



Hierarchical livelihood outcomes among co-managed fisheries



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ABSTRACT

Collaborative management arrangements are increasingly being used in fisheries, yet critical questions remain about the conditions under which these are most successful. Here, we conduct one of the first comprehensive tests of Elinor Ostrom's diagnostic framework for analyzing social–ecological systems to examine how 16 socioeconomic and institutional conditions are related to the livelihood outcomes in 42 co-management arrangements in five countries across the Indo-Pacific. We combine recent developments in both theory and modeling to address three key challenges among comparative studies of social–ecological systems: the presence of a large number of explanatory mechanisms, variables operating at multiple scales, and the potential for interactions among socio-economic and institutional factors. We find that resource users were more likely to perceive benefits from co-management when they are more involved in decisions, were aware that humans are causal agents of change in marine systems, were wealthier, were not migrants, were in villages with smaller populations and older co-management arrangements, and had clearly established boundaries. Critically, we quantify a number of key interactions between: wealth, dependence on marine resources, involvement in decision-making, and population size that have strong implications for co-management success in terms of livelihood benefits. This study demonstrates that context plays a critical but identifiable role in co-management success.

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1. Introduction

Coastal communities are being increasingly empowered to work with governments and non-governmental organizations to make decisions about fisheries management, in a process known as co-management (Cinner et al., 2012a; Pomeroy and Berkes, 1997). In parts of Africa (Bene et al., 2009; Cinner et al., 2009), South America (Gelcich et al., 2010), and the Pacific (Russ et al., 2004), co-management is being implemented at national scales. This move toward co-management is partially a reflection of the perceived failure of many top-down approaches to fisheries management; recognizing that local resource users are often better placed to develop and implement rules than policy makers in far-off capital cities, but also that local institutions alone may be insufficient to deal with many of the multi-scale challenges facing natural resource management.

By developing locally appropriate rules to limit overexploitation, some fisheries co-management initiatives have improved both ecosystems conditions (Gelcich et al., 2008a; Russ and Alcalá, 1999), and the livelihoods of resource users. For example, in Chile,

a co-management system developed primarily to manage benthic resources has had add-on effects that increase the abundance of key demersal fishes and improve habitat quality (Gelcich et al., 2008b). Although co-management has been successful under some circumstances, it has been unsuccessful under others (Bene et al., 2009; Blaikie, 2006; McClanahan et al., 2006) and a critical research objective is to identify the circumstances under which co-management is most likely to succeed for both resource users and for marine ecosystems (Cinner et al., 2012b; Gutierrez et al., 2011).

A broad body of theoretical and empirical research has found that a range of social and economic conditions can influence outcomes in commons governance arrangements such as fisheries co-management (e.g., Agrawal, 2001; Ostrom, 1990; Ruddle, 1998). These include issues such as local population size, poverty, dependence on natural resources, and social capital among others. For example, the relatively more wealthy may be better poised to capture the benefits of local governance arrangements – a phenomenon often referred to as “elite capture” (Adger and Kelly, 1999; Christie, 2004). Additionally, aspects of how rules and norms guiding human behavior are formed and implemented (often referred to as institutional design principles; Ostrom, 1990; Ostrom and Cox, 2010) can help provide credible structures that encourage resource users to follow the rules. These design principles include mechanisms such as graduated sanctions

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(penalties that increase with the number or severity of infringements), clearly defined boundaries and memberships, and the ability to make and change rules.

The number of socioeconomic and institutional variables that could influence resource management outcomes is large (up to 40 or more; Agrawal, 2001). Importantly these variables operate at different scales, some influence the household or individual, while others affect the community as a whole. In some instances, the interaction of variables at the same or at different scales may also critically influence outcomes. For example, both household wealth and participation in decision-making may influence whether households benefit from co-management arrangements (Cinner et al., 2012b), but given that the wealthy are often able to position themselves in decision-making situations (e.g., Christie, 2004), it is unclear whether these variables interact to create different co-management benefits. Likewise, group size (i.e. a community-scale factor) has been shown to influence people's willingness to engage in collective action (Agrawal and Goyal, 2001), but it is unclear whether and how this relationship interacts with household-scale factors such as poverty. These three issues – a large number of variables, multiple scales, and potential for interactions – make comparative analyses of resource management outcomes particularly challenging, and few studies have had the data or approach to study them simultaneously.

