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Early steps for successful management in small-scale fisheries: An analysis of fishers', managers' and scientists' opinions preceding implementation

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ABSTRACT

This study analyzes fishers', managers' and scientists' opinions on management measures to facilitate the initiation of management processes towards more sustainable small-scale seagrass fisheries in Zanzibar, Tanzania. The results show that most fishers and managers agreed on the need to include seagrasses specifically in future management. There was further agreement on dragnets being the most destructive gears, and the use of dragnets being a major threat to local seagrass ecosystems. Gear restrictions excluding illegal dragnets were the favored management measure among fishers. Differences between fishers and managers were found concerning seaweed farming, eutrophication and erosion being potential threats to seagrass meadows. A majority of the interviewed fishers were willing to participate in monitoring and controls, and most fishers thought that they themselves and their communities would benefit the most from establishing seagrass management. Co-managed gear restrictions and the inclusion of different key actors in the management process including enforcement are promising starting points for management implementation.

1. Introduction

To maintain, or ideally to improve people's livelihoods by sustainably managing the resources they depend on, is one of today's biggest challenges. The degradation of marine resources due to intense fishing pressure and the use of non-sustainable gears is a global concern (Jackson et al., 2001; Myers and Worm, 2003; Berkes et al., 2006). However, in fisheries management, the positive outcomes managers strive for when designing protected or restricted areas are often not reached after implementation (McClanahan, 1999; Pitcher and Lam, 2010). It has been highlighted that participation of fishers in planning, decision-making and governance is crucial for the success of management schemes which restrict access to fishing grounds (Jentoft and McCay, 1995; Jentoft et al., 1998; Berkes, 2009; Jentoft et al., 2012). Further, perceptions and common values and goals among stakeholders and resource users have been pointed out to be of highest importance for sustainable management (McClanahan et al., 2005b; Gelcich et al., 2006; Gelcich et al., 2007). The chances of management to be successful increase when fishers and managers share preferences for certain management measures and cooperate on their implementation (Jentoft et al., 1998; Defeo and Castilla, 2005), and shared attitudes can improve compliance and reduce the costs of enforcement (McClanahan

et al., 2004). These attitudes, perceptions and actions which fishers and managers share or which deviate from each other, are in turn based on values, images and principles which shape their worldviews (Song et al., 2013). The more diverse the stakeholders' and managers' images are, the more complex to govern are the fisheries (Jentoft et al., 2012). In many cases, the images and perceptions of resource users may deviate substantially from those of managers, which can lead to misunderstandings, confrontations and even challenge the overall governability of a fishery system (Jentoft and Chuenpagdee, 2009; Song et al., 2013). Attitudes to management can also differ between and within groups of fishers, for example with varying management experiences (Gelcich et al., 2005) or between different gear users (Blyth et al., 2002; de la Torre-Castro and Lindström, 2010). In such situations, it is valuable to explore the priorities of the different stakeholder groups, which can build respect and trust and can help to identify areas of agreement (Hicks et al., 2013). Therefore, the assessment and comparison of perceptions and opinions is a constructive first step towards communicating, rationalizing and bringing them into convergence for implementation (McClanahan et al., 2005b; McClanahan et al., 2009; Jentoft et al., 2012).

Most studies on attitudes and perceptions of resource users are conducted *after* new rules or restrictions already have been implemented.

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However, studies of fishers' and managers' opinions preceding management implementation can be a valuable first step, as they might help to decide how to proceed and may be decisive for the outcome of the management process (Chuenpagdee and Jentoft, 2007).

Seagrasses fulfill a key role in the marine environment (e.g. Short and Green, 2003) and the global importance of seagrass-associated small-scale fisheries as social-ecological systems has recently been highlighted (Cullen-Unsworth et al., 2014). This study was conducted in Zanzibar, Tanzania, where seagrass-associated fisheries play an explicitly important role for the livelihoods of local communities (Gullström et al., 2002; de la Torre-Castro and Rönnbäck, 2004; Nordlund et al., 2010). For certain fishing communities in Zanzibar, seagrasses have even been shown to serve as the most frequently visited fishing grounds (de la Torre-Castro and Rönnbäck, 2004; de la Torre-Castro et al., 2014). Despite their importance for local livelihoods, seagrass ecosystems receive only little attention in research, management and policy compared to other marine habitats (Duarte et al., 2008). Recent studies emphasize the need for an inclusion of all key ecosystems in coastal management and explicitly seagrasses and their social dimensions (Unsworth and Cullen, 2010; de la Torre-Castro et al., 2014). In Zanzibar, current management efforts of marine resources appear to focus on the protection of corals for tourism benefits rather than fish provision services (de la Torre-Castro, 2012b), and there are to the authors' knowledge currently no national laws, rules, regulations or management plans focusing on or including seagrasses specifically.

