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A systematic review of co-managed small-scale fisheries: Social diversity and adaptive management improve outcomes

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ABSTRACT

Small-scale fisheries are an important source of livelihoods, particularly among poor coastal populations. To improve fisheries' condition and maximize their contribution to human welfare, co-management approaches have proliferated worldwide. In this article, we conduct a systematic review of academic literature to examine the context and attributes of co-management initiatives in small-scale fisheries, and their expected outcomes. The review suggests that a supporting legal and institutional framework facilitates the emergence of co-management, because it contributes to clarify and legitimize property rights over fish resources. It is also found that co-management delivers both ecological and social benefits: it increases the abundance and habitat of species, fish catches, actors' participation, and the fishery's adaptive capacity, as well as it induces processes of social learning. Furthermore, co-management is more effective if artisanal fishers and diverse stakeholders become involved through an adaptive institutional framework. However, the review also suggests that more research is needed to discern when co-management initiatives can transform pre-existing conflicts, challenge power asymmetries and distribute benefits more equitably.

1. Introduction

Small-scale fisheries support the livelihoods of many coastal communities around the world (Kittinger et al., 2013). Ninety percent of the world's fishers are directly involved in small-scale fishing, i.e. about 34 million people, and another 100 million are involved in related activities (Béné et al., 2007; FAO, 2016a, 2016b). However, these fisheries face growing threats such as overfishing, competition with industrial fleets, water pollution, destruction of fish habitats, and an increasing human population and demand for land in coastal areas (FAO, 2016b). Increasing fishing pressure is leading to a reduction of marine biodiversity, which will over time make fisheries less resilient in a changing global climate (Brander, 2007). These threats are coupled with a limited capacity of many governments to develop and support management models that suit the multispecies character of small-scale fisheries and the numerous and dispersed landing sites characterizing them (Allison, 2001; Kolding et al., 2014).

The co-management of small-scale fisheries has emerged as a response to these threats and challenges, proliferating worldwide over the last decade (FAO, 2016b). Co-management promotes the joint management of the fisheries' resources by direct users, governments and other actors (Armitage et al., 2007a; Berkes, 2009). It is regarded as a participatory management model able to foster the sustainability of fisheries in biological, social, and economic terms (Costanza et al., 1998; Gutiérrez et al., 2011; Jentoft, 1989; Muñoz-Erickson et al., 2010; Pinkerton, 1989). Co-management can contribute to meet both fisheries and conservation objectives in marine ecosystems (Worm et al., 2009). It has also been shown that co-management can deliver greater benefits to local communities in both terrestrial and marine protected areas because, by strengthening tenure rights and decision-making processes, it can result in increased and more equitably shared economic benefits (Oldekop et al., 2016).

A previous review of industrial and artisanal fisheries (Gutiérrez et al., 2011) identifies a number of co-management attributes that are conducive to positive outcomes, including the presence of community leaders, strong social cohesion, individual or community fish quotas, and community-based protected areas. A meta-analysis focused on small-scale fisheries (Evans et al., 2011) demonstrates that co-

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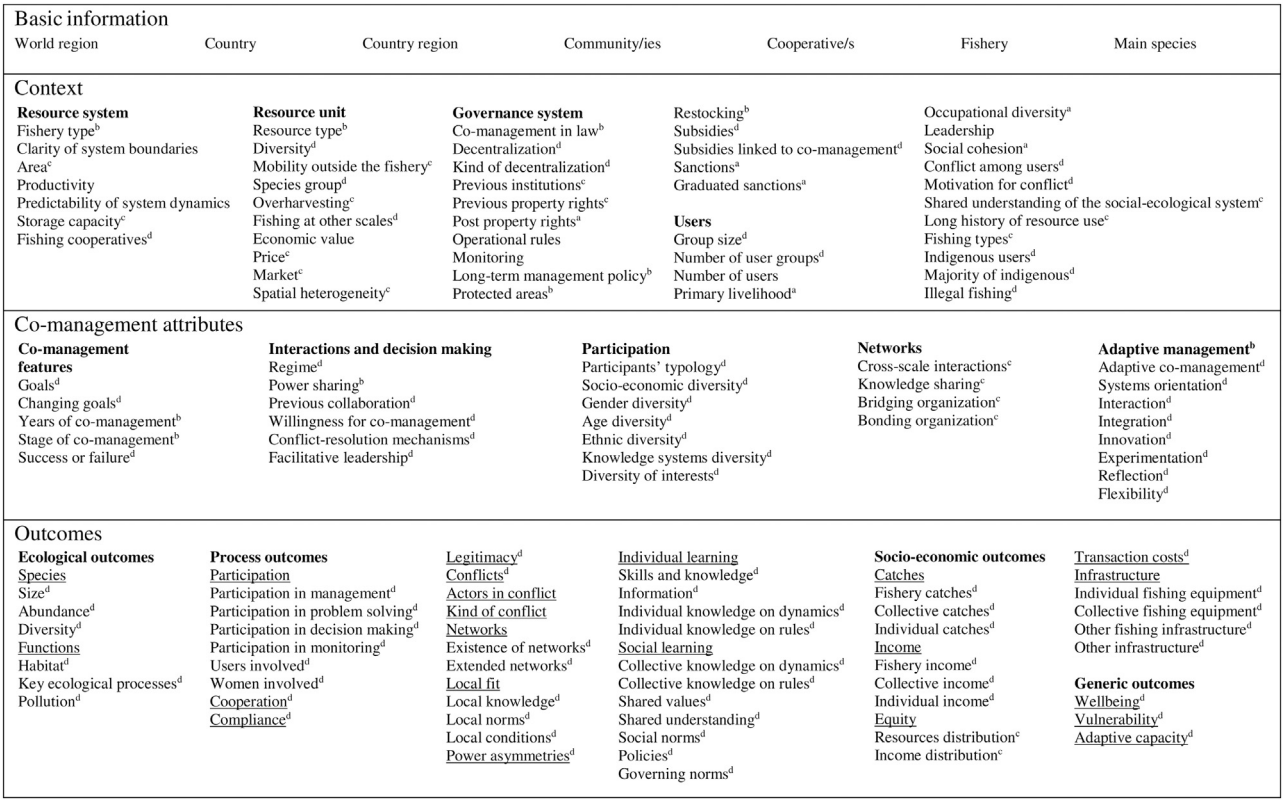

