



Rivers as resources, rivers as borders: community and transboundary management of fisheries in the Upper Zambezi River floodplains

JAMES ABBOTT

Department of Geography and Urban Studies, Temple University, 309 Gladfelter Hall, Philadelphia, PA, USA 19122-2585 (e-mail: jabbott@temple.edu)

LISA M. CAMPBELL

Nicholas School of Environment and Earth Sciences, Duke University, 135 Duke Marine Lab Rd, Beaufort, NC, USA 28516 (e-mail: lcampbe@duke.edu)

CLINTON J. HAY

Ministry of Fisheries and Marine Resources, Private Bag 2116, Mariental, Namibia (e-mail: cjhay@mweb.com.na)

TOR F. NÆSJE

Norwegian Institute for Nature Research, Tungasletta 2, NO-7485 Trondheim, Norway (e-mail: tor.naesje@nina.no)

AMON NDUMBA

Department of Fisheries, Sesheke, Zambia (deceased)

JOHN PURVIS

Lake Victoria Fisheries Organization, P.O. Box 1625, Jinja, Uganda (e-mail: jpurvis@lvfo.org)

This article examines the recent convergence of community-based and transboundary natural resource management in Africa. We suggest that both approaches have potential application to common-pool resources such as floodplain fisheries. However, a merging of transboundary and community-based management may reinforce oversimplifications about heterogeneity in resources, users, and institutions. A scalar mismatch between the ecosystem of concern in transboundary management and local resources of concern in community-based management, as well as different colonial and post-colonial histories contribute to this heterogeneity. We describe a fishery shared

Les rivières comme ressources, les rivières comme frontières: la gestion communautaire et transfrontière dans la plaine inondable du bassin supérieur de la rivière Zambezi

Cet article examine l'état actuel du processus de convergence en Afrique entre gestions communautaire et transfrontalière des ressources naturelles. Nous laissons entendre que les deux approches ont le potentiel pour servir à la gestion de ressources halieutiques communes situées par exemple dans les plaines inondable. Par contre, la fusion des modes de gestion communautaire et transfrontaliers pourrait renforcer l'idée selon laquelle l'hétérogénéité des ressources, usagers et



by Namibia and Zambia in terms of hybrid fisheries management. We examine settlement patterns, fishermen characteristics, sources of conflict, and perceptions regarding present and potential forms of fisheries management in the area. We also consider the implications that initiatives to manage resources on the local and ecosystem scale have for these fishing livelihoods. Our findings indicate that important social factors, such as the unequal distribution of population and fishing effort, as well as mixed opinions regarding present and future responsibility for fisheries management will complicate attempts to implement a hybrid community-transboundary management initiative.

institutions est plus simple qu'elle ne l'est en réalité. Un décalage entre l'écosystème en question dans la gestion transfrontalière et les ressources locales en question dans la gestion communautaire, en plus des diverses histoires coloniales et post-coloniales, contribuent à cette hétérogénéité. Une description de la pêche que partagent la Namibie et la Zambie est présentée en termes d'une gestion hybride de la pêcherie. Nous examinons les schémas de peuplement, les traits distinctifs des populations de pêcheurs, les sources de conflit et les perceptions à l'égard des modes actuels et potentiels de gestion de la pêcherie dans la région. Nous étudions les conséquences que des initiatives en matière de gestion des ressources à l'échelle locale et à celle de l'écosystème peuvent avoir sur ces moyens de subsistance. Les résultats semblent montrer que des facteurs sociaux importants, comme la distribution inégale de la population et l'effort de pêche, ainsi que des opinions partagées concernant l'exercice des responsabilités dans la gestion de la pêcherie peuvent compliquer la tâche de mise en œuvre d'une initiative de gestion communautaire et transfrontalière hybride.

Introduction

Discussions concerning natural resources in Africa often question the role of the state and nation as suitable institutional and spatial scales for management (e.g., Hulme and Murphree 2001; Adams and Mulligan 2003). Proposed alternatives include community-based natural resource management (CBNRM) and transboundary natural resource management (TBNRM). Support for CBNRM argues that increased local-level involvement leads to more equitable and effective management of natural resources (Agrawal and Gibson 1999; Barrow and Murphree 2001), and that communities have the most at stake in the conservation and sustainable use of locally important resources (Li 2002). By contrast, TBNRM is premised on the idea of the ecosystem being the most appropriate scale at which to manage resources. As such, management should not be restricted by national boundaries, but should cross them as necessary (Wolmer 2003; Duffy 2006).

This article explores questions regarding suitable scales (institutional and spatial) for the

management of artisanal fisheries in southern Africa. We consider the promises and challenges of fisheries management at ecosystem and local scales in a floodplain river shared by two countries; thus, in this case, ecosystem management implies transboundary management. In particular, we examine differences in settlements, users, fishing practices and institutions on either side of the political boundary formed by the river. In turn, we consider how these differences may affect the feasibility of a 'hybrid' combination of transboundary and community-based fisheries management being considered for the fishery.

Our case study focuses on the Zambezi River as it flows between Namibia and Zambia. In order to evaluate potential differences in resource use and management norms, we conducted a comprehensive survey of fishing settlements and fishers on the Namibian and Zambian sides of the river to determine: (1) the number, age, and seasonality of settlements; (2) characteristics of fishers in settlements, including their ethnic backgrounds; (3) fishing assets and activity; (4) knowledge of rules concerning what types of fishing are allowed and where, as well as the authorities responsible for

setting and implementing these rules; (5) beliefs about forms and causes of fishery-related conflict; and (6) opinions regarding if the fishery should be managed, the rationale for management, and the most appropriate management authority. In doing so, we sought to determine if differences exist between Namibian and Zambian fishing settlements, fishers and fishing practices and how such differences might impact attempts to implement hybrid CBNRM-TBNRM management in the region.

We suggest that attributes of both TBNRM and CBNRM have potential application to biologically and socially dynamic environments such as floodplain fisheries (or drylands, e.g., Haro *et al.* 2005). However, challenges exist when attempts to fuse transboundary and community-based management carry assumptions of a smooth nesting of homogenous and congruent users, activities and institutions within a broader management area (Young 2006). These challenges, described below, emerge from contradictions in the *spatial* scales of ecosystem and local-level resources, as well as the *institutional* scales of transboundary and community-based management.

The first challenge is the potential mismatch between the highly dynamic movement of resources and users at the scale of the ecosystem typifying TBNRM, against the local-scale resources, users, practices and institutions characterizing CBNRM. In our case study, this tension is illustrated by results showing the majority of conflicts occur when fishers from the more populated Zambian side of the river enter Namibian waters to take advantage of the more abundant habitat and fish. In the context of hybrid management, a freer movement of users in the floodplain through transboundary management focused on the ecosystem may conflict with existing locally defined rules of tenure and access to what are considered local resources (e.g., fishing grounds).

The second challenge concerns the contrasting colonial and post-colonial histories of southern African nations. These differing histories in turn affect the degree of contiguity amongst individuals, activities, and institutions brought together under supranational arrangement such as TBNRM. While fishers sharing the floodplain in our case study have similar types of fishing assets and traditional authorities, the proportion

of ethnic groups, population densities, and views regarding fisheries management differ significantly (see results). Again, if there is not sufficient common ground amongst users and institutions in Namibia and Zambia, hybrid management risks aggravating the same types of power struggles and access conflicts that have characterized other changes in resource use in Africa (e.g., Neumann 1997). This kind of failed attempt to hybridize management could also undermine any already existing and functioning community-based regimes.

Most studies of CBNRM and TBNRM in Africa focus on terrestrial resources (Schroeder 1999; Hulme and Murphree 2001; Adams and Mulligan 2003), but the rationale for applying these management approaches is relevant for many inland fisheries on the continent. The majority of African inland fisheries are artisanal, characterized by limited and/or local-level management (Jul-Larsen *et al.* 2003), making CBNRM an appealing option. At the same time, existing boundaries established during Africa's colonial era frequently used rivers as reference points (Sadoff *et al.* 2002), making many inland fisheries transboundary for at least part of their range. The importance of fish to the region's inhabitants and the potential for a drier regional climate in the future (de Wit and Stankiewicz 2006) suggests that many livelihoods will depend on perennial water sources. The appropriate scale of management or even if management should take place at all (e.g., Jul-Larsen *et al.* 2003) are therefore important issues to raise in the context of freshwater environments in the region.

