

Environmental Histories and Emerging Fisheries Management of the Upper Zambezi River Floodplains

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Abstract

In response to a widespread decline in fisheries, scientists and policy makers have constructed models outlining the biological and social drivers that cause changes in fishing intensity and methods identified with overfishing. The models also address the consequences of overfishing, namely changes in biomass, trophic structure and ecosystem resilience, as well as increased poverty and vulnerability of the fishers, particularly in the developing world. While these models have emerged from marine and coastal fisheries, they have also been used to identify overfishing in floodplain fisheries and to guide management recommendations. In this article, we critique the assumptions of a global overfishing narrative describing the serial depletion of fish species, increased fishing effort and fisher dependence, which are considered valid by various stakeholders in the floodplain fisheries of the Upper Zambezi River. We find that researchers highlight how the inherent variability of the floodplain environment defies the simple diagnoses of overfishing, based on changes in effort and methods or livelihood. However, the views of policy makers and local users on the 'problem of overfishing' are that the fish biomass is declining and intensive fishing methods are to blame, which largely resonate with the narrative. We consider how differing emphasis on parts of the narrative by stakeholders has implications for management, and what such differences tell us about the malleability of narratives.

Keywords: small-scale fisheries, environmental narratives, floodplain fisheries, sub-Saharan Africa

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INTRODUCTION

In 2002, a project to distribute subsidized mosquito nets in the far northeast region of Namibia faced a problem. It had become apparent to the non-governmental organisation (NGO) responsible that some inhabitants were using the mosquito nets to catch fish. As a response, T-shirts were widely distributed, bearing the message that mosquito nets should be used for malaria protection, not fishing (Figure 1). However, objections to the use of mosquito nets for fishing did not arise only because they were being used for something other than their intended purpose, or the risk to people eating fish contaminated by pesticide-treated nets (e.g. New Era 2008).¹ Mosquito net fishing is also viewed by policy makers in Namibia and elsewhere as a particularly destructive fishing method, contributing to the general decline in the area's fish stocks, and the Namibian government and traditional



Figure 1: Detail of T-shirt distributed as part of the awareness campaign against using subsidised mosquito nets for fishing in North-east Namibia, 2002

authorities in the area make provisions for restricting such intensive methods.

Each sweep of a mosquito net in the water does yield a catch consisting of very small fish (Figure 2), seemingly reinforcing concerns about overfishing and justifying the prohibition of this method. These beliefs and justifications stem from a broader overfishing narrative, where the use of highly intensive fishing methods such as small-mesh nets is depicted as both a cause and consequence of interrelated biological and socioeconomic crises. However, the actual effects of this fishing method on fish stocks have not been examined systematically in the floodplain environments of the Upper Zambezi River or elsewhere. This lack of data, combined with the complex social and biological environments of floodplains, means that the limited information available must often be interpreted in the context of how tropical fisheries behave elsewhere.

Policies on fisheries based on assumptions or generalizations about causative linkages between fishers, their behaviour and fish stocks risk being ineffective if the assumptions turn out to be false. In this case, restricting intensive fishing with mosquito nets in the Upper Zambezi River risks depriving some of the most vulnerable groups of an important source of protein. This is because the majority of mosquito net fishing is done by women and children, who typically occupy marginal positions in the region. Furthermore, while their livelihoods are most vulnerable to restrictions on mosquito net fishing, women and children have little influence in shaping management decisions.

In this article we describe a global narrative of overfishing and the direct and indirect causal factors implicated in it. We then consider the extent to which this narrative resonates among a wide range of actors in the Upper Zambezi River floodplains in Southern Africa. We argue that within this study area, the majority of claims about intensive fishing resonate strongly with the global narrative among almost all actors. However, different groups emphasize different direct and indirect causal factors and indicators to make conclusions about changes in fish stocks and why these changes occur. Although the overfishing narrative generally supports more management intervention, this differential emphasis on particular causal factors supports

different forms of intervention, and interventions promoted by particular stakeholders reflect their interests. Our concern here is not to evaluate whether or not the narrative is 'correct', but rather to explore how the narrative 'works' for a diverse set of stakeholders with seemingly different interests, and with what consequences. Given the ambiguity of Namibia's new fisheries legislation (introduced in 2003 and described in detail a little later in the article), such consequences are not strictly of academic interest; as Namibia looks to change its fishing practices, the ability of any one group to capture the attention of policy makers may be associated with real outcomes, for example, a ban on intensive fishing methods, like the use of mosquito nets.

Environmental narratives often depend on anecdotal evidence, assumptions about the causes, consequences, meanings of environmental change and results of research undertaken in one place or time and then applied to another. (Eg., Leach & Mearns 1996; Keeley & Scoones 2000). For example, Keeley & Scoones describe how the current legitimacy of soil degradation narratives in Ethiopia still largely stem from two seminal studies published in the mid 1980s. Scientists have often been implicated in the formation and uptake of environmental narratives, as the authority of science often allows research results to be readily transferred from one context to another (Forsyth 2003). However, the role of science is one of the features of our case study that departs from other critical analyses of policy narratives; scientists and the primary research they produce within our case study site is not used to legitimise an overfishing narrative. As we will show, most primary research reviewed in our study is optimistic about the state of the floodplain fishery, and several researchers question the assumption that intensive methods targeting small fish are unsustainable. In spite of this locally produced and contextualised science, many policy documents we review cite intensive fishing, specifically the use of mosquito nets, as both a cause and a consequence of the fisheries crisis, and as a justification for management intervention.

In examining environmental narratives associated with floodplain fisheries, we add to a growing body of literature examining environmental processes and their associated impacts on livelihoods in Africa. Terrestrial environments and livelihoods, such as protected areas, pastoralism and agriculture, have largely dominated critiques of how African environments and livelihoods are perceived and managed. This focus is reasonable, since it is on land that the most prevalent 'environmental orthodoxies' such as poaching, deforestation, and erosion (Forsyth 2003) have unfolded (Eg., Leach & Mearns 1996; Keely & Scoones 2000; Hulme & Murphree 2001; Bassett & Crummey 2003). However, we believe attention to fisheries is also warranted, given the importance of fisheries in the livelihoods of a large part of Africa (FAO 1996).

Besides the biological and social complexity of floodplain fisheries (Welcomme 1979; Winemiller 2004), we see three reasons for considering how environmental narratives persist and shape resource management policy in floodplain fisheries. First, as already noted, artisanal fishing is an important livelihood in large parts of Africa (FAO 1996) and floodplain



Figure 2: Sample of a catch from a mosquito net used for fishing in the Zambezi River, 2002

fisheries are largely artisanal, providing important sources of protein and income (Eg., Adams 1993; Thomas & Danjaji 1997). Second, boundaries established during Africa's colonial era had frequently used rivers as reference points and this means that many African inland fisheries are transboundary resources (Sadoff *et al.* 2002; Nakayama 2003), further complicating management (Abbott *et al.* 2007a). Third, recent projections of climate change in sub-Saharan Africa suggest that large areas of the region will undergo considerable drying (Thomas & Twyman 2005). Projected patterns of precipitation and flooding, if accurate, will lead to dramatic changes in southern Africa's floodplain environments and fisheries, in addition to the other resource-based activities that make up most inhabitants' livelihood strategies (Purvis 2002a).

Our article is structured as follows: First, we discuss the concept of narratives, in particular how different types of knowledge and understanding become embedded in an explanatory narrative. In particular, we draw attention to the narrative's three interdependent and mutually-reinforcing assumptions: (i) Exploitation leads to a serial reduction of fish biomass, species diversity and trophic complexity; (ii) Reduced yields cause a correspondent increase in fishing effort and use of intensive fishing methods; (iii) Fishers become increasingly poor and dependent on fishing.