Fig. 1. A framework for the analysis of co-management in small-scale fisheries.
Each of the four variable domains includes variables and may also include categories (in bold). In the *outcomes* domain, underlined words with variables underneath refer to variable groupings. Variables without superscript specify variables from Ostrom's framework (Ostrom, 2009, 2007), superscript [a] specifies variables adapted from Ostrom's framework by other authors, superscript [b] specifies variables included in other works (Basurto et al., 2013; Ernst et al., 2013; Gutiérrez et al., 2011; MacNeil and Cinner, 2013), superscript [c] specifies variables adapted from Ostrom's framework, and superscript [d] specifies our own proposed variables.

management results in positive impacts on fishers' income and other sources of material wellbeing, as well as on the fishery's ecological condition. The study also shows that co-management improves social participation, compliance with the fishery's management rules, and local control over resources while reducing conflict. These findings echo others who previously argued that co-managed fisheries enhanced social equality (Loucks et al., 2003), resulted in more legitimate norms that better fit local conditions (Jentoft, 1989), fostered responsibility among resource users (Nielsen and Vedsmand, 1999), and reduced management costs (Carlsson and Berkes, 2005).

Further, in a context of climatic changes related to sea level rise, ocean temperature change and ocean acidification, which might modify coastal ecosystems and fish species' range and behaviours (Savo et al., 2017; Wong et al., 2014), the adoption of adaptive management principles can be critical for the sustainability of small-scale fisheries in the near future. Flexible, innovative and experimental management practices could in this context strengthen co-management initiatives and improve the capacity of the social-ecological system to better cope with uncertainty and surprise (Armitage et al., 2007b; Olsson et al., 2004).

Our systematic review builds on and contributes to co-management literature by examining the links between context, attributes and outcomes of co-managed small-scale fisheries through the lens of Ostrom's framework for the analysis of social-ecological systems (Mcginnis and Ostrom, 2014; Ostrom, 2009, 2007), which we complement with other indicators from adaptation and co-management literature (Basurto et al., 2013; Cinner et al., 2012; Ernst et al., 2013; Gutiérrez et al., 2011; Partelow, 2015; Plummer et al., 2014, 2012; Plummer and Armitage, 2007a; Plummer and FitzGibbon, 2007). To our knowledge, this is the first review of co-managed small-scale fisheries that includes adaptive management attributes to test how such attributes affect outcomes. Specifically, we ask: Which are the context and attributes of co-managed small-scale fisheries? Which outcomes does the co-management of small-scale fisheries result in? And, how are the context and attributes influencing co-management outcomes? By answering these questions, we contribute to a better understanding of how co-managed small-scale fisheries work as complex social-ecological systems while suggesting ways to improve their performance.

In what follows we introduce the analytical framework, explain the systematic review's protocol, and present our results organized according to our three questions. We first characterise the context and attributes of co-management, and we find that co-management usually develops in contexts of natural resource management decentralization, where co-management contributes to move away from an open access condition and it supports the creation of a new property regime and more legitimate management rules. Second, we show that co-management results in positive social and ecological outcomes overall, while its ability to resolve pre-existing conflicts, address power asymmetries or distribute benefits more equitably is less certain because these issues are scarcely reported in the literature reviewed. Finally, when looking at which context and attribute variables might be influencing co-management effects, we find that involving a diversity of actors and implementing adaptive management practices contribute to more positive outcomes. We discuss these and other findings in the light of relevant literature and we conclude by emphasizing the potential of co-management to foster the sustainability of small-scale fisheries and by highlighting research gaps.