Our study adds to a growing body of research concerning appropriate scale in floodplain fisheries management (e.g., Hoggarth *et al.* 1999; Béné *et al.* 2003; Castro and McGrath 2003; Thompson *et al.* 2003; Sneddon and Fox 2006) and the role of communities and traditional authorities in artisanal fisheries management (e.g., Hara 1996; Owino 2000; Berkes *et al.* 2001; Aswani 2005; Pomeroy and Rivera-Guieb 2006). It may also serve a more practical purpose, by informing ongoing government and NGO efforts to incorporate elements of CBNRM and TBNRM in the region. Examples include the 'Four Corners' and 'Heartlands' projects of the Worldwide Fund for Nature and the African Wildlife Foundation and the recently formalized Kavango-Zambezi



Transfrontier Conservation Area, described later in this article.

Our article is organized as follows: In the first section, we review the principles of CBNRM and TBNRM in general and their application to fisheries. We also examine some of the critiques of each approach and the challenges associated with hybrid CBNRM-TBNRM management, namely, the potential mismatch between ecosystem and local scales (and associated transboundary and community-based management regimes) and the effect of contrasting colonial and post-colonial influences on settlement patterns, users, activities, and institutions in adjacent countries. In the second section, we describe our research area, highlighting the differences and similarities between Namibians and Zambians living in the area and the institutional environments in which they function. We also describe the floodplain environment and livelihoods, demonstrating the complex historical and biophysical factors existing there. These two sections provide the context for understanding our methods and results that follow. In the discussion and conclusion sections, we situate our results in the present and emerging concepts regarding fisheries management in African floodplains.

CBNRM and TBNRM in Africa: Concepts and Practice

CBNRM in Africa emerged from a perceived failure of conventional natural resource management practiced by government agencies, which relied on prohibiting local populations from using particular resources and excluding them from decision-making processes (Hulme and Murphree 2001). New community-based approaches to management by governments and NGOs (in Africa and elsewhere) seek in principle greater involvement of inhabitants, allowing both increased access to resources and the opportunity to benefit financially from protected resources and areas. In addition, attempts have been made to make resource management itself more participatory, by including local representation and authority in management objectives and processes (Agrawal and Gibson 1999; Hulme and Murphree 2001; Western *et al.* 1994). In doing so, CBNRM has two goals: (1) to enhance conservation of wildlife, biodiversity and/or the environment; and (2) to

provide economic, social, cultural and political benefits to local people participating in conservation (Adams and Hulme 2001).

While the focus of natural resource management in Africa has shifted to the level of community over the past 20 years, the scope of resource management has recently expanded across political boundaries. In southern Africa, 17 areas have been identified as potential sites for TBNRM initiatives (Griffen 1999; cited in McDermott-Hughes 2005). The key principle behind TBNRM is the concept of ecosystems, or *bioregionalism*, where management is defined primarily by ecological scale and function (Alexander 1990). TBNRM in theory allows for a greater geographical range of protection for certain ecological features (e.g., watersheds, forests) or migratory species (e.g., wildebeest, elephants) (Magome and Murombedzi 2003). However, the rationale for TBNRM, like the rationale for CBNRM, is not just ecological. For example, the economic importance of wildlife-based tourism in southern Africa provides additional incentives for TBNRM as a means of linking tourism 'corridors' that may run through different countries (Ramutsindela 2004).

While the logic of TBNRM argues that some resources cannot be managed at the community level (Barrow and Murphree 2001), the prevalence of 'community' in contemporary thinking about resource use and management in Africa means that proponents of TBNRM cannot overlook it. As a result, TBNRM initiatives also reference local institutions and inhabitants in the region and contain important assumptions about them (discussed later in this article). Several examples exist in southern Africa where conservation goals and means are being defined both at the local and ecosystem scale, such as the Great Limpopo Transfrontier Park and the Kgalagadi Transfrontier Park (Ramutsindela 2004).

CBNRM and TBNRM in fisheries

Community-based management (and the related concept of co-management) is a prevalent theme in artisanal fisheries. However, existing examples of fishery-related CBNRM occur largely in coastal (e.g., Pido *et al.* 1997; Berkes *et al.* 2001; Aswani 2005; Pomeroy and Rivera-Guieb 2006) and small lake environments (e.g., McGrath *et al.* 1993), as opposed to the inland floodplain environment of this study. In contrast to floodplains, marine and

lake environments often have discrete and localized fisheries, making their demarcation and enforcement by artisanal fishers and communities less challenging and the potential benefits of management more apparent (e.g., Sanchirico and Wilen 2001).

In southern Africa, attempts to devolve management and/or promote fisher participation have experienced only modest success (e.g., Normann *et al.* 1998; Wilson *et al.* 1999; Haroldsdottir 2000; Geheb and Sarch 2002; Béné *et al.* 2003; Jul-Larsen *et al.* 2003; Nielsen *et al.* 2004). Challenges identified as confounding devolution include the variable activity within a fishery (e.g., Allison and Ellis 2001; Jul-Larsen *et al.* 2003), conflicts with traditional authorities and government institutions (e.g., Hara 1996; Owino 2000), and ambiguity regarding management goals (such as sustainable or equitable use) and what form intervention should take (Haroldsdottir 2000; Geheb and Sarch 2002; Jul-Larsen *et al.* 2003).

Fisheries policy has also embraced TBNRM through the concept of ecosystem-based management (e.g., Babcock and Pikitch 2004). However, application has been limited to marine environments, where fisheries straddle national and/or international pelagic waters (e.g., Sherman and Duda 1999). These open-ocean settings usually fall outside of typical artisanal fishing activity and management issues are related to commercial fishing. In these instances, TBNRM initiatives in fisheries have not had to consider community-scale institutions or artisanal fishing patterns. In some inland water bodies, such as the African Rift Valley lakes, or the Middle Zambezi River, states have successfully coordinated ecosystem-level research (Geheb and Sarch 2002), but attempts to decentralize fisheries management and/or increase local participation have been limited to activities within states (e.g., Nunan 2006).

Potential for combining CBNRM and TBNRM in floodplain fisheries

New management arrangements combining local and ecosystem scale through CBNRM and TBNRM have considerable potential for floodplain fisheries. Floodplain environments are by nature highly dynamic and diffuse. Fish abundance and catchability varies spatially and temporally

(Welcomme 1985), as do the levels of fishing effort and relative tenure that can be asserted (Scudder and Conelly 1985; Welcomme 1985; Thomas and Danjaji 1997). CBNRM offers the institutional flexibility to respond to such variation, for example, to address issues of sustainability and equity during periods of fish breeding or limited food security. Ecosystem management of floodplain fisheries is also important, given the dispersed nature of the fishery and the fact that key influences on fishery productivity, namely, the timing and duration of flooding, is an outcome of factors outside of the immediate watershed (Sneddon and Fox 2006). Moreover, our limited understanding of floodplain ecology (Arthington *et al.* forthcoming) would improve with data collected at the local level on catch-effort patterns in a multispecies fishery (e.g., Ticheler *et al.* 1998) and the integration of broader ecosystem-level trends in productivity and exploitation (e.g., Halls *et al.* 2006).

In spite of the potential usefulness of a hybrid approach in floodplain fisheries, we did not find any operating case studies in the literature surveyed. In cases where ecosystem-based management has been proposed for floodplain environments, policy makers typically envision a nested order of authority, from community-level management of adjacent waters, to a broader, catchment-level administration (e.g., Hoggarth *et al.* 1999). With this vision comes the optimistic assumption that fishers and communities have institutions compatible with this hierarchical framework and sufficient incentives to cooperate for local and ecosystem-wide benefit.

Challenges to hybrid CBNRM-TBNRM approaches

Questions about whether resource management at local and ecosystem levels can be combined have not been raised to date in the course of CBNRM and TBNRM co-evolution in southern Africa. This is likely because most of the areas under consideration for TBNRM already have some form of protected status. Exclusion and marginalization of local users has been a common characteristic of these areas (Schroeder 1999) and attempts to promote local involvement do not typically involve devolution of any kind of management responsibilities. Instead, focus has been directed at a broader distribution of



monetary benefits from conservation or the development of alternative livelihoods not dependent on wildlife consumption (Adams and Hulme 2001). Thus, community participation in these examples is mostly at low levels (Barrow and Murphree 2001). While protected areas remain sites of contestation between inhabitants, NGOs, and the state over access, use, and benefit (Schroeder 1999; West and Brockington 2006), TBNRM governance remains at the level of state-state negotiation.

However, the popularity of TBNRM in management discourse makes it likely that it will be considered beyond protected areas. Common property resources, such as freshwater fisheries, have less of a history of explicit conservation or marginalization, making issues of local-scale resource use and governance difficult to overlook. In the following paragraphs, we identify two main challenges in harmonizing CBNRM and TBNRM in such cases: mismatches in real (and perceived) institutional scales of management and spatial scales of resources; and the heterogeneity of users and institutions arising from colonial and post-colonial histories.