Second, we consider how well the assumptions inherent in this narrative fit with the current scientific understanding about the ecology and livelihood strategies of African floodplain fisheries. In particular, the non-equilibrium nature of floodplain ecosystems and the fundamental influence of annual and decadal flood cycles on the productivity of the fishery and the livelihoods of inhabitants require careful consideration. We draw particular attention to how periods of resource scarcity and intensive use challenge the largely linear trajectories assigned to fisheries and fishing livelihoods by the overfishing narrative. We then use a case study to consider how the overfishing narrative is constructed by different actors (researchers, policy makers, recreational fishers, floodplain inhabitants) in the Upper Zambezi River floodplains, to what extent the causal factors and indicators inherent in this narrative are apparent at the local level, and consider how the different actors might benefit from supporting an overfishing narrative when Namibia's new inland fisheries legislation is applied. We conclude the article with a discussion on the relevance of our work for the narrative concept more generally.

Environmental Narratives

Scientific and political discourses about environmental degradation and unsustainable resource use often take the form of what has been termed a narrative (Roe 1991). A narrative is often useful and arguably necessary, as it allows decision-makers to define and explain problems in the face of complex and uncertain situations (Roe 1991). In constructing a 'problem', types of information and their sources are both implicitly and explicitly given different levels of importance, relevance and logical order, thus streamlining the types of data

that go into understanding a situation. Furthermore, a narrative is a 'story' of a problem that identifies the actors and prescribes a solution that is intuitively logical, given the evidence (Leach & Mearns 1996; Forsyth 2003; Smith & Link 2005 also discuss how analogies are used to understand why fisheries fail). The simplified patterns of cause and effect, combined with the intuitive logic of solutions, means that policy makers, scientists and the public at large often adopt environmental narratives, including those that identify a crisis and its causes, uncritically.

The role of science in informing environmental narratives has been of particular interest, as science is often the basis on which problems are described (Keeley & Scoones 2000; Campbell 2002, 2007). Like narratives themselves, science seeks and creates 'generalised' knowledge that can be replicated and applied across various contexts. As a result, science and scientists have sometimes failed to recognise contrary local evidence that better explains environmental change or resource use (Leach & Mearns 1996; Forsyth 2003; Robbins 2004). Reasoning arising from generalised models means that the information may be ignored or misinterpreted in the face of assumed truths about a resource and its users. This deductive flaw especially characterises environmental narratives that: (a) Rely on information based on limited spatial or temporal contexts (i.e., environmental 'snapshots'), and (b) Assume that the environments are largely stable unless disturbed by exploitation or that environmental change occurs largely through unidirectional causative linkages (Eg., intensive slash and burn agriculture ultimately causes transition to grasslands, Leach & Mearns 1996). Similarly, resource management policies arising from environmental narratives, especially those that ignore environmental variability, can actually make livelihoods less adaptive, more vulnerable and less sustainable (Johnson & Anderson 1988).

The Global Overfishing Narrative

Over the past decade, a crisis narrative in fisheries has emerged and been widely adopted, (Eg., Millennium Ecosystem Assessment 2005) with some analysts predicting the impending collapse of almost all commercially valuable marine fish stocks over the next 20 years (Worm *et al.* 2006; but see Beddington *et al.* 2007). Declines in trophic structure, biomass and catch per unit effort are cited as proof of overfishing, or 'fishing down the food chain' (Pauly *et al.* 2005). Catches may stabilize or even increase (Mullon *et al.* 2005), but as the number of fishers and/or effort increases, fishers are obliged to increase their efforts further, often through more intensive methods of extraction. In doing so, the fishery becomes progressively less diverse and fish become smaller and less abundant.

Within this narrative, the apparent cause of overfishing is largely linked to institutional failure in several forms (Alverson 2002). Unsustainable levels of fishing occur when governments either do not regulate at all (such as in open-access fisheries), or structure access in such a way that fishers 'race to fish' for a collective quota within a limited time period (Hilborn *et al.* 2005; Beddington *et al.* 2007). Overfishing may also occur when governments provide subsidies promoting more intensive and

economically inefficient fishing effort, while at the same time reducing the cost (Parma *et al.* 2006). If the problem defined by the overfishing narrative is high and/or damaging fishing effort, the intuitive logic would be to restrict the effort or stop it altogether. This can be accomplished through decommissioning fleets, removing subsidies, promoting high value fishing for sport or tourist consumption, establishing marine protected areas, and introducing individual (or community-based) transferable quotas (see Campbell *et al.* 2009).

Small-scale Fisheries and the Global Overfishing Narrative

The models and empirical data that support the global overfishing narrative are derived largely from commercial temperate fisheries in developed countries. However, small-scale fisheries (SSFs), particularly in tropical regions of the developing world, are characterised by a similar crisis narrative of overfishing in both marine (Pauly *et al.* 1989; Pauly 1997; Sadovy 2005; Akapul 2008; Basurto 2008; Cinner *et al.* 2008) and freshwater settings (FAO 2003; Allan *et al.* 2005). The assumptions made about how the fisheries respond to exploitation are similar to the general narrative in a biological context (i.e., increase in effort combined with a serial decline in trophic complexity, Crowder *et al.* 2008, p. 271). However, SSF narratives are distinct in that they stress population growth, poverty, erosion of traditions, modernisation and incorporation into market economies as factors driving overfishing.

Small-scale fishers play an important role in overfishing narratives by causing changes in the fishery as well as responding to the broader socioeconomic forces. While low levels of fishing, using traditional methods under customary arrangements, may have been sustainable, the overfishing narrative depicts this sustainability as being overwhelmed by a combination of increasing human population, poverty, modernisation and the entrance of fishers from outside the area. Because fisheries are common pool resources, fishing is increasingly relied upon to meet growing food and income demands by existing and new subsistence and commercial fishers. As overall fishing increases, fishing methods become more intensive, and this leads to a decline in the catch per unit effort as well as a change in the size and species of fish caught (McClanahan *et al.* 2008). The synergistic interaction of these socioeconomic and biological factors leads to an accelerating degradation of the fishery. Traditional management regimes for these SSFs either become overwhelmed by high levels of fishing activity or are eroded by influxes of outsiders who are unfamiliar with or do not recognise customary arrangements (Scudder & Connelly 1985; Pauly 1997; McGoodwin 2001; Haller & Merten 2008).

Guided by this narrative, the use of intensive and apparently unsustainable fishing methods, such as mosquito nets, can be interpreted in a number of different ways. Most importantly, fishers using highly intensive methods, especially those that mainly catch small fish, can be seen as evidence that overfishing is already taking place and placing the fishery at risk. Such forms of fishing, following the narrative's logic, would most likely occur once the fishery has already been depleted of

larger fish, hence changing the composition of the catch and accelerating the move towards more intensive methods. Fishers using such methods may be understood as either unaware of the consequences of their actions or unwilling to change despite evidence of declining fish stocks. Similarly, the open-access nature of fisheries, and recent increases in the number of fishers in an area could be blamed for causing a runaway 'Tragedy of the Commons' (Hardin 1968) or again, for making fisheries an 'occupation of last resort' (Allan *et al.* 2005; p. 1049).

Alternatively, a more contextualised interpretation might see such behaviour as a part of a progressive and reinforcing cycle of ecological degradation and socioeconomic marginalisation. Marginalised individuals fish intensively to meet gaps in subsistence and income; as a result, the fishery begins to show declining returns in the number and size of fish, compelling marginalised groups to fish even more intensively, what Béné, (2003) refers to as a 'circular and auto-reinforcing paradigm' (p. 967). Regardless of the causal interpretation, the overfishing narrative logically calls for measures to limit fishing intensity and methods, although the means and institutions most appropriate for implementing these measures remain open to debate (Eg., the relative desirability of market mechanisms like Individual Transferable Quotas versus community-based or co-management regimes, Parma *et al.* 2006, p. 417-420).