The background of Zanzibar's small-scale fisheries is, among other factors, shaped by weak resource user participation in management, low compliance, negative experiences from past management efforts, lack of seagrass-specific incentives and newly planned efforts on monitoring and enforcement. We consider the need for improved management in the area, and act on the assumption that management is more likely to be successful if resource users support it. Consequently, the main objective of this study is to assess agreements as well as differences in fishers' and managers' attitudes and opinions towards management of seagrass-associated small-scale fisheries *a priori* rather than after management implementation. We identify areas of congruence and/or disparity between fishers' and managers' views, which can contribute as a basis for communication among stakeholder groups, which in turn enables the process of reaching equitable solutions for future seagrass management. The four specific aims were to assess and compare the fishers' and managers' opinions concerning i) the importance, current state and eventual need for management of local seagrass ecosystems, ii) the present threats to seagrasses and measures to lessen them, iii) the readiness of fishers to adopt different management measures and iv) the fishers' willingness to participate in monitoring as well as the perceived distribution of benefits of seagrass management. The results of this study contribute insights for a valuable step towards the co-management of seagrass fisheries in Zanzibar, where fishers are not only at the receivers' end, but are active players in the implementation and preceding steps (Chuenpagdee and Jentoft, 2007).

2. Methods

2.1. Study site description

The data was collected in Unguja Island in the Zanzibar Archipelago, situated ca. 50 km outside of Tanzania (hereafter referred to as 'Zanzibar'). Typical for Zanzibar's coastlines are shallow lagoons with coral reefs, seagrass beds and in certain areas mangrove forests. As in coastal East Africa in general, small-scale fisheries are of highest importance as a source of food and income for Zanzibar's population (Jiddawi and Öhman, 2002; DoFD, 2010; de la Torre-Castro, 2012a; Thyresson et al., 2013). In Tanzania including Zanzibar, 95% of all marine catches originate from small-scale fisheries (Jiddawi and Öhman, 2002), and a big part of Zanzibar's population is directly dependent on

fisheries resources (DoFD, 2010). Many fishers are marginalized and live close to the extreme poverty line of US\$ 1.25 per day (de la Torre-Castro et al., 2014). Local finfish-fisheries employ roughly 34,000 people, the majority of which are men, are predominantly low-tech and generate low income (Jiddawi and Khatib, 2007; DoFD, 2010; Frocklin et al., 2013). Due to the dominance of low-technology gear and non-motorized fishing vessels, most fishers operate in shallow inshore waters at patchy and fringing coral reefs and seagrass beds, resulting in a heavy fishing pressure on these ecosystems (de la Torre-Castro et al., 2014). Typical fishing vessels used are dugout canoes, outrigger canoes or wooden boats with sails but also engine-driven wooden boats or fiberglass boats are used to some extent (Jiddawi and Khatib, 2007). A high variety of fish species is targeted and fishing gears used are mainly of traditional character (including 'madema' basket traps, smaller nets and handlines), but also more modern gears are used (like larger gillnets, beach seines or spear guns (DoFD, 2010)). The fish catches are used for own consumption as well as sold to local markets and fish traders, restaurants or hotels (Thyresson et al., 2013). Fisheries related activities like processing and trading employs another 2900 people (Lange and Jiddawi, 2009), whereof many women (Frocklin et al., 2013).

In many areas of Zanzibar's coast, local fishing communities used traditional systems for self-regulation to avoid overexploitation (Jiddawi, 1998). Due to population growth, migration, few employment opportunities, growing tourism and the open access fisheries character however, the demand for marine resources is growing and signs of overexploitation of near-shore ecosystems have been reported (Tobisson et al., 1998; Jiddawi and Öhman, 2002). The use of destructive gears like dragnets and nets with small mesh-sizes (which dragnets often are) endangers, among other factors, a sustainable provision of marine resources due to their damaging effect on habitats like seagrasses and corals or catches of undersized fish (McClanahan and Mangi, 2001; Jiddawi and Öhman, 2002; Mangi and Roberts, 2006). The fishing communities in Zanzibar are heterogeneous e.g. in terms of used fishing gears or attitudes and opinions concerning the government (Lindström, 2012). As managing small-scale fisheries is a complex endeavor (Jentoft and Chuenpagdee, 2009), shortcomings in local fisheries management have also been described for Zanzibar (de la Torre-Castro, 2012a; Lindström, 2012). These are for example illustrated in the use of illegal gears or conflicts over gears and fishing grounds in certain areas (de la Torre-Castro and Lindström, 2010). De la Torre-Castro (2012b) describes that the "dominating focus on conservation, the lack of a holistic approach and failure to consider resource users seriously" have led to unsuccessful management, and that current management plans often miss the context of poverty and resource dependency. Promising approaches for the management of such small-scale fisheries have been suggested to be the seascape approach in combination with co-management and ecosystem stewardship, and a focus on resource users as central actors (Chapin et al., 2010).

In Zanzibar's National Integrated Coastal Management (ICM) Strategies, an emphasis is put on community involvement in fisheries management (ICM, 2003). For the time being however, the communities' participation is mainly regulated in top-down fashion (Lindström, 2012) rather than through self-organization and –mobilization which has been emphasized as an essential starting point for successful fisheries co-management (Chuenpagdee and Jentoft, 2007). However, de la Torre-Castro and Lindström (2010) describe cases of self-organization, but on the purpose of defending fishing gears, fishing grounds and fishing rights in times of conflict rather than to act for environmental conservation. Beach recorders, called "Bwana Dikos" in local Swahili, are monitoring agents and build, together with village fishery committees, the links to higher levels of organization like the government and its' ministries and agencies or to international organizations (de la Torre-Castro, 2006; Lindström, 2012). These local committees representing local people on village level have however been described as to be to a substantial part creations of the government and international organizations (Lindström, 2012), and it can be

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