Institutional and spatial scales

Both CBNRM and TBNRM approaches often contain oversimplified assumptions about the structure and behaviour of inhabitants and resources of an area, and these can impact on the success of hybrid CBNRM-TBNRM arrangements. For example, CBNRM has been critiqued for its failure to adequately consider the meaning of 'community', too often considering communities as homogenous entities acting collectively to achieve common environmental goals and giving little consideration to differences within them (e.g., Agrawal and Gibson 1999; Schroeder 1999). CBNRM often includes a process of formalizing institutions and rules, linked to identifiable communities (Allison and Ellis 2001). This formalization overlooks the fact that most local-scale resource access and use involves ambiguous institutional borders and overlapping rationales for legitimacy (Neumann 1997; Robbins 2004). Emphasizing exclusive use and tenure to residents can conflict with seasonal resources use defining many rural livelihoods in Africa (e.g., Allison and Ellis 2001; Turner 2004). With regards

to resources, CBNRM often assumes local-scale resources and environments are relatively stable and distinct (and thus amenable to local level management), but this view has been challenged by new understandings of the spatial and temporal dynamics of ecological systems (Leach *et al.* 1997).

In the case of TBNRM, similarly problematic assumptions are evident. For example, while ecosystems are portrayed as 'naturally' delineated by physical and biological processes, many authors have demonstrated how TBNRM in southern Africa is influenced by regional and international political processes (e.g., Wolmer 2003; Duffy 2006). As a result, ecosystems are 'constructed' according to how certain actors perceive nature as it is or should be (Robbins 2004). Demarcation and appropriate uses of transboundary areas may be driven by narrow definitions of ecosystems, such as the behaviour of charismatic megafauna and their habitat (due to their appeal to tourism). TBNRM proponents often also assert that as ecological networks are reopened, so too will previously fractured social networks. Wolmer (2003, 262) argues that the bioregionalism underpinning TBNRM extends to assumptions about local and regional cultures and their rootedness in the landscape. The *Peace Parks Foundation* (1999), the largest TBNRM initiative in the region, aspires to 'stitch' together ecological and social landscape separated by local borders (cited in Ramutsindela 2004). In practice, movement by inhabitants may become even more restricted under TBNRM. McDermott-Hughes states that establishment of the Great Limpopo TCFA implicitly carries two 'geographical notions in polar opposition: "Africa" for tourists; and "community" for peasants' (2005, 2). Small-scale resource use and benefits typical of CBNRM may continue under limited terms, but free movement encouraged for tourists is not extended to inhabitants.

Colonial and post-colonial differences

TBNRM in Africa seeks to stitch back together ecosystems fractured by the establishment and persistence of colonial-era borders. CBNRM addresses policies towards resource use and users practiced within states. Yet in asserting either ecological or community legitimacy, the scale and influence of the state is not removed. State

policies of resource use and management, as well as the identities created for (and asserted by) inhabitants and institutions persist despite changes in scale. Moreover, colonial and post-colonial policies and identities are not uniform. Even adjacent countries that were part of the same colonizing power often experienced vastly diverse trajectories. These colonial and post-colonial differences must be considered when attempting to bring together contrasting uses, management and institutions.

Adams (2003) suggests the 'colonial approach' towards resource conservation in Africa cannot be generalized. Perceptions of nature, conservation and the proper use of resources varied over time and amongst actors within colonies. These varying colonial-era ideologies and institutions persisted in newly independent African nations (Adams 2003). At the same time, states adopted, responded to, or were coerced by the forces of socialization, economic liberalization, proxy wars and global environmentalism. These regional and global changes in political and economic structures affected each state differently over time, adding to contemporary distinctions (e.g., McDermott-Hughes 2001; Adams 2003; Malasha 2003).

Another enduring aspect of colonial rule is how ethnic group identity and institutions were defined, created and used by administrators. Traditional authorities were co-opted or created to provide labour, collect taxes and govern certain aspects of indigenous affairs, for a cash-strapped and thinly spread colonial infrastructure (Berry 1992). Murombedzi (2003, 141) points out that 'starting with the colonial project of indirect rule, traditional authority in southern Africa has been engineered and reengineered so many times that it is hardly fair to refer to the contemporary authority figures as "traditional" at all'. Not only are communities and institutions 'imagined' (Brosius *et al.* 1998) but these imaginations are a product of diverse colonial and post-colonial experiences (e.g., West and Kloeck-Jenson 1999).

In the context of hybrid management, the (tenuous) assumption that TBNRM brings together harmonious communities and analogous institutions may lead to more, rather than less conflict. Scalar differences in resource use and management may aggravate conflicts arising over access to different areas by users deemed as 'outsiders' (Nielsen

et al. 2004). If TBNRM fails to consider these issues, it may be destined to make the same erroneous assumptions of homogeneity and strict tenure seen in some CBNRM projects, only at larger scales and with wider impacts.

As the following description of our study area illustrates, the Upper Zambezi River floodplains have a distinct colonial and post-colonial political geography. However, there is also some degree of contiguity in cultural identity and the structure of traditional authorities. Rules about tenure and use of fisheries are also flexible and context-specific. These conditions, we suggest, present hope for a workable attempt at hybrid management. At the same time, we highlight the need to determine in greater detail where similarities and differences exist regarding the distribution of fishers, fishing activity, management and conflict.

The Upper Zambezi River

The study focused on a 120 km stretch of the Upper Zambezi River shared by Namibia and Zambia. Many (but not all, see Results) inhabitants on both sides of the river are members of the Lozi ethnic group, sharing common cultural characteristics and are often related by family. However, the complex political history of the area and its high level of natural variability have acted as important factors in shaping resource access and governance.

Once part of a larger paramount Lozi Kingdom, the area was cut into two colonies during the 'Scramble for Africa' in the late 1800s (Flint 2003). From this stage onwards, the institutional landscape on either side of the river diverged. The British colonial administration north of the Zambezi River (Northern Rhodesia; present day Zambia) provided a considerable role for traditional authorities to set and enforce resource management policies (Bell-Cross 1974), although the influence of traditional authorities declined considerably after Zambian independence in 1964 (Flint 2003). In contrast, administration south of the river (South West Africa; present day Namibia) was traded between authorities no less than five times (between Germany, Britain, modern-day Botswana and South Africa) until Namibia's independence in 1990. These changes were often accompanied by tightening or loosening of access



to the floodplains on the southern bank by inhabitants of the northern bank (Abbott 2005). These restrictions on border crossing arose not only due to official policy of one or both countries; during the 1970s and 1980s, the stretch of river was also a focal point of the conflict between South Africa and neighbouring states of Angola, Zambia and Zimbabwe, and movement in the area was likely curtailed for fear of personal safety.

At the national level, the two countries contrast with respect to economic and social development achievements, with Namibia ranked at 125 in the Human Development Index (HDI) and Zambia at 166. Namibia's estimated GDP/capita is US\$ 6,184, compared with Zambia's GDP/capita of US\$ 877 (UNDP 2005). The extent to which these national differences are relevant in our case study area is questionable, however, as the region of Namibia where our research took place has consistently had the lowest HDI ranking within the country (UNDP 2005) and Namibian residents of the study area may have income levels and abilities to acquire assets that are more similar to their Zambian neighbours than to their fellow Namibians.¹

Traditional authorities on both sides of the river share an almost identical hierarchical structure, with village, ward and regional representatives (*indunas*) and councils (*khutas*). All of the traditional authorities, including those in Namibia, ostensibly fall under a paramount chief (*Litunga*) based in Zambia. Traditional authorities in Namibia can be characterized as relevant in that many civil disputes are still arbitrated within the khuta framework (Purvis 2002). Moreover, government agencies often rely on traditional authorities as a point of contact for public awareness and aid distribution (J. Abbott personal observation). Less information is available regarding the status of traditional authorities on the Zambian side, although the limited government presence, combined with the history of semi-autonomy prior to independence, suggests that traditional authorities and structures are still relevant in daily life. Traditional authorities on both sides of the river have an ambiguous role

in present and emerging fisheries management, as discussed further below.

The Upper Zambezi River is a relatively unmodified watercourse compared to other rivers of its size, with no barriers or irrigation, a rural population and limited pollution. Annual cycles of flooding and precipitation cause a seasonal contraction and expansion of the floodplain, which in turn affects the productivity of the fishery. As areas become covered in water, fish migrate onto the floodplain to feed and reproduce. When waters begin to recede, adult and juvenile fish return to the main channel or become trapped in isolated bodies of water on the floodplain. Fishing activity is mostly artisanal, with the majority of fishers using monofilament gill nets and dugout canoes (Purvis 2002; Næsje *et al.* 2003). In many floodplain environments, fishing is usually not targeted towards specific species (Welcomme 1985), a pattern also seen in the Upper Zambezi River fishery; over 50 species of fish are caught by inhabitants, with the majority of individuals being either cichlids or catfish (Purvis 2002). Changes in fishing technique and effort are linked to seasonal variations in overall fish biomass and movement of fish between the main channel and floodplain (Purvis 2002).