Recent critiques argue against the linearity in the overfishing narrative. For example Allison & Ellis (2001), Béné (2003), Andrew *et al.* (2007) and Cinner *et al.* (2008) have called for understanding of SSFs as part of a broader set of livelihood activities. These authors argue that the intensity of fishing and the methods used by fishers are not simply a product of the environmental characteristics of their surroundings or a rational response to economic demands (see also Abernethy *et al.* 2007). Decisions to fish are made in the context of the relative costs and benefits of other livelihood options. Social and cultural institutions, such as gender, age, income and ethnicity also shape the access to fishing and the methods used; complicating explanations for the observed fishing patterns (see also Salas & Gaertner 2004). This complexity is also argued by Scudder & Connelly (1985), who, while categorising how a river fishery changes from subsistence to commercial through four progressive 'stages', point out that different participants may be characteristic of different stages even within the same fishery. In spite of these perspectives, concern for the sustainability of SSFs remains largely couched in the language of the dominant narrative (Akpalu 2008).

Floodplain Fisheries and the Global Overfishing Narrative

Inland floodplain fisheries are the subset of SSFs that are of interest in our paper. To a large degree, management concepts and objectives in inland fisheries are still largely based on marine fisheries (Berkes *et al.* 2001; Coates *et al.* 2003), and inland fisheries in Africa have received far less attention than their coastal or marine counterparts (Béné 2005). However, the distinct environmental and socioeconomic characteristics of floodplain fisheries mean that intensive fishing practices

and high reliance on fishing may take on different meanings than they have in marine or coastal fisheries, small-scale or otherwise. Of primary importance are the roles of seasonal and inter-annual variations in flooding, which have profound effects on floodplain fisheries and livelihoods. The existing research indicates that (a) floodplain fisheries are inherently multi-species and variations in fish biomass are strongly affected by flooding volume and duration (Welcomme 1979; Junk *et al.* 1989; Arthington *et al.* 2003; de Graaf 2003); (b) participants in floodplain fisheries use a wide variety of methods at different places and times (Welcomme 1979); (c) floodplain livelihoods often include periods of intense fishing activity in response to seasonal abundance of fish or scarcity of other resources (Evans-Pritchard 1940; Hickling 1961; Adams 1993; Sarch 1996; Thomas & Adams 1997; Sarch & Birkett 2000; Shorr 2000; Evans & Mohieldeen, 2002), as well as longer term livelihood shifts in response to changes in fish abundance (Thomas & Adams 1997; Sarch & Birkett 2000, Allison & Ellis 2001; Jul-Larsen *et al.* 2003); (d) floodplain fisheries appear to be robust to even high levels of exploitation (Welcomme 1979; Mosepele *et al.* 2002; Jul-Larsen *et al.* 2003; Fox & Sneddon 2005), although exploitation can lead to changes in their trophic structure, over time (Laë 1997; Welcomme 1999).

This combination of natural variability, multiple fishing methods, varying intensity and catches, often composed of several different species, makes identifying management priorities and assessing policy effects challenging (Muncy 1978; Scudder & Connelly 1985; Hoggarth *et al.* 1999; Adger & Luttrell 2000; Jul-Larsen *et al.* 2003). For example, Muncy (1978) noted that the challenges of identifying 'underutilization' or 'overfishing' in African floodplain fisheries was due to the fact that the two concepts had largely been developed in the context of fisheries models assuming constant physical and biological parameters. The variability of both floodplain environments and livelihoods challenge these assumptions of constant recruitment and growth rates, as well as how fishers react to change (Muncy 1978; Jul-Larsen *et al.* 2003).

Despite the recognised complexity of floodplain fisheries and livelihoods, direct and indirect indicators are still used persuasively by policy makers to argue that overfishing is taking place, and to identify the specific causes and advocate specific solutions; that is, the overfishing narrative holds sway. This is true in the Upper Zambezi River floodplain fisheries, where concerns about fishing, as expressed by a variety of stakeholders, rely on the same assumptions about what constitutes overfishing, its causes and effects. This is perhaps not surprising, as high levels of complexity make it more likely that a narrative will be both adopted and its assumptions will be faulty (Roe 1991). In this region, the consequences of adopting a flawed (or incomplete) narrative will be greatest for a highly vulnerable segment of society who depend on their livelihood strategies remaining as flexible as possible (Allison & Ellis 2001), and who are likely to have little voice in any policy change.

In exploring the case of floodplain fisheries in the Upper Zambezi River, we have three main objectives: (1) To show how the global overfishing narrative resonates at the local level with

a variety of stakeholders, in spite of the existing understanding of floodplains, as reviewed earlier, and of the specific scientific research in our case study area; (2) to illustrate how narratives remain malleable, in that different stakeholders with seemingly contrary objectives can adopt the same narrative because they can emphasize and downplay particular assumptions in the overfishing narrative to suit their needs, and (3) to consider the potential management implications of this differing emphasis by different stakeholders. To a certain extent, the article may be read as a critique of the overfishing narrative, but our primary intention is to critique its untested application to this particular place, and the potential consequences thereof. At the same time, we recognise that overfishing can and does occur in fisheries in floodplain environments (examples include fisheries described by Jackson 2000, Gordon 2005 and Haller & Merten 2008).

CASE STUDY:

THE UPPER ZAMBEZI RIVER FLOODPLAINS

Our case study focused on the section of the Zambezi River and the approximately 304,600 ha of floodplains (Turpie *et al.* 1999) framed by the confluence of the Zambezi River to the north and the Chobe River to the south. A majority of the research described in this article was conducted in the Namibian portion of the floodplains, known as the Caprivi Region, although research was also carried out on the Zambian side of the Zambezi River.

The study region was relatively remote, but due to its proximity to several political borders and its physical geography, it had experienced periods of dramatic change. Each new political and institutional arrangement was accompanied by increasingly restrictive policies concerning transboundary access to natural resources, including fisheries (Fisch 1999; Abbott *et al.* 2007a). Demographically, settlement in this area was largely rural, consisting of households and villages scattered throughout the floodplain or along semi-permanent roads. Using aerial photos, Mendelsohn & Roberts (1997), concluded that the number of households in one area of the floodplains had quadrupled between 1943 and 1996, although this growth rate was lower than other parts of the Caprivi. The portion of the Zambezi River within our study site and upstream had little evidence of human modification. Aside from a few bridges, there were no physical barriers, and there was no irrigation beyond a few small farm operations. There were also no industrial activities or large urban areas in this region.

The floodplains experience a bimodal pattern of precipitation and flooding each year, typical of tropical river systems. Recent analyses of decadal trends indicate that the Zambezi River has decreased its annual flow volume since the early 1980s (Mazvimavi & Wolski 2006). Within this trend there is considerable intra-annual variation in the Zambezi River's annual volume. For example, Herbert (2002), cites memoirs of the record flood of 1957, and the fear among administrators and inhabitants alike that villages would be drowned, whereas, 30 years earlier the whole area had been abandoned by inhabitants for lack of water. Similarly, Lake Liambezi, fed

by a tributary of the Zambezi, was a highly productive fishery until it dried out completely in 1985 (Mendelsohn & Roberts 1997). Recent years have demonstrated equally dramatic contrasts between consecutive years, such as the record low floods in 2002 and the record high floods in 2004 that refilled Lake Liambezi (The Namibian 2004).

The fisheries ecology of the region is characteristic of tropical floodplains (Welcomme 1979; Junk *et al.* 1989), with abundance and species distribution influenced by seasonal flooding (Næsje *et al.* 2002). Inter-annual trends in flood volume and timing may also affect the floodplain's productivity, similar to patterns described elsewhere (Lindholm *et al.* 2007), although this is not known at present. The rising waters spill the banks of the main channel and spread across the floodplain, leading to an explosion of primary production in the shallow flooded areas. The majority of fish breeding cycles coincide with this period, where adults migrate onto the floodplains to lay eggs as well as feed. As the flood slackens, adult and juvenile fish alike either return to the main channel with the retreating waters, or become trapped in the seasonal water bodies. The distinct temporal and spatial trends in fish species abundance have a particular significance in the role of fishing in livelihood strategies and institutional arrangements, as described a little later in the article.

