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Self-empowerment and successful co-management in an artisanal fishing community: Santa Cruz de Miramar, Mexico

Francisco Javier De la Cruz-González[a], José Luis Patiño-Valencia[a], Ma. Consepción Luna-Raya[a], Andrés M. Cisneros-Montemayor[b,*]

[a] Instituto Nacional de Pesca, Calle Tortuga No.1, La Cruz de Huanacaxtle, Nayarit, 63732, Mexico
[b] Nereus Program, Institute for the Oceans and Fisheries, The University of British Columbia, Vancouver, BC, V6K1J5, Canada

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ABSTRACT

Artisanal fisheries for relatively sessile benthic organisms have become key test cases for developing and testing sustainability policies, as they can address challenges, such as limited enforcement capacity or uncertainty in biological information, by applying area and economics-based management and research methods that are difficult for highly mobile species. We use results from a Participatory Rural Appraisal to analyze the evolution of governance of oyster fisheries along the coast of Nayarit, Mexico, within a community management effort led by local fishers, and highlight key factors in success (and challenges) that are relevant for similar contexts in other regions. We particularly focus on the dynamics of local management, the identification of problems and solutions by fishers, and the integration of community management with the various stakeholders and institutions that participate in formal governance frameworks. These actions have led to self-imposed area and seasonal rotation of harvest to maximize per-unit value, with independent information showing concurrent increases in local oyster abundance and size. Fishers identified lack of enforcement capacity as a main barrier to sustainability, yet were eager to engage with relevant institutions to fill these gaps and continue community-led management that leverages their social cohesion, low production costs, and empirical knowledge of local markets to increase landed value while minimizing overfishing.

1. Introduction

Artisanal (or small-scale) fisheries are increasingly recognized as a cornerstone for coastal economies and livelihoods, particularly across the developing world (Allison and Ellis, 2001; Berkes et al., 2001; Pauly et al., 1997). Globally, these fisheries generate over 274 billion USD in revenue per year (Blackmore et al., 2015), supporting some 22 million small-scale fishers (Teh and Sumaila, 2013) and 38 million full time jobs for men, women, and children; an additional 100 million people are estimated to be involved in the small-scale post-harvest sector (Aheto et al., 2012; Béné et al., 2016). The downstream economic impacts of small-scale fisheries (SSF) can furthermore contribute significantly to national economies. In Mexico SSF account for 25% of total fisheries catch, yet 94% of fisheries employment (CONAPESCA, 2014). Nevertheless, SSF are highly vulnerable to ongoing social, economic, and climate change that can impact both their human context and the marine resources on which they rely. This creates an urgent need to develop policies to protect and ensure the sustainability of SSF worldwide, both in socioeconomic and ecological terms (Cochrane, 2002; Townsend et al., 2008). This study analyzes a case of successful co-management of oyster stocks by an artisanal fishing community in Mexico, highlighting the context and continuing challenges as well as their strategies and solutions.

A "small-scale fishery" has not been uniquely defined (Béné et al., 2007; Bjorndal et al., 2014; Schorr, 2005), but is generally understood as a context-specific (usually national-level) distinction between fishing sectors with relatively more labor- (as opposed to capital) intensive gears and operations. In Mexico, the artisanal fleet is distinguished by the use of *pangas*, ~7 m length, open-deck, fiberglass vessels with an outboard engine (usually < 200 hp). These can deploy any type of fishing gear, and season-based sequential species targeting is the norm. Nevertheless, many regions rely heavily on specific species that are locally abundant and have higher economic value (Luna-Raya et al., 2015).

Given the strong social component of SSF, "traditional" fisheries management policies—often having evolved in an industrial fishery

* Corresponding author.
E-mail addresses: francisco.delacruz@inapesca.gob.mx (F.J. De la Cruz-González), luis.patinno@inapesca.gob.mx (J.L. Patiño-Valencia), concepcion.luna@inapesca.gob.mx (M.C. Luna-Raya), a.cisneros@oceans.ubc.ca (A.M. Cisneros-Montemayor).

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context—have proven generally ineffective at addressing SSF issues including multi-stock fisheries, informal employment, and economic and social equity, among others. Co-management frameworks have thus become increasingly common and featured prominently around the world (Gutiérrez et al., 2011), though their role and efficacy varies widely (Defeo, 2015). For example, co-management can entail a formal process of multi-stakeholder information sharing, goal setting, policy development, and enforcement (Pomeroy and Douvere, 2008); a somewhat formal avenue by which fishers can make their concerns known to resource managers (Kalikoski et al., 2002); or an organization of fishers to make a formal claim to a defined set of marine resources (Defeo et al., 2016). Crucially, successful co-management frameworks should feature continued engagement and participation despite setbacks or disagreements (Jentoft et al., 1998).

There are various examples of successfully co-managed fisheries around the world, including in contexts somewhat similar to the case presented here. Defeo et al. (2016) note increases in CPUE and individual economic benefits following from catch share programs in shellfish fisheries, but highlight the role of bottom-up implementation of the management strategy in achieving success. Similarly, Gutiérrez et al. (2011) analyzed co-management efforts around the world (including artisanal and industrial fisheries) and found that, while quotas and area-based management were beneficial, the most important factors in explaining success were community cohesion and leadership. This solid organization of fishing groups in co-management has also been crucial for engaging with international guidelines including certification schemes, such as the case of lobster fisheries on the Pacific coast of Mexico (Pérez-Ramírez et al., 2012).