Several sources suggest that the recent increase in the area's human population, combined with the adoption of more extractive fishing methods and an apparent erosion of traditional management, have resulted in unsustainable levels of fishing (Tvedten *et al.* 1994; Byers 1997; Turpie *et al.* 1999; Chenje 2000). If catches have declined, it may indeed be a result of fishing pressure, but may also be linked to reduced decadal flood volumes, changes in herbivore-mediated floodplain morphology and nutrient cycling, or a combination of all three (Abbott 2005). In contrast to this portrayal of declining fisheries, unpublished biological surveys indicate that the trophic structure and biomass of the fishery does not resemble what is expected for heavily exploited fisheries (C. Hay unpublished data) and unpublished data collected by J. Abbott during 2002 indicated a wide range of fish species and sizes available in local markets. Given these conflicting views and the limited biological and fishing effort data existing for the area, it is difficult to make concrete statements about the condition

1 While there is a high GDP/capita in Namibia, it also has a relatively low population density and the highest Gini index (70.7) of all 176 countries (UNDP 2005). Hence, income disparity is more prevalent in Namibia than Zambia.

of the fish stock or the effects of present fishing activity.

At the time of the survey in 2002, the Zambian government had fisheries legislation at the national level, with minimum mesh size of 51 mm, an annual closed season between December and February and a prohibition on 'bashing' (a method of catching fish where the water is struck in order to scare fish into nets). Namibia had a very vague pre-independence legislation with traditional authorities principally responsible for fisheries management in 'Native' areas such as the floodplains (Abbott 2001). Generally speaking, the use of active gears such as mosquito nets and dragnets, as well as small mesh nets was prohibited in Namibia. However, there was and continues to be a heterogeneous interpretation of customary law both within and between Namibia's traditional authorities (Purvis *et al.* 2003). A more informal, yet equally important aspect of management on both sides of the river is the *silalanda*, an area of land and water within a traditional authority's territory (*silalo*), associated with a specific kin group. Non-kin wishing to graze livestock or fish in a *silalanda* are expected to ask permission (Purvis *et al.* 2003).

The area's physical geography has important implications for the distribution of fishing areas, settlement, and assertion of fishing tenure. The northern bank of the river is higher than the southern bank, where the majority of the floodplains are located. As a result, the majority of seasonal inundation occurs in Namibia. Floodplain settlements are therefore largely seasonal, with tenure to specific areas linked to kinship and a tradition of use over time. The gentle gradient of the floodplain leads to subtle and dramatic changes in the areas covered in water and hence the availability of potential fishing grounds, as adult fish migrate to the inundated floodplain to spawn and feed (Purvis 2002).

Recent changes in Namibian and Zambian legislation, regional policy initiatives, and NGO involvement have important implications for the current limited and ambiguous nature of fisheries management in the study area. At the regional level, the Southern African Development Community (SADC), a state-level coordinating body, passed the 2001 *Protocol on Fisheries*, obliging parties (including Namibia and Zambia) to adapt or change fisheries policy to incorporate

traditional authorities and participatory management (SADC 2001). Also notable is the States' obligation to 'adopt equitable arrangements whereby...fishers who are traditionally part of a transboundary fishery may continue to fish and trade in goods and services' (SADC 2001). Thus, the policy recognizes the relevance of both community-based and transboundary management.

Nationally, Namibia introduced a new Inland Fisheries Act in 2003. In this Act, control of the fisheries rests with the state. However, there is some scope for community involvement (largely through traditional authorities) in the formation and enforcement of regulations, as well as coordination with neighbouring states in the management of shared waterways. Zambia is also in the process of adopting legislation with similar provisions for potential community and transboundary involvement (P. Kapaasa, DFO staff, personal conversation with J. Abbott, July 2002). At the same time, the area falls within the recently formalized plans for the Kavango-Zambezi Transfrontier Conservation Area, a Peace Parks initiative involving watersheds shared by five countries (Peace Parks 2006). The terms of reference for the feasibility study tendered by Peace Parks, outlines some of the envisioned rationales and benefits of TBNRM for the area, including 'harmonizing the policies, strategies, and practices of conserving and managing the resources that the five countries share through natural movements' (Peace Parks 2006).

While fisheries are not explicitly mentioned in the above passage, their role in the area's livelihoods and tourism makes fisheries use and management an issue. Peace Parks does acknowledge the 'people of various nationalities, cultural backgrounds, and income levels whose livelihood depend on the shared common waters' (Peace Parks 2006). However, the goal to 'sustain the economic developments of the people' (Peace Parks 2006), while suitable in theory, risks an implicit assumption of homogeneity, underlining the need to understand where differences lie at this early stage in policy development.

Survey approach

A 120 km stretch of the Zambezi River was surveyed, collecting multiple types of data



concerning settlements, livelihoods, and management. Data collection was based on frame surveys (e.g., Moses *et al.* 2002), where the shoreline is divided into sections, or frames. Typically, frame surveys are standardized so areas can be revisited after a period of time to determine if change has occurred. It is an exhaustive survey of all fishing settlements, fishers and fishing assets found within the frame. Due in part to high mobility of artisanal fishers and their assets (Allison and Ellis 2001) as well as the ephemeral nature of some floodplain settlements (Sarch and Birkett 2000), there is always the possibility our survey missed some fishers or settlements.

A previous frame survey of the Zambian side of the Zambezi River had been carried out in 1996 by the Zambian Department of Fisheries (DoF). DoF staff experienced in frame surveys cooperated in method development and survey implementation in the present study. The frame survey took place during October and November 2002, as the flood reached its lowest point. This time was chosen on the assumption that it coincided with the peak of bank side settlement and fishing activity, since fishing yields are relatively high and the labour bottlenecks due to ploughing, which take place with the onset of the seasonal rains, are not yet apparent (Purvis 2002; see also Shorr 2000).

Survey teams travelled the Zambezi River by boat. Given the range of flooding as well as the high banks sometimes encountered, we determined that only visiting villages in line of sight of the boat would result in inadequate coverage. As a result, all villages within 500 m of the Zambian side or 1 km of the Namibian side of the main channel or navigable waterway were visited. Different distances for each country were chosen due to the different profile of the floodplain on each side; while the floodplains on the Zambian side are less extensive due to a gradually rising landscape, the gradient on the Namibian side is almost nonexistent, allowing for greater potential inundation.

Initial contact with a settlement was made through the village *induna* (village-level traditional authority), to whom the goals and practical details of the frame survey were explained and from whom consent to work in the village was obtained. For larger settlements (more than five households), it was proposed that, where possi-

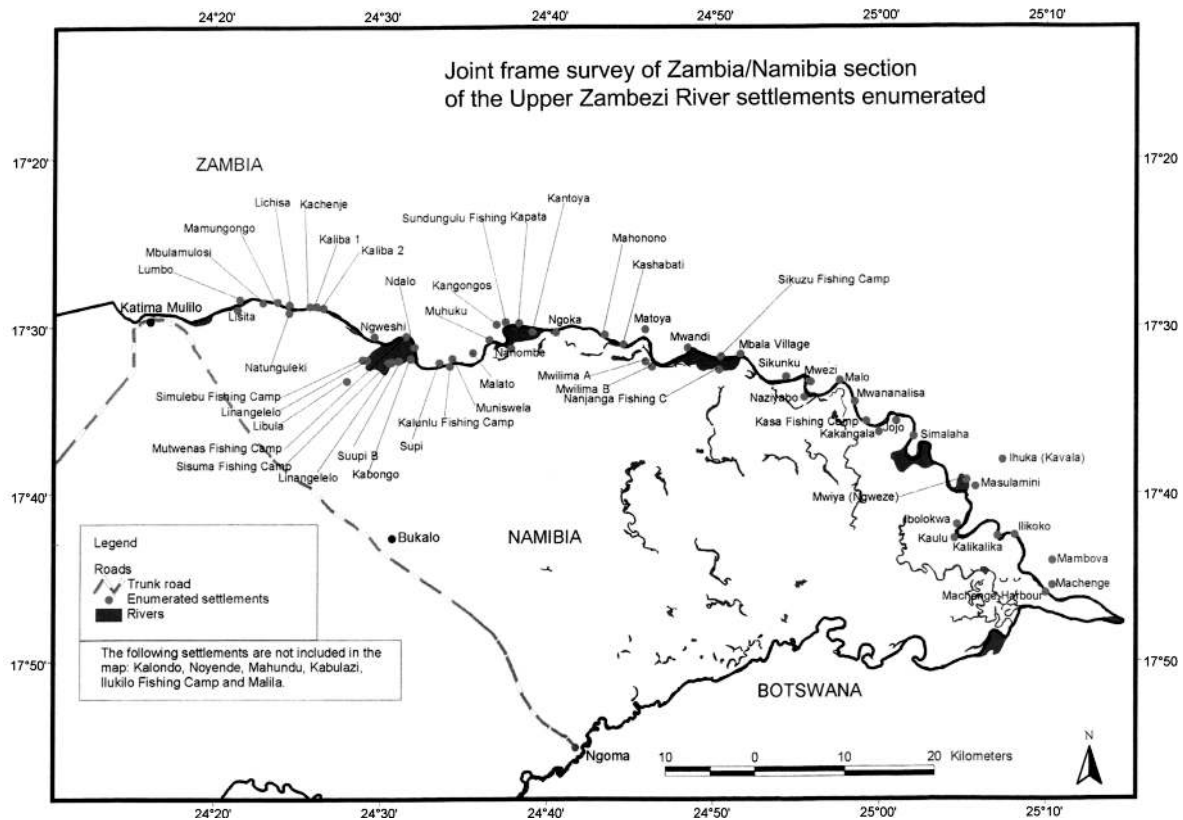
ble, appointments would be made the next day, allowing the *induna* to assemble those fishers who consented to being interviewed. Visits to settlements were made between 8 A.M. and 3 P.M., so as not to interfere during times in the early morning and evening when fishers usually attend to their nets.