Livelihoods in the Upper Zambezi River Floodplains

Most inhabitants depend on the area's natural resources and their livelihoods often combine fishing, farming, livestock and off-farm activities (Purvis 2002a). Fishing is a common characteristic of the past and present livelihoods of the area (Zeller 1998; Tvedten 2002) and besides formal employment and pensions; it is one of the few livelihoods providing both a reliable source of income and a daily source of protein (Ashley & LaFranchi 1997; Purvis 2002a). The fishery is artisanal in nature with distinct gender roles. Men fish with gill nets, barriers, and drag nets in dugout canoes, while women and children are largely restricted to using mosquito nets, traps, hooks, and baskets from the shore (Purvis 2002a). Marketing of fish is done almost exclusively by women (Purvis 2002b; Abbott *et al.* 2007b). There is also a small but important tourism industry based on the area's wildlife, in particular catering to recreational fishing; however, few local inhabitants are employed in this sector (and none surveyed in any of our research).

While we focus on fishing narratives in Namibia in this article, it is important to note that the Zambezi River is a shared resource. A 2002 survey of villages along both the Namibian and Zambian sides of the Zambezi River revealed important trends in population growth and distribution (Abbott *et al.* 2007a) that inform overfishing narratives. Each settlement had fishers, and most riverside settlements were permanent (i.e., not vacated during the rainy season). The number of settlements had increased over time, with the majority having been established in the last 10 years. Moreover, most settlements and over 95 percent of the estimated total population of riverside inhabitants were on the Zambian side of the river (Abbott *et al.* 2007a). This larger regional context of increased fishing activities by Zambians

becomes important in the narratives of some stakeholder groups, particularly those of the Namibian fishers.

The relative importance of fishing has changed since Namibia's independence in 1990, when the Caprivi's rural economy was largely based on agriculture (Næraa *et al.* 1993). The causes for this shift may be a series of poor rainy seasons — the eastern Caprivi region in particular had abnormally poor rains in 2001/2002 compared to the previous five-year average (FEWS 2002). Other reasons include the cessation of agricultural subsidies, both directly through the end of government provision of free ploughing, and indirectly through the removal of subsidies that made cheap seed and fertilizer available from the adjacent countries (Abbott 2005). In addition, during 2002, the prices for staple foodstuffs (including maize) increased in Namibia by nearly 25 percent, with a 13.3 percent increase in the consumer price index overall (FEWS, 2002).

Fisheries Tenure and Management

There has been little fisheries management in the area by the national government until recently, and traditional management has in the past focused mostly on the tenure of seasonal water bodies. The seasonable variability of the floodplain landscape is the primary factor shaping local institutional arrangements for fishing. During the low flood season, water is confined to either the main channel or isolated bodies of water (*mulapos*). These *mulapos* are valued not only for concentrating fish, but also for their relatively humid and nutrient rich soils that are exposed as waters recede. Most *mulapos* are 'owned' by specific individuals or families and permission must be asked to fish in them (Tvedten *et al.* 1994; Abbott 2001; Purvis 2002a). Fishers assert their tenure over certain areas during the onset of flooding by placing weirs (*sinyandi*) across channels in order to catch fish as they migrate to their breeding areas in the floodplain and as they return to the main channel with the ebbing floodwaters. When the floodplain is inundated, the fishery becomes largely 'open access'. At least three factors can contribute to this seasonal shift in tenure: Distinct bodies of water associated with the tenure can no longer be distinguished, the dispersal of fish across the floodplains makes them more difficult to catch, and many households begin ploughing upland fields in anticipation of the rainy season, leading to a labour shortage for fishing (Abbott 2005).

Prior to Namibian independence in 1990, the South African-backed administration ruled by devolving management of certain natural resources, including fisheries, to tribal authorities in each homeland established under *apartheid*. After independence, uncertainty about the status of traditional authorities (Hinz 2003) meant that Namibia's inland fisheries management remained undefined in the absence of a new policy (Abbott 2001). Policy reform was also slow to emerge. During the early 1990s, responsibility for inland fisheries passed through three ministries, before research and management duties finally coalesced within the Namibian Ministry of Fisheries and Marine Resources (Abbott 2001). In 2003, the new inland fisheries legislation came into force. The legislation closely resembled the 2000 *Marine Fisheries Act*,

which was designed largely for offshore commercial fisheries. As such, the 2003 *Inland Fisheries Resources Act* had only a general acknowledgement of the role of non-state institutions, and a very malleable set of regulatory measures such as closed seasons and mesh-size limits (Abbott 2005). The malleability lay in the fact that the application of any specific measure was left to the discretion of the state, based on perceived threats to the sustainability of the fishery and through consultation with local councils and traditional authorities (Government of Namibia 2003). Because implementation of the act was responsive to local conditions and institutions, various stakeholders had both room and incentives to ensure that their particular interpretation of local conditions dominated.

Changes in the Upper Zambezi River floodplain fisheries and livelihoods, as well as the environment in general, are therefore an outcome of a complex set of environmental, political and economic factors, operating at different scales over time. Inter-annual trends in flooding, combined with changes in livelihoods and institutional and economic environments, all leave space for contrasting theories about if, how and why fish stocks and fishing activity has changed, and to what degree this signifies overfishing. Actors perceive change differently and may accord contrasting levels of significance to the causes and effects they identify as most important in influencing change and, more importantly, their construction of an overfishing narrative. The potential differences are important because the ambiguity in the new legislation provides considerable potential for different actors to assert their legitimacy as stakeholders, and to promote specific management measures. In the following sections, we examine perceptions among different social actors of the causes and effects of changing fishing strategies and fish stocks, and consider how these perceptions support particular types of interventions.

MATERIALS AND METHODS

Examining the basis and evolution of policy discourse requires drawing on a wide range of published and unpublished sources (Keeley & Scoones 2000). In this article, these include results of our own research and sources uncovered through an extensive literature search. Regarding our own research, field work in the region was undertaken from April 2002 to December 2003 as part of J. Abbott's doctoral research, and involved a series of primary data collection efforts. For the purpose of this article, results from this research are summarized rather than explored in detail, and readers are directed to other publications for further data resulting from specific research activities (Table 1). Regarding the literature search, we sought research articles, policy documents and consultancy reports written by a broad range of actors, which address the science and policy for fishing in the Upper Zambezi River. We searched major scientific and media databases (*ISI Web of Knowledge*, *Access World News*), and collected relevant documents while in the region. Although the views of some stakeholders, namely researchers, are captured in published scientific articles (Van der Waal & Skelton, 1984, 1990), the majority of sources are

Table 1
Sources used to examine perceptions among different social actors of the causes and effects of changing fishing strategies and fish stocks of the Upper Zambezi River

Source and reference	Coverage
Fishing village survey (Abbott 2005; Abbott <i>et al.</i> 2007a)	All settlements in Namibia and Zambia along a portion of the Zambezi River shared between the two countries. In total 73 settlements were recorded and 541 structured interviews with fishers were completed; September-November 2002
Intensive Namibian household surveys (Abbott unpublished data)	Random stratified survey of households in the Namibian floodplain in Kalimbeza ($n = 14$), Impalila ($n = 10$), Musanga ($n = 9$) and Nakabolelwa ($n = 10$) villages; March 2002-November 2002
Extensive Namibian household surveys (Abbott <i>et al.</i> , in review)	Random stratified survey of 429 fishing and non-fishing households of census districts in the Namibian constituency where the floodplains are located (Kabbe); July and September 2002
Key informant interviews (Abbott unpublished data)	12 traditional authorities and other older male residents in Zambia and Namibia; May 2002-November 2002
Market vendor surveys and interviews (Abbott <i>et al.</i> 2007b)	Surveys: 591 market vendor surveys completed over a 1-year period, with 300 + different vendors working in the central market of Katima Mulilo, the Caprivi Region's capital in Namibia; April 2002-March 2003 44 in-depth interviews; April 2002-December 2002; December 2003
Participant observation at community meetings	4 Meetings attended in Impalila, Kalimbeza, Ihaha and Nakabolelwa administrative wards; July-August 2002
Document analysis	Historical documents, policy documents, legislation, news articles, scientific articles on fishery and floodplain livelihoods

'grey' literature, documents produced by government, NGOs and consultants, often with limited circulation. Discourse emerging from government and consultancy documents is often particularly important in driving narratives. For example, Keeley & Scoones (2000), constructed their entire discourse analysis either from policy documents (both government & NGO), consultant reports, or interviews with government officials and consultants. The high proportion of grey literature also highlights the relatively small amount of primary research that has been conducted in the area, and the even smaller amount that has been published in peer-reviewed sources. We also use articles published in the press, where stakeholders express their views in letters to the editor and editorials, and where stories related to fisheries appear. It is often in these types of sources, rather than the academic literature, that policy narratives are formed, diffused and repeated.