The artisanal oyster fishery of Nayarit, Mexico, is presented here as a case study of successful self-empowerment leading to active co-management of key marine resources, where fishers themselves identified the current status, challenges and potential solutions for their fishery. Their social and operational context, strategies, and outcomes were explored and analyzed through participatory research (including a Participatory Rural Appraisal) conducted including local fishers and researchers. The key objective of this research was to involve fishers in self-identifying challenges and developing strategies to overcome them. Results are discussed in the context of providing potential strategies to other small-scale fishing communities challenged with establishing economically and ecologically viable fisheries despite cross-scale pressures. This can furthermore be useful for government agencies, researchers and fishers in other regions as a potential blueprint for sustainable shellfish fisheries, emphasizing the role of fishers themselves and recognizing the challenges for community-led management.

2. Methods

2.1. Study area

The town of Santa Cruz de Miramar (SCM), Nayarit, is located on the central Pacific coast of Mexico (population 1564; Fig. 1). Fishing is the main industry in the community and supports most employment, with secondary industries being agriculture and commerce. Rock oyster (*Crassostrea iridescens*) is the most important target species (SCM is the largest oyster producer in the state), followed by lobster and finfishes. Organized fishers are integrated into the Fisheries Production Society Cooperative “Santa Cruz de Miramar” (henceforth, “the Cooperative”), which includes 68 partners with commercial fishing licenses. These are issued by the Mexican National Commission for Aquaculture and Fisheries (CONAPESCA), the agency in charge of management, monitoring, and enforcement of fisheries and aquaculture in the country.

Typically, rock oysters are hand-collected by free divers (i.e. not using hookas or SCUBA gear) using iron bars (~50 cm) to pry oysters off, and a nylon mesh bag for storage. Oyster fisheries occur from September to May, with a seasonal closure from June 1 to August 31 enacted by CONAPESCA to protect oyster spawning. In addition to the oyster fishery, and particularly during its seasonal closure, most fishers participate in agriculture-related activities. Nevertheless, oyster fisheries are the most important contributor to the local economy (De la Cruz-González et al., 2013).

In addition to fishers in the Cooperative, significant illegal fishing activity occurs in the area, both by local fishers and others from surrounding towns including El Monteón and San Blas. This is a key challenge for local fishers, who have no legal power to enforce self-enacted regulations and can only report illegal activity to local authorities. Unfortunately, enforcement continues to be inadequate and there is little trust that it can curtail illegal fishing (pers. obs.). Other challenges faced by legal fishers in the community include difficulty directly accessing markets and exerting more control over prices.

2.2. Participatory Rural Appraisal

A Participatory Rural Appraisal (PRA) (Cornwall, 2000; Norton et al., 2001; Townsley, 1996) was used as a framework for workshops aiming to define and analyze challenges and current and potential solutions for improved fisheries in Santa Cruz de Miramar. Participatory methods facilitate information sharing, analysis, and subsequent actions by stakeholders, allowing local users to share in responsibility for design and implementation of action plans (Kanji and Greenwood, 2001). A PRA particularly focuses on recognizing the value in people's knowledge, perceptions, and analytical capacity; it includes their social and economic context and attempts to visualize their complexity. Most importantly, any participatory approach, including the PRA, shares common principles including a defined methodology and systemic learning process; multiple perspectives; group learning; being context specific; facilitating experts and stakeholders; and leading to sustained action (Kanji and Greenwood, 2001). A PRA uses similar guidelines and tools to Rapid Rural Appraisals (RRA) but focuses on the fostering of participation by local people. Specific techniques are used to encourage greater involvement among people and to enable them to take the leading role in appraising conditions and identifying solutions. Generally, PRA is thought of as an initial step in a process of planning (Fig. 2) in which the community will take a progressively more important role (Townsley, 1996).

From April to May 2013, three formal workshops and multiple individual conversations focused on defining general characteristics of the area and fishing units and operation, followed by a structured identification, by local fishers, of challenges and possible solutions. Participants were initially asked only a small set of questions related to social and demographic characteristics, as well as the degree of dependence on the oyster fishery. The sequence of research activities was initially outlined in a work schedule (Fig. 2), though time spent on a given activity was flexible.

Once the objective and scope of the workshop was established, fishers were first asked to identify relevant aspects of their fishery and how these had changed over time. Fishers were not limited to any particular subject, with the discussion moving forward once all fishers were satisfied that a particular subject had been adequately discussed. A second theme involved the perception of participation by stakeholders and institutions in the oyster fishery, including aspects related to government, regulations, enforcement, or research. Again, fishers could decide when to move to the next theme, which involved the identification of specific challenges and solutions. This included noting specific points of problems or conflict, as well as their scope and importance. All fishers reviewed and discussed each issue at length, and suggested potential solutions.

A total of 60 fishers participated in workshops, which used the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis framework, informed through group discussion and individual surveys to analyze the internal (strengths, weaknesses) and external (opportunities, threats) factors affecting private firms, industries and regions (Helms and Nixon, 2010). Finally, fishers were asked to identify on a