Once the forms and a recording protocol had been agreed upon by the survey team, the method was tested in a village on the Namibian side and refined. The final questionnaire had three parts: Part A contained questions about the settlement and were directed towards the *induna*, whereas questions in Parts B and C, regarding fishing activity and management, were directed towards individual fishers. While the final survey included 43 questions, those of interest in this article addressed: age, location, estimated number of households, fishing assets and status (i.e., seasonal or permanent) of settlements (Part A). Questions directed at fishers gathered data on their age, gender and ethnic group, as well as the number and type of fishing gear (and, where relevant, mesh size) used, knowledge of current fishery-related rules and authority, opinions about sources of conflict and about what form (if any) future fisheries management should take (Parts B and C). Questions about settlements, fisheries activity, conflict and present management were open-ended, with the most frequent responses pre-coded for ease of recording. Questions about future management were in the form of discrete choices.

The eight-person survey team consisted of the lead author, representatives from the Zambian Department of Fisheries, the Namibian Ministry of Fisheries and Marine Resources and staff from a WWF-LIFE funded project titled 'Shared Resource Management on the Zambezi/Chobe Systems in Northeast Namibia: Current Practices and Future Opportunities'. A total of 72 settlements were recorded and 541 fishers were interviewed during the survey.

Selected Characteristics of Fishing Along the Upper Zambezi River

Our first set of findings concern the demographic patterns of settlements along the river, especially the distribution, size, permanence and age of settlements. Settlements were found on

**Figure 1**

Villages and fishing settlements enumerated in the 2002 frame survey of the Upper Zambezi River (adapted from Abbott *et al.* 2003).

both sides of the river along the whole length of the survey area (Figure 1). We recorded 18 settlements (25 percent) on the Namibian side of the river, while 54 (75 percent) settlements were on the Zambian side. Settlement population was estimated by recording the number of households per site. A household in this context was defined as a collection of people who regularly eat together. Hence, there could be several individual structures within a single household with several related and unrelated individuals living within them. A total of 1,709 households were enumerated, with 1,643 households on the Zambian side and 66 households on the Namibian side. Zambian settlements were on average denser (30 households per settlement) in comparison to Namibian settlements (average 3.6 households per settlement).

Settlements varied according to how many months they were occupied. According to village indunas, most Namibian settlements were considered seasonal (61 percent), while most Zambian settlements were considered permanent (61 percent). Most Namibian households were in seasonal settlements, while most Zambian households were in permanent settlements and the difference in distribution is statistically significant (Table 1). However, the majority of both Namibian settlements (69 percent) and Zambian settlements (67 percent) were occupied for at least nine months of the year.

The reported age of settlements varied from one year to up to nine decades. Almost half (41 percent) of all settlements had been established within the last 20 years. The majority of Namibian (61 percent) settlements were less

Table 1

Estimated households in fishing settlements covered during the 2002 frame survey of the Upper Zambezi River¹ (Significant; $\chi^2 = 36.30$, $p \leq 0.0001$)

	Seasonal	Permanent
Namibia ($n = 66$)	40 (61%)*	26 (39%)*
Zambia ($n = 1,643$)	438 (27%)	1,205 (73%)

¹Three Zambian settlements were omitted from this analysis, as in the first two cases the number of households was not given and in the last case a household estimate of over 3,000 was given, suggesting that household number was confused with settlement population in a relatively large settlement (Mambova).

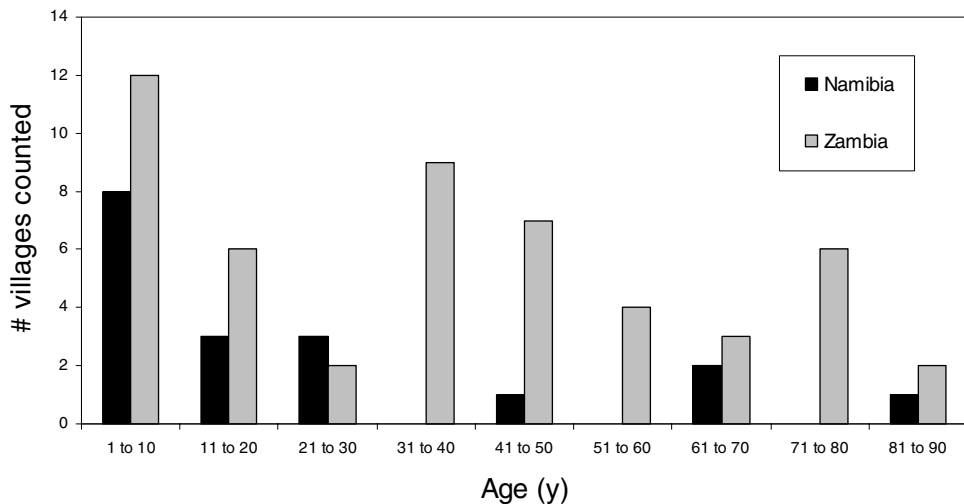
*Cell χ^2 residual value above 2 or below -2.

than 20 years old, while the majority of Zambian (61 percent) were between 30 and 90 years old (Figure 2).

Fisher characteristics and assets: Of the 541 fishers interviewed, 98 (18 percent) were Namibian and 443 (82 percent) were Zambian. Only four of the fishers interviewed were female. It is important to note that our results do not reflect the total number of people who may fish in the survey area. Women and children who reside in permanent settlements often use hook and line

or mosquito nets to catch fish as an important supplement to their diet. While their exclusion may be potentially problematic in terms of understanding fisheries livelihoods and the impact of management interventions on local inhabitants, the research focused on fishers using dugout canoes and nets for three reasons: First, the types of artisanal fishers recorded in our study are those normally targeted by management interventions like TBNRM and CBNRM. Second, fishing with mosquito nets are most frequently practiced when water is draining out of the floodplains and illegal and controversial; hence users would be unlikely to reveal their fishing practices to our survey team. Finally, catches from mosquito nets, along with hook and line fishing, are very small compared to gill and dragnet fishing (Næsje *et al.* 2003).

The fishers inhabiting the settlements came from a broad range of ethnic backgrounds, with 11 different ethnic groups present in the region. The most common ethnic groups overall were Lozi and Subia, accounting for 61 percent and 20 percent of fisher affiliations overall. Namibian settlements were overall much less diverse, with only four ethnic groups recorded and over 90 percent of respondents belonging to one of the two major ethnic groups. In Zambia, 11 ethnic

**Figure 2**

Age frequency histograms of Namibian and Zambian settlements enumerated in the 2002 frame survey of the Upper Zambezi River.

Table 2

Fishing assets and activities reported by fishers surveyed during the 2002 frame survey of the Upper Zambezi River

	Boat & net	Boat only	Net only
Fishing asset ownership by fishers (Significant: $\chi^2 = 16.02, p \leq 0.05$)			
Namibia ($n = 98$)	84 (86%)*	7 (7%)*	7 (7%)*
Zambia ($n = 443$)	288 (65%)	80 (18%)	75 (17%)
	Gill nets	Dragnets	Both gill and drag
Fishing activity (Significant: $\chi^2 = 7.90, p \leq 0.001$)			
Namibia ($n = 94$)	87 (93%)	4 (4%)	2 (2%)
Zambia ($n = 409$)	351 (86%)	52 (13%)	2 (<1%)
			Hook and line
			1 (1%)
			4 (1%)

*Cell χ^2 residual value above 2 or below -2.

groups were recorded and 78 percent of fishers belonged to the Lozi or Subia ethnic groups.