Stakeholders in fishing narratives include scientists, policy makers (both governmental and non-governmental), recreational fishers and floodplain inhabitants. The Namibian government, scientists and NGOs active in the country often collaborate closely on environmental and developmental projects. The political and social circumstances that have led

to the co-evolution of shared priorities and stakeholders in each group (Murphy & Abbott, 2006) make separating them as distinct social actors impractical. We choose instead to draw a distinction between views based largely on the *primary* sources (i.e., research conducted by the authors themselves), and views based largely on *secondary* sources (i.e., literature reviews of work done elsewhere) or anecdotal data. While individuals identifying with either source may come from the government, academy or NGOs, we refer to those drawing on primary sources as researchers and those drawing on secondary sources as policymakers.

Recreational fishers and the related industry form a small but important stakeholder group in fisheries narratives, as their claims to fish can be construed as competing with claims of small scale fishers. Given the increasing importance of tourism in the region (Namibia Tourism Board, 2009), their claims may correspondingly gain increased weight among policy makers. Among floodplain inhabitants, we consider the views of fishers and non-fishers, and of traditional authorities; it is the views of local inhabitants that are derived mainly from our primary research. While most of the research was conducted with residents on the Namibian side of the river, views of Zambian fishers were captured in a frame survey (Table 1) and are included later in the article, where relevant.

RESULTS

Views about Fisheries and Fishing

The factors that researchers, policymakers, recreational fishers and floodplain inhabitants deem as having important effects on fisheries can be categorised as either environmental (Eg., natural cycles, changes in habitat), technical (Eg., changes in fishing methods) or demographic (Eg., population growth or migration). These categories are not mutually exclusive and often occur together in explanations. In the following sections, we describe the factors that are emphasized by each group and how this emphasis influences their suggested approach to fisheries management in the area.

Views of Researchers

Scientific literature about the socioeconomic and biological dimensions of the area's fisheries is limited, reflecting in part its geographical and institutional isolation, as well as the relatively limited attention given to African inland fisheries in general (Béné 2005). However, documents covering a time span from 1966 to 2003, describe qualitative and quantitative data collection, exploring links between fish populations and human activity in the area. The first of these is a synthesis of fisheries research conducted between 1966 and 1969 on the Zambian portion of the floodplains (Bell-Cross 1974). Bell-Cross (1974) concluded that limited data made an accurate assessment of the ecological impact of fishing impossible, but also asserted that the apparent species diversity and abundance suggested that the fishery was under-exploited. The report cited several potential

drivers of declining fish stocks, including direct causes such as lower-than-average floods, and indirect causes such as changes in floodplain ecology. Bell-Cross (1974) particularly cautioned against prohibiting intensive fishing methods, such as poison, if '*[T]he general acceptance of its adverse affects is based on sentiment and not on any sound biological basis*' (p. 305). The report recommended increased research capacity in the Upper Zambezi floodplains in order to better understand the fishery's ecology before implementing concrete measures.

Both Bell-Cross (1974) and Tweddle (2003) specifically evaluated the ecological impact of highly extractive fishing methods, such as, the use of baskets, noting that these methods could initially appear very destructive to fish stocks. However, both authors point out that this type of fishing typically takes place in ephemeral pools whose populations of minnows would die regardless, as pools dried up. Bell-Cross (1974) also emphasized that intensive fishing methods targeting small fish were important to subsistence diets during the dry season.

Van der Waal and Skelton (1984) conducted a survey of the fishery on the Namibian side of the Zambezi River, noting that fishers relied on large mesh gill nets and hence were highly selective of the larger species, tending to overlook adults of the smaller species. A greater catch, they argued, could be achieved by making smaller mesh sizes available without risking overexploitation of juveniles. Further survey data collected by Van der Waal (1990), led him to conclude that the ratio of nets per fisher, and hence individual fishing effort, had actually declined between 1975 and 1980, due to gear supply problems and extensive net damage by crocodiles and hippos. Catches also declined in these years, a trend that Van der Waal (1990) speculated was due to the aforementioned decline in nets per fisherman or a series of low floods.

More recently, the high species diversity and catch per unit effort yielded by fish surveys conducted between 1997 and 2000, on the Namibian side of the river, indicated that the fisheries in the Namibian portion of the floodplain were relatively undisturbed by human impacts (Hay *et al.* 2002). Koekemoer (2003) analysed the same data to a greater extent, concluding that catch effort and species diversity varied largely throughout the floodplain and did not directly indicate overfishing.

These findings, suggesting that the area's fishery had a relatively low level of human disturbance, reflected conclusions made by Næsje *et al.* (2001), who analysed effort, fisher distribution and catches from a local angling competition held in 2000. The catch/effort estimates arising from the competition led Næsje *et al.* (2001) to state that the overall recreational fishery in that part of the Zambezi River was 'excellent' (p. 24) and that angling would not significantly affect recruitment to the fish stock. Koekemoer (2003) also examined the species composition of the fish caught in extremely small mesh nets, concluding that the majority of fish caught were adult minnows, rather than juveniles of larger fish species. However, Koekemoer (2003) did express concern about the 'callous use of dragnets with fine mesh by commercial fishermen' (p. 13), saying it could have a deleterious effect on the fishery.

Tvedten *et al.* (1994) focused on the socioeconomic aspects of the region's freshwater fisheries (Tvedten *et al.* 1994; see also Tvedten 2002). The authors used focus group interviews, fisher surveys as well as reviews of background literature to make specific recommendations about the Caprivi fisheries. Tvedten *et al.* (1994) stressed that the high level of biological variability in the region's fishery, combined with its widespread yet varied importance to the region's livelihoods made management difficult. The lead author also suggested elsewhere that traditional authorities tolerated the use of baskets and mosquito nets to catch fish because these methods were mainly used in relatively brief (albeit intensive) periods by the most marginal (and usually female-headed) households to supplement diet (Tvedten 2002; p. 434). Any management, Tvedten *et al.* (1994) argued, should be formulated and implemented at the most local scale possible. Moreover, management decisions to restrict certain potentially damaging fishing methods, such as small mesh nets, must be considered in socioeconomic as well as biological contexts.

In summary, researchers have recognised how environmental variability affected fish stocks and livelihoods. They tended to view the potential effect of fishing in the context of where and when fishing takes place, and under what conditions, rather than absolute levels of extraction.

Researchers who mentioned the use of intensive fishing methods often drew attention to the socioeconomic context of the activity, in terms of what segment of the community practised it and whether the catch was used mainly for subsistence or income generation. The studies described earlier in the article do not deny that overfishing may take place under certain circumstances of low flooding or ecosystem alteration, but are cautiously optimistic about the status of local fisheries. We find no primary research that argues for a concrete and predominant link between current fishing methods and adverse effects on the area's fisheries. The main management recommendation of scientists is to caution against arbitrarily assuming deleterious effects to fish stocks in the absence of proof.

Views of Policy Makers

Recent resource management activity in the region contrasts the previous *laissez-faire* approach of the Namibian government and the limited presence of NGOs prior to independence. In 1996, the Namibian Government released the *White Article on the Responsible Management of the Inland Fisheries of Namibia*, (Government of Namibia 1996) based largely on the recommendations made by Tvedten *et al.* (1994). Above all, the *White Article* emphasized the need to favour subsistence over commercial use of fisheries. In addition, the *White Article* recommended favouring passive over active fishing methods, and traditional over modern fishing methods, two recommendations that have particular significance towards fishing methods such as mosquito nets.

