs and revenues for smoked fish buyers and their sponsored fishermen for supply of fishes from the Rufiji floodplain to Dar es Salaam, November 2008.**

	Notes	Fishermen (2 individuals)	Buyers (2 individuals)
<b>STARTING CAPITAL</b>		0	120
Length of cycle		7 days	10 days
<b>COSTS (USD)</b>			
<i>Camp expenses</i> <sup>1</sup>			
<i>Posho</i> <sup>2</sup>		16	0
Cigarettes, Marijuana		0.80	0
Canoe rental	@300/day	1.68	0
Food		16	16
Fish purchase		0	80
<i>Transport</i>			
Return bus fare to DSM	x 1 person		8
Fee to transport goods			8
Porters			0.80
Cart rental at DSM			1.60
<i>Fees</i>			
Trading license <sup>3</sup>	@24TZS/d		0.19
District tax			2.40
<i>Total expenses</i>		<b>34.50</b>	<b>117.00</b>
<b>EARNINGS</b>			
Revenue from fish sale		80	200
Profit		45.50	83
Re-investment		0	48
Earnings/day/individual		3.25	3.50
Cycles/season (maximum)		26	18
<i>Earnings/season/individual</i>		<b>592</b>	<b>738</b>
			<i>(630 + capital growth)</i> <sup>5</sup>

Notes: <sup>1</sup>All camp costs are advanced to the fishermen. <sup>2</sup>The maintenance allowance left with fishermen's families in their absence <sup>3</sup> See Table 7.2. <sup>4</sup>Can be negotiated or avoided <sup>5</sup> See Appendix E for calculation

Source: Interview with Athumani; see Box 7.2 for details.

**Table E-2. Estimated costs and revenues (USD) for an established buyer selling fresh fish at Kibiti market (A) through his own employees, travelling by bicycle and (B) to an independent market trader, travelling by motorcycle, Rufiji District, 2008.**

	Buyer A	Buyer B
<b>COSTS</b>		
<b>Fish Purchase</b>	<b>64</b>	<b>64</b>
<b>Fixed Costs</b>		
<i>Supply costs</i>		
Advances to fishermen <sup>1</sup>		
Personal loans (jiwe)		(3.20)
Canoe rental		(0.48)
Gear rental		(1.60)
Buying fee to net owner		1.60
Village tax on <i>juya</i> fishing		0.80
<i>Subtotal</i> <sup>2</sup>	<i>0</i>	<i>2.40</i>
<i>Travel costs</i>		
Bicycle transporter	1.60	n/a
Bus fare (Passenger)	0.80	n/a
Bus fare (Goods)	2.40	n/a
Motorcycle gas and maintenance <sup>3</sup>	n/a	3.52
<i>Subtotal</i>	<i>4.80</i>	<i>3.52</i>
<i>Fees</i>		
Trading license <sup>4</sup>	0.02	0.02
District tax on basket	0.80	0.80
<i>Subtotal</i>	<i>0.82</i>	<i>0.82</i>
<i>Market costs</i>		
Worker	1.20	n/a
Helper x2	1.60	n/a
<i>Subtotal</i>	<i>2.80</i>	<i>0</i>
<b>Subtotal – Fixed Costs</b>	<b>8.42</b>	<b>6.74</b>
<b>Losses</b> <sup>5</sup>	<b>3.20</b>	<b>3.20</b>
<b>Total - Costs</b>	<b>75.62</b>	<b>73.94</b>
<b>REVENUES and PROFIT</b>		
Fish sale	112	102
Profit	36.38	28.06
Profit Margin	57%	45%

Notes: <sup>1</sup> Personal loans of 0.80USD/fisherman per day, to four fishermen, rental of two canoes at 0.24USD each, and rental of a *juya* net. <sup>2</sup> Does not include advances to fishermen. <sup>3</sup>Gas 2L a day @1.36/L; maintenance estimated at about 0.80USD/d based on my own expenses in the field <sup>4</sup>As shown in

Table 7.2 Table 7.2. <sup>5</sup>Estimated at 5% of purchase value.  
Source: Juma and Omari, with others

**Table E-3. Costs and earnings (USD) for mobile smoked fish traders bringing fish from Rufiji landing sites by bus to sell at regional markets, Rufiji District, 2008.**

	Large basket	Small basket
<b>COSTS</b>		
<b>Fish purchase</b>	<b>240</b>	<b>80</b>
<b>Fixed costs</b>		
<i>Travel costs</i>		
Bus fare (Passenger)	2.40	2.40
Bus fare (Goods)	5.60	1.60
Porters	0.80	0.80
<i>Subtotal</i>	<i>8.80</i>	<i>4.80</i>
<i>Fees</i>		
Trading license	0.02	0.02
District tax on basket	2.40	2.40
<i>Subtotal</i>	<i>2.42</i>	<i>2.42</i>
<i>Market costs</i>		
Stall fee	0.16	0.16
Market tax	0.08	0.08
<i>Subtotal</i>	<i>0.24</i>	<i>0.24</i>
<b>Total Fixed Costs</b>	<b>11.22</b>	<b>7.46</b>
<b>Losses<sup>1</sup></b>	<b>6.00</b>	<b>2.00</b>
<b>Total Costs</b>	<b>257.22</b>	<b>89</b>
<b>REVENUES</b>		
Fish sale	360	120
<i>Profit</i>	<i>103</i>	<i>31</i>
<i>Profit Margin</i>	<i>43%</i>	<i>38%</i>

**Notes:** <sup>1</sup>As per Richmond et al. (2002), based on a 5% physical loss of product, sold at 50% of original purchase value

**Table E-4 Estimated schedule of re-investment in working capital by a smoked fish buyer, and resultant seasonal earnings (in '000 TSH) (Source: Interview with Athumani; see Chapter 6 for details).**

Level	Starting Capital	Fixed Costs	Fish Purchase	Revenues <sup>1</sup>	Profit	Amount Reinvested	Personal earnings per cycle (for 2 people)	No. of cycles <sup>2</sup>	Total individual earnings at that level
1	150	46	104	250	100	60	40	3	60
2	210	46	164	361	150	90	30	6	181
3	300	56	244	537	237	(142) <sup>3</sup>	47	9	427
Total Earnings from Fish Sales									668
Capital Growth <sup>4</sup>									75
Food savings <sup>5</sup> 10,000TSH/person for 18 cycles									180
Total Seasonal Income									923'000TSH (=738 USD)

Notes: <sup>1</sup> Revenues on purchased fishes set at 2.2X purchase cost, based on Athumani's own estimates <sup>2</sup> The number of cycles at each starting capital level is my own assumption; Athumani noted that certain trips could be unprofitable, and capital had to be rebuilt again, which could also explain why he and his partner couldn't build their capital beyond 300,000TSH. <sup>3</sup> Not necessarily re-invested, but covering shortfalls on earlier cycles. <sup>4</sup> On dissolving partnership, each get half of 300,000, minus original 150,000 contributed. <sup>5</sup> Food paid for out of fixed costs while living at camp.