Fishing assets recorded consisted of *mokoros* (dugout canoes) and fishing nets (Table 2). While there is a statistically significant difference in the numbers of Namibians and Zambians identifying different assets, the majority of fishers in both instances own both a boat and a net. Proportionately more Namibians owned both, while a higher percentage of Zambians owned either just a boat or just a net.

The most common fishing gear used by fishers were nets. Nets can be distinguished between gill nets and dragnets. Gill nets are typically set overnight for passive capture of fish, whereas dragnets are actively pulled through the water. While there is more gear on the Zambian side (reflecting the larger population), most fishers on both sides of the river use gill nets and there is no statistically significant difference in the numbers of Namibian and Zambian fishers using gill or dragnets (Table 2). Both groups used similar mesh sizes (Figure 3). The majority of nets reported by fishers had a mesh size between 63 and 76 mm.

Rules and authority: National law in both countries does not distinguish access and tenure between different types of fresh water bodies. However, customary law in the Upper Zambezi floodplains does provide for kin-linked tenure of permanent and ephemeral ponds and waterways (*silalanda*) as described above. We therefore wanted to know how tenure and access might vary throughout the survey area. Of those fishers interviewed, only 16 percent of Namibian fish-

ers and 17 percent of Zambian fishers indicated that permission was needed to fish. Thus, most fishers on both sides of the river see the fishery as predominantly open access. Those who responded that permission was needed to fish identified specific bodies of water where permission was required, with Namibian fishers identifying *mulapos* (small seasonal or permanent lakes) most frequently (62 percent) and Zambian fishers identifying streams most frequently (39 percent) (Table 3). There was a significant difference in Namibian and Zambian fisher responses to this question.

A total of 60 percent of Namibian fishers and 32 percent of Zambian fishers said that no fishing methods were prohibited (statistically significant difference, $\chi^2 = 27.72, p < 0.0001$). Among the remaining fishers, small mesh nets (note that the specific minimum mesh size was not asked) were the most frequently cited as banned by Namibians versus dragnets by Zambians (Table 3). The differences in responses by Namibian and Zambian fishers are statistically significant, although the conditions for a χ^2 test are violated since no Namibians identified closed seasons as a management measure. One method does stand out; while 20 percent of Zambian identified close seasons as a management method, no Namibians did so. Fishers who cited certain methods as being prohibited or management measures were also asked if illegal fishing took place and 59 percent of Namibians and 56 percent of Zambians agreed that it did (no significant difference, $\chi^2 = 0.1275, p = 0.7210$).

Fishers who cited management restrictions were also asked who was responsible for making

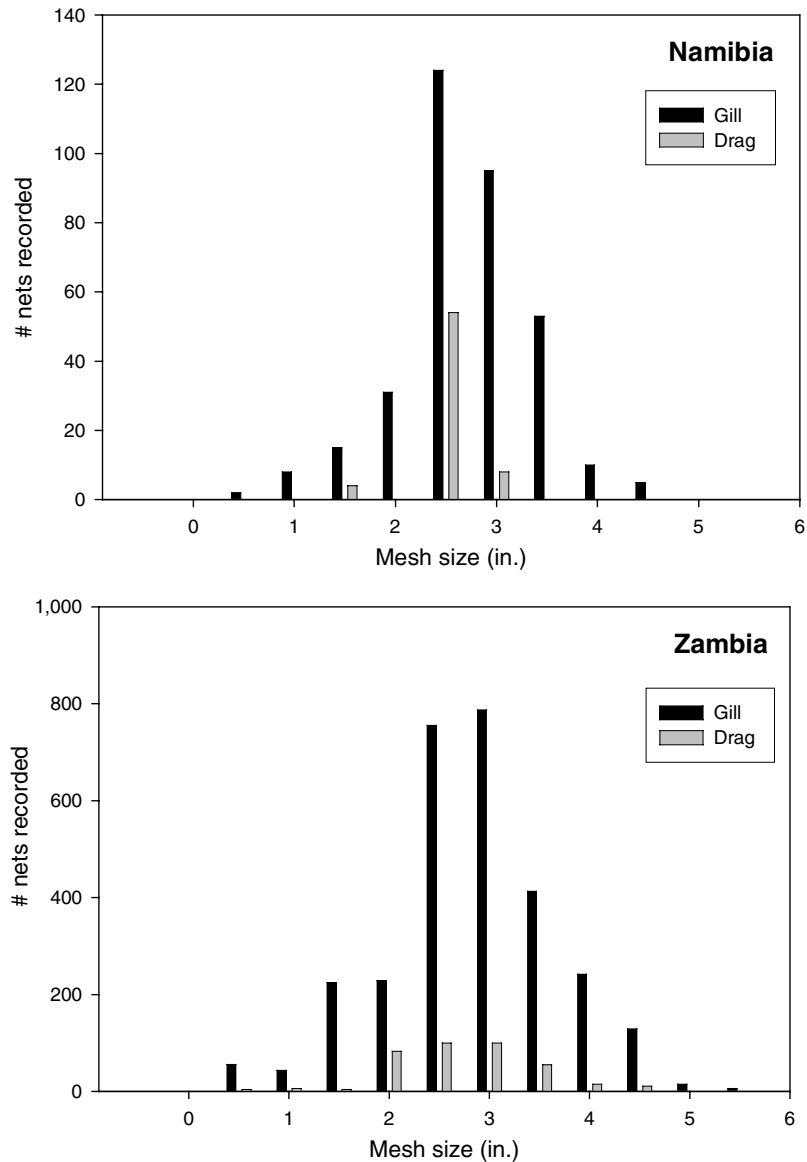


Figure 3

Frequency distribution of mesh sizes of nets reported by Namibian and Zambian fishers surveyed in the 2002 frame survey of the Upper Zambezi River.

and enforcing restrictions. Of these, 62 percent of Zambian fishers said that the government was responsible for restricting methods and enforcing rules, while 54 percent of Namibian fishers identified traditional authorities as responsible

(Table 3) and the differences in responses are statistically significant.

Perceptions of conflict: When asked if fisher-related conflicts occurred in their area, less than

Table 3

Perceptions of fishing rules and authority for enforcement reported by fishers surveyed during the 2002 frame survey of the Upper Zambezi River

Fishing areas identified as needing permission to use for fishing

Respondents could identify more than one area (Significant: $\chi^2 = 15.9$, $p \leq 0.01$)

	Main channel	Streams	Mulapos	All areas
Namibia ($n = 16$)	4 (25%)	1 (6%)	10 (62%)*	1 (6%)*
Zambia ($n = 77$)	27 (35%)	30 (39%)	13 (17%)*	7 (9%)*

Fishing methods identified as prohibited, or management measure used

Respondents could identify more than one method or measure

	Nothing	Small mesh	Lamp ¹	Dragnets	Bashing	Closed Season	Poison
Namibian ($n = 98$)	59 (60%)	27 (28%)	7 (7%)	8 (8%)	8 (8%)	0	2 (2%)
Zambian ($n = 443$)	141 (32%)	98 (22%)	58 (13%)	30 (28%)	40 (9%)	91 (20%)	3 (1%)

Institutions identified as implementing prohibited fishing measures

(Significant: $\chi^2 = 14.98$ $p \leq 0.001$)

	Government	Traditional authority	Both
Namibia ($n = 39$)	16 (41%)	21 (54%)*	2 (5%)
Zambia ($n = 302$)	187 (62%)	74 (24%)	35 (12%)

¹ 'Lamp' fishing involves fishing at night using a light to attract fish, which are then speared. 'Bashing' (*kutumpula*) is done by striking the water with a broad piece of wood to scare fish from vegetation into nets.

*Cell χ^2 residual value above 2 or below -2.

a fifth of Namibians (18 percent) and just over a quarter (28 percent) of Zambian fishers responded that they did (no significant difference in perceptions of whether or not conflict exists, $\chi^2 = 3.678$, $p = 0.06$), suggesting that conflict is not a major issue for the majority of fishers on both sides of the river. Among those who did perceive conflict, Namibians identified Zambians as the greatest source of conflict, followed by fellow Namibians in general and their immediate neighbours. Zambians identified other Zambians and their immediate neighbours as the largest sources of conflict, while few Zambians identified Namibians as sources of conflict (Table 4). Namibians perceived fishing without permission as the greatest source of conflict, while Zambians saw sources of conflict spread equally between access, fishing practices and too many nets (Table 4), but these differences were not statistically significant.