With the exception of the legal framework for fisheries management, the Namibian Government and several NGOs now regard fisheries in the Upper Zambezi River, as well as other Namibian rivers as being at risk. Policy documents

discuss several factors as contributing to this risk, including ecological changes, such as a series of low flood years (Mendelsohn & Roberts 1997; Barnard 1998; Chenje 2000) and indirect human effects (such as overgrazing of floodplain habitats by livestock (Mendelsohn & Roberts 1997; Abbott 2001), a growth in population and/or fishers (Government of Namibia 1996; Byers 1997; Timberlake 1998; Chenje 2000).

Intensive fishing methods are identified by several policy makers as either an indicator that overfishing is taking place, or as a risk to the sustainability of the fishery. Table 2 provides evidence of both concerns for overfishing and beliefs about the source of the problem, as stated in the existing policy documents. Factors leading to this shift to intensive methods include the introduction of modern fishing gear (Schlettwein *et al.* 1991; Byers 1997; Barnard 1998; Abbott 2001; Chenje 2000; Okeyo 2000; Government of Namibia 2003), commercialisation (Abbott 2001), and waning traditional management (Byers 1997; Okeyo 2000). Declines in overall fish biomass, catch and the size of fish species are also used by policy makers as evidence of overfishing (Timberlake 1998; Barnard 1998; Chenje 2000). We also draw attention to the fact that out of the eight documents we reviewed, four explicitly mention mosquito net use as direct proof of a crisis in the area's fisheries (Barnard 1998; Chenje 2000; Okeyo 2000; Government of Namibia 2003).

Close examination of the cited policy documents suggests that claims about overfishing and its causes made by policy makers are either asserted without citation or through inference, (Schlettwein *et al.* 1994; Timberlake 1998; Okeyo 2000; Government of Namibia 2003), rely on other secondary sources (Byers 1997; Chenje 2000; Abbott 2001) or have partial interpretation of primary documents (Barnard 1998). For example, several sources cite Van der Waal (1990) in claiming that declining catches over time indicate overfishing is taking place. However, Van der Waal suggests that this decline has occurred due to a decline in the number of nets, rather than changes in the fish biomass itself. In addition, small-mesh fishing is assumed to have a significant effect on fish stocks, and hence the risk that mosquito net fishing poses is presented as self-evident. Two documents (Chenje 2000 and Okeyo 2000) do mention that women primarily use small mesh nets. However, they do not place its use in the context of how gender shapes the use and access of the area's fisheries.

In constructing a narrative that identifies risks to the area's fisheries and their causes, it is not surprising that policy makers also recommend solutions (Table 2). These solutions are either general (i.e., research and increased management of fisheries) or specific (i.e., ban destructive fishing practices, strengthen traditional management measures, promote local scale management and increase the role of state institutions in fisheries management). Three documents either directly or implicitly identify women, or the intensive fishing methods they predominantly use, as areas of management focus.

Views of Recreational Fishers

Recreational fishers usually come from outside of the region and stay at one of the many small lodges along the Zambezi

Table 2
Selected excerpts from policy documents that discuss threats to the Upper Zambezi River floodplain fishery

Definition of problem	Proposed solutions	Citation
‘Local inhabitants have turned to intensive fishing using seine nets stretched to the full length of the river and up to four nets deep. This unsustainable level of fishing may have drastic consequences on the recovery of fish populations once the floods return again.’ (p. 72)	None mentioned specific to fisheries, although the authors caution against alteration of floodplain hydrology by roads, or disruption of ecosystem functions by grass fires and overgrazing	Schlettwein <i>et al.</i> (1991)
‘Overfishing in Caprivi has resulted from a combination of environmental changes and increased fishing pressure from modern gear.’ (p. 26) (repeating verbatim from Tvedten <i>et al.</i> , 1994)	Strengthen management overall, and in particular traditional management	Byers (1997)
‘All studies so far report a reduction in catches as fisheries have moved from baskets to nylon nets.’ (p. 143) ‘Overexploitation of fish populations is of great concern where small-mesh nets, even mosquito nets, and year-round pressure simply remove all size classes.’ (p. 141)	‘Clearly, tighter controls are required to make these fisheries sustainable.’ (p. 143)	Barnard (1998)
‘Owing to the high human populations and aspirations in Caprivi, there is reportedly much overfishing resulting in changes in both the aquatic ecology and species composition’ (p. 93).	Very general recommendations to increase research and management	Timberlake (1998)
‘...the fish stocks of this area, and the communities they support may be at risk due to overexploitation and destructive fishing practices. There is uncertainty regarding the actual state of fish stocks, due to the complexity of the system and the limited biological surveys carried out in this region...’ (p. 111) ‘The most pertinent management issues can be identified as the following: Commercialisation of the fisheries, especially large scale operations; destructive fishing methods, such as drag netting and small mesh sizes...’ (p. 145)	‘The complicated nature of the river/floodplain habitats and the communities which use them, as well as the linkages between different resource uses means that it would be almost impossible to separate fisheries management from other resource use activities.’ (p. 147)	Abbott (2001)
‘Fish sizes are perceived to have decreased in recent years and a greater proportion of the fish are now species with high fecundity and a short life span. These changes are typical of the impacts of the change from large mesh (150 mm) to those of a mesh size of 35 mm or less (mosquito nets or even shade cloth).’ (p. 61; quoting from Bethune, 1995)	General need for increased regulation, but in particular, increased awareness of the difference in fishing methods by gender ‘ <i>since women, who often fish in shallow waters where fish breed, may not be aware of conservation and wise use</i> ’ (p. 255) (emphasis added)	Chenje (2000)
‘...clear evidence of overfishing in parts of the system, stemming from a combination of ecological changes and increased fishing pressure due to changes towards modern gear and disintegration of traditional fishery management practices.’ (p. 115) ‘Unfortunately, women are now subsidising traditional gear with modern gear. For example, women are the main users of mosquito nets...’	Management and protection of floodplain fisheries, involvement of women and children in conservation measures	Okeyo (2000)
‘The major cause for declining freshwater fish populations in Namibia is overfishing.’ (p. 136)	Avoid ‘overfishing and the use of unsustainable methods for catching fish (such as the use of mosquito nets that remove immature fish as well as adults from the population).’ (p. 138)	Government of Namibia (2004)

River. A lodge’s reputation is largely based on the quality of fishing, specifically the amount and especially the size of specific species that guests hope to catch. A recent exchange in the Namibian press illustrates how the degradation narrative is reproduced among recreational fishers. A letter to the editor written by British anglers expressed concern that tourists were hardly able to catch fish anymore. The authors stated that fishing lodge owners in the area (a large number of whom are expatriates) agreed, but were hesitant to speak out individually as ‘fingers will be pointed’ (The Namibian 2005a). The letter highlights several concerns, including the use of drag nets and small mesh nets that have caused a steep drop in the number of fish caught. The letter also asserts that if current complaints to authorities go unheeded, the fish may disappear and ‘*if there are no fish, soon then there will be no birds*’.

The letter’s author also claimed that Zambians were responsible for 90 percent of these apparently destructive practices. This allegation prompted the Zambian High Commissioner to respond in the same newspaper two weeks later, saying that his government was ‘*equally concerned over the depletion of stocks in the Zambezi*’ and acknowledged that some fishers ‘*use unorthodox methods of fishing — factors that contribute to the depletion of fish stocks*’ (The Namibian 2005b). The High Commissioner then stated that the fisheries management was largely devolved to traditional authorities, who were best positioned to monitor and enforce regulations. His letter also mentioned current efforts to coordinate enforcement activities by the Namibian and Zambian governments. Two weeks later, a letter from an owner of a fishing lodge on the Zambezi was published, saying that the problem of destructive

fishing by Zambians was symptomatic of a larger problem of porous and corrupt border controls in Zambia allowing criminals and smugglers to pass freely (The Namibian 2005c).