Here, we combine the diagnostic frameworks proposed by Ostrom (2007, 2009) with hierarchical modeling to provide novel insights into how socioeconomic and institutional conditions are related to co-management outcomes. Ostrom's framework structures relationships among a range of variables operating at multiple scales that are thought to influence outcomes in common property situations (see Cinner et al., 2013). Specifically, we use Ostrom's framework as a basis for both our study design and analysis to examine how key aspects of user characteristics and the governance system influence livelihood outcomes in fisheries co-management. Using data from a related study on social and ecological outcomes in fisheries co-management across 42 sites across five Indo-Pacific countries (Cinner et al., 2012b) as a starting point, we ask four theoretically driven research questions to highlight key interactions between factors within and across scales:

- (1) What are the socioeconomic and institutional conditions related to successful livelihood outcomes in fisheries co-management arrangements? This research question aims to identify the most important explanatory factors at both the household and community scales and to provide insights into which factors might merit further investigation.
- (2) Do poorer fishers derive greater livelihood benefits from co-management depending on whether they have a greater number of alternative occupations? This research question investigates the theory that people will buy-in to common property regimes and thereby perceive greater benefits from them when their livelihoods depend on it, but this relationship is influenced by people's relative wealth.
- (3) Does active involvement in decision-making lead to beneficial livelihood outcomes for the poorer members of the communities? This research question relates to the notion that those who are actively involved in decision-making will perceive greater livelihood benefits than those who are not involved, and that relative poverty plays a role in who benefits from such involvement.
- (4) Do the effects of wealth and resource dependency on livelihood benefits from co-management change for fishers across larger and smaller populations? This research question examines how the importance of wealth in facilitating livelihood benefits changes according to the size of the community and the user's level of dependence on the fishery.

2. Materials and methods

2.1. Study sites

We studied 42 independent co-management arrangements spanning five Indo-Pacific countries: Kenya, Tanzania, Papua New Guinea, Indonesia, and Madagascar (Fig. 1). Sites were selected to represent a variety of institutional designs, user characteristics, as well as social, economic, and political settings.

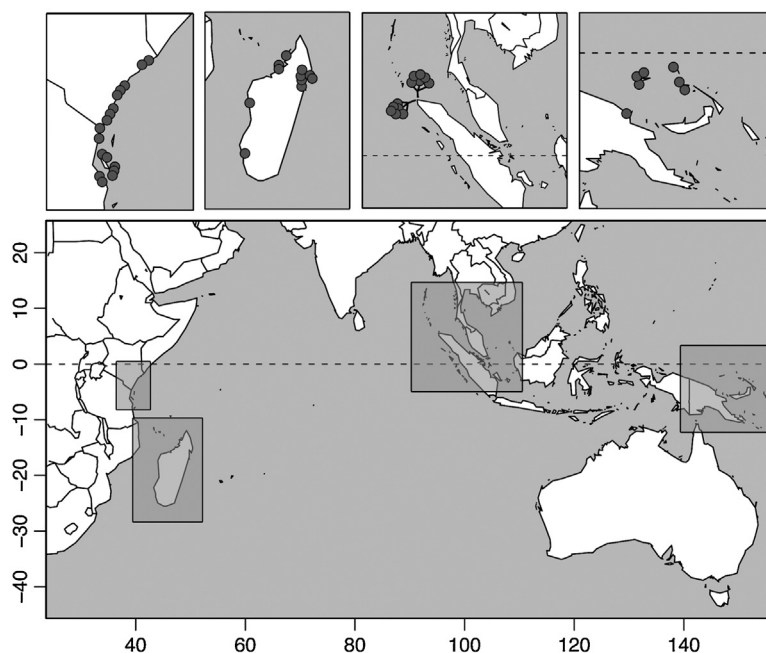


Fig. 1. Map of study sites.

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