Opinions on management: When asked, 49 percent of Namibians and 79 percent of Zambians said that the fishery should be managed and the difference is significant ($\chi^2 = 37.21$, $p < 0.0001$). Of Namibians and Zambians who

supported management, the majority of both groups identified their respective national government as being the most suitable to manage fisheries (Table 5). Following this, Zambians then preferred co-management by governments and traditional authorities, while traditional authorities were identified by 25 percent of Namibians and 9 percent of Zambians as most suitable. The differences in responses by Namibian and Zambian fishers regarding management regimes are statistically significant.

The purpose of fishing regulations was regarded by most fishers of either group to be for 'conserving fish' (85 percent of Namibians and 93 percent of Zambians), with very few identifying 'keeping outsiders away' as a reason for regulation (Table 5). There were no significant differences according to nationality regarding purpose of management.

Discussion

We begin by first summarizing and discussing our results. Then, we consider what implications our results have for hybrid CBNRM-TBNRM fisheries management in the region.

**Table 4**

Perceptions of conflict reported by fishers surveyed during the 2002 frame survey of the Upper Zambezi River

	People here	Namibians	Zambians	Namibians & Zambians
Sources of conflict by group				
Namibia (<i>n</i> = 18)	1 (5%)	3 (17%)	14 (78%)	0
Zambia (<i>n</i> = 123)	46 (37%)	16 (13%)	60 (48%)	1 (1%)
	Fishing without asking		Banned methods	Too many nets
Sources of conflict by cause (Not significant: $\chi^2 = 4.19, p \leq 0.10$)				
Namibia (<i>n</i> = 18)	9 (50%)		7 (39%)	2 (11%)
Zambia (<i>n</i> = 123)	40 (32%)		41 (33%)	42 (35%)

Table 5

Views of future management reported by fishers surveyed during the 2002 frame survey of the Upper Zambezi River

	Government	Both	Traditional authority
Preference for regulating institution			
(Significant: $\chi^2 = 11.28, p \leq 0.01$)			
Namibia (<i>n</i> = 48)	27 (56%)	9 (19%)	12 (25%)*
Zambia (<i>n</i> = 350)	219 (62%)	99 (28%)	32 (9%)*
	Conserve fish	Keep outsiders away	Both
Purpose of fishing regulations			
(Not significant: $\chi^2 = 5.79, p \leq 0.10$)			
Namibia (<i>n</i> = 48)	41 (85%)	3 (6%)	4 (8%)
Zambia (<i>n</i> = 345) ¹	322 (93%)	5 (1%)	18 (5%)

¹Five responses missing.*Cell χ^2 residual value above 2 or below -2.

There has been a change in the numbers of settlements on the river over the course of the last twenty years, with over a third of all riverside settlements and almost two-thirds of Namibian settlements, having been established in the last twenty years (Figure 2). These findings support anecdotal accounts from Namibian fishers that numbers of fishing settlements, fishers and fishing activity have increased over time, trends that may reflect endogenous population growth (Mendelsohn and Roberts 1997) and perhaps an increased importance of fishing for some households (Abbott 2005). While we do not have reliable historical data on fishing exploitation to compare against present levels, we assume that

as settlements along the river have increased, so has fishing activity.

Other political, historic, and geographic factors have likely contributed to settlement patterns. Politically, the end of South Africa's occupation of Namibia in 1990 led to a cessation of border hostilities as well as increased freedom of movement for Namibians. Historically, the larger overall number of fishers and settlements on the Zambian side of the river reflects the long occupation and active commerce on the northern bank of the Zambezi River in both pre-colonial and colonial eras (Gluckmann 1968). By contrast, during colonial and pre-colonial times the Namibian side of the river was used largely as a source of fish, reeds or grazing, with relatively few people actually living along the river (Gluckman 1968; Prins 1980; Fisch 1999; Herbert 2002, 78 & 97). This settlement pattern was and is linked to geography, as the Namibian side's higher likelihood of inundation makes settlement more difficult and explains why the majority of Namibian settlements are seasonal rather than permanent.

The ethnic diversity in Zambian and Namibian settlements is an outcome of pre-colonial ethnic distributions as well as the colonial and post-colonial institutions that maintained them. The area of Zambia covered in our survey is a zone of convergence for several different ethnic affinities and this reflects the long history of commerce in the region. In contrast, the Namibian area is mainly composed of two major ethnic groups that historically dominated in the area. While most Namibians living along the river have relatives on the Zambian side of the river, border

restrictions during the South African occupation of Namibia and particularly during the bush war of the 1970s and 1980s, prevented cross-border migration. In addition, historical reports and recent events (such as the attempted secession of the Caprivi Region in 1999) suggest that inhabitants of the Namibian part of the floodplains are more resistant to migration or union with other areas (Stanley 2002).

The similarity in the types of fishing assets on both sides of the river, as well as the similarity in mesh sizes used by Namibian and Zambian fishers reflects the biological and social nature of a floodplain fishery. Given the high variability of the resource, it makes more sense for participants in a fishery, regardless of their income, to invest in very simple assets, such as monofilament nets and dugout canoes with investments going into increasing the number of units, rather than technology (Scudder and Conelly 1985; Jul-Larsen *et al.* 2003). In this way, participants in the fishery can more easily enter or leave as opportunity costs change, due in part to the seasonality of floodplain fisheries (Welcomme 1985; Allison and Ellis 2001).

While the *types* of fishing assets used are similar, our survey found a significant difference in the *proportion* of asset ownership. Namibian fishers were more likely to own both boats and nets. At the national scale, Namibian fishers are part of a stronger economy and currency than Zambia, as well as a formalized system of social pensions (Devereux 2001). Namibian fishers may therefore have greater potential access to income that can in turn be invested in individual fishing assets.

Gill nets were the predominant fishing gear used throughout the survey area. While the difference in the use of gill versus dragnets was statistically insignificant, a higher proportion of Zambians used dragnets and it is worth considering these differences in the context of the overall size of the population of fishers in Namibia and Zambia. Gill netting is a passive fishing method that can be done by one fisher in a dugout, while dragnetting is an active method, requiring teams of two or more fishers. The higher proportion of dragnet use amongst Zambian fishers may be related to the apparent lower levels of individual net ownership, favouring group activity. Similarly, the higher ownership of both nets and boats by Namibians may be out of necessity, as there are

not enough fishers to work cooperatively. However, since our survey did not include questions about collaborative fishing activity, we can not confirm this supposition. Further research on the social norms of fishing is required.

A low number of respondents claimed that permission is needed to fish and almost one third of Zambians and two thirds of Namibians reported that no fishing methods were prohibited. These findings support the claim by Scudder and Conelly (1985) as well as Béné *et al.* (2003) that most floodplain fisheries have low levels of management. The differences in areas identified as needing permission for access (Table 3), i.e., the much higher percentage of Namibian's claiming permission is needed to access mulapos, may reflect the physical differences of each side: the more floodplain-dominated topography of the Namibian side results in more watercourses and pools and hence more potential for tenure over these distinct water bodies. Regardless, concerns about access to mulapos must be seen in the context of overall low levels of concerns about access among Namibians. A similar situation was reported in case studies by Hitchcock (1995) and Olomola (1998) regarding access rules for river fishing in Botswana and Nigeria, respectively. While outsiders were expected to ask the ostensible 'owner' of a body of water for permission to fish, in most cases permission was given and it was only in extreme situations, such as drought, that exclusion might occur.

The broad and varying range of prohibited fishing measures reported by fishers is likely due to the fact that the survey spanned two provinces and wards with traditional authorities that have potential roles in fisheries management. These overlapping institutions have led to a mosaic of different fishing management policies and enforcement measures. This finding is also reflected in a related study of fisheries regulations and the level of traditional authorities, where specific prohibited measures varied between the boundaries of each traditional authority along a 100 km stretch (Purvis *et al.* 2003). This situation is typical of transboundary resources, with multiple users responsible to different authorities, with different rules, capabilities and means of enforcement (Jones and Chonguica 2001). The significant difference between the number of Zambians and Namibians believing that no



methods are prohibited is likely accounted for by the fact that Zambia has standardized rules that, while not evenly enforced, are likely known by fishers.