In addition to increased enforcement, anglers particularly advocate the banning of drag netting and the implementation of closed seasons during fish breeding events (The Namibian 2005a, c). One author's (Abbott) experience during 2002, provides some insight into not only what some lodge owners feel is an appropriate management intervention, but also how it should be implemented. The owners of one lodge stated that they nested a species of cichlid fish, valued by anglers, concentrated in backwater adjacent to them during the breeding season. The owners feared that the concentration of fish, especially during an important time in their life cycle, made them vulnerable to local fishers who targeted these nesting sites. In response to these fears, the lodge owners stated that, during the breeding season, they keep a round-the-clock watch on the nesting site (an earlier lodge owner claimed to have permission to do so from the Traditional Authority). Their rationale, the lodge owners explained, was not to control fishing everywhere, but to keep the main breeding stock from being wiped out.

Views of Floodplain Inhabitants

The majority of floodplain inhabitants consulted asserted that fish abundance had declined over time, although different groups gave different reasons for this apparent decline. In a series of village meetings held in each floodplain administrative ward, the participants of the meeting cited increased levels of fishing and use of destructive methods as reasons for this perceived decline. Zambians were frequently mentioned as being responsible for a rise in fishing activity and identified as the main culprits in the use of destructive methods (Purvis *et al.* 2003).

Traditional authorities responsible for each administrative ward stated at the same meetings that several fishing methods were prohibited, including drag nets and small mesh, due to their negative effect on fish stocks. However, traditional authorities and fishers also said these restrictions were difficult to enforce, and that fishers were compelled to use them to get sufficient catches. At each village meeting, the consensus view was that the government should work with the floodplain inhabitants. In particular, participants voiced support for giving traditional authorities in each administrative ward the authority to enforce prohibitions on certain fishing methods. There was less support, however, for a closed season or the outright exclusion of Zambian fishers.

One issue that emerged from our research is that there has been an apparent change in the importance of fish as part of the subsistence and income livelihood strategy of the region's inhabitants. Results from an intensive survey of Namibian floodplain households in 2002 indicated that reliance on fish had increased over the five-year period identified in the survey. Respondents cited declining agricultural production (due to poor floods, drought, and animal damage), as the most important cause for their increased reliance on fishing (J. Abbott

unpublished data). Interviews with key informants in 2002 and 2005 also provided an insight into the perceived changes in fish stocks over a longer time frame. Older inhabitants stated that until the 1960s, traditional fishing gear was more common. Nets that were previously handmade with cord from discarded tires were replaced by manufactured nets, which had originally been distributed by a fisheries development project in Zambia.

While none of the interviewees explicitly linked flooding and fish abundance, one elderly respondent mentioned changes in area hydrology and fauna:

'During that time [onset of the little rainy season, November-December] there were a lot of trees bearing fruit, which we ate. The trees are still there, but there is no more fruit. Maybe the roots can't reach water anymore. Even by this village you could see antelope coming right to the mulapo and we would sometimes hunt them. Elephant would also pass through, although only the Baswara knew how to hunt them. Now the elephants pass through on their way to the [Zambezi] river but there are no antelope'

Namibian village, December 2003

We draw attention to this account because it is reasonable to assume that wild fruit gathering and protein from game play an important part in subsistence diets, when available. As a result, changes in their availability would have an effect on the amount of time and relative returns of other livelihood strategies, such as fishing. If food, especially small game, became less abundant, fishing would become a more important source of protein. What is also evident is that for floodplain residents practicing diverse livelihoods, fisheries are one part of an overall strategy; what is happening in fisheries cannot be separated from this larger livelihood context (Purvis 2002a).

The reputation of Zambians being the most numerous and damaging fishers, as described earlier, must be placed into the context of the views collected during the 2002 frame survey, of the Zambians themselves. The first quote, from a middle-aged woman, echoes a common sentiment throughout the floodplain that fishers simply have no choice but to use intensive methods:

'How can we be told to use large mesh nets when we can only catch fish in small mesh? Even now the prisons in Sesheke and Mwandu are full of young men who have no choice but to become cattle rustlers.'

Zambian village, November 2002

A second quote, from an older man, suggests that spatial heterogeneity of fisheries abundance plays as important a role in fisher behaviour as seasonal cycles. At the same time, the statement reveals a tension between users who are ethnically contiguous and frequently related, yet are separated by an invisible national boundary:

'We [Zambians] feel bad when Namibians chase us away from their side of the river. We go to that side to fish because the fishing is better there. It is better because the land is lower

on the Namibian side so there are more streams and swamps. On this side we have mostly cliffs'.

Zambian village, May 2002

Fish vendors at the region's only formal market also reflected the predominant perception of a change in the abundance of fish and its importance to the economy (Abbott *et al.* 2007b). In open-ended interviews, fish vendors stated that the number of people selling fish, as well as vendors overall, had increased over time. Respondents cited a series of dry years since 2000 as having caused an increase in fish vendors, as vegetable vendors switched to fishing and harder conditions overall created increased demand for off-farm income. Vendors were not sure if the overall catch had declined over time, but did say that fish bought at the riverside cost more and there was less to go around.

These results support the views asserted as part of an overfishing narrative that numbers of fishers and fishing settlements have increased over time, as has the reliance on fishing. Some fishers echoed the perception shared by other groups that the fishing intensity had increased and mesh sizes had declined, accompanied by a decline in fish catches. There is also support for the claim that 'outsiders' are encroaching on fishing grounds and traditional management has eroded. Similarly, fishers supported the banning of certain methods and the strengthening of traditional management measures.

CONCLUSION: OVERFISHING NARRATIVES AND EMERGING MANAGEMENT

In this final section of the article, we: (a) Review stakeholder positions and incentives for them, and how these positions reflect broader themes found in research on fisheries and their management; (b) Consider how some would-be indicators of overfishing might be interpreted differently in the local context; and (c) Reflect on what our analysis implies of our understanding of the narratives concept.

Understanding Stakeholder Positions

Ideas about the causes and effects of overfishing presented by researchers, policy makers, recreational fishers and floodplain inhabitants overlap, in that they all assume that changes to a fishery can occur under certain conditions. However, there are differences over the relative importance of natural and human factors in driving changes in a fishery, with researchers emphasizing the former, and policymakers, recreational fishers and local inhabitants' views emphasizing the latter.

Interpretations of change by researchers working in the area emphasize the role of intra-annual flooding trends affecting the productivity of fisheries, reflecting broader views of floodplain dynamics and non-equilibrium ecological systems. They also draw attention to how fishing methods are affected by seasonal variations in the habitat and damage by animals. In these ways, researchers largely resist conventional overfishing narratives, and they argue for more research in the region. Cochrane (2000;

p. 12-13) asserts that highlighting uncertainty in fisheries management can be used as a tool for guarding against blame, establishing personal legitimacy or accessing funding. While this may or may not be the case for our researchers, they have consistently, over time, argued for caution in assuming cause and effect linkages in this highly variable environment.

These findings make our case stand in contrast to many others in Africa, where scientists have been implicated in uncritical formation, adoption and circulation of degradation narratives (Leach & Mearns 1996; Keeley & Scoones 2000). Moreover, discourse around the region's fishery did not emerge out of a seminal study, in contrast to the Ethiopian degradation narrative described by Keeley & Scoones (2000). Ours is not a case of 'science versus users', where the views of resource users are disregarded or ignored in favour of scientific assertions about problems and the necessary solutions. Rather, locally based scientists can be depicted as challenging a narrative supported and promoted by some of their scientific peers. Similarly, in her work on marine protected areas in Belize, Gray (in review) found scientific disagreement between locally based scientists working for an NGO and visiting researchers. These findings reinforce Forsythe's (2003) critique of a tendency of those interested in narratives to assume oversimplified relationships between science and the policy process. They also highlight the importance of power in determining which narratives are adopted, and whose voices are heard in reinforcing or disputing them. However, while there has been much attention to the issue of diversity and power differentials among resource users (Agrawal & Gibson 1999), there has been less attention to diversity among scientists (but see Campbell 2002). The relationships among scientists, science and policy-making are probably much more nuanced and multifarious than they are often portrayed.

Policy makers similarly acknowledge the effects of poor flooding. However, they largely adopt the overfishing narrative, stressing impacts from growth in the region's population, the nature of subsistence fishing activity and a decline in traditional management. Above all, policy makers are unequivocal about the current threats to the fishery caused by increased levels and intensity of fishing in the area. Policy-makers also emphasize a management vacuum in the region, related to declining traditional authority that results in the inability to address a present crisis. This vacuum justifies increased administrative involvement by the government and NGOs in an area that is attracting growing international attention, due to its tourism potential and transboundary nature (Abbott *et al.* 2007a).

Recreational fishers and lodge owners identified a decline in the species of fish targeted by visitors, as symptomatic of destructive subsistence fishing methods. They simultaneously assert the importance of recreational fishing to the area's economy and demonstrate how catch-and-release methods associated with angling contrast with the subsistence methods (Malasha 2003 & McGregor 2005 for further examples of how conservation and aesthetics dichotomize fishing methods). In doing so, recreational fishers and lodge owners are better able to justify restrictions on fishing intensity and methods available to local fishers under the new Namibian legislation.

It is not a problem of fishing *per se*, but the type and value of particular practices.

Floodplain inhabitants also identify declining catches and link the causes to the use of certain fishing methods and increased fishing pressure. The local version of the degradation narrative identifies both a threat and the cause, but in doing so identifies an 'outside' group, specifically Zambians, as 'culprits'. In identifying an outside culprit, attention to the role of fishing by women and children is somewhat reduced; the conflict between Namibian and Zambian fishers is usually construed as a conflict between men fishing with nets from boats, rather than women fishing from the shore. At the same time, the local narrative makes a clear argument for the role of inhabitants, in particular traditional authorities, in managing the fisheries. As fishing on the Zambian side of the river has increased, incentives for Namibian fishers to opt for more formal management have increased, as this potential allows them to address problems of exclusion. Given the ambiguous nature of the current policy towards institutional capacity and responsibility for fisheries management, it is understandable that the overfishing narrative constructed by local inhabitants legitimises the inclusion of certain local voices and institutions, especially traditional authorities.

The resonance of the overfishing narrative with diverse stakeholders surprised us, especially given the lack of supporting evidence in the local fisheries research. We were particularly surprised at the extent to which floodplain inhabitants adopted key elements of the narrative. On first glance, seemingly disparate and potentially at odds actors (such as fishing lodge owners and floodplain inhabitants) supported a shared narrative of a fisheries crisis. However, when we attended to the detail of the narrative, differences arose. In the case of fishing lodge owners and floodplain inhabitants, they might agree on the problem of overfishing, but they identified different culprits. In doing so, they were legitimising their own rights to use and manage a resource in a changing institutional environment. Thus, the potential for conflict here lay not in the adoption of the narrative itself, but in the subtle differences in emphasis and related implications for management intervention.

Narratives in Context

One of the strengths and weaknesses of narratives is their generality. As Roe (1991) has pointed out, narratives are supposed to reduce complexity in order to allow for decision-making. Attention to complexity can lead to paralysis, and simplifying a narrative helps to overcome this. The problems of simplification are many, and we have suggested here that the simplified linear model of fisheries overexploitation does not fit well with the complex biophysical and socio-economic context of this particular floodplain. Two important components of the narrative that overfishing results from increased fishers and intensive fishing methods can be interpreted very differently in the context of our study site. We consider three examples.

First, while the increase in the overall number of fishers,

particularly from the Zambian side of the river (Abbott *et al.* 2007a), can be interpreted as supporting the overfishing narrative, this trend may not represent a unidirectional rush towards a last resort of the poor, but rather an elastic response to longer term shifts in the Zambian economy. As Gordon (2005) describes, the collapse of the price of copper led to a prolonged economic downturn in Zambia, causing many urban inhabitants to invest their labour and capital in fishing. Given Zambia's recent gains from record prices for the same commodity, it would be useful to determine if a reciprocal pull from the periphery to the core occurred and the numbers of fishers decreased.

Second, there have been considerable changes in the abundance and composition of wildlife in the area over the last 30 years, and this has impacted the fishing effort and practice. One well-recognised impact is the effect on agriculture through crop damage (O'Connell-Rodwell *et al.* 2000; Mulonga & Murphy 2003), making farming more difficult. Less attention has been paid to how the decrease in small game (and prohibition on their use) removed this source of protein from most people interviewed for this study, likely affecting their perception of the importance of fishing and its relative ability to meet subsistence needs. Similarly, adoption of active fishing methods, such as drag netting with small mesh (something the overfishing narrative would accept as indicative of the problem), may be to avoid the risk of damage to nets by animals crossing rivers, particularly in areas within wildlife corridors (Robinson *et al.* 2001).

Finally, the use of mosquito nets by women is often a seasonal phenomenon, mediated as much by institutional dimensions of gender and class as by the efficiency of the method; fishing is in principle (rather than practice) a male activity. Our own research reflects the marginalised position of women in this sector; women are seldom recognised as fishers by governments, NGOs, traditional authorities, or by male fishers. Furthermore, women rarely identify themselves as fishers. Because we were often working with traditional authorities and/or government representatives in the field, and because it was clear that mosquito net fishing was a controversial and potentially illegal fishing method, we did not ask women directly about their own fishing activities unless they offered the information freely. Thus, our data collected from female fishers are limited, and most information came from fish vendors in the market who also caught some of their stock (gender divisions of labour run throughout the fishery, and in contrast to their marginal role in fishing, women dominate in fish vending (Abbott *et al.* 2007b). Further understanding of the importance of this activity and of its impacts on fish stocks is required before policy change is implemented, particularly as women themselves are unlikely to have much voice in this process.

Narratives serve a practical function because they are necessary to reduce complexity. However, they may be adopted and resonate for strategic reasons, or in a broader environmental and socioeconomic context that makes narrative uptake possible and desirable. For example, Keeley & Scoones (2000) demonstrate how a series of good rains in the early 1990s opened up policy space for promoting aggressive

agricultural interventions in Ethiopia. The relative success of different approaches to agricultural extension in Ethiopia also depended on the ability of discourse to adapt to changing domestic and international politics. In our case study, the emergence of overfishing concerns coincided with a series of low floods and poor rainy seasons, combined with the growing cost of staples. At the same time, the region itself 'opened up', in the context of both geographical and policy space, with Namibia's independence. Research and policy intervention, especially by NGOs, expanded considerably as the region emerged from its previous status as a frontline for a bush war and part of a pariah state. This made specific policy-driven discourses, particularly those that resonate with international concerns, more likely to emerge and become established.

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Notes

1. This reflects recent views in the media regarding the distribution of subsidized mosquito nets in Africa and their use for other purposes, including fishing. Examples include: 'Liberals, Conservatives and Aid' (Brooks 2005) and 'Net Gains for Africa' (Anonymous 2005) appearing in the New York Times and Los Angeles Times, respectively. The Wikipedia entry for 'malaria' goes so far as to take a single reference regarding mosquito nets in Namibia and generalize it the entire African continent. An online debate titled 'Mosquito nets and indiscriminate fishing, good or detrimental for Africa?' can also be found at Safaritalk, (<http://safaritalk.net/index.php?showtopic=1532&st=0>). An even more recent example can be found in Harper's Magazine (2009, p.84).

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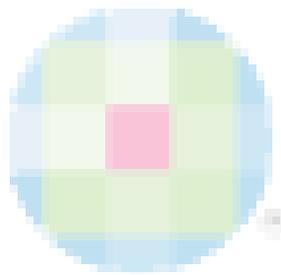
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