The difference in the apparent role of government and traditional authorities in each country is also influenced by the priority each country's government gives to inland fisheries. In Zambia, fisheries are part of a cabinet-level Ministry, with decentralized offices throughout the country (P. Kapaasa, DFO staff, personal conversation with J. Abbott, July 2002). Thus, the national government has played a role in local fisheries management to date. In Namibia, fisheries in general have a more influential profile as a government responsibility; however, most emphasis is given to marine, rather than freshwater, fisheries. At the time of research, there was no inland fisheries legislation and limited extension services. Moreover, Namibian fisheries administration is highly centralized. At the time of the survey, the closest inland fisheries office to the Caprivi was located over 1,000 km to the south. Thus, while government is ostensibly responsible for management, the present institutional and policy vacuum means that fisheries management is limited, explaining the perception amongst most Namibian fishers that no methods are prohibited.

Illegal fishing was reported to occur, with Zambians being identified as the most common culprits by fishers on both sides of the river. This can be explained in a number of ways. (1) The absolute numbers of fishers on either side also make it more likely that Zambian fishers are illegally fishing, at least visibly so, or that conflict between fishers involve Zambians. (2) The geography makes the Namibian side more desirable, so fishing without permission or out of territory is more likely. (3) Diversity of ethnic groups in Zambia means that the outsider/insider divide is not just between Zambians/Namibians—Zambians identify other Zambians as part of the problem. The paramount Chief and other representatives of the traditional authority in Mwanzi (Zambia) area have cited a growing trend of 'outsiders' moving from other areas of Zambia and establishing themselves along the river.

Given the prevalence of fishing as a livelihood in households with access to fishing throughout the study area (Abbott 2005) and the perception of illegal fishing occurring, it is not surpris-

ing that an albeit low number of fishers report fisheries-related conflicts. Zambians are cited as the most frequent group with whom conflicts occur by both sides. However, the causes of conflicts are different on either side of the border. Namibians identify access and methods as being equally important sources of conflict but hardly mention the issue of too many nets, whereas Zambian conflicts are spread equally amongst the three categories. One potential explanation for this difference is that due to the floodplain's topography, tenure-related water bodies (such as streams and mulapos) occur more frequently on the Namibian side; hence asserting tenure over these areas may be a greater issue for Namibians.

Only three-quarters of Zambian fishers and less than half of Namibian fishers perceived a need for fisheries management. The majority of fishers that did see a need for management supported management by government over traditional authorities. The stated support for government may be biased by the fact that the frame survey itself was led and conducted in part by government staff. The higher level of support amongst Namibians for management by traditional authorities may be due to the history of devolution of responsibility for fisheries to the local level, which had only lapsed into ambiguity in 1990. By contrast, traditional authorities on the Zambian side of the river had experienced increased curtailment of their powers, both related to fisheries and in general, upon independence in 1964 (Bell-Cross 1974; Flint 2003). Limited backing for management by both government and traditional authorities could be due to the novelty or inherent ambiguity of the concept of co-management itself (e.g., Agrawal and Gibson 1999), especially in areas with overlapping national and traditional administrations and borders.

Perceptions about the rationale of regulations gave a promising result, as most Zambians and Namibians identified with the concept of conserving fish stocks, rather than excluding others as the goal. This is cause for optimism that regulations will be used in a productive way to overcome issues of access and method cited, despite the current environment of conflict.

What implications do these results have for emerging hybrid CBNRM and TBNRM efforts in the area? We address four important aspects of this question, namely, the growth and asymmetry

of population and fishing effort in the area, similarities in fishing assets and activity, sources of conflict (related to fishing and otherwise) and management capacity.

The asymmetry in settlement patterns has two potential consequences for CBNRM and TBNRM. The number of settlements, high population, and ethnic diversity on the Zambian side of the river will make CBNRM more complex, as there are more stakeholders to consider and more 'communities' to account for. Community-based management in Namibia may be less complicated and Namibians were more supportive of management by traditional authorities. For TBNRM, Zambian fishers may claim larger representation and access to more fishing, particularly the productive fishing grounds in the Namibian portion of the floodplain, as Zambians are both more numerous and their settlements are more permanent. Namibian fishers would undoubtedly perceive their minority status under TBNRM with some concern.

The significance of potentially higher levels of fishing and smaller mesh sizes to CBNRM and TBNRM is ambiguous. Highly variable fisheries such as floodplains appear to be relatively robust to high levels of exploitation compared to temperate fisheries (Jul-Larsen *et al.* 2003; Welcomme 1985), meaning that limited management intervention may be needed. Furthermore, the similarity in fishing assets and patterns of exploitation amongst fishers implies that what management intervention might take place could be relatively simple and uniform, a prospect appealing to proponents of both CBNRM and TBNRM. Nevertheless, the asymmetry in topography means differences in tenure and management demands can lead to 'conflicts of assignment' (Oström *et al.* 1994), when fishery resources are not spread evenly, causing some fishing grounds to be more productive and hence more desirable, than others. In effect, conflicts may arise not due to resource *scarcity*, but rather resource *distribution* (e.g., Turner 2004, 871). Potential conflicts over access to fishing may be especially apparent since most of the floodplains and in turn, the most suitable fishing grounds, lie within Namibian territory.

Existing sources of fishery-related conflict reported in our results lend support to the significance of asymmetry in settlement. Most respon-

dents identified Zambians as being the greatest source of conflict, a reasonable finding considering that Zambians are the most numerous. The ethnic diversity of Zambian settlements makes CBNRM and TBNRM more challenging. From a broader context, inhabitants of the area are likely to invoke a broad range of identities, ranging from family to region, influencing how claims to different resources are asserted. These fluid points of reference do not easily fit into the view of a repaired social fabric envisioned by some advocates of TBNRM.

Similarly, the differences in levels and degrees of management as well as in the capacity to manage inland fisheries challenge efforts to make management locally relevant and consistent under CBNRM/TBNRM. The Namibian government has a limited (but growing) presence in fisheries management in the region, both in terms of infrastructure and local legitimacy. The mixed views regarding the most appropriate institutions for managing fisheries pose similar potential difficulties. The majority of fishers' support for government management in either country reflects experiences with specific governments, which differ considerably in the case of Namibia and Zambia. In Zambia, the national government is responsible for fisheries management and indeed assumed considerable responsibility from traditional authorities upon independence. By contrast, until 1990, Namibian government policy mandated responsibility for fisheries management to traditional authorities. Hence, support for the government by Zambian and Namibian fishers may carry different assumptions of the role of other institutions.

The rationales that fishers (as well as other stakeholders, including NGOs and states) use to support different institutions may arise not out of an institutions' potential to manage, but rather the degree to which its legitimacy is reinforced. For example, traditional authorities and NGO-TBNRM initiatives may both back community-level management, but for different reasons. Support of CBNRM legitimizes already existing traditional authority structures; whereas for NGOs, a focus on the local scale makes national boundaries seem all the less relevant, backing a rationale for TBNRM. Fishers meanwhile may support government management because it has been so limited to date.



Conclusion

Current efforts to incorporate aspects of community and ecosystem in the management of transboundary resources in southern Africa have been critiqued on the basis that differences in inhabitants' characteristics, livelihoods and attitudes towards management are overlooked, or at best assumed to largely correspond with goals of regional collaboration. These issues become particularly important when there is a high potential for variation in livelihoods and management, such as when neighbouring states have contrasting socio-economic environments, or the livelihood itself is inherently variable, such as artisanal fisheries.

We have described an example of a shared fishery resource in a river that also acts as an international boundary. The low level of management reported throughout the area is characteristic of floodplain fisheries and implies that a hybrid arrangement could be made amenable to variable intensity of fishing and movement of fishers. Despite the apparent differences in the socio-economic and political environments of Namibia and Zambia, fishers on both sides of the river have similar assets and fishing behaviour. There was support amongst fishers surveyed on both sides of the river for management of the fisheries. Moreover, the most frequent rationale reported by fishers to justify management, namely, the conservation of fisheries, is encouraging as it does not immediately presume that one group has more of a claim over resources than another. The conflicts reported by Namibians are largely linked to requesting permission to fish in an area, rather than outright encroachment (Table 4). This suggests that negotiation, rather than strict rules of tenure and access, may be a more suitable approach to manage the area's fisheries.

It is tempting to assume enough common ground and flexibility exists between users, livelihoods and institutions to make hybrid fisheries management an appealing option. Our findings do not necessarily contradict this view. However, we underline the constant risks of oversimplification inherent in CBRNM and TBNRM and how these conceptual flaws may be magnified in hybrid management of resources. Management of the fishery as an ecosystem addresses fluctua-

tions in the availability of fish and fishing areas. However, the spatial asymmetry of fishers and fishing effort makes it likely that management at the community scale will focus on access and use of Namibian resources by Zambian fishers. The greatest challenges in attempting to blend ecosystem and local scales will not arise from how it affects the management of the fishery, but rather on the myriad of social and political identities that are reinforced, challenged or created